



AGENDA

TOWN OF FLOWER MOUND PLANNING AND ZONING COMMISSION MEETING

OCTOBER 8, 2018

FLOWER MOUND TOWN HALL
2121 CROSS TIMBERS ROAD
FLOWER MOUND, TEXAS

AN AGENDA INFORMATION PACKET IS AVAILABLE FOR PUBLIC INSPECTION
ONLINE AT www.flower-mound.com/AgendaCenter

A. **CALL TO ORDER: 6:30 P.M.**

B. **INVOCATION AND PLEDGE OF ALLEGIANCE**

C. **PUBLIC COMMENT**

The purpose of this item is to allow the public an opportunity to address the Commission on issues that are not the subject of a public hearing. Items requiring a public hearing are clearly marked as such on the agenda, and citizens and visitors will be allowed to speak on those items during the public hearing.

D. **ELECTION OF OFFICERS**

- a. Chair
- b. Vice Chair

E. **REGULAR ITEMS**

1. *Minutes of September 24, 2018*

Consider approval of the minutes of the September 24, 2018, Planning and Zoning Commission Work Session and Regular Session.

2. *SP18-0006 – Home2Suites River Walk*

Consider a request for a Site Plan to develop a hotel. The property is generally located in the southwest corner of Central Park Avenue and River Walk Drive.

3. *SP18-0010 – Fire Station No. 7*

Consider a request for a Site Plan to develop a fire station with certain waivers and exceptions to the Code of Ordinances. The property is generally located west of Skillern Road and north of Wichita Trail.

4. *MPA18-0006 – Section 8.0, Water Plan*

Public Hearing

Public Hearing to consider a request for a Master Plan Amendment to amend Section 8.0, Water Plan, of the Master Plan to adopt the Lakeside Reuse Water Master Plan to meet the Town of Flower Mound's reuse water system infrastructure needs over the build-out of the system located within the Lakeside Business District.

F. ADJOURNMENT

I do hereby certify that the Notice of Meeting was posted on the bulletin board in Town Hall of the Town of Flower Mound, Texas, a place convenient and readily accessible to the general public at all times, on the following date and time: October 4, 2018, at 3:15 p.m., at least 72 hours prior to the scheduled time of said meeting.

LauriAnn Cash, Executive Assistant

Pursuant to Section 551.071 of the Texas Government Code, the Planning and Zoning Commission reserves the right to consult in closed session with its attorney and to receive legal advice regarding any item listed on this agenda.

The Flower Mound Town Hall and Council Chambers are wheelchair accessible. Requests for accommodations or interpretive services must be made at least 48 hours prior to this meeting by contacting Planning Services at (972) 874-6350 .
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THE FLOWER MOUND PLANNING & ZONING COMMISSION MEETING HELD ON THE 24TH DAY OF SEPTEMBER, 2018, IN THE FLOWER MOUND TOWN HALL, LOCATED AT 2121 CROSS TIMBERS ROAD IN THE TOWN OF FLOWER MOUND, COUNTY OF DENTON, TEXAS, AT 6:30 PM

The Planning & Zoning Commission met in a work session and regular session with the following members present:

Perfecto Solis	Chair
Laile Neal	Vice Chair
Brad Ruthrauff	Commissioner, Place 1
David Johnson	Commissioner, Place 4
Albert Picardi	Commissioner, Place 5
Laura Dillon	Commissioner, Place 6
Heth Kendrick	Commissioner, Place 8
Rob Rawson	Commissioner, Place 9

Constituting a quorum with the following members absent:

Vacant	Commissioner, Place 3
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(Places 8 and 9 of the Commission do not vote on items unless they sit in place of one of the regular members, Places 1-7.)

And the following members of Town staff present:

Ashley Dierker	Town Attorney
Tommy Dalton	Assistant Town Manager
Chuck Russell	Town Planner
Robert Pegg	Engineering Manager
Poornima Kashyap	Senior Planner
Richard Brown	Senior Planner
Cindi Price	Executive Assistant

i. WORK SESSION (Executive Conference Room): 6:00 P.M.

a. Update regarding public email communication process.

A. CALL REGULAR SESSION TO ORDER (Council Chambers): 6:30 P.M.

B. INVOCATION AND PLEDGE OF ALLEGIANCE

C. PUBLIC COMMENT

There were none.

D. REGULAR ITEMS

- 1. Consider approval of the minutes of the August 27, 2018, Planning and Zoning Commission Regular Session.**

Commission Deliberation

Commissioner Johnson moved to approve the August 27, 2018, minutes as written. Vice Chair Neal seconded the motion.

VOTE ON THE MOTION

AYES: Dillon, Picardi, Neal, Johnson, Ruthrauff

NAYS: None

ABSTAIN: Rawson

ABSENT: None

The motion passed with a vote of 5-0-1.

2. **Public Hearing to consider a request for a Specific Use Permit No. 452 (SUP18-0001 - Tidal Wave Car Wash) to permit an automatic car wash, with an exception to Section 82-242, "Street buffer landscaping," of the Code of Ordinances, and a waiver to certain Architectural Standards in the Town's Urban Design Plan. The property is generally located south of Flower Mound Road and east of Gerault Road.**

Staff Presentation

Richard Brown, Senior Planner

Applicant Presentation

Martie Murphy, SHJ Construction Group
Matt Moore, Clay Moore Engineering

In Support:

Vaughn Miller, 25 Highland Park Village, Dallas

In Opposition:

Kier Johnson, 1301 Paprika, Flower Mound

Close Public Hearing

Commission Deliberation

Commissioner Picardi moved to recommend approval of SUP18-0001 – Tidal Wave Car Wash as presented. Commissioner Johnson seconded the motion, with the stipulation that either the applicant or the Town provide a measured noise study at the time of Certificate of Occupancy.

VOTE ON THE MOTION

AYES: Johnson, Picardi

NAYS: Ruthrauff, Rawson, Neal, Dillon

ABSTAIN: None

ABSENT: None

The motion failed with a vote of 2-4.

3. **Public Hearing to consider a request for rezoning (ZPD18-0006 – Townlake East) from Agricultural District (A) to Planned Development District No. 166 (PD-166) for a cluster development with certain modifications and exceptions to the Code of Ordinances. The property is generally located south of Cross Timbers Road and east of Flower Mound Road.**
4. **Consider a request for a Development Plan (DP18-0005 – Townlake East) to develop a residential subdivision. The property is generally located south of Cross Timbers Road and east of Flower Mound Road.**

Staff Presentation

Chuck Russell, Town Planner

Applicant Presentation

Mike Boswell, Toll Brothers

In Support:

Nancy Kleckner, 2608 Wisdom Creek, Flower Mound
Jim Linker, 2504 Cross Haven, Flower Mound
Katie Mayer, 3612 Burlington, Flower Mound

Submitted a card In Support, but chose not to speak:

Robert Stanley, 4504 Darlington, Flower Mound

In Opposition:

William Canova, 4600 Darlington, Flower Mound
Alan Magill, 4508 Caddo Maple Way, Flower Mound
Amy Canova, 4600 Darlington, Flower Mound

Submitted a card In Opposition, but did not wish to speak:

Robert Redden, 4604 Darlington, Flower Mound
Robyn Redden, 4604 Darlington, Flower Mound
Srikanth Katuru, 4504 Blackjack, Flower Mound
Hemanth Kumar Kamalanathan, 4505 Blackjack, Flower Mound

Questions of an Informational Nature:

Paul Stone, 4100 Broadway, Flower Mound

Close Public Hearing

Commission Deliberation (ZPD18-0006)

Commissioner Johnson moved to recommend approval of ZPD18-0006 – Townlake East as presented. Vice Chair Neal seconded the motion.

VOTE ON THE MOTION (ZPD18-0006)

AYES: Dillon, Picardi, Neal, Johnson, Rawson, Ruthrauff

NAYS: None

ABSTAIN: None

ABSENT: None

The motion passed with a vote of 6-0.

Commission Deliberation (DP18-0005)

Commissioner Johnson moved to recommend approval of DP18-0005 – Townlake East as presented. Commissioner Ruthrauff seconded the motion.

VOTE ON THE MOTION (DP18-0005)

AYES: Ruthrauff, Rawson, Johnson, Neal, Picardi, Dillon

NAYS: None

ABSTAIN: None

ABSENT: None

The motion passed with a vote of 6-0.

[Chair called for a 10-minute break.]

- 5. Public Hearing to consider a request for rezoning (ZPD17-0003 - NEM Senior Living) from Retail District-1 (R-1) to Planned Development District No. 154 (PD-154) with age-restricted, high-density residential use, and with certain modifications and exceptions to the Code of Ordinances. The property is generally located south of Rippy Road and east of Long Prairie Road.**

Staff Presentation

Poornima Kashyap, Senior Planner

Applicant Presentation

Randi Rivera, G & A McAdams

In Support:

Paul Stone, 4100 Broadway, Flower Mound

In Opposition – None

Close Public Hearing

Commission Deliberation

Vice Chair Neal moved to recommend approval of ZPD17-0003 – NEM Senior Living as presented. Commissioner Johnson seconded the motion.

VOTE ON THE MOTION

AYES: Dillon, Picardi, Neal, Johnson, Rawson

NAYS: Ruthrauff

ABSTAIN: None

ABSENT: None

The motion passed with a vote of 5-1.

6. Consider a request for a Development Plan (DP18-0003 – Sunset Point at Twin Coves, previously Ridge Bluff Estates) to develop a residential subdivision. The property is generally located west of Simmons Road and south of Holly Lane.

Staff Presentation

Poornima Kashyap, Senior Planner

Applicant Presentation

Peter Edwards, Development Design Consultants

Commission Deliberation

Vice Chair Neal moved to recommend approval of DP18-0003 – Sunset Point at Twin Coves as presented. Commissioner Johnson seconded the motion.

VOTE ON THE MOTION

AYES: Ruthrauff, Rawson, Johnson, Neal, Picardi, Dillon

NAYS: None

ABSTAIN: None

ABSENT: None

The motion passed with a vote of 6-0.

E. ANNOUNCEMENT FROM CHAIR

Chair Solis and the commissioners offered their congratulations and best wishes to Cindi Price on her retirement. Chuck Russell presented her with a gift.

F. ADJOURNMENT: 10:57 P.M.

TOWN OF FLOWER MOUND, TEXAS

Chuck Russell, Town Planner

ATTEST:

Cindi Price, Executive Assistant

DRAFT



PLANNING AND ZONING COMMISSION AGENDA ITEM NO: 2

DATE: October 8, 2018

FROM: Poornima Kashyap, Senior Planner

ITEM: **Consider a request for a Site Plan (SP18-0006 - Home2Suites River Walk) to develop a hotel. The property is generally located in the southwest corner of Central Park Avenue and River Walk Drive.**

I. ITEM SUMMARY

This application has been reviewed by DRC and determined to be ready for consideration by the Planning and Zoning Commission. There are no outstanding issues.

This application will require final action by the Planning and Zoning Commission.

II. APPLICATION ANALYSIS

The purpose of this request is to obtain site plan approval to develop a four-story, 67,868-square-foot hotel to be located within The River Walk at Central Park. A replat application to subdivide Lot 2, Block I, in order to create a 1.227 acre lot for the proposed hotel and associated parking is under review by staff and will be brought forward for Planning and Zoning Commission consideration in the near future. Building permits for the proposed building will be issued only upon approval of the replat application.

The site plan depicts the hotel and associated parking to be located at the southwest corner of Central Park Avenue and River Walk Drive. The proposed building will contain 100 lodging rooms, dining area, indoor pool, exercise room, approximately 1,200 square feet of lease space for retail uses and other guest amenities (see Attachment A(2)). Primary entrance to the hotel is from west façade. The hotel requires 100 parking spaces and the site plan depicts 36 on-site parking spaces, 35 on-street parking spaces adjacent to the hotel, and another 130 parking spaces (not counted towards meeting required parking for other approved/existing uses) located within 500 feet of the entrance to the hotel.

The landscape plan depicts required plantings and screening as required by The River Walk development standards. The building materials, colors, and architecture complements approved/existing buildings within the River Walk. The east elevation along River Walk Drive includes secondary entrance to the hotel, retail lease space with outdoor seating areas, and enhanced landscape and hardscape elements to create a vibrant sidewalk environment. The site plan, landscape plan and elevations

comply with The River Walk development standards and other applicable Town standards.

III. ATTACHMENTS

A. Background Information

1. Vicinity Map
2. Letter of Intent

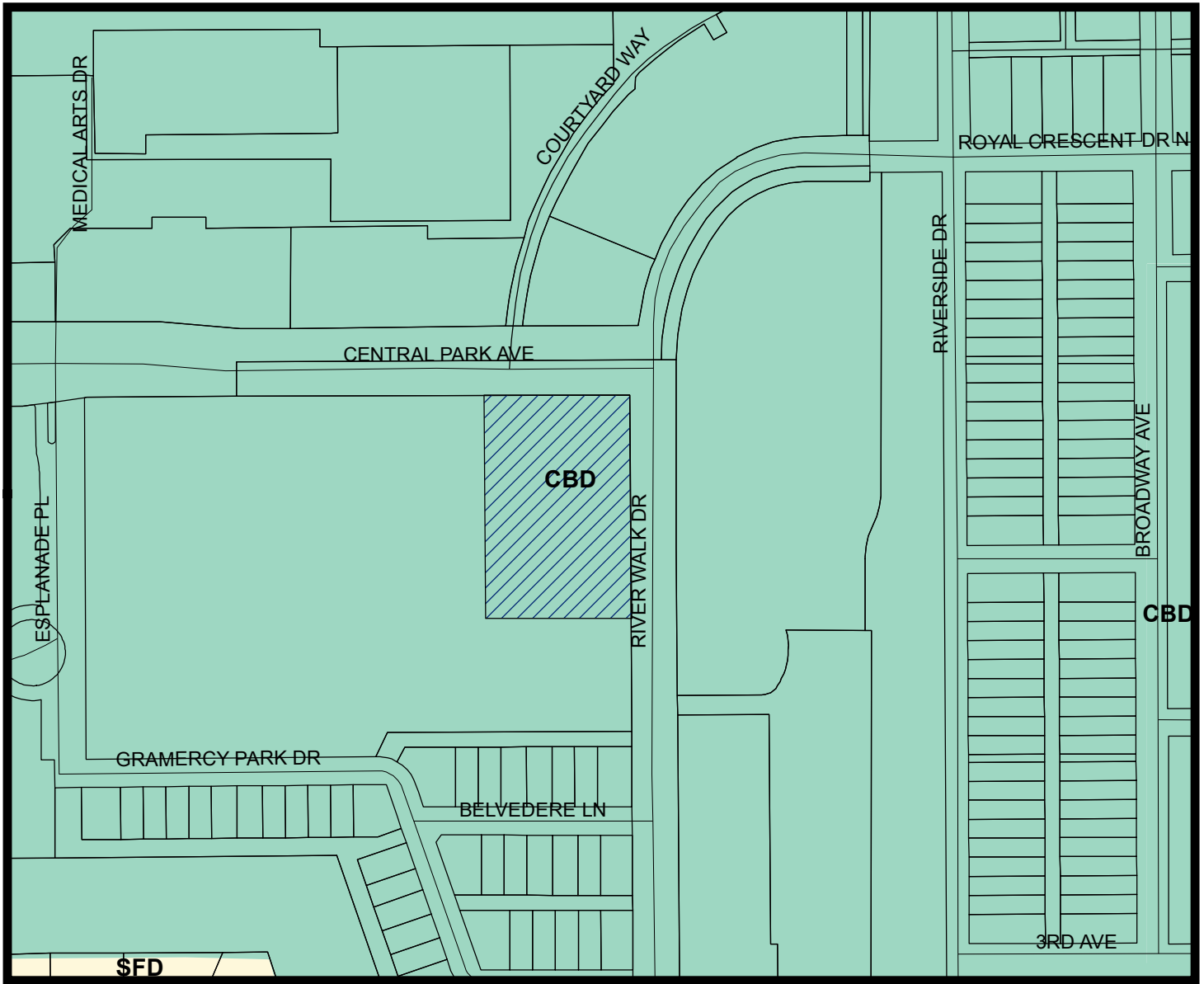
B. Application Details

1. Site Plan Package



Vicinity Map

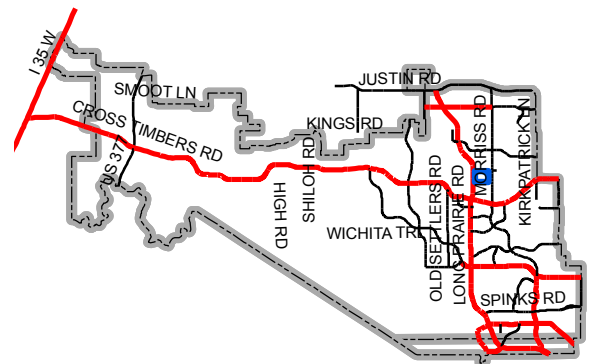
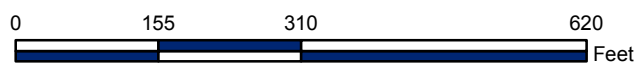
Reference Project: SP18-0006



LEGEND

Central Business District Single Family Density

Subject Property



Map Location



September 10, 2018

Mrs. Poornima Kashyap, Senior Planner
 Town of Flower Mound
 2121 Cross Timbers Road
 Flower Mound, TX 75028

RE: HOME2SUITES – Site Plan Application

Dear Poornima:

The Patel family, dba Flower Mound RW, LLC is acquiring approximately 1.3 acres of land in the River Walk at Central Park. The property is located in the southwest corner of Central Park Avenue and River Walk Drive. They will be developing a HOME2SUITES Hotel on the property. We are excited to submit this site plan to the Town of Flower Mound for the second hotel to be located in the River Walk at Central Park. The proposed project will be located on across from the River Walk Amphitheater and the River Walk Farmer's Market. Directly south of the proposed hotel is the River Walk Promenade.

The development will be a 4-story, approximate 67,900 square foot hotel containing 100 rooms, a dining area, a small gathering area, an indoor pool and exercise area, an lease space for retail uses and other guest amenities. Access will be provided from the adjacent streets to the market place and lease space within the building. Approximately one-half of the proposed rooms will be oriented toward, and have views of, the River Walk Amenity, Amphitheater, and Farmer's Market. In addition to the views, the hotel will provide easy access to these locations, the River Walk Promenade and the restaurants, chapel and reception hall currently under construction.

Site Plan:

- The site plan maintains the overall design set forth in the Concept Plan for the River Walk at Central Park. It does not (i) change the character of The River Walk CBD; (ii) change internal boundaries of a district or a sub-district; (iii) change a permitted use in the district or a sub-district; (iv) increase the intensity of use; (v) increase the approved building heights; (vi) reduce the approved buffers separating the development within The River Walk CBD from any existing developed properties or roadways; (vii) increase or create a problem with circulation, safety or utilities; (viii) reduce the approved setbacks from property lines; (ix) decrease the percentage of open space or common area required; (x) reduce the required number of on-street and off-street parking spaces; or (xi) increase by more than ten percent (10%) the ground coverage of any structure.
- The site plan orients the building toward River Walk Drive, part of the one-way couplet around the River Walk Amenity area. The main drop off location will be along the internal drive aisle that will provide the primary access to the hotel. This entrance is accessible from both Central Park Avenue and Promenade



Way. Secondary entrances will be provided along Central Park Avenue, River Walk Drive, and Promenade Way for guests to enter and exit to the amenity areas within the River Walk.

- The site plan provides for sufficient parking to meet the requirements of the River Walk Zoning Ordinance by onsite surface parking and existing adjacent street parking. Additional future structured parking, to the east, will be provided by others as this portion of the River Walk continues to develop.

Building Design:

- The architectural design for the building blends design criteria required by the Holiday Inn Express Hotel design guidelines with the River Walk at Central Park design guidelines to create a building design that is consistent with and complementary to the elevations of the Amphitheater, Farmer's Market, Restaurant Row, the Chapel and Reception Hall, and the existing Courtyard by Marriott building. The design will include an outdoor dining patio and an outdoor patio area by the interior pool area will enhance the pedestrian experience along River Walk Drive.
- The building will be designed and constructed using quality materials, color scheme and workmanship. The materials used in construction of the Hotel will be consistent with those used in the balance of the River Walk Medical Park. The exterior materials are predominately masonry. Including cultured stone, brick, and cast stone.
- The design incorporates both vertical and horizontal articulation of the building facades. Offsets in the exterior wall plane of the building have been incorporated into the design to provide visual interest and texture; this coupled with variety in the design of the windows, balconies and detail elements associated with the windows will break down the scale of the building facades. Roof mounted equipment will be screened.
- Landscaping will be an essential element of the design and will incorporate street tree plantings that will provide a rhythmic pattern at the street edge, shade for pedestrians and will break up the facades to a more pedestrian scale. Accent planting will be incorporated into the landscape plan and will soften the texture of the overall site and building related improvements.
- The location of the building entrances are easily identifiable for guests. The primary guest entrance, along the west façade, provides a covered drop-off lane and easy of entry for the guests. The main guest entrance incorporates a distinctive atrium and a drive up canopy that provides shelter for the guests, taken together they will provide an attractive architectural element.

North Elevation – Facing Central Park Avenue:

1. The design of this elevation has been segmented, the roof line/height of the building has been varied and several materials have been used in order to provide interest and break down the overall scale of the building, cornices are used at the roof lines to provide a distinctive visual termination;



2. The principal building material used on this elevation are stone and brick, accented with cast stone window accents;
3. A variety of colors and materials will be used that are consistent with other buildings in the River Walk, these will add variety to this elevation and break the scale of this elevation down and provide more interest when viewed from the adjacent streets and buildings.

West Elevation – Facing future Buildings:

1. The design of this elevation has been segmented, the roof line/height has been varied and several materials have been used in order to provide interest and break down the overall scale of the building; cornices are used at the roof lines to provide a distinctive visual termination;
2. The main entry to the building is located at mid-block, it has a covered canopy that allows guests to drive up to the entry, check-in and drop off baggage before parking. To create a more pedestrian oriented and traditional feel the ground floor windows at the entry have been lengthened to near ground level; exterior seating and waiting areas are provided.
3. The principal building material used on this elevation are stone and brick, accented with cast stone window accents;
4. A variety of colors and materials will be used on this elevation, additional detail will be incorporated, this detail includes brick, EFIS, brick veneer and cast stone base at ground level.

South Elevation – Facing Promenade Way:

1. The design of this elevation has been segmented, the roof line/height has been varied and several materials have been used in order to provide interest and break down the overall scale of the building, cornices are used at the roof lines to provide a distinctive visual termination;
2. The principal building materials used on this elevation are stone and brick, accented with cast stone window accents; and
3. The stone on this elevation will complement the stone on the River Walk Amenity and the Amphitheater, tying the project elements together.
4. An entrance has been provided along the south façade to access the proposed retail space located at the southwest corner of the building.



East Elevation – Facing River Walk Drive:

1. The design of this elevation has been segmented, the roof line/height has been varied and several materials have been used in order to provide interest and break down the overall scale of the building, cornices are used at the roof lines to provide a distinctive visual termination;
2. The principal building materials used on this elevation are stone and brick, with cast stone window accents;
3. To create a more pedestrian orientation and tie the outdoor function space into interior market and dining areas, the first floor windows have been lengthened to near ground level and
4. The stone on this elevation will complement the stone on the River Walk Amenity and the Amphitheater, tying the project elements together.
5. An entrance has been provided along the south façade to access the proposed retail space located at the southwest corner of the building.

Parking:

Parking for the project is provided in accordance with the River Walk Ordinance, by onsite, adjacent on-street and parking within 500' of the entrance (section 7.5 of the River Walk Ordinance). Seventy-one of the one hundred required parking spaces are located onsite or directly adjacent to the proposed building. There are approximately another 350 parking spaces with 500' of the entrance. Of these spaces 130 have not been previously accounted. An exhibit has been provided on the site plan showing the spaces that have not been counted towards any required parking within the River Walk.

In addition to all of the parking described above, there will be available parking within the future parking structure directly west of this site. As the mixed use buildings between the HOME2SUITES and River Walk Retail between Central Park Avenue and Promenade Way develop an internal garage will need to be constructed to serve those business. The site plan has accounted for this and shows a connection to the future garage.

We believe the site plan for the hotel submitted with this letter accomplishes the challenging task of creating a land plan and architecture that ties the hotel into the overall Concept Plan for the River Walk at Central Park. Due to the hotel use, this site plan must provide an "ease of access" that will facilitate the guest's use of the building and ease of access to the rest of the River Walk property. We believe that the site plan and building design are consistent with and in compliance with the River Walk Zoning Ordinance.



Feel free to contact me if you have any questions or comments. Thank you in advance for your consideration of the site plan application.

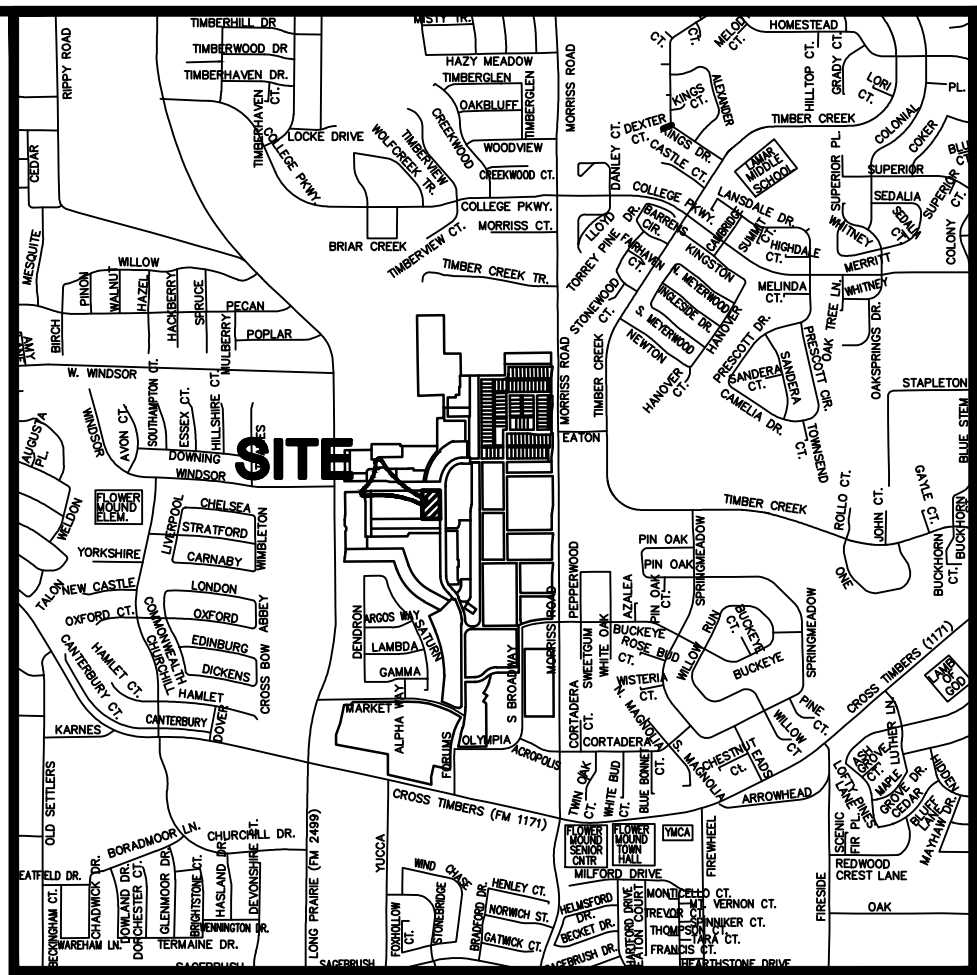
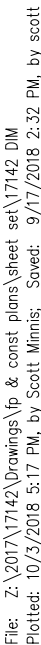
Sincerely,

A handwritten signature in blue ink, appearing to read 'Scott Minnis', with a long horizontal flourish extending to the right.

Scott Minnis, E.I.T.

Designer III

Cc. Mr. Robert J. Dollak, Jr. P.E., G&A | MCADAMS
Ms. Amisha Patel, Flower Mound RW, LLC.



*The number of spaces within 500' listed does not include the adjacent Existing on Street Parking indicated above and only includes those parking spaces that are completely within the 500' radius circle indicated below.

*The number of spaces within 500' listed does not include the future parking garage to the west.

TBM - "□" CUT ON ON THE TOP OF CURB ALONG THE CENTERLINE OF THE
MEDIAN NOSE ON EATON DRIVE; EAST OF MORRIS ROAD
ELEV. 576.15

1. CONTRACTOR IS TO CONTACT THE TOWN'S TREE ARBORIST PRIOR TO THE START OF CONSTRUCTION TO OBTAIN TREE PRESERVATION REQUIREMENTS DURING CONSTRUCTION.
2. ALL PAVEMENT DIMENSIONS SHOWN ARE TO FACE OF CURB UNLESS OTHERWISE NOTED.
3. ALL SIDEWALK DIMENSIONS SHOWN ARE TO THE EDGE OF PAVEMENT UNLESS OTHERWISE SHOWN.
4. ALL RADII ARE 3.0 FEET UNLESS OTHERWISE NOTED.
5. ALL PROPOSED PARKING SPOTS ARE 9.0' WIDE x 17.5' LONG; UNLESS OTHERWISE NOTED.
6. THE LOCATION OF THE EXISTING UTILITIES SHOWN IS APPROXIMATE, THE CONTRACTOR IS TO FIELD VERIFY LOCATION AND DEPTH PRIOR TO CONDUCTING ANY WORK.
7. REFER TO SHEET C4 FOR PAVING HATCH LEGEND. THE HATCHED AREAS ON THIS SHEET REPRESENT THE PROPOSED FIRE LANES.
8. ALL RETAINING WALLS ARE TO BE CLAD IN A MATERIAL THAT MATCHES THE PROPOSED BUILDINGS.
9. THE TOWN OF FLOWER MOUND CONSTRUCTION STANDARDS APPLY WHETHER INDICATED ON THESE PLANS OR NOT.
10. ALL BUILDING MOUNTED UTILITY OR EQUIPMENT BOXES SHALL BE SCREENED FROM A STREET VIEW BY A MINIMUM SIX FOOT HIGH SCREENING DEVICE WHETHER SHOWN IN THESE PLANS OR NOT. SUCH SCREENING DEVICE SHALL CONSIST EITHER OF PLANT MATERIAL OR A SCREENING WALL CONSTRUCTED OF OR FINISHED WITH A MATERIAL TO MATCH THE BUILDING, PROVIDED HOWEVER THAT WOOD FENCING OR SCREENING SHALL BE PROHIBITED. THIS RELATES TO ONLY THE NORTHERN, SOUTHERN AND WESTERN BUILDING FACADES, SINCE THESE ARE THE ONLY FACADES ABUTTING A STREET.
11. SIGNS REQUIRE A SEPARATE BUILDING PERMIT. ANY SIGNS DEPICTED ON THE SIGNAGE OR ELEVATIONS ARE NOT APPROVED AS PART OF THIS REVIEW AND MUST COMPLY WITH THE RIVER WALK SIGNAGE REGULATIONS.
12. THE DUMPSTER SCREENING WALL SHALL BE CLAD IN A MATERIAL TO MATCH THE MATERIALS ON THE MAIN BUILDING.
13. FURNITURE PLACEMENT WITHIN THE PATIO AREAS IS SHOWN FOR INFORMATIONAL PURPOSES ONLY. REFER TO THE ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.
14. ALL GROUND BASED HVAC SHALL BE SCREENED WITH LIVE SCREENING OR MASONRY ENCLOSURE. MASONRY ENCLOSURE SHALL BE CLAD IN THE SAME MATERIAL AS THE MAIN BUILDING.



OWNER/DEVELOPER
FLOWER MOUND RW, LLC
1178 TORREY PINES LANE
FRISCO, TX 75034
Ph. 214-315-9020
Contact: MS. AMISHA PATEL



SITE PLAN AND DIMENSIONAL CONTROL PLAN

THIS DOCUMENT IS FOR
INTERIM REVIEW AND IS
NOT INTENDED FOR
CONSTRUCTION, BIDDING,
OR PERMIT PURPOSES.
G&A | MCADAMS,
TBPE: 19762
ROBERT JOHN DOLLAH, JR.,
P.E. #86898
DATE 10/3/2018

Drawn By: SM
Date: 03/12/2018
Scale: 1"=20'
Revisions:
04/17/2018
07/05/2018
09/10/2018
10/03/2018

C3

REVISIONS
BY

PROPOSED HOTEL
THE RIVERWALK AT CENTRAL PARK
CENTRAL PARK AVENUE - FLOWER MOUND, TX

HOME2
SUITES BY HILTON

PRELIMINARY
REGISTERED ARCHITECT
STATE OF TEXAS
10-02-2018

1029 LANG PRAIRIE ROAD
SUITE E
FLOWER MOUND, TX 75022
817/538-9258
RSS-ARCHITECTS.COM

10-02-2018
17025
PRELIM
A-105

MATERIAL CALCULATIONS								
		NORTH		SOUTH		EAST		WEST
1	TOTAL FAÇADE S.F.	4332		4097		13560		11401
2	FAÇADE S.F. (EXCLUSIVE OF DOORS AND WINDOWS)	4002		3680		10853		8553
3	DOORS AND WINDOWS S.F.	330		417		2707		2848
4	PRIMARY MASONRY TOTALS (MIN. 80%)	3907	98%	3561	97%	10604	98%	8376 98%
	THIN BRICK (MASONRY 1) SF	960	24%	393	11%	1997	18%	2753 32%
	THIN BRICK (MASONRY 2) SF	1622	41%	1967	53%	3488	32%	4072 48%
	SYNTHETIC STONE (MASONRY 3) SF	740	18%	612	17%	2547	23%	155 2%
	CAST STONE (MASONRY 4) SF	585	15%	589	16%	1234	11%	1232 14%
	STUCCO (STUCCO 1) SF	0	0%	0	0%	1178	11%	0 0%
	STUCCO (STUCCO 2) SF	0	0%	0	0%	160	1%	164 2%
5	SECONDARY MASONRY TOTALS (MAX. 20%)	95	2%	119	3%	249	2%	177 2%
	METAL CANOPY / SUNSCREEN SF	95	2%	119	3%	249	2%	177 2%

MASONRY 1 - THIN BRICK, ACME WEATHERWOOD GRAY

MASONRY 2 - THIN BRICK, ACME ROXBURY

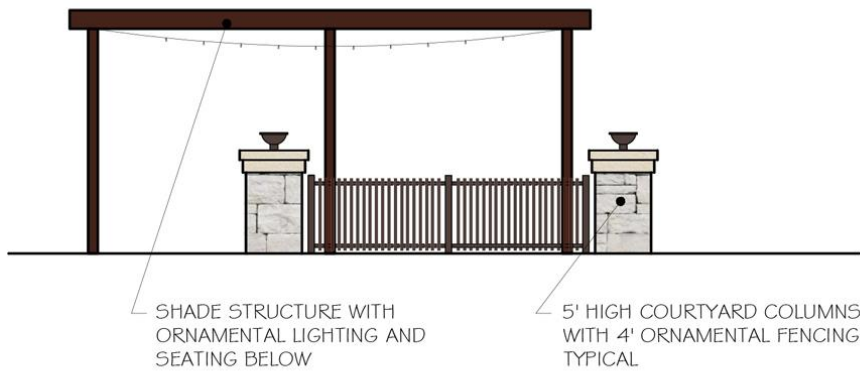
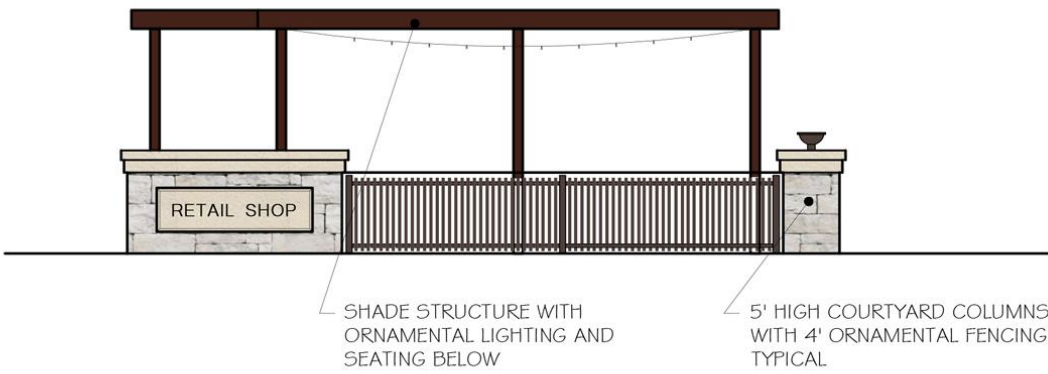
MASONRY 3 - SYNTHETIC STONE, ACME CREAM CHOPPED

MASONRY 4 - CAST STONE - BUFFSTONE

STUCCO 1 - STO CORP, COLOR CORAL

STUCCO 2 - STO CORP, COLOR FRENCH VANILLA

ADDITIONAL COLORS:
STOREFRONT COLOR - DARK BRONZE, TYPICAL.
METAL CANOPIES / AWNINGS - DARK BRONZE, TYPICAL.
STANDING SEAM METAL ROOF - MUELLER, INC. BURNISHED SLATE



REVISIONS

BY

PROPOSED HOTEL

THE RIVERWALK AT CENTRAL PARK

CENTRAL PARK AVENUE - FLOWER MOUND, TX

HOMER

SUITES BY HILTON

PRELIMINARY

REGISTERED ARCHITECT

STATE OF TEXAS

10-02-2018

1029 LANG PRAIRIE ROAD

SUITE E

FLOWER MOUND, TX 75022

817/538-9258

RSS-ARCHITECTS.COM

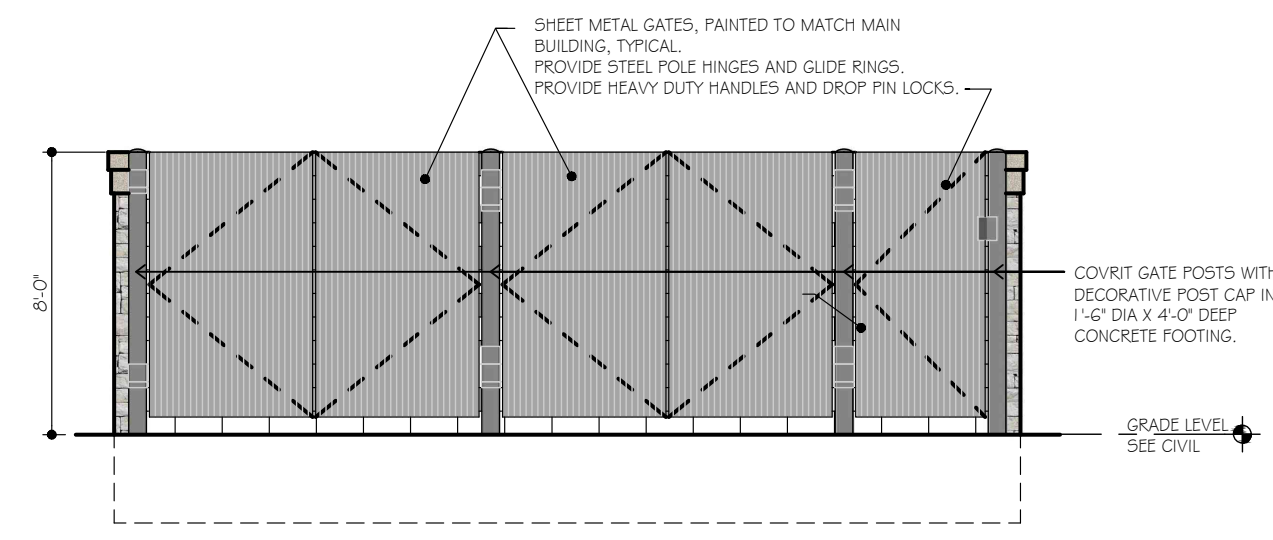
10-02-2018

Job

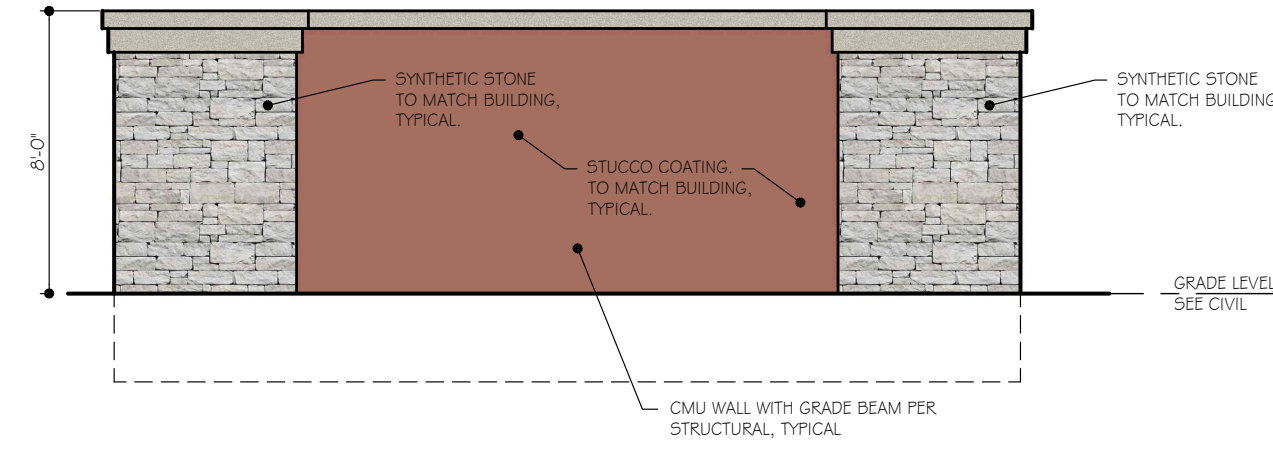
17025

Sheet

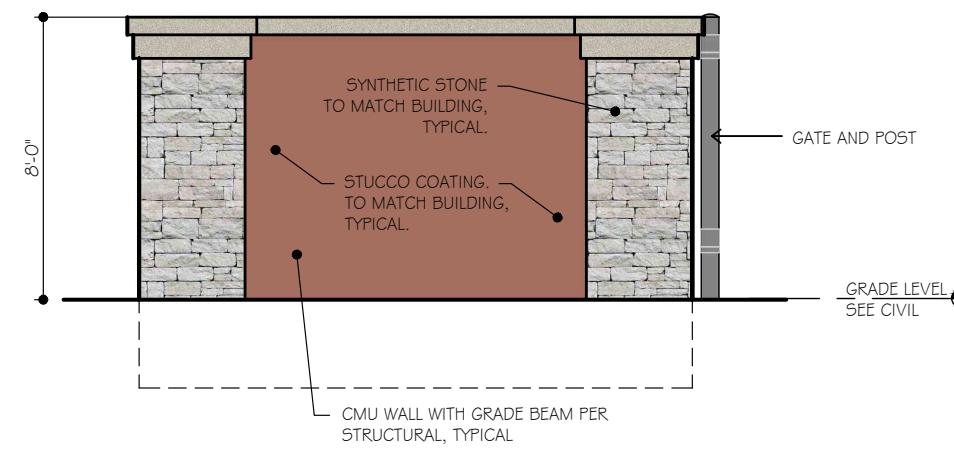
PRELIM A-106



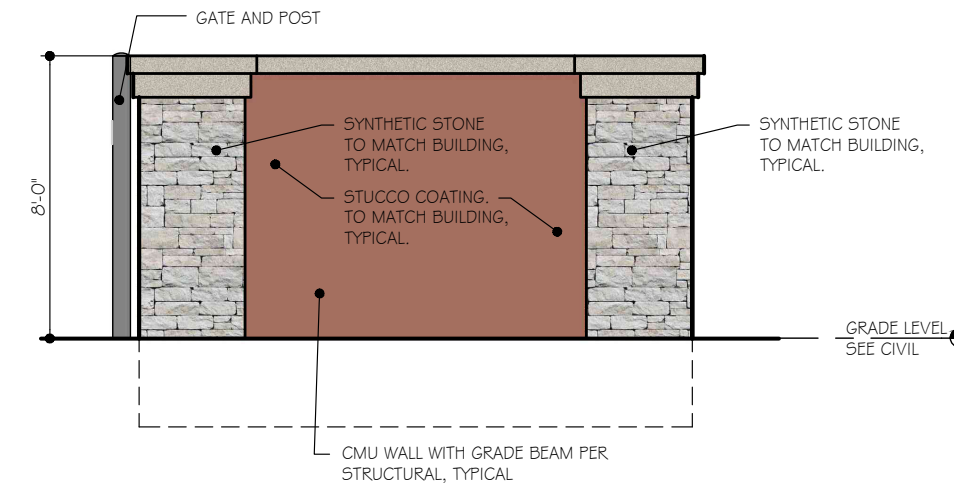
4 DUMPSTER SCREEN ELEV.
SCALE: 1/4" = 1'-0"



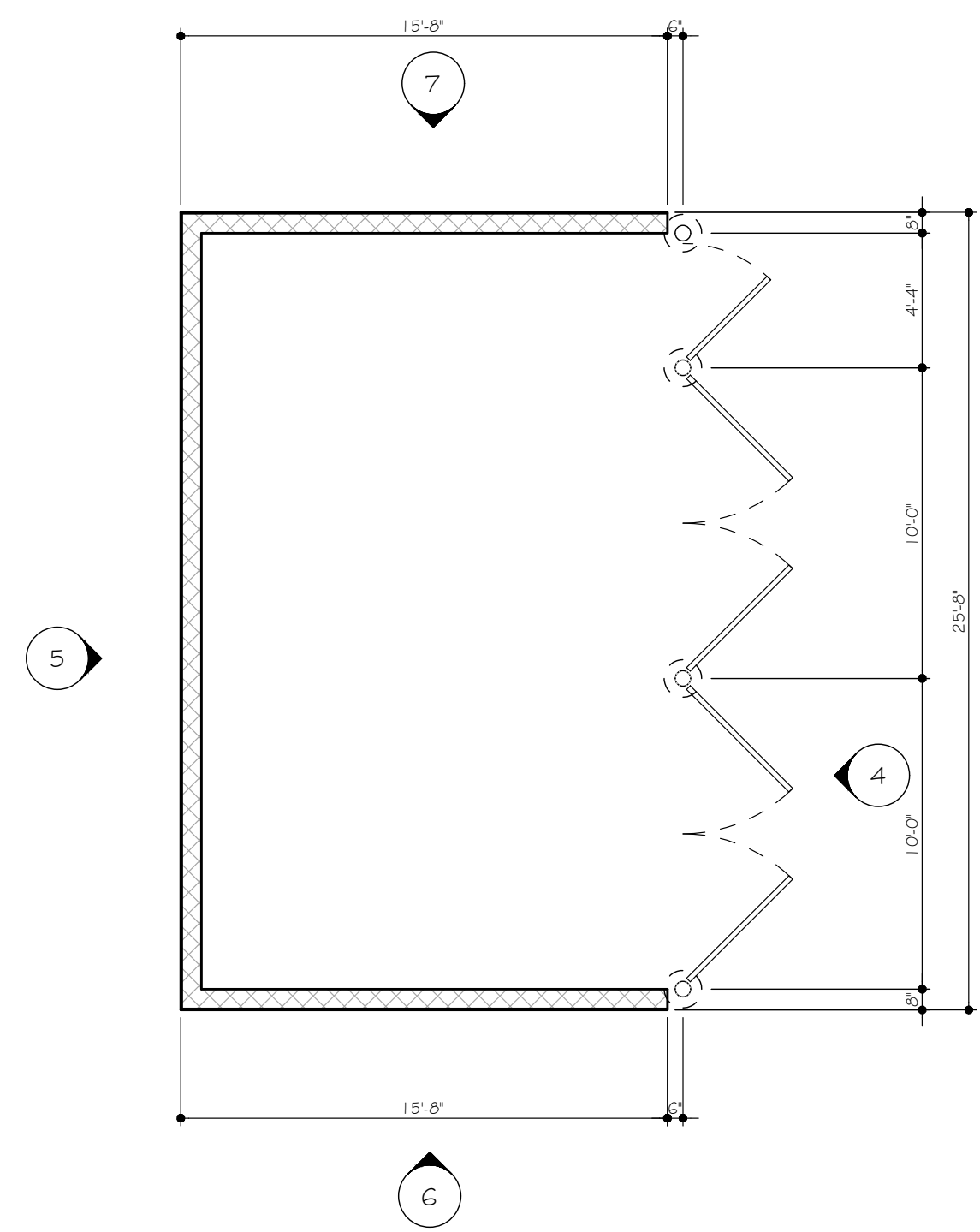
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SCALE: 1/4" = 1'-0"



6 DUMPSTER SCREEN ELEV.
SCALE: 1/4" = 1'-0"



7 DUMPSTER SCREEN ELEV.
SCALE: 1/4" = 1'-0"



3 DUMPSTER SCREEN PLAN
SCALE: 1/4" = 1'-0"

	MASONRY 1 - THIN BRICK ACME WEATHERWOOD GRAY		MASONRY 4 - CAST STONE - BUFFSTONE
	MASONRY 2 - THIN BRICK ACME ROXBURY		STUCCO 1 - STO CORP. COLOR CORAL
	MASONRY 3 - SYNTHETIC STONE ACME CREAM CHOPPED		STUCCO 2 - STO CORP. COLOR FRENCH VANILLA

ADDITIONAL COLORS:
STOREFRONT COLOR - DARK BRONZE, TYPICAL.
METAL CANOPIES / AWNINGS - DARK BRONZE, TYPICAL.
STANDING SEAM METAL ROOF - MUELLER, INC. BURNISHED SLATE



1 PRELIMINARY WEST ELEVATION
SCALE: 3/32" = 1'-0"

REVISIONS	BY

PROPOSED HOTEL
THE RIVERWALK AT CENTRAL PARK
CENTRAL PARK AVENUE - FLOWER MOUND, TX



1029 LANG PRAIRIE ROAD
SUITE E
FLOWER MOUND, TX 75022
817/538-9258
RSS-ARCHITECTS.COM

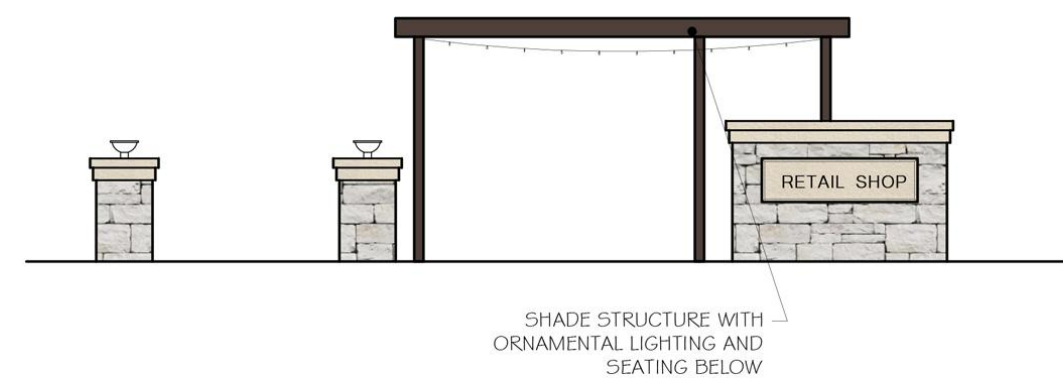
Date: 10-02-2016
Job: 17025
Sheet: **PRELIM A-107**



3 **PRELIMINARY NORTH ELEVATION**
SCALE: 3/32" = 1'-0"
VIEW FROM CENTRAL PARK AVE.



2 **PRELIMINARY SOUTH ELEVATION**
SCALE: 3/32" = 1'-0"
VIEW FROM PROMENADE WAY





	(LO) LIVE OAK <i>Quercus virginiana</i>
	(LE) LACEBARK ELM <i>Ulmus parvifolia</i>
	(HL) SKYLINE HONEY LOCUST <i>Gleditsia tricanthos f. inermis 'Skycole' SKYLINE</i>
	(FH) FOSTER'S HOLLY <i>Ilex x attenuata 'Fosteri'</i>
	(CM) CRAPEMYRTLE <i>Lagerstromia indica</i>
	(NRS) NELLIE R. STEVENS <i>Ilex x Nellie R. Stevens'</i>
	(DIH) DWARF INDIAN HAWTHORN <i>Raphiolepis indica</i>
	(GMB) GREEN MOUNTAIN BOXWOOD <i>Buxus x 'Green Mountain'</i>
	(DWM) DWARF WAX MYRTLE <i>Myrica pusilla</i>
	(CA) COMPACT ABELIA <i>Abelia x grandiflora 'Compacta'</i>
	(MF) MEXICAN FEATHER GRASS <i>Nassella tenuissima</i>
	(BFD) BLACKFOOT DAISY <i>melampodium leucanthum</i>
	(AJ) ASIAN JASMINE <i>Trachelospermum asiaticum</i>
	BERMUDA SOD



LANDSCAPE PLAN

PLANS
INTERIM REVIEW
FOR CONSTRUCTION.
PURPOSED LANDSCAPE ARCHITECT
28
RECORDED & INDEXED
JAMES R. PINSON
2826
STATE OF TEXAS

17142

L1.0

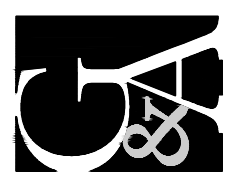
QUAN.	COMMON NAME	BOTANICAL NAME	SIZE	MIN. HT.	QUAN.	QUAN.
3	LIVE OAK	Quercus virginiana	3"	10'-12'	Per Plan	Single Trunk
2	SKYLINE HONEY LOCUST	Gleditsia triacanthos f. inermis 'Skycole'	3"	10'-12'	Per Plan	Single Trunk
19	LACEBARK ELM	Ulmus parvifolia	3"	10'-12'	Per Plan	Single Trunk
3	FOSTER HOLLY	Ilex x attenuata	20gal.	5'-6'	Per Plan	Full
9	NELLIE R. STEVENS	Ilex x 'Nellie R. Stevens'	20gal.	5'-6'	Per Plan	Full
39	DWARF WAX MYRTLE	Myrica pusilla	5gal.	24"	4'-0"	Full
31	BOXWOOD	Buxus x 'Green Mountain'	3gal.	36"	5'-0"	Full
430	MEXICAN FEATHER GRASS	Nassella tenuissima	3gal.	12"	2'-0"	Xeri
134	COMPACT ABELIA	Abelia x grandiflora 'Compacta'	3gal.	24"	3'-0"	Full
16	DWARF INDIAN HAWTHORN	Rhaphiolepis indica	5gal.	24"	3'-0"	Full
525	BLACKFOOT DAISY	Melampodium leucanthum	1gal.	12"	18" o.c.	Full
293	ASIAN JASMINE	Trachelospermum asiaticum	4" pot	6"	18" o.c.	Full
2064	BERNUDA SOD					

- 1) Contractor shall stake out tree locations and bed configuration for approval prior to installation.
- 2) Contractor is responsible for verifying location of all underground utilities prior to construction.
- 3) It is the responsibility of the contractor to advise the owners representative of any condition found on site which prohibits installation as shown on these plans
- 4) All shrub and groundcover beds shall have a minimum of 3" of hardwood bark mulch
- 5) Landscape edging shall be located as noted on plan.
- 6) Trees overhanging walks and parking areas shall have a clear trunk height of seven feet.
- 7) Multi trunk and ornamental trees will be allowed in the city's right of way with staff approval only. Must be outside any visibility triangles.
- 8) A visibility triangle must be provided at all intersections as required by the thoroughfare standards code. Trees will have a minimum clear trunk branching height of nine feet.
- 9) All plant material shall be maintained in a healthy and growing condition, and must be replaced with plant material of similar variety and size if damaged, destroyed, or removed.
- 10) Landscape areas shall be kept free of trash, litter and weeds.
- 11) An automatic irrigation system shall be provided to maintain all landscape areas. Over spray on streets and walks is prohibited. A permit from the building inspection department is required for each irrigation system. Impact fees must be paid to the development services department for separate irrigation meters prior to any permit release.
- 12) Irrigation Controller to have a Rain and Freeze Stat.
- 13) All landscape is to be greater than 8 feet from all underground utilities.
- 14) All areas of grading disturbance are to have grass reestablished at 75% coverage prior to letter of acceptance from the city. Means and methods of grass establishment and application of water for grass establishment are at the discretion of the owner and contractor.



THE
RIVERWALK
AT CENTRAL PARK

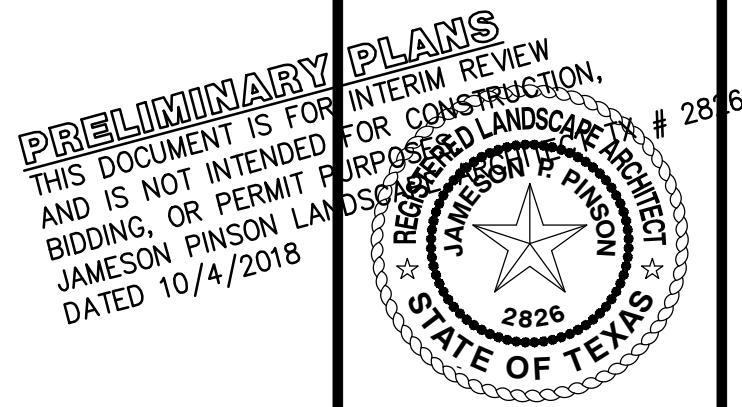
The John R. McAdams
Company, Inc.
(DBA, G&A McAdams)
111 Hillside Drive
Lewisville, Texas 75057
972.435.9712
201 Hillside Drive
Lewisville, Texas 75057
940.240.1012
TBP# 19762 TBP#S: 10194440
www.mcadams22.com



HOME2SUITES
THE RIVER WALK PROMENADE
Lot 4, Block A

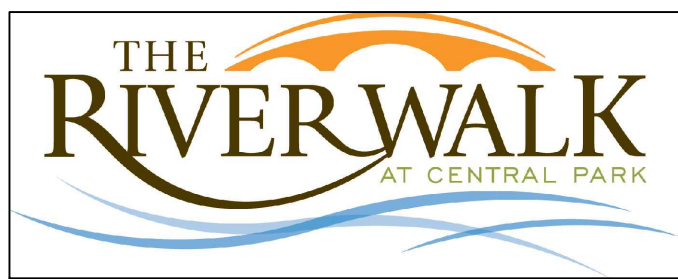
1227 Acres
in the
CHACON SURVEY, ABSTRACT NO. 299
TOWN OF FLOWER MOUND
DENTON COUNTY, TEXAS

HARDSCAPE PLAN



Drawn By: LP
Date: 03/12/2018
Scale: 1"=20'
Revisions:

OWNER/DEVELOPER
FLOWER MOUND RW, LLC
1178 TORREY PINES LANE
FRISCO, TX 75034
Ph. 214-315-9020
Contact: MS. AMISHA PATEL



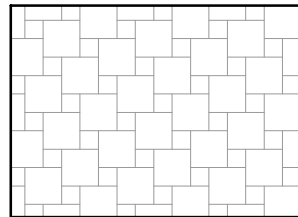
17142

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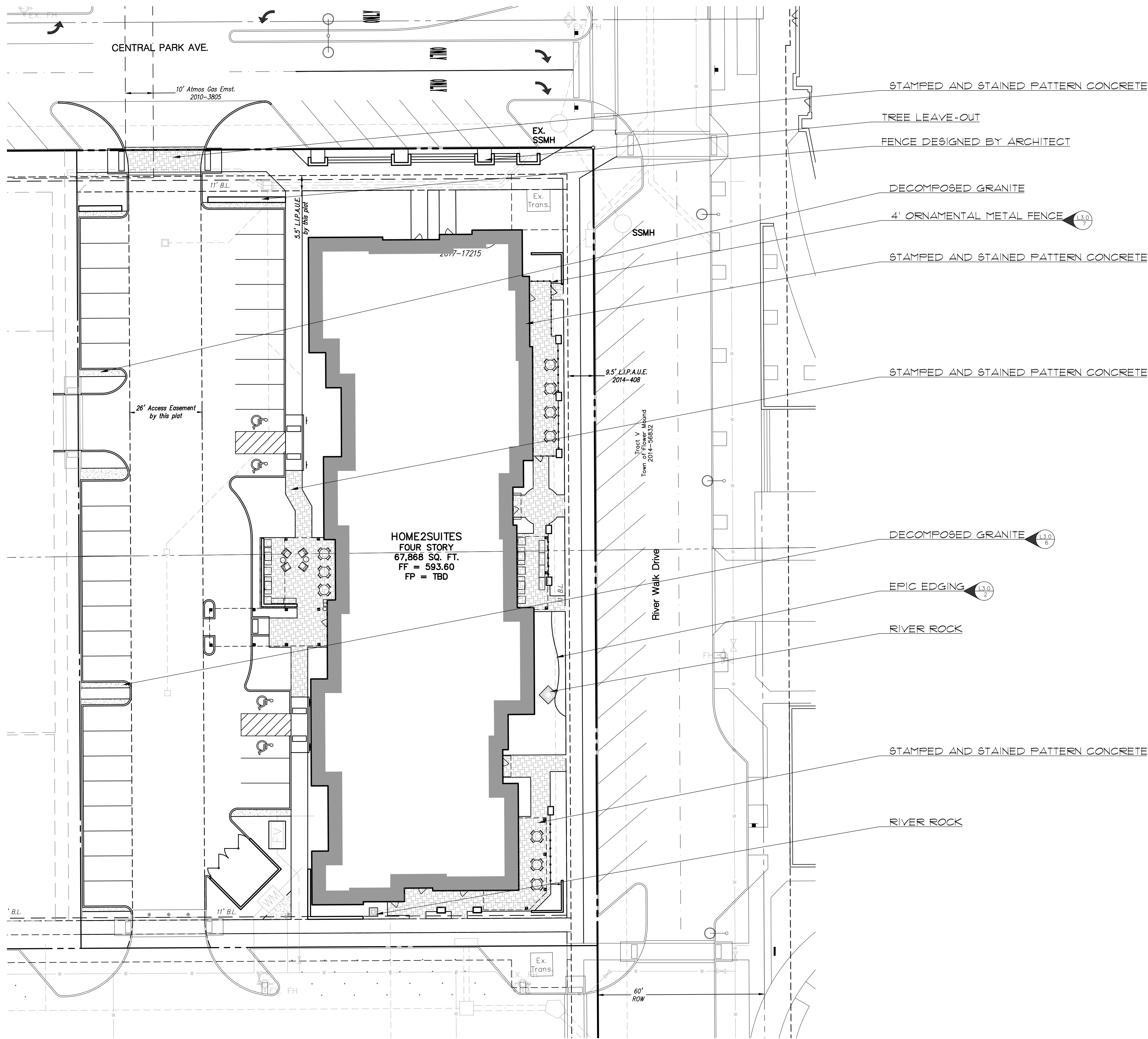
20 0 20 40 60 Feet
SCALE: 1"=20'

LEGEND



STAMPED AND STAINED PATTERN CONCRETE
RIVER WALK STANDARD -(SHEET C21)
PATTERN - ASHLAR SLATE
COLOR - SOLOMON COLORS, COLORFLO LIQUID COLOR NO. 338
LEATHER WITH CHARCOLE RELEASE AGENT, INTEGRAL COLOR

○ BUTTERFIELD COLOR
625 W ILLINOIS AVE
AURORA, IL 60506
800-282-3388
www.butterfieldcolor.com



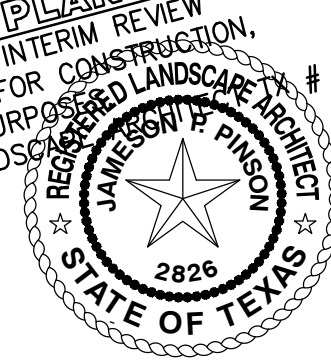
The John R. McAdams
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Lewisville, Texas 75057
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Lewisville, Texas 75057
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TBPE: 19762 TBPLS: 10194440
www.mcadamscc.com



HOME2SUITES
THE RIVER WALK PROMENADE
Lot 4, Block A
1227 Acres
in the
C. CHACON SURVEY, ABSTRACT NO. 299
TOWN OF FLOWER MOUND
DENTON COUNTY, TEXAS

HARDSCAPE PLAN

PRELIMINARY PLANS
THIS DOCUMENT IS FOR INTERIM REVIEW
AND IS NOT INTENDED FOR CONSTRUCTION,
BIDDING, OR PERMIT PURPOSES.
JAMESON PINSON LANDSCAPE ARCHITECT
DATED 10/4/2018
2826



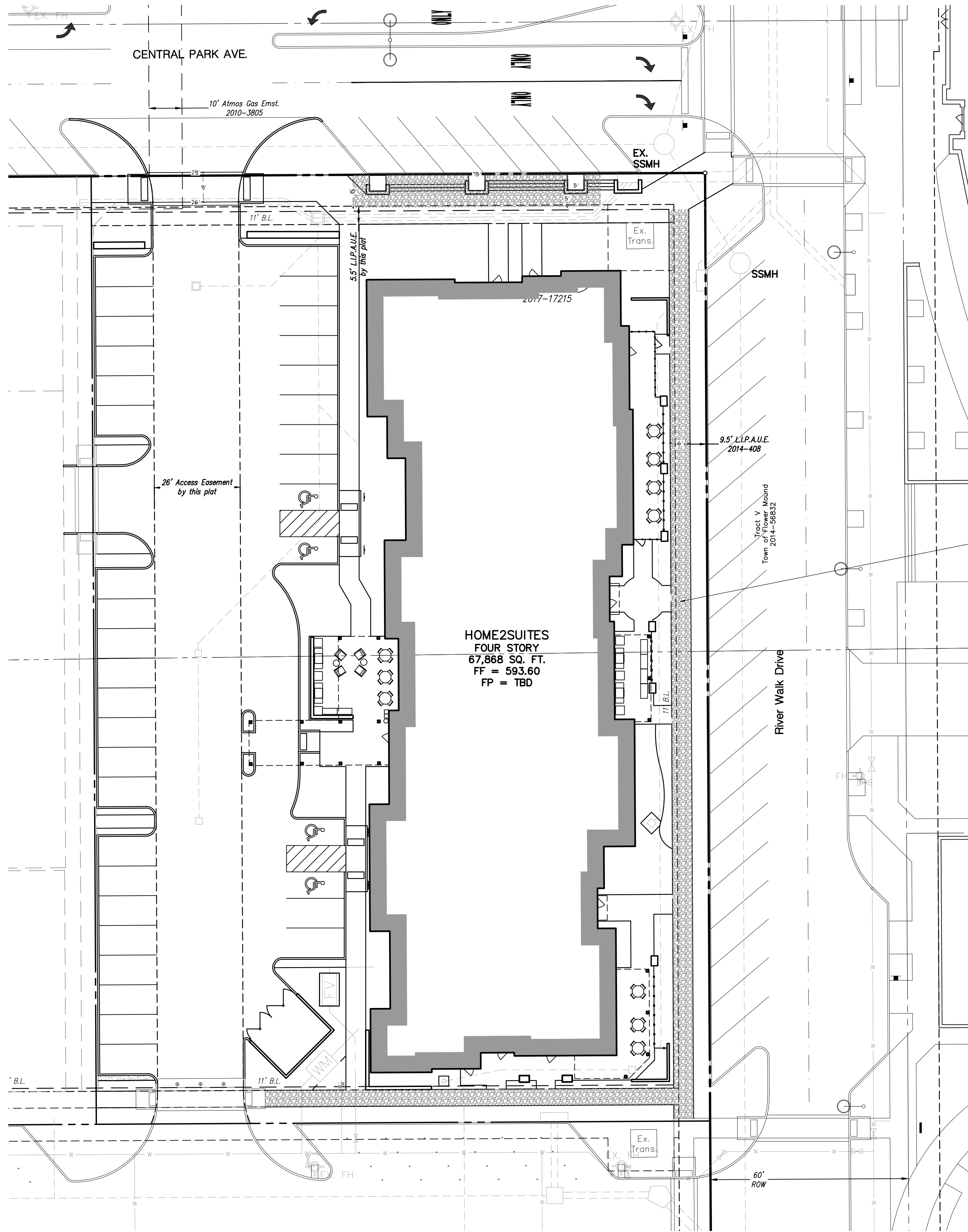
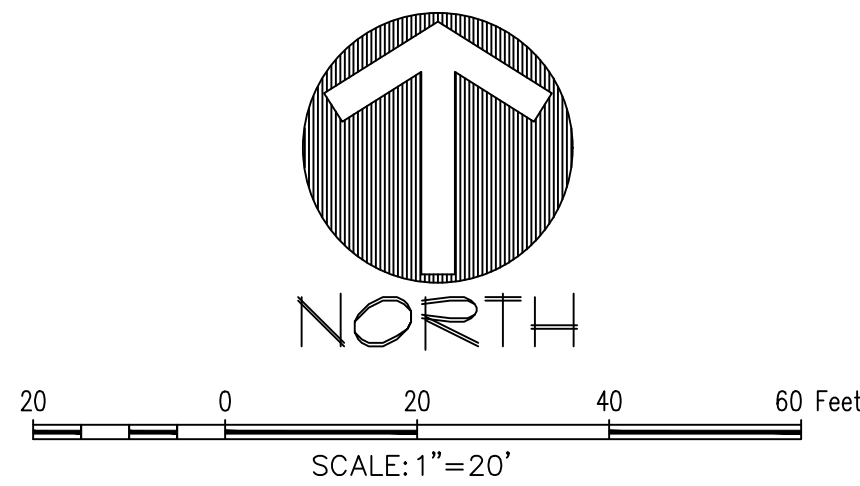
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Date: 03/12/2018
Scale: 1"=20'
Revisions:

OWNER/DEVELOPER
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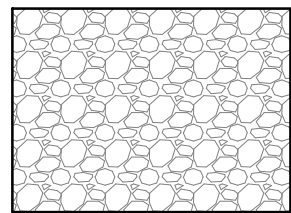
17142

L2.1



CU-STRUCTURAL SOIL

LEGEND



CU-STRUCTURAL SOIL
REF. L3.1, DETAIL #5

L3.0



PLANNING AND ZONING COMMISSION AGENDA ITEM NO: 3

DATE: October 8, 2018

FROM: Chuck Russell, Town Planner

ITEM: Consider a request for a Site Plan (SP18-0010 - Fire Station No. 7) to develop a fire station with certain waivers and exceptions to the Code of Ordinances. The property is generally located west of Skillern Road and north of Wichita Trail.

I. ITEM SUMMARY

This application has been reviewed by DRC and determined to be ready for consideration by the Planning and Zoning Commission. There are waiver and exception requests to the Town's regulations which necessitates special consideration by the Commission (see Analysis below).

This application will require final action by the Town Council.

II. APPLICATION ANALYSIS

The purpose of this request is to obtain site plan approval for the Town's Fire Station No. 7. The subject property contains 1.02 acres and is zoned Single-Family Estate (SF-E) and is located on a platted lot (Lot 40, Block F of the River Oaks Estates Subdivision). There are single family residential uses to the west, north and east of the site across Skillern Road. Coram Deo School is located south of the site.

The applicant is proposing to construct a 9,870 square foot fire station with two points of access on Skillern Road (see driveway spacing waiver request below). The maximum permitted height within the SF-E district is 35 feet measured to highest point of the flat roof surface or to the mid-point of a pitched roof. The facility contains a pitched roof with a peak height of 37.5 feet. The mid-point of the pitch is 30 feet in height which is in compliance with the Town's regulations. The applicant is requesting an exception to Section 82-303, "Compatibility setback" of the Code of Ordinances (see below)

The Town's Code of Ordinances does not have a standard parking requirement for fire stations. Required parking for a fire station is therefore determined by Town staff, which is 14 spaces in this case (14 spaces are being provided). The landscape plan depicts required number of buffer trees, parking lot trees and street yard trees. However, the applicant is requesting an exception to Section 82-302, "Compatibility buffer" of the Code of Ordinances (see below). The building materials and architecture meet the architectural standards outlined in the Urban Design Plan.

A. Exception to Section 82-302, Compatibility Buffer

The residential compatibility standards apply when a nonresidential or multi-family development is proposed adjacent to an existing residential use or zoning, or designated for residential use on the comprehensive master plan. The proposed development shares a boundary with property zoned for single family uses on three sides (north, west and south).

A brick wall or masonry wall with stucco or mortar wash finish, both exterior finishes being the same, is required to be constructed along the property line. Such walls shall have no vehicular access point into or from an alley and shall be a minimum of six feet in height, except that the first 25 feet in from the street line may be stepped down to a minimum height of four feet. For nonresidential and multi-family development (except for churches or schools), the landscaped setback shall consist of a minimum 25-foot landscaped buffer. Understory plants shall be provided in order to achieve a continuous dense six-foot screen. Native shade trees, a minimum of three-inch caliper each, shall be provided at a ratio of one tree per 400 square feet of buffer area.

Due to the size of the site and operational requirements of the facility, the applicant is requesting a complete waiver to the compatibility buffer requirements along the southern property line adjacent to Coram Deo School. The applicant is proposing to located portions of the HVAC unit and retaining walls within the western buffer area as well as not planting any understory plants. Finally, the applicant is proposing to construct driveway paving, portions of parking spaces and retaining walls within the northern buffer area.

B. Exception to Section 82-303, Compatibility Setback

One-story, nonresidential or multifamily buildings, main or accessory, shall be set back from the property adjacent to an existing or proposed residential use 60 feet. Nonresidential or multifamily buildings, more than one story, main or accessory, shall be set back from the property line adjacent to an existing or proposed residential use five feet for every one foot of building height. As noted above (Compatibility Buffer exception) the zoning of the property to the north and east requires a compatibility setback.

Due to the size of the site and operational requirements of the facility, the applicant is proposing a 40-foot setback from the western property boundary.

C. Exception to Chapter 32, Access Management Policy and Criteria

The Engineering Design Criteria and Construction Standards adopted through Chapter 32 of the Code of Ordinances requires driveway spacing along Skillern Road (Rural Collector) to be a minimum 250 feet between drive approaches (inside edge to inside edge). The requested exception is needed for the distance between the facilities' two driveways (proposed distance is 180 feet) as well as the distance between the proposed southern driveway and the driveway to Coram Deo School to the south (approximately 230 feet).

On September 12, 2018, the Board of Adjustment held a public hearing and approved a request from The Town of Flower Mound for a variance from Sec. 98-1026, "Minimum front yard setback" and Section 98-1142, "Front Yard Fence Height and Visibility," of the Code of Ordinances. The first variance allows the proposed fire station to encroach over the required 40-foot front setback by 10 feet. The second variance allows a 6-foot-tall tall masonry screen wall, gate, and wood fence to be constructed within the required front yard (fence height is limited to 4-feet-tall within the front yard).

The link to the September 12, 2018, Board of Adjustment meeting is:

<http://flowermoundtx.swagit.com/play/09122018-1228/5/>

III. CORRESPONDENCE

As required by the Town Code, a notice was sent to all adjacent property owners and adjacent homeowners' associations no less than ten days prior to the consideration of a site plan containing a modification or waiver of the compatibility buffer and compatibility setback requirements. At the time this report was written, the Town had not received any correspondence or phone calls regarding the requests. All correspondence received will be sent directly to the Planning and Zoning Commission according to the new public communication process.

IV. ATTACHMENTS

A. Background Information

1. Vicinity Map
2. Letter of Intent

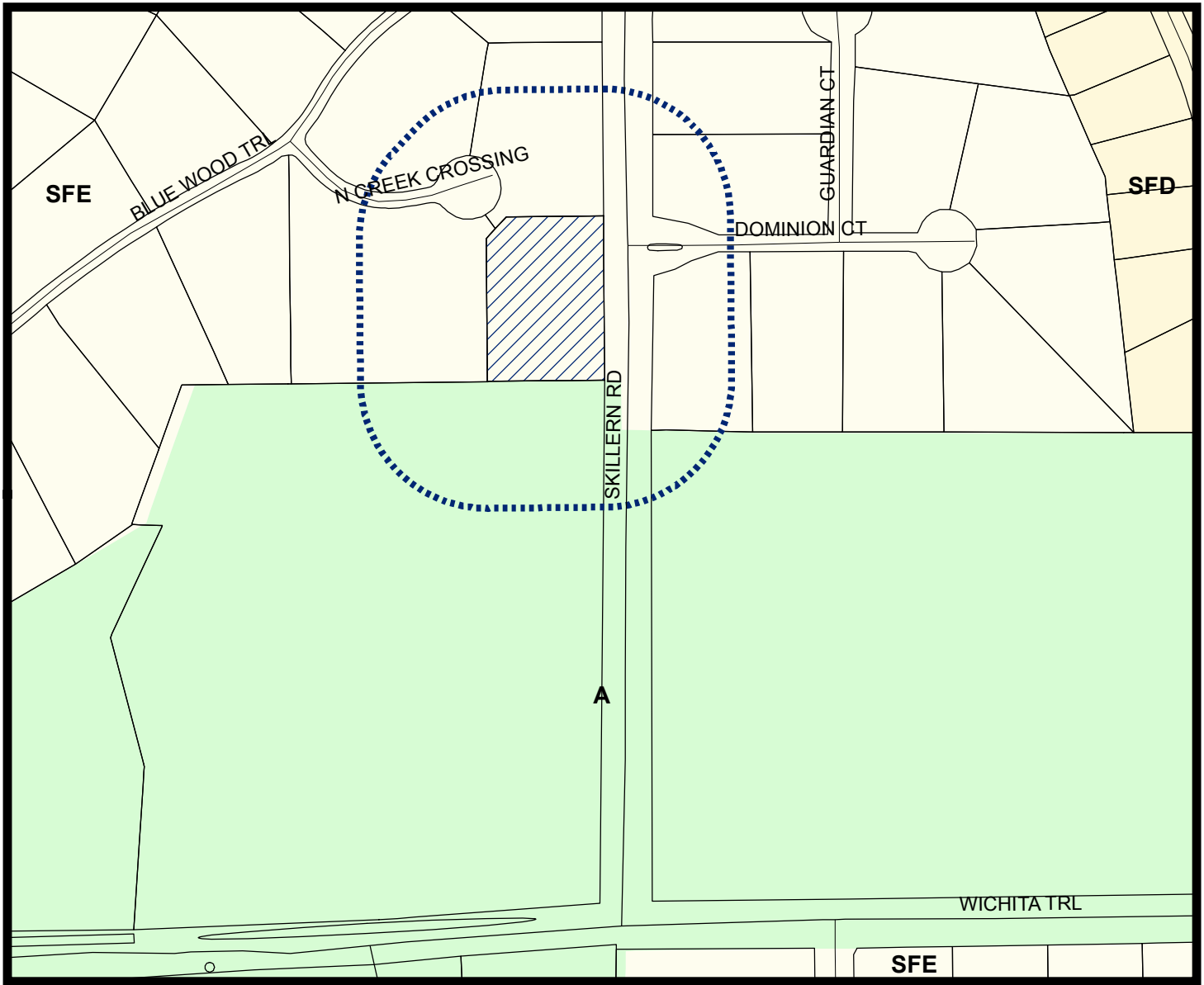
B. Application Details

1. Site Plan Package



Vicinity Map

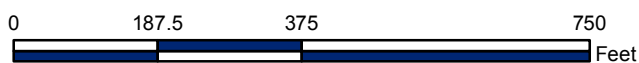
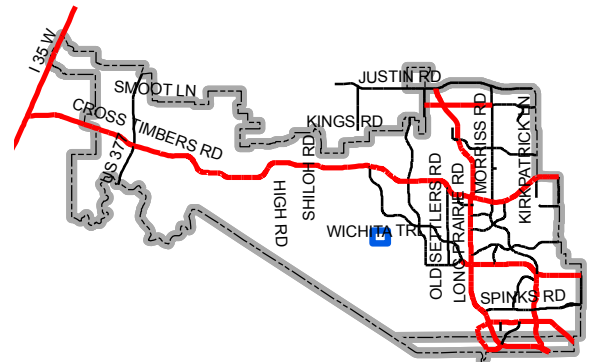
Reference Project: SP18-0010



LEGEND

- Agriculture
- Single Family Density
- Single Family Estate

- Subject Property
- 200 ft Notification Buffer around Property



Map Location

BROWN REYNOLDS WATFORD
ARCHITECTS



3535 TRAVIS STREET
SUITE 250
DALLAS, TEXAS 75204
214-528-8704
WWW.BRWARCH.COM

LETTER OF INTENT

DATE: July 13, 2018
TO: Town of Flower Mound
Planning Services Division
FROM: Carol Kesler, AIA
Project Architect
RE: Flower Mound Fire Station 7
BRW PROJECT NO: 218008.00

CC: David Bauer
File

MESSAGE:

The proposed new Fire Station for the flower mound Fire Department at 2701 Skillern Boulevard includes:

- Existing Zoning District: Single Family Estates (SFE). No change proposed.
- Property Acreage: 1.02 acre
- Operations: Single use - Flower Mound Fire Station No. 7
- Proposed Building Area: First Floor – 9,120 SF, Mezzanine – 750 SF
- Development Phasing: No phasing planned
- Exceptions requested include:
 1. The distance between driveways is currently at 180' from the inside edge of each driveway. 200' is not obtainable with the required driveway widths.
 2. Proposed building is 7' within 40' front setback. Due to the existing slope of the site, and the required minimal paving slope for the fire apparatus, being closer to the street enables area for the terraced gravity retaining walls at the west side of the site while minimizing the amount of fill and paving required.
 3. Paving is included within the 25' required landscape buffer at the north parking lot. Refer to Sheet AS1.1 for required turning radius for fire apparatus.
 4. The existing 6' masonry wall with a maintenance easement is being retained, so the 6' perimeter landscape shrubs are being excluded.

Thank you,


Carol Kesler, AIA



CLICK ENGINEERING

325 N. SAINT PAUL ST.
SUITE 2850
DALLAS, TEXAS 75201
P: 214.871.2302

TEXAS REG. NO. F-10142

**TOWN OF FLOWER
MOUND
FIRE STATION NO 7**

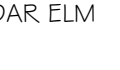
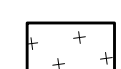
2701 SKILLERN BLVD.
FLOWER MOUND, TX 75028

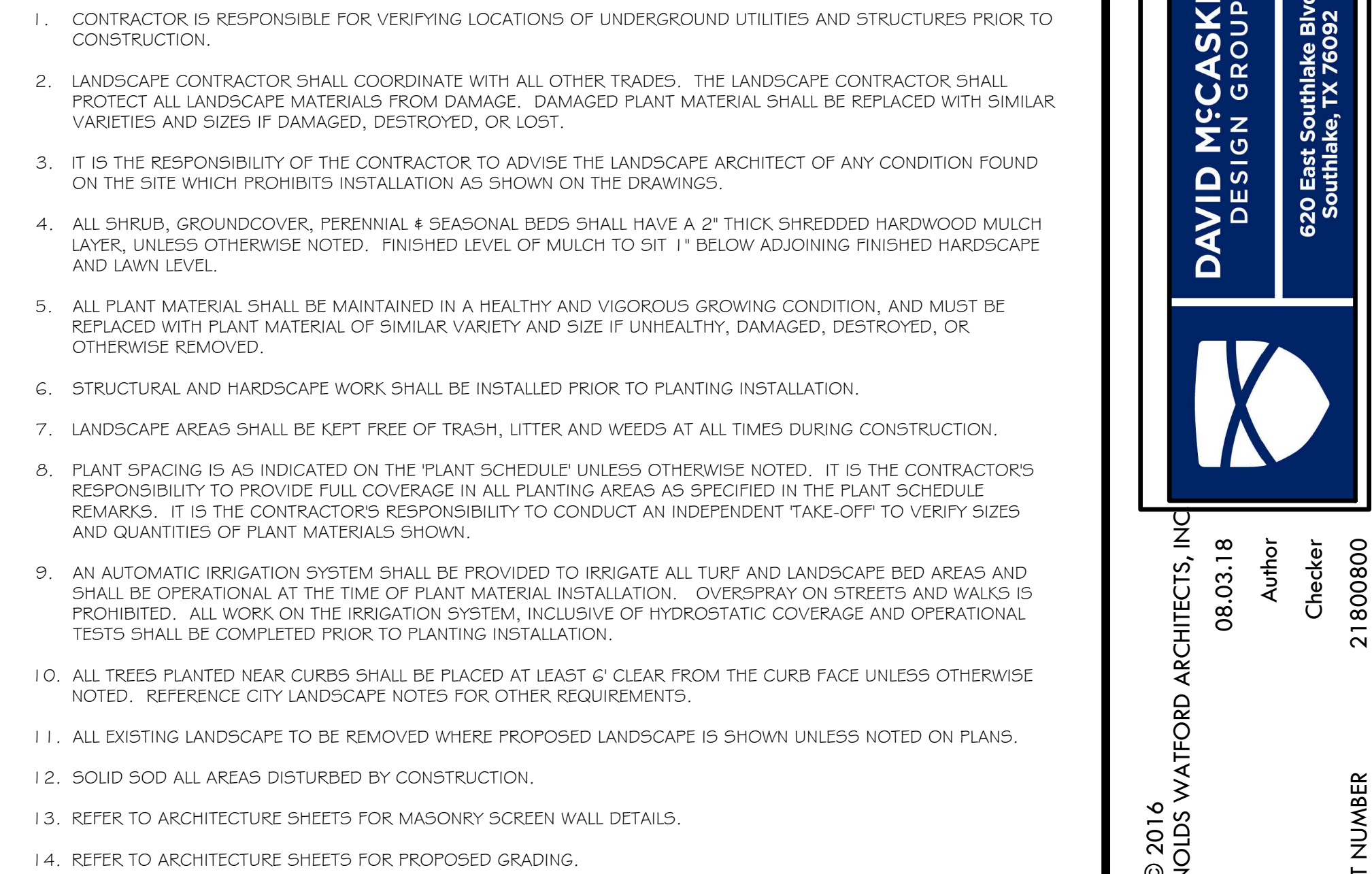


C1.01

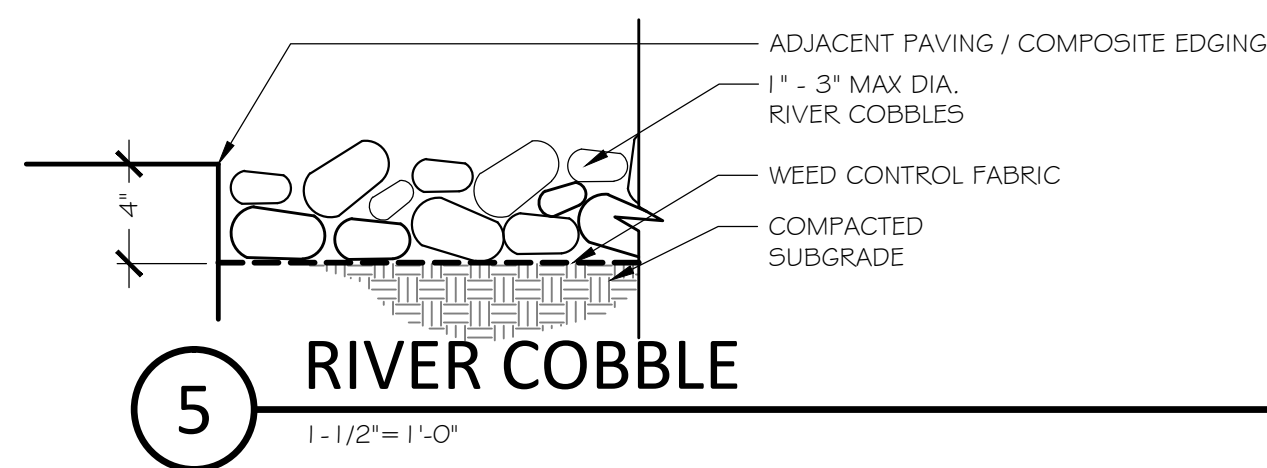
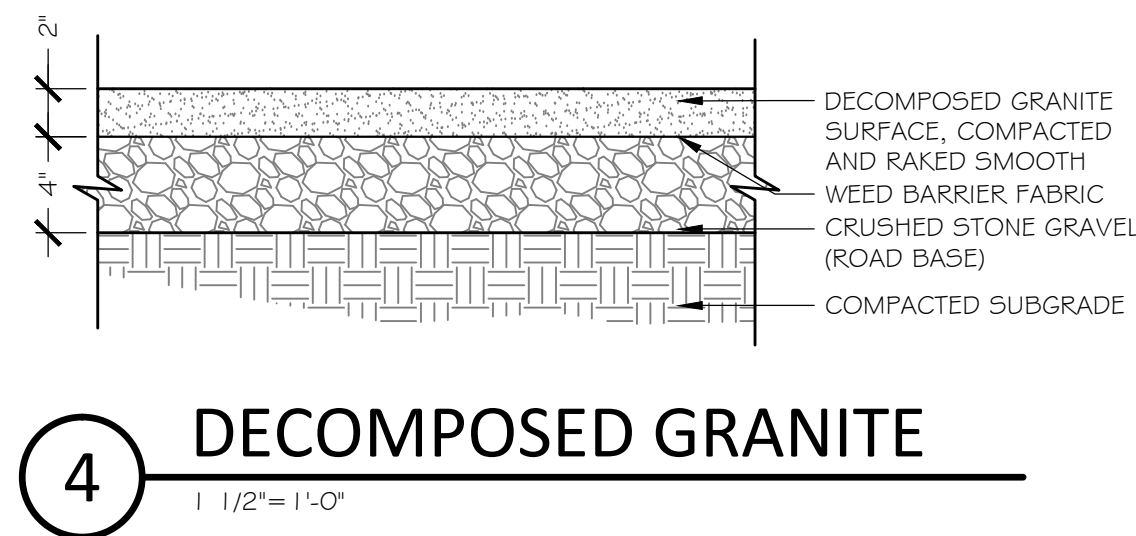
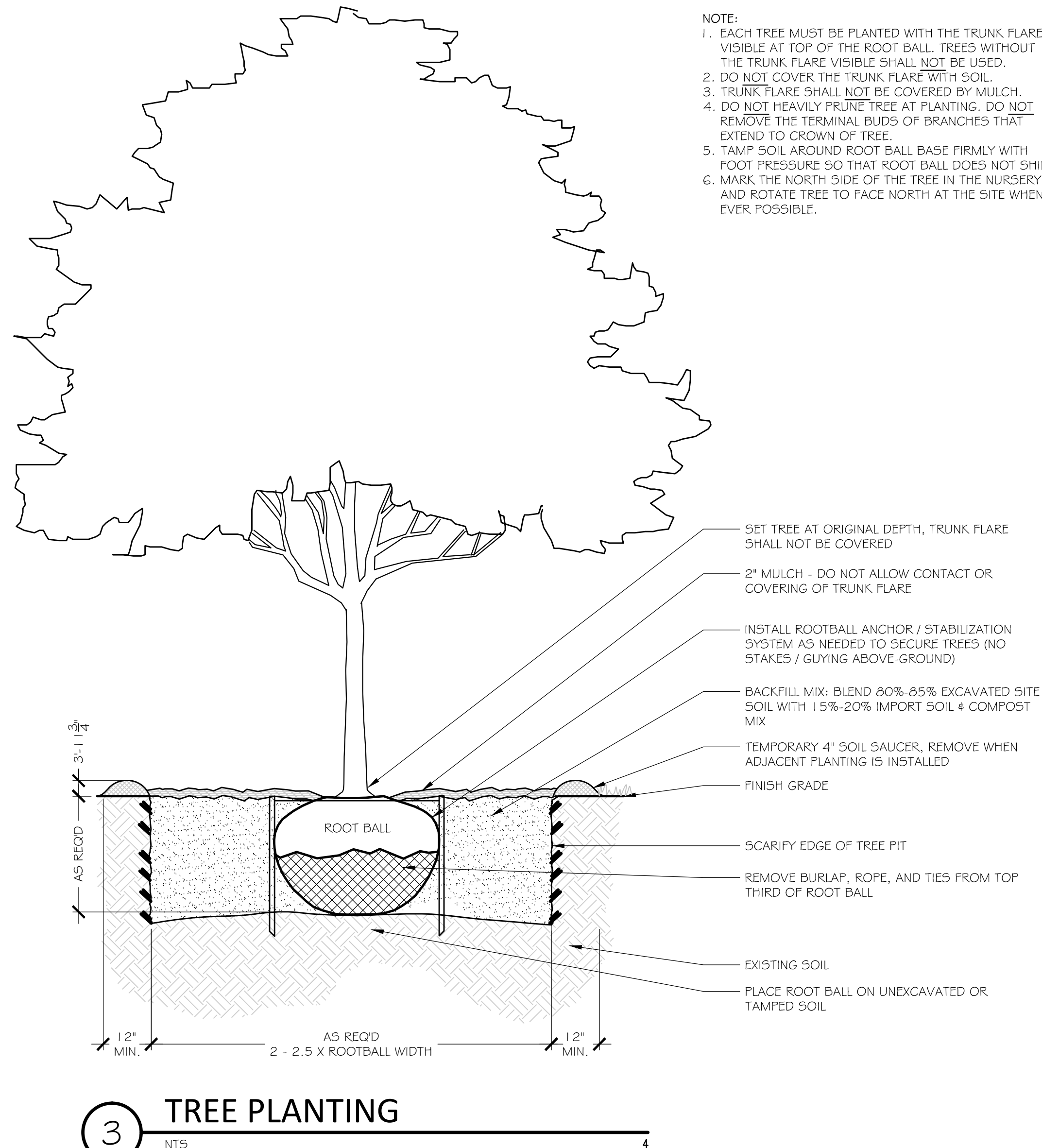
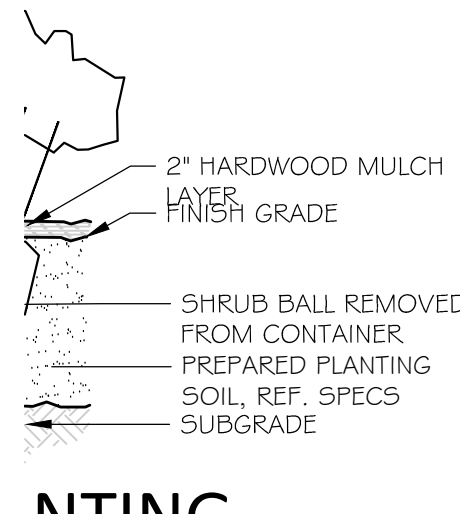
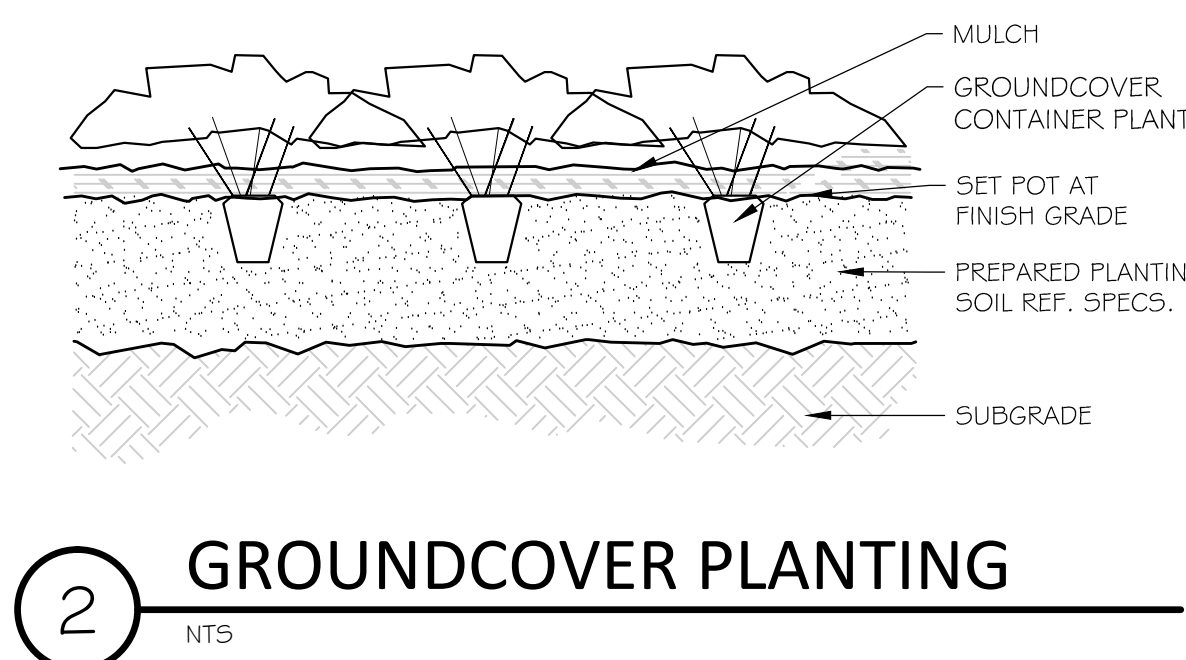
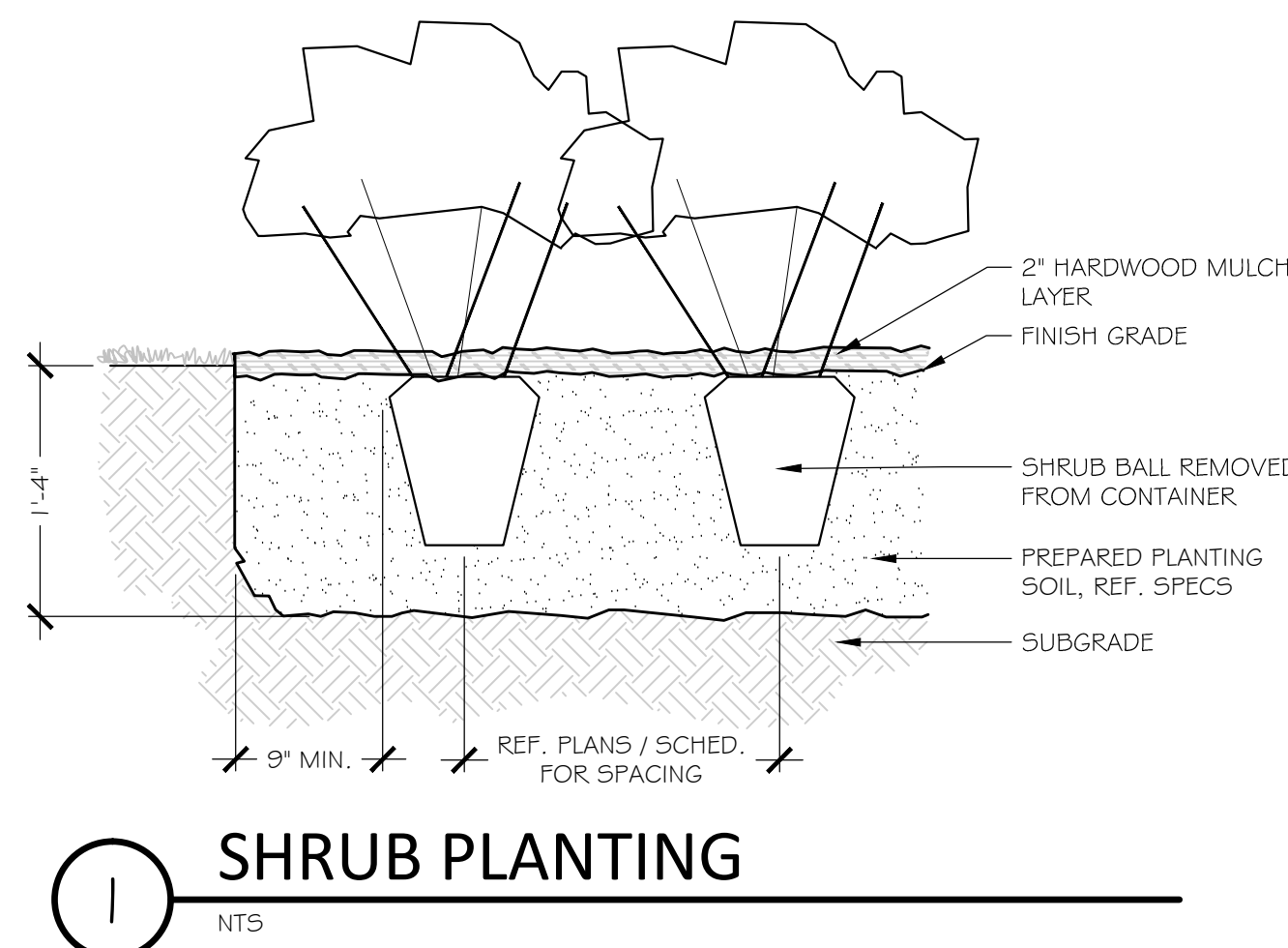


GROUND COVER						
104	BIG BLUE LIRIOPE	LIRIOPE MUSCARI (BIG BLUE)	-	-	-	1 GAL. 12" O.C. SPACING, PER PLANT
9	SALVIA	SALVIA X SYLVESTRIS MAY NIGHT	-	0.5"	12"	1 GAL. 24" O.C. SPACING, PER PLANT
TURF GRASS						
100,135 SF	COMMON BERNUOLA GRASS SOD	CHYSDON DACTYLON	HAND-LAD SOD PANELS			
OTHER						
265 LF	BED EDGING	STEEL	GREEN			INSTALL 1" ABOVE ADJACENT GRADE
4,721 SF	RIVER COBBLE	BRAZOS RIVER ROCK				
1,399 SF	RIVER COBBLE	TEXAS COBBLE BASKETS				
1,346 SF	HARDWOOD MULCH					
321 SF	DECOMPOSED GRANITE					

CANOPY TREES		GROUND COVER	
	TEXAS RED OAK		BIG BLUE LIRIOPE
	SOUTHERN LIVE OAK	SHRUBS & PERENNIALS	
	TEXAS ASH		AUTUMN SAGE
	CEDAR ELM		DWARF CRAPEMYRTLE
	LACEBARK ELM		BRAKE LIGHTS YUCCA
			TEXAS SAGE
			ROSEMARY
			SALVIA
ACCENT TREES		OTHER	
	TEXAS REDBUD		BRAZOS RIVER ROCK
			TEXAS COBBLE BASKETS
TURF			DECOMPOSED GRANITE
	BERMUDA GRASS SOD		HARDWOOD MULCH
			LANDSCAPE EDGE



STREET YARD LANDSCAPING			
STANDARD	AREA / MEASUREMENT	REQUIRED	PROVIDED
MIN. 20% OF STREET YARD	0.66' 5F	1,732 5F	5,727 5F OR 66%
STREET YARD LANDSCAPING			
< 10,000 SF = 1 PER 1,000 SF	0.66' 5F	9 TREES	9 TREES
STREET BUFFER LANDSCAPING			
SKILLERIN BLVD.	NA	15'	15'
STREET BUFFER TREES			
1 PER 30 LF	250 LF	0 TREES	0 TREES
PARKING AREA LANDSCAPING			
90 5F PER 1 2 SPACES	14 SPACES	90 5F	713 5F
PARKING AREA TREES			
1 PER 10 PARKING SPACES	14 SPACES	1 TREE	1 TREE
ALL PARKING SPACES ARE LOCATED WITHIN 50 FT OF A TREE			
COMPATIBILITY BUFFER LANDSCAPING			
CONTINUOUS LANDSCAPE SCREEN ADJACENT TO RESIDENTIAL LOTS	NA	NA	NA
COMPATIBILITY BUFFER TREES			
1 SHADE TREE PER 400 5F OF BUFFER AREA	0,904 5F	22 TREES	22 TREES



NO.	REVISION	DATE

L2.0

LANDSCAPE PLANS AND DETAILS

TOWN OF
FLOWER MOUND
FIRE STATION NO 7
2701 SKILLERN BLVD.
FLOWER MOUND, TX 75028

COPYRIGHT © 2016
BROWN REYNOLDS WATFORD ARCHITECTS, INC.
DATE 08.03.18
DRAWN BY
CHECKED BY
BRW PROJECT NUMBER 21800800

Author
Checker

DAVID McCASKILL
DESIGN GROUP
620 East Southlake Blvd
Southlake, TX 76092

INTERIM REVIEW
DOCUMENTS
NOT INTENDED FOR
BIDDING OR
CONSTRUCTION
PURPOSES

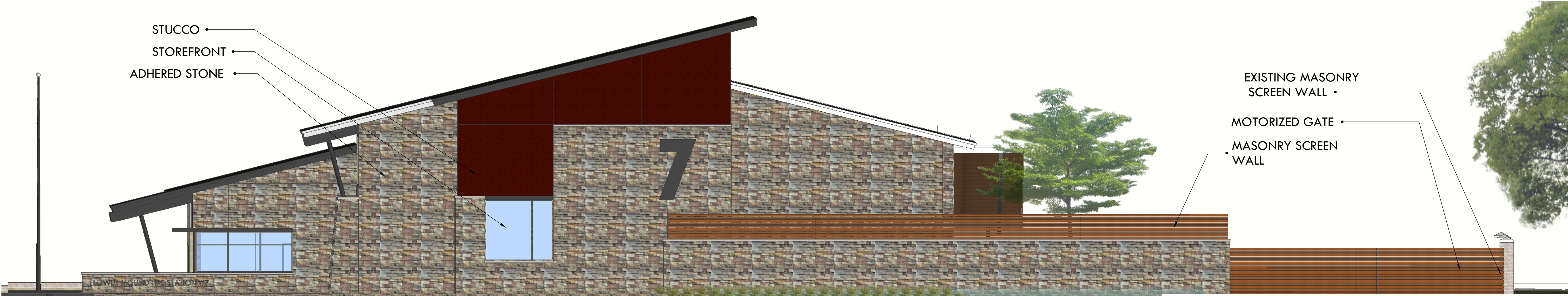
BROWN REYNOLDS WATFORD
ARCHITECTS
3532 TRAVIS STREET
SUITE 250
DALLAS, TEXAS 75204
214.238.8704
WWW.BRWARCH.COM

BRW



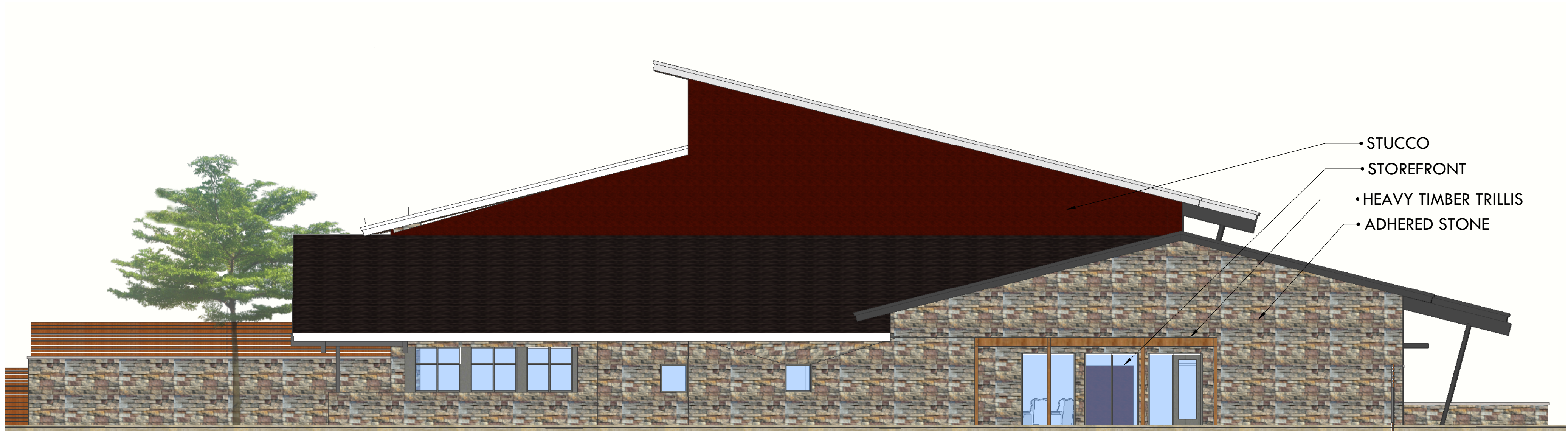
SOUTH ELEVATION

1/8" = 1'-0"



EAST ELEVATION

1/8" = 1'-0"



WEST ELEVATION

1/8" = 1'-0"



NORTH ELEVATION

1/8" = 1'-0"



PLANNING AND ZONING COMMISSION AGENDA ITEM NO: 4

DATE: October 8, 2018

FROM: Brian Waltenburg, P.E., CIP Engineering Manager

ITEM: **Public Hearing to consider a request for a Master Plan Amendment (MPA18-0006) to amend Section 8.0, Water Plan, of the Master Plan to adopt the Lakeside Reuse Water Master Plan to meet the Town of Flower Mound's reuse water system infrastructure needs over the build-out of the system located within the Lakeside Business District.**

I. ITEM SUMMARY

A summary of the draft Lakeside Reuse Water Master Plan was presented to Town Council at the July 17, 2018, Strategic Planning Session. An additional presentation was made to the Town Council at the September 20, 2018, Work Session which included additional information related to financial payback period, funding, and next steps. A public hearing and final consideration by Town Council for a Master Plan Amendment to amend Section 8.0 of the Water Master Plan of the Master Plan and to adopt the Lakeside Reuse Water Master Plan is scheduled for the October 15, 2018, Town Council Meeting.

This application will require final action by the Town Council.

II. APPLICATION ANALYSIS

The purpose of this request is to amend Section 8.0, of the Water Master Plan of the Master Plan, to include the Lakeside Reuse Water Master Plan. This will allow reuse water to be utilized for irrigation within the Lakeside Business District.

III. CORRESPONDENCE

The Town Code requires public notice in a newspaper of general circulation (Denton Record Chronicle) for all Master Plan amendment requests. At the time this report was written, staff had received no correspondence regarding the request.

IV. ATTACHMENTS

1. Proposed Lakeside Reuse Water Master Plan



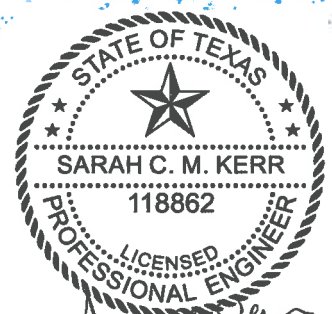
Town of Flower Mound

LAKE SIDE REUSE WATER MASTER PLAN

October 2018



Ellen T. McDonald
10/2/18



Sarah C. M. Kerr
10.2.18

Submitted by:



ALAN PLUMMER
ASSOCIATES, INC.

ENVIRONMENTAL
ENGINEERS AND SCIENTISTS



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List of Acronyms and Abbreviations

ac-ft/yr	acre-feet per year
AMI	Automated Meter Infrastructure
APAI	Alan Plummer Associates, Inc.
CBOD ₅	five-day carbonaceous biochemical oxygen demand
DMR	Discharge Monitoring Report
EPS	extended period simulation
ft	feet
gal	gallons
gpcd	gallons per capita per day
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
lbs	pounds
LF	linear feet
MG	million gallons
MGD	million gallons per day
NCTCOG	North Central Council of Governments
O&M	operating and maintenance
OPCC	opinion of probable construction cost
psi	pounds per square inch
SBR	sequencing batch reactor
SRF	State Revolving Fund
SWD	side water depth
SWIFT	State Water Implementation Fund for Texas
TCEQ	Texas Commission on Environmental Quality
Town	Town of Flower Mound
TPDES	Texas Pollutant Discharge Elimination System
TWDB	Texas Water Development Board
UV	ultraviolet
VFD	variable frequency drive
WSE	water surface elevation
WWTP	wastewater treatment plant



List of Appendices

Appendix A – Lakeside Business District Zoning Map

Appendix B – Top Irrigation Users Contact Information and Surveys

Appendix C – Current Irrigation Meters and Demands in the Study Area

Appendix D – Future Demand Included in Hydraulic Model

Appendix E – Water Age Phase Model Results

Appendix F – Flower Mound Reclaimed Water Authorization

Appendix G – Financial Evaluation



1 Executive Summary

The Lakeside Reuse Water Master Plan report presents the findings and recommendations for providing reclaimed water to irrigation customers in the Lakeside Business District area of the Town of Flower Mound (Town) from the nearby wastewater treatment plant (WWTP).

The Town provided Alan Plummer Associates, Inc. with a list of 106 potable water irrigation meters throughout the Lakeside Business District for connection to a future reclaimed water distribution system. A map of the proposed distribution system is shown in Figure 10. Historical monthly meter consumption data were collected and analyzed to develop average and peak demands for the area. A hydraulic model was used to perform an evaluation of the proposed distribution system based on the peak demands calculated from the historical data and future build-out demands estimated from current zoning for the area. A summary of the estimated existing and future system demands is shown in Table E-1 and Figure E-1.

Table E-1: Summary of Existing and Future Reclaimed Water Demand in the Lakeside Business District

Demand Type	Units	Existing	Future	Total Build-Out Demand
Peak Day Demand	MGD	3.79	2.76	6.56
Peak Hour Demand	MGD	12.1	8.84	21.0
Average Demand	MGD	0.46	0.34	0.80

The hydraulic evaluation of the proposed reclaimed water distribution system was performed using the Innovyze InfoWater® hydraulic model to appropriately size pipelines in the proposed reclaimed water system while maintaining water pressure between 40 psi and 100 psi. The reclaimed water system is shown in Figure 11. It includes approximately 15 miles of pipeline ranging in diameter from 2 inches to 30 inches.

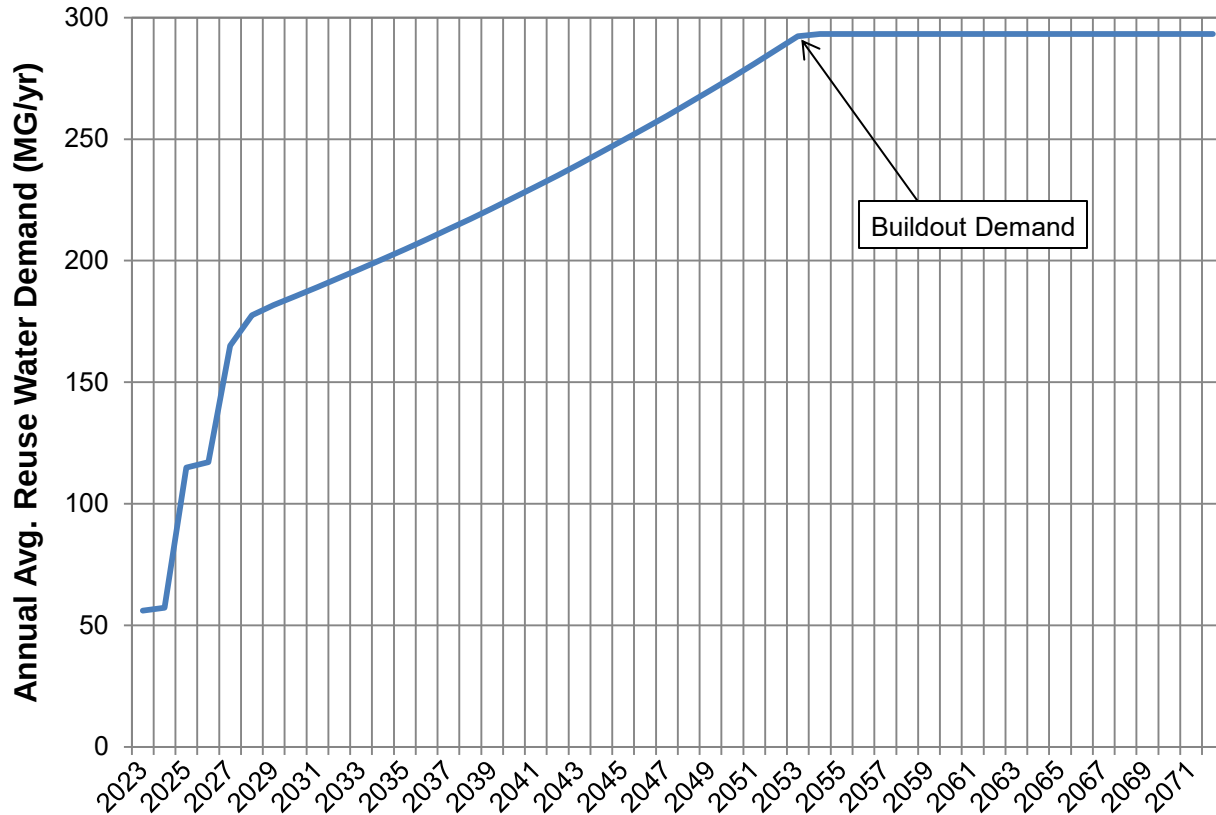


Figure E-1 – Lakeside Business District Average Reclaimed Water Demand

In addition to pipeline infrastructure, several improvements are recommended at the WWTP. These improvements include a new ultraviolet disinfection system, a transfer pump station, two 1 million gallon (MG) storage tanks, a sodium hypochlorite feed system, and a reuse pump station.

A phased implementation plan is proposed for the reuse system to manage capital costs and maximize revenue from the reuse system. The phases were established based on proximity to the WWTP and amount of reclaimed water demand. Meters located close to the WWTP with high demand will be connected to the reuse system in the early phases, and meters located far from the WWTP in undeveloped areas will be connected during later phases.

Irrigation meters near the WWTP along Spinks Road will be the first meters connected to the reclaimed water system in Phase 1. These meters are primarily used for irrigation



of open spaces at Gerault Park, Heritage Park, and Bakersfield Park. The system would be expanded in Phase 2 to include Irrigation meters on commercial properties generally located along Lakeside Parkway, east of Gerault Road. The third phase would expand the reclaimed water system to additional properties along Lakeside Parkway and Spinks Road between Gerault Road and Long Prairie Road. Phase 4 of the implementation plan would extend reclaimed water service along Long Prairie Road between Silveron Boulevard and Gerault Road, and will also connect to three dead ends created in Phases 2 and 3 to form a looped system. The fifth and final phase of the implementation plan would provide service To the residential properties located along Lakeside Parkway, west of Long Prairie Road. A summary of the proposed implementation plan is provided in Table E-2.

Table E-2: Reclaimed Water Implementation Plan

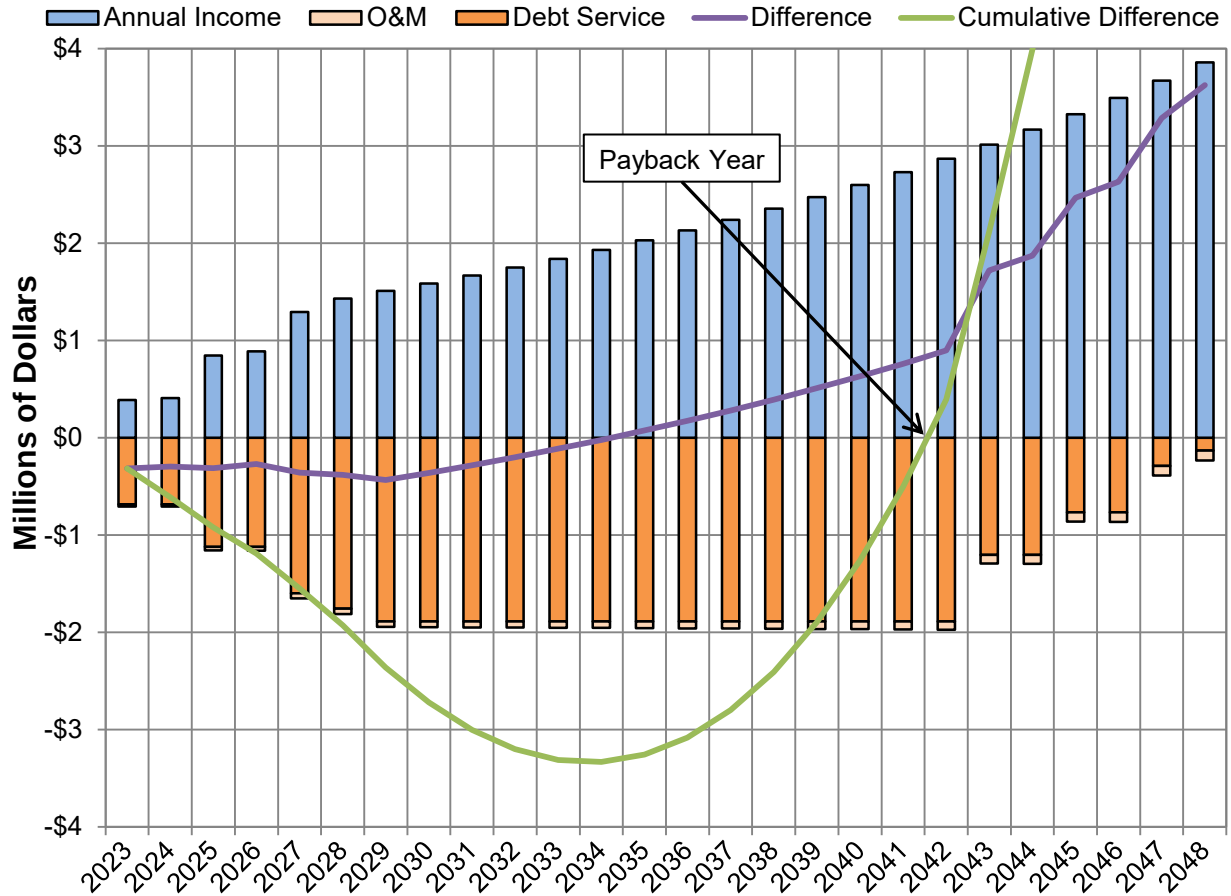
Phase	Improvements at WWTP	LF of Pipe Installed	OPCC (million) ¹
1	Transfer pump station Temporary storage tanks Reuse pump station Sodium hypochlorite feed system	14,900	\$9.03
2	1 MG storage tank	20,800	\$5.45
3	1 MG storage tank	18,900	\$5.63
4	-	9,900	\$1.44
5	-	12,900	\$1.80
Total System		77,400	\$23.35

A preliminary financial evaluation was conducted for the proposed reclaimed water system to estimate the financial impact that the reclaimed water system would have on the Town. A payback period of approximately 19 years was estimated (Figure E-2).

The financial evaluation is significantly impacted by a number of factors such as loan term, loan interest rate, and the Town's reclaimed water rate. It is also important to note that these calculations do not include loss in revenue by replacing potable water for irrigation with reclaimed water. They also do not include benefits associated with



reduction of peak demands on the potable water system. Therefore, it is recommended that the Town conduct a formal financial evaluation and rate study prior to moving forward with development of the reclaimed water system.



Financing Assumptions shown in Table 20

Figure E-2: Reclaimed Water System Financial Analysis

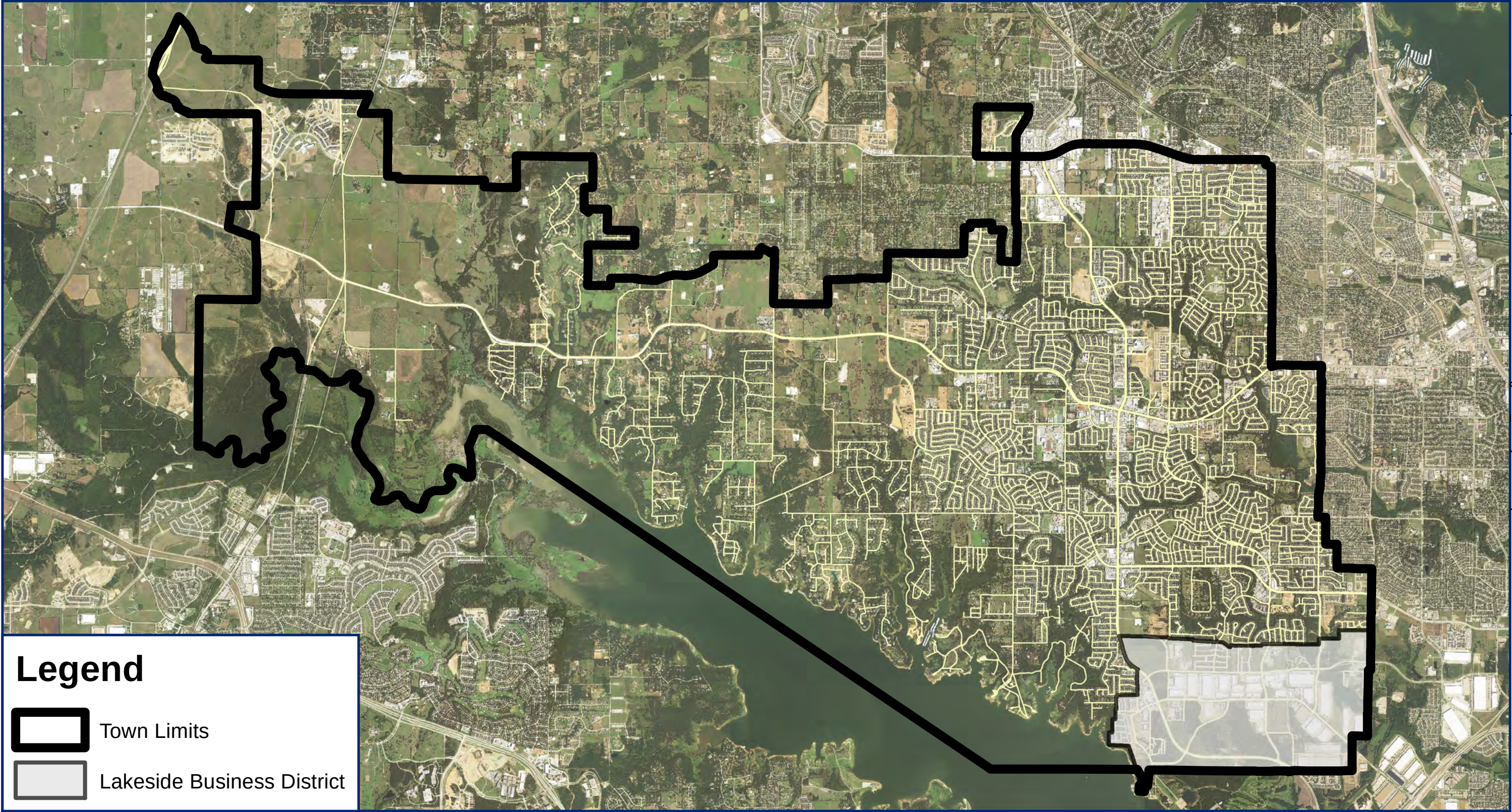


2 Introduction

In response to current and projected population increases and the associated increased demands on existing water infrastructure, the Town of Flower Mound (Town), located in Denton County, Texas, is proposing a project to provide reclaimed water from the Town's Wastewater Treatment Plant (WWTP) to the Lakeside Business District area, identified in Figure 1. Reclaimed water can be used for many beneficial purposes, including irrigation of landscaped areas and evaporation makeup water for ponds. This project would reduce the demands on the Town's potable water system by replacing potable water currently used for irrigation with reclaimed water. Potential irrigation areas in the Lakeside Business District include recreational sports facilities, parks, road medians, boulevards, parkways, commercial buildings with landscaped areas, multi-use areas, and others. Grapevine Golf Course is also near the Lakeside Business District, but was not included as a potential irrigation area in this report, as directed by the Town.

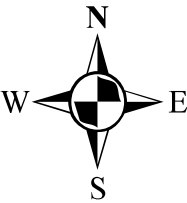
The Town retained the services of Alan Plummer Associates, Inc. (APAI) to develop the Lakeside Reuse Water Master Plan. The purpose of this reuse master plan is to evaluate the feasibility of providing reclaimed water to irrigation customers in the Lakeside Business District area. The contents of the master plan include:

- Identification of irrigation customers in the Lakeside Business District and estimated demands.
- Evaluation of reclaimed water supply available from the Town's WWTP.
- Proposed reclaimed water distribution system route and hydraulic evaluation.
- Reclaimed water quality requirements and recommended WWTP improvements.
- Proposed implementation plan and opinions of probable construction costs.



Legend

-  Town Limits
-  Lakeside Business District



0 0.3 0.6 1.2 1.8 2.4 3 Miles

DATE: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan

Figure 1: Lakeside Business District Location



1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536



2.1 PROJECTED POPULATION AND WATER DEMANDS

The Town of Flower Mound serves potable water to an estimated retail customer population of approximately 72,000, a population that increased by 27.5% between 2000 and 2010. The Town is located in the Texas Water Development Board (TWDB) water planning Region C, which contains 16 counties in North Central Texas and most of the upper half of the Trinity River Basin. According to the 2016 Region C Water Plan, the Town's population is expected to reach a buildout population of 93,000 by 2030. However, a second projection developed in 2016 by the North Central Texas Council of Governments (NCTCOG) predicts that the Town's population will reach 109,739 by 2040. The NCTCOG estimated the Town's 2017 population to be 71,850.

The corresponding estimated total water demand is projected to grow to approximately 23,000 acre-feet per year by 2030 and then remain relatively stable after that time (Table 1).

Table 1: Projected Population, Demand, and Supply from Regional Plan

(Values in Ac-Ft/Yr)	Projected Population and Demand					
	2020	2030	2040	2050	2060	2070
Projected Population	75,555	93,000	93,000	93,000	93,000	93,000
Projected Water Demand						
Municipal Demand	19,049	23,148	23,022	22,948	22,924	22,922
Total Projected Demand	19,049	23,148	23,022	22,948	22,924	22,922
Currently Available Water Supplies						
UTRWD	10,477	11,297	8,763	6,929	6,162	5,401
Dallas Water Utilities	6,166	6,166	6,166	6,166	5,817	5,540
Total Current Supplies	16,643	17,462	14,929	13,094	11,979	10,941
Need (Demand - Current Supply)	2,407	5,686	8,093	9,854	10,945	11,981
Water Management Strategies						
Water Conservation	349	597	691	765	841	917
Additional Water from Upper Trinity Regional Water District	0	2,685	5,082	6,825	7,529	8,243
Additional Water from Dallas Water Utilities and additional pipeline	2,249	2,404	2,320	2,264	2,574	2,822
Total Water Management Strategies	2,589	5,686	8,093	9,854	10,945	11,981
Reserve (Shortage)	192	0	0	0	0	0

*From TWDB 2016 Region C Water Plan: Table 5D.101



Flower Mound is committed to supporting sustainable water conservation and efficiency practices. The Town's water conservation ordinance has identified wastewater recycling and reuse as a promising strategy to reduce potable water demands. Implementation of this water reuse project would allow the Town to replace potable water used for irrigation with reclaimed water to preserve current water supplies.



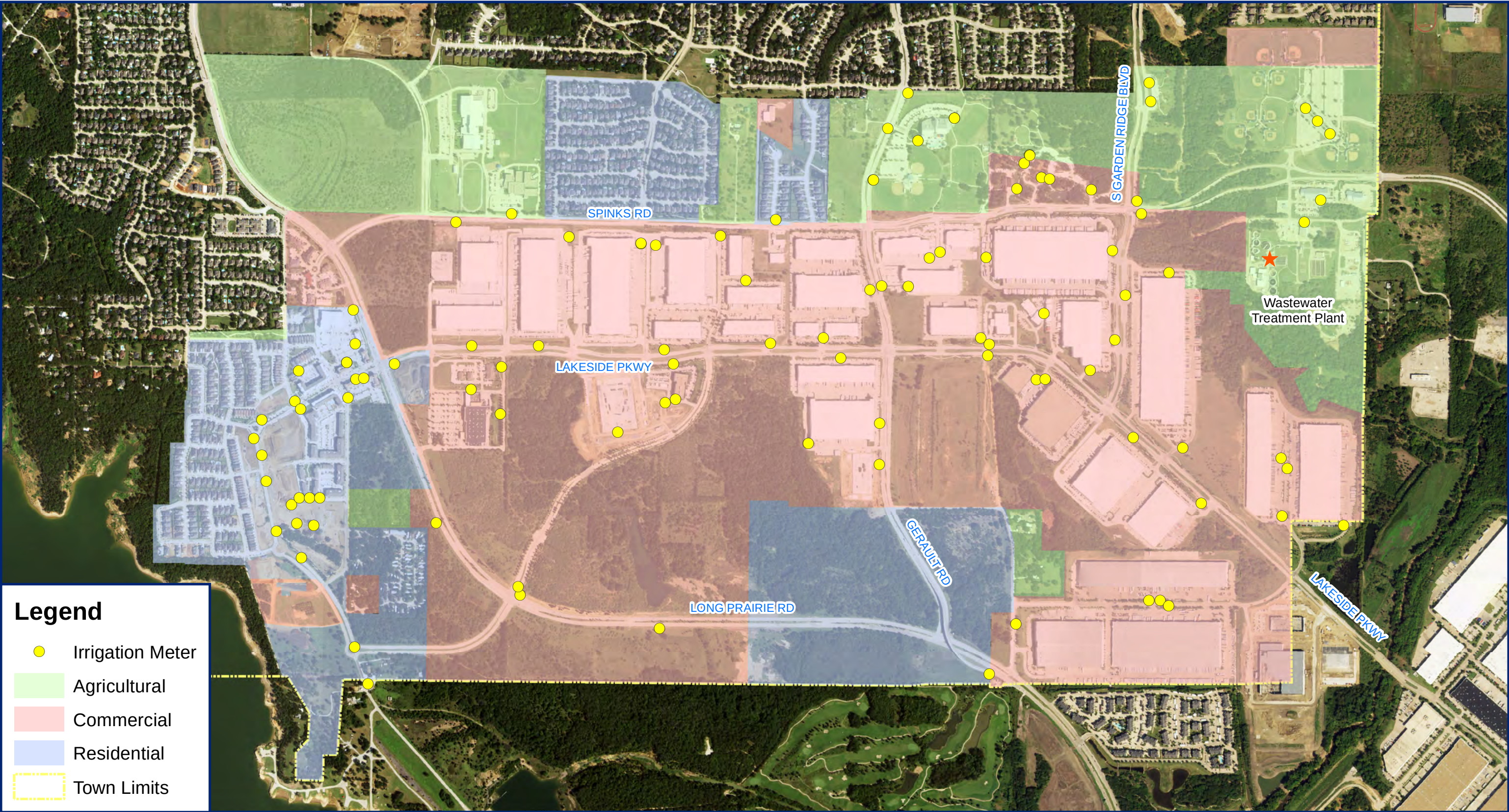
3 Reclaimed Water Demand Analysis

The Town provided APAI with a list of 106 potable water irrigation meters throughout the Lakeside Business District for connection to a future reclaimed water distribution system. While the majority of land within the Lakeside Business District is zoned as either commercial or industrial, significant areas in or near the District are zoned for recreational facilities or residential areas. A detailed zoning map for the Lakeside Business District is provided in Appendix A. For simplicity, the zones have been combined into three categories: Agricultural, Commercial, and Residential, as shown in Table 2. The land area and number of irrigation meters in each zone are also presented in the table. Locations of the irrigation meters and the simplified zones are presented in Figure 2.

Table 2: Simplified Zoning Divisions

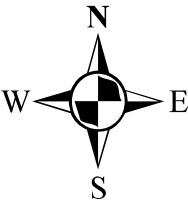
Simplified Zones	Number of Irrigation Meters	Land Area (acres)	Flower Mound Zoning Map
Agricultural	24	425	Agricultural
Commercial	56	1,110	Commercial Industrial
Residential	26	418	Combined Use Multi-Family Mobile Homes Mixed Use Retail Single Family
Combined	106	1,953	-

The Lakeside Business District is not yet fully developed and future development could significantly increase the reclaimed water demand. The following sections estimate the reclaimed water demand for existing areas currently serviced by a dedicated irrigation meter and future areas not yet serviced.



Legend

-  Irrigation Meter
-  Agricultural
-  Commercial
-  Residential
-  Town Limits



0 0.1 0.2 0.4 0.6 0.8 Miles

DATE: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan

Figure 2: Irrigation Meter Locations



1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536



3.1 EXISTING RECLAIMED WATER DEMAND

Historical monthly meter consumption data were collected for the 106 irrigation meters and analyzed to estimate the future reclaimed water demand. Monthly consumption data can be used to estimate the average monthly demand for the reclaimed water system, but do not provide information regarding changes in demand throughout the month or within a given day. The reclaimed water conveyance equipment and infrastructure will be designed to meet the Peak Hour and Peak Day Demand. Further data analysis and assumptions are required to estimate the peak hour demand from monthly consumption data. The following definitions are used to quantify demands:

Peak Month: The historical month with the greatest total water demand.

Peak Month Demand: Total water demand during the Peak Month. This value is available from monthly consumption data provided by the Town.

Peak Day: The day in the Peak Month with the greatest water demand.

Peak Day Demand: Total water demand during the Peak Day.

Peak Day Factor: Peak Day Demand divided by the Peak Month Demand.

Peak Hour: The hour in the Peak Day with the greatest water demand.

Peak Hour Demand: Total water demand for the Peak Hour. The conveyance infrastructure will be designed to operate at the peak hour demand.

Peak Hour Factor: Peak Hour Demand divided by Peak Day Demand.

Peak Month Demand for the future reclaimed water system was estimated using the monthly consumption data provided by the Town. Available monthly consumption data since 2007 was evaluated for each meter. The Peak Month Demand per meter was assumed to be equal to the highest month of consumption from historical data. The Peak Month Demand for each meter was added together to estimate the Peak Month Demand for the entire reclaimed water system (Table 3). Available monthly data for each meter were averaged together to calculate an average demand per meter. The

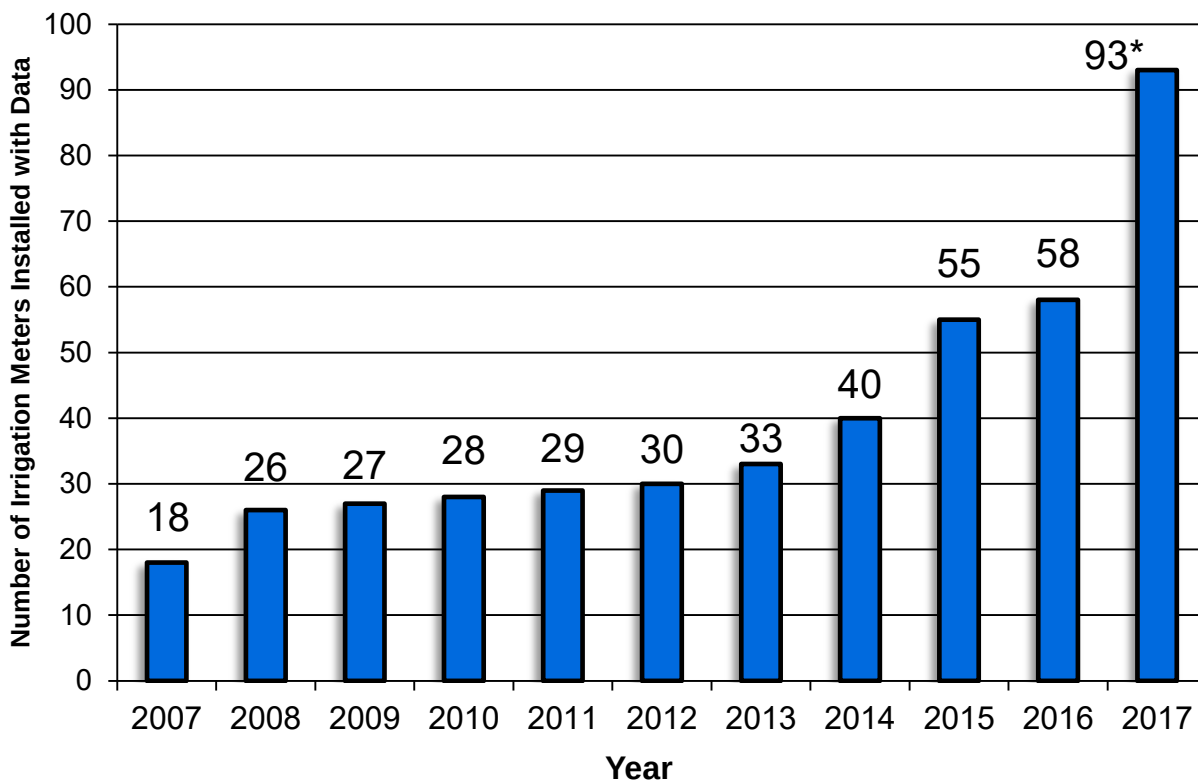


average demands for each meter were added together to determine the estimated average demand for the entire reclaimed water system (Table 3). The conveyance infrastructure will be designed to meet peak demands, but the average demands can be used to estimate system revenues and operational costs.

Table 3: Existing Reclaimed Water System Demands

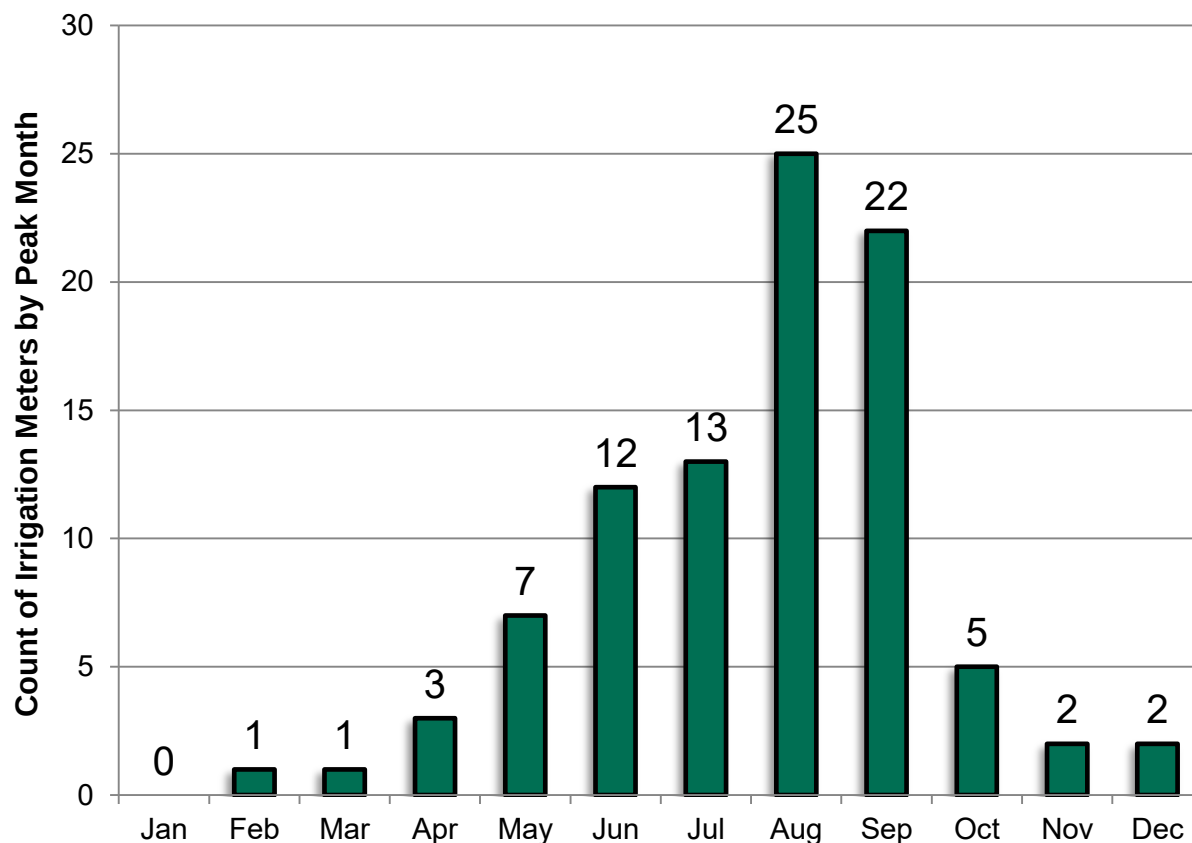
Value	MGD
Peak Day Demand	3.79
Average Demand	0.46

Figure 3 displays the number of irrigation meters in the Lakeside Business District with available monthly consumption data by year. The highest month of consumption (peak month) for each irrigation meter was found regardless of which year it occurred, and Figure 4 displays the summary of peak months by irrigation meter. This summary demonstrates that the highest irrigation demand in the Lakeside Business District area occurs in August and September. Thirteen of the 106 irrigation meters did not have any recorded monthly consumption data at the time of this master plan.



*Thirteen of the 106 meters are newly installed and do not have any available consumption data at the time of this master plan.

Figure 3: Available Monthly Consumption Data by Year



*Thirteen of the 106 meters are newly installed and do not have any available consumption data at the time of this master plan.

Figure 4: Historical Peak Months by Irrigation Meter

In addition to monthly consumption data, daily and hourly consumption data were also available since the Town has replaced their existing manual meters with Automated Meter Infrastructure (AMI). Hourly consumption data between July 15, 2017 and October 19, 2017 were evaluated for three of the largest irrigation users in the Lakeside Business District. The Peak Day and Peak Hour Demands and associated Peak Day and Peak Hour Factors were obtained from this data set and are presented in Table 4.

**Table 4: Summary of Historical Hourly Data**

Meter Number	55-0165-99	86-2995-99	86-9210-99	Combined
Peak Month¹	8/2017	9/2017	8/2017	9/2017
Peak Month Demand¹ (gpd)	20,939	23,550	5,829	46,477
Peak Day	8/9/2017	9/1/2017	8/21/2017	9/1/2017
Peak Day Demand² (gpd)	46,042	51,685	31,329	79,749
Calculated Peak Day Factor	2.20	2.19	5.37	1.72
Peak Day Demand² (gph)	1,918	2,154	1,305	3,323
Peak Hour	10 am	7 pm	8 pm	11 pm
Peak Hour Demand² (gph)	4,837	4,493	3,910	11,199
Calculated Peak Hour Factor	2.52	2.09	3.00	3.37

1. Only monthly consumption data collected between 7/15/2017 and 10/19/2017 was evaluated.

2. Based on hourly consumption data collected between 7/15/2017 and 10/19/2017.

The purpose of the Peak Day Factor is to calculate the Peak Day Demand from the Peak Month Demand by accounting for the fact that irrigation likely does not occur every day in a month. A simplified assumption would be that an individual user might irrigate their property every other day during a low precipitation, high temperature period of time. Irrigating every other day would represent a Peak Day Factor of 2.0. This assumption is confirmed by the hourly data displayed in Table 4, where the combined Peak Day Factor for the three meters was 1.72. Peaking factors can vary by the type of irrigation (such as golf course, parks and rec, commercial, residential, etc.) but typically range between 1.0 and 3.0². A Peak Day Factor of 2.0 was selected for this evaluation. Using this factor, the assumed Peak Day Demand for the entire system is 3.79 million gallons per day (MGD)³.

In a similar manner, the purpose of the Peak Hour Factor is to calculate the Peak Hour Demand from the Peak Day Demand, knowing that an irrigation user does not typically irrigate their property for all 24 hours in a day. Rather, irrigation may be accomplished in an 8 hour window, which would represent a Peak Hour Factor of 3.0. Hourly data from

² Direct, Non-Potable Reuse Guidance Document, Prepared for Region C Water Planning Group, Alan Plummer Associates, Inc. and Freese and Nichols, Inc., April 2009. Table 5-1.

³ Equal to the Peak Month Demand of 1.89 MGD times the Peak Day Factor of 2.0.



the three meters show Peak Hour Factors that range between 2.09 and 3.37 (Table 4). Hourly data for a full 24 hours from a number of peak flow days is shown in Table 5. An irrigation pattern can be estimated from this data.

Table 5: Hourly Irrigation Data during High Flow Days

Hour	Sum of 3 Irrigation Meters (gal)				Hourly Flow to Daily Peak Flow Ratio			
	8/21/17	9/18/17	9/25/17	10/2/17	8/21/17	9/18/17	9/25/17	10/2/17
0	8,704	9,651	8,158	9,409	0.76	0.87	0.82	0.86
1	11,419	11,150	9,996	10,518	1.00	1.00	1.00	0.96
2	6,659	7,631	7,180	7,319	0.58	0.68	0.72	0.67
3	7,118	7,371	7,453	7,627	0.62	0.66	0.75	0.70
4	7,380	3,692	3,382	3,593	0.65	0.33	0.34	0.33
5	4,218	3,443	3,342	3,476	0.37	0.31	0.33	0.32
6	4,516	3,643	3,594	3,803	0.40	0.33	0.36	0.35
7	2,149	1,369	1,997	1,839	0.19	0.12	0.20	0.17
8	980	74	1,058	78	0.09	0.01	0.11	0.01
9	951	71	1,033	68	0.08	0.01	0.10	0.01
10	891	58	606	65	0.08	0.01	0.06	0.01
11	984	70	152	74	0.09	0.01	0.02	0.01
12	973	81	175	104	0.09	0.01	0.02	0.01
13	932	71	167	82	0.08	0.01	0.02	0.01
14	929	65	129	90	0.08	0.01	0.01	0.01
15	922	62	221	134	0.08	0.01	0.02	0.01
16	983	71	175	84	0.09	0.01	0.02	0.01
17	1,038	89	210	85	0.09	0.01	0.02	0.01
18	957	72	82	85	0.08	0.01	0.01	0.01
19	1,349	796	300	586	0.12	0.07	0.03	0.05
20	2,771	2,922	1,326	2,328	0.24	0.26	0.13	0.21
21	4,568	6,033	3,835	4,469	0.40	0.54	0.38	0.41
22	10,275	8,114	9,455	10,234	0.90	0.73	0.95	0.93
23	10,796	9,872	9,647	10,958	0.95	0.89	0.97	1.00

Demand throughout these days (normalized by the peak hour demand) is displayed in Figure 5. It can be seen from this figure that the data from all four days demonstrate a similar trend. The single hour with the highest demand (Peak Hour) occurred between 11 pm and 2 am on all four days. Additionally, demand decreased to almost zero during the daytime hours of 9 am to 6 pm. This trend is consistent with typical irrigation practices of irrigating during the evening when pedestrian activity and evaporation is at a minimum. An approximated irrigation pattern (shown in Figure 5) to be used for the reclaimed water system analysis was developed based on the historical trends from these four days.

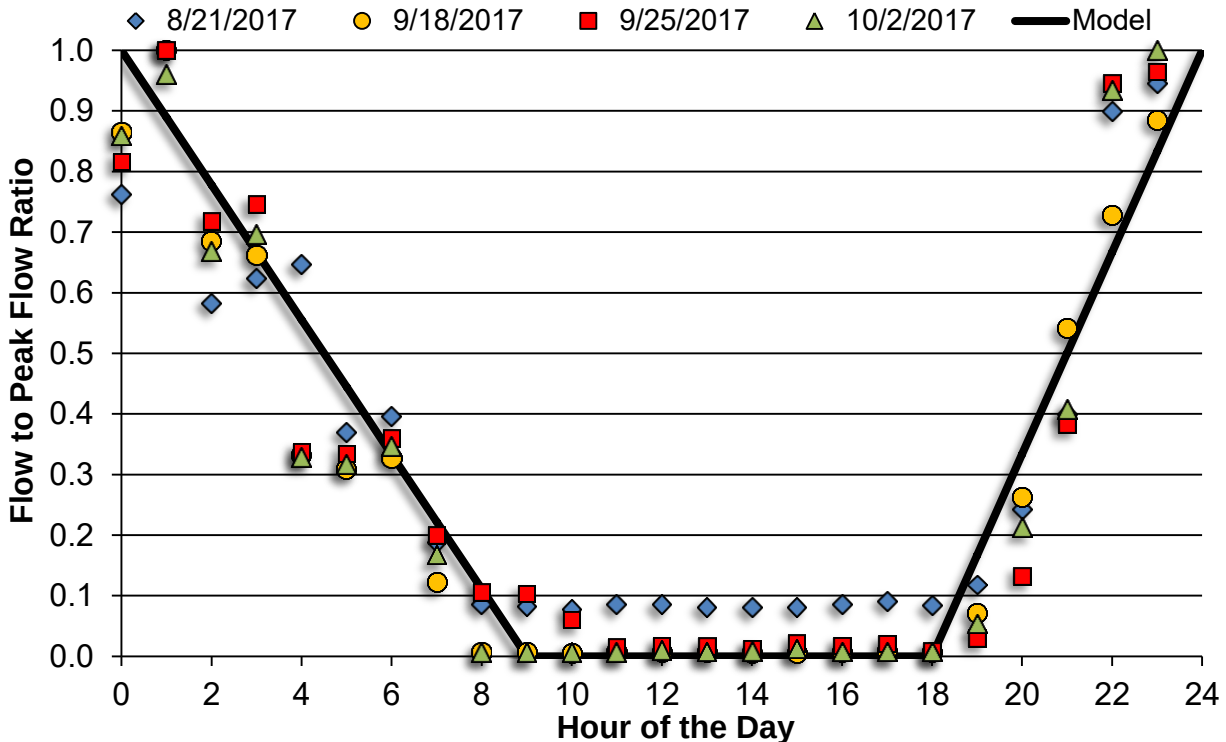


Figure 5: Average Irrigation by Hour on a Peak Day

The Peak Hour Demand and Peak Hour Factor can be calculated from the geometry of the modeled irrigation pattern by determining the percentage of the day that irrigation actually occurs:

$$\text{Peak Hour Factor} = \frac{\text{Peak Hour Demand}}{\text{Peak Day Demand}} = \frac{24 \text{ hours}}{\frac{(1.0 * 9 \text{ hours})}{2} + \frac{(1.0 * 6 \text{ hours})}{2}} = 3.2$$

The Peak Hour Factor of 3.2 calculated from the shape of the approximated irrigation pattern is within the range of historical peaking factors presented in Table 4, where an average of 3.37 was calculated. Peak Hour Factors generally range between 1.0 and 6.0 depending on the entity accomplishing irrigation⁴. A Peak Hour Factor of 3.2 was selected for this evaluation based on the historical data presented in Figure 5. Using the

⁴ Direct, Non-Potable Reuse Guidance Document, Prepared for Region C Water Planning Group, Alan Plummer Associates, Inc. and Freese and Nichols, Inc., April 2009. Table 5-1.



peaking factors defined above, the estimated Peak Hour Demand for the entire existing system is 12.1 MGD⁵. The average demand was calculated to be 0.46 MGD. A summary of the assumed existing reclaimed water demands used in this evaluation is presented in Table 6.

Table 6: Summary of Existing Lakeside Reclaimed Water System Demands

Demand Type	Value
Peak Monthly Demand	1.89 MGD
Month to Day Factor	2.0
Peak Daily Demand	3.79 MGD
Day to Hour Factor	3.2
Peak Hourly Demand	12.1 MGD
Average Demand	0.46 MGD

3.2 ESTIMATED FUTURE DEMAND

The Lakeside Business District has rapidly developed in recent years, and is anticipated to continue growing. The reclaimed water demand could significantly increase in the coming years as more businesses and developments are constructed. Future demands in the Lakeside area were estimated by calculating current peak hour unit demands (gpm/acre) and applying them to areas not yet serviced with dedicated irrigation meters.

Current peak hour unit demands were calculated for each of the simplified zones (agricultural, commercial, residential), acknowledging that land zoned differently may have different irrigation demands. These peak hour unit demands were multiplied by the total area available for future development, by zone, to estimate future irrigation demand.

A few areas in the Lakeside Business District were not included in the future demand calculation because development in these areas is not anticipated. The land south and west of the WWTP was deemed not available for development since it lies within the

⁵ Peak Hour Demand = Peak Day Demand (3.79 MGD) times Peak Hour Factor of 3.2.

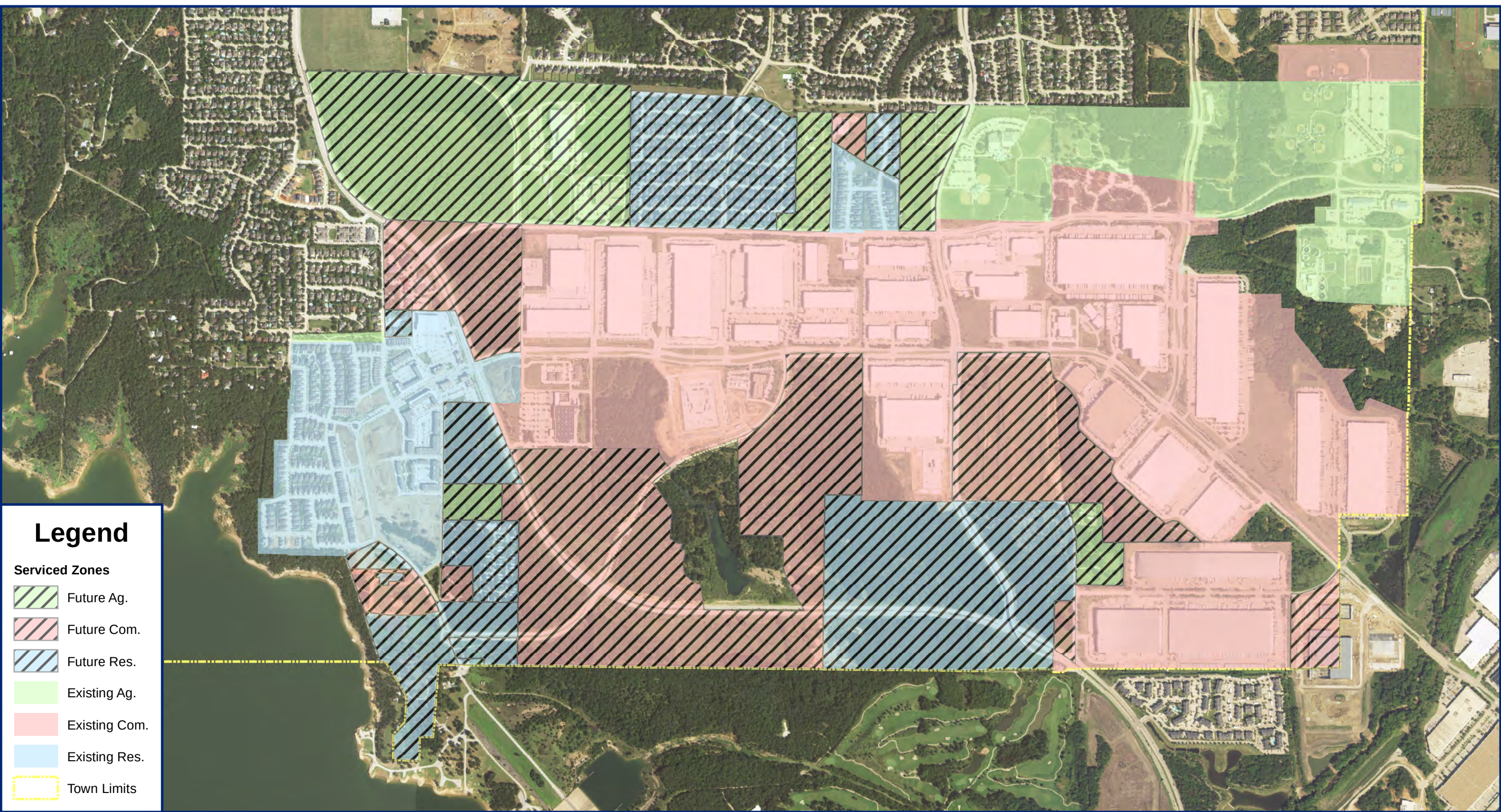


100-year floodplain. Additionally, an on-channel pond exists south of Silveron Boulevard and north of Long Prairie Rd. This pond may be considered “waters of the United States” which would require environmental permitting and mitigation to disturb the area.

Figure 6 displays area already serviced by irrigation meters in the Lakeside Business District along with area available for future service, by zone, and area not available for future service. The Peak Day Demand in the Lakeside Business District is anticipated to increase from 3.79 MGD to 6.56 MGD after the area becomes fully serviced (Table 7). Table 8 provides a detailed summary of existing and future demands.

Table 7: Summary of Lakeside Reuse System Existing and Future Demands

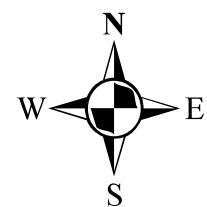
Demand Type	Units	Existing	Future	Total
Peak Day Demand	MGD	3.79	2.76	6.56
Peak Hour Demand	MGD	12.1	8.84	21.0
Average Demand	MGD	0.46	0.34	0.80



Legend

Serviced Zones

-  Future Ag.
-  Future Com.
-  Future Res.
-  Existing Ag.
-  Existing Com.
-  Existing Res.
-  Town Limits



0 0.1 0.2 0.4 0.6 0.8 Miles

DATE: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan
Figure 6: Existing and Future Irrigation Service Zones



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**Table 8: Estimated Future Demand for the Lakeside Business District**

Item No.	Parcel/Zone Type	Units	Ag.	Com.	Res.	Total
[1]	Existing Peak Hour Demand	MGD	0.77	9.7	1.65	12.1
[2]	Area Currently Serviced	acres	194	686	145	1,024
[3]=[1] / [2]	Estimated Peak Hour Unit Demand	gpm/acre	2.76	9.82	7.90	-
[4]	Future Area Available for Service	acres	187	352	278	817
[5]	Area Not Available for Service	acres	37	72	2	111
[6]=[3]x[4]	Additional Future Peak Hour Demand	MGD	0.74	4.98	3.16	8.88
[7]=[1]+[6]	Total Future Peak Hour Demand	MGD	1.51	14.7	4.81	21.0

3.3 IRRIGATION CUSTOMER COMMUNICATION

The five largest existing irrigation users in the Lakeside Business District were contacted to obtain information about their irrigation system and to inform them of the goals of this study. A standard survey was distributed to each of the five customers with specific questions regarding the user's irrigation system. Two of the five users returned the survey.

The survey responses confirm the assumption that irrigators in the Lakeside Business District typically irrigate every other day between 6 pm and 9 am. Selected responses from the two surveys received are summarized in Table 9. The two completed surveys and contact information for the top five irrigation users are provided in Appendix B.

Table 9: Selected Survey Responses

Survey Number	Minimum System Pressure (psi)	Maximum System Pressure (psi)	Irrigation Schedule	Irrigation Window
1	40	100	Every Other Day	10 pm – 5 am
2	-	80	Every Other Day	8 pm – 5 am



4 Reclaimed Water Supply and Required Storage

The Town owns and operates a WWTP, serving the eastern part of the Town, which will supply reclaimed water for the future Lakeside Business District reuse system. The plant has a permitted annual average capacity of 10 MGD and a two-hour peak capacity of 33.3 MGD. Historical effluent flow data collected between 2015 and 2017 were analyzed to determine the amount of reclaimed water currently available. Figure 7 and Table 10 demonstrate that the WWTP produces 5.22 MG of reclaimed water per day on average, and at least 4.43 MG each day 95% of the time. However, the plant uses a non-continuous treatment process (sequencing batch reactor (SBR)) which causes the effluent flow to vary significantly throughout the day depending on the status of the SBR, as seen in Figure 8. The minimum effluent flow during the day represents the limitation for supplying reclaimed water to the distribution system if no storage is constructed. A simplified approximation of diurnal changes in effluent flow throughout the day, discounting the effects of the SBR, is also shown in Figure 8.

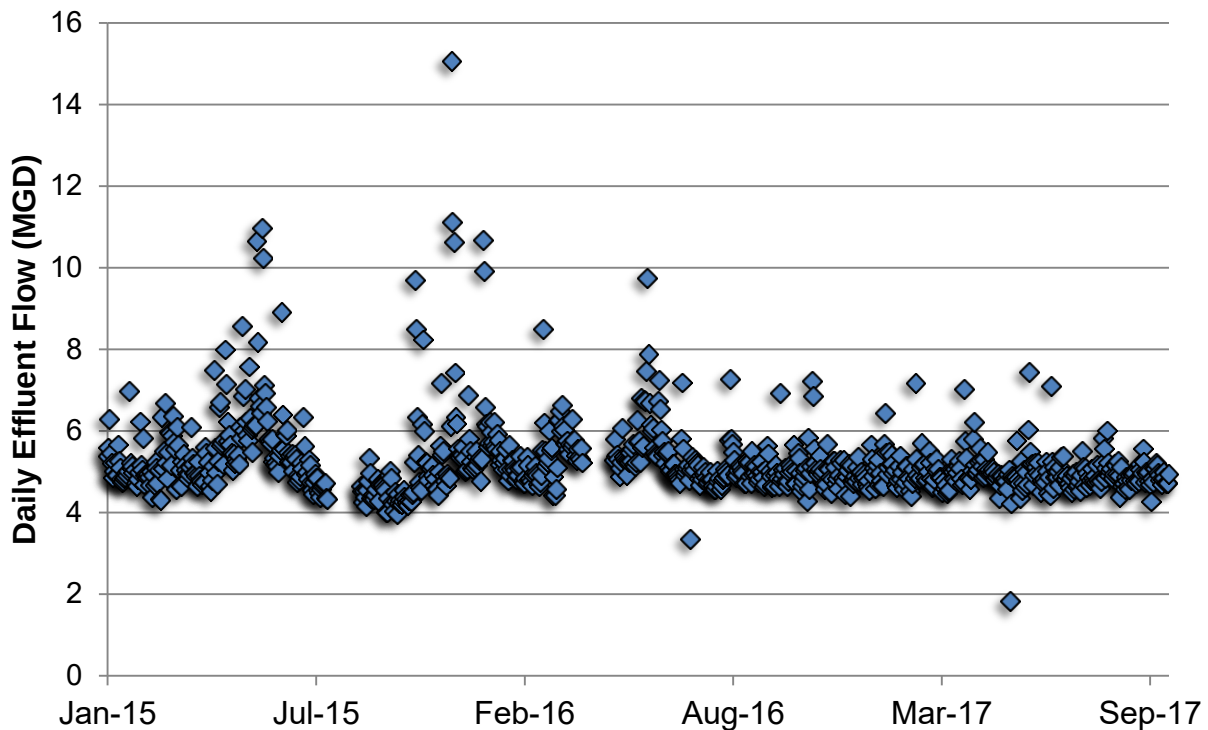
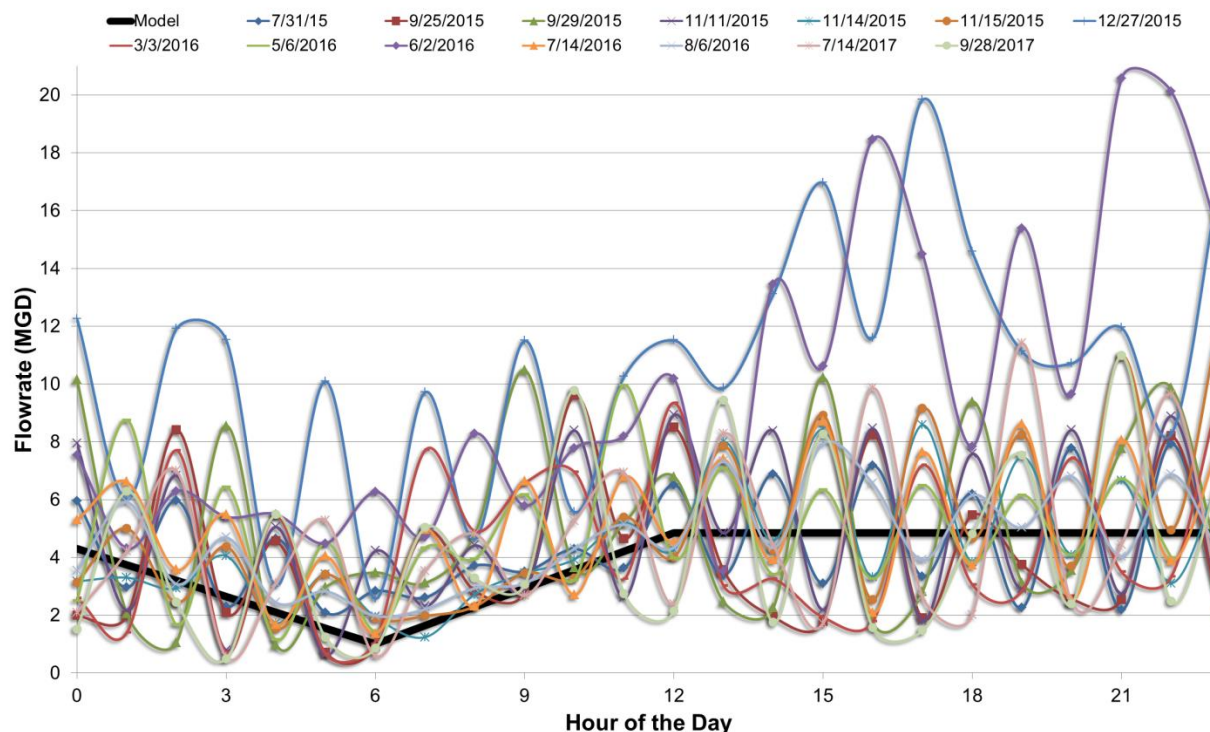


Figure 7: Daily Effluent Flow from Town WWTP

**Table 10: Town WWTP Daily Effluent Flow Summary**

Description	Value ¹ (MGD)
Minimum	1.81
5 th Percentile	4.43
Average	5.22
Maximum	15.1

1. Daily effluent flow data from 1/1/15 to 10/15/17

**Figure 8: Hourly Effluent Flow from Town WWTP**

4.1 REQUIRED RECLAIMED WATER STORAGE

The estimated Peak Day Demand of 3.79 MGD for the existing 106 irrigation meters is well below the amount of water produced by the WWTP on a typical day. In fact, of the 958 days of effluent flow data available, there were only two days where the WWTP produced less than 3.79 MGD of reclaimed water. However, as discussed in Section 3.1, irrigation demand is not consistent throughout the day, but increases to a maximum around midnight and reduces to no demand during the daytime. The historical hourly effluent data displayed in Figure 8 demonstrates that there were few days where hourly



effluent flow was greater than the reclaimed water Peak Hour Demand of 12.1 MGD. Therefore, storage will be required at the WWTP to meet the reclaimed water demand.

The hourly reclaimed water demand pattern approximation was compared against the hourly reclaimed water supply approximation to initially calculate the minimum volume of storage required (Figure 9). It is estimated from this calculation that approximately 2 MG of storage would be required to meet the existing reclaimed water demand on a day where the WWTP produces a Peak Day Demand of at least 3.79 MG in a day, which was achieved on 99.8% of days from historical data. For confirmation, the calculation was repeated using historical hourly flow instead of the approximated effluent diurnal flow. The calculated required storage ranged from 0.25 MG to 2.00 MG (Table 11), confirming the calculation initially performed.

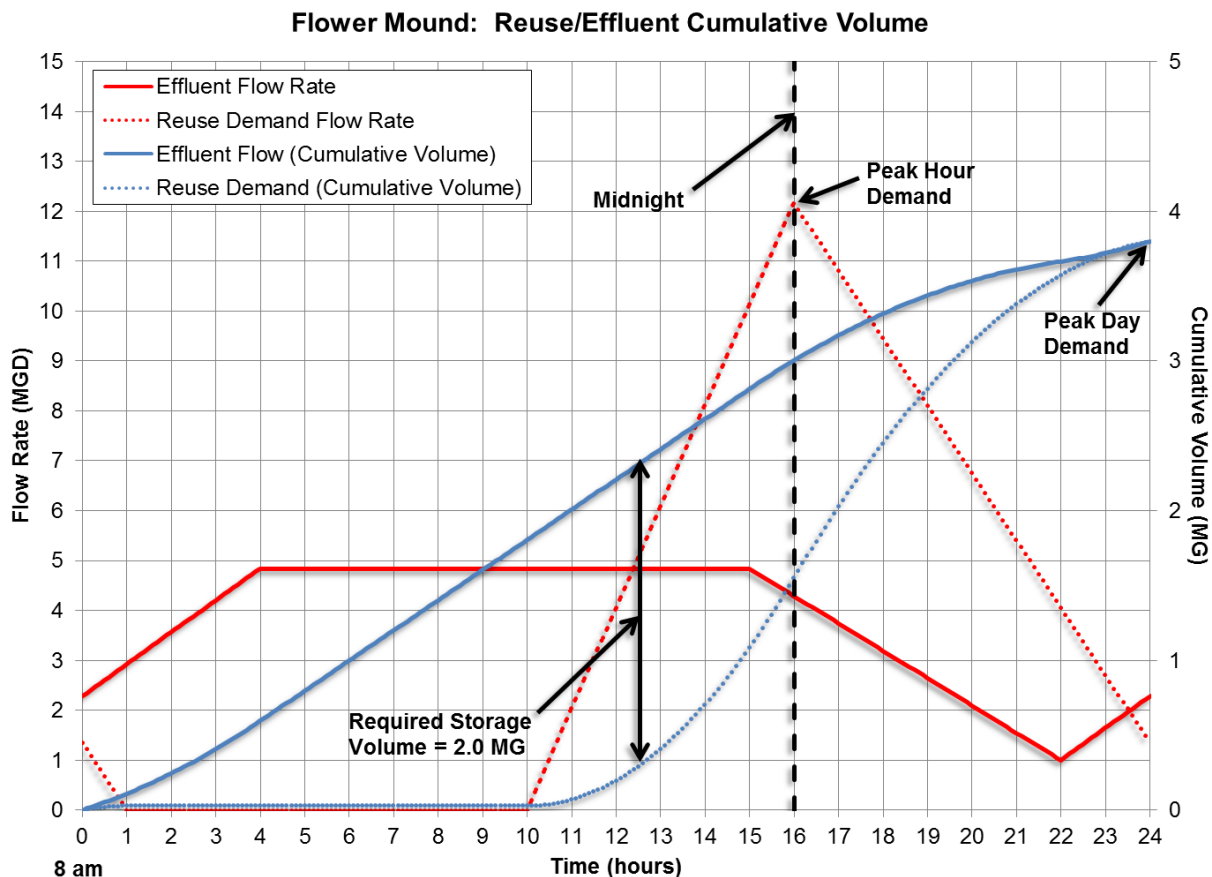


Figure 9: Required Volume of Reclaimed Water Storage

**Table 11: Required Storage using Historical Effluent Flow**

Date	Daily Effluent Flow (MG)	Peak Hour Effluent Flow Rate (MGD)	Minimum Required Storage Volume (MG)
7/31/2015	4.32	7.94	1.71
9/25/2015	4.00	9.62	2.00
9/29/2015	5.00	10.48	1.39
11/11/2015	4.83	8.93	1.62
11/14/2015	4.43	8.58	1.89
11/15/2015	5.00	12.47	1.50
12/27/2015	10.68	19.85	0.25
3/3/2016	4.41	9.98	1.79
5/6/2016	4.88	9.97	1.51
6/2/2016	9.74	20.57	0.74
7/14/2016	5.04	8.71	1.42
8/6/2016	4.57	7.95	1.72
7/14/2017	4.49	11.41	1.78
9/28/2017	4.26	10.99	1.89

It is recommended that the Town construct 2 MG of storage at the WWTP to meet the existing Peak Day Demand of 3.79 MGD and the existing Peak Hour Demand of 12.1 MGD.

The required storage volume is calculated from existing demands only and does not account for future growth in the Lakeside Business District area. As additional users beyond the 106 meters initially identified are connected to the distribution system, it is recommended that the required storage volume be reevaluated. Additional storage may be necessary to accommodate future demand. However, as the Lakeside Business District area grows, wastewater flows to the WWTP will also rise, increasing the supply of reclaimed water and dampening the effect that additional growth will have on storage requirements. Additionally, reclaimed water users could be placed on an irrigation schedule in the future to manage peak demands and reduce storage requirements.



5 Hydraulic Evaluation

A hydraulic evaluation of the proposed reclaimed water distribution system was performed using the Innovyze InfoWater® hydraulic model. A Peak Day Demand scenario was created as an extended period simulation (EPS) with a duration of 24 hours. This simulation contains the Peak Hour Demand condition occurring at midnight, as indicated by historical data presented in Figure 5. The hydraulic modeling was conducted to appropriately size pipelines in the reclaimed water distribution system and to determine the resulting water pressure throughout the system. A second hydraulic model, using an average demand scenario, was created to evaluate the water age within the system. This second model was created as an EPS with a duration of 168 hours (1 week). Water age can be used as an indicator to evaluate the water quality deterioration within a distribution system. This simulation assumes the same irrigation pattern as the Peak Day Demand scenario but uses the average demand within the system instead of Peak Day Demand, to be conservative. The following sections describe the model development, performance criteria, and model results.

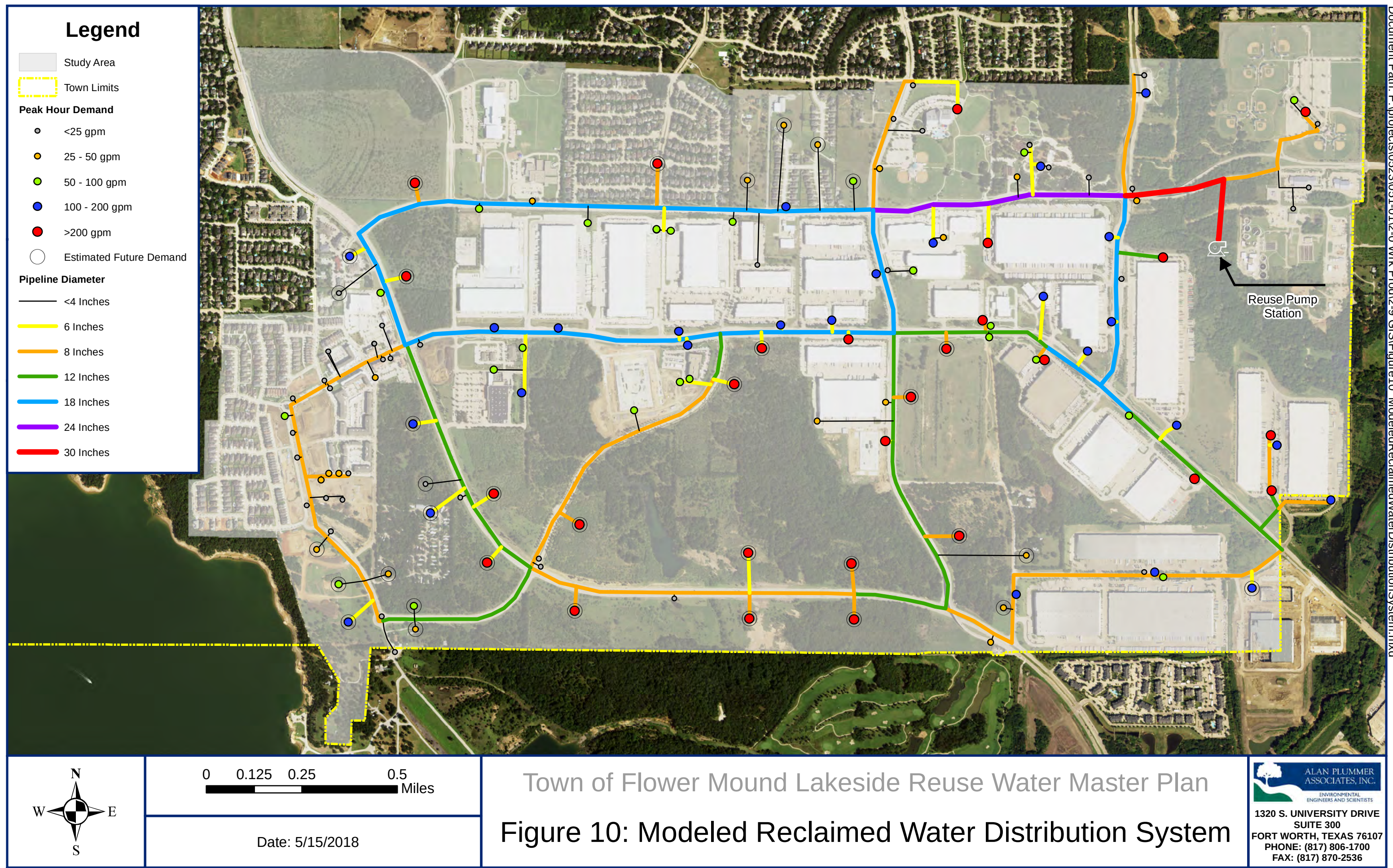
5.1 MODEL DEVELOPMENT

The hydraulic model contains both existing and estimated future demands. The Peak Hour Demand for each of the existing meters was placed in the model and assigned the approximated irrigation pattern displayed in Figure 5. Appendix C contains information for all 106 existing irrigation meters, including their Peak Hour Demand and average consumption. Estimated future demand was also included in the model. Appendix D contains a map showing the location of future demand added to the model and a table specifying the amount of demand per location. A summary of the existing and future Peak Hour and average demands included in the hydraulic model are displayed in Table 12. Standard hydraulic roughness coefficients based on PVC pipe were used in the model. The Peak Hour Demands included in the hydraulic model and the modeled pipeline sizes are presented in Figure 10.



Table 12: Summary of Modeled Demands

Description	Value
Existing Peak Hour Demand, MGD	12.1
Additional Future Peak Hour Demand, MGD	8.84
Total Future Peak Hour Demand, MGD	21.0
Existing Average Demand, MGD	0.46
Additional Future Average Demand, MGD	0.34
Total Future Average Demand, MGD	0.80





5.2 PERFORMANCE CRITERIA

A number of model performance criteria were developed in conjunction with the Town (Table 13). These criteria specify the minimum/maximum allowable water pressure at irrigation meters and maximum allowable unit headloss through pipelines in the system.

Table 13: Performance Criteria

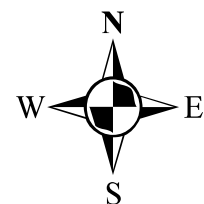
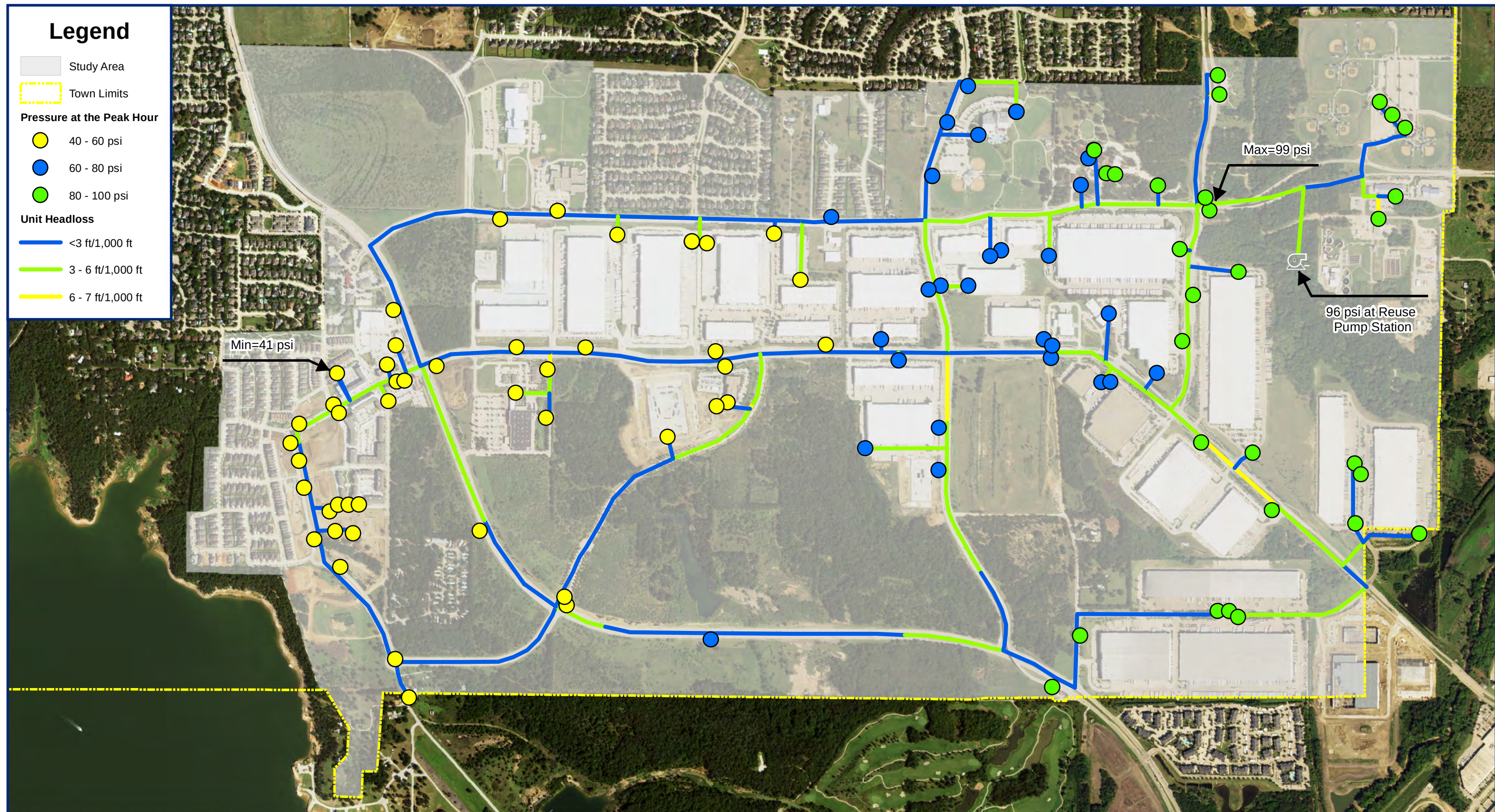
Performance Criteria	Value
Minimum Pressure at Irrigation Meter	40 psi
Maximum Pressure at Irrigation Meter	100 psi
Maximum Unit Headloss	7 feet per 1,000 feet of pipe

5.3 MODEL PRESSURE RESULTS

The hydraulic model was used to evaluate the performance of the system based on the criteria defined in Table 13. Meters near the WWTP are only slightly under 100 psi while the meters at the western edge of the Lakeside area are only slightly above 40 psi (Figure 11). These differences are partly due to the variation in elevation throughout the Lakeside Business District. The elevation at the western edge of the Lakeside area is approximately 100 ft higher than the eastern edge, resulting in a pressure reduction of 43 psi due to static headloss alone. The remaining difference in pressure can be attributed to frictional losses in the pipelines. A summary of pipeline length by diameter is shown in Table 14. The combined length of all pipelines is approximately 15 miles.

Table 14: Reclaimed Water System Pipeline Diameters

Diameter (inches)	Total Length (ft)
30	1,861
24	2,949
18	16,888
14	1,250
12	13,184
10	2,181
8	23,108
6	5,872
4	2,806
3	3,663
2	3,661
Total	77,423



0 0.125 0.25 0.5 Miles

Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan

Figure 11: Model Results for Existing Meters

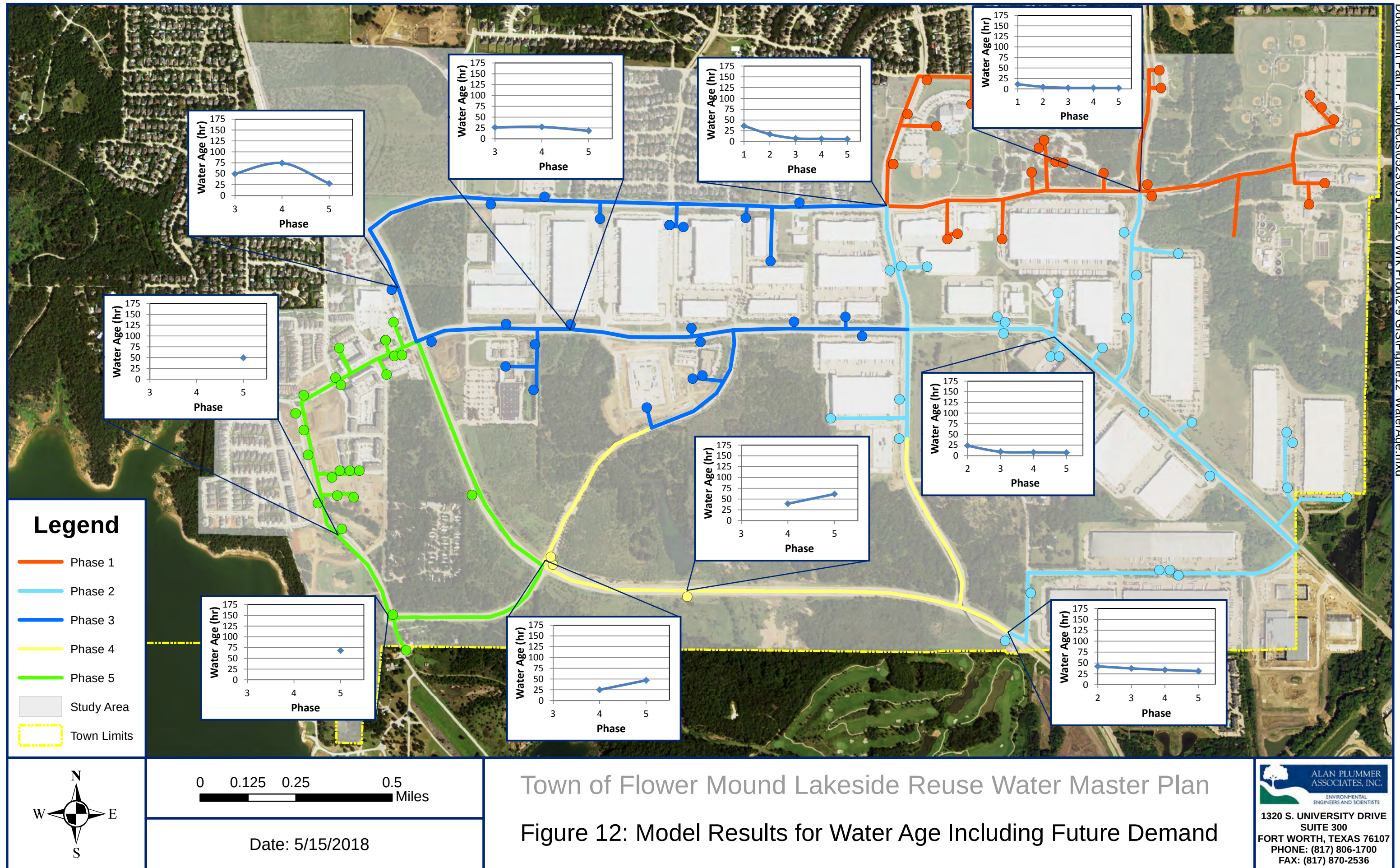
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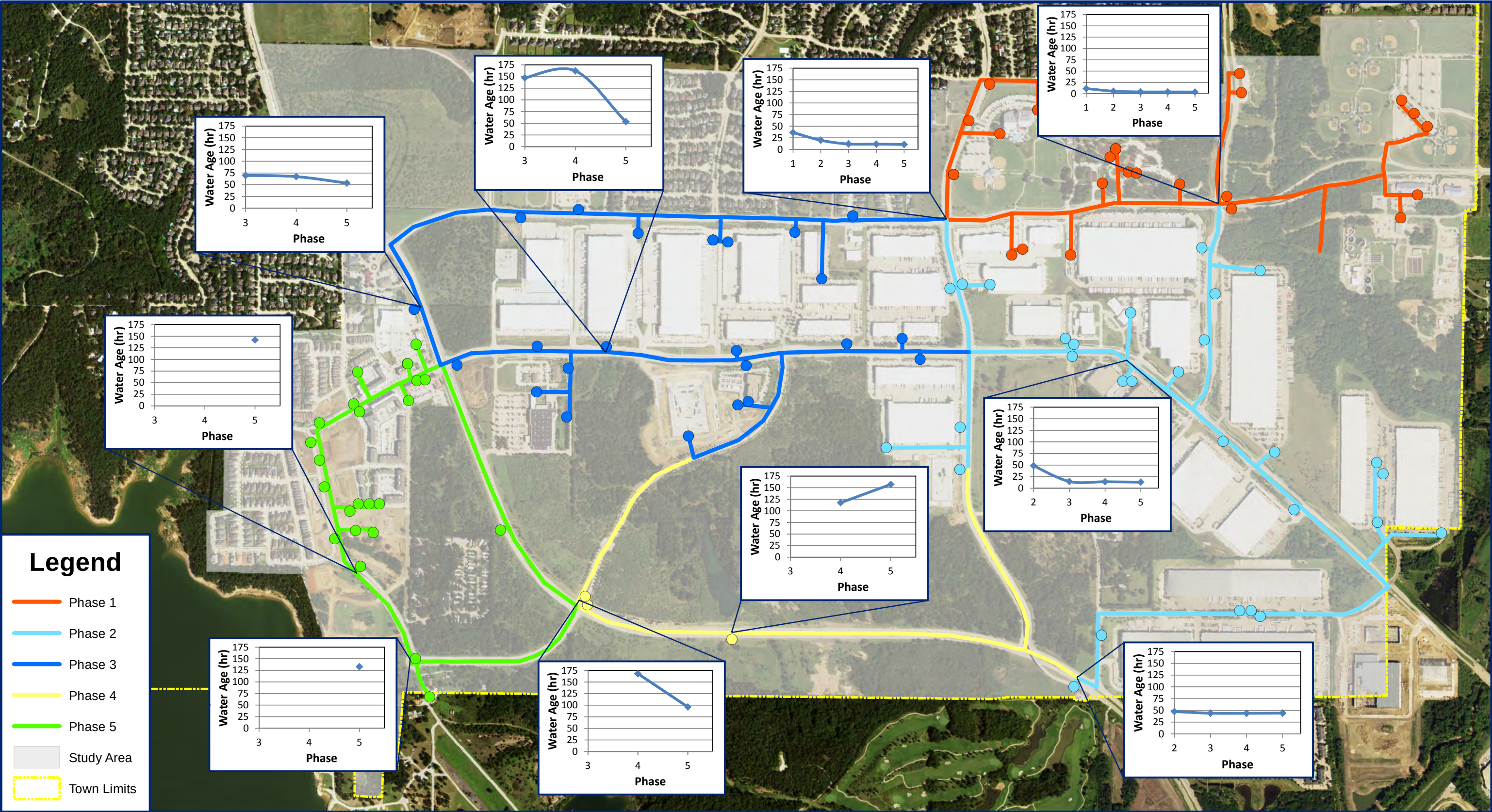


5.4 MODEL WATER AGE RESULTS

In addition to water pressure on a peak day, the hydraulic model was also used to simulate the anticipated water age in the system on an average day. Water age can be used as an indicator of water quality conditions. Higher water age (older water) may be more susceptible to chlorine residual decay and potential water quality issues. Water age is a helpful metric in reclaimed water systems to identify regions of the network that may be prone to biological growth in the pipeline and residual decay.

The results of the water age model for areas of interest across the distribution system are shown in Figure 12 and Figure 13. Two different simulations were conducted using the water age model, one including estimated future demands (Figure 12) and one that does not include estimated future demands (Figure 13). The model, in both scenarios, indicates that as more phases are brought online the overall water age within the system decreases. As expected, the northeast area of the system has much lower water age than the southwest area due to the distance from the source and because there is less demand in the southwest area. When this area begins to fully develop and customers are added on to the system, the water age significantly decreases. Model results for water age throughout the system during each phase, and in each scenario, are presented in Appendix E. The southwest area is shown to have very high water age if future demand is not included, which again reinforces the recommendation of building Phases 4 and 5 once the area is more developed.



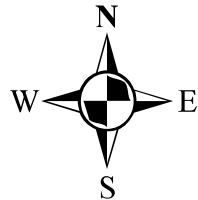


Town of Flower Mound Lakeside Reuse Water Master Plan

Figure 13: Model Results for Water Age Not Including Future Demand



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0 0.125 0.25 0.5 Miles

Date: 5/15/2018



5.4.1 Flushing Device Considerations

It is recommended that the Town install a flushing device to periodically flush out stagnant water within the system during seasons of low demand. Periods of low irrigation, such as winter months or periods with significant rainfall, can cause water age within the system to increase since little to no irrigation will occur during these times. The flushing device would evacuate water from the reclaimed water system and deposit it into a manhole connected to the Town's sewer collection system.

Possible locations for the flushing device, located in conjunction with sewer lines and manholes, are shown in Appendix E. The locations shown in Appendix E represent the possible location for each respective phase. The flushing device would be relocated after the completion of each phase. The possible locations presented in Appendix E were selected based on the following criteria:

1. Located near a major sewer line (> 12 inches);
2. Located on a major reclaimed water line (> 12 inches); and
3. Located on the fringes of the reclaimed system.

The locations presented in Appendix E are preliminary. The Town should confirm the capacity of the sewer lines prior to selecting a location during each phase to ensure that the collection system would be able to handle the additional volume of water added during a flushing event.



6 Wastewater Treatment Plant Effluent Quality

The Texas Commission on Environmental Quality (TCEQ) has water quality requirements for reclaimed water used for non-potable purposes. In the following sections, effluent quality from the Town's WWTP is compared with regulated reclaimed water quality requirements and improvements to the plant are recommended.

6.1 WASTEWATER TREATMENT PLANT INFORMATION

The Town's WWTP has been in operation since 1972. The WWTP is authorized to discharge treated wastewater into Baker's Branch under the Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0011321001. The original plant was expanded in 1985 to 2 MGD, and in 1993, was expanded from 2 to 5 MGD. The plant consists of a conventional activated sludge treatment process including primary clarifiers (currently decommissioned), aeration basins, and final clarifiers. In 2001, the WWTP was expanded to its current treatment capacity of 10 MGD by the addition of a parallel 5 MGD activated sludge treatment train that uses sequencing batch reactors (SBRs). Secondary effluent from each of the parallel treatment processes is combined and filtered through cloth media filters. Finally, filtered effluent is disinfected using ultraviolet (UV) irradiation prior to discharge at the plant outfall. The Town's TPDES permit limits are presented in Table 15.

Table 15: WWTP TPDES Discharge Requirements

Effluent Characteristic	Units	Daily Average	7-day Average	Daily Max	Single Grab
CBOD ₅	mg/L (lbs/day)	10 (834)	15	25	35
TSS	mg/L (lbs/day)	15 (1251)	25	40	60
NH ₃ -N	mg/L (lbs/day)	2 (167)	5	10	15
<i>E. coli</i>	MPN/100 mL	126	N/A	399	N/A

6.2 RECLAIMED WATER QUALITY REQUIREMENTS

The TCEQ's water quality requirements for reclaimed water are stricter than the Town's TPDES discharge limits. The TCEQ has two categories for reclaimed water depending



on the use of reclaimed water (Type I and Type II), and they each have different limits. Type I reclaimed water can be used for irrigation in areas with the potential for public contact with the water, such as public parks or athletic fields. Type II reclaimed water, on the other hand, can only be used in areas where public contact is unlikely, such as land with restricted access. Therefore, Type I reclaimed water has stricter water quality limits than Type II. Due to the public nature of land to be irrigated in the Lakeside Business District, reclaimed water produced from the Town's WWTP would need to meet the Type I quality limits, which are presented in Table 16. While the Town does not currently provide reclaimed water to any customer, they have already obtained the necessary authorization from the TCEQ to produce and distribute Type I reclaimed water. The Town's reclaimed water authorization is included in Appendix F.

Table 16: Type I Reclaimed Water Quality Limits

Parameter	Unit	Quality Limit ¹
CBOD ₅	mg/L	5
Turbidity	NTU	3
<i>E. coli</i> or Fecal Coliform	CFU/100 mL	20 ²
		75 ³

1. Measured as 30-day average, unless otherwise noted

2. 30-day geometric mean

3. Single grab sample

6.3 EVALUATION OF HISTORICAL WWTP EFFLUENT QUALITY

Effluent water quality data from the Town's WWTP were collected and analyzed to determine if treatment improvements would be required to meet Type I reclaimed water quality limits. Monthly Discharge Monitoring Reports (DMRs) indicate that the average effluent concentrations of five-day carbonaceous biochemical oxygen demand (CBOD₅) and *E. coli* have not exceeded their respective Type I average limits over the past three years (Figure 14). However, the May 2017 DMR had a reported daily maximum *E. coli* concentration of 108 CFU/100 mL. While this single value did not exceed the WWTP's TPDES limit, it would have exceeded the Type I reclaimed water single grab limit for *E. coli*. May 2017 was the only month in the past three years where this single grab sample limit was exceeded (Figure 15).

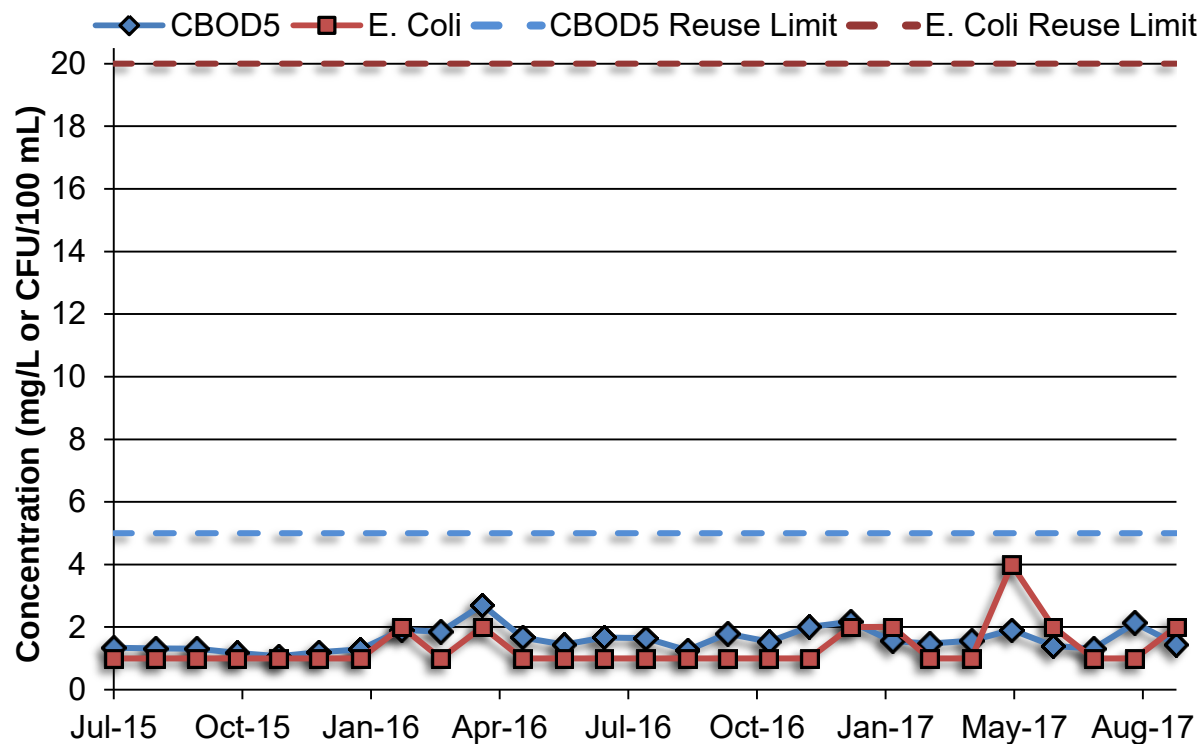


Figure 14: Monthly Average Effluent Quality– CBOD₅ and *E. coli*

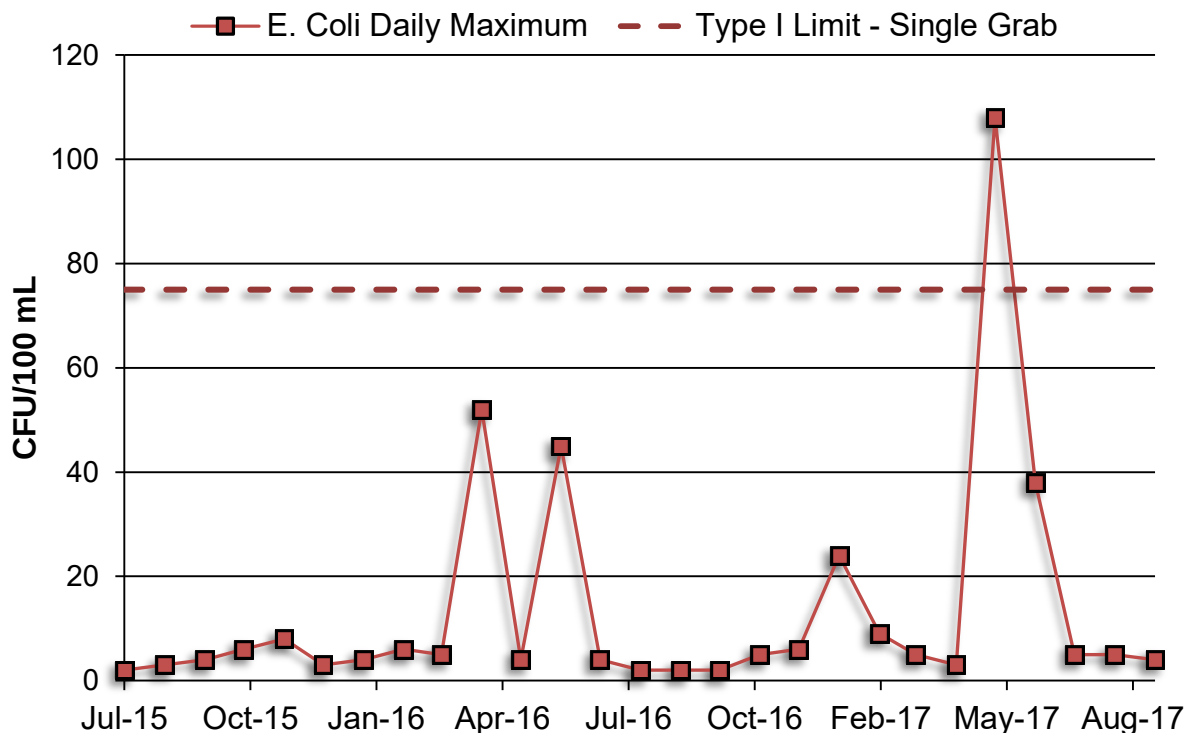


Figure 15: Daily Maximum Effluent Quality – *E. coli*

The TCEQ requires turbidity of Type I reclaimed water to be less than 3 NTU on a 30-day average. However, turbidity data is not routinely collected at the WWTP since it is not included as a requirement in the TPDES permit. The Town began collecting turbidity data in November 2017 to determine if treatment improvements would be required to meet Type I quality requirements. The limited effluent turbidity data collected indicates that the existing WWTP treatment processes are adequate to meet the Type I turbidity limit, and no improvements are anticipated to be necessary (Figure 16).

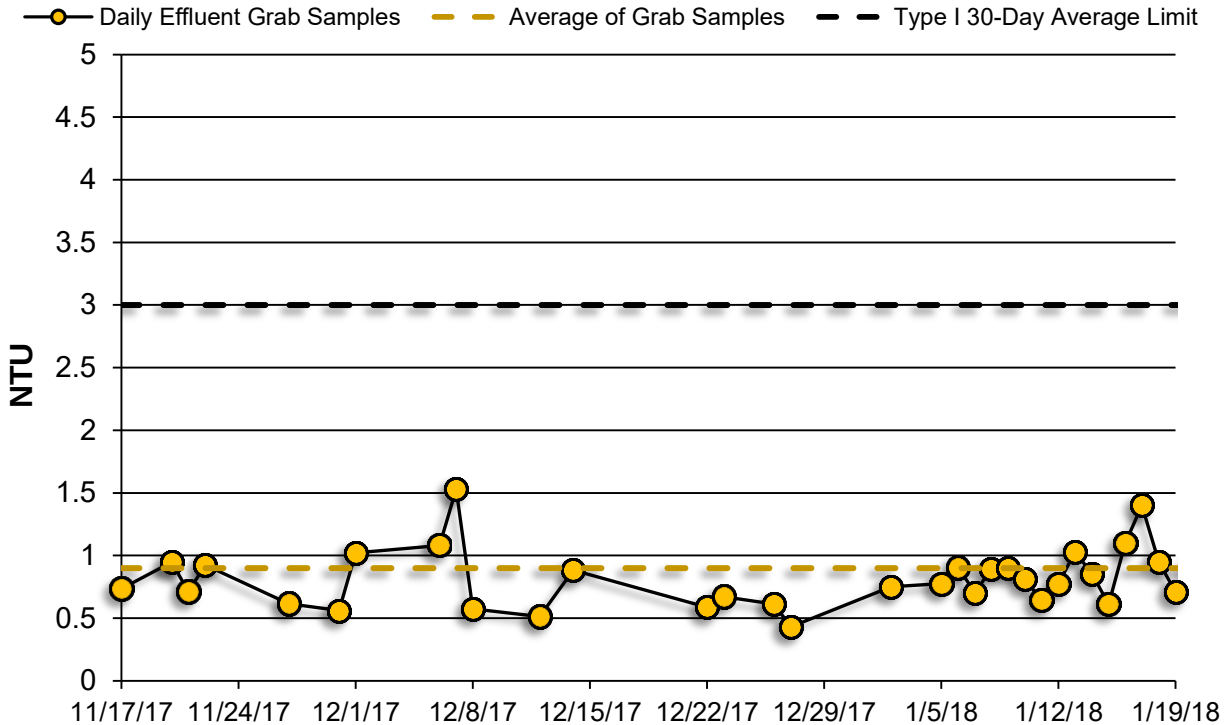
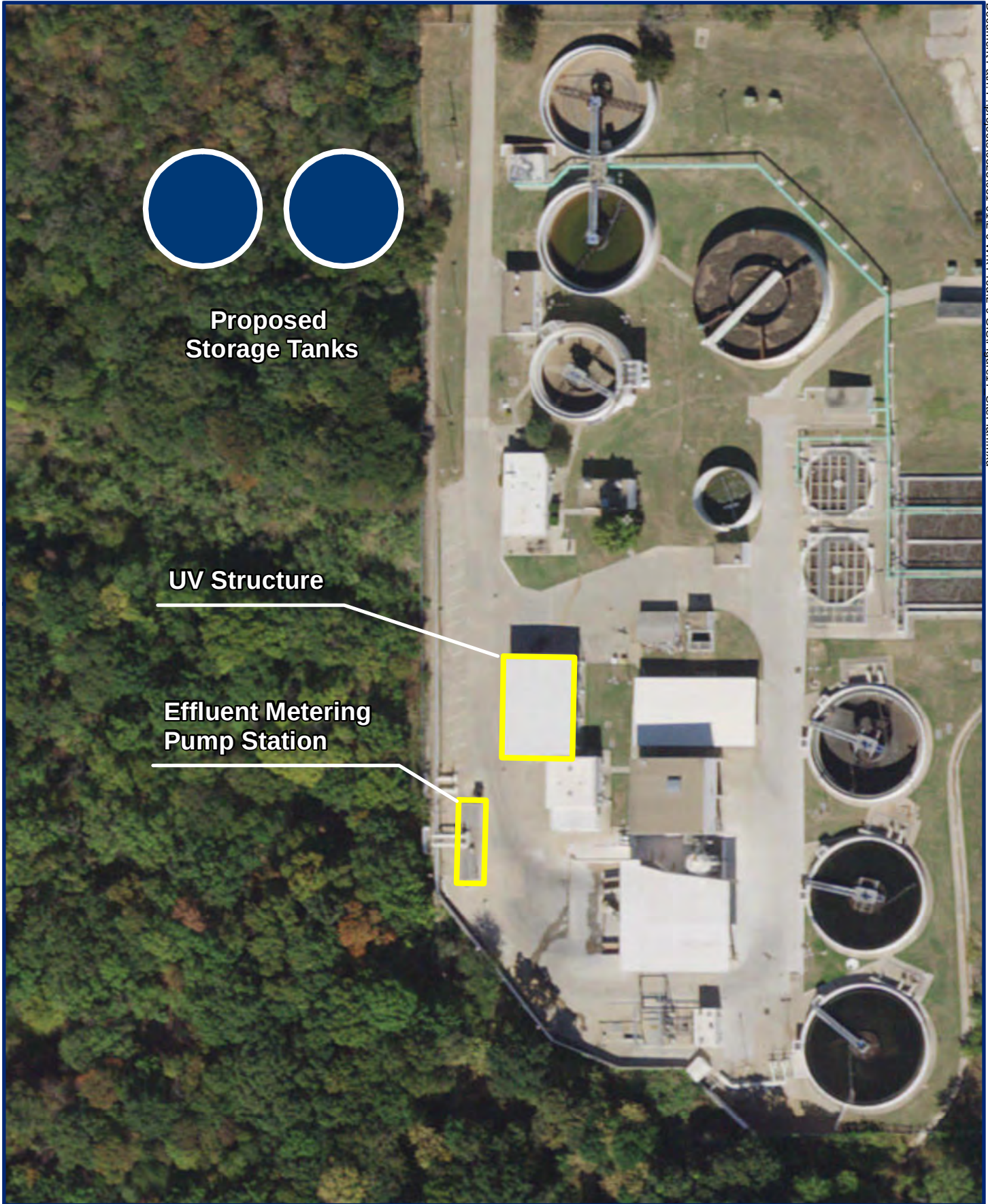


Figure 16: Daily Effluent Quality – Turbidity

6.4 RECOMMENDED WASTEWATER TREATMENT PLANT IMPROVEMENTS

This section summarizes the WWTP improvements recommended to implement water reuse in the Lakeside Business District. The recommended improvements are grouped into two categories: treatment improvements and infrastructure additions. The treatment improvements include a new UV system, and sodium hypochlorite feed system. The infrastructure additions include a Transfer Pump Station, two storage tanks, and a Reuse Pump Station. A site plan and process flow diagram depicting the recommended improvement and infrastructure additions at the WWTP are displayed in Figure 17 and Figure 18, respectively. The Transfer and Reuse Pump Stations are not shown on the site plan. The locations of these pump stations will be determined at a later date.



Proposed
Storage Tanks

UV Structure

Effluent Metering
Pump Station



Town of Flower Mound Lakeside Reuse Water Master Plan
Figure 17: Wastewater Treatment Plant Site Plan

0 125 250 500 Feet

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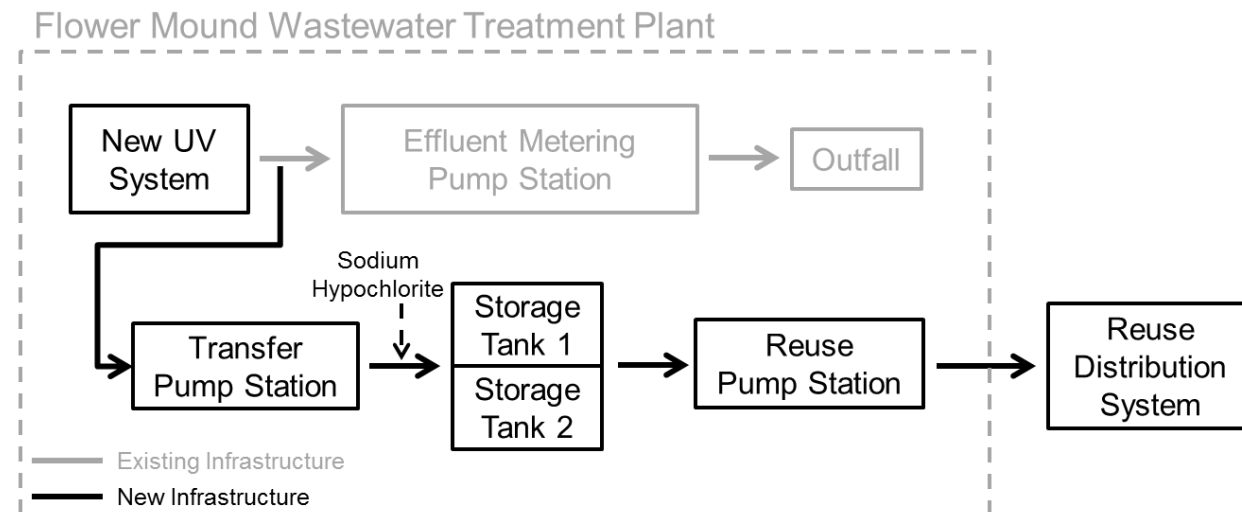


Figure 18: Recommended WWTP Improvements

6.4.1 Treatment Improvements

The effluent quality data summarized in Section 5.3 indicate that the existing treatment processes at the WWTP are adequate to meet the Type I requirements for CBOD₅ and turbidity. However, the *E. coli* data suggest a potential need for improvements to the disinfection process. Replacing the plant's UV disinfection system is recommended for the following reasons:

1. The existing UV disinfection equipment is a Trojan 3000 system, which the manufacturer no longer sells or services. It is recommended that the existing UV system be replaced with a newer system that will be supported by the manufacturer.
2. The single grab sample for *E. coli* collected in May 2017 would have exceeded the Type I maximum limit of 75 CFU/100mL. In general, UV systems used in reuse applications are designed to deliver a higher dose than UV systems used at WWTPs that discharge to a stream or lake due to the stricter quality restrictions placed on reuse water. The existing system is designed to deliver 40 mJ/cm² using the *Bacillus Subtilis* indicator organism. New UV systems are designed using the male-specific-2 (MS2) bacteriophage as the indicator organism, instead, which is more resistant to UV than *Bacillus Subtilis*. In this



application, it is recommended that the replacement UV system be designed to deliver a dose of 40 mJ/cm^2 (using the MS2 bacteriophage) to reclaimed water used for irrigation. However, final effluent discharged to Baker's Branch would not need to be disinfected at this high dosage. A UV dosage of only 30 mJ/cm^2 (MS2 bacteriophage) would be necessary to meet the plant's TPDES discharge requirements. To save capital and operating expenses, the plant's future UV system could be designed to deliver 30 mJ/cm^2 in peak flow conditions, but 40 mJ/cm^2 during normal conditions. Reclaimed water used for irrigation would always be given a dose of 40 mJ/cm^2 .

In addition to a replacement UV system, a chemical feed system is also recommended. While the UV system alone will provide adequate disinfection to meet the Type I bacterial requirements, it will not provide a disinfection residual for the distribution system. Although a disinfection residual is not directly required by TCEQ regulations, it is recommended in order to control biological growth within the distribution system. A sodium hypochlorite disinfection system is recommended and would be added to the reclaimed water prior to entering the storage tanks. The sodium hypochlorite disinfection system would be sized for the reuse flow rate from the plant.

6.4.2 Infrastructure Additions

Beyond treatment improvements, there are a number of infrastructure additions required at the WWTP. These include two storage tanks and two pump stations.

6.4.2.1 Storage Tanks

As explained in Section 4.1, storage will be required at the WWTP to provide water to the reclaimed water system when demands exceed the supply produced by the WWTP. The analysis suggests that a total storage of 2 MG will be required to supply the Peak Day Demand to the existing irrigation meters on a low flow day at the WWTP.

Reclaimed water storage can be provided using either ponds or constructed storage tanks. The Town's reclaimed water authorization (Section II of Appendix F) provides



guidance for the construction of holding ponds designed to store Type I reclaimed water. While open ponds are typically less costly than storage tanks, water stored in ponds is more susceptible to negative changes in water quality. Specifically, the turbidity and *E. coli* limits may be difficult to meet after storage in an open pond. Therefore, covered ground storage tanks are recommended at the WWTP.

It is recommended that two 1 MG covered ground storage tanks be constructed instead of a single 2 MG tank. This will allow the Town to reduce the capital cost burden by delaying construction of the second tank until a later date, since the reclaimed water system will be constructed in phases. Additionally, two parallel tanks will provide more operational flexibility than a single tank since one tank could be taken offline for maintenance without discontinuing service to the reclaimed water system. The tanks will be conceptually located west of the decommissioned primary clarifiers, across the road and will be approximately 92 feet in diameter with a side water depth (SWD) of 20 feet. The existing primary clarifiers at the Town's WWTP have been decommissioned and it may be possible to locate the storage tanks in the same footprint of the clarifiers. However, the Town directed APAI to conceptually locate the tanks west of the primary clarifiers.

The Town may want to consider installing a potable water line to the storage tanks to fill them with potable water in the event that the supply of reclaimed water is disrupted.

6.4.2.2 Pump Station

Two pump stations will be required to deliver reclaimed water to the Lakeside Business District area from the existing WWTP. The first will be a Transfer Pump Station to convey final effluent downstream of the new UV system to the proposed reclaimed water storage tanks. Water will need to be lifted approximately 50 feet from the water surface elevation (WSE) at the UV structure to the WSE at the proposed tanks.

The Reuse Pump Station will be constructed downstream of the storage tanks and will supply reclaimed water to the distribution system. Vertical turbine pumps with variable frequency drives (VFD) are recommended in this application to allow the adjustment of



flows to more closely match the variable demand. These pumps will need to provide approximately 250 feet of head. A hydropneumatic tank will also be required downstream of the pump station to maintain pressure in the distribution system when the pumps are not operational.



7 Implementation Plan and Costs

A phased implementation plan is proposed for the reuse system to manage capital costs and maximize revenue from the reuse system. The phases were established based on proximity to the WWTP and amount of reclaimed water demand. Meters located close to the WWTP with high demand will be connected to the reuse system in the early phases, and meters located far from the WWTP in undeveloped areas will be connected during later phases. While the Lakeside area is rapidly developing, there remain some areas that may not be developed for a number of years. It would be advantageous to the Town to wait until a significant demand is present in those areas before extending the reuse system to them.

The proposed Lakeside Reuse System Implementation Plan consists of five phases, with each phase expanding the reuse system to a new area of the Lakeside Business District. The proposed implementation plan is shown in Figure 19, and the following sections describe the scope of each phase.

7.1 PRIOR TO PHASE 1

The UV disinfection system at the WWTP requires replacement prior to the first phase of the implementation plan. As noted earlier, the plant's existing UV system is no longer supported by the manufacturer. Additionally, the bacterial requirements are stricter for Type I reclaimed water than the plant's existing TPDES discharge permit, which will require a UV system with a higher disinfection dose.

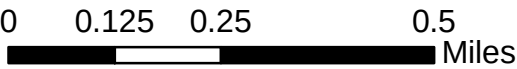
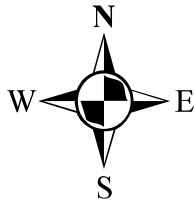
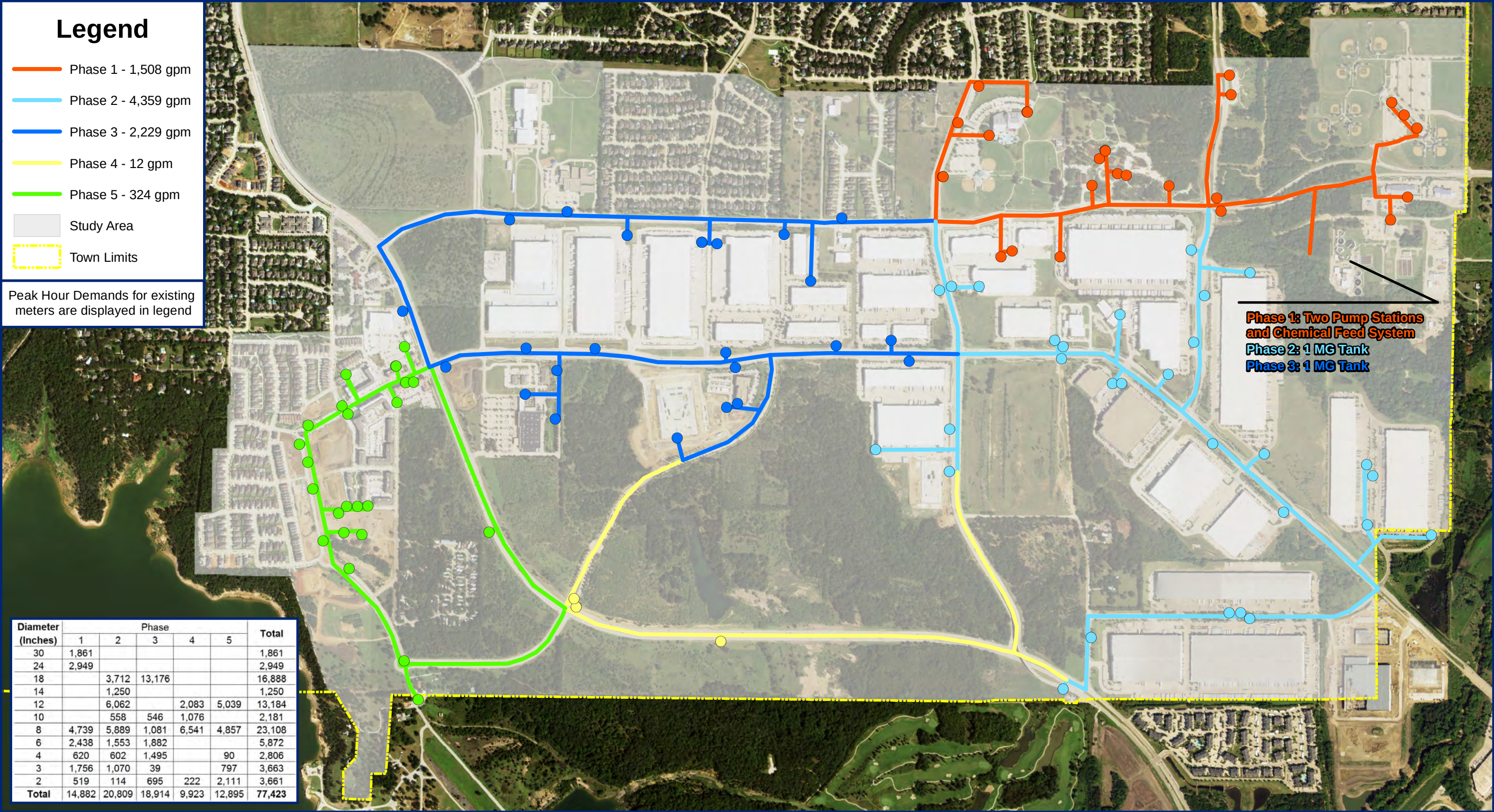
It is also recommended that the Town develop a number of administrative documents and financial evaluations prior to Phase 1 that will be required to provide reclaimed water. These administrative documents and financial evaluations include:

1. Rate Study: A financial evaluation to determine the rate structure for reclaimed water.
2. Standard Contract for Customer: A contract between the Town and each customer will be required. A standard contract can be developed before Phase 1



that will be used for all customers who will connect to the reclaimed water system. The contract may include items such as: prohibited uses of reclaimed water, price of reclaimed water, compliance with TCEQ rules and regulations, delivery of reclaimed water, quality of water to be provided, obligation of the parties, etc.

3. Reclaimed Water Policies and Procedures: Policies and procedures typically addressed by a reclaimed water program include technical design specifications, cross-connection control requirements, funding sources and rules, rate structure, site inspection authority, enforcement policies, reclaimed water user manual, and an emergency response plan.
4. Reclaimed Water Operating and Maintenance Plan: A reclaimed water O&M plan is required by the TCEQ in the Town's reclaimed water authorization (Appendix F). The O&M plan must present a labeling and separation plan for the prevention of cross connections, procedures for monitoring reclaimed water, schedules for routine maintenance, and other times.
5. Development of Town Reclaimed Water Ordinance: Several aspects of the reclaimed water program may require modification of existing ordinances or creation of new ordinances. Some possible considerations relative to Town ordinances include: establishment of pricing structure, potential restrictions on the use of potable water for irrigation within the Lakeside Business District area, or requirements for developers to install dual distribution systems for new developments in the Lakeside Business District.
6. Public Outreach Program/Materials: It is recommended that the Town identify a public relations coordinator to develop a public awareness campaign for the reclaimed water system. Possible marketing efforts may include: stakeholder workshops, news media articles, informational website, public television announcements, or public presentations at community events.



Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan

Figure 19: Lakeside Reuse System Implementation Plan

ALAN PLUMMER
ASSOCIATES, INC.
ENVIRONMENTAL
ENGINEERS AND SCIENTISTS

1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536



7.2 PHASE 1

Phase 1 will include further upgrades to the WWTP along with approximately 15,000 linear feet (LF) of reclaimed water piping to connect to 26 existing irrigation meters near the WWTP. The 26 meters connected in Phase 1 are primarily Town meters irrigating parks along Spinks Road including Gerault Park, Heritage Park, and Bakersfield Park.

The Peak Hour Demand for the meters connected in Phase 1 is estimated to be low enough to not necessitate the construction of a large storage tank. However, three temporary 10,000 gallon storage tanks are recommended to maintain operational consistency for the pumps between the different phases.

The WWTP improvements constructed in Phase 1 will include the transfer pump station, sodium hypochlorite feed system, temporary polyethylene storage tanks, and the reuse pump station. The pump stations will be constructed with space to accommodate additional pumps required in subsequent phases.

7.3 PHASE 2

The reclaimed water system will be expanded in Phase 2 to include irrigation meters on commercial properties generally located along Lakeside Parkway, east of Gerault Road. Twenty nine existing irrigation meters will be connected in Phase 2 and the Peak Hour Demand will significantly increase from 2.2 MGD in Phase 1 to a cumulative demand of 8.5 MGD. This increase in demand will necessitate additional storage at the WWTP. The temporary storage tanks installed during Phase 1 will be replaced in Phase 2 with the first 1 MG covered storage tank. Additional pumps will be installed at the Transfer and Reuse Pump Stations in Phase 2, and approximately 20,800 LF of pipeline will be added in the distribution system.

7.4 PHASE 3

The third phase will expand the reclaimed water system to additional properties along Lakeside Parkway and Spinks Road between Gerault Road and Long Prairie Road.



Approximately 18,900 LF of pipe will be added to the system to include 24 additional irrigation meters. The expansion of the system will necessitate construction of the second 1 MG covered storage tank at the WWTP and will provide additional pumping capacity at the Reuse Pump Station. It is recommended that the required storage be reevaluated in Phase 3 to account for any changes in reclaimed water demand or supply. The cumulative Peak Hour Demand will increase from 8.5 MGD in Phase 2 to 11.6 MGD.

7.5 PHASE 4

The fourth phase of the implementation plan will extend reclaimed water service along Long Prairie Road between Silveron Boulevard and Gerault Road, and will also connect to three dead ends created in Phases 2 and 3 to form water loops. This area is predominantly undeveloped. There are three existing irrigation meters in this area; together they only increase the Peak Hour Demand by 0.02 MGD. However, significant growth is anticipated in this area. It is recommended that the Town delay implementation of Phase 4 until significant demand is present in the service area to generate revenue following construction of the expansion.

7.6 PHASE 5

Reclaimed water service to the residential properties located along Lakeside Parkway, west of Long Prairie Road will be included in the fifth and final phase. Approximately 12,900 LF of pipeline will be added in this phase to include 24 additional irrigation meters, but the Peak Hour Demand will only increase by approximately 0.5 MGD. This area of the Lakeside Business District has room for development and it is anticipated that future growth will increase the reclaimed water demand in this area. However, it is recommended that the Town delay construction of Phase 5 until the area is further developed and demand has increased.



7.7 PHASE COSTS

Opinions of probable construction cost (OPCC) and annual operating and maintenance costs (O&M) were created for each phase of the implementation plan. The scope and cost of each phase is summarized in Table 17 with demands summarized in Table 18. A preliminary implementation plan schedule has been developed, assuming that the Town will construct one phase each year (Table 19). However, it is recommended that construction of Phases 4 and 5 be delayed until additional reclaimed water demand is present in those areas.

**Table 17: Implementation Plan Summary**

Phase	Improvements at WWTP	LF of Pipe Installed	Existing Irrigation Meters Connected	OPCC (million) ¹	Cumulative Annual O&M ¹
1	Transfer pump station Temporary storage tanks Reuse pump station Sodium hypochlorite feed system	14,900	26	\$9.03	\$42,000
2	1 MG storage tank ²	20,800	29	\$5.45	\$53,000
3	1 MG storage tank ²	18,900	24	\$5.63	\$62,000
4	-	9,900	3	\$1.44	\$64,000
5	-	12,900	24	\$1.80	\$63,000
Total System		77,400	106	\$23.4	-

1. Costs are presented in December 2017 dollars

2. Storage requirements based on estimated demand for existing 106 irrigation meters.

Table 18: Lakeside Reuse System Demand Summary by Phase

Phase	Average Demand (MGD)				Peak Day Demand (MGD)			
	Existing	Future	Total	Cumulative	Existing	Future	Total	Cumulative
1	0.15	0.00	0.15	0.15	0.68	0.00	0.68	0.68
2	0.16	0.04	0.19	0.34	1.96	0.38	2.34	3.02
3	0.13	0.18	0.31	0.65	1.00	0.98	1.98	5.00
4	0.03	0.09	0.11	0.76	0.15	0.98	1.13	6.13
5	0.002	0.04	0.04	0.80	0.01	0.42	0.43	6.56
Total	0.46	0.34	0.80	-	3.79	2.76	6.56	-



Table 19: Preliminary Implementation Plan Schedule

Phase	Year of Completion
1	2023
2	2025
3	2027
4	TBD ¹
5	TBD ¹

1. It is recommended that construction of Phases 4 and 5 be delayed until the reclaimed water demand increases in the areas serviced in those phases.



8 Financial Evaluation

The Town requested that a preliminary financial evaluation be conducted for the proposed reclaimed water system. The financial evaluation includes an assessment of the cost to the Town for the overall system based on the construction and operations and maintenance costs shown in Table 17. This financial evaluation is only preliminary and it is recommended that the Town conduct a formal rate study prior to implementing the reclaimed water program. This section begins with a discussion of available financial strategies and funding opportunities and then concludes by presenting the financial evaluation.

8.1 FINANCING STRATEGIES AND FUNDING OPPORTUNITIES

As a consequence of the increased appreciation of the benefits of reclaimed water, there are several funding opportunities that may be available to cities and utilities who seek to implement reuse programs. There are generally three methods of financing these sorts of projects, which are often employed in combination: federal or state grants, federal or state loans, and rate/fee restructuring. In most cases, a combination of federal and state grants and loans fund the up-front capital expenditures. With these sorts of sources, eligibility requirements have to be met, and most of these programs explicitly state that funds cannot be employed for any O&M needs. Water and wastewater revenue bonds can also serve to spread the capital costs over a considerable amount of time. The following sections examine some of the more common federal and state programs used to finance capital costs of reuse projects.

8.2 FEDERAL AND STATE FUNDING PROGRAMS

The Bureau of Reclamation may provide funding through Title XVI water reuse grants, which finance project construction in the 17 western states. The award to construct reclaimed water facilities is often preceded by funding for appropriate studies and research regarding the best reuse program for the area. These monies are given to economically and environmentally sound projects that are not eligible for other types of federal funding.



Texas has developed several programs to facilitate the implementation of reuse projects, many of which are sponsored by the Texas Water Development Board (TWDB). One program available through the TWDB is the State Participation Program, which enables the TWDB to assume a temporary ownership interest in regional projects when the local sponsors are unable to assume debt for the optimally sized facility. While this program has typically been used for water system construction, the TWDB has indicated that it can also be applied to reuse projects if excess capacity is provided in the reuse facilities to meet anticipated future demands. The goal of this program is to allow for the “right sizing” of projects in consideration of future growth. For new water supply projects, the TWDB will fund up to 80% of the costs and for other projects up to 50% of the costs. Only excess capacity can be funded through this program.

Another program available through the TWDB is the State Water Implementation Fund for Texas (SWIFT). Funding through SWIFT is used specifically for recommended water management strategy projects within the most recently adopted state water plan, and only components included in the plan are eligible. Types of eligible projects include conservation and reuse, desalinating groundwater and seawater, building new pipelines, developing reservoirs and well fields, and purchasing water rights. The TWDB offers a variety of financing options through SWIFT including low-interest loans, deferred loans, and board participation to accommodate the diversity of projects included in the state water plan. Funds can be used for planning, design, acquisition, and construction costs, and SWIFT also has the ability to provide multi-year commitments for entities that have project funding needs spanning several years.

Aside from TWDB’s initiatives, the EPA guides the management of another state-managed source of financing, the State Revolving Fund (SRF). Under this program, low-interest loans, 80% of which are federally funded, are offered to entities for use in upgrading existing facilities, installing water-efficient devices, and supporting tax incentives for water conservation programs. Under the broader umbrella of the SRF are the Clean Water SRF and the Drinking Water SRF; the former focuses more on improvements for wastewater projects, while the latter funds are intended for water improvements that address health and compliance issues for existing water utilities.



SRF funds can also be used for development of water conservation plans or the development of water conservation regulations. Water reuse projects can be funded under either the Clean Water SRF or Drinking Water SRF.

8.3 DEBT REPAYMENT AND OPERATIONS AND MAINTENANCE FINANCING

Debt recovery and operations and maintenance costs can be recovered through monthly water or sewer rates and/or through direct charges for the reclaimed water. Many utilities have struggled with how to set volume rates for reclaimed water. Often, in order to insure that the water is marketable, the reclaimed water rate is set as a percentage of the potable water rate. In other instances, elimination of effluent discharges to receiving streams was the goal of the program and reclaimed water was provided to customers at a very minimal cost. However, as experience with reclaimed water rate systems develops, it is becoming recognized that the best method of allocating costs is through a cost-of-service evaluation that is consistent and defensible. Often sharing costs among the wastewater, water and reclaimed water users is justified and can minimize the burden on any one group of users.

8.4 PROJECTED PAYBACK PERIOD FOR LAKESIDE REUSE SYSTEM

The projected payback period for the Lakeside Reuse System project was evaluated based on the project phasing in Table 19. The payback period is defined as the time elapsed between the initial capital investment in the project and the break-even year, i.e. when the total cumulative revenue from the project is equal to the total cumulative expenditures (including debt service and operation and maintenance costs). It should be noted that the estimated payback period is very sensitive to financing assumptions, such as principal forgiveness of the construction cost, interest rate of the loan, and inflation. The assumptions used in this evaluation are shown in Table 20. The Town indicated that an interest rate of 3.5% should be used in the financial analysis.

**Table 20: Financing Assumptions**

Financial Variable	Value
Capital Recovery Period	20 Years
Project Life	50 Years
Annual Interest Rate	3.5%
Annual Inflation Rate	3.0%
Percent of Total Capital Cost Funded by Grant Funding Program	10%
Reclaimed Water Rate (Percentage of Potable Water Rate)	85%

The annual average reuse water demand assumed for this evaluation is shown in Figure 20. A summary of the analysis is shown in Figure 21, and the calculated payback year would occur in 2042. If the Town were to charge 85% of the current 2018 potable rate for reuse water, the top 10 average monthly consumers would have an average bill reduction of 14%.⁶ The overall current customer base would see an average bill reduction of 11%. A more detailed customer analysis is shown in Appendix G. This evaluation does not take into account the loss of revenue caused by replacing potable water sales with reclaimed sales, since reclaimed water will be sold at a lower rate than potable water.

⁶ This calculation assumes that the base charge for a reclaimed water meter remains the same as the base charge for a potable water meter. Only the consumptive use rates for reclaimed water would be reduced.

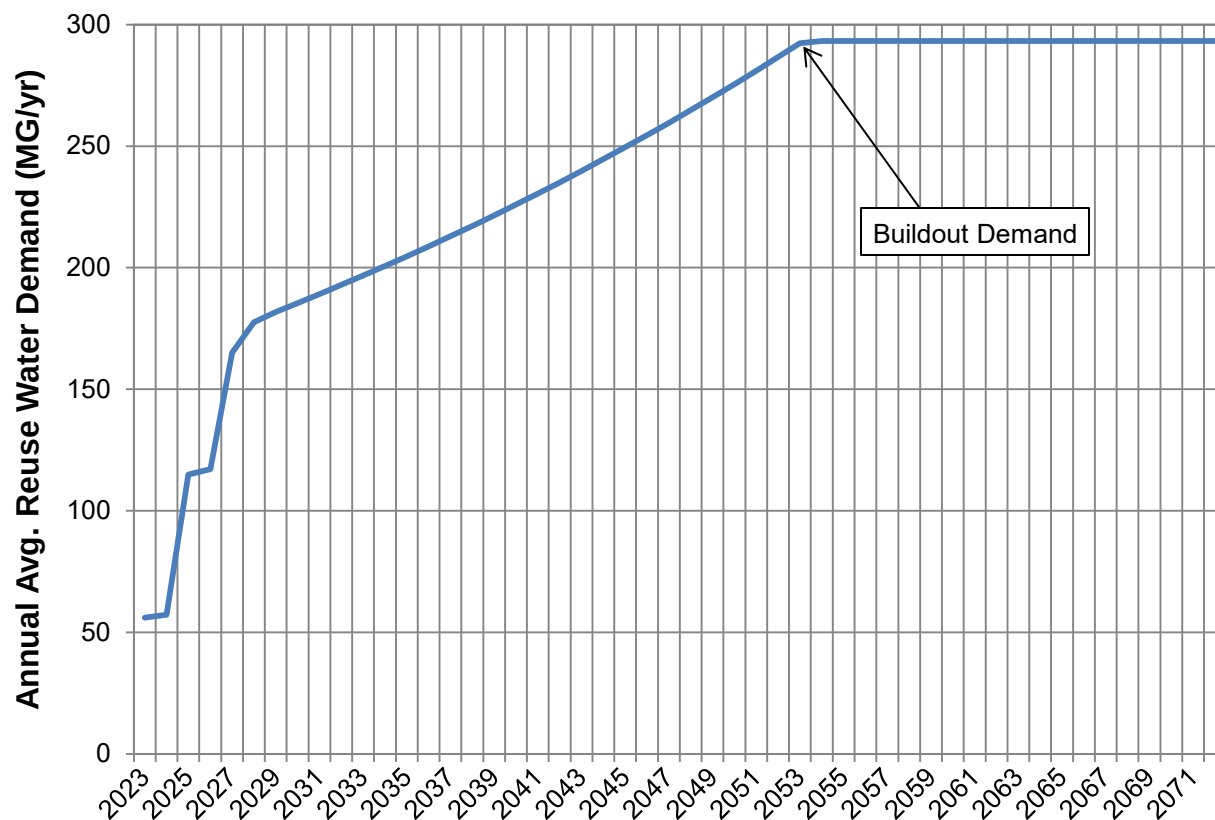


Figure 20: Projected Annual Reuse Water Demand

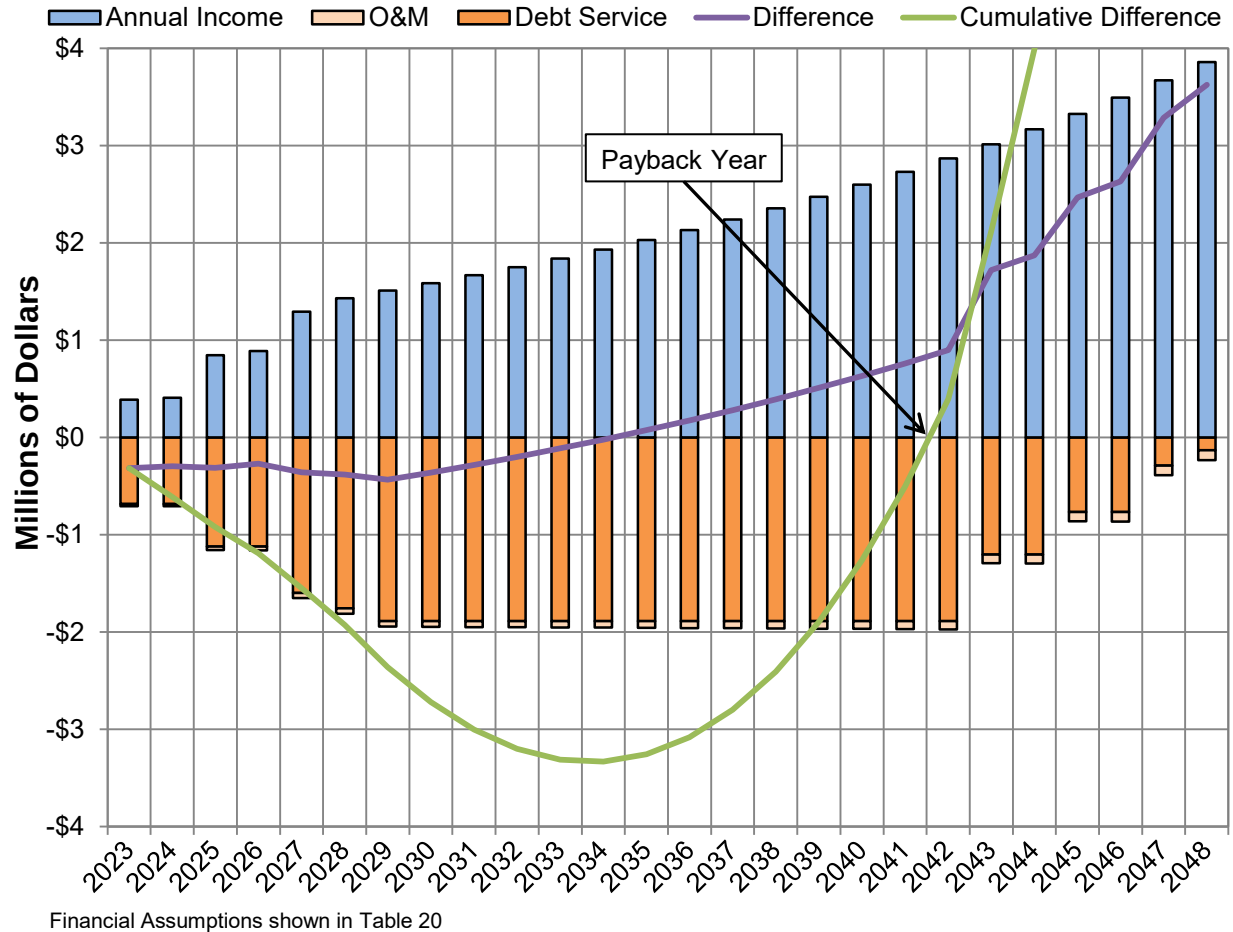


Figure 21: Reclaimed Water System Financial Analysis

8.5 POTENTIAL IMPACT OF FINANCIAL ASSUMPTIONS

A sensitivity analysis was performed to evaluate the impacts that principal forgiveness (from grants, or other entities), annual finance interest rate, and the rate charged for reuse water could have on the payback period for the Town. The payback year of the reuse water system as a whole was computed across a range for all three variables, principal forgiveness, interest rate, and reuse water charge. The principal forgiveness ranged from 0 to 30% of the total capital cost of all phases; the interest rate varied between 1.5%, 2.0%, and 3.5%, and reuse water rate ranged from 75% to 90% of the projected potable water rates charged. The cumulative difference between estimated net costs and net profits were evaluated and the respective payback year was



calculated in each scenario. Best and worst case scenarios along with a few other scenarios are summarized in Figure 22. The payback year ranges from 2025 in the best case scenario to 2047 in the worst case scenario. The rest of the evaluated scenarios used to calculate payback periods are included in Appendix G.

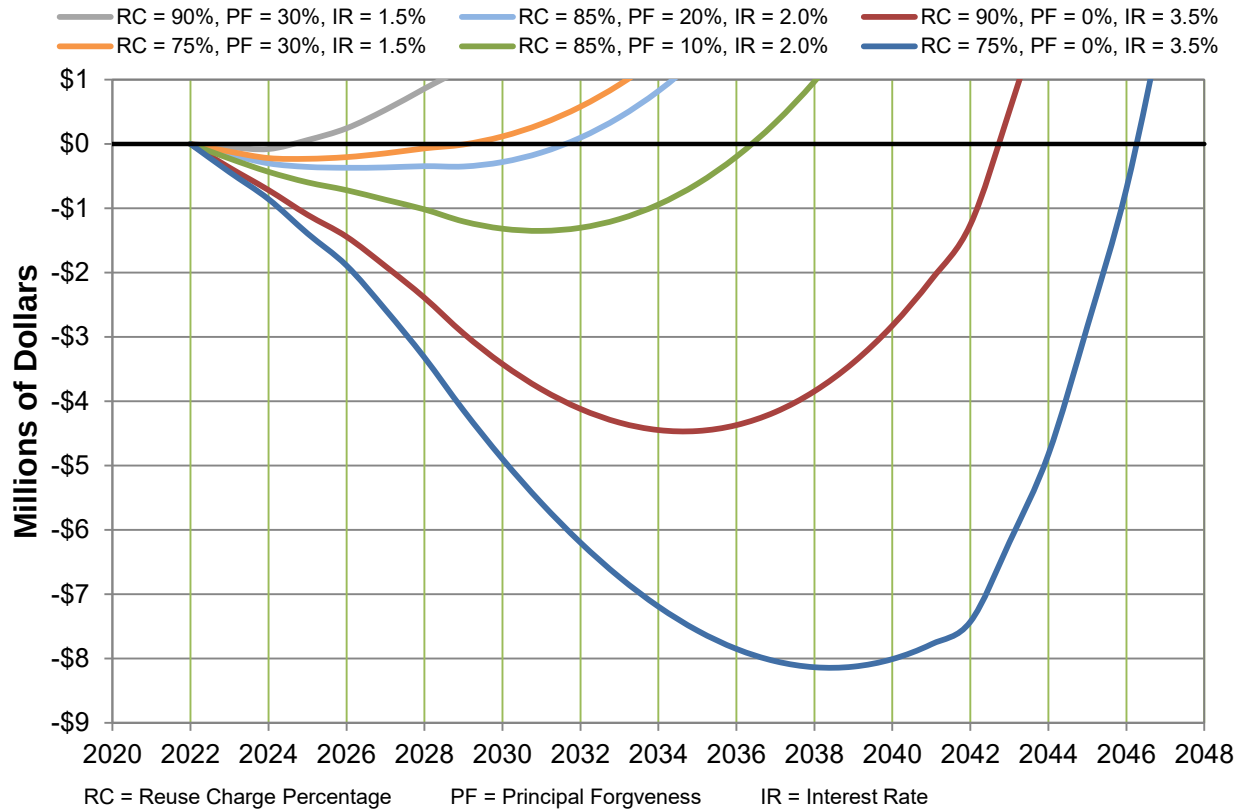


Figure 22: Cumulative Difference for Several Scenarios



9 Summary and Recommendations

As the Town expands and potable water demands increase, irrigating with reclaimed water instead of potable water is an effective conservation strategy available to the Town. The proximity of the Lakeside Business District to the Town's WWTP and its current irrigation demand make reclaimed water irrigation an attractive option for the area. Furthermore, future development in this area is anticipated to increase the amount of potable water used for irrigation.

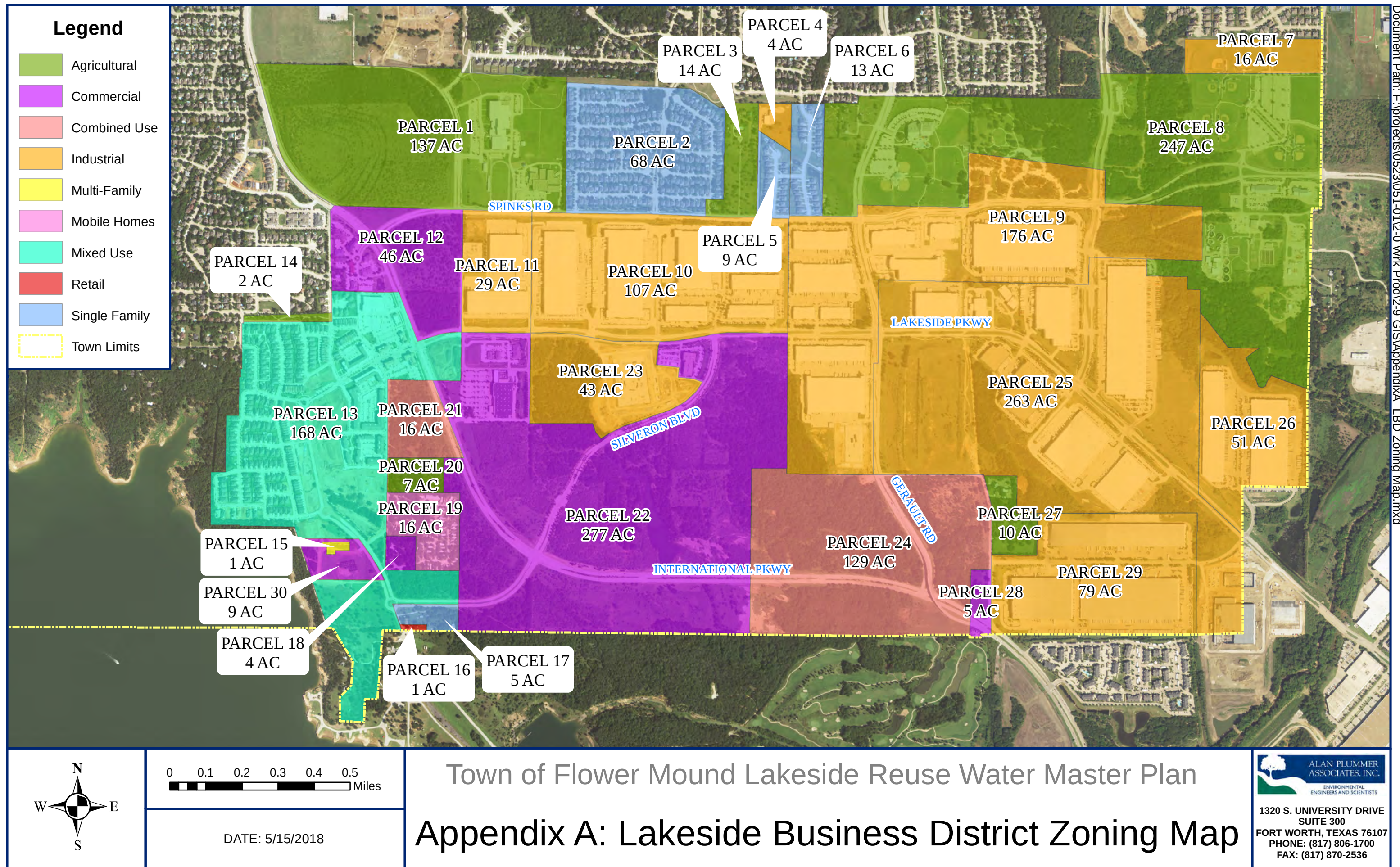
However, significant infrastructure will be required to deliver reclaimed water to irrigation meters throughout the Lakeside Business District including: two pump stations, two storage tanks, a chemical feed system, and an updated UV system at the WWTP, along with approximately 15 miles of pipeline.

A detailed economic evaluation was not included in the scope of this master plan. If the Town desires to continue pursuing development of a reclaimed water system in the Lakeside Business District, it is recommended that a rate study be completed to determine a rate structure for reclaimed water. Additional economic factors should be considered when determining the economic feasibility of constructing this Lakeside Reuse System. For example, state and federal agencies have developed low interest loan programs that are specifically reserved for projects that promote water conservation by using reclaimed water. In some instances, grant funds are also available through these same programs.

The following initial actions are recommended:

- Launch a public outreach program;
- Develop a reclaimed water ordinance;
- Develop a standard contract for reclaimed water customers;
- Perform a rate study for the Lakeside Reuse System;
- Pursue State and Federal funding opportunities; and
- Replace the UV System.

Appendix A – Lakeside Business District Zoning Map

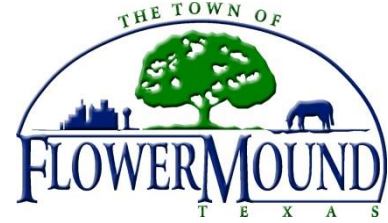


Appendix B – Top Irrigation Users Contact Information and Surveys

Meter Number	Average Monthly Consumption (gallons)	Contact Name	Phone Number	Email Address
86-2995-99	342,244	Ryley Hastings	469-763-2403	Ryley.Hastings@stryker.com
86-9210-99	314,926	Daniel Davila	512-826-2727	ddavila@exeterpg.com
86-3445-99	287,230	Christy Walters	972-361-6725	Christy.walters@dukerealty.com
86-3260-99	282,990	Greg Simnacher	214-267-0457	greg.simnacher@streamrealty.com
86-5971-99	281,499	Michael Johnson	214-232-8579	-

Reclaimed Water Use Survey

Property Name: Stryker Communications
 Contact Person: Ryley Hastings
 Title: Facilities Lead
 Phone Number: 469-470-4134
 Email Address: Ryley.Hastings@Stryker.com
 Mailing Address: 571 Silveron Blvd Flower Mound, TX 75028
 Meter Number: 86-2995-99



System Information

Does the system have a separate irrigation meter?	☒ Yes ☐ No
Are there any other connections to the irrigation system for uses other than irrigation?	☐ Complex Pools ☐ Drinking Fountains ☐ Decorative Fountains ☐ Hose Bibs ☐ Dumpster Wash Down ☐ Car Washing ☐ Ponds ☐ Water Features ☐ Cooling Towers ☐ Other _____
Do you have any onsite storage or booster pumping for your irrigation system?	☐ Yes ☒ No
How many acres are irrigated?	Approximately 12 Acres
How many zones does this irrigation system have?	77
If known, what is the flow rate (in gpm) needed to serve each zone or alternatively, what is the estimated maximum flow rate required during any irrigation period?	Approximately 68gpm per zone average, 204 max for 3 simultaneous zones.
How many irrigation zones are typically irrigated simultaneously?	3
How many irrigation heads are in each zone?	14 Avg.
What is the approximate flowrate per irrigation head?	4.8 gpm (1.6gpm sprays, 8gpm rotors)
What is the maximum/minimum operating pressure on the system?	40/100
What is the irrigation system water window (E.G. Number of hours to water the property)?	5 During growing season
Is there a preference for the time of day the irrigation system should be operated?	22:00-05:00
How many days per week do you irrigate during peak summer period (in the absence of drought restrictions)?	☒ Monday ☐ Tuesday ☒ Wednesday ☐ Thursday ☒ Friday ☐ Saturday ☒ Sunday
Would you be willing to change the watering schedule if needed?	☒ Yes ☐ No
To convert to reclaimed water, all valve boxes and other exposed piping or controls will need to be designated with purple covers, tape, etc. Identify the number of such exposed elements (E.G. Ten 6" Round, Fifteen 14x19 Rectangular, ETC.).	17x30" Jumbo Valve Box - 19 10" Round Valve Box - 67 6" Round Valve Box - 22
Do you foresee any connection or retrofit issues with your system if you were to convert to reclaimed water? What would they be?	None foreseen

Reclaimed Water Use Survey

Property Name: SCG Lakeside
Commerce Center
1410 Lakeside Pkwy
Flower Mound, Tx



Contact Person: Michael Johnson, Lawnscape of Dallas, LTD.

Title:

Phone Number: 214-232-8579

Email Address:

Mailing Address:

System Information

Does the system have a separate irrigation meter?	☒ Yes ☐ No
Are there any other connections to the irrigation system for uses other than irrigation?	☐ Complex Pools ☐ Drinking Fountains ☐ Decorative Fountains ☐ Hose Bibs ☐ Dumpster Wash Down ☐ Car Washing ☐ Ponds ☐ Water Features ☐ Cooling Towers ☐ Other <u>No</u>
Do you have any onsite storage or booster pumping for your irrigation system?	☐ Yes ☒ No
How many acres are irrigated?	<u>0.1-2</u>
How many zones does this irrigation system have?	<u>37</u>
If known, what is the flow rate (in gpm) needed to serve each zone or alternatively, what is the estimated maximum flow rate required during any irrigation period?	<u>356 GPM - 55 GPM</u>
How many irrigation zones are typically irrigated simultaneously?	<u>1</u>
How many irrigation heads are in each zone?	<u>18-20</u>
What is the approximate flowrate per irrigation head?	<u>Spray 1.5 GPM Rotor 4 GPM</u>
What is the maximum/minimum operating pressure on the system?	<u>80 PSI</u>
What is the irrigation system water window (E.G. Number of hours to water the property)?	<u>16 hr 6:00 PM - 10:00 AM</u>
Is there a preference for the time of day the irrigation system should be operated?	<u>8:00 PM - 5:00 AM</u>
How many days per week do you irrigate during peak summer period (in the absence of drought restrictions)?	☒ Monday ☐ Tuesday ☒ Wednesday ☐ Thursday ☒ Friday ☐ Saturday ☒ Sunday
Would you be willing to change the watering schedule if needed?	☒ Yes ☐ No
To convert to reclaimed water, all valve boxes and other exposed piping or controls will need to be designated with purple covers, tape, etc. Identify the number of such exposed elements (E.G. Ten 6" Round, Fifteen 14x19 Rectangular, ETC.).	<u>40 10" round</u> <u>7 12x15 rectangular</u>
Do you foresee any connection or retrofit issues with your system if you were to convert to reclaimed water? What	

- ① Will the spray heads and rotors need to be retrofitted
- ② Will a master valve be required
- ③ Will a whole system filter be needed
- ④ Are there dissolved solids or chemicals that would stain or affect stucco walls or stone facades
- ⑤ Backflow requirements; DCVA or RPZ



Appendix C – Current Irrigation Meters and Demands in the Study Area

Customer	Meter Number	Phase	Use Type ¹	Months of Data	Peak Month	Max Month (gal)	Max Month (gpm)	Peak Hour (gpm)	Average Consumption (gal per month)
TOWN METER	55-0265-99	1	A	5	Aug-17	1,679,000	38.33	245.33	959,900
TOWN METER	55-0055-99	1	A	5	Aug-17	2,039,500	46.56	298.01	886,700
TOWN METER	55-0165-99	1	A	5	Jun-17	687,700	15.70	100.49	527,080
TOWN METER	86-0380-99	1	C	5	Jun-17	685,000	15.64	100.09	450,400
CHI / SILVERON LP ²	86-2995-99	3	C	7	Sep-17	706,500	16.13	103.23	385,025
BIG BOX PROPERTY OWNER ²	86-9210-99	2	C	40	Sep-16	2,844,000	64.93	415.56	314,926
DUKE REALTY LMTD PARTNERSHIP ²	86-3445-99	2	C	111	Nov-13	2,353,500	53.73	343.89	287,230
LIT INDUSTRIAL LIMITED ²	86-3260-99	2	C	80	Jul-08	1,596,000	36.44	233.21	282,990
SCG LAKESIDE COMMERCE CENTER ²	86-5971-99	3	C	120	Sep-07	945,500	21.59	138.16	281,499
THE HOME DEPOT	86-5962-99	3	C	123	Sep-12	1,071,300	24.46	156.54	280,593
LIT HW1 LP	86-6024-99	2	C	103	Sep-07	1,107,500	25.29	161.83	267,978
TOWN METER	86-0326-99	2	C	2	Sep-17	1,078,000	24.61	157.52	267,500
TAF DALLAS INDUSTRIAL PORTIFOLIO LP	86-4026-99	3	C	37	Jul-15	1,533,900	35.02	224.13	258,997
NATIONAL INDUSTRIAL HOLDINGS	86-5215-99	2	C	83	Jul-09	1,177,500	26.88	172.05	246,925
TOWN METER	55-0185-99	1	A	5	Aug-17	729,100	16.65	106.54	246,440
TOWN METER	86-0320-99	2	C	4	May-17	597,500	13.64	87.31	242,500
STACY FAMILIES ENTERPRISES	86-6040-99	2	C	67	Aug-09	1,346,500	30.74	196.75	231,533
CHI / SILVERON LP	86-2990-99	3	C	9	May-17	429,800	9.81	62.80	231,211
LMEG WIRELESS LLC	86-2890-99	2	C	10	Apr-17	1,391,000	31.76	203.25	230,960
MI WINDOWS AND DOORS	86-9870-99	3	C	29	Jun-16	596,100	13.61	87.10	229,340
KOHLER CO	86-3470-99	1	C	101	Aug-07	1,739,000	39.70	254.10	222,077
WAYFAIR LLC	86-9880-99	3	C	18	Jul-16	1,052,500	24.03	153.79	221,124
TOWN METER	55-0085-99	1	A	5	Jun-17	443,000	10.11	64.73	208,920
SCG LAKESIDE COMMERCE CENTER	86-4260-99	3	C	102	May-09	757,500	17.29	110.68	200,576
EASTGROUP PROPERTIES	86-9920-99	3	R	25	Oct-15	774,200	17.68	113.13	195,496
TOWN METER	55-0195-99	1	A	4	Jul-17	355,300	8.11	51.92	194,740
IPT LAKESIDE CORPORATE CENTER	86-9220-99	2	C	112	Aug-15	806,500	18.41	117.84	192,540
IPT LAKESIDE CORPORATE CENTER	86-9240-99	3	C	110	Jul-13	815,500	18.62	119.16	189,992
BEST BUY STORES LP	86-6033-99	2	C	108	Sep-14	684,000	15.62	99.95	184,385
SPEARS MANUFACTURING	86-3855-99	2	C	102	Feb-11	2,519,500	57.52	368.15	184,188
BIG BOX PROPERTY OWNER	86-4116-99	2	C	34	Aug-15	617,900	14.11	90.29	180,805
TOWN METER	55-0285-99	1	A	5	Sep-17	264,000	6.03	38.58	179,300
KOHLER CO	86-3505-99	2	C	90	Aug-15	976,000	22.28	142.61	178,883
AZURE LAKESIDE	86-0945-99	4	R	24	Jun-16	563,610	12.87	82.35	169,383
WIFPIR PROPERTIES LLC	86-8860-99	3	C	98	Sep-14	887,500	20.26	129.68	164,847
HEAT AND CONTROL INC	86-3830-99	2	C	116	Jul-13	871,800	19.90	127.39	160,305
MI WINDOWS AND DOORS	86-9865-99	3	C	28	Jul-15	687,500	15.70	100.46	154,287
DUKE REALTY LMTD PARTNERSHIP	86-3455-99	2	C	103	Nov-13	990,500	22.61	144.73	153,472
EASTGROUP PROPERTIES	86-9900-99	2	C	25	Sep-16	495,500	11.31	72.40	151,472

Customer	Meter Number	Phase	Use Type ¹	Months of Data	Peak Month	Max Month (gal)	Max Month (gpm)	Peak Hour (gpm)	Average Consumption (gal per month)
IPT LAKESIDE CORPORATE CENTER	86-5265-99	3	C	42	Oct-15	545,300	12.45	79.68	143,542
LISANTI FOODS	86-9890-99	3	C	19	Mar-16	424,500	9.69	62.03	132,476
COMMUNICATIONS TEST DESIGN INC	86-9205-99	2	C	80	Sep-13	2,870,500	65.54	419.43	132,229
LIT INDUSTRIAL LIMITED	86-3285-99	2	C	96	Jun-08	825,000	18.84	120.55	131,404
MORTGAGE FINANCIAL SERVICES	86-8825-99	3	C	92	May-11	476,500	10.88	69.63	130,964
TOWN METER	55-0365-99	1	A	4	Aug-17	214,000	4.89	31.27	130,760
TOWN METER	86-0390-99	2	C	5	Jul-17	187,000	4.27	27.32	128,400
IPT LAKESIDE CORPORATE CENTER	86-5230-99	3	C	47	Aug-13	633,100	14.45	92.51	128,125
WIFPIR PROPERTIES LLC	86-8855-99	3	C	95	Aug-09	429,000	9.79	62.68	120,187
TOWN METER	55-0245-99	1	A	5	Jun-17	190,500	4.35	27.84	120,000
MORTGAGE FINANCIAL SERVICES	86-4705-99	3	C	78	Aug-11	570,500	13.03	83.36	113,193
IPT LAKESIDE CORPORATE CENTER	86-5270-99	3	C	39	Oct-15	551,300	12.59	80.56	113,113
LIT INDUSTRIAL LIMITED	86-3290-99	2	C	94	Jun-08	811,900	18.54	118.63	110,442
LIT INDUSTRIAL LIMITED	86-3270-99	2	C	98	Jun-08	2,175,900	49.68	317.94	105,934
AZURE LAKESIDE	86-3515-99	4	R	34	Aug-15	238,370	5.44	34.83	102,419
EASTGROUP PROPERTIES	86-9910-99	1	C	25	Oct-15	261,600	5.97	38.22	102,184
TOWN METER	55-0215-99	1	A	5	Jul-17	151,100	3.45	22.08	95,700
GREYSTAR DEV	86-3391-99	4	R	1	Sep-17	182,930	4.18	26.73	91,465
CCA	86-5145-99	2	C	49	Sep-13	536,600	12.25	78.41	90,411
MOVIE HOUSE & EATERY	86-3590-99	3	R	25	Sep-15	670,200	15.30	97.93	82,624
TOWN METER	55-0105-99	1	A	5	Jun-17	107,000	2.44	15.63	77,700
TOWN METER	55-0135-99	1	A	5	Jun-17	135,000	3.08	19.73	75,900
TOWN METER	55-0315-99	1	A	5	Aug-17	118,300	2.70	17.29	74,520
TITAN CORRUGATED INC	86-9195-99	2	C	94	Oct-07	417,000	9.52	60.93	72,027
TAF DALLAS INDUSTRIAL PORTIFOLIO LP	86-4042-99	2	C	35	Aug-15	223,600	5.11	32.67	69,022
AZURE LAKESIDE	86-3566-99	4	R	27	Sep-15	260,840	5.96	38.11	68,085
TOWN METER	55-0225-99	1	A	4	Aug-17	125,900	2.87	18.40	67,160
TAF DALLAS INDUSTRIAL PORTIFOLIO LP	86-4041-99	2	C	35	Dec-14	265,700	6.07	38.82	66,189
TOWN METER	86-0430-99	5	C	5	Jul-17	83,500	1.91	12.20	63,200
SCG LAKESIDE COMMERCE CENTER	86-4270-99	3	C	104	May-12	396,500	9.05	57.94	56,408
AZURE LAKESIDE	86-3520-99	4	R	34	Aug-17	128,040	2.92	18.71	47,556
AZURE LAKESIDE	86-0940-99	4	R	23	Apr-16	187,190	4.27	27.35	45,386
TOWN METER	86-0385-99	2	C	5	Jul-17	65,030	1.48	9.50	42,508
GREYSTAR DEV	86-0970-99	4	R	22	Apr-16	138,580	3.16	20.25	39,614
TOWN METER	55-0345-99	1	A	2	Sep-17	158,300	3.61	23.13	37,580
TOWN METER	86-0631-99	4	R	5	Aug-17	67,640	1.54	9.88	28,546
ONCOR ELECTRIC DELIVERY	86-3915-99	3	A	66	Sep-08	204,000	4.66	29.81	26,967
LAKESIDE DFW RETAIL	86-3186-99	4	R	16	Jul-16	37,670	0.86	5.50	24,747
AZURE LAKESIDE	86-3573-99	4	R	28	Aug-15	130,740	2.98	19.10	23,948

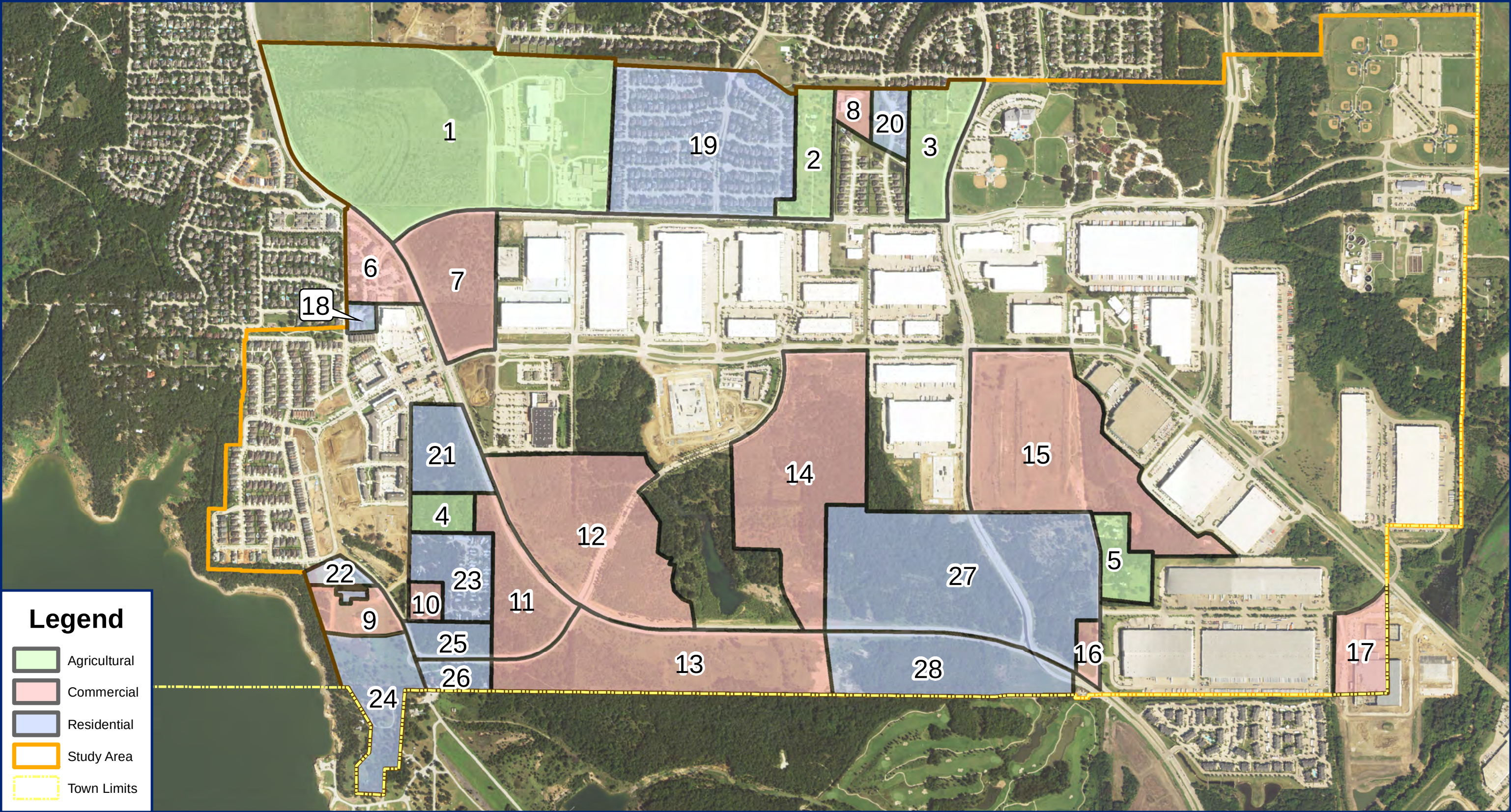
Customer	Meter Number	Phase	Use Type ¹	Months of Data	Peak Month	Max Month (gal)	Max Month (gpm)	Peak Hour (gpm)	Average Consumption (gal per month)
TOWN METER	86-0570-99	4	R	5	May-17	28,500	0.65	4.16	23,000
TOWN METER	86-0655-99	4	R	5	Aug-17	32,710	0.75	4.78	18,526
AZURE LAKESIDE	86-3574-99	4	R	24	Aug-15	78,580	1.79	11.48	17,689
TOWN METER	86-0410-99	4	C	5	Sep-17	17,500	0.40	2.56	15,900
GREYSTAR DEV	86-5480-99	4	R	2	Sep-17	28,290	0.65	4.13	15,030
AZURE LAKESIDE	86-3246-99	4	R	30	Sep-17	53,710	1.23	7.85	13,986
KOHLER CO	86-3510-99	1	A	79	Dec-10	229,500	5.24	33.53	13,793
GREYSTAR DEV	86-5470-99	4	R	2	Aug-17	22,270	0.51	3.25	12,603
IPT LAKESIDE CORPORATE CENTER	86-5973-99	3	C	44	Sep-11	98,000	2.24	14.32	6,757
AZURE LAKESIDE	86-3370-99	4	R	31	May-16	22,460	0.51	3.28	4,820
TOWN METER	55-0035-99	1	A	3	Jun-17	4,500	0.10	0.66	2,300
TOWN METER	55-0255-99	1	A	5	Aug-17	2,000	0.05	0.29	1,300
TOWN METER (NEW)	55-0735-99	1	A	1	Sep-17	200	0.00	0.03	200
TOWN METER	55-0325-99	1	A	1	Aug-17	180	0.00	0.03	36
LIT HW1 LP	86-6017-99	2	C	2	Aug-15	400	0.01	0.06	4
GREYSTAR DEV	86-3523-99	4	R	0	-	0	0.00	0.00	0
TOWN METER (NEW)	55-0725-99	1	A	0	-	0	0.00	0.00	0
TOWN METER	86-0585-99	4	R	0	-	0	0.00	0.00	0
TOWN METER	55-0145-99	1	A	0	-	0	0.00	0.00	0
TOWN METER	86-0420-99	3	R	0	-	0	0.00	0.00	0
TOWN METER	55-0175-99	1	A	0	-	0	0.00	0.00	0
TOWN METER	86-0405-99	5	C	0	-	0	0.00	0.00	0
TOWN METER	86-0395-99	5	C	0	-	0	0.00	0.00	0
TOWN METER	86-0580-99	4	R	0	-	0	0.00	0.00	0
GREYSTAR DEV	86-3521-99	4	R	0	-	0	0.00	0.00	0
TOWN METER	86-0322-99	2	C	0	-	0	0.00	0.00	0
GREYSTAR DEV	86-3393-99	4	R	0	-	0	0.00	0.00	0
GREYSTAR DEV	86-3394-99	4	R	0	-	0	0.00	0.00	0

¹A=Agricultural; C=Commercial; R=Residential

²Contacted customer to inform of reclaimed water master plan

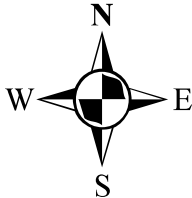
Total 8,433 14,055,096

Appendix D – Future Demand Included in Hydraulic Model



Legend

-  Agricultural
-  Commercial
-  Residential
-  Study Area
-  Town Limits



0 0.075 0.15 0.3 0.45 0.6 0.75 Miles

DATE: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan

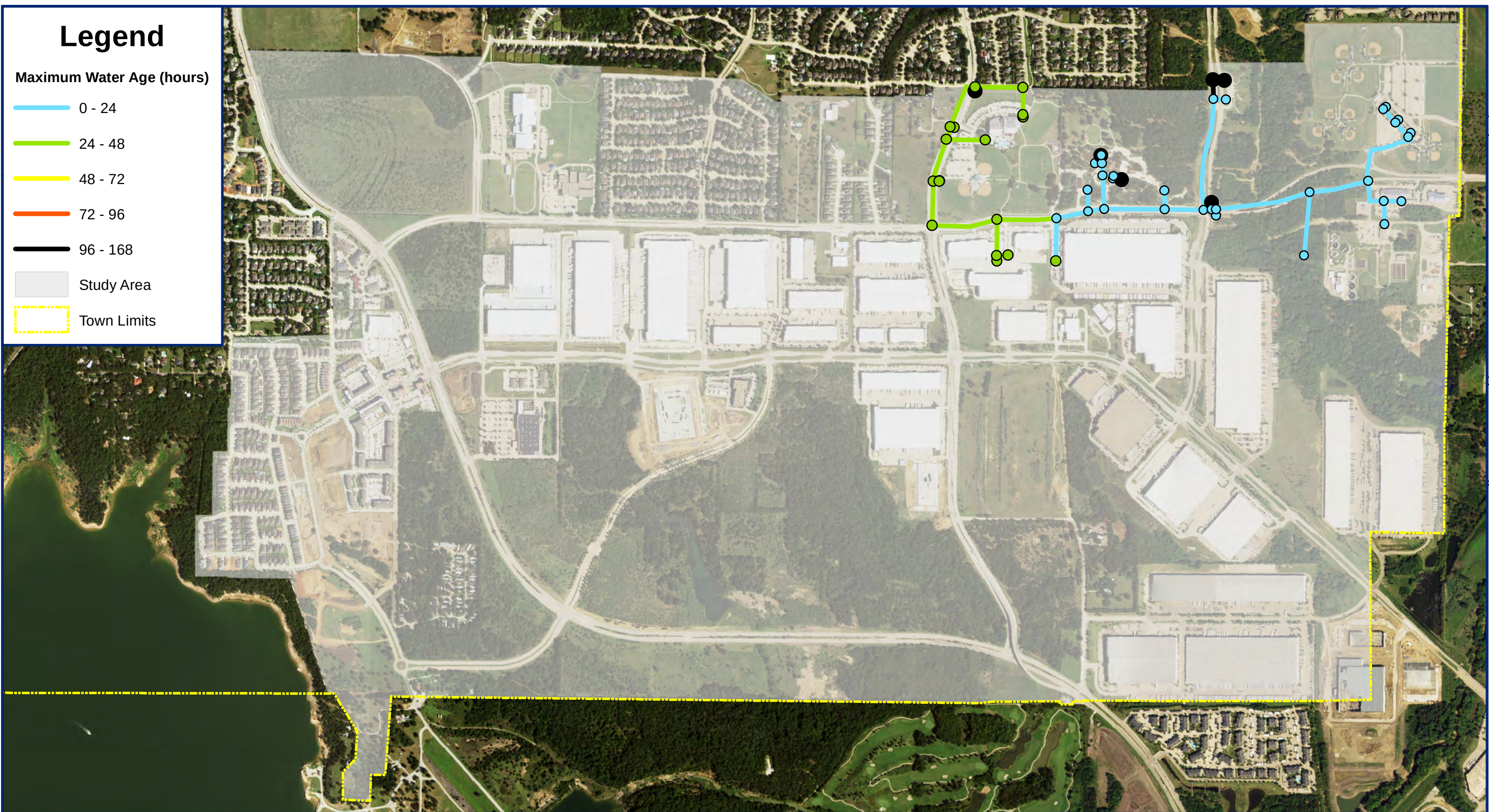
Appendix D: Future Demand Included in Hydraulic Model



1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536

Parcel Type	Parcel ID #	Acres	Unit Peak Hour Demand (gpm/Acre)	Peak Hour Demand (gpm)
Agricultural	1	141.17	2.76	389.62
Agricultural	2	14.17	2.76	39.11
Agricultural	3	18.52	2.76	51.11
Agricultural	4	6.75	2.76	18.63
Agricultural	5	10.23	2.76	28.23
Total		191	-	527
Commercial	6	12.77	9.82	125.39
Commercial	7	28.97	9.82	284.45
Commercial	8	4.19	9.82	41.16
Commercial	9	9.17	9.82	90.08
Commercial	10	3.54	9.82	34.75
Commercial	11	22.56	9.82	221.51
Commercial	12	61.56	9.82	604.57
Commercial	13	53.87	9.82	529.04
Commercial	14	64.22	9.82	630.68
Commercial	15	69.80	9.82	685.39
Commercial	16	3.80	9.82	37.36
Commercial	17	12.60	9.82	123.76
Total		347	-	3,408
Residential	18	2.26	7.90	17.86
Residential	19	69.33	7.90	547.74
Residential	20	6.28	7.90	49.64
Residential	21	16.22	7.90	128.12
Residential	22	4.62	7.90	36.48
Residential	23	16.08	7.90	127.06
Residential	24	21.86	7.90	172.71
Residential	25	8.23	7.90	65.00
Residential	26	5.80	7.90	45.82
Residential	27	92.35	7.90	729.54
Residential	28	36.07	7.90	284.93
Total		279	-	2,205

Appendix E – Water Age Phase Model Results



Legend

Maximum Water Age (hours)

0 - 24

24 - 48

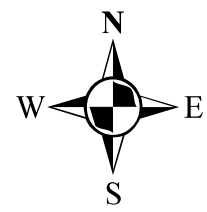
48 - 72

72 - 96

96 - 168

Study Area

Town Limits



0 0.125 0.25 0.5 Miles

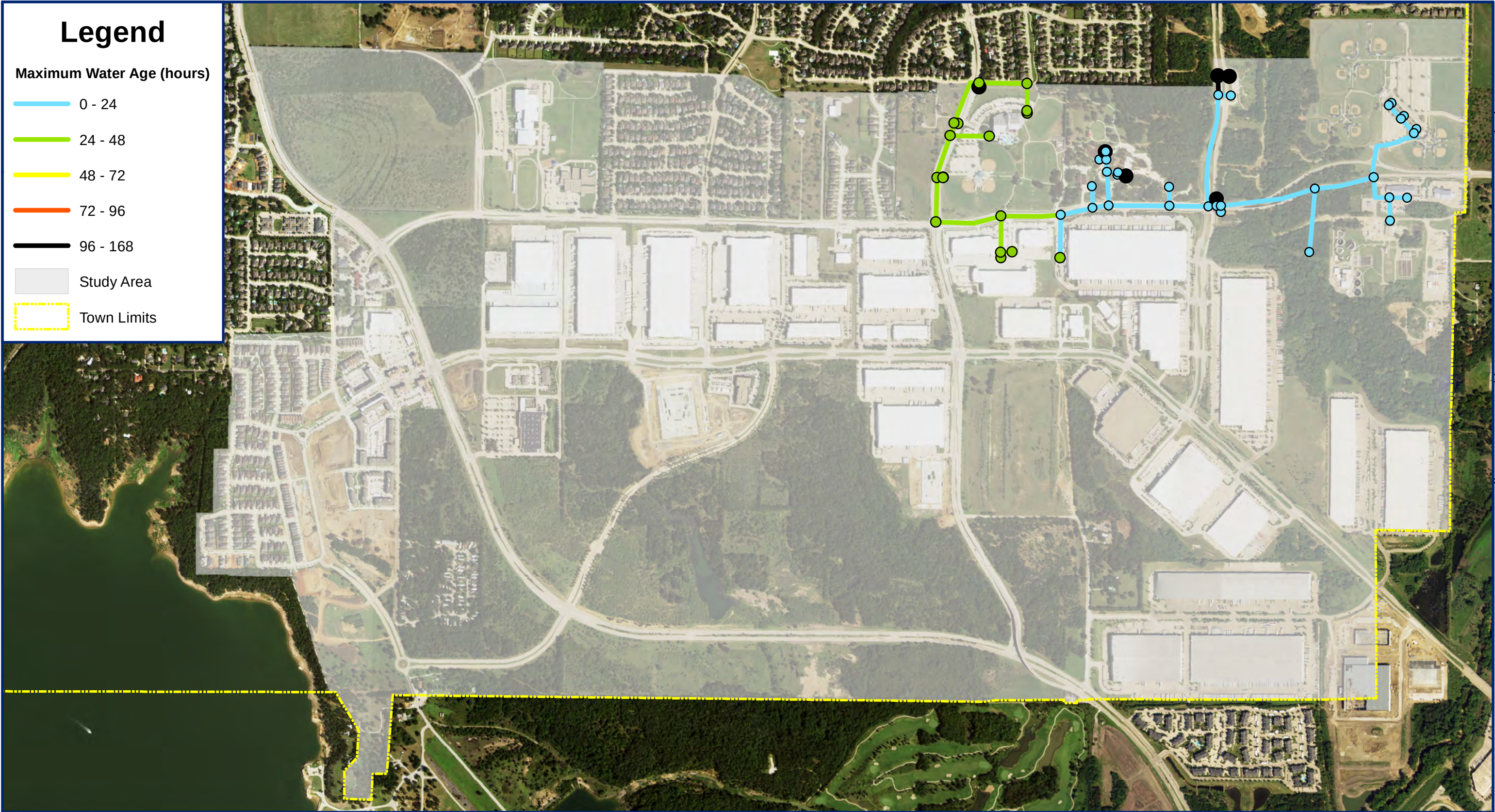
Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Including Future Demand - Phase 1



ALAN PLUMMER
ASSOCIATES, INC.
ENVIRONMENTAL
ENGINEERS AND SCIENTISTS

1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536



Legend

Maximum Water Age (hours)

0 - 24

24 - 48

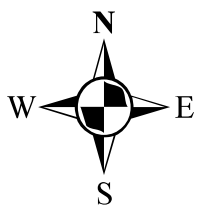
48 - 72

72 - 96

96 - 168

Study Area

Town Limits

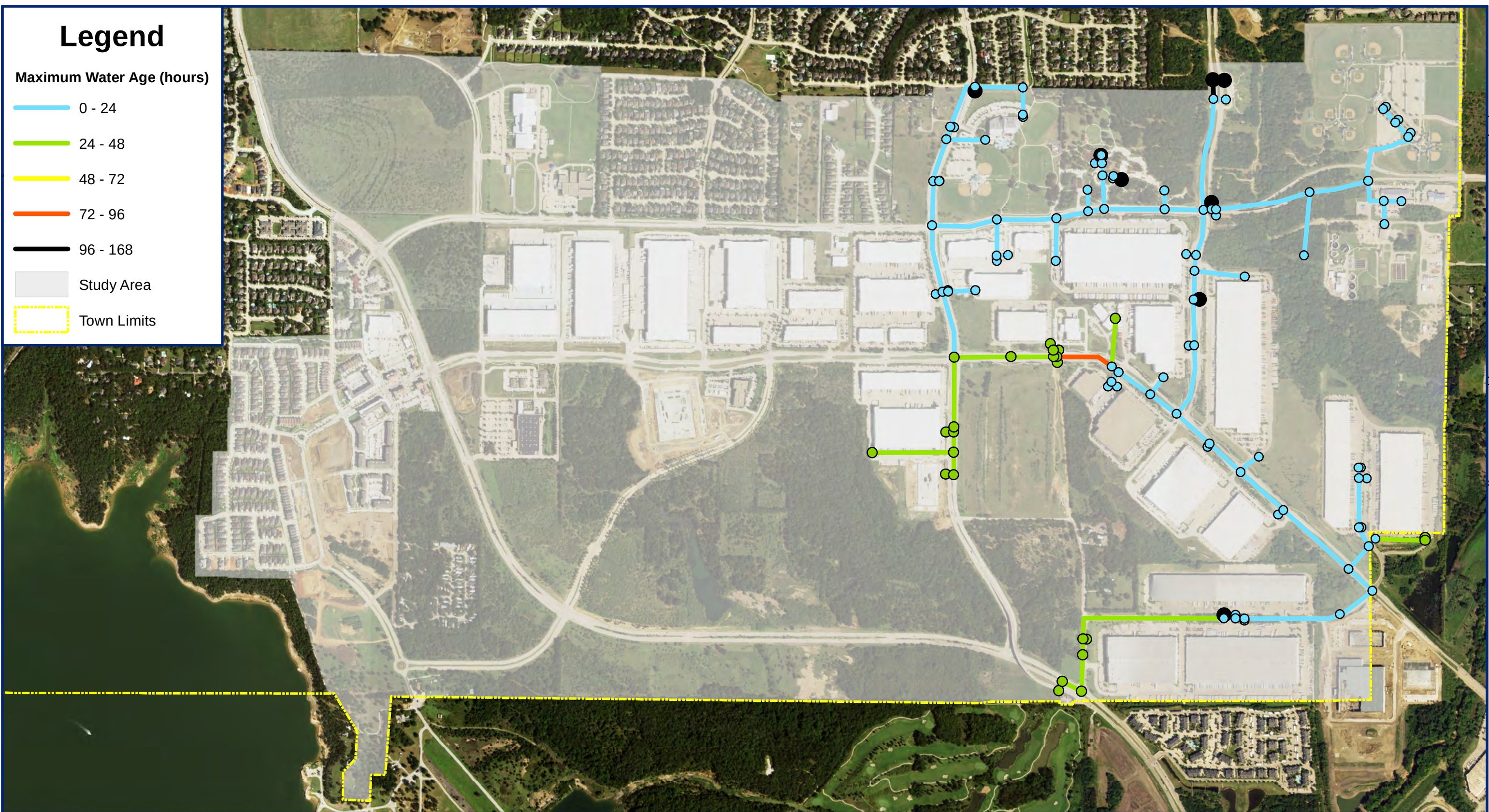


0 0.125 0.25 0.5 Miles

Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Not Including Future Demand - Phase 1

 **ALAN PLUMMER ASSOCIATES, INC.**
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FORT WORTH, TEXAS 76107
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Legend

Maximum Water Age (hours)

0 - 24

24 - 48

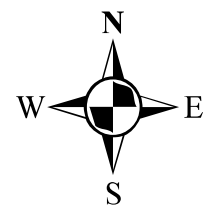
48 - 72

72 - 96

96 - 168

Study Area

Town Limits

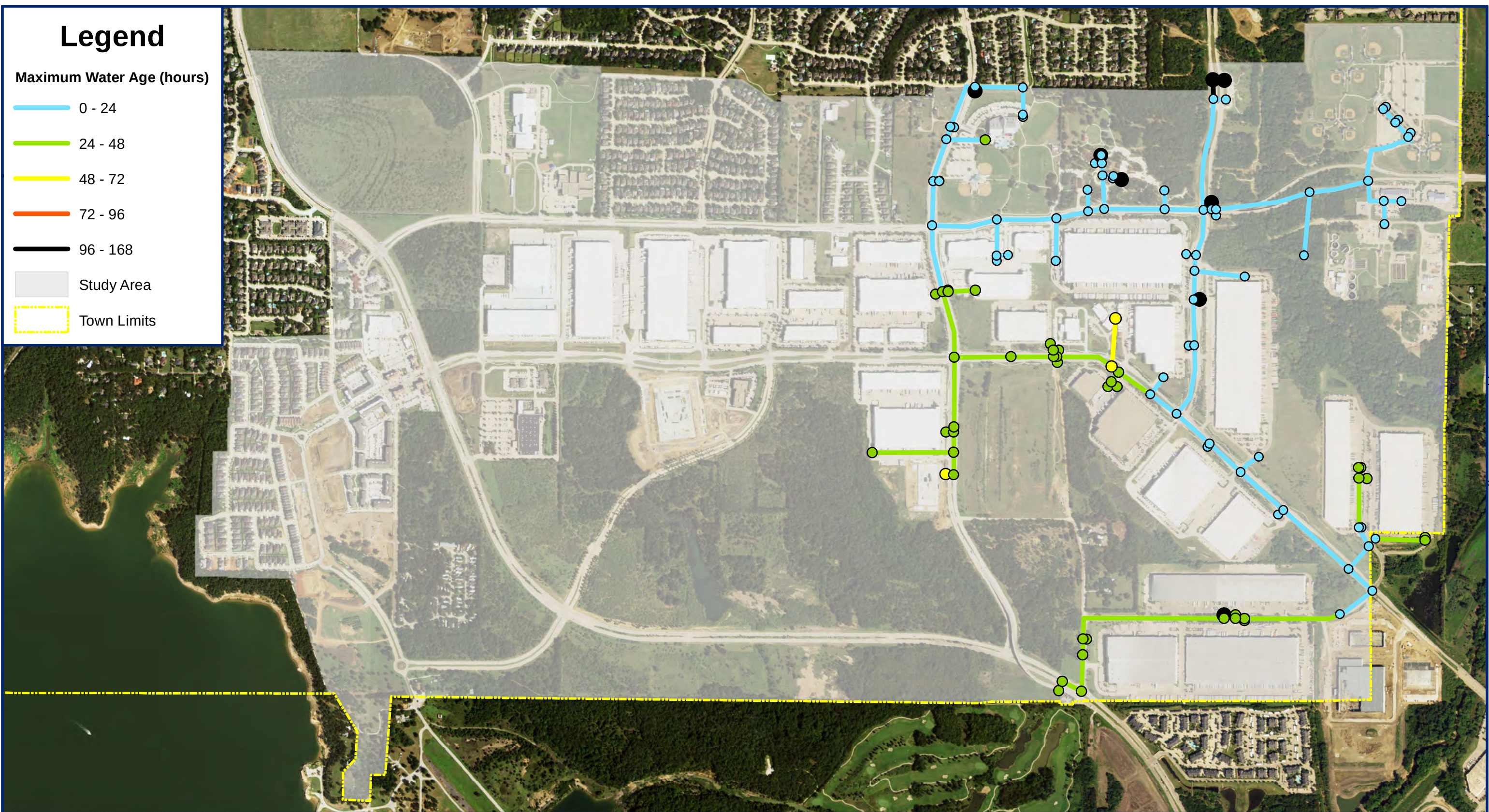


0 0.125 0.25 0.5 Miles

Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Including Future Demand - Phase 2

 **ALAN PLUMMER
ASSOCIATES, INC.**
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1320 S. UNIVERSITY DRIVE
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FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
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Legend

Maximum Water Age (hours)

0 - 24

24 - 48

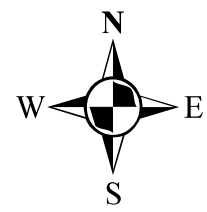
48 - 72

72 - 96

96 - 168

Study Area

Town Limits

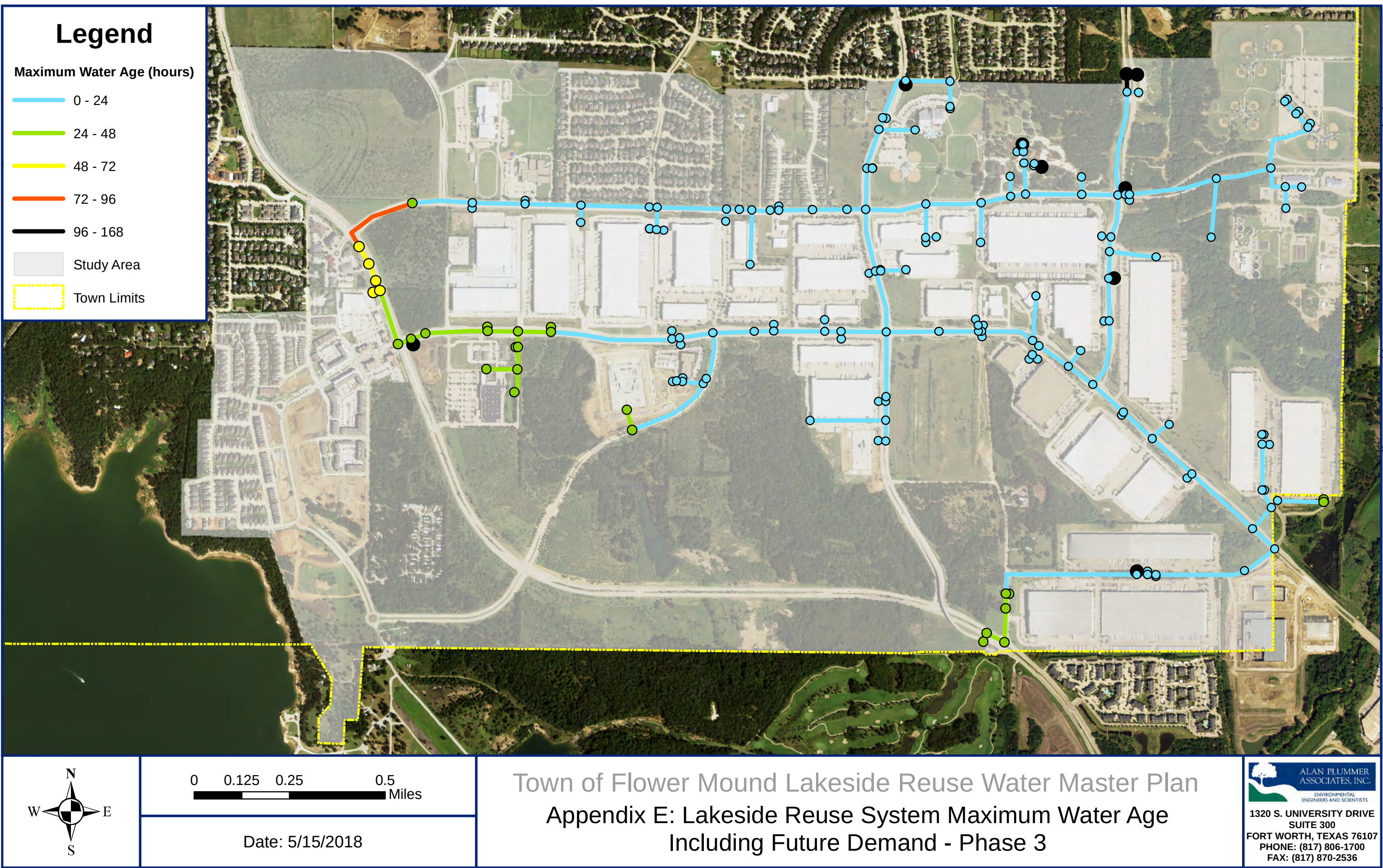


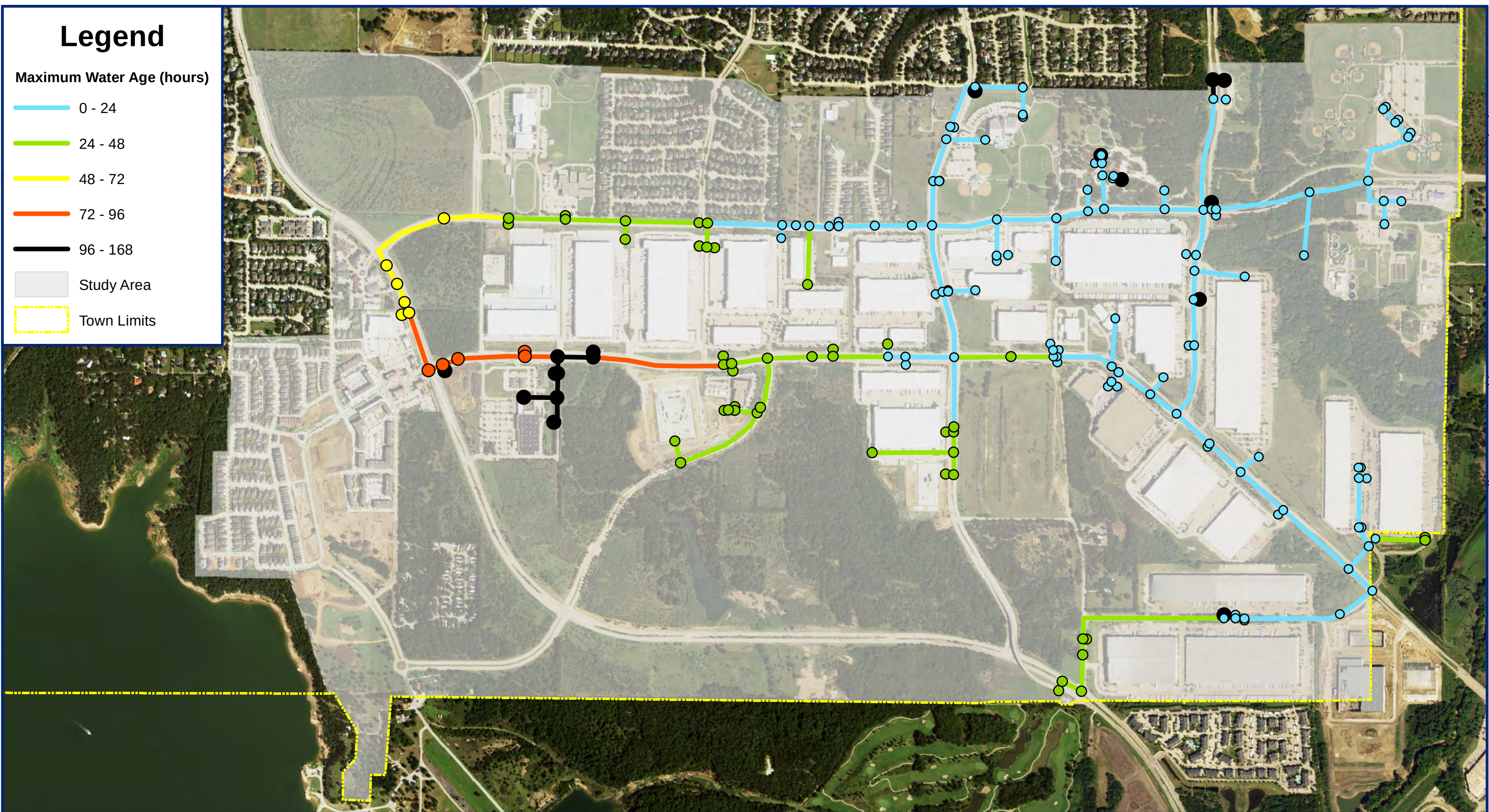
0 0.125 0.25 0.5 Miles

Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Not Including Future Demand - Phase 2

**ALAN PLUMMER
ASSOCIATES, INC.**
ENVIRONMENTAL
ENGINEERS AND SCIENTISTS
1320 S. UNIVERSITY DRIVE
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FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
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Legend

Maximum Water Age (hours)

0 - 24

24 - 48

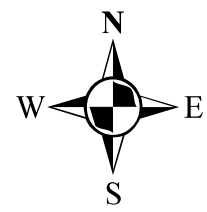
48 - 72

72 - 96

96 - 168

Study Area

Town Limits

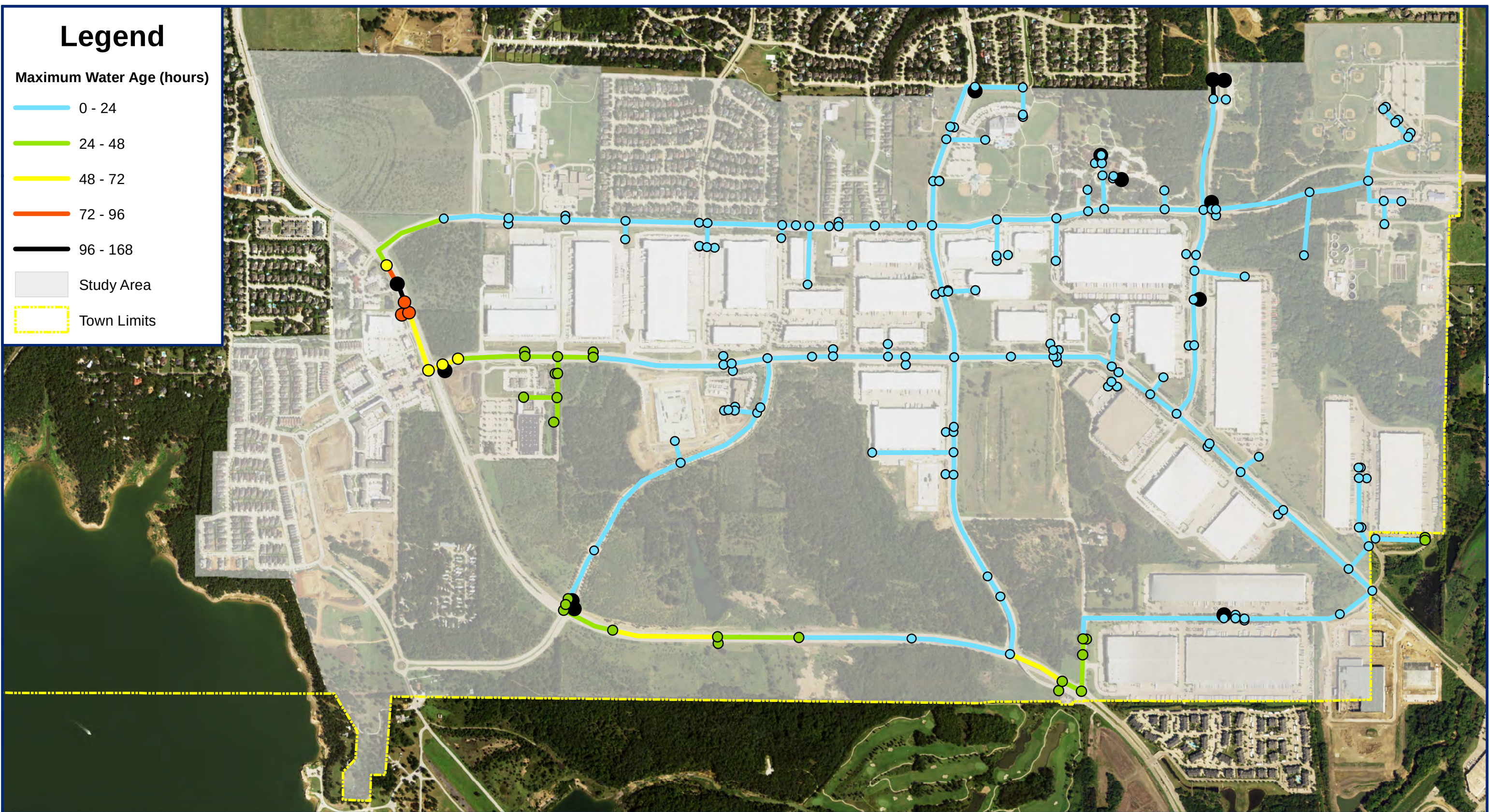


0 0.125 0.25 0.5 Miles

Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Not Including Future Demand - Phase 3

 **ALAN PLUMMER ASSOCIATES, INC.**
ENVIRONMENTAL ENGINEERS AND SCIENTISTS
1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536



Legend

Maximum Water Age (hours)

0 - 24

24 - 48

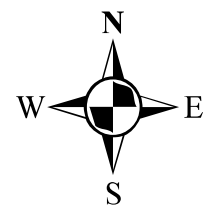
48 - 72

72 - 96

96 - 168

Study Area

Town Limits

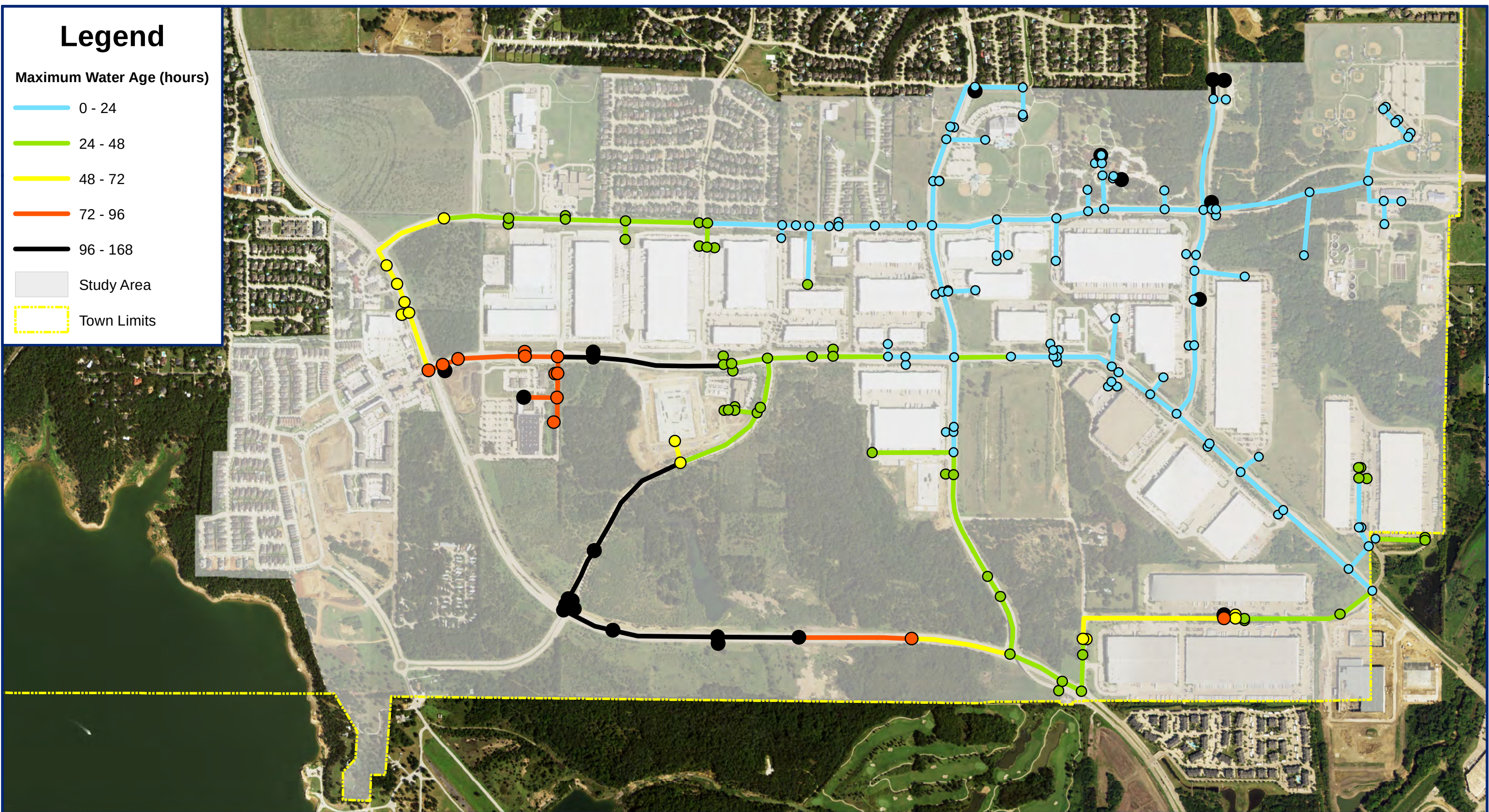


0 0.125 0.25 0.5 Miles

Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Including Future Demand - Phase 4

ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS AND SCIENTISTS
1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536



Legend

Maximum Water Age (hours)

0 - 24

24 - 48

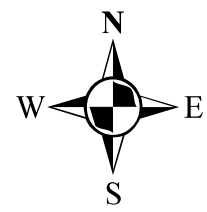
48 - 72

72 - 96

96 - 168

Study Area

Town Limits

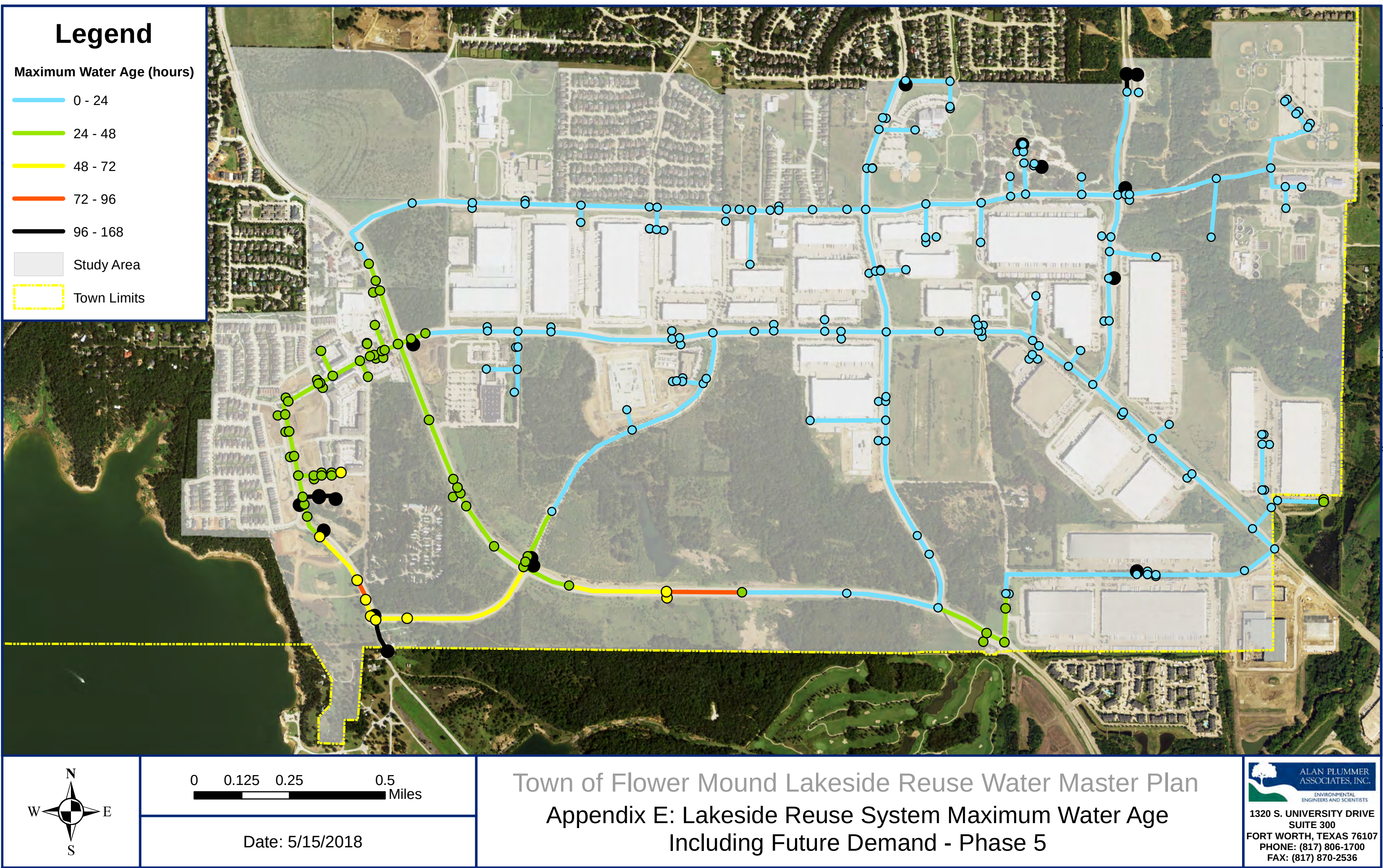


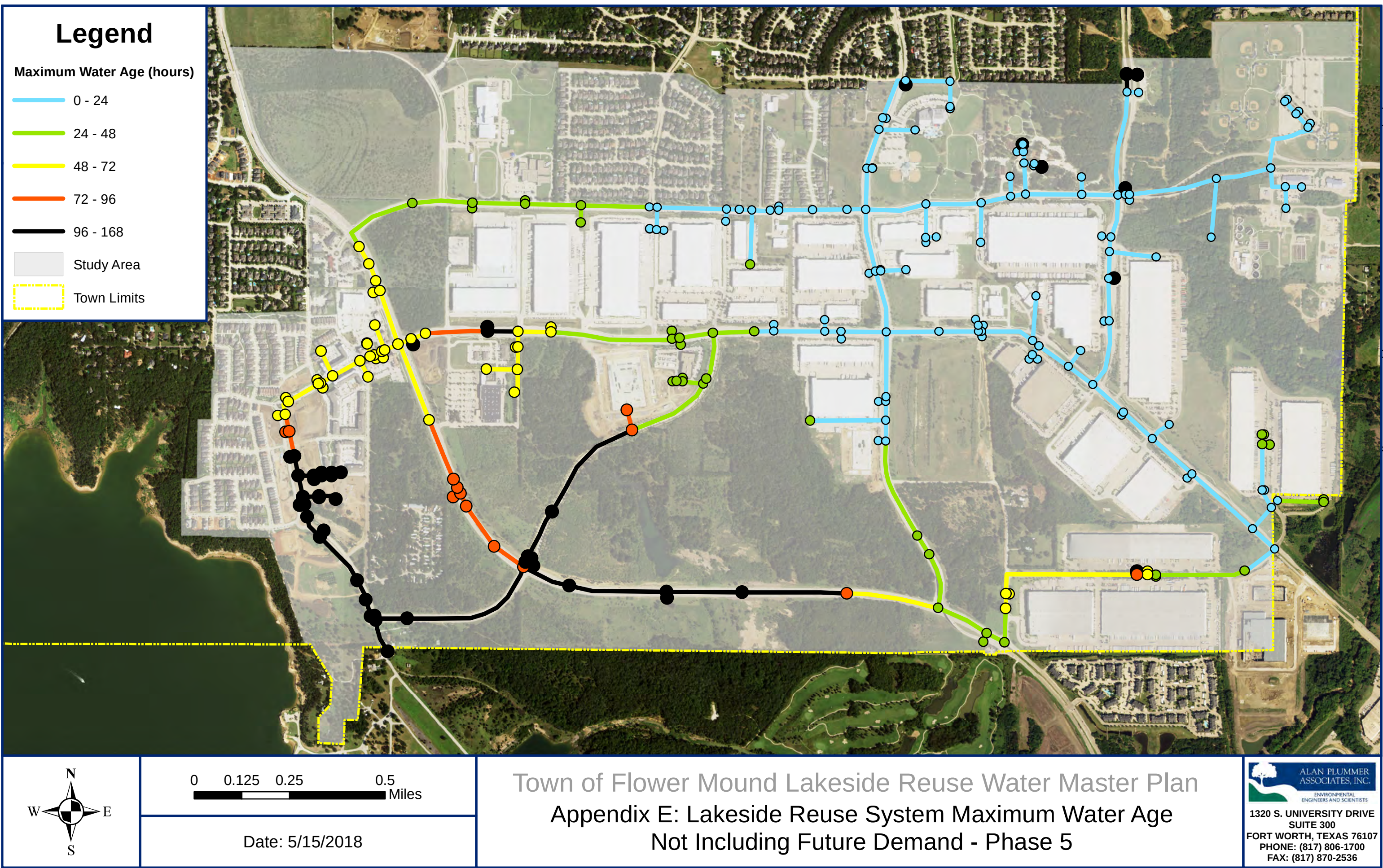
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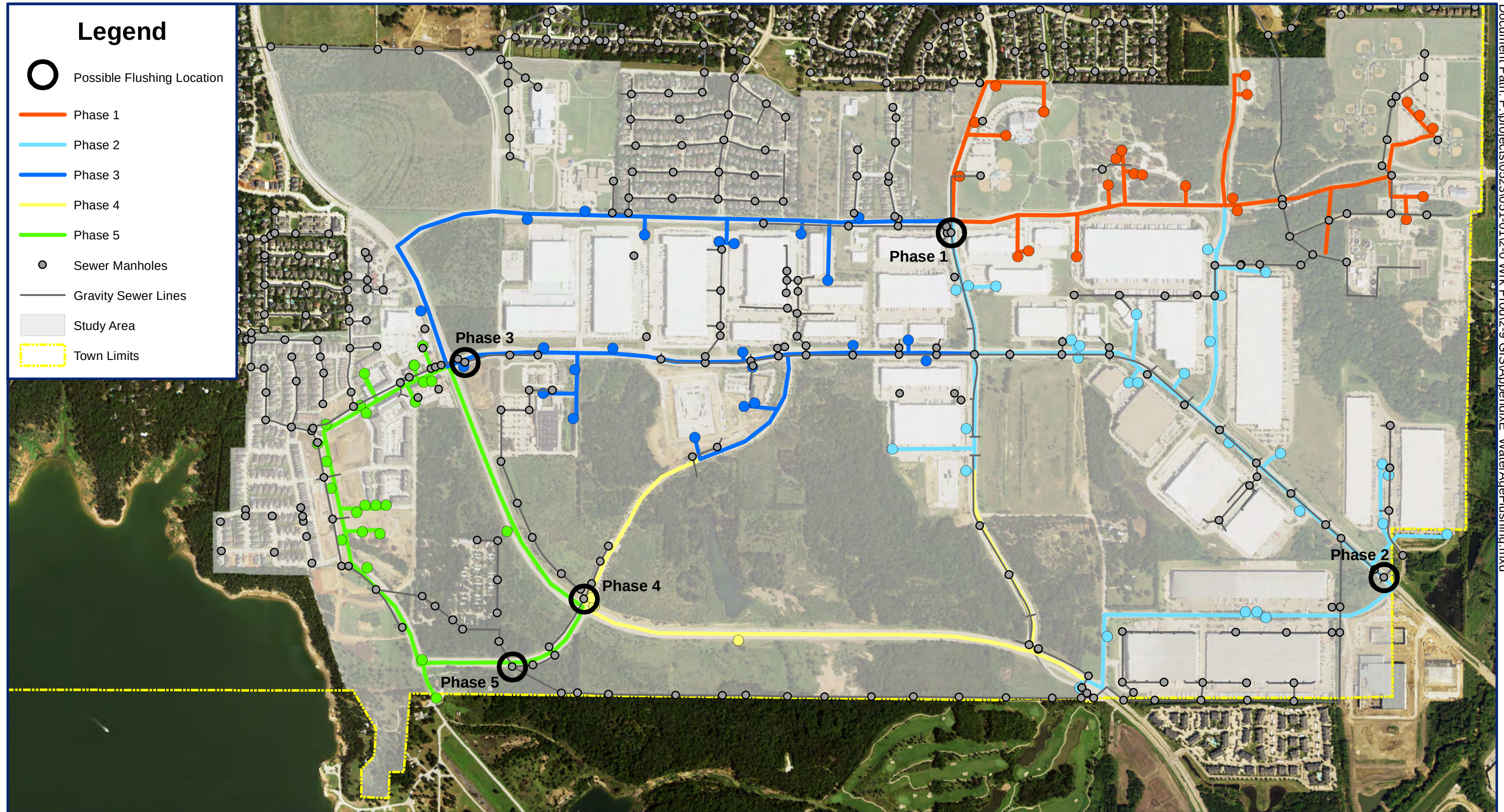
Date: 5/15/2018

Town of Flower Mound Lakeside Reuse Water Master Plan Appendix E: Lakeside Reuse System Maximum Water Age Not Including Future Demand - Phase 4

 **ALAN PLUMMER ASSOCIATES, INC.**
ENVIRONMENTAL ENGINEERS AND SCIENTISTS
1320 S. UNIVERSITY DRIVE
SUITE 300
FORT WORTH, TEXAS 76107
PHONE: (817) 806-1700
FAX: (817) 870-2536







Appendix F – Flower Mound Reclaimed Water Authorization

Kathleen Hartnett White, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
Larry R. Soward, *Commissioner*
Glenn Shankle, *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

April 5, 2006

Mr. Brian K. McDonald, P.E.
Alan Plummers Associates, Inc.
7524 Mosier View Court
Suite 200
Fort Worth, Texas 76118

Re: Reclaimed Water Project - Town of Flower Mound
Texas Commission on Environmental Quality (TCEQ) Permit No. R11321-001
WWPR R11321-001
Denton County, Texas
CN600639835 RN101251619

Dear Mr. McDonald:

We are updating above-referenced authorization. I am enclosing is a copy of the updated authorization. The authorization consists of the reuse of wastewater effluent from the Town of Flower Mound Wastewater Treatment Plant (TCEQ Permit No. R11321-001).

The treated effluent will be used for: residential irrigation, including landscape irrigation at individual homes; urban uses, including irrigation of public parks, golf courses, school yards, or athletic fields; use of reclaimed water for fire protection, either in internal sprinkler systems or external fire hydrants; maintenance of impoundments or natural water bodies; toilet or urinal flush water; other similar activities where the potential for unintentional human exposure may occur; cooling tower makeup water; irrigation of sod farms, silviculture, limited access highway rights of way; and soil compaction or dust control in construction areas.

The enclosure for this letter indicates the approved sites and conditions that apply to this approval. If you have any questions please contact me at (512) 239-4552.

Sincerely,

A handwritten signature in dark ink, appearing to read "Louis C. Herrin, III".

Louis C. Herrin, III, P.E.
Wastewater Permitting Section
Water Quality Division

cc: Town of Flower Mound, w/attachments
TCEQ Region 4 Office, w/attachments
TCEQ Water Quality Application Review and Processing Team (MC 148) , w/attachments



Authorization No. R11321-001
This authorization supersedes
and replaces WWPR R11321-001
approved April 10, 2003

AUTHORIZATION FOR RECLAIMED WATER

Producer: Town of Flower Mound
2121 Cross Timbers Road
Flower Mound, Texas 75028

Provider: Town of Flower Mound
2121 Cross Timbers Road
Flower Mound, Texas 75028

Users: The Users that the Town of Flower Mound, permitted as distributors and bulk users of the reclaimed water.

Location: The plant site is located at 1101 Duncan Lane, approximately two miles east and one mile south of the intersection of Farm-to-Market Road 2499 and Farm-to-Market Road 3040, in the Town of Flower Mound, in Denton County, Texas.

Authorization: Reclaimed water from the Town of Flower Mound's Wastewater Treatment Plant (Permit No. R11321-001), to be used for residential irrigation, including landscape irrigation at individual homes; urban uses, including irrigation of public parks, golf courses, school yards, or athletic fields; use of reclaimed water for fire protection, either in internal sprinkler systems or external fire hydrants; maintenance of impoundments or natural water bodies; toilet or urinal flush water; other similar activities where the potential for unintentional human exposure may occur; cooling tower makeup water; irrigation of sod farms, silviculture, limited access highway rights of way; and soil compaction or dust control in construction areas. The service area is shown on Attachment A.

This authorization contained the conditions that apply for the uses of the reclaimed water.

Issued Date: April 5, 2006

A handwritten signature in black ink, appearing to read "Chris Linendoll", written over a horizontal line.

Chris Linendoll, Manager
Wastewater Permitting Section
Water Quality Division

Limitations: The authorization is subjected to the following requirements:

I. General Requirements.

- (a) No wastewater treatment plant operator (producer) shall transfer to a user reclaimed water without first notifying the commission.
- (b) Irrigation with untreated wastewater is prohibited.
- (c) Food crops that may be consumed raw by humans shall not be spray irrigated. Food crops including orchard crops that will be substantially processed prior to human consumption may be spray irrigated. Other types of irrigation that avoid contact of reclaimed water with edible portions of food crops are acceptable.
- (d) There shall be no nuisance conditions resulting from the distribution, the use, and/or storage of reclaimed water.
- (e) Reclaimed water shall not be utilized in a way that degrades ground water quality to a degree adversely affecting its actual or potential uses.
- (f) Reclaimed water managed in ponds for storage must be prevented from discharge into waters in the state, except for discharges directly resulting from rainfall events, in accordance with a permit issued by the commission, or as authorized under the Town of Flower Mound's Wastewater Treatment Plant (Permit No. 11321-001). All other discharges are unauthorized. If any unauthorized overflow of a holding pond occurs causing discharge into or adjacent to waters in the state, the user or provider, as appropriate, shall report any noncompliance. A written submission of such information shall also be provided to the commission regional office and to the Austin Office, Water Enforcement Section (MC-149), within five (5) working days of becoming aware of the overflow. The written submission shall contain a description of the noncompliance and its cause; the potential danger to human health or safety, or the environment; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the anticipated time it is expected to continue; and, steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.
- (g) Unless otherwise provided in this authorization, there shall be no off-site discharge, either airborne or surface runoff, of reclaimed water from the user's property except to a wastewater treatment system or wastewater treatment collection system unless the reclaimed water user applies for and obtains a permit from the commission which authorizes discharge of the water.
- (h) Signs in both English and Spanish shall be posted at storage areas, hose bibs and faucets reading "Reclaimed Water, Do Not Drink" or similar warnings. Alternately, the area may be secured to prevent access by the public.
- (i) All new reclaimed water piping shall be separated from potable water piping when trenched by a distance of at least nine feet. All new exposed piping, hose bibs and faucets shall be painted purple and designed to prevent connection to a standard water hose. All piping shall be stenciled with a warning reading "NON-POTABLE WATER".
- (j) The design of any new distribution systems which will convey reclaimed water to a user shall be approved by the executive director. Materials shall be submitted for approval by the executive director in accordance with the Texas Engineering Practice Act (Article 3271a, Vernon's Annotated Texas Statutes). The plans and specifications for any new distribution systems constructed pursuant to this authorization must be approved pursuant to state law, and failure to secure approval before commencing construction of such works or making a transfer of reclaim water therefrom is a violation of this authorization, and each day of a transfer is an additional violation until approval has been secured.

- (k) Nothing in this authorization modifies any requirements of the Texas Department of Health found in Title 25 Texas Administrative Code (TAC), Chapter 337.
- (l) Major changes from a prior notification for use of reclaimed water must be approved by the executive director. A major change includes:
 - (1) A change in the boundary of the approved service area not including the conversion of individual lots within a subdivision to reclaimed water use;
 - (2) The addition of a new producer;
 - (3) Major changes in the intended use, such as conversion from irrigation of a golf course to residential irrigation; or
 - (4) Changes from either Type I or Type II uses to the other.
- (m) The reclaimed water producer and user shall maintain on the sites a current operation and maintenance plan. The operation and maintenance plan which shall contain, as a minimum the following:
 - (1) A labeling and separation plan for the prevention of cross connections between reclaimed water distribution lines and potable water lines;
 - (2) The measures that will be implemented to prevent unauthorized access to reclaimed water facilities (eg., secured valves);
 - (3) Procedures for monitoring reclaimed water;
 - (4) A plan for how reclaimed water use will be scheduled to minimize the risk of inadvertent human exposure;
 - (5) Schedules for routine maintenance;
 - (6) A plan for worker training and safety; and
 - (7) Contingency plan for system failure or upsets.

II. Storage Requirements for Reclaimed Water

- (a) All initial holding ponds designed to contain Type I effluent shall conform to the following requirements:
 - (1) The ponds, whether constructed of earthen or other impervious materials, shall be designed and constructed so as to prevent groundwater contamination;
 - (2) Soils used for pond lining shall be free from foreign material such as paper, brush, trees, and large rocks;
 - (3) All soil liners must be of compacted material having a permeability less than or equal to 1×10^{-4} cm/sec, at least 24 inches thick, compacted in lifts no greater than 6 inches each;
 - (4) Synthetic membrane linings shall have a minimum thickness of 40 mils. In situ liners at least 24 inches thick meeting a permeability less than or equal to 1×10^{-4} cm/sec are acceptable alternatives;
 - (5) Certification shall be furnished by a Texas Registered Professional Engineer that the pond lining meets the appropriate criteria prior to utilization of the facilities; and
 - (6) Soil embankment walls shall have a top width of at least five feet. The interior and exterior slopes of soil embankment walls shall be no steeper than one foot vertical to three feet horizontal unless alternate methods of slope stabilization are utilized. All soil embankment walls shall be protected by a vegetative cover or other stabilizing material to prevent erosion. Erosion stops and water seals shall be installed on all piping penetrating the embankments.
 - (7) An alternative method of pond lining which provides equivalent or better water quality protection than provided under this section may be utilized with the prior approval of the executive director.

- (8) A specific exemption may be obtained from the executive director if, after the review of data submitted by the reclaimed water provider or user, as appropriate, the executive director determines containment of the reclaimed water is not necessary, considering:
- (A) Soil and geologic data, and ground water data, including its quality, uses, quantity and yield; and
 - (B) Adequate demonstration that impairment of ground water for its actual or potential use will be prevented.
- (b) Reclaimed water may be stored in leak-proof, fabricated tanks.
- (c) Subsequent holding ponds utilized for the receipt and storage of reclaimed water of a quality that could cause or causes a violation of a surface water quality standard or impairment of ground water for its actual or intended use will be also subject to the storage requirements of this section.

III. Specific Uses and Quality Standards for Reclaimed Water

Numerical parameter limits pertaining to specific reclaimed water use categories are contained in this section. These limits apply to reclaimed water before discharge to initial holding ponds or a reclaimed water distribution system. It shall be the responsibility of the reclaimed water producer to establish that the reclaimed water meets the quality limits at the sample point for the intended use in accordance with the monitoring requirements identified in Section IV relating to Sampling and Analysis.

- (a) Any new construction shall conform to Type I use which includes irrigation or other uses where the public is not present during the time when irrigation activities occur or other uses where the public would not come in contact with the reclaimed water.
- (b) Type I Reclaimed Water Use. The type of use where the public will not come in contact with the reclaimed water. The following use is allowed by this authorization: residential irrigation, including landscape irrigation at individual homes; urban uses, including irrigation of public parks, golf courses, school yards, or athletic fields; use of reclaimed water for fire protection, either in internal sprinkler systems or external fire hydrants; maintenance of impoundments or natural water bodies; toilet or urinal flush water; other similar activities where the potential for unintentional human exposure may occur; cooling tower makeup water; irrigation of sod farms, silviculture, limited access highway rights of way; and soil compaction or dust control in construction areas.
- (b) The following conditions apply to this type of use of reclaimed water. At a minimum, the reclaimed water producer shall only transfer reclaimed water of the following quality as described for Type I reclaimed water use, reclaimed water on a 30-day average shall have a quality of:

CBOD ₅	5 mg/l
Turbidity	3 NTU
Fecal Coliform	20 CFU/100 ml*
Fecal Coliform (not to exceed)	75 CFU/100 ml**
* geometric mean	
** single grab sample	

IV. Sampling and Analysis.

The reclaimed water producer shall sample the reclaimed water prior to distribution to user to assure that the water quality is in accord with the intended contracted use. Analytical methods shall be in accord with those specified in Chapter 319 (relating to Monitoring and Reporting). The

minimum sampling and analysis frequency for Type I reclaimed water is twice per week.

The monitoring shall be done after the final treatment unit. These records shall be maintained on a monthly basis and be available at the plant site for inspection by authorized representatives of the Commission for at least five years.

V. Record Keeping and Reporting.

- (a) The reclaimed water provider and user shall maintain records on site for a period of five years.
 - (1) Records to be maintained by the provider include:
 - (A) Copies of notifications made to the commission concerning reclaimed water projects.
 - (B) As applicable, copies of contracts made with each reclaimed water user (this requirement does not include reclaimed water users at residences that have separate distribution lines for potable water).
 - (C) Records of volume of water delivered to each reclaimed water user per delivery (this requirement does not apply to reclaimed water users at residences that have separate distribution lines for potable water).
 - (D) Reclaimed water quality analyses.
 - (2) The reclaimed water producer shall report to the commission on a monthly basis the following information on forms furnished by the executive director. Such reports are due to the commission by the 20th day of the month following the reporting period.
 - (A) Volume of reclaimed water delivered to provider.
 - (B) Quality of reclaimed water delivered to a user or provider reported as a monthly average for each quality criteria except those listed as "not to exceed" which shall be reported as individual analyses.

VI. Transfer of Reclaimed Water.

Reclaimed water transferred from a provider to a user shall be done on a demand only basis. This means that the reclaimed water user may refuse delivery of such water at any time. All reclaimed water transferred to a user must be of at least the treatment quality specified in Section IV. Transfer shall be accomplished via pipes or tank trucks.

VII. General Prohibitions.

Except for on-channel ponds, storage facilities for retaining reclaimed water prior to use shall not be located within the floodway and shall be protected from the 100-year flood.

VIII. Restrictions.

This authorization does not convey any property right and does not grant any exclusive privilege.

IX. Responsibilities and Contracts.

- (a) The producer of reclaimed water will not be liable for misapplication of reclaimed water by users, except as provided in this section. Both the reclaimed water provider and user

have, but are not limited to, the following responsibilities:

- (1) The reclaimed water producer shall:
 - (A) Transfer reclaimed water of at least the minimum quality required by this chapter at the point of delivery to the user for the specified use;
 - (B) Sample and analyze the reclaimed water and report such analyses in accordance with Sections IV and V relating to Sampling and Analysis and Record keeping and Reporting, respectively; and
 - (C) Notify the executive director in writing within five (5) days of obtaining knowledge of reclaimed water use not authorized by the executive director's reclaimed water use approval.
- (2) The reclaimed water provider shall:
 - (A) Assure construction of reclaimed water distribution lines/systems in accordance with 30 TAC Chapter 317 and in accordance with approved plans and specifications;
 - (B) Transfer reclaimed water of at least the minimum quality required by this chapter at the point of delivery to the user for the specified use;
 - (C) Notify the executive director in writing within five (5) days of obtaining knowledge of reclaimed water use not authorized by the executive director's reclaimed water use approval; and
 - (D) Not be found in violation of this chapter for the misuse of the reclaimed water by the user if transfer of such water is shut off promptly upon knowledge of misuse regardless of contract provisions.
- (3) The reclaimed water user shall:
 - (A) Use the reclaimed water in accordance with this authorization; and
 - (B) Maintain and provide records as required by Section III relating to Record Keeping and Reporting.

X. Enforcement.

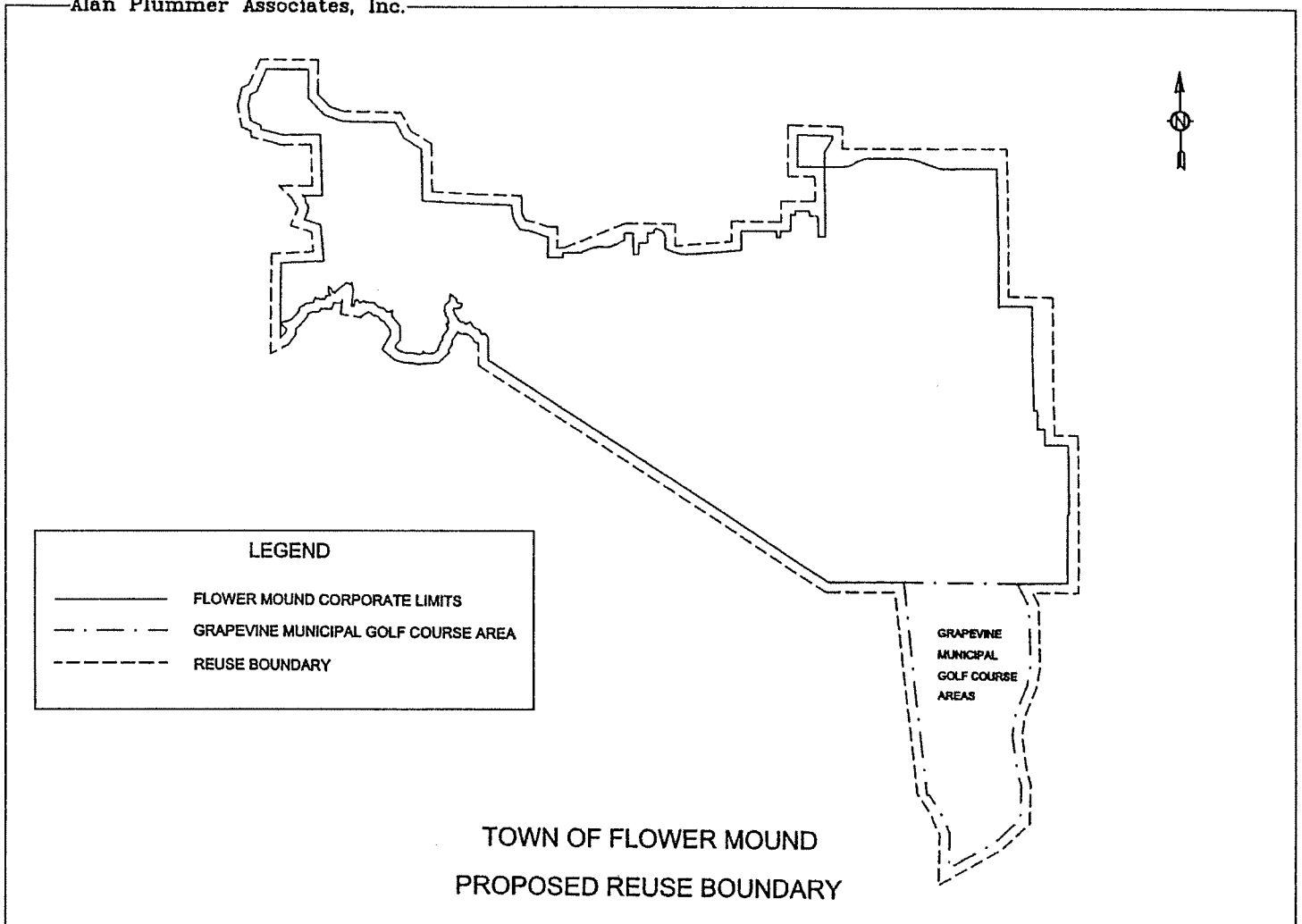
If the producer, provider and/or user fails to comply with the terms of this authorization, the executive director may take enforcement action provided by the Texas Water Code, §§26.019 and 26.136.

XI. STANDARD PROVISIONS:

- (a) This authorization is granted in accordance with the Texas Water Code and the rules and other Orders of the Commission and the laws of the State of Texas.
- (b) Acceptance of this authorization constitutes an acknowledgment and agreement that the provider and user will comply with all the terms, provisions, conditions, limitations and restrictions embodied in this authorization and with the rules and other Orders of the Commission and the laws of the State of Texas. Agreement is a condition precedent to the granting of this authorization.

Attachment "A"

Alan Plummer Associates, Inc.



Appendix G – Financial Evaluation

					75% of Potable Charge	80% of Potable Charge	85% of Potable Charge		90% of Potable Charge
Customer	Meter Number	Average Consumption (gal per month)	Meter Size (inch)	Est. Avg Potable Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	% Decrease	Est. Avg Reuse Monthly Water Bill (2018 \$)
TOWN METER	55-0265-99	959,900	2.00	\$6,347	\$4,794	\$5,105	\$5,415	14.7%	\$5,726
TOWN METER	55-0055-99	886,700	4.00	\$6,115	\$4,682	\$4,969	\$5,256	14.1%	\$5,542
TOWN METER	55-0165-99	527,080	2.00	\$3,516	\$2,671	\$2,840	\$3,009	14.4%	\$3,178
TOWN METER	86-0380-99	450,400	2.00	\$3,015	\$2,295	\$2,439	\$2,583	14.3%	\$2,727
CHI / SILVERON LP	86-2995-99	385,025	2.00	\$2,587	\$1,974	\$2,097	\$2,220	14.2%	\$2,342
BIG BOX PROPERTY OWNER	86-9210-99	314,926	2.00	\$2,129	\$1,631	\$1,730	\$1,830	14.0%	\$1,930
DUKE REALTY LMTD PARTNERSHIP	86-3445-99	287,230	2.00	\$1,948	\$1,495	\$1,585	\$1,676	14.0%	\$1,766
LIT INDUSTRIAL LIMITED	86-3260-99	282,990	2.00	\$1,920	\$1,474	\$1,563	\$1,652	13.9%	\$1,742
SCG LAKESIDE COMMERCE CENTER	86-5971-99	281,499	2.00	\$1,910	\$1,467	\$1,555	\$1,644	13.9%	\$1,733
THE HOME DEPOT	86-5962-99	280,593	2.00	\$1,904	\$1,462	\$1,551	\$1,639	13.9%	\$1,727
LIT HW1 LP	86-6024-99	267,978	2.00	\$1,822	\$1,400	\$1,485	\$1,569	13.9%	\$1,653
TOWN METER	86-0326-99	267,500	2.00	\$1,819	\$1,398	\$1,482	\$1,566	13.9%	\$1,650
TAF DALLAS INDUSTRIAL PORTIFOLIO LP	86-4026-99	258,997	2.00	\$1,763	\$1,356	\$1,438	\$1,519	13.8%	\$1,600
NATIONAL INDUSTRIAL HOLDINGS	86-5215-99	246,925	2.00	\$1,684	\$1,297	\$1,374	\$1,452	13.8%	\$1,529
TOWN METER	55-0185-99	246,440	2.00	\$1,681	\$1,295	\$1,372	\$1,449	13.8%	\$1,526
TOWN METER	86-0320-99	242,500	2.00	\$1,655	\$1,275	\$1,351	\$1,427	13.8%	\$1,503
STACY FAMILIES ENTERPRISES	86-6040-99	231,533	2.00	\$1,583	\$1,221	\$1,294	\$1,366	13.7%	\$1,439
CHI / SILVERON LP	86-2990-99	231,211	2.00	\$1,581	\$1,220	\$1,292	\$1,364	13.7%	\$1,437
LMEG WIRELESS LLC	86-2890-99	230,960	2.00	\$1,580	\$1,219	\$1,291	\$1,363	13.7%	\$1,435
MI WINDOWS AND DOORS	86-9870-99	229,340	1.50	\$1,525	\$1,167	\$1,239	\$1,310	14.1%	\$1,382
KOHLER CO	86-3470-99	222,077	2.00	\$1,522	\$1,175	\$1,244	\$1,314	13.7%	\$1,383
WAYFAIR LLC	86-9880-99	221,124	1.50	\$1,472	\$1,127	\$1,196	\$1,265	14.1%	\$1,334
TOWN METER	55-0085-99	208,920	4.00	\$1,683	\$1,358	\$1,423	\$1,488	11.6%	\$1,553
SCG LAKESIDE COMMERCE CENTER	86-4260-99	200,576	2.00	\$1,381	\$1,070	\$1,132	\$1,194	13.5%	\$1,256
EASTGROUP PROPERTIES	86-9920-99	195,496	2.00	\$1,348	\$1,045	\$1,105	\$1,166	13.5%	\$1,227
TOWN METER	55-0195-99	194,740	2.00	\$1,343	\$1,041	\$1,101	\$1,162	13.5%	\$1,222
IPT LAKESIDE CORPORATE CENTER	86-9220-99	192,540	2.00	\$1,328	\$1,030	\$1,090	\$1,150	13.5%	\$1,209
IPT LAKESIDE CORPORATE CENTER	86-9240-99	189,992	2.00	\$1,312	\$1,018	\$1,077	\$1,135	13.4%	\$1,194

					75% of Potable Charge	80% of Potable Charge	85% of Potable Charge		90% of Potable Charge
Customer	Meter Number	Average Consumption (gal per month)	Meter Size (inch)	Est. Avg Potable Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	% Decrease	Est. Avg Reuse Monthly Water Bill (2018 \$)
BEST BUY STORES LP	86-6033-99	184,385	2.00	\$1,275	\$990	\$1,047	\$1,104	13.4%	\$1,161
SPEARS MANUFACTURING	86-3855-99	184,188	2.00	\$1,274	\$989	\$1,046	\$1,103	13.4%	\$1,160
BIG BOX PROPERTY OWNER	86-4116-99	180,805	2.00	\$1,252	\$973	\$1,028	\$1,084	13.4%	\$1,140
TOWN METER	55-0285-99	179,300	3.00	\$1,358	\$1,082	\$1,137	\$1,192	12.2%	\$1,248
KOHLER CO	86-3505-99	178,883	2.00	\$1,239	\$963	\$1,018	\$1,074	13.4%	\$1,129
AZURE LAKESIDE	86-0945-99	169,383	1.00	\$1,097	\$837	\$889	\$941	14.2%	\$993
WIFPIR PROPERTIES LLC	86-8860-99	164,847	2.00	\$1,147	\$894	\$945	\$996	13.2%	\$1,046
HEAT AND CONTROL INC	86-3830-99	160,305	1.00	\$1,038	\$792	\$841	\$890	14.2%	\$939
MI WINDOWS AND DOORS	86-9865-99	154,287	1.50	\$1,035	\$799	\$846	\$893	13.7%	\$940
DUKE REALTY LMTD PARTNERSHIP	86-3455-99	153,472	2.00	\$1,073	\$839	\$885	\$932	13.1%	\$979
EASTGROUP PROPERTIES	86-9900-99	151,472	2.00	\$1,060	\$829	\$875	\$921	13.1%	\$967
IPT LAKESIDE CORPORATE CENTER	86-5265-99	143,542	2.00	\$1,008	\$790	\$834	\$877	13.0%	\$921
LISANTI FOODS	86-9890-99	132,476	1.50	\$892	\$692	\$732	\$772	13.5%	\$812
COMMUNICATIONS TEST DESIGN INC	86-9205-99	132,229	2.00	\$934	\$734	\$774	\$814	12.8%	\$854
LIT INDUSTRIAL LIMITED	86-3285-99	131,404	2.00	\$929	\$730	\$770	\$810	12.8%	\$849
MORTGAGE FINALCIAL SERVICES	86-8825-99	130,964	2.00	\$926	\$728	\$768	\$807	12.8%	\$847
TOWN METER	55-0365-99	130,760	2.00	\$924	\$727	\$767	\$806	12.8%	\$846
TOWN METER	86-0390-99	128,400	1.00	\$829	\$636	\$674	\$713	14.0%	\$752
IPT LAKESIDE CORPORATE CENTER	86-5230-99	128,125	2.00	\$907	\$714	\$753	\$791	12.8%	\$830
WIFPIR PROPERTIES LLC	86-8855-99	120,187	2.00	\$855	\$675	\$711	\$747	12.6%	\$783
TOWN METER	55-0245-99	120,000	1.50	\$810	\$631	\$667	\$703	13.3%	\$739
MORTGAGE FINALCIAL SERVICES	86-4705-99	113,193	2.00	\$809	\$641	\$675	\$708	12.5%	\$742
IPT LAKESIDE CORPORATE CENTER	86-5270-99	113,113	2.00	\$809	\$641	\$674	\$708	12.5%	\$742
LIT INDUSTRIAL LIMITED	86-3290-99	110,442	2.00	\$792	\$628	\$660	\$693	12.4%	\$726
LIT INDUSTRIAL LIMITED	86-3270-99	105,934	2.00	\$762	\$605	\$637	\$668	12.3%	\$699
AZURE LAKESIDE	86-3515-99	102,419	1.00	\$659	\$508	\$538	\$569	13.7%	\$599
EASTGROUP PROPERTIES	86-9910-99	102,184	2.00	\$737	\$587	\$617	\$647	12.2%	\$677
TOWN METER	55-0215-99	95,700	2.00	\$695	\$555	\$583	\$611	12.1%	\$639

					75% of Potable Charge	80% of Potable Charge	85% of Potable Charge		90% of Potable Charge
Customer	Meter Number	Average Consumption (gal per month)	Meter Size (inch)	Est. Avg Potable Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	% Decrease	Est. Avg Reuse Monthly Water Bill (2018 \$)
GREYSTAR DEV	86-3391-99	91,465	1.00	\$587	\$454	\$481	\$508	13.6%	\$534
CCA	86-5145-99	90,411	2.00	\$661	\$529	\$556	\$582	11.9%	\$608
MOVIE HOUSE & EATERY	86-3590-99	82,624	2.00	\$610	\$491	\$515	\$538	11.7%	\$562
TOWN METER	55-0105-99	77,700	2.00	\$577	\$467	\$489	\$511	11.5%	\$533
TOWN METER	55-0135-99	75,900	2.00	\$566	\$458	\$480	\$501	11.4%	\$523
TOWN METER	55-0315-99	74,520	2.00	\$557	\$451	\$472	\$493	11.3%	\$514
TITAN CORRUGATED INC	86-9195-99	72,027	2.00	\$540	\$439	\$459	\$480	11.2%	\$500
TAF DALLAS INDUSTRIAL PORTIFOLIO LP	86-4042-99	69,022	1.50	\$477	\$381	\$400	\$419	12.1%	\$438
AZURE LAKESIDE	86-3566-99	68,085	1.00	\$434	\$340	\$359	\$378	13.1%	\$397
TOWN METER	55-0225-99	67,160	2.00	\$508	\$415	\$434	\$453	11.0%	\$471
TAF DALLAS INDUSTRIAL PORTIFOLIO LP	86-4041-99	66,189	1.50	\$458	\$367	\$385	\$403	12.0%	\$422
TOWN METER	86-0430-99	63,200	2.00	\$483	\$396	\$413	\$431	10.8%	\$448
SCG LAKESIDE COMMERCE CENTER	86-4270-99	56,408	2.00	\$438	\$362	\$378	\$393	10.4%	\$408
AZURE LAKESIDE	86-3520-99	47,556	0.75	\$280	\$219	\$231	\$243	13.2%	\$255
AZURE LAKESIDE	86-0940-99	45,386	0.75	\$267	\$209	\$221	\$232	13.1%	\$244
TOWN METER	86-0385-99	42,508	1.00	\$273	\$218	\$229	\$240	11.9%	\$251
GREYSTAR DEV	86-0970-99	39,614	1.00	\$256	\$206	\$216	\$226	11.7%	\$236
TOWN METER	55-0345-99	37,580	2.00	\$324	\$277	\$286	\$296	8.7%	\$305
TOWN METER	86-0631-99	28,546	1.00	\$191	\$157	\$164	\$171	10.6%	\$178
ONCOR ELECTRIC DEELIVERY	86-3915-99	26,967	2.00	\$262	\$230	\$237	\$243	7.2%	\$249
LAKESIDE DFW RETAIL	86-3186-99	24,747	1.00	\$169	\$141	\$146	\$152	10.1%	\$158
AZURE LAKESIDE	86-3573-99	23,948	1.00	\$164	\$137	\$143	\$148	9.9%	\$153
TOWN METER	86-0570-99	23,000	2.00	\$239	\$213	\$218	\$223	6.5%	\$228
TOWN METER	86-0655-99	18,526	1.00	\$133	\$113	\$117	\$121	8.7%	\$125
AZURE LAKESIDE	86-3574-99	17,689	0.75	\$106	\$88	\$92	\$95	10.2%	\$99
TOWN METER	86-0410-99	15,900	2.00	\$197	\$182	\$185	\$188	4.7%	\$191
GREYSTAR DEV	86-5480-99	15,030	0.75	\$91	\$76	\$79	\$82	9.4%	\$85
AZURE LAKESIDE	86-3246-99	13,986	0.75	\$85	\$72	\$75	\$77	9.0%	\$80

					75% of Potable Charge	80% of Potable Charge	85% of Potable Charge		90% of Potable Charge
Customer	Meter Number	Average Consumption (gal per month)	Meter Size (inch)	Est. Avg Potable Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	Est. Avg Reuse Monthly Water Bill (2018 \$)	% Decrease	Est. Avg Reuse Monthly Water Bill (2018 \$)
KOHLER CO	86-3510-99	13,793	2.00	\$186	\$173	\$176	\$178	4.1%	\$181
GREYSTAR DEV	86-5470-99	12,603	0.75	\$78	\$67	\$69	\$71	8.5%	\$74
IPT LAKESIDE CORPORATE CENTER	86-5973-99	6,757	2.00	\$154	\$149	\$150	\$151	1.8%	\$152
AZURE LAKESIDE	86-3370-99	4,820	0.75	\$45	\$42	\$43	\$43	3.7%	\$44
TOWN METER	55-0035-99	2,300	4.00	\$384	\$384	\$384	\$384	0.0%	\$384
TOWN METER	55-0255-99	1,300	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER (NEW)	55-0735-99	200	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	55-0325-99	36	0.75	\$34	\$34	\$34	\$34	0.0%	\$34
LIT HW1 LP	86-6017-99	4	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
GREYSTAR DEV	86-3523-99	0	1.00	\$56	\$56	\$56	\$56	0.0%	\$56
TOWN METER (NEW)	55-0725-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	86-0585-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	55-0145-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	86-0420-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	55-0175-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	86-0405-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	86-0395-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
TOWN METER	86-0580-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
GREYSTAR DEV	86-3521-99	0	1.00	\$56	\$56	\$56	\$56	0.0%	\$56
TOWN METER	86-0322-99	0	2.00	\$136	\$136	\$136	\$136	0.0%	\$136
GREYSTAR DEV	86-3393-99	0	1.00	\$56	\$56	\$56	\$56	0.0%	\$56
GREYSTAR DEV	86-3394-99	0	1.00	\$56	\$56	\$56	\$56	0.0%	\$56

Payback Year, Interest Rate 1.5%					
		Percent of Potable Charge for Reuse Water			
		75%	80%	85%	90%
Principal Forgiveness - Over Entire Project Capital	0%	2043	2041	2039	2037
	5%	2042	2039	2037	2035
	10%	2040	2037	2035	2033
	20%	2035	2033	2030	2027
	30%	2030	2027	2026	2025

Payback Year, Interest Rate 2.0%					
		Percent of Potable Charge for Reuse Water			
		75%	80%	85%	90%
Principal Forgiveness - Over Entire Project Capital	0%	2044	2043	2041	2039
	5%	2043	2041	2039	2037
	10%	2042	2039	2037	2035
	20%	2037	2035	2032	2029
	30%	2032	2028	2027	2026

Payback Year, Interest Rate 3.5%					
		Percent of Potable Charge for Reuse Water			
		75%	80%	85%	90%
Principal Forgiveness - Over Entire Project Capital	0%	2047	2046	2044	2043
	5%	2046	2045	2043	2042
	10%	2045	2044	2042	2040
	20%	2043	2040	2038	2035
	30%	2038	2035	2032	2029