

Waller Creek District

**ADDENDUM ONE
(ADDITIONAL AUTHORITY, OPERATING &
MANAGEMENT AGREEMENT) –
THE CONFLUENCE
CONSTRUCTION PHASE PLAN**

Proposing Party: City of Austin



**waterloo
greenway**

21 February 2024

COA CIP Project No. 12861.002

COA CIP Project Name: Waller Creek District – Creek Delta Link - The Confluence Project
(formerly known as Creek Delta)



City of Austin

Founded by Congress, Republic of Texas, 1839
Watershed Protection Department
P.O. Box 1088, Austin, Texas 78767

February 21, 2024

Tim LaFrey
Vice President
Waller Creek Local Government Corporation (LGC)

RE: Waller Creek District: Addendum One (Additional Authority, Operating and Management Agreement) – Confluence Construction Phase Plan

Dear Mr. LaFrey:

Enclosed herewith you will find Addendum One to the Confluence Construction Phase Plan (Addendum #1) which includes improvements to Waller Creek from 4th St to Lady Bird Lake.

This addendum includes:

- Exhibit B: Project Area Diagram
- Exhibit G: Project Budget. Updates include:
 - Additional Authority for 4th Street modification from Transportation and Public Works Department (TPW)
 - Additional Authority related to Developer Contribution Agreement-Waller Creek Delta
- Exhibit J: Developer Contribution Agreement-Waller Creek Delta for stormwater outfall modifications
- Exhibit M: Operating & Management Agreement for the Confluence.

This addendum does not change the original Phase Plan project area along Waller Creek from 4th St to Lady Bird Lake. The northern extent of the project is bounded to the east by the southbound I-35 frontage road and to the west by Sabine Street, while at the southern extent it is bounded to the east by River Street and to the west by Trinity Street. See **Exhibit B** for the Project Area Diagram.

The Joint Development Agreement, Section 3, identifies the documentation required for each proposed phase plan. The attached checklist identifies all the submission requirements including those applicable to this Phase Plan and where they can be found in this document.

If you have questions or concerns, please let me know and we will address them quickly.

Sincerely,

Ms. Kristin Pipkin
Waller Creek District Project Management Supervisor
Watershed Protection Department, City of Austin
Proposing Party/City Representative

Date

Ms. Alyssa Tharrett
Project Management Supervisor
Parks and Recreation Department, City of Austin
Proposing Party/City Representative

Date

The Phase Plan described in this document has been reviewed and approved specific to the scope described herein.

Mr. Tim LaFrey
Vice President
Waller Creek Local Government Corporation
LGC Representative

Date

Mr. Jesús Aguirre
Chief Executive Officer
Waterloo Greenway
Responding Party

Date

PHASE PLAN PROPOSAL CHECKLIST

Project: Waller Creek District

ADDENDUM ONE (ADDITIONAL AUTHORITY, OPERATING AND MANAGEMENT AGREEMENT) – THE CONFLUENCE CONSTRUCTION PHASE PLAN

PAGE #	JDA SECTION*	TOPIC	DESCRIPTION	EXHIBITS
N/A	3.03 B.	Responding Party Review		
N/A		Cover Letter		
N/A		Front Cover		
N/A		Table of Contents		
N/A		Check List		
1	3.04 A.1	General	Exec Summary - general outline of the project	
4			Schedule with milestones & projected completion	Exhibit C
4			Implementation plan	Exhibit E
5	3.04 A.2 (i)	Identify Team	List all professionals and their discipline	Exhibit D
5	3.04 A.2 (ii)	Construction Delivery Method	Proposed Construction Delivery Method	Exhibit F
4	3.04 A.2 (iii)	Designate the Reviewer of Construction Schedule	Project Director or Managing Party	
1, 12	3.04 A.2 (iv)	Design Material	Prelim site plans, architectural plans, elevations, other design materials	Exhibit A
13	3.04 A.3	Project Area Diagram	Map of District showing Limits of Phase Plan Area	Exhibit B
6, 14	3.04 A.4	Project Budget	All Phase Plan costs including allowances and contingencies	Exhibit G (updated)
7		Including:	List of funding sources	
7			List where funds are to be held	
8, 15			List constraints on use of funds	Exhibit J (updated)
23			Post construction budget - capital repairs, operating and maintenance budgets	Exhibit M
8	3.04 A.5	Cost Overrun Plan	Identify how any cost overruns will be funded	
8	3.04 A.6	Compliance with Foundational Articles	If the proposed project does not comply with the terms of the JDA, the proposed modification to the JDA is provided here	
9	3.04 A.7	Third Party Agreements	Outline any third-party agreements that will need to be obtained	Exhibit J (updated)
9,	3.04 A.8	Procurement Process Requirements	If funded in part by the City, comply with City Code and other applicable law	Exhibit K
			Local Government Code Sections 252 and 271	
			Texas Transportation Code Chapter 432	
9, 22	3.04 A.9	MWBE Participation	If funded in part by the City, outline plan	Exhibit F
9, 80	3.04 A.10	Public Improvement Projects/Approvals and Permits	Identify responsibilities for obtaining approvals from Government Authorities for design and construction	Exhibit L
9	3.04 A.11	Operations & Maintenance	Plan for obtaining approvals/permits and for paying for operations and maintenance	

PHASE PLAN PROPOSAL CHECKLIST

PAGE #	JDA SECTION*	TOPIC	DESCRIPTION	EXHIBITS
10	3.04 A.12	ID and Mapping Easements	Identify and map all easements and other real property interests	
7, 27, 44	3.04 A.13	Requirements on Use of Funds	Identify any requirements that apply to the use of tax-exempt obligations, grants or other funds	Exhibits I & J
10, 86	3.04 A.14	Insurance and Bonding	Provision of insurance and bonding in Article 9	Exhibit N
10	3.04 A.15	Use by City	Identify terms for use by the City	
10	3.04 A.16	Activities and Rates	Identify activities by groups	
10	3.04 A.17	Maintenance in ROW's	Identify of maintenance of District ROW's	
10	3.04 A.18	Utilities	Identify how utilities will be provided, cost of services, metering etc	
10, 23	3.04 A.19	Operations and Maintenance	Identify operations and maintenance standards	Exhibit M
10	3.04 A.20	Revenue Source and Fees	Create a pro forma re fees, licensing to cover Operation Expenses	
11	3.04 A.21	Commercial Design Standards	Identify if Comm Design Stds apply or waived	
11	3.04 A.22	License Agreements	Identify if License Agreements apply	
11	3.04 A.23	Naming Rights	Identify any license agreements necessary for naming rights	
11	3.04 A.24	Change in Ownership	Identify if there is a proposed change in ownership of a Public District Site	
11, 26	3.04 A.25	Capital Needs Timing	Identify the capital needs timing for City Planning purposes	Exhibit H
11	3.04 A.26	Payment to PARD or other City Departments	Identify how payments will be made to PARD or other City Depts for their operations	
11	3.04 A.27	Public Accessibility	Identify public accessibility and provisions thereof	
11	3.04 A.28	Timing of transfers	Identify timing of transfers of improvements and land	
11	3.04 A.29	Maintain natural space	Identify the ways projects will be designed to maintain natural space	
11	3.04 A.30	Maintain flexibility of City owned properties	Identify how the flexibility of City Owned properties will be maintained	
11	3.04 A.31	Issues related to alcohol use	Identify any desired exemptions of City Code or park rules	
N/A	3.04 A.32	Other Relevant Info		

*THIS CHECKLIST IS BASED ON THE WALLER CREEK DISTRICT JOINT DESIGN, DEVELOPMENT, MANAGEMENT AND OPERATION AGREEMENT (JDA) DATED APRIL 16, 2014 AND THE AMENDMENT DATED AUGUST 27, 2020.

Waller Creek District

**ADDENDUM ONE (ADDITIONAL AUTHORITY, CONFLUENCE OPERATING
& MANAGEMENT AGREEMENT) – THE CONFLUENCE CONSTRUCTION
PHASE PLAN**

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EXHIBIT B: PROJECT AREA DIAGRAM	PAGE 13
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EXHIBIT E: IMPLEMENTATION PLAN	
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ADDENDUM ONE (ADDITIONAL AUTHORITY, CONFLUENCE OPERATING & MAINTENANCE AGREEMENT) – THE CONFLUENCE CONSTRUCTION PHASE PLAN

Project Identification:

Title: Addendum One to The Confluence Construction Phase Plan

Location: Along Waller Creek from Lady Bird Lake to 4th Street

Date: February 21, 2024

Unless otherwise specified herein, section reference shall refer to that certain Joint Design Development, Management and Operation Agreement by and among the City of Austin (“City”), Waller Creek Conservancy (“WCC”) and Waller Creek Local Governmental Corporation (“LGC”), dated April 16, 2014 and the Amendment dated August 27, 2020 (the “JDA”).

Effective August 14, 2019, the non-profit corporation formerly known as Waller Creek Conservancy (“WCC”) became known as Waterloo Greenway Conservancy and all references in this Addendum to Waller Creek Conservancy from and after that date shall mean Waterloo Greenway Conservancy (“WGC”).

In previous phase plans, this project has been referred to as “Creek Delta” and “Creek Mouth”. Moving forward, the project outlined in this Phase Plan will be referred to collectively as “The Confluence”.

EXECUTIVE SUMMARY (3.04 A.1)

Waterloo Greenway includes a one-and-a-half mile urban creek and riparian ecosystem that meanders southward from Waterloo Park at 15th Street along the eastern edge of downtown Austin ending at Lady Bird Lake. Once complete, Waterloo Greenway will total 35 acres of connected urban green space and will feature four distinct beautifully designed park spaces, pedestrian and bicycle paths, a revitalized creek, and other urban amenities – a place where the environment, culture, health, adventure, and diversity converge. The revitalized Waller Creek will renew the natural environment, foster the creative arts, and nourish authentic and uplifting experiences that reflect Austin’s diversity and dynamic spirit.

The Confluence section of Waterloo Greenway is an approximately 14-acre green space and creek reconstruction along Waller Creek in Austin from Lady Bird Lake to 4th Street. This part of the program includes one mile of pathways, trails and bridges creating a cohesive and accessible circulation network enabling a new downtown district. There will be top-of-bank pathways and creek level elevated walkways allowing a unique way of traversing through the City. Eleven new trail connections to adjacent rights-of-way will be created through this design; strategically placed to connect to important downtown amenities such as the Emma S. Barrientos Mexican American Cultural Center, the Ann and Roy Butler Hike-and-Bike Trail, the Rainey Street Historic District, the Austin Convention Center, Palm Park, the historic Palm School, the Lance Armstrong Bikeway, the Sabine St. Promenade, and the Capital Metro Downtown. In addition, The Confluence design work reconstructs a robust creek ecology to create an immersive public nature experience. Currently, the banks of the creek are in disrepair, evident by the eroded banks and undermined trail systems in the middle of the city. This work utilizes cutting edge reconstruction and restoration techniques to design the aquatic and riparian habitat along the creek. **Exhibit A, Project Design Materials** provides an overview of the project and shows key design elements.

The Construction Phase Plan is proposed by the City to perform the construction of creek restoration, trails, bridges, and associated improvements along Waller Creek from Lady Bird Lake to 4th Street (see **Exhibit B, Project Area Diagram**).

The Phase Plan Project Area includes the east and west banks along Waller Creek from Lady Bird Lake to 4th Street. The southern boundary includes The Butler Trail at Lady Bird Lake and continues north along Waller Creek to Cesar Chavez Street. This section includes three bridges, top of bank trail installation and repair, creek elevated walkway, and park space. The Project Area boundary advances under the Cesar Chavez Street Bridge past Iron Works on the east and the Austin Convention Center on the west bank. Here the elevated walkway continues through this narrow area toward Red River Street. The creek level elevated walkway advances under Red River Street Bridge to the eastern bank of Waller Creek at Palm Park. Here the walkway passes an area known as The Bend which includes the outfall of a stormwater quality treatment device in Palm Park. The Project Area continues up into a portion of Palm Park and connects to 2nd Street and 3rd Street. The reconstructed Austin Convention Center biofiltration pond is situated along the top of the western bank near 3rd Street. Moving north from Palm Park, a creek trail continues along the eastern bank of Waller Creek under the 3rd Street Bridge into the Cypress Grove area of the project between 3rd and 4th Streets. The eastern trail sweeps over Waller Creek at a bridge and meets the 4th Street trailhead across from the Sabine Street ROW. A top of bank trail on the west bank of Waller Creek extends from 3rd to 4th Street. From Lady Bird Lake to 4th Street, creek channel work and bank reconstruction and restoration will occur at varying degrees along both the east and west banks of Waller Creek. In addition, there are a few bank areas where the vegetation will be preserved as part of the project. The Project Area includes the western edge of Palm Park. The remaining area of Palm Park will be designed and constructed under future Phase Plans.

This Construction Phase Plan realizes the design work completed in the *Creek Delta Construction Documents, Permitting & Bidding Phase Plan* and *Addenda One through Five*. As part of the work outlined in this Phase Plan, the team will be pursuing SITES certification for The Confluence. SITES is a comprehensive rating system for sustainable and resilient landscape projects internationally. The Phase Plan will augment, incorporate, and advance the work done in previous phase plans, but not be duplicative of this work.

The Phase Plan utilizes construction management expertise of Jay-Reese Contractors, Inc. (Jay-Reese, Construction Team), the firm selected for construction services for this Project, as well as construction administration performed by Michael Van Valkenburgh Associates (MVVA, Landscape Architecture Team Lead) and the City of Austin Public Works Department (PWD Team). The PWD Team will support the project as the contract manager and owner's representative in the field.

This Phase Plan encompasses the following:

- Construction Administration and Post-Construction Administration
- Construction and Post-Construction of The Confluence
- Other Budget Items: Materials Testing

Addendum One to the Construction Phase plan includes:

- Additional authority added to the contract from:
 - Transportation and Public Works Department for 4th St trailhead modification
 - Developer Contribution Agreement – Waller Creek Delta for stormwater outfall modifications
- Confluence O+M Agreement
- Correction to MVVA contract amount.

This project will require extensive coordination with Waterloo Greenway Conservancy and the City PWD Team. Other City agencies that will require coordination include but are not limited to: Austin Water (AW), Austin Energy (AE), Austin Transportation Department (ATD), Development Services Department (DSD), and Real Estate Services Department (RES). The project will also rely on coordination with other utility companies and adjacent property owners, including several that will be under construction.

All services performed under this Phase Plan shall be in accordance with the existing contractual agreements held by the City, applicable codes (local, City, County, State and Federal), including the City code, and accepted industry standards.

All Consultant documents shall be prepared using the English System of Weights and Measurements. It is assumed that CAD and PDF drawings are acceptable formats for submissions. Other file formats (e.g., MicroStation, AutoCAD Civil 3D) will be considered as needed on a case-by-case basis.

MAIN POINTS OF CONTACT

Proposing and Managing Party:

City of Austin (City)

Lead Sponsor: Watershed Protection Department (WPD)

Director: Jorge Morales, jorge.morales@austintexas.gov (512-974-3438)

Project Management Supervisor: Kristin Pipkin, kristink.pipkin@austintexas.gov
(512-974-3315)

Project Manager: Melissa Carugati, melissa.carugati@austintexas.gov (512-552-5382)

Sponsor: Parks and Recreation Department (PARC)

Assistant Director: Liana Kallivoka, liana.kallivoka@austintexas.gov (512-974-9455)

Project Management Supervisor: Alyssa Tharrett, alyssa.tharrett@austintexas.gov
(512-974-9508)

Project Manager: Lana Denkeler, lane.denkeler@austintexas.gov (512-974-9414)

Project Management: Capital Delivery Services Department (CDS)

Assistant Director: Eric Bailey, eric.bailey@austintexas.gov (512-974-7713)

Project Manager: Ana Seivert, ana.seivert@austintexas.gov (512-974-3566)

Responding Party:

Waterloo Greenway Conservancy (WGC)

CEO: Jesús Aguirre, jaguirre@waterloogreenway.org (512-541-3520)

Vice President of Planning & Design: John Rigdon, jrigdon@waterloogreenway.org
(512-541-3520)

Capital Projects Coordinator: Gabriele Huffman, ghuffman@waterloogreenway.org (850-200-8844)

Construction Team Lead:

Jay-Reese Contractors, Inc. (Jay-Reese)

CEO: Ron Albee, ralbee@jayreese.net (512-829-5360)

Jay-Reese Point of Contact: Derek Eckhoff, deckhoff@jayreese.net (512-829-5360)

Landscape Architecture Team Lead:

Michael Van Valkenburgh Associates (MVVA)

President and CEO: Michael Van Valkenburgh, Michael@mvvainc.com (718-243-2044)

Principal: Gullivar Shepard, gshepard@mvvainc.com (718-243-2044)

Project Manager and Point of Contact: Tim Gazzo, tgazzo@mvvainc.com (718-243-2044)

Materials Testing Team Lead:

ATLAS

Principal: Dale Rand, dale.rand@oneatlas.com (512-771-3667)

Asst. General Manager: Joe Fiello, joe.fiello@oneatlas.com (512-757-6352)

Project Manager and Point of Contact: Jimmy Baldwin, jimmy.baldwin@oneatlas.com
(512-689-5903)

SCHEDULE (3.04 A.1)

The Notice to Proceed (N.T.P.) for The Confluence Construction Phase Plan is anticipated to occur on February 27, 2023, following approval of the Phase Plan by the Waller Creek Local Government Corporation, full execution of the construction contract, encampment outreach and clean-up on the creek, and receipt of pre-construction submittals from Jay-Reese. The services associated with the Phase Plan shall be provided from the end of February 2023-November 2025 for the construction duration and December 2025-November 2026 for post-construction. Jay-Reese, MVVA, PWD, and Atlas fees have been calculated based on the construction schedule, which is shown in greater detail in **Exhibit C, Project Schedule**. In accordance with 3.04 A.2(iii) of the JDA, the Managing Party will review and approve the construction schedule. Additional details on the schedule will be provided by Jay-Reese after execution of the construction contract.

PERFORMANCE PERIOD

The contracted total performance period is the next forty-five (45) months which includes thirty-three (33) months for construction and twelve (12) months for post-construction. A more detailed project schedule is shown in

Exhibit C, Project Schedule.

GENERAL SCOPE OF SERVICE REQUIREMENTS

An organizational diagram of workflow is in **Exhibit D, Organizational Chart** that describes the relationship between the landscape architecture team, the contractor, City, and WGC. In addition, more detailed explanations of the scope of services and deliverables is in **Exhibit E, Implementation Plan** for construction administration, construction services, and materials testing.

DESIGN TEAM & CONTRACTOR LIST (3.04 A.2 (i))

The following contractor, landscape architect design team, PWD project manager and construction inspector, and materials testing team will be responsible for delivering The Confluence.

- Construction Contractor: Jay-Reese Contractors, Inc.
- Landscape Architect and Design Team Lead: Michael Van Valkenburgh Associates, Inc. (MVVA)
 - Permitting and Environmental Consulting: ACI Consulting (ACI)
 - Structural Engineer: Architectural Engineers Collaborative (AEC)
 - Accessibility Consultant: Altura
 - Civil Engineer: Wantman Group, Inc. (WGI), formerly Big Red Dog Engineering, Inc.
 - Local Landscape Architect: dwg (DWG)
 - Mechanical, Electrical and Plumbing Engineer: EEA Consulting Engineers (EEA)
 - Irrigation Design: James Pole
 - Local Ecologist: Lady Bird Johnson Wildflower Center (LBJWC)
 - Hydrologist: LimnoTech
 - Soil Scientist: Olsson
 - Geotechnical Engineer: Terracon
 - Lighting Design: Tillett
- Materials Testing: Atlas
- City's Capital Delivery Services (CDS) Department (under internal City service agreement)
 - Project Manager: CDS Project Management Division
 - Construction Inspector: CDS Construction Services Division

CONTRACTING METHOD (3.04 A.2(ii))

MVVA and their subconsultants will be contracted directly with the City under the Professional Services Agreement (PSA) that was executed in September 2022. An assignment to the existing MVVA PSA will be executed after approval of the subject Phase Plan. All the MVVA design team consultants and subconsultants identified by name in this project were selected prior to the execution of the JDA or have been selected utilizing methods that meet the City of Austin Ordinances for procurement of services. Any subsequent consultants will be selected utilizing the same.

The PWD Team, which includes a project manager from the PWD Project Management Division and a construction

inspector from the PWD Construction Services Division are internal to the City and will work under a signed service agreement between PWD and WPD. Atlas was assigned from an approved City rotation list.

Jay-Reese will work with the City under a standard City construction contract that will be executed after approval of the subject Phase Plan. In accordance with requirements for City contracts, the request to the LGC for authorization to award and execute the construction contract is included as **Exhibit F, Request For Action (RFA)**.

PROJECT BUDGET (3.04 A.4)

Exhibit G, Project Budget provides a detailed breakdown of the fees, an updated summary of the fees including Addendum 1 changes, are as follows:

	Original w/ Addendum One Fees	Original fees
1. Construction Administration		
Professional Service Fees (MVVA Team)	\$5,909,828	\$5,909,244
Reimbursable Expenses (MVVA Team)	\$328,010	\$328,010
Project Management Service Fees (COA PWD)	\$643,500	\$643,500
Construction Inspection Service Fees (COA PWD)	\$828,120	\$828,120
Construction Administration Total	\$7,709,458	\$7,708,874
2. Testing		
Materials Testing (Atlas Team)	\$348,347	\$348,347
Testing Total	\$348,347	\$348,347
3. Construction (Jay-Reese)		
Cost of Work (Base Bid + Alternates A and B)	\$63,752,983	\$63,752,983
Construction Allowances	\$670,500	\$670,500
Construction Total	\$64,423,483	\$64,423,483
4. Owner Allowances, Contingencies, and Cost Overrun		
Unknown Conditions Allowance	\$2,500,000	\$2,500,000
AE Chilled Water Allowance	\$500,000	\$500,000
Telecommunications Relocation Allowance	\$300,000	\$300,000
Structural Assessment Allowance	\$60,000	\$60,000
Tree Care Survey Allowance	\$15,000	\$15,000
<u>Original Allowances Total</u>	<u>\$3,375,000</u>	<u>\$3,375,000</u>
Developer Contribution- Waller Creek Delta	\$133,900	
4th st. Modification-reimbursed from TPW	\$491,830	
Additional Allowances TOTAL	\$4,000,730	
Change Order Contingency (9%)	\$5,976,565	\$5,976,565
Cost Overrun Reserve (3%)	\$1,932,704	\$1,932,704

SUMMARY

1. Construction Administration	\$7,709,458	\$7,708,874
2. Testing	\$348,347	\$348,347
3. Construction	\$64,423,483	\$64,423,483
4. Owner Allowances, Contingencies, and Cost Overrun	\$11,910,000	\$11,284,270
TOTAL:	\$84,391,288	\$83,764,974

Funding contributions toward The Confluence Construction Phase Plan from City, WGC, and federal funding sources will be provided in amounts not to exceed the following:

	<u>Funding Contribution</u>	<u>%</u>
City of Austin (City) _____	\$ 62,878,393	75%
Watershed Protection (WPD)	\$ 52,679,587	62%
Parks and Recreation (PARD)	\$ 2,310,772	3%
Development Services Department (DSD)		
Urban Forest Replenishment Fund*	\$ 5,266,185	6%
Austin Energy (AE)	\$ 1,330,018	2%
Austin Convention Center	\$ 500,000	1%
Austin Water (AW)	\$ 300,000	0.4%
Transportation Public Works (TPW)	\$ 491,830	0.6%
Waterloo Greenway Conservancy (WGC) _____	\$ 12,487,894	15%
United States Army Corps of Engineers (USACE)* _____	\$ 9,025,000	11%
<u>Funding Total for The Confluence Construction:</u>	\$ 84,391,288	

*DSD Urban Forest and USACE funding were jointly pursued by WGC and COA

As required by Section 3.04 A.25 of the JDA, **Exhibit H, Capital Needs Projection** addresses the prime scope of work and the projected funding needs, excluding Allowances, Change Order Contingency, and Cost Overrun Reserve.

FUNDING SOURCES & REQUIREMENTS/CONSTRAINTS ON FUNDS (3.04 A.4 & 3.04 A.13)

Project invoices will be paid for by the City and reviewed by WGC. The funding split will be determined on an invoice-by-invoice basis. Depending on the scope of work, invoices may not follow the funding split for the overall Phase Plan outlined in the Project Budget section above. A detailed breakdown of City funding sources can be found in The Confluence Construction Phase Plan Funding Letter.

In addition to typical City funding source restrictions, several funding agreements were executed to establish the funding reimbursement timing, cost sharing requirements, and eligible scope. The Project Partnership Agreement (PPA) between USACE and WPD included as **Exhibit I, US Army Corps Project Partnership Agreement** establishes the City's cost sharing requirement and the scope of work, which includes the biofiltration pond and creek improvements between Cesar Chavez and 3rd Street.

Additional agreements involving City departments and WGC are included in **Exhibit J, Funding Agreements**, and summarized as follows:

- Confluence Funding MOU: WGC will reimburse the City (PARC) for their funding contribution during and after construction. This MOU was established prior to bid opening and includes a different construction cost and budget than the Project Budget section above. The funding commitments reflected in the MOU are still valid.
- Urban Forestry MOU: DSD Urban Forest Replenishment will reimburse WPD for their funding contribution during and after construction (Urban Forestry MOU)
- Lattice Bridge No. 3 MOU: WGC and PARC are dedicating funding toward construction of Lattice Bridge No. 3
- ACC Pond MOU: Austin Convention Center is contributing funding toward the biofiltration pond
- Developer Contribution Agreement – Waller Creek Delta: Developer contribution for modifications to the stormwater outfall

COST OVERRUN PLAN (3.04 A.5)

In accordance with the JDA, the identification of the source of funds for the Cost Overrun Reserve are required. The Proposing Party must seek approval from the Responding Party to utilize Cost Overrun funding. The request to use Cost Overrun funds does not require LGC approval unless additional funding is needed. For The Confluence Construction Phase Plan, there is a Cost Overrun Reserve of \$1,932,704. **Additionally, there is an Additional Owner Allowance total of \$4,000.730** and Owner Change Order Contingency of \$5,976,565 held by the City and WGC team to address any changes or modifications to the construction project. These costs are detailed above in the Project Budget section.

COMPLIANCE WITH FOUNDATIONAL ARTICLES (3.04 A.6)

Section 3.3 B of the JDA outlines the right of the parties to mutually agree to modification of foundational articles with respect to any phase of any project. In accordance with this section, and with the intent of formally making these changes in a revised JDA currently under negotiation, the parties agree to modify the following articles:.

1. In accordance with Section 3.04 A.4 of the JDA, the parties agree to modify the requirement that 24 months of O&M funding be placed in the Project Disbursement Fund Account before construction authorization. The parties agree that at a date no later than one year prior to the park opening to the public, WGC and the City will agree on a new financial reserve structure for the completed Phase Plan areas. The new policy will be included in the updated JDA and O&M Agreements currently under negotiation and better align with the other operational and fundraising agreements for local non-profit partnerships.

2. In accordance with Section 3.04 A.19 of the JDA, the parties agree to modify the requirement that the operations and maintenance standards for the project be included with the **initial construction Phase Plan, approved by the LGC on January 18th, 2023**. The final Operating and Management Agreement for the project is added as Exhibit M to this Phase Plan Addendum.

THIRD PARTY AGREEMENTS (3.04 A.7)

Pursuant to the JDA between City and WGC, any third-party agreements needed to execute the work in the phase plan are noted in the Phase Plan document. For The Confluence Construction Phase Plan, there will be one third party agreement that is referenced in the Funding Resources & Requirements/Constraints on Funding section above and described below.

The Project Partnership Agreement (PPA) between USACE and WPD included as **Exhibit I, US Army Corps Project Partnership Agreement**, establishes the City's cost sharing requirement and the eligible scope of work, which encompasses the biofiltration pond and creek improvements between Cesar Chavez and 3rd Street.

The Waller Creek Delta Developer Contribution Agreement between the City and Waller Creek Owner LLC included in the updated **Exhibit J**, establishes that the Developer will contribute funds to the city to design and construct City constructed Drainage facilities that tie in to a portion of the developer's drainage facilities.

PROCUREMENT PROCESS REQUIREMENTS & MWBE PARTICIPATION (3.04 A.8 & 3.04 A.9)

Pursuant to the JDA, any Project funded in part by the city must meet City ordinance and state law requirements for procurement, Local Government Code Sections 252, 271 and Texas Transportation Code Chapter 432. The Confluence construction contract is a City-held contract and followed the City Invitation for Bid (IFB) procurement process. The construction contract with Jay-Reese will be awarded in compliance with City Code Chapter 2-9A (Minority Owned and Women Owner Business Enterprise Procurement Program) through the achievements of Good Faith Efforts with 4.5% MBE and 2.94% WBE participation. The City of Austin Small and Minority Business Resources (SMBR) Department has confirmed that Jay-Reese met the compliance plan requirements through Good Faith Efforts

General MWBE Participation requirement information outlined in the JDA can be found in **Exhibit K, JDA Procurement Requirements**.

All the MVVA design team consultants and subconsultants identified by name in this project were selected prior to the execution of the JDA or have been selected utilizing methods that meet the City of Austin Ordinances for procurement of services. Any subsequent consultants will be selected utilizing the same

APPROVALS & PERMITS (3.04 A.10)

The Design Team led by MVVA has the responsibility of obtaining approvals and permits from governmental authorities for design and construction of Public Improvement Projects.

The official Notice to Proceed (N.T.P.) for construction work is contingent on the Site Development Permit (Creek

Delta, SPC-2019-0400D) and USACE Nationwide Permits 25 and 27 which were obtained under the Creek Delta Construction Documents, Permitting & Bidding Phase Plan, **see Exhibit L, The Confluence Permits**. Building permits are anticipated in February 2023. Jay-Reese is responsible for obtaining ROW and excavation permits during construction.

Any minor site development permit corrections that result from the construction work proposed in the Phase Plan will be coordinated and addressed by the Design Team.

OPERATIONS & MAINTENANCE RESPONSIBILITIES & STANDARDS (3.04 A.11 & 3.04 A.19)

WGC and the City share responsibility for the operations and maintenance of The Confluence and must coordinate on these activities upon completion of the project. In order to ensure effective management and communication, the parties have outlined policies and procedures that govern these activities in **Exhibit M, Operating & Management Agreement for The Confluence**.

ADJACENT PROPERTY ACQUISITION (3.04 A.12)

All acquisitions either by fee simple or easement will follow City Real Estate Service's Standard Operating Procedures for approval, land plans, land title surveys, Environmental Site Assessment Plans I and II, and title policies. In accordance with the 3.04 A.28 of the JDA, any acquisitions either by fee simple or by easement will follow the Office of Real Estate's Standard Operating Procedures for approvals, land plans, land title surveys, Environmental Site Assessment Plans I and II, and title policies.

INSURANCE & BONDING (3.04 A.14)

Insurance information can be found in **Exhibit N, Insurance Certificates**. Jay-Reese will provide bonding insurance for the construction as required by the construction contract.

ACTIVITIES & RATES (3.04 A.15 & 3.04 A.16)

The WGC, as the operator of the completed project, will take responsibility for the programming of The Confluence upon completion. Programs will be established in accordance with the WGC's mission and feedback from the community. Special attention will be given to the programs that address issues of equity and inclusion of marginalized groups within the Austin community. In addition to many free programs, spaces will be rented from time-to-time by the WGC. These rates will be established through an analysis of existing comparable spaces in the region and will be updated on a regular basis.

The WGC will work with PARD, WPD, and other City Departments to allow City sponsored events in The Confluence limits that align with the mission of both the City and WGC. The City will not be charged the applicable rental fees for this use. WCC will set aside a certain number of days for the free use by the City for public functions and City sponsored events, pursuant to Section 2.3(g) of the Master O&M Agreement.

MAINTENANCE OF DISTRICT ROW (3.04 A.17)

Maintenance of the ROW is the role of the City of Austin, as noted in the JDA Article 4, Section 4.03 and 6.03, unless otherwise agreed upon through a license agreement between the parties.

UTILITIES (3.04 A.18)

No utilities will be distributed to any vendor or park lessee as part of this Phase Plan.

REVENUE SOURCES & FEES (3.04 A.20)

In order to maintain and operate the park at the highest level, the WGC will utilize opportunities within the park to generate revenue. These opportunities include, but are not limited to, ticketed special events, fundraisers, park area rentals, and concession opportunities. Rates will be established based on the market and timing/frequency of these opportunities and will be balanced with the core mission of serving the community by creating parks for all. Programming plans will be presented annually to and reviewed by the Waller Creek LGC. Revenue opportunities will comply with the JDA and all applicable law. A pro forma of how fees will cover estimated Operating Expenses will be shared at a future date and is not included with the Confluence O+M agreement (Exhibit M).

COMMERCIAL DESIGN STANDARDS (3.04 A.21)

Unless otherwise indicated, commercial design standards outlined in the Waller Creek District Design Guidelines will be followed under this Phase Plan.

LICENSE AGREEMENTS (3.04 A.22)

License agreements will be secured as required by the permitting process.

NAMING RIGHTS (3.04 A.23)

WGC has identified recognition opportunities in The Confluence project limits. These opportunities include various architectural features, like the bridges, and park space of distinction. All naming rights will be established in accordance with the JDA and Foundational Articles.

CHANGE OF OWNERSHIP (3.04 A.24)

There are no changes of ownership anticipated with this Phase Plan.

CAPITAL NEEDS TIMING (3.04 A.25)

See **Exhibit H, Capital Needs Projection** addressing the anticipated project of the prime scope of work, which excludes Allowances, Change Order Contingency, and Cost Overrun Reserve.

PAYMENTS (3.04 A.26)

Currently no payments from the City are anticipated for operations for this Phase Plan.

PUBLIC ACCESSIBILITY (3.04 A.27)

The design of The Confluence will meet the requirement of the Texas Accessibility Standards (TAS) and City Code. This Phase Plan includes the scope of work by Altura Solutions, the accessibility consultant, to ensure the project follows applicable accessibility rules and standards.

TIMING OF TRANSFERS (3.04 A.28)

There are no anticipated transfers of improvements or land to the City with this Phase Plan.

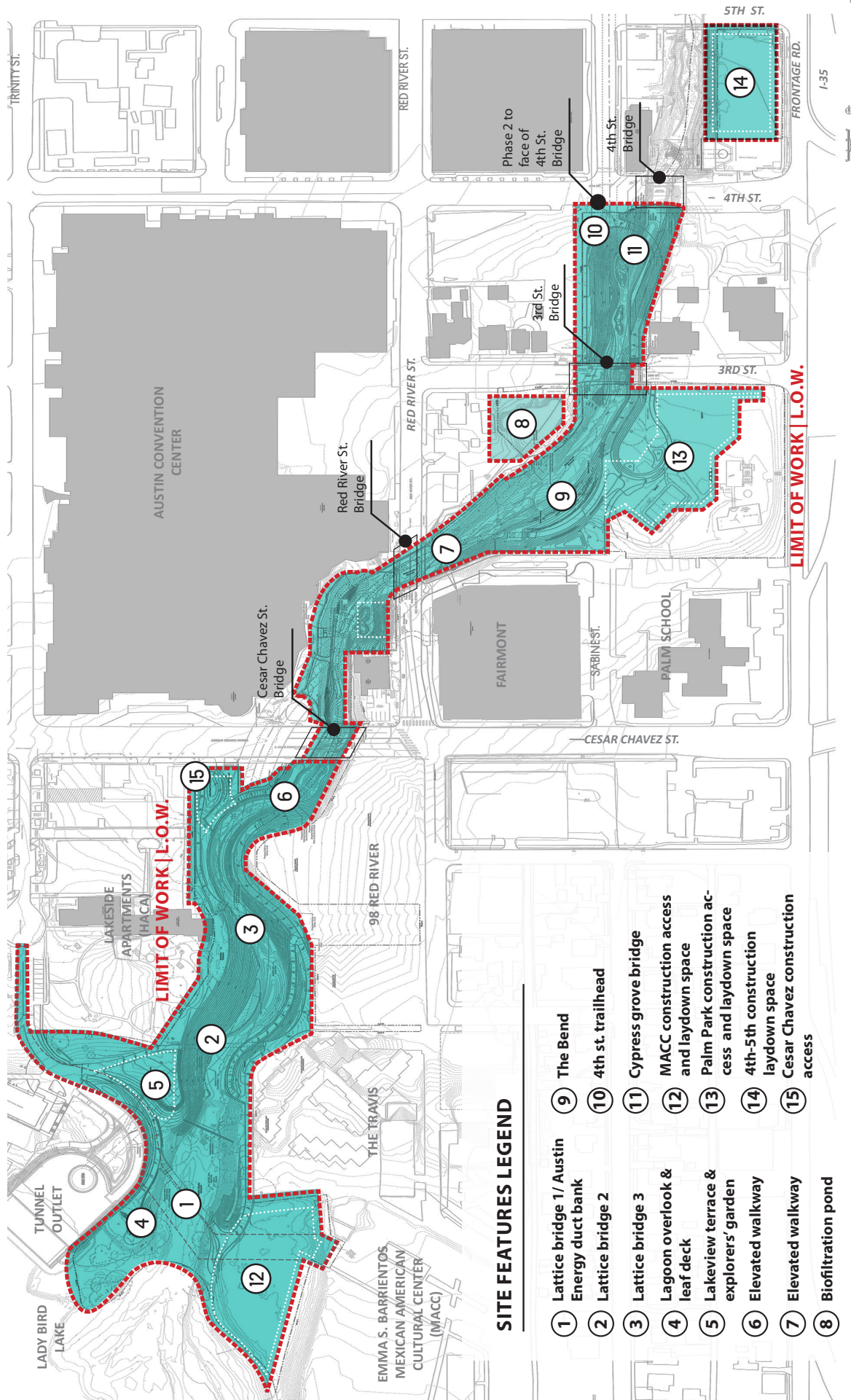
GREEN SPACE & FLEXIBILITY (3.04 A.29 & 3.04 A.30)

A core element of the approved Project Plan calls for conserving and maintaining natural space. This will be a guiding principle for all work on the Chain of Parks including The Confluence. A goal of the design team has been to maintain flexibility with respect to City owned land.

ALCOHOL USE IN THE PARK (3.04 A.31)

This item is not applicable to the work outlined in The Confluence Construction Phase Plan.

EXHIBIT B: PROJECT AREA DIAGRAM



THE CONFLUENCE CONSTRUCTION PHASE PLAN

	Original w/ Addendum One Fees	Original fees
1. Construction Administration		
Professional Service Fees (MVVA Team)	\$ 5,909,828	\$ 5,909,244
Reimbursable Expenses (MVVA Team)	\$ 328,010	\$ 328,010
Project Management Service Fees (COA PWD)	\$ 643,500	\$ 643,500
Construction Inspection Service Fees (COA PWD)	\$ 828,120	\$ 828,120
Construction Administration Total	\$ 7,709,458	\$ 7,708,874
2. Testing		
Materials Testing (Atlas Team)	\$ 348,347	\$ 348,347
Testing Total	\$ 348,347	\$ 348,347
3. Construction (Jay-Reese)		
Cost of Work (Base Bid + Alternates A and B)	\$ 63,752,983	\$ 63,752,983
Construction Allowances	\$ 670,500	\$ 670,500
Construction Total	\$ 64,423,483	\$ 64,423,483
4. Owner Allowances, Contingencies, and Cost Overrun		
Unknown Conditions Allowance	\$ 2,500,000	\$ 2,500,000
AE Chilled Water Allowance	\$ 500,000	\$ 500,000
Telecommunications Relocation Allowance	\$ 300,000	\$ 300,000
Structural Assessment Allowance	\$ 60,000	\$ 60,000
Tree Care Survey Allowance	\$ 15,000	\$ 15,000
<i>Original Allowances Total</i>	<i>\$ 3,375,000</i>	<i>\$ 3,375,000</i>
Developer Contribution- Waller Creek Delta	\$ 133,900	
4th st. Modification-reimbursed from TPW	\$ 491,830	
Additional Allowances TOTAL	\$ 4,000,730	
Change Order Contingency (9%)	\$ 5,976,565	\$ 5,976,565
Cost Overrun Reserve (3%)	\$ 1,932,704	\$ 1,932,704
SUMMARY		
1. Construction Administration	\$ 7,709,458	\$ 7,708,874
2. Testing	\$ 348,347	\$ 348,347
3. Construction	\$ 64,423,483	\$ 64,423,483
4. Owner Allowances, Contingencies, and Cost Overrun	\$ 11,910,000	\$ 11,284,270
TOTAL:	\$ 84,391,288	\$ 83,764,974

EXHIBIT J: FUNDING AGREEMENTS*DEVELOPER CONTRIBUTION AGREEMENT***WALLER CREEK DELTA**

This **Developer Contribution Agreement** (this “**Agreement**”) is made by and between the City of Austin, a Texas home rule municipal corporation (the “**City**”) and Waller Creek Owner LLC, a Delaware limited liability company (the “**Developer**”), hereinafter sometimes referred to individually as a “**Party**” and collectively as the “**Parties**”.

WHEREAS, the Developer owns a tract of land in Austin, Travis County, Texas, known as Lots 1 – 3, Block A, Waller Park Place, a subdivision in Travis County, Texas, according to the map or plat thereof recorded in Document No. 201500087 of the Official Public Records of Travis County, Texas (the “**Property**”);

WHEREAS, the Developer has filed a revision to Site Plan No. SP-2013-0449C(R1) (the “**Revised Site Plan**”) to allow for the construction of a mixed use project and related appurtenances (the “**Developer Project**”);

WHEREAS, in connection with obtaining approval for the Revised Site Plan, certain drainage facilities must be constructed to protect the health, safety, and general welfare of the community (the “**Drainage Facilities**”);

WHEREAS, the City has filed Site Plan No. SPC-2019-0400D to allow for creek restoration and construction of a pathway and pedestrian bridges within Waller Creek from Lady Bird Lake to 4th Street (the “**City Project**”);

WHEREAS, the Developer has not yet constructed the Drainage Facilities and the City Project would require the City to remove and replace certain portions of the Drainage Facilities;

WHEREAS, the City and the Developer agree that it will be beneficial for each Party to construct a portion of the Drainage Facilities in accordance with the timeline for their respective projects;

WHEREAS, the City has determined that it is in the City’s best interest to construct the portion of the Drainage Facilities identified as City facilities in the attached **Exhibit A** (the “**City-Constructed Drainage Facilities**”) as a part of the City Project because it will allow the stormwater outfall to be installed in a location that facilitates proper creek channel flow;

WHEREAS, the Developer has determined it is the Developer’s best interest to construct the portion of the Drainage Facilities identified as Developer facilities in the attached **Exhibit A** (the “**Developer Drainage Facilities**”);

WHEREAS, as consideration for the City incorporating the City-Constructed Drainage Facilities into the City Project, the Developer has agreed to pay the City the Developer Contribution as defined and described in Article III below;

WHEREAS, the City and the Developer desire to generally provide for coordination in the design, permitting, development, and construction of the Drainage Facilities, the Developer Project, and the City Project.

{W1105638.11}

NOW, THEREFORE, in consideration of these premises, the mutual covenants set forth in this Agreement, and other good and valuable consideration, the receipt and sufficiency of which both Parties acknowledge, the City and the Developer agree as follows:

I. CITY PROJECT

1. The City or its contractors, subcontractors, agents, or representatives (collectively, the “**City Parties**”) will design, permit, develop, and construct the City Project. As a part of the City Project, the City will permit, develop, and construct the City-Constructed Drainage Facilities. The City-Constructed Drainage Facilities will tie into the portion of the Developer Drainage Facilities to be constructed by Developer and will terminate in Waller Creek.

2. The Developer will pay the Developer Contribution to the City in accordance with this Agreement. The Developer Contribution may only be used by the City to pay for the Actual Cost (defined in Article III, Section 2 below) and not for any other purpose.

3. The Developer acknowledges that the City has provided notice that the City’s obligations under this Agreement related to the City Project are contingent upon i) the City being able to appropriate funds or have lawfully available funds to process the City Project (the “**Funding Contingency**”) and ii) the Waller Creek Local Government Corporation approving the execution of any contract necessary for the City Project (the “**Approval Contingency**”). If the Funding Contingency or Approval Contingency is not satisfied on or before December 31, 2025 (the “**Contingency Deadline**”), the City shall immediately return to the Developer any portions of the Initial Developer Contribution paid to the City hereunder upon written demand therefor and, thereafter, all of the obligations of the Parties in this Agreement will be void and of no further force or effect.

II. DEVELOPER PROJECT

1. Developer will design, permit, develop, and construct the Developer Project, including the Developer Drainage Facilities, in accordance with the Revised Site Plan at its sole cost and expense.

2. The Developer will provide information to and coordinate with the City about the Drainage Facilities.

III. DEVELOPER CONTRIBUTION

1. Promptly upon execution of this Agreement, the Developer will pay the City an amount equal to \$73,000.00 (the “**Initial Developer Contribution**”), which represents the estimated cost to design and construct the City-Constructed Drainage Facilities, without contingencies or potential modifications, as set forth in the cost estimate attached as **Exhibit B**.

2. Upon completion of the City-Constructed Drainage Facilities, the City will provide written notice of same (the “**Completion Notice**”) to the Developer along with evidence reasonably satisfactory to Developer to show: (a) the actual cost incurred by the City to design and construct the City-Constructed Drainage Facilities (the “**Actual Cost**”); (b) that the City-Constructed Drainage Facilities have been completed in accordance with the City’s applicable

construction documents; and (c) that such City-Constructed Drainage Facilities are operable and able to accept drainage from the Developer Project. Within thirty (30) calendar days after Developer's receipt of the Completion Notice and all required supporting documentation, in the event that the Actual Cost is greater than the Initial Developer Contribution, the Developer will pay the City an amount equal to the Actual Cost less the Initial Developer Contribution, but not to exceed \$60,900.00 (the "**Additional Developer Contribution**"); provided, however, that Developer will only be responsible for those portions of the Additional Developer Contribution attributable to costs that were approved in writing by Developer in advance of the City incurring such costs. In the event that the Actual Cost is less than the Initial Developer Contribution, the City will pay to the Developer an amount equal to the Initial Developer Contribution less the Actual Cost (the "**Developer Refund**") at such time that the City provides the Completion Notice to Developer. The Initial Developer Contribution, together with the Additional Developer Contribution, if any, are referred to herein as the "**Developer Contribution**".

IV. GENERAL PROVISIONS

1. Interpretation of this Agreement. This Agreement shall, in the event of any dispute over its meaning or application, be interpreted fairly and reasonably, and neither more strictly for nor against either Party.

2. Notice and Addresses. Any Notice in this Agreement provided or permitted to be given, made or accepted by either Party to the other must be in writing. Notice may, unless otherwise provided herein, be given or served (a) by depositing the same in the United States mail, postage paid, certified mail, and addressed to the Party to be notified at the last address for which that the sender has at the time of mailing, with return receipt requested, or (b) by delivering the same to such Party, or an agent of such Party. Notice deposited in the mail in the manner described above shall be effective two (2) days after such deposit. Notice given in any other manner shall be effective only if and when received by the Party to be notified. For the purposes of Notice, the addresses of the City and Developer for receipt of any notice in this Agreement are:

DEVELOPER: Waller Creek Owner LLC
Attn: John Walter
2000 McKinney Avenue, Suite 1000
Dallas, Texas 75201-2027
E-Mail Address: jwalter@lpc.com

CITY: City of Austin, Texas

With copy to: City of Austin, Texas
Law Department
Attn: Sean Creegan
301 West 2nd Street (78701)
P.O. Box 1088
Austin, Texas 78767-1088
Facsimile Number: 512-974-6461
E-Mail Address: Sean.Creegan@austintexas.gov

3. Notice of Default; Opportunity to Cure; Remedies. If any Party alleges that the other has defaulted in the performance of any obligation under this Agreement, the alleging Party will provide written Notice to the other Party specifying the nature of the alleged default and provide the other Party a reasonable opportunity of at least fifteen (15) calendar days to cure the default before exercising any remedy related to the alleged default. Upon the failure of either Party to comply with the provisions of this Agreement, which failure continues beyond any applicable grace or notice and opportunity to cure period, the other Party shall have the right to enforce the terms and provisions of this Agreement by specific performance, or by such other legal or equitable relief to which the non-defaulting Party may be entitled.

4. Amendment. This Agreement may be modified only by a writing properly executed by each of the Parties. Neither any representation or promise made after the execution of this Agreement, nor any modification or amendment of this Agreement, shall be binding on the Parties unless made in writing and properly executed by each of the Parties.

5. No Third-Party Beneficiaries. Except as expressly provided in this Agreement, nothing in this Agreement will be construed to confer upon any person other than the Parties any rights, benefits or remedies under or because of this Agreement.

6. Assignment. A Party to this Agreement may not assign or transfer its interests under this Agreement without written approval of the other Party.

7. No Joint Venture, Developer, Agency. This Agreement will not be construed in any form or manner to establish a joint venture or agency, express or implied, or any employer-employee or borrowed servant relationship by and among the Parties.

8. Severability. If any term or provision of this Agreement is void or unenforceable as determined by a court of competent jurisdiction, the remainder of this Agreement remains effective to the extent permitted by law.

9. Applicable Law; Venue. This Agreement is made under and shall be governed by the laws of the State of Texas, without regard to conflicts of laws principles, which would apply the law of any other jurisdiction.

10. Counterparts. The Parties may execute this Agreement in one or more duplicate originals each of equal dignity.

11. Electronic Signatures. The use of electronically transmitted signatures, in place of original signatures on this Agreement is expressly allowed. The Parties intend to be bound by the signatures on such electronically transmitted document; are aware that the other Party will rely on the electronically transmitted signatures; and hereby waive any defenses to the enforcement of the terms of this Agreement based on the form of signature.

12. Effective Date. The "Effective Date" shall be the date the final Party signs this Agreement.

13. No Waiver. No waiver of any provision of this Agreement will be deemed to constitute a waiver of any other provision or any other agreement between the Parties. No waiver of any provision of this Agreement will be deemed to constitute a continuing waiver

THIS AGREEMENT is duly executed by the Parties to this Agreement on the respective dates following each Party's signature and is effective on the Effective Date.

[Signature Page Follows.]

CITY:**City of Austin**By: JL MoralesName: Jorge L. MoralesTitle: Director, Watershed Protection Dept.Date: 05/02/2023

Approved as to Form:

Sean CreeganSean Creegan
Assistant City Attorney**DEVELOPER:****WALLER CREEK OWNER LLC,**
a Delaware limited liability companyBy: Waller Creek JV LLC, a Delaware limited liability company,
its sole memberBy: Tony CorpName: Tony CorpTitle: Authorized RepresentativeDate: 3.24.23

EXHIBIT A

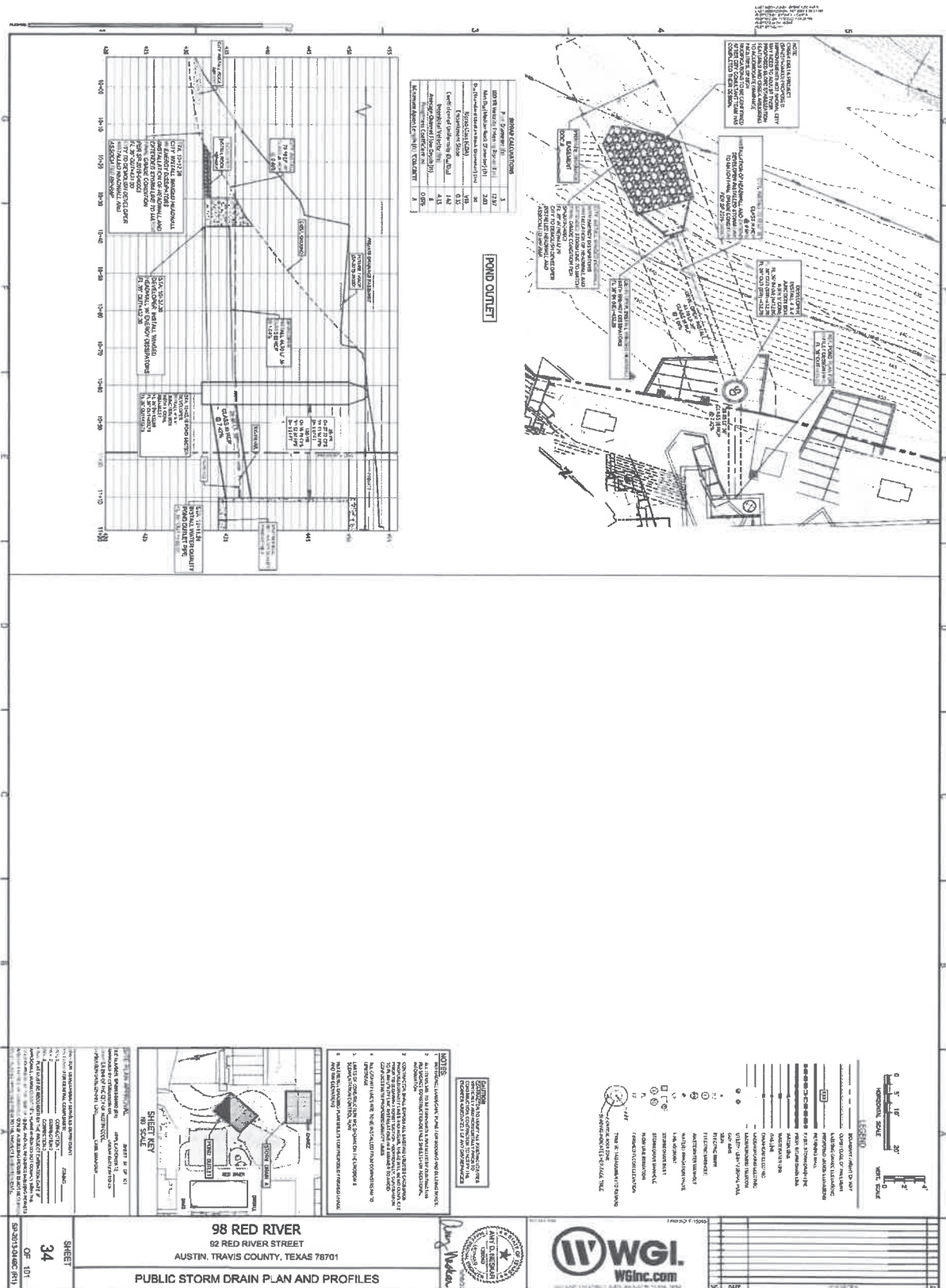


EXHIBIT B
ESTIMATED COSTS

Preliminary Design of Creek Delta (SPC-2019-0400D)
Extension to Waller Park Place (SP-2013-0449C(R1)) Stormwater Infrastructure
April __, 2022

INITIAL DEVELOPER CONTRIBUTION				
Description	Quantity	Unit	Unit Cost	Total
Engineering	-	-	\$38,500.00	\$38,500.00
Construction Inspection	-	-	\$5,500.00	\$5,500.00
Demolish Existing Headwall	1	EA	\$2,275.00	\$2,275.00
Demolish Existing 36" RCP	45	LF	\$75.00	\$3,375.00
Install 36" RCP	70	LF	\$225.00	\$15,750.00
Install 36" Headwall w/ Dissipaters	1	EA	\$7,600.00	\$7,600.00
Total Initial Developer Contribution				\$73,000.00

POTENTIAL ADDITIONAL DEVELOPER CONTRIBUTION				
Description	Quantity	Unit	Unit Cost	Total
Potential modifications to Creek Delta (SPC-2019-0400D) Grading, Walls, Creek Armoring, and Improvements Associated with Addition of Stormwater Infrastructure, and storm drain video inspection	1	LS	\$30,000.00	\$30,000.00
30% Contingency				\$30,900.00
Total Potential Additional Developer Contribution				\$60,900.00

**OPERATING AND MANAGEMENT AGREEMENT
FOR THE CONFLUENCE**

BY AND AMONG

CITY OF AUSTIN, TEXAS

AND

WATERLOO GREENWAY CONSERVANCY

_____, 2024

OPERATING AND MANAGEMENT AGREEMENT FOR THE CONFLUENCE

This OPERATING AND MANAGEMENT AGREEMENT (this “**Agreement**”) is made and entered into as of the Effective Date (as defined below) by and between the **CITY OF AUSTIN, TEXAS**, a Texas home rule city and municipal corporation (the “**City**”) and the **WATERLOO GREENWAY CONSERVANCY**, a Texas non-profit corporation (the “**WGC**”), (individually referred to herein as a “**Party**” and collectively as the “**Parties**).”

RECITALS:

WHEREAS, the Parties previously entered into the Waller Creek District Joint Design, Development, Management and Operation Agreement, dated April 16, 2014, as amended by that certain Amendment to Joint Design, Development, Management and Operation Agreement dated effective October 14, 2020 (as amended, the “**JDA**”) in which the Parties agreed to their respective roles and responsibilities for the implementation of a schedule of improvements for the area of the City referred to as the Waller Creek District, including The Confluence (as defined herein), and the Operating and Management Agreement, dated April 16, 2014 (the “**OMA**”), which governs WGC’s operations and maintenance requirements for the Waller Creek District, including The Confluence; and

WHEREAS, the City (i) is the owner or easement holder of the land comprising The Confluence and all associated improvements, (ii) is the owner of the Waller Creek Flood Control Tunnel (hereinafter defined) and related infrastructure, and (iii) has easements relating to right of way and utility infrastructure in areas immediately outside The Confluence and inside The Confluence.

WHEREAS, once the construction of improvements at The Confluence is completed in accordance with the Confluence Construction Phase Plan (hereinafter defined), WGC will operate and maintain certain areas of the Park as required by the JDA, the OMA, and this Agreement. The City will operate and maintain the Waller Creek Flood Control Tunnel and the area’s flood control improvements; and

WHEREAS, each Party’s operations and maintenance impacts the other Party’s operations and maintenance;

WHEREAS, the Parties desire to enter into this Agreement in order to set forth certain of the Parties’ respective rights, obligations and undertakings relating to the construction of improvements in the Confluence area and the time after completion of these improvements to the Confluence;

NOW, THEREFORE, for and in consideration of the mutual covenants, agreements and benefits to the Parties, it is agreed as follows:

AGREEMENT

ARTICLE I. DEFINITIONS

Section 1.1 Definitions. The following terms have the meanings set forth below:

“Applicable Law” means any law, statute, ordinance, rule, regulation, order or determination of any Governmental Authority, including, without limitation, all applicable restrictive covenants, zoning ordinances and building codes, flood disaster laws, all access, health, safety, natural resource protection and environmental laws and regulations, and all other applicable federal, state, and local laws, statutes, ordinances, rules, regulations, orders, determinations and court decisions, including without limitation, the Texas Prompt Payment Act, Waterfront Overlay District, Downtown Creek Overlay, Capitol View Corridor restrictions, Great Streets Development Program and Urban Design Guidelines for Austin (f/k/a the Downtown Austin Design Guidelines).

“The Confluence” is the 14.5-acre public space along Waller Creek between 4th St. and Lady Bird Lake, between IH-35 on the east and Trinity St. on the west as depicted on Attachment A.

“Construction Period” means the period commencing on the date a “notice to proceed” is issued for the Work and ending on the date of Substantial Completion of the Work as defined in the JDA.

“Effective Date” means the date on which this Agreement has been duly executed by the last Party to sign this Agreement as evidenced by the date below the signature of the last Party to sign.

“Governmental Function” means any regulatory, legislative, permitting, zoning, enforcement (including police power), licensing or other functions which a Governmental Authority is authorized or required to perform, or any function identified in Section 101.0215, Tex. Civ. Prac. & Rem. Code.

“PARD” means the Parks and Recreation Department of the City.

“Property Agreements” means those leases, easements, licenses or other property use agreements that allow the City to use portions of The Confluence as parkland or otherwise with certain restrictions and limitations existing as of the Effective Date and any new agreements or amendments to the Existing Property Agreements entered into by the City consistent with the WGC consent requirements of Section 4.1 below.

“Waterloo Greenway Conservancy” is the entity responsible for the operations of The Confluence.

“Waller Creek Flood Control Tunnel” means the flood control tunnel and related infrastructure along Waller Creek operated by the City. Tunnel includes the total surface area, and the area above and below the surface containing the Waller Creek Tunnel infrastructure constructed by the City including property and easements, reserved by plat, or otherwise owned or

controlled by the City, for use in the Tunnel operations for flood control, life safety concerns, and general operations and maintenance of the Tunnel, including those areas used for Tunnel purposes that are within the District ROW. The Waller Creek Flood Control Tunnel includes a significant facility at Lady Bird Lake identified on Attachment A as the “**Tunnel Outlet**” that requires regular, ongoing operations, maintenance, and access.

“**WPD**” means the City of Austin’s Watershed Protection Department, which manages the City’s creeks, drainage systems and water quality programs, operates and maintains the Waller Creek Flood Control Tunnel and related flood control infrastructure.

Section 1.2 Points of Contact

The following contacts shall be used in complying with the requirements of this Agreement:

WGC

Main Point of Contact: Martin Nembhard
(512-541-3520)

mnembhard@waterloogreenway.org

John Rigdon (512-541-3520 x 112)

jrigdon@waterloogreenway.org

City – WPD

Main Point of Contact: John Beachy
(512-974-3516)

john.beachy@austintexas.gov

Kristin Kasper Pipkin (512-974-3315)

KristinK.Pipkin@austintexas.gov

City – PARD

Lana Denkeler (512-974-9414)

Lana.denkeler@austintexas.gov

A Party may amend their designated contact(s) listed above by written notice to the other Party.

ARTICLE II. CONFLUENCE OPERATIONS & MAINTENANCE COORDINATION DURING CONSTRUCTION

The City will construct improvements within The Confluence, in accordance with the plans and specifications for the Confluence project, the JDA, and the approved Confluence Construction Phase Plan (hereinafter so called), through its contractor (the “**Work**”). The Work is contemplated to commence and run from approximately January 2023 through to completion in Winter 2025, but such dates may shift in the ordinary course of a construction project. WPD operates and maintains the Tunnel Outlet, parts of Waller Creek, and related flood control infrastructure. The operations and maintenance of these public facilities will be the responsibility of the City through the Construction Period. WGC shall have no operations and maintenance authority or responsibility for The Confluence during the Construction Period.

ARTICLE III. OVERVIEW OF THE PARK POST-CONSTRUCTION

The Confluence is a 14.5-acre park with a variety of landscape types and structures. WGC and the City developed a detailed manual describing the tasks, hours, and costs of maintenance of the park after completion, a copy of which is attached to this Agreement as Attachment B (the “**Site Management Manual**”). The Site Management Manual will be used by the WGC to create a staffing plan for The Confluence.

The Confluence is a complex site with overlapping operational responsibilities. The site includes Waller Creek, elevated boardwalk trails, bridges, planted slopes, maintenance access paths, and other park and public infrastructure improvements including ponds and other stormwater and utility infrastructure. It is also immediately adjacent to the Tunnel Outlet. Coordination of operations will be essential to success because the site is geographically constrained and has limited street access.

ARTICLE IV. CONFLUENCE OPERATIONS & MAINTENANCE RESPONSIBILITIES

Section 4.1 Responsibilities of WGC.

WGC has the responsibility for operations and maintenance of the area identified as “WG Primary Responsibility” on Attachment A (“**WGC Area**”).

WGC and City acknowledge and agree that portions of The Confluence are not owned in fee simple by the City, and that the Property Agreements grant the City other property rights through leases, easements, licenses or other property use agreements that allow the City to use such property as parkland or otherwise with certain restrictions and limitations. Prior to the Substantial Completion of construction, City will provide WGC with copies of the Existing Property Agreements. WGC’s use of The Confluence is limited to the rights available to the City under the Property Agreements. WGC shall use The Confluence consistent with the rights available to the City in the Property Agreements. The City has the responsibility to keep the Existing Property Agreements documentation up-to-date and to provide timely responses to WGC when information is requested on the Agreements. WGC acknowledges that failure to comply with the terms of the Property Agreements may result in the termination of those agreements and the loss of access to those areas for both the WGC and City.

Section 4.2 Responsibilities of the City

The City has responsibility for the operations and maintenance of the area identified as “COA Primary Responsibility” on Attachment A (the “**WPD Area**”).

Section 4.3 Coordination of Use of the WGC Area

The City will seek to minimize its use of the WGC Area, as much as practicable. When the City needs to utilize the WGC Area for non-routine maintenance, the City will provide written notice to WGC that provides:

1. A description of the area it needs to use, with that area shown on a map;

2. The specific days and times this use is needed;
3. A description of the reason for the use and the impact the use will have, including sound, equipment, odors, and potential disturbance to the primary operations of the WGC Area.

The City will provide notice to WGC at least 48 hours prior to needing use of the WGC Area. If the days and times that the City seeks to use the WGC Area interferes with WGC's pre-planned use of the WGC Area, WGC and the City will negotiate, in good faith, alternate days and times that the City may use the WGC Area. If a health and safety concern requires the City to make use of the WGC Area within a certain period of time that occurs at the same time as WGC's pre-planned use, WGC and the City will negotiate, in good faith, for the City's use of the Area to be performed at a time and in a manner so as to have as little impact with WGC's pre-planned use as possible.

In the event of an emergent situation, involving a threat to the public safety, health or welfare, the City reserves its right to use the WGC Area as needed to abate that threat. The City will give oral notice to WGC of the emergent situation as soon as possible.

Section 4.4 Coordination of Use of the WPD Area

If WGC needs access to the WPD Area for maintenance, repairs, or improvements of WGC equipment or improvements constructed pursuant to the Confluence Construction Phase Plan, it will provide WPD with written notice at least 48 hours prior to needing such access. If the days and times that WGC seeks to use the WPD Area will interfere with the City's pre-planned use of the WPD Area or the use the City anticipates will be necessary due to an expected storm or other weather event affecting the WPD Area, WGC and WPD will negotiate, in good faith, alternate days and times that WGC may use the WPD Area. If the City determines that there is a safety concern with the requested access, the City may require that WGC be escorted by WPD during such access, and that the WPD area must be accessed between the hours of 6:00 a.m. and 5:00 p.m. on weekdays.

Section 4.5 Coordination for Use of Shared Confluence Areas

As depicted in Attachment A, there are maintenance access points and paths in The Confluence identified on Attachment A as "Shared Responsibility" ("**Shared-Use Areas**") that both WGC and WPD need to use for the operations and management of their respective areas. WGC and WPD will coordinate the use of these Shared-Use Areas, except in emergent situations when WGC or WPD must use the Shared-Use Areas to prevent or mitigate a threat to public safety, health or welfare.

The Main Points of Contact in Section 1.2 will schedule monthly meetings, including additional attendees as needed, to provide a general overview of upcoming operations and management activities. These meetings will be designed to share information for awareness and coordination. The Parties will create and maintain a Shared-Use Area calendar. This will be a digital calendar that the Parties have access to and will update with upcoming events that utilize the Shared-Use Area. Tasks that require use of or access to the other Party's primary area will also be posted to the calendar.

In addition to the monthly coordination meetings, the Parties will meet in January and July to preview the coming six months. All anticipated activities at that time will be outlined on the calendar. It is understood that this will not be inclusive of all activities, but good-faith efforts will be made to include all known events.

The WGC and the City will work together on a warning system for public safety for The Confluence, including features such as the elevated boardwalk, trails, bridges, and shared maintenance access points.

Section 4.6 Special, Recurring Operations and Maintenance Tasks

Certain operational situations are anticipated that will require special coordination. These include, but are not limited to:

1. Special events and large-scale maintenance activities along Waller Creek.
2. Regular cleaning of the outlet lagoon and related flood control infrastructure.
3. Storm events that impact the Waller Creek Flood Control Tunnel operations.

For these special recurring events, the Parties will provide documentation of what activities and area uses will occur in the biennial meetings. This documentation will include the following information:

1. Details of the area of impact in written and map format;
2. The estimated duration of the special, recurring task with a description of changes in operations and the impacts caused by these changes; including sound, equipment, odors, and potential disturbance to the primary operations of that area; and
3. Any other important information that the Parties should know, such as staffing and equipment impacts.

These special task summaries will be kept on record for reference. If significant changes to the task are required for any particular event, the Parties will provide written notice of those modifications in advance of the work being initiated.

Section 4.7 Areas of Elevated Coordination

As depicted on Attachment A, there are certain “**Areas of Elevated Coordination**” (hereinafter so called) located within or adjacent to the Confluence that require a heightened level of coordination and attention with respect to the operations and maintenance of such areas, including, communication and coordination with other departments of the City and other third-party agencies, entities or organizations (“**Relevant Parties**”). The Parties will work in good faith to coordinate with the Relevant Parties applicable to each Area of Elevated Coordination set forth below:

Area of Elevated Coordination	Relevant Parties
1. MACC Trail Connection/Butler Trail	PARD/MACC, WGC, The Trail Conservancy
2. Waller Creek Tunnel Outlet	WPD, WGC, The Trail Conservancy
3. Shared O&M Path near HACA	WPD, WGC, HACA
4. Cesar Chavez St. Bridge	WPD, COA Street & Bridge/ROW, WGC
5. Canopy Walk	WPD, ACC, COA Street & Bridge, WGC
6. Red River St. Bridge	WPD, COA Street & Bridge/ROW, WGC
7. The Bend/The Spring	WPD, PARD, WGC
8. Austin Convention Center Pond	ACC, WPD, PARD, WGC
9. 3 rd St. Bridge	WPD, COA Street & Bridge/ROW, WGC
10. Cypress Grove/Trailhead Plaza	WPD, ATPWD, CapMetro, WGC

Notwithstanding their designation as Areas of Elevated Coordination, City and WGC acknowledge and agree that WGC has no maintenance responsibilities for the Cesar Chavez St. Bridge, the 3rd St. Bridge or the Red River St. Bridge.

Section 4.8 Reporting Requirements

WGC staff will regularly document and track inspection and maintenance activities, making recurring maintenance issues easy to identify and providing reports to the City Representative from time to time but at a minimum annually.

ARTICLE V. TERM OF AGREEMENT

Section 5.1 Initial Term.

The initial term of this Agreement commences on the Effective Date and terminates on January 31, 2043.

Section 5.2 Renewals

This Agreement will automatically renew for eight consecutive terms of 10 years each, unless the City, the LGC, or the Conservancy give 180-days' prior written notice to each other party of its election for the Agreement not to renew and for the Agreement to expire on the expiration of the term then in effect. If this Agreement is terminated by mutual agreement of the Parties, or other event, the Parties upon request shall promptly execute a document confirming the termination of this Agreement and such other documents as may be reasonably appropriate under the circumstances.

ARTICLE VI. NOTICES

Section 6.1 Delivery of Notice.

The Parties contemplate that they will engage in informal communications with respect to the subject matter of this Agreement. However, any formal notices or other communications

required or permitted to be given by one Party to another by this Agreement shall be given in writing addressed to the Party to be notified at the address described below for the Party, (a) by delivering the same in person, (b) by depositing the same in the United States mail, certified, return receipt requested, postage prepaid, addressed to the Party to be notified, (c) by depositing the same with a nationally recognized courier service guaranteeing "next day delivery," addressed to the Party to be notified, (d) by electronic mail with confirming copy sent by one of the methods described in subsections (a), (b) or (c) of this sentence or (e) by sending the same by telefax with confirming copy sent by one of the methods described in subsections (a), (b) or (c) of this sentence. A notice delivered in accordance with the immediately preceding sentence will be deemed to have been given upon the date of delivery (or refusal to accept delivery) as indicated on the return receipt; provided, however, if such notice is not delivered or refused on a Business Day, then notice shall be deemed to have been given on the first Business Day following the actual date of delivery or refusal. For the purposes of notice, the addresses of the Parties, until changed as provided below, shall be as follows:

City:

John Beachy
City of Austin
Division Manager
Downtown & Waller Creek Tunnel Operations
Watershed Protection Department
411 Chicon St, Austin TX, 78702
Cell (512) 974-3516

2001 E 5th St. Building G
Austin, Texas 78702
(512) 974-3516
john.beachy@austintexas.gov

With copies to:

Jesús Garza
Interim City Manager
City of Austin
301 W. 2nd Street, 3rd Floor
Austin, Texas 78701
512-974-2200
Jesus.Garza@austintexas.gov

Anne Morgan
City Attorney
City of Austin
301 W. 2nd Street, 3rd Floor
Austin, Texas 78701
512-974-2507
Anne.Morgan@ austintexas.gov

Ed Van Eenoo
Chief Financial Officer

City of Austin
 301 W. 2nd Street, 4th Floor
 Austin, Texas 78704
 512-974-2268
 Ed.vaneenoo@ austintexas.gov

Conservancy: Jesús Aguirre
 CEO
 Waterloo Greenway Conservancy
 P.O. Box 12363
 Austin, Texas 78711
 512-541-3520

With copies to: Chair
 Waterloo Greenway Conservancy
 P. O. Box 12363
 Austin, Texas 78711
 512-541-3520

The Parties must endeavor to provide at least five days written notice to the other Parties of a change to their respective addresses.

ARTICLE VII. GENERAL PROVISIONS

Section 7.1 Independent Contractor.

It is understood and agreed that the relationships among the City and WGC will be that of an independent contractor. Nothing contained in this Agreement will be deemed or construed to (i) make the City the agent, servant or employee of WGC, (ii) make WGC the agent, servant or employee of the City, (iii) create any partnership, joint venture, or other association between the City and WGC.

Section 7.2 Waiver.

The failure of any Party to insist, in any one or more instances, on the performance of any of the terms, covenants or conditions of this Agreement, or to exercise any of its rights under this Agreement, will not be construed as a waiver or relinquishment by such Party of such term, covenant, condition or right with respect to further performance.

Section 7.3 Reservation of Rights.

To the extent not inconsistent with this Agreement, each Party reserves all rights, privileges, and immunities under Applicable Laws. The rights and remedies of the Parties under this Agreement shall not be mutually exclusive. The exercise of one or more of the provisions of this Agreement shall not preclude the exercise of any other provisions of this Agreement.

Section 7.4 Easements.

This Agreement has no impact or effect on the rights and obligations of the Parties in any existing or future easements.

Section 7.5 Governing Law; Venue.

This Agreement will be governed, construed and enforced in accordance with the laws of the State of Texas. Venue shall be in state courts in Travis County, Texas.

Section 7.6 Dates.

If a Day requiring notice or action falls on a weekend or national or local holiday, the next non-weekend day or non-holiday shall be applicable.

Section 7.7 Severability.

If any provision of this Agreement is held to be illegal, invalid or unenforceable under present or future laws, the legality, validity and enforceability of the remaining provisions of this Agreement will not be affected thereby, and this Agreement will be liberally construed so as to carry out the intent of the Parties to it.

Section 7.8 Parties in Interest.

The terms of this Agreement will be binding upon, and inure to the benefit of, the Parties and their permitted successors and assigns. Nothing in this Agreement, whether express or implied, will be construed to give any person or entity (other than the Parties and their permitted successors and assigns) any legal or equitable right, remedy or claim under or in respect of any terms or provisions contained in this Agreement or any standing or authority to enforce the terms and provisions of this Agreement.

Section 7.9 Assignments.

Neither Party may assign its rights or obligations under this Agreement without the prior consent of the other Parties.

Section 7.10 Amendments.

This Agreement will not be modified or amended in any manner except by a writing signed by all the Parties.

Section 7.11 Entire Agreement.

The JDA, the OMA and this Agreement represents the entire and integrated agreement between the Parties with respect to the subject matter of this Agreement. All prior negotiations, representations or agreements not expressly incorporated into this Agreement are superseded and canceled. In the event of a conflict between this Agreement, the JDA, and the OMA, the JDA controls over the OMA and this Agreement and the OMA controls over this Agreement.

Section 7.12 Incorporation of Attachments.

All attachments, exhibits, schedules, plans, and other documents attached to or referred to in this Agreement are incorporated into this Agreement by reference for the purposes described in this Agreement.

Section 7.13 Counterparts.

This Agreement may be executed in any number of counterparts, all of which taken together shall constitute one and the same instrument and any of the Parties hereto may execute this Agreement by signing any such counterpart.

Section 7.14 Captions.

Captions and section headings appearing herein are included solely for convenience of reference and are not intended to affect the interpretation of any provision of this Agreement.

Section 7.15 Interpretation.

The Parties acknowledge and represent that this Agreement has been jointly drafted by the Parties, that no provision of this Agreement will be interpreted or construed against any Party solely because the Party or its legal counsel drafted such provision and that each of them has read, understood, and approved the language and terms set forth herein.

Section 7.16 Capacity of the City.

Without in any way limiting or extending the obligations, duties, covenants and agreements of the City as a Party to this Agreement, the Parties agree that any action, omission or circumstance arising out of the exercise or performance of the City's required Governmental Functions shall not cause or constitute a default by the City under this Agreement or any other document delivered in connection with this Agreement or give rise to any rights or claims for damages or injury against the City in its capacity as a Party to this Agreement. WGC's remedies for any injury, damage or claim resulting from any other action, omission or circumstance shall be governed by the laws and regulations concerning claims against the City as a home rule charter city. These provisions shall survive any termination of this Agreement.

Section 7.17 Capacity of Parties Acting on Behalf of the City.

All references in this Agreement to employees, agents, representatives, contractors and the like of the City shall refer only to persons or entities acting on behalf of the City in its capacity as a Party to this Agreement, and all such references specifically exclude any employees, agents, representatives, contractors, elected officials and the like acting in connection with the performance of the City's required Governmental Functions.

Section 7.18 No Limitation on the City's Governmental Functions.

The Parties acknowledge that no representation, warranty, consent, approval or agreement in this Agreement by the City (as a Party to this Agreement) shall be binding upon, constitute a

waiver by or estop the City from exercising any of its rights, powers or duties in its required Governmental Functions. For example, approval by the City of this Agreement shall not constitute satisfaction of any requirements of, or the need to obtain any approval by, the City in the exercise of its Governmental Functions or as may be required under any Applicable Laws.

Section 7.19 Annual Review of Agreement.

Due to the long-term nature of this Agreement, the Parties recognize the need to review this Agreement annually to determine if provisions are adequate for the circumstances existing at such time. The Parties agree that such review may indicate the need to amend this Agreement and they agree to work in good faith to agree upon amendments and modifications to the Agreement in light of the results of this review.

[Remainder of this page intentionally left blank; signature pages follow.]

IN WITNESS WHEREOF, the City and the Conservancy have executed this Agreement as of dates below, to be effective as of the Effective Date.

WGC:

WATERLOO GREENWAY CONSERVANCY

By_____

Name:_____

Title:_____

Date:_____

CITY:

CITY OF AUSTIN, TEXAS

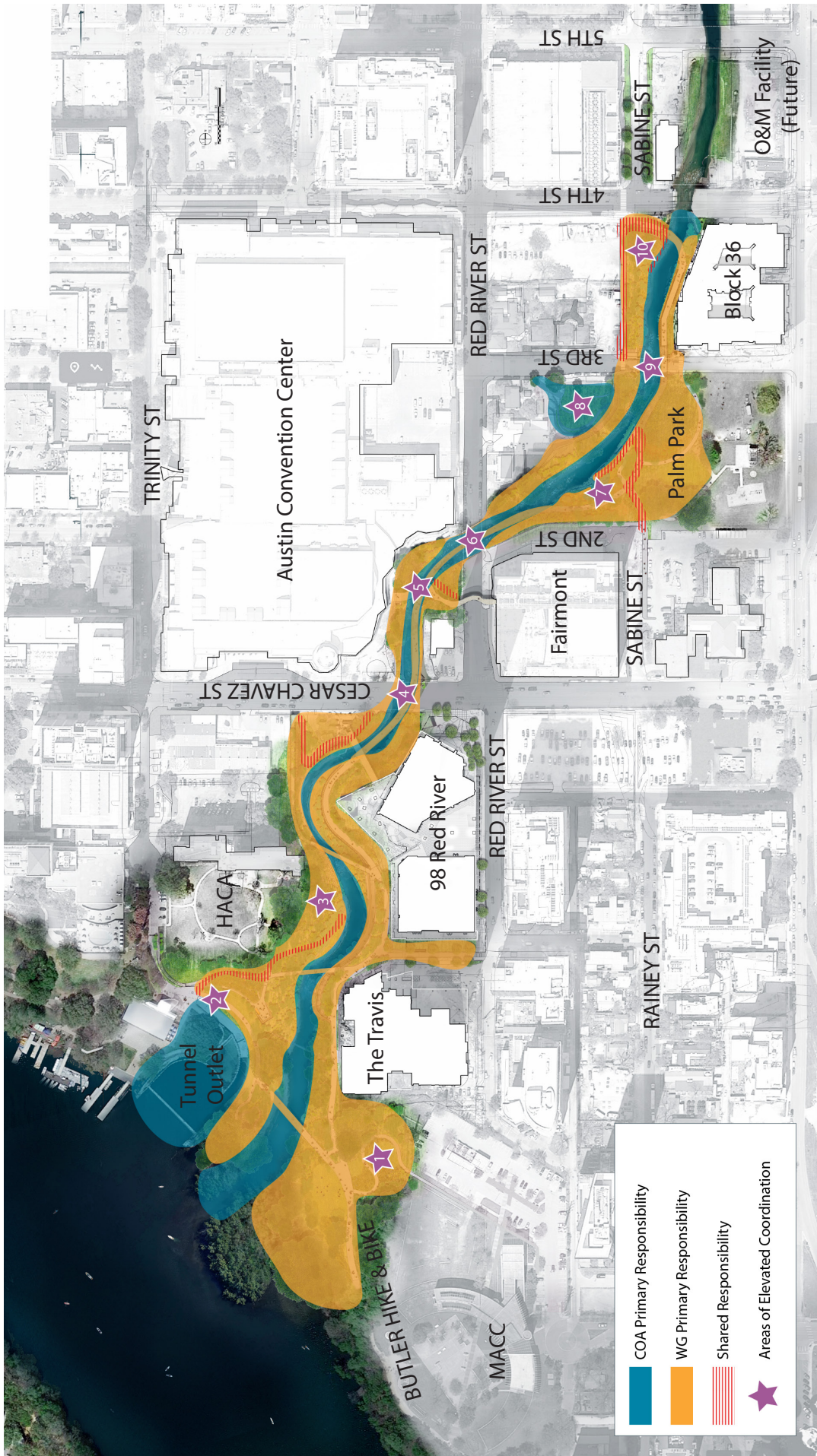
By_____

Name:_____

Title:_____

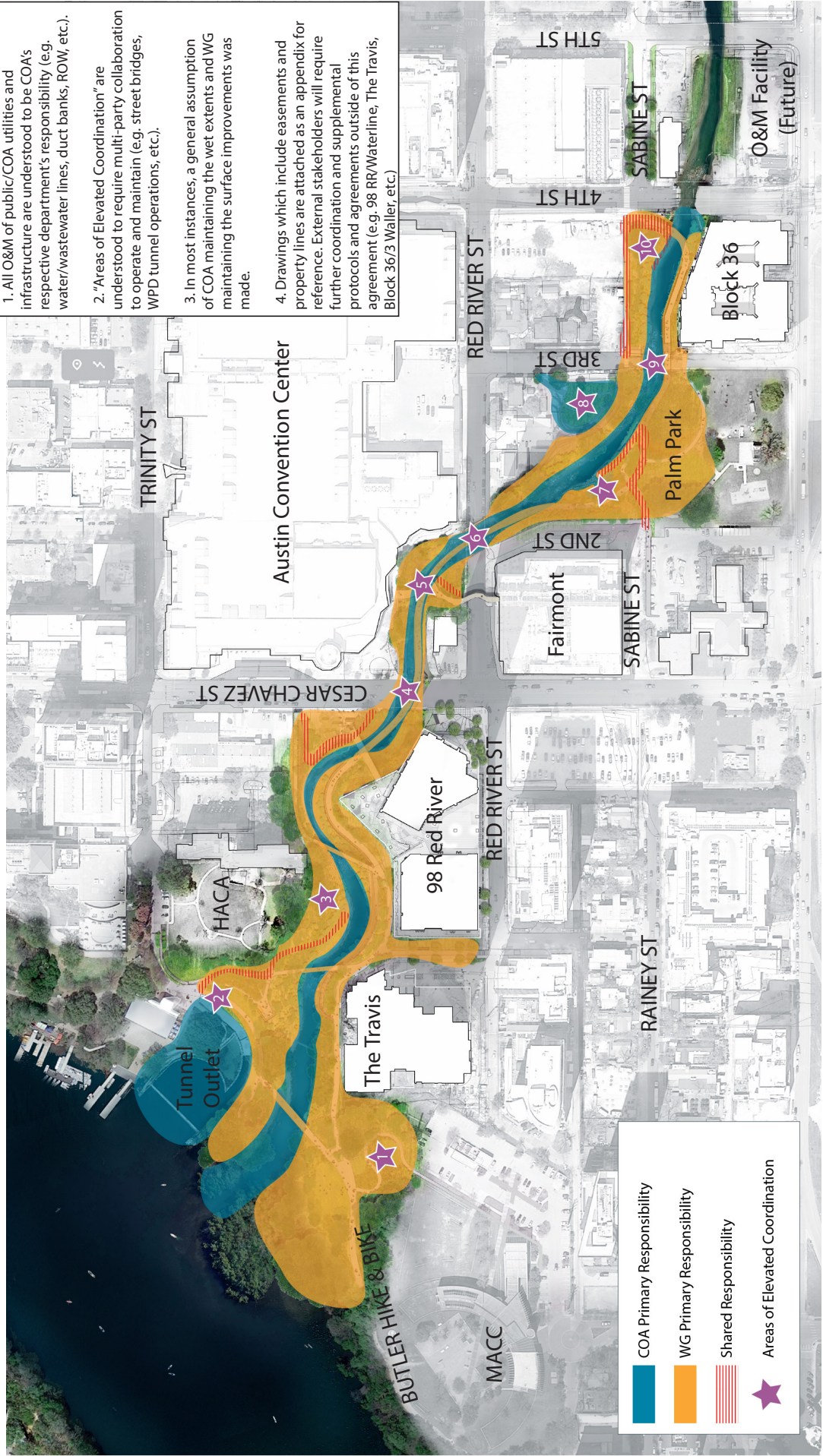
Date:_____

ATTACHMENT A
CONFLUENCE MAP

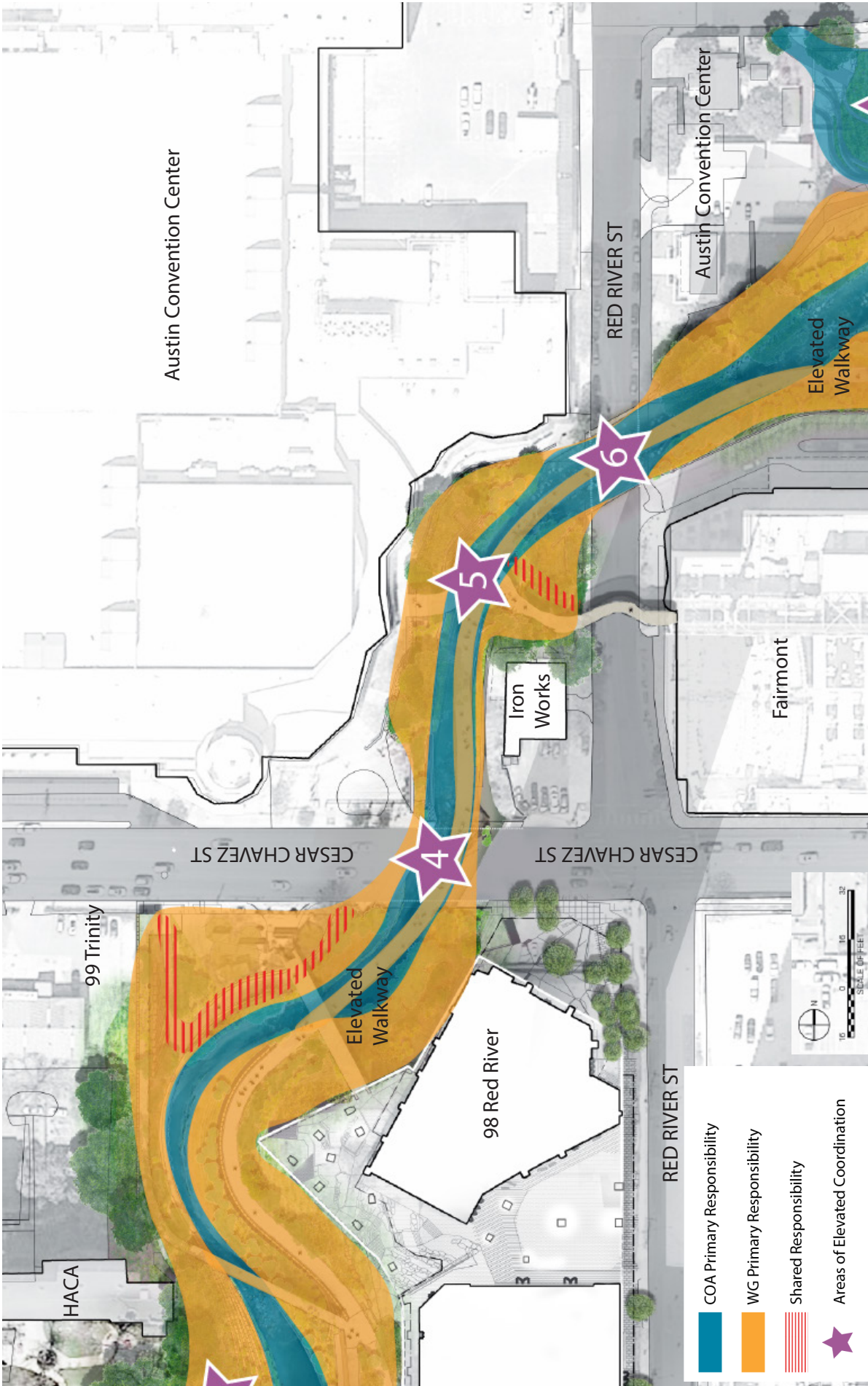


Notes/Assumptions:

1. All O&M of public/COA utilities and infrastructure are understood to be COA's respective department's responsibility (e.g. water/wastewater lines, duct banks, ROW, etc.).
2. "Areas of Elevated Coordination" are understood to require multi-party collaboration to operate and maintain (e.g. street bridges, WPD tunnel operations, etc.).
3. In most instances, a general assumption of COA maintaining the wet extents and WG maintaining the surface improvements was made.
4. Drawings which include easements and property lines are attached as an appendix for reference. External stakeholders will require further coordination and supplemental protocols and agreements outside of this agreement (e.g. 98 RR/Waterline, The Travis, Block 36/3 Wailer, etc.).









Areas of Elevated Coordination

1	<p>MACC Trail Connection/Butler Trail</p> <p>The trail connection from the Mexican American Cultural Center to the Waterloo Greenway improvements and the Butler Hike and Bike trail will require special coordination due to elevated visibility and overlapping areas of responsibilities.</p> <p>Relevant Parties/Entities: COA PARD/MACC, WGC, The Trail Conservancy</p>	5	<p>Canopy Walk</p> <p>The area near the Canopy Walk will require additional coordination and with the convention center and hotel uses that the walkway connects to under existing agreements.</p> <p>Relevant Parties/Entities: COA WPD, ACC, WGC, Street & Bridge/ROW</p>	9	<p>3rd Street Bridge</p> <p>The 3rd Street Bridge will require coordination of maintenance due to the trail structure passing underneath.</p> <p>Relevant Parties/Entities: COA WPD, COA Street and Bridge/ROW, WGC</p>
2	<p>Waller Creek Tunnel Outlet</p> <p>The area near the entrance to the tunnel outlet facility will require coordination with WPD clean out schedules and the Butler Trail operations.</p> <p>Relevant Parties/Entities: COA WPD, WGC, The Trail Conservancy</p>	6	<p>Red River Street Bridge</p> <p>The Red River Street Bridge will require coordination of maintenance due to the elevated walkway structure passing underneath.</p> <p>Relevant Parties/Entities: COA WPD, COA Street & Bridge/ROW, WGC</p>	10	<p>Cypress Grove/Trailhead Plaza</p> <p>The trailhead at 4th St will require additional coordination due to elevated visibility, access constraints, and adjacencies to the commuter rail lines and the Lance Armstrong Bikeway.</p> <p>Relevant Parties/Entities: COA WPD, ATPWD, CapMetro, WGC</p>
3	<p>Shared O&M Path near HACA</p> <p>The design features near the O&M path by HACA will require coordination due to elevated visibility via the lattice bridges and the sensitive populations in the HACA housing complex.</p> <p>Relevant Parties/Entities: COA WPD, WGC, HACA</p>	7	<p>The Bend/The Spring</p> <p>The water quality and design feature at the entrance of Palm Park will require additional coordination due to elevated visibility and use in the park space.</p> <p>Relevant Parties/Entities: COA WPD, COA PARD, WGC</p>		
4	<p>Cesar Chavez Street Bridge</p> <p>The Cesar Chavez Street Bridge will require coordination of maintenance due to the elevated walkway structure passing underneath.</p> <p>Relevant Parties/Entities: COA WPD, COA Street & Bridge/ROW, WGC</p>	8	<p>Austin Convention Center Pond</p> <p>The COA FOD biofiltration pond at 3rd St will require coordination of maintenance items, including surface improvements and regular clean outs of the pond itself. Roles and responsibilities are outlined in an MOU between City Departments.</p> <p>Relevant Parties/Entities: Austin Convention Center, COA WPD, COA PARD, WGC</p>		

ATTACHMENT B
SITE MAINTENANCE MANUAL

WATERLOO GREENWAY SITE MANAGEMENT MANUAL

AUSTIN, TEXAS

Prepared For:
Waterloo Greenway
11 E. 7th Street, #712
Austin, TX 78701

Prepared By:
ETM Associates, L.L.C.
1202 Raritan Avenue
Highland Park, NJ 08904

February, 2022

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Chapter 1.0

Introduction



1.0. INTRODUCTION

1.1 MANUAL SCOPE AND PURPOSE

The Operations and Maintenance (O+M) of Waterloo Greenway (WG) and its project areas will be managed by the Waterloo Greenway Conservancy (WGC), in partnership with the City of Austin (City), for annual n maintenance, security and programming.

This Site Management Manual (the Manual) provides overall O+M guidelines and identifies the standards for maintenance and management of the landscapes and infrastructure within WG. The Manual is intended to be a living document that is to be reevaluated annually and updated as needed. The maintenance of WG project areas will be guided by the overall standards and maintenance practices outlined in this Manual. Specific details and dedicated project area issues will be addressed in their respective sections. With the exception of restrooms and small free standing structures (e.g. pavilions), that fall within the boundaries of the project areas are not included in the scope of this Manual.

The purpose of the Manual is to ensure that site maintenance staff, whether in-house or contracted, follow agreed upon procedures and protocols. The Manual will guide the staff to deliver the appropriate level of services and allow for a consistent, high standard of care and management throughout the WG.

1.2 PROJECT AREAS

The WG includes the following areas (see Figure 1):

- Pontoon Bridge
- Creek Delta (Lady Bird Lake to 4th Street)
- Palm Park
- The Narrows
- The Refuge
- Symphony Square
- Waterloo Park

The current Manual (February 2022) covers Waterloo Park and Creek Delta. Other future project areas will be added as designs are completed.

Each project area will contain various types of hardscapes, constructed landscapes, plantings, site furnishings, and amenities. ETM has developed a list of these “landscape types” with descriptions, tasks, and estimated hours needed for maintenance of each type. These have been reviewed and revised based on comments from MVVA, Lady Bird Johnson Wildflower Center (LBJWC), the WGC, other subconsultants, and relevant City departments with responsibility for maintenance of the WG.

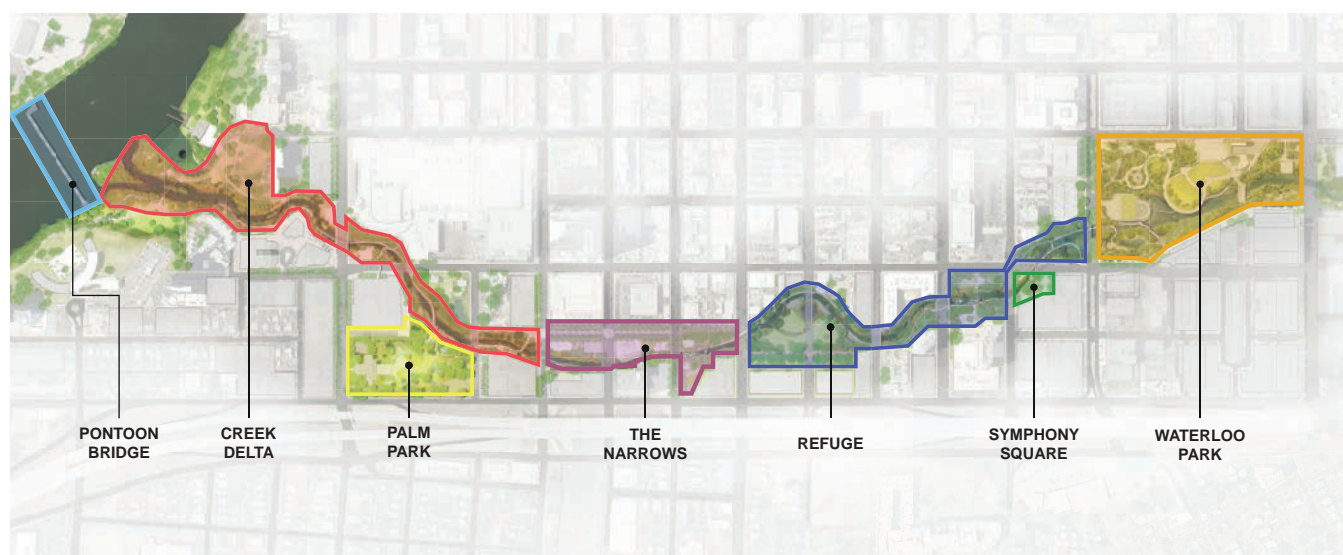


Figure 1. Project Areas

1.3 ESTABLISHING THE IMPORTANCE OF MAINTENANCE

The goal of maintenance is to ensure the WG is clean, attractive, safe, and provides a high-quality visitor experience. Quality maintenance work is done by those who have a vested interest and take pride in their work, understand how the WG is used and operates, and have the necessary skills to do what is required.

High quality maintenance is essential to protecting the long-term capital investment of WG. Establishing and continuing to employ high maintenance standards with either in-house staff or contracted services will protect the public/private partnership investment for many years.

1.3.1 DIFFERENCES BETWEEN MAINTENANCE AND MANAGEMENT

“Maintenance” and “management” are two terms used throughout the Manual. The differences are:

Maintenance is performance of tasks necessary to protect the park from damage, wear and tear, and deterioration. It includes all work needed to keep the park in proper condition and ensure visitors enjoy their experience.

Management ensures the entire the WG operates as intended and provides the resources and staff needed to carry out maintenance tasks, standards, and identifies roles and responsibilities.

1.4 NAVIGATING THIS MANUAL

To help with reading and understanding this Manual, chapters are broken down as follows:

- Chapter 1: Introduces the Manual, project areas and their boundaries.
- Chapter 2: Sets the standards and practices that are applied to the entire WG system, regardless of project areas.
- Chapter 3: Identifies the maintenance needs for the landscapes, materials, and features proposed by the Design Team. Each project area will be made up of various elements identified in Chapter 3.
- Chapter 4: Outlines general management needs and the staffing skill sets required to maintain the features and landscapes in WG.
- Chapter 5: Identifies the specific maintenance and budgetary needs to the unique to the landscapes, materials, and features in Waterloo Park.
- Chapter 6: Identifies the specific maintenance and budgetary needs to the unique to the landscapes, materials, and features in Creek Delta.

1.5 SUBMISSION HISTORY

- August 2018: 100% Waterloo Park submission.
 - All content related to Waterloo Park (Chapter 5) completed.
- November 2019: 75% Creek Delta submission.
 - Includes content related to Creek Delta (Chapter 6).
 - No changes made to materials related to Waterloo Park (Chapter 5).
 - With the exception of name changes to the park system and organization.
- September 2021: 90% Creek Delta submission.
 - Chapter 6 updated to reflect the 90% Construction Documents.
 - Content included materials discussed during the Maintenance Workshop (June 2020) with WG.
 - Manual updated to address most comments provided by COA. Outstanding comments will be addressed at 100%.
 - No changes made to materials related to Waterloo Park (Chapter 5).
- February 2022: 100% Creek Delta submission.
 - Chapter 6 updated to reflect the 100% Construction Documents.

Chapter 2.0

Standards of Care



2.0. STANDARDS OF CARE

Chapter 2.0 outlines the best practices and level of services for WG. These standards are applicable to all project WG areas and are to be followed regardless of staffing strategy chosen (i.e., in-house staff, contracted services, volunteers, or combination of staff). The standards are meant to be broad and represent the ideal best practices for maintenance (e.g. following SITES guidelines). They cover more general topics that apply to all the WG project areas. They may be modified for different project areas based on the area's specific needs and features. Specific maintenance needs for the landscape types found within project areas are located in Chapter 3. Needs unique to each project area are located in related chapters.

2.1 CREATION OF STANDARDS

The recommended standards of care found in this Chapter were developed as part of the Creek Corridor Framework Plan in consultation with LBJWC, who provided recommendations for tasks and task frequencies care of non-traditional park landscapes. Standards are defined by the frequency and types of tasks performed and were developed in order to achieve high standards of maintenance (i.e., scheduled litter removal, mown turf areas, etc.); park specific standards can be found in each project area's chapter.

For traditional park landscapes (turf, concrete/asphalt paths etc.), the Austin Parks and Recreation Department (PAR) maintenance standards were used as a baseline and adjusted to meet the needs of WG, reflecting the design, location, and anticipated usage. PAR Service Level 1 maintenance care is used here as the base for standards.

Natural planting areas are non-traditional urban park landscapes and the standards were developed in consultation with LBJWC, and reviewed by PAR and the Watershed Protection Department (WPD). These are function-driven landscapes, which are not intended to be heavily used. Instead, these are planting areas for ecological restoration, erosion control, wildlife habitats, and/or stormwater management. Aesthetics for these areas are secondary to their function; thus, they may appear a bit wild, particularly during the establishment phase.

Maintenance tasks and frequencies detailed in the spreadsheets (see Chapter 5 for Waterloo Park and Chapter 6 for Creek Delta) aim to achieve the standards needed in order to provide a healthy, well-maintained public landscape and to protect the capital investment. Actual maintenance is expected

to be monitored and modified by the site supervisor/maintenance staff and will ultimately be based on usage, weather, standards of care, and resources available for maintenance. For instance, litter removal may need to be done more frequently during heavy-use months and less frequently during times of light use. The frequencies used to define the standards for this project represent an average to be performed over the year.

Although the frequency and demand of the tasks may seem high during the initial establishment period, the amount of work required is expected to diminish once plant communities establish. The establishment period will vary among landscape types, ranging from three (3) years for grasses, sedges, and perennial planting, to five (5) years for woodland landscapes and small woody shrubs. Larger woody shrubs and trees can take longer with eight to ten (8-10) years to establish.

The following titles are referenced throughout this Manual and defined as follows:

- A maintenance staff is grounds staff who performs both unskilled and semi-skilled tasks. Maintenance staff may also provide supervised horticultural support.
- Contracted staff is staff provided by an outside contractor
- A horticulturist is certified by the American Society of Horticultural Science. A horticulturist has an in-depth knowledge of plants and has been properly trained to care for their care. The horticulturist for WG is familiar with selected plants for the site and is able to identify invasive species common to Austin.
- An ecologist (or ecological management staff) has knowledge of plant distribution across the landscapes and an understanding of the

environmental impact of plants and other organisms that interact with them.

- An arborist is an expert in the cultivation, management, and study of trees and is certified by the International Society of Arboriculture (ISA).
- A trades staff is someone trained to perform high-level maintenance tasks, such as plumbing, electrical work, pavement repairs, playground equipment repairs, or operate specific equipment.

Refer to Chapter 4 for how maintenance work may be distributed among these positions.

2.2 SENSITIVE SITE MANAGEMENT

The WG itself is an ecologically sensitive area, and maintenance practices will need to be performed with this in mind. For example, cleaning of hardscape areas will be done manually (with hand tools preferably, such as a broom, rather than power equipment), and power washing will be limited to areas that do not drain into Waller Creek (the Creek). In instances where power washing is needed near the Creek, maintenance staff will need to take proper steps to ensure water is directed away from the Creek; if needed, absorption mats can be used to prevent water from running into it. (See Section 2.3.1 for guidelines on power washing.)

Removal of invasive and other undesirable plant species will require manual labor or physical removal. Chemical means will be used only when necessary as described in this Manual after other methods have failed (e.g., *Arundo donax* and *Sorghum halepense* are difficult to eradicate through physical means). See Section 2.6 Invasive Species Management for additional information with regard to invasive species removal. Contact the City's Integrated Pest Management (IPM) coordinator to clarify on requirements and restrictions on the use of chemical control. (<https://www.austintexas.gov/department/integrated-pest-management>)

Some proposed landscapes, such as riparian woodlands and sloped planting areas, may become habitats for small animals and migratory birds. It is critical to monitor these areas for habitat use and to ensure they are healthy, and record any species that may be nesting. If threatened or endangered species are present, maintenance practices may need to be adjusted to limit work to times when nesting birds are not present.

All trees that are identified to remain must be adequately protected during construction. This includes installing and maintaining tree protection fencing around the root zone; not operating or storing equipment, vehicles, materials, or debris within the dripline; and installing protection mats or plywood sheets to distribute the weight of a vehicle.

Post-construction, these trees must continue to be monitored and managed in order to protect them. The general rule of thumb for trees (whether existing, planted or transplanted) is deterioration will become

visible at a rate of one (1) year per one (1) inch of diameter (measured at breast height). Because most trees that remain are large, visible stress or die back may not occur for five to ten (5-10) years or more after construction. Therefore, it is important to continue monitoring and caring for plants within these zones. Post-construction practices may include:

- Monitoring tree health, soil conditions (moisture level and compaction), diseases, and invasive species.
- Any work done under the canopy of these trees must be performed with equipment that can be carried in and out of the zone on foot, to minimize soil compaction.

2.3 WATER MANAGEMENT

Careful water management supports WGC's mission to revitalize and protect the Creek, and will have a long-term environmental and financial impact. Given the Texas climate, drought is expected to occur on a regular basis; selecting a plant palette that is suitable for this environment will greatly reduce the need for regular irrigation, thus minimizing long-term costs. Given WG's proximity to the Creek, managing stormwater runoff, general water use, and applications of fertilizer, compost, soil amendments, pesticides, and herbicides will have an impact on the water quality.

The WG includes rain gardens, outfalls, overbanks, and other features to help manage stormwater runoff (both controlling flow and reducing pollutant run-off into the Creek). These features will need to be managed and monitored to ensure continued effectiveness. The systems that are designed for each project areas can be found in their respective chapters.

2.3.1 POWER WASHING

Power washing is generally not permitted in areas near and above the Creek (i.e. bridges, trails, trails on structures) due to the potential for runoff. If power washing is needed for clean up after a storm event, dry and remove the sediment and debris prior to power washing. No chemicals or additives will be permitted when power washing (only water will be allowed). Maintenance staff will need to use care to direct the water away from the Creek and toward other hardscapes or landscapes. Biodegradable detergent may be needed if high-pressured water alone is not sufficient, especially for treatment of bio-waste and other hazards. Remove as much solid waste as possible prior to power washing. Utilizing capture and recovery systems can help keep certain pollutants out of the creek and should be considered when working along the Creek.

Maintenance staff will contact the Spill and Response Team at the Watershed Protection Department (WPD) for assistance when water run-off from cleaning or maintenance activities may enter the Creek, such as graffiti removal on a bridge or abutment. (Spills and Response Team can be reached at 512-974-2550.) Absorption mats can be used to prevent water from running into the Creek.

Power washing is likely to be necessary in areas where food and beverages are served and on paved surfaces under large trees where birds are likely to perch or nest. Frequent, controlled spot treatment can reduce the need for harsher cleaning products.

The final decision to power wash will be at the maintenance staff's discretion; however, it is encouraged that other options, or other COA interested party approved methods be explored prior to power washing.

2.4 SOIL STEWARDSHIP

Soils are a critical component to the health of a landscape. Soils contain vital nutrients, impact water infiltration and run-off, and are home to numerous beneficial organisms and plant seeds. Ensuring healthy soils is an important aspect to maintaining healthy vegetation.

2.4.1 SOIL TESTING

Routine monitoring of soil health begins with regular soil testing. Soil monitoring and maintenance includes: sample collection for laboratory testing of the soil's chemical and nutrient condition; in-situ physical testing of soil density and structure; and biological testing to evaluate important soil biological conditions.

2.4.1.1 VISUAL OBSERVATIONS

Degradation of soil health and function is common in a heavily-used park, particularly for lawns. Maintaining optimal soil organic matter, microbiological health, and healthy root growth is the best method to minimize soil compaction and to promote water infiltration and drainage. Visual inspections should be incorporated with daily grounds maintenance and maintenance of soils and vegetation will result in a more resilient and healthy park.

An important component of maintaining soil health, and therefore plant health, is regular observation and monitoring of park conditions during routine maintenance. Observations include:

1. Infiltration of water into the soil after rainfall or irrigation: If standing water remains on the soil surface for more than one (1) hour after rainfall or irrigation, this may be indicative of poor infiltration. Further examination of the soil condition must be conducted as soon as possible.
2. Stressed or dying vegetation: Stressed or dying vegetation are often indicators of poor soil nutrient status, poor soil biological conditions, or poor soil physical condition. Examine and remediate plant stresses observed during routine maintenance as soon as possible. Stressed or dying plants can result from:
 - A. Soil-borne diseases: Often plants will exhibit distinct leaf stresses, such as yellowing at leaf tips or edges, or discoloration of soils. In some cases, soil

pathogens may create hydrophobic soil conditions, which do not allow water to infiltrate.

- B. Compacted soils: Soils with high compaction levels restrict root growth, and as a result, roots cannot grow to where water is stored in the ground or water may not be able to reach roots.
 - C. Nutrient imbalances: Low soil fertility, as well as excessive nutrients, can stress plants and ultimately lead to death. The balance of nutrients can also affect plant health, such as too much sodium in the soil, or excessive calcium or sulfur, which creates high electrical conductivity (saline conditions) that pulls water away from plants.
 - D. Over irrigating: Too much water can create anaerobic conditions in the soil in which the plant roots cannot get oxygen. Anaerobic conditions can also affect nutrient availability and stress or kill soil microbial populations.
3. Bare spots: These are often the result of high foot traffic which leads to soil compaction and bare spots. Examine bare spots and remediate them to restore soil health and then re-seed or replant.

2.4.1.2 SOIL SAMPLE COLLECTION AND ANALYSES

Soil testing will be done every time prior to the application of soil amendments, this is especially important during the first three (3) years after plant establishment. Soil amendments may not be applied on an annual basis, therefore testing is typically done on an as-needed basis after the recommended time frame. Soil samples will be collected for analyses of soil health (via the Haney test – a test to assess soil microbial health and function), primary soil nutrient levels (nitrogen, phosphorus, and potassium), soluble salts (measured as electrical conductivity), soil reaction (pH), and total organic matter. Soil sample collection will consist of composite soil samples (subsoil samples mixed into single samples, with one sample for every 2,000 square feet of growing areas such as lawns, gardens, and meadows/native plant areas) and be directed by LBJWC and/or trained maintenance staff.

Soil samples are typically collected in the spring (March or April) and tested by an approved soil-

testing laboratory as listed in this document (refer to Section 2.4.1.5 for the list of approved laboratories). Apply soil amendments based on laboratory test results and recommendations.

The WGC's maintenance staff (whether in-house or contracted service) will be tracking all soil tests, including sample locations, type of tests, and testing results. All data will be archived and used as reference in the future. Reference materials will include construction soil tests.

2.4.1.3 IN-SITU PHYSICAL TESTING

Monitoring and testing of soil's physical condition can be done regularly by LBJWC and/or WGC maintenance staff with some training and simple tools. These tests include:

1. Soil density testing: Using a static cone penetrometer, soil density can be checked randomly by pushing the penetrometer into the ground. The resistance to pressure exerted by the soil is displayed on the dial, which can be recorded by location and time. Perform testing when the soil is moist, not wet or exceptionally dry. Penetration resistance four to six (4-6) inches in the surface cannot exceed 120- to 150 pounds per square inch (psi) or 200 psi below six (6) inches. Testing with the static cone penetrometer can be done at anytime and is recommended to determine if measures to "rest" the soil or to loosen the soil are necessary.
2. Soil structure: Soil structure informs maintenance staff of the soil's ability for water infiltration and retention, and for root penetration. Soil structure can be tested by using a soil coring tool to extract a one (1) inch diameter core from randomly selected areas, and then visually and physically testing the structural condition. Healthy soils will be friable and "crumbly" that easily break apart with minor hand pressure. Soil will break into aggregates or peds, not into a granular or powdery substance. Soil pores will be visible and will not have a soil block appearance with only a few or no pores. Soil will not be "platy" or break into flat segments, which can restrict root growth and water infiltration. Platy structure, in particular, is a sign of excessive compaction and an indicator that physical

measures must be taken to break up compacted areas.

In-situ physical testing should be conducted on a monthly basis, more frequently if necessary. Begin remediation efforts of compacted or structureless soil as soon as possible after discovery.

2.4.1.4 BIOLOGICAL TESTING

Monitoring and managing soil biology is a relatively new but very important soil and landscape management tool. Soil biology can be tested as follows:

1. Conduct routine soil microbiology testing using a soil biometer. This test allows the user to collect a small soil sample and conduct an in-field count of soil microorganisms, which are indicators of soil health and critical to maintaining optimal soil conditions. The soil microbiometer kit, including training, can be obtained from Ecological Landscape Management.
 - ELM can be reached at 631.484.1979. james@ecolandmanagement.com (34 E. Main Street, Suite 266, Smithtown, NY 11787)
2. Observation of soil biological conditions can be done by trained maintenance staff or soil scientist to gauge healthy root systems and visible signs of active organic matter and microorganisms.
 - Observable biological conditions include: fungal hyphae. Soil that clings to plant roots when a soil plug is removed (a sign that mycorrhizal fungi extend from plant roots into the soil), and white to beige plant roots that are being maintained by healthy bacteria and fungi.

Biological testing is to be done during the spring (mid-April to mid-May) and fall (mid-September to mid-October).

2.4.1.5 APPROVED TESTING LABORATORIES

Soil Physical Parameters:

Turf Diagnostics & Design Inc.

613 East 1st Street, Linwood, KS 66052
Phone: 913-723-3700, Fax: 913-723-3701, www.turfdiag.com

Soil Nutrient/Micronutrient Testing:

A&L Agricultural Laboratories

302 34th Street, Lubbock, TX 79404
Phone: 806-763-4278

Texas A&M AgriLife Extension Service Soil, Water and Forage Testing Laboratory

2610 F&B Road, College Station, TX 77845

Phone: 979-845-4816

Ward Laboratories

4007 Cherry Ave, Kearney, NE 68847

Phone: 800-887-7645

Biological Testing:

Ward Laboratories

4007 Cherry Ave, Kearney, NE 68847

Phone: 800-887-7645

2.4.1.6 DECOMPACTING SOILS

Areas of the Critical Root Zone of any tree must maintain soil density below the limits identified in 2.4.1.3. Soils may be decompacted one of two ways.

1. Mulching. Soil that is appropriately mulched will naturally decompact over a period of 2-4 years if no additional foot or vehicular traffic occurs. This is appropriate when either a relatively small percentage of the overall Critical Root Zone area is compacted or the level of compaction is relatively minor.
2. Pneumatic decompaction. This method involves breaking apart the compacted soil using an Airspade or similar high speed pneumatic device. Decompact the areas of work to the depth of 6-12" and have organic material such as compost mixed into the soil during the decompaction. All decompacted areas should be topped with 2-4" of mulch and be heavily irrigated immediately following decompaction to avoid dessication of the fine feeder roots. Pneumatic decompaction is appropriate when a large percentage of the overall Critical Root Zone is compacted, the level of compaction is significant, or following extended periods of construction or constant foot traffic. Pneumatically decompacted soils must be protected from foot traffic for several weeks following decompaction and may require higher than usual levels of irrigation for several weeks following decompaction. Temporary fencing and signage are recommended to discourage access to these areas.

2.4.2 ORGANIC FERTILIZERS, COMPOST, AND SOIL AMENDMENTS

Organic fertilizers are derived from animal matter, waste, and manure, and vegetable matter. Organic fertilizers referenced in this Manual refer to nutrients that are usually surface applied to feed plants over an extended period of time. Proper usage of organic fertilizers can be beneficial, with limited environmental impact. Organic fertilizers tend to have a strong odor, which can be unpleasant to park users. As such, they are best applied during the early morning to avoid high park use, wind, rain, and high temperatures, and to allow odors to dissipate.

Compost that will be used within WG will be sourced by a third party vendor. At this time (February 2022), there is no plan that the organic materials collected in WG will be used towards composting.

Soil amendments are additives used to improve soil quality, soil profile, permeability/drainage, moisture retention, and tilth. Examples of soil amendments include bone meal, blood meal, manure, feather meal, fish emulsion, and lime. The additions of soil amendments can increase the soil volume.

Application of organic fertilizers will vary depending on the landscape area and soil test results. Organic fertilizers cannot be used in rain gardens or other water quality areas per the City regulations.

Organic fertilizer is not recommended for restoration areas, Creek channel/flood benches, upland corridor edge, open riparian planting, or wetlands. Organic fertilizer is also not recommended for meadows or grass plantings as these landscapes thrive in low-nutrient soils; however, they can benefit from an occasional application of compost.

Organic fertilizer, soil amendments, and/or compost are recommended for the following landscapes: lawns, shrub planting/gardens, and some trees. Application of fertilizer on trees may not be required on an annual basis and will be dependent on the soil test results and/or based on the monitoring and evaluation conducted by an arborist in early spring. Lawns and shrub planting/gardens will require regular application of fertilizer to maintain an attractive visual appearance.

2.5 HERBICIDE AND PESTICIDE APPLICATIONS

Conventional herbicide and pesticide use is not recommended for most of the park, but may be needed for treating invasive species. Herbicides and pesticides must be used selectively and only in situations where other methods, such as repeated manual removal and other organic methods, have failed. Employ targeted spot treatments, rather than general (or broadcast) treatment. (See Section 2.7 Invasive Species Management for recommended removal methods.) Conventional chemical use will be the last resort. Proper use of herbicides and pesticides ensures there is no residual application that will get into waterways and potentially damage adjacent plants. It is important to note that chlorpyrifos and neonicotinoid pesticides have been banned from use on City property, and glyphosate should only be applied using approved IPM methods. Bifenthrin and pyrethroid insecticides should only be used upon approval from the City IPM coordinator. Only aquatic formulations of herbicides will be used unless prior approval from the City IPM Coordinator.

In other City properties, mechanical/physical removal has not been effective on *Arundo donax* (Giant Reed) and *Colocasia esculenta* (Elephant Ears). Herbicide applications had proved to be successful in managing the infestation of both species. While alternative methods are generally encouraged, it can be in WG's interest to apply herbicide on first sighting to help manage infestation, particularly in areas that are difficult to reach, or not frequently accessed.

Appendix A includes lists of approved herbicides and pesticides, along with application areas. Herbicides and pesticides can only be applied by, or under the supervision of, a certified pesticide applicator. Record all materials and applications. (City application approval forms and a sample record keeping form can also be found in Appendix A). Refer to the Austin Parks and Recreation Integrated Pest Management Program for in-depth instructions and regulations.

The proposed use of pesticides and herbicides within 50 feet of the Creek and other surface water (the Critical Water Quality Zone; e.g., flowing, standing, or temporarily dry water bodies) must be reviewed and approved by the City's IPM Coordinator at WPD.

The City of Austin's IPM plan will govern pesticide and herbicide applications in all management areas. The City's IPM Coordinator should be consulted if any questions or concerns arise.

2.5.1 APPLICATION TIMES

Herbicides and pesticides application is generally done in early morning, when there is less public use and high temperatures. Applications may need to be done over several days to avoid spraying late in the day. Minimizing public inconvenience and concerns supersedes other considerations. In general, do not apply when rainfall is expected within 48 hours or when winds exceed 10 miles per hour.

2.5.2 PERSONNEL AND PUBLIC SAFETY

Health and safety are the highest priorities. Staff should take precautions and properly geared with personal protection equipment prior to work. Signage informing users of any herbicide or pesticide application will be posted as well as notices on bulletin boards, the WG website, and other social media platforms. Additionally, small warning flags or fences will be used to keep visitors off the affected areas after applications.

2.6 PLANT MANAGEMENT

2.6.1 PLANT SANITATION

Plant sanitation is extremely important for the control and spread of plant diseases. Diseased or dead plants need to be removed immediately in order to lessen or prevent the spread of disease-causing organisms (e.g., fungi, bacteria, viruses, nematodes) to other healthy plants. Procedures for practicing plant sanitation include the following:

- Identify diseased or dead plant parts.
- Practice sanitary pruning/trimming practices:
 - Make cuts in healthy bark, wood, or stems at least several inches below the area of the diseased or dead area.
 - Make a smooth cut to promote wound closure.
 - If discoloration is observed from the cut surface, sanitize tool with Lysol or similar sanitation spray and make another cut.
 - Prune where the branch meets the collar, when applicable, but never cut the collar.
 - Never prune or trim in wet weather.
 - Collect and destroy diseased debris.
- All pruning requires prior approval and supervision from an International Society of Arboriculture (ISA) Certified Arborist.

2.6.2 DISPOSAL OF DISEASED PLANTS

Diseased shrubs and other vegetation must be completely removed, including roots and surrounding soil. Diseased trees need to be closely monitored but not removed, as many trees can recover over time. An ISA Certified Arborist will evaluate diseased trees and determine how to proceed.

Proper practices for diseased plant removal and disposal include:

- Do not use/move contaminated soil to other areas. Watch for soil clinging to shovels, boots, stakes, etc.
- Bag and remove soil that surrounds the diseased plants from the site.
- Avoid planting the same plant or related plants in the contaminated area unless the soil is treated first or completely replaced with uncontaminated soil. It can be difficult to completely eliminate disease organisms from the soil.
 - Ecologist will recommend treatment options. Treatments may be difficult within the managed landscapes

and adjacent waterways, and some conditions will discourage treatments.

- Bag and dispose of diseased plants, branches, twigs, chips, shavings, root pieces, leaves, flowers, and other plant debris (infected plant refuse) with collected trash; do not compost or recycle these materials as disease-causing organisms may survive composting.
- Remove diseased debris, such as leaves, flowers, or tender shoots as soon as they are noticed. Rake up and destroy diseased debris. But never remove debris in wet weather. (See Section 2.7 for waste disposal.)

2.6.3 TOOL SANITATION

Tools used for removal of dead or diseased plants can spread disease to other healthy plants. Use the following practices to eliminate the spread of disease from tools:

- After plant removal, sterilize tools used for removal.
- Clean boots and tools that have contacted the soil.
- Wash tools with detergent; this not only physically removes diseases/viruses from tools but can neutralize any remaining viruses.
- Sanitize tools by dipping them in a diluted bleach solution (3 cups of bleach to 1 gallon of water) or liquid Lysol diluted to 20 percent.
- Rinse tools thoroughly and oil to prevent rusting.
- If hands, gloves, or boots come in contact with diseased plants, wash before using them again.

2.6.4 PLANT REPLACEMENT

When replacing plants, only use plants listed on the planting schedule and sourced from a reputable local or regional supplier. Any changes or modifications need to be approved by WGC, and must be like species. Planting areas and specific plants are included in Appendix B.

See Figure 2 for a typical schedule for replanting:

Item	Spring Season	Fall Season
Lawn (sod)	March 01 to April 30 (preferred)	October 01 to November 15
Deciduous Tree/Shrub (container)	February 15 to April 30	October 15 to December 30
Deciduous Tree/Shrub (B&B)	February 15 to April 30	October 15 to December 30
Evergreen Tree/Shrub	February 15 to April 15	October 15 to December 30
Live Stakes	N/A	November 30 to March 01
Bulbs	N/A	September 15 to November 15
Groundcovers	February 15 to May 15	October 15 to November 15
Perennials	February 15 to May 15	October 15 to November 15

Figure 2. Plant Replacement Schedule

2.7 INVASIVE SPECIES MANAGEMENT

The plantings for WG are native or adapted species. Maintenance staff will be trained to differentiate between these intended species and invasives. Monitoring invasive species will be done regularly as part of routine maintenance. Record and treat/remove invasive species as needed. Recommendations for removal method will be provided by the ecologist and be based on specific site/landscape needs. The following are the preferred actions for the management of invasive species:

1. Manual removal: Pull plants including roots, or perform repeated cutbacks.
2. Organic treatments: Spray foliage with vinegar spray (5-10 percent concentrate) on new growth; greater than 10 percent concentrate may be needed for older plants.
3. Spot torching: Done with a small flame tip propane torch. Carry out right after irrigation or in the early morning when the ground is still wet to minimize smoke, and when there are fewer park users.
 - A. It is recommended that any burning or torching is to be coordinated with the City of Austin Fire Department Wildfire Division. (Wildfire Division can be reached at: 512-974-0270)
 - B. Staff may need to post on social media to notify the public of this practice.
4. Foliar spray: This is a selective and concentrated foliage spray of invasive plants. It is generally used on aggressive plants that do not respond to manual removal, e.g. those with rhizomes.
5. Cut and spot treat woody species: Cut invasive species as close to the ground as possible, and spray herbicide on open wound within five (5) minutes of cutting.

All invasive species will be removed especially during the establishment period to allow intended plants to grow. Regular hand weeding during the growing season will eliminate weeds before they become a problem or go to seed. Generally, once the intended plantings become established, the need for invasive species removal will decrease. Care must be taken to prevent the spread of invasive species throughout the site. For example, any invasive species in bloom will

have its seed heads removed and bagged to prevent further spread. For invasive species with rhizomes, bag the roots after removal and before disposal.

Proper disposal of invasive plants is a critical step to ensure establishment of intended plants and prevent further invasive distribution (see Figures 3 to 5). As a general rule of thumb, the best time to dispose of invasive plants is before plants flower and produce seeds. After flowers, fruit, or seeds develop, minimize movement of plants during this time to prevent unnecessary dispersal. Plants that are actively flowering or fruiting will not be transported to other areas such as a transfer station, compost site, or brush processing site.

It is extremely difficult to completely eradicate invasive species because they can spread by rain, wind, flood, and animals (i.e. birds). Additionally, invasive species may be present in the soil bank and take years to germinate or emerge. Some invasive species will be difficult to access (particularly in sloped areas and areas along the Creek), and significant damage can be done to the landscapes trying to remove the species. In these cases, the decision to remove an invasive species is at the discretion of the site manager/supervisor.

For a comprehensive Invasive Species Management Plan produced by the City of Austin and LBJWC, refer to the three (3) resources at the links below.

Invasive Species Management Plan:
(http://www.austintexas.gov/watershed_protection/publications/document.cfm?id=196403)

Invasive Species Management Plan: Field Resources Guide

(http://www.austintexas.gov/watershed_protection/publications/document.cfm?id=202217)

Invasive Species Management Plan: Appendices
(http://www.austintexas.gov/watershed_protection/publications/document.cfm?id=195341)

Refer to Appendix A, or the City IPM Plan for further instructions on invasive species removal through chemical applications. If herbicides/pesticides are used, staff will need to take cautions and use proper personal protection equipment, fence off and put up signage to warn park users of the applications.

Type	Method	Description
<i>Invasive Trees, Shrubs, and Woody Vines</i>		
	Air Dry	Plant development stage: Prior to flowering. Small seedlings can be pulled and left with roots exposed to dry out. This material can be left on site or can be composted once it is fully dead and dried.
	Leave Behind	Plant development stage: Prior to flowering. Consider using larger woody plants to construct habitats for wildlife because larger materials can be difficult to remove from site. Make sure all material is fully dead or dried before use. Remove materials smaller than 5" caliper or that can be carried out by hand/with small equipment. Alternative: If the woody debris is greater than 5" caliper, leave in place and treat it as a nurse log to encourage wildlife habitat.
	Note on Vines	Remove vines before they become unreachable. In areas where vines are difficult to access and vines have matured: It is generally not necessary and sometimes not possible to dispose of vines that may be caught high in trees or wrapped tightly around tree trunks. If the vine is cut at the base and dies, the plant will gradually break apart and fall out of the tree. Dead and dried fallen fragments may be disposed of as described above.
	Additional Notes	Large stumps and branches may require special disposal. They are encouraged to be left behind and used as wildlife habitats or nurse logs. If they pose a safety hazard or in high use areas, they will need to be cut into smaller, manageable pieces, and disposed as noted above.

Figure 3. Invasive Trees, Shrubs, and Woody Vines Disposal Summary Table

Type	Method	Description
<i>Invasive Herbaceous</i>		
	Air Dry	Plant development stage: Prior to flowering. Pull and leave roots exposed to dry out. This material can be left on site or be composted once it is fully dead and dried. If material cannot be reused on site, dispose of in trash.
	Bag and Dispose	Plant development stage: During or after flowering. Do not compost. Bag all material and dispose of in trash. If volume of material is too large to bag: Remove all flowering heads, secure flowering heads in plastic bag, and dispose of in trash.
	Additional Notes	The recommended disposal methods are significantly more difficult and resource consuming once the plants go to flower and seeds. Given the limited space and access restriction throughout the WCPD, have staff devote more of their resources toward monitoring and removal as soon as possible. It is recommended that invasive plants with rhizomes or other parts that may survive in compost (such as bulbs and shoots) be removed from the site entirely. Never compost these materials because they will survive and continue to spread.

Figure 4. Invasive Herbaceous Plants Disposal Summary Table

Type	Method	Description
<i>Invasive Grasses and Sedges</i>		
	Air Dry	Plant development stage: Prior to flowering Pull plants and leave roots exposed to dry out. Leave on site. Continuously check site for germinated plants.
	Bag and Dispose	Plant development stage: During or after flowering Do not compost. Bag all material and dispose of in regular trash to be landfilled or incinerated.
	Additional Notes	It is difficult to determine whether a grass is flowering or in fruit production. Treat all grasses as if they have already begun producing viable seeds. Minimize plant movement and do not compost.

Figure 5. Invasive Grasses and Sedges Disposal Summary Table

2.7.1 NUTRIA MANAGEMENT

Nutria (*Myocastor koypu*) is a large, herbivorous, semiaquatic rodent that originated in subtropical and temperate South American climates. The large rodent lives in burrows alongside stretches of water and feeds on herbaceous vegetation. Nutria can eat 25% of their body weight in a single day, and will be detrimental to the Creek vegetation if left unattended. These rodents mature quickly and can reproduce prolifically, typically having two (2) litters per year with more than ten (10) babies per litter.

Nutria has been spotted in Waller Creek and around Lady Bird Lake, with a pair living upstream from Symphony Square. It is possible that the restoration effort could attract more with newly planted herbaceous vegetation. However, there is not enough evidence to determine the actual outcome at this time.

Areas with fewer trees, woody species, and large switch grass are likely more attractive to Nutria. They can chew through erosion control blanket and can contribute towards potential bank erosion. Fences can be erected around planting for protection. However, chicken wires are typically used for plant protection, and can be costly and unsightly.

When Nutria are observed within the Creek, action should be taken immediately by closely observing and monitoring their impact on the vegetation. Appropriate measures should be taken proportionate to their impact on vegetation. Nutria tend to appear at night but have been observed during the day. Spotting a nutria does not mean immediate removal is needed, the health and potential damage of the vegetations will help drive the decision on the necessary steps that should be taken.

Trapping is the best control method. At San Antonio River, 30 traps are used per mile; with this metric, approximately 15 traps will be needed at the Creek Delta stretch of the project area. While trapping is the best control method, it is an expensive method to employ and brings up concerns and questions from park users. If the presence/spotting of the nutria does not lead to vegetation damage (or below the tolerable threshold), the decision for trapping and removal will be at the discretion of the site supervisor.

It is currently assumed that nutria management will be a contracted service. However, grounds staff will incorporate visual inspection with routine grounds maintenance to identify any sign of plant damage, which may indicate the presence of nutria or other pest.

2.7.1.1 COMPREHENSIVE CONTROL PROGRAM RECOMMENDATIONS

1. A comprehensive survey is recommended prior to construction to gather as much information as possible on existing Nutria populations. A team should survey during optimal periods to find all evidence, including their presence, tracks, burrows, damaged vegetation, etc. along the entire length of the project area. Record and categorize all sighting and observations. Using a program such as iNaturalist could encourage participation from others, and allow WGC to crowd-source this information.
2. Conduct another survey post-construction, after planting and any deterrent structures are installed. The post-construction survey can be less formal and encourage volunteer participation to complete the data. However, staff time should be allocated to survey areas along the banks and other areas where access is restricted to typical park users.
3. Establish tolerance level (to be determined by WGC staff) of damage to plantings by Nutria; if damage is to be found approaching that level, conduct another formal comprehensive survey before taking action.
4. Once action has been executed, conduct another comprehensive volunteer-led survey.
5. Repeat steps 2-4.

2.8 WASTE MANAGEMENT

Careful thought to a sound waste management plan is important for the management of any public park. Given the location of the WG to nearby office buildings and heavy pedestrian traffic, it is conceivable that the WG will generate a large amount of daily waste. Proper disposal will reduce the amount of waste that ends up in the waste disposal stream.

2.8.1 TRASH AND RECYCLING

Due to limited space along trails, smaller trail receptacles are proposed. It is recommended that trash and recycling cans are emptied frequently (i.e., daily during the slow season and several times a day during peak season) in areas where smaller receptacles are located. Traditional sized receptacles require less frequent removal but result in greater volume of trash. Larger volumes of trash may pose a challenge to transport from Creek back to street level, due to use of small vehicles with limited carrying capacities (e.g., a golf cart or a trike with a small trailer attached). Areas such as Waterloo Park or Palm Park will not present the same challenge as Creek Delta, since they and other locations within the site will have access to street level. Where access is limited, temporary trash storage areas may be needed to temporarily store trash before removal from the site.

2.8.2 ORGANIC MATTER/COMPOSTING

Management of organic matter will be done according to where the materials are found and collected. In the natural/managed landscapes (areas along the Creek; described in more detail in Section 3.3.1), most organic materials can be left on site. In general, these areas are more difficult to access; thus removing large debris will require equipment that may damage the landscapes. Leaving woody debris in-situ will provide nutrients, wildlife habitat, landscape interest, and provide educational opportunities. Using fallen trees for public education allows visitors to understand the more naturalistic/hands-off management approach taken for these landscapes. Removal of organic materials from natural/managed landscapes within the trails system is only recommended when it poses a public safety hazard (e.g., branches on the verge of falling over or fallen onto trails) or if they are invasive species.

It is recommended that 25-50% of non-turf grass clippings can be left in place as a ground cover over the winter. Leaving 100% behind can reduce regrowth of grasses or germination of wildflowers. If this approach is not desirable at the site, compost the materials. Reducing the material down to smaller segments or pieces will speed up composting.

In the urban/maintained landscapes (in the parkland areas; see Section 3.3.2), park visitors tend to expect a well-kept, litter-free appearance. Remove all landscape debris from parkland areas, especially near the Creek level or areas subject to inundation. Use materials collected in such landscapes for composting operations. Maintenance staff will sort collected materials and remove any litter or debris not suitable for composting. Typically, turf grass clippings can be mulched and left in place. However, if clippings are collected (due to aesthetics reasons, such as mowing prior to an event), they will be disposed of properly.

Refer to Section 2.4.2 for application of Organic Fertilizers, Compost, and Soil Amendments.

Material	Disposal Procedure
Trash (collected from trash receptacle)	Dispose of according to City rules and procedures
Recycling (collected from Recycling receptacle)	Dispose of according to City rules and procedures
Organic Material (non-diseased, non-invasive)	Collect and use for compost; material may be ground to smaller pieces to speed up composting time Creek-side: large woody materials may be used for nurse logs, to be evaluated by site supervisor/ ecologist
Organic Material (invasive, non-diseased)	Refer Section 2.7 for disposal methods
Diseased/Contaminated Organic Material	Bag and dispose of with collected trash; DO NOT compost or recycle
Miscellaneous Litter (e.g., collected by staff during routine maintenance)	Sort and dispose of in accordance with the type of material and reference Austin Resource Recovery (ARR)
Hazardous Materials (fuel, herbicides, fertilizers, etc.)	Follow all disposal instructions on the label, as well as City requirements; never pour hazardous waste down drains or discard in the trash
Construction/Repair/Replacement/Project Debris	Take debris to a mixed construction and demolition (C&D) debris processor, where it will be sorted and either recycled or landfilled Clean scrap material or reclaimed building components may be brought to Austin-area Construction Material Reuse or Recycling Facilities for reuse or recycling; see ARR website

Figure 6. Disposal Summary Table

2.9 GRAFFITI REMOVAL

Graffiti is one of the most common forms of vandalism occurring in any park. Common forms of modern graffiti include spray paint, indelible marker, solid surface etching (“scratchiti”), and other common pigments or stains. All graffiti should be removed as quickly as possible, because most types of graffiti become more difficult to remove as time elapses and graffiti begets more graffiti.

Staff using any of the products below will need to ensure appropriate safety gear is worn, such as goggles, chemical resistant gloves, and masks are equipped prior. Always test the product out on an inconspicuous area before applying to a larger area.

2.9.1 METHODOLOGY

There are many methods of graffiti removal based upon the surface and the type of graffiti. Common surfaces found in WG include stone, concrete, metal, and wood. Each surface can be cleaned if the proper method is used.

- Most Graffiti on wood can be dissolved and removed with solvents. Basic thinners will remove magic markers and acetone will remove day old spray paint. A sealer coat after final finish on wood will help protect against vandalism and make clean up easier.
- Most unpainted metal surfaces can be treated with a basic solvent. Some polished aluminum surfaces will cloud or oxidize with aggressive cleaners like lacquer thinner. Paint remover can be used as a more aggressive method. These methods may be used on painted metal surfaces; however greater caution should be taken in application.
- Porous surfaces such as concrete and pavers can also be cleaned with specialized solvents that remove the paints and pigments from the pores. For larger or more difficult tasks, vapor/wet blasting may be necessary for removal of graffiti. Often these methods do have the potential to wear or break down concrete surfaces and potentially damage them.
- Painted surfaces could typically be mitigated through an application of fresh paint, but will require approved measures when used near the waterways to ensure no illicit discharges into the Creek.

The following products are recommended either as preventive measures against graffiti or as graffiti removers. The selected products should be non-toxic and biodegradable and would be minimally damaging to the objects they are being applied to.

BEHR’S CLEAR WATERPROOFING – WOOD

Applying Behr’s Clear Waterproofing helps protect unpainted wood exposed to the elements from deterioration, and enables easy removal of graffiti with standard graffiti removers. Waterproofing gives the wood surfaces a dark stain look that is quite attractive. On surfaces that have not been waterproofed, graffiti removers are ineffective. The waterproofing will need to be reapplied where graffiti was removed. After waterproofing, benches should not be used for 48 hours in order to dry. For maximum effectiveness, wood surfaces should also receive a complete new coating every six months to a year.

ELEPHANT SNOT – POROUS MATERIALS

Elephant Snot is currently being used by WG as a preferred product for graffiti removal. Elephant Snot is ideal on porous surfaces as it penetrates the material and dissolves graffiti. This product can be used with a powerwasher, or applied to the surface and left for 30-35 minutes, scrub with a stiff brush/broom, and then clean up with water hose on maximum pressure.

TWOCAN GRAFFITI STOPP & TAGSTER GRAFFITI EMULSIFIER – PLASTIC BENCHES AND TREES

These two products are nontoxic and biodegradable that work well on recycled plastic and on trees. The products can safely remove most spray paints and markers from plastic benches and trees without damaging the surface.

VAPOR/WET BLASTING

Vapor/wet blasting is a process that utilizes pressurized water and abrasive blast media to remove contaminants from a surface. One of the biggest advantages of this process is it produces a cleaner surface as the water flushes the abrasive so there is no impregnation of the blasted surface. Any sediment or residual abrasive media gets carried out with the water.

However, vapor blasting can potentially strip away the protective coating on metal and may require a re-application of paint or protective coating after utilizing this method. Vapor blasting should also be avoided

on wood as the pressure can potentially damage the wood grain.

This process is highly preferred over solvents near waterways. It will require approved measures to prevent discharge into the Creek. Absorption mat should also be used while employing this method.

2.10 RECORD-KEEPING

Proper and consistent record-keeping will help in monitoring and providing direction for best maintenance practices. The information will assist in determining future annual costs, resources, maintenance challenges, and life cycle costs, identify long-term trends, and identify potential problematic areas (e.g. areas prone to erosion, or wear and tear). The record-keeping will be done by both in-house WGC staff and contracted staff as needed. All documents will be turned over to WGC and archived for record purposes. These documents may help inform future decisions and maintenance practices.

Examples of records that should be kept are described below.

2.10.1 SOILS

Refer to Section 2.4 Soil Stewardship for detailed information.

Maintain an activity log for the following:

1. Planting soil mix production: Date, weather, type of soil produced, volume in cubic yards of soil produced
2. Volume of planting soil material on hand:
 - A. Base loam
 - B. Dry screened sand
 - C. Compost
 - D. Planting soil mixes, all types
3. Volume of planting soil delivered for renovation/replenishment. Record:
 - A. Date and time of receiving
 - B. Vendor where the soils were received from
 - C. Type(s) of planting soil mixes delivered
 - D. Total volume in cubic yards, for each planting soil mix delivered
4. Testing. Include for each soil material: test type, date, and interval. Record both acceptable and unacceptable findings. Immediately report unacceptable test reports.

Note: Record-keeping log is cumulative; each week's results are added to the previous results.

2.10.2 PESTICIDES AND HERBICIDES

Maintain an activity log for the following:

1. All procurement/purchases of pesticides and herbicides
 - A. Applications of the pesticides and herbicides
 - i. Date, type of application, interval, amount used, where the materials were applied
 - B. Application to the City
 - C. Amount of material in stock
2. The following records of pesticide use shall be maintained for a period of two years:
 - A. Maintain records of each pesticide application regardless of the use classification of the pesticide applied.
3. The record of each pesticide application shall be kept current and maintained at the applicator's principal place of business as designated on the applicator's application/renewal for a pesticide applicator's license.

See Appendix A for a sample record-keeping form.

2.10.3 PLANTINGS

1. Keep original planting plan for reference
2. Keep track of areas that require replanting
3. Photo documentation on a monthly basis during first year after planting; reduce to quarterly for all subsequent years to note any patterns and track growth

2.10.4 WILDLIFE

1. Keep record of sighting
2. Keep record of nesting
3. Keep record of trapping and damage dealt by undesirable species

2.10.5 MANUAL EVALUATION

It is crucial for WGC to continue to provide maintenance practices and provide adequate resources that are appropriate for the site needs. Much of the landscapes within WG are dynamic and ever-changing. Consistent and prescribed maintenance may be appropriate within the parkland landscapes but is not recommended within the natural areas. Therefore, maintenance and landscape management practices will need to be reevaluated on an annual basis. It is recommended that WGC meets with the key stakeholders (such as WPD and PARD) once a year to evaluate some key issues that are to

be included in the updated/“new” Manual. Key topics and issues may include:

- Major repair or plant replacement needs in the past year.
- Significant plant failure – are there certain plants that are not thriving within the landscapes? What could be the cause? What should they be replaced by?
- Large scale creek cleanup - is it needed? What were the results of previous cleanups? What groups must be involved?
- Review records, such as herbicide/pesticide applications.
- Significant adaptive changes.
- New practices that are introduced/implemented.
- Summaries of why these changes are recommended.

Chapter 3.0

Maintenance Recommendations



3.0. MAINTENANCE RECOMMENDATIONS

In contrast to the previous chapter which focused on park-wide maintenance and management recommendations, this chapter discusses specific maintenance needs for specific landscapes and features within the WG. This chapter covers the following:

- **3.1 Maintenance Assumptions:** This section establishes the framework for the maintenance estimates provided in this Manual.
- **3.2 Planting Types:** The landscapes in WG consists of nine (9) primary types of plants. Each type with its own specific maintenance needs. This section provides the maintenance guidelines for these plant types.
- **3.3 Landscape Typologies:** The landscapes in WG are made up combinations of the plants described in Section 3.2. This section describes the maintenance guidelines that reflect the design team’s vision for WG landscapes. The landscapes are broken into two different categories: Natural/management landscapes and urban parklands/maintenance landscapes. Natural landscapes are landscapes generally found along the Creek and function-driven. Maintained landscapes are located in parklands and require intensive year-round care.
- **3.4 Hardscapes and Constructed Landscapes:** This section covers the maintenance needs for paved surfaces and constructed features in WG, e.g. trails, concrete paved surfaces, limestone paving, etc.
- **3.5 Site Features:** This section covers the maintenance needs for site features and amenities, e.g. seating, drinking fountains, trash receptacles, etc.
- **3.6 Capital Replacement:** This section provides a basic time frame of when certain site elements need to be replaced as they reach the end of their life cycle.

3.1 MAINTENANCE ASSUMPTIONS

3.1.1 METHODOLOGY

The first critical step in defining a maintenance plan is to create a framework tailored to the design, its intent, and level of use. For the purposes of this Manual, ETM defined several “landscape types” based on the proposed design landscapes. Each landscape type has specific maintenance needs, which determines maintenance recommendations and estimated cost for each landscape type. Landscape types in the current Manual include the WG sites currently in design or under construction. Additional landscape types will be added or revised as other project areas are designed or come on line. Sections 3.3 through Section 3.5 offers a narrative description of maintenance recommendations for each landscape type and designed features. More specific tasks and their frequencies can be found in task hour sheets for each project area chapter.

3.1.2 SEASONALITY

Austin’s climate generally ranges from very hot summer days to mild winter days, with some limited freezing temperatures in winter months. Therefore, it is assumed that drinking fountains, irrigation, and standalone restrooms will not operate year-round due to potential freezing, and will be winterized in late fall with a spring start up. Additionally, it is assumed that WG will not regularly get ice and snow.

Due to Austin’s climate, plants grow throughout the year, with some seasonal reduction during winter or extremely hot summer months. Monitoring and removal of invasive species will occur more frequently (once every week to every two weeks) during the spring through early fall growing seasons, and less frequently (once every two weeks to monthly) during winter when plant growth has slowed.

Ecological maintenance tasks and frequencies have been estimated for both the initial establishment and the post-establishment periods. More effort will be needed during the establishment period and decrease somewhat as plant communities establish.

3.2 PLANTING TYPES

The planting types used in WG are comprised of the following nine (9) types:

- Turf grass (lawns)
- Grasses and sedges
 - Live Roots
- Perennials
- Shrubs and wood species
- Live stakes
- Succulents/xerophytes
- Ferns
- Vines
- Trees

This section identifies the specific maintenance required for each planting type.

3.2.1 TURF GRASS (LAWNS)

Latitude 36 Bermudagrass has been selected for WG for lawn areas. Latitude 36 is drought tolerant, resistant to spring dead spot, and is a high-wear-tolerant turf grass. Installation and initial care is crucial for its long-term quality and performance. The general guidelines that follow are for turf grasses that have not been installed on a special system, which have different needs. The primary difference between turf grass and grasses and sedges is the mowing cycle and the height the grasses are kept at. Turf grass is to be kept short and mowed frequently, whereas grasses and sedges are encourage to reach their full height with limited mowing.

Mowing Frequencies

The recommended height for the Latitude 36 Bermudagrass is two (2) inches. Rotary mowers are recommended for mowing. Remove no more than 1/3 of the total length in one mowing. Mow Latitude 36 every five to seven (5-7) days during the growing season and 10-14 days, or as needed, during cooler seasons. The exact mowing schedule may vary depending on use and weather conditions. If a scheduled mowing is missed (due to weather or scheduled events) and there are visible clippings after mowing, it is recommended that clippings be collected and removed.

Irrigation

Watering needs depend on the soil type/profile, season, amount of sun/shade, and amount of rain received. Generally, Latitude 36 needs three-quarters to one (3/4 to 1) inch of water weekly. During routine

maintenance (either during litter removal or mowing), look for signs of stress (such as wilting) to indicate watering is needed. Shaded areas and heavy soils will require less water than full-sun areas and sandy soils. Encourage deep root growth by watering to a depth of three (3) inches; shallow watering will encourage shallow roots. Infrequent deep watering will maximize drought tolerance and resistance.

Fertilization

Fertilization rates and frequency will be done based on soil tests results. High nitrogen rates can be applied in the spring to allow for “recovery” and growth. Apply lower rates of organic nitrogen fertilizers in summer and fall, if needed.

Replacement

When Latitude 36 is replaced, the new sod will need irrigation to ensure turf grass growth. Soil moisture will need to reach a depth of three (3) inches, for two to three (2-3) weeks after replacement. In hot weather, irrigate within the first few hours of installation to minimize damage and stress from dehydration. Mow new turf grass within 10 days of installation and collect clippings from the first few mowings. Apply an organic fertilizer that is low in nitrogen but higher in phosphorus and potassium to encourage root growth.

3.2.2 GRASSES AND SEDGES

Grasses and sedges (*Carex*) provide a variety of visual interest and need minimal maintenance once established. Grasses include *Bouteloua* (grama grass), *Koeleria* (June grass), and *Muhlenbergia* (muhly grass). Although these grasses are tall, they become unruly and topple over from their own weight or after rain. Sedges are shorter but can go dormant in very hot and dry conditions. Unless the grasses are meant to be kept at a certain height, grasses and sedges and encouraged to reach maturity and allow seed heads to form. Establishment period for these grasses and sedges is approximately one to three (1-3) years.

During the establishment period, invasive species will be removed weekly to biweekly. Some grasses favor a frequent cut-back during establishment to a height of six (6) inches, while most other grasses can be cut-back four to six (4-6) times a year, during their early years. The frequency may be adjusted depending on the health of the plant and weather conditions. *Carex* species can benefit from a cut-back every

four (4) to six (6) weeks during the first year to help promote root growth and then four (4) times a year to a height of six (6) inches during the remainder of establishment.

Once established, some grasses only require annual cut back in late winter/early spring to 1/3 of their height. The timing will be determined by the site supervisor. Cutting the grasses too short (under 4" to 6" depending on species) can remove the plant's primary growing points and minimize future growth. Sedges and muhly grasses can be cut back every two to three (2-3) years instead of annually. Sedges can also benefit from a light cut-back after they finish blooming in the spring, which will help stimulate new growth. Consider collecting the seed heads for future use. Which plants are cut back can be rotated to provide optimum aesthetics.

Stalk removal can greatly benefit the growth and appearance of grasses. Removal of dead stalks can be labor intensive, although this is a perfect volunteer opportunity and may be done selectively for high visibility areas. Grasses that are hard to access can simply be cut back and left behind. Removal of cuttings can be done in late winter, to improve appearance, to prevent fire, and to discourage pests and disease. The practice between cut back and manual stalk removal can be rotated between different planting areas to optimize their growth.

3.2.2.1 LIVE ROOTS

Several types of grasses will be planted as live roots. Live root plants have slower growth patterns than plugs and containerized plants. Live root plants are dormant when they arrive on site and will need to be planted as soon as possible. If they cannot be planted immediately, the roots will need to be kept moist at all times while they are exposed. Due to the minimal amount of soil, the plants may go into "transplant shock" and will require continuous watering (daily) until new growth appears to ensure establishment. There is a possibility that they will suffer a higher mortality. Once established, the live root grasses will be maintained the same as all other grasses.

3.2.3 SHRUBS/ WOODY UNDERSTORY

Maintenance of shrub plantings occurs spring through fall. The season begins with an early spring clean-up, which includes weeding, trimming, debris removal/ bed clean-up, dead heading (for selective plants),

staking, pruning, monitoring, and watering. Continue this practice into the fall. During the spring clean-up, soil samples can be taken, in order to determine the rate of organic fertilizer application, which will help ensure optimal growth.

Mulching is an important maintenance practice. It helps retain soil moisture (especially during hot summer months), reduces erosion, improves water filtration and reduces weeds. Surfaces without mulch are susceptible to erosion and compaction, which can result in more weeds and decrease water infiltration. However, over-mulching can be detrimental and deprive roots of oxygen. 2 to 3 inches of mulch is needed in the shrub beds.

Weeding and pruning is important for plant health. Weeding will be done regularly to avoid unsightliness and competition. Maintenance staff need to be familiar with the plant palette and note which plants require removal and which are to remain (i.e., what is and is not a weed). Woody plants will be pruned annually to maintain their correct shape, and avoid overcrowding and shading of adjacent plants.

Shrub plantings will require regular irrigation. Plants will need to be checked to ensure they do not block pop-up heads' spray patterns.

3.2.4 LIVE STAKES

Several types of shrubs and trees will be planted within the natural landscapes as live stakes. Prior to planting, ensure the stakes remain moist. Some species, with the general exception of dogwood and willow, can benefit from the addition of a rooting hormone before going into the soils. Once planted, live stakes typically do not require a significant amount of maintenance, especially when access is restricted due to where they are planted within the natural landscapes. Monitor the live stakes closely to increase their survivability. Sufficient irrigation and monitoring encroachment of other vegetation to reduce competition will help ensure the establishment of live stakes.

3.2.5 PERENNIALS

Perennials make up the predominant plantings in parklands, with many providing year-round visual interest.

Low-growing perennial groundcovers will need

trimming when they overgrow their areas, particularly onto paved areas. During the first year, little to no mulch (1-2 inches max) will be applied to prevent “suffocating” perennials. Ongoing maintenance will focus on removal of invasive species. Once the perennials have filled in, a thicker layer (2-3 inches) of mulch can be applied, which will reduce weeds and retain soil moisture. Deadheading may be desirable on plants with larger flowers to encourage continuous flowering.

3.2.6 FORBS

Forbs will be planted as both plugs and seeds to achieve dense coverage. Removal of invasives is a critical step in ensuring successful establishment of forbs. Due to the planting palette, manual removal may be the best method to remove invasive species without damaging the intended planting; otherwise, consider mowing or use a string trimmer to reduce time. Cutting competing vegetation to a height of three to six (3-6) inches, or just above the height of the native plants whenever they begin to shade out the ground will help ensure that the forms are not accidentally cut. Frequent mowing during the first year will not damage the new planting as they are spending most of their energy in developing the root system and shoot growth will be limited. Avoid mowing in fall when the plants have gone dormant. Mow during Year 2 only if weeds continue to out-compete the forbs, and keep mowing during early spring. When plants are established, maintenance will be minimal. However, consider raking or removing old growth and spent materials in early spring and after bloom to encourage continuous growth.

3.2.7 SUCCULENTS/XEROPHYTES*

*Note: Xerophytes are a species that have adapted to survive with little water. Succulents are a type of xerophyte, but not all xerophytes are succulents.

This group of plantings include *Agave*, *Aloe*, *Yucca*, and *Opuntia*. Succulents/xerophytes are generally slow growing, have low water needs, favor sandy and well-drained soil, and thrive in full sun but can take some shade. Succulents are relatively low maintenance. A spring and fall clean-up is recommended. Dead, damaged, or poorly formed leaves/pads will need removal, particularly from the base of the plants. Yuccas can benefit from some pruning to remove flower stalks, and always dead or diseased wood and leaves.

During the rest of the year the succulents/xerophytes will be monitored monthly, increasing to twice a month during periods of drought. Although plants are generally drought tolerant, some extra watering may be needed during the first couple growing seasons to assist with establishment and periods of extended heat and drought.

Fertilizers or amendments are discouraged for agaves as they may cause premature blooming. (Agaves typically die after flowering). Organic mulch will provide sufficient nutrients for agave. With the exception of cactuses (*Opuntia*), other succulents can benefit from occasional low nitrogen fertilizers (typically half strength), particularly during establishment. Cactuses require specific cactus fertilizers. Fertilizers are not required for Yuccas post establishment, but if it is needed, use a time-released fertilizer.

While flowering is uncommon for agaves, most other plants in this group bloom in late spring and summer. Once they reach maturity, agaves will bloom in the summer then die. However, by this time, the plant has usually produced pups, or suckers, that will replace the original plant. Agaves can be divided to fill in other areas of the planting bed.

Always wear protective gear (i.e., thick gloves, long sleeves, and pants) when working on or near succulents/xerophytes as most have sharp spines or pointed leaves. Pay particular attention to *Agave lechugilla* as this plant has the nickname “shin daggers.”

3.2.8 FERNS

Only a few species of ferns are specified for parkland plantings. Ferns typically prefer partial shade; the more sun they receive, the more watering they need. Ferns also need water during periods of drought. Remove dead and diseased fronds before spring growth. Fertilizer is generally not needed but a periodic application use of an all-purpose fertilizer (organic or slow-release) can help. However, if the ferns begin to brown out, reduce fertilizer application. Leaf litter and/or mulch is also usually sufficient. Mulch can help retain soil moisture and provide additional nutrients.

3.2.9 VINES

Vines are planted near walls and building/structure areas. They are either trained on structures to provide a visual screening or are planted in beds on top of concrete walls to cascade over and create green walls. Vines will be accessible with step ladders. Vines are encouraged to commingle, but vines can be aggressive if left untended.

Vines can generally benefit from heavy pruning in the late winter when they are dormant. Cut near a healthy bud at an angle with the cut slanted away from the bud. Some vines, such as the Virginia Creeper, can withstand as much as one-half or two-thirds of its most recent year's growth removed. Throughout spring, thin growth out at the base to control growth. Vines selected for WG can become woody as they mature. Heavy pruning can rejuvenate plants and promote new growth. Frequent trimming and pruning can keep vines from getting out of control. Take care when pruning mature plants such as creeping figs that are attached to structures because the woody vines become lodged and can damage the structure. Keep the top of flowering vines trimmed to allow flowering to occur at eye level or in areas visible to park users.

Vines can benefit from fertilization in spring and summer before and after blooming, but avoid fertilization during fall and winter. Vines selected for WG bloom from spring through summer, though *Gelsemium sempervirens* can bloom from February through April.

In general, these practices apply to all vines:

- Remove dead, damaged, diseased and unproductive stems.
- Remove overly entangled stems.
- Remove stems that growing away from structural support or intended areas (or into other planting areas).
- Aggressive vines may need to be pruned twice annually to keep them under control.

3.2.10 TREES

Maintenance of park trees will be an ongoing process and is particularly important. An ISA Certified Arborist will oversee all tree care, including pruning, fertilization, and disease treatment. All tree maintenance work must be approved by PARD Forestry through the Public Tree Care Permit process. All tree maintenance procedures will follow ANSI

A300 Standards for Tree Care Operations, ANSI Z133 Safety Requirements for Arboricultural Operations, and all applicable Best Management Practices, and will include:

- Regular inspection
- Regular pruning schedule
- Proper pruning and sanitation techniques
- Regular sustained watering for new plantings
- Mulching
- Fertilization based on soil samples or diagnosed nutrient deficiency
- Treatment for insects and diseases as needed
- Inspection and maintenance of tree stakes and their removal
- Decomposition of compacted soils within the Critical Root Zone

Regular Inspection

Trees will be regularly examined for pests and disease infestation, throughout the year. Inspection involves identifying any potential abnormalities to roots, trunk, branches, and leaves. Removal may be recommended for severely infested or dying trees that are beyond treatment, or may infect other trees. All removals require the approval of Parks and Recreation Urban Forestry staff and may require a Tree Ordinance Review Application (TORA) from the City Arborist's Office (see Appendix C). Proactively spotting any new infestations and implementing control/quarantine measures is important for the health of park trees.

Inspection schedules will be dependent on the species and age. Larger, more mature trees, especially those that have been stressed (either through transplanting or as a result of construction), will require closer inspection and monitoring, ranging from monthly to bimonthly visits. Smaller trees (less than 3 inches in caliper) will need a quarterly or biannual inspection.

Regular Pruning Schedule

Pruning will be done annually while plants are still in their "dormant" state. Minor pruning might be needed throughout the year, such as after a storm event or from vandalism. When addressing oaks and oak wilt, pruning should be avoided from February to June when the fungus is active. All pruning must be approved by an ISA certified arborist prior to performing the work

Proper Pruning And Sanitation Techniques

Pruning will be needed during the life of the tree to remove dead or diseased parts, and ensure proper growth habits. All tree pruning will follow the ANSI A300 (Part1) – 2017 Pruning Standards. Proper and sharp tools will be used when pruning. Tools will be sanitized with Lysol disinfectant spray or a 10 percent solution of bleach before the pruning and especially when moving from tree to tree. All tools will be sanitized prior to pruning oak trees, and all pruning wounds on oaks will be painted with a wound sealant immediately following the cut in order to minimize the spread of oak wilt. Pruning objectives will be identified prior to the commencement of any work, and may include risk management, tree health management, promotion of good tree structure, and clearance. Tree topping, excessive removal of internal branches (lion's tailing), and flush cuts will not be allowed. Horticultural staff will be properly trained and overseen by an ISA Certified Arborist.

Regular Sustained Watering For New Plantings

Some hand watering may be necessary to supplement scheduled irrigation to keep trees healthy and growing. Park staff will monitor trees and determine whether trees need additional watering. Water will be applied slowly so as to penetrate the entire root zone.

Mulching

For trees in turf areas, a ring of organic hardwood mulch will be applied to the area under the dripline of the tree to an average depth of two (2) inches, with a minimum radius of 12 inches of clearance between the trunk and the mulch ring, leaving the root collar exposed. Trees in planting areas where groundcovers are present can still benefit from mulching to retain soil moisture and avoid damage from mowing or string trimming. Apply the same restrictions as outlined above. If trees are located in difficult-to-access areas or close to the Creek, mulching will not be necessary.

Prescriptive Fertilization Based On Soil Sampling Or Diagnosed Nutrient Deficiency

If indicated by soil test, trees will be fertilized in the fall (October through December) or spring (February through April). All fertilizing must be overseen by an ISA Certified Arborist with a Texas Department of Agriculture Pesticide Applicator's License. Manufacturer's written instructions for mixing and applying fertilizers will be followed. All

tree fertilization will follow ANSI A300 (Part 2) – Soil Management Standard Practices and Tree and Shrub Fertilization Best Management Practices.

Seasonal Treatment For Insects And Diseases As Needed

A ISA Certified Arborist will be consulted if and when diseases and pests are identified after inspection. Treatments will vary depending on tree species and specific pest or disease, and are to be applied as recommended.

Inspection And Maintenance Of Tree Stakes

If and when tree stakes are used, they will be inspected regularly to ensure no damage to trees. Guy wires may need to be tightened or loosened as needed. Materials, such as rubber hoses or plastic flagging, might need replacement overtime. All tree stakes will be removed after one (1) year.

Decompaction of compacted soils within the Critical Root Zone. See Section 2.4.1.6 for information.**3.2.10.1 TREE REMOVAL**

The cost of tree removal will be significantly higher than the cost of ongoing monitoring and maintenance. If and when a large tree dies, it may be left if it does not pose a safety threat. However, removal of dead trees may be warranted in parklands, due to high visibility and use. The site conditions and location, will dictate whether the use of large vehicles and equipment may be or not be able to access these areas. Arborists may need to rely on climbing and manual removal, which can be expensive.

3.2.11 TRANSPLANTED TREE MAINTENANCE

As a general rule of thumb, the larger the transplanted tree, the longer it takes to establish and/or exhibit signs of distress. A basic formula used to estimate the time is one (1) year for every one (1) inch in diameter (measured at breast height). (For example, a 6-inch caliper tree will take 6 years to fully establish or show signs of distress.)

During this establishment period, transplanted trees are stressed and highly susceptible to disease. They are to be inspected regularly for any signs of pests or disease. It is recommended that inspection be done weekly for the first two (2) years. Afterwards, weekly inspection of the smaller trees (less than 5 inches in caliper) can be decreased to every two (2) weeks or monthly. Weekly monitoring will continue with larger trees, increasing to monthly after five (5) years. Inspection involves identifying any potential abnormality by examining the surface roots, trunk, branches, and leaves for signs of pest infestation or diseases. Soil moisture will be monitored and tested; additional hand watering or irrigation may be needed. Additional mulch may need to be applied to maintain adequate soil moisture levels. The arborist is responsible for providing all records of work and performed inspections.

3.3 LANDSCAPE TYPOLOGIES

This section outlines the general maintenance protocols, and most importantly, the intended aesthetics envisioned for plantings for both the short and long term.

It is important to note that, regardless of the landscape typologies, sight lines need to be maintained in and around areas that are publicly accessible to enhance sense of safety for visitors. This is primarily applicable to constructed landscapes but may impact some portions of the natural landscapes.

3.3.1 NATURAL/MANAGED LANDSCAPES

Natural landscapes are expected to see little or no public use. They are meant to have a “natural” aesthetic. Rather than requiring extensive daily maintenance, these landscapes will be managed to ensure ecological health, function, safety, and aesthetic beauty. Natural landscapes are generally adjacent to the Creek.

The establishment period varies for each landscape type. Generally the landscape types with more herbaceous planting may take as little as one to three (1-3) years to reach maturity. The landscape types with more woody species may take five to ten (5-10) years to establish, some may even take longer than ten (10) years depending on the size of woody species that have been planted and micro-site conditions that may influence the establishment period.

3.3.1.1 RIPARIAN WOODLANDS

These landscapes are located along the slopes abutting the Creek channel, from top of bank to the water’s edge. Slopes are typically 2:1 to 4:1. Vegetation is characterized by native trees, shrubs, groundcovers, and grasses. Most of these areas do not have public access and are not intended for frequent use. However, these areas will be impacted by some limited use from adjacent development, and use of surrounding landscapes. Management of riparian woodlands will be function-driven and guided by regular ecological monitoring. Depending on the species mix, these areas may require semi-annual management, including invasive species and pest control, overseeding, and soil amending. Regular monitoring for erosion, related repairs, and public safety hazards, such as debris and low-hanging branches (if they block views and trail access), will

need to be done regularly. Litter and debris removal will be done on an as-needed basis, with sensitivity to organic debris such as fallen leaves, which may be beneficial. Access for all maintenance and monitoring activities may take additional time due to the steepness of slopes and limited access from top of bank when adjacent to buildings and private development sites.

3.3.1.2 NATURAL PLANTING AREAS

The natural planting areas include “juniper oak savannah,” “shade terrace,” and “hill country” landscape types. Slopes are typically 3:1 to 5:1. They are located near trails to provide slope stability and visual interest. Plants include trees, shrubs, forbs, grasses, and perennials. The management of natural planting areas is similar to that of riparian woodlands, as these areas will also be function-driven and receive regular ecological monitoring. However, because they are adjacent to trails and are anticipated to have more use and visibility, a higher level of maintenance is needed to ensure safety, plant health, and appearance.

3.3.1.3 CREEK CHANNEL/FLOOD BENCHES

The Creek channel is defined as the area within the 100-year floodplain. It includes riffles, pools, other aquatic features, floodplain benches, and wetland benches (both existing and proposed). These areas will not be used by the public, and maintenance will be limited to removal of debris and litter (particularly after storm events when debris may accumulate and need to be removed) and invasive species management.

3.3.1.4 STORMWATER MANAGEMENT FEATURES

Stormwater management features include rain gardens, outfalls, overbanks, and other features that help manage stormwater quality and runoff. These areas will receive little or no public use. Maintenance will be minimal, but rain gardens will require some regular care, such as inspection for scouring, erosion, sediment and debris accumulation, blockage and water infiltration, as well as horticultural maintenance. Most stormwater management features will require regular inspections, particularly before and after storms and rain events.

3.3.2 URBAN PARKLANDS/MAINTAINED LANDSCAPES

The plants chosen for urban parklands will require more intensive care as opposed to “natural” trail system plantings. Like other plantings, parkland plants are generally drought tolerant, have relatively low maintenance needs once established, thrive with limited fertilization, similar to selected trail system plants. However, due to visibility, and the quantity of plants, they will need extensive maintenance and a thorough knowledge of plant species’ needs. Maintenance staff cannot employ a “hands-off” approach to parkland plantings. Parklands plants will bloom year-round and maintenance will be needed throughout the year, not just seasonally.

Horticultural maintenance and the long-term appearance and function of parkland landscapes will rely heavily on a skilled horticulturist’s knowledge and expertise. While this Manual outlines the design team’s long-term vision and high standards of maintenance, the horticulturist will know the site conditions and seasonal changes that occur over time. There may be instances when the horticulturist deems a more hands-on or hands-off approach is necessary than what is described in this Manual. It will be the responsibility of the horticulturist to make educated judgment calls on how to best care for and guide parkland plantings over time to meet the desired functional and aesthetic goals.

Maintained landscapes may include lawn areas, both of high-use/event space and non-event spaces, and planting areas made up of plants identified in Section 3.2. Site-specific maintained landscapes for Waterloo Park can be found in Section 5.1. These landscapes types are not intended to be repeated in other parkland areas.

3.4 HARDSCAPES AND CONSTRUCTED LANDSCAPES

3.4.1 PAVED SURFACES/GENERAL HARDSCAPES

All hardscapes will require frequent litter removal and regular cleaning. Depending on the surface type, cleaning may include debris removal with a hand or backpack blower, sweeping, and/or power washing. (Refer to Section 2.3.1 if power washing is warranted in areas near or above the Creek.) Debris removal can be done with an electrical blower and limited to the morning hours when there are fewer park users. Frequency of litter removal and cleaning will depend on the type of surface and level of use. Inspect hardscapes when performing other maintenance tasks for damage, vandalism, or needed repairs; address issues as soon as they are identified. Remove graffiti or gum as needed, ideally within 24 hours of detection.

In winter, when ice removal is needed, only apply abrasives on hardscapes with limited runoff to avoid impacting adjacent water or planting areas. Abrasives, such as sand or crushed dolomite, can provide traction on top of snow or ice, but they can only be used in areas where re-capturing is possible and will not discharge to receiving drains and waterways. Following a freeze, the abrasive material can be recovered (e.g. swept up) for future re-use or properly disposed of. De-icers are not to be used as they can get into the stormwater system. Abrasives are also to be avoided on bridges and elevated walkways as runoff will be difficult to recover and will likely enter the Creek. Manual removal with hand tools will be done whenever possible. When that is not feasible, the bridges will be closed for use and notifications posted until ice is melted.

3.4.2 TRAILS - CONCRETE

Trails are the primary means of moving through the WG. Trails will typically be concrete and vary in width from 8 to 14 feet, with 10 feet being the average width. Trails will have railings on the Creekside edge; lighting, seating, and other furnishings will be located along trails. When cleaning, take care to not wash or push debris into the Creek. Push debris toward the inner (non-Creekside) path edge, where it can be collected. In situations where a cleaning agent is required, select one that is least harmful to plants and water quality.

3.4.3 TRAILS ON STRUCTURES

Trails on structures are supported by piers, pilings, or footings; in some cases, these trails are integrated into larger structures, such as the tunnel side inlets. Trails on structures also include small foot bridges at Creek level and areas under these bridges. Trails on structures will have similar amenities as other trails, but in some cases, railings may be required on both sides. Site furnishing may be anchored to rails to conserve space. Some trailheads may also be trails on structures. Trails on structures may have a weight restriction, which may limit the type of vehicles that can be used for trail maintenance. Maintenance for trails on structure will be similar to concrete trails, with additional maintenance for railing and other amenities (refer to Section 3.5 Site Features for maintenance needs).

3.4.4 TRAIL BRIDGES

Trail bridges are integrated into the circulation system, but differ from trails on structures as they span a greater distance. In many cases, bridges will connect trails well above the Creek level and will need regular safety and structural inspections, and any repairs done immediately. Additionally, bridges will need to be inspected for graffiti and accumulated debris. Bridges may be of varying materials such as cable, composite decking, concrete, or steel.

3.4.5 STABILIZED DECOMPOSED GRANITE

While stabilized decomposed granite will require less overall maintenance than standard decomposed granite, it will require weekly maintenance. Weekly maintenance will include litter removal and a visual inspection of the top surface for loose materials. Normal wear and tear will cause some loose material on the top surface, but overall the material will remain level with no low areas or depressions. When loose material reaches the depth of 1/4", the paved section of stabilized decomposed granite will need repair by following the manufacturer's recommendations. The metal trail edging may become exposed from wear and tear or from weathering and become a trip hazard. Metal edging will be included in the weekly visual inspection and repaired as necessary.

Maintenance of stabilized decomposed granite includes:

- Litter removal (2x/day for 6 months, 1x/day for 6 months)
- Level surface (1x/month)

- Repair and renovate (1x/year or as needed)
- Edging (done along with repair and renovation)

3.4.6 CONCRETE PAVED SURFACES - TYPICAL

The concrete paved surfaces will have similar maintenance needs as concrete trails. Paved surfaces will be kept litter free and may require occasional washing and debris removal, particularly in areas of high use, or near areas where food and beverages are served. Power wash with a fan-tipped nozzle to prevent damage, or use a stiff-bristle broom.

Maintenance of concrete paved surfaces includes:

- Litter removal (2x/day for 6 months, 1x/day for 6 months)
- Blow/sweep debris (average 2x/week)
- Clean surface (monthly)
- Remove debris from drain inlets (as needed)
- Repair pavement (as needed)

3.4.7 PERVIOUS CONCRETE

Pervious concrete will be used in some sections throughout the WG to create a visual interest from other paved areas and will not function as a water quality/stormwater management feature. Areas with pervious concrete will receive the same maintenance needs as concrete trails or concrete paved surfaces.

Maintenance of pervious concrete includes:

- Litter removal (2x/day for 6 months, 1x/day for 6 months)
- Blow/sweep debris (average 2x/week)
- Clean surface (monthly)
- Repair pavement (as needed)

3.4.8 ENGINEERED WOOD FIBER

Engineered Wood Fiber (EWF) is a specially manufactured product with uniform sized virgin softwoods and/or hardwoods. EWF is used specially as a play surface. It has minimal bark and is free of twigs, leaf debris, and other organic material. The EWF may be mixed with fine binding particles (made with latex, silicone, or polyurethane) that help knit the fibers together in order to provide a uniform surface to cushion falls, yet firm enough to support wheelchairs. Wood fiber is porous, allowing water to pass through, however, EWF can occasionally freeze in winter and impair drainage. Play areas may need to be closed due to frozen surfaces.

Regular inspections will need to be done and foreign objects removed. The entire EWF play area needs to be raked and leveled weekly, with particular attention given to edges and around play structures. A deep raking may be needed periodically to remove debris that might have collected below the surface. Particular attention needs to be paid to heavy use areas, where the EWF may need to be replaced or refilled more frequently. Depth inspection of EWF will be done monthly to ensure that proper depth is maintained based on fall height. The depth can vary from 6"-12", and a marking on the base of the play feature can serve as a guide. EWF will be topped off as needed. The drainage system below the EWF will need inspecting to ensure proper water flow, particularly after a heavy rain event by checking for any standing water, which can be a sign of poor drainage or a clogged drain.

EWF will break down over time and lose its cushioning properties. It may need replacing every two to three years, depending on level of use. At least two times annually, staff will dig down in the most heavily used area to determine the structural integrity of the EWF to determine if replacement is needed.

Maintenance of EWF includes:

- Litter removal (1x/day for 9 months, 3x/week for 3 months)
- Deep cleaning (1x/week)
- Refill and regrade (monthly)
- Rake/level – incorporate with litter removal (1x/week for 9 months, 3x/week for 3 months)
- Weeding (as needed)
- Edging maintenance and repair (2x/year for inspection, maintenance, and repair)

3.4.9 WOOD DECK

Wood decking is used where protection is needed for sensitive areas, or around transplanted trees, while serving as seating. The day-to-day cleaning of the wood decking is similar to paved areas, but the need for power washing may be more frequent, particularly in areas with an overhead tree canopy, as birds like to perch among the branches. The structure will need monthly inspection, checking for any loose connections or damaged planks. Repair as needed.

If power washing is warranted, a fan shaped tip can be used with pressure no higher than 1,000 PSI to avoid

damaging the wood. Power wash with the grain of the wood to prevent “peeling.” Scrub with a soft bristle brush to remove any stains and soiled spots.

Maintenance of wood deck includes:

- Litter removal (2x/day for 6 months, 1x/day for 6 months)
- Clean surface (average 2x/week)
- Power wash (1x/week for 8 months, 1x/month for 4 months)
- Inspection (monthly)
- Maintenance and repair (as needed)

3.4.10 CLAY PAVERS (DRY-LAID)

Power washing of dry-laid pavers must be avoided unless absolutely necessary, as power washing can remove sand and blow out the joints. Manual scrubbing with a stiff bristle brush will be done first before considering power washing. Pavers may settle or shift over time, requiring some resetting and leveling as needed. Dry-laid pavers will require periodic topping-up with sand that can be swept into joints. Weeds may appear in joints and will need to be removed.

Maintenance of clay pavers includes:

- Litter removal (5x/week)
- Clean surface (2x/week)
- Manual cleaning – with broom or spot power wash (quarterly)
- Sweep sand between pavers (quarterly, or after major storm events)
- Re-set and repair (annually)

3.4.11 LIMESTONE SCRAMBLES

Limestone scrambles are pavers used throughout the landscapes as accents. Limestone pieces sit on a sand setting bed, with joints of polymeric sand. While the polymeric sand will hold limestone together, they may settle overtime. Maintenance staff will occasionally inspect them, as part of the daily maintenance and cleaning routine to see if they are tripping hazards. Resetting will be necessary if they pose as danger to park users. If power washing is warranted, focus on the surface of the scrambles and avoid the joints. Even though the joints are filled with polymeric sand, the concentrated pressure from high pressure spray can damage joints.

Maintenance of limestone scrambles includes:

- Litter removal (5x/week)

- Blow/sweep surface (2x/week)
- Power wash (quarterly)
- Re-set and repair (annually)

3.4.12 LIMESTONE PAVING

Unlike limestone scrambles, limestone paving sits on a mortar bed with varying mortar joints widths (4” maximum). The limestone paving can be treated similar to concrete; power wash if necessary, but avoid harsh cleaning products that may damage the finish. (Limestone has a mohs hardness of 3, and can be damaged by harsh cleaning agents.)

Maintenance of limestone paving includes:

- Litter removal (5x/week)
- Blow/sweep surface (2x/week)
- Power wash (quarterly)
- Re-set and repair (annually)

3.4.13 LIMESTONE STEPS

Limestone steps are large stacked pieces of limestone (12”-18” in width, and approximately same height) that are used as steps. The limestone steps are set on a sand setting bed, with sand swept joints, but a polymeric sand joint is used when the steps meet other paving. Limestone steps are anchored by their own weight, with each limestone weighing approximately 150-225 pounds (limestone weighs approximately 150 pound per cubic foot) and be difficult to lift. They may shift over time.

Maintenance of limestone steps includes:

- Litter removal (5x/week)
- Clean surface (2x/week)
- Manual cleaning – with broom or spot power wash (quarterly)
- Sweep sand between pavers (quarterly, or after major storm events)
- Re-set and repair (annually)

3.4.14 STONE ARMOR

Rip-rap, boulders, and other stone materials are used along the Creek to reduce bank erosion, run-off, and Creek edge protection. These materials will require limited maintenance, from the occasional litter removal (in areas that are accessible) and visual inspection for damage. Large debris may become trapped on the Creek edge, and need removal during the routine Creek clean-up. Damaged stone armor will need to be repaired as damage is identified. Leave sediments that are deposited in the stone armor in

place. While some volunteer plants are acceptable, invasives and volunteer woody plants should be removed.

Woody plants within the stone armor can compromise the integrity of the structure.

Maintenance of stone armor includes:

- Litter removal (biweekly)
- Monitoring (biweekly - monthly)
- Repair (as needed)

3.5 SITE FEATURES

Site features include furnishing and site amenities, such as trash receptacles, benches, lighting, restrooms, etc. Site furnishings will require regular cleaning, wiping down, and routine inspections for damage or loose connections (e.g. fencing and railings), repainting, and repair as necessary. Graffiti must be removed within 24 hours of reporting. Quick removal of graffiti is easier and reduces absorption thereby reducing the chance of lasting “shadowing.” Failure to remove graffiti can “attract” additional graffiti - as graffiti often begets more graffiti.

3.5.1 TRASH/RECYCLING RECEPTACLES

WG uses a waste and recycling receptacle with a 30-gallon capacity within its parklands and trail system. Some of the receptacles within the trail system, e.g. along the Creek, may require more frequent pickup (twice/day in some areas) to ease the removal of collected refuse from the trail to the street level. While the parkland trash receptacles may require less frequent emptying (on average once/day), receptacles will require more frequent and thorough cleaning. More food and drinks will be disposed of in the parkland receptacles, and if not cleaned frequently, they will attract pests and vermin.

3.5.2 DOGGIE BAG DISPENSER

The doggie bag dispenser is relatively low maintenance and is important in collecting dog debris. The dispenser houses several rolls of doggie bags and is attached to a metal pole. The dispenser will need to be refilled regularly throughout the week to accommodate demand (up to 5x/week). Aside from refills, maintenance staff will wipe down the housing, check for damage, and repaint as needed.

3.5.3 DRINKING FOUNTAINS AND BOTTLE FILLERS

The drinking fountains and bottle fillers will require daily cleaning. Staff will also check for water flow, remove any debris that clogs drains, and check for damage. These features will need inspection and routine maintenance on a monthly basis, which includes descaling, adjusting the valve taps, and checking for leaks. Drinking fountains and bottle fillers will be winterized in late fall with a spring turn-on.

3.5.4 LIGHTING

It is assumed that there will be a number of different

light types proposed for WG. Most lights will only require routine maintenance unless damaged or vandalized. In-ground up-lights may require additional maintenance due to condensation build-up inside of lenses. In addition, in-ground lenses may become scratched and require replacement if located in heavily trafficked areas. Taller mast lights located throughout WG may need a boom truck for repairs and bulb replacement, which may be a challenge depending on location and vehicle accessibility. Frequency of bulb replacement will depend on bulb type. Maintenance will include scheduled inspections with subsequent repairs.

3.5.5 FENCING AND RAILINGS

Fencing and railings are used to either limit foot traffic or to prevent access. They are relatively low maintenance, but regular inspection and as needed repair can extend their longevity. Inspection may include checking for damage, loose connections, broken pieces, evidence of trespassing/vandalism. This will be done monthly to prevent major repair and replacement.

3.5.6 PLAY FEATURES

There will be a variety of play features in the parklands. Play features may include both stationary and interactive equipment. Play features will require routine monthly visual and mechanical inspections to ensure there is no damage to netting, fabric, or other components. All connections also need to be checked to make sure they are tight and without no protruding bolts. Perform a thorough inspection and maintenance twice a year. A certified play equipment inspector will perform these inspections and make any necessary repairs. Keep a record of all inspections and repairs.

3.5.7 SEATING

There are many types of seating throughout WG. Maintenance staff will need to check for any damage and graffiti during their daily routine. Graffiti will need to be removed within 24 hours. Once a month, a thorough inspection is needed to check on benches connections, looking for loose or broken pieces. Repair and replacement will be done as needed. Some spot power washing may be needed in areas close to where food and beverages are served.

3.5.8 RESTROOMS

Public restroom facilities are located within the WG.

These restrooms will meet Americans with Disabilities Act (ADA) accessibility standards and may be unisex, all-gender inclusive, or family units. Some restrooms located in conditioned buildings will be accessible to the public year-round. Non-conditioned standalone facilities will be winterized and shut down. While operating, all restroom facilities will need regular cleaning and restocking, periodic repairs, and graffiti removal. The recommended frequency of cleaning will vary with use, opening times, and responsibilities.

3.6 CAPITAL REPLACEMENT

Routine maintenance, inspection, and repair will greatly extend the life of all park elements. However, most materials will reach a point where the cost of repair or care exceeds, or is comparable to, replacement. Below is a chart that summarizes the typical lifespan of park materials that will require major repair or replacement over time. A park can benefit from a capital replacement fund, by taking a small percentage of the initial construction cost as a sinking fund or allocating a capital repair cost annually that would accumulate into a larger fund over time to meet future needs.

ETM recommends allocating an initial 0.5 percent of construction cost annually from years 1-5, then slowly building up to 1 percent for years 6-10, 1.5 percent for years 11-15, until it reaches approximately 2.5-3 percent by year 20 to cover any capital repair and replacement.

See Figure 7 for estimated capital repair timeline.

Material	Estimated Lifespan (Years)
Non-porous paved materials (asphalt, concrete)	25+
Decomposed granite	3-5
Wood deck	15-20
Pavers	20+
Site furnishing	10-20
Restroom	15 (renovation may be needed)

Figure 7. Estimated Capital Repair Timeline

Restrooms may reach a point where renovation is needed due to wear and tear, or energy/water efficient features may be available that will benefit the operations.

Chapter 4.0

Management Needs



4.0. MANAGEMENT NEEDS

4.1 SITE MANAGEMENT RESPONSIBILITIES

Maintenance and management of WG may involve various public and private entities, including:

- Waterloo Greenway Conservancy (WGC)
- City of Austin Parks and Recreation Department (PARD)
- City of Austin Parks and Recreation Department: Urban Forestry (PARD Urban Forestry)
- City of Austin Watershed Protection Department (WPD)
- City of Austin Public Works Department: Roads and Bridges (PWD)
- City of Austin Police Department/Park Police (APD)
- City of Austin Fire Department: Wild Fire Division (AFD)
- Volunteers (organized by WGC)

WGC will be responsible for coordinating all maintenance, operations, and management of the WG. The responsibility matrix summarizes the roles and responsibilities as of August, 2018.

	Waterloo Greenway Conservancy (WGC)	City of Austin
Management	Provide overall management coordination of Waterloo Greenway (WG) and participate in management committee	Participate in a management committee
Funding	Launch capital campaign to raise private funds for capital costs and WG O&M endowment fund	
Overall WCP Maintenance	WGC will be responsible to provide the day-to-day park maintenance with either in-house staff or through third party contracts. General park maintenance includes: <ul style="list-style-type: none"> - Litter pick-up - Trash removal/ waste management (includes recycling) - Hardscapes maintenance and repair - Bridges maintenance and repair - Restroom cleaning, upkeep, and repair - Water feature maintenance and repair - Site furnishing maintenance and repair - Play feature maintenance and repair - Irrigation maintenance and repair - Walls, embankment, and other park structure maintenance and repair - Tree maintenance 	<p>WPD: Spill Team may provide assistance in cleanup in and near the waterway</p> <p>PARD Urban Forestry: SOW review and Public Tree Care Permit issuance, assistance with emergency response</p> <p>PWD: Provide maintenance on city properties</p> <p>AFD: Provide guidance and coordination on any spot burning/targeted burning</p>
Urban Parkland Maintenance	WGC will be responsible for providing maintenance of plantings with either in-house staff or through third party contracts. Plantings may include but are not limited to: <ul style="list-style-type: none"> - shrubs and perennials - garden areas - lawns and turf 	
Natural Landscape Management	WGC will be responsible for providing the management of the natural landscapes with either in-house staff or through third party contracts. Supervision, monitoring and record keeping will be done by an in-house ecologist	

Figure 8. Responsibility Matrix 1/2

	Waterloo Greenway Conservancy (WGC)	City of Austin
In-Channel Creek Maintenance	WGC will be responsible for in-channel creek maintenance	WPD: Responsible for the maintenance of the inlet facility and tunnel May provide some clean-up effort and support during a post-storm/ flood event
Security	May provide some additional security, particularly for WGC events.	APD: To patrol WG on a regular basis
Programming/ Events	Oversee all programming activities in the park. Communicate with third-party events to ensure coordination with park construction schedule and supplemental maintenance	PARD: May provide some programs and events, and will coordinate with WGC Any standard event permits required by the city will be issued by city, such as sound, security, etc. securing permits will be event sponsor's responsibility
Volunteer Coordination	Oversee all volunteer coordination	WPD: May choose to engage volunteers to support WPD mission areas, coordinate with the WGC
Communications/ Marketing	Serve as lead for all communications related to the capital campaign, programming, events, volunteer efforts, etc.	PARD: Serve as the lead for all communications related to the City of Austin's role in the park development, and provide communications support for events and other efforts as requested by WGC
Advocacy	Oversee all advocacy efforts on behalf of WG	
Vendors/ concessions	Oversee the development of a third-party contract to select and manage the food vendor(s) at WG and collect associated revenues	PARD: Any required vendor/concession required will be issued by the City Vendor will be responsible for securing all necessary permits

Figure 8. Responsibility Matrix 2/2

4.2 STAFFING SKILLS SETS

Maintenance tasks have been divided into the following categories based on skills and qualifications: unskilled/semi-skilled maintenance, skilled maintenance (including trades), semi-skilled ecological landscape management/horticulture, skilled ecological landscape management, and arboriculture.

UNSKILLED & SEMI-SKILLED STAFF

Unskilled/semi-skilled maintenance includes tasks that will not require intensive training, or that can be done under supervised guidance and instructions. Unskilled staff can be up-trained. Semi-skilled labor includes maintenance tasks that can be done with some training, some experience, or under supervision. Semi-skilled staff will require supervision with proper equipment, and therefore skilled or trades staff would be needed to provide additional expertise (e.g. semi-skilled staff could replace a light bulb, but would not be able to remove and install a lighting fixture). Semi-skilled staff may work alongside skilled staff (or trades staff) to complete a larger or more difficult task.

Unskilled/semi-skilled maintenance tasks include:

- Litter removal: grounds, planting areas, water's edge, and fence *
- Debris removal * (some may require special equipment)
- Emptying trash and recycle bins *
- Cleaning paths * (manual or with equipment)
- Power washing
- Cleaning/maintenance of furnishings *
- Cleaning catch basin inlets
- Cleaning catch basin sumps
- Maintenance and cleaning of drinking fountains
- Some light repair (bulb and lens replacement)
- Some graffiti removal
- Some pest control (rodent, birds, ants, etc.)
- Some signage maintenance
- Some railing maintenance
- Some fence maintenance
- Fence graphic panel and component maintenance
- Some irrigation inspection and maintenance (50 percent; general inspection and minor repairs)
- Some clean-out of stormwater features
- Some annual furnishing maintenance
- Restroom cleaning
- Installation and maintenance of temporary

fence for planting *

- Seasonal restroom maintenance
- Some play equipment maintenance
- EWF routine maintenance
- Wood decking maintenance
- Pavers maintenance
- Waste management (sorting materials for compost, waste, and recyclable, as needed)

SKILLED & TRADES STAFF

Skilled and trades maintenance includes tasks that require specialized equipment, training, or both. Skilled and trades staff may engage and oversee semi-skilled staff to help complete larger or more difficult tasks.

Skilled/trades maintenance tasks include:

- Light repair
- Graffiti removal
- Pest control (rodent, birds, ants, etc.)
- Signage maintenance/repair/installation/replacement
- Railing maintenance/repair/installation/replacement
- Irrigation inspection and maintenance/repair/installation/replacement
- Fence maintenance/repair/installation/replacement
- Hardscape maintenance/repair/installation/replacement
- Clean-out of stormwater features and maintenance/repair
- Cleaning of storm drain system
- Annual maintenance/repair/replacement of site furnishings
- Restroom repair (plumbing, infrastructure)
- Drinking fountain monthly inspection and seasonal maintenance
- Infrastructural repair
- Play equipment biannual inspection
- Play equipment major maintenance and repair
- EWF replacement
- Solid surface maintenance (concrete)
- Pesticide and herbicide application (certified personnel)
- Cistern clean-out

HORTICULTURAL STAFF

Horticultural staff will need to be knowledgeable with the plant palettes, the common invasive species in Austin and their removal, proper organic waste management, and be certified to apply pesticides and herbicides.

Horticultural tasks include:

- Landscape management
 - Monitoring (plants, disease, and invasive species)
 - Replanting
 - Plant division
 - Weeding *
 - Over-seeding
 - Spot watering *
 - Woody plant thinning & removal
 - Cutbacks (on grasses)
 - Planting maintenance *
- Turf management (See Section 3.2 for general turf management, Section 5.1 for Waterloo Park turf management)
- Weed monitoring and control
- Traditional garden/planting maintenance
- Compost management

- Tree maintenance (under supervision from a certified arborist)
- Shrub bed maintenance

Arboriculture tasks include:

- Tree inspections
- Monitoring and record keeping of all transplanted trees
- Tree pruning
- Prescribe and apply tree fertilizer
- Treat insects and diseases
- Inspect and maintain tree stakes

See Sections 3.2 and 3.3 for detailed maintenance needs and tasks. Refer to the maintenance and task hours sheets for recommended maintenance tasks and frequency for each landscape types.

* Indicates tasks that can be done by volunteers with limited training under supervision; focus is primarily on cleaning and provides some horticultural support.

ECOLOGICAL STAFF

Many of the ecological landscape management tasks overlap with traditional horticultural tasks. However, as previously noted, ecological landscape management's primary focus is on the larger ecosystem, or landscape, rather than individual plants. There are opportunities to train horticultural staff to take on some ecological landscape management tasks under the guidance of an ecologist.

Ecological landscape management tasks include:

- Monitoring and record keeping (plants, disease, and invasive species)
- Invasive species control (flora)
- Over-seeding
- Replanting
- Plant division
- Plant transplanting or moving plants
- Spot watering
- Determining soil amendments
- Erosion control measures
- Landscape management in restoration areas
- Vegetation protection
- Woody plant thinning and removal
- Pest control and monitoring

4.3 MAINTENANCE FACILITIES

It is WGC's long-term goal to have a team of in-house staff; therefore, adequate facilities are needed to accommodate the staff's needs. Currently, the planning for more immediate maintenance facilities includes the following:

- Small, temporary facility at Symphony Square (1-2 offices); Symphony Square facility may expand to provide some lockers and showers/clean up areas
- Convert construction trailer at Waterloo Park into a semi-permanent facility for use for 3-5 years
- In Phase 2, convert the Ronald McDonald House in Waterloo Park into a maintenance facility
- Potential space at the 12th Street parking area for a small temporary facility
- The east bank of Creek between 4th and 5th Street

As of February 2022, there has not been any new development on establishing a maintenance facility.

4.4 MAINTENANCE EQUIPMENT MANAGEMENT


Maintenance equipment and tools will be determined by which maintenance tasks are contracted out and which are done in-house. Generally speaking, access to some areas of WG is limited and will be difficult for any large equipment or vehicles to access the Creek level. Selecting the proper vehicles for maintenance is challenging: smaller vehicles will be able to access the pathways, but will also need enough power to travel on sloped paths. For trails with severe slopes (above 15 percent), gas-powered or diesel-powered vehicles are more desirable, even if they are not able to fulfill SITES requirements. The WGC will consider electric-powered vehicles and equipment when possible to reduce air and noise pollution. To reduce the potential for leakage of oil and gasoline into the Creek, any gas-powered equipment or vehicles will be refueled away from the Creek. Repairs to vehicles and equipment will be done immediately.

Maintenance work will be performed, ideally, when there are fewer visitors, in order to create the best user experience possible. For example, low impact maintenance tasks, such as litter removal, may take place throughout the day. However, disruptive maintenance tasks, such as power washing, can be performed during early morning or off-hours when there are fewer park visitors (if possible). Similarly, any maintenance work that will affect the use of, or limit access to park features, such as lawn renovation or trail repairs, will be announced prior to scheduled work whenever possible. (For instance, trail repairs may require trail re-routing or trail closures.) Notification may be done through postings on bulletin boards, social media, or temporary signage throughout the park.

Tools used for removal of diseased plants or invasive species must be cleaned based on the guidelines in Section 2.5.4 Tool Sanitation. For lists of equipment and tools necessary for each project area can be found in the respective chapters for each project.

Chapter 5.0

Waterloo Park O+M Considerations



5.0. WATERLOO PARK O+M CONSIDERATIONS

As of the writing of this chapter of the Manual (August 2018), the Agreement between the WGC and the Event Operator has not been finalized. Therefore, a number of assumptions have been made based on previous discussions to advance the completion of this chapter, and recommendations have taken the potential programming schedule and WPD's maintenance needs into consideration. The recommendations put forth are believed to be the best practices for the heavily-used site, in order to sufficiently protect the capital investment.

5.1 WATERLOO PARK LANDSCAPE TYPOLOGIES

The following section discusses the different lawns and planting mixes in Waterloo Park and their specific maintenance needs. All the landscape typologies consist of the various combinations of plants identified in Section 3.2 Planting Types. For a complete list of plantings, see Appendix B.

5.1.1 TURF GRASS: LAWNS - NON-EVENT

Non-event lawns are used for passive and active recreation. The lawns are installed on a stabilized structural subsoil that consists of loamy sand soil blended with lightweight expanded shale and compost to allow water to infiltrate. While these lawns are not considered high-use lawns, there will be enough activity that wear and stress on the turf must be managed. Heavy use causes compaction of the soil, while regular use places consistent stress on lawns. The best management plan is to develop and maintain a deep, healthy root system, periodically resting the lawns, and applying effective amendments when needed to foster plant growth and maintain critical soil biology.

Typical non-event lawn turf maintenance includes:

1. Turf establishment, including rehabilitation:

As new turf is established, it is important that grass fully develop before full-time use is permitted. Turf establishment includes:

 - A. Prepare soil for seeding and/or sod, which will facilitate deep root growth. Soil preparation will include balanced soil structure, fertility, and microbiology, which is essential for early plant growth. If a healthy balance of soil microbiology, nutrient content, and physical structure is achieved, roots are expected to grow deeper and denser.
 - B. Maintain consistent soil organic matter content (a source of nutrients as well as microbiological community support). Incorporate high-quality compost into soil to maintain at least 2.5 percent organic matter by weight. If this amount of organic matter is not present, add additional high-quality compost (fully prepared, complete compost) to the soil. Annually top-dressing with high-quality compost at a rate of one (1) cubic yard of compost per 300 square feet is recommended.
 - C. Early turf establishment requires balanced nutrients. Organic fertilizer with sufficient nitrogen (N), phosphorus (P), and potassium (K), as well as iron (Fe), is necessary to establish early turf growth. Organic fertilizer having an N-P-K content of 5 percent N, 5 percent P, and 5 percent K (5-5-5) at a minimum will provide sufficient nutrient content to facilitate growth and development (a fertilizer such as Sustane 4-6-4 or equivalent is a good starter fertilizer). NOTE: Phosphorus is essential for early plant growth, especially the development of roots. The P content in a starter organic fertilizer will supply sufficient P without releasing P in stormwater runoff to waterways.
 - D. Irrigate the new lawn to keep the soil moist, but not excessively wet. Early irrigation may be more frequent (approximately 1 to 2 inches of water per week for the first month), and then progress to deeper irrigation (longer irrigation period with more water) with longer periods between irrigation. This will force plant roots deeper. Excessive irrigation must be avoided as it will limit root growth and development.

- E. Avoid using the new or rehabilitated lawn areas until roots are three (3) inches or deep and grass has begun tillering (when multiple stems or side shoots begin forming), and they have received one (1) mowing. Monitor growth and health after initial use has begun.
2. Routine turf maintenance: After the non-event lawn has become established routine maintenance will include:
 - A. Mow on an as-needed basis. Maintain grass at a two (2)-inch height. When mowing, allow clippings to remain. Recommended mowing schedule is:
 - i. Every five (5) to seven (7) days in growing season
 - ii. Every ten (10) to fourteen (14) days during cooler seasons.
 - iii. Do not remove more than 1/3 of turf height.
 - B. Irrigate only in the absence of sufficient rainfall. Keep soil moist but not excessively wet to a depth of at least eight (8) inches below the surface. This will require periodic deep irrigation, which means the surface soil will be very wet for a short period of time while water infiltrates to deeper depths. Do not over-irrigate turf areas.
 - i. Turf will thrive with approximately one and a half to two (1.5-2) inches of water per week.
 - ii. Water sensors and weekly monitoring of turf conditions will be conducted to assess irrigation needs.
 - C. Fertilize approximately three (3) times per year or as recommended by soil test results for nutrient content. Use organic fertilizer. Depending on soil test results, fertilizers may include:
 - i. Spring: Fertilize with 10 percent N, 1 to 2 percent P, and 8 percent or more K. (10-2-8)
 - ii. Summer: Fertilize with 10 percent N, 0 percent P, and 4 percent K. (10-0-4)
 - iii. Fall: Fertilize with 10 to 15 percent N, 0 percent P, and 10 percent K. (15-0-10)
 - D. Perform core aeration annually, typically in late fall. Alternate de-thatching/verticutting can be conducted every third year to open soil surface.
 - E. Monitor turf areas for stress or damage weekly. Stress may be related to water needs, nutrient deficiencies, disease, or physical damage. In areas with excessive wear or stress, fence damaged areas and undertake turf restoration actions. See Item 3 below for more information.
 - F. Rest turf areas periodically. This may include fencing areas for a few weeks each year to allow turf to rest and rebuild root and shoot vigor. Monitor turf for wear at common “entry points” where heavy use occurs. It may be necessary to alternate access points.
3. Turf damage assessment and repair: Turf conditions will inevitably be stressed due to public use, seasonality, or disease. Assessment and repair of turf areas will include:
 - A. Conducting routine monitoring of turf conditions, especially after high-use periods. Signs of stress may include:
 - i. Bare soil: Inspect for compaction, shearing, or other reasons for lack of turf
 - ii. Yellowing of grass: Assess for nutrient deficiencies and disease
 - iii. Browning of grass: Assess for lack of moisture
 - B. If cause of stressed or damaged turf cannot be determined, consult with a plant pathologist, or turf expert.
 - i. Assess soil for potential issues.
 - a. Compaction
 - b. Lack of nutrients
 - c. Salinity and/or pH
 - d. Potential pathogens
 - e. Contamination
 - ii. Analyze turf leaf samples for pathogens or nutrient deficiencies.
 - C. If nature of turf stress or damage can be readily determined, implement remedial measures.
 - i. Fence area to be repaired
 - ii. Recondition soil if necessary (or replace if pathogens or contaminants are present), and prepare seedbed
 - iii. Plant seed or re-sod the area. Refer to turf establishment (Item 1 above) for restoration of grass.

- iv. Allow damaged area to adequately grow without disturbance or use for at least one month, or more depending on time of year.
- D. Overseeding can be done in small areas (<9 squared inches) that get heavy use. Turf grass can be overseeded or slit-seeded, ideally in late spring or early summer. Areas that have been seeded will be fenced off for approximately eight (8) weeks until they receive one (1) mowing.

Maintenance for non-event lawns is summarized as follows:

- Litter removal (daily)
- Leaf removal (as needed)
- Mowing and trimming to maintain a two (2)-inch lawn height (46x/year)
- Soil test and evaluation (annually, or as needed)
- Fertilizer application (3x/year)
- LBA application (annually)
- Renovation, including slit aeration and de-thatching, top dressing (1x/year, in spring)
- Fencing (as needed)
- Reseeding, allowing closure for three to four (3-4) weeks (as needed)
- Irrigation system maintenance (see Section 5.3.2)
- Lawn replacement, allowing for six to eight (6-8) weeks of closure and establishment (as needed)

5.1.2 TURF GRASS: LAWNS – HIGH USE/ EVENT

The event lawn area has been designed with a special structural soil for enhanced drainage and compaction resistance. Although it has been designed for high use, it is still prone to damage from compaction, shear stress, and other forces. For example, when chairs are placed on the lawn, concentrated excessive ground pressure will be exerted, which will damage even the most compaction-resistant soil. Likewise, foot traffic creates lateral stresses and may damage top growth of grasses. The best practice for maintaining a resilient lawn is ensuring a healthy and dense root system and periodic resting. Therefore, turf maintenance focuses on healthy roots as well as healthy top growth for grasses.

The structural soil designed for the high-use/event lawn consists of a four (4)-inch soil/expanded shale mix overlain by a four (4)-inch layer of sandy loam.

Organic matter has been added to the soil to maintain an organic matter content of 2.5 percent or more by mass. Soil fibers have been blended into the topsoil to resist compaction.

Follow the same maintenance regimen that is used for the non-event lawn with the following additional measures:

- The system is designed to withstand frequent use and heavy foot traffic. The soils promote quick drainage; therefore, lawn areas need to be sufficiently irrigated to allow for deeper watering into the soil profile. Because the soil is designed to have increased drainage, more frequent irrigation may be necessary. Monitor soil moisture on a weekly basis, increasing to a daily basis in summer. Do not irrigate the high-use lawn within 36 hours of an event.
- Lawns are to be kept at a height of two (2) inches with a mowing frequency of every five (5) to seven (7) days during growing season, and every ten (10) to fourteen (14) days during cooler seasons. When mowing, clippings can remain, unless there are extensive visible clippings.
 - Mow with sharp blades.
 - Change mowing pattern each time.
 - Do not remove more than 1/3 of turf height.
- Fertilize the high-event lawn up to four (4) times per season using the same organic fertilizers for non-event lawns. Apply fertilizers as granular material.
- Lawn aeration must not exceed three (3)-inch depth to avoid damaging the subsurface structural soil layer. Slit aeration is the preferred method and can be done as often as two (2) times per year. Core aeration is possible; however, “core plugs” may pull up aggregates and fiber in the structural soil layer.

Additional recommendations:

- Use seating that reduces ground pressure as much as possible. For example, typical folding chairs exert excessive forces on and into the soil. Chairs with wide legs, runners, or rails are preferred.
- Avoid consistent access points to minimize compaction. If access to event lawns at

selected areas is necessary, use hard-spaced flagstone or other materials to reduce lawn damage.

- The lawn is designed to support vehicular traffic. Even so, avoid use of vehicles on the high-event lawn as much as possible. If vehicles must use the lawn, protect the lawn with mats if possible, especially after rain or irrigation.
- Avoid use of lawn when turf is wet.

Maintenance for high-use lawns is summarized as following:

- Litter removal (daily)
- Leaf removal (as needed)
- Mowing and trimming to maintain a two (2)-inch lawn height (46x/year)
- Monitoring and evaluation, done pre- and post-event (assumes 140x/year)
- Soil test and evaluation (annually, or as needed)
- Fertilizer application (4x/year)
- LBA application (monthly)
- Renovation, including slit aeration and de-thatching, top dressing (2x/year)
- Irrigation system maintenance (see Section 5.3.2)
- Fencing (as needed)
- Reseeding, allowing closure for three to four (3-4) weeks (as needed)
- Lawn replacement, allowing for six to eight (6-8) weeks of closure and establishment (as needed)

After the first full year of operations, WGC will perform compaction tests and evaluate the overall condition of the turf in order to determine if resodding/replacement is needed. This will help determine the impact of programming on the health of the lawn and the maintenance schedule. Lawn replacement is needed when an extensive area of the lawn (≥ 25 percent) is visibly deteriorated from the previous year's programming schedule unable to recover from the stress, or when more than 25 percent of the lawn area is bare. The best time to evaluate the lawn is March, when growth begins. March to April is the best time to perform lawn replacement. October to mid-November is also an acceptable timeframe, though less ideal. (See Specification 32 92 00 Lawn for the quality of acceptable sod.)

Refer to section 5.1.1 for establishment and rehabilitation, and turf damage assessment and repair.

5.1.3 LIVE OAK CANOPY MIX

The live oak canopy consists of agaves, grasses, some shrubs, and perennials. The plantings specified need partial sun to shade and are relatively low growing (1-2 feet in height), leaving unobstructed views. During the first establishment year, the ground plane will be left bare or minimally mulched with a maximum one to two (1-2) inches of hardwood mulch. This will give the perennial groundcover a chance to establish and fill in. Excessive or heavy mulching will suffocate low-growing groundcovers and increase the potential for rot. Selected plantings are generally drought tolerant and favor free-draining soils, but during excessively dry seasons, some hand watering may be needed to supplement irrigation. This landscape type is located in areas where heavy pedestrian foot traffic is expected, and can be affected or damaged. However, plants will recuperate if given adequate rest and care. The plants are resilient and will not need to be replanted or replaced unless there are extensive bare spots. The design team envisions this landscape type to "evolve" with minimal replanting by allowing the plants to self spread, with limited maintenance intervention.

Woody shrubs will need to be kept low (under 2 feet), to prevent visual obstruction. If the agave spreads on the pedestrian walkways, the agave pups (plant offsets) will need to be removed or relocated.

Compost and soil amendments are recommended to maintain soil health. Soil testing will need to be conducted prior to the application of amendments. See Section 2.4 Soil Stewardship for more information. The addition of synthetic fertilizers is not recommended.

Maintenance for the live oak canopy mix includes:

- Litter removal (5x/week from May to October, 3x/week from November to April)
- Fall and spring leaf removal (as needed)
- Weeding (1x/week, April to October)
- Seasonal preparation and clean up (2x/year, in spring and fall)
 - This may include: pruning, deadheading,

cutback, plant division, bed clean-up, replanting, removing dead plants, mulching, etc. Some maintenance can only be done during spring and fall.

- Planting areas maintenance (monthly, April to October)
 - This may include: trimming, deadheading, spot mulching, spot watering, removing dead plants, etc. Maintenance is done to ensure plant health and overall aesthetics.
- Annual soils test and evaluation (annually)
- Monitoring and evaluation (incorporate into routine maintenance, or as needed)
- Spot watering (incorporate into routine maintenance, or as needed)
- Pest control (quarterly)
- Fencing (as needed)
- Collect compostable landscape debris (as needed)

5.1.4 PARTIAL-SUN FEATURE MIX

Similar to the live oak canopy mix, the partial-sun feature mixes are showy and bloom year-round. There are three (3) sub-mixes with different planting palettes based on location. The first palette consists of a taller understory with a “soft” carpet of low planting; this is the least “flashy” of the three. The understory will mature at three to eight (3-8) feet in height and is found under the canopy of Texas Persimmon and Desert Willow. The second palette can be found in areas with open canopies (e.g., entrances) and has colorful and attractive blooms that are primarily red and orange. The second palette is low growing; perennials are expected to reach to one to three (1-3) feet in height. The bloom time ranges from spring to fall, but with a heavy concentration between June to August. The third palette is also made up of attractive and colorful perennials and shrubs. The color palette ranges primarily from reds to violets and purples. This palette can also be found in highly visible areas, such as entrances and plaza areas.

All plantings selected for this mix are located in heavy use areas and will require regular maintenance. Amongst all of the planting mixes, this mix will be the most maintenance intensive. Plant replacement will need to be done in both spring and fall, especially along bed edges with a high potential for damage from foot traffic. Most flowering plants will not require deadheading, with the exception of the Giant

False Yucca and Yuccas. Their flower stalks can reach eight (8) feet in height, and plants will benefit from stalk removal. Possum Haw, a showy shrub, can be aggressive and crowd-out other plants. They will be selectively trimmed to minimize potential crowding-out of other plants throughout the growing season, with a more severe pruning in early spring.

Due to the low-growing nature of the groundcovers selected for the partial-sun plantings, mulch is not recommended for the establishment period. In the first year, maintenance will focus on weeding and invasive species removal to allow groundcovers to grow-in and become established. This is estimated to take one to two (1-2) years. After plants are established, apply 1-2 inches of mulch to the beds.

Maintenance for partial-sun feature mixes includes:

- Litter removal (5x/week from May to October, 3x/week from November to April)
- Fall leaf removal (as needed)
- Weeding (1x/week, April to October)
- Seasonal preparation and clean up (2x/year, in spring and fall)
 - This may include: pruning, deadheading, cutback, plant division, bed clean-up, replanting, removing dead plants, mulching, etc. Some maintenance can only be done during spring and fall.
- Planting areas maintenance (monthly, April to October)
 - This may include: trimming, deadheading, spot mulching, spot watering, removing dead plants, etc. Maintenance is done to ensure plant health and overall aesthetics.
- Annual soils test and evaluation (annually)
- Monitoring and evaluation (incorporate into routine maintenance, or as needed)
- Small tree maintenance, on newly planted trees (1-2x/year)
- Spot watering (incorporate into routine maintenance, or as needed)
- Pest control (quarterly)
- Plant replacement (allocate time for twice annually)
- Fencing (as needed)
- Collect compostable landscape debris (as needed)

5.1.5 SHRUB THICKET MIX

The shrub thicket mix is used to discourage foot traffic in areas with steep slopes. It is densely planted, with plants reaching four to eight (4-8) feet. Plants are more woody, shrubby, and even thorny to discourage use. Because this area will have limited access, it will require less frequent maintenance. Shrubs and succulents will see two (2) thorough seasonal maintenance efforts, which includes bed cleanup, soil testing, removal of dead plants, mulching, and plant health inspection. Maintenance will also include pruning and cutbacks to correct plant shapes and plant health. Protective gear may be needed because of thorns. The perennial groundcovers are meant to provide temporary coverage and slope stabilization. They will eventually be shaded out and die; they do not need to be replaced. Although some plants will flower and bear fruit, deadheading and removal of fruit will not be necessary unless plants appear to be diseased or dying. Some die back may occur over time but plants are expected to rejuvenate. Removal and replacement after the first season is not recommended unless large areas die, which may result in increased slope erosion.

This landscape area will receive three to four (3-4) inches of mulch.

Maintenance for shrub thicket mix includes:

- Litter removal (biweekly)
- Fall leaf removal (as needed)
- Weeding (biweekly, April to October)
- Seasonal preparation and clean up (2x/year, in spring and fall)
 - This may include: pruning, deadheading, cutback, plant division, bed clean-up, replanting, removing dead plants, mulching, etc. Some maintenance can only be done during spring and fall.
- Planting area maintenance (monthly, April to October)
 - This may include: trimming, deadheading, spot mulching, spot watering, removing dead plants, etc. Maintenance is done to ensure plant health and overall aesthetics.
- Annual soils test and evaluation (annually)
- Monitoring and evaluation (incorporate into routine maintenance, or as needed)
- Small tree maintenance, on newly planted trees (1-2x/year)
- Spot watering (as needed)

- Pest control (quarterly)
- Fencing (as needed)
- Collect compostable landscape debris (as needed)

5.1.6 GREEN BASIN MIX

The green basin mix is drought tolerant with free-draining soil. These areas are expected to be very dry most of the time, but can withstand occasional inundation. Maintenance of this area is minimal and will be guided by a mostly hands-off approach to allow plants to spread, thus, limiting foot traffic through the area. Seasonal maintenance will be needed to monitor and track plantings. Maintenance will involve basin cleanup, removal of sediment and debris, monitoring the spread of plants, soil testing, and inspecting for plant health. The green basin areas are intended for water quality purposes, and therefore will receive no fertilizer or amendments due to runoff concerns.

Maintenance for green basin mix includes:

- Litter removal (weekly)
- Seasonal preparation and clean up (2x/year, in spring and fall)
 - This may include: pruning, cutback, plant division, bed clean-up, replanting, removing dead plants, mulching, etc. Some maintenance can only be done during spring and fall.
- Planting area maintenance (monthly, April to October)
 - This may include: trimming, removing dead plants, etc. Maintenance is done to ensure plant health and overall aesthetics.
- Monitoring and evaluation (incorporate into routine maintenance, or as needed)
- Spot watering (as needed during extreme heat)

5.1.7 VENUE GARDEN MIX

The venue garden mix consists primarily of succulents/xerophytes and grasses. The selected plants are expected to reach one to five (1-5) feet in height. They are drought tolerant but may need some watering during establishment. A light layer (1-2 inches) of mulch will help with weed growth and retain soil moisture. The need for mulching may

be reduced as the groundcovers mature and knit together.

The semi-annual bed maintenance will also include removal of any dead plants, particularly in areas with high visibility. Plant replacement in bare areas and plant division may be needed. During the first year of establishment, mulching will be limited to allow the plants to fill in. Some cut back will be needed when perennials encroach beyond planting beds. Wind-blown debris can become trapped along or in planted areas and will need to be removed. In addition to ensuring plant health, the roof waterproofing membrane and root barrier will be inspected semi-annually to ensure it is not damaged. This inspection will be done during the semi-annual bed cleanup and maintenance.

Maintenance for venue garden mix includes:

- Litter removal (5x/week)
- Fall leaf removal (as needed)
- Weeding (1x/week, April to October)
- Seasonal preparation and clean up (2x/year, in spring and fall)
 - This may include: pruning, deadheading, cutback, plant division, bed clean-up, replanting, removing dead plants, mulching, etc. Some maintenance can only be done during spring and fall.
- Planting area maintenance (monthly, April to October)
 - This may include: trimming, deadheading, spot mulching, spot watering, removing dead plants, etc. Maintenance is done to ensure plant health and overall aesthetics.
- Annual soils test and evaluation (annually)
- Monitoring and evaluation (incorporate into routine maintenance, or as needed)
- Spot watering (as needed)
- Pest control (quarterly)
- Plant replacement (allocate time for twice annually)
- Fencing (as needed)
- Collect compostable landscape debris (as needed)

5.1.8 WALL PLANTING MIX

Vines are used around edges of event spaces and buildings and in planting beds on top of the retaining walls. They are intended to cascade over structures and create a green wall once established. During

the establishment period, the vines may need to be trained to grow toward these features. All vines are encouraged to commingle, particularly with the Cross Vine and Climbing Fig. Although vines are intended to largely be left “free form,” some trimming may be required to keep them tidy, and to remove dead leaves regularly during the growing season. At the beginning of spring and in late fall, a severe pruning will be done to remove dead wood. Some plant replacement or replanting may be needed to fill in bare areas. Wind-blown debris may get trapped in planting beds or structures and will need to be removed. Vines will be accessible by step ladders or via the roof top.

The green wall maintenance needs are similar to those for vine edges, except the vines are expected to overgrow the structure and create a densely vegetated green wall.

Maintenance for the wall planting mix includes:

- Litter removal (1x/week or as needed)
- Training and correction (monthly during establishment, 12x/year; quarterly after)
- Seasonal maintenance (spring and fall, 2x/year)
 - This may include: pruning, bed clean-up, replanting, removing dead plants, mulching, training, etc. Some maintenance can only be done during spring and fall.
- Trimming -- touch-up throughout the year (approximately 8x/year)
- Monitoring and evaluation for plant health, pest and invasive species, and any exposed or damaged structures
- Plant maintenance (monthly, April to October)
 - This may include: trimming, deadheading, spot watering, removing dead plants, etc. Maintenance is done to ensure plant health and overall aesthetics.
- Spot watering (as needed)

5.1.9 WETLANDS

The plantings chosen for the wetlands are wet-site-tolerant, and a mechanical system is in place to ensure consistent water level. While wetland areas are largely inaccessible, debris and litter will collect and need to be removed. Twice annually, herbaceous aquatic plantings will need to be thinned during routine maintenance, as they can over take other

species. Woody shrubs will need to be pruned for health and safety, with the exception of *Cephalanthus occidentalis* (Buttonbush), which can be pruned to improve its aesthetics. Monitor algae levels monthly. Shading and dense planting mass will keep algal blooms to a minimum. Short duration blooms can be tolerated. Large sedges and non-turf grasses will need to be cut in late winter to improve form. Sediment and silt will need to be removed every two to three (2-3) years from the basin to improve water quality and maintain plant soil quality. Additional care is needed during the establishment period, when invasive species will need to be removed and dead plantings replaced/replanted to discourage other species from taking over, especially *Typha latifolia*, or cattails. Overall, once plants are established, maintenance in these areas will be limited. Maintaining healthy floral and faunal communities will contribute to water quality and algae and mosquito management goals.

Maintenance of wetlands includes:

- Litter removal (biweekly)
- Removal of large debris and sediment (as needed)
- Annual cutback (annual)
- Landscape maintenance (quarterly)
 - Thin fast growing herbaceous plants to maintain open water (biannually)
 - Problematic species management (biannually)
 - Integrated Pest Management will be used
 - Herbicide, if used, must be approved for aquatic use
- Algae management
 - Short duration blooms can be tolerated
 - In the event of significant winter vegetation die-off, blackout dye can be considered
 - Barley straw products can be used, as needed
- Mosquito control (as needed)
 - Seasonal stocking of predatory fish
- Inspection
 - Inspect for clogged pipes (monthly)
 - Investigate shoreline for erosion (quarterly and after major storms)
 - Monitor wetland plant composition and health and identify problematic species (monthly)
 - Check pH, nitrate, nitrite, phosphate, and

dissolved oxygen levels (biannually)

- Check depth to determine if sediment removal is needed (annually)
- Mechanical circulation/aeration system
 - Mechanical and electrical maintenance of pump, control panel and filtration system, if present, as specified by manufacturer. Adhere to manufacturer specified maintenance interval and procedures
 - Check and clean pump as specified by manufacturer
 - Regularly clean filters; inspect on a weekly basis during the first year to establish cleaning pattern
 - Seasonally, inspect hoses and cables for damage and/or blockages; clear excess debris

Establishment

- Low nutrient levels can cause problems for plants. Use slow release, organic fertilizer as needed
- Newly submerged and anoxic conditions can cause an initial release of phosphorus

5.1.10 CYPRESS GROVE WET UNDERSTORY (SECTOR 9)

Sector 9 is being developed and has not been finalized for the 100% Waterloo Site Management Manual submission. (As of August 2018)

The cypress grove wet understory landscape type is designed to withstand dry conditions with periodic inundation. Though this landscape type will have a “naturalistic” aesthetic (composed primarily of non-turf grasses and native shrubs) it is intended to be highly monitored in an effort to deter the establishment of invasive species that will be drop along its banks through natural Creek processes. Native species are welcome, but will need to be selectively cleared to maintain a healthy landscape. All invasive species must be removed immediately.

The cypress grove wet understory is located near the 14th and 15th Street Bridge abutments. Due to its high visibility, the woody understory will require pruning and shaping, and the canopy trees will need to be limbed up to keep clear views into the park.

Watering is not necessary except during periods of sustained drought and during the establishment

phase, when occasional watering may be needed. After a flood event, monitor and identify any erosion and flood damage, and remove flood debris as needed. Fertilizer, soil amendments, and compost will not be used in any Sector 9 landscapes. However, LBA may be used in Sector 9, the exact application will be determined as the program is further developed.

Maintenance of the cypress grove wet understory includes:

- Litter removal (2x/week)
- Planting maintenance (bimonthly)
 - This may include: trimming, deadheading, removing dead plants, etc.
- Monitoring and evaluation (incorporate into routine maintenance, or as needed)
- Volunteer plant removal (biweekly)
- LBA application (1-2x/year)
- Spot watering (only in extreme heat)

5.1.11 SEDGE UNDERSTORY (SECTOR 9)

This landscape type is planted along the Creek, providing a dense low growing buffer to the heavy stone armoring. Volunteer plantings will most likely occur in the planting beds, with natives being desirable and encouraged to remain, and invasive species removed. See Section 3.2.2 Non-Turf Grasses for maintenance guidelines on sedges. After a flood event, monitor and identify any erosion and flood damage, and remove flood debris as needed.

Fertilizer, soil amendments, and compost will not be allowed in the sedge understory. LBA may be used in the sedge understory; its application protocols will be further developed at a later time.

Maintenance of the sedge understory includes:

- Litter removal (weekly)
- Seasonal prep/planting maintenance (annual)
 - This may include: pruning, cutback, replanting, removing dead plants, etc. Some maintenance can only be done during spring and fall.
- Monitoring and evaluation (incorporate into routine maintenance, such as visual inspection during litter removal, or as needed)
- Volunteer plant removal (biweekly)
- LBA application (1-2x/year)
- Spot watering (only in extreme heat)

5.1.12 VINE MIX (SECTOR 9)

Similar to sedge understory, the vine mix is located close to the stone armor and is intended to grow out and through the rip-rap, softening the visual presence of the heavy stone. Vines are encouraged to commingle with one another, and some pruning and cut back may be necessary to direct growth and avoid becoming overgrown. Similar to the sedge mix, volunteer plants are expected to appear. Natives volunteer species will remain and selectively cleared. Invasive volunteer species will be removed. After a flood event, monitor and identify any erosion and flood damage, and remove flood debris as needed.

Fertilizer, soil amendments, and compost will not be allowed in the vine mix. LBA may be used in the vine mix, its application protocols will be further developed at a later time.

Maintenance of vine mix includes:

- Litter removal (weekly)
- Seasonal prep/planting maintenance (quarterly)
 - This may include: trimming, deadheading, removing dead plants, etc.
- Monitoring and evaluation (incorporate into routine maintenance, such as visual inspection during litter removal, or as needed)
- Volunteer plant removal (biweekly)
- Vine pruning and correction (1x/month, April-October)
- LBA application (1-2x/year)
- Spot watering (only in extreme heat)

5.1.13 BIO-ENGINEERED EDGE (SECTOR 9)

This planting type is located on the “bottleneck” of the Creek and is intended to withstand the high velocities and shearing forces caused by the water currents during storm events. The plants selected for this landscape are fast growing and resilient. This landscape type will compete with many plants deposited from flood water. Clear native plantings as needed, and remove invasive species as soon as possible. *Populus deltoides*, or Eastern Cottonwood, are planted as whips and benefit from a cut back every three to five (3-5) years.

Fertilizer, soil amendments, and compost will not be allowed in the bio-engineered edge. LBA may be used and its application protocols will be further developed at a later time.

Maintenance of bio-engineered edge includes:

- Litter removal (weekly)
- Seasonal prep/planting maintenance (quarterly)
 - This may include: trimming, deadheading, removing dead plants, etc.
- Monitoring and evaluation (incorporate into routine maintenance, such as visual inspection during litter removal, or as needed)
- Volunteer plant removal (biweekly)
- LBA application (1-2x/year)
- Spot watering (only in extreme heat)

5.7 MAINTENANCE AND TASKS HOURS SHEETS

The following pages are the detailed calculations of maintenance tasks and hours needed to maintain Waterloo Park. They are in the order of: hardscapes, landscapes, and site-wide needs and features.

5.2 WATER USE/MANAGEMENT SYSTEMS

5.2.1 CISTERN/STORMWATER CAPTURE

A 46,850 gallon below ground concrete cistern will be sited within the park to capture, store, and slowly release rain water. Water captured from some planting areas (such as expansive lawn areas) will drain into the cistern. The cistern pump system is designed to empty the below ground storage tank within approximately 48 hours after a rainfall event. The water captured will not be stored for irrigation purposes and the pump system will continually discharge captured rainwater (following a 24 hour delay) into the rain garden areas for further slow release until the cistern is emptied.

A water intake structure is located near the subsurface cistern. Debris and litter may accumulate and collect on the exterior of the water intake structure. The intake structure will be inspected after every heavy rain event for any debris, blockages or heavy sedimentation and will be cleared as needed depending on the rate of accumulation. Silt accumulation cannot exceed 4 inches in depth and sediment will be removed from the intake structure floor. Regardless of rain frequency, the interior and exterior of the inlet structure needs to be inspected at least every 3 months.

The subsurface storage cistern will accumulate sediment over time. Sediment will be removed from the storage tank and sump floor when it reaches a depth of 6 inches. A 36-inch square access hatch is located at the top of the cistern to allow access for inspection and maintenance. Two submersible pumps are located on the vault floor (12 inches above floor); staff will need to inspect the pumps for contaminant and sediment deposits.

Maintenance of the concrete cistern includes:

- Inspect the system, open the access hatch and enter the vault. Inspection can be done with a stadia rod or pole, and a flashlight. Sediment depths can easily be determined by lowering the measuring device to the top of the sediment pile and calculating the distance from the top of the sediment pile to the water surface.
 - To avoid underestimating the volume of sediment in the chamber, the measuring

device must be carefully lowered to the top of the sediment pile. The finer sediment at the top typically offers less resistance than larger particles found at the bottom of the pile.

- Sediment can be collected by flushing into a lower point in the cistern. Sediment can then be collected by hand with shovels and hoisted out. The use of a small trash pump (3HP with a minimum 3" discharge port recommended) may be necessary to remove sediment.
 - Sediment removed from the ground storage tank and water intake structure will be properly disposed of at an approved off-site disposal facility or may be disposed of in an approved on-site location if it meets standards outlined in the Erosion Control Criteria of the City of Austin.
 - However, it is advised against disposing the sediments in Waterloo Park, as the sediments may clog up the structural soils used for the planting areas.
- The level sensor probes, the control station, the pump and the electronic controls will be inspected at least every 2 months, to insure that the system is functioning properly. Any failures or issues must be promptly addressed.
- Components will be repaired and replaced as needed.

During the first year, it is recommended that the cistern receive a comprehensive monthly inspection, which can then be reduced to bi-monthly in following years only if sedimentation build up rates warrant a reduced inspection frequency. An inspection is recommended after a large storm event. Sediment removal will be dependent on inspection result.

At project construction completion, the contractor is responsible for providing a maintenance plan to include:

- A general description of the function of the below ground storage tank.
- An inspection maintenance plan including a detailed schedule.
- A replacement parts list with supplier contact information.

5.2.2 IRRIGATION

Irrigation is essential for the overall establishment

and resilience of the Waterloo Park landscape. An extensive irrigation system will be installed in all planting areas including temporary irrigation zones along the Creek in wetland areas and sections of Sector 9. A mix of pop-up spray heads and rotors will be used for lawn areas and display gardens. Subsurface drip irrigation tubing and tree bubblers will be used in shrub beds, narrow lawn areas, and tree plantings.

The automatic irrigation system will not require extensive management to operate on a daily basis; however, the individual components will require regular monitoring and will need to be inspected regularly to ensure all spray heads and drip components are functioning properly. Controllers need to be checked for proper scheduling and lines will require regular inspection to minimize or repair leaks. The irrigation system will be monitored daily, some of which can be done remotely; the irrigation schedule will need to be seasonally adjusted to meet water needs. Even minor irrigation failures may result in the loss of plant material, especially for large caliper transplanted trees.

Regular maintenance for both permanent and temporary irrigation systems will include inspection for leaks or breaks; checking pop-up spray and rotor heads for damage and proper retraction; inspection of the weather station/rain gauge; visually checking all surface equipment; repairing damaged components; and seasonal startup/shut down. All flow meters and pressure gauges will be inspected daily to ensure the system is working properly. A low pressure reading will indicate a leak in the system (e.g., leaking components or a broken pipe). A difference in pressure between individual spray heads may mean the system is not back flushing properly and requires a clean-out.

It is projected that the spray head/rotor and valve components will require approximately two percent (2%) annual replacement during the first five (5) years, and afterwards approximately ten percent (10%) annual replacement after the establishment period. Components must be replaced quickly to avoid potential plant losses.

Subsurface drip irrigation systems are designed to deliver water at uniform low flow and rates. The system is designed to be permanent and can be long-

lasting (up to 20 years) if properly maintained.

Specific zones in the wetland areas and sections of Sector 9 will have temporary irrigation systems to help establish wetland plantings. Temporary irrigation systems are designed with above ground components. Once plants are established (after approximately 3-5 years), the temporary above ground system will be fully removed. Hand irrigation may be needed during periods of severe drought in these areas following the establishment period. Typical permanent sub-surface maintenance protocols apply to temporary irrigation systems in addition to frequent inspections of above ground piping for damage from vehicle/foot traffic and fallen branches. Occasional flooding may also occur in these areas and all system piping must be inspected and re-secured after flood events.

As noted in Section 5.2.1, Cistern/Stormwater Capture, a below ground water cistern will temporarily store rain water and slowly release water through a reclaimed water irrigation piping system leading to the on-site rain garden planting areas. Although not defined as an irrigation system, the stormwater discharge infrastructure will incorporate purple colored PVC piping/fittings and Netafim tubing (for reclaimed water). This system will be monitored, inspected and maintained similarly to all other typical drip tubing irrigation components throughout the site. The reclaimed water from the cistern will not be used for irrigation, due to its high nutrient content and potential impact on the waterways. Irrigation water quantities and schedules must be continually adjusted to ensure little to no water from the planting areas will return to the cistern.

All irrigation systems in areas that are subject to freezing temperatures will require winterization to prevent the possibility of burst pipes, especially when using PVC pipes and fittings. A thorough fall winterization will include:

- Shut off water supply at main distribution line
- Clean pump housing
- Drain all water lines and pumps
- Blow out remaining water with compressed air
- Check valves to ensure any trapped water has escaped
- Leave shutoff valves open after draining the unit; "ball" type shutoff valves will be left at a 45 degree angle to prevent water from

entering the seal

- Lubricate all gaskets and cover pump for the season

The entire irrigation system (except for the main distribution line) will need to be flushed and drained at the end of the growing season to prevent any winter freeze damage. The system lateral lines will have to be fully drained by pressurizing the lines to ensure no water remains in the system. In the spring, once any risk of freezing has passed, the entire system may be recharged and all lines tested for adequate pressure.

During the spring start-up when the system is turned back on, the system must be thoroughly checked for potential failures, damaged components, or lines and require repair and/or replacement as needed. Signs may include: non-retractable sprinkler heads, water spraying in directions not intended, water bubbling up from the ground (broken line), etc. All heads must be cleaned or adjusted as needed. The irrigation schedule will be reevaluated and reprogrammed or modified for the upcoming season based on historical data from previous seasons.

At project construction completion, the contractor is responsible for providing an operation and maintenance manual detailing operating and maintenance requirements for all irrigation system components. The manual shall include:

- Duration of guarantee period.
- Comprehensive equipment list with make/model/manufacture, local manufacturer representative, spare parts list, and detailed operating and maintenance instruction of major equipment.

5.3 MAINTENANCE ESTIMATES AND BUDGET

Based on the 100 percent CD design, ETM has estimated that approximately 9,718 - 10,090 hours are needed for annual maintenance during post-establishment and establishment, respectively. The most maintenance intensive work comes from basic site feature maintenance, such as emptying of receptacles and restroom cleaning. There are a total of 30 trash, recycling, and compost receptacles in Waterloo Park. The detailed calculations can be found at the end of this chapter for all the hardscape areas, landscape areas, and site features and furnishing. Below is a summary of the hour breakdown by landscape type, and the estimated maintenance hours per landscape type is shown as a frame of reference.

Based on the estimated hours and the proposed maintenance strategy outlined in section 5.3, ETM is able to calculate an annual maintenance cost for Waterloo Park, which is estimated to be approximately \$747,864 - \$747,336 (see Figure 10). There are several frequently reoccurring replacement items, such as EWF replacement and event lawn replacement, identified in the budget. These tasks will be done as needed.

	<i>Hours/Acre</i>	Estab Hours	<i>Hours/Acre</i>	Post-Estab Hours
Concrete - Typical	557	1054	557	1054
Concrete - Pervious	594	77	594	77
Decomposed Granite - Stabilized	303	58	303	58
Dry-Laid Pavers	293	13	293	13
Wet-Laid Pavers	92	6	92	6
Wood Decking	721	70	721	70
Engineered Wood Fiber	707	50	707	50
Rip-Rap and others	50	32	50	32
Lawn - High Performance	971	391	971	354
Lawn - Non-Event	377	480	377	430
Small Trees		878	0	853
Large Trees		444	0	404
Wetland Plantings	410	66	410	41
Live Oak Canopy Mix	707	668	707	638
Partial-Sun Feature Mixes	933	254	933	224
Shrub Thicket Mixes	294	347	294	317
Venue Garden Mix	1137	116	1137	91
Green Basin Mix	159	51	159	36
Vines Edge/Green Walls	429	38	429	23
Cypress Grove Wet Understory	666	46	666	31
Sedge Understory	348	47	348	37
Vine Mix	1017	26	1017	11
Bio-Engineered Edge	770	21	770	11
Site Features and Furnishing		4,857		4,857
Total		10,090		9,718

Figure 9. Summary of Estimated Maintenance Hours for Waterloo Park

Operating Costs for Waterloo Park Austin, Texas	Establishment Period				Post-Establishment Period			
	Hrs	# of FTE/PTE	\$/hr	Cost	Hrs	# of FTE/PTE	\$/hr	Cost
Grounds Maintenance								
Maintenance Personnel								
Supervisor - skilled with ecological/horticultural knowledge	1,860	1 FTE	\$36.93	\$68,681	1,860	1 FTE	\$36.93	\$68,681
Crew Leader	3,720	2 FTEs	\$22.01	\$81,877	3,720	2 FTEs	\$22.01	\$81,877
Semi-Skilled Staff	7,440	4 FTEs	\$18.99	\$141,286	7,440	4 FTEs	\$18.99	\$141,286
Unskilled/Semi-Skilled Staff	5,376	6 PTEs	\$13.84	\$74,404	3,584	4 PTEs	\$13.84	\$49,613
Overtime				\$10,000				\$10,000
Fringe				\$131,686				\$123,010
Subtotal Maintenance Personnel	18,396			\$507,934	16,604			\$474,466
Supplemental Personnel								
Volunteers				\$0				\$0
Arborist	1,257	hourly	\$40	\$50,270	1,257	hourly	\$40	\$50,270
Contracted Tree Maintenance - 10+" caliper	1		\$960	\$960	1		\$600	\$600
Transplanted Tree Maintenance*				\$5,000				\$5,000
Contracted Trades Services				\$25,000				\$50,000
Subtotal Supplemental Personnel				\$81,230				\$105,870
Subtotal Maintenance Personnel				\$589,164	16,604			\$580,336

*Placeholder

The items in the estimated budget are subject to change based on the needs of the owner team.

Figure 10. Estimated Annual Maintenance Cost for Waterloo Park 1/2

Figure 10 Notes

Supervisor will spend approximately 25% of his/her time on grounds supervision, while remaining time is spent towards monitoring, recording, grounds work, training, administrative work, etc. It is assumed that approximately 15-20% of his/her time is available for grounds work (assumes 280 grounds hours) during the initial years, but may provide less or no grounds maintenance work as his/her responsibilities increase in the future.

Crew Leader will spend approximately 25% of his/her time to oversee the grounds operations and provide supervision, and the remaining 75% (or 1,395 hours) to provide grounds work and skilled service. The Crew Leader will be an equivalent to a Skilled Staff.

Semi-Skilled Staff will be performing both horticultural tasks and grounds maintenance, with the exception of trades work such as electrical, plumbing, etc. This category also covers semi-skilled horticultural staff.

Unskilled/Semi-Skilled Staff will provide lawn care and approximately 50% landscape management while under supervision. Staff will work from April-October, or approximately 28 weeks. Each staff will provide 32 hours per week, which equates to 896 hours per staff in those 28 weeks. Approximately 6 staff will be needed during the establishment period, and 4 staff during the post-establishment.

Contracted Trades Services

It is assumed that some allowance for trades services may be needed for tasks that cannot be done by Skilled Staff, or will require special equipment. Contracted services are typically \$75-100/hour.

While the role of an Event Coordinator is not within the scope of this Chapter of Waterloo Park, this staff is essential to coordinating between the vendor events and WGC sponsored events. The Site Supervisor may sit in during scheduled meetings to provide better maintenance effort.

Material and Other Expenses	Qty	Unit Cost	Cost	Qty	Unit Cost	Cost	
Pest control			\$5,000			\$5,000	Non-horticultural rodent/pest control Assumes one 50-plant flat is \$40/flat; 9,000 plants are replanted annually, assumes 180 flats are purchased (ground plantings only)
Annual plantings			\$7,200			\$7,200	
Understory planting			\$5,000			\$5,000	Allowance for woody shrubs and small trees replacement
Materials			\$20,000			\$20,000	Material purchase related to everyday maintenance: trash bags, doggie bags, gloves, small tools, hoses, playground rubberize mats, etc.
Toilet supplies			\$6,800			\$6,800	Commercial 9" 2ply TP @ \$18 for 12/case (183 cases annually), commercial 800' PT @ \$17 for 6/case (122 cases annually), commercial hand soap 1 gallon @ \$15/gallon (92 gallons annually). Does not include supply costs needed to meet events needs.
Soil testing			\$600			\$400	Cost for soil tests, assumes \$100 per test. 6 tests during establishment period, reduces to 4 tests during post-establishment period.
Mulch	100	\$40	\$4,000	250	\$40	\$10,000	Assumes about \$40/CY, 100CY covers approximately 6,500SF at 2" depth. 250CY covers approximately 40,000SF at 2" depth.
EWf cost	20	\$30	\$600	20	\$30	\$600	Materials only, routine top off
Waste hauling			\$6,000			\$6,000	Services for waste removal, recycling, and composting (if applicable); assumes \$500/month
Irrigation parts			\$5,000			\$7,500	Routine replacement parts, such as sprayheads (assumes larger and more expensive components need to replace in post-establishment years)
Uniforms & communication devices			\$7,500			\$2,500	All-weather gear, radios/ cellphones/ tablets, etc.
Equipment rental			\$15,000			\$20,000	Allowance for vehicle and equipment rental for special tasks, such as vacuum trucks, scissor lifts, etc.
Utilities			\$75,000			\$75,000	Allowance, covers water and electricity
Subtotal Material Expenses			\$157,700			\$166,000	
Total Maintenance Costs			\$746,864			\$746,336	In 2018 dollar
Total Maintenance Costs			\$770,763			\$770,219	Escalated to 2020 dollar with an additional 3.2%
Tasks Done As Needed	Qty	Unit Cost	Cost				
EWf Complete Replacement	3,100	\$6	\$18,600				
EWf Loading (In and Out) Cost	129	\$19	\$2,410				
Event Lawn Replacement	17,526	\$2.50	\$43,815				

Figure 10. Estimated Annual Maintenance Cost for Waterloo Park 2/2

5.4 MAINTENANCE STRATEGY

5.4.1 GENERAL MAINTENANCE GUIDELINES

- Dedicated weekly maintenance and rest days are needed; this may change to two (2) maintenance days per week during growing season. If turf has been significantly damaged at any time during the summer or after specific events, added maintenance and rest days for recovery of turf may be needed. Schedule dedicated maintenance and rest days immediately after high-use events.
- Light use of lawns is permitted, but no event can be scheduled on this dedicated maintenance/rest day (e.g., every Tuesday).
- Limited maintenance work can be done when it rains. Depending on the severity of rainfall, limited maintenance may include light raking of the lawn, some soil repair, and fertilization (if timing is correct). Discretion of the supervisor is advised. In no circumstances are vehicles be allowed on to turf areas when wet.
- PARD considers one (1) inch or more a rain event and calls off/reschedules events. This has not been established for Waterloo Park.
- Regular maintenance work will be rescheduled for the next available day or time of day when the ground is dry. Maintenance work can resume when the top two (2) inches of soil is dry.
- If scheduled events occur when the high-use lawn is wet, then measures to protect the lawns will be implemented. Protective measures may include:
 - Protective mats (coir mats are best, but mats may also include turf-reinforced mats, screens, or plywood sheet).
 - Protected walkways: Walkways in and through event areas will likely encounter the most damaging forces. Protected walkways (provided with protective covers) will limit damages to the event lawn area.
- Restrict seating to low ground pressure chairs or benches, if possible. Use ones with wide legs or “bars” to evenly distribute the weight, rather than chairs with 4 thin points that can potentially damage the lawns.
- It is important to note that damage to turf when it is wet is likely expected during high-use events, and therefore, follow up

maintenance and lawn restoration measures will be needed.

5.4.2 STAFFING RECOMMENDATIONS

Due to the number of potential events, scheduling maintenance work will be complex at Waterloo Park. Maintenance crew scheduling will need to be flexible. Ideally, there will be dedicated days for routine horticultural grounds maintenance. However, it is likely that the event schedule will vary from month to month, and the dedicated work days will need to change. Additionally, maintenance staff will not be able to work in and around the venue when an event is being set up or during sound checks, rehearsals, and take downs. Staff will also need to work around the weather (e.g., beginning and end of seasons, rain, extreme heat, etc.). Although it is possible to contract out maintenance on an “as-needed” basis, it will be costly and will not necessarily involve the same maintenance staff each time. This is a concern given the complexity of the scheduling of events; having consistent staff, who are well-versed in the specific maintenance and operating needs of the park landscapes and plantings, is crucial for success. For the best results at Waterloo Park, the maintenance crew will need to be flexible with both scheduling and actual work, while having the expertise to effectively perform the work.

ETM is recommending a supervisor with a background in ecology and familiarity with the native plants. This supervisor will be a full-time staff, leading a team of full-time, seasonal and/or part-time staff, who can be nimble and able to reschedule work quickly if need be. The supervisor will provide some grounds support and oversee maintenance work done by the crew. His/her main focus would be on monitoring, recording, training, administrative work, and coordination. The crew will consist of a crew leader, and semi-skilled and some unskilled staff. The addition of crew leader can relieve the supervisor from some of the day-to-day on-site supervision as his/her role evolves. A crew leader will provide actual grounds maintenance work and supervision to the semi-skilled staff, and possibly volunteers if the opportunity presents itself.

The supervisor’s role is expected to expand as more of WG comes online. It is envisioned that the supervisor will work closely with the General Manager (see Section 5.6.1) to coordinate maintenance schedule and tasks around the scheduled events.

5.5 RECOMMENDED INITIAL EQUIPMENT AND TOOLS

Below (Figure 11) are lists of equipment and tools that are appropriate for the day-to-day maintenance at Waterloo Park. More tools and equipment may be needed in the future, but these will be available by day one of full operations.

5.6 SPECIAL EVENT MANAGEMENT

5.6.1 ASSUMPTIONS

The assumptions are as follows:

- There will be approximately 70 annual events in Waterloo Park.
- The Event Operator will produce 35 events from early-April to mid-October. The events can draw up to 5,000 people.
 - Each event will require the morning of the event for set-up and a day for take-down after the event. While the actual event is expected to take place in the late afternoon or early evening, it is assumed that the performers will begin rehearsal and sound-check in the late morning/early afternoon. An additional two to three (2-3) hours of security check prior to the event may be needed in some cases.
 - The licensed premise areas will be closed to the public on consecutive event days.
- The WGC, COA, or other groups will be responsible for producing approximately 35 additional events (community events). These events will vary in size, ranging from medium to large events (assumes 100-5,000

Equipment	Tools
Ride-on mower	Step and extension ladders
Push mower	Sprayers (for both landscape application and LBA)
String trimmer	Utility wagon/lawn cart/wheel barrow
Small utility vehicles (e.g. Taylor Dunn, GEM vehicles)	Hoses and sprayhead
Power washer	Safety equipment: gloves, goggles, hearing protection
Smaller generator	Gardening tools:
Leaf or backpack blower	Shears
KombiSystem (STIHL) or equivalent with attachments:	Loppers (forged, anvil)
PowerSweep	Pruners (hedge, specialty, hand)
Blower	Landscape push brooms and dust pans
Edger	Rakes (poly lawn, metal spring, forged garden)
Trimmer	Saws (pole pruning, bow)
Pole pruner	Weeder
Shaft extension	Forks (garden, mulch/compost)
Bristle brush	Spades and shovels (transfer, round point, steel)
	Manual aerator

Figure 11. Recommended initial equipment and tools

attendees). The community events will take place throughout the year. Small events and private rentals (under 100 attendees) are not included in this event tally.

- A General Manager (GM), hired by WGC, will be the representative of WGC and also be responsible for all operations and coordination related to the venue and events in Waterloo Park.
 - The GM will be responsible for housekeeping and kitchen equipment within the venue.
 - The GM will hire, train, and manage the staff, including temporary staff.
 - The GM will be responsible for securing and closing off the licensed premise areas prior to an event.
- The Event Operator will only be responsible for all maintenance within its licensed premises, as outlined in their agreement with WGC, on event days.
 - The Event Operator will be responsible for having event security and asking non-event attendees to leave the event area during event time.
- The food truck vendors will be responsible for maintenance within their licensed premises.
 - WGC will provide supplemental cleanup and offer waste management services,

which will be reimbursed by the vendors.

- WGC is responsible for maintenance of the site outside of the Event Operator's and food truck vendors' licensed premises, even on event days.
- WGC will be responsible for building maintenance, including building systems. The Event Operator and food truck vendors are responsible for housekeeping.
 - WGC will be responsible for cleaning the publicly accessible restrooms in the venue building on days when events are not occurring and the restrooms are open.
- Event Operator will be responsible for the restrooms and the venue building on event days.
- WGC will be responsible for maintaining the standalone restrooms at the food truck areas.
- The Event Operator is responsible for all waste management related to the event. WGC will provide an area for trash, recycling, and compost. The Event Operator will reimburse WGC for the removal services.
- See Figure 12 for licensed premise areas.

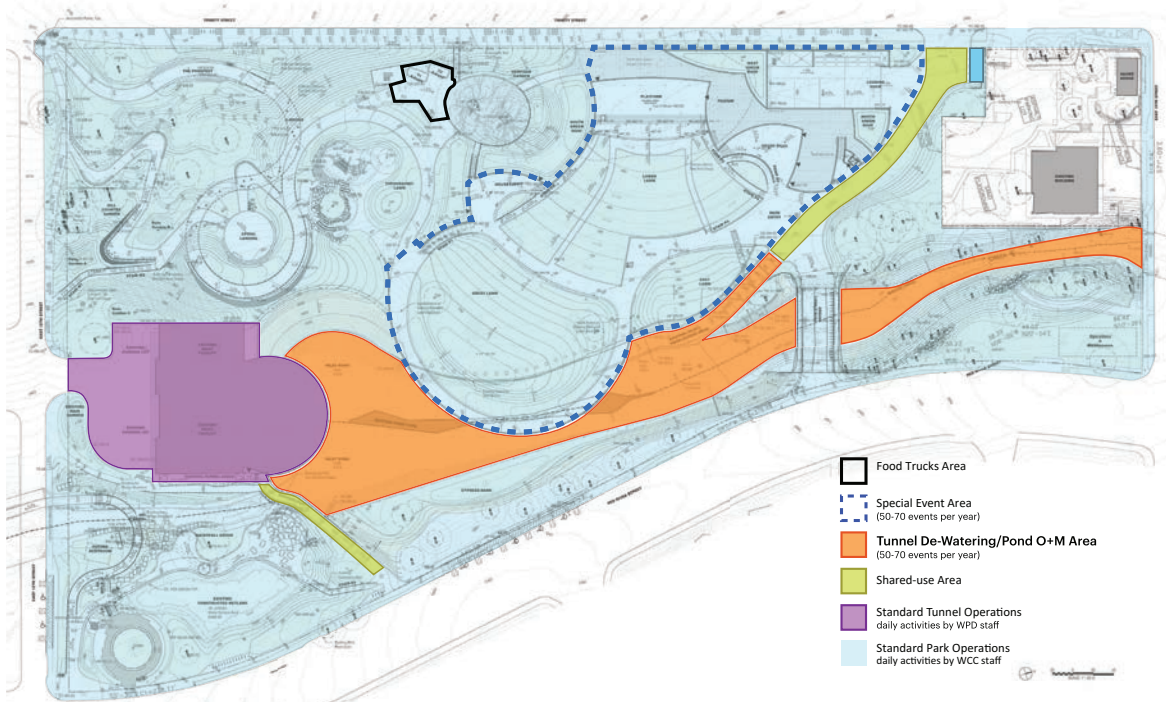


Figure 12. Waterloo Park Areas of Responsibilities

5.6.2 EVENT IMPACT ON MAINTENANCE

The events and the crowds they draw will significantly impact Waterloo Park. Damage to the park can and will occur, particularly when an event ends and thousands of people attempt to leave the site at the same time. While the egresses are intended to be controlled, traffic may spill into planted areas and may cause damage. This becomes a challenge when determining responsibility for damage and who pays for repair. The WGC may need to consider installing fencing and staff in particular areas to control access and limit spillover damage, especially at the entrance by the play area adjacent to the lawn areas. The Event Operator will be responsible for returning the park within the licensed premises back to its original state prior to the event. It is recommended that the General Manager and a representative from the Event Operator inspect the site before and after an event to assess damage and determine maintenance and repair costs and responsibilities.

Maintenance responsibilities beyond the licensed premises will fall to the WGC on event days. It is anticipated that event crowds will begin queuing in open park spaces hours before the event. It is not unimaginable that these crowds will impact the park maintenance staff's maintenance efforts. Maintenance staff may need to increase basic ground maintenance (litter removal and emptying of trash receptacles) to accommodate this usage.

5.6.3 EVENT WALK-THROUGH

The following is a list of items WGC staff need to look out for during a walk-through before and after an event with the Event Operator's representative. The walk-through will help identify damages that occur during the events and who will be responsible for the cost of repairs. Items include:

- Photo documentation of site conditions, before and after event.
 - Site conditions may include, but not limited to: turf areas, site furnishing (benches, walls), planting beds, trees, restrooms, venue stage, etc.
- Examine turf for excessive wear or damage caused by the event.
- Examine site for potential damage caused by the event.
- Sign-off on condition assessment by both the Event Operator's representative and WGC staff.
- Document findings of walk-through.

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Concrete - Typical								
Litter removal	21	msf	3	62	1	540	1,054	Includes: Pedestrian, Vehicular, and Vehicular on Structure Lawn Concrete (C, CV, CS) 25% of an area, 2x/day for 6 months, 1x/day for 6 months
Blow/sweep debris	21	msf	10	206	3	104	357	25% of area, 2x per week with hand or backpack blower
Clean surface	16	msf	30	495	8	12	99	20% of area; clean stained/dirty areas manually or spot clean with power washer using a fan-tipped nozzle when needed
Debris removal from drain inlets		allow					26	Done every two weeks to remove debris and sediment, assumes 1 hour each time
Paving repair		allow					15	Repair pavement markings, cracks, spalling, settling, etc.
Pervious Concrete								
Litter removal	1	msf	3	4	0	540	38	25% of an area, 2x/day for 6 months, 1x/day for 6 months
Blow/sweep debris	1	msf	10	14	0	52	12	25% of area, 1x per week with hand or backpack blower
Clean surface	1	msf	30	34	1	12	7	20% of area; clean stained/dirty areas manually or spot clean with power washer using a fan-tipped nozzle when needed
Paving repair		allow					20	Repair pavement markings, cracks, spalling, settling, etc.
Engineered Wood Fiber								
Litter removal	0	msf	2	1	0	320	5	15% of area, daily in peak season (9 months), 3x/week in off season (3 months)
Deep cleaning	0	msf	10	3	0	52	3	10% of area, done weekly, dig few inches down to buried litter
Refill and regrade	1	msf	90	56	1	12	11	20% of area; monthly refilling (bring in new materials) and regrading as needed to ensure proper depth of EWF
Rake/ level	0	msf	10	3	0	320	17	10% of area; inspect, rake and level surface; daily during peak season, 3x/week in off season (incorporate into daily litter removal)
Weeding		allow					5	As needed
Edging maintenance & repair		allow					10	2x annually for inspection, maintenance & repairs

Figure 13. Estimated maintenance tasks and hours for hardscapes 1/3

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Decomposed Granite (Stabilized)								
							58	
Litter removal	2	msf	3	6	0	264	27	25% of an area, 2x/day for 6 months, 1x/week for 6 months; also includes visual inspection of edging; report and repair accordingly
Level surface	8	msf	15	125	2	12	25	100% of area, 1x/month; evenly distribute the loose materials across the surface
Stabilized stone dust renovation & repairs	0.8	msf	180	150	2	1	2	10% of stone dust surface; may include filling, leveling, and restabilizing; may require bringing in new material
Edging		allow					3	Maintenance and repair as needed
Dry-Laid Pavers								
							13	Clay Pavers and Limestone steps
Litter removal	0.3	msf	3	1	0	260	4	15% of an area, 5x per week
Clean/sweep paved surface	0.2	msf	15	3	0	104	5	10% of area, sweeping 2x per week
Manual cleaning	0.4	msf	70	27	0	4	2	20% of area; clean stained/dirty areas with stiff bristle brush, only use power washer when necessary
Sweep sand between pavers	0.4	msf	30	12	0	6	1	20%, done quarterly; additional hours allocated for storm events
Re-set & repair pavers	0.5	msf	150	75	1	1	1	10% of paver surface, once annually to level any pavers that have shifted or repair damaged pavers
Wet-Laid Pavers								
							6	Limestone scrambles and limestone paving
Litter removal	0.3	msf	3	1	0	260	4	10% of an area, 5x per week
Blow/ sweep debris	0.1	msf	6	1	0	104	2	10% of area, 2x per week with hand or backpack blower
Power washing	0.1	msf	30	4	0	4	0.3	20% of area; clean stained/dirty areas with power washer using a fan-tipped nozzle to avoid overexposing the mortared joints
Re-set & repair pavers	0.1	msf	240	36	1	1	1	2% of paver surface, once annually to level any pavers that have shifted or repair damaged pavers
Wood Decking								
							70	
Litter removal	1	msf	3	3	0	365	19	25% of an area, daily
Clean surface	1	msf	10	8	0	104	15	20% of area, sweeping 2x per week, backpack blower only if needed
Power washing	1	msf	30	32	1	36	19	25% weekly for 8 months, monthly for 4; clean stained/dirty areas with power washer; avoid using harsh chemicals by water, and use only biodegradable cleaners when necessary
Inspection		allow					12	Done monthly
Wood deck maintenance & repair		allow					5	Repair and maintain wood decking and support structure

Figure 14. Estimated maintenance tasks and hours for hardscapes 2/3

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Rip-Rap, Boulders, and Retenments								
Litter removal	3	msf	10	28	0	26	32	10% of an area, done biweekly
Monitoring		allow					10	Check for debris, unwanted growth, structural issues and damage
Repair		allow					10	Done only as needed
Hardscape Maintenance Subtotal							1,361	
Engineered Wood Fiber - Complete Replacement								
							114	Assumes 12" depth on average, and 6 CF per wheelbarrow load (contractor grade)
Removal	518	each	8	4144	69	1	69	100% area removed, unit time includes: shoveling EWF out of play area into wheelbarrows, wheeling it to dispose, wheeling it back to play area
Refill	518	each	5	2590	43	1	43	100% area refilled, unit time includes: filling wheelbarrow, wheeling it to fill the play area, wheeling it back to site for more materials
Leveling	6	msf	15	90	2	1	2	100% area
Cleanup	6	msf	5	30	1	1	1	15% of area

Figure 15. Estimated maintenance tasks and hours for hardscapes 3/3

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Event areas; lawn replacement would be treated as a separate cost item in the budget. Event setup (i.e. putting out additional trashcans) and post-event cleanup related to the events are the responsibilities of the vendors/ programming staff.								
High Performance Lawns							342	
Establishment Period Subtotal								
Remove litter	4	msf	3	11	0	365	64	20% of area; daily
Pre-event cleanup	3	msf	5	13	0	70	15	15% of area; assumes 70 events annually, quick cleanup or mowing/tidying
Pre- and post-event evaluation and documentation		allow					140	Assumes 70 events annually, 2 hours for each event
Mow turf (open area)	13	msf	3	39	1	46	30	75% of open turf with ride-on mower; mow once every 7-10 days from March - May and September - October, once every 4-7 days from June - August, and once every 14 days from November - February (or as needed)
Mow walking/trim	4	msf	10	44	1	46	34	25% of open turf, with walking mower and string trimmer
Soil test/evaluation							5	Done prior to fertilization
Turf fertilizer	18	msf	10	175	3	4	12	100% of area; organic fertilizer or amendments
Weed & pest control - spot treat	4	msf	30	131	2	8	18	25% of turf, 1x/month during the growing season; spot treat application
Top dress soil and/or mulch	9	msf	25	219	4	1	4	50% of turf area
Seasonal turf renovation	9	msf	40	351	6	2	12	50% of area; dethatch, aerate (manual), seed
Temporary fencing	3	mif	15	45	1	12	9	Install/maintain temporary fencing, assumes 3,000 lf per acre
Adjust irrigation		allow					12	Adjust irrigation to ensure no watering is done within 36 hours of an event
Establishment tasks		allow					25	Applied to establishment years; includes erosion control, additional temporary fencing, spot watering and weed control

Figure 16. Estimated maintenance tasks and hours for landscapes 1/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Lawns							428	Non-event areas
							478	Establishment Period Subtotal
Remove litter	6	msf	3	17	0	365	101	10% of area; daily
Leaf removal	14	msf	10	139	2	8	18	25% of turf area with push sweeper, or manual raking
Mow turf (open area)	42	msf	3	125	2	46	96	75% of open turf with ride-on mower; mow once every 7-10 days from March - May and September - October, once every 4-7 days from June - August, and once every 14 days from November - February (or as needed)
Mow walking/trim	14	msf	10	139	2	46	106	25% of open turf, with walking mower and string trimmer
Soil Test/Evaluation							10	Done prior to fertilization
Turf fertilizer	55	msf	10	554	9	1	9	100% of area; organic fertilizer or amendments
Weed & pest control - spot treat	14	msf	30	416	7	8	55	25% of turf, 1x/month during the growing season; spot treat application
Top dress soil and/or mulch	28	msf	25	693	12	1	12	50% of turf area
Seasonal turf renovation	28	msf	40	1108	18	1	18	Dethatch, aerate (manual), re-sodding (small area) or reseeding
Temporary fencing	2	mlf	15	30	1	4	2	Install/maintain temporary fencing, assumes 3,000 lf per acre
Establishment tasks		allow					50	Applied to establishment years; includes erosion control, additional temporary fencing, spot watering and weed control

Figure 17. Estimated maintenance tasks and hours for landscapes 2/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Small Trees							853	385 small trees (<5") total; 20% Establishment Period Subtotal
Monitoring & inspection	77	each	15	1155	19	12	231	Visual inspection, analysis, & record keeping of tree, soil moisture levels, and individual tree irrigation system performed by a certified arborist
Tree pruning	77	each	30	2310	39	1	39	Prune by hand w/ extension pole pruners
Tree fertilizer application	77	each	15	1155	19	1	19	1 application spring
Horticultural pest & disease control	77	each	60	4620	77	1	77	As needed
Hand irrigation	77	each	15	1155	19	24	462	Supplemental monitoring 2x/month & watering as needed
Tree replacement		allow					25	Only if needed following exhaustive tree care measures - to be discussed
Establishment tasks		allow					25	Applied to establishment period; includes additional spot watering & monitoring, weed control, adjusting tree stakes/ protection, plant replacement/ removal & thinning
Large Trees							404	105 large trees (5"+) total; 15% Establishment Period Subtotal
Monitoring & inspection	16	each	40	640	11	12	128	Visual inspection, analysis, & record keeping of tree, soil moisture levels, and individual tree irrigation system performed by a certified arborist
Tree pruning	16	each	480	7680	128	1	128	Prune by hand w/ extension pole pruners & bucket truck
Tree fertilizer application	16	each	15	240	4	1	4	1 application spring
Horticultural pest & disease control	16	each	60	960	16	1	16	As needed
Interim inspection & hand irrigation	16	each	20	320	5	24	128	Supplemental monitoring 2x/month & watering as needed
Tree replacement		only if needed						Only if needed following exhaustive tree care measures - to be discussed
Establishment tasks		allow					40	Applied to establishment period; includes additional spot watering & monitoring, weed control, adjusting tree stakes/ protection, plant replacement/ removal & thinning

Figure 18. Estimated maintenance tasks and hours for landscapes 3/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Wetland Plantings								
							41	PLACEHOLDER
							66	<i>Establishment Period Subtotal</i>
Remove litter	1	msf	3	2	0.0	104	4	10% of planting areas; includes 2x/week litter removal
Remove large debris and sediment		allow					5	Large tree or fallen branches removal, remove sediment/silt build-up as needed
Landscape Maintenance	1	msf	90	94	1.6	4	6	15% of planting areas; minor erosion control, invasive control, aesthetic pruning, etc.; done quarterly. Thin out aquatic plants biannually
Annual cutback	3	msf	15	52	0.9	1	1	50% of planting areas
Algae management		allow					10	Done quarterly, includes mosquitoes management
Inspection		allow					15	Inspect pipe for clog and plant health monthly, shoreline erosion quarterly and after major storms, check various chemical levels biannually, and sediment level annually
Establishment tasks		allow					25	Applied to establishment period; includes additional spot watering & monitoring, weed control, adjusting tree stakes/ protection, plant replacement/ removal & thinning
Live Oak Canopy Mix								
							638	Establishment Period Subtotal
							668	<i>Establishment Period Subtotal</i>
Litter removal	6	msf	5	31	1	182	94	15% of planting areas, 5x/week May-October, 3x/week November-April
Fall leaf removal	12	msf	15	185	3	5	15	30% of planting areas
Weeding (by hand)	10	msf	30	309	5	30	154	25% of planting areas, 1x/week, April-October
Seasonal prep	31	msf	120	3702	62	2	123	75% of area, spring clean-up and winter prep
Planting areas maintenance	16	msf	75	1234	21	7	144	40% of planting areas, 1x/month, April-October; deadheading, trimming, minor cutbacks, pruning, inspection for invasive species, fertilizing, etc.
Annual soils test evaluation		allow					1	Done prior to fertilizing to determine need
Monitoring and evaluation		allow					25	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Spot watering	8	msf	30	247	4	8	33	20% of planting areas, 1x/month spring through fall to supplement irrigation
Pest control	8	msf	30	247	4	4	16	20% of planting areas
Temporary fencing	1	mif	10	10	0	10	2	Install/maintain temporary fencing; assume 1,000 lf per acre
Composting of landscape debris		allow					30	Collect and deposit compostable materials in compost area
Establishment tasks		allow					30	Tasks for the first 4 years of establishment, including additional spot watering, temporary fencing, plant replacement, & weed control

Figure 19. Estimated maintenance tasks and hours for landscapes 4/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Partial Sun Feature Mixes								
<i>Establishment Period Subtotal</i>								
Litter removal	2	msf	5	12	0	182	36	20% of planting areas, 5x/week May-October, 3x/week November-April
Fall leaf removal	4	msf	15	53	1	5	4	30% of planting areas
Weeding (by hand)	3	msf	30	89	1	30	44	25% of planting areas, 1x/week, April-October
Seasonal prep	9	msf	120	1066	18	2	36	75% of area, spring clean-up and winter prep
Planting areas maintenance	6	msf	75	444	7	7	52	50% of planting areas, 1x/month, April-October; deadheading, trimming, minor cutbacks, pruning, inspection for invasive species, fertilizing, etc.
Annual soils test evaluation		allow					1	Done prior to fertilizing to determine need
Monitoring and evaluation		allow					15	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Spot watering	2	msf	30	71	1	8	9	20% of planting areas, 1x/month spring through fall to supplement irrigation when necessary
Pest control	2	msf	30	53	1	4	4	20% of planting areas
Plant replacement	2	msf	120	213	4	2	7	15% of planting areas, spring or fall
Temporary fencing	0.3	mlf	10	3	0	10	0.5	Install/maintain temporary fencing; assume 1,000 If per acre
Composting of landscape debris		allow					15	Collect and deposit compostable materials in compost area
Establishment tasks		allow					30	Tasks for the first 4 years of establishment, including additional spot watering, temporary fencing, plant replacement, & weed control

Figure 20. Estimated maintenance tasks and hours for landscapes 5/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Shrub Thicket Mix							317	
							347	<i>Establishment Period Subtotal</i>
Litter removal	8	msf	5	39	1	26	17	15% of planting areas, biweekly
Fall leaf removal	8	msf	15	116	2	5	10	30% of planting areas
Weeding (by hand)	8	msf	30	231	4	15	58	25% of planting areas, biweekly, April-October
Seasonal prep	8	msf	120	925	15	2	31	75% of area, spring clean-up and winter prep
Planting areas maintenance	10	msf	75	771	13	7	90	20% of planting areas, 1x/month, April-October; deadheading, trimming, minor cutbacks, pruning, inspection for invasive species, fertilizing, etc.
Annual soils test evaluation		allow					1	Done prior to fertilizing to determine need
Monitoring and evaluation		allow					15	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Spot watering	8	msf	30	231	4	8	31	20% of planting areas, 1x/month spring through fall to supplement irrigation
Pest control	8	msf	30	231	4	4	15	20% of planting areas
Temporary fencing		mlf	10	0	0	10	0	Install/maintain temporary fencing; assume 1,000 lf per acre
Composting of landscape debris		allow					50	Collect and deposit compostable materials in compost area
Establishment tasks		allow					30	Tasks for the first 4 years of establishment, including additional spot watering, temporary fencing, plant replacement, & weed control

Figure 21. Estimated maintenance tasks and hours for landscapes 6/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Venue Garden Mix								
							91	<i>Establishment Period Subtotal</i>
Litter removal	1	msf	5	3	0	260	14	15% of planting areas, 5x/week
Fall leaf removal	1	msf	15	20	0	5	2	30% of planting areas
Weeding (by hand)	1	msf	30	33	1	30	17	25% of planting areas, 1x/week, April-October
Seasonal prep	3	msf	120	400	7	2	13	75% of area, spring clean-up and winter prep
Planting areas maintenance	2	msf	75	133	2	7	16	40% of planting areas, 1x/month, April-October; deadheading, trimming, minor cutbacks, pruning, inspection for invasive species, fertilizing, etc.
Annual soils test evaluation		allow					1	Done prior to fertilizing to determine need
Monitoring and evaluation		allow					15	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Spot watering	1	msf	30	27	0	8	4	20% of planting areas, 1x/month spring through fall to supplement irrigation when necessary
Pest control	1	msf	30	27	0	4	2	20% of planting areas
Plant replacement	1	msf	90	80	1	1	1	20% of planting areas, spring or fall
Temporary fencing	1	mlf	10	10	0	10	2	Install/maintain temporary fencing; assume 1,000 lf per acre
Composting of landscape debris		allow					5	Collect and deposit compostable materials in compost area
Establishment tasks		allow					25	Tasks for the first 4 years of establishment, including additional spot watering, temporary fencing, plant replacement, & weed control
Green Basin Mix								
							36	<i>Establishment Period Subtotal</i>
Litter removal	1	msf	5	7	0	52	6	10% of planting areas, 1x/week
Seasonal prep	2	msf	120	251	4	2	8	15% of area; bed cleanup (includes sediment and large debris removal), mulching, etc.
Monitoring and evaluation		allow					10	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Planting maintenance	3	msf	30	104	2	6	10	25% of planting areas, 1x/month, April-October; includes weeding, groundcover trimming
Spot watering	2	msf	10	21	0	3	1	15% of planting areas, only in extreme heat
Establishment tasks		allow					15	Tasks for the first 2 years of establishment, including additional spot watering, plant replacement, & weed control

Figure 22. Estimated maintenance tasks and hours for landscapes 7/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Vines Edge/ Green Walls								
							23	
							38	Establishment Period Subtotal
Litter removal	1	msf	5	3	0	52	3	15% of planting areas, 1x/week
Seasonal prep	1	msf	90	88	1	2	3	25% of area; deep pruning, bed cleanup, mulching, replanting if needed, soil testing, etc.
Vine training	1	msf	30	29	0	4	2	25% of planting areas, corrective training
Monitoring and evaluation		allow					10	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Trimming	1	msf	15	15	0	8	2	25% of planting areas, light trimming
Planting maintenance	1	msf	30	29	0	7	3	25% of planting areas, 1x/month, April-October; includes weeding, soil compaction testing, limited LBA/compost application, groundcover trimming
Spot watering	1	msf	10	6	0	6	1	15% of planting areas, done as needed
Establishment tasks		allow					15	Tasks for the first 2 years of establishment, including additional spot watering, plant replacement, & weed control
Cypress Grove Wet Understory								
							29	Sector 9 Planting
							44	<i>Establishment Period Subtotal</i>
Litter removal	0.5	msf	5	2	0	104	4	15% of planting areas, 2x/week
Planting maintenance	1	msf	90	54	1	6	5	20% of area; bed cleanup (includes sediment and large debris removal), tree pruning, etc.
Monitoring and evaluation		allow					10	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Volunteer plants removal	1	msf	30	23	0	26	10	25% of area; done biweekly, selectively remove volunteer natives and remove all invasives
Spot watering	1	msf	10	8	0	3	0.4	25% of planting areas, only in extreme heat
Establishment tasks		allow					15	Tasks for the first 3 years of establishment, including additional spot watering, plant replacement, & weed control

Figure 23. Estimated maintenance tasks and hours for landscapes 8/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Sedge Understory								
							34	Sector 9 Planting
							44	Establishment Period Subtotal
Litter removal	1	msf	5	3	0	52	3	10% of planting areas, 1x/week
Seasonal prep/planting maintenance	1	msf	120	105	2	1	2	100% of area; bed cleanup (includes sediment and large debris removal), cut back, rake dead stalks, etc.
Volunteer plants removal	1	msf	30	44	1	26	19	25% of area; done biweekly, selectively remove volunteer natives and remove all invasives
Monitoring and evaluation		allow					10	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Spot watering	1	msf	10	9	0	3	0	15% of planting areas, only in extreme heat
Establishment tasks		allow					10	Tasks for the first 3 years of establishment, including additional spot watering, plant replacement, weed control, and cut back
Vine Mix								
							11	Sector 9 Planting
							26	Establishment Period Subtotal
Litter removal	0.1	msf	5	1	0	52	0.5	10% of planting areas, 1x/week
Seasonal prep/planting maintenance	0.2	msf	120	20	0	4	1	15% of area; bed cleanup (includes sediment and large debris removal), etc.
Volunteer plants removal	0.3	msf	30	8	0	26	4	25% of area; done biweekly, selectively remove volunteer natives and remove all invasives
Monitoring and evaluation		allow					5	Visual inspection and monitoring of plant health, soil condition
Vine pruning and correction	0.2	msf	15	3	0	6	0	15% of planting areas, 1x/month, April-October; prune to correct shape/direction of growth, and to encourage new growth
Spot watering	0	msf	10	2	0	3	0	15% of planting areas, only in extreme heat
Establishment tasks		allow					15	Tasks for the first 2 years of establishment, including additional spot watering, plant replacement, & weed control

Figure 24. Estimated maintenance tasks and hours for landscapes 9/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Bio-Engineered Edge							10	Sector 9 Planting
							20	Establishment Period Subtotal
Litter removal	0.1	msf	5	1	0	52	1	10% of planting areas, 1x/week
Seasonal prep/planting maintenance	0.2	msf	60	11	0	4	1	15% of area; bed cleanup (includes sediment and large debris removal), cut back on Eastern Cottonwood, etc.
Volunteer plants removal	0.3	msf	30	9	0	26	4	25% of area; done biweekly, selectively remove volunteer natives and remove all invasives
Monitoring and evaluation		allow					5	Visual inspection and monitoring of plant health, soil condition (check for compaction)
Spot watering	0	msf	10	2	0	3	0	15% of planting areas, only in extreme heat
Establishment tasks		allow					10	Tasks for the first 2 years of establishment, including additional spot watering, plant replacement, & weed control
Landscapes Maintenance Subtotal							2,587	Post-Establishment Period
Landscapes Maintenance Subtotal							2,909	Establishment Period

Figure 25. Estimated maintenance tasks and hours for landscapes 10/10

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Site Features and Furnishing Maintenance								
Empty trashcans, recycling bins, and compost bins	30	each	4	120	2	602	1204	14x/week March-October (34 weeks), 7x/week November-February (18 weeks) (includes trashcans for Great Street)
Clean trashcans and recycling bins, and compost bins	30	each	15	450	8	42	315	100%; weekly from March-October, 2x/month November-February; includes cleaning, touchup on paint (if needed), inspection (check for damages, loose parts, etc.) (includes trashcans for Great Street)
Waste management - food truck	1	once	20	20	0	365	122	Collect waste from the trash storage by food trucks, done daily
Trash storage - cleaning	1	once	15	15	0	78	20	Clean out/wash down of trash storage area by food trucks; done weekly for 6 months, and 2x/week for 6 months
Event day trashcans and recycling bins	8	each	3	24	0	245	98	Assumes 35 events annually, time included putting out, emptying five times per event, and collecting (7x)
General post-event cleanup and maintenance	1	each	60	60	1	70	70	Assumes 70 events annually, additional cleanup as a result of users "over spilling" into other areas of the park, includes damage assessment and repair/replace as needed. (Allocate 1 hour per event.) Does not include venue space.
Creek cleanup	1	each	120	120	2	26	52	In creek cleanup for visible litter, especially after a rain event, assumes each clean up will take 2 hours
Dog bag dispenser - refill	3	each	3	9	0	260	39	Assumes refill 5x/week
Clean - site furnishings	15	each	10	150	3	38	95	20% weekly April-Oct., 2x/month Nov-March; includes bike racks, signage, benches, and other general site furnishings not otherwise listed
Drinking fountain and bottle filler cleaning	5	each	5	25	0.4	240	100	Daily spot cleaning (for 8 months), ensuring drains are clear (placeholder)

Figure 26. Estimated maintenance tasks and hours for site features 1/3

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Drinking fountain and bottle filler seasonal prep		allow					65	Spring startup & winterization (assumes two days for startup and two days to shutdown, one plumber and one apprentice)
Drinking fountain and bottle filler maintenance	5	each	60	300	5.0	8	40	Routine maintenance (monthly)
Light fixture lumen board replacement		allow					15	Replacements as needed
Light fixture repair & maintenance		allow					20	Routine maintenance as needed due to operations, vandalism, etc.
Signage - cleaning & inspection		allow					15	Inspection with other maintenance tasks, cleaning every two months or as needed, i.e. graffiti removal
Clean walls & seating walls	10	clf	15	150	3	7	18	25% of walls, 1x/month, April-October
Wall inspection and maintenance	6	clf	30	180	3	12	36	15% of walls, 1x/month, primarily visual inspection for look for any damages, and allow some time for minor repair and maintenance
Railing cleaning	3	clf	3	9	0	43	6	100% of rails, quick wipe down and visually inspect for any damages and graffiti; done weekly from March-October, biweekly from November-February
Railing inspection and maintenance	3	clf	30	90	2	12	18	15% of rails, 1x/month, primarily visual inspection for look for any damages, and allow some time for minor repair and maintenance
Drain cleaning	2	clf	15	30	1	7	4	25% of walls, 1x/month, April-October
Pest control		allow					50	Focus in areas where food is present (pests and vermin)
Gum & graffiti removal		allow					50	As needed
Play feature maintenance	6	each	45	270	5	12	54	Monthly maintenance and inspection, check for loose connection, damages, general cleanup
Play feature inspection and repair	6	each	120	720	12	2	24	2x/year, thorough inspection based on the manufacturer's specifications. Routine repair, part replacement etc. Done by a certified play equipment personnel.

Figure 27. Estimated maintenance tasks and hours for site features 2/3

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS
Irrigation and Stormwater Management								
Irrigation - Monitoring/System Check	215	msf	5	1075	18	26	466	Bi-weekly; Monitor to ensure adequate coverage, damage, and functionality.
Irrigation - Component Maintenance & Repair	15	msf	400	6018	100	1	100	Repair above grade components (rotors, spray heads, drip tubing, bubblers) as needed; assume 7% replacement annually
Irrigation - System maintenance	215	msf	26	5589	93	2	186	System repair and clean out, winterization, spring startup. Note: System maintenance includes supply lines to all quick couplers,
Cistern - Component & Sediment Inspection	1	each	90	90	2	6	9	Bi-monthly; Monitor inlet debris, tank sediment levels and pump components
Cistern - Sediment Removal	1	each	720	720	12	2	24	Assume 2x annual sediment removal from tank and inlet
Cistern - Pump/component Repair	1	each	240	240	4	1	4	Assume 2x annual sediment removal
Restroom cleaning	4	each	30	120	2	548	1,096	1x/day for half the year, 2x/day for the other half
Restroom restocking	4	each	5	20	0	1114	371	2x/day for half the year, 4x/day for the other half; in addition to cleaning, staff will check to restock the restrooms, toiletries, quick mop down and wipe down
Restroom maintenance and repair	4	each	60	240	4	18	72	Assumes once per month, with higher frequency from April to October when usership is higher
Site Features and Furnishing Maintenance							4,857	

Figure 28. Estimated maintenance tasks and hours for site features 3/3

Chapter 6.0

Creek Delta O+M

Considerations



6.0 CREEK DELTA O+M CONSIDERATIONS

This chapter of the Manual is based on the 100% Construction Documents for Creek Delta (CD) that were released in November 2021. Any assumptions made in this Manual have been thoroughly discussed with had been thoroughly discussed with WGC, PARD, and WPD.. ETM had also reviewed the maintenance contracts for Waterloo Park and taken the current maintenance practices into considerations. The recommendations included are based on previous work and discussions guided the Framework Plan.

6.1 CREEK DELTA RECOMMENDED MANAGEMENT PRACTICES

6.1.1 ADAPTIVE MANAGEMENT

In an urban park setting, park maintenance is typically done on a routine schedule, such as mowing on a 7-10 day cycle or daily de-littering. The maintenance effort is generally done at a consistent level and plantings are maintained to remain roughly as designed. However, most of the landscapes within CD will be dynamic and allowed to evolve over time. As they change, they may respond differently at different times to the same treatment.

Adaptive Management is a landscape management philosophy that is recommended for CD. Landscape management practices are processes that often require multiple steps over time and feature changing conditions that may require a mid-course change. This practice encourages the staff to monitor and respond to plant conditions and needs instead of solely performing scheduled maintenance. This process will require long-term monitoring and the need to learn about the site over time, and allows for changes in circumstances and adjusting of methods accordingly. There is not a “right” or “definitive” way of managing the landscapes and adjustments may be required along the way to identify the most appropriate approach at that moment. Actions will be taken based on the results of monitoring and inspections and are up to the discretion of the ecologist/site supervisor.

As a general rule, vegetative coverage will be one of the most important factors in ensuring the health of the natural landscapes. Adequate coverage is the primary preventative measure against invasive species and erosion. However, the ecologist/site supervisor has the discretion in determining other factors that may be more or equally important, and respond with appropriate action.

6.1.2 PLANT REPLACEMENT NEEDS

With the adaptive management approach (and with the exception of the warranty period), plant replacement does not need to strictly adhere to the one to one rule. Certain species may thrive in one area of the landscape type better than another area due to micro site conditions. If a species is not available, or continuously fails to perform in one area, it is up to the ecologist to select a replacement species from the planting schedule. The general rules to follow for choosing replacements include:

- Native species (or approved adaptive species) that will offer ecological benefits.
- Appropriate for the ecosystem of CD.
- Will diversify the planting palette.
- Selected from the proposed planting schedule, or one approved by PARD, LBJWC, or WPD.

Refer to Figure 2 for recommended planting season dates. Even within those recommended planting seasons, avoid work under the following conditions:

- Air temperature is below 37°F or above 89°F.
- Wind velocity is over 25 mph.
- The ground or planting soil is frozen or wet.
- Continuation of prevailing weather will damage plant materials, including sustained periods of above-normal high temperatures.
- Complete planting operations as early in the specified season as possible.

6.1.3 LONG-TERM EXPECTATIONS/10-YEAR GOAL

The maintenance of the planting areas is expected to be intensive at the beginning to minimize invasive species and encourage plant establishment. Once established, the channel and most planting will be self-sustaining and the overall maintenance is expected to reduce. Some maintenance needs, such as weeding and invasive removal will be consistent as well as tree maintenance. However, some maintenance work may become more difficult due to accessibility and the scale of the work (the larger the

tree becomes, the more difficult the work becomes). It is anticipated that all the planting areas will be established within 10 years. The site supervisor will continue to monitor and evaluate the site conditions and determine whether certain tasks will be performed or not.

The features designed are to perform as they are intended. Intensive planting areas will minimize erosion and stabilize the banks; the recommended maintenance practices will minimize impact, if not improve on stormwater quality; the diversified landscapes will encourage desirable wildlife. All these features will offer opportunities to activate the space for engagement and educational activities.

However, due to the developments around CD and the increase in uses and programmatic opportunities, it would mean more wear and tear and an increase need for overall grounds maintenance. Localized failures and focused repair are expected, particularly in areas of high foot-traffic, this could include armoring placement, soil replacement, new planting/seeding (especially along the edges of trails), and replacement of site furnishing (such as slats on benches). Site manager is expected to evaluate and adjust the grounds maintenance needs on a regular basis to ensure the service level is reflective of the uses and activities at CD. While management of the planting/natural areas may decrease over time, the management of people and activities are expected to increase, or at the very least remain consistent. Maintenance strategy and needs will need to be evaluated and adjusted based on the potential uses and activities in the park.

6.2 CREEK DELTA LANDSCAPE ZONES AND TYPOLOGIES

6.2.1 CD LANDSCAPES

The maintenance and landscape management within CD is complex and requires a multi-tiered and flexible approach. The maintenance and management recommendations are based on both “landscape zones” and “landscape areas” perspectives. There are 11 planting mixes proposed for CD; each mix is a specific collection of plant species.

From a maintenance and ecological management perspective, CD plantings are broken down into landscape areas, where the needs are driven by the planting mixes, site topography, and accessibility. Accessibility and site topography are big drivers behind how often work will be done, and the time it takes to accomplish these tasks. The landscape areas can be found across the four (4) different zones.

The landscape zones shown in Figure 29 reflect the anticipated uses of different areas, which indicates the level of maintenance needed within these zones. The zones with higher use will require higher levels of maintenance, such as daily delittering and a lower tolerance for landscape debris and dead plants. The planting mixes within the high maintenance zones generally consist of planting with more visual interests and require a different approach in keeping the desired aesthetics.

The maintenance and management recommendations provided for CD take both landscape areas and landscape zones into consideration. The maintenance and management approach within these planting areas will need to be evaluated and adjusted in the future.

6.2.1.1 TERMINOLOGIES

PLANTING TYPES are identified in 3.2. There are eight (8) different types of plants used in Creek Delta.

There are 11 types of PLANT MIXES for Creek Delta, as defined by the design team. Plant Mixes are made up of combinations of Planting Types.

LANDSCAPE AREAS are made up of Plant Mixes. There are three (3) types of Landscape Areas within Creek Delta, they are defined in sections 6.2.2 - 6.2.4. The Plant Mixes are grouped by Landscape Areas to help simplify maintenance and determine level of maintenance.

LANDSCAPE ZONES consist of Landscape Areas. The Landscape Zones are defined by LBJWC to outline plant replacement needs. 6.2.1.2 outlines the replacement needs and expectation. This information is used to help determine plant replacement costs within the annual maintenance budget.

6.2.2 NATURAL PLANTING AREAS - PM1, PM4, PM9, PM10

While both of “vine mix” (PM9) and “juniper oak savannah” (PM1) might not share the same aesthetics as the “riparian woodlands” (PM4) and “riparian recovery mix” (PM10), all of these landscapes share one common factor. These landscapes are located along the slopes abutting the Creek channel, from top of bank to the water’s edge, or areas with steep slopes that are difficult to access. Slopes are typically 2:1 to 4:1. For the purpose of maintenance and site management, these areas are very difficult to access and may result in less frequent care compared to other landscapes. All lower priority work (such as delittering) that will not impact the health and safety of the public will not get done and will be incorporated into the scheduled site cleanup or landscape management.

Generally, vegetation is characterized by native trees, shrubs, groundcovers, and grasses. Most of these areas do not have public access and are not intended for frequent use. However, these areas will be impacted by some limited use from adjacent development, use of surrounding landscapes, and post-storm wash down from the higher elevation. Management of riparian woodlands and riparian recovery mix will be function-driven and guided by regular ecological monitoring. Depending on the species mix, these areas may require semi-annual management, including invasive species and pest control, overseeding, and soil amending.

The establishment period will be critical in determining the overall health of the natural planting areas. Herbaceous coverage within these areas will be the top priority; while species diversity is also important, the greater the coverage provided by intended species, the less likely invasive species will thrive.

Regular monitoring for erosion, related repairs, and public safety hazards, such large woody debris, will be critical. Most organic debris is encouraged to be left behind, however, if the large woody debris poses as potential safety hazard, or may be carried by the Creek, it will require removal. The large woody may need to be cut down into smaller manageable pieces to be left behind or carried out. Litter and debris removal will be done on an as-needed basis. Access for all maintenance and monitoring activities may take

additional time due to the steepness of slopes and limited access from top of bank where adjacent to buildings and private development sites.

In general, monitoring is the most critical process within the natural planting areas. Any actions taken will be guided by the site conditions and input from the ecologist.

6.2.2.1 LEVEL 2

It is assumed that approximately 30% of the Natural Planting Areas are very difficult to access and will require more time to carry out work. While these areas are not accessed frequently, the time it takes to maintain would be significantly more, as these areas are only be accessible by connecting to tie-offs and staff will have to hand carry (or on their back) the necessary tools and materials into these areas to complete the work. These hard to reach areas will not allow for temporary staging and staff may need to make multiple trips to the entry point to load-in and load-out. The tolerance of the presence of invasive species would also be higher, as the safety of the staff would be a higher priority. The ecologist/site supervisor will determine whether certain tasks will need to be completed or not. The creation of this category is to help account for additional staffing needs and for budgeting purposes.

6.2.3 DISPLAY PLANTING AREAS - PM2, PM3, PM7, PM8, SM1

The display planting areas are made up of landscape types that are of high maintenance and are of high complexity. These include “seed mix” (SM1), “shade terrace” (PM2), “hill country” (PM3), “creek garden” (PM7), and “succulent garden” (PM8) landscape types. They are located near trails or gathering spaces to provide visual interest. Plants include trees, shrubs, forbs, grasses, and perennials. Compared to other landscapes within CD, the maintenance within these areas are closer to traditional parkland gardens. Due to their locations, they are anticipated to have more use and visibility, and so a higher level of maintenance is needed to ensure safety, plant health, and appearance. However, these areas are still function-driven; therefore, some of the management philosophy from the natural planting areas will also be applied here. The landscapes should also be monitored, and the health of the overall landscape type is more important than each individual plant.

6.2.4 WETLAND PLANTING AREAS - PM5 AND PM6 (A&B)

The wetland planting areas include both seepage wetland plantings (PM5) and wet extents (PM6A & B). The planting areas are primarily along the creek, within the flood bench, and some areas of the islands within the creek. The planting materials chosen for this area are wet-tolerant, and may withstand periods of dryness depending on the water level. These wetland planting areas will not be used by the public, but will be a place where debris, litter, and floatables are expected to collect. Debris that can be accessed from the landside will be removed. Flood debris may stay if it enhances the constructed habitat, but it will be moved/removed when it appears to be adversely impacting existing vegetation (such as accumulated material smothering plants). Limited amounts of vegetation maintenance may occur, as these areas are difficult to reach. These wetland areas are mostly planted with perennials, grasses and forbs. Once established, maintenance in these areas will be limited. During the establishment period, invasive species will need to be removed, dead plantings should be replaced/replanted to discourage other species from taking over. The wetland areas also serve as important habitats for invertebrates and fish. Care should be taken within these areas to ensure habitats are not disturbed while maintenance work is done.

6.2.5 LANDSCAPE ZONES AND PLANT REPLACEMENT NEEDS

Plants are typically replaced for two reasons: mortality and aesthetics. Mortality may result from site conditions, pests and diseases, or users (e.g. trampling). Plant mortality will be higher in areas with high traffic and replacement will need to occur more frequently in order to keep plants in the trampled areas. For example, fragile species like columbine may see 50% mortality each year, while most species will see much less.

Diversity should also be considered when replacing plants. Higher diversity is important everywhere, but is especially critical in landscape zones (Level 3 and Level 4) where the communities will need to respond to more varied conditions with less assistance. Plant mortality will also vary by species.

Note: This section does not supersede any tree maintenance and replacement requirements associated with the conditions of the Site Development Permit.

Plant replacement needs by zone are as follows:

Zone 1:

- As these areas are assumed to have permanent irrigation and high maintenance, approximately 10% or less of plant mortality is expected. Mortality typically occurs over winter or after summer.
- It can be assumed that approximately 30% of plants will be replaced for aesthetic reasons in areas that need to maintain a high level of appearance.
- Only Display Planting Areas can be found in Zone 1.

Zone 2:

- Assuming high maintenance and temporary irrigation system is likely installed within this zone, expect about 10% plant mortality.
- However, plant replacement usually occurs only if a large section is lost; otherwise, let the remaining plants fill in.
- Only Display Planting Areas can be found in Zone 2.

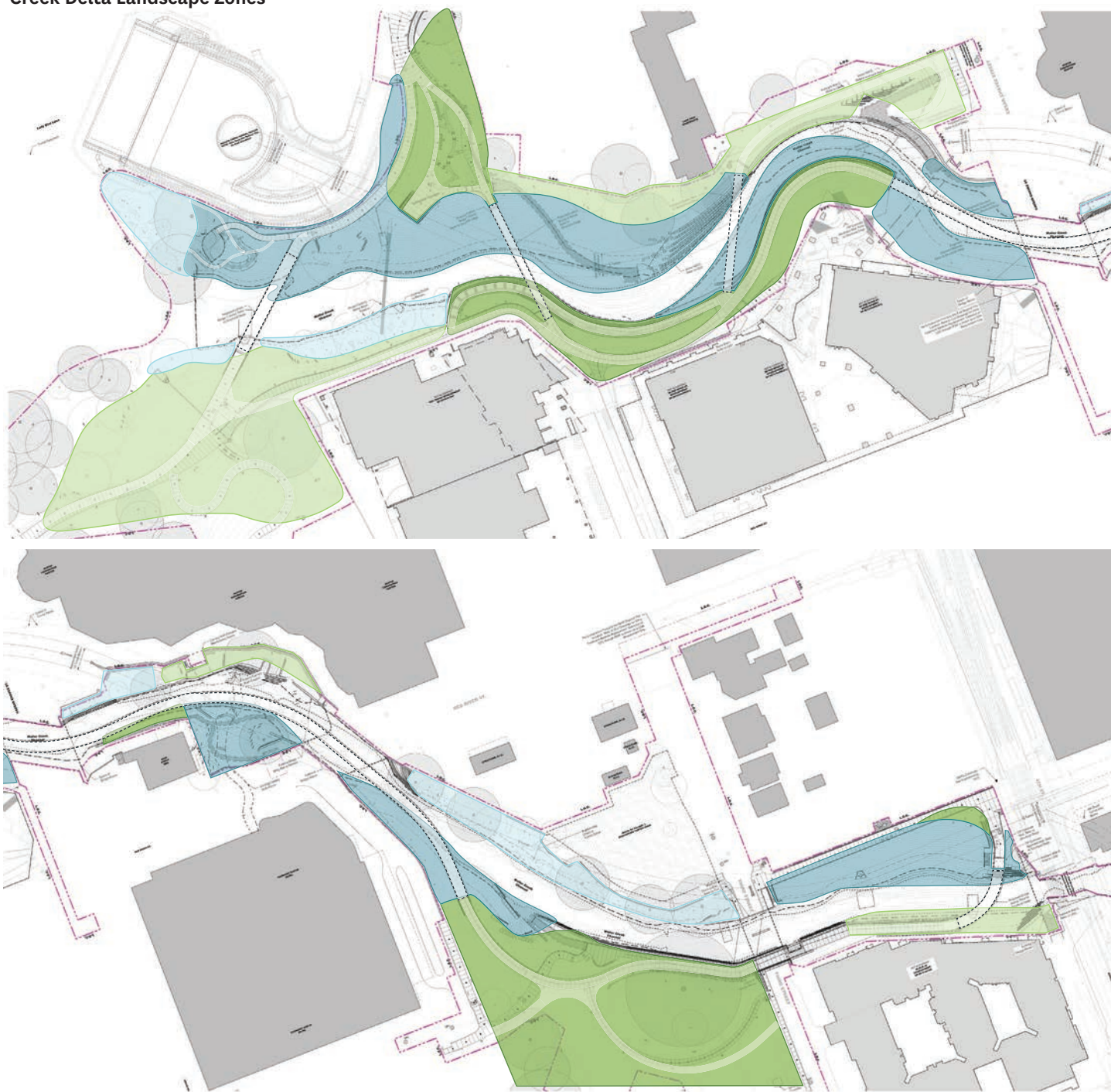
Zone 3:

- Mortality is expected to hover around 10 to 15% initially, assuming only hardy species that spread readily are used.
- No temporary or permanent irrigation will be installed in this zone, with the exception of some bubblers/pop-up spray heads for the woody species.
- Replacement does not necessarily need to be triggered by mortality alone; instead, replace plants when the mortality increases the likelihood of erosion, or if mortality create an unacceptable aesthetic. Individual plants that die but are surrounded by living ones do not need to be replaced.
- Mortality rates will likely fall over time, assuming the diversity is high, as the species best suited to the spot expand and the others contract.
- Only Natural Planting Areas can be found in Zone 3.

Zone 4:

- Similar to Level 3, the initial post-establishment mortality will likely be in the 10-15% range.
- No temporary or permanent irrigation will be installed in this zone.
- Replacement should only be triggered if a large enough section is lost to increase the chance of erosion. If individual plants are dying here and there, it means they were not suited to that spot, or conditions were bad for them that year. However, if an entire species seems to be doing poorly, it should be replaced with a different species, ideally selected from the species in the area that are doing well. Species that are doing well can be allowed to expand.
- Address bare spots through a quick cover seeding mix for each season.
- Both Natural Planting Areas and Wetland Planting Areas can be found in Zone 4.

Creek Delta Landscape Zones

**LANDSCAPE ZONES**

- | | |
|---|--|
| Zone 1: High Maintenance/High Complexity | Zone 3: Moderately Maintained/Natural |
| Zone 2: High Maintenance/Low Complexity | Zone 4: Low Maintenance/Natural |

LANDSCAPE FEATURES

- Elevated Trail

Figure 29. Landscape Zones

6.2.6 IRRIGATION

Irrigation is essential for the overall establishment and resilience of the landscapes in CD. Both permanent and temporary irrigation systems will be used in some of the landscapes. The permanent irrigation systems (approximately 35,000 SF) can be found within the Zone 1 landscapes. Temporary irrigation systems (approximately 74,000 SF) can be found within the Zone 2 landscapes. Some bubblers and pop-up spray heads will be installed for some woody species within Zone 3. No irrigation system will be installed within Zone 4, where there will be steep slopes and closer to the Creek. Both permanent and temporary irrigation systems are drip irrigation systems. The permanent system is installed 2" below ground and under a layer of mulch. The temporary system is installed on ground level under the mulch.

The automatic irrigation system will not require extensive management to operate daily; however, individual components will require regular monitoring and regular inspection to ensure all spray heads and drip components are functioning properly. Controllers need to be checked for proper scheduling and lines will require regular inspection to minimize or repair leaks. The irrigation system will be monitored daily, some of which can be done remotely; the irrigation schedule will need to be seasonally adjusted to meet water needs. Even minor irrigation failures may result in the loss of plant material, especially for large caliper transplanted trees (the 10"+ trees).

Regular maintenance for both permanent and temporary irrigation systems includes:

- Inspection for leaks or breaks
- Check pop-up spray and rotor heads for damage and proper retraction
- Restake drip system as needed
- Inspection of the weather station/rain gauge
- Visually inspect all surface equipment
- Repairing damaged components
- Seasonal startup/shut down.

In general, the irrigation heads will require adjustments to ensure the heads are not spraying the trunk of the trees. Some areas in Zone 3 where spray and rotor heads are located may be difficult to access, inspection and repair should be incorporated into scheduled maintenance to reduce the frequency of travel into these areas. All flow meters and pressure gauges will be inspected daily to ensure the system

is working properly. A low-pressure reading is an indicator for a leak in the system, such as a leaking component or a broken pipe. A difference in pressure between individual spray the spray head/rotor and valve components will require approximately two percent (2%) annual replacement during the first five (5) years, and afterwards approximately ten percent (10%) annual replacement after the establishment period. Components must be replaced quickly to avoid potential plant losses. It is recommended to have an attic stock of heads and components to allow quick repair.

Subsurface drip irrigation systems are designed to deliver water at uniform low flow and rates. The system is designed to be permanent and can be long-lasting (up to 20 years) if properly maintained.

Temporary irrigation systems are designed to be on the surface and below the layer of mulch. Once plants are established, the temporary system will be fully removed. Based on current experience at Waterloo Park, the temporary irrigation systems are expected to be removed approximately 1-1.5 years after installation. In areas where the irrigation may be difficult to access and may cause damage to the plants, the irrigation lines will be left in place but the system will be capped and shut down. Hand irrigation may be needed when new plants are installed or replaced after the establishment period. Typical permanent sub-surface maintenance protocols apply to temporary irrigation systems in addition to frequent inspections of above ground piping for damage from vehicle/foot traffic and fallen branches. As temporary irrigation systems are only staked above ground, the vibration generated from the water might loosen stakes overtime and will require occasional restaking.

Winterization is not standard operating procedure for irrigation systems. It is anticipated that only the critical elements of the system (and ones without insulation) will be winterized. While the system is not winterized, it is recommended that it receive a detailed seasonal maintenance and inspection to ensure all components are functioning as intended.

During spring, the system must be thoroughly checked for potential failures, damaged components, or lines and require repair and/or replacement as needed. Signs may include: non-retractable sprinkler heads,

water spraying in directions not intended, water bubbling up from the ground (broken line), etc. All heads must be cleaned or adjusted as needed. The irrigation schedule will be reevaluated and reprogrammed or modified for the upcoming season based on historical data from previous seasons.

At project construction completion, the contractor is responsible for providing an operation and maintenance manual detailing operating and maintenance requirements for all irrigation system components. The manual shall include:

- Duration of guarantee period.
- Comprehensive equipment list with make/model/manufacture, local manufacturer representative, spare parts list, and detailed operating and maintenance instruction of major equipment.

6.3 ECOLOGICAL/IN-CREEK BUILT FEATURES

Several types of built features are proposed within the Creek that serve as erosion control measure, bank stabilization, stream flow control, and/or wildlife habitats. These features generally will require minimal maintenance. General trash will need to be removed along the Creek and within these features during routine cleanup. Organic debris, such as leaves and branches, are desirable and are encouraged to be left behind. Some shifting or decaying may occur with these features over time, and no action will need to be taken unless they become a safety hazard or no longer serve their function. Routine visual inspection will help determine whether a closer inspection or other courses of action is necessary.

The built materials/features proposed within the Creek include the following:

- Riffle Stone
- Native Salvaged Channel Material
- Boulder Clusters
- Lunker Structures
- Large Wood
 - Root Wad
 - Log Vane
 - Woody Debris Cluster
 - Log on Slope

6.3.1 RIFFLE STONE

The riffle stone consists of a combination of riprap and native salvaged channel materials. The riprap bed is used to replicate the angularity of the existing native stone and will be infilled with native salvaged channel material. The sand fraction of the salvaged material will fill the riprap voids to prevent water from short circuiting through the riffle, and the cobble fraction of the salvaged material will add roughness to the riffle bed and serve as habitat stone. If woody plants are growing within the riffle stones, removal will be needed to prevent compromising the integrity of the stones.

6.3.2 NATIVE SALVAGED CHANNEL MATERIAL

This material consists of sand, gravel, and cobbles and has an assumed nominal sediment size of 3 inches. This material is the preferred finish material for the channel and has been incorporated as a top dressing for all riffles and armored channel sections. This material is used at Sector 9 in Waterloo Park. It has scoured and migrated over time, WGC is actively

monitoring Sector 9 and will determine whether and when redistribution will occur. The locations where this material is used in the Creek may prove to be difficult to access, and WGC will have the final decision on how it will be managed.

6.3.3 BOULDER CLUSTERS

The boulder clusters are used throughout the Creek, slowing down the velocity of the waterflow and serving as subaqueous refuge for small fish and rock-dwelling macroinvertebrates. Emergent boulder clusters provide resting perches for turtles and ones that are placed outside of the inset channel will provide habitat and warming platforms for small vertebrates.

6.3.4 LUNKER STRUCTURES

Log lunker structures are designed to provide habitat and refugia for fish. A log lunker consists of two (2) logs placed horizontally on top of riprap. The riprap is graded so that there is 6-12 inch void under the logs. The logs shall be set at an elevation below the elevation of the 10 cfs water surface. The logs shall be anchored to the bed using cable anchors. Organic debris can be caught against and be trapped under the lunkers; as this is a desirable feature, the debris should not be removed. However, trash caught within the lunkers should be removed from site.

6.3.4 LARGE WOOD

The large wood features may include root wads, log vanes, woody debris clusters, and logs on slope. These large wood features provide habitat diversity and complexity that cannot be achieved by boulders alone. These features also create the aesthetics of down trees within the natural landscapes that will allow other future fallen trees to blend into the landscapes.

Trash will likely get caught against the large wood and it will be laborious to remove depending on the intricacy of the wood.

Ideally, large wood would be provided naturally by tree succession, but this process may take some time to accomplish in post-restoration Waller Creek. Therefore, these features are incorporated into the design to provide “instant” habitats until the system will reach a point where the woody vegetation will fall and become natural habitats. Therefore, it is highly encouraged for the fallen woody vegetation to be left

behind for this purpose, with the exception of ones that may become safety hazards (such as ones that fall onto the trails, or that have fallen within the Creek and may migrate downstream).

Large wood features that are placed above the mean water level are expected to decay away within one to ten (1-10) years. Features placed below the water line are expected to last significantly longer, where they could potentially have a life span of 50-100 years.

6.4 FLOOD CLEANUP

The proposed design of the channel and armoring can withstand 100-year flood events. However, it is anticipated that some level of cleanup will be needed for the smaller storm events, as the storms can carry debris and litter into CD from adjacent areas, from planted areas, or down the Creek. Vegetation can also topple over and may require some level of removal. This topic will be further discussed and refined in the next draft.

For the purposes of budget estimates, the following assumptions have been made:

Small scale cleanup:

- There will be four (4) storm events that would require some cleanup annually.
- Cleanup may include some removal of silt (primarily on hardscapes), large debris within the hardscapes, tree limbs that may become safety hazards, fallen vegetation on hardscapes, and other floatables.
- Each event will require a team of two (2) and two (2) full days of cleanup.
- Site features, such as ecological features and erosion control features, will also be inspected for potential damages.
- It is assumed that these cleanups will be small scale and will not require larger equipment; small power tools (such as a chainsaw or pole saw) may be needed.

Medium scale cleanup:

- There will be one (1) storm events that would require medium scale cleanup annually.
- Cleanup may include some removal of silt (primarily on hardscapes), large debris within the hardscapes, tree limbs that may become safety hazards, fallen vegetation on hardscapes, and other floatables.
- Each event will require a team of four (4) and three (3) full days of cleanup.
- Site features, such as ecological features and erosion control features, will also be inspected for potential damages.
- It is assumed that these cleanups may be more challenging but may still not require large equipment for cleanup. However, more time is accounted for reducing debris into small pieces to be carried out of the site.

Large scale cleanup:

- This category assumes 100-year (or greater) flood events.
- It is assumed that this would only happen once every few to several years and therefore is not included in the annual maintenance cost.
- In addition to cleanup, it is assumed that some repair and/or plant replacement will be needed.
- Each event will require a team of six (6) and five (5) full days of cleanup.
- Time is also included for landscape damage assessment, some replanting may be needed, and erosion control may also be needed.
- It is assumed that these cleanups will be challenge and may require larger equipment for cleanup. Example of equipment may include:
 - Sweeper for removal of dried silt.
 - Truckers or other small equipment for silt/debris removal.
 - Portable power wash and water tank.
 - Front end loader.

6.5 MAINTENANCE ACCESS

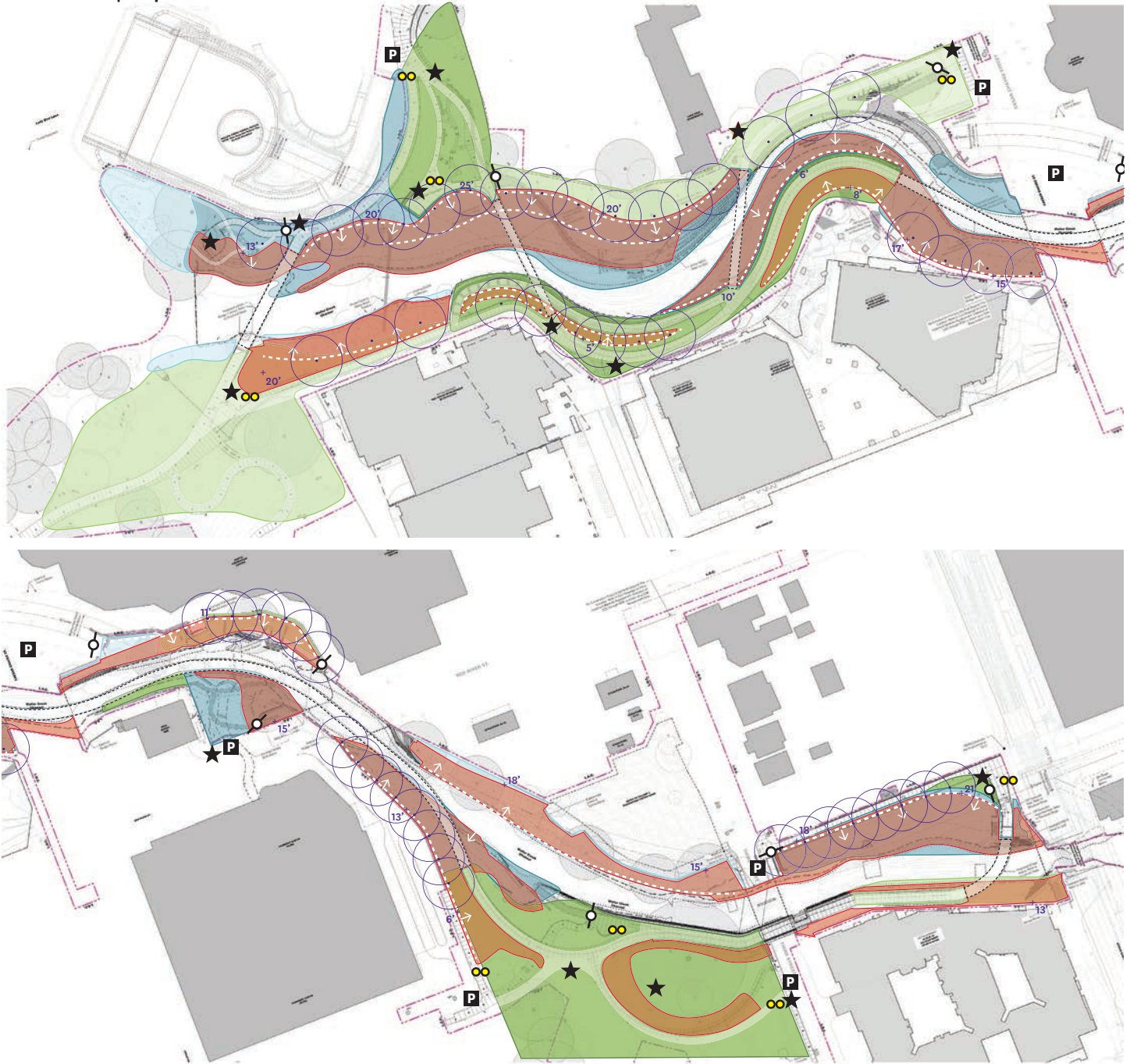
Due to the site topography, certain areas of CD will be difficult to access. Maintenance within these areas are not performed frequently, however, they may need to be carried out several times a year (4-6 times) to ensure the health of the landscapes. Due to the site limitations, staff are limited to the type of vehicles they can use to access some areas of CD, and there are areas along the Creek where work can only be performed by connecting to the safety tie-offs. See Figures 30 and 31 for a maintenance access map and the location of the safety tie-offs.

6.5.1 VEHICLE LIMITATIONS

To ensure optimal access and safety of maintenance staff, below is an outline that provides some guidance on maintenance vehicle selection and potential safety concerns.

- Maintenance vehicle manufacturers recommended a maximum slope of 15 degrees (or 3.75:1), the accessible paths are at maximum 4:1. Vehicles will turn over when traveling on slope greater than 15 degree.
- It is WG's intention to purchase and use electric vehicles and equipment.
 - Electric vehicles might have their own challenges – such as ground clearance due to the location of the battery. It is different from a gas/diesel powered vehicle. Prior to purchasing an electric vehicle, do note the location of the battery and its ground clearance height.
- The gator and Polaris average 5' (60") wide, a minimum of 1.5' (2' would be) on either side to allow access/unloading. When traveling, ensure there's adequate access (8' width is recommended in critical access point, otherwise, 6' width is adequate).
- Vehicle with an extended cab is more ideal than one with a trailer as it will have a smaller turning radius.
 - John Deere Gator 6x4's minimum turning radius: 150" (12.3')
 - Consider vehicles that are made for off road as they will be more durable than indoor vehicles (such as the Taylor Dunn used for interior spaces).
 - Cellular concrete blocks are used in areas for access. If hardscapes cannot be installed, loose materials such as crushed stones and mulches are recommended to minimize soil erosion and damage to the plants.
- Polaris Ranger EV's minimum turning radius: 150" (12.4')
- EV is a 2-seater with a small flatbed/cargo box (maximum 500 pounds)
- Polaris Crew 1000's minimum turning radius: 158"
- Crew 1000 is a 4-seater with a small flatbed/cargo box (maximum 1000 pounds)

Creek Delta | Slope Maintenance



LANDSCAPE ZONES

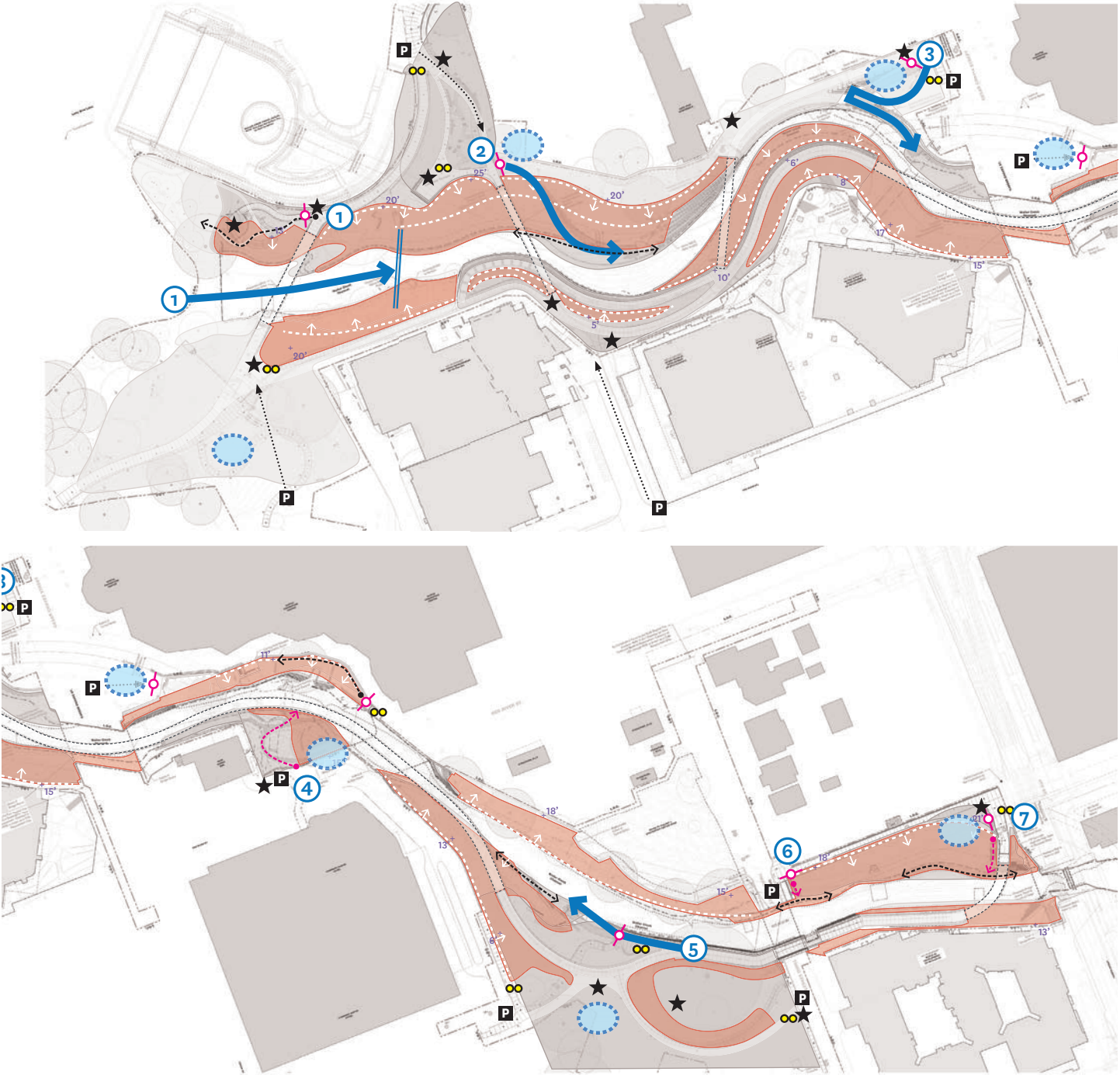
- | | |
|---|--|
| Zone 1: High Maintenance/High Complexity | Zone 3: Moderately Maintained/Natural |
| Zone 2: High Maintenance/Low Complexity | Zone 4: Low Maintenance/Natural |

LANDSCAPE FEATURES

- | | | | |
|---|---|--|---|
| Elevated Trail | P Truck Parking | ●● Trash Receptacles | . Slope Anchor Tie-Off |
| ≥ 3:1 Slopes | ★ Drop Box Location | + Gate | |

Figure 30. Safety Tie-Off Locations

Creek Access



LANDSCAPE FEATURES

- | | | | |
|---|--|----------------|-----------------------------|
| Elevated Trail | Truck Parking | Trail to Creek | 200' Along Creek Centerline |
| $\geq 3:1$ Slopes | Job Box Location | Gate | Trash Receptacles |
| Vehicular Maintenance Access to the Creek | Person Maintenance Access to the Creek | | |
| Potential Maintenance Staging Area | Creek Edge Maintenance Path | | |

Figure 31. Maintenance Access Routes and Entry Points

6.6 MAINTENANCE ESTIMATES AND BUDGET

Based on the 100 percent CD drawings, ETM has estimated that approximately 9,057 - 12,359 hours (see Figure 32 - Figure 33) will be needed for annual maintenance during post-establishment and establishment, respectively. The most maintenance intensive work comes from basic site feature maintenance, such as emptying of receptacles and restroom cleaning. There are a total of 14 trash and recycling receptacles in Creek Delta. The detailed calculations can be found at the end of this chapter for all the hardscape areas, softscape areas, and site-wide needs. Below is a summary of the hour breakdown by types, and the estimated maintenance hours per softscape type is shown as a frame of reference.

Depending on the maintenance strategy employed, the annual estimated annual costs can vary. Currently, it is assumed that all work will be done by contracted services, the rates are reflective of those personnel. However, depending on how CD will be staffed (whether they will be on-site around the clock or not), the final estimates have yet to be determined. Currently, ETM estimated that an annual maintenance costs for Creek Delta are approximately \$767,340 - \$1,032,922 (see Figure 34 - Figure 35).

Note that the estimates for Creek Delta have gone up since Design Development. Reasons include the understanding that this park will be used significantly higher and that some areas of the park will be more difficult to access and maintain than originally anticipated. Additionally, the maintenance strategy changed to be through an outside contractor, which was not the original assumption.

6.6.1 Additional Costs

Additional costs that fall outside of the estimated annual maintenance costs, such as flood clean-up costs and the preliminary security costs, can be found in Figure 36.

While security needs and its costs are not covered under the Manual. ETM had worked with WGC to develop some preliminary estimated costs. Similar to Waterloo Park, CD is expected to have complete coverage at all hours during the day. This may be done through a combination of Park Ambassadors (grounds staff), other WGC staff, or contracted security staff. The preliminary security costs assumed the overnight security needs, where CD may be patrol by one overnight (8-hour) contracted security staff, or a team of two contracted security staff as CD may present a greater safety concern due to heavier vegetation, reduced visibility, and physically below the street level. Another potential security strategy is to have the team of two patrol the site on an hourly basis, rather than being present at the park for 8-hour. The final strategy is to be determined.

	Unit	Unit/Hour	# of Unit	Total Hours	Grounds	Horticulture	Ecology	Trades
Hardscapes				1,607				
Concrete - Cast-in-Place				617	602			15
Pervious Concrete				453	433			20
Elevated Structures				279	259			20
Limestone Gravel (Non-Stabilized)				40	27			12
Cellular Concrete Block				41	37			4
Wood Decking				27	10			17
Stone Armours				150	100		24	26
Softscapes				6,963				
Natural Areas	Acre	941	2.69	2,532	473		2,058	
Natural Areas Lv 2	Acre	1,831	1.15	2,111	383		1,728	
Display Planting Areas	Acre	1,050	1.91	2,006	407		1,599	
Wetlands	0.34 Acre	243	1.29	314	114		201	
Site Needs				3,789				
General				2,849	2,263			586
Irrigation System				467	238			229
Storm Cleanup				224	224			
Ecological Needs				249			249	
Total Hours				12,359	5,570	0	5,859	930

Figure 32. Summary of Estimated Maintenance Hours for Creek Delta - Establishment Period

	Unit	Unit/Hour	# of Unit	Total Hours	Grounds	Horticulture	Ecology	Trades
Hardscapes				1,607				
Concrete - Cast-in-Place				617	602			15
Pervious Concrete				453	433			20
Elevated Structures				279	259			20
Limestone Gravel (Non-Stabilized)				40	27			12
Cellular Concrete Block				41	37			4
Wood Decking				27	10			17
Stone Armours				150	100		24	26
Softscapes				3,922				
Natural Areas	Acre	526	2.69	1,415	473		942	
Natural Areas Lv 2	Acre	1,013	1.15	1,168	383		785	
Display Planting Areas	Acre	591	1.91	1,129	407		722	
Wetlands	0.34 Acre	162	1.29	210	114		96	
Site Needs				3,528				
General				2,849	2,263			586
Irrigation System				207	77			130
Storm Cleanup				224	224			
Ecological Needs				249			249	
Total Hours				9,057	5,409	0	2,818	830

Figure 33. Summary of Estimated Maintenance Hours for Creek Delta - Post-Establishment Period

Operating Costs for Creek Delta Austin, Texas	Establishment Period			Post-Establishment Period			Comments
	Hrs	\$/hr	Cost	Hrs	\$/hr	Cost	
Grounds Maintenance							
Maintenance Personnel							
Unskilled/ Semi-Skilled Maintenance Staff	5,570	\$25.37	\$141,322	5,409	\$25.37	\$137,228	Primarily provides all grounds maintenance
Skilled Staff	930	\$28.42	\$26,418	830	\$28.42	\$23,596	Trades work
Landscape Maintenance Staff	0	\$25.37	\$0	0	\$25.37	\$0	Provides horticultural work (lawn work)
Skilled-Landscape Maintenance / Ecological Management Staff	5,859	\$42.90	\$251,337	2,818	\$42.90	\$120,872	Provides landscape management and actual grounds work
Overtime	1,000	\$45.77	\$45,773	1,000	\$45.77	\$45,773	Rate is 1.5x of average of all four positions.
Subtotal Maintenance Personnel	12,359		\$464,849	9,057		\$327,468	
Supervisory / Supplemental Staff							
Maintenance Supervisor	557	\$42.90	\$23,897	541	\$42.90	\$23,205	Assumes 10% additional maintenance staff hours, Supervisor is to provide administrative support, scheduling, etc. Equivalent to BBB Operations Supervisor. Some time is allowed to handle matters related to social issues.
Foreman/ Team Lead	557	\$28.42	\$15,831	541	\$28.42	\$15,373	Assumes 10% additional maintenance staff hours, provides grounds supervision
Ecological Management Staff	1,465	\$42.90	\$62,834	704	\$42.90	\$30,218	Assumes 25% additional ecological staff hours, time is spent towards monitoring, recording, supervising, training, etc. This allows for time needed to manage paperwork/record keeping, and any other tasks that are not on the grounds.
Arborist	586	\$42.90	\$25,134	282	\$42.90	\$12,087	Assumes 10% additional ecological staff hours. Arborist will provide tree services that cannot be done by ecological management staff.
Volunteers			\$0			\$0	When applicable.
Contracted Trades Services			\$25,000			\$50,000	Allowance for trades services that cannot be done by Skilled Staff, Contracted Services are assumed at \$75/hour.
Contracted Tree Maintenance - 10+\" caliper	9	\$960	\$8,640	9	\$600	\$5,400	At \$80/tree/month, inspection and maintenance done by a certified arborist. Cost reduces to \$50/tree/month after 5 years.
Contracted Pest Control			\$10,000			\$10,000	Wildlife control/pest management, this may include Nutria, Grackles, Pigeons, etc. Allowance for monitoring/inspection, management, capture and disposal.
Subtotal Supervisory / Supplemental Staff			\$171,336			\$146,283	
Subtotal Maintenance Personnel			\$636,185	9,057		\$473,750	

Figure 34. Estimated Annual Maintenance Cost for Creek Delta 1/2

Operating Costs for Creek Delta Austin, Texas	Establishment Period		Post-Establishment Period		Comments
	Hrs	\$/hr	Hrs	\$/hr	
Material Expenses					
Replacement plants - herbaceous layer		\$100,000			Plant replacement cost, on average, is approximately 10% of the herbaceous layer during establishment period (assumes first year). This cost reduces down to approximately 5% after. (Based on seed mix budget of approximately \$650,000.)
Replacement plants - understory		\$75,000			Allowance for woody shrubs and small trees replacement
Materials		\$50,000			Material purchase related to everyday maintenance: trash bags, gloves, small tools, hoses, etc.
Equipment rental		\$10,000			Rental of equipment and machineries that are not covered/typically used under the general maintenance and contracts
Mulch	500	\$40	500	\$40	Assumes about \$40/CY, mulch will be used in display planting areas and landscaped areas that might have been damaged by foot traffic for protection
Soil testing		\$600			Cost for soil tests, assumes \$100 per test. 6 tests during establishment period, reduces to 4 tests during post-establishment period.
Irrigation parts		\$5,000			Routine replacement parts, while it is assumed that the temporary irrigation will be out of service and therefore there's less to take care of, larger and more expensive components are more likely in need of replacement in post-establishment years
Waste hauling		\$8,000			Services for waste removal, recycling, and composting (if applicable)
Uniforms & communication devices		\$10,000			All-weather gear, radios/ cellphones/ tablets, etc.
Utility		\$75,000			Allowance, covers water and electricity. Placeholders. Water use is expected to reduce post-establishment when the temporary irrigation system is capped.
Subtotal Maintenance Expenses		\$303,600			
Total Maintenance Costs		\$939,785			In 2019 dollar, staffing rates were last confirmed during 2019
Total Maintenance Costs		\$1,032,922			Escalated to 2022 dollar at 3.2% per year

Figure 35. Estimated Annual Maintenance Cost for Creek Delta 2/2

Operating Costs for Creek Delta Austin, Texas		Establishment Period		Post-Establishment Period		Comments	
		Hrs	\$/hr	Cost	Hrs		\$/hr
Flood Cleanup - Done as Needed							
Post-storm cleanup - Low		32	\$25.37	\$812	Cost for each additional small storm cleanup, 4 events already accounted for in the annual maintenance estimates. Each event requires a team of two (2) and two (2) full days of cleanup. 25% is added for material costs. Cost for each additional small storm cleanup, 1 event already accounted for in the annual maintenance estimates. Each event will require a team of four (4) and three (3) full days of cleanup. 25% is added for material costs. Cost for each large storm cleanup, no event is accounted for in the annual maintenance estimates. Each event will require a team of six (6) and five (5) full days of cleanup. 50% is added for material costs and equipment rental.		
Post-storm cleanup - Medium		96	\$25.37	\$2,436			
Post-storm cleanup - Large		240	\$25.37	\$9,133			
Contracted Security							
Overnight Security Staff		2,920	\$21.50	\$62,780	5,840	\$21.50	\$125,560
				\$62,780			\$125,560

Figure 36. Estimated Flood Clean-Up and Security Costs for Creek Delta

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Concrete - Cast-in-Place									
Litter removal	8	msf	5	41	1	540	617	25% of an area, 2x/day for 6 months, 1x/day for 6 months	Unskilled/ Semi-Skilled
Blow/sweep debris	8	msf	10	83	1	104	144	25% of area, 2x per week with hand or backpack blower	Unskilled/ Semi-Skilled
Clean surface	7	msf	45	298	5	12	60	20% of area; clean stained/dirty areas manually or spot clean with power washer using a fan-tipped nozzle when needed	Unskilled/ Semi-Skilled
Debris removal from drain inlets		allow					26	Done every two weeks to remove debris and sediment, assumes 1 hour each time	Unskilled/ Semi-Skilled
Paving repair		allow					15	Repair pavement markings, cracks, spalling, settling, etc.	Skilled
Pervious Concrete									
Litter removal	7	msf	5	36	1	540	453	25% of an area, 2x/day for 6 months, 1x/day for 6 months	Unskilled/ Semi-Skilled
Blow/sweep debris	7	msf	10	71	1	52	62	25% of area, 1x per week with hand or backpack blower	Unskilled/ Semi-Skilled
Clean surface	6	msf	45	256	4	12	51	20% of area; clean stained/dirty areas manually or spot clean with power washer using a fan-tipped nozzle when needed	Unskilled/ Semi-Skilled
Paving repair		allow					20	Repair pavement markings, cracks, spalling, settling, etc.	Skilled

Figure 37. Estimated maintenance tasks and hours for hardscapes 1/4

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Elevated Structures									
							279	Includes lattice bridges and metal grate walkway	
Litter removal	4	msf	5	20	0.3	540	177	25% of an area, 2x/day for 6 months, 1x/day for 6 months	Unskilled/ Semi-Skilled
Blow/sweep debris	4	msf	10	39	1	52	34	25% of area, 1x per week with hand or backpack blower 20% of area; clean stained/dirty areas manually or spot clean with power washer using a fan-tipped nozzle when needed. Powerwashing is only done under special circumstances, unit time takes prep work (such as setting up absorbant mats) into considerations. Powerwashing should direct water away from the Creek	Unskilled/ Semi-Skilled
Clean surface	3	msf	60	189	3	12	38		Unskilled/ Semi-Skilled
Ice management		allow					10	Time allowed for manual ice removal, putting up warning signs/barriers to inform of trail users of slippery surfaces, etc.	Unskilled/ Semi-Skilled
Structure maintenance		allow					20	Task applies to general inspection and minor surface (metal grate) and structure maintenance. Does not include time for any major repair work.	Skilled/ Contracted Services
Limestone Gravel (Non-Stabilized)									
							40		
Litter removal	0.6	msf	5	3	0.05	365	20	25% of an area, daily	Unskilled/ Semi-Skilled
Level surface	3	msf	15	39	0.6	12	8	100% of area, 1x/month; evenly distribute the loose materials across the surface	Unskilled/ Semi-Skilled
Renovation & repairs	0.3	msf	180	47	1	12	9	25% surface; may include filling and leveling, may require bringing in new material, allow time for monthly patching	Skilled
Edging		allow					3	Maintenance and repair as needed	Skilled

Figure 38. Estimated maintenance tasks and hours for hardscapes 2/4

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Decomposed Granite (Stabilized)									
							0	25% of an area, daily; also includes visual inspection of edging; report and repair accordingly	Unskilled/ Semi-Skilled
Litter removal	0.0	msf	5	0	0	365	0		
Level surface	0	msf	15	0	0	12	0	100% of area, 1x/month; evenly distribute the loose materials across the surface	Unskilled/ Semi-Skilled
Renovation & repairs	0.0	msf	180	0	0	1	0.0	15%; includes adding new material, recompact/repatch eroded surfaces, or replace/repair broken paths.	Skilled
Edging		allow					0	Maintenance and repair as needed	Skilled
Cellular Concrete Block									
							41	Includes both stone scramble and brick pavers	
Litter removal	0.5	msf	5	2	0.0	365	15	15% of an area, daily	Unskilled/ Semi-Skilled
Clean/sweep paved surface	0.3	msf	15	5	0.1	104	9	10% of area, sweeping 2x per week	Unskilled/ Semi-Skilled
Manual cleaning	0.7	msf	70	46	1	4	3	20% of area; clean stained/dirty areas with stiff bristle brush, only use power washer when necessary	Unskilled/ Semi-Skilled
Sweep joint materials between pavers	1.7	msf	60	99	2	6	10	50%, done quarterly; additional hours allocated for storm events and for stone scramble	Unskilled/ Semi-Skilled
Re-set & repair pavers	0.5	msf	480	240	4	1	4	10% of paver surface, once annually to level any pavers that have shifted or repair damaged pavers	Skilled

Figure 39. Estimated maintenance tasks and hours for hardscapes 3/4

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Wood Decking									
Litter removal	0.1	msf	5	1	0.01	365	4	25% of an area, daily	Unskilled/ Semi-Skilled
Clean surface	0.1	msf	10	1	0.02	104	2	20% of area, sweeping 2x per week, backpack blower only if needed	Unskilled/ Semi-Skilled
Power washing	0.1	msf	45	7	0.1	36	4	25% weekly for 8 months, monthly for 4; clean stained/dirty areas with power washer; avoid using harsh chemicals by water, and use only biodegradable cleaners when necessary	Unskilled/ Semi-Skilled
Inspection							12	Done monthly	Skilled
Wood deck maintenance & repair		allow					5	Repair and maintain wood decking and support structure	Skilled
Stone Armours									
Litter removal		allow					48	Done 6 times annually, 8 hours each time	Unskilled/ Semi-Skilled
Visual Inspection		allow					52	Done weekly, visual inspection, walk along the Creek	Unskilled/ Semi-Skilled
Close inspection		allow					16	Done annually, up-close inspection of the features. Team of 2, one full day event.	Skilled
Woody species removal		allow					24	Done as needed to ensure woody species do not impact the integrity of the stone armors and site features. Allows approximately 2 hours per week	Ecological Management
Repair		allow					10	Done only as needed (to be discussed)	Skilled
Hardscape Maintenance Subtotal							1,582		

Figure 40. Estimated maintenance tasks and hours for hardscapes 4/4

DISPLAY PLANTING AREAS													
The display areas are made up of landscape types that are of high maintenance and are of high complexity. These include lawns, "shade terrace," (PM2) "hill country," (PM3) "creek garden," (PM7) and "succulent garden" (PM8) landscape types. They are located near trails or gathering spaces to provide visual interest. Plants include trees, shrubs, forbs, grasses, and perennials.													
Unit = 1 Acre													
Display Planting Areas			QTY	Unit	Unit (mins)	Once (mins)	Once (hours)	Estab. Freq (Annual)	Estab. Total Hours	Post-Estab. Freq (Annual)	Post-Estab. Total Hours	Comments	Corresponding Position
Litter removal			4	msf	15	60	1.0	208	208	208	208	20% of an acre, done 4x/week	Unskilled/ Semi-Skilled
Debris removal				allow					5		5	Debris removal	Unskilled, Semi-Skilled, Ecological Management
Monitoring			7	msf	60	420	7.0	12	84	4	28	15% of an acre; regular monitoring of vegetation and site conditions: site photos, take soil samples [if needed] inspection and action report	Ecological Management
Invasive species control (flora)			7	msf	120	840	14.0	12	168	4	56	15% of an acre; weeding, herbicide treatment, cut and paint etc., done on an as needed basis based on monitoring	Ecological Management
Pest control			4	msf	15	60	1.0	4	4	4	4	10% of an acre; done on an as needed basis based on monitoring	Ecological Management, Contracted Services
Over-seeding/replanting			11	msf	60	660	11.0	2	22	2	22	25% of an acre; done on an as needed basis based on monitoring	Ecological Management
Soil amendments (OM, fertilizer, mulch)			17	msf	60	1,020	17.0	2	34	1	17	40% of an acre; done on an as needed basis based on monitoring	Ecological Management
Erosion control			9	msf	240	2,160	36.0	4	144	2	72	20% of an acre; landscapes and slopes repair from erosion: install erosion blanket, coir logs, compost and revegetate as needed	Ecological Management/ Contracted Services
Spot-watering			9	msf	20	180	3.0	6	18	12	36	15% of an acre; hand watering to help plants established during the establishment period. Some time is allocated for post-establishment period during time of drought or very hot weather.	Ecological Management
Landscape management			11	msf	150	1,650	27.5	12	330	4	110	25% of an acre; includes grass cutback (if necessary), seasonal removal/cleanup, prune back, removal of thatch, leaves etc., maintain log of actions taken. Additional time included for organic waste management/hauling.	Ecological Management
Vegetation protection			11	msf	45	495	8.3	4	33	4	33	25% of an acre; protect areas that have been repaired or overused; install temporary fence, tree protection, tree/shrub staking, flagging, signage	Ecological Management
Display Planting Areas									1,050	591	Annual Hours/1 Acre		

Figure 41. Estimated maintenance tasks and hours for softscapes by unit 1/4

NATURAL PLANTING AREAS													
These planting areas include PM1, PM4, PM9, and PM10. While both of vine mix (PM9) and juniper oak savannah (PM1), riparian woodlands (PM4) and riparian recovery mix (PM10) may not share the same aesthetics values, all of these landscapes share one common factor. These landscapes are located along the slopes abutting the Creek channel, from top of bank to the water's edge. These areas can be difficult to reach where slopes are typically 2:1 to 4:1. For the purpose of maintenance and site management, these areas are very difficult to access and may result in less frequent care as other landscapes.													
Unit = 1 Acre													
Natural Planting Areas			QTY	Unit	Unit (mins)	Once (mins)	Once (hours)	Estab. Freq (Annual)	Estab. Total Hours	Post-Estab. Freq (Annual)	Post-Estab. Total Hours	Comments	Corresponding Position
Litter removal		4	msf	45	180	3.0		52	156	52	156	10% of an acre, done biweekly	Unskilled/ Semi-Skilled
Debris removal			allow						20		20	Debris removal, only as needed	Unskilled/ Semi-Skilled, Ecological Management
Monitoring		7	msf	90	630	10.5		12	126	4	42	Regular monitoring of vegetation and site conditions: site photos, take soil samples [if needed] inspection and action report	Ecological Management
Invasive species control (flora)		9	msf	60	540	9.0		12	108	4	36	Weeding, herbicide treatment, cut and paint etc. 10% of an acre	Ecological Management, Skilled/ Semi-Skilled
Pest control		4	msf	30	120	2.0		4	8	4	8	10% of an acre	Ecological Management
Over-seeding/replanting		7	msf	120	840	14.0		2	28	1	14	15% of an acre	Ecological Management
Erosion control		7	msf	480	3,360	56.0		6	336	3	168	15% of an acre; landscapes and slopes repair from erosion: install erosion blanket, coir logs, compost and revegetate as needed	Ecological Management, Contracted Services
Landscape management		11	msf	210	2,310	38.5		4	154	2	77	25% of an acre; includes grass cutback (if necessary), seasonal removal/cleanup, prune back, removal of thatch, leaves etc., maintain log of actions taken. Additional time allocated for organic waste management/hauling.	Ecological Management
Structure inspection and maintenance			allow						5		5	Regular inspection of retaining structures (when applicable)	Skilled, Contracted Services
Natural Planting Areas									941		526	Annual Hours/1 Acre	

Figure 42. Estimated maintenance tasks and hours for softscapes by unit 2/4

NATURAL PLANTING AREAS LV2											
These planting areas are assumed to make up 30% of all Natural Planting Areas (PM1, PM4, PM9). These planting areas are difficult to reach and may take significantly more time to complete a task than other natural planting areas that may be more accessible/adjacent to a pathway. These areas may only be accessible/manageable by connecting to the tie-off system.											
Unit = 1 Acre											
Natural Planting Areas	QTY	Unit	Unit (mins)	Once (mins)	Once (hours)	Estab. Freq (Annual)	Estab. Total Hours	Post-Estab. Freq (Annual)	Post-Estab. Total Hours	Comments	Corresponding Position
Litter removal	4	msf	90	360	6.0	52	312	52	312	10% of an acre, done biweekly	Unskilled/ Semi-Skilled
Debris removal		allow					20		20	Debris removal, only as needed	Unskilled, Semi-Skilled, Ecological Management
Monitoring	7	msf	90	630	10.5	12	126	4	42	Regular monitoring of vegetation and site conditions: site photos, take soil samples [if needed] inspection and action report	Ecological Management
Invasive species control (flora)	9	msf	180	1,620	27.0	12	324	4	108	Weeding, herbicide treatment, cut and paint etc. 10% of an acre	Ecological Management
Pest control	4	msf	30	120	2.0	4	8	4	8	10% of an acre	Ecological Management, Contracted Services
Over-seeding/replanting	7	msf	240	1,680	28.0	2	56	1	28	15% of an acre	Ecological Management
Erosion control	7	msf	960	6,720	112.0	6	672	3	336	15% of an acre; landscapes and slopes repair from erosion: install erosion blanket, coir logs, compost and revegetate as needed	Ecological Management, Contracted Services
Landscape management	11	msf	420	4,620	77.0	4	308	2	154	25% of an acre: includes grass cutback (if necessary), seasonal removal/cleanup, prune back, removal of thatch, leaves etc., maintain log of actions taken. Additional time allocated for organic waste management/hauling.	Ecological Management
Structure inspection and maintenance		allow					5		5	Regular inspection of retaining structures (when applicable)	Skilled, Contracted Services
Natural Planting Areas							1,831		1,013	Annual Hours/1 Acre	

Figure 43. Estimated maintenance tasks and hours for softscapes by unit 3/4

WETLAND PLANTINGS - WET EXTENTS & SEEPAGE WETLAND												
The wetland plantings would include both wet extents and seepage wetland plantings. The planting areas are primarily along the creek, within the flood bench, and some areas in the islands within the creek.												
Unit = 0.34 Acre 15,000 SF (assumes 1,000 LF and 15' wide)												
Wetland Plantings		QTY	Unit	Unit (mins)	Once (mins)	Once (hours)	Estab. Freq (Annual)	Estab. Total Hours	Post-Estab. Freq (Annual)	Post-Estab. Total Hours	Comments	Corresponding Position
Remove litter - landscape		2	cif	60	90	1.5	52	78	52	78	20% of entire length (15' wide), weekly	Unskilled/ Semi-Skilled
Remove large debris and sediment			allow					10		10	Large tree or fallen branches removal, remove sediment/silt build-up as needed	Unskilled/ Semi-Skilled, Ecological Management
Algae management			allow					5		5	Done quarterly, includes mosquitoes management	Ecological Management
Landscape maintenance		3	msf	270	810	13.5	6	81	2	27	20% of unit, revegetation/replanting/seedling/invasive removal	Ecological Management
Woody plant thinning and removal		3	msf	270	810	14	4	54	2	27	30% of unit; selective wood plant thinning and removal on an as needed basis. Done primarily for health and opening up canopy and to prevent overcrowding.	Ecological Management
Inspection			allow					15		15	Inspect pipe for plant health bi-monthly, shoreline erosion quarterly and after major storms, check various chemical levels biannually, and sediment level annually	Ecological Management
Wetland Plantings								243		162	Annual Hours/0.34 Acre	

Figure 44. Estimated maintenance tasks and hours for softscapes by unit 4/4

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Site-Wide Maintenance									
Empty trashcans, recycling bins, and compost bins	14	each	10	140	2	602	1405	14x/week March-October (34 weeks), 7x/week November-February (18 weeks)	Unskilled/ Semi-skilled
Clean trashcans and recycling bins, and compost bins	14	each	20	280	5	42	196	100%; weekly from March-October, 2x/month November-February; includes cleaning, touchup on paint (if needed), inspection (check for damages, loose parts, etc.)	Unskilled/ Semi-skilled
Waste management		allow					156	Bringing trash to collection points or out of the site. Assumes 3 hours spent per week on mobilization. Assumes additional cleanup, reseeding/mulching, repair, etc. as a result of special events from within the Creek or other WG parklands. Waterloo Park will have 70 events, assumes 1/3 of them will result in additional cleanup (23 events), and 4 events from CD itself (27 events total). 4 hours of support needed per event	Unskilled/ Semi-skilled
Special Events Impact		allow					108	In creek cleanup for visible litter, routine cleanup, assumes each clean up will take 8 hours (1 day). NOT PART OF WPD ROUTINE WORK.	Unskilled/ Semi-skilled
Creek cleanup	1	each	480	480	8	18	144	25% weekly April-Oct., 2x/month Nov-March; includes bike racks and seating	Unskilled/ Semi-skilled
Site furnishings - cleaning	6	each	10	58	1	38	36	10%, done as needed; includes bike racks and seating	Unskilled/ Semi-skilled
Site furnishings - repair	2	each	30	69	1	4	5	Daily spot cleaning (for 8 months), ensuring drains are clear	Unskilled/ Semi-skilled
Drinking fountain and bottle filler cleaning	3	each	10	30	0.5	240	120	Spring startup & winterization (assumes two days for startup and two days to shutdown, one plumber and one apprentice)	Unskilled/ Semi-skilled
Drinking fountain and bottle filler seasonal prep		allow					65	Routine maintenance (monthly)	Skilled / Contracted Trades
Drinking fountain and bottle filler maintenance	3	each	60	180	3.0	8	24		Skilled / Contracted Services

Figure 45. Estimated maintenance tasks and hours for site-wide needs 1/4

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Light fixture lumen board replacement		allow					5	Replacements as needed	Unskilled/ Semi-skilled
Light fixture repair & maintenance		allow					10	Routine maintenance as needed due to operations, vandalism, etc.	Skilled/ Contracted Services
Signage - cleaning & inspection		allow					5	Inspection with other maintenance tasks, cleaning every two months or as needed, i.e. graffiti removal	Unskilled/ Semi-skilled
Fence/Railing cleaning	18	clf	3	55	1	43	40	25% of chainlink fences and all rails, quick wipe down and visually inspect for any damages and graffiti; done weekly from March-October, biweekly from November-February	Unskilled/ Semi-skilled
Fence/Railing inspection and maintenance	11	clf	60	662	11	12	132	15% of chainlink fences and all rails, 1x/month, primarily visual inspection for look for any damages, and allow some time for minor repair and maintenance	Skilled
Walls visual inspection		allow					24	Visual inspection of linear walls to identify any damage. Assumes 2 hours per month. Walls include: vine wall, standalone walls, and stone walls.	Unskilled/ Semi-skilled
Walls maintenance and repair		allow					120	10% of walls; done every six months, repair as necessary. Assumes a 2 full days of close inspection and maintenance.	Unskilled/ Semi-skilled
Drain cleaning		allow					24	1x/month, done quarterly, 4 hours each time (To be reviewed)	Unskilled/ Semi-skilled
Pest control		allow					100	Allowance	Skilled/ Contracted Services
Gum & graffiti removal		allow					50	As needed	Skilled (Special Licensed/Permit)
Erosion control visual inspection and evaluation		allow					40	Visual inspection of linear walls to identify any damage. Assumes 2 hours per month.	Skilled
Erosion control maintenance and repair		allow					40	10% of walls; done every six months, repair as necessary. Assumes a 2 full days of close inspection and maintenance.	Skilled/ Contracted Services

Figure 46. Estimated maintenance tasks and hours for site-wide needs 2/4

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Irrigation System - Permanent									
Irrigation - Monitoring/System Check	35	msf	5	177	3	26	77	Approximately bi-weekly; monitor to ensure adequate coverage, damage, and functionality.	Unskilled/ Semi-skilled
Irrigation - Component Maintenance & Repair	2	msf	400	991	17	6	99	Repair above grade components (spray heads, drip tubing) as needed; assume 7% replacement annually	Skilled/ Contracted Services
Irrigation - System maintenance	35	msf	26	921	15	2	31	System repair and clean out, seasonal maintenance, winterization will be done only on critical elements. Note: System maintenance includes supply lines to all quick couplers, Assumes will be removed in 1-1.5 year after installation. (Will not be needed during Post-Establishment Period.)	Skilled/ Contracted Services
Irrigation System - Temporary									
Irrigation - Monitoring/System Check	74	msf	5	372	6	26	161	Approximately bi-weekly; monitor to ensure adequate coverage, damage, and functionality.	Unskilled/ Semi-skilled
Irrigation - Component Maintenance & Repair	5	msf	400	2086	35	1	35	Repair above grade components (spray heads, drip tubing) as needed; assume 7% replacement annually	Skilled/ Contracted Services
Irrigation - System maintenance	74	msf	26	1937	32	2	65	System repair and clean out. Time allocated for 2 major seasonal maintenance depending on the time the irrigation is installed and will be operating. Note: System maintenance includes supply lines to all quick couplers,	Skilled/ Contracted Services
Irrigation System - Sprayheads and Nozzles									
Irrigation - Monitoring/System Check		allow					25	Approximately bi-weekly; monitor to ensure adequate coverage, damage, and functionality. Time allowed for some grounds visual inspection during normal routine.	Unskilled/ Semi-skilled
Irrigation - Component Maintenance & Repair		allow					25	Repair above grade components (spray heads, bubblers) as needed	Skilled/ Contracted Services
Irrigation - System maintenance		allow					15	System repair and clean out, winterization, spring startup. Note: System maintenance includes supply lines to all quick couplers,	Skilled/ Contracted Services


Figure 47. Estimated maintenance tasks and hours for site-wide needs 3/3

TASK	QTY	UNIT	UNIT (min)	ONCE (min)	ONCE (hours)	ANNUAL FREQ.	TOTAL HOURS	COMMENTS	Corresponding Position
Post-storm cleanup (Low)							128	Assumes 4 events annually. Each event will require a team of two (2) and two (2) full days of cleanup.	Unskilled/ Semi-skilled
Post-storm cleanup (Medium)							96	Assumes 1 event annually. Each event will require a team of four (4) and three (3) full days of cleanup.	Unskilled/ Semi-skilled
Ecological Needs								Visual inspection of the ecological materials/habitats, monitor for nesting, bird counts, animal browsing/damage to the landscapes, recording and assessment as needed. Assumes average a team of 2 for each inspection period. Each inspection period is 1 weeks long (112 hours each time). 2 inspection period annually.	
Inspection and monitoring - ecological habitats							224	Habitats needs are to be determined depending on the type and associated issues. Habitats are not expected to require significant maintenance/repairs, however, some materials such as the Native Salvage Channel Materials may shift and will require redistribution. Some time is allocated for work that has not been captured.	Ecological Management
Ecological habitats - other needs		allow					25		Ecological Management
Site Features and Furnishing Maintenance							3,854		

Figure 48. Estimated maintenance tasks and hours for site-wide needs 4/4

Appendix A

Approved Pesticides, Herbicides, and Applications





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APPENDIX 1: Approved Pesticide Lists, Use Up and Do Not Restock List

Following are lists of pesticides that are approved for use in specific work units in parks. A good IPM approach allows for the choice of ideal materials for specific needs. IPM also anticipates the need to managing pest resistance with rotations of products with differing modes of action rather than relying on a “one material fits all” approach. Despite the lengthy appearance of these approved lists, most of these pesticides are not used in a typical year, or are used in a very minor way.

It is also important to understand that pesticide applications are used after many other IPM strategies have first been either employed, or considered. The vast majority of PARD pest management practices never involve the use of pesticides. Similarly, the vast majority of park acreage never receives any kind of pesticide application. Other IPM strategies PARD employs include prevention of pests through Strategy, design and selection, and management of pests through cultural practices, physical means, and mechanical methods.

All pesticides available for use within parks must first be placed upon an approved list after undergoing a review process that carefully examines the individual characteristics of the product and whether it would be an appropriate addition within our program. Issues of efficacy, public health and safety, potential environmental impacts, overall plant health requirements, land management needs, and other concerns are taken into account during this process. Applicators within a specific work unit must then make their choices of materials from their own approved list. Individual work units have different responsibilities and pest management requirements for the lands under their care. The individually tailored approved lists reflect these differences.

Occasionally, subsets of work units may receive approval for certain materials that are not on their general approved list. For example, trial uses of products may be focused on a single golf course for demonstration purposes.

All applicators in each work unit are limited to the pesticides appearing on their specific approved list. Pesticides not appearing on their particular list are not available for their use. Careful attention should be paid to the further limitations of pesticides available for use within waterway buffer zones and aquatic sites as outlined and defined in the Waterways Pest Management Strategy.

Additions to the approved lists must follow the process as described in the “Pesticides Approved for Use in Parks” Strategy.



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APPENDIX 2: Approved Lists for Parks Use

The following lists of approved pesticide materials are specific to each work unit. PARD applicators must choose only from currently listed products. Only state licensed applicators may apply pesticides in Austin Parks. (Use of pesticides by non-licensed personnel, such as, but not inclusive of, Wasp spray and Fire Ant powder, may be used as an incidental application, see Appendix 14). Use of pesticides must occur under adherence to the PARD Integrated Pest Management Program policies and oversight. Pesticide use must adhere to all product label directions.

Format:

Product trade name (active ingredient) Description of purpose and use within IPM program.

PARK USE APPROVED LIST

Areas of pest management: Pocket, neighborhood, district, and metropolitan parks.

HERBICIDES

Primary choices:

- **Battleship III** - A good alternative for 2,4-D in broadleaf control. Not a primary choice, but an alternative should the need arise.
- **Celsius WG** - Safe and effective control of both a large list of broadleaves and many grassy weeds. This is our primary choice due to its effectiveness and safety level.
- **Certainty** - Controls many grassy weeds. It will be used primarily for nutsedge, both purple and yellow.
- **Dimension** - Pre-emergent product with some post control of goosegrass in the 2-3 leaf stage. Primarily will be used in the spring in a split-application strategy.
- **Gallery 75 DF** (isoxaben) - Used on shrub beds, tree circles, and other areas. Can be used in combination or rotation with oryzalin to broaden the spectrum of weeds prevented.
- **Garlon 3A, Greenlight Tough Brush Killer** (triclopyr amine) - Selective products for woody, difficult to control perennials. Used in spray and cut-stem applications, also for invasives and habitat restoration.
- **Katana PIS** - Used for grassy weeds and sedges. PARD will use, if necessary, as a late season *Poa annua* control in February.
- **Kocide 101, Kocide DF** (copper hydroxide) - Used on canopies and branches occupied by ball moss.
- **Manage** - Nutsedge control.
- **Monument** - controls certain broadleaves and grassy weeds. Used primarily for cool season grass control.
- **MSM Turf** - Inexpensive broadleaf control, but user must be cautious and not apply under drip lines of trees.
- **Prodiamine** - Pre-emergent weed control, especially effective on *Poa annua* in the fall and winter.
- **Roundup Pro, ProDry, Razor Pro, Rodeo, Aquamaster** (glyphosate) - Primary vegetation control product used with other methods in shrub beds, tree circles, bare ground, and on invasive weeds.
- **Sedghammer** - Nutsedge control.
- **Specticle** - Pre-emergent weed control with the longest residual (up to 6 months) of any other pre-emergent herbicide. The downside to its use is that turf will not recover bare ground where Specticle was applied.



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- **Surflan AS, WDG** (oryzalin) - Used in shrub beds, tree circles, fence lines and other park areas for weed control. A primary liquid form pre-emergent product.
- **TributeTotal** - A combination of Celsius, Sedghammer and Revolver; very expensive product but the absolute most effective in controlling dallisgrass in the fall.
- **XL 2G** (benefin+oryzalin) - Combination product for wider spectrum weed control. Useful in sites where liquid products are more difficult to apply. This is a primary granular pre-emergent product.
- **XLR8** - Effective on crabgrass.

Specialty uses:

- **Arsenal** (isopropylamine salt of imazapyrs) - A brush-on application used where woody plants and poison ivy persist.
- **DeMoss, Garden Safe Moss and Algae Killer, others** (fatty acids) - Moss control desiccant. For structures and non-vegetated surfaces. Not typically used, but possible sporadic use.
- **Devrinol 50 DF** (napropamide) - Rare use in park shrub beds, tree circles, and other areas to prevent weed seed germination. Can be used in combination or rotation with oryzalin to broaden the spectrum of weeds prevented.
- **Manage** (halosulfuron-methyl) - Specialty systemic weed control for Equisetum and Cyperus species. Use is minor in scope and where control is essential.
- **Scythe** (pelargonic fatty acid) - Minor use desiccant used for top-kill of early-stage, easily killed weeds.

FUNGICIDES

- **Fertilome Liquid Systemic Fungicide** (propiconazole) - Possible use for disease control for high value plants in short term, special situations where long term plant health is affected. Typically not used, in park zones but retained for unusual circumstances.
- **Heritage** (Azoxystrobin) - broad spectrum fungicide to be used in the event of an emergency. Likely will not have to be used in park lands.
- **Microcop** (copper sulfate), **Copper soap** (copper octanoate) - Possible use for disease control for high value plants in short term, special situations where long term plant health is affected. Typically not used in park zones, but retained for unusual circumstances.

INSECTICIDES

- **Acelepryn** - Timing is very important for use. It can be used as both a preventative and curative application for a wide variety of grubs. As a preventative it should only be used in areas where grub problems previously existed. Product application should be around mid-April (depending on weather conditions). It is also effective for controlling armyworms should we ever experience an infestation. Because it will reside in the soil for 4-6 weeks it is extremely effective against armyworms. Armyworms will hatch every 10 days and a residual is necessary in order to prevent damage and excess product application.
- **Advion** - Fire ant bait applied at 1.5 pounds/acre. It'll only effect the ants and eradicates them in 24-72 hours. It is an extremely safe product that protects patrons and pets from fire ants.
- **Aerosol Wasp Sprays, Misty Wasp and Hornet Killer** (pyrethroids) - Directed jet sprays used for individual wasp and hornet nest treatments posing health and safety threats to park users.
- **Amdro** (hydamethylnon) - Used on individual ant mounds in active areas.
- **Ascend** (abamectin) - Used on individual ant mounds in active areas.
- **Award** (fenoxycarb) - Used on individual ant mounds in active areas.



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- **Azatin XL** (azadirachtin) - Neem tree extract used for control through growth regulating and anti-feeding effects. Specialty use product. Typically not used in park zones, but retained for unusual circumstances.
- **Bacillus thuringiensis** - Primarily for lepidopterous insects, although subspecies can be used for other targets. Typically not used in park zones, but retained for unusual circumstances.
- **Beneficial nematodes** - Predatory nematodes for insect control treatments for susceptible targets where needed. Typically not used in park zones, but retained for unusual circumstances.
- **Dylox 420 SL** - Used as a curative for grubs.
- **M-Pede, Safer Insecticidal Soap, others** (soaps) - General soft body insect control. Typically not used in park zones, but retained for unusual circumstances.
- **Sevin SL** - Can be used as a curative for grubs, armyworms, etc. but with little to no residual effect.
- **Speckoz multicide wasp and hornet killer** (tetramethrin) - Directed jet sprays used for individual wasp and hornet nest treatments posing health and safety threats to park users.
- **Sunspray, others** (horticultural oils) - General insect control both for dormant and growing season use. Typically not used in park zones, but retained for unusual circumstances.

Specialty uses:

- **Results** (pyrethrin) - Used on ant mounds in active areas where red fire ants persist.
- **Safer Fire Ant Killer** (D-limonene) - Used on ant mounds in active areas where red fire ants persist.

MISCELLANEOUS

- **Activator 90, R-11, LI 700, Hasten, Silwet, Syl-Tac, others** (spray adjuvant) - Surfactant used in solutions to enhance spray coverage and increase efficacy.
- **Deer-Off** (putrescent egg and capsaicin) - Deer foliage repellent.
- **No Foam** (anti-foaming agent) - Silicon-based, reduces foaming, used in large agitated spray tanks.
- **Sluggo, Escargo** (iron phosphate) - Slug and snail bait for specialty areas susceptible to unacceptable damage, such as certain perennials, annuals. Not typically used, but retained on list for use if plant loss is unacceptable.
- **Tanglefoot** (barrier product) - Physical sticky barrier for crawling insect pests. Not typically used, but retained on list for use if loss is unacceptable.
- **Turf Trax, Signal, others** (marker colorant) - Used in spray solutions to temporarily mark area of application.
- **Wasp/yellow jacket traps** (pheromone trap) - Yellow jacket trap for certain areas. Not typically used, but retained on list for use if safety issues are created by wasp and yellow jacket presence.

SPECIAL APPROVAL PRODUCTS: Requires manager level/Strategy approval prior to use.

- **Aquashade** (acid blue 9, acid yellow 23) - Blue colorant used to suppress algae growth in certain ponds in developed parks. Used only within approved framework for noxious invasive weeds and algae as part of weed management strategy specific to site as outlined in Waterways Policy.
- **Cutrine Plus** (chelated elemental copper) - Aquatic algae control. Used only within approved framework for noxious invasive weeds and algae as part of weed management strategy specific to site as outlined in Waterways Policy. Minor to zero use material retained on list for specific situations.
- **Horsepower** (MCPA, triclopyr, dicamba) - Selective weed control in turf. Used for turf



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renovation as part of overall IPM approach. Turf broadleaf herbicide use must be pre-approved per Turf Broadleaf Weed Strategy. Used very rarely, primarily for athletic field surface renovation. Not for general use on park turf.

- **Sonar AS** (fluridone) - For control of noxious invasive weeds that threaten the health of an aquatic system as part of approved overall IPM management plan specific to site; potential sites and uses outlined in Waterways Policy. Minor to zero use material retained on list for specific situations.
- **Spotlight** (fluroxypyr) - Selective weed control in turf. Used for turf renovation as part of overall IPM approach. Turf broadleaf herbicide use must be pre-approved per Turf Broadleaf Weed Strategy. Used very rarely, primarily for athletic field surface renovation. Not for general use on park turf.

USE UP AND DO NOT RESTOCK LIST

The listed materials are to be used until remaining stocks are gone and are not to be restocked.

- Pendulum WDG - Pre-emergent weed control effective in heavy soils.



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APPENDIX 3: Specialty Rose Garden Approved List

This list does not apply to general parks in service areas. (Specialty Rose Garden sites are also approved for use of Service Area listed pesticides.)

Integrated pest management activities in rose gardens on park land are highly dependent on factors such as garden location, intent and use of the planting, rose varietal choice, site conditions, and public expectations. Tolerance of disease and insect presence, and intensity of pest control activities and inputs will vary with these factors. PARD IPM inputs at rose garden sites, including the use of pesticides, will reflect these factors and take place only under a carefully considered and planned approach.

FUNGICIDES

- **Banner Maxx, Fertlome Liquid Systemic Fungicide** (propiconazole) - For disease control in rotation with other materials on specialty rose gardens.
- **Bayleton** (triadimefon) - For disease control in rotation with other materials on specialty rose gardens.
- **Carbamate 75 WDG** (ferbam) - For disease control in rotation with other materials on specialty rose gardens.
- **Clearys 3336** (thiophanate) - For disease control in rotation with other materials on specialty rose gardens.
- **Compass** (trifloxystrobin) - For disease control in rotation with other materials on specialty rose gardens.
- **Daconil** (chlorothalonil) - For control of diseases in rotation with other materials primarily on golf greens, specialty rose gardens, and special situations.
- **Microcop** (copper sulfate) **Copper soap** (copper octanoate) - Unlikely, but potential use in cases of clear benefit from dormant season application in special need situations in rose gardens.
- **Norbac 84c** (Agrobacterium radiobacter) - Beneficial bacteria for prevention of crown gall disease.
- **Rubigan AS** (fenarimol) - For disease control in rotation with other materials on specialty rose gardens.
- **Zyban WP** (thiophanate methyl+zinc and maneb) - For disease control in rotation with other materials on specialty rose gardens.

INSECTICIDES and MITICIDES

- **Avid 1.5 EC** (abamectin) - Miticide for use as part of a carefully implemented plan to keep mite levels at a non-injurious level in specialty rose gardens.
- **Azatin XL** (azadirachtin) - Neem tree extract used for control through growth regulating and anti-feeding effects. Specialty use product.
- **Conserve** (spinosad) - Material for specialty rose gardens. Minor use specialty product, not typically used.
- **Floramite** (bifenazate) - Miticide for use as part of a carefully implemented plan to keep mite levels at a non-injurious level in specialty rose gardens.
- **Hexygon** (hexythiozox) - Miticide for use as part of a carefully implemented plan to keep mite levels at a non-injurious level in specialty rose gardens.



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APPENDIX 4: Athletic Field Services Approved List

Areas of pest management: Athletic fields such as softball, baseball, football and soccer fields.

HERBICIDES

- **Roundup Pro, ProDry, Razor Pro, Rodeo, Aquamaster** (glyphosate) - Primary vegetation control product used along with other control methods on infields, fence lines, field lines and other areas.
- **Scythe** (pelargonic fatty acid) - Minor use contact herbicide used for top-kill of easily controlled weeds.

INSECTICIDE

- **Ascend** (abamectin) - Used on individual ant mounds in active areas.

Specialty uses:

- **Results** (pyrethrin) - Used on ant mounds in active areas where red fire ants persist.

MISCELLANEOUS

- **Activator 90, R-11, LI 700, Hasten, others** (spray adjuvant) - Surfactant used in solutions to enhance spray coverage and increase efficacy.
- **Armorex** (garlic, sesame oil, white pepper) - Goose repellent for stadium turf. Trial use.
- **Turf Trax, Signal, others** (marker colorant) - Used in spray solutions to temporarily mark area of application.

SPECIAL USE PRODUCTS: Requires manager level/special policy approval prior to use.

- **Horsepower** (MCPA, triclopyr, dicamba) - Selective weed control in turf. Used for turf renovation as part of overall IPM approach. Turf broadleaf herbicide use must be pre-approved per Turf Broadleaf Weed Strategy. Used very rarely, primarily for athletic field surface renovation. Not for general use on park turf.
- **Spotlight** (fluroxypyr) - Selective weed control in turf. Used for turf renovation as part of overall IPM approach. Turf broadleaf herbicide use must be pre-approved per Turf Broadleaf Weed Strategy. Used very rarely, primarily for athletic field surface renovation. Not for general use on park turf.



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APPENDIX 5: City Urban Forestry Approved List

Areas of pest management: trees on streets, parks, other city property, and UF nursery operations.

HERBICIDES

- **Garlon 3A, Remedy, Greenlight Tough Brush Killer** (triclopyr) - Selective products for woody, difficult to control perennials, also for invasives and habitat restoration.
- **Kocide 101, Kocide DF** (copper hydroxide) - Used on canopies and branches occupied by ball moss.
- **Manage** (halosulfuron-methyl) - Specialty systemic weed control for Equisetum and Cyperus species. Use is minor in scope such as in nursery growing areas and where control is essential.
- **Roundup Pro, ProDry, Razor Pro, Rodeo, Aquamaster** (glyphosate) - Primary vegetation control product used with other methods in shrub beds, tree circles, bare ground, and on invasive weeds.
- **Scythe** (pelargonic fatty acid) - Minor use desiccant used for top-kill of early-stage, easily killed weeds.
- **Surflan AS, WDG** (oryzalin) - Used in nursery, shrub beds, tree circles, fence lines and other park areas for weed control. A primary liquid form pre-emergent product.

FUNGICIDES

- **Alamo** (propiconazole) - Trunk injection product for certain high value elms.
- **Arbortect** (thiabendazole) - Trunk injection product for certain high value elms.
- **Daconil** (chlorothalonil) - Disease control on high value trees in special situations. Typically not used, but retained for unusual, short term use where long term plant health is affected.

INSECTICIDES and MITICIDES

(Street trees do not routinely receive scheduled insecticide or miticide treatments.)

- **Aerosol Wasp Sprays. Misty wasp and hornet killer** (pyrethroids) - Directed jet sprays used for individual wasp and hornet nest treatments posing health and safety threats to park users.
- **Azatin XL** (azadirachtin) - Neem tree extract used for insect growth regulating and anti-feeding effects. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Bacillus thuringiensis** - Primarily for lepidopterous insects, although subspecies can be used for other targets. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Beneficial nematodes** - Predatory nematodes for susceptible targets where needed. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Conserve** (spinosad) - Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Floramite** (bifenazate) - Miticide as part of a carefully implemented plan to keep mites at non-injurious levels. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **M-Pede, Safer Insecticidal Soap, others** (soaps) - General soft body insect control. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Sunspray, others** (horticultural oils) - General insect control both for dormant and growing season use. Not typically used in general parks. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Tempo SC Ultra** (cyfluthrin) - Contact product for special or high value plant material. Typically



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not used, but retained for unusual, short term use where long term plant health is affected.

- **TREE-age** (Emamectin Benzoate - Used as a systemic trunk injection to treat emerald ash borers.

MISCELLANEOUS

- **Activator 90, R-11, LI 700, Hasten, others** (spray adjuvant) - Surfactant used in solutions to enhance spray coverage and increase efficacy.
- **No Foam** (anti-foaming agent) - Silicon-based, reduces foaming, used in large agitated spray tanks.
- **Turf Trax, Signal, others** (marker colorant) - Used in spray solutions to temporarily mark application.



APPENDIX 6: City Parks and Recreation-Horticultural Services

Approved List

Areas of pest management: greenhouse management, nursery management, specialty rose and botanic gardens, turf renovation, other specialized pest management needs in all park areas.

HERBICIDES

Primary choices:

- **Gallery 75 DF** (isoxaben) - Used on shrub beds, tree circles, and other areas. Can be used in combination or rotation with oryzalin to broaden the spectrum of weeds prevented.
- **Garlon 3A, 4 Ultra, Greenlight Tough Brush Killer** (triclopyr) - Selective products for woody and other difficult to control broadleaf weeds. For spray and cut-stem applications.
- **Kocide 101, Kocide DF** (copper hydroxide) - Used on canopies and branches occupied by ball moss.
- **Roundup Pro, ProDry, Razor Pro, Rodeo, Aquamaster** (glyphosate) - Primary vegetation control product used with other methods in shrub beds, tree circles, bare ground, and invasive weeds.
- **Surflan AS, WDG** (oryzalin) - Used in nursery, shrub beds, tree circles, fence lines and other park areas for weed control. A primary liquid form pre-emergent product.
- **XL 2G** (benefin+oryzalin) - Combination product for wider spectrum weed control. Useful in sites where liquid products are more difficult to apply. This is a primary granular pre-emergent product.

Specialty uses:

- **Arsenal** (imazapyr) - Used only for non-landscaped, non-park, intergovernmental contract sites for total vegetation control.
- **Devrinol 50 DF** (napropamide) - Used in some nursery areas and occasional use in park shrub beds, tree circles, and other areas to prevent weed seed germination. Useful on newly planted areas.
- **DeMoss, Garden Safe Moss and Algae Killer, others** (fatty acids) - Moss control desiccant. For structures and non-vegetated surfaces. Not typically used, but possible targeted use.
- **Fusilade II** (fluazifop) - Trial use. Selective post-emergent for invasive grass species in natural areas only.
- **Manage** (halosulfuron-methyl) - Specialty systemic weed control for Equisetum and Cyperus species. Use is minor in scope such as in nursery growing areas and where control is essential.
- **Scythe** (pelargonic fatty acid) - Minor use desiccant used for top-kill of early-stage, easily killed weeds.
- **Milestone** (aminopyralid) - Invasive broadleaf weed and woody plant control for natural areas.

FUNGICIDES

- **Banner Maxx, Fertilome Liquid Systemic Fungicide** (propiconazole) - For control of diseases in rotation with other materials primarily in specialty rose gardens. Not typically used in general parks.
- **Bayleton** (triadimefon) - For control of diseases in rotation with other materials primarily in specialty rose gardens and special situations. Not typically used in general parks.
- **Carbamate 75 WDG** (ferbam) - For control of diseases in rotation with other materials primarily in specialty rose gardens. Not typically used in general parks.
- **Clearys 3336** (thiophanate) - For control of diseases in rotation with other materials primarily in greenhouse and specialty rose gardens. Not typically used in general parks.



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- **Compass** (trifloxystrobin) - For control of diseases in rotation with other materials primarily in specialty rose gardens. Not typically used in general parks.
- **Daconil** (chlorothalonil) - For control of diseases in rotation with other materials primarily in specialty rose gardens, and special situations. Not typically used in general parks.
- **Microcop** (copper sulfate) **Copper soap** (copper octanoate) - Possible use for high value plants. Typically not used but retained on approved list for use where other materials are not appropriate or different mode of action is required.
- **Subdue Maxx** (metalaxyl) - For control of diseases primarily in special situations. Not typically used.
- **Systhane** (myclobutanil) - For control of certain diseases, initial use for Rhododendron powdery mildew control.
- **Zyban WP** (thiophanate methyl, + zinc and maneb) - For control of diseases in rotation with other materials primarily in specialty rose gardens. Not typically used in general parks.

INSECTICIDES and MITICIDES

- **Aerosol Wasp Sprays, Misty wasp and hornet killer** (pyrethroids) - Directed jet sprays used for individual wasp and hornet nest treatments posing health and safety threats to park users.
- **Avid 1.5 EC** (abamectin) - Miticide for use as part of a carefully implemented plan to keep mite levels at a non-injurious level in specialty rose gardens, greenhouse. Not typically used in general parks.
- **Azatin XL** (azadirachtin) - Neem tree extract used for insect growth regulating and anti-feeding effects. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Bacillus thuringiensis** - Primarily for lepidopterous insects, although subspecies can be used for other targets. Insect control not usually done in general parks.
- **Beneficial nematodes** - Predatory nematodes for insect control treatments for susceptible targets where needed. Insect control not usually done in general parks.
- **Conserve** (spinosad) - Material derived from a bacterial fermentation, for specialty rose gardens. Minor use specialty product, typically not used.
- **Floramite** (bifenazate) - Miticide for use as part of a carefully implemented plan to keep mite levels at a non-injurious level in specialty rose gardens and special areas. Not typically used in general parks.
- **Hexygon** (hexythiozox) - Miticide, with ovacidal and larvacidal action used as part of a carefully implemented plan to keep mite levels at a non-injurious level in specialty rose gardens.
- **M-Pede, Safer Insecticidal Soap, others** (soaps) - General soft body insect control. Not typically used in general parks. Minor use material.
- **Sunspray, others** (horticultural oils) - General insect control both for dormant and growing season use. Not typically used in general parks. Minor use material.
- **Tempo SC Ultra** (cyfluthrin) - Contact product for specialty rose gardens or for special needs. Minor use material for potential rotational needs.

MISCELLANEOUS

- **Activator 90, R-11, LI 700, Hasten, Silwet, Syl-Tac, others** (spray adjuvant) - Surfactant used in solutions to enhance spray coverage and increase efficacy.
- **Aquashade** (acid blue 9, acid yellow 23) - Blue colorant used to suppress algae growth in certain ponds in developed parks and golf courses.
- **Deer-Off** (putrescent egg and capsaicin) - Deer foliage repellent.



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- **Green Clean** (sodium carbonate peroxyhydrate) - Algae control on surfaces in greenhouse and nursery.
- **No Foam** (anti-foaming agent) - Silicon-based, reduces foaming, used in large agitated spray tanks.
- **PT 2000** (quaternary ammonium chloride salts) - Disinfectant for use in greenhouse and propagation.
- **Slug baits, various** (metaldehyde) - For nursery canyand areas susceptible to unacceptable damage. Not typically used, but retained on list for use if loss is unacceptable.
- **Sluggo, Escargo** (iron phosphate) - For specialty areas susceptible to unacceptable damage, such as in some annual flower beds. Not typically used, but retained on list for use if loss is unacceptable.
- **Tanglefoot** (barrier product) - Physical sticky barrier for crawling insect pests.
- **Turf Trax, Signal, others** (marker colorant) - Used in spray solutions to temporarily mark area of application.
- **Wasp/yellow jacket traps** (pheromone trap) - Yellow jacket trap for certain areas. Not typically used, but retained on list for use if safety issues are created by wasp and yellow jacket presence.

SPECIAL APPROVAL PRODUCTS: Requires manager level/policy approval prior to use.

- **Arsenal** (imazapyr) - Herbicide for evaluation purposes at Austin International Raceway in non-landscaped, non-park areas only as per labeled site directives.
- **Cutrine Plus** (chelated elemental copper) - Used only within approved framework for noxious invasive weeds and algae as part of weed management strategy specific to site as outlined in Waterways Policy.
- **Horsepower** (MCPA, triclopyr, dicamba) - Selective weed control in turf. Used for turf renovation as part of overall IPM approach. Turf broadleaf herbicide use must be pre-approved per Turf Broadleaf Weed Strategy. Used very rarely, primarily for athletic field surface renovation. Not for general use on park turf.
- **Sonar AS** (fluridone) - For control of noxious invasive weeds threatening the health of an aquatic system. Used as part of approved overall weed management plan specific to site; potential sites and uses outlined in Waterways Policy. Minor to zero use material retained on list for specific situations.
- **Spotlight** (fluroxypyr) - Selective weed control in turf. Used for turf renovation as part of overall IPM approach. Turf broadleaf herbicide use must be pre-approved per Turf Broadleaf Weed Strategy. Used very rarely, primarily for athletic field surface renovation. Not for general use on park turf.

For IPM Enhancement program trials:

- **EcoEXEMPT HC** (2-phenethyl propionate, eugenol) - Post-emergent herbicide for trial use.
- **Natures Glory weed and grass killer** (acetic and citric acid) - Post-emergent herbicide for trial use.
- **Blackberry and Brush Blocker** (acetic and citric acid) - Post-emergent herbicide for trial use.
- **A-maiz-N** (corn gluten) - Pre-emergent herbicide for trial use.

Greenhouse production use only:

INSECTICIDES

- **Distance** (pyriproxyfen) - Insect growth regulator for greenhouse use only.
- **Floramite SC** (bifenazate) - Mite control for greenhouse use.



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- **Margosan-O** (azadirachtin) - Contact product for greenhouse use.
- **Orthene** (acephate) - Systemic product for greenhouse use.
- **Precision/Award** (fenoxycarb) - Insect growth regulator for greenhouse use only.
- **Resmethrin EC 26** (resmethrin) - Contact product for greenhouse use only.

FUNGICIDES

- **Chipco 26019** (iprodione) - For control of diseases in rotation for greenhouse use only.
- **Domain** (thiophanate) - For control of diseases in rotation for greenhouse use only.



APPENDIX 7: City Parks and Recreation-Natural Areas Approved List

Areas of pest management: natural area parks.

INSECTICIDES

- **Aerosol Wasp Sprays, Misty wasp and hornet killer** (pyrethroids) - Directed jet sprays used for individual wasp and hornet nest treatments posing health and safety threats to park or natural area users.
- **Azatin XL** (azadirachtin) - Neem tree extract used for insect growth regulating and anti-feeding effects. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Bacillus thuringiensis** - Primarily for lepidopterous insects, although subspecies can be used for other targets. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Beneficial nematodes** - Predatory nematodes for susceptible targets where needed. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **M-Pede, Safer Insecticidal Soap, others** (soaps) - General soft body insect control. Typically not used, but retained for unusual, short term use where long term plant health is affected.
- **Sunspray, others** (horticultural oils) - General insect control both for dormant and growing season use. Typically not used, but retained for unusual, short term use where long term plant health is affected.

HERBICIDES

- **Certainty** - Control of Johnsongrass.
- **Fusilade II** (fluazifop) - Trial use. Selective post-emergent for invasive grass species in natural areas only.
- **Garlon 3A, Garlon 4 Ultra** (triclopyr) - Selective products for woody, difficult to control perennials. Used both in spray and cut-stem applications, also for invasives and habitat restoration.
- **Roundup Pro, ProDry, Razor Pro, Rodeo, Aquamaster** (glyphosate) - Primary vegetation control product used with other methods in shrub beds, tree circles, bare ground, and on invasive weeds.
- **Surflan AS, WDG** (oryzalin) - Used in some shrub beds, tree circles, and potentially in restoration.
- **Milestone** (aminopyralid) - Invasive broadleaf weed and woody plant control for natural areas.

MISCELLANEOUS

- **Activator 90, R-11, LI 700, Hasten, Kinetic, Syl-Tac, others** (spray adjuvant) - Surfactants used to enhance spray coverage and increase efficacy.
- **Deer-Off** (putrescent egg and capsaicin) - Deer foliage repellent.
- **No Foam** (anti-foaming agent) - Silicon-based, reduces foaming, used in large agitated spray tanks.
- **Turf Trax, Signal, others** (marker colorant) - Used to temporarily mark area of application.
- **Wasp/yellow jacket traps** (pheromone trap) - Yellowjacket trap for certain areas. Not typically used.

FUNGICIDES

- **Fertilome Liquid Systemic Fungicide** (propiconazole) - For control of diseases in rotation with



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other materials in special situations in high value plants or specialty plantings. Not typically used.

- **Microcop** (copper sulfate) - For control of diseases in rotation with other materials in special situations in high value plants or specialty plantings. Not typically used.

HERBICIDES

- **Devrinol 50 DF** (napropamide) - Occasional use in shrub beds, tree circles, and other areas to prevent weed seed germination. Useful on newly planted areas.
- **XL 2G** (benefin+oryzalin) - Combination product for wider spectrum weed control. Useful in sites where liquid products are more difficult to apply. This is a primary granular pre-emergent product.

USE UP AND DO NOT RESTOCK LIST

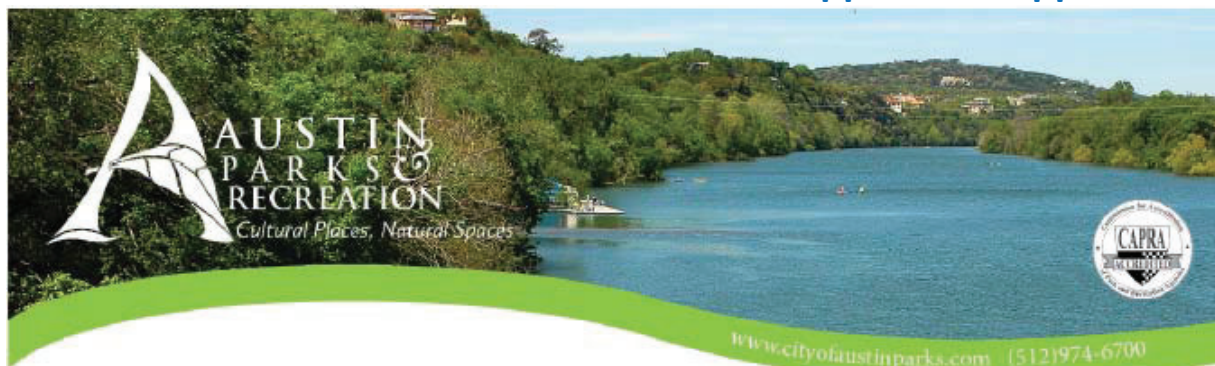
The listed materials are to be used until remaining stocks are gone and are not to be restocked.

- Casoron 4G Ronstar 2G PrePair
- B-Nine Banrot 40WP < 1 lbs. remaining.
- Cycocel Terraclor < 2 lbs.
- Truban WP < 2 lbs.




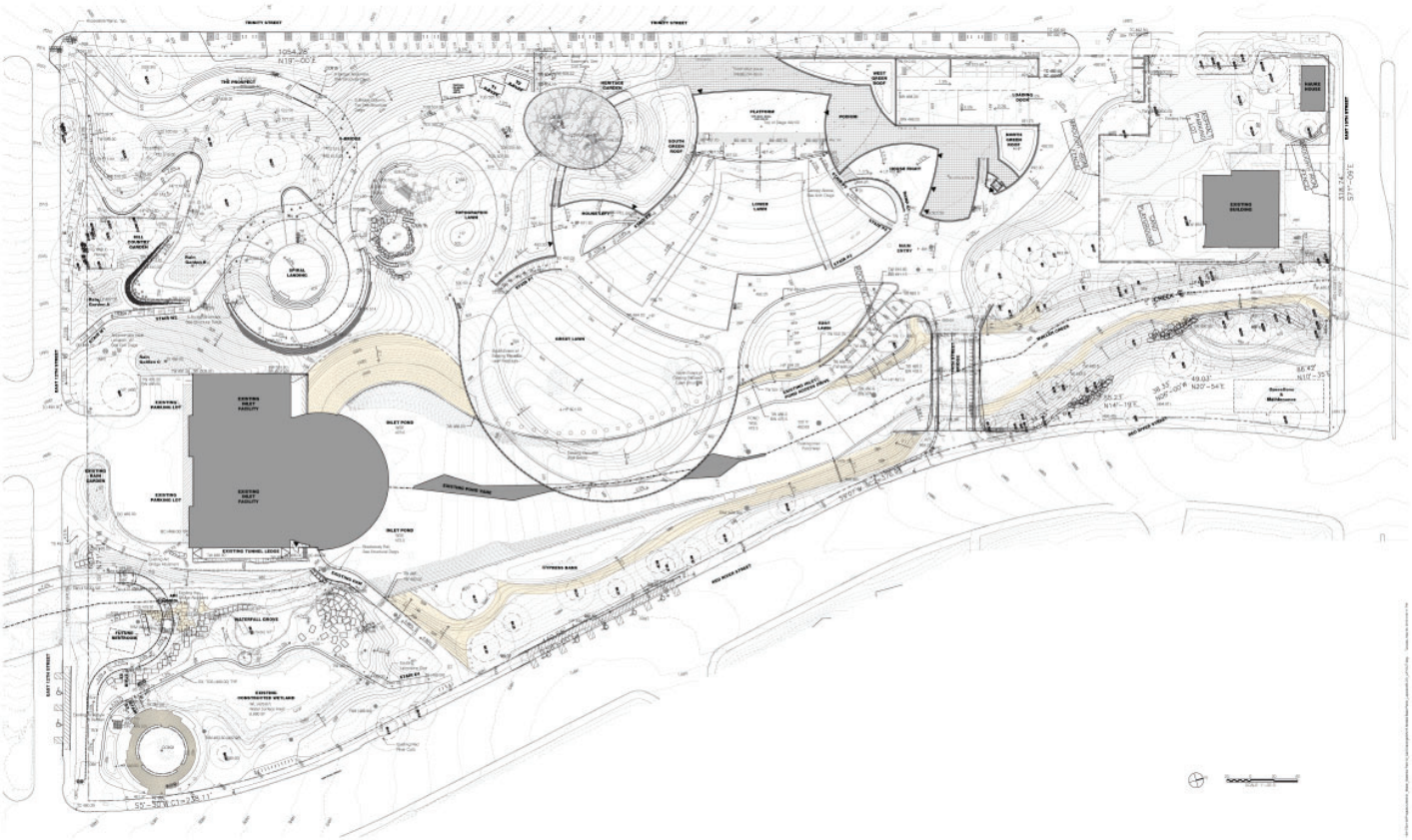
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APPENDIX 11: Form for Non-PARD Pesticide Application Approval



Application for Pesticide Use on PARD Property

APPLICANT					
Requester Name:			Commercial Operator License Number:		
Business or Organization:			Address:	City State Zip	
Applicator (s) Names (s) and License Number (s):			Phone/Fax:		
Contact individual (s):			Phone #:		
SITE					
Name/Address of Park/Site:				Specific Area Treated (Attach Map):	
CHEMICAL APPLICATION					
Purpose of Application:					
Date (s) of Application:			Area Treated (Sq. Ft. etc.):		
Method of Treatment (Include Pesticide Formulations, Dilutions, and Type of Equipment Used):					
Treatment Notification Procedures: Describe Signage, Fencing, or Other Public Notification Plans:					
Does Any Part Of Application Take Place Within An Aquatic Site, Or Within 25 Feet Of A Body Of Water? If So, Describe:					
PERMISSION					
Submit to: Austin Parks and Recreation Attention: Joe Diaz, PARD Grounds Maintenance Division IPM Coordinator, 512-391-0402, Joe.Diaz@austintexas.gov					
This application is:	APPROVED:	<input type="checkbox"/>	DENIED:	<input type="checkbox"/>	
With The Following Stipulations/Explanation:					
Approved by PARD IPM Coordinator:			Date:		
NOTE: PESTICIDE APPLICATION RECORDS (APPENDIX 9) MUST BE SUBMITTED TO G-Drive WITHIN 48 HOURS AFTER AN APPLICATION					



Date & time _____

Temperature _____

Worker Name & License # _____

Wind Direction & Velocity _____

Location					
Product Name					
EPA Registration #					
Rate per Unit					
Volume Applied per Unit					
Pests/Invasive Treated					
Total Area (square feet)					
FAA #, Equipment Used					

Additional Notes:

Appendix B

Planting Palettes



Waterloo Park Canopy











MVVA, May 2018

Waterloo Park Shrubs, Perennials, Cacti, and Succulents

Source	Latin Name	Common Name	Zone	Source	Latin Name	Common Name	Zone
N	Agave americana	Hardy Century Plant	  	N	Dasylium wheeleri	Sotol	  
N	Agave bracteosa	Squid Agave	  	N	Dichondra argentea	Silver Pony Foot	  
N	Agave lechugilla	Shindaggers	  	N	Diets bicolor	Fortnight lily	  
N	Agave ovalifolia	Whale Tongue Agave	  	N	Dryopteris ludoviciana	Southern Wood Fern	  
N	Agave parryi	Parry's Agave	  	N	Dyschoriste linearis	Snake Herb	  
N	Agave striata	Agave	  	N	Echinacea pallida	Pale Cone Flower	  
N	Ajuga spp.	Ajuga	  	N	Echinacea purpurea	Purple Coneflower	  
	Aloe 'Blue Elf'	Blue Elf Aloe	  	N	Erythrina herbacea	Coralbean	  
	Aloe maculata	Soap Aloe	  	N	Ficus pumila	Creeping Fig	  
	Anonatheca laxa	False Freesia	  	N	Glandularia bipinnatifida	Prairie Verbena	  
N	Aquilegia chrysantha var. hinckleya	Hinckley's Gold Columbine	  	N	Guara linderheimeri	Guara	  
N	Aristida purpurea	Purple Three Awn	  	N	Hamelia patens	Mexican Fire Bush	  
N	Asclepias asperula	Antelope Horn Milkweed	  	N	Hesperaloe funifera	Giant False Yucca	  
N	Asclepias tuberosa	Butterfly Milkweed	  	N	Hesperaloe parviflora	Red Yucca	  
N	Asclepias iridis	Green Milkweed	  	N	Hibiscus coccineus	Red Swamp Mallow	  
N	Bauhinia lunaroides	Anacacho Orchid Tree	  	N	Hydrangea quercifolia	Oak Leaf Hydrangea	  
N	Bauhinia mexicana	Mexican Orchid Tree	  	N	Hymenocallis litoralis	Spider Lily	  
N	Bignonia capreolata	Cross Vine	  	N	Indigofera heterantha	Himalayan Indigo	  
N	Bouteloua curtipendula	Side Oats Grama	  	N	Indigofera linderheimerana	Lindheimer's Indigo	  
N	Bouteloua gracilis 'Blonde Ambition'	Blonde Ambition Gramagrass	  	N	Ipomopsis rubra	Standing Cypress	  
	Buddleia 'Orange Seppre'	Orange Seppre Butterflybush	  	N	Koeleria macrantha	Prairie June Grass	  
	Bulbine frutescens	Orange Bulbine	  	N	Leucophyllum frutescens	Cenizo	  
	Caesalpinia gilliesii	Yellow Pride of Barbados	  	N	Liatrius punctata var. mucronata	Texas Gayfeather	  
N	Caesalpinia pulcherrima	Pride of Barbados	  	N	Linum perenne var. lewisii	Perennial Flax	  
N	Callicarpa americana	American Beautyberry	  	N	Mahonia trifoliolata	Agarita	  
N	Callirhoe bushii	Bush's Winecup	  	N	Malvastrum arborescens var. dummondii	Turk's Cap	  
N	Calypocarpus vialis	Wine Cups	  	N	Mangreda virginica	False Aloe	  
N	Carex blanda	Horseherb	 	N	Marsilea marcopoda	Bigfoot Water Clover	 
N	Carex cherokeensis	Common Wood Sedge					
N	Carex divulsa	Cherokee Sedge					
N	Carex peridentata	Berkeley Sedge					
N	Carex texensis	Meadow Sedge					
N	Cassia corymbosa	Texas sedge					
N	Chasmanthium latifolium	Senna					
N	Clematis pitcheri	Northern Sea Oats					
N	Conoclinium coelestinum	Purple Leatherflower					
N	Conoclinium greggii	Blue Mistflower					
N	Crocosmia 'Lucifer'	Greg's Mist Flower					
N	Crinum spp.	Montbretia					
N	Cuphea micropetala	Crinum Lily					
N	Dalea formosa	Batface					
N	Dalea frutescens	Feather Plume					
N	Dalea greggii	Black Dalea					
N	Dasylium texanum	Greg's Dalea					
		Texas Sotol					

KEY
Source: N = Native

 Live Oak Canopy  Partial Sun Feature  Shrub Thicket
 Wet Feature  Venue Green Roof  Venue Edge Planter

Waterloo Park Shrubs, Perennials, Cacti, and Succulents cont.

Source	Latin Name	Common Name	Zone	Source	Latin Name	Common Name	Zone
N	Melampodium leucanthum	Blackfoot Daisy	A B	N	Salvia lyrata	Lyre Leaf Sage	A
N	Melica imperfecta	Smallflower Melic	B C	N	Salvia madrensis	Forsythia Sage	B
N	Morella cerifera	Wax Myrtle	B C	N	Salvia nemorosa Plumosa	Plumed Woodland Sage	A
N	Muhlenbergia capillaris	Gulf Muhly	A B C E	N	Salvia penstemonoides	Big Red Sage	A C
N	Muhlenbergia dubia	Pine Muhly	A B C E	N	Salvia sylvestris 'May Night'	May Night Wood Sage	A
N	Muhlenbergia dumosa	Bamboo Muhly	E	N	Santolina chamaecyparissus	Lavender Cotton	A
N	Muhlenbergia linderheimeri	Linderheim's Muhly	A B C E	N	Scirpus cyperinus	Woolgrass	B C E
N	Muhlenbergia rigens	Deer Muhly	A B C E	N	Scutellaria ovata	Heart Leaved Skullcap	A
N	Muhlenbergia rigens	Deer Muhly	A B C E	N	Scutellaria suffrutescens	Pink Skullcap	A
N	Nemophila menziesii	Baby Blue Eyes	B	N	Scutellaria wrightii	Wright's Skullcap	A
N	Nemophila phalcelloides	Texas Baby Blue Eyes	B	N	Sedum spp.	Sedum	A B
N	Nemophila phalcelloides	Walker's Low Catmint	B	N	Senna corymbosa	Flowering Senna	B
N	Nepeta x faassenii 'Walker's Low'	Walker's Low Catmint	A B C F	N	Solidago rugosa 'Witchita Mountains'	Witchita Mountains Goldenrod	B
N	Nolinia texana	Beargrass	A B C	N	Sophora secundiflora	Texas Mountain Laurel	B
N	Nolina linderheimeri	Basketgrass	A B C	N	Sphaeralcea abigua	Desert Mallow	B
N	Oenothera macrocarpa	Sundrops	B C	N	Stemodia lantana	Woolly Stemodia	B
N	Opuntia engelmannii	Englemann's Prickly Pear	B C	N	Symphiocarpos orbiculatus	Coral Berry	C
N	Opuntia ellisiana	Spineless Prickly Pear	B C	N	Symphyotrichum oblongifolia	Aromatic Aster	B
N	Opuntia ficus-indica	Prickly Pear	B C	N	Tetaneuris scaposa	Four Nerve Daisy	B
N	Opuntia gomei 'Old Mexico'	Old Mexico Spineless Prickly Pear	B	N	Thelypteris kunthii	River Fern	B
N	Orbexilum pedunculatum	Sampson's Snakeroot	A	N	Tradescantia occidentalis	Spider wort	B
N	Packeria obovata	Golden Groundsel	A B C	N	Tradescantia sillamontana	Cobweb Spiderwort	B
N	Pavonia lasiopetala	Rock Rose	B C	N	Ungnadia speciosa	Mexican Buckeye	B
N	Penstemon baccharifolius	Rock Penstemon	B C	N	Veronica pectinata	Blue Wolly Speedwell	A
N	Penstemon pinifolius	Pineleaf Penstemon	B C	N	Vernonia lindheimeri var. leucophylla	Wolly Ironweed	B
N	Penstemon pinifolius 'Mesa yellow'	Pine Leaf Penstemon	B C	N	Viburnum rufidulum	Rusty Blackhaw Viburnum	B
N	Penstemon triflorus	Hill Country Penstemon	B C	N	Wedelia acapulcensis var. hispida	Zexmenia	B
N	Philadelphus coronarius	Mock Orange	B C	N	Yucca aloifolia	Spanish Dagger	B
N	Phlomis fruticosa	Jerusalem Sage	B C	N	Yucca recurvifolia	Pale Yucca	B
N	Phlox drummondii	Drummond's Phlox	B C	N	Yucca rostrata 'Sapphire Skies'	Soft Leaf Yucca	B
N	Phyla nodiflora	Frog Fruit	B C	N		Big Bend Yucca	B
N	Poa fendleriana	Mutton Grass	B C				
N	Polioanthus longifolia	Mexican Oregano	B C				
N	Prosopis glandulosa	Honey Mesquite	B C				
N	Prunus mexicana	Mexican Plum	B C				
N	Rhus copallinum	Shining sumac	B C				
N	Rhus lanceolata	Prairie Sumac	B C				
N	Rhus virens	Evergreen Sumac	B C				
N	Rosmarinus officinalis 'Prostratus'	Trailing Rosemary	A B C				
N	Rudbeckia maxima	Great Coneflower	B C				
N	Ruellia drummondiana	Wild Petunia	B C				
N	Ruellia equisetiformis	Firecracker Plant	B C				
N	Sabal minor	Dwarf Palmetto	B C				
N	Salvia 'Raspberry Delight'	Raspberry Delight Salvia	B				
N	Salvia coccinea	Scarlet Sage	A B C				
N	Salvia greggii	Gregg's Sage	A B C				
N	Salvia leucantha	Mexican Bush Sage	B				

KEY
Source: N = Native



Appendix C

Tree Ordinance Review Application





Tree Ordinance Review Application

Development Services Department

One Texas Center, 505 Barton Springs Road, 4th floor, Austin, TX 78704

Phone: (512) 974-1876 Fax: (512) 974-3010

Email: cityarborist@austintexas.gov Website: www.austintexas.gov/departments/city-arborist

ROW I.D. _____

Mapsco Pg _____

Application request* (specify all that apply):

- ☐ Tree removal (LDC 25-8-602[3])
- ☐ Critical Root Zone impacts (ECM 3.5.2 A)
- ☐ Live canopy impacts of more than 25% (ECM 3.5.2 B)

* Refer to Land Development Code (LDC) 25-8 (B)(1) and Environmental Criteria Manual (ECM) (Section 3 & App. F). Applicant understands that all impacts may threaten the health of the tree and that approval of this application does not guarantee favorable tree results.

Address and zip code of property: _____

Name of owner or authorized agent: _____

Building permit number (if applicable): _____

Telephone #: _____ Fax #: _____ E-mail: _____

Tree Species: _____ Tree location on lot: _____

Trunk size (in inches) at 4 ½ feet above ground: circumference (around) _____ or diameter (across) _____

General tree condition: ☐ Good / ☐ Fair / ☐ Poor / ☐ Dead

Reason for request: ☐ Development ☐ Tree condition ☐ Other: _____

Owner/ Authorized Agent Signature _____

Date _____

- o Proposed development projects are to include a plan view drawing that depicts the location of the tree and the planned improvements (e.g. structure, driveway, utility and irrigation lines).
- o This permit application only reviews for compliance with tree regulations.
- o The application fee must be paid prior to permit issuance. No fee is required for dead or diseased trees.

Application Determination – To be completed by City Arborist Program Personnel

- ☐ Approved ☐ *Approved With Conditions ☐ Statutory Denial (more information required) ☐ Denied

Comments _____

☐ Heritage Tree(s) ☐ A heritage tree variance is required: ☐ Administrative / ☐ Land Use Commission

Conditions of Approval: ☐ None or ☐ As described within Arborist Comments (see above); and

- ☐ Applicant agrees to plant _____ caliper inches of central Texas native trees (see ECM Appendix F) on the lot prior to obtaining a final inspection (if applicable). Trees are to have a minimum 2-inch trunk diameter. Examples include Oaks, Cedar Elm, Bald Cypress, Desert Willow, Mountain Laurel, Texas Persimmon, Mexican Plum, etc.
- ☐ Prior to development, applicant agrees to supply a root zone mulch layer and maintain tree protection fencing (chain-link, five-foot in height) throughout the project duration.
- ☐ No additional impacts are permitted within the ½ Critical Root Zone, including utility trenching.
- ☐ Provide a receipt from a certified arborist for: ☐ remedial root care ☐ any required pruning

Applicant Signature _____

Date _____

City Arborist Signature _____

Date _____

Post this document on site while any proposed work is in progress.

Conditions for approval of this application must be met within 1 year of the effective date.

5/2015

Appendix D

Lawn Specifications



SECTION 32 92 00 - LAWN

PART 1 GENERAL

1.1 SUMMARY

- A. The work of this Section all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to:

1. Review of conditions and materials affecting lawns.
2. Cover crop.
3. Removal of cover crop.
4. Sodding lawns.
5. PaveGro.
6. Warranty.
7. Coordination with other trades.
8. Testing.
9. Clean-up.
10. Restoring all lawn areas within the limit of work that are disturbed by the work of the Contract.

1.2 RELATED SECTIONS

- A. Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following:

1. Section 01 71 23 "Execution and Field Engineering."
2. Section 31 10 00 "Site Preparation, Salvage and Clearing."
3. Section 32 12 16 "Asphalt Pavement"
4. Section 32 15 00 "Granular Pavement."
5. Section 32 80 00 "Site Irrigation."
6. Section 32 91 00 "Planting Soil."
7. Section 32 93 00 "Planting and Fine Grading."

1.3 REFERENCES AND STANDARDS

- A. Materials and methods of construction shall comply with the following standards:

1. ASTM: American Society for Testing and Materials.
2. AOAH: Association of Official Agricultural Chemists.

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LAWN

3. International Society of Arboriculture.

1.4 DEFINITIONS

- A. Certified Turfgrass Sod: Certified turfgrass sod is superior sod grown from certified, high quality seed of known origin or from plantings of certified grass sprigs or stolons. It is inspected by the certification agency of the area to assure satisfactory varietal identity and purity, overall high quality and freedom from noxious weeds or excessive amounts of other crop and weedy plants at time of harvest. It may be of either one variety or composed of a mixture of two or more varieties or species. However, all seed in a mixture must be certified. The turfgrass sod must meet the area's published standards for certification.
 1. As used herein, Certified Turfgrass Sod shall also by reference be identified as:
 - a. Turfgrass
 - b. Sod
 - c. Grass
 - d. Turf
 - e. Or any combination thereof.

1.5 LINES AND GRADES

- A. The Contractor shall verify that the grade lines and grade are consistent with the Drawings and acceptable to the Landscape Architect. The Contractor shall make adjustments as necessary to establish finish grades.
- B. Grades: Protect and maintain grade stakes and location stakes until removal is acceptable to Landscape Architect. If grade stakes are not present, establish grade stakes to ensure that grades shown on the Drawings are being met.
 1. Before installing turfgrass sod verify that subgrade is positively sloped and pitched toward a drainage inlet or structure.
- C. The location and limits of lawns shall be marked prior to planting.

1.6 SUBMITTALS

- A. The planting soil shall meet the specifications noted in this Section and in Section 32 91 00 "Planting Soil."
- B. Sources for Sod: Submit sod grower location and contact information.
- C. Qualification Data: In addition to requirements of Section 01 33 00 "Submittals," provide suppliers and installer's years of experience, and a minimum of five project references.
 1. The Landscape Architect shall have the right to reject any seed or sod supplier if he/ she determines, before, during or after inspecting or receipt of seed or sod, any of the following:

- a. The seed or sod supplier's cultural practices or maintenance procedures do not meet specified standards.
- D. Installer Certificates: In addition to requirements of Section 01 33 00 "Submittals," submit for the seeding methods, including equipment to be used.
- E. Product Data: Provide manufacturer's data showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements. Work includes but is not limited to:
 - 1. Sod seed mix.
 - 2. Pavegro composition.
 - 3. Sod- Mechanical gradation test for sod soil.
 - 4. Sod – Photographs of the sod at the source
 - 5. Soil tests, if required. Refer to article 1.12 in this Section.
- F. Samples: Provide for each element of construction listed.
 - 1. Sod: Two (2) sod sections, 16" x 24" (min.), showing grass species and soil to be used in the final product.
 - 2. Pavegro: Provide duplicate one (1) gallon bags.
- G. Material Certificate: Provide for each element of construction listed:
 - 1. Sod seed mix, certified copy of mix.
 - 2. Pavegro mix.
- H. Maintenance Instructions: Provide clear, concise typewritten maintenance instructions and recommendations for year round care of all work provided under this Section.
 - 1. Maintenance Instructions shall include the following information plus any special instructions deemed necessary by the Contractor, Landscape Architect, and Construction Manager:
 - 2. Title and location of project; date of project; name, address, and telephone/ fax number of Landscape Contractor and Landscape Architect.
 - 3. Lawn Sod covered by the maintenance instructions.
 - 4. Identify by calendar month the maintenance requirements for fertilizing, irrigation, pest/disease control, mowing, and general maintenance. Indicate type and quantity of fertilizer to be used, which pests/ diseases can be anticipated for lawns, and quantity of water needed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: In addition to the requirements of Section 01 40 00 "Quality Requirements," a qualified landscape installer whose work has resulted in successful establishment of turf on at least five projects of similar size and complexity. Minimum Experience for Foreman and Installer shall be 10 years.

- B. Supplier qualifications: Minimum 10 years in business.
- C. Pre-installation Conference: A pre-installation conference with the Landscape Architect is required for the work of this section.
- D. Inspection: Inspection of turfgrass sod by the Landscape Architect may be made at the growing site at any time, but such inspection will not preclude rejection after delivery to the job site for sod that has dry base soil, bald patches greater than ½" diameter, infestation, abnormal color, abnormal blading or disease. Any turfgrass sod so rejected shall be removed from the site immediately and replaced with acceptable turfgrass sod. Inspection of turfgrass sod shall include conformity to quantity, specified nomenclature, and health requirements.
 - 1. The Landscape Architect shall have the right to reject any sod materials if he/ she determines, before, during or after inspecting or receipt of sod, for any of the following:
 - a. The sod does not meet quality standards set forth herein.
 - b. The sod supplier cannot supply the specified sod seed mix or an acceptable substitute species.
 - c. The sod does not meet the intended visual characteristics of the lawn as determined by the Landscape Architect.
 - d. The sod farm's cultural practices or maintenance procedures do not meet specified standards.
 - e. The soil medium used for growing sod does not meet the specifications.
- E. Pre Installation Conference
 - 1. The Landscape Architect, the Contractor and the Construction Manager shall attend a pre installation meeting to discuss the work of this section. Installation shall not commence until all previous work has been accepted by the Landscape Architect.

1.8 DELIVERY, STORAGE AND HANDLING

- A. In addition to the requirements of Section 01 60 00 "Product Requirements," provide the following:
 - 1. Deliver materials only after preparation for on-site seeding or sodding have been completed and accepted, including but not limited to: subdrainage system, irrigation, rough grading, utilities, soil and plant installation, decompaction or remediation of planting soils. The Landscape Architect shall determine if the site is acceptable for sodding.
 - 2. Sequence deliveries to avoid delay.
 - 3. Prohibit vehicular and pedestrian traffic on or around areas to be sodded.
 - 4. Sod shall be closely monitored for sufficient root moisture and shall be protected from sun and wind. Stored sod shall be watered and misted several times a day if necessary to maintain proper root moisture and to reduce transpiration in sunny and windy locations. Sod shall not be stored more than twenty-four hours without written acceptance by the Landscape Architect.
 - 5. Sod stored longer than twenty-four (24) hours shall be rejected and promptly removed from the site.

1.9 PROJECT CONDITIONS AND COORDINATION

- A. Utilities: Determine and mark the location of below grade utilities before starting work. Hand excavate as necessary to avoid damage. Repair all damage and restore items to their original condition as approved by the Landscape Architect at no change in Contract Amount.
- B. Planting, irrigation and hardscape work will be underway during turf installation and the Contractor shall coordinate his work with other Trades. The Contractor shall take care to avoid damaging any adjacent work. Should damage occur, the Contractor shall repair elements to the Landscape Architect's satisfaction.
- C. Sequence of Installation: Sequence installation so that trees and shrubs are installed before lawns, unless otherwise approved by the Landscape Architect. Protect installed lawns and plants and restore any disturbed areas. Complete seeding and sodding work as quickly as possible on portions of the site as they become available.
 - 1. Coordinate installation of sodded areas with installation of planting soils and plants. Refer to Section 32 91 00 "Planting Soil" and Section 32 93 00 "Planting and Fine Grading."
- D. Verify that irrigation work is installed and available, or an adequate potable watering supply is available, for watering at time of installation. If water service is discontinued, for any reason, before final acceptance, provide water as needed to maintain seeded areas in a healthy condition. Provide all equipment and manpower required for watering.
- E. Painting: Do not paint vegetation or lawns for any reason.

1.10 LONG LEAD ITEM

- A. Long Lead Time Item: The Contractor is advised that the Sod required for this project is a Custom or Contract Grown material and is a CRITICAL PATH item, requiring timely attention to meet the requirements of the Documents and Schedule. The Contractor shall consider this to be A LONG LEAD TIME ITEM.

1.11 PLANTING SEASONS

- 1. General: Planting season for sod shall be as described below. The actual planting of the sod, however, shall be done only during periods within this season that are normal for such work as determined by weather conditions, moisture content of the soil, and by accepted practice in this locality. At his option and on his responsibility, the Contractor may sod under unseasonable conditions without compensation but subject to the Landscape Architects approval as to time and methods:
- 2. Planting Seasons:
 - a. Sod: March 15 to September 30
 - b. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.12 TESTING

A. General:

1. Soil testing is required only at areas exhibiting unsatisfactory growth of sod shall be required for diagnostic purposes. Contractor shall be responsible for the costs of testing including sampling, submittal for testing, and retrieval of test results. Adhere to Landscape Architects recommended amendment(s) for unsatisfactory areas. Refer to Section 32 91 00 "Planting Soil System."

1.13 ACCEPTANCE AND MAINTENANCE

- A. Request for Acceptance: In writing, request Landscape Architects inspection for acceptance at least 10 days in advance of preferred inspection date. Do not request inspection for acceptance until work is 100% complete (not including maintenance) and in compliance with the Contract requirements.

- B. Acceptance Criteria for Sod: Create an acceptable lawn which is defined to mean a uniform, smooth lawn with well established, close stands of grass, meeting the following criteria:

1. A minimum of 6 thriving grass plants per square inch.
2. No bare or dead spots over 3" in maximum dimension.
3. No more than one bare spot for each square yard of lawn area. Free from weeds, disease, and detrimental insect infestation.
4. Roots extending four (4) inches into new root zone.

- C. Provide complete maintenance and service as required to gain Final Acceptance and to promote and maintain healthy growth including, without limitation, watering, fertilizing, liquid biological amendments, weeding, mowing, trimming, rolling, regrading, fallen leaf removal, treating for insects and disease, and other operations and work.

1. Mow to the following heights:
 - a. Lawn Sod: Maintain at 2" height.
2. Length of Maintenance Required: Completely maintain lawns for the duration of the Project and for 60 days after Final Acceptance of Project.
 - a. Final Acceptance is defined as the time at which all work has been performed and accepted by the Landscape Architect including any work noted on the "Punch List".

1.14 WARRANTY

- A. Provide written warranty agreeing to remove and replace work that exhibits defects in materials or workmanship for the specified periods. "Defects" is defined to include, but is not limited to, death, unsatisfactory growth, failure to adequately root into soil, disease, abnormal foliage density, abnormal size, abnormal color, failure to thrive, and other unsatisfactory characteristics.
- B. Lawn Replacement: Replace defective lawn with new lawn of same species, character, and quality of originally accepted work. If a replacement is unacceptable during its one year

warranty, the Contractor shall provide another replacement or, when approved by the Construction Manager, equivalent cash payment.

1. Replacement Planting Seasons: Planting for replacement and warranty work for lawns shall comply with the Planting Seasons specified herein.
- C. Warranty Period for Lawns: One (1) year from the date of Final Acceptance of the Project.
- D. Owner Responsibility and Warranty Exclusions: The Contractor's warranty shall exclude problems due to improper or inadequate maintenance, vandalism or acts of nature.
 1. During the warranty period, the Contractor shall visit the site at least three times during the growing seasons to review the conditions of the accepted work. The Contractor shall submit in writing to the Owner regarding the Owners maintenance practices and/ or any vandalism. The content of this notice shall include a list of specific plants involved, the presumed problem, and a method of remedy for the problem(s) cited. The Owner shall make reasonable efforts to correct the problems cited by the Contractor but the Owner shall not be held responsible for the Contractor's defects in materials or workmanship that result in decline or death to plants.
 2. Failure of the Contractor to make the required reviews of the site during the warranty period and to submit written notice to the Owner of maintenance defects shall negate the Contractor's ability to make a claim against the Owner for negligence of maintenance.

PART 2 PRODUCTS

2.1 PLANTING SOIL

- A. Refer to Section 32 91 00 "Planting Soil System" for Planting soil materials and handling.

2.2 PAVEGRO

- A. Install PaveGro system at Lower Lawn. Manufactured by: Trinity LW LLC, 1112 E Copeland Road, Arlington, Texas, 76011, 800-581-3117.

2.3 LAWN SOD

- A. Grass Sod: Provide strongly rooted, mature, vigorous, healthy, commercially grown sod free of weeds, other grasses, insects, pests, diseases, gravel and other deleterious matter, be of firm, tough texture, having a compact growth of grass and good root development; of a minimum two (2) years growth prior to harvest. The sod root zone shall be of good, fertile, natural field soil and free from stones and debris, and the sod shall contain sufficient moisture to maintain its vitality during transportation.
- B. Grass Sod Shall be Certified "Number 1 Quality/Premium" turf and shall be of sufficient density so that no surface soil is visible when mowed to a height of 1.5 inches (40 mm). Provide strongly rooted, mature vigorous, healthy, commercially grown sod free of weeds other grasses, diseases, gravel (greater than 3.4 mm), and other deleterious matter. At the time of sale, the turf shall contain no more than one percent undesirable grasses or clover and not more than

two weeds per 50 square yards. The thickness of the soil portion of the turfgrass sod should not exceed one-half inch (15mm).

1. Composition: Nursery grown sod composed of Latitude-36 Bermudagrass (*Cynodon dactylon* *Burtt-Davy x. transvaalensis* (L.) Pers as grown by: Thomas Turf Grass sourced only from Paige/McDade Farm. www.thomasturfgrass.com/latitude-36.
2. Thatch: Turfgrass sod shall be relatively free of thatch, up to 0.5-inch (15 mm) allowable (uncompressed).
3. Diseases, Nematodes and Insects: Turfgrass sod shall be reasonably free of diseases, nematodes and soil-borne insects. Specific nursery and/or plant materials laws may require that all sod entering inter-state commerce be inspected and approved for sale. The inspections and approval must be by the appropriate government representative of the agriculture department or office of entomologist.
4. Weeds: Nursery Grown Turfgrass Sod: shall be free of objectionable grassy and broad leaf weeds. Turfgrass sod shall be considered free of such weeds if less than 5 such plants are found per 100 square feet (10 sq m) of area. Turfgrass sod shall not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and/or brome grass.
5. Mowing Height: Before harvesting, grass sod shall be mowed uniformly at the following height: 1 inch.
6. Stripping: Provide sod machine cut to 3/4", thickness, with a maximum variation of 0.25" thicker, excluding top growth and thatch. Sod to be mowed not more than seven days prior to being cut. Provide only non-dormant, viable sod in uniform sized pads. Sod must be capable of supporting its own weight when held vertically within the top 10%. Roll or fold sod prior to lifting and handle in a manner to prevent tearing, breaking, drying, or any other damage. Deliver sod to site and begin installation within 24 hours after stripping.
 - a. Strength of Turf Sod Sections: Standard size sections of turfgrass sod shall be strong enough that it can be picked up and handled without damage.
 - b. Moisture Content: Turfgrass sod shall not be harvested or transplanted when its moisture content (excessively dry or wet) may adversely affect its survival.
 - c. Time Limitations: Turfgrass sod shall be harvested, delivered and installed/transplanted within a period of 24 hours, unless a suitable preservation method is approved prior to delivery. Turfgrass sod not transplanted within this period shall be inspected and approved by the inspecting officer or his representative prior to its installation.
7. Contractor shall submit certification from sod supplier indicating that sod shall be obtained from that supplier.
8. Sources for Sod: Only sod growers with experience producing custom sod shall be considered. Sod grower shall provide certification that they can produce sod of the quantities required for this project.

2.4 SOIL AMENDMENTS

- A. Refer to Section 32 91 00 "Planting Soil" for additives and amendments to the planting soils.

- B. Refer to Section 32 93 20 “Liquid Biological Amendments” for Liquid Biological soil amendments.

2.5 MISCELLANEOUS MATERIALS

- A. Soil and Pavement Protection. The driving of vehicles over planted and turgrass areas is expressly prohibited. Protect sub-grade, planting soil and pavement using one of the following:
1. Plywood: Provide 3/4” Grade C or better plywood for use as planking when driving vehicles or moving equipment over areas to be planted.
 2. Oriented Strand Board (OSB): Two (2) Layers of 3/4” OSB on top of 6” mulch. Provide Filter Fabric under mulch layer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and notify the Construction Manager in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not commence work associated with the installation of Lawns until all work in adjacent areas is complete and accepted by the Landscape Architect. The Contractor shall confirm that:
1. Planting soil is installed and has been accepted.
 2. Surface of planting soil is free of debris, weeds, or other deleterious materials.
 3. Fine grading is accepted and is positively pitched to a drainage inlet or structure.
 4. Drain Inlet Assembly and Drainage Mat are installed and accepted.
 5. Utilities have been installed and accepted.
 6. Irrigation main lines have been installed and accepted.
 7. Verify that the irrigation system can be activated. If not, verify that there is a sufficient means for on-site watering of installed turfgrass.
 8. Steel edging for adjacent paving has been installed and accepted.
 9. Area is free of invasive species of the type and to the extent described in Article 3.6 of this Section.

3.2 PLANTING SOIL PLACEMENT

- A. See Section 32 91 00 “Planting Soil” for execution requirements and limitations. Maintain at all times during the planting operations at least one stockpile of planting soil to complete the following work which is in addition to the requirements for finish grade described in Section 32 93 00 “Planting and Fine Grading.”

1. Place and spread approved planting soil to repair areas that have settled and to ensure that the completed work will conform to the lines, grades and elevations indicated on the Drawings. Ensure that there is proper drainage in an uninterrupted pattern free of hollows, pockets, pools, or other low areas.
2. Prepare planting soil for sod placement by carefully scarifying, harrowing or raking. Remove all stiff clods, lumps, litter and other foreign material and stones over 1 inch in diameter and dispose of legally off the site. Areas of planting soil shall also be free of smaller stones in excessive quantities as determined by the Landscape Architect. During the rolling fill all depressions caused by settlement with additional planting soil and then regrade and roll until the surface presents a smooth, even and uniform finish and is up to the required grade.
3. No planting soil shall be worked, handled, or otherwise disturbed when wet or frozen. Refer to Section 32 91 00 "Planting Soil."
4. Use light track equipment with a maximum PSI of 4.

3.3 PAVEGRO PLACEMENT

- A. Install PaveGro per details and manufacturers installation instructions. Ensure that subgrade properly drains prior to placement.

3.4 SODDING PREPARATION

- A. Areas of new sodding: Provide and set sufficient grade stakes to insure correct line and grade of finish grade. See Section 01 73 29 "Execution and Field Engineering" for staking requirements.
- B. Immediately before placing planting soils, any sticks, stones, or foreign material three inches or greater shall be removed from the subgrade. Large stones and/or boulders shall be buried eighteen inches below finished grade.
- C. Harrow or otherwise loosen the surface of the subgrade to a depth of 3-4 inches.
- D. In areas that have been severely compacted, as determined by the Landscape Architect, scarify to a depth of 12 inches by approved methods. Perform percolation tests to confirm soils have been de-compacted to create an acceptable free draining condition for the lawn soils.
- E. Protect new existing site improvements from damage due to planting operations. Repair all damage and restore items to their original condition as approved by Landscape Architect at no change in Contract Amount.

3.5 SOD INSTALLATION

- A. General: Limit of sodding shall be as shown on the Drawings. All areas on the plan are to be sodded only after written approval of the finished grading or as directed by the Landscape Architect.
- B.

1. Perform an examination of work areas as described in this Section, Part 3.
 2. Cut, deliver, and install sod within a 24-hour period.
 3. Do not harvest or transport sod when moisture content may adversely affect sod survival. Protect sod from sun, wind, and dehydration prior to installation.
 4. Do not lay dormant sod or install sod on wet or frozen soil.
 5. Do not tear, stretch, or drop sod during handling and installation.
 6. Scarify top 2" of planting soil and place sod immediately.
- C. Sod Placement: Moisten the upper 5 to 6 inches of soil several days before sodding and dampen soil with a mist immediately prior to placing sod. Install initial row of sod in a straight line, beginning at bottom of slopes, and lay sod perpendicular to slope direction. Place subsequent rows parallel to and lightly against the previously installed row. Lay sod to form a solid mass with close joints.
1. No space between joints should be greater than 1/4" by 1/4". Fill any space between joints to level with High Use Turf planting soil mix.
 2. Cut sod to conform and fit tightly with adjacent element.
 3. Butt ends and sides of sod strips; do not overlay edges. Stagger strips to offset joints in adjacent courses.
 4. Set the top of the sod pad flush with pavement edge restraint.
 5. On slopes over 10% gradient, stake sod pads in place to prevent movement.
 - a. Sod stakes shall be galvanized, 9 gage, 6" long x 2" wide, and shall be manufactured for this use.
 - b. Place stakes at corners of sod pad and at edges as necessary to prevent uplift or rolling of sod.
 6. Rolling: Press sod firmly into contact with the plant bed by tamping, rolling, or by other methods approved by Landscape Architect to eliminate air pockets, provide true and even surfaces, ensure knitting and protect all exposed sod edges, but without displacement of the sod or deformation of the sod surface. Sod surface shall be smooth and free of depressions or lumps, and without gaps, seams and bare patches. Care shall be taken to ensure that soil compaction does not result from sod rolling.
 7. Mowing: The first mowing of sodded areas shall not be done until the sod is firmly rooted, as determined by the Landscape Architect, and securely in place. Not more than 33% of the grass leaf shall be removed by the initial or subsequent mowing.

3.6 INVASIVE SPECIES CONTROL

- A. Inspect all sodded areas, disturbed areas and areas throughout the site and within 1,500 linear feet of all edges of the Limit of Work which are accessible to the Contractor every two weeks during the construction and establishment period to check for the presence of invasive or weedy species. Remove/kill material within 14 days by hand pulling. If visibly flowering, the weed must be physically removed. Bag and remove off-site. Do not compost on site.
- B. Common weeds include, but are not restricted to, the following:

1. Dallis grass (*Paspalum dilatatum*)
2. Johnsongrass (*Sorghum halapense*)
3. Buffelgrass (*Cenchrus ciliaris*)
4. Giant ragweed (*Ambrosia trifida*)
5. Thistles (*Cirsium* spp.)
6. Bastard cabbage (*Rapistrum rugosum*)
7. Cocklebur (*Xanthium strumarium*)
8. King Ranch bluestem (*Bothriochloa ischaemum*)
9. Old World bluestems (*Dicanthium* spp.)
10. Sandbur (*Cenchrus spinifex*)
11. Junglerice/barnyardgrass (*Echinochloa* spp.)
12. Pigweed (*Amaranthus* spp.)

3.7 WATERING

A. Watering of Lawn Areas

1. First Week: Water sod thoroughly with a fine spray. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least 2 inches.
2. Second and Subsequent Weeks: The Contractor shall water the lawn as required to maintain adequate moisture, in the upper 5 inches of soil, necessary for the promotion of deep root growth.
3. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment.
 - a. In the establishment period, use fine droplets to water sod.

3.8 REPAIR OF INSTALLED LAWNS

- A. If lawn is damaged, remove damaged materials and replace with sod, as originally approved and installed.
- B. If lawns exhibit unsatisfactory growth, perform soil testing for chemical properties, compaction and infiltration rates. Adhere to Landscape Architects recommended remediation. Remediation may include, but is not limited to, soil amendments, LBA treatments and soil decompaction.

3.9 CLEANUP, PROTECTION AND EXCESS MATERIALS

- A. Surround the area of new sod with flag rope on stakes to minimize foot traffic in sod area during and after sod installation.
- B. Maintain flag rope on stakes for course of remaining construction and provide other temporary protection as may be necessary to ensure work is without damage or deterioration after installation.
- C. Store materials and equipment remaining on site in locations which do not interfere with the Owner's maintenance of accepted lawns or other construction operations.
- D. The Contractor shall be responsible for keeping all paving and building surfaces clean during seeding and sodding operations.
- E. Protection of Drainage System: Protect drainage system at all drain inlets to prevent silt, materials or debris caused by planting operations from entering the drainage system.
- F. Following the final acceptance of lawns, the Contractor shall immediately remove from the site all materials and equipment not required for any other planting or maintenance work.

PART 4 ESTABLISHMENT AND MAINTENANCE

4.1 MOWING

- A. When grass has grown to at least 1/3 of an inch higher than the recommended height of 1 to 2 inches (i.e., grass has grown to 2 1/2 inches tall versus a recommended height of 2 inches), begin mowing.
- B. Avoid removing more than 1/3 of the total grass blade length at any single mowing.
- C. Certify all mowing equipment meets emissions levels set by the EPA.
- D. For required Project maintenance, see Article 1.12 of this Section.

END OF SECTION 32 92 00

Appendix E

Irrigation Control Plan



Placeholder
To Be Included

Appendix F

Glossary



APPENDIX F - GLOSSARY

Arborist – see Staff/Staffing

ATP – Adenosine triphosphate, coenzyme used as an energy carrier in the cells of all known organisms; the process in which energy is moved throughout the cell

B&B – balled and burlapped plant material

Bacteria – Single-cell organisms and the most numerous inhabitant of agriculture, with populations ranging from 100 million to 3 billion in a gram. They are capable of very rapid reproduction by binary fission (dividing into two) in favorable conditions. One bacterium is capable of producing 16 million more in just 24 hours. Most soil bacteria live close to plant roots and are often referred to as rhizobacteria or Plant Growth Promoting Bacteria (PGPB)

Border cells – Border cells and border-like cells are released from the root tip as individual cells and small aggregates, or as a group of attached cells. These are viable components of the root system that play a key role in controlling root interaction with living microbes of the rhizosphere. As their separation from root tip proceeds, the cells synthesize and secrete a hydrated mucilage that contains polysaccharides, secondary metabolites, antimicrobial proteins and extracellular DNA (exDNA).

Chloroplast – Organelles, specialized subunits, in plant and algal cells. Their main role is to conduct photosynthesis, where the photosynthetic pigment chlorophyll captures the energy from sunlight, and stores it in the energy storage molecules ATP and NADPH while freeing oxygen from water. They then use the ATP and NADPH to make organic molecules from carbon dioxide in a process known as the Calvin cycle. Chloroplasts carry out a number of other functions, including fatty acid synthesis, much amino acid synthesis, and the immune response in plants.

Creek Delta – refers to the improvements done to the trails along Waller Creek

Establishment period – typically the first three to five years after planting, though some landscapes (such as woodlands) may take five to seven or more years

Exudates: Plant roots exude a variety of molecules into the rhizosphere, including acids, sugars, polysaccharides and ectoenzymes; this can account for 40% of root carbon. Exudation of these compounds has various benefits to the plant and to the microorganisms of the rhizosphere.

Flood bench – flat part of floodplain closest to the stream or river channel and above the banks of the waterway which slows high velocity flows when the waterway overflows its banks

Floodplain – a flat or nearly flat land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high discharge

Function-driven landscapes – refers to planting areas that are not intended for heavy use, they function as ecological restoration, erosion control, wildlife habitats, and/or stormwater management. Aesthetics for these areas are secondary to their function.

General manager – see Staff/Staffing

Hardscape – general term referring to paved surfaces, trails, and bridges

Ecologist – see Staff/Staffing

Horticulturist – see Staff/Staffing

Integrated pest management (IPM) – a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. IPM is site-specific in nature, with individual tactics determined by the particular crop/pest/environment scenario. The IPM approach places an emphasis on the reduction of pesticide use and the implementation of preventative and alternative control measures.

Invasive species – a plant or animal that is not native to the ecosystem under consideration and that causes or is likely to cause economic or environmental harm or harm to human, animal, or plant health

Maintained/Urban landscapes – landscapes that receive regular maintenance to achieve a desired aesthetic; examples are lawn areas and planting beds

Maintenance staff – see Staff/Staffing

Managed landscapes – landscapes that receive infrequent maintenance, enough to ensure ecological health and function of the landscapes and safety of visitors, and are monitored for potential damage and risks; an example would be natural planting areas

Manually – using physical labor, tools, and/or means (e.g. compared to chemical methods)

Mycorrhizae (VAM) – Mycorrhizae form a mutualistic relationship with the roots of most plant species. This mutualistic association provides the fungus with relatively constant and direct access to carbohydrates, such as glucose and sucrose. The carbohydrates are translocated from their source (usually leaves) to root tissue and on to the plant's fungal partners. In return, the plant gains the benefits of the mycelium's higher absorptive capacity for water and mineral nutrients due to the comparatively large surface area of mycelium: root ratio, thus improving the plant's mineral absorption capabilities

Native plant – vegetation native to the EPA Level III ecoregion of the site or known to naturally occur within 200 miles (321.87 kilometers) of the site. Naturally occurring hybrids, varieties, and cultivars of species native to the ecoregion are acceptable.

Natural planting areas – a type of landscape within the Waterloo Greenway that features a mix of trees, shrubs, forbs, grasses, and perennials and is largely left to grow/function without human input, except for maintenance to ensure visitor safety and ecological health and function

Non-traditional park landscapes – landscapes such as wetlands, steep slopes, meadows, and natural woodlands that are typically not found in urban parks

Overbank – a deposit of sediment on the flood plain of a river

Photosynthesis – Process used by plants and other organisms to convert light energy, normally from the Sun, into chemical energy that can be later released to fuel the organisms' activities

Pest – an insect, plant, animal, pathogen, or any other undesirable living organism that threatens the health, structure, or safety of other living organisms.

Pesticide – a chemical used to control or eradicate insects, plants, animals, pathogens, and any other undesirable living organisms.

Post-establishment period – follows the establishment period; by this time plants will be established at the site, e.g. good root growth, healthy condition, etc.

Rhizosphere – The rhizosphere develops as the root tip penetrates the soil environment, and a well-characterized complex of carbohydrates, proteins and small metabolites is released from the root cap into the extracellular matrix (Baetz and Martinoia 2013; Vermeer and McCully 1982)

Rubisco – An enzyme involved in the first major step of carbon fixation, a process by which atmospheric carbon dioxide is converted by plants to energy-rich molecules such as glucose.

Site features – amenities and other elements throughout the site, such as benches, trash receptacles, railings, water fountains, and lighting; does not include hardscapes, landscapes, or utilities

Site user – an individual who is expected to occupy, work at, or pass through the site. Users may visit the site regularly or periodically. Site users will range in age, ethnicity, and socioeconomic status, but all users' needs should be considered.

Site supervisor – see Staff/Staffing

SITES – a sustainable rating program for landscapes developed by a joint effort of the American Society of Landscape Architects, The Lady Bird Johnson Wildflower Center at The University of Texas at Austin, and the United States Botanic Garden

Softscape – general term referring to plantings, including turf, trees, gardens, and woodlands

Soil Texture – Qualitative classification tool used in both the field and laboratory to determine classes for agricultural soils based on their physical texture

Staff/Staffing – personnel working on maintenance, operations, programming, and management of the WGD. Personnel include the following:

- **Arborist** – staff that are expert in the cultivation, management, and study of trees. This individual must be certified by the International Society of Arboriculture (ISA).
- **Ecologist** – staff that has knowledge of plant distribution across the landscapes and an understanding of the environmental impact of plants and other organisms that interact with them.
- **Horticulturist** – staff certified as a professional horticulturist through the American Society of Horticultural Science. They have an in-depth knowledge of plants and have been trained to properly care for them. The horticulturist will be familiar with the plants selected for the WGD and be able to identify invasive species that are common in Austin.
- **General manager** – staff person responsible for overseeing operations related to special events and programs
- **Maintenance staff** – grounds staff who will be performing both unskilled and semi-skilled tasks. Maintenance staff may also provide horticultural support under supervision
- **Site supervisor** – staff person responsible for overseeing maintenance work
- **Trades staff** – person certified to perform high-level maintenance tasks, such as plumbing, electrical work, pavement repairs, playground equipment repairs, or operate certain pieces of equipment.

Standards of care – guidelines for how often and what type of maintenance work will be performed

Sun Energy – radiant light and heat from the sun

Trades staff – see Staff/Staffing

Traditional park landscapes – landscapes such as turf/grass and planting beds that are commonly found in urban parks

User – see “Site user”

Vegetation and Soil Protection Zones (VSPZs) – areas identified during the pre-design phase that will be

protected from all disturbances throughout the construction process to prevent damage to vegetation, soil structure, and function. Refer to SITES section P2.3 for requirements of VSPZs.

Waller Creek – the Creek itself; in this document refers to the Creek only

Waterloo Greenway Conservancy (WGC) – non-profit that will manage the operations and maintenance of the Waterloo Greenway in partnership with the City of Austin

Waterloo Greenway – refers to the Creek and all the improvements surrounding the Creek

Wetlands – areas that are inundated or saturated by surface or ground water (e.g., swamps, marshes, bogs) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated conditions (Clean Water Act, U.S. Code of Federal Regulations 40 CFR 230.3).

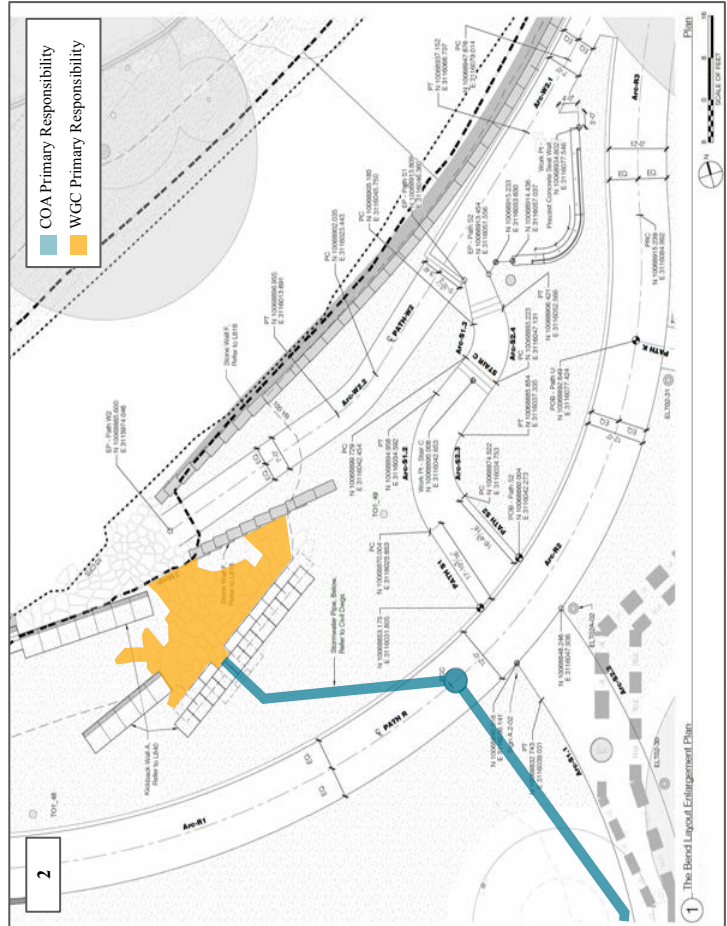
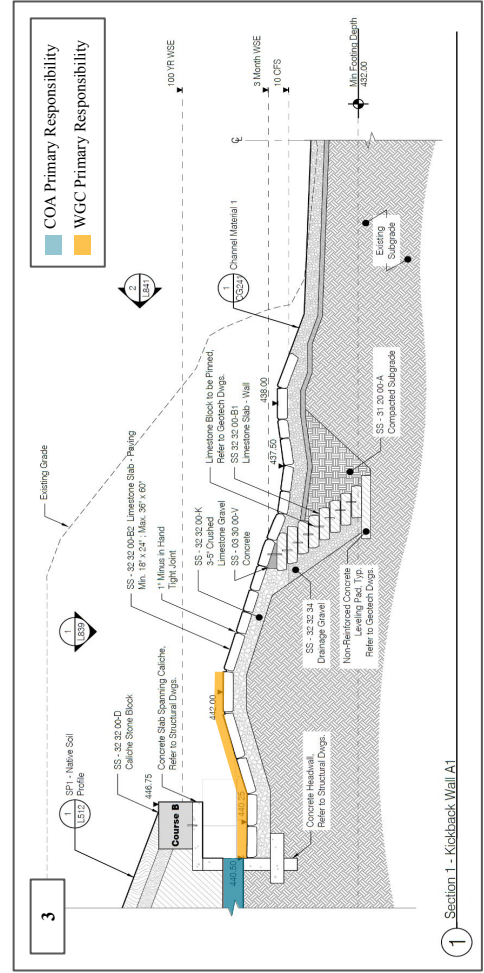
ATTACHMENT C

**PALM PARK STORMWATER FACILITY SHARED MAINTENANCE
RESPONSIBILITIES**

Palm Park Stormwater Facility Shared Maintenance Responsibilities

The maintenance responsibilities of the Palm Park stormwater outfall facility shall be as follows:

1. The area in blue represent enclosed pipes and manholes that are transporting stormwater from the right-of-way to the outfall at Waller Creek. These areas will be the City's responsibility to maintain.
2. The area in orange represents surface-level stone infrastructure at the outfall of the stormwater pipe. Maintenance responsibilities such as regular debris removal, landscape maintenance, and graffiti/vandalism mitigation around the outfall will fall onto Waterloo Greenway Conservancy.
3. WGC and CoA will continue to regularly coordinate on the maintenance and upkeep of this infrastructure.



Figures 1-3 (numbered in counterclockwise order): CS107 and CS108 (Figure 1), L904 (Figure 2), and L840 Section 1 (Figure 3) of the 100% Construction Documents Civil Engineering Site Plan Drawings depicting the Palm Park Stormwater Outfall Facility, referred to as The Bend/The Spring in the Operating and Management Agreement (Please note that this figure is a general visual representation of the shared maintenance responsibilities for this stormwater facility)