

SOLA C-1 Engineering Report

South Lamar Blvd Improvements

Multi-modal Improvements on South Lamar
Boulevard: Barton Springs Road to Riverside Drive

South Lamar Blvd: Barton Springs Rd. to Riverside Dr.
June 29, 2020

PREPARED FOR: CITY OF AUSTIN
PREPARED BY: HDR ENGINEERING, INC.

DRAFT - SUBJECT TO CHANGE



Introduction

South Lamar Boulevard (SOLA) is currently designated as a Major Arterial and is a TxDOT owned facility. The project limits for construction of SOLA Segment C1 extend along South Lamar Boulevard approximately 280' south of Barton Springs Road and 100' north of Riverside Drive. The project terminates before the existing South Lamar Bridge. The proposed improvements include a 10' cycle track on both sides of South Lamar with sidewalk improvements to meet minimum mobility standards as defined by ATD. There will be a designated planting area of varying width located between the curb and cycle track. When minimum mobility standards are met there will be a second row of trees provided between the cycle track and the sidewalk. Existing trees will be protected in place.

The existing varying width median will be removed and replaced with a 13' median/turn lane. These changes result in a net decrease to impervious area of 1.5 Acres. Narrowing the center median and realigning the travel lanes results in a new proposed curb and gutter location. The existing inlets will be relocated to match this new curb location, with several new inlets added to satisfy spread width criteria.

This portion of South Lamar Boulevard is owned by Texas Department of Transportation (TxDOT), though it is maintained by the City of Austin (COA). TxDOT approvals are required in addition to COA approvals. The TxDOT approvals are managed through a separate process not described in this report.

Several waivers were requested for the project from the Transportation Criteria Manual (TCM), Utility Criteria Manual (UCM), and Drainage Criteria Manual (DCM). The improvements will all be maintained within the existing right-of-way or easements. No addition easements are needed for this project.

The following outlines the existing conditions and proposed improvements for the South Lamar Corridor Project with an emphasis on satisfying criteria for City of Austin Permitting.

Existing Conditions

The existing South Lamar Blvd. includes a center median of varying width, 3 travel lanes in each direction, and a sidewalk with tree planters. The existing right-of-way is typically 120' with variations near the Barton Springs intersection. There are three signalized intersection within the project limits; located at Barton Springs Road, Toomey Road, and Riverside Drive. Butler Road also intersects with South Lamar as a stop controlled intersection. Left turn movements are restricted at Butler, with only a southbound left from South Lamar to Butler allowed.

Water/Wastewater

Austin Water has one water line exceeding 20" within the project limits. Located on the north side of Barton Springs Road and South Lamar Boulevard is a 24" water line. This line runs east-west and is considered to be out of conflict with the proposed improvements. Several test holes are being collected to confirm clearance between the existing water line and proposed improvements.

There is an anticipated conflict between the proposed storm drain system and an existing 6" water line at the Butler Road intersection, on the west side of South Lamar. A relocated detail will be prepared as

part of the final submittal. Other water lines located within the project limits are not in conflict and do not exceed 20" in diameter.

There is an existing 54" wastewater line location on the north side of the Toomey Road/South Lamar Boulevard intersection and runs east-west. Utility records indicate the wastewater line is located approx. 30' deep and will not be in conflict with any of the proposed infrastructure. A 30" wastewater line is located near the center of the Riverside Drive and South Lamar Boulevard intersection and runs east-west. Utility records indicate the wastewater line is located 30' deep and will not be in conflict with the proposed improvements.

The project will include an irrigation system to the proposed planting/landscape areas. The new irrigation system will tap the existing 6" water line near Butler Road. This tap will require review and approval from Austin Water.

Floodplain

The project is located within two 100-year floodplains. The first is the 100-year floodplain for Lady Bird Lake and the second is the 100-year floodplain for West Bouldin Creek. Floodplains were confirmed with the latest FEMA mapping and City of Austin FloodPro Mapper for the Atlas-14 estimated floodplain for West Bouldin Creek.

The project is also located within an urban watershed regulatory area. This project is not within the Barton Springs Zone.

For urban watersheds, the critical water quality zone is defined as equal to the 100-year floodplain. The critical water quality zone is shown in the Project Overview (**Appendix A**) as a 100' offset of the shoreline, assumed to be the 429' contour line.

Cut/Fill

The project will produce a net fill in areas where the curb is being relocated and a raised and protected bike lane or cycle track is provided. Reconstruction of existing driveways and side streets will also result in a net fill due to the recommended raised crossings for pedestrian and bicycle safety.

Drainage

The project site is located within the West Bouldin Creek (WBO) and Lady Bird Lake (LBL) Watersheds which are both classified as an Urban Watershed by the City of Austin.

Existing Drainage Conditions

The project limits generally consist of South Lamar Boulevard from Barton Springs Road to West Riverside Drive, right-of-way to right-of-way, and is outside of the Critical Water Quality Zone (CWQZ) and Water Quality Transition Zone (WQTZ) areas. Offsite runoff generally flows from west to east where South Lamar captures the runoff by curb and grates inlets where it enters a closed conduit storm system. The West Bouldin Creek and Lady Bird Lake Watersheds divide is located approximately 140-feet north of the South Lamar and Toomey Road intersection. At this divide, runoff is conveyed to the north via South Lamar Road entering Drainage System 15. The Barton Springs Road intersection is a low

point in the West Bouldin Creek Watershed. Runoff is conveyed from south of Barton Springs to the north, west of South Lamar to the east, and from Toomey Road to the south. Drainage Systems 12, 13 and 14 capture runoff from these areas.

Drainage System 15 outfalls directly into Lady Bird Lake approximately 300-feet east of South Lamar. Drainage Systems 12, 13 and 14 outfall into West Bouldin Creek which is a tributary to Lady Bird Lake. West Bouldin Creek is undersized and the backwater effect from this channel results in the mapped 100-yr, 24-hr floodplain limits at the intersection of South Lamar and Barton Springs Road.

Proposed Drainage Design

DESIGN CRITERIA - HYDROLOGIC ANALYSIS CRITERIA

Peak flow rate calculations were performed using the Rational Method. Per the COA DCM 2.3.0, the Rational Method is accepted as adequate for drainage areas totaling 100 acres or less. The total combined drainage area studied as part of this project is 10.17 acres with the largest individual sub-basin area totaling 0.784 acres. An existing conditions drainage area map is provided in **Appendix B**. Additional off-site sub-basins that contribute to each drainage system were included in the City provided StormCAD model and these basins were not changed from what was provided.

Delineation of the drainage areas was completed using a combination data including drainage areas exported from COA StormCAD Models, survey data, and 2-foot contours downloaded from the COA GIS database.

Runoff coefficients were developed using aerial photography and contours to determine areas of undeveloped and developed surfaces along with the approximate surface slope. The areas for each surface type were then associated with a runoff coefficient based on Table 2-1 in the COA DCM (2019) and combined to create a composite runoff coefficient.

Time of concentration calculations were performed in accordance with the NRCS method as noted in COA DCM 2.4.2. The minimum times of concentration used were 5 minutes. Manning's "n" values used in estimating channel flow times of concentration were referenced from Table 2-2 in the COA DCM.

The rainfall intensity values for use in the Rational Method were calculated based upon the intensity equation (Equation 2-8) listed in COA DCM 2.4.3.

The resulting existing condition peak surface runoff flows developed for this project are provided in **Table 1** below.

Table-1 – Existing Conditions Runoff

Drainage System	Drainage Area (ac.)	Q ₂	Q ₁₀	Q ₂₅	Q ₁₀₀
12 (WBO)	2.75	13.61	20.73	25.44	33.27
13 (WBO)	1.25	6.22	9.47	11.62	15.20
14 (WBO)	4.07	20.65	31.46	38.60	50.49
15 (LBL)	2.10	10.25	15.62	19.17	25.07

COLLECTION

Collection of stormwater runoff is to be captured in the same manner as the existing conditions; surface runoff to a series of curb inlets where it enters the existing storm systems. Existing grate inlets are proposed to be replaced with standard curb inlets. The COA DCM 1.2.2 states that street curbs, gutters, inlets and storm sewers shall be designed to intercept, contain, and transport all runoff from the 25-year frequency storm event.

COA DCM 3.2.0 states that the flow of water in gutters of typical streets during the 25-year frequency storm shall be contained below the top of curb and shall maintain a clear width of 12 feet in each direction for a collector street. The flow of water shall be limited to a maximum of 6" above the top of crown during the 100-year storm event and must be contained within the defined right-of-way and easements. For on-grade inlets the maximum allowable ponded depth is 7-inches (curb depth + rise across sidewalk). Due to the reduction in lanes along South Lamar, the current inlet spacing is not sufficient to meet the DCM requirement of providing 12 feet of clear width in each direction. Additional inlets were added to meet this requirement.

CONVEYANCE

COA DCM 5.2.0 states that the 25-year hydraulic grade line (HGL) shall remain six inches below the theoretical gutter flow line of the storm drain inlets.

COA DCM 5.3.2 states that the maximum permissible velocity for storm drains in the trunk line during the 25-year frequency storm is 20 fps.

PROPOSED IMPROVEMENTS

The proposed conditions will keep the drainage patterns largely the same, with minor changes within each drainage system to include the addition of inlets to meet the 12-foot clear width in each direction. The drainage patterns were maintained to prevent an increase in flow at any of the existing outfalls. The offsite drainage areas that contribute to the project are assumed to continue conveying runoff to the roadway at the same rates as existing conditions. However, there are several planned developments along South Lamar that are proposing minimal changes to the overall systems. These developments were considered as much as possible using the proposed improvements plans for each as they stand at the current time. These developments were considered in the existing conditions analysis to ensure an appropriate comparison from existing to proposed conditions. A proposed drainage area map is included in **Appendix C**.

In accordance with COA DCM, stormwater runoff peak flow rates leaving the site for 2-, 10-, 25-, and 100-year storm events must be equal to or lower than the peak flow rates for the runoff leaving the previously existing site. Due to the reduction in impervious cover within each drainage system, there are no adverse impacts as a result of surface runoff. See **Table 2** for proposed condition peak flows.

Table 2 – Proposed Conditions Runoff

Drainage System	Drainage Area (ac.)	Q ₂	Q ₁₀	Q ₂₅	Q ₁₀₀
12 (WBO)	2.75	13.53	20.62	25.30	33.09
13 (WBO)	1.25	6.11	9.31	11.43	14.95
14 (WBO)	4.07	20.46	31.17	38.25	50.03
15 (LBL)	2.10	10.04	15.30	18.77	24.56

The storm system trunk line is to remain untouched as part of this project. Existing inlets will be replaced with new inlets and will tie back into the existing laterals where possible. In areas that additional inlets are required to meet the 12-foot clear width in each direction, the additional inlets are proposed to be connected via a new lateral system that ties back into the existing lateral. **Appendix D** provides a summary of the existing and proposed inlet calculations including the allowable spread and calculated spread.

Overall, the modeling shows no adverse impact to the existing trunk line as a result of adding inlets. **Appendix E** show the proposed underground storm system layout. A summary of the existing and proposed condition conduit calculations is provided in **Appendix F**. These calculations include one pipe segment upstream of the project and continue to the system outfall.

Impervious Cover

The project is located within the urban watershed, so net site area calculations do not apply.

Table-3 below shows the impervious area calculations for the proposed project:

Table-3 – Impervious Area Summary

South Lamar Blvd. C1 – Impervious Cover Summary							
Outfall	Existing		Proposed		New Impervious (AC)	Reconstructed Impervious (AC)	Total Added Impervious (AC)
	Impervious (AC)	Pervious (AC)	Impervious (AC)	Pervious (AC)			
West Bouldin Creek (WBO)	1.63	0.61	1.23	1.01	0.01	0.000	0.01
Tributary to WBO	1.83	0.51	1.15	1.19	0.12	0.005	0.12
Lady Bird Lake	1.21	0.41	0.79	0.84	0.07	0.002	0.08

As shown in the table above, overall impervious area is decreased for the project. However, existing pervious areas are being reconstructed as impervious areas, resulting in the amount of total added impervious area in the last column. The additional impervious areas resulting from the project will trigger an impact to water quality.

Water Quality

This site is designing full infiltration rain gardens to capture the required water quality volume (~990 cu. ft.) to the best extent possible without making significant impacts to other aspects of the design. The rain garden soils will be Colorado River Terrace Deposits as identified in the geotechnical boring logs. The infiltration rate for river terrace deposits exceeds the minimum requirements in the Environmental Criteria Manual (ECM) section 1.6.7(H) for full infiltration rain gardens. The neighboring site (Zach Scott Theater) used an infiltration rate of 0.53 inches per hour (SPC-2010-0061C) in the rain garden design. This site will assume a rate of 0.25 inches per hour.

Per ECM 1.6.7(H) Rain Gardens:

“Soil conditions – When siting a full or partial infiltration rain garden, appropriate soil conditions must be present. The depth to an impermeable layer must be at least 12 inches below the bottom of the rain garden. For full infiltration rain gardens, the underlying native soil must have a design infiltration rate that will draw down the full ponded depth in less than 48 hours. For example, for a 12-inch maximum ponding depth, the design infiltration rate must be at least 0.25 inches per hour. For a 6-inch maximum ponding depth, the design infiltration rate must be at least 0.13 inches per hour. The design infiltration rate is based on applying at least a factor of safety of two (2) to the measured steady state saturated infiltration rate (i.e., the design infiltration rate is equal to one-half of the measured infiltration rate). A higher factor of safety may be used at the discretion of the design engineer to take into variability associated with assessment methods, soil texture, soil uniformity, influent sediment loads, and compaction during construction.”

Additional water quality will also be provided for the outfall to Lady Bird Lake by the Taco PUD (SP-2019-0056C) by a green water quality pond located within public right-of-way. **Appendix G** includes the relevant sheets from the referenced Taco PUD (SP-2019-0056C). Water quality details related to this permit application are provided in **Appendix H**.

Landscape

Landscape areas provided at the back of curb will vary in width from a minimum of 6.5' to 11.5'. Planting details can be found in the Landscape/Site Plan Sheets. Existing trees will be protected per the Tree Protection Plan and in accordance with City of Austin guidance.

Soil Survey

Per USDA Web Soil Survey the site contains mostly Lower Colorado soils.

Requested Waivers and Variances

Several waivers are being requested for the SOLA-C1 project. These waivers and associated code are listed below:

1. Transportation Criteria Manual (TCM) – Code 6.2.3.A
2. Utility Criteria Manual (UCM) – Code 2.9.2.B.20
3. Drainage Criteria Manual (DCM) – Code 3.2.2 and Code 5.2.0.H

Critical Environmental Features

Critical environmental features near and within the project limits include the bluff located on the west side of South Lamar Boulevard, south of the Barton Springs Road intersection. Also within the project limits are the 100-year floodplain for both West Bouldin Creek and Lady Bird Lake, as well as, the critical water quality zone for Lady Bird Lake. These environmental features are all shown on the Project Overview sheet, provided in **Appendix A**.

The aforementioned bluff is located up gradient and outside the LOC of this project. An environmental resource inventory (ERI) was prepared for the entire SOLA corridor (extending from Riverside Drive to State Highway 71).

Section C1, detailed in this report, and is being permitted with this site plan extending from 280' south of Barton Springs Road and 100' north of Riverside Drive.

Utilities

In addition to the 24" Austin Water line, 54" wastewater line, and 30" wastewater line there is an existing AT&T duct bank running north-south on the west side of South Lamar. The duct is approx. 3' to 7' deep. The improvements have been designed to avoid impacts to this duct bank but subsurface utility engineering is being completed to verify depths in areas of potential conflicts.

The existing 4" gas line adjacent the Car Wash property at the southwest corner of South Lamar and Barton Springs is to be relocated before construction. The existing 2" gas line parallel Butler Rd is to be lowered in place prior to construction. Coordination for these relocations has been initiated with the owner(s) of the utility line(s).

Spoils Disposal

Any spoils resulting from the full depth excavation of the existing medians will be properly removed from the site. In addition, proper erosion control measures will be taken during excavation to prevent any spoils from leaving the construction site.

Onsite soils excavated should be reused if accepted for tree planting.

A spoils storage area will be determined by the contractor with approval from the engineer. The storage may not be located in the 100-year floodplain, within a creek channel, or on land with slope greater than 15%.

Miscellaneous

No erosion hazards zones are adjacent or within the project limits.

City of Austin and Texas Commission on Environmental Quality (TCEQ) provide regulatory guidance for the Edwards Aquifer. The project is not located within the Edwards Aquifer but is located within the Edwards Aquifer Transition Zone.

City of Austin parkland is located adjacent to the project, north of the improvements at the South Lamar Riverside intersection. There are no impacts on COA parkland.

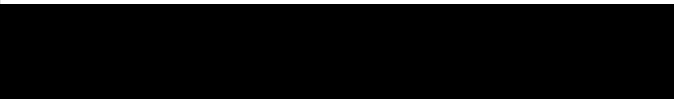


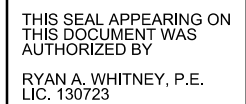
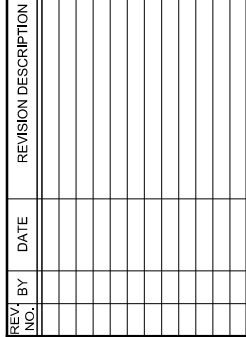
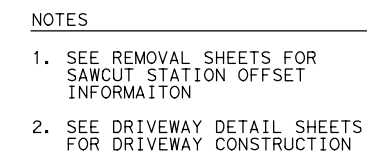
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APPENDIX



PROJECT OVERVIEW





CITY OF AUSTIN
austin
MOTION
2016 MOBILITY BOND

HORIZONTAL SCALE IN FEET

28 OF 269

 HDR Engineering, Inc.
4401 West Gate Boulevard
Austin, TX 78745
Texas Registered
Engineering Firm F-754



B

APPENDIX



EXISTING DRAINAGE AREAS



SOUTH LAMAR C1 - HYDROLOGIC SUMMARY (EXISTING CONDITIONS)														
Drainage System	Drainage Area ID	Inlet ID	Drainage Area (ac.)	TC (min.)	Runoff Coeff. C	I 2 Yr	I 10 Yr	I 25 Yr	I 100 Yr	Q 2 Yr	Q 10 Yr	Q 25 Yr	Q 100 Yr	Q
12	E1-1a	CI-01-WBO-12	0.645	5.0	0.811	6.3079	6.6091	1.7921	5.4233	3.30	5.03	6.17	8.07	
	E1-2a	CI-02-WBO-12	0.221	5.0	0.772	6.3079	6.6091	1.7921	5.4233	1.08	1.64	2.01	2.63	
	E1-3a	CI-03-WBO-12	0.227	5.0	0.863	6.3079	6.6091	1.7921	5.4233	1.24	1.88	2.31	3.02	
	O1-1	CI-01-WBO-12	0.752	5.0	0.862	6.3079	6.6091	1.7921	5.4233	4.09	6.23	7.64	9.99	
	O1-2	CI-02-WBO-12	0.120	5.0	0.880	6.3079	6.6091	1.7921	5.4233	0.67	1.01	1.24	1.63	
	O1-3	CI-03-WBO-12	0.784	5.0	0.656	6.3079	6.6091	1.7921	5.4233	3.24	4.94	6.06	7.93	
	Subtotal=		2.749							13.61	20.73	25.44	33.27	
	E2-1a	SURFACE	0.043	5.0	0.860	6.3079	6.6091	1.7921	5.4233	0.23	0.36	0.44	0.57	
	E2-2a	CI-04-WBO-13	0.567	5.0	0.862	6.3079	6.6091	1.7921	5.4233	3.08	4.70	5.77	7.54	
	E2-3a	CI-05-WBO-13	0.182	5.0	0.825	6.3079	6.6091	1.7921	5.4233	0.95	1.44	1.77	2.32	
13	O2-1	CI-04-WBO-13	0.291	5.0	0.562	6.3079	6.6091	1.7921	5.4233	1.03	1.57	1.93	2.52	
	O2-2	CI-05-WBO-13	0.166	5.0	0.880	6.3079	6.6091	1.7921	5.4233	0.92	1.40	1.72	2.25	
	Subtotal=		1.249							6.22	9.47	11.62	15.20	
	E3-1a	CI-06-WBO-14	0.315	5.0	0.818	6.3079	6.6091	1.7921	5.4233	1.62	2.47	3.04	3.97	
	E3-2a	CI-07-WBO-14	0.581	5.0	0.826	6.3079	6.6091	1.7921	5.4233	3.03	4.61	5.66	7.40	
	E3-3a	CI-08-WBO-14	0.305	5.0	0.838	6.3079	6.6091	1.7921	5.4233	1.61	2.46	3.01	3.94	
	E3-4a	SURFACE	0.153	5.0	0.790	6.3079	6.6091	1.7921	5.4233	0.76	1.16	1.43	1.87	
	E3-5a	CI-09-WBO-14	0.137	5.0	0.792	6.3079	6.6091	1.7921	5.4233	0.68	1.04	1.28	1.67	
	E3-6a	CI-10-WBO-14	0.474	5.0	0.816	6.3079	6.6091	1.7921	5.4233	2.44	3.72	4.56	5.97	
	E3-7a	CI-11-WBO-14	0.348	5.0	0.824	6.3079	6.6091	1.7921	5.4233	1.81	2.75	3.38	4.42	
14	E3-8a	SURFACE	0.458	5.0	0.668	6.3079	6.6091	1.7921	5.4233	1.93	2.94	3.61	4.72	
	O3-1	CI-07-WBO-14	0.583	5.0	0.793	6.3079	6.6091	1.7921	5.4233	2.92	4.44	5.45	7.13	
	O3-2	CI-08-WBO-14	0.159	5.0	0.860	6.3079	6.6091	1.7921	5.4233	0.86	1.31	1.61	2.11	
	O3-3	CI-10-WBO-14	0.115	5.0	0.860	6.3079	6.6091	1.7921	5.4233	0.62	0.95	1.17	1.53	
	O3-4	CI-10-WBO-14	0.174	5.0	0.809	6.3079	6.6091	1.7921	5.4233	0.89	1.35	1.66	2.17	
	O3-5	CI-09-WBO-14	0.191	5.0	0.860	6.3079	6.6091	1.7921	5.4233	1.04	1.58	1.94	2.53	
	O3-6	CI-11-WBO-14	0.080	5.0	0.860	6.3079	6.6091	1.7921	5.4233	0.43	0.66	0.81	1.06	
	Subtotal=		4.073							20.65	31.46	38.60	50.49	
	E4-1a	SURFACE	0.121	5.0	0.838	6.3079	6.6091	1.7921	5.4233	0.64	0.97	1.20	1.56	
	E4-2a	CI-01-LBL-15	0.542	5.0	0.801	6.3079	6.6091	1.7921	5.4233	2.74	4.17	5.12	6.70	
15	E4-3a	CI-02-LBL-15	0.563	5.0	0.777	6.3079	6.6091	1.7921	5.4233	2.76	4.20	5.16	6.75	
	E4-4a	SURFACE	0.290	5.0	0.802	6.3079	6.6091	1.7921	5.4233	1.47	2.23	2.74	3.56	
	E4-5a	SURFACE	0.221	5.0	0.801	6.3079	6.6091	1.7921	5.4233	1.12	1.70	2.09	2.73	
	O4-1	CI-02-LBL-15	0.359	5.0	0.678	6.3079	6.6091	1.7921	5.4233	1.53	2.34	2.87	3.75	
	Subtotal=		2.096							10.25	15.62	19.17	25.07	
	TOTAL AREA:		10.17											

REVISION DESCRIPTION

DATE

REV. BY

NO.

STATE OF TEXAS

BRETT A. LARSON

113028

LICENSED PROFESSIONAL ENGINEER

06/24/2020

CITY OF AUSTIN, TEXAS

AUSTIN TRANSPORTATION

SOUTH LAMAR BOULEVARD-C1

EXISTING DRAINAGE AREA MAP

CITY OF AUSTIN

austin

MOTION

2016 MOBILITY BOND

NOTES

NAME

DATE

SURVEY BY

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SP-2020-0084D

199 OF 300



SOUTH LAMAR C1 - HYDROLOGIC SUMMARY (EXISTING CONDITIONS)														
Drainage System	Drainage Area ID	Inlet ID	Drainage Area (ac.)	TC (min.)	Runoff Coeff. C	I 2 Yr	I 10 Yr	I 25 Yr	I 100 Yr	Q 2 Yr	Q 10 Yr	Q 25 Yr	Q 100 Yr	Q 100 Yr
12	E1-1a	CI-01-WBO-12	0.645	5.0	0.811	6.3079	9.6091	11.7921	15.4233	3.30	5.03	6.17	8.07	
	E1-2a	CI-02-WBO-12	0.221	5.0	0.772	6.3079	9.6091	11.7921	15.4233	1.08	1.64	2.01	2.63	
	E1-3a	CI-03-WBO-12	0.227	5.0	0.863	6.3079	9.6091	11.7921	15.4233	1.24	1.88	2.31	3.02	
	O1-1	CI-01-WBO-12	0.752	5.0	0.862	6.3079	9.6091	11.7921	15.4233	4.09	6.23	7.64	9.99	
	O1-2	CI-02-WBO-12	0.120	5.0	0.880	6.3079	9.6091	11.7921	15.4233	0.67	1.01	1.24	1.63	
13	O1-3	CI-03-WBO-12	0.784	5.0	0.656	6.3079	9.6091	11.7921	15.4233	3.24	4.94	6.06	7.93	
	Subtotal =		2.749							13.61	20.73	25.44	33.27	
	E2-1a	SURFACE	0.043	5.0	0.860	6.3079	9.6091	11.7921	15.4233	0.23	0.36	0.44	0.57	
	E2-2a	CI-04-WBO-13	0.567	5.0	0.862	6.3079	9.6091	11.7921	15.4233	3.08	4.70	5.77	7.54	
	E2-3a	CI-05-WBO-13	0.182	5.0	0.825	6.3079	9.6091	11.7921	15.4233	0.95	1.44	1.77	2.32	
14	O2-1	CI-04-WBO-13	0.291	5.0	0.562	6.3079	9.6091	11.7921	15.4233	1.03	1.57	1.93	2.52	
	O2-2	CI-05-WBO-13	0.166	5.0	0.880	6.3079	9.6091	11.7921	15.4233	0.92	1.40	1.72	2.25	
	Subtotal =		1.249							6.22	9.47	11.62	15.20	
	E3-1a	CI-06-WBO-14	0.315	5.0	0.818	6.3079	9.6091	11.7921	15.4233	1.62	2.47	3.04	3.97	
	E3-2a	GI-07-WBO-14	0.581	5.0	0.826	6.3079	9.6091	11.7921	15.4233	3.03	4.61	5.66	7.40	
15	E3-3a	CI-08-WBO-14	0.305	5.0	0.838	6.3079	9.6091	11.7921	15.4233	1.61	2.46	3.01	3.94	
	E3-4a	SURFACE	0.153	5.0	0.790	6.3079	9.6091	11.7921	15.4233	0.76	1.16	1.43	1.87	
	E3-5a	GI-09-WBO-14	0.137	5.0	0.792	6.3079	9.6091	11.7921	15.4233	0.68	1.04	1.28	1.67	
	E3-6a	CI-10-WBO-14	0.474	5.0	0.816	6.3079	9.6091	11.7921	15.4233	2.44	3.72	4.56	5.97	
	E3-7a	CI-11-WBO-14	0.348	5.0	0.824	6.3079	9.6091	11.7921	15.4233	1.81	2.75	3.38	4.42	
16	E3-8a	SURFACE	0.458	5.0	0.668	6.3079	9.6091	11.7921	15.4233	1.93	2.94	3.61	4.72	
	O3-1	GI-07-WBO-14	0.583	5.0	0.793	6.3079	9.6091	11.7921	15.4233	2.92	4.44	5.45	7.13	
	O3-2	CI-08-WBO-14	0.159	5.0	0.860	6.3079	9.6091	11.7921	15.4233	0.86	1.31	1.61	2.11	
	O3-3	CI-10-WBO-14	0.115	5.0	0.860	6.3079	9.6091	11.7921	15.4233	0.62	0.95	1.17	1.53	
	O3-4	CI-10-WBO-14	0.174	5.0	0.809	6.3079	9.6091	11.7921	15.4233	0.89	1.35	1.66	2.17	
17	O3-5	GI-09-WBO-14	0.191	5.0	0.860	6.3079	9.6091	11.7921	15.4233	1.04	1.58	1.94	2.53	
	O3-6	CI-11-WBO-14	0.080	5.0	0.860	6.3079	9.6091	11.7921	15.4233	0.43	0.66	0.81	1.06	
	Subtotal =		4.073							20.65	31.46	38.60	50.49	
	E4-1a	SURFACE	0.121	5.0	0.838	6.3079	9.6091	11.7921	15.4233	0.64	0.97	1.20	1.56	
	E4-2a	CI-01-LBL-15	0.542	5.0	0.801	6.3079	9.6091	11.7921	15.4233	2.74	4.17	5.12	6.70	
18	E4-3a	CI-02-LBL-15	0.563	5.0	0.777	6.3079	9.6091	11.7921	15.4233	2.76	4.20	5.16	6.75	
	E4-4a	SURFACE	0.290	5.0	0.802	6.3079	9.6091	11.7921	15.4233	1.47	2.23	2.74	3.56	
	E4-5a	SURFACE	0.221	5.0	0.801	6.3079	9.6091	11.7921	15.4233	1.12	1.70	2.09	2.73	
	O4-1	CI-02-LBL-15	0.359	5.0	0.678	6.3079	9.6091	11.7921	15.4233	1.53	2.34	2.87	3.75	
	Subtotal =		2.096							10.25	15.62	19.17	25.07	
			TOTAL AREA:	10.17										

REVISION DESCRIPTION

REV. BY

DATE

NO.

STATE OF TEXAS

BRETT A. LARSON

113028

LICENSED PROFESSIONAL ENGINEER

06/24/2020

CITY OF AUSTIN, TEXAS

AUSTIN TRANSPORTATION

SOUTH LAMAR BOULEVARD-C1

EXISTING DRAINAGE AREA MAP

CITY OF AUSTIN

austin

MOTION

2016 MOBILITY BOND

NOTES

NAME

DATE

SURVEY BY

DRAWN BY

DESIGNED BY

CHECKED BY

REVIEWED BY

BT

BT

BAL

BAL

06/20

06/20

06/20

06/20

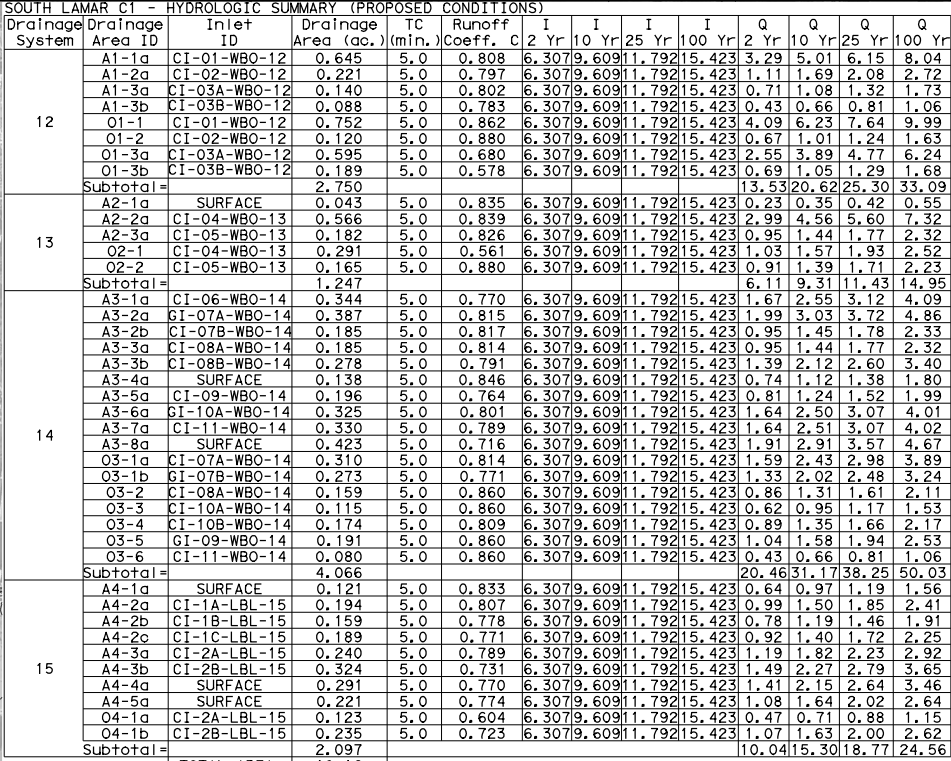
SP-2020-0084D

200 OF 300

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APPENDIX

PROPOSED DRAINAGE AREAS



CITY OF AUSTIN
austin
MOTION
2016 MOBILITY BOND

SP-2020-0084D
201 OF 300



PROPOSED DRAINAGE AREA MAP

NOTES	NAME	DATE
SURVEY BY		
DRAWN BY	BT	06/20
DESIGNED BY	BT	06/20
CHECKED BY	BAL	06/20
REVIEWED BY	BAL	06/20

SP-2020-0084D

202 OF **300**

D

APPENDIX



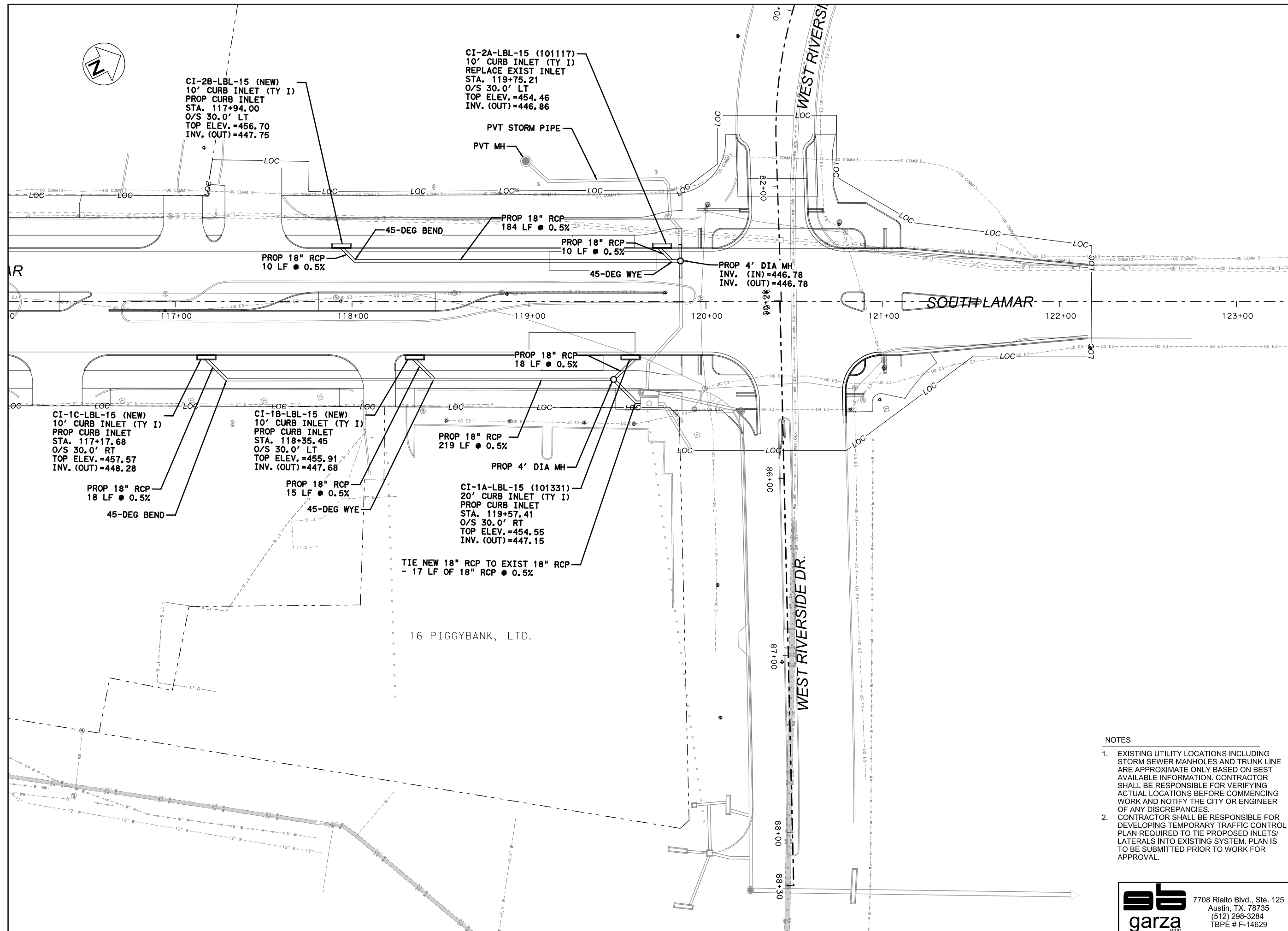
EXISTING & PROPOSED
INLET CALCULATIONS



A large, bold, black letter 'E' that serves as a background element for the title.

APPENDIX

PROPOSED DRAINAGE LAYOUT



A large, bold, black letter 'F' is positioned to the right of a large orange rectangular block. The 'F' is composed of a vertical stem and two horizontal bars.

APPENDIX

EXISTING & PROPOSED
CONDUIT CALCULATIONS

Label	COA STRUCTURE ID	Rise (Unified) (ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Stop) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)
System 12										
L-1-WBO-12	CO-22	4.5	173.60	10.92	443.37	443.40	453.16	453.28	455.01	455.14
L-2-WBO-12	CO-21	4.5	174.42	10.97	443.40	443.60	453.54	454.28	455.41	456.15
L-3-WBO-12	261668	4.5	166.23	10.45	443.60	444.11	454.29	455.92	455.98	457.61
L-4-WBO-12	261650	4.5	166.65	10.48	444.11	444.89	455.99	456.33	457.70	458.04
L-5-WBO-12	261649	4.5	143.94	9.05	444.89	446.15	456.73	457.14	458.01	458.41
L-6-WBO-12	260404	4.0	144.11	11.47	446.15	446.35	456.50	456.73	458.54	458.77
L-7-WBO-12	260401	4.0	142.17	11.31	446.35	446.91	456.78	457.40	458.76	459.39
L-8-WBO-12	260396	4.0	131.10	10.43	446.91	447.46	459.61	460.33	461.30	462.02
L-9-WBO-12	260393	4.0	92.89	7.39	447.46	447.90	462.11	462.40	462.96	463.25
LAT-3-WBO-12	260400	1.5	15.99	9.05	446.91	447.73	459.86	460.74	461.13	462.01
System 13										
L-1-WBO-13	227149	4.5	37.86	1.98	443.25	443.27	453.16	453.17	453.22	453.23
L-2-WBO-13	227148-A	4.5	37.97	2.39	443.27	443.30	453.14	453.15	453.23	453.23
L-3-WBO-13	227148-B	4.5	38.12	2.40	443.30	443.34	453.15	453.16	453.24	453.25
L-4-WBO-13	227148-C	4.5	38.78	2.44	443.34	443.51	453.18	453.22	453.27	453.31
L-5-WBO-13	261654	4.5	38.31	2.41	443.51	443.80	453.28	453.36	453.37	453.45
L-6-WBO-13	22980	4.5	39.11	2.46	443.80	444.20	453.36	453.40	453.45	453.49
L-7-WBO-13	23209-A	4.5	39.86	2.51	444.20	444.40	453.40	453.44	453.50	453.53
L-8-WBO-13	23209-B	4.5	40.21	2.53	444.40	444.50	453.44	453.46	453.54	453.56
L-9-WBO-13	381909	4.5	40.37	2.54	444.50	444.54	453.46	453.47	453.56	453.57
L-10-WBO-13	381908	4.5	40.70	2.56	444.54	444.65	453.47	453.48	453.57	453.58
L-11-WBO-13	381907	4.3	40.88	2.88	444.65	444.72	453.46	453.48	453.59	453.60
LAT-1-WBO-13	261252	1.5	3.51	1.99	444.72	447.32	453.63	453.66	453.69	453.72
LAT-2A(1)-WBO-13	256816-A	2.0	7.64	2.43	444.72	446.76	453.61	453.66	453.70	453.75
LAT-2A(2)-WBO-13	256816-B	2.0	7.68	2.44	446.76	447.91	453.73	453.75	453.83	453.84
LAT-2A(3)-WBO-13	CO-7	1.5	1.95	1.10	447.91	448.20	451.08	451.08	453.85	451.10
System 14										
L-1-WBO-14	23012	3.5	183.22	19.04	444.50	444.59	447.95	448.51	453.62	454.15
L-2-WBO-14	22995	3.5	167.65	17.42	444.59	444.70	449.55	449.88	457.07	454.60
L-3-WBO-14	22994	3.5	167.88	17.45	444.70	444.80	452.99	453.85	457.72	458.59
L-4-WBO-14	261247	3.5	156.67	16.28	444.80	445.36	449.64	451.87	460.23	455.99
L-5-WBO-14	26116	3.5	156.82	16.30	445.36	445.43	451.93	452.41	456.06	456.54
L-6-WBO-14	260421	3.5	130.18	13.53	445.43	445.53	456.26	456.73	459.11	459.57
L-7-WBO-14	260435	3.5	128.00	13.30	445.53	445.86	458.63	460.12	461.38	462.87
L-8-WBO-14	26									



Label	COA STRUCTURE ID	Rise (Unified) (ft)	Flow (ft³/s)	Velocity (ft/s)	Invert (Stop) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Energy Grade Line (In) (ft)
System 12										
L-1-WBO-12	CO-22	4.5	173.72	10.92	443.37	443.40	453.16	453.28	455.01	455.14
L-2-WBO-12	CO-21	4.5	174.54	10.97	443.40	443.60	453.54	454.28	455.41	456.15
L-3-WBO-12	261668	4.5	166.34	10.46	443.60	444.11	454.29	455.92	455.99	457.62
L-4-WBO-12	261650	4.5	166.76	10.49	444.11	444.89	456.00	456.34	457.71	458.04
L-5-WBO-12	261649	4.5	157.36	9.89	444.89	446.15	456.37	456.85	457.89	458.38
L-6-WBO-12	260404	4.0	157.52	12.54	446.15	446.35	456.09	456.36	458.53	458.80
L-7-WBO-12	260401	4.0	155.53	12.38	446.35	446.91	456.42	457.17	458.80	459.55
L-8-WBO-12	260396	4.0	150.09	11.94	446.91	447.46	459.70	460.63	461.91	462.85
L-9-WBO-12	260393	4.0	114.32	9.10	447.46	447.90	462.82	463.26	464.11	464.55
LAT-3-WBO-12	CO-26	1.5	8.28	4.69	446.91	447.52	460.82	461.00	461.16	461.34
System 13										
L-1-WBO-13	227149	4.5	37.74	1.97	443.25	443.27	453.16	453.17	453.22	453.23
L-2-WBO-13	227148-A	4.5	37.84	2.38	443.27	443.30	453.14	453.15	453.23	453.23
L-3-WBO-13	227148-B	4.5	38.00	2.39	443.30	443.34	453.15	453.16	453.24	453.25
L-4-WBO-13	227148-C	4.5	38.65	2.43	443.34	443.51	453.18	453.22	453.27	453.31
L-5-WBO-13	261654	4.5	38.20	2.40	443.51	443.80	453.28	453.36	453.37	453.45
L-6-WBO-13	22980	4.5	39.00	2.45	443.80	444.20	453.36	453.40	453.45	453.49
L-7-WBO-13	23209-A	4.5	39.75	2.50	444.20	444.40	453.40	453.43	453.49	453.53
L-8-WBO-13	23209-B	4.5	40.10	2.52	444.40	444.50	453.44	453.46	453.54	453.55
L-9-WBO-13	381909	4.5	40.26	2.53	444.50	444.54	453.46	453.46	453.56	453.56
L-10-WBO-13	381908	4.5	40.58	2.55	444.54	444.65	453.46	453.48	453.56	453.58
L-11-WBO-13	381907	4.3	40.77	2.87	444.65	444.72	453.46	453.47	453.59	453.60
LAT-1-WBO-13	261252	1.5	3.51	1.99	444.72	447.32	453.62	453.66	453.68	453.72
LAT-2A(1)-WBO-13	256816-A	2.0	7.48	2.38	444.72	446.76	453.61	453.66	453.70	453.75
LAT-2A(2)-WBO-13	256816-B	2.0	7.51	2.39	446.76	447.91	453.73	453.74	453.82	453.83
LAT-2A(3)-WBO-13	CO-7	1.5	1.94	1.10	447.91	448.20	451.08	451.08	453.84	451.10
System 14										
L-1-WBO-14	23012	3.5	181.98	18.91	444.50	444.59	447.95	448.50	453.54	454.06
L-2-WBO-14	22995	3.5	166.54	17.31	444.59	444.70	449.55	449.88	456.97	454.54
L-3-WBO-14	22994	3.5	166.77	17.33	444.70	444.80	452.95	453.80	457.61	458.47
L-4-WBO-14	261247	3.5	155.65	16.18	444.80	445.36	449.64	451.84	460.09	455.91
L-5-WBO-14	26116	3.5	155.80	16.19	445.36	445.43	451.90	452.38	455.97	456.45
L-6-WBO-14	260421	3.5	128.59	13.37	445.43	445.53	456.21	456.67	458.99	459.44
L-7-WBO-14	260435	3.5	126.23	13.12	445.53	445.85	458.52	459.77	461.20	462.44
L-8-WBO-14	260446									



06/24/2020

CITY OF AUSTIN, TEXAS
AUSTIN TRANSPORTATION

SOUTH LAMAR BOULEVARD-C1

CONDUIT CALCS

CITY OF AUSTIN

austin
MOTION
2016 MOBILITY BOND

NOTES	NAME	DATE
SURVEY BY		
DRAWN BY	BT	06/20
DESIGNED BY	BT	06/20
CHECKED BY	BAL	06/20
REVIEWED BY	BAL	06/20

SP-2020-0084D

204 OF 300



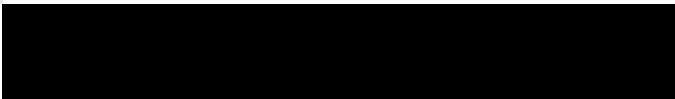
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Austin, TX. 78735
(512) 298-3284
TBPE # F-14629

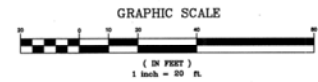
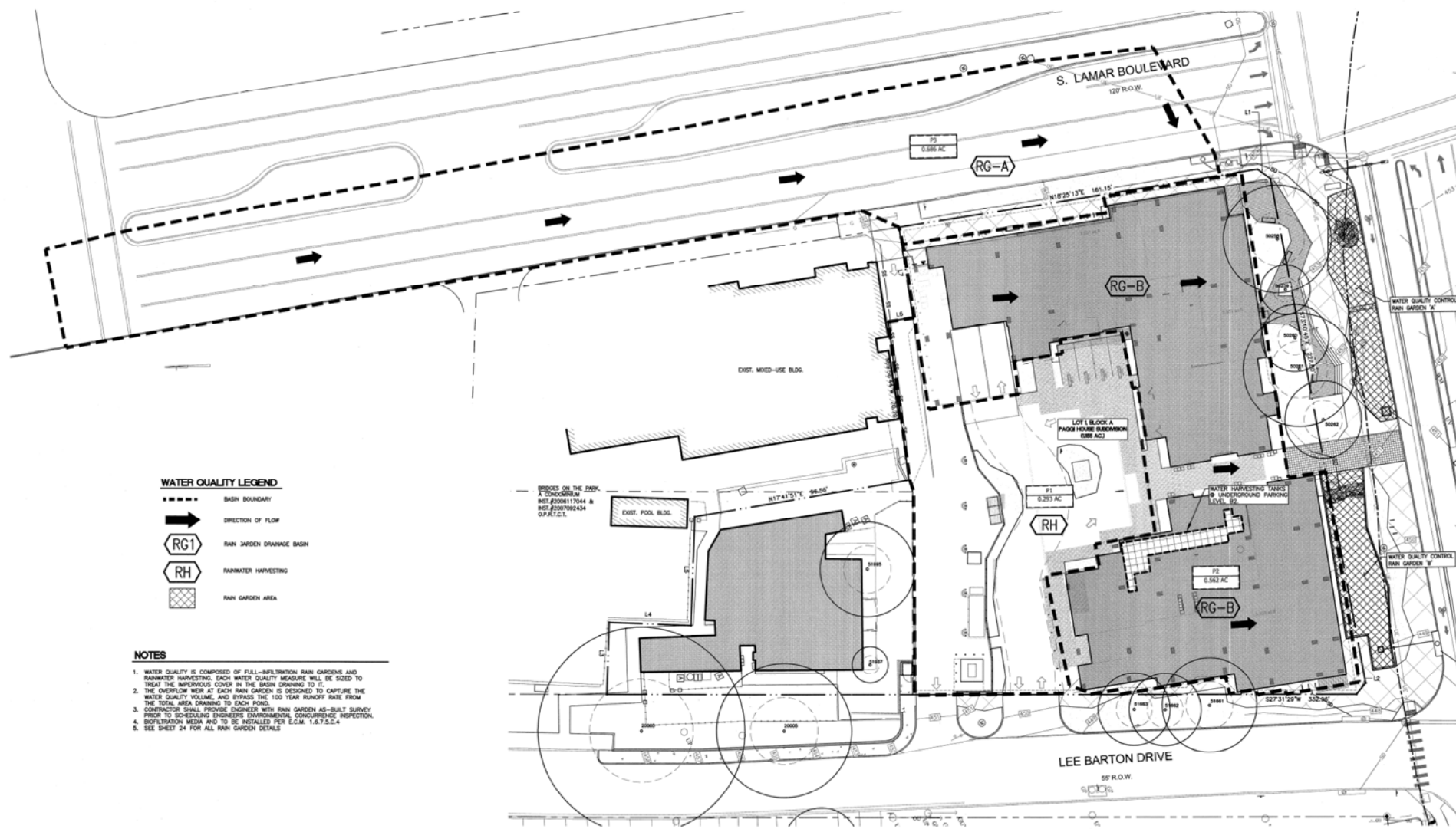


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APPENDIX

**TACO PUD (SP-2019-0056C)
REFERENCE WATER QUALITY SHEETS**



[illegible]

SITE PLAN RELEASE Sheet 04 of 51

FILE NUMBER: 97-2019-02595 EXPIRATION DATE: _____

CASE MANAGER: REBEK JONES APPLICATION DATE: 08/12/2019

APPROVED BY GENERAL COMMISSION: _____

APPROVED BY PLANNING COMMISSION OR: _____

APPROVED BY CITY COUNCIL OR: _____

under Section 11L of Chapter 20A of Austin City Code.

Director, Development Services Department

RELEASED FOR Sealing: P20 & C2-18

GENERAL COMPLIANCE:

Req. 1 ☐ Correction 1 _____

Req. 2 ☐ Correction 2 _____

Req. 3 ☐ Correction 3 _____

RELEASE OF THIS APPLICATION DOES NOT CONSTITUTE A VERIFICATION OF ALL DATA, INFORMATION AND CALCULATIONS SUPPLIED BY THE APPLICANT. THE OWNER OF THIS PROJECT SHALL BE RESPONSIBLE FOR THE COMPLETENESS, ACCURACY AND ABSENCE OF THEIR PUNITAL MATTERS OR NOT. THE CITY OF AUSTIN DOES NOT GUARANTEE THE COMPLETENESS OF THIS APPLICATION OR THE CITY ENGINEER IS NOT RESPONSIBLE FOR THE COMPLETENESS OF THIS APPLICATION.

APPENDIX

SOLA-C1: PROPOSED WATER QUALITY

APPENDIX R-11
RAIN GARDEN CALCULATIONS
FOR DEVELOPMENT PERMITS

Legend
Not In Compliance
Do Not Modify Values

DRAINAGE AREA DATA:			
criteria	Drainage area to control (DA < 2 acre)	≤ <u>2.00</u> ac.	<u>0.25</u> ac.
	Drainage Area Impervious Cover		<u>95.00%</u>
	Capture Depth (CD) = (0.5+(IC-20)/100)	<u>1.250</u> in	
WATER QUALITY CONTROL CALCULATIONS			
criteria	Water Quality Volume	≥ <u>987</u> cf	<u>1,118</u> cf
	The Water Quality Control is to be RAIN GARDEN		
	100-year peak flow rate to control (Q100)	<u>3</u> cfs	
criteria	Filtration Pond Area (Af or Ai)	≥ <u>1,300</u> sf	<u>1,300</u> sf
criteria	Depth of Ponding (D) (maximum 1.0 foot)	≤ <u>1.00</u> ft	<u>0.50</u> ft
criteria	Depth of Filtration Media (L) (minimum 1.5 foot)	≥ <u>1.50</u> ft	<u>1.50</u> ft
	Effective Porosity Water Quality Volume ($WQV_{ep} = 0.24 * Af * L$)		<u>468</u> cf
	Provided Water Quality Volume ($WQV_{provided} = Af * D + WQV_{ep}$)		<u>1118</u> cf
	Total WQV		<u>1118</u> cf
	Water Quality Elevation (WQE) Varies to be 5.5 Inches Below Top of Curb		<u>456</u> ft msl
criteria	Elevation of Splitter/Overflow Weir (min. WQE)	≥ <u>456</u> ft msl	<u>456</u> ft msl
	Length of Splitter Weir (total of curb cut width)		<u>12</u> ft
criteria	Required Head to Pass Q100	≤ <u>0.50</u> ft	<u>0.177</u> ft
criteria	Pond Freeboard Provided to Pass Q100	≥ <u>0.25</u> ft	<u>0.283</u> ft
	Total Height of curb (roadside) above WQ elevation	≥ <u>5.3</u> in	<u>5.5</u> in
	Total Height of curb above top of Media	≥ <u>11.3</u> in	<u>11.5</u> in
FOR INFILTRATION RAIN GARDENS			
	Infiltration Rate (in/hr)	≥ <u>0.13</u> in/hr.	<u>0.25</u> in/hr.
	Rain Garden Pond Drawdown Time (max 48 hours)	≤ <u>48.00</u> hr	<u>24</u> hr.

Calculation on R-11 sheet. This is pasted values to avoid Macro issues