Appendix G

Public Utilities Memoranda

RIVER ISLANDS AT LATHROP
PHASE 2 SEWER TECHNICAL REPORT
Revision 1

Prepared for:

River Islands

Prepared by:

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November 2020
#B520

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List of Abbreviations

ADWF	Average Dry Weather Flows
City	City of Lathrop
City Standards	City of Lathrop's Design and Construction Standards 2019
City Wastewater Master Plan	City of Lathrop's Wastewater System Master Plan December 2018
CTF	Consolidated Treatment Facility
DU	Dwelling Unit
FF	Finished Floor
FG	Finished Grade
ft	Feet
GIS	Geographical Information Systems
GPD	Gallons per Day
GPM	Gallons per Minute
HGL	Hydraulic Grade Line
hp	Horsepower
in	Inches
LS	Lift Station
MDD	Maximum Day Demands
MG	Million Gallons
MGD	Million Gallons per Day
MSL	Mean Sea Level
ODELL	Odell Engineering – Civil Engineer for the River Islands Development
PACE	Pacific Advanced Civil Engineering
PHD	Peak Hour Demands
PS	Pump Station
psi	Pounds per Square Inch
PSV	Pressure Sustaining Valve
PW	Potable Water
PWWF	Peak Wet Weather Flow
Site C	City of Lathrop Sewer Lift Station – To be referred to as Sewer Lift Station A2
SS	Soft Starter
TDH	Total Dynamic Head
VFD	Variable Frequency Drive

1. Introduction

1.1 Background

River Islands, located in the Stewart Tract within the City of Lathrop, is a 4,905-acre, master planned community being constructed southwest of the San Joaquin River. The River Islands development will consist of low, medium, and high density residential, school (institutional), parks, and commercial land uses. River Islands will be constructed in two separate phases known as Phase I and Phase II. Phase I is currently being constructed over 4 separate stages and Phase II is entering the master planning stages.

Currently, the generated sewage from the constructed portions of River Islands is conveyed to an interim sewer pump station (PS) located between Lakes 1 and 2. The interim sewer PS initially pumped the development's sewage to the Mossadale collection area located just west of Interstate-5 (I-5). From here it flowed to the City of Lathrop's Consolidated Treatment Facility (CTF) for treatment. The PS force mains have now been extended to connect directly to the CTF, without flowing through the Mossdale collection system.

At full buildout, the River Islands sewer collection system will consist of six separate sewer collection areas based on the service area of the six sewer lift/pump stations. The distinction between lift and pump stations are that lift stations raise the hydraulic grade line (HGL) of the sewage, allowing it to flow by gravity into an adjacent collection area, while pump stations transmit the sewage under pressure. The collection areas will be designed to convey the generated sewage from each service point of connection (POC) to the corresponding sewer lift/pump station by gravity. All of the generated sewage from River Islands will eventually be conveyed to sewer pump station A2 (also known as Site C) located in the southeast of the development. The A2 pump station will pump raw sewage directly to the Lathrop CTF through the existing 12 and 18-inch force mains.

River Islands sewer collection system will be required to be planned, designed, and constructed per the City of Lathrop's 2019 Design and Construction Standards (City Standards). The City Standards were created to provide the minimum requirements for all facilities and appurtenances to be turned over to the City for operation and maintenance.

1.2 Report Objectives

The objectives of the River Islands Phase 2 Sewer Technical Report are as follows:

- Provide updates to the previous Phase I Sewer Master Plan prepared by PACE in 2017.
- Analyze and model the average dry weather sewer flows (ADWF) for Phase I and II in accordance with the City Standards under Steady State Conditions.
- Analyze and model the peak wet weather sewer flows (PWWF) for Phase I and II in accordance with the City Standards, under Steady State Conditions.
- Analyze and model the pipe velocities under PWWFs for Phase I in accordance with the City Standards, under Steady State Conditions.
- Describe the River Islands sewer collection system including the conveyance networks, locations of proposed sewage lift or pump stations, and pumping between collection areas during emergency, interim, and low-flow conditions.
- Provide a preliminary firm pump capacity requirement for the proposed Phase II sewer lift stations.
- Present the potential impact Phase II sewer flows will have on Phase I.

This technical report does not address permitting and environmental review/compliance requirements as those activities shall be conducted during the design of the sewer collection system.

2. River Islands Sewer Collection System

2.1 Existing River Islands Sewer Collection System

2.1.1 Interim Sewer Pump Station

Construction of River Islands began in the early 2010s. Stages 1A and 1B are nearly completed and occupied and Stages 2A and 2B are currently under construction. Generated sewage from Stage 1A and 1B is currently being conveyed from each point of connection, to the interim sewer PS located between Lakes 1 and 2 and north of Golden Valley Parkway. Per the City's Master Plan, the interim sewer PS was formally completed in 2017. It includes two 20-horsepower (hp) submersible pumps designed to provide 1,100 gallons per minute (GPM) at a total dynamic head (TDH) of 46.5-feet. The PS was initially designed to pump the raw sewage approximately 8,700 feet east to a manhole under Sadler Oak located within the Mossadale collection area. However, recent force main improvements have allowed for the station to pump directly to the City's CTF for treatment.

2.1.1.1 Capacity Evaluation

A sewer pump/lift station firm pumping capacity is required to be equal to the ultimate PWWF of the collection area, with the firm pumping capacity defined as the total pumping capacity of all the pumps minus the capacity of the largest pump (see **Section 4.2**). The interim sewer PS has firm pumping capacity of 1,100 GPM which is equivalent to an **ADWF of 511 GPM** when using the City Detail S-1 sanitary sewer peaking factors. As of June 2019, the interim sewer lift station has an average flow rate of 213,500 GPD or 150 GPM which is still below the maximum ADWF the station is rated for. It is recommended that the influent flows are regularly monitored to help accurately predict when the station is approaching its capacity.

Sewer Pump Station A2 (Site C) is currently under construction. Before the influent flows exceed the capacity of the interim sewer PS, the new sewer pump station A2 will be brought online to accommodate additional land developments. The City plans on decommissioning the interim sewer PS and transferring the 20-hp submersible pumps to pump station A2.

2.1.2 Existing River Islands Recycled Water Flushing System

Per Section 5-4.1 in the City Standards, main sewer lines should account for and be designed to transmit the ultimate buildout sewer flows, including potential tributary areas. As shown in **Figure 2-1**, Stage 1A will be located at the end of River Islands sewer collection system and will be required to handle flows from several tributary areas. Until full building conditions, the northern trunk line will experience low sewer flows which may lead to sediment/debris accumulation and potential odor and corrosion issues. To avoid these problems, flushing stations have been designed to occasionally add flow from recycled water mains into the sewer system, flushing any accumulated sediment/debris.

The original recycled water flushing station, located at the intersection of Lakeside Drive and Somerston Parkway, has been removed as a result of the ongoing expansions in the collection system. A new 1,100 GPM flushing station, located along River Islands Parkway within Stage 2A, has been installed upstream of the original station to flush out the north trunk line of accumulated sediments and reduce odor and corrosion issues. During the initial startup of the flushing station, operators will be able to calibrate approximate flushing time intervals based on observations in the field.

2.2 Phase I and II River Islands Sewer Collection System

At full buildout, River Islands sewer collection system is proposed to consist of six sewer collection areas with collection areas A1 and A2 located within Phase I and the proposed collection areas C1, C2, B1, and B2 located within Phase II. Each collection area is/recommended to convey the generated sewage from each POC to the collection area's sewer lift or pump station by gravity. Collection areas C1, C2, B1, B2, and A1 will be equipped with sewer lift stations designed to lift the HGL of the collected sewage allowing gravity flows to continue onto the next collection system.

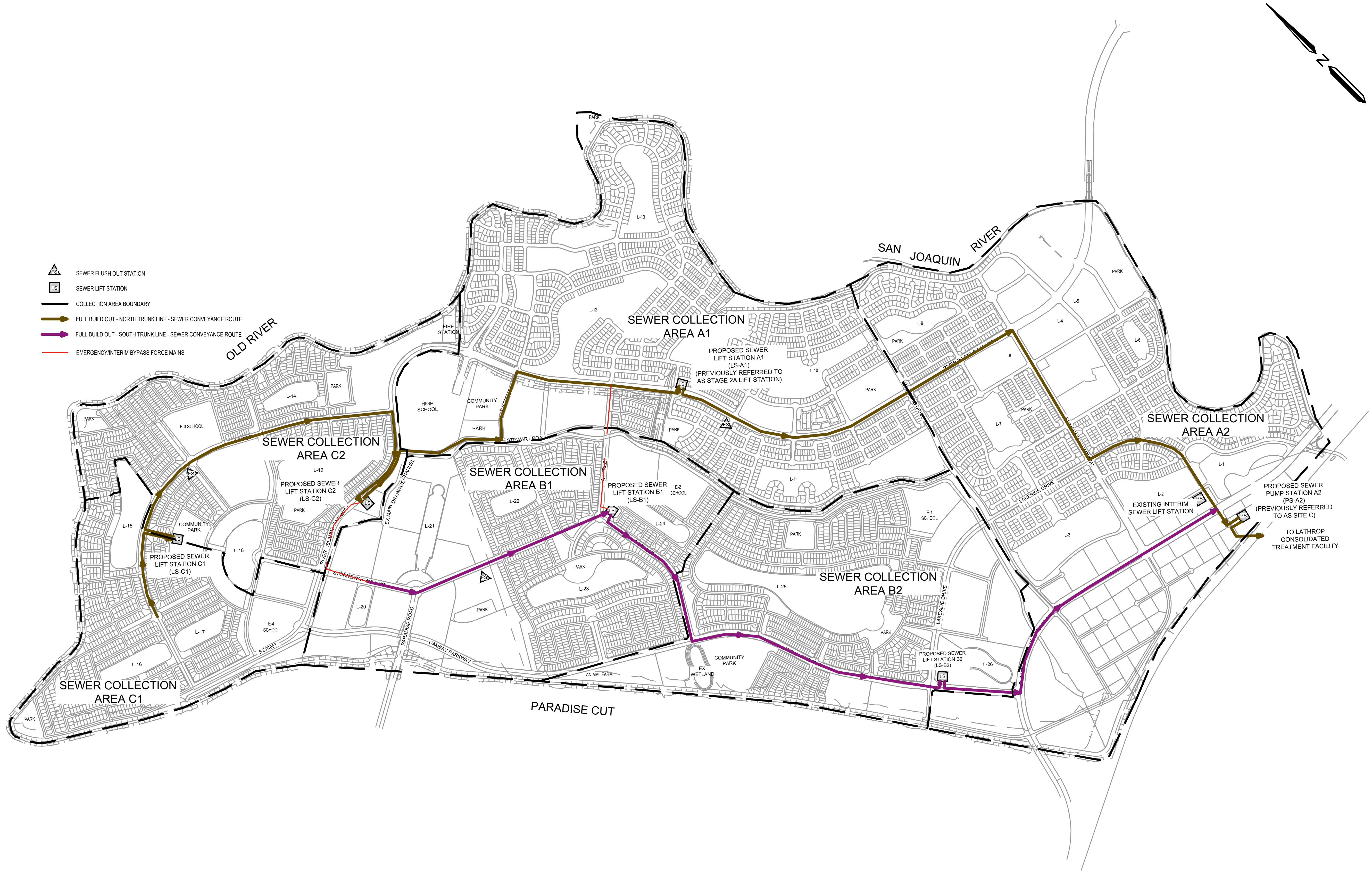
All of the generated sewage from River Islands is proposed to be conveyed to area's A2 pump station (also referred to as Site C) located along J7 Street in the south east of River Islands (see **Figure 2-1**). The A2 pump station will pump raw sewage directly to the Lathrop CTF through the existing 12 and 18-inch force mains.

2.2.1 Land Uses

O'Dell Engineering, serving as the civil engineer for the River Islands Development, provided land use exhibits showing each parcel's boundaries and land uses for Phases I and II (see **Appendix A**) in accordance with the City's Requirements. The River Islands development will consist of low, medium and high density residential, schools/institutional, parks, and commercial land uses. The employment centers located in the south of the River Islands development will be categorized as commercial land uses. **Table 2-1** shows the total number of units and acreage of each land use within the River Islands Development.

Table 2-1: River Islands Land Uses

Land Use	Area C1	Area C2	Area B1	Area B2	Area A1	Area A2	Total
Low Density Residential (DUs)	783	931	876	1,091	1,998	1,512	**7,191**
Medium Density Residential (DUs)	258	602	1,150	789	723	114	**3,636**
High Density Residential (DUs)	0	0	1,562	1,641	312	668	**4,183**
Commercial (acres)	0.0	0.0	0.0	56.0	0.0	202.4	**258.4**
Industrial (acres)	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Parks (acres)	26.6	37.0	56.9	61.4	88.0	71.9	**341.8**
Schools / Institutional (acres)	14.6	19.3	0.0	30.0	64.0	34.1	**162.0**



RIVER ISLANDS SEWER COLLECTION SYSTEM

RIVER ISLANDS SEWER COLLECTION MODEL

LATHROP CA

JOB	
SCALE	1"=1800'
DESIGNED	TDM
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

PACE
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17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
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FIGURE
2-1

2.2.2 Phase II Recycled Water Flushing System

The construction and occupancy of River Islands is expected to be completed in separate stages lasting until final buildout in 2040. The primary conveyance sewer mains (also known as trunk lines), will be required to be designed for full buildout conditions and any tributary collection areas. As a result, these trunk lines will initially be subject to low flows which can lead to sediment/debris buildup, and potentially increase corrosion and odor issues through the formation of anaerobic conditions. It is recommended that an additional two recycled water flushing stations be included in the design Phase II's sewer infrastructure to address interim low flow conditions. . The stations are recommended to provide sufficient recycled water to scour and flush out the accumulated sediments/debris (5-6 feet per second) and to decrease the occurrence of continued low flow conditions. The sizing of flow control valves will need to consider limiting flushing flows to prevent overwhelming/surcharging the downstream collection system. Similar to the existing flushing stations, the proposed recycled water flushing stations should be designed with a remote control panel allowing operators to control flushing events at set time intervals. This situation will also require increased monitoring of sediment and odor by City staff to ensure the flushing program is adequate.

2.2.3 Interim and Emergency Bypass System – Phase II

At full buildout and under normal operating conditions (see **Section 6**), the River Islands sewer collection system will have a northern and southern trunk lines designed to be the primary means of conveying the generated sewage offsite. As shown in **Figure 2-1**, northern trunk line will be responsible for conveying sewage from Collection Areas C1, C2, A1 and portions of A2 and the southern trunk line will be responsible for conveying sewage from Areas B1, B2 and the southern portion of Area A2, primarily consisting of the employment centers.

The remaining portions of the development will continue to be constructed in a series of separate stages, with the portions of collections areas C2, B1 and eventually C1 proposed to be constructed first. To prevent having to oversize or design the sewer lift stations to accommodate the interim conditions, bypass force mains as shown in **Figure 2-1**, will be constructed allowing for LS-C2 to pump to Area's B1 collection system and LS-B1 to pump into Area's A1 collection system. These interim force mains should be designed as a permanent system allowing for the City's operations staff to use them as emergency bypass force mains should the need arise in the future.

During the design phases of the Phase II collection system, it is recommended that the River Islands sewer collection model be re-run for future interim and emergency conditions to determine the capacity limitations for each scenario. To be discussed further in **Section 7**, collection area's A1 and A2 sewer infrastructure was designed with additional capacity to accommodate potential tributary flows. Re-running the model for interim conditions will allow for capacity verification of the existing A1 and A2 infrastructure.

3. Sewer Generation Rates

3.1 Sewer Generation Rates

Per the City Standards, all sewers lines should be designed to carry the PWWF from all areas tributary to them. The design flows (PWWF) at any point should be the ADWF multiplied by the peaking factor per City Detail S-1 (see **Appendix D**). Sewer should also be designed for both size and depth to accommodate developments in upstream tributary areas that would logically be served by them.

3.1.1 Sewer Generation Rates – Average Dry Weather Flow

Section 5-4.2 in the City Standards, lists the land use sewer flow factors to be used to estimate the ADWF. These generation factors have recently been revised, based upon review of actual flow data from more than a thousand homes, measured at the interim pump station. **Table 3-1** below summarizes the land use sewer flow factors to compute the ADWF in accordance with Section 5-4.2.

Table 3-1: Land Use Sewer Flow Factors

Land Use	Land Use Sewer Flow Factor
Low Density Residential	200 GPD/du
Medium Density Residential	180 GPD/du
High Density Residential	170 GPD/du
Commercial	590 GPD/ac
Industrial	355 GPD/ac
Parks	55 GPD/ac
Schools / Institutional	245 GPD/ac

NOTE 1 – Land Use Sewer Flow Factors in **Table 3-1** are from the City's Design and Construction Standards.
NOTE 2 – Gallons per Day (GPD)

To compute the ADWF, the assigned land use for each lot/parcel should be multiplied by its applicable land use sewer flow factors as shown in the equation below.

$$Average\ Dry\ Weather\ Flows\ (gpd) = Parcel's\ Land\ Use\ Factor\ x\ Land\ Use\ Wastewater\ Flow\ Factor$$

Table 3-2 lists the computed ADWF for each land use type within River Islands in accordance with the City's Standards.

Table 3-2: Phase I and II Average Dry Weather Flows

Land Use	Phase I & II Total Number of DU/Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (DUs)	7,191	200	**1,438,200**
Medium Density Residential (DUs)	3,636	180	**654,480**
High Density Residential (DUs)	4,183	170	**711,110**
Commercial (acres)	258.4	590	**152,438**
Industrial (acres)	0.0	355	**0**
Parks (acres)	341.8	55	**18,798**
Schools / Institutional (acres)	162.0	245	**39,692**
		Total	**3,014,719**

3.1.2 Sewer Generation Rates – Peak Wet Weather Flow

PWWF is equal to the sanitary sewer peaking factors determined in the City's Detail S-1 (see **Appendix D**) multiplied by each pipe segments ADWF. The peaking factors are a function of the pipe segment's ADWF and larger collection areas provide a greater capacity to attenuate flows, as peak flows generated in the upstream reaches of the system take a longer amount of time to travel downstream. The following equations summarizes the PWWF sewer generation rates required by the City's Standards.

$$Peak\ Wet\ Weather\ Flows\ (gpd) = Average\ Dry\ Weather\ Flows\ x\ Sanitary\ Sewer\ Peaking\ Factor$$

$$with\ the\ Sanitary\ Sewer\ Peaking\ Factor = e^{(-3.95xAWDF(MGD)+0.6)} + 2.05$$

The total PWWF entering the Area A2 sewer pump station was calculated to be **6,180,211 GPD** which is equivalent to the total PWWF from the River Islands Development at full buildout based on the land use exhibits provided by Odell (see **Appendix A**).

4. Sewer Collection System Design and Performance Requirements

The City Standards establish the minimum design and performance requirements for any sewer facility or collection system in the City of Lathrop that will be installed within the public right of way or easement. The following requirements taken from the City Standards provided the evaluation criteria for the sewer collection model.

4.1 Pipe Capacity

4.1.1 Pipe Capacity - Depth/Diameter Ratio

Table 4-1 lists the maximum depth to diameter ratio allowed for the design of sewers under PWWF conditions. In no case should any sewer line be less than 8-inches except in cul-de-sacs or alleys servicing six or fewer homes. In addition, in no case should a smaller diameter pipe be used in any downstream location of a larger pipe.

Table 4-1: Pipe Depth/Diameter Ratio

Pipe Size (inches)	Depth/Diameter Ratio (d/D)
≤ 15	0.50
18 >	0.75

Notes:

1. Pipe Depth/Diameter ratios taken from the City of Lathrop's Design and Construction Standards January 2019.

To determine the flow capacity of each pipe, manning equation was used at the maximum allowable d/D ratio along with the following sewer design parameters provided by Odell Engineering.

$$Manning\ Equation\ Q = \frac{1.49}{0.013}(A)\left({R_h}^{2/3}\right)\left(S^{1/2}\right)$$

Where,
Q – Volumetric flow, cubic feet per second
A – Cross sectional area of flow, square feet. Per City Standards, the cross sectional area is based on the maximum allowable depth
R_h – Hydraulic radius of the pipe (Area/Wetted Perimeter), ft
S – Slope of the Pipe, ft/ft. If improvement plans or as built drawings are not available (see **Section 5.2** for further details), then the minimum required pipe slopes are used.

4.1.2 Pipe Capacity – Minimum and Maximum Velocities and Slope

Per Section 5-4.1 in the City's Standards, the minimum velocity for any gravity sewer lines, should be 2 feet per second for pipes flowing half full. The maximum velocity should not exceed 10 feet per second under any operating condition. Sewer velocities are a function of the pipes slope and size and maintaining a minimum slope is necessary to ensure self-cleaning and oxidizing velocities are present. With the ongoing trends of lower sewer generation rates, all future lines, specifically trunk lines, shall be designed with sufficient scouring velocities at peak flows. This reduces the generation of hazardous, odorous, and corrosive sulfur compounds. Table 5-1 in the City's standards (see **Table 4-3** below), lists the minimum pipe slopes for lines 6-18 inches in diameter. Pipe sizes larger than 18 inches were analyzed with a minimum slope ratio of 0.0012 ft/ft.

In locations were substandard slope and velocities are present, corrosion resistant pipe and materials are required to be installed per the City Standards. It is also recommended that corrosion resistant coatings such as 2-part epoxies be providing in manholes downstream of substandard slope or velocities.

Table 4-2: Minimum and Maximum Pipe Velocities

Parameter	Value (fps)
Minimum Pipe Velocity @ Pipes Half Full	2.0
Maximum Pipe Velocity	10.0

Notes:
1. From Section 5-4 in the 2019 City Standards

Table 4-3: Minimum Pipe Slopes

Pipe Size (inches)	Minimum Slope (ft/ft)
8	0.0035
10	0.0025
12	0.0020
15	0.0015
18	0.0012

Notes:
1. From Table 5-1 in the 2019 City Standards.

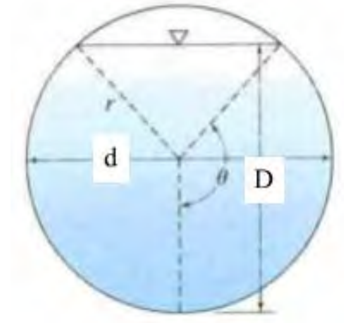
Kings method was utilized for determining the velocity of each pipe segment under PWWF. The Kings Method expands manning equation by providing a variable “K” which correlates the uniform depth of flow to the pipes current flow rate. When solving for K the depth of flow in each pipe can be determined.

$$Q = \frac{K}{n} d^{8/3} S^{1/2}$$

Where,
Q – Volumetric flowrate (PWWF in this model), cfs
K - Kings variable for circular channels given in King’s Handbook Tables -13 and 7-14. (see **Appendix C**). Kings variable is a relationship between the pipe current flow rate and it depth of flow (i.e. Depth/Diameter)
n – Manning coefficient
d – Insider diameter of the pipe, ft
S – Slope of the Pipe, ft/ft. If improvement plans or as built drawings are not available (see **Section 5.2** for further details), then the minimum required pipe slopes are used.

After the depth of flow in each pipe was determined, the calculated wetted cross sectional area was used to determine each segments velocity under PWWF using the continuity equation

$$A_w = \frac{D^2}{4}(\Theta - \frac{1}{2}\sin 2\Theta)$$



Where,
Aw – Wetted Area, sq. ft per Section 10.7 Fluid Mechanics 10th edition
D – Depth of Flow, ft
Θ – Central Angle (calculated based on depth of water), in radians

$$Q = VA_w$$

Where,
Q – Volumetric flowrate (PWWF in this model), cfs
Aw – Wetted Area, sq. ft per Section 10.7 Fluid Mechanics 10th edition
V – Velocity at PWWF, fps

4.2 Sewer Lift Stations – Firm Pumping Capacity

Sewer lift stations are installed in sewer collections systems to raise the hydraulic grade line of the sewer main where gravity flow are no longer feasible. Sewer lift stations are typically installed at localized low points in the collection system. In no case shall any sewer main be deeper than 25 feet unless approved by the City Engineer.

The City requires documentation demonstrating the need (i.e. gravity flow is no longer feasible) and the required firm pumping capacity of the lift station (Appendix H in the City Standards). Each lift station must be designed to provide a firm pumping capacity equal to the ultimate peak flow (PWWF) of the collection area and all potential tributary areas. Appendix H-C.5 in the City Standards defines firm pumping capacity as the total pumping capacity of all the pumps minus the capacity of the largest pump.

In locations where the PWWF exceed 1.0 cfs (450 GPM or 0.65 MGD), the lift station shall be installed with a low flow pump with a pumping capacity of 5% to 10% of the design flows. The low flow pump shall operate as the lead pump to prevent excessive wear and tear on the larger pumps due to repeated starts and stops during low flow conditions.

5. River Islands Sewer Collection System Model

5.1 GIS Sewer Collection System Model

ArcGIS, a geographic information system (GIS) software, was used to conduct a steady state analysis of the River Islands sewer collection system under ADWF and PWWF. A steady state analysis determines the operating performance of the sewer collection system at a specific point in time under steady state conditions (flows and hydraulic grades remain constant over time). The results of the steady-state analysis helped validate the following performance criteria of the River Islands sewer collection system.

- Pipe capacities per the City Standards
- Average Dry Weather Flows in each pipe
- Peak Wet Weather Flow peaking factors in each pipe
- Peak Wet Weather Flows in each pipe
- Required firm pumping capacity for each sewer lift station.
- Pipe Velocities under Peak Wet Weather Flows

5.2 GIS Sewer Collection System Model Basis and Assumptions

The GIS model was created from a combination of as built drawings, issued for construction improvement plans, or preliminary sanitary sewer utility exhibits. The AutoCad drawings were imported into GIS to provide the following parameters of the model.

- Location, slope, pipe size and length of the sewer lines
- Location and inlet and outlet pipe invert elevations of the sanitary sewer manholes
- Parcel size, land use, and corresponding sewer lines based on the location of the sewer laterals.

As required by the City's Standards, the following baseline assumptions were used in the steady state analysis.

- Pipe capacities and velocities for each pipe were determined utilizing a manning's coefficient (n) of 0.013
- Pipe capacities were determined at the maximum allowable flow depth listed in the City's Standards (see **Table 4-1**)
- Peaking factors were determined based on each pipe segments ADWF. In other words, the peaking factors were higher at lower ADWF typically seen at the start of the collection system based on the City's Standard Detail S-1 (see **Appendix D**).

5.2.1 Areas Without Finalized Improvement Plans Assumptions

In locations where improvement plans or as built drawings were not available, the following was assumed in order to conduct a steady state analysis.

- The location of all sewer lines was assumed to match the preliminary sanitary sewer exhibits provided by Odell Engineering.
    - For Phase II, the location of the main trunk lines was provided by Odell Engineering. The location of the smaller lateral sewer lines was assumed in order to reasonably provide service to each applicable parcel. Sizes shown are based on the minimum requirements listed in the City's Standards.
- The location of manholes was assumed to be at all pipe junctions or major turns.
- The slope is assumed to remain constant in each individual pipe segment (between manholes)
- The slope of each pipe is assumed to be minimum allowable slope listed in the City Standards (see **Table 4-3**)

- The size of each pipe was determined based on the 90 percent of maximum allowable capacity of each pipe under PWWFs.
- Pipe velocities were not determined as minimum pipe slopes were used.

The following areas did not have finalized improvement plans and the assumptions listed above were utilized in order to model the sewer demands. The total number of dwelling units or acreage of these areas was assigned based on projected quantities provided by River Islands. **Ultimately the model results should be revisited when improvement plans for these areas becomes available.** Please reference **Appendix A** for the location of these areas

- Employment Centers in Phase 1B
- Town Center in Phase 1B
- Village R in Phase 1B
- Village CC in Stage 2A
- Village X in Stage 2A
- Village KK and II in Stage 2B
- All of Phase II

6. River Islands Sewer Collection System Model – Preliminary Phase 2 Results

6.1 Overview

The Phase II sewer collection system is proposed to be subdivided into 4 separate collections areas designated areas C1, C2, B1, and B2. Each collection area will be equipped with sewer laterals designed to convey sewage from each point of connection to the larger trunk lines located in the major streets. The function of the larger trunk lines will be to convey the collected sewage to each area's lift station, located at the lowest (end) of the collection system. As shown in **Appendix B**, the preliminary alignment of the main trunk lines still has sufficient cover to allow for slopes greater than the City's minimum requirements should future modeling scenarios determine low sewer velocities should occur. It is recommended that the sewer model be updated as sewer improvement plans are developed to verify the future sewer infrastructure will meet the City's requirements.

6.2 Sewer Collection Area C1

6.2.1 Sewer Collection Area C1 – Land Uses, Average Dry Weather Flows, and Peak Wet Weather Flows

Sewer Collection Area C1 is proposed to be located in the western portion of Phase II and will be bounded by Paradise Cut levee in the south, the Old River distributary in the west and collection areas C2 and B1 in the north and east. Area C1 will encompass approximately 283 acres of low and medium density residential units as well as parks and school land uses. **Table 6-1** lists the proposed number of dwelling units or acreage of each land use in collection area C1, the corresponding land use sewer flow factor, and the ADWF in gallons per day.

The total PWWF generated from sewer collection area C1 and conveyed to the proposed sewer lift station C1 (LS-C1) is approximately 593,236 GPD with a peaking factor of 2.85 as shown in **Table 6-1**. As discussed in **Section 5.2**, only the location of the main trunk lines was provided by Odell Engineering. The location of the all the Phase II lateral lines conveying flows from each parcel to the main trunk lines was assumed in order to reasonably provide service to each applicable parcel. **Figure 6-1** shows the PWWFs of each pipe if the sewer lines were designed as shown.

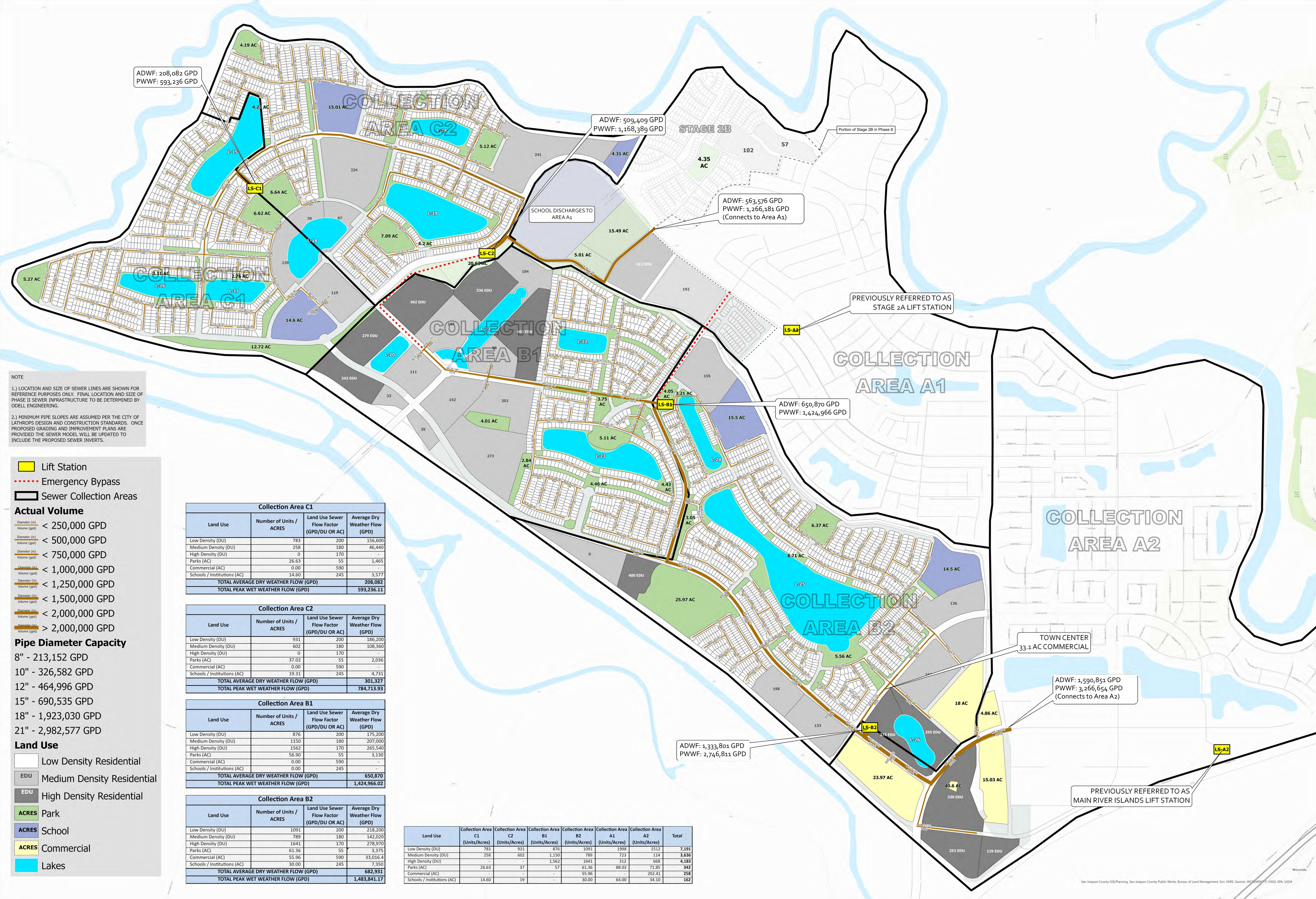
Figure 6-1 also shows the minimum pipe sizes required by the City Standards to convey that segments PWWF. Please note that smaller pipe sizes may be used if the slope is increased. Upon completion of the Phase II improvement plans, the sewer model will be updated accordingly and also run for pipe velocities.

Table 6-1: Sewer Collection Area C1 – Land Uses, ADWF, and PWWF

Land Use	Area C1 Total No of DU / Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (per DU)	783	200	**156,600**
Medium Density Residential (per DU)	258	180	**46,440**
High Density Residential (per DU)	0	170	**0**
Commercial (per acre)	0	590	**0**
Industrial (per acre)	0	355	**0**
Parks (per acre)	27	55	**1,465**
Schools / Institutional (per acre)	15	245	**3,577**
Total Area C1 Average Dry Weather Flow			**208,082**
Peaking Factor			**2.85**
Peak Wet Weather Flow[1]			**593,236**

Notes:

1. PWWF shown is based on the ADWF conveyed to the proposed sewer lift station LS-C1



Collection Area C1

Land Use	Number of Units / ACRES	Land Use Sewer Flow Factor (GPD/DU OR AC)	Average Dry Weather Flow (GPD)
Low Density (DU)	783	200	156,600
Medium Density (DU)	258	180	46,440
High Density (DU)	0	170	-
Parks (AC)	26.63	55	1,465
Commercial (AC)	0.00	590	-
Schools / Institutions (AC)	14.60	245	3,577
TOTAL AVERAGE DRY WEATHER FLOW (GPD)			**208,082**
TOTAL PEAK WET WEATHER FLOW (GPD)			**593,236.11**

Collection Area C2

Land Use	Number of Units / ACRES	Land Use Sewer Flow Factor (GPD/DU OR AC)	Average Dry Weather Flow (GPD)
Low Density (DU)	931	200	186,200
Medium Density (DU)	602	180	108,360
High Density (DU)	0	170	-
Parks (AC)	37.02	55	2,036
Commercial (AC)	0.00	590	-
Schools / Institutions (AC)	19.31	245	4,731
TOTAL AVERAGE DRY WEATHER FLOW (GPD)			**301,327**
TOTAL PEAK WET WEATHER FLOW (GPD)			**784,713.93**

Collection Area B1

Land Use	Number of Units / ACRES	Land Use Sewer Flow Factor (GPD/DU OR AC)	Average Dry Weather Flow (GPD)
Low Density (DU)	876	200	175,200
Medium Density (DU)	1150	180	207,000
High Density (DU)	1562	170	265,540
Parks (AC)	56.90	55	3,130
Commercial (AC)	0.00	590	-
Schools / Institutions (AC)	0.00	245	-
TOTAL AVERAGE DRY WEATHER FLOW (GPD)			**650,870**
TOTAL PEAK WET WEATHER FLOW (GPD)			**1,424,966.02**

Collection Area B2

Land Use	Number of Units / ACRES	Land Use Sewer Flow Factor (GPD/DU OR AC)	Average Dry Weather Flow (GPD)
Low Density (DU)	1091	200	218,200
Medium Density (DU)	789	180	142,020
High Density (DU)	1641	170	278,970
Parks (AC)	61.36	55	3,375
Commercial (AC)	55.96	590	33,016.4
Schools / Institutions (AC)	30.00	245	7,350
TOTAL AVERAGE DRY WEATHER FLOW (GPD)			**682,931**
TOTAL PEAK WET WEATHER FLOW (GPD)			**1,483,841.17**

Land Use	Collection Area C1 (Units/Acres)	Collection Area C2 (Units/Acres)	Collection Area B1 (Units/Acres)	Collection Area B2 (Units/Acres)	Collection Area A1 (Units/Acres)	Collection Area A2 (Units/Acres)	Total
Low Density (DU)	783	931	876	1091	1998	1512	**7,191**
Medium Density (DU)	258	602	1,150	789	723	114	**3,636**
High Density (DU)	-	-	1,562	1641	312	668	**4,183**
Parks (AC)	26.63	37	57	61.36	88.03	71.85	**342**
Commercial (AC)	-	-	-	55.96	-	202.41	**258**
Schools / Institutions (AC)	14.60	19	-	30.00	64.00	34.10	**162**

San Joaquin County GIS/Planning, San Joaquin County Public Works, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

PHASE II SEWER TECHNICAL REPORT

PRELIMINARY COLLECTION AREAS B1, B2, C1, & C2
SEWER PEAK WET WEATHER FLOWS

PACE

0 500 1,000 2,000 Feet

Date: 8/12/2020

Job Number: 8520

Figure: 6-1

6.2.2 Sewer Lift Station C1 (LS-C1) – Preliminary Firm Pumping Capacity Requirements

The City's Standards require that sewer lift stations be designed to provide a firm pumping capacity equal to the PWWFs from the corresponding collection area. Firm pumping capacity is defined as the total pumping capacity of each pump minus the capacity of the largest pump.

The proposed Sewer Lift Station LS-C1 should be designed to have a firm pump capacity of 593,236 GPD or 412 GPM to service the PWWFs of Area C1. The PWWF do not exceed 1.0 cfs (450 GPM) and therefore a low flow pump is not required.

Table 6-2: Sewer Lift Station Area C1 (LS-C1) – Preliminary Firm Pumping Capacity Requirements

Parameter	Pumping Capacity
Preliminary Required Firm Pumping Capacity	**593,236 GPD or 412 GPM**

6.3 Sewer Collection Area C2 – Preliminary Steady State Results

6.3.1 Sewer Collection Area C2 – Land Uses, Average Dry Weather Flows, and Peak Wet Weather Flows

Sewer collection area C2 is proposed to be located in the northwestern portion of Phase II and is bounded by collection area A1 in the south, the Old River distributary in the north and west, and collection area A1 east. Area C2 is approximately 372 acres comprised of low and medium density residential units, parks, a school, and a fire station. As shown in **Table 6-3**, the ADWF from just collection area A2 is 301,327 GPD.

Sewage from collection area C1 will be collected and pumped into collection area C2 along B street. As described in **Section 3.1.2**, the PWWFs of any pipe are determined based on its ADWF. In other words, the PWWFs of Area C1 and C2 is not equal to the sum of individual area's PWWFs, but moreover equal to the sum of the ADWFs from area C1 and C2 with the respective peaking factor applied. Per the City Standards, the PWWF conveyed to the proposed sewer lift station C2 (LS-C2) is 1,168,388 GPD based on the combined ADWF from areas C1 and C2.

Table 6-3: Sewer Collection Area C2 – Land Uses, ADWF, and PWWF

Land Use	Area C2 Total No of DU or Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (per DU)	931	200	**186,200**
Medium Density Residential (per DU)	602	180	**108,360**
High Density Residential (per DU)	0	170	**0**
Commercial (per acre)	0	590	**0**
Industrial (per acre)	0	355	**0**
Parks (per acre)	37	55	**2,036**
Schools / Institutional (per acre)	19	245	**4,731**
Total Area C2 Average Dry Weather Flow			**301,327**
Total Area C1 Average Dry Weather Flow			**208,082**
Total Area C1 + C2 Average Dry Weather Flow			**509,409**
Peaking Factor			**2.29**
Peak Wet Weather Flow[1]			**1,168,388**

Notes:
1. PWWF shown is based on the ADWF from areas C1 and C2 conveyed to the proposed sewer lift station LS-C2

6.3.2 Sewer Lift Station C2 (LS-C2) – Preliminary Firm Pumping Capacity Requirements

Under normal operating conditions, PWWFs from collection areas C1 and C2 will be conveyed to the proposed sewer lift station C2. The firm pumping capacity for lift station C2 should be 1,168,388 GPD or 811 GPM. Per Appendix H in the City Standards, when design flows exceed 1.0 cfs (or 450 GPM), a low flow pump designed for 5% to 10% of the total design flow should be provided and operated as the lead pump. For the proposed sewer lift station C2, the low flow pump should be designed for 41-81 GPM.

Table 6-4: Sewer Lift Station Area C2 (LS-C2) – Preliminary Firm Pumping Capacity Requirements

Parameter	Pumping Capacity
Low Flow Pump Capacity	41-81 GPM
Preliminary Required Firm Pumping Capacity	**1,168,388 GPD or 811 GPM**

6.4 Sewer Collection Area B1 – Preliminary Steady State Results

6.4.1 Sewer Collection Area B1 – Land Uses, Average Dry Weather Flows, and Peak Wet Weather Flows

Sewer Collection Area B1 is proposed to be located in the center of Phase II near Lakes 20 & 21. Area B1 is bounded by Collection Area A1 in the North, Collection Area B2 in the east, the Paradise Cut in the south and Collection Area C1 in the west. B1 is approximately 550 acres composed of comprised mainly of low, medium and high density residential units and some parks and a school. **Table 6-5** lists the total number of dwelling units or acreage of each land use in collection area B1, and the ADWF in gallons per day.

The total PWWF generated from sewer collection area B1 and conveyed to the proposed sewer lift station B1 is approximately 1,424,966 GPD. See **Figure 6-1** for the PWWFs and minimum required pipe sizes for collection area B1.

Table 6-5: Sewer Collection Area B1 – Land Uses, ADWF, and PWWF

Land Use	Area B1 Total No of DU / Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (per DU)	876	200	**175,200**
Medium Density Residential (per DU)	1,150	180	**207,000**
High Density Residential (per DU)	1,562	170	**265,540**
Commercial (per acre)	0	590	**0**
Industrial (per acre)	0	355	**0**
Parks (per acre)	57	55	**3,130**
Schools / Institutional (per acre)	0.0	245	**0**
Total Area B1 Average Dry Weather Flow			**650,870**
Peaking Factor			**2.19**
Peak Wet Weather Flow[1]			**1,424,966**

Notes:

1. PWWF shown is based on the ADWF from area B1 conveyed to the proposed sewer lift station LS-B1.

6.4.2 Sewer Lift Station B1 (LS-B1) – Preliminary Firm Pumping Capacity Requirements

The firm pumping capacity for lift station B1 should be equal to the PWWF of 1,424,966 GPD or 990 GPM. This exceeds 1.0 cfs (or 450 GPM), and therefore a low flow pump should be provided and designed for 50-100 GPM. As described in **Section 2.2.3**, the design TDH for LS-B1 pumps should consider the secondary requirement of being able to utilize the interim/emergency bypass pipelines. During the design of Phase II's sewer collection system, the sewer model should be updated based the proposed interim and future emergency situations to provide TDH sizing parameters for the LS-B1 pumps.

Table 6-6: Sewer Lift Station Area B1 (LS-B1) – Preliminary Firm Pumping Capacity Requirements

Parameter	Pumping Capacity
Low Flow Pump Capacity	50-100 GPM
Preliminary Required Firm Pumping Capacity	**1,424,966 GPD or 990 GPM**

6.5 Sewer Collection Area B2 – Preliminary Steady State Results

6.5.1 Sewer Collection Area B2 – Land Uses, Average Dry Weather Flows, and Peak Wet Weather Flows

Sewer Collection Area B2 is proposed to be located in the South of Phase II and is bounded by Collection Area A1 in the North, Collection Area A2 in the east, the Paradise Cut in the South and Collection Area B1 in the west. B2 is approximately 605 acres composed of all land uses except industrial. Based on conversations with River Islands, the future employment centers should be modeled as commercial land uses. **Table 6-7** lists the total number of dwelling units or acreage of each land use in collection area B2, and the ADWF in gallons per day.

At full buildout and under normal operating conditions, LS-B1 will pump Area B1's sewage into Area B2's collection system along A Street. Per the City Standards, the PWWF conveyed to the proposed sewer lift station B2 (LS-B2) is 2,746,811 GPD based on the combined ADWF from areas B1 and B2.

Table 6-7: Sewer Collection Area B2 – Land Uses, ADWF, and PWWF

Land Use	Area B2 Total No of DU or Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (per DU)	1,091	200	**218,200**
Medium Density Residential (per DU)	789	180	**142,020**
High Density Residential (per DU)	1,641	170	**278,970**
Commercial (per acre)	56.0	590	**33,016**
Industrial (per acre)	0.0	355	**0**
Parks (per acre)	61.4	55	**3,375**
Schools / Institutional (per acre)	30.0	245	**7,350**
Total Area B2 Average Dry Weather Flow			**682,931**
Total Area B1 Average Dry Weather Flow			**650,870**
Total Area B1 + B2 Average Dry Weather Flow			**1,333,801**
Peaking Factor			**2.06**
Peak Wet Weather Flow[1]			**2,746,811**

Notes:

1. PWWF shown is based on the ADWF from areas B1 and B2 conveyed to the proposed sewer lift station LS-B2

6.5.2 Sewer Lift Station B2 LS-B2 – Preliminary Firm Pumping Capacity

Under normal operating conditions, the model results determined the Sewer Lift Station B2 should have a firm pumping capacity of **2,746,811 GPD or 1,908 GPM**. Also a low flow pump designed for 95-191 GPM should be provided.

Table 6-8: Sewer Lift Station Area B2 – Preliminary Firm Pumping Capacity Requirements

Parameter	Pumping Capacity
Low Flow Pump Capacity	95-191 GPM
Preliminary Required Firm Pumping Capacity	**2,746,811 GPD or 1,908 GPM**

At full buildout and under normal operating conditions, **Table 6-9** summarizes ADWF and PWWF (firm pumping capacity) required for each lift station in Collection Area C1, C2, B1, & B2.

Table 6-9: Summary of Collection Areas C1, C2, B1 & B2 Model Results

Parameter	Proposed Sewer Lift Station LS-C1	Proposed Sewer Lift Station LS-C2	Proposed Sewer Lift Station LS-B1	Proposed Sewer Lift Station LS-B2
Average Dry Weather Flow (GPD)	208,082	509,409	650,870	1,333,801
Peak Wet Weather Flow (GPD)	593,236	1,168,388	1,424,966	2,746,811
Low Flow Pump Required (Yes/No)	No	Yes	Yes	Yes

7. River Islands Sewer Collection System Model – Phase I Results

7.1 Sewer Collection Area A1

7.1.1 Sewer Collection Area A1 – Land Uses, Average Dry Weather Flows, and Peak Wet Weather Flows

Sewer Collection Area A1 is located in the western portion of Phase I and is comprised of development Stages 2A and 2B of Phase I. Area A1 encompasses approximately 785 acres composed of low and medium density residential units as well as parks, a K-8 school, and a high school. The calculated ADWF from collection area A1 is 603,302 GPD as shown in **Table 7-1**. At full buildout and under normal operating conditions, the proposed LS-C2 will discharge sewage into A1's collection system along River Islands Parkway. ADWF from collection areas C1+C2 and A1 produces a PWWF of 2,306,068 GPD to A1 lift station (previously referred to as Stage 2A lift station).

Table 7-1: Sewer Collection Area A1 – Land Uses, ADWF, and PWWF

Land Use	Area A1 Total No of DU or Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (per DU)	1,998	200	**399,600**
Medium Density Residential (per DU)	723	180	**130,140**
High Density Residential (per DU)	312	170	**53,040**
Commercial (per acre)	0.0	590	**0**
Industrial (per acre)	0.0	355	**0**
Parks (per acre)	88.0	55	**4,842**
Schools / Institutional (per acre)	64.0	245	**15,680**
Total Area A1 Average Dry Weather Flow			**603,302**
From Collection Area C1 + C2 Average Dry Weather Flow			**509,409**
Total Average Dry Weather Flow			**1,112,710**
Peaking Factor			**2.07**
Peak Wet Weather Flow[1]			**2,306,068**

Notes:

1. PWWF shown is based on the ADWF from areas C1+C2 and A1 conveyed to the LS-A1

7.1.2 Sewer Collection Area A1 – Pipe Capacity Under PWWF

Figure 7-1 shows the PWWFs of all the pipes within Area A1 and the corresponding pipe capacities in accordance with the City's Standards. None of the pipes exceeded the maximum capacity (Depth/diameter ratio) requirement described in **Section 4.1.1.**

7.1.3 Sewer Collection Area A1 – Pipe Velocities Under PWWF

Figure 7-2 shows the velocity of each pipe within Area A1 under PWWFs. None of the pipes exceed the maximum allowable velocity list in the City Standards.

As shown in **Figure 7-2**, 6 segments of pipe are estimated to have a velocity less than 2 feet per second with the line being at least half full under PWWF conditions. All 6 of these pipes are located along or in close proximity to the eastern trunk line. Phase I infrastructure was design in accordance with the City's 2014 Standards which utilized higher sewer generation rates than the 2019 City Standards, reflecting historical trends seen in the City. The few segments in which the model determined low sewer velocities may occur, can be attributed to the reduction in sewer generation rates as required by the 2019 City

Standards. Low velocities in sewer lines has the potential to lead to increased odor and corrosion issues in the sewer collection system as these conditions create the following environments which promote the rate of hydrogen sulfide odor and corrosion.

- Low velocities attribute to longer detention time in the collection system which can decrease the dissolved oxygen of the sewage thus promoting anaerobic bacterial growth contributing to corrosion and odor.
- Low velocity can promote less aeration of the sewage due to turbulence, increase solids deposition, and not removing the anaerobic slime buildup beneath the flow line. This is especially a concern with pipes operating at low velocities with larger depths creating a larger wetted surface area.

Future sewer infrastructure will be required to be designed in accordance with the newer lower sewer generation rates to reduce the occurrence of low sewer velocities. For the existing Phase I infrastructure designed with the higher 2014 sewer generation rates, the River Islands sewer collection system has the following features to combat potential low velocity conditions. Improvement plans provided by Odell indicate that the larger sewer lines were designed in accordance with the City's Standards and were specified to be constructed of corrosion resistant C900/C905 PVC pipe. LS-A1 is also installed with a Bioxide (nitrate solution) dosing system, which will reduce the potential for anaerobic conditions by promoting anoxic bacterial growth and will be the primary means of combating odor and corrosion issues. The installation of recycled water flushing stations throughout River Islands will allow for operations staff to combat the previously mentioned low velocity conditions by flushing out the larger lines, primarily during interim conditions. At full buildout, flushing of the trunk lines should be considered as a secondary means of combating low sewer velocities as frequent flushing not only wastes recycled water, but also has the potential to affect the wastewater characteristics such as increasing total dissolved solid concentrations.

However, during the interim and just after the full buildout of the collection system, the sewer collection system should be monitored for odor and corrosion issues to see if further measures are required. It is recommended that all trunk lines in the future continue to be designed and constructed of corrosion resistant material and the interior of all trunk line manholes be PVC lined or epoxy coated and installed composite corrosion resistant manhole covers.

Land Use	Collection Area C1 (Units/Acres)	Collection Area C2 (Units/Acres)	Collection Area B1 (Units/Acres)	Collection Area B2 (Units/Acres)	Collection Area A1 (Units/Acres)	Collection Area A2 (Units/Acres)	Total
Low Density (DU)	783	931	876	1091	1998	1512	**7,191**
Medium Density (DU)	258	602	1,150	789	723	114	**3,636**
High Density (DU)	-	-	1,562	1641	312	668	**4,183**
Parks (AC)	26.63	37	57	61.36	88.03	71.85	**342**
Commercial (AC)	-	-	-	55.96	-	202.41	**258**
Schools / Institutions (AC)	14.60	19	-	30.00	64.00	34.10	**162**

Collection Area A1			
Land Use	**Number of Units / ACRES**	**Land Use Sewer Flow Factor (GPD/DU OR AC)**	**Average Dry Weather Flow (GPD)**
Low Density (DU)	1998	200	399,600
Medium Density (DU)	723	180	130,140
High Density (DU)	312	170	53,040
Parks (AC)	88.03	55	4,841
Commercial (AC)	0.00	590	-
Schools / Institutions (AC)	64.00	245	15,680
TOTAL AVERAGE DRY WEATHER FLOW (GPD)			**603,301**
TOTAL PEAK WET WEATHER FLOW (GPD)			**1,338,198.70**

PHASE II SEWER TECHNICAL REPORT

COLLECTION AREA A1
PIPE CAPACITY - PEAK WET WEATHER FLOWS

PACE

0 250 500 1,000 Feet

Date: 8/12/2020

Job Number: 8520

Figure: 7-1

PHASE II SEWER TECHNICAL REPORT

COLLECTION AREA A1
PIPE VELOCITY - PEAK WET WEATHER FLOWS

PACE

0 250 500 1,000 Feet

Date: 8/11/2020

Job Number: 8520

Figure: 7-2

7.1.4 Sewer Lift Station A1 (LS-A1)

Sewer lift station A1 (previously referred to as the Stage 2A lift station) was designed by PACE and is currently in operation. The lift station is located in development stage 2A at the intersection of S2 Street and River Islands Parkway. Flow from Collection Area A1 is conveyed along River Islands Parkway into the lift station's 8-foot wide by 18-foot long by 31-foot tall precast concrete wet well. At full buildout, the lift station will be installed with 3 duty + 1 standby 15 horsepower (hp) submersible pumps each rated at 1,100 GPM at 28 feet TDH. The 3 duty pumps will provide a firm pumping capacity of 3,300 GPM. The station is equipped with a standby generator, and an above ground electrical and chemical building as shown in **Figure 7-3** below.

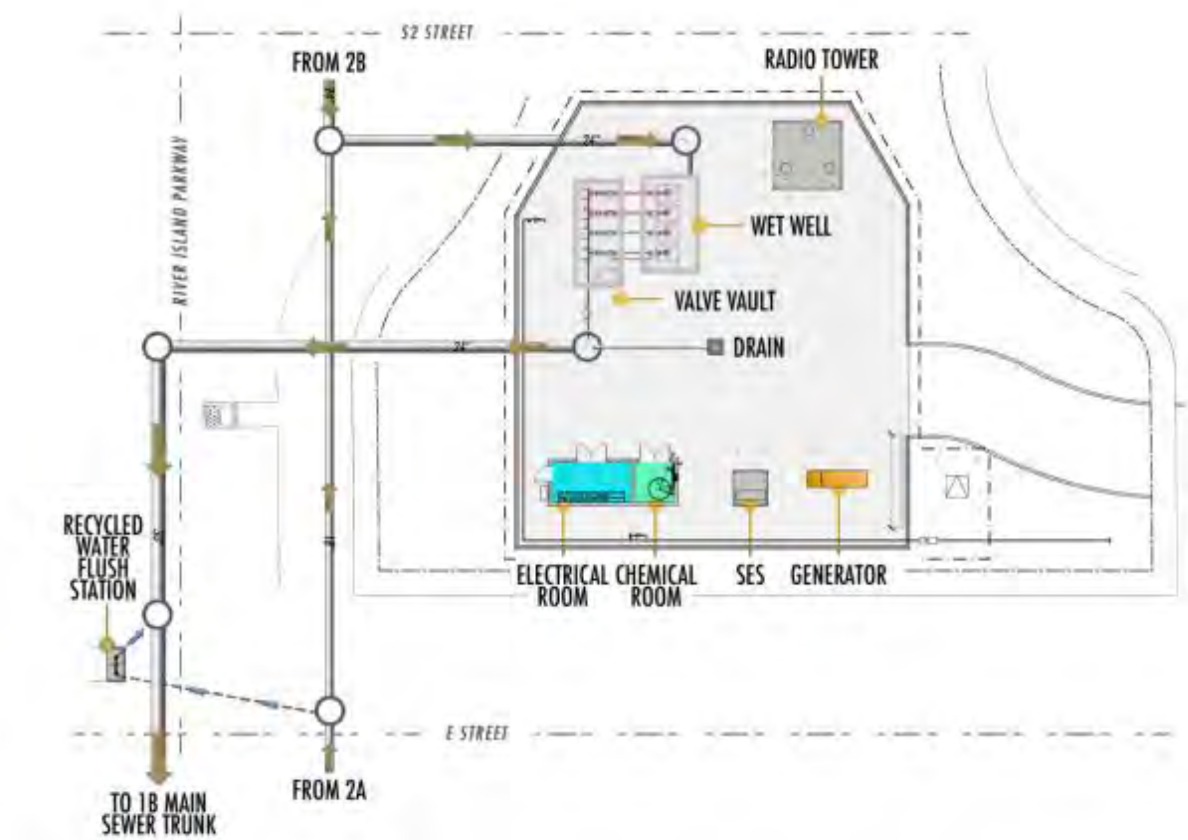


Figure 7-3: Collection Area Sewer Lift Station A1 Site Plan View

Table 7-2: Sewer Lift Station A1 – Firm Pump Capacity at Full Buildout

Pump Number	Pumping Capacity (GPM) @ 28' TDH	Motor Rated Horsepower	Motor Drive	Status
Sewage Pump #1	1,100	15	Variable Frequency Drive	Duty
Sewage Pump #2	1,100	15	Variable Frequency Drive	Duty
Sewage Pump #3	1,100	15	Variable Frequency Drive	Duty
Sewage Pump #4	1,100	15	Variable Frequency Drive	Standby
Total Firm Pumping Capacity	**3,300**			

7.1.4.1 Sewer Lift Station LS-A1 Preliminary Capacity Analysis

As shown in **Figure 2-1**, LS-A1 has the potential to see flows from multiple different collection areas under interim, normal, and emergency situations in the future. The station is currently only installed with two 1,100 GPM pumps with provisions for two additional 1,100 GPM pumps in the future. The two pumps currently provide a firm pumping capacity of 1,100 GPM in accordance with the City Standards. **Table 7-3** below describes the potential interim, normal, and emergency operating scenarios and the corresponding pumping capacity requirements for LS-A1. This preliminary capacity analysis is required to be revisited once final improvement plans and land use summaries are provided for Phase II.

Table 7-3: Sewer Lift Station LS-A1 Preliminary Capacity Analysis

Scenario	ADWF From Other Areas (GPD)	Area A1 ADWF (GPD)	PWWF[1] (GPD) *GPM*	Minimum Firm Pumping Capacity Requirements
From Collection Area A1 Only	0	603,302	1,338,199 *929*	1 duty + 1 standby 1,100 GPM pumps required
From Collection Area A1+B1	650,870	603,302	2,587,174 *1,797*	2 duty + 1 standby 1,100 GPM pumps required
From Collection Area A1+C2	301,327	603,302	1,900,747 *1,320*	2 duty + 1 standby 1,100 GPM pumps required
From Collection Area A1+B1+C2	952,197	603,302	3,194,853 *2,219*	3 duty + 1 standby 1,100 GPM pumps required
From Collection Area A1+B1+C2+C1	1,160,278	603,302	3,618,370 *2,513*	3 duty + 1 standby 1,100 GPM pumps required

Notes:
1. PWWF shown is based on the ADWF from mentioned areas and conveyed to LS-A1.

7.2 Sewer Collection Area A2

7.2.1 Sewer Collection Area A1 – Land Uses, Average Dry Weather Flows, and Peak Wet Weather Flows

Sewer Collection Area A2 is located in the southeast of the River Islands development and is the last collection area before sewage leaves the site. Area A2 will ultimately receive all 6 collection areas sewage and will pump the sewage directly to the Lathrop CTF through the installation of a 12 and 18-inch force mains. Collection Area A2 is comprised of development stages 1B and 1A of Phase I, and encompasses approximately 975 acres composed of all land uses. **Table 7-4** lists the ADWF that enter or are generated from area A2, and the corresponding PWWF entering PS-A2.

Table 7-4: Sewer Collection Area A2 – Land Uses, ADWF, and PWWF

Land Use	Area A4 Total No of DU or Acres	Land Use Sewer Flow Factor (GPD/du or ac)	Average Dry Weather Flow (GPD)
Low Density Residential (per DU)	1,512	200	**302,400**
Medium Density Residential (per DU)	114	180	**20,520**
High Density Residential (per DU)	668	170	**113,560**
Commercial (per acre)	202	590	**119,422**
Industrial (per acre)	0	355	**0**
Parks (per acre)	72	55	**3,952**
Schools / Institutional (per acre)	34	245	**8,355**
Total Area A2 Average Dry Weather Flow			**568,208**
From Collection Area A1 Average Dry Weather Flow			**1,112,710**
From Collection Areas B1+B2 Average Dry Weather Flow			**1,333,801**
Total Average Dry Weather Flow			**3,014,719**
Peaking Factor			**2.05**
Peak Wet Weather Flow[1]			**6,180,211**

Notes:

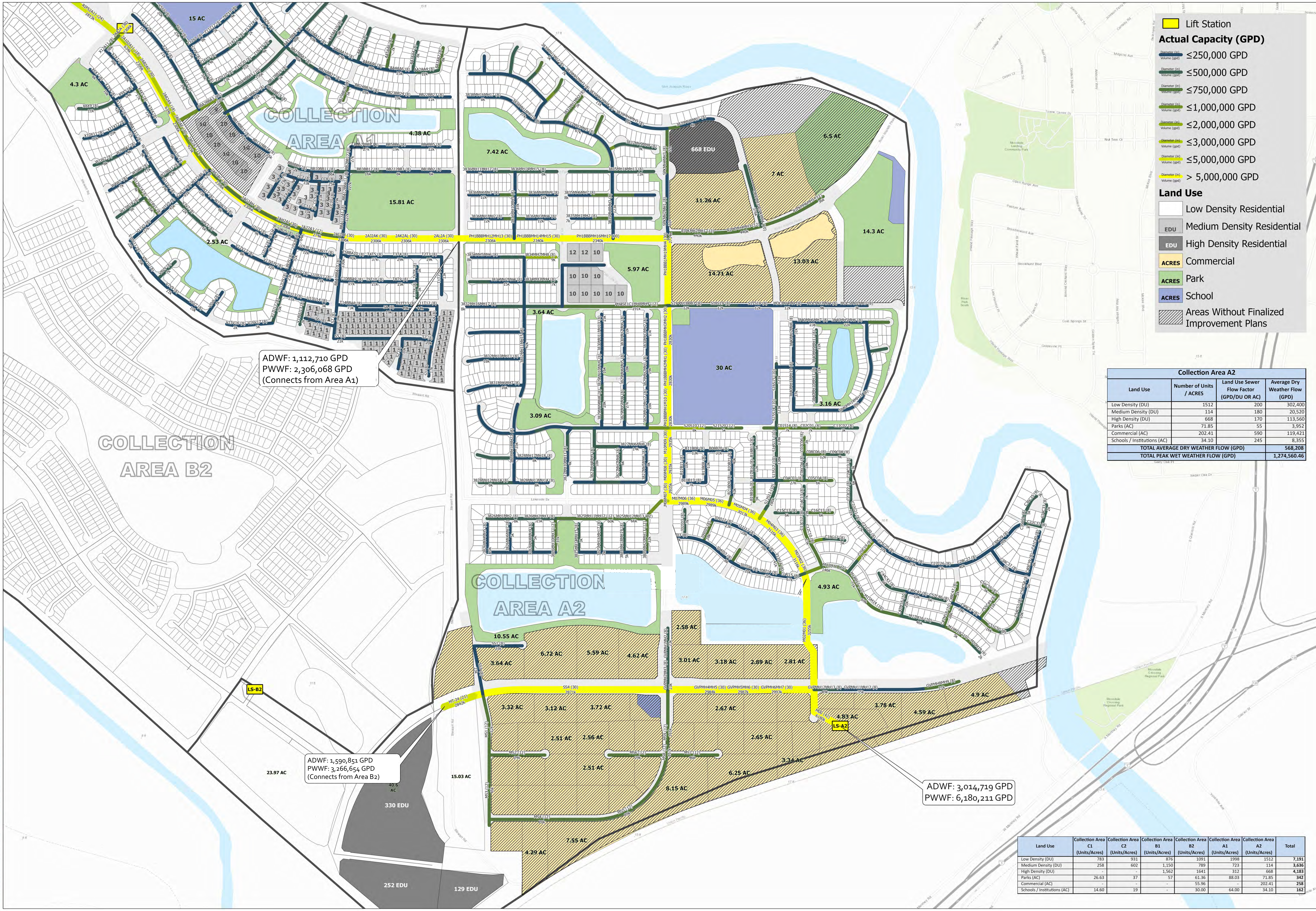
1. PWWF shown is based on the ADWF from areas C1+C2, B1+B2, A1 and A2 conveyed to the PS-A2.

7.2.2 Sewer Collection Area A2 – Pipe Capacity Under PWWF

Figure 7-4 shows the PWWFs of all the pipes within Area A2. The PWWF for all of River Islands entering sewer lift station A2 is 6,180,211 GPD or 4,292 GPM. None of the pipes exceeded the maximum capacity (Depth/diameter ratio) requirement described in **Section 4.1.1.**

7.2.3 Sewer Collection Area A2 – Pipe Velocities Under PWWF

Figure 7-5 shows the velocity of each pipe within Area A1 under PWWFs. As discussed in **Section 7.1.3**, the northern trunk line along River Islands Parkway and Somerton Parkway can be expected to operate under low velocity conditions regularly. However, except for 1 pipe segment, none of the other sewer lines did not satisfy the City's minimum or maximum pipe velocities requirements.



Collection Area A2			
Land Use	Number of Units / ACRES	Land Use Sewer Flow Factor (GPD/DU OR AC)	Average Dry Weather Flow (GPD)
Low Density (DU)	1512	200	302,400
Medium Density (DU)	114	180	20,520
High Density (DU)	668	170	113,560
Parks (AC)	71.85	55	3,952
Commercial (AC)	202.41	590	119,421
Schools / Institutions (AC)	34.10	245	8,355
TOTAL AVERAGE DRY WEATHER FLOW (GPD)			**568,208**
TOTAL PEAK WET WEATHER FLOW (GPD)			**1,274,560.46**

Land Use	Collection Area C1 (Units/Acres)	Collection Area C2 (Units/Acres)	Collection Area B1 (Units/Acres)	Collection Area B2 (Units/Acres)	Collection Area A1 (Units/Acres)	Collection Area A2 (Units/Acres)	Total
Low Density (DU)	783	931	876	1091	1998	1512	**7,191**
Medium Density (DU)	258	602	1,150	789	723	114	**3,636**
High Density (DU)	-	-	1,562	1641	312	668	**4,183**
Parks (AC)	26.63	37	57	61.36	88.03	71.85	**342**
Commercial (AC)	-	-	-	55.96	-	202.41	**258**
Schools / Institutions (AC)	14.60	19	-	30.00	64.00	34.10	**162**

PHASE II SEWER TECHNICAL REPORT

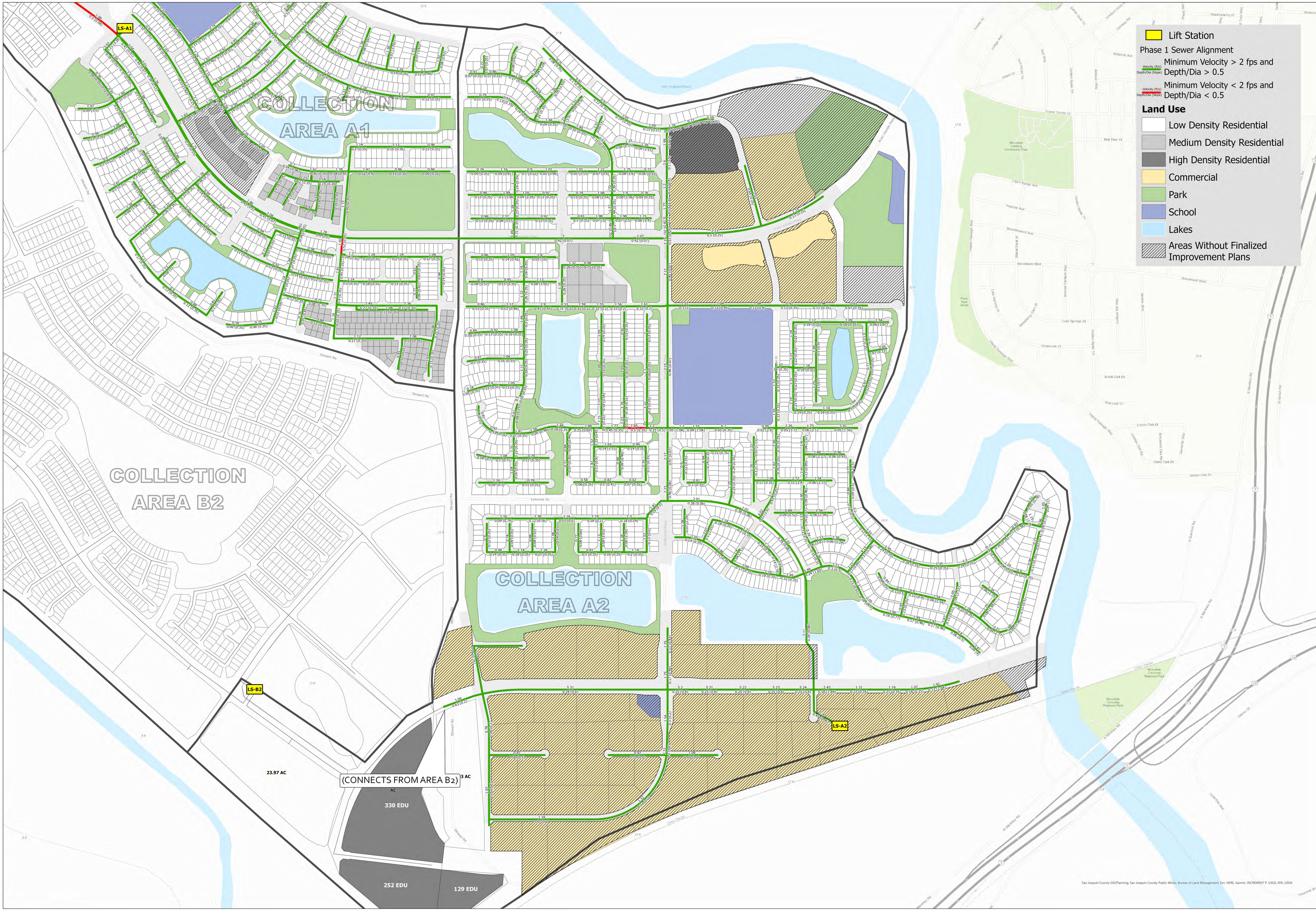
COLLECTION AREA A2
PIPE CAPACITY - PEAK WET WEATHER FLOWS

0 300 600 1,200 Feet

Date: 8/12/2020

Job Number: 8520

Figure: 7-4



PHASE II SEWER TECHNICAL REPORT

COLLECTION AREA A2
PIPE VELOCITY - PEAK WET WEATHER FLOWS

PACE

0 300 600 1,200 Feet

Date: 8/11/2020

Job Number: 8520

Figure: 7-5

7.2.4 Sewer Pump Station A2 (PS-A2)

The sewer pump station PS-A2 (previously referred to as the Site C Sewer Lift Station) was designed by PACE and is currently under construction. The lift station is located in stage 1B along J7 Street. Flow from all of River Islands will be conveyed to sewer lift station A2 through a 42-inch line located underneath J7 Street. A total of six 110 HP submersible pumps will be installed each with a pumping capacity of 2,000 GPM at a TDH of 119 feet. The station's six pumps were designed to operate as 4 duty, and 2 standby pumps providing a firm pumping capacity of 8,000 GPM at full build out conditions.

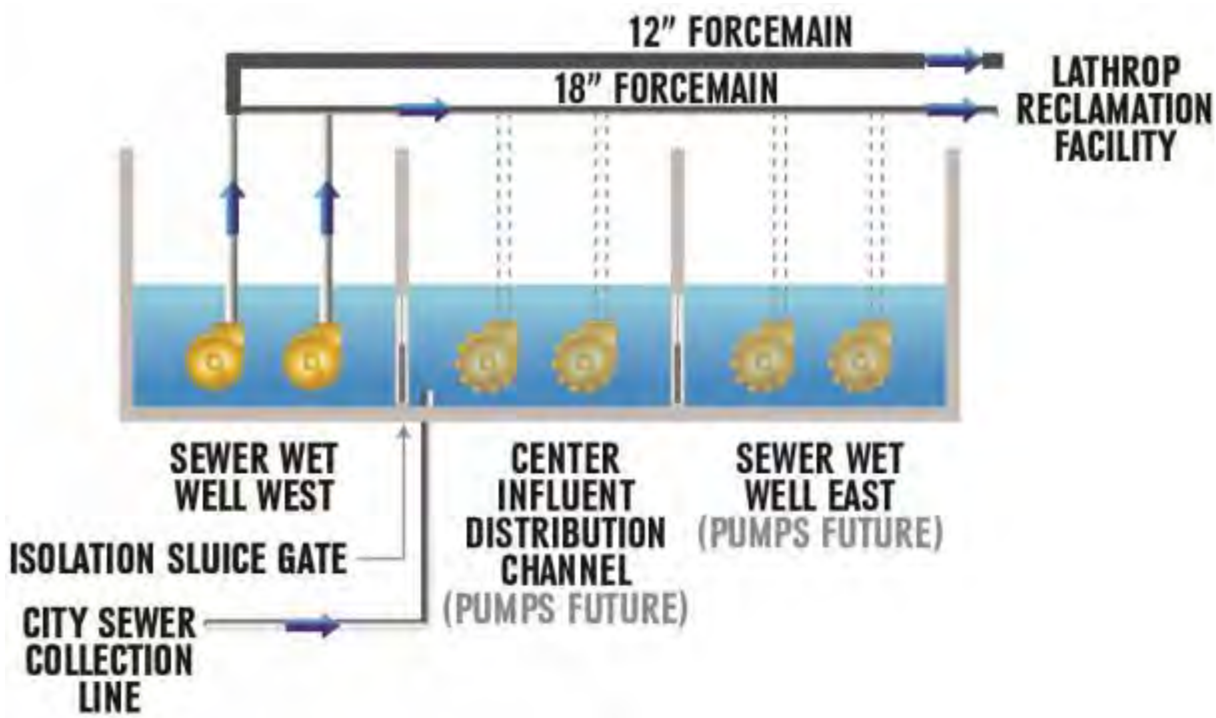


Figure 7-6: Collection Area Sewer Lift Station A1 Site Plan View

Table 7-5: Sewer Lift Station A1 – Firm Pumping Capacity at Full Buildout

Pump Number	Pumping Capacity (GPM) @ 119' TDH	Motor Rated Horsepower	Motor Drive	Status
Sewage Pump #1	2,000	110	Variable Frequency Drive	Duty
Sewage Pump #2	2,000	110	Variable Frequency Drive	Duty
Sewage Pump #3	2,000	110	Variable Frequency Drive	Duty
Sewage Pump #4	2,000	110	Variable Frequency Drive	Duty
Sewage Pump #5	2,000	110	Variable Frequency Drive	Standby
Sewage Pump #6	2,000	110	Variable Frequency Drive	Standby
Total Firm Pumping Capacity	**8,000**			

7.2.4.1 Sewer Lift Station PS-A2 Preliminary Capacity Analysis

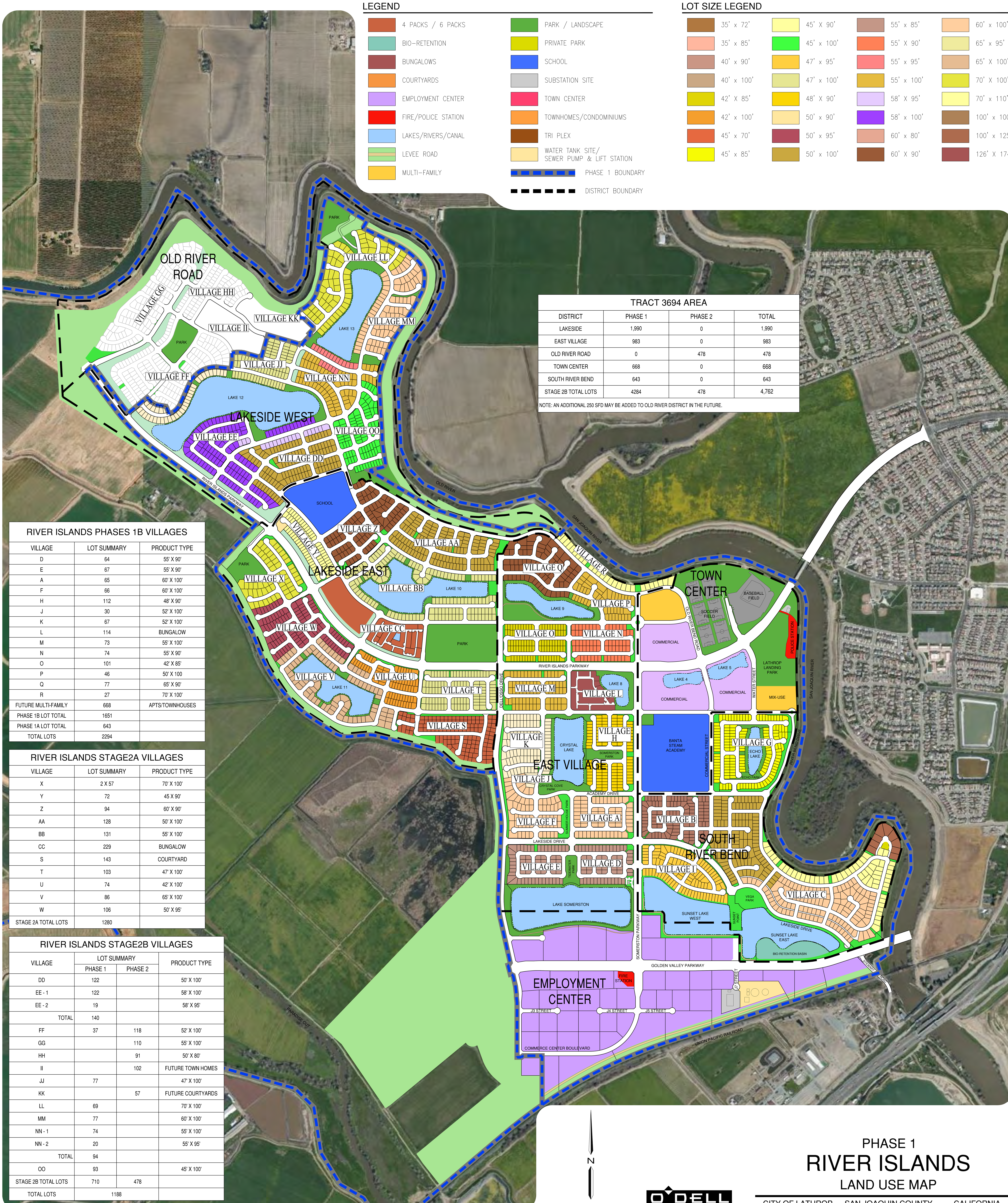
As shown in **Figure 2-1**, PS-A2 will be located at the end of the River Islands collection system and will be responsible for pumping all the collected sewage offsite. The station is currently only installed with two 2,000 GPM pumps with provisions for four additional 2,000 GPM pumps in the future. The two pumps currently provide a firm pumping capacity of 2,000 GPM in accordance with the City Standards. **Table 7-6** below describes the potential interim, normal, and emergency operating scenarios and the corresponding pumping capacity requirements for PS-A2. The preliminary capacity analysis is required to be revisited once final improvement plans and land use summaries are provided for Phase II.

Table 7-6: Sewer Lift Station PS-A2 Preliminary Capacity Analysis

Scenario	Other Areas ADWF (GPD)	Area A1 ADWF (GPD)	PWWF (GPD) *GPM*	Minimum Firm Pumping Capacity Requirements
From Collection Area A2 Only	0	568,208	1,274,561 *885*	1 duty + 1 standby 2,000 GPM pumps required
From Collection Area A2+A1	603,302	568,208	2,422,471 *1,682*	1 duty + 1 standby 2,000 GPM pumps required
From Collection Area A2+A1+B1	1,254,171	568,208	3,738,361 *2,596*	2 duty + 1 standby 2,000 GPM pumps required
From Collection Area A2+A1+B1+C2	1,555,498	568,208	4,354,478 *3,024*	2 duty + 1 standby 2,000 GPM pumps required
From Collection Area A2+A1+B1+C2+C1	1,763,580	568,208	4,780,590 *3,320*	2 duty + 1 standby 2,000 GPM pumps required
From Collection Area A2+A1+B1+B2+C2+C1	2,446,511	568,208	6,180,211 *4,292*	3 duty + 1 standby 2,000 GPM pumps required

As mentioned previously, PS-A2 is a critical chokepoint in the River Islands sewer collection system. Even though the City's minimum firm pumping capacity only requires 1 standby pump, due to the size of these pumps it is recommended to still proceed with the design of 2 standby pumps as there can be an expected level of difficulty in replacing a damaged pump as the size of the pumps limits the potential of shelf spare pumps being available from the manufacturer.

Appendix A – River Islands Land Use Exhibits



TRACT 3694 AREA

DISTRICT	PHASE 1	PHASE 2	TOTAL
LAKESIDE	1,990	0	1,990
EAST VILLAGE	983	0	983
OLD RIVER ROAD	0	478	478
TOWN CENTER	668	0	668
SOUTH RIVER BEND	643	0	643
STAGE 2B TOTAL LOTS	4284	478	4,762

NOTE: AN ADDITIONAL 250 SFD MAY BE ADDED TO OLD RIVER DISTRICT IN THE FUTURE.

RIVER ISLANDS PHASES 1B VILLAGES

VILLAGE	LOT SUMMARY	PRODUCT TYPE
D	64	55' X 90'
E	67	55' X 90'
A	65	60' X 100'
F	66	60' X 100'
H	112	48' X 90'
J	30	52' X 100'
K	67	52' X 100'
L	114	BUNGALOW
M	73	55' X 100'
N	74	55' X 90'
O	101	42' X 85'
P	46	50' X 100
Q	77	65' X 90'
R	27	70' X 100'
FUTURE MULTI-FAMILY	668	APTS/TOWNHOUSES
PHASE 1B LOT TOTAL	1651	
PHASE 1A LOT TOTAL	643	
TOTAL LOTS	2294	

RIVER ISLANDS STAGE2A VILLAGES

VILLAGE	LOT SUMMARY	PRODUCT TYPE
X	2 X 57	70' X 100'
Y	72	45 X 90'
Z	94	60' X 90'
AA	128	50' X 100'
BB	131	55' X 100'
CC	229	BUNGALOW
S	143	COURTYARD
T	103	47' X 100'
U	74	42' X 100'
V	86	65' X 100'
W	106	50' X 95'
STAGE 2A TOTAL LOTS	1280	

RIVER ISLANDS STAGE2B VILLAGES

VILLAGE	LOT SUMMARY		PRODUCT TYPE
	PHASE 1	PHASE 2	
DD	122		50' X 100'
EE - 1	122		58' X 100'
EE - 2	19		58' X 95'
TOTAL	140		
FF	37	118	52' X 100'
GG		110	55' X 100'
HH		91	50' X 80'
II		102	FUTURE TOWN HOMES
JJ	77		47' X 100'
KK		57	FUTURE COURTYARDS
LL	69		70' X 100'
MM	77		60' X 100'
NN - 1	74		55' X 100'
NN - 2	20		55' X 95'
TOTAL	94		
OO	93		45' X 100'
STAGE 2B TOTAL LOTS	710	478	
TOTAL LOTS	1188		

N

0' 250' 500' 1000'
SCALE: 1" = 500'

O'DELL ENGINEERING

PHASE 1
RIVER ISLANDS
LAND USE MAP

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA
JUNE 26, 2020

PHASE 2 LOTTING SUMMARY

PARCEL	LOT PRODUCT	AREA (ACRES)	DENSITY (DU/AC)	# OF UNITS	DENSITY TYPE
MU-1	Condos/Commercial	3.9	10.0	39	MEDIUM
MU-2	Condos/Commercial	3.3	10.0	33	MEDIUM
MU-3	Condos/Commercial	14.2	10.0	142	MEDIUM
MU-4	Condos/Commercial	11.1	10.0	111	MEDIUM
MU-5	Condos/Commercial	9.8	10.0	98	MEDIUM
MU-6	Condos/Commercial	14.7	10.0	147	MEDIUM
MU-7	Condos/Commercial	10.4	10.0	104	MEDIUM
MU-8	Apts	19.2	21.0	403	HIGH
MU-9	Apts	14.6	23.0	336	HIGH
MU-10	Apts	15.9	19.0	302	HIGH
MU-11	Apts	12.7	22.0	279	HIGH
MU-12	Apts	10.5	23.0	242	HIGH
MU-13	TOWNHOME	14.5	14.0	203	MEDIUM
MU-14		12.8	0.0	0	
R-0e (Village HH)	50x80	13.9	6.5	91	LOW
R-0d (Village FF Remainder)	52x100	24.1	4.9	118	LOW
R-0a (Village GG)	55x100	24.1	4.6	110	LOW
R-0c (Village KK)	Courtyards	8.2	7.0	57	LOW
R-0b (Village II)	Townhomes	10.2	10.0	102	MEDIUM
R-13	SFD Cluster	27.3	10.0	273	MEDIUM
R-15a	50x100	12.3	5.0	61	LOW
R-15b	SFD Cluster	19.2	10.0	192	MEDIUM
R-16	CONDO	15.6	20.0	312	HIGH
R-22	SFD Cluster	13.2	9.0	119	LOW
R-23	42x100	24.0	5.8	139	LOW
R-24	55x100	19.3	5.3	102	LOW
R-25	55x100	13.1	4.7	62	LOW
R-26	SFD Cluster	24.9	9.0	224	MEDIUM
R-27	50x100	18.6	4.7	87	LOW
R-28	42x100	19.3	5.4	104	LOW
R-29	47x100	10.2	6.0	61	LOW
R-2a	42x100	17.1	6.0	102	LOW
R-2b	50x100	31.9	5.0	158	LOW
R-2c	55x100	23.0	4.5	103	LOW
R-30	47x100	15.4	5.8	89	LOW
R-31	CONDO	7.7	18.0	139	MEDIUM
R-32	CONDO	7.6	18.0	137	MEDIUM
R-33	SFD Cluster	26.8	9.0	241	MEDIUM
R-34	50x100	31.7	5.0	159	LOW
R-35	42x100	28.7	5.4	154	LOW
R-36a	47x100	21.8	5.5	120	LOW
R-36b	52x100	22.1	4.9	109	LOW
R-37	60x100	21.7	4.2	92	LOW
R-38	55x100	24.8	4.9	121	LOW
R-39	60x100	32.8	4.1	135	LOW
R-3a	60x100	22.1	4.5	99	LOW
R-3b	52x100	20.4	4.3	87	LOW
R-40	52x100	34.5	5.2	180	LOW
R-41	42x100	44.2	6.1	269	LOW
R-42	50x100	22.8	4.8	109	LOW
R-4a	SFD Cluster	17.2	9.0	155	MEDIUM
R-4b	42x100	9.7	5.3	51	LOW
R-5	Condos	9.9	20.0	198	MEDIUM
R-6	55x100	24.4	4.6	113	LOW
R-7	Apts	8.0	18.0	144	MEDIUM
R-8 - R-12 (ACTIVE ADULT)	SFD	174.4	5.0	876	LOW
TOD-1	Apts	13.1	21.0	275	HIGH
TOD-2	Apts	8.8	29.0	255	HIGH
TOD-3	Apts	22.0	15.0	330	HIGH
TOD-4	Apts	12.6	20.0	252	HIGH
TOD-5	Apts	11.7	11.0	129	MEDIUM
TOD-6	SFD Cluster	22.7	6.0	136	LOW
TOD-7	TOWNHOME	16.7	10.0	167	MEDIUM
TOD-8	SFD Cluster	13.3	10.0	133	MEDIUM
TOTAL				10,470	

RIVER ISLANDS LOTTING SUMMARY

PHASE	UNIT # (LOW DENSITY)	UNIT # (MEDIUM DENSITY)	UNIT # (HIGH DENSITY)	TOTAL
PHASE 1	3,273	223	788	4,284
PHASE 2	4,373	3,111	2,986	10,470
TOTAL	7,646	3,334	3,774	14,754

NOTES:
1. DENSITY TYPE: LOW DENSITY (3–9 DU/AC), MEDIUM DENSITY (6–20 DU/AC), AND HIGH DENSITY (15–40 DU/AC).

PHASE 2
LOTTING SUMMARY
RIVER ISLANDS
CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA
DATE: APRIL 24, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

Appendix B – Preliminary Phase II Sanitary Sewer Exhibit from Odell Engineering

LEGEND

SS	PROPOSED SANITARY SEWER MAIN TRUNK LINE
EX SS	EXISTING SANITARY SEWER LINE
	EMERGENCY BYPASS
	PHASE 2 BOUNDARY
FS	SANITARY SEWER FLUSHING STATION
LS	SANITARY SEWER LIFT STATION

NOTES:

1. SANITARY SEWER DESIGN TO BE FINALIZED WITH DESIGN PLANS.

DRAFT

PHASE 2
SANITARY SEWER EXHIBIT
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: JUNE 24, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

T:\25504-RIVER ISLANDS\ACAD\EXHIBITS\PHASE 2 MASTER UTILITIES EXHIBIT\PHASE 2 MSTR SEWER EXHIBIT.DWG

Appendix C – King's Variable Chart

Table 1-9.
Values of K for Circular Channels in the Formula

$$Q = \frac{K}{n} D^{8/3} s^{1/2}$$

D = depth of water   d = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		15.02	10.56	8.57	7.38	6.55	5.95	5.47	5.08	4.76
.1	4.49	4.25	4.04	3.86	3.69	3.54	3.41	3.28	3.17	3.06
.2	2.96	2.87	2.79	2.71	2.63	2.56	2.49	2.42	2.36	2.30
.3	2.25	2.20	2.14	2.09	2.05	2.00	1.96	1.92	1.87	1.84
.4	1.80	1.76	1.72	1.69	1.66	1.62	1.59	1.56	1.53	1.50
.5	1.470	1.442	1.415	1.388	1.362	1.336	1.311	1.286	1.262	1.238
.6	1.215	1.192	1.170	1.148	1.126	1.105	1.084	1.064	1.043	1.023
.7	1.004	.984	.965	.947	.928	.910	.891	.874	.856	.838
.8	.821	.804	.787	.770	.753	.736	.720	.703	.687	.670
.9	.654	.637	.621	.604	.588	.571	.553	.535	.516	.496
1.0	.463									

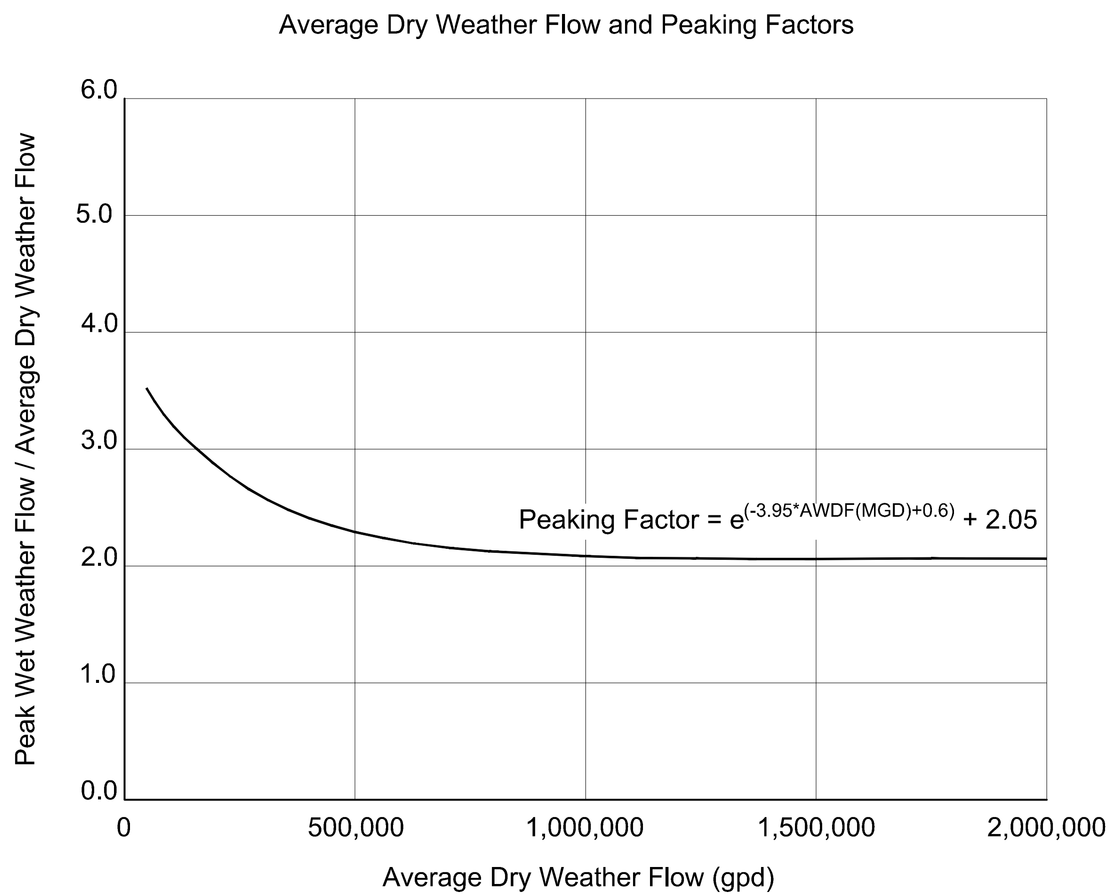
Table 1-10.
Values of K for Circular Channels in the Formula

$$Q = \frac{K'}{n} d^{8/3} s^{1/2}$$

D = depth of water   d = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		.00007	.00031	.00074	.00138	.00222	.00328	.00455	.00604	.00775
.1	.00967	.0118	.0142	.0167	.0195	.0225	.0257	.0291	.0327	.0366
.2	.0406	.0448	.0492	.0537	.0585	.0634	.0686	.0738	.0793	.0849
.3	.0907	.0966	.1027	.1089	.1153	.1218	.1284	.1352	.1420	.1490
.4	.1561	.1633	.1705	.1779	.1854	.1929	.2005	.2082	.2160	.2238
.5	.232	.239	.247	.255	.263	.271	.279	.287	.295	.303
.6	.311	.319	.327	.335	.343	.350	.358	.366	.373	.380
.7	.388	.395	.402	.409	.416	.422	.429	.435	.441	.447
.8	.453	.458	.463	.468	.473	.477	.481	.485	.488	.491
.9	.494	.496	.497	.498	.498	.498	.496	.494	.489	.483
1.0	.463									

Appendix D – City Standard Detail S-1 : Sanitary Sewer Peaking Factors



NOT TO SCALE

Approved by:

City Of Lathrop
City Engineer

No	Revised	Date

CITY OF LATHROP

DEPARTMENT OF PUBLIC WORKS

SANITARY SEWER PEAKING FACTORS

CITY OF LATHROP INCORPORATED 1989 SAN JOAQUIN COUNTY

STANDARD DETAIL

Date: **January 2019**

Drawing No: **S-1**

Stormwater Analysis Report

River Islands Phase 2 Stormwater Mitigation - Revision 2

November 2020
August 2020 *DRAFT – Revised*
July 2020 *Preliminary DRAFT - Revised*

Prepared for:

Ramon Batista
Director of Planning & Entitlements
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Lathrop, CA 95330

Prepared by:

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17520 Newhope Street, Suite 200
Fountain Valley, CA 92708

Contacts:

Andy Komor, MS, PE

PACE # B520

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1 Introduction

This report, presenting the preliminary stormwater mitigation analysis of River Islands Phase 2, is a continuation of the *River Islands Phase 1 Stormwater Mitigation report* dated *April 2020*. Phase 1 lakes are included in the modelling as described in section 2 and section 3 . Results for phase 1 lakes are however not presented in detail in this report. Part of the information presented in this section and other sections of this report are updated and/or revised information of Phase 1 to include the additional information relevant for Phase 2 of the River Islands development.

1.1 A Note on Nomenclature of River Islands' Areas

During the development of River Islands, there have been a number of different area divisions and nomenclature for the different Phases. In Figure 1-1, Figure 1-2 and Figure 1-4 on the following pages, this nomenclature is shown graphically.

The general division based on the initially hydrologic system design of the area is the division into Watershed A, B and C. Initially there was three (3) stormwater evacuation pump stations (A, B and C) planned, each evacuating the stormwater runoff from lakes in Watershed A, B and C respectively. The most recent design reduced the number of stormwater evacuation pump stations to two (2) thus removing the hydrological correlation for the division into watershed A, B and C. While no longer adhering to three (3) separate pump stations, references to watersheds A, B and C, as well as to Watershed A, B and C lakes, are still used throughout this report.

Phase 1 and 2 is a division derived from the sequence of construction (or anticipation thereof). The division of Phase 1 into Stage 1, Stage 2A and Stage 2B is also derived from the order of construction. Note that the layout of lakes, roads and other infrastructure in Phase 2 may not be the most recent in the below Figures as the figures are included for the purpose of showing area boundaries only.

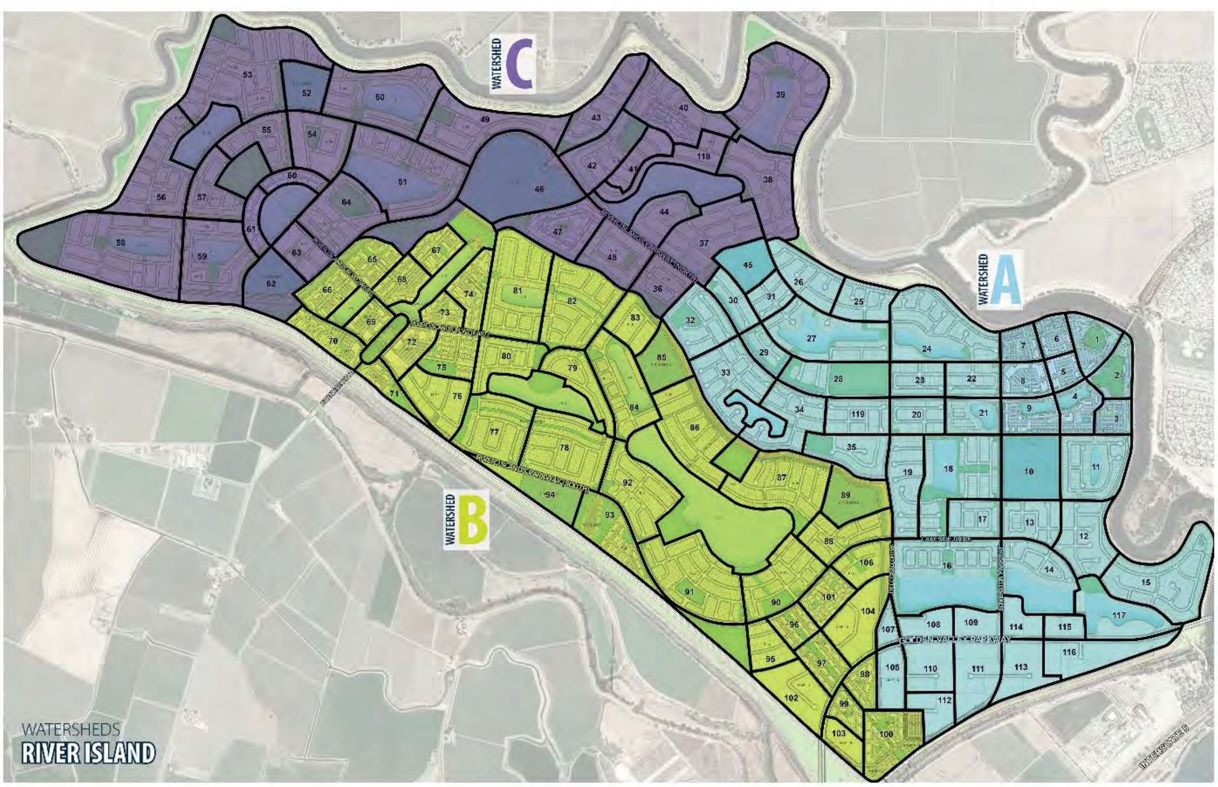

Figure 1-1: Watershed Division of River Islands Development

The phase divison of River Islands was most recently updated in the spring of 2020. This division has thus changed since the writing of the *River Islands Phase 1 Stormwater Mitigation* report. The “original one” shown in Figure 1-2 shows how the Phase division was prior to this most recent change. This version is a better representation of the stormwater areas since the contributary areas for each lakes are contained within the same Phase as the lake itself. This version is hereafter refereed to as the stormwater phase division. Figure 1-3 shows the Phase 1/Phase 2 divison when the residental development in northern part of Phase 1 Stage 2B has been moved to Phase 2. This is the official Phase 1/Phase 2 boundary but does not have the contributary drainage area for each lake in the same phase as the lake itself. This is referred to simply as the main phase division.

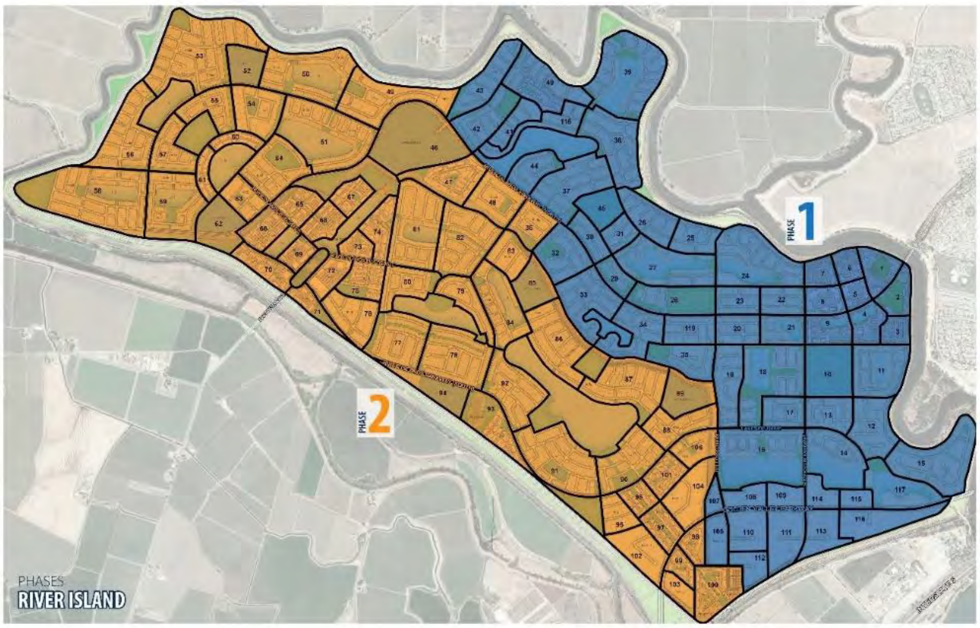

Figure 1-2: River Islands Phase Division form a stormwater perspective

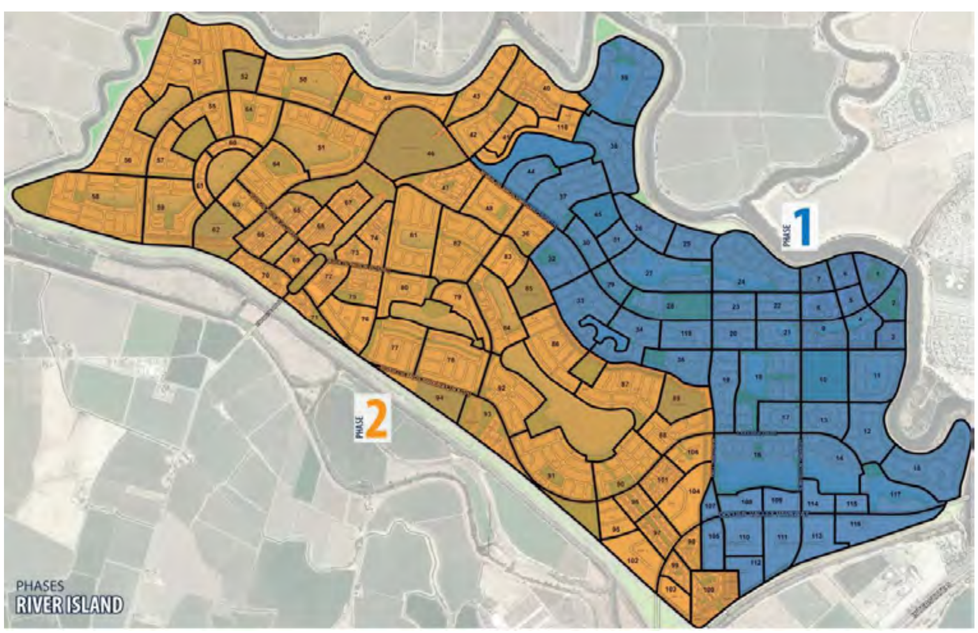

Figure 1-3: River Islands Main Phase Division

The change of Phase boundaries may also reflect the stage division for the respective Phases. However, since the “Stage 2B” division is still treated as its own subdivision for other water supply purposes (e.g. Non Potable Water) and as Phase 2 is yet to have stage divisions, a non-stormwater division of the stages is not provided at this time. Figure 1-4 below shows the “original” stage division of Phase 1, hereafter referred to as the stormwater stage division referring the reasoning from above section.

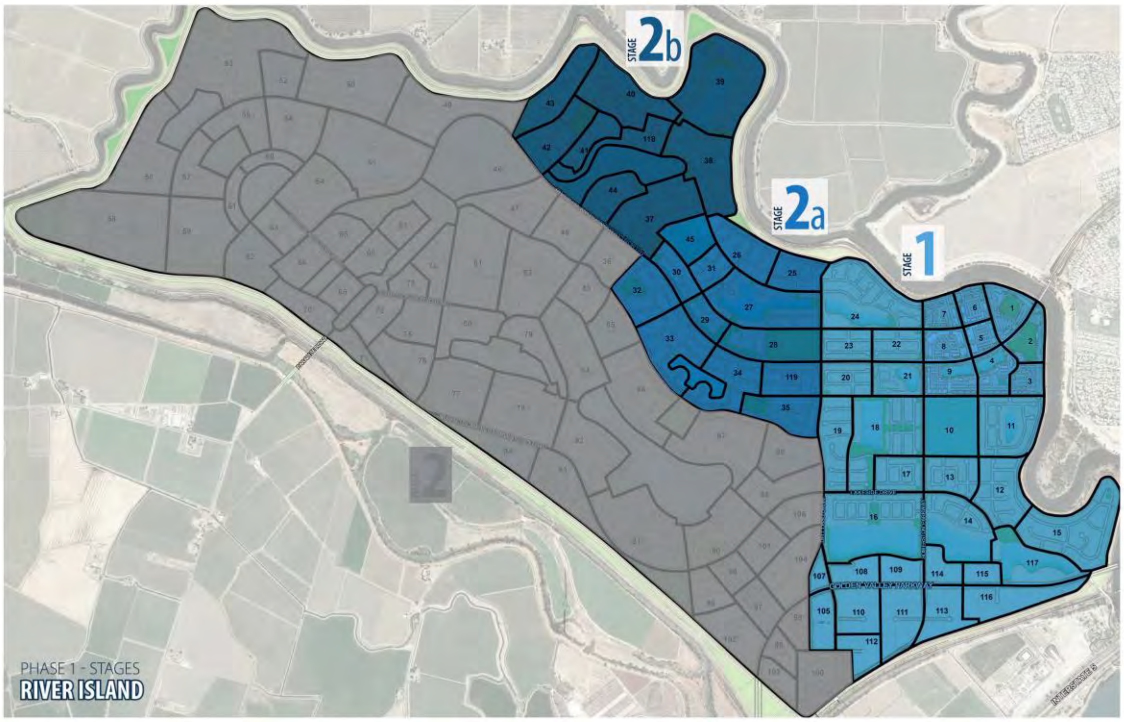

Figure 1-4: River Islands Phase 1, Stage Division from a storm water perspective

AREA LEFT INTENTIONALLY BLANK

1.2 Stormwater evacuation path

Ultimately, all the stormwater runoff from both Phase 1 and Phase 2 of the River Islands development will be drained to Paradise cut via the Phase 2 pump station located west of lake 12. As shown in Figure 1-5, the pump station is connected to lakes 12, 19 and 22 in Watershed C[1], C and B respectively and thus the last link in the stormwater evacuation path for all three watersheds. Phase 1 (watershed A, plus lakes 12 and 13) stormwater runoff is evacuated from the lakes in Phase 1 either directly to the Phase 2 pump station via lake 12 or via Pump Station A (located by lake 3) which pumps the water to lake 25 in Phase 2 (watershed B).

While not included in the modelling or analysis presented in this report, there is an additional stormwater drainage path for Phase 1 lakes to Phase 2 and Paradise Cut that could be created at a later time, if deemed necessary. This path would consist of a lake interconnect pipe between lake 11 (Phase 1/watershed A) and lake 25 (Phase 2/watershed B) offering a third Phase 1-Phase 2 connection.

The Phase 2 pump station will house 3+1 standby stormwater evacuation pumps operating at 25cfs each[2] totaling 75cfs. The pump settings used for the modelling of the 100-year 48-hour storm is described in Section 3.2.1.

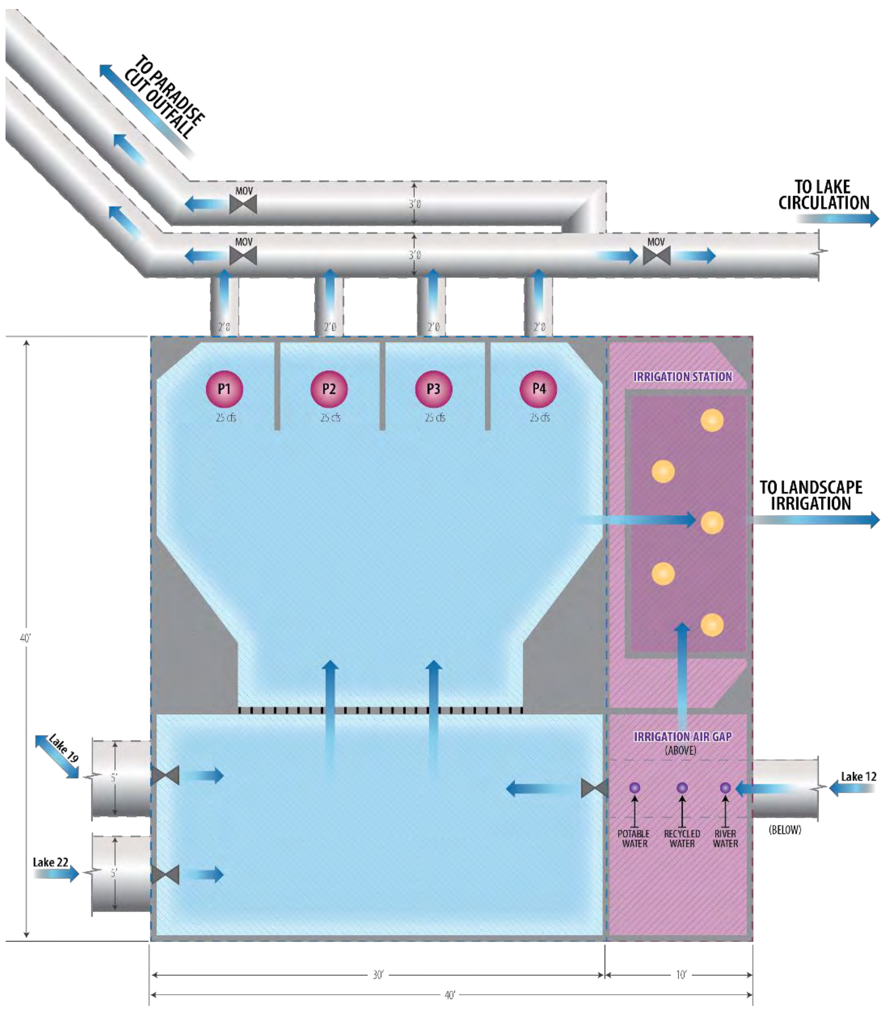

Figure 1-5: Schematic plan view of the Phase 2 pump station.

Note: The irrigation and recirculation features shown for schematic only.

[1] While technically located in watershed C (see Figure 1-1), lake 12 constitutes the connection of watershed A to the Phase 2 pump station as lake 12 in turn is directly connected to the watershed A lake system.
[2] For reference, each pump at pump station A has a capacity of 12.5cfs.

2 Modelling Software and Base Data

2.1 Basic XPSWMM Configuration

An interconnected lake system, drained by pumping, is most realistically analyzed using an integrated hydraulic modelling tool such as XPSWMM. The XPSWMM model captures the behavior of dynamic systems of storage (lakes) and conveyance (pipes) with nonlinear hydraulic elements such as pump arrays. The models were created using dimensional data extracted from the construction plans to represent the actual system geometry, capacity, and pump parameters.

An example plan view of the model with the equalizer pipes is depicted in Figure 2-1. The model includes Phase 2 lakes as well as Phase 1 lakes. The inverts of each of the equalizer pipes are well below the normal operating lake water surface elevations so that the inlets and outlets remained submerged, see Figure 2-2 for an typical example from Phase 1. Phase 2 is assumed to have lake interconnection pipes also well below the normal water surface elevation, though the exact elevation is yet to be determined as these structures are not yet designed for phase 2 lakes.

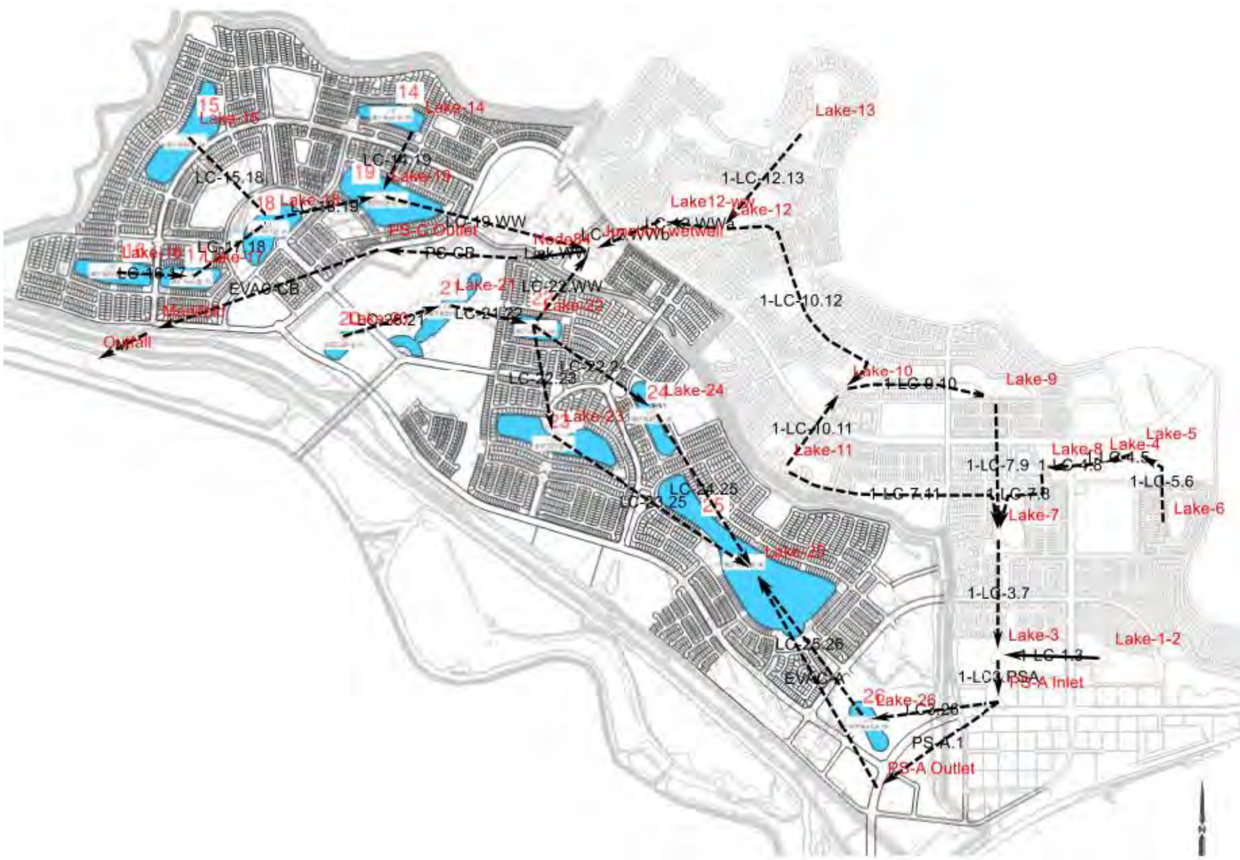

Figure 2-1: Example plan View of XPSWMM Model for phase 2

In addition to the equalizer pipes shown, there are 12-inch overflow pipes in parallel with each of the equalizer pipes, except between lake 2 and lake 3, and between lake 4 and lake 5, for which there is no overflow pipe. The inverts of the overflow pipes are 1.5 feet above the normal lake water surface elevations[3] for all of the overflow pipes in Phase 1 except for the overflow pipe between lake 9 and lake 7, for which the inverts are 2 feet above the normal lake water surface elevations. An example of these overflow pipes is also shown in Figure 2-2. As these structures are not yet designed for phase 2 lakes, the overflow pipes for phase 2 lakes are assumed to be 1.5 feet above the normal water surface elevation – same as for most of phase 1 lakes.

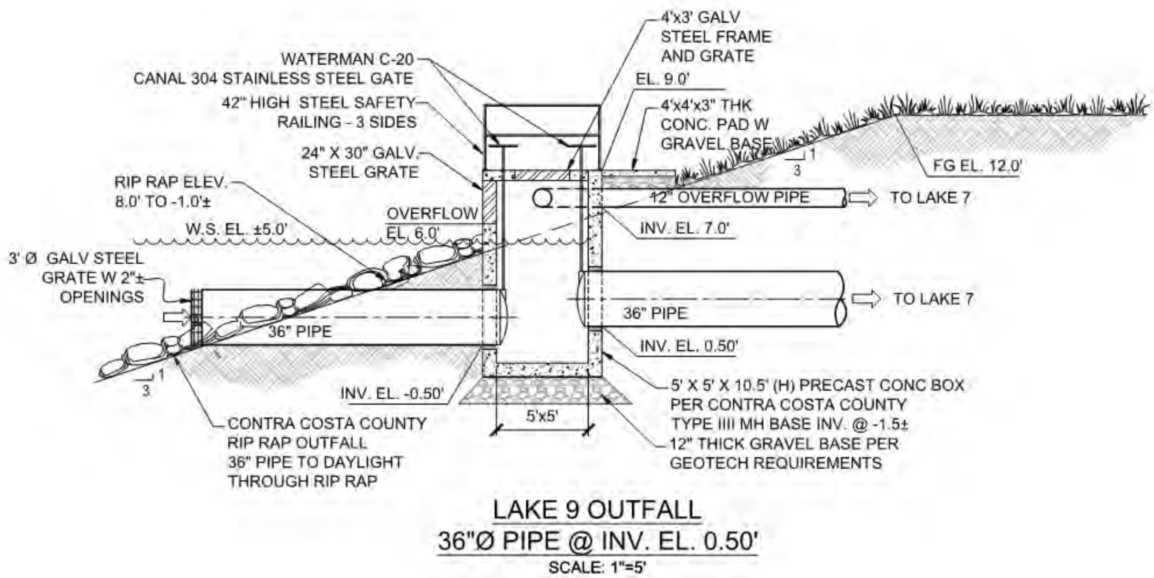

Figure 2-2: Typical Lake Outfall Structure for 36" Equalizer Pipes

[3] Normal water surface elevation is at 5 feet.

2.2 Lake Storage Capacity

Figure 2-3 shows a snapshot of how the lake storage capacity is entered into the modelling software XPSWMM using a stepwise linear curve.

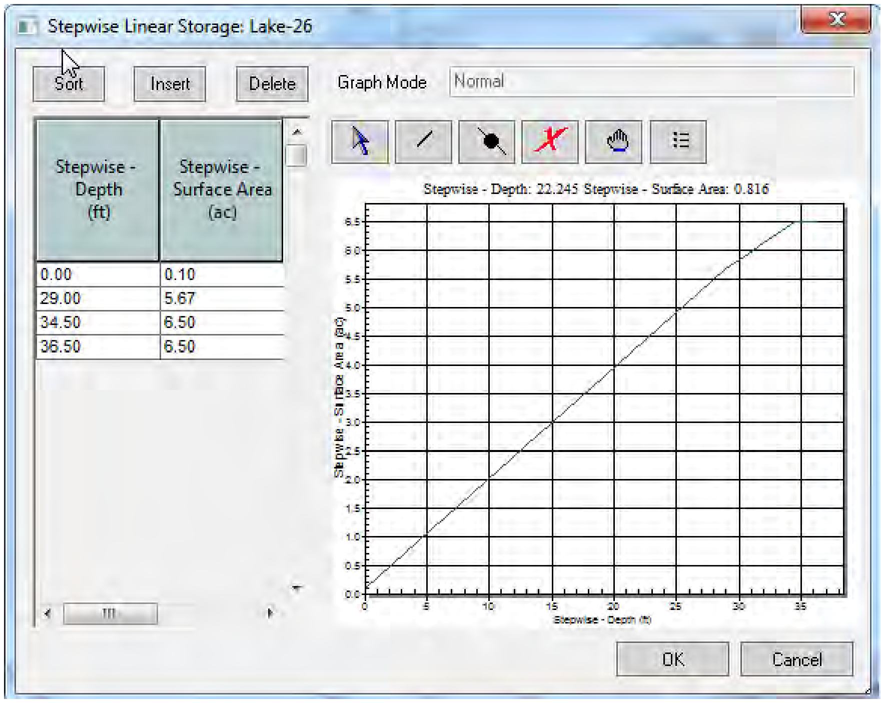

Figure 2-3: View of XPSWMM Input Data for Lake Storage Capacity

The available data for storage modelling (see Exhibits of Lake Storage Volume, Depth and Areas in Appendix A) included:

i. Lake Surface Area
ii. Top Storage Volume
iii. Lake Bottom Elevation
iv. Normal WSEL
v. Lake Top Elevation

With this data the graph could be characterized by three coordinates, $[x_1, y_1]$, $[x_2, y_2]$ and $[x_3, y_3]$, as seen in Figure 2-4 on the following page.

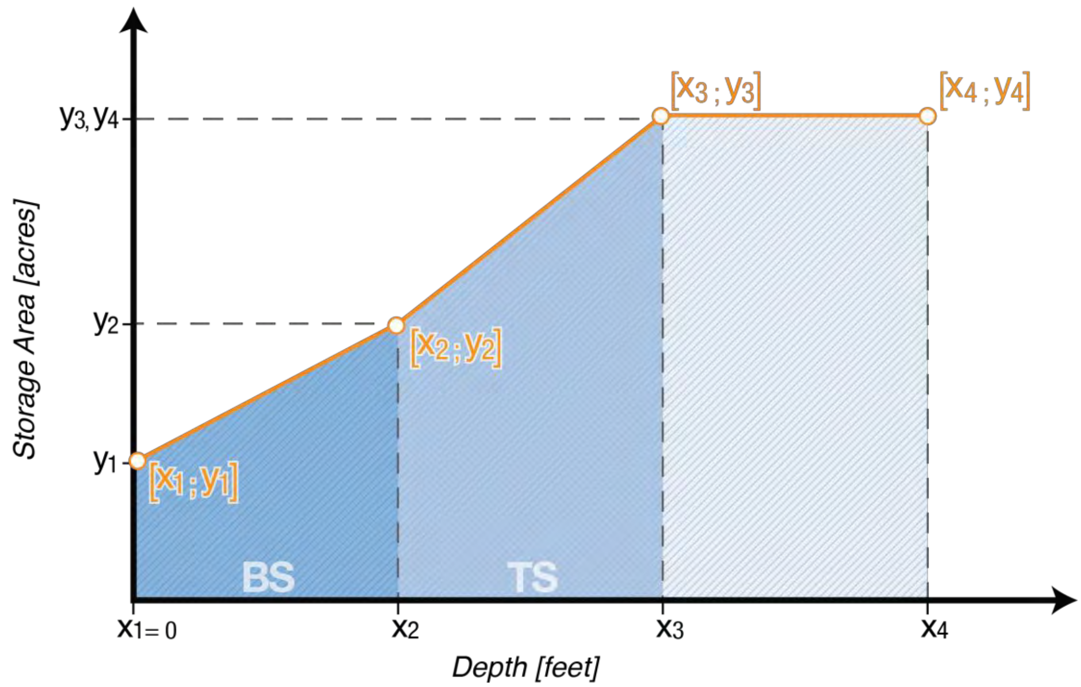

Figure 2-4: Schematic Lake Storage Capacity Graph

Since x_1, x_2, x_3 and y_3 are known, only values for y_1 and y_2 need to be approximated. The abbreviation 'BS', meaning "Bottom Storage", refers to the storage volume below 5 feet, which is the normal water surface elevation. The abbreviation "TS", meaning "Top Storage", refers to the storage volume above 5 feet up to the top of the lake. Since the lakes' water surface will always be 5 feet or greater, the storage volume below 5 feet (the bottom storage) is not important for this analysis. It becomes important first when/if water is being pumped to decrease the lake water surface elevations below 5 feet. As the available data for Phase 2 lakes did not include the Bottom Storage (BS) volume, a value for y_1 was chosen.[4] For simplicity the y_1 was chosen to be the same for all lakes and the value of 0.1 acres was chosen since the modelling software does not allow zero values.

Equations 2.2-1a to 2.2-2b, derived from the calculation of the "area under the curve", were used to mathematically determinate values for y_2. For more details on these calculations refer to Appendix B.

$$TS = (x_3 - x_2) \times y_2 + \frac{(y_3 - y_2) \times (x_3 - x_2)}{2} \qquad \text{Eq. 2.2-1a}$$

$$\rightarrow y_2 = \frac{2 \times TS + x_2 \times y_3 - y_3 \times x_3}{(x_3 - x_2)} \qquad \text{Eq. 2.2-1b}$$

This mathematical model assumes that between these three coordinate points, the lake volume is increasing linearly. The additional fourth coordinate, [x_4, y_4], that can be seen in Figure 2-3, Figure 2-4 and Table 2-1 were added for modelling purposes. Since the purpose of the XPSWMM analysis is to determine if the lakes have sufficient stormwater storage capacity, the additional coordinate was included to capture the water surface elevation if any of the lakes should overtop, assuring no water was "removed" during the analysis due to an overtopping lake. This additional coordinate was placed two feet above the third coordinate ([x_3, y_3]) and has the same storage area as the third coordinate.

[4] For Phase 1 lakes, which are also a part of the Phase 2 models, the bottom storage is calculated based on available data which included bottom storage volume. See River Islands Phase 1 Stormwater Mitigation report dated April 2020 for more information on phase 1 lakes.

Table 2-1: Lake Storage Data for Phase 2 Lakes

Lake 14		Lake 15		Lake 16		Lake 17	
0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10
25.00	6.97	29.00	18.03	29.00	9.15	29.00	7.21
30.50	8.00	34.50	19.70	34.50	10.30	34.50	8.10
32.50	8.00	36.50	19.70	36.50	10.30	36.50	8.10
Lake 18		**Lake 19**		**Lake 20**		**Lake 21**	
0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10
29.00	13.09	25.00	21.17	22.00	4.22	29.00	9.99
34.50	14.30	30.50	22.80	27.50	5.00	34.50	11.90
36.50	14.30	32.50	22.80	29.50	5.00	36.50	11.90
Lake 22		**Lake 23**		**Lake 24**		**Lake 25**	
0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10
23.00	5.93	25.00	16.76	20.00	6.93	29.00	52.93
28.50	6.80	30.50	18.60	25.50	8.10	34.50	56.20
30.50	6.80	32.50	18.60	27.50	8.10	36.50	56.20
Lake 26		***Note:*** *First column is the lake depth in [feet}. Second column is cross-section area in [acres] at that depth.*					
0.00	0.10						
29.00	5.67						
34.50	6.50						
36.50	6.50						

In addition to being used to create the stepwise linear curve for lake storage area per depth, the depth data from the Exhibits in Appendix A was used as direct input in XPSWMM, see example in Figure 2-5 below.

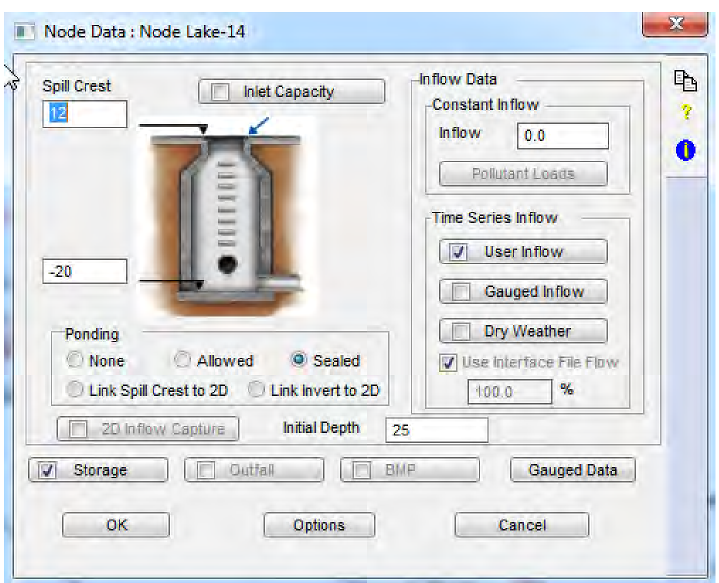

Figure 2-5: Example of XPSWMM Input Data for Lake Depth and Initial Depth

2.3 Lake Interconnection pipe lengths

The lengths for the lake interconnection pipes were collected from the suggested Lake Piping Exhibits, see Appendix C.

After the length was measured, an additional 10% of total pipe length was added to account for any fittings and bends. The velocity is not expected to reach any values that causes significant friction loss, but the extra length was added as a conservative measure. Table 2-2 on the following page shows the measured lengths between the lakes in Phase 2 as well as the lengths including the additional 10% that was used in the analysis. The link between two lakes may be listed more than once as all conduits between the lakes are listed individually (main lake interconnection pipes and overflow pipes). The pipe lengths between two of the same lakes are, however, the same for all conduits between them, as shown in Table 2-2 on the following page. All conduits for Phase 2 are assumed to be 48-inches with a 12” overflow pipe except for the conduit connecting lake 19 to the Phase 2 pump station wet well and the conduit connecting lake 22 to the Phase 2 pump station wet well which are both 60-inches. Figure 2-6 (reduced size version of the Lake Piping Exhibit from Appendix C) shows the layout for Phase 2 of the lake interconnection pipes and the pipes connecting lakes to the stormwater evacuation pump station (Phase 2 pump station).

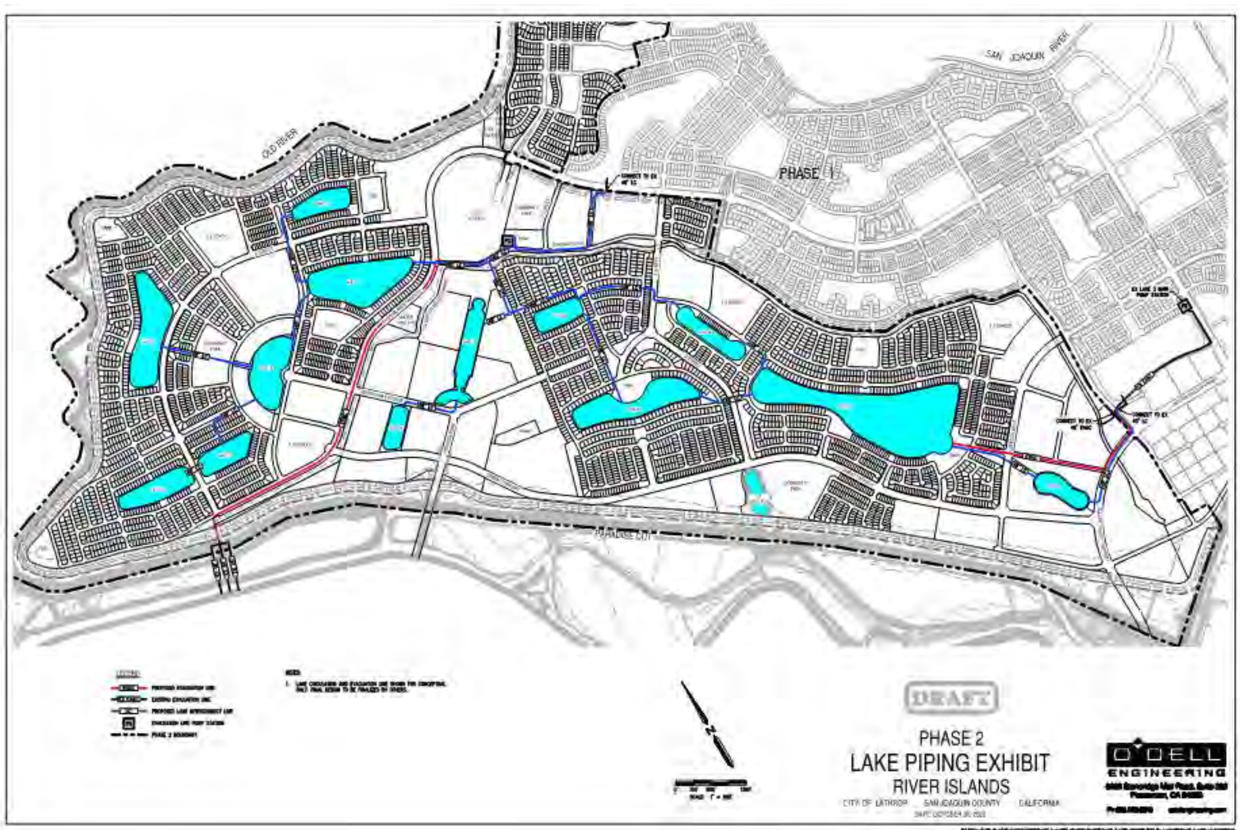

Figure 2-6: Lake interconnection pipe and pump station connection layout

Table 2-2: Pipe Lengths and Invert Elevations for Phase 2

Link Name	Conduit Name	Length [feet]	110% Length [feet]	Upstream Invert Elevation [feet]	Downstream Invert Elevation [feet]
EVAC-A	EVAC-A.1	5633	6196	0	0
EVAC-CB	EVAC-BC	8600	9460	0	0
LC-12.WWa	LC-12.WWa-32	100	110	0	0
LC-12.WWb	LC-12.WWb-48	2663	2930	0	0
LC-14.19	LC-14.19-12	1319	1452	6.5	6.5
LC-14.19	LC-14.19-48	1319	1452	0	0
LC-15.18	LC-15.18-12	1597	1757	6.5	6.5
LC-15.18	LC-15.18-48	1597	1757	0	0
LC-16.17	LC-16.17-12	164	181	6.5	6.5
LC-16.17	LC-16.17-48	164	181	0	0
LC-17.18	LC-17.18-12	1234	1358	6.5	6.5
LC-17.18	LC-17.18-48	1234	1358	0	0
LC-18.19	LC-18.19-12	1147	1262	6.5	6.5
LC-18.19	LC-18.19-48	1147	1262	0	0
LC-19.WW	LC-19.WW-60	1636	1800	0	0
LC-20.21	LC-20.21-12	1129	1242	6.5	6.5
LC-20.21	LC-20.21-48	1129	1242	0	0
LC-21.22	LC-21.22-12	967	1064	6.5	6.5
LC-21.22	LC-21.22-48	967	1064	0	0
LC-22.23	LC-22.23-12	1676	1845	6.5	6.5
LC-22.23	LC-22.23-48	1676	1845	0	0
LC-22.24	LC-22.24-12	1760	1937	6.5	6.5
LC-22.24	LC-22.24-48	1760	1937	0	0
LC-22.WW	LC-22.WW-60	1400	1540	0	0
LC-23.25	LC-23.25-12	946	1041	6.5	6.5
LC-23.25	LC-23.25-48	946	1041	0	0
LC-24.25	LC-24.25-12	526	579	6.5	6.5
LC-24.25	LC-24.25-48	526	579	0	0
LC-25.26	LC-25.26-12	3428	3772	6.5	6.5
LC-25.26	LC-25.26-48	3428	3772	0	0
LC-3.26	LC-3.26-12	2386	2625	6.5	6.5
LC-3.26	LC-3.26-48	2386	2625	0	0
Link.WW	Link.WW	n/a	33	0	0

2.4 Hydrographs and Rainfall Data

The input data for XPSWMM that represents the rainfall and drainage from surrounding watershed into each lake is a hydrograph. The hydrograph shows the amount of water going into the lake over time (the rain event).

A technical report, *River Islands Stage 1, 2A and 2B Full Buildout Internal Hydrology Analysis* dated *October 23 2019*, contained the analysis of all Phase 1 lakes (lakes 1-13) for the 48-hour storm event. The 48-hour storm event data (hydrographs) for lakes 10-13 were directly used as input in the XPSWMM 48-hour storm event hydraulic models. The hydrographs for Phase 1 lakes are also described in detail in *River Islands Phase 1 Stormwater Mitigation report* dated *April 2020.*

Since an HEC-HMS analysis was not available for the Phase 2 watershed, the below methods was used to retrieve hydrographs for the lakes in Phase 2. The analysis was done for the hydrographs given by both methods below to allow a comparison. More exact hydrographs would be obtained by a detailed HEC-HMS analysis of the Phase 2 development, which is assumed to be completed at a later date. See Appendix D for detailed calculations from the below described scaling methods.

2.4.1 Scaling based on approximated drawn contributory area

The hydrograph for each lake and design storm was scaled from the hydrograph for lakes 1-2-3 based on their approximated contributory area, thus assuming the ratio of developed/undeveloped area as well as runoff coefficients etc. to be the same in Phase 2 as in Phase 1 Stage 1. See Figure 2-7 for a graphic representation of the contributory areas for each lake.

$$\frac{Contributory\ Area\ for\ Lake\ X}{Contributory\ Area\ for\ Lake\ 1\!-\!2\!-\!3} = \frac{Hydrograph\ Value\ Lake\ X}{Hydrograph\ Value\ Lake\ 1\!-\!2\!-\!3} \qquad \text{Eq. 2.4-1}$$

- *Solve for Hydrograph Value Lake X*

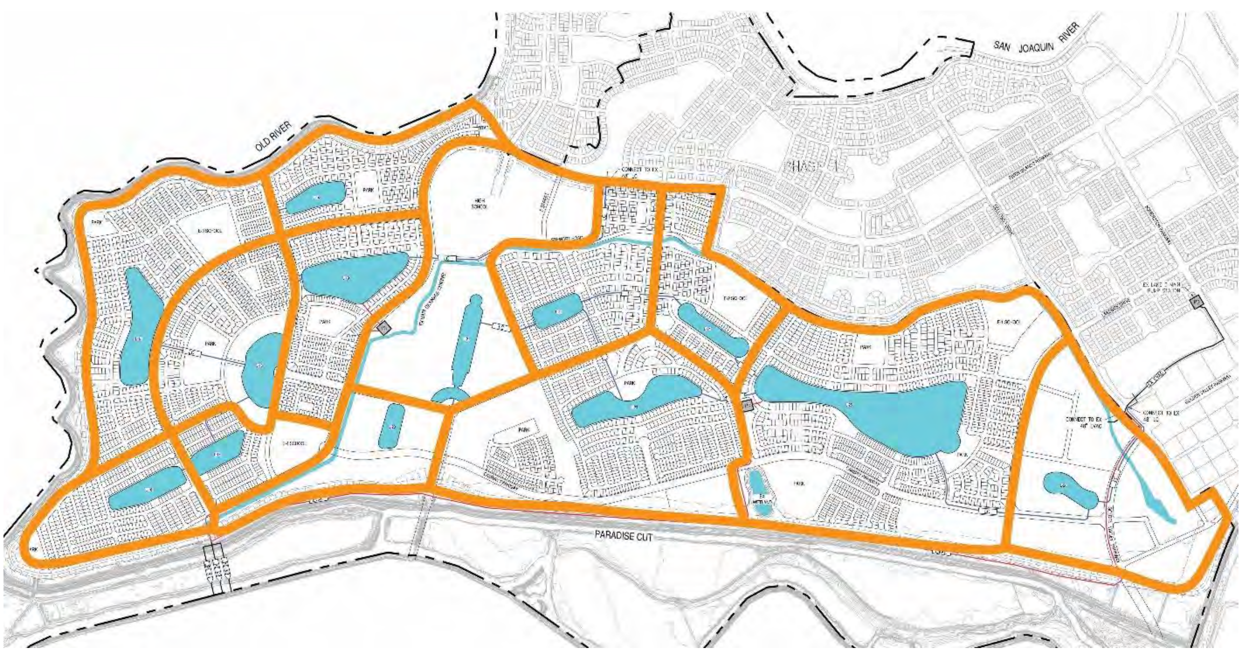

Figure 2-7: Approximate contributory drainage area for phase 2 lakes

The scaling factors for each of the lakes in Phase 2, received by using the above described method, are shown in Table 2-3 below.

Table 2-3: Scaling factor based on Approximated Contributory Drainage Area

Lake	Scaling factor based on Approximated Contributory Drainage Area
14	0.190
15	0.402
16	0.204
17	0.136
18	0.248
19	0.254
20	0.157
21	0.425
22	0.224
23	0.546
24	0.197
25	0.835
26	0.434

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2.4.2 *Scaling based of contributory area relative to lake size*

1. The contributory area for each lake group relative to the total area of the lake group contributory area was assumed to be proportional to the area of each individual lake relative to the total lake area for the lakes in Phase 2. Since the total land area for Phase 2 could be measured/estimated, the amount of area draining to each lake could be approximated.

$$\frac{Contributory\ Area\ for\ Lake\ X}{Total\ area\ of\ Watershed\ Phase\ 2} = \frac{Area\ Lake\ X}{Total\ Area\ of\ Phase\ 2\ Lake} \qquad \text{Eq. 2.4-2a}$$

   - *Solve for Contributory Area for Lake X*

2. The hydrograph for each lake and design storm was scaled from the hydrograph for lakes 1-2-3 based on their contributory area (from step 1), thus assuming the ratio of developed/undeveloped area as well as runoff coefficients etc. to be the same in Phase 2 as in Phase 1 Stage 1.

$$\frac{Contributory\ Area\ for\ Lake\ X}{Contributory\ Area\ for\ Lake\ 1{-}2{-}3} = \frac{Hydrograph\ Value\ Lake\ X}{Hydrograph\ Value\ Lake\ 1{-}2{-}3} \qquad \text{Eq. 2.4-2b}$$

   - *Solve for Hydrograph Value Lake X*

The scaling factors for each of the lakes in Phase 2, received by using the above described method, are shown in Table 2-4 below.

Table 2-4: Scaling based on Contributory Area Relative to Lake Size

Lake	**Scaling factor based on Contributory Area Relative to Lake Size**
14	0.402
15	0.204
16	0.136
17	0.248
18	0.254
19	0.157
20	0.425
21	0.224
22	0.546
23	0.197
24	0.835
25	0.434

3 Model Configurations

For Phase 1, a number of different modeling configuration was analyzed due to the ongoing discussion about abandoning pipes, slip lining and other repair procedures. Since this is not relevant for Phase 2, there are fewer model configurations. The two different model configurations for Phase 2 that will be presented in the sections below, are both based on the Phase 1 layout of Model Configuration *D-48.* The below sections contain a brief summary of the nomenclature used for that particular configuration as well as the description of some new Phase 2 nomenclature. For the full Phase 1 nomenclature descriptions, please refer to *River Islands Phase 1 Stormwater Mitigation Report* dated *April 2020*.

3.1 Phase 1 nomenclature summary

3.1.1 Model D

As the "D" model is the most recent estimation of Phase 1 layout, this model was used for the Phase 2 analysis. Compared to the "As Built" conditions, these are the things that changed for the D-model.

i. Abandoning the pipe between lakes 12 and 11 modelled by removing this pipe from the model (Proposed modification)
ii. Slip lining the 48 inches pipe between lakes 12 and 10 modelled by using a smaller pipe diameter, 32 inches (Performed modification)
iii. Slip lining the 48 inches pipe between lakes 12 and Phase 2 lake modelled by using a smaller pipe diameter, 32 inches (Proposed modification)
iv. The first 100 feet between lake 12 (phase 1) and phase 2 are reduced to 32" (original size 48").

3.1.2 48

The 100-year 48-hour storm event is modelled.[5]

3.1.3 Dynamic (d) and Static (s)[6]

Each model scenario is analyzed both for the event that the pumps (Phase 1 pump station[7] and Phase 2 pump station) are turned on and turned off. The scenario for when the pumps are turned off is analyzed to get the highest possible water surface elevation in the lakes. The results for these analyses is presented together with its dynamic counterpart since all other data, e.g. time to stabilize the water surface elevation, is non-applicable for this scenario.

d. Dynamic – Pumps turned on
a. Static – Pumps turned off

[5] Technically not related to Phase 1 layout but first introduced in the Phase 1 models/Phase 1 Stormwater Mitigation report.
[6] idem
[7] *Phase 1 pump station* and *Pump Station A* are used interchangeably.

3.2 New Phase 2 nomenclature

3.2.1 Alternative 6 (Alt 6)

As for Phase 1 nomenclature, Alternative 6 (Alt 6) refers to the number of active stormwater evacuation pumps. For this new alternative, it does not only refer to the pump station in watershed A but also the one in watershed B/C.

- **Alt 6** has an equivalent of 8 active unit pumps: 2 at pump station A (by lake 3), 6[8] (3 actual pumps) at Phase 2 pump station in watershed B/C (between lakes 12, 19 and 22).

The pumps (for models with pumping) are modelled with pumps "Rated By Static Head" meaning that a pump that pumps according to the head at the upstream node using a multi-point pump curve and starting and stopping elevations. The pump rate was set to 12.5cfs for all static head values meaning that all pumps would pump 12.5cfs (each) whenever on[9]. The start and stop elevations for the pumps at all pump stations:

- Pump 1: Start 5.3 Stop: 5.1
- Pump 2: Start 5.5 Stop: 5.1
- Pump 3: Start 5.7 Stop: 5.1 (Phase 2 pump station only)
- Pump 4: Start 5.3 Stop: 5.1 (Phase 2 pump station only)
- Pump 5: Start 5.5 Stop: 5.1 (Phase 2 pump station only)
- Pump 6: Start 5.7 Stop: 5.1 (Phase 2 pump station only)

3.2.2 Lake (L)

The designation "L" refer to the path the stormwater from watershed A/phase 1 is evacuated.

- **L:** Water from lake 3 in watershed A is pumped into lake 25 located in watershed B.

3.2.3 Version 2.0 (V20)

The designation V20 refers to the finalized lake- and pump station connection pipes layout for phase 2. While this report only presents the results for this layout, the designation is included to differentiate between pervious model configurations presented in earlier revisions of the River Islands Phase 2 Stormwater Report. In Appendix C the layout of the lake interconnection pipes for this model are shown and Figure 2-1 shows the same layout in the XPSWMM interface.

3.2.4 Contributory (ca) and Lake (la) drainage areas

- **ca:** Approximated contributory drainage area used for phase 2 lake hydrograph as described in section 2.4.1.

- **la:** Contributory drainage area scaled relative to the lake size compared to total lake area in phase 2 as described in section 2.4.2.

3.2.5 Phase 2 Pump Station (PS)

- **PS**: Assumes there is a lake interconnection pipe (flat gravity pipe) between lake 12 in Phase 1 and the wet well at the Phase 2 pump station in watershed B/C[10].

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[8] As described in Section 1.2, the actual Phase 2 Pump station will have 3 active pumps with twice the flow (25cfs) from described here (12.5cfs) as well as one standby pump. The 12.5cfs unit pumps are used for correlation with the other pump station (pump station A in Phase 1).
[9] idem
[10] Note that the "Phase 2 Pump Station" (PS) configuration is different from the Phase 1 model configuration "Farm Pump" (FP) where a temporary pump is evacuating stormwater from lake 12. See River Islands Phase 1 Stormwater Mitigation report dated April 2020 for more information on the "Farm Pump" model configuration.

3.3 List of Modelled Scenarios for Phase 2

Reference to the different models/scenarios are made using the nomenclature of the variables described in the previous sections, including both nomenclature from phase 1 and 2. When combining the different categories, a unique ID for referencing a specific model/scenario is created. This nomenclature is used when referring to the different model configurations henceforth. An example is presented below.

Example: **Alt 6-L-ca-V20-PS-D-48-d** refers to the modelling scenario where there are the equivalent of 8[11] (5 actual pumps[12]) *unit pumps active* in watersheds A, B and C *(***Alt6***),* watershed A pump station is pumping *into lake 25* (L) and phase 2 lake hydrographs are based on *approximated contributory drainage area* (**ca**). *Lake 12 is connected to the Phase 2 Pump station* (**PS**). Phase 1 pipes are altered from their as built conditions *per model D* (**D**). The *48-hour 100-year storm* event is analyzed (**48**) for the *dynamic scenario* where the pumps are turned on (**d**).

The list below presents all the analyzed scenarios using the nomenclature described above.

Phase 2 models:

1. Alt6-LAKE-V20-ca-PHASE 2 PUMP STATION-D-48-d and s
2. Alt6-LAKE-V20-la- PHASE 2 PUMP STATION -D-48-d and s

Notes:

1. *As the list above shows, the "D" part (referring to some Phase 1 nomenclature) of the model configuration names are identical for all phase 2 model configurations. This may seem unnecessary to include at present but these index are kept for easier reference to important model information as well as to distinguish between these models and other models that may be created in the future.*
2. *As per Note 1 above, most of the Phase 2 model configuration nomenclature ("Alt6-LAKE-V20" as well as "*PHASE 2 PUMP STATION*") is the same for both model configurations. This may also seem unnecessary to include at present but these index are kept for easier reference and to not confuse these Phase 2 models configurations with those from previous revisions of this report.*

[11] As described in Section 1.2, the actual Phase 2 Pump station will have 3 active pumps with twice the flow compared to the "unit pump", thus totaling a capacity of 2x3=6 unit pumps at the Phase 2 pump station. Phase 1 pump station (pump station A) will have 2 active unit pumps.
[12] idem

4 Results from the Analyses XPSWMM models

The results from the 4 different modelling variations described above yielded 2 different results for each lake. The static analyses for all variations are presented together with its dynamic counterpart since all other data, e.g. time to stabilize the water surface elevation, is non-applicable for the static analyses. For each lake and scenario, the six result parameters defined below have been extracted.

i. Instantaneous Peak water surface elevation (static analysis):
Maximum water surface elevation in lake after storm event when pumps are turned off (static analysis).

ii. Static water surface elevation (static analysis):
Stable and equalized water surface elevation in the lakes after storm event when pumps are turned off (static analysis).

iii. Peak water surface elevation (dynamic analysis):
Maximum water surface elevation in lake after storm event when pumps are turned on as programmed as soon as the lake water surface elevation exceeds 5.3’ (dynamic analysis).

iv. Stable water surface elevation (dynamic analysis):
The minimum water surface elevation reached after a storm event (dynamic analysis).

v. Time to 7’ (dynamic analysis):
The required time in days after a storm event for the lake water surface elevation to recede to the top of wall at 7’ (dynamic analysis). The duration of the storm is not included in the drawback times.

vi. Time to stable (dynamic analysis):
The required time in days after a storm event for the lake water surface elevation to recede to the stable water surface elevation (dynamic analysis). The duration of the storm is not included in the drawback times.

The results, using the above result parameters, for both scenarios are shown in the Table 4-1. The results from Table 4-1 are shown graphically in Figure 4-1and Figure 4-2. Figure 4-3 and Figure 4-4 shows the results for the dynamic analyses in graph form (water surface elevation vs. time) for all 26 lakes. The corresponding graphs for the static analysis can be found in Appendix F. The subsequent subsections discuss some of the most relevant results

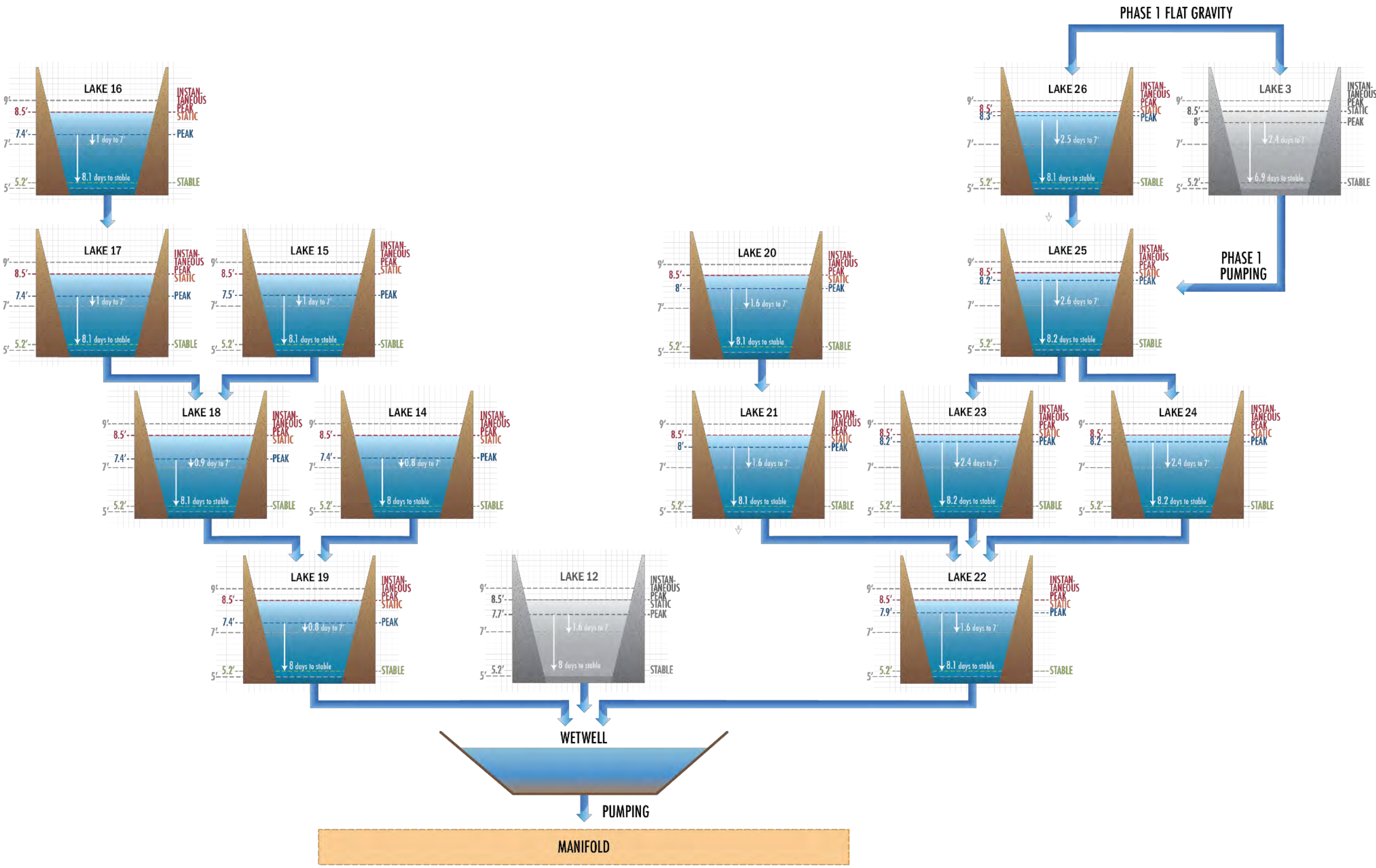

Figure 4-1: Graphical representation of the result for analysis of model configuration Alt 6-L-V20-ca-PS-D-48.

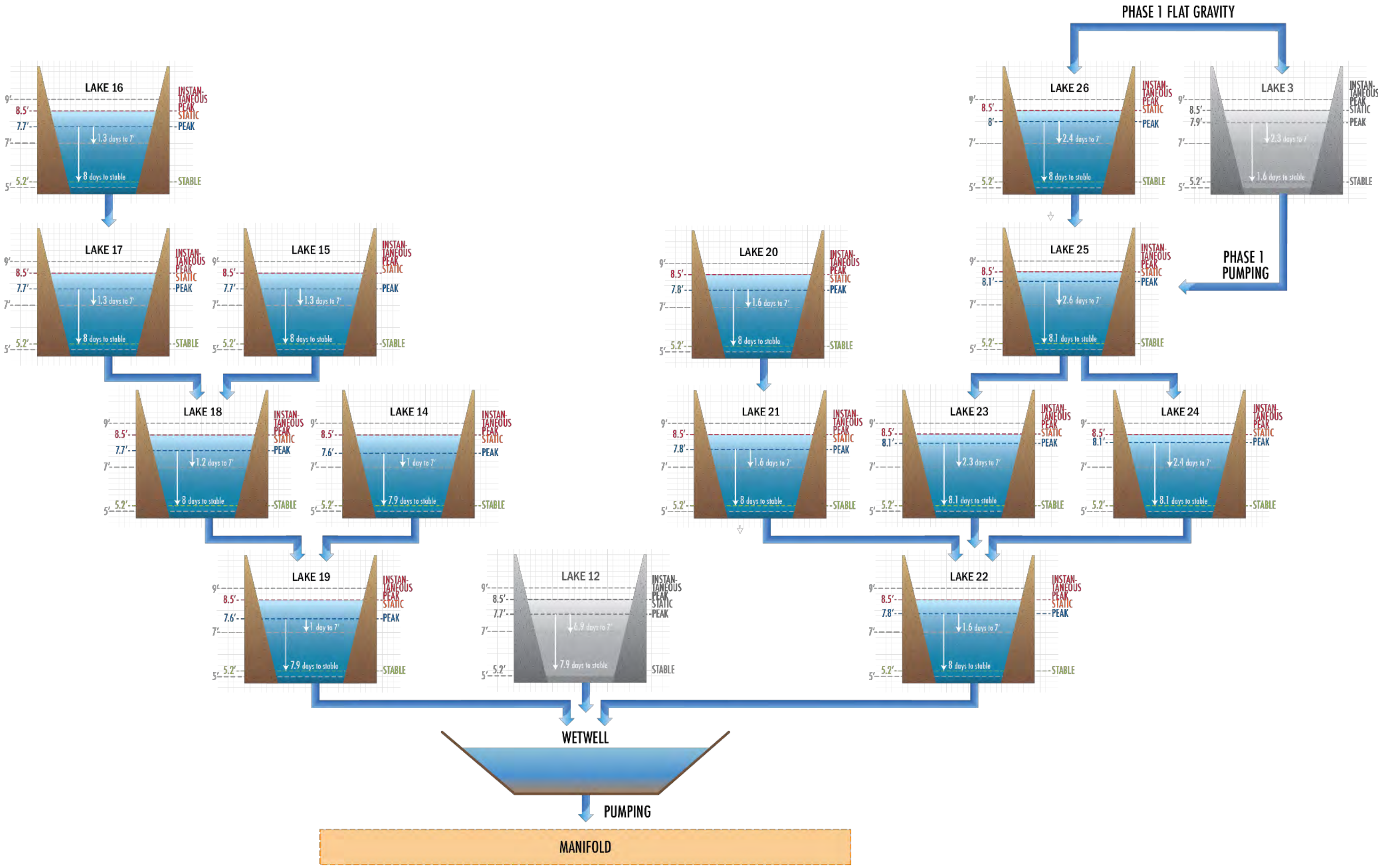

Figure 4-2: Graphical representation of the result form analysis of model configuration Alt6-L-ca-V20-la-PS-D-48.

PACE

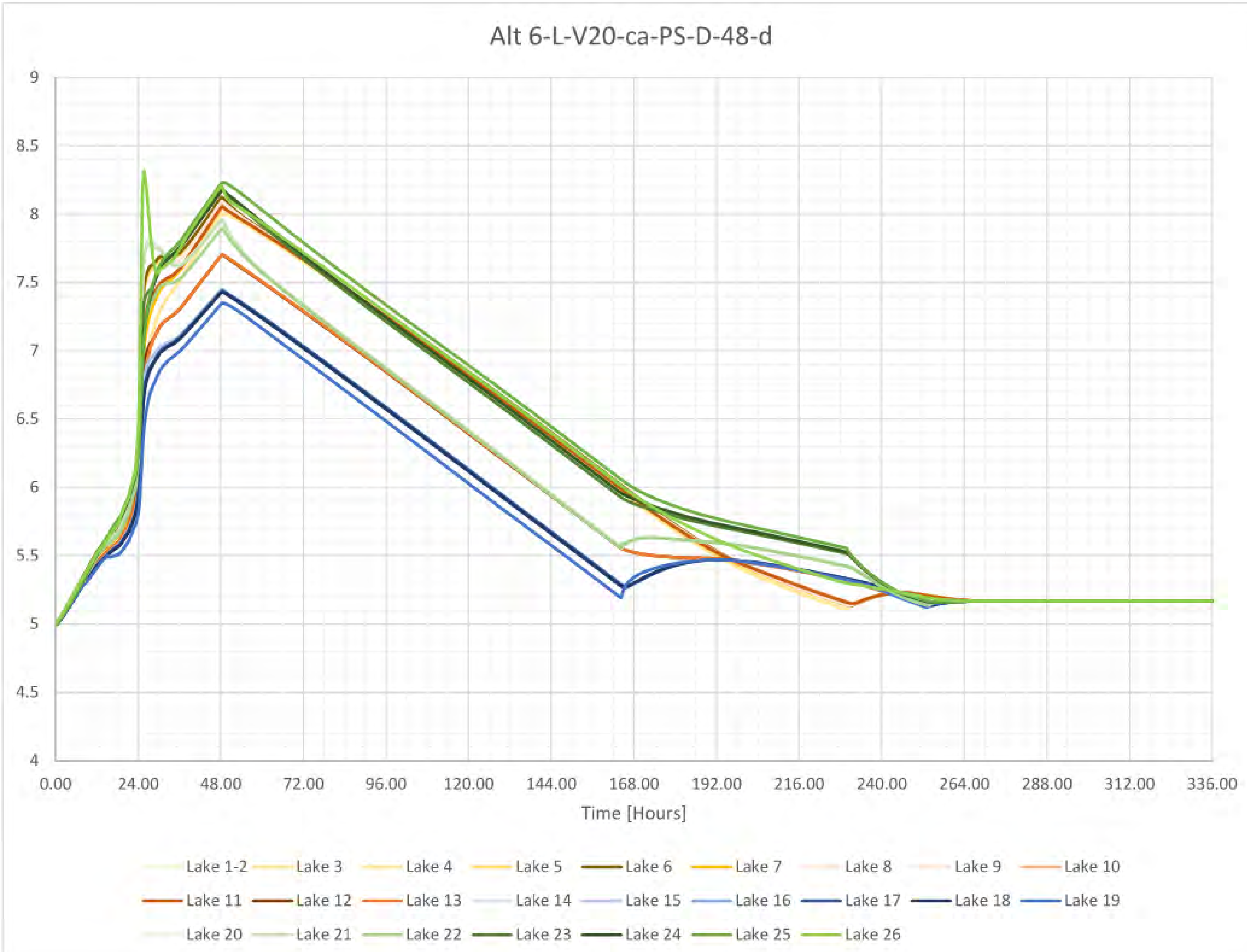

Figure 4-3: Result for the dynamic analysis for model configuration Alt6-L-V20-ca-PS-D-d.

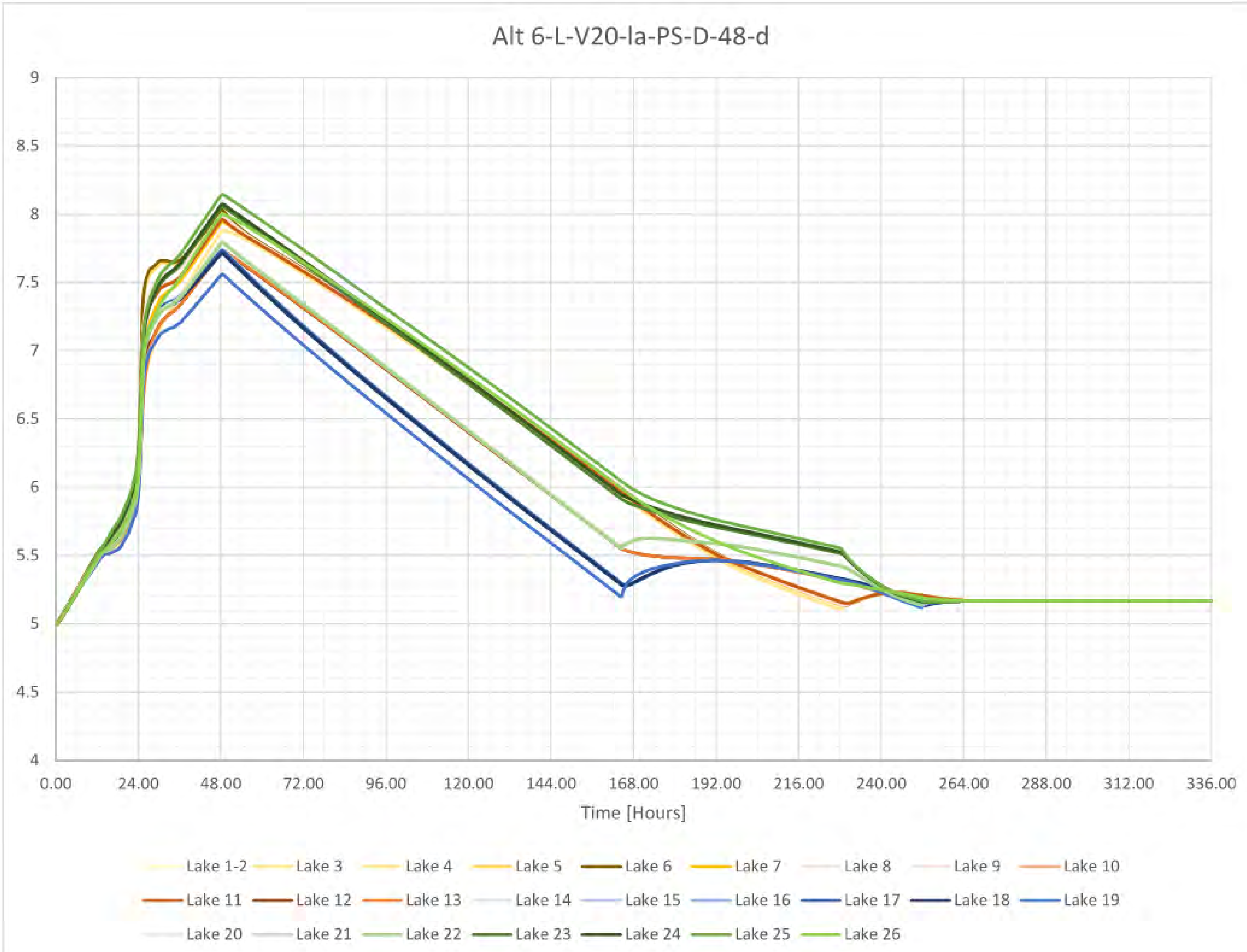

Figure 4-4: Result for the dynamic analysis of model configuration Alt6-L-V20-la-PS-D-d.

Table 4-1: Result table for model configurations Alt-6-L-V20-ca-PS-D and Alt-6-L-V20-la-PS-D.

Lake	Alt6-LAKE-V20-ca- PHASE 2 PUMP STATION -D-48						Lake
	INSTAN-TANEOUS PEAK WSEL	STATIC WSEL	PEAK WSEL	TIME TO 7'	TIME TO STABLE	STABLE WSEL	
	[FEET]	[FEET]	[FEET]	[DAYS]	[DAYS]	[FEET]	
14	8.5	8.5	**7.4**	0.8	8.0	5.2	**14**
15	8.5	8.5	**7.5**	1.0	8.1	5.2	**15**
16	8.5	8.5	**7.4**	1.0	8.1	5.2	**16**
17	8.5	8.5	**7.4**	1.0	8.1	5.2	**17**
18	8.5	8.5	**7.4**	0.9	8.1	5.2	**18**
19	8.5	8.5	**7.4**	0.8	8.0	5.2	**19**
20	8.5	8.5	**8.0**	1.6	8.1	5.2	**20**
21	8.5	8.5	**8.0**	1.6	8.1	5.2	**21**
22	8.5	8.5	**7.9**	1.6	8.1	5.2	**22**
23	8.5	8.5	**8.2**	2.4	8.2	5.2	**23**
24	8.5	8.5	**8.2**	2.4	8.2	5.2	**24**
25	8.5	8.5	**8.2**	2.6	8.2	5.2	**25**
26	8.5	8.5	**8.3**	2.5	8.1	5.2	**26**

Lake	Alt6-LAKE-V20-la- PHASE 2 PUMP STATION -D-48						Lake
	INSTAN-TANEOUS PEAK WSEL	STATIC WSEL	PEAK WSEL	TIME TO 7'	TIME TO STABLE	STABLE WSEL	
	[FEET]	[FEET]	[FEET]	[DAYS]	[DAYS]	[FEET]	
14	8.5	8.5	**7.6**	1.0	7.9	5.2	**14**
15	8.5	8.5	**7.7**	1.3	8.0	5.2	**15**
16	8.5	8.5	**7.7**	1.3	8.0	5.2	**16**
17	8.5	8.5	**7.7**	1.3	8.0	5.2	**17**
18	8.5	8.5	**7.7**	1.2	8.0	5.2	**18**
19	8.5	8.5	**7.6**	1.0	7.9	5.2	**19**
20	8.5	8.5	**7.8**	1.6	8.0	5.2	**20**
21	8.5	8.5	**7.8**	1.6	8.0	5.2	**21**
22	8.5	8.5	**7.8**	1.6	8.0	5.2	**22**
23	8.5	8.5	**8.1**	2.3	8.1	5.2	**23**
24	8.5	8.5	**8.1**	2.4	8.1	5.2	**24**
25	8.5	8.5	**8.1**	2.6	8.1	5.2	**25**
26	8.5	8.5	**8.0**	2.4	8.0	5.2	**26**

4.1 Maximum Instantaneous Peak water surface elevation and Static water surface elevation

For both the “ca” and the “la” model configurations, the static and the instantaneous peak water surface elevations coincide and are 8.5 feet for all lakes.

4.2 Maximum Peak Water Surface Elevation

The maximum peak water surface elevation in any of the lakes was 8.3 (lake 26, for *Alt 6-L-ca-PS-D-48-d*). Assuming that the planned lowest road elevations are expected to be around the same as in Phase 1 (10.5ft), the lake elevations for the analyzed scenarios would not be an issue.

4.3 Maximum stable water surface elevations

As the pump stops pumping at the same elevations for both model configurations, the same stable water surface elevation is to be expected. The stable water surface elevation is 5.2 feet for all lakes and model configurations. Since the pumps stop pumping when the water surface elevation is 5.1 feet (first pump starts at 5.3 feet), 0.1-0.2 feet will evaporate naturally before the lakes reach their design water surface level of 5 feet.

4.4 Average Time to a 7 feet Water Surface Elevation

The time to drain back to a 7 feet water surface elevation ranges from 0.8 days to 2.6 days.

4.5 Peak Duration and Time to Stable

As section 4.4 suggests, the water surface elevation recedes down to 7 feet rather quickly with lakes 20-26 taking the longest. It takes around 8 days for the water surface elevation to recede to its stable elevation. As Figure 4-3 and Figure 4-4 show, the draining velocity is more or less constant (constant slope in elevation vs. time graph) from the lakes’ water surface elevation peak to five days after the storm after which the draining velocity is reduced.

At the end of the storm when most of the stormwater runoff has been evacuated the flow between lakes and into the pump station wet well decreases, resulting in a slowdown in the drainage time for the last few inches in the lakes. The inflow to the Phase 2 pump station wet well varies with the fluctuating rainfall intensity and with the dynamic head difference between lakes. Since the pumps on- and off elevations are based on the wet well water surface elevation, there may be times where the water surface elevation in the wet well temporarily goes below the ‘stopping’ elevation and then goes back up when the inflow to the wet well increases again. This was the case for the modelled scenarios presented in this report resulting in the last couple days’ drainage only utilizing one of the pumps (25cfs) as the starting elevation for pump number two and three was not reached after a temporary low water surface elevation. For both the analyzed model configurations all pumps have stopped 8.6[13] days after the end of the storm. The pump flow (25cfs) at the end of the storm evacuation keeps up with the inflow to the wet well indicating that the drainage time would not be decreased significantly even if all pumps were used at the end (75cfs) as it likely would not significantly increase the flow between lakes several steps upstream of the wet well/pump station.

[13] 8.5 days and 8.6 days after the end of the storm event respectively for the “ca” and “la” model configurations.

4.6 Difference between the two hydrograph methods (ca and la)

As Table 4-2below shows, the difference between the “ca” and the “la” hydrograph scaling method has a small impact on the peak water surface elevation. For lakes 14-19, the “la” method yielded up to 0.3ft higher peak (compared to “ca”) and for lakes 20-26 the “ca” method yielded up to 0.3ft higher peak (compared to “la”).

Table 4-2: Difference in water surface elevation between the two hydrograph scaling methods.

Lake	Alt6-LAKE-V20-ca-PS-D-48-d	Alt6-LAKE-V20-la-PS-D-48-d	N/A	Lake
	PEAK WSEL	PEAK WSEL	ΔWSEL	
	[FEET]	[FEET]	[FEET]	
14	7.4	7.6	0.2	**14**
15	7.5	7.7	0.3	**15**
16	7.4	7.7	0.3	**16**
17	7.4	7.7	0.3	**17**
18	7.4	7.7	0.3	**18**
19	7.4	7.6	0.2	**19**
20	8.0	7.8	-0.2	**20**
21	8.0	7.8	-0.2	**21**
22	7.9	7.8	-0.1	**22**
23	8.2	8.1	-0.1	**23**
24	8.2	8.1	-0.1	**24**
25	8.2	8.1	-0.1	**25**
26	8.3	8.0	-0.3	**26**

The difference between the “la” and “ca” methods is reasonable when considering how all the water was distributed throughout the lake system. Phase 2 can be divided into two sets of smaller lake systems. Lakes 14 -19 all drains to the Phase 2 pump station via lake 19. Lakes 20-26 all drains to the Phase 2 pump station via lake 22. For the “la” scenarios, lakes 14-19 combined received more water than they did for the “ca” scenario and vice versa for lakes 20-26 See Section 2.4 for more details.

4.7 Outfall manifold velocity

In addition to the lakes’ drainage time and maximum water surface elevation for the different scenarios, the maximum velocity in the manifold pipes conveying the stormwater above the levee to the river was analyzed. Table 4-3 below shows the velocity in the three outfall pipes for the eight modelled scenarios. As the flow to the manifold are determined solely by the pumps at the Phase 2 pump station, the velocity in the outfall manifold pipes is the same for both scenarios.

Table 4-3: Maximum velocities in the outlet manifold.

Model configuration	Manifold/outlet maximum velocity [fps]		
	24" Ø pipe	18" Ø pipe	24" Ø pipe
Alt6-L-V20-ca- PS-D-48-d	9.2	9.6	9.2
Alt6-L-V20-la-PS-D-48-d	9.2	9.6	9.2

4.8 Phase 1 impact

As these phase 2 models also included some alterations that could potentially impact phase 1 lakes (e.g. the lake 12 connection to the Phase 2 pump station), the peak water surface elevation for both model scenarios was compared to a few of the Phase 1 modelling results.

The most accurate comparison would be a comparison with Alt 1-Farm Pump-D-48 and Alt 1-Gravity-D-48 as the “Alt 1” models have two (2) pumps active at the lake 3 pump station (pump station A) as does the “Alt6” configuration for the modeling results presented in this report. Furthermore, a comparison with the Phase 2 pump station scenario (PS) would be best done with both the “Gravity” and the “Farm Pump” scenarios. As the model configurations “Alt 1-Farm Pump-D-48” or “Alt 1-Gravity-D-48” were not analyzed as a part of the Phase 1 stormwater modelling, the comparison have been made with following Phase 1 model configurations:

- Alt 1- Farm Pump-B-48
- Alt 1- Farm Pump-C-48
- Alt 1- Gravity-B-48
- Alt 1- Gravity-C-48
- Alt 2- Gravity-D-48

The comparison can be found in in Appendix G. Details on the Phase 1 model configuration nomenclature not used for the Phase 2 model configurations presented in this report, as well as detailed Phase 1 model configuration results can be found in the *Stormwater Analysis Report-River Islands Phase 1 Stormwater Mitigation, Revision 2* dated *April 2020*.

5 Conclusions

The results indicate that the lakes and pump capacities are sufficient for interim stormwater storage and drainage with no water surface elevation exceeding the expected lowest road elevation (assuming the lowest elevation is no less than 10.5 as for Phase 1).

APPENDIX

A

Appendix A: Lake Volume Exhibit

PHASE 2 LAKES				
SITE	AREA (AC)	PERIMETER (FT)	ULTIMATE LAKE BOTTOM ELEV. (FT)	STORAGE VOLUME (CY)
L-1	56.2±	8,870±	-24	484,200±
L-2	8.1±	3,190±	-15	66,700±
L-3	18.6±	5,100±	-20	156,900±
L-4	6.8±	2,220±	-18	56,500±
L-5	11.9±	4,990±	-24	97,100±
L-6	5.0±	1,940±	-17	40,900±
L-7	22.8±	4,330±	-20	195,100±
L-8	8.0±	2,720±	-20	66,400±
L-9	14.3±	3,280±	-24	121,500±
L-10	19.7±	4,650±	-24	167,400±
L-11	8.1±	2,560±	-24	67,900±
L-12	10.3±	3,140±	-24	86,300±
L-13	6.5±	2,390±	-24	54,000±
TOTAL	196.3±	49,380±		1,660,900±

NOTES:
1. ULTIMATE LAKE BOTTOM ELEVATION PER ENGEO'S RECOMMENDATION DATED 02/11/2020.
2. LAKE PERIMETER LENGTH SHOWN REPRESENTS THE TOTAL LENGTH AT LAKE EDGE.
3. STORAGE VOLUME IS CALCULATED FROM LAKE EDGE AT ELEVATION 10.5 TO WATER SURFACE ELEVATION @ 5.0.

PHASE 2
LAKE EXHIBIT
RIVER ISLANDS

CITY OF LATHROP   SAN JOAQUIN COUNTY   CALIFORNIA
DATE: APRIL 03, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340   odellengineering.com

T:\25503-RIVER ISLANDS\PHASE 43 - PHASE 2 CONCEPTUAL LAYOUT\ACAD\PHASE 2 LAKES\PHASE 2 LAKE EXHIBIT\PHASE 2 LAKE EXHIBIT.DWG

B

Appendix B: Lake Storage, Volume and Depth Tables

APPENDIX B: LAKE STORAGE, VOLUME AND DEPTH TABLES FOR RIVER ISLANDS PHASE 2

Name	Lake Surface Area	Lake Bottom Elevation	Normal WSEL	Lake Top Elevation	Total depth	Total Lake Volume	Bottom Storage	Top Storage	x_1	x_2	x_3	y_1	y_2	y_3
Acronym	**LA**	**BE**	**NE**	**TE**	**TD**	**LV**	**BS**	**TS**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Unit	*[acres]*	*[ft]*	*[ft]*	*[ft]*	*[ft]*	*[acre-ft]*	*[acre-ft]*	*[acre-ft]*	*[ft]*	*[ft]*	*[ft]*	*[acres]*	*[acres]*	*[acres]*
Formula for calculation	[Given data]	[Given data]	[Given data]	[Given data]	[TE-BE]	[Not available]	[Not available]	[Given data]	[Start at zero]	[NE-BE]	[TD]	[See report]	[See report]	[LA]
14	8	-20	5	10.5	30.5	n/a	n/a	41.16	0	25	30.5	0.10	6.97	8
15	19.7	-24	5	10.5	34.5	n/a	n/a	103.76	0	29	34.5	0.10	18.03	19.7
16	10.3	-24	5	10.5	34.5	n/a	n/a	53.49	0	29	34.5	0.10	9.15	10.3
17	8.1	-24	5	10.5	34.5	n/a	n/a	42.09	0	29	34.5	0.10	7.21	8.1
18	14.3	-24	5	10.5	34.5	n/a	n/a	75.31	0	29	34.5	0.10	13.09	14.3
19	22.8	-20	5	10.5	30.5	n/a	n/a	120.93	0	25	30.5	0.10	21.17	22.8
20	5	-17	5	10.5	27.5	n/a	n/a	25.35	0	22	27.5	0.10	4.22	5
21	11.9	-24	5	10.5	34.5	n/a	n/a	60.19	0	29	34.5	0.10	9.99	11.9
22	6.8	-18	5	10.5	28.5	n/a	n/a	35.02	0	23	28.5	0.10	5.93	6.8
23	18.6	-20	5	10.5	30.5	n/a	n/a	97.25	0	25	30.5	0.10	16.76	18.6
24	8.1	-15	5	10.5	25.5	n/a	n/a	41.34	0	20	25.5	0.10	6.93	8.1
25	56.2	-24	5	10.5	34.5	n/a	n/a	300.12	0	29	34.5	0.10	52.93	56.2
26	6.5	-24	5	10.5	34.5	n/a	n/a	33.47	0	29	34.5	0.10	5.67	6.5

Lake #	
x_1	y_1
x_2	y_2
x_3	y_3
x_4	y_4

Notes:
i. The data in the below individual Lake tables were used for the Phase 2 hydraulic analysis in XPSWMM.
*ii. The data in *yellow* In the above table was data taken from Lake Exhibits (see Appendix B).*
*iii. The data in *green* in the above table was calculated using the method decribed in Section 2.2 of the report.*
iv. For Top Storage "TS", a coversion factor of (27/43560) was used to convert for cubic-yards to acre-fee

Lake 14		Lake 15		Lake 16		Lake 17		Lake 18		Lake 19	
0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10
25.00	6.97	29.00	18.03	29.00	9.15	29.00	7.21	29.00	13.09	25.00	21.17
30.50	8.00	34.50	19.70	34.50	10.30	34.50	8.10	34.50	14.30	30.50	22.80
32.50	8.00	36.50	19.70	36.50	10.30	36.50	8.10	36.50	14.30	32.50	22.80

Lake 20		lake 21		Lake 22		Lake 23		Lake 24		Lake 25		Lake 26	
0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10	0.00	0.10
22.00	4.22	29.00	9.99	23.00	5.93	25.00	16.76	20.00	6.93	29.00	52.93	29.00	5.67
27.50	5.00	34.50	11.90	28.50	6.80	30.50	18.60	25.50	8.10	34.50	56.20	34.50	6.50
29.50	5.00	36.50	11.90	30.50	6.80	32.50	18.60	27.50	8.10	36.50	56.20	36.50	6.50

C

Appendix C: Lake Interconnection Pipe Length Exhibit

LEGEND

- EVAC — PROPOSED EVACUATION LINE
- EX EVAC — EXISTING EVACUATION LINE
- LC — PROPOSED LAKE INTERCONNECT LINE
- PS — EVACUATION LINE PUMP STATION
- PHASE 2 BOUNDARY

NOTES:

1. LAKE CIRCULATION AND EVACUATION LINE SHOWN FOR CONCEPTUAL ONLY. FINAL DESIGN TO BE FINALIZED BY OTHERS.

N

0' 300' 600' 1200'
SCALE: 1" = 600'

DRAFT

PHASE 2
LAKE PIPING EXHIBIT
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: OCTOBER 30, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

T:\25504-RIVER ISLANDS\ACAD\EXHIBITS\PHASE 2 MASTER UTILITIES EXHIBIT\PHASE 2 MSTR UTILITIES (PER TM LAYOUT)\PHASE 2 MSTR LC EXHIBIT.DWG

D

Appendix D: Phase 2 Hydrograph scaling

APPENDIX D: LAKE HYDROGRAPH SCALING FOR PHASE 2 LAKES

Lake	Contributory Area Relative to Lake Size Method			Approximated Contributory Draiange Area Method		
	Lake Area [acres]	Lake Area as % of total Phase 2 Lake Area	Scaling factor based on Contributory Area Relative to Lake Size	Approximated Drainage Area [acres]	Percent of total Phase 2 Drainage Area	Scaling factor based on Approximated Contributory Drainage Area
14	8	4.1%	0.173	96.5	4.5%	0.190
15	19.7	10.0%	0.427	203.7	9.4%	0.402
16	10.3	5.2%	0.223	103.6	4.8%	0.204
17	8.1	4.1%	0.175	68.9	3.2%	0.136
18	14.3	7.3%	0.310	125.7	5.8%	0.248
19	22.8	11.6%	0.494	129.0	6.0%	0.254
20	5	2.5%	0.108	79.5	3.7%	0.157
21	11.9	6.1%	0.258	215.4	10.0%	0.425
22	6.8	3.5%	0.147	113.4	5.3%	0.224
23	18.6	9.5%	0.403	276.8	12.8%	0.546
24	8.1	4.1%	0.175	99.8	4.6%	0.197
25	56.2	28.6%	1.217	423.4	19.6%	0.835
26	6.5	3.3%	0.141	219.9	10.2%	0.434
Total	196.3	100.0%	n/a	2155.6	100.0%	n/a

Notes:

The scaling is referring to percent of the values from the hydrograph from the contributary area for Lakes 1, 2 and 3 in Phase 1 Stage 1.

	Scaling based on approximated contributory drainage area													TIME	Scaling based on lake size relative to total phase 2 lake area												
1	0.190335	0.401775	0.204339	0.135897	0.247929	0.254438	0.156805	0.424852	0.223669	0.545957	0.196844	0.835108	0.433728		0.173224	0.426565	0.223026	0.17539	0.309639	0.493689	0.108265	0.257671	0.147241	0.402747	0.17539	1.216901	0.140745
425.4	*81.0*	*170.9*	*86.9*	*57.8*	*105.5*	*108.2*	*66.7*	*180.7*	*95.1*	*232.2*	*83.7*	*355.3*	*184.5*	[hrs]	*73.7*	*181.5*	*94.9*	*74.6*	*131.7*	*210.0*	*46.1*	*109.6*	*62.6*	*171.3*	*74.6*	*517.7*	*59.9*
Lake 1-2-3	**Lake 14**	**Lake 15**	**Lake 16**	**Lake 17**	**Lake 18**	**Lake 19**	**Lake 20**	**Lake 21**	**Lake 22**	**Lake 23**	**Lake 24**	**Lake 25**	**Lake 26**		**Lake 14**	**Lake 15**	**Lake 16**	**Lake 17**	**Lake 18**	**Lake 19**	**Lake 20**	**Lake 21**	**Lake 22**	**Lake 23**	**Lake 24**	**Lake 25**	**Lake 26**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.3	0.628107	1.325858	0.67432	0.448462	0.818166	0.839645	0.517456	1.402012	0.738107	1.801657	0.649586	2.755858	1.431302	0.08	0.57164	1.407665	0.735987	0.578786	1.021807	1.629175	0.357275	0.850315	0.485894	1.329064	0.578786	4.015774	0.464458
5.3	1.008777	2.129408	1.082998	0.720256	1.314024	1.348521	0.831065	2.251716	1.185444	2.89357	1.043274	4.426075	2.298757	0.17	0.918089	2.260795	1.18204	0.929565	1.641084	2.616554	0.573806	1.365658	0.780376	2.134557	0.929565	6.449577	0.745947
7.5	1.427515	3.013314	1.532544	1.019231	1.859467	1.908284	1.176036	3.186391	1.677515	4.094675	1.476331	6.263314	3.252959	0.25	1.299183	3.199238	1.672698	1.315423	2.322289	3.702671	0.811989	1.932534	1.104305	3.0206	1.315423	9.126759	1.055586
9.9	1.88432	3.977574	2.022959	1.345385	2.454497	2.518935	1.552367	4.206036	2.21432	5.40497	1.948757	8.267574	4.293905	0.33	1.714921	4.222994	2.207961	1.736358	3.065422	4.887526	1.071826	2.550945	1.457683	3.987192	1.736358	12.04732	1.393374
12.1	2.303057	4.861479	2.472505	1.644359	2.999941	3.078698	1.897337	5.14071	2.706391	6.606075	2.381815	10.10481	5.248107	0.42	2.096015	5.161437	2.698619	2.122215	3.746627	5.973643	1.310009	3.117822	1.781613	4.873235	2.122215	14.7245	1.703012
13.9	2.645661	5.584675	2.840316	1.888974	3.446213	3.536686	2.179586	5.905444	3.108994	7.588797	2.736134	11.60801	6.028817	0.5	2.407819	5.929254	3.100067	2.437917	4.303976	6.862284	1.504887	3.58163	2.046646	5.598179	2.437917	16.91493	1.956353
15.3	2.91213	6.14716	3.126391	2.079231	3.793314	3.892899	2.399112	6.500237	3.42213	8.353136	3.011716	12.77716	6.636036	0.58	2.650333	6.526445	3.412304	2.683462	4.73747	7.553449	1.656458	3.94237	2.252783	6.162024	2.683462	18.61859	2.153396
16.3	3.102465	6.548935	3.33073	2.215128	4.041243	4.147337	2.555917	6.925089	3.645799	8.899093	3.20856	13.61227	7.069763	0.67	2.823557	6.95301	3.63533	2.858852	5.047109	8.047138	1.764723	4.200041	2.400024	6.564771	2.858852	19.83549	2.29414
17	3.2357	6.830178	3.473767	2.310256	4.214793	4.325444	2.66568	7.222485	3.802367	9.281262	3.346351	14.19684	7.373373	0.75	2.944814	7.251605	3.791449	2.981625	5.263856	8.392721	1.840509	4.380411	2.503092	6.846693	2.981625	20.68732	2.392662
17.5	3.330868	7.031065	3.575937	2.378205	4.338757	4.452663	2.744083	7.434911	3.914201	9.554241	3.444773	14.6144	7.590237	0.83	3.031427	7.464888	3.902962	3.069319	5.418675	8.639566	1.894642	4.509247	2.576713	7.048067	3.069319	21.29577	2.463034
17.9	3.407002	7.191775	3.657673	2.432564	4.437929	4.554438	2.806805	7.604852	4.003669	9.772623	3.523511	14.94844	7.763728	0.92	3.100716	7.635514	3.992172	3.139475	5.54253	8.837041	1.937948	4.612316	2.635609	7.209165	3.139475	21.78253	2.519332
18.2	3.464103	7.312308	3.718974	2.473333	4.512308	4.630769	2.853846	7.732308	4.070769	9.93641	3.582564	15.19897	7.893846	1	3.152684	7.763483	4.05908	3.192092	5.635422	8.985148	1.970427	4.689617	2.679781	7.329989	3.192092	22.1476	2.561555
18.4	3.50217	7.392663	3.759842	2.500513	4.561893	4.681657	2.885207	7.817278	4.115503	10.0456	3.621933	15.366	7.980592	1.08	3.187328	7.848796	4.103685	3.22717	5.69735	9.083886	1.99208	4.741151	2.709229	7.410539	3.22717	22.39098	2.589704
18.6	3.540237	7.473018	3.80071	2.527692	4.611479	4.732544	2.916568	7.902249	4.160237	10.15479	3.661302	15.53302	8.067337	1.17	3.221973	7.934109	4.148291	3.262248	5.759277	9.182624	2.013733	4.792685	2.738677	7.491088	3.262248	22.63436	2.617853
18.8	3.578304	7.553373	3.841578	2.554872	4.661065	4.783432	2.947929	7.987219	4.20497	10.26398	3.700671	15.70004	8.154083	1.25	3.256618	8.019422	4.192896	3.297326	5.821205	9.281362	2.035386	4.84422	2.768126	7.571637	3.297326	22.87774	2.646002
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	1.33	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
19.1	3.635404	7.673905	3.90288	2.595641	4.735444	4.859763	2.99497	8.114675	4.272071	10.42777	3.759724	15.95057	8.284201	1.42	3.308586	8.147392	4.259804	3.349943	5.914097	9.429469	2.067866	4.921521	2.812298	7.692461	3.349943	23.24281	2.688226
19.2	3.654438	7.714083	3.923314	2.609231	4.760237	4.885207	3.010651	8.15716	4.294438	10.48237	3.779408	16.03408	8.327574	1.5	3.325908	8.190048	4.282107	3.367482	5.945061	9.478838	2.078692	4.947288	2.827022	7.732736	3.367482	23.3645	2.7023
19.4	3.692505	7.794438	3.964181	2.63641	4.809822	4.936095	3.042012	8.24213	4.339172	10.59156	3.818777	16.2011	8.41432	1.58	3.360553	8.275361	4.326712	3.40256	6.006988	9.577576	2.100346	4.998822	2.85647	7.813285	3.40256	23.60788	2.730449
19.5	3.711538	7.834615	3.984615	2.65	4.834615	4.961538	3.057692	8.284615	4.361538	10.64615	3.838462	16.28462	8.457692	1.67	3.377875	8.318018	4.349014	3.420099	6.037952	9.626945	2.111172	5.02459	2.871194	7.85356	3.420099	23.72957	2.744524
19.6	3.730572	7.874793	4.005049	2.66359	4.859408	4.986982	3.073373	8.327101	4.383905	10.70075	3.858146	16.36813	8.501065	1.75	3.395198	8.360674	4.371317	3.437638	6.068916	9.676314	2.121999	5.050357	2.885918	7.893835	3.437638	23.85126	2.758598
19.7	3.749606	7.91497	4.025483	2.677179	4.884201	5.012426	3.089053	8.369586	4.406272	10.75535	3.87783	16.45164	8.544438	1.83	3.41252	8.403331	4.39362	3.455177	6.09988	9.725683	2.132825	5.076124	2.900642	7.934109	3.455177	23.97295	2.772673
19.8	3.768639	7.955148	4.045917	2.690769	4.908994	5.03787	3.104734	8.412071	4.428639	10.80994	3.897515	16.53515	8.587811	1.92	3.429843	8.445987	4.415922	3.472716	6.130844	9.775051	2.143652	5.101891	2.915366	7.974384	3.472716	24.09464	2.786747
19.9	3.787673	7.995325	4.066351	2.704359	4.933787	5.063314	3.120414	8.454556	4.451006	10.86454	3.917199	16.61866	8.631183	2	3.447165	8.488644	4.438225	3.490255	6.161808	9.82442	2.154478	5.127658	2.93009	8.014659	3.490255	24.21633	2.800822
20	3.806706	8.035503	4.086785	2.717949	4.95858	5.088757	3.136095	8.497041	4.473373	10.91913	3.936884	16.70217	8.674556	2.08	3.464487	8.5313	4.460528	3.507794	6.192771	9.873789	2.165305	5.153425	2.944814	8.054933	3.507794	24.33802	2.814896
20.1	3.82574	8.07568	4.107219	2.731538	4.983373	5.114201	3.151775	8.539527	4.49574	10.97373	3.956568	16.78568	8.717929	2.17	3.48181	8.573957	4.48283	3.525333	6.223735	9.923158	2.176131	5.179192	2.959538	8.095208	3.525333	24.45971	2.828971
20.2	3.844773	8.115858	4.127653	2.745128	5.008166	5.139645	3.167456	8.582012	4.518107	11.02832	3.976252	16.86919	8.761302	2.25	3.499132	8.616613	4.505133	3.542872	6.254699	9.972527	2.186958	5.204959	2.974263	8.135483	3.542872	24.5814	2.843045
20.3	3.863807	8.156036	4.148087	2.758718	5.032959	5.165089	3.183136	8.624497	4.540473	11.08292	3.995937	16.9527	8.804675	2.33	3.516455	8.65927	4.527436	3.56041	6.285663	10.0219	2.197784	5.230727	2.988987	8.175757	3.56041	24.7031	2.85712
20.4	3.88284	8.196213	4.168521	2.772308	5.057751	5.190533	3.198817	8.666982	4.56284	11.13751	4.015621	17.03621	8.848047	2.42	3.533777	8.701926	4.549738	3.577949	6.316627	10.07127	2.208611	5.256494	3.003711	8.216032	3.577949	24.82479	2.871194
20.5	3.901874	8.236391	4.188955	2.785897	5.082544	5.215976	3.214497	8.709467	4.585207	11.19211	4.035306	17.11972	8.89142	2.5	3.5511	8.744583	4.572041	3.595488	6.347591	10.12063	2.219437	5.282261	3.018435	8.256307	3.595488	24.94648	2.885268
20.6	3.920907	8.276568	4.209389	2.799487	5.107337	5.24142	3.230178	8.751953	4.607574	11.24671	4.05499	17.20323	8.934793	2.58	3.568422	8.787239	4.594343	3.613027	6.378555	10.17	2.230264	5.308028	3.033159	8.296581	3.613027	25.06817	2.899343
20.6	3.920907	8.276568	4.209389	2.799487	5.107337	5.24142	3.230178	8.751953	4.607574	11.24671	4.05499	17.20323	8.934793	2.67	3.568422	8.787239	4.594343	3.613027	6.378555	10.17	2.230264	5.308028	3.033159	8.296581	3.613027	25.06817	2.899343
20.7	3.939941	8.316746	4.229822	2.813077	5.13213	5.266864	3.245858	8.794438	4.629941	11.3013	4.074675	17.28675	8.978166	2.75	3.585745	8.829896	4.616646	3.630566	6.409518	10.21937	2.24109	5.333795	3.047883	8.336856	3.630566	25.18986	2.913417
20.8	3.958974	8.356923	4.250256	2.826667	5.156923	5.292308	3.261538	8.836923	4.652308	11.3559	4.094359	17.37026	9.021538	2.83	3.603067	8.872552	4.638949	3.648105	6.440482	10.26874	2.251917	5.359562	3.062607	8.377131	3.648105	25.31155	2.927492
20.9	3.978008	8.397101	4.27069	2.840256	5.181716	5.317751	3.277219	8.879408	4.674675	11.41049	4.114043	17.45377	9.064911	2.92	3.620389	8.915209	4.661251	3.665644	6.471446	10.31811	2.262743	5.385329	3.077331	8.417405	3.665644	25.43324	2.941566
20.9	3.978008	8.397101	4.27069	2.840256	5.181716	5.317751	3.277219	8.879408	4.674675	11.41049	4.114043	17.45377	9.064911	3	3.620389	8.915209	4.661251	3.665644	6.471446	10.31811	2.262743	5.385329	3.077331	8.417405	3.665644	25.43324	2.941566
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	3.08	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	3.17	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	3.25	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
21.2	4.035108	8.517633	4.331992	2.881026	5.256095	5.394083	3.32426	9.006864	4.741775	11.57428	4.173097	17.7043	9.19503	3.33	3.672357	9.043178	4.728159	3.718261	6.564338	10.46622	2.295223	5.462631	3.121503	8.538229	3.718261	25.79831	2.98379
21.2	4.035108	8.517633	4.331992	2.881026	5.256095	5.394083	3.32426	9.006864	4.741775	11.57428	4.173097	17.7043	9.19503	3.42	3.672357	9.043178	4.728159	3.718261	6.564338	10.46622	2.295223	5.462631	3.121503	8.538229	3.718261	25.79831	2.98379
21.3	4.054142	8.557811	4.352426	2.894615	5.280888	5.419527	3.339941	9.049349	4.764142	11.62888	4.192781	17.78781	9.238402	3.5	3.689679	9.085835	4.750462	3.7358	6.595302	10.51559	2.306049	5.488398	3.136227	8.578504	3.7358	25.92	2.997864
21.4	4.073176	8.597988	4.37286	2.908205	5.30568	5.44497	3.355621	9.091834	4.786509	11.68347	4.212465	17.87132	9.281775	3.58	3.707002	9.128491	4.772765	3.753339	6.626265	10.56495	2.316876	5.514165	3.150951	8.618779	3.753339	26.04169	3.011939
21.4	4.073176	8.597988	4.37286	2.908205	5.30568	5.44497	3.355621	9.091834	4.786509	11.68347	4.212465	17.87132	9.281775	3.67	3.707002	9.128491	4.772765	3.753339	6.626265	10.56495	2.316876	5.514165	3.150951	8.618779	3.753339	26.04169	3.011939
21.5	4.092209	8.638166	4.393294	2.921795	5.330473	5.470414	3.371302	9.13432	4.808876	11.73807	4.23215	17.95483	9.325148	3.75	3.724324	9.171148	4.795067	3.770878	6.657229	10.61432	2.327703	5.539932	3.165675	8.659053	3.770878	26.16338	3.026013
21.5	4.092209	8.638166	4.393294	2.921795	5.330473	5.470414	3.371302	9.13432	4.808876	11.73807	4.23215	17.95483	9.325148	3.83	3.724324	9.171148	4.795067	3.770878	6.657229	10.61432	2.327703	5.539932	3.165675	8.659053	3.770878	26.16338	3.026013
21.6	4.111243	8.678343	4.413728	2.935385	5.355266	5.495858	3.386982	9.176805	4.831243	11.79266	4.251834	18.03834	9.368521	3.92	3.741646	9.213804	4.81737	3.788417	6.688193	10.66369	2.338529	5.565699	3.1804	8.699328	3.788417	26.28507	3.040088
21.6	4.111243	8.678343	4.413728	2.935385	5.355266	5.495858	3.386982	9.176805	4.831243	11.79266	4.251834	18.03834	9.368521	4	3.741646	9.213804	4.81737	3.788417	6.688193	10.66369	2.338529	5.565699	3.1804	8.699328	3.788417	26.28507	3.040088
21.7	4.130276	8.718521	4.434162	2.948974	5.380059	5.521302	3.402663	9.21929	4.853609	11.84726	4.271519	18.12185	9.411893	4.08	3.758969	9.256461	4.839673	3.805956	6.719157	10.71306	2.349356	5.591466	3.195124	8.739603	3.805956	26.40676	3.054162
21.7	4.130276	8.718521	4.434162	2.948974	5.380059	5.521302	3.402663	9.21929	4.853609	11.84726	4.271519	18.12185	9.411893	4.17	3.758969	9.256461	4.839673	3.805956	6.719157	10.71306	2.349356	5.591466	3.195124	8.739603	3.805956	26.40676	3.054162
21.8	4.14931	8.758698	4.454596	2.962564	5.404852	5.546746	3.418343	9.261775	4.875976	11.90185	4.291203	18.20536	9.455266	4.25	3.776291	9.299118	4.861975	3.823495	6.750121	10.76243	2.360182	5.617233	3.209848	8.779877	3.823495	26.52845	3.068237
21.8	4.14931	8.758698	4.454596	2.962564	5.404852	5.546746	3.418343	9.261775	4.875976	11.90185	4.291203	18.20536	9.455266	4.33	3.776291	9.299118	4.861975	3.823495	6.750121	10.76243	2.360182	5.617233	3.209848	8.779877	3.823495	26.52845	3.068237
21.9	4.168343	8.798876	4.47503	2.976154	5.429645	5.572189	3.434024	9.30426	4.898343	11.95645	4.310888	18.28888	9.498639	4.42	3.793614	9.341774	4.884278	3.841034	6.781085	10.8118	2.371009	5.643001	3.224572	8.820152	3.841034	26.65014	3.082311
21.9	4.168343	8.798876	4.47503	2.976154	5.429645	5.572189	3.434024	9.30426	4.898343	11.95645	4.310888	18.28888	9.498639	4.5	3.793614	9.341774	4.884278	3.841034	6.781085	10.8118	2.371009	5.643001	3.224572	8.820152	3.841034	26.65014	3.082311
22	4.187377	8.839053	4.495464	2.989744	5.454438	5.597633	3.449704	9.346746	4.92071	12.01105	4.330572	18.37239	9.542012	4.58	3.810936	9.384431	4.90658	3.858573	6.812049	10.86117	2.381835	5.668768	3.239296	8.860427	3.858573	26.77183	3.096386
22	4.187377	8.839053	4.495464	2.989744	5.454438	5.597633	3.449704	9.346746	4.92071	12.01105	4.330572	18.37239	9.542012	4.67	3.810936	9.384431	4.90658	3.858573	6.812049	10.86117	2.381835	5.668768	3.239296	8.860427	3.858573	26.77183	3.096386
22.1	4.20641	8.879231	4.515897	3.003333	5.479231	5.623077	3.465385	9.389231	4.943077	12.06564	4.350256	18.4559	9.585385	4.75	3.828259	9.427087	4.928883	3.876112	6.843012	10.91054	2.392662	5.694535	3.25402	8.900701	3.876112	26.89352	3.11046
22.1	4.20641	8.879231	4.515897	3.003333	5.479231	5.623077	3.465385	9.389231	4.943077	12.06564	4.350256	18.4559	9.585385	4.83	3.828259	9.427087	4.928883	3.876112	6.843012	10.91054	2.392662	5.694535	3.25402	8.900701	3.876112	26.89352	3.11046
22.2	4.225444	8.919408	4.536331	3.016923	5.504024	5.648521	3.481065	9.431716	4.965444	12.12024	4.369941	18.53941	9.628757	4.92	3.845581	9.469744	4.951186	3.893651	6.873976	10.95991	2.403488	5.720302	3.268744	8.940976	3.893651	27.01521	3.124535
22.2	4.225444	8.919408	4.536331	3.016923	5.504024	5.648521	3.481065	9.431716	4.965444	12.12024	4.369941	18.53941	9.628757	5	3.845581	9.469744	4.951186	3.893651	6.873976	10.95991	2.403488	5.720302	3.268744	8.940976	3.893651	27.01521	3.124535
22.3	4.244477	8.959586	4.556765	3.030513	5.528817	5.673964	3.496746	9.474201	4.987811	12.17483	4.389625	18.62292	9.67213	5.08	3.862904	9.5124	4.973488	3.91119	6.90494	11.00928	2.414315	5.746069	3.283468	8.981251	3.91119	27.1369	3.138609
22.3	4.244477	8.959586	4.556765	3.030513	5.528817	5.673964	3.496746	9.474201	4.987811	12.17483	4.389625	18.62292	9.67213	5.17	3.862904	9.5124	4.973488	3.91119	6.90494	11.00928	2.414315	5.746069	3.283468	8.981251	3.91119	27.1369	3.138609
22.3	4.244477	8.959586	4.556765	3.030513	5.528817	5.673964	3.496746	9.474201	4.987811	12.17483	4.389625	18.62292	9.67213	5.25	3.862904	9.5124	4.973488	3.91119	6.90494	11.00928	2.414315	5.746069	3.283468	8.981251	3.91119	27.1369	3.138609
22.4	4.263511	8.999763	4.577199	3.044103	5.553609	5.699408	3.512426	9.516686	5.010178	12.22943	4.40931	18.70643	9.715503	5.33	3.880226	9.555057	4.995791	3.928729	6.935904	11.05864	2.425141	5.771836	3.298192	9.021525	3.928729	27.25859	3.152684

22.4	4.263511	8.999763	4.577199	3.044103	5.553609	5.699408	3.512426	9.516686	5.010178	12.22943	4.40931	18.70643	9.715503	5.42	3.880226	9.555057	4.995791	3.928729	6.935904	11.05864	2.425141	5.771836	3.298192	9.021525	3.928729	27.25859	3.152684
22.5	4.282544	9.039941	4.597633	3.057692	5.578402	5.724852	3.528107	9.559172	5.032544	12.28402	4.428994	18.78994	9.758876	5.5	3.897548	9.597713	5.018094	3.946268	6.966868	11.10801	2.435968	5.797603	3.312916	9.0618	3.946268	27.38028	3.166758
22.5	4.282544	9.039941	4.597633	3.057692	5.578402	5.724852	3.528107	9.559172	5.032544	12.28402	4.428994	18.78994	9.758876	5.58	3.897548	9.597713	5.018094	3.946268	6.966868	11.10801	2.435968	5.797603	3.312916	9.0618	3.946268	27.38028	3.166758
22.5	4.282544	9.039941	4.597633	3.057692	5.578402	5.724852	3.528107	9.559172	5.032544	12.28402	4.428994	18.78994	9.758876	5.67	3.897548	9.597713	5.018094	3.946268	6.966868	11.10801	2.435968	5.797603	3.312916	9.0618	3.946268	27.38028	3.166758
22.6	4.301578	9.080118	4.618067	3.071282	5.603195	5.750296	3.543787	9.601657	5.054911	12.33862	4.448679	18.87345	9.802249	5.75	3.914871	9.64037	5.040396	3.963807	6.997832	11.15738	2.446794	5.82337	3.32764	9.102075	3.963807	27.50197	3.180833
22.6	4.301578	9.080118	4.618067	3.071282	5.603195	5.750296	3.543787	9.601657	5.054911	12.33862	4.448679	18.87345	9.802249	5.83	3.914871	9.64037	5.040396	3.963807	6.997832	11.15738	2.446794	5.82337	3.32764	9.102075	3.963807	27.50197	3.180833
22.7	4.320611	9.120296	4.638501	3.084872	5.627988	5.77574	3.559467	9.644142	5.077278	12.39321	4.468363	18.95696	9.845621	5.92	3.932193	9.683026	5.062699	3.981346	7.028796	11.20675	2.457621	5.849138	3.342364	9.142349	3.981346	27.62366	3.194907
22.7	4.320611	9.120296	4.638501	3.084872	5.627988	5.77574	3.559467	9.644142	5.077278	12.39321	4.468363	18.95696	9.845621	6	3.932193	9.683026	5.062699	3.981346	7.028796	11.20675	2.457621	5.849138	3.342364	9.142349	3.981346	27.62366	3.194907
22.7	4.320611	9.120296	4.638501	3.084872	5.627988	5.77574	3.559467	9.644142	5.077278	12.39321	4.468363	18.95696	9.845621	6.08	3.932193	9.683026	5.062699	3.981346	7.028796	11.20675	2.457621	5.849138	3.342364	9.142349	3.981346	27.62366	3.194907
22.8	4.339645	9.160473	4.658935	3.098462	5.652781	5.801183	3.575148	9.686627	5.099645	12.44781	4.488047	19.04047	9.888994	6.17	3.949516	9.725683	5.085002	3.998885	7.059759	11.25612	2.468447	5.874905	3.357088	9.182624	3.998885	27.74535	3.208982
22.8	4.339645	9.160473	4.658935	3.098462	5.652781	5.801183	3.575148	9.686627	5.099645	12.44781	4.488047	19.04047	9.888994	6.25	3.949516	9.725683	5.085002	3.998885	7.059759	11.25612	2.468447	5.874905	3.357088	9.182624	3.998885	27.74535	3.208982
22.8	4.339645	9.160473	4.658935	3.098462	5.652781	5.801183	3.575148	9.686627	5.099645	12.44781	4.488047	19.04047	9.888994	6.33	3.949516	9.725683	5.085002	3.998885	7.059759	11.25612	2.468447	5.874905	3.357088	9.182624	3.998885	27.74535	3.208982
22.9	4.358679	9.200651	4.679369	3.112051	5.677574	5.826627	3.590828	9.729112	5.122012	12.50241	4.507732	19.12398	9.932367	6.42	3.966838	9.768339	5.107304	4.016424	7.090723	11.30549	2.479274	5.900672	3.371812	9.222899	4.016424	27.86704	3.223056
22.9	4.358679	9.200651	4.679369	3.112051	5.677574	5.826627	3.590828	9.729112	5.122012	12.50241	4.507732	19.12398	9.932367	6.5	3.966838	9.768339	5.107304	4.016424	7.090723	11.30549	2.479274	5.900672	3.371812	9.222899	4.016424	27.86704	3.223056
22.9	4.358679	9.200651	4.679369	3.112051	5.677574	5.826627	3.590828	9.729112	5.122012	12.50241	4.507732	19.12398	9.932367	6.58	3.966838	9.768339	5.107304	4.016424	7.090723	11.30549	2.479274	5.900672	3.371812	9.222899	4.016424	27.86704	3.223056
23	4.377712	9.240828	4.699803	3.125641	5.702367	5.852071	3.606509	9.771598	5.144379	12.557	4.527416	19.2075	9.97574	6.67	3.984161	9.810996	5.129607	4.033963	7.121687	11.35486	2.4901	5.926439	3.386537	9.263173	4.033963	27.98873	3.237131
23	4.377712	9.240828	4.699803	3.125641	5.702367	5.852071	3.606509	9.771598	5.144379	12.557	4.527416	19.2075	9.97574	6.75	3.984161	9.810996	5.129607	4.033963	7.121687	11.35486	2.4901	5.926439	3.386537	9.263173	4.033963	27.98873	3.237131
23	4.377712	9.240828	4.699803	3.125641	5.702367	5.852071	3.606509	9.771598	5.144379	12.557	4.527416	19.2075	9.97574	6.83	3.984161	9.810996	5.129607	4.033963	7.121687	11.35486	2.4901	5.926439	3.386537	9.263173	4.033963	27.98873	3.237131
23.1	4.396746	9.281006	4.720237	3.139231	5.72716	5.877515	3.622189	9.814083	5.166746	12.6116	4.547101	19.29101	10.01911	6.92	4.001483	9.853652	5.151909	4.051502	7.152651	11.40423	2.500927	5.952206	3.401261	9.303448	4.051502	28.11042	3.251205
23.1	4.396746	9.281006	4.720237	3.139231	5.72716	5.877515	3.622189	9.814083	5.166746	12.6116	4.547101	19.29101	10.01911	7	4.001483	9.853652	5.151909	4.051502	7.152651	11.40423	2.500927	5.952206	3.401261	9.303448	4.051502	28.11042	3.251205
23.1	4.396746	9.281006	4.720237	3.139231	5.72716	5.877515	3.622189	9.814083	5.166746	12.6116	4.547101	19.29101	10.01911	7.08	4.001483	9.853652	5.151909	4.051502	7.152651	11.40423	2.500927	5.952206	3.401261	9.303448	4.051502	28.11042	3.251205
23.2	4.415779	9.321183	4.740671	3.152821	5.751953	5.902959	3.63787	9.856568	5.189112	12.66619	4.566785	19.37452	10.06249	7.17	4.018805	9.896309	5.174212	4.069041	7.183615	11.4536	2.511753	5.977973	3.415985	9.343723	4.069041	28.23211	3.265279
23.2	4.415779	9.321183	4.740671	3.152821	5.751953	5.902959	3.63787	9.856568	5.189112	12.66619	4.566785	19.37452	10.06249	7.25	4.018805	9.896309	5.174212	4.069041	7.183615	11.4536	2.511753	5.977973	3.415985	9.343723	4.069041	28.23211	3.265279
23.2	4.415779	9.321183	4.740671	3.152821	5.751953	5.902959	3.63787	9.856568	5.189112	12.66619	4.566785	19.37452	10.06249	7.33	4.018805	9.896309	5.174212	4.069041	7.183615	11.4536	2.511753	5.977973	3.415985	9.343723	4.069041	28.23211	3.265279
23.3	4.434813	9.361361	4.761105	3.16641	5.776746	5.928402	3.65355	9.899053	5.211479	12.72079	4.586469	19.45803	10.10586	7.42	4.036128	9.938965	5.196515	4.08658	7.214579	11.50296	2.52258	6.00374	3.430709	9.383997	4.08658	28.3538	3.279354
23.3	4.434813	9.361361	4.761105	3.16641	5.776746	5.928402	3.65355	9.899053	5.211479	12.72079	4.586469	19.45803	10.10586	7.5	4.036128	9.938965	5.196515	4.08658	7.214579	11.50296	2.52258	6.00374	3.430709	9.383997	4.08658	28.3538	3.279354
23.3	4.434813	9.361361	4.761105	3.16641	5.776746	5.928402	3.65355	9.899053	5.211479	12.72079	4.586469	19.45803	10.10586	7.58	4.036128	9.938965	5.196515	4.08658	7.214579	11.50296	2.52258	6.00374	3.430709	9.383997	4.08658	28.3538	3.279354
23.3	4.434813	9.361361	4.761105	3.16641	5.776746	5.928402	3.65355	9.899053	5.211479	12.72079	4.586469	19.45803	10.10586	7.67	4.036128	9.938965	5.196515	4.08658	7.214579	11.50296	2.52258	6.00374	3.430709	9.383997	4.08658	28.3538	3.279354
23.4	4.453846	9.401538	4.781538	3.18	5.801538	5.953846	3.669231	9.941538	5.233846	12.77538	4.606154	19.54154	10.14923	7.75	4.05345	9.981622	5.218817	4.104118	7.245543	11.55233	2.533406	6.029507	3.445433	9.424272	4.104118	28.47549	3.293428
23.4	4.453846	9.401538	4.781538	3.18	5.801538	5.953846	3.669231	9.941538	5.233846	12.77538	4.606154	19.54154	10.14923	7.83	4.05345	9.981622	5.218817	4.104118	7.245543	11.55233	2.533406	6.029507	3.445433	9.424272	4.104118	28.47549	3.293428
23.4	4.453846	9.401538	4.781538	3.18	5.801538	5.953846	3.669231	9.941538	5.233846	12.77538	4.606154	19.54154	10.14923	7.92	4.05345	9.981622	5.218817	4.104118	7.245543	11.55233	2.533406	6.029507	3.445433	9.424272	4.104118	28.47549	3.293428
23.5	4.47288	9.441716	4.801972	3.19359	5.826331	5.97929	3.684911	9.984024	5.256213	12.82998	4.625838	19.62505	10.1926	8	4.070773	10.02428	5.24112	4.121657	7.276506	11.6017	2.544233	6.055275	3.460157	9.464547	4.121657	28.59718	3.307503
23.5	4.47288	9.441716	4.801972	3.19359	5.826331	5.97929	3.684911	9.984024	5.256213	12.82998	4.625838	19.62505	10.1926	8.08	4.070773	10.02428	5.24112	4.121657	7.276506	11.6017	2.544233	6.055275	3.460157	9.464547	4.121657	28.59718	3.307503
23.5	4.47288	9.441716	4.801972	3.19359	5.826331	5.97929	3.684911	9.984024	5.256213	12.82998	4.625838	19.62505	10.1926	8.17	4.070773	10.02428	5.24112	4.121657	7.276506	11.6017	2.544233	6.055275	3.460157	9.464547	4.121657	28.59718	3.307503
23.5	4.47288	9.441716	4.801972	3.19359	5.826331	5.97929	3.684911	9.984024	5.256213	12.82998	4.625838	19.62505	10.1926	8.25	4.070773	10.02428	5.24112	4.121657	7.276506	11.6017	2.544233	6.055275	3.460157	9.464547	4.121657	28.59718	3.307503
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	8.33	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	8.42	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	8.5	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	8.58	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	8.67	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	8.75	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	8.83	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.8	4.52998	9.562249	4.863274	3.234359	5.90071	6.055621	3.731953	10.11148	5.323314	12.99377	4.684892	19.87558	10.32272	8.92	4.12274	10.15225	5.308028	4.174274	7.369398	11.74981	2.576713	6.132576	3.504329	9.585371	4.174274	28.96225	3.349726
23.8	4.52998	9.562249	4.863274	3.234359	5.90071	6.055621	3.731953	10.11148	5.323314	12.99377	4.684892	19.87558	10.32272	9	4.12274	10.15225	5.308028	4.174274	7.369398	11.74981	2.576713	6.132576	3.504329	9.585371	4.174274	28.96225	3.349726
23.8	4.52998	9.562249	4.863274	3.234359	5.90071	6.055621	3.731953	10.11148	5.323314	12.99377	4.684892	19.87558	10.32272	9.08	4.12274	10.15225	5.308028	4.174274	7.369398	11.74981	2.576713	6.132576	3.504329	9.585371	4.174274	28.96225	3.349726
23.8	4.52998	9.562249	4.863274	3.234359	5.90071	6.055621	3.731953	10.11148	5.323314	12.99377	4.684892	19.87558	10.32272	9.17	4.12274	10.15225	5.308028	4.174274	7.369398	11.74981	2.576713	6.132576	3.504329	9.585371	4.174274	28.96225	3.349726
23.9	4.549014	9.602426	4.883708	3.247949	5.925503	6.081065	3.747633	10.15396	5.34568	13.04836	4.704576	19.95909	10.36609	9.25	4.140063	10.1949	5.330331	4.191813	7.400362	11.79918	2.587539	6.158343	3.519053	9.625645	4.191813	29.08394	3.363801
23.9	4.549014	9.602426	4.883708	3.247949	5.925503	6.081065	3.747633	10.15396	5.34568	13.04836	4.704576	19.95909	10.36609	9.33	4.140063	10.1949	5.330331	4.191813	7.400362	11.79918	2.587539	6.158343	3.519053	9.625645	4.191813	29.08394	3.363801
23.9	4.549014	9.602426	4.883708	3.247949	5.925503	6.081065	3.747633	10.15396	5.34568	13.04836	4.704576	19.95909	10.36609	9.42	4.140063	10.1949	5.330331	4.191813	7.400362	11.79918	2.587539	6.158343	3.519053	9.625645	4.191813	29.08394	3.363801
23.9	4.549014	9.602426	4.883708	3.247949	5.925503	6.081065	3.747633	10.15396	5.34568	13.04836	4.704576	19.95909	10.36609	9.5	4.140063	10.1949	5.330331	4.191813	7.400362	11.79918	2.587539	6.158343	3.519053	9.625645	4.191813	29.08394	3.363801
24	4.568047	9.642604	4.904142	3.261538	5.950296	6.106509	3.763314	10.19645	5.368047	13.10296	4.72426	20.0426	10.40947	9.58	4.157385	10.23756	5.352633	4.209352	7.431326	11.84855	2.598366	6.18411	3.533777	9.66592	4.209352	29.20563	3.377875
24	4.568047	9.642604	4.904142	3.261538	5.950296	6.106509	3.763314	10.19645	5.368047	13.10296	4.72426	20.0426	10.40947	9.67	4.157385	10.23756	5.352633	4.209352	7.431326	11.84855	2.598366	6.18411	3.533777	9.66592	4.209352	29.20563	3.377875
24	4.568047	9.642604	4.904142	3.261538	5.950296	6.106509	3.763314	10.19645	5.368047	13.10296	4.72426	20.0426	10.40947	9.75	4.157385	10.23756	5.352633	4.209352	7.431326	11.84855	2.598366	6.18411	3.533777	9.66592	4.209352	29.20563	3.377875
24	4.568047	9.642604	4.904142	3.261538	5.950296	6.106509	3.763314	10.19645	5.368047	13.10296	4.72426	20.0426	10.40947	9.83	4.157385	10.23756	5.352633	4.209352	7.431326	11.84855	2.598366	6.18411	3.533777	9.66592	4.209352	29.20563	3.377875
24	4.568047	9.642604	4.904142	3.261538	5.950296	6.106509	3.763314	10.19645	5.368047	13.10296	4.72426	20.0426	10.40947	9.92	4.157385	10.23756	5.352633	4.209352	7.431326	11.84855	2.598366	6.18411	3.533777	9.66592	4.209352	29.20563	3.377875
24.1	4.587081	9.682781	4.924576	3.275128	5.975089	6.131953	3.778994	10.23893	5.390414	13.15755	4.743945	20.12611	10.45284	10	4.174707	10.28022	5.374936	4.226891	7.46229	11.89792	2.609192	6.209877	3.548501	9.706195	4.226891	29.32732	3.39195
24.1	4.587081	9.682781	4.924576	3.275128	5.975089	6.131953	3.778994	10.23893	5.390414	13.15755	4.743945	20.12611	10.45284	10.1	4.174707	10.28022	5.374936	4.226891	7.46229	11.89792	2.609192	6.209877	3.548501	9.706195	4.226891	29.32732	3.39195
24.1	4.587081	9.682781	4.924576	3.275128	5.975089	6.131953	3.778994	10.23893	5.390414	13.15755	4.743945	20.12611	10.45284	10.2	4.174707	10.28022	5.374936	4.226891	7.46229	11.89792	2.609192	6.209877	3.548501	9.706195	4.226891	29.32732	3.39195
24.1	4.587081	9.682781	4.924576	3.275128	5.975089	6.131953	3.778994	10.23893	5.390414	13.15755	4.743945	20.12611	10.45284	10.3	4.174707	10.28022	5.374936	4.226891	7.46229	11.89792	2.609192	6.209877	3.548501	9.706195	4.226891	29.32732	3.39195
24.2	4.606114	9.722959	4.94501	3.288718	5.999882	6.157396	3.794675	10.28142	5.412781	13.21215	4.763629	20.20963	10.49621	10.3	4.19203	10.32287	5.397238	4.24443	7.493253	11.94729	2.620019	6.235644	3.563225	9.746469	4.24443	29.44901	3.406024
24.2	4.606114	9.722959	4.94501	3.288718	5.999882	6.157396	3.794675	10.28142	5.412781	13.21215	4.763629	20.20963	10.49621	10.4	4.19203	10.32287	5.397238	4.24443	7.493253	11.94729	2.620019	6.235644	3.563225	9.746469	4.24443	29.44901	3.406024
24.2	4.606114	9.722959	4.94501	3.288718	5.999882	6.157396	3.794675	10.28142	5.412781	13.21215	4.763629	20.20963	10.49621	10.5	4.19203	10.32287	5.397238	4.24443	7.493253	11.94729	2.620019	6.235644	3.563225	9.746469	4.24443	29.44901	3.406024
24.2	4.606114	9.722959	4.94501	3.288718	5.999882	6.157396	3.794675	10.28142	5.412781	13.21215	4.763629	20.20963	10.49621	10.6	4.19203	10.32287	5.397238	4.24443	7.493253	11.94729	2.620019	6.235644	3.563225	9.746469	4.24443	29.44901	3.406024
24.2	4.606114	9.722959	4.94501	3.288718	5.999882	6.157396	3.794675	10.28142	5.412781	13.21215	4.763629	20.20963	10.49621	10.7	4.19203	10.32287	5.397238	4.24443	7.493253	11.94729	2.620019	6.235644	3.563225	9.746469	4.24443	29.44901	3.406024
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	10.8	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	10.8	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	10.9	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	11	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	11.1	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.4	4.644181	9.803314	4.985878	3.315897	6.049467	6.208284	3.826036	10.36639	5.457515	13.32134	4.802998	20.37665	10.58296	11.2	4.226675	10.40819	5.441844	4.279508	7.555181	12.04602	2.641672	6.287179	3.592674	9.827019	4.279508	29.69239	3.434173
24.4	4.644181	9.803314	4.985878	3.315897	6.049467	6.208284	3.826036	10.36639	5.457515	13.32134	4.802998	20.37665	10.58296	11.3	4.226675	10.40819	5.441844	4.279508	7.555181	12.04602	2.641672	6.287179	3.592674	9.827019	4.279508	29.69239	3.434173
24.4	4.644181	9.803314	4.985878	3.315897	6.049467	6.208284	3.826036	10.36639	5.457515	13.32134	4.802998	20.37665	10.58296	11.3	4.226675	10.40819	5.441844	4.279508	7.555181	12.04602	2.641672	6.287179	3.592674	9.827019	4.279508	29.69239	3.434173

24.4	4.644181	9.803314	4.985878	3.315897	6.049467	6.208284	3.826036	10.36639	5.457515	13.32134	4.802998	20.37665	10.58296	11.4	4.226675	10.40819	5.441844	4.279508	7.555181	12.04602	2.641672	6.287179	3.592674	9.827019	4.279508	29.69239	3.434173
24.4	4.644181	9.803314	4.985878	3.315897	6.049467	6.208284	3.826036	10.36639	5.457515	13.32134	4.802998	20.37665	10.58296	11.5	4.226675	10.40819	5.441844	4.279508	7.555181	12.04602	2.641672	6.287179	3.592674	9.827019	4.279508	29.69239	3.434173
24.5	4.663215	9.843491	5.006312	3.329487	6.07426	6.233728	3.841716	10.40888	5.479882	13.37594	4.822682	20.46016	10.62633	11.6	4.243997	10.45084	5.464146	4.297047	7.586145	12.09539	2.652498	6.312946	3.607398	9.867293	4.297047	29.81408	3.448248
24.5	4.663215	9.843491	5.006312	3.329487	6.07426	6.233728	3.841716	10.40888	5.479882	13.37594	4.822682	20.46016	10.62633	11.7	4.243997	10.45084	5.464146	4.297047	7.586145	12.09539	2.652498	6.312946	3.607398	9.867293	4.297047	29.81408	3.448248
24.5	4.663215	9.843491	5.006312	3.329487	6.07426	6.233728	3.841716	10.40888	5.479882	13.37594	4.822682	20.46016	10.62633	11.8	4.243997	10.45084	5.464146	4.297047	7.586145	12.09539	2.652498	6.312946	3.607398	9.867293	4.297047	29.81408	3.448248
24.5	4.663215	9.843491	5.006312	3.329487	6.07426	6.233728	3.841716	10.40888	5.479882	13.37594	4.822682	20.46016	10.62633	11.8	4.243997	10.45084	5.464146	4.297047	7.586145	12.09539	2.652498	6.312946	3.607398	9.867293	4.297047	29.81408	3.448248
24.5	4.663215	9.843491	5.006312	3.329487	6.07426	6.233728	3.841716	10.40888	5.479882	13.37594	4.822682	20.46016	10.62633	11.9	4.243997	10.45084	5.464146	4.297047	7.586145	12.09539	2.652498	6.312946	3.607398	9.867293	4.297047	29.81408	3.448248
24.6	4.682249	9.883669	5.026746	3.343077	6.099053	6.259172	3.857396	10.45136	5.502249	13.43053	4.842367	20.54367	10.6697	12	4.26132	10.4935	5.486449	4.314586	7.617109	12.14476	2.663325	6.338713	3.622122	9.907568	4.314586	29.93577	3.462322
24	4.568047	9.642604	4.904142	3.261538	5.950296	6.106509	3.763314	10.19645	5.368047	13.10296	4.72426	20.0426	10.40947	12.1	4.157385	10.23756	5.352633	4.209352	7.431326	11.84855	2.598366	6.18411	3.533777	9.66592	4.209352	29.20563	3.377875
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	12.2	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.1	4.396746	9.281006	4.720237	3.139231	5.72716	5.877515	3.622189	9.814083	5.166746	12.6116	4.547101	19.29101	10.01911	12.3	4.001483	9.853652	5.151909	4.051502	7.152651	11.40423	2.500927	5.952206	3.401261	9.303448	4.051502	28.11042	3.251205
22.6	4.301578	9.080118	4.618067	3.071282	5.603195	5.750296	3.543787	9.601657	5.054911	12.33862	4.448679	18.87345	9.802249	12.3	3.914871	9.64037	5.040396	3.963807	6.997832	11.15738	2.446794	5.82337	3.32764	9.102075	3.963807	27.50197	3.180833
22.1	4.20641	8.879231	4.515897	3.003333	5.479231	5.623077	3.465385	9.389231	4.943077	12.06564	4.350256	18.4559	9.585385	12.4	3.828259	9.427087	4.928883	3.876112	6.843012	10.91054	2.392662	5.694535	3.25402	8.900701	3.876112	26.89352	3.11046
21.7	4.130276	8.718521	4.434162	2.948974	5.380059	5.521302	3.402663	9.21929	4.853609	11.84726	4.271519	18.12185	9.411893	12.5	3.758969	9.256461	4.839673	3.805956	6.719157	10.71306	2.349356	5.591466	3.195124	8.739603	3.805956	26.40676	3.054162
21.4	4.073176	8.597988	4.37286	2.908205	5.30568	5.44497	3.355621	9.091834	4.786509	11.68347	4.212465	17.87132	9.281775	12.6	3.707002	9.128491	4.772765	3.753339	6.626265	10.56495	2.316876	5.514165	3.150951	8.618779	3.753339	26.04169	3.011939
21.2	4.035108	8.517633	4.331992	2.881026	5.256095	5.394083	3.32426	9.006864	4.741775	11.57428	4.173097	17.7043	9.19503	12.7	3.672357	9.043178	4.728159	3.718261	6.564338	10.46622	2.295223	5.462631	3.121503	8.538229	3.718261	25.79831	2.98379
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	12.8	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
20.9	3.978008	8.397101	4.27069	2.840256	5.181716	5.317751	3.277219	8.879408	4.674675	11.41049	4.114043	17.45377	9.064911	12.8	3.620389	8.915209	4.661251	3.665644	6.471446	10.31811	2.262743	5.385329	3.077331	8.417405	3.665644	25.43324	2.941566
20.8	3.958974	8.356923	4.250256	2.826667	5.156923	5.292308	3.261538	8.836923	4.652308	11.3559	4.094359	17.37026	9.021538	12.9	3.603067	8.872552	4.638949	3.648105	6.440482	10.26874	2.251917	5.359562	3.062607	8.377131	3.648105	25.31155	2.927492
20.8	3.958974	8.356923	4.250256	2.826667	5.156923	5.292308	3.261538	8.836923	4.652308	11.3559	4.094359	17.37026	9.021538	13	3.603067	8.872552	4.638949	3.648105	6.440482	10.26874	2.251917	5.359562	3.062607	8.377131	3.648105	25.31155	2.927492
20.2	3.844773	8.115858	4.127653	2.745128	5.008166	5.139645	3.167456	8.582012	4.518107	11.02832	3.976252	16.86919	8.761302	13.1	3.499132	8.616613	4.505133	3.542872	6.254699	9.972527	2.186958	5.204959	2.974263	8.135483	3.542872	24.5814	2.843045
19.7	3.749606	7.91497	4.025483	2.677179	4.884201	5.012426	3.089053	8.369586	4.406272	10.75535	3.87783	16.45164	8.544438	13.2	3.41252	8.403331	4.39362	3.455177	6.09988	9.725683	2.132825	5.076124	2.900642	7.934109	3.455177	23.97295	2.772673
19.2	3.654438	7.714083	3.923314	2.609231	4.760237	4.885207	3.010651	8.15716	4.294438	10.48237	3.779408	16.03408	8.327574	13.3	3.325908	8.190048	4.282107	3.367482	5.945061	9.478838	2.078692	4.947288	2.827022	7.732736	3.367482	23.3645	2.7023
18.6	3.540237	7.473018	3.80071	2.527692	4.611479	4.732544	2.916568	7.902249	4.160237	10.15479	3.661302	15.53302	8.067337	13.3	3.221973	7.934109	4.148291	3.262248	5.759277	9.182624	2.013733	4.792685	2.738677	7.491088	3.262248	22.63436	2.617853
18.1	3.445069	7.27213	3.69854	2.459744	4.487515	4.605325	2.838166	7.689822	4.048402	9.881815	3.56288	15.11546	7.850473	13.4	3.135361	7.720827	4.036778	3.174553	5.604458	8.935779	1.959601	4.66385	2.665057	7.289715	3.174553	22.02591	2.547481
17.7	3.368935	7.11142	3.616805	2.405385	4.388343	4.50355	2.775444	7.519882	3.958935	9.663432	3.484142	14.78142	7.676982	13.5	3.066071	7.550201	3.947567	3.104397	5.480603	8.738304	1.916295	4.560781	2.606161	7.128616	3.104397	21.53915	2.491183
17.4	3.311834	6.990888	3.555503	2.364615	4.313964	4.427219	2.728402	7.392426	3.891834	9.499645	3.425089	14.53089	7.546864	13.6	3.014104	7.422231	3.880659	3.05178	5.387711	8.590197	1.883815	4.48348	2.561989	7.007792	3.05178	21.17408	2.44896
17.2	3.273767	6.910533	3.514635	2.337436	4.264379	4.376331	2.697041	7.307456	3.847101	9.390454	3.38572	14.36387	7.460118	13.7	2.979459	7.336918	3.836054	3.016702	5.325783	8.491459	1.862162	4.431946	2.53254	6.927243	3.016702	20.9307	2.420811
17	3.2357	6.830178	3.473767	2.310256	4.214793	4.325444	2.66568	7.222485	3.802367	9.281262	3.346351	14.19684	7.373373	13.8	2.944814	7.251605	3.791449	2.981625	5.263856	8.392721	1.840509	4.380411	2.503092	6.846693	2.981625	20.68732	2.392662
16.9	3.216667	6.79	3.453333	2.296667	4.19	4.3	2.65	7.18	3.78	9.226667	3.326667	14.11333	7.33	13.8	2.927492	7.208949	3.769146	2.964086	5.232892	8.343352	1.829682	4.354644	2.488368	6.806419	2.964086	20.56563	2.378587
16.8	3.197633	6.749822	3.432899	2.283077	4.165207	4.274556	2.63432	7.137515	3.757633	9.172071	3.306982	14.02982	7.286627	13.9	2.910169	7.166292	3.746843	2.946547	5.201928	8.293983	1.818856	4.328877	2.473644	6.766144	2.946547	20.44394	2.364513
16.8	3.197633	6.749822	3.432899	2.283077	4.165207	4.274556	2.63432	7.137515	3.757633	9.172071	3.306982	14.02982	7.286627	14	2.910169	7.166292	3.746843	2.946547	5.201928	8.293983	1.818856	4.328877	2.473644	6.766144	2.946547	20.44394	2.364513
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.1	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.2	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.3	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.3	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.4	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.5	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.6	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.7	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.8	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.8	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	14.9	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
16.7	3.1786	6.709645	3.412465	2.269487	4.140414	4.249112	2.618639	7.09503	3.735266	9.117475	3.287298	13.94631	7.243254	15	2.892847	7.123636	3.724541	2.929008	5.170964	8.244614	1.808029	4.30311	2.45892	6.725869	2.929008	20.32225	2.350438
17.3	3.292801	6.95071	3.535069	2.351026	4.289172	4.401775	2.712722	7.349941	3.869467	9.445049	3.405404	14.44738	7.503491	15.1	2.996782	7.379575	3.858356	3.034241	5.356747	8.540828	1.872989	4.457713	2.547264	6.967517	3.034241	21.05239	2.434885
17.7	3.368935	7.11142	3.616805	2.405385	4.388343	4.50355	2.775444	7.519882	3.958935	9.663432	3.484142	14.78142	7.676982	15.2	3.066071	7.550201	3.947567	3.104397	5.480603	8.738304	1.916295	4.560781	2.606161	7.128616	3.104397	21.53915	2.491183
18.2	3.464103	7.312308	3.718974	2.473333	4.512308	4.630769	2.853846	7.732308	4.070769	9.93641	3.582564	15.19897	7.893846	15.3	3.152684	7.763483	4.05908	3.192092	5.635422	8.985148	1.970427	4.689617	2.679781	7.329989	3.192092	22.1476	2.561555
18.8	3.578304	7.553373	3.841578	2.554872	4.661065	4.783432	2.947929	7.987219	4.20497	10.26398	3.700671	15.70004	8.154083	15.3	3.256618	8.019422	4.192896	3.297326	5.821205	9.281362	2.035386	4.84422	2.768126	7.571637	3.297326	22.87774	2.646002
19.4	3.692505	7.794438	3.964181	2.63641	4.809822	4.936095	3.042012	8.24213	4.339172	10.59156	3.818777	16.2011	8.41432	15.4	3.360553	8.275361	4.326712	3.40256	6.006988	9.577576	2.100346	4.998822	2.85647	7.813285	3.40256	23.60788	2.730449
19.8	3.768639	7.955148	4.045917	2.690769	4.908994	5.03787	3.104734	8.412071	4.428639	10.80994	3.897515	16.53515	8.587811	15.5	3.429843	8.445987	4.415922	3.472716	6.130844	9.775051	2.143652	5.101891	2.915366	7.974384	3.472716	24.09464	2.786747
20.1	3.82574	8.07568	4.107219	2.731538	4.983373	5.114201	3.151775	8.539527	4.49574	10.97373	3.956568	16.78568	8.717929	15.6	3.48181	8.573957	4.48283	3.525333	6.223735	9.923158	2.176131	5.179192	2.959538	8.095208	3.525333	24.45971	2.828971
20.4	3.88284	8.196213	4.168521	2.772308	5.057751	5.190533	3.198817	8.666982	4.56284	11.13751	4.015621	17.03621	8.848047	15.7	3.533777	8.701926	4.549738	3.577949	6.316627	10.07127	2.208611	5.256494	3.003711	8.216032	3.577949	24.82479	2.871194
20.5	3.901874	8.236391	4.188955	2.785897	5.082544	5.215976	3.214497	8.709467	4.585207	11.19211	4.035306	17.11972	8.89142	15.8	3.5511	8.744583	4.572041	3.595488	6.347591	10.12063	2.219437	5.282261	3.018435	8.256307	3.595488	24.94648	2.885268
20.7	3.939941	8.316746	4.229822	2.813077	5.13213	5.266864	3.245858	8.794438	4.629941	11.3013	4.074675	17.28675	8.978166	15.8	3.585745	8.829896	4.616646	3.630566	6.409518	10.21937	2.24109	5.333795	3.047883	8.336856	3.630566	25.18986	2.913417
20.8	3.958974	8.356923	4.250256	2.826667	5.156923	5.292308	3.261538	8.836923	4.652308	11.3559	4.094359	17.37026	9.021538	15.9	3.603067	8.872552	4.638949	3.648105	6.440482	10.26874	2.251917	5.359562	3.062607	8.377131	3.648105	25.31155	2.927492
20.8	3.958974	8.356923	4.250256	2.826667	5.156923	5.292308	3.261538	8.836923	4.652308	11.3559	4.094359	17.37026	9.021538	16	3.603067	8.872552	4.638949	3.648105	6.440482	10.26874	2.251917	5.359562	3.062607	8.377131	3.648105	25.31155	2.927492
20.9	3.978008	8.397101	4.27069	2.840256	5.181716	5.317751	3.277219	8.879408	4.674675	11.41049	4.114043	17.45377	9.064911	16.1	3.620389	8.915209	4.661251	3.665644	6.471446	10.31811	2.262743	5.385329	3.077331	8.417405	3.665644	25.43324	2.941566
20.9	3.978008	8.397101	4.27069	2.840256	5.181716	5.317751	3.277219	8.879408	4.674675	11.41049	4.114043	17.45377	9.064911	16.2	3.620389	8.915209	4.661251	3.665644	6.471446	10.31811	2.262743	5.385329	3.077331	8.417405	3.665644	25.43324	2.941566
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	16.3	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	16.3	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	16.4	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	16.5	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
21	3.997041	8.437278	4.291124	2.853846	5.206509	5.343195	3.292899	8.921893	4.697041	11.46509	4.133728	17.53728	9.108284	16.6	3.637712	8.957865	4.683554	3.683183	6.50241	10.36748	2.27357	5.411096	3.092055	8.45768	3.683183	25.55493	2.955641
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	16.7	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	16.8	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	16.8	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	16.9	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
21.1	4.016075	8.477456	4.311558	2.867436	5.231302	5.368639	3.30858	8.964379	4.719408	11.51968	4.153412	17.62079	9.151657	17	3.655034	9.000522	4.705857	3.700722	6.533374	10.41685	2.284396	5.436864	3.106779	8.497955	3.700722	25.67662	2.969715
20.5	3.901874	8.236391	4.188955	2.785897	5.082544	5.215976	3.214497	8.709467	4.585207	11.19211	4.035306	17.11972	8.89142	17.1	3.5511	8.744583	4.572041	3.595488	6.347591	10.12063	2.219437	5.282261	3.018435	8.256307	3.595488	24.94648	2.885268
20.1	3.82574	8.07568	4.107219	2.731538	4.983373	5.114201	3.151775	8.539527	4.49574	10.97373	3.956568	16.78568	8.717929	17.2	3.48181	8.573957	4.48283	3.525333	6.223735	9.923158	2.176131	5.179192	2.959538	8.095208	3.525333	24.45971	2.828971
19.6	3.730572	7.874793	4.005049	2.66359	4.859408	4.986982	3.073373	8.327101	4.383905	10.70075	3.858146	16.36813	8.501065	17.3	3.395198	8.360674	4.371317	3.437638	6.068916	9.676314	2.121999	5.050357	2.885918	7.893835	3.437638	23.85126	2.758598
19	3.616371	7.633728	3.882446	2.582051	4.710651	4.83432	2.97929	8.072189	4.249704	10.37318	3.740039	15.86706	8.240828	17.3	3.291263	8.104735	4.237501	3.332404	5.883133	9.3801	2.057039	4.895754	2.797574	7.652187	3.332404	23.12112	2.674151

18.5	3.521203	7.43284	3.780276	2.514103	4.586686	4.707101	2.900888	7.859763	4.13787	10.1002	3.641617	15.44951	8.023964	17.4	3.204651	7.891453	4.125988	3.244709	5.728314	9.133255	2.002907	4.766918	2.723953	7.450813	3.244709	22.51267	2.603779
18.1	3.445069	7.27213	3.69854	2.459744	4.487515	4.605325	2.838166	7.689822	4.048402	9.881815	3.56288	15.11546	7.850473	17.5	3.135361	7.720827	4.036778	3.174553	5.604458	8.935779	1.959601	4.66385	2.665057	7.289715	3.174553	22.02591	2.547481
17.8	3.387968	7.151598	3.637239	2.418974	4.413136	4.528994	2.791124	7.562367	3.981302	9.718028	3.503826	14.86493	7.720355	17.6	3.083394	7.592857	3.96987	3.121936	5.511567	8.787673	1.927121	4.586548	2.620885	7.168891	3.121936	21.66084	2.505258
17.5	3.330868	7.031065	3.575937	2.378205	4.338757	4.452663	2.744083	7.434911	3.914201	9.554241	3.444773	14.6144	7.590237	17.7	3.031427	7.464888	3.902962	3.069319	5.418675	8.639566	1.894642	4.509247	2.576713	7.048067	3.069319	21.29577	2.463034
17.4	3.311834	6.990888	3.555503	2.364615	4.313964	4.427219	2.728402	7.392426	3.891834	9.499645	3.425089	14.53089	7.546864	17.8	3.014104	7.422231	3.880659	3.05178	5.387711	8.590197	1.883815	4.48348	2.561989	7.007792	3.05178	21.17408	2.44896
17.3	3.292801	6.95071	3.535069	2.351026	4.289172	4.401775	2.712722	7.349941	3.869467	9.445049	3.405404	14.44738	7.503491	17.8	2.996782	7.379575	3.858356	3.034241	5.356747	8.540828	1.872989	4.457713	2.547264	6.967517	3.034241	21.05239	2.434885
17.2	3.273767	6.910533	3.514635	2.337436	4.264379	4.376331	2.697041	7.307456	3.847101	9.390454	3.38572	14.36387	7.460118	17.9	2.979459	7.336918	3.836054	3.016702	5.325783	8.491459	1.862162	4.431946	2.53254	6.927243	3.016702	20.9307	2.420811
17.1	3.254734	6.870355	3.494201	2.323846	4.239586	4.350888	2.681361	7.26497	3.824734	9.335858	3.366036	14.28036	7.416746	18	2.962137	7.294262	3.813751	2.999164	5.29482	8.44209	1.851336	4.406179	2.517816	6.886968	2.999164	20.80901	2.406736
18.8	3.578304	7.553373	3.841578	2.554872	4.661065	4.783432	2.947929	7.987219	4.20497	10.26398	3.700671	15.70004	8.154083	18.1	3.256618	8.019422	4.192896	3.297326	5.821205	9.281362	2.035386	4.84422	2.768126	7.571637	3.297326	22.87774	2.646002
20.1	3.82574	8.07568	4.107219	2.731538	4.983373	5.114201	3.151775	8.539527	4.49574	10.97373	3.956568	16.78568	8.717929	18.2	3.48181	8.573957	4.48283	3.525333	6.223735	9.923158	2.176131	5.179192	2.959538	8.095208	3.525333	24.45971	2.828971
21.7	4.130276	8.718521	4.434162	2.948974	5.380059	5.521302	3.402663	9.21929	4.853609	11.84726	4.271519	18.12185	9.411893	18.3	3.758969	9.256461	4.839673	3.805956	6.719157	10.71306	2.349356	5.591466	3.195124	8.739603	3.805956	26.40676	3.054162
23.4	4.453846	9.401538	4.781538	3.18	5.801538	5.953846	3.669231	9.941538	5.233846	12.77538	4.606154	19.54154	10.14923	18.3	4.05345	9.981622	5.218817	4.104118	7.245543	11.55233	2.533406	6.029507	3.445433	9.424272	4.104118	28.47549	3.293428
25	4.758383	10.04438	5.108481	3.397436	6.198225	6.360947	3.920118	10.6213	5.591716	13.64892	4.921105	20.87771	10.8432	18.4	4.330609	10.66413	5.57566	4.384742	7.740964	12.34224	2.706631	6.441781	3.681018	10.06867	4.384742	30.42253	3.51862
26.4	5.024852	10.60686	5.394556	3.587692	6.545325	6.71716	4.139645	11.21609	5.904852	14.41325	5.196686	22.04686	11.45041	18.5	4.573123	11.26132	5.887896	4.630288	8.174458	13.0334	2.858202	6.802521	3.887155	10.63251	4.630288	32.12619	3.715563
27.3	5.196154	10.96846	5.578462	3.71	6.768462	6.946154	4.280769	11.59846	6.106154	14.90462	5.373846	22.79846	11.84077	18.6	4.729025	11.64523	6.08862	4.788138	8.453133	13.47772	2.955641	7.034425	4.019672	10.99498	4.788138	33.2214	3.842333
28.1	5.348422	11.28988	5.741933	3.818718	6.966805	7.149704	4.406213	11.93834	6.285089	15.34138	5.531321	23.46655	12.18775	18.7	4.867605	11.98648	6.267041	4.92845	8.700844	13.87267	3.042253	7.240562	4.137464	11.31718	4.92845	34.19492	3.954929
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	18.8	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.9	5.50069	11.6113	5.905404	3.927436	7.165148	7.353254	4.531657	12.27822	6.464024	15.77815	5.688797	24.13464	12.53473	18.8	5.006184	12.32773	6.445462	5.068762	8.948555	14.26763	3.128865	7.446699	4.255257	11.63938	5.068762	35.16845	4.067525
29.2	5.557791	11.73183	5.966706	3.968205	7.239527	7.429586	4.578698	12.40568	6.531124	15.94193	5.74785	24.38517	12.66485	18.9	5.058152	12.4557	6.51237	5.121379	9.041446	14.41573	3.161345	7.524001	4.299429	11.7602	5.121379	35.53352	4.109748
29.4	5.595858	11.81219	6.007574	3.995385	7.289112	7.480473	4.610059	12.49065	6.575858	16.05112	5.787219	24.55219	12.7516	19	5.092797	12.54101	6.556976	5.156457	9.103374	14.51447	3.182998	7.575535	4.328877	11.84075	5.156457	35.7769	4.137897
30.1	5.729093	12.09343	6.150611	4.090513	7.462663	7.65858	4.719822	12.78805	6.732426	16.43329	5.92501	25.13677	13.05521	19.1	5.214054	12.83961	6.713094	5.279229	9.320121	14.86005	3.258784	7.755905	4.431946	12.12267	5.279229	36.62873	4.236419
30.7	5.843294	12.3345	6.273215	4.172051	7.61142	7.811243	4.813905	13.04296	6.866627	16.76087	6.043116	25.63783	13.31544	19.2	5.317988	13.09555	6.84691	5.384463	9.505904	15.15627	3.323743	7.910508	4.52029	12.36432	5.384463	37.35887	4.320865
31.3	5.957495	12.57556	6.395819	4.25359	7.760178	7.963905	4.907988	13.29787	7.000828	17.08844	6.161223	26.1389	13.57568	19.3	5.421923	13.35149	6.980726	5.489697	9.691687	15.45248	3.388702	8.06511	4.608634	12.60597	5.489697	38.08901	4.405312
32	6.09073	12.8568	6.538856	4.348718	7.933728	8.142012	5.017751	13.59527	7.157396	17.47061	6.299014	26.72347	13.87929	19.3	5.54318	13.65008	7.136844	5.61247	9.908434	15.79806	3.464487	8.24548	4.711703	12.88789	5.61247	38.94084	4.503834
32.6	6.204931	13.09787	6.66146	4.430256	8.082485	8.294675	5.111834	13.85018	7.291598	17.79819	6.41712	27.22454	14.13953	19.4	5.647115	13.90602	7.27066	5.717704	10.09422	16.09428	3.529447	8.400083	4.800047	13.12954	5.717704	39.67098	4.588281
33	6.281065	13.25858	6.743195	4.484615	8.181657	8.39645	5.174556	14.02012	7.381065	18.01657	6.495858	27.55858	14.31302	19.5	5.716404	14.07665	7.359871	5.787859	10.21807	16.29175	3.572753	8.503151	4.858944	13.29064	5.787859	40.15774	4.644579
33.4	6.357199	13.41929	6.824931	4.538974	8.280828	8.498225	5.237278	14.19006	7.470533	18.23495	6.574596	27.89262	14.48651	19.6	5.785694	14.24727	7.449081	5.858015	10.34193	16.48923	3.616059	8.60622	4.91784	13.45174	5.858015	40.6445	4.700876
33.7	6.4143	13.53982	6.886233	4.579744	8.355207	8.574556	5.28432	14.31751	7.537633	18.39874	6.633649	28.14316	14.61663	19.7	5.837661	14.37524	7.515989	5.910632	10.43482	16.63734	3.648538	8.683521	4.962012	13.57256	5.910632	41.00957	4.7431
33.9	6.452367	13.62018	6.927101	4.606923	8.404793	8.625444	5.31568	14.40249	7.582367	18.50793	6.673018	28.31018	14.70337	19.8	5.872306	14.46055	7.560594	5.94571	10.49675	16.73607	3.670191	8.735056	4.99146	13.65311	5.94571	41.25295	4.771249
34	6.4714	13.66036	6.947535	4.620513	8.429586	8.650888	5.331361	14.44497	7.604734	18.56252	6.692702	28.39369	14.74675	19.8	5.889629	14.50321	7.582897	5.963249	10.52771	16.78544	3.681018	8.760823	5.006184	13.69339	5.963249	41.37464	4.785323
34.1	6.490434	13.70053	6.967968	4.634103	8.454379	8.676331	5.347041	14.48746	7.627101	18.61712	6.712387	28.4772	14.79012	19.9	5.906951	14.54587	7.6052	5.980788	10.55868	16.83481	3.691844	8.78659	5.020909	13.73366	5.980788	41.49633	4.799398
34.2	6.509467	13.74071	6.988402	4.647692	8.479172	8.701775	5.362722	14.52994	7.649467	18.67172	6.732071	28.56071	14.83349	20	5.924274	14.58852	7.627502	5.998327	10.58964	16.88418	3.702671	8.812357	5.035633	13.77394	5.998327	41.61802	4.813472
33.7	6.4143	13.53982	6.886233	4.579744	8.355207	8.574556	5.28432	14.31751	7.537633	18.39874	6.633649	28.14316	14.61663	20.1	5.837661	14.37524	7.515989	5.910632	10.43482	16.63734	3.648538	8.683521	4.962012	13.57256	5.910632	41.00957	4.7431
33.3	6.338166	13.37911	6.804497	4.525385	8.256036	8.472781	5.221598	14.14757	7.448166	18.18036	6.554911	27.80911	14.44314	20.2	5.768372	14.20462	7.426779	5.840476	10.31096	16.43986	3.605232	8.580453	4.903116	13.41146	5.840476	40.52281	4.686802
32.8	6.242998	13.17822	6.702327	4.457436	8.132071	8.345562	5.143195	13.93515	7.336331	17.90738	6.456489	27.39156	14.22627	20.3	5.681759	13.99133	7.315265	5.752781	10.15615	16.19301	3.5511	8.451617	4.829496	13.21009	5.752781	39.91436	4.61643
32.3	6.14783	12.97734	6.600158	4.389487	8.008107	8.218343	5.064793	13.72272	7.224497	17.6344	6.358067	26.974	14.00941	20.3	5.595147	13.77805	7.203752	5.665087	10.00133	15.94617	3.496967	8.322782	4.755875	13.00872	5.665087	39.30591	4.546057
31.7	6.033629	12.73627	6.477554	4.307949	7.859349	8.06568	4.97071	13.46781	7.090296	17.30682	6.239961	26.47294	13.74917	20.4	5.491213	13.52211	7.069936	5.559853	9.815543	15.64996	3.432008	8.168179	4.667531	12.76707	5.559853	38.57577	4.46161
31.3	5.957495	12.57556	6.395819	4.25359	7.760178	7.963905	4.907988	13.29787	7.000828	17.08844	6.161223	26.1389	13.57568	20.5	5.421923	13.35149	6.980726	5.489697	9.691687	15.45248	3.388702	8.06511	4.608634	12.60597	5.489697	38.08901	4.405312
31	5.900394	12.45503	6.334517	4.212821	7.685799	7.887574	4.860947	13.17041	6.933728	16.92465	6.10217	25.88836	13.44556	20.6	5.369956	13.22352	6.913818	5.43708	9.598796	15.30437	3.356222	7.987809	4.564462	12.48515	5.43708	37.72394	4.363089
30.8	5.862327	12.37467	6.293649	4.185641	7.636213	7.836686	4.829586	13.08544	6.888994	16.81546	6.062801	25.72134	13.35882	20.7	5.335311	13.1382	6.869213	5.402002	9.536868	15.20564	3.334569	7.936275	4.535014	12.4046	5.402002	37.48056	4.33494
30.6	5.82426	12.29432	6.252781	4.158462	7.586627	7.785799	4.798225	13.00047	6.84426	16.70627	6.023432	25.55432	13.27207	20.8	5.300666	13.05289	6.824607	5.366924	9.47494	15.1069	3.312916	7.88474	4.505566	12.32405	5.366924	37.23718	4.306791
30.5	5.805227	12.25414	6.232347	4.144872	7.561834	7.760355	4.782544	12.95799	6.821893	16.65168	6.003748	25.47081	13.2287	20.8	5.283343	13.01023	6.802305	5.349385	9.443976	15.05753	3.30209	7.858973	4.490842	12.28377	5.349385	37.11549	4.292717
30.5	5.805227	12.25414	6.232347	4.144872	7.561834	7.760355	4.782544	12.95799	6.821893	16.65168	6.003748	25.47081	13.2287	20.9	5.283343	13.01023	6.802305	5.349385	9.443976	15.05753	3.30209	7.858973	4.490842	12.28377	5.349385	37.11549	4.292717
30.4	5.786193	12.21396	6.211913	4.131282	7.537041	7.734911	4.766864	12.9155	6.799527	16.59708	5.984063	25.3873	13.18533	21	5.266021	12.96758	6.780002	5.331846	9.413013	15.00816	3.291263	7.833206	4.476118	12.2435	5.331846	36.9938	4.278642
33.3	6.338166	13.37911	6.804497	4.525385	8.256036	8.472781	5.221598	14.14757	7.448166	18.18036	6.554911	27.80911	14.44314	21.1	5.768372	14.20462	7.426779	5.840476	10.31096	16.43986	3.605232	8.580453	4.903116	13.41146	5.840476	40.52281	4.686802
35.5	6.756903	14.26302	7.254043	4.824359	8.801479	9.032544	5.566568	15.08225	7.940237	19.38146	6.987968	29.64635	15.39734	21.2	6.149465	15.14306	7.917437	6.226334	10.99217	17.52598	3.843416	9.14733	5.227046	14.29751	6.226334	43.19999	4.996441
38.2	7.270809	15.34781	7.805759	5.191282	9.470888	9.719527	5.989941	16.22935	8.544142	20.85554	7.519448	31.90114	16.5684	21.3	6.617171	16.29478	8.519608	6.699886	11.82819	18.85894	4.135732	9.843042	5.624595	15.38492	6.699886	46.48563	5.376452
41.3	7.860848	16.59331	8.439211	5.612564	10.23947	10.50828	6.476036	17.54639	9.237515	22.54801	8.129665	34.48998	17.91296	21.3	7.154167	17.61714	9.21099	7.243594	12.78807	20.38938	4.471354	10.64182	6.081042	16.63344	7.243594	50.25802	5.81276
44	8.374753	17.67811	8.990927	5.979487	10.90888	11.19527	6.899408	18.69349	9.84142	24.02209	8.661144	36.74477	19.08402	21.4	7.621872	18.76886	9.813161	7.717146	13.6241	21.72234	4.76367	11.33754	6.478592	17.72085	7.717146	53.54365	6.192771
46.3	8.812525	18.60219	9.460907	6.292051	11.47911	11.78047	7.260059	19.67065	10.35586	25.27779	9.113886	38.66552	20.0816	21.5	8.020289	19.74996	10.32612	8.120542	14.33627	22.85782	5.01268	11.93018	6.817245	18.64717	8.120542	56.34253	6.516484
48	9.136095	19.28521	9.808284	6.523077	11.90059	12.21302	7.526627	20.3929	10.73609	26.20592	9.448521	40.08521	20.81893	21.6	8.31477	20.47512	10.70527	8.418705	14.86265	23.69709	5.196731	12.36822	7.067554	19.33184	8.418705	58.41126	6.755751
49.2	9.364497	19.76734	10.05349	6.686154	12.19811	12.51834	7.714793	20.90272	11.0045	26.86107	9.684734	41.08734	21.33941	21.7	8.522639	20.987	10.9729	8.629172	15.23422	24.28952	5.32665	12.67743	7.244243	19.81514	8.629172	59.87154	6.924644
50.1	9.535799	20.12893	10.2374	6.808462	12.42124	12.74734	7.855917	21.28509	11.2058	27.35243	9.861893	41.83893	21.72976	21.8	8.678541	21.37091	11.17362	8.787023	15.51289	24.73384	5.424088	12.90933	7.37676	20.17761	8.787023	60.96675	7.051315
50.7	9.65	20.37	10.36	6.89	12.57	12.9	7.95	21.54	11.34	27.68	9.98	42.34	21.99	21.8	8.782476	21.62685	11.30744	8.892257	15.69868	25.03006	5.489047	13.06393	7.465104	20.41926	8.892257	61.69689	7.135762
51.2	9.745168	20.57089	10.46217	6.957949	12.69396	13.02722	8.028402	21.75243	11.45183	27.95298	10.07842	42.75755	22.20686	21.9	8.869088	21.84013	11.41895	8.979952	15.85349	25.2769	5.54318	13.19277	7.538725	20.62063	8.979952	62.30534	7.206134
51.5	9.802268	20.69142	10.52347	6.998718	12.76834	13.10355	8.075444	21.87988	11.51893	28.11677	10.13748	43.00809	22.33698	22	8.921055	21.9681	11.48586	9.032568	15.94639	25.42501	5.57566	13.27007	7.582897	20.74145	9.032568	62.67041	7.248357
51.2	9.745168	20.57089	10.46217	6.957949	12.69396	13.02722	8.028402	21.75243	11.45183	27.95298	10.07842	42.75755	22.20686	22.1	8.869088	21.84013	11.41895	8.979952	15.85349	25.2769	5.54318	13.19277	7.538725	20.62063	8.979952	62.30534	7.206134
51	9.707101	20.49053	10.4213	6.930769	12.64438	12.97633	7.997041	21.66746	11.4071	27.84379	10.03905	42.59053	22.12012	22.2	8.834443	21.75482	11.37435	8.944874	15.79157	25.17816	5.521527	13.14123	7.509277	20.54008	8.944874	62.06196	7.177985
50.6	9.630966	20.32982	10.33957	6.87641	12.54521	12.87456	7.93432	21.49751	11.31763	27.6254	9.960316	42.25649	21.94663	22.3	8.765153	21.58419	11.28513	8.874718	15.66771	24.98069	5.478221	13.03817	7.45038	20.37898	8.874718	61.5752	7.121687
50.1	9.535799	20.12893	10.2374	6.808462	12.42124	12.74734	7.855917	21.28509	11.2058	27.35243	9.861893	41.83893	21.72976	22.3	8.678541	21.37091	11.17362	8.787023	15.51289	24.73384	5.424088	12.90933	7.37676	20.17761	8.787023	60.96675	7.051315
49.6	9.440631	19.92805	10.13523	6.740513	12.29728	12.62012	7.777515	21.07266	11.09396	27.07945	9.763471	41.42138	21.5129	22.4	8.591929	21.15763	11.06211	8.699328	15.35807	24.487	5.369956	12.78049	7.30314	19.97623	8.699328	60.3583	6.980942
49.2	9.364497	19.76734	10.05349	6.686154	12.19811	12.51834	7.714793	20.90272	11.0045	26.86107	9.684734	41.08734	21.33941	22.5	8.522639	20.987	10.9729	8.629172	15.23422	24.28952	5.32665	12.67743	7.244243	19.81514	8.629172	59.87154	6.924644
49	9.32643	19.68698	10.01262	6.658974	12.14852	12.46746	7.683432	20.81775	10.95976	26.75187	9.645365	40.92032	21.25266	22.6	8.487994	20.90169	10.92829	8.594094	15.17229	24.19078	5.304996	12.62589	7.214795	19.73459	8.594094	59.62816	6.896495
48.8	9.288363	19.60663	9.971755	6.631795	12.09893	12.41657	7.652071	20.73278	10.91503	26.64268	9.605996	40.75329	21.16592	22.7	8.453349	20.81637	10.88369	8.559016	15.11036	24.09205	5.283343	12.57436	7.185347	19.65404	8.559016	59.38478	6.868346
48.7	9.269329	19.56645	9.951321	6.618205	12.07414	12.39112	7.636391	20.6903	10.89266	26.58809	9.586312	40.66978	21.12254	22.7	8.436027	20.77372	10.86138	8.541477	15.0794	24.04268	5.272517	12.54859	7.170623	19.61376	8.541477	59.26309	6.854272
48.6	9.250296	19.52627	9.930888	6.604615	12.04935	12.36568	7.62071	20.64781	10.8703	26.53349	9.566627	40.58627	21.07917	22.8	8.418705	20.73106	10.83908	8.523938	15.04843	23.99331	5.26169	12.52282	7.155899	19.57349	8.523938	59.1414	6.840197
48.5	9.231262	19.48609	9.910454	6.591026	12.02456	12.34024	7.60503	20.60533	10.84793	26.4789	9.546943	40.50276	21.0358	22.9	8.401382	20.6884	10.81678	8.506399	15.01747	23.94394	5.250864	12.49706	7.141175	19.53321	8.506399	59.01971	6.826123
48.5	9.231262	19.48609	9.910454	6.591026	12.02456	12.34024	7.60503	20.60533	10.84793	26.4789	9.546943	40.50276	21.0358	23	8.401382	20.6884	10.81678	8.506399	15.01747	23.94394	5.250864	12.49706	7.141175	19.53321	8.506399	59.01971	6.826123
59	11.22978	23.70473	12.05602	8.017949	14.62781	15.01183	9.251479	25.06627	13.19645	32.21144	11.61381	49.2714	25.58994	23.1	10.22024	25.16734	13.15856	10.34799	18.26868	29.12768	6.387649	15.2026	8.687202	23.76205	10.34799	71.79717	8.303943
67.1	12.7715	26.95911	13.71116	9.118718	16.63604	17.07278	10.5216	28.50757	15.00817	36.63369	13.20824	56.03578	29.10314	23.2	11.62336	28.62251	14.96507	11.76865	20.77675	33.12656	7.264597	17.28974	9.879852	27.0243	11.76865	81.65407	9.443976
77.2	14.69389	31.01704	15.77499	10.49128	19.14012	19.6426	12.10533	32.79858	17.26722	42.14785	15.19637	64.47037	33.48379	23.2	13.37292	32.93082	17.21764	13.54008	23.9041	38.11283	8.358076	19.89222	11.36698	31.09204	13.54008	93.94478	10.8655
88.3	16.80661	35.47675	18.04316	11.99974	21.89213	22.46686	13.84586	37.51444	19.74994	48.20797	17.38134	73.74008	38.29817	23.3	15.29571	37.66569	19.69323	15.48691	27.34109	43.59278	9.55982	22.75237	13.00136	35.56253	15.48691	107.4524	12.42777

98.5	18.74803	39.57485	20.12742	13.3859	24.42101	25.06213	15.44527	41.84793	22.03136	53.77673	19.38915	82.25819	42.72219	23.4	17.0626	42.01665	21.9681	17.27588	30.4994	48.62841	10.66413	25.38062	14.50321	39.67055	17.27588	119.8648	13.86336
106.8	20.32781	42.90959	21.82343	14.51385	26.47882	27.17396	16.74675	45.3742	23.88781	58.30817	21.02296	89.18959	46.32213	23.5	18.50036	45.55714	23.81922	18.73162	33.0694	52.72604	11.56273	27.51929	15.72531	43.01334	18.73162	129.9651	15.03155
113.1	21.52692	45.44077	23.11077	15.37	28.04077	28.77692	17.73462	48.05077	25.29692	61.74769	22.26308	94.45077	49.05462	23.6	19.59168	48.2445	25.22428	19.83657	35.02012	55.83628	12.2448	29.14262	16.65293	45.55065	19.83657	137.6315	15.91824
117.6	22.38343	47.24876	24.0303	15.98154	29.15645	29.92189	18.44024	49.9626	26.30343	64.2045	23.14888	98.20876	51.00639	23.7	20.37119	50.16405	26.2279	20.62583	36.4135	58.05788	12.73199	30.30214	17.31551	47.36301	20.62583	143.1076	16.55159
120.9	23.01154	48.57462	24.70462	16.43	29.97462	30.76154	18.95769	51.36462	27.04154	66.00615	23.79846	100.9646	52.43769	23.7	20.94283	51.57171	26.96389	21.20461	37.4353	59.68706	13.08927	31.15246	17.8014	48.69207	21.20461	147.1234	17.01605
123.3	23.46834	49.53888	25.19503	16.75615	30.56964	31.37219	19.33402	52.38426	27.57834	67.31645	24.27089	102.9689	53.47864	23.8	21.35857	52.59547	27.49915	21.62555	38.17844	60.87191	13.3491	31.77087	18.15478	49.65866	21.62555	150.0439	17.35383
125	23.79191	50.22189	25.54241	16.98718	30.99112	31.80473	19.60059	53.10651	27.95858	68.24458	24.60552	104.3886	54.21598	23.9	21.65305	53.32063	27.8783	21.92371	38.70482	61.71118	13.53315	32.20891	18.40509	50.34333	21.92371	152.1127	17.5931
126.3	24.03935	50.7442	25.80805	17.16385	31.31343	32.1355	19.80444	53.65882	28.24935	68.95432	24.86142	105.4742	54.77982	24	21.87824	53.87516	28.16823	22.15172	39.10735	62.35298	13.6739	32.54388	18.5965	50.8669	22.15172	153.6946	17.77607
166	31.59566	66.69467	33.92032	22.55897	41.15621	42.23669	26.02959	70.52544	37.12899	90.6288	32.67613	138.628	71.99882	24.1	28.75525	70.80979	37.02238	29.11469	51.4	81.95245	17.97203	42.77343	24.44196	66.85595	29.11469	202.0056	23.36364
197	37.49606	79.1497	40.25483	26.77179	48.84201	50.12426	30.89053	83.69586	44.06272	107.5535	38.7783	164.5164	85.44438	24.2	34.1252	84.03331	43.9362	34.55177	60.9988	97.25683	21.32825	50.76124	29.00642	79.34109	34.55177	239.7295	27.72673
235.6	44.843	94.65822	48.14233	32.01744	58.41207	59.94556	36.9432	100.0951	52.69633	128.6274	46.37649	196.7516	102.1863	24.2	40.81166	100.4987	52.54502	41.32181	72.95085	116.3132	25.50729	60.70735	34.68991	94.88712	41.32181	286.7019	33.15948
277.8	52.87515	111.6131	56.76544	37.75231	68.87467	70.68284	43.56036	118.0239	62.13515	151.6667	54.68331	231.9931	120.4896	24.3	48.12173	118.4998	61.95673	48.72325	86.01759	137.1469	30.07608	71.58108	40.90347	111.883	48.72325	338.0552	39.09891
316.5	60.24112	127.1618	64.67337	43.01154	78.46953	80.52959	49.6287	134.4657	70.79112	172.7953	62.30118	264.3118	137.2749	24.4	54.82551	135.0078	70.58785	55.51083	98.00061	156.2527	34.26595	81.55295	46.60169	127.4693	55.51083	385.1492	44.54573
348.6	66.35089	140.0588	71.23266	47.37385	86.42805	88.69704	54.66213	148.1034	77.97089	190.3205	68.61988	291.1188	151.1975	24.5	60.38602	148.7006	77.747	61.14084	107.94	172.1001	37.74126	89.8242	51.32811	140.3975	61.14084	424.2118	49.06364
372.7	70.93797	149.7416	76.15724	50.64897	92.40314	94.82899	58.44112	158.3424	83.3613	203.478	73.36383	311.2449	161.6504	24.6	64.56072	158.9808	83.12193	65.36773	115.4023	183.9981	40.35045	96.03408	54.87662	150.1037	65.36773	453.5391	52.45559
390.3	74.28787	156.8128	79.75361	53.04077	96.76669	99.3071	61.20089	165.8198	87.29787	213.0869	76.82828	325.9428	169.284	24.7	67.60947	166.4883	87.0472	68.45459	120.8519	192.687	42.25592	100.5691	57.46805	157.192	68.45459	474.9566	54.9327
403.3	76.76223	162.0359	82.41002	54.80744	99.98976	102.6148	63.23935	171.3428	90.20556	220.1843	79.38726	336.7993	174.9224	24.7	69.86139	172.0337	89.94654	70.73466	124.8772	199.105	43.66337	103.9188	59.38218	162.4277	70.73466	490.7763	56.76238
412.9	78.58945	165.893	84.37168	56.11205	102.3699	105.0574	64.74467	175.4214	92.35278	225.4255	81.27696	344.8163	179.0862	24.8	71.52434	176.1287	92.08759	72.4184	127.8498	203.8444	44.70272	106.3925	60.79569	166.2941	72.4184	502.4585	58.11353
420	79.94083	168.7456	85.82249	57.07692	104.1302	106.8639	65.85799	178.4379	93.94083	229.3018	82.67456	350.7456	182.1657	24.9	72.75424	179.1573	93.67108	73.66367	130.0482	207.3496	45.4714	108.2219	61.8411	169.1536	73.66367	511.0985	59.11282
425.4	80.96864	170.9151	86.92592	57.81077	105.469	108.2379	66.70473	180.7321	95.14864	232.2499	83.73751	355.2551	184.5078	25	73.68965	181.4608	94.87542	74.61077	131.7202	210.0155	46.05603	109.6134	62.6362	171.3284	74.61077	517.6698	59.87284
384	73.08876	154.2817	78.46627	52.18462	95.20473	97.70414	60.21302	163.1432	85.88876	209.6473	75.58817	320.6817	166.5515	25.1	66.51816	163.801	85.64213	67.34964	118.9012	189.5768	41.57385	98.94576	56.54044	154.6547	67.34964	467.2901	54.046
350.9	66.78866	140.9829	71.70264	47.68641	86.99828	89.28225	55.02278	149.0806	78.48533	191.5762	69.07262	293.0396	152.1951	25.2	60.78443	149.6817	78.25996	61.54424	108.6522	173.2356	37.99027	90.41684	51.66677	141.3238	61.54424	427.0106	49.38735
307.3	58.49004	123.4655	62.79345	41.76128	76.18858	78.18876	48.18609	130.557	68.73337	167.7725	60.49022	256.6288	133.2846	25.2	53.23185	131.0834	68.53601	53.89725	95.15193	151.7108	33.26991	79.18238	45.24707	123.7641	53.89725	373.9537	43.25088
258.9	49.27781	104.0196	52.90343	35.18385	64.18882	65.87396	40.59675	109.9942	57.90781	141.3482	50.96296	216.2096	112.2921	25.3	44.84779	110.4377	57.74153	45.40839	80.16543	127.8162	28.02987	66.71109	38.12062	104.2711	45.40839	315.0557	36.43883
214.6	40.84596	86.22095	43.8512	29.16359	53.20556	54.60237	33.6503	91.17325	47.99929	117.1623	42.24276	179.2143	93.07799	25.4	37.17395	91.54085	47.86146	37.63863	66.44844	105.9458	23.23372	55.29625	31.59786	86.42944	37.63863	261.147	30.20384
178.1	33.89872	71.55615	36.39282	24.20333	44.15615	45.31538	27.92692	75.66615	39.83538	97.23487	35.05795	148.7328	77.24692	25.5	30.85126	75.97123	39.721	31.2369	55.14663	87.92609	19.28204	45.89125	26.22357	71.72918	31.2369	216.7301	25.06665
151.2	28.7787	60.7484	30.89609	20.54769	37.48686	38.47101	23.70888	64.23763	33.8187	82.54864	29.76284	126.2684	65.57964	25.6	26.19153	64.49663	33.72159	26.51892	46.81735	74.64585	16.3697	38.95989	22.2628	60.8953	26.51892	183.9955	21.28061
132	25.12426	53.03432	26.97278	17.93846	32.72663	33.5858	20.69822	56.08047	29.52426	72.06627	25.98343	110.2343	57.25207	25.7	22.86562	56.30658	29.43948	23.15144	40.87229	65.16701	14.29101	34.01261	19.43577	53.16256	23.15144	160.631	18.57831
118.2	22.49763	47.48982	24.1529	16.06308	29.30521	30.07456	18.53432	50.21751	26.43763	64.53207	23.26698	98.70982	51.26663	25.7	20.47512	50.41999	26.36172	20.73106	36.59928	58.3541	12.79695	30.45674	17.40385	47.60466	20.73106	143.8377	16.63604
108.4	20.63235	43.55243	22.15037	14.73128	26.8755	27.58107	16.99763	46.05396	24.24568	59.1817	21.33791	90.52576	47.01609	25.8	18.77752	46.23965	24.17606	19.01224	33.56482	53.51594	11.73595	27.93156	15.96089	43.65774	19.01224	131.9121	15.25674
101.6	19.33807	40.82036	20.76087	13.80718	25.18959	25.85089	15.93136	43.16497	22.72473	55.46919	19.99937	84.84702	44.06675	25.9	17.5996	43.33901	22.65948	17.81959	31.45928	50.15885	10.99975	26.1794	14.95966	40.91906	17.81959	123.6372	14.29967
96.7	18.40542	38.85166	19.75961	13.14128	23.97473	24.60414	15.16302	41.0832	21.62876	52.794	19.03483	80.75499	41.94148	26	16.7508	41.24884	21.56665	16.96018	29.94205	47.73977	10.46925	24.91681	14.23818	38.9456	16.96018	117.6743	13.61002
89.6	17.05404	35.99905	18.3088	12.17641	22.21444	22.79763	14.0497	38.06675	20.04071	48.91771	17.63724	74.82572	38.86201	26.1	15.5209	38.22023	19.98316	15.71492	27.74362	44.23458	9.700565	23.08734	13.19277	36.0861	15.71492	109.0344	12.61073
84.2	16.02623	33.82947	17.20536	11.44256	20.87562	21.42367	13.20296	35.77254	18.8329	45.96955	16.57428	70.31613	36.51988	26.2	14.58549	35.91677	18.77882	14.76781	26.07157	41.56865	9.115933	21.69592	12.39767	33.91127	14.76781	102.4631	11.85071
78.8	14.99842	31.65988	16.10193	10.70872	19.5368	20.0497	12.35621	33.47834	17.62509	43.02138	15.51132	65.80655	34.17775	26.2	13.65008	33.61332	17.57448	13.82071	24.39952	38.90273	8.5313	20.3045	11.60257	31.73644	13.82071	95.89182	11.09069
73.6	14.00868	29.57065	15.03937	10.00205	18.24757	18.72663	11.54083	31.26911	16.46201	40.18241	14.48773	61.46398	31.92237	26.3	12.74931	31.39519	16.41474	12.90868	22.7894	36.33554	7.968321	18.9646	10.83692	29.64216	12.90868	89.56393	10.35882
69	13.13314	27.72249	14.09941	9.376923	17.1071	17.55621	10.81953	29.31479	15.43314	37.67101	13.58225	57.62249	29.92722	26.4	11.95248	29.43299	15.38882	12.10189	21.36506	34.06457	7.470301	17.77932	10.15961	27.78952	12.10189	83.96619	9.711392
65.4	12.44793	26.27609	13.36379	8.887692	16.21456	16.64024	10.25503	27.78533	14.62793	35.70556	12.87361	54.61609	28.3658	26.5	11.32887	27.89735	14.58593	11.47049	20.25036	32.28729	7.080546	16.8517	9.629543	26.33963	11.47049	79.58534	9.20471
62.7	11.93402	25.1913	12.81207	8.520769	15.54515	15.95325	9.831657	26.63822	14.02402	34.23148	12.34213	52.3613	27.19473	26.6	10.86117	26.74563	13.98375	10.99693	19.41434	30.95433	6.78823	16.15599	9.231993	25.25222	10.99693	76.29971	8.824699
60.8	11.57239	24.42793	12.42383	8.262564	15.07408	15.46982	9.533728	25.83101	13.59905	33.19416	11.96813	50.7746	26.37065	26.7	10.53204	25.93515	13.56	10.66369	18.82603	30.01632	6.582526	15.66641	8.952236	24.487	10.66369	73.98759	8.557284
59.5	11.32495	23.90562	12.15819	8.085897	14.75178	15.13905	9.329882	25.2787	13.30828	32.48442	11.71223	49.68895	25.8068	26.7	10.30685	25.38062	13.27007	10.43569	18.42349	29.37452	6.441781	15.33144	8.760823	23.96343	10.43569	72.40562	8.374316
58.5	11.13462	23.50385	11.95385	7.95	14.50385	14.88462	9.173077	24.85385	13.08462	31.93846	11.51538	48.85385	25.37308	26.8	10.13363	24.95405	13.04704	10.2603	18.11386	28.88083	6.333516	15.07377	8.613582	23.56068	10.2603	71.18872	8.233571
57.9	11.02041	23.26278	11.83124	7.868462	14.35509	14.73195	9.078994	24.59893	12.95041	31.61089	11.39728	48.35278	25.11284	26.9	10.02969	24.69811	12.91323	10.15506	17.92807	28.58462	6.268557	14.91917	8.525238	23.31903	10.15506	70.45858	8.149124
57.4	10.92525	23.06189	11.72907	7.800513	14.23112	14.60473	9.000592	24.38651	12.83858	31.33791	11.29886	47.93523	24.89598	27	9.943079	24.48483	12.80171	10.06737	17.77325	28.33778	6.214424	14.79033	8.451617	23.11766	10.06737	69.85013	8.078752
54.7	10.41134	21.9771	11.17736	7.43359	13.56172	13.91775	8.577219	23.23941	12.23467	29.86383	10.76738	45.68043	23.72491	27.1	9.475373	23.33311	12.19954	9.593815	16.93723	27.00481	5.922108	14.09462	8.054067	22.03024	9.593815	66.5645	7.698741
52.5	9.992604	21.0932	10.72781	7.134615	13.01627	13.35799	8.232249	22.30473	11.7426	28.66272	10.33432	43.8432	22.77071	27.2	9.09428	22.39466	11.70889	9.207958	16.25602	25.9187	5.683925	13.52774	7.730138	21.1442	9.207958	63.88731	7.389102
50	9.516765	20.08876	10.21696	6.794872	12.39645	12.72189	7.840237	21.2426	11.18343	27.29783	9.842209	41.75542	21.68639	27.2	8.661219	21.32825	11.15132	8.769484	15.48193	24.68447	5.413262	12.88356	7.362036	20.13733	8.769484	60.84506	7.03724
47.2	8.983826	18.96379	9.644813	6.414359	11.70225	12.00947	7.401183	20.05302	10.55716	25.76915	9.291045	39.41712	20.47195	27.3	8.17619	20.13387	10.52685	8.278393	14.61494	23.30214	5.110119	12.16208	6.949762	19.00964	8.278393	57.43774	6.643155
44.7	8.507988	17.95935	9.133964	6.074615	11.08243	11.37337	7.009172	18.99089	9.997988	24.40426	8.798935	37.32935	19.38763	27.4	7.74313	19.06746	9.969279	7.839919	13.84084	22.06792	4.839456	11.51791	6.58166	18.00278	7.839919	54.39549	6.291293
42.7	8.127318	17.1558	8.725286	5.802821	10.58657	10.8645	6.695562	18.14118	9.550651	23.31235	8.405247	35.65913	18.52018	27.5	7.396681	18.21433	9.523227	7.489139	13.22157	21.08054	4.622926	11.00256	6.287179	17.19728	7.489139	51.96168	6.009803
41.2	7.841815	16.55314	8.418777	5.598974	10.21467	10.48284	6.460355	17.50391	9.215148	22.49341	8.10998	34.40647	17.86959	27.6	7.136844	17.57448	9.188687	7.226055	12.75711	20.34001	4.460528	10.61606	6.066318	16.59316	7.226055	50.13633	5.798686
40.2	7.651479	16.15136	8.214438	5.463077	9.966746	10.2284	6.30355	17.07905	8.991479	21.94746	7.913136	33.57136	17.43586	27.7	6.96362	17.14791	8.965661	7.050665	12.44747	19.84632	4.352262	10.35838	5.919077	16.19042	7.050665	48.91943	5.657941
39.4	7.499211	15.82994	8.050966	5.354359	9.768402	10.02485	6.178107	16.73917	8.812544	21.51069	7.755661	32.90327	17.08888	27.7	6.82504	16.80666	8.787239	6.910353	12.19976	19.45137	4.26565	10.15225	5.801284	15.86822	6.910353	47.94591	5.545345
38.9	7.404043	15.62905	7.948797	5.28641	9.644438	9.897633	6.099704	16.52675	8.70071	21.23771	7.657239	32.48572	16.87201	27.8	6.738428	16.59338	8.675726	6.822659	12.04494	19.20452	4.211518	10.02341	5.727664	15.66685	6.822659	47.33746	5.474973
38.5	7.327909	15.46834	7.867061	5.232051	9.545266	9.795858	6.036982	16.3568	8.611243	21.01933	7.578501	32.15168	16.69852	27.9	6.669138	16.42275	8.586516	6.752503	11.92108	19.00704	4.168212	9.920343	5.668768	15.50575	6.752503	46.8507	5.418675
38.2	7.270809	15.34781	7.805759	5.191282	9.470888	9.719527	5.989941	16.22935	8.544142	20.85554	7.519448	31.90114	16.5684	28	6.617171	16.29478	8.519608	6.699886	11.82819	18.85894	4.135732	9.843042	5.624595	15.38492	6.699886	46.48563	5.376452
38	7.232742	15.26746	7.764892	5.164103	9.421302	9.668639	5.95858	16.14438	8.499408	20.74635	7.480079	31.73412	16.48166	28.1	6.582526	16.20947	8.475003	6.664808	11.76627	18.7602	4.114079	9.791508	5.595147	15.30437	6.664808	46.24225	5.348303
37.9	7.213708	15.22728	7.744458	5.150513	9.396509	9.643195	5.942899	16.10189	8.477041	20.69176	7.460394	31.65061	16.43828	28.2	6.565204	16.16681	8.4527	6.647269	11.7353	18.71083	4.103252	9.765741	5.580423	15.2641	6.647269	46.12056	5.334228
37.8	7.194675	15.1871	7.724024	5.136923	9.371716	9.617751	5.927219	16.05941	8.454675	20.63716	7.44071	31.5671	16.39491	28.2	6.547881	16.12416	8.430397	6.62973	11.70434	18.66146	4.092426	9.739974	5.565699	15.22382	6.62973	45.99887	5.320154
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	28.3	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	28.4	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	28.5	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	28.6	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	28.7	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	28.7	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	28.8	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	28.9	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.1	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.1	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.2	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.3	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005

37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.4	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.5	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.6	7.156607	15.10675	7.683156	5.109744	9.32213	9.566864	5.895858	15.97444	8.409941	20.52797	7.401341	31.40008	16.30817	29.6	6.513236	16.03884	8.385792	6.594652	11.64241	18.56272	4.070773	9.688439	5.536251	15.14327	6.594652	45.75549	5.292005
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	29.7	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	29.7	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	29.8	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	29.9	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
37.7	7.175641	15.14692	7.70359	5.123333	9.346923	9.592308	5.911538	16.01692	8.432308	20.58256	7.421026	31.48359	16.35154	30	6.530559	16.0815	8.408095	6.612191	11.67337	18.61209	4.081599	9.714206	5.550975	15.18355	6.612191	45.87718	5.306079
35.9	6.833037	14.42373	7.335779	4.878718	8.900651	9.13432	5.62929	15.25219	8.029704	19.59984	7.066706	29.98039	15.57083	30.1	6.218755	15.31368	8.006647	6.296489	11.11602	17.72345	3.886722	9.250398	5.285942	14.45861	6.296489	43.68675	5.052738
34.5	6.566568	13.86124	7.049704	4.688462	8.55355	8.778107	5.409763	14.6574	7.716568	18.8355	6.791124	28.81124	14.96361	30.2	5.976241	14.71649	7.69441	6.050944	10.68253	17.03229	3.735151	8.889658	5.079805	13.89476	6.050944	41.98309	4.855696
32.7	6.223964	13.13805	6.681893	4.443846	8.107278	8.320118	5.127515	13.89266	7.313964	17.85278	6.436805	27.30805	14.1829	30.2	5.664437	13.94868	7.292963	5.735243	10.12518	16.14365	3.540273	8.42585	4.814771	13.16982	5.735243	39.79267	4.602355
30.7	5.843294	12.3345	6.273215	4.172051	7.61142	7.811243	4.813905	13.04296	6.866627	16.76087	6.043116	25.63783	13.31544	30.3	5.317988	13.09555	6.84691	5.384463	9.505904	15.15627	3.323743	7.910508	4.52029	12.36432	5.384463	37.35887	4.320865
28.9	5.50069	11.6113	5.905404	3.927436	7.165148	7.353254	4.531657	12.27822	6.464024	15.77815	5.688797	24.13464	12.53473	30.4	5.006184	12.32773	6.445462	5.068762	8.948555	14.26763	3.128865	7.446699	4.255257	11.63938	5.068762	35.16845	4.067525
27.4	5.215187	11.00864	5.598895	3.72359	6.793254	6.971598	4.29645	11.64095	6.128521	14.95921	5.393531	22.88197	11.88414	30.5	4.746348	11.68788	6.110923	4.805677	8.484097	13.52709	2.966467	7.060192	4.034396	11.03526	4.805677	33.34309	3.856408
26.3	5.005819	10.56669	5.374122	3.574103	6.520533	6.691716	4.123964	11.17361	5.882485	14.35866	5.177002	21.96335	11.40704	30.6	4.555801	11.21866	5.865594	4.612749	8.143494	12.98403	2.847376	6.776754	3.872431	10.59224	4.612749	32.0045	3.701588
25.5	4.85355	10.24527	5.210651	3.465385	6.322189	6.488166	3.998521	10.83373	5.70355	13.92189	5.019527	21.29527	11.06006	30.7	4.417222	10.87741	5.687173	4.472437	7.895784	12.58908	2.760763	6.570617	3.754638	10.27004	4.472437	31.03098	3.588993
25	4.758383	10.04438	5.108481	3.397436	6.198225	6.360947	3.920118	10.6213	5.591716	13.64892	4.921105	20.87771	10.8432	30.7	4.330609	10.66413	5.57566	4.384742	7.740964	12.34224	2.706631	6.441781	3.681018	10.06867	4.384742	30.42253	3.51862
24.6	4.682249	9.883669	5.026746	3.343077	6.099053	6.259172	3.857396	10.45136	5.502249	13.43053	4.842367	20.54367	10.6697	30.8	4.26132	10.4935	5.486449	4.314586	7.617109	12.14476	2.663325	6.338713	3.622122	9.907568	4.314586	29.93577	3.462322
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	30.9	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.1	4.587081	9.682781	4.924576	3.275128	5.975089	6.131953	3.778994	10.23893	5.390414	13.15755	4.743945	20.12611	10.45284	31	4.174707	10.28022	5.374936	4.226891	7.46229	11.89792	2.609192	6.209877	3.548501	9.706195	4.226891	29.32732	3.39195
23.9	4.549014	9.602426	4.883708	3.247949	5.925503	6.081065	3.747633	10.15396	5.34568	13.04836	4.704576	19.95909	10.36609	31.1	4.140063	10.1949	5.330331	4.191813	7.400362	11.79918	2.587539	6.158343	3.519053	9.625645	4.191813	29.08394	3.363801
23.8	4.52998	9.562249	4.863274	3.234359	5.90071	6.055621	3.731953	10.11148	5.323314	12.99377	4.684892	19.87558	10.32272	31.2	4.12274	10.15225	5.308028	4.174274	7.369398	11.74981	2.576713	6.132576	3.504329	9.585371	4.174274	28.96225	3.349726
23.8	4.52998	9.562249	4.863274	3.234359	5.90071	6.055621	3.731953	10.11148	5.323314	12.99377	4.684892	19.87558	10.32272	31.2	4.12274	10.15225	5.308028	4.174274	7.369398	11.74981	2.576713	6.132576	3.504329	9.585371	4.174274	28.96225	3.349726
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	31.3	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	31.4	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	31.5	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	31.6	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	31.7	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	31.7	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	31.8	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	31.9	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	32	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23	4.377712	9.240828	4.699803	3.125641	5.702367	5.852071	3.606509	9.771598	5.144379	12.557	4.527416	19.2075	9.97574	32.1	3.984161	9.810996	5.129607	4.033963	7.121687	11.35486	2.4901	5.926439	3.386537	9.263173	4.033963	27.98873	3.237131
22.5	4.282544	9.039941	4.597633	3.057692	5.578402	5.724852	3.528107	9.559172	5.032544	12.28402	4.428994	18.78994	9.758876	32.2	3.897548	9.597713	5.018094	3.946268	6.966868	11.10801	2.435968	5.797603	3.312916	9.0618	3.946268	27.38028	3.166758
21.9	4.168343	8.798876	4.47503	2.976154	5.429645	5.572189	3.434024	9.30426	4.898343	11.95645	4.310888	18.28888	9.498639	32.2	3.793614	9.341774	4.884278	3.841034	6.781085	10.8118	2.371009	5.643001	3.224572	8.820152	3.841034	26.65014	3.082311
21.3	4.054142	8.557811	4.352426	2.894615	5.280888	5.419527	3.339941	9.049349	4.764142	11.62888	4.192781	17.78781	9.238402	32.3	3.689679	9.085835	4.750462	3.7358	6.595302	10.51559	2.306049	5.488398	3.136227	8.578504	3.7358	25.92	2.997864
20.7	3.939941	8.316746	4.229822	2.813077	5.13213	5.266864	3.245858	8.794438	4.629941	11.3013	4.074675	17.28675	8.978166	32.4	3.585745	8.829896	4.616646	3.630566	6.409518	10.21937	2.24109	5.333795	3.047883	8.336856	3.630566	25.18986	2.913417
20.2	3.844773	8.115858	4.127653	2.745128	5.008166	5.139645	3.167456	8.582012	4.518107	11.02832	3.976252	16.86919	8.761302	32.5	3.499132	8.616613	4.505133	3.542872	6.254699	9.972527	2.186958	5.204959	2.974263	8.135483	3.542872	24.5814	2.843045
19.8	3.768639	7.955148	4.045917	2.690769	4.908994	5.03787	3.104734	8.412071	4.428639	10.80994	3.897515	16.53515	8.587811	32.6	3.429843	8.445987	4.415922	3.472716	6.130844	9.775051	2.143652	5.101891	2.915366	7.974384	3.472716	24.09464	2.786747
19.5	3.711538	7.834615	3.984615	2.65	4.834615	4.961538	3.057692	8.284615	4.361538	10.64615	3.838462	16.28462	8.457692	32.7	3.377875	8.318018	4.349014	3.420099	6.037952	9.626945	2.111172	5.02459	2.871194	7.85356	3.420099	23.72957	2.744524
19.4	3.692505	7.794438	3.964181	2.63641	4.809822	4.936095	3.042012	8.24213	4.339172	10.59156	3.818777	16.2011	8.41432	32.7	3.360553	8.275361	4.326712	3.40256	6.006988	9.577576	2.100346	4.998822	2.85647	7.813285	3.40256	23.60788	2.730449
19.2	3.654438	7.714083	3.923314	2.609231	4.760237	4.885207	3.010651	8.15716	4.294438	10.48237	3.779408	16.03408	8.327574	32.8	3.325908	8.190048	4.282107	3.367482	5.945061	9.478838	2.078692	4.947288	2.827022	7.732736	3.367482	23.3645	2.7023
19.1	3.635404	7.673905	3.90288	2.595641	4.735444	4.859763	2.99497	8.114675	4.272071	10.42777	3.759724	15.95057	8.284201	32.9	3.308586	8.147392	4.259804	3.349943	5.914097	9.429469	2.067866	4.921521	2.812298	7.692461	3.349943	23.24281	2.688226
19.1	3.635404	7.673905	3.90288	2.595641	4.735444	4.859763	2.99497	8.114675	4.272071	10.42777	3.759724	15.95057	8.284201	33	3.308586	8.147392	4.259804	3.349943	5.914097	9.429469	2.067866	4.921521	2.812298	7.692461	3.349943	23.24281	2.688226
19	3.616371	7.633728	3.882446	2.582051	4.710651	4.83432	2.97929	8.072189	4.249704	10.37318	3.740039	15.86706	8.240828	33.1	3.291263	8.104735	4.237501	3.332404	5.883133	9.3801	2.057039	4.895754	2.797574	7.652187	3.332404	23.12112	2.674151
19	3.616371	7.633728	3.882446	2.582051	4.710651	4.83432	2.97929	8.072189	4.249704	10.37318	3.740039	15.86706	8.240828	33.2	3.291263	8.104735	4.237501	3.332404	5.883133	9.3801	2.057039	4.895754	2.797574	7.652187	3.332404	23.12112	2.674151
19	3.616371	7.633728	3.882446	2.582051	4.710651	4.83432	2.97929	8.072189	4.249704	10.37318	3.740039	15.86706	8.240828	33.2	3.291263	8.104735	4.237501	3.332404	5.883133	9.3801	2.057039	4.895754	2.797574	7.652187	3.332404	23.12112	2.674151
19	3.616371	7.633728	3.882446	2.582051	4.710651	4.83432	2.97929	8.072189	4.249704	10.37318	3.740039	15.86706	8.240828	33.3	3.291263	8.104735	4.237501	3.332404	5.883133	9.3801	2.057039	4.895754	2.797574	7.652187	3.332404	23.12112	2.674151
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.4	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.5	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.6	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.7	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.7	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.8	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	33.9	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
18.9	3.597337	7.59355	3.862012	2.568462	4.685858	4.808876	2.963609	8.029704	4.227337	10.31858	3.720355	15.78355	8.197456	34	3.273941	8.062079	4.215199	3.314865	5.852169	9.330731	2.046213	4.869987	2.78285	7.611912	3.314865	22.99943	2.660077
19.5	3.711538	7.834615	3.984615	2.65	4.834615	4.961538	3.057692	8.284615	4.361538	10.64615	3.838462	16.28462	8.457692	34.1	3.377875	8.318018	4.349014	3.420099	6.037952	9.626945	2.111172	5.02459	2.871194	7.85356	3.420099	23.72957	2.744524
20	3.806706	8.035503	4.086785	2.717949	4.95858	5.088757	3.136095	8.497041	4.473373	10.91913	3.936884	16.70217	8.674556	34.2	3.464487	8.5313	4.460528	3.507794	6.192771	9.873789	2.165305	5.153425	2.944814	8.054933	3.507794	24.33802	2.814896
20.6	3.920907	8.276568	4.209389	2.799487	5.107337	5.24142	3.230178	8.751953	4.607574	11.24671	4.05499	17.20323	8.934793	34.2	3.568422	8.787239	4.594343	3.613027	6.378555	10.17	2.230264	5.308028	3.033159	8.296581	3.613027	25.06817	2.899343
21.3	4.054142	8.557811	4.352426	2.894615	5.280888	5.419527	3.339941	9.049349	4.764142	11.62888	4.192781	17.78781	9.238402	34.3	3.689679	9.085835	4.750462	3.7358	6.595302	10.51559	2.306049	5.488398	3.136227	8.578504	3.7358	25.92	2.997864
21.9	4.168343	8.798876	4.47503	2.976154	5.429645	5.572189	3.434024	9.30426	4.898343	11.95645	4.310888	18.28888	9.498639	34.4	3.793614	9.341774	4.884278	3.841034	6.781085	10.8118	2.371009	5.643001	3.224572	8.820152	3.841034	26.65014	3.082311
22.4	4.263511	8.999763	4.577199	3.044103	5.553609	5.699408	3.512426	9.516686	5.010178	12.22943	4.40931	18.70643	9.715503	34.5	3.880226	9.555057	4.995791	3.928729	6.935904	11.05864	2.425141	5.771836	3.298192	9.021525	3.928729	27.25859	3.152684
22.7	4.320611	9.120296	4.638501	3.084872	5.627988	5.77574	3.559467	9.644142	5.077278	12.39321	4.468363	18.95696	9.845621	34.6	3.932193	9.683026	5.062699	3.981346	7.028796	11.20675	2.457621	5.849138	3.342364	9.142349	3.981346	27.62366	3.194907
23	4.377712	9.240828	4.699803	3.125641	5.702367	5.852071	3.606509	9.771598	5.144379	12.557	4.527416	19.2075	9.97574	34.7	3.984161	9.810996	5.129607	4.033963	7.121687	11.35486	2.4901	5.926439	3.386537	9.263173	4.033963	27.98873	3.237131
23.2	4.415779	9.321183	4.740671	3.152821	5.751953	5.902959	3.63787	9.856568	5.189112	12.66619	4.566785	19.37452	10.06249	34.7	4.018805	9.896309	5.174212	4.069041	7.183615	11.4536	2.511753	5.977973	3.415985	9.343723	4.069041	28.23211	3.265279
23.3	4.434813	9.361361	4.761105	3.16641	5.776746	5.928402	3.65355	9.899053	5.211479	12.72079	4.586469	19.45803	10.10586	34.8	4.036128	9.938965	5.196515	4.08658	7.214579	11.50296	2.52258	6.00374	3.430709	9.383997	4.08658	28.3538	3.279354
23.4	4.453846	9.401538	4.781538	3.18	5.801538	5.953846	3.669231	9.941538	5.233846	12.77538	4.606154	19.54154	10.14923	34.9	4.05345	9.981622	5.218817	4.104118	7.245543	11.55233	2.533406	6.029507	3.445433	9.424272	4.104118	28.47549	3.293428
23.5	4.47288	9.441716	4.801972	3.19359	5.826331	5.97929	3.684911	9.984024	5.256213	12.82998	4.625838	19.62505	10.1926	35	4.070773	10.02428	5.24112	4.121657	7.276506	11.6017	2.544233	6.055275	3.460157	9.464547	4.121657	28.59718	3.307503
23.5	4.47288	9.441716	4.801972	3.19359	5.826331	5.97929	3.684911	9.984024	5.256213	12.82998	4.625838	19.62505	10.1926	35.1	4.070773	10.02428	5.24112	4.121657	7.276506	11.6017	2.544233	6.055275	3.460157	9.464547	4.121657	28.59718	3.307503
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	35.2	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	35.2	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	35.3	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577

23.6	4.491913	9.481893	4.822406	3.207179	5.851124	6.004734	3.700592	10.02651	5.27858	12.88458	4.645523	19.70856	10.23598	35.4	4.088095	10.06693	5.263423	4.139196	7.30747	11.65107	2.55506	6.081042	3.474881	9.504821	4.139196	28.71887	3.321577
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	35.5	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	35.6	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	35.7	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	35.7	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	35.8	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	35.9	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
23.7	4.510947	9.522071	4.84284	3.220769	5.875917	6.030178	3.716272	10.06899	5.300947	12.93917	4.665207	19.79207	10.27935	36	4.105418	10.10959	5.285725	4.156735	7.338434	11.70044	2.565886	6.106809	3.489605	9.545096	4.156735	28.84056	3.335652
24.3	4.625148	9.763136	4.965444	3.302308	6.024675	6.18284	3.810355	10.32391	5.435148	13.26675	4.783314	20.29314	10.53959	36.1	4.209352	10.36553	5.419541	4.261969	7.524217	11.99665	2.630845	6.261412	3.577949	9.786744	4.261969	29.5707	3.420099
24.8	4.720316	9.964024	5.067613	3.370256	6.148639	6.310059	3.888757	10.53633	5.546982	13.53972	4.881736	20.71069	10.75645	36.2	4.295964	10.57881	5.531054	4.349664	7.679037	12.2435	2.684978	6.390247	3.65157	9.988117	4.349664	30.17915	3.490471
25.4	4.834517	10.20509	5.190217	3.451795	6.297396	6.462722	3.98284	10.79124	5.681183	13.8673	4.999842	21.21176	11.01669	36.2	4.399899	10.83475	5.66487	4.454898	7.86482	12.53971	2.749937	6.54485	3.739914	10.22977	4.454898	30.90929	3.574918
26.1	4.967751	10.48633	5.333254	3.546923	6.470947	6.640828	4.092604	11.08864	5.837751	14.24947	5.137633	21.79633	11.3203	36.3	4.521156	11.13335	5.820989	4.577671	8.081567	12.8853	2.825723	6.72522	3.842983	10.51169	4.577671	31.76112	3.673439
26.7	5.081953	10.7274	5.455858	3.628462	6.619704	6.793491	4.186686	11.34355	5.971953	14.57704	5.25574	22.2974	11.58053	36.4	4.625091	11.38929	5.954804	4.682904	8.26735	13.18151	2.890682	6.879823	3.931327	10.75334	4.682904	32.49126	3.757886
27.2	5.17712	10.92828	5.558028	3.69641	6.743669	6.92071	4.265089	11.55598	6.083787	14.85002	5.354162	22.71495	11.7974	36.5	4.711703	11.60257	6.066318	4.770599	8.422169	13.42835	2.944814	7.008658	4.004948	10.95471	4.770599	33.09971	3.828259
27.5	5.234221	11.04882	5.619329	3.737179	6.818047	6.997041	4.31213	11.68343	6.150888	15.01381	5.413215	22.96548	11.92751	36.6	4.76367	11.73054	6.133226	4.823216	8.515061	13.57646	2.977294	7.08596	4.04912	11.07553	4.823216	33.46478	3.870482
27.8	5.291321	11.16935	5.680631	3.777949	6.892426	7.073373	4.359172	11.81089	6.217988	15.17759	5.472268	23.21602	12.05763	36.7	4.815638	11.85851	6.200133	4.875833	8.607952	13.72457	3.009774	7.163261	4.093292	11.19636	4.875833	33.82985	3.912706
28	5.329389	11.2497	5.721499	3.805128	6.942012	7.12426	4.390533	11.89586	6.262722	15.28679	5.511637	23.38304	12.14438	36.8	4.850282	11.94382	6.244739	4.910911	8.66988	13.82331	3.031427	7.214795	4.12274	11.27691	4.910911	34.07323	3.940855
28.1	5.348422	11.28988	5.741933	3.818718	6.966805	7.149704	4.406213	11.93834	6.285089	15.34138	5.531321	23.46655	12.18775	36.8	4.867605	11.98648	6.267041	4.92845	8.700844	13.87267	3.042253	7.240562	4.137464	11.31718	4.92845	34.19492	3.954929
28.2	5.367456	11.33006	5.762367	3.832308	6.991598	7.175148	4.421893	11.98083	6.307456	15.39598	5.551006	23.55006	12.23112	36.9	4.884927	12.02913	6.289344	4.945989	8.731808	13.92204	3.05308	7.266329	4.152188	11.35746	4.945989	34.31661	3.969003
28.3	5.386489	11.37024	5.782801	3.845897	7.016391	7.200592	4.437574	12.02331	6.329822	15.45057	5.57069	23.63357	12.2745	37	4.90225	12.07179	6.311647	4.963528	8.762772	13.97141	3.063906	7.292097	4.166912	11.39773	4.963528	34.4383	3.983078
28.3	5.386489	11.37024	5.782801	3.845897	7.016391	7.200592	4.437574	12.02331	6.329822	15.45057	5.57069	23.63357	12.2745	37.1	4.90225	12.07179	6.311647	4.963528	8.762772	13.97141	3.063906	7.292097	4.166912	11.39773	4.963528	34.4383	3.983078
28.4	5.405523	11.41041	5.803235	3.859487	7.041183	7.226036	4.453254	12.0658	6.352189	15.50517	5.590375	23.71708	12.31787	37.2	4.919572	12.11445	6.333949	4.981067	8.793735	14.02078	3.074733	7.317864	4.181636	11.43801	4.981067	34.56	3.997152
28.4	5.405523	11.41041	5.803235	3.859487	7.041183	7.226036	4.453254	12.0658	6.352189	15.50517	5.590375	23.71708	12.31787	37.3	4.919572	12.11445	6.333949	4.981067	8.793735	14.02078	3.074733	7.317864	4.181636	11.43801	4.981067	34.56	3.997152
28.4	5.405523	11.41041	5.803235	3.859487	7.041183	7.226036	4.453254	12.0658	6.352189	15.50517	5.590375	23.71708	12.31787	37.3	4.919572	12.11445	6.333949	4.981067	8.793735	14.02078	3.074733	7.317864	4.181636	11.43801	4.981067	34.56	3.997152
28.4	5.405523	11.41041	5.803235	3.859487	7.041183	7.226036	4.453254	12.0658	6.352189	15.50517	5.590375	23.71708	12.31787	37.4	4.919572	12.11445	6.333949	4.981067	8.793735	14.02078	3.074733	7.317864	4.181636	11.43801	4.981067	34.56	3.997152
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	37.5	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	37.6	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	37.7	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	37.8	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	37.8	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	37.9	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.1	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.2	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.3	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.3	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.4	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.5	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.6	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.7	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.8	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.8	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	38.9	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.1	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.2	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.3	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.3	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.4	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.5	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.6	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.7	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.8	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.8	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.5	5.424556	11.45059	5.823669	3.873077	7.065976	7.251479	4.468935	12.10828	6.374556	15.55976	5.610059	23.80059	12.36124	39.9	4.936895	12.1571	6.356252	4.998606	8.824699	14.07015	3.085559	7.343631	4.19636	11.47828	4.998606	34.68169	4.011227
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.1	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.2	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.3	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.3	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.4	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.5	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.6	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.7	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.8	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.8	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	40.9	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.1	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.2	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.3	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
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28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.4	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.5	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
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28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.8	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	41.9	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.1	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.2	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
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28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.3	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.4	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.5	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.6	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.7	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.8	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.8	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	42.9	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	43	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	43.1	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	43.2	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	43.3	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.6	5.44359	11.49077	5.844103	3.886667	7.090769	7.276923	4.484615	12.15077	6.396923	15.61436	5.629744	23.8841	12.40462	43.3	4.954217	12.19976	6.378555	5.016145	8.855663	14.11952	3.096386	7.369398	4.211085	11.51855	5.016145	34.80338	4.025301
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.4	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.5	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.6	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.7	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	43.9	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.1	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.2	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
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28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.3	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
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28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.5	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.6	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.7	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	44.9	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.1	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.2	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.3	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
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28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.6	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.7	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	45.9	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.1	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.2	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.3	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
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28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.4	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.5	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.6	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.7	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.8	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	46.9	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	47	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.7	5.462623	11.53095	5.864536	3.900256	7.115562	7.302367	4.500296	12.19325	6.41929	15.66895	5.649428	23.96761	12.44799	47.1	4.97154	12.24242	6.400857	5.033684	8.886627	14.16889	3.107212	7.395165	4.225809	11.55883	5.033684	34.92507	4.039376
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.2	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.3	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.3	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345

28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.4	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.5	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.6	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.7	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.8	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.8	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	47.9	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
28.8	5.481657	11.57112	5.88497	3.913846	7.140355	7.327811	4.515976	12.23574	6.441657	15.72355	5.669112	24.05112	12.49136	48	4.988862	12.28507	6.42316	5.051223	8.917591	14.21826	3.118039	7.420932	4.240533	11.5991	5.051223	35.04676	4.05345
25.2	4.79645	10.12473	5.149349	3.424615	6.247811	6.411834	3.951479	10.70627	5.63645	13.75811	4.960473	21.04473	10.92994	48.1	4.365254	10.74944	5.620265	4.41982	7.802892	12.44097	2.728284	6.493316	3.710466	10.14922	4.41982	30.66591	3.546769
22.3	4.244477	8.959586	4.556765	3.030513	5.528817	5.673964	3.496746	9.474201	4.987811	12.17483	4.389625	18.62292	9.67213	48.2	3.862904	9.5124	4.973488	3.91119	6.90494	11.00928	2.414315	5.746069	3.283468	8.981251	3.91119	27.1369	3.138609
18.5	3.521203	7.43284	3.780276	2.514103	4.586686	4.707101	2.900888	7.859763	4.13787	10.1002	3.641617	15.44951	8.023964	48.3	3.204651	7.891453	4.125988	3.244709	5.728314	9.133255	2.002907	4.766918	2.723953	7.450813	3.244709	22.51267	2.603779
14.5	2.759862	5.82574	2.962919	1.970513	3.59497	3.689349	2.273669	6.160355	3.243195	7.916371	2.854241	12.10907	6.289053	48.3	2.511753	6.185193	3.233883	2.54315	4.489759	7.158497	1.569846	3.736233	2.13499	5.839827	2.54315	17.64507	2.0408
10.8	2.055621	4.339172	2.206864	1.467692	2.677633	2.747929	1.693491	4.588402	2.415621	5.896331	2.125917	9.019172	4.68426	48.4	1.870823	4.606902	2.408685	1.894209	3.344097	5.331846	1.169265	2.78285	1.5902	4.349664	1.894209	13.14253	1.520044
7.8	1.484615	3.133846	1.593846	1.06	1.933846	1.984615	1.223077	3.313846	1.744615	4.258462	1.535385	6.513846	3.383077	48.5	1.35115	3.327207	1.739606	1.368039	2.415181	3.850778	0.844469	2.009836	1.148478	3.141424	1.368039	9.49183	1.097809
5.5	1.046844	2.209763	1.123866	0.747436	1.363609	1.399408	0.862426	2.336686	1.230178	3.002761	1.082643	4.593097	2.385503	48.6	0.952734	2.346108	1.226645	0.964643	1.703012	2.715292	0.595459	1.417192	0.809824	2.215107	0.964643	6.692957	0.774096
4	0.761341	1.607101	0.817357	0.54359	0.991716	1.017751	0.627219	1.699408	0.894675	2.183826	0.787377	3.340434	1.734911	48.7	0.692897	1.70626	0.892106	0.701559	1.238554	1.974758	0.433061	1.030685	0.588963	1.610987	0.701559	4.867605	0.562979
2.8	0.532939	1.12497	0.57215	0.380513	0.694201	0.712426	0.439053	1.189586	0.626272	1.528679	0.551164	2.338304	1.214438	48.8	0.485028	1.194382	0.624474	0.491091	0.866988	1.382331	0.303143	0.72148	0.412274	1.127691	0.491091	3.407323	0.394085
2	0.380671	0.80355	0.408679	0.271795	0.495858	0.508876	0.313609	0.849704	0.447337	1.091913	0.393688	1.670217	0.867456	48.8	0.346449	0.85313	0.446053	0.350779	0.619277	0.987379	0.21653	0.515343	0.294481	0.805493	0.350779	2.433802	0.28149
1.4	0.266469	0.562485	0.286075	0.190256	0.347101	0.356213	0.219527	0.594793	0.313136	0.764339	0.275582	1.169152	0.607219	48.9	0.242514	0.597191	0.312237	0.245546	0.433494	0.691165	0.151571	0.36074	0.206137	0.563845	0.245546	1.703662	0.197043
1	0.190335	0.401775	0.204339	0.135897	0.247929	0.254438	0.156805	0.424852	0.223669	0.545957	0.196844	0.835108	0.433728	49	0.173224	0.426565	0.223026	0.17539	0.309639	0.493689	0.108265	0.257671	0.147241	0.402747	0.17539	1.216901	0.140745
0.7	0.133235	0.281243	0.143037	0.095128	0.17355	0.178107	0.109763	0.297396	0.156568	0.38217	0.137791	0.584576	0.303609	49.1	0.121257	0.298596	0.156118	0.122773	0.216747	0.345583	0.075786	0.18037	0.103069	0.281923	0.122773	0.851831	0.098521
0.5	0.095168	0.200888	0.10217	0.067949	0.123964	0.127219	0.078402	0.212426	0.111834	0.272978	0.098422	0.417554	0.216864	49.2	0.086612	0.213283	0.111513	0.087695	0.154819	0.246845	0.054133	0.128836	0.07362	0.201373	0.087695	0.608451	0.070372
0.4	0.076134	0.16071	0.081736	0.054359	0.099172	0.101775	0.062722	0.169941	0.089467	0.218383	0.078738	0.334043	0.173491	49.3	0.06929	0.170626	0.089211	0.070156	0.123855	0.197476	0.043306	0.103069	0.058896	0.161099	0.070156	0.48676	0.056298
0.3	0.057101	0.120533	0.061302	0.040769	0.074379	0.076331	0.047041	0.127456	0.067101	0.163787	0.059053	0.250533	0.130118	49.3	0.051967	0.12797	0.066908	0.052617	0.092892	0.148107	0.03248	0.077301	0.044172	0.120824	0.052617	0.36507	0.042223
0.2	0.038067	0.080355	0.040868	0.027179	0.049586	0.050888	0.031361	0.08497	0.044734	0.109191	0.039369	0.167022	0.086746	49.4	0.034645	0.085313	0.044605	0.035078	0.061928	0.098738	0.021653	0.051534	0.029448	0.080549	0.035078	0.24338	0.028149
0.1	0.019034	0.040178	0.020434	0.01359	0.024793	0.025444	0.01568	0.042485	0.022367	0.054596	0.019684	0.083511	0.043373	49.5	0.017322	0.042657	0.022303	0.017539	0.030964	0.049369	0.010827	0.025767	0.014724	0.040275	0.017539	0.12169	0.014074
0.1	0.019034	0.040178	0.020434	0.01359	0.024793	0.025444	0.01568	0.042485	0.022367	0.054596	0.019684	0.083511	0.043373	49.6	0.017322	0.042657	0.022303	0.017539	0.030964	0.049369	0.010827	0.025767	0.014724	0.040275	0.017539	0.12169	0.014074
0.1	0.019034	0.040178	0.020434	0.01359	0.024793	0.025444	0.01568	0.042485	0.022367	0.054596	0.019684	0.083511	0.043373	49.7	0.017322	0.042657	0.022303	0.017539	0.030964	0.049369	0.010827	0.025767	0.014724	0.040275	0.017539	0.12169	0.014074
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49.8	0	0	0	0	0	0	0	0	0	0	0	0	0
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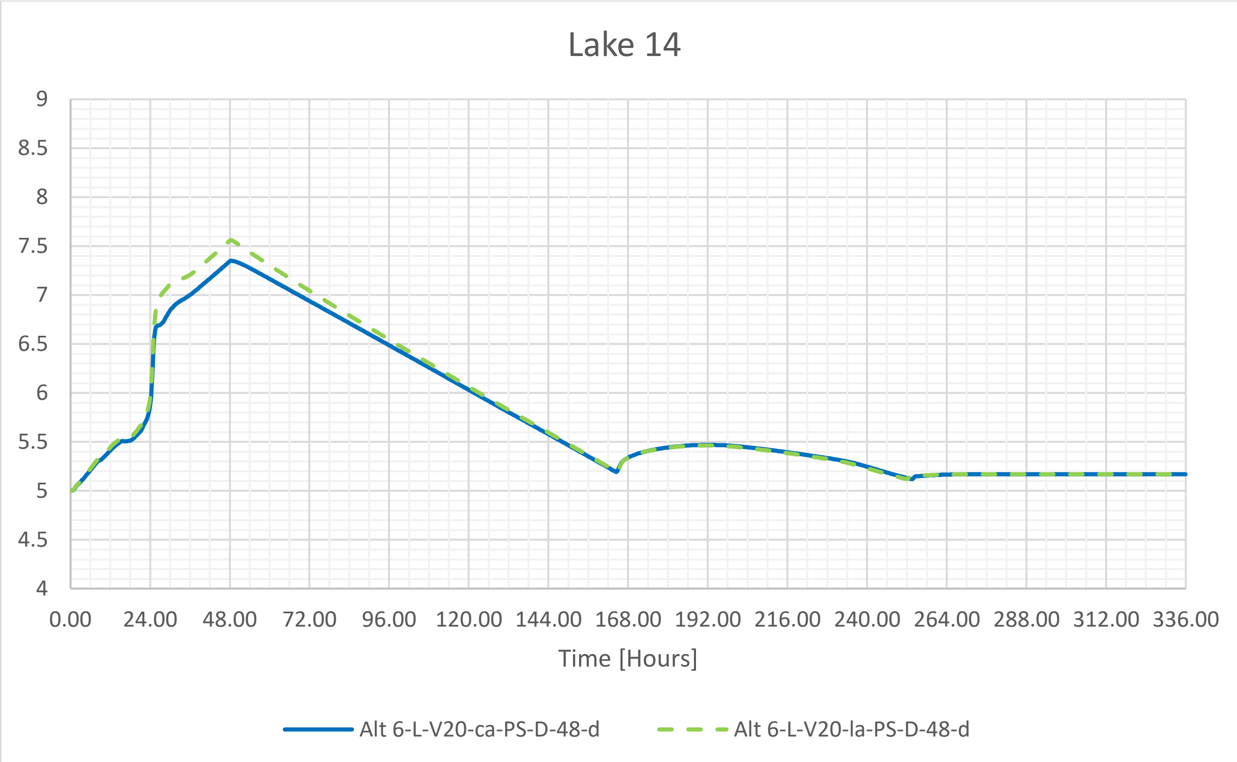
E

Appendix E: Phase 2 Individual lakes XPSWMM Result Graphs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8
7.5
7
6.5
6
5.5
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4.5
4
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Time [Hours]
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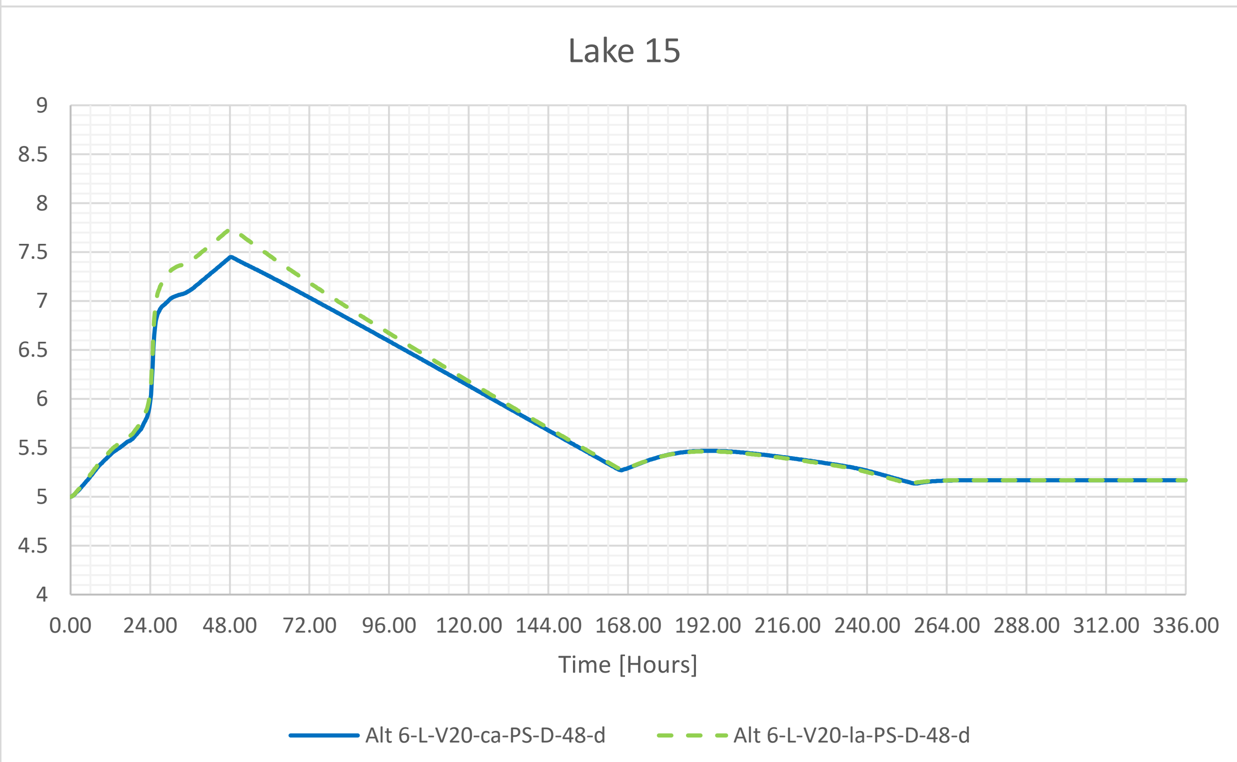
Alt 6-L-V20-la-PS-D-48-d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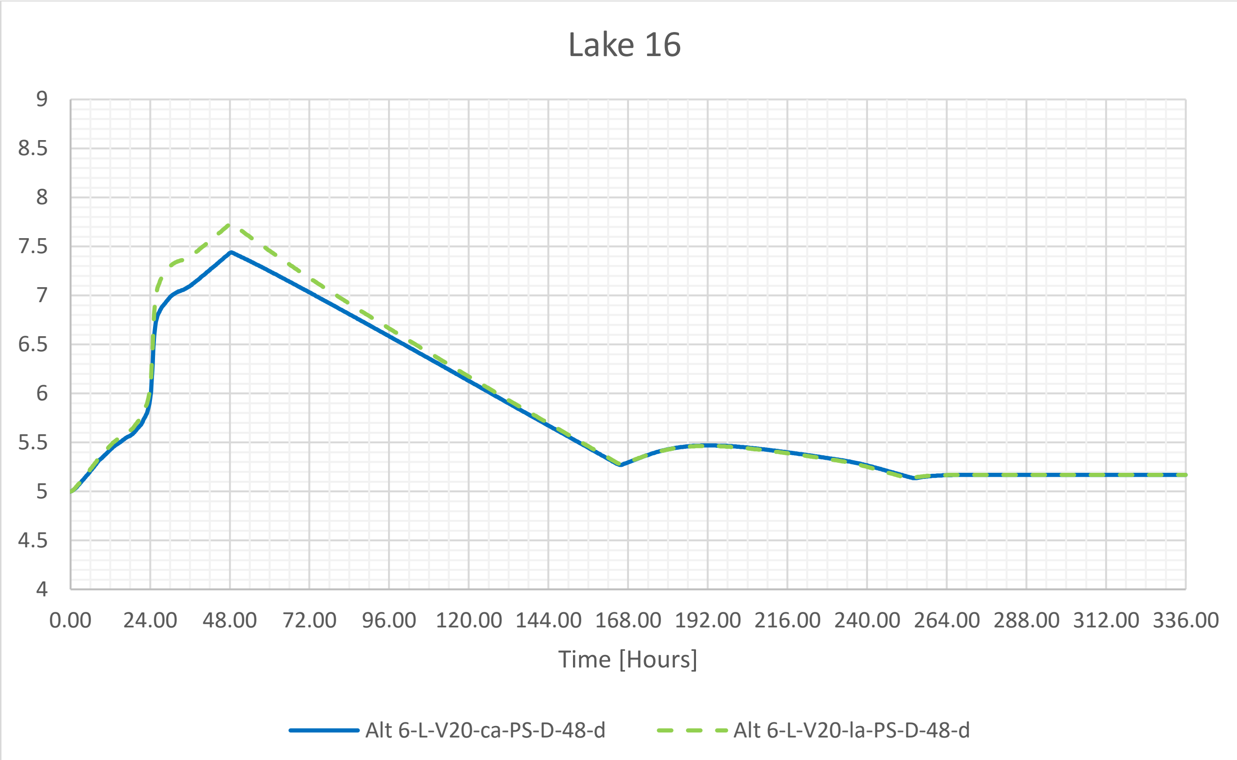
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4.5
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Time [Hours]
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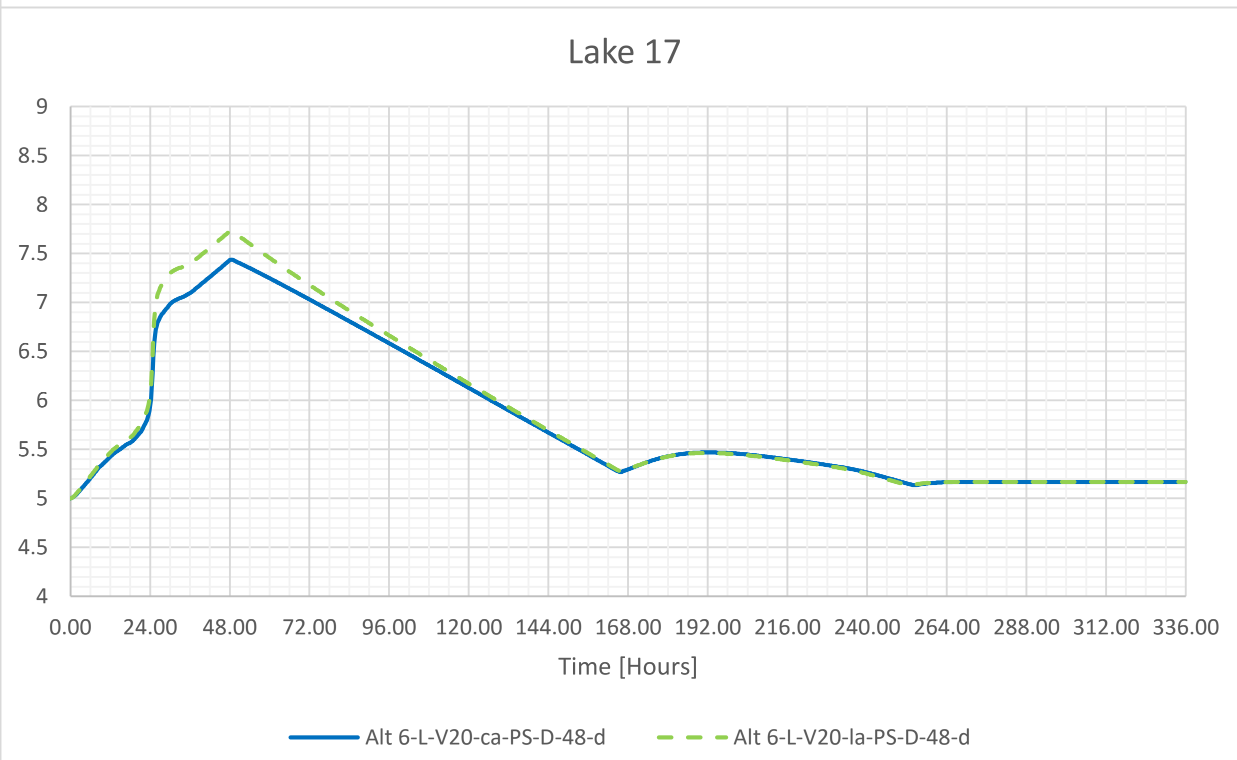
Alt 6-L-V20-la-PS-D-48-d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4.5
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Time [Hours]
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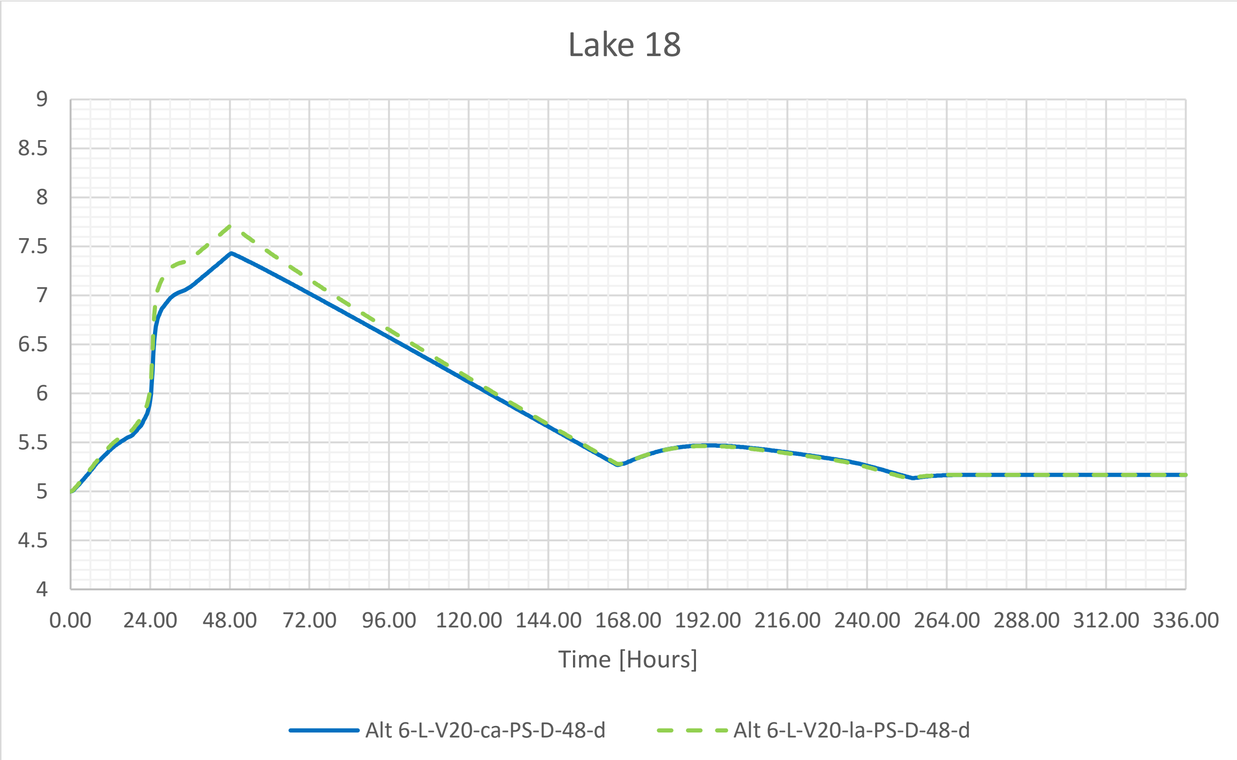
Alt 6-L-V20-la-PS-D-48-d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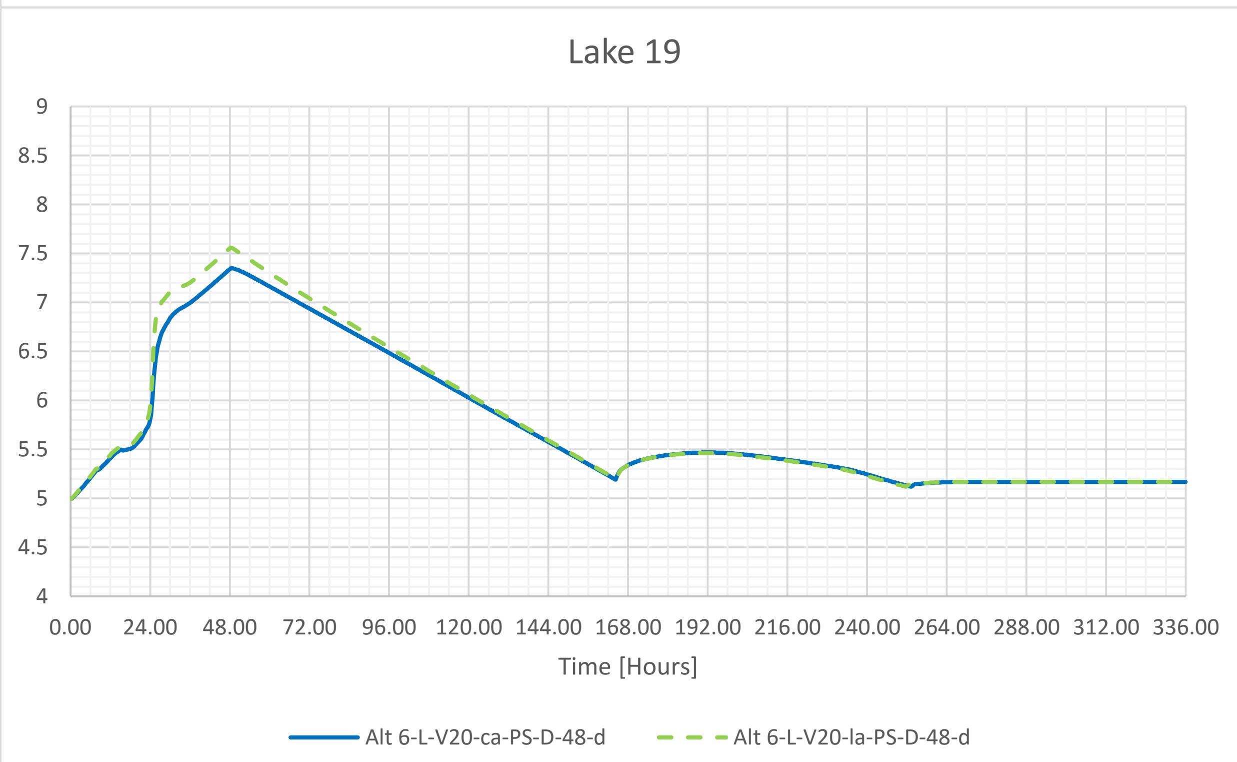
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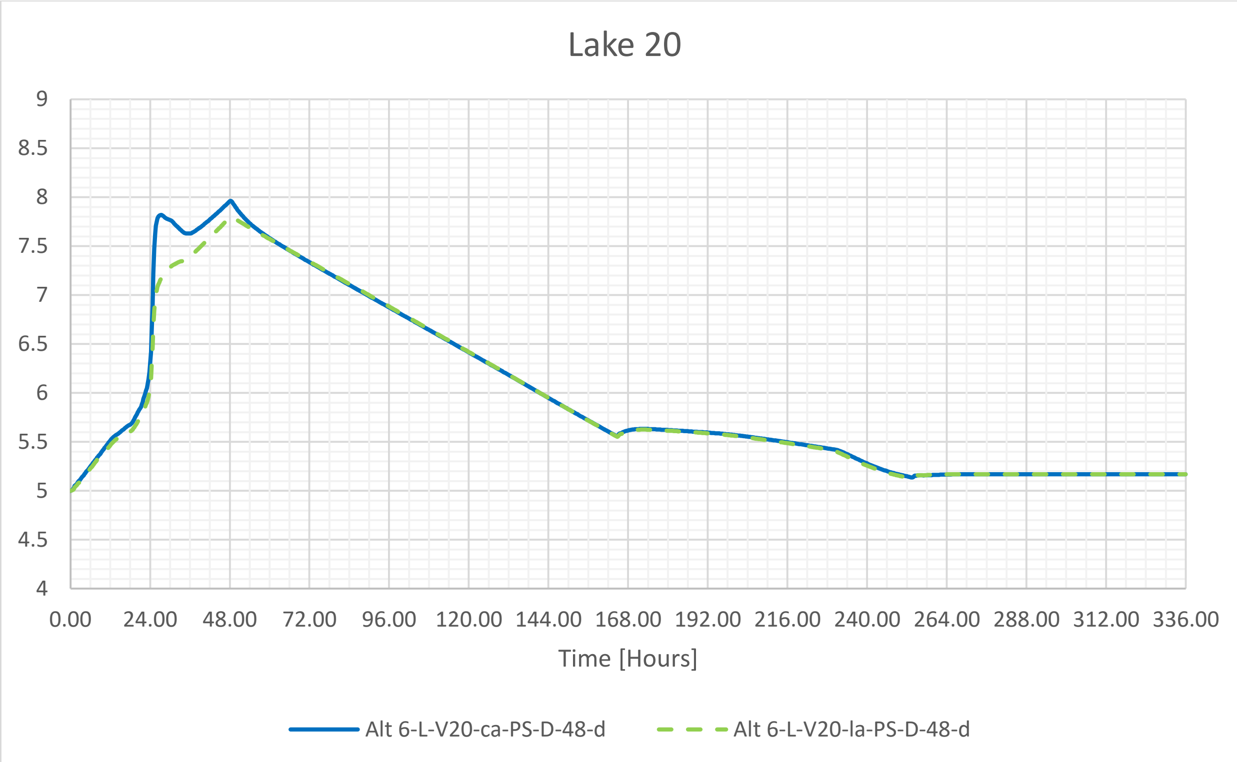
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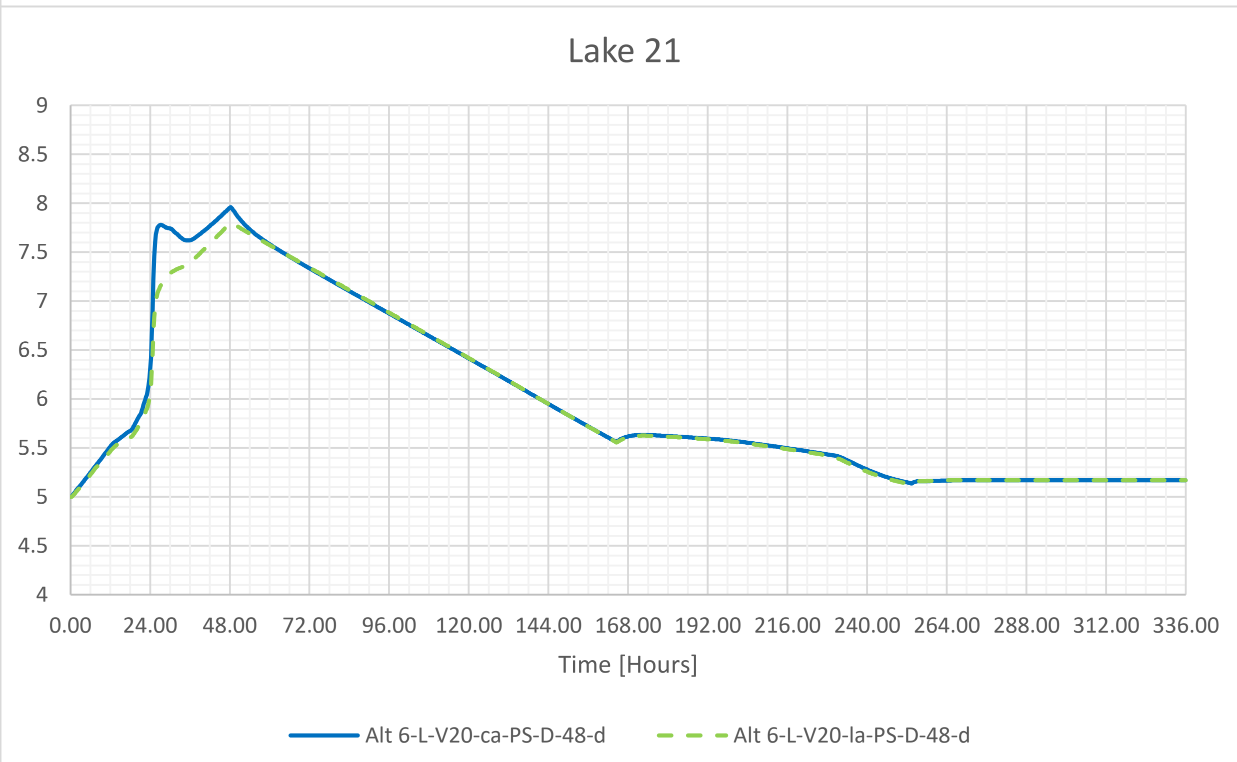
72.00
96.00
120.00
144.00
168.00
192.00
216.00
240.00
264.00
288.00
312.00
336.00
Time [Hours]
Alt 6-L-V20-ca-PS-D-48-d
Alt 6-L-V20-la-PS-D-48-d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6
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5
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96.00
120.00
144.00
168.00
192.00
216.00
240.00
264.00
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Time [Hours]
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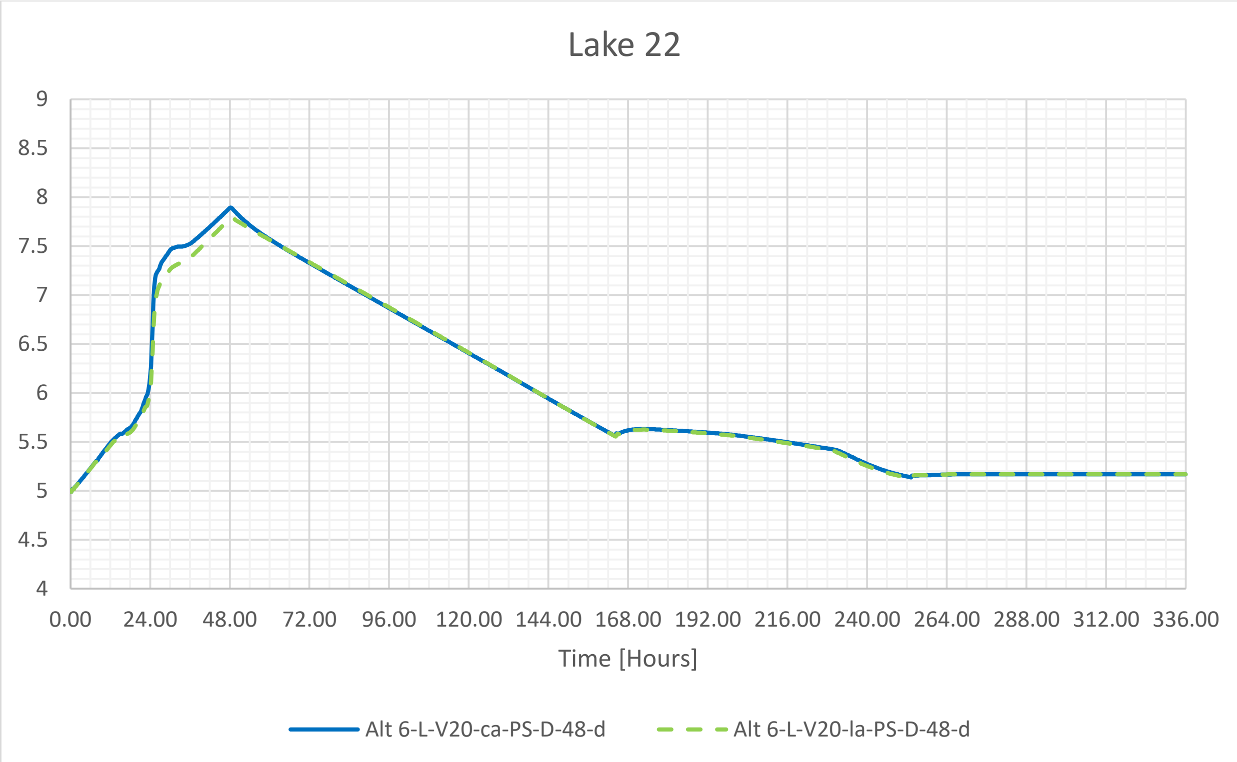
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4.5
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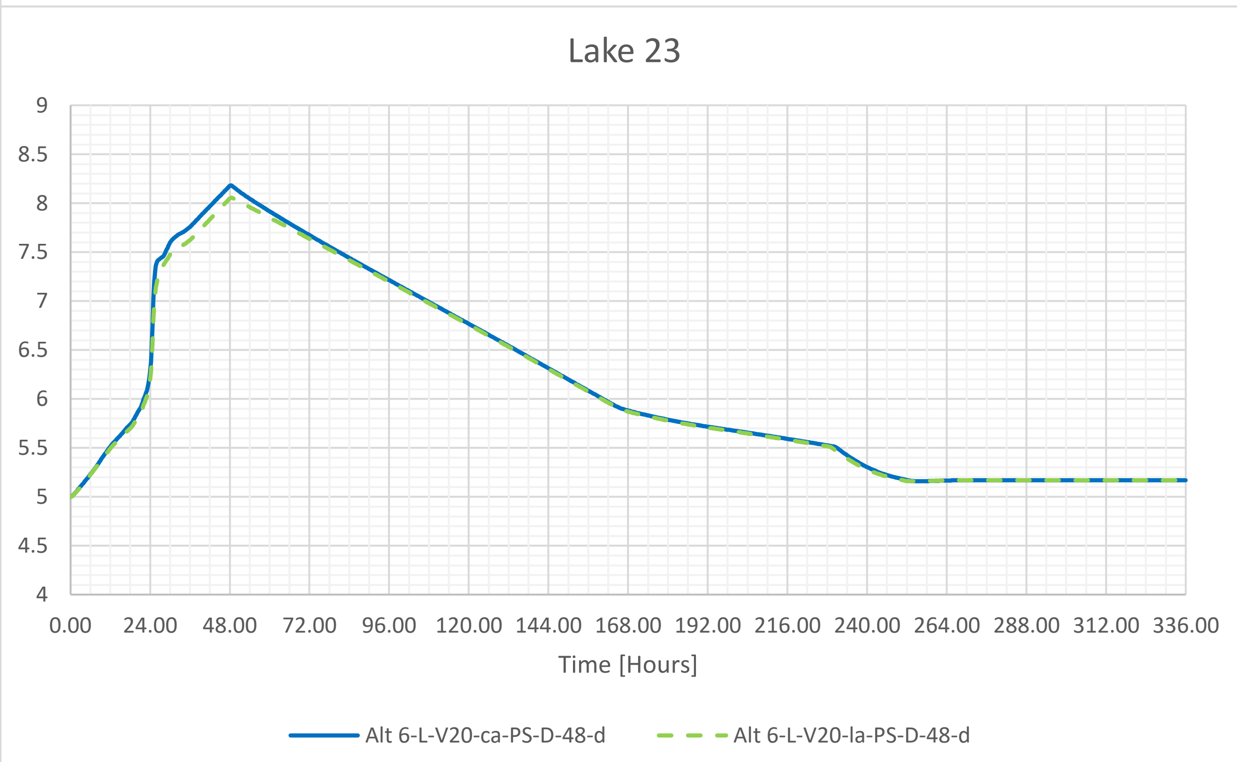
72.00
96.00
120.00
144.00
168.00
192.00
216.00
240.00
264.00
288.00
312.00
336.00
Time [Hours]
Alt 6-L-V20-ca-PS-D-48-d
Alt 6-L-V20-la-PS-D-48-d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72.00
96.00
120.00
144.00
168.00
192.00
216.00
240.00
264.00
288.00
312.00
336.00
Time [Hours]
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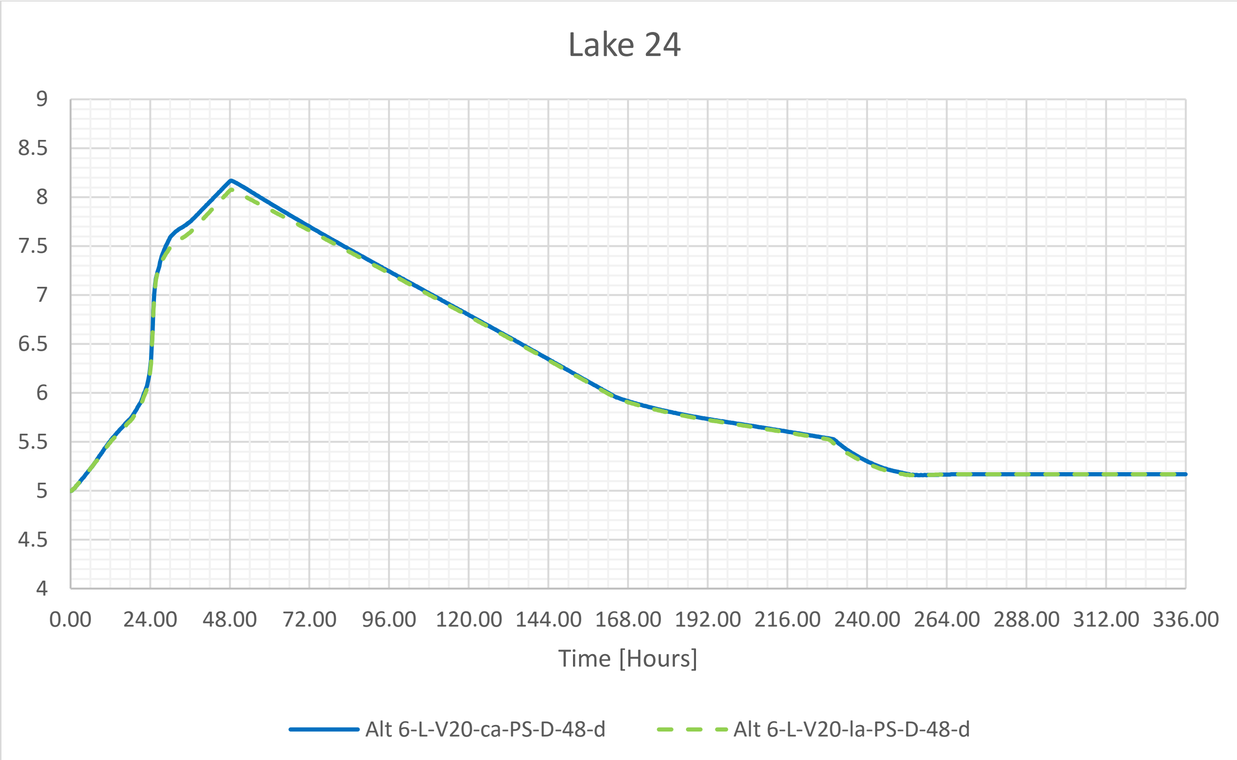
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Time [Hours]
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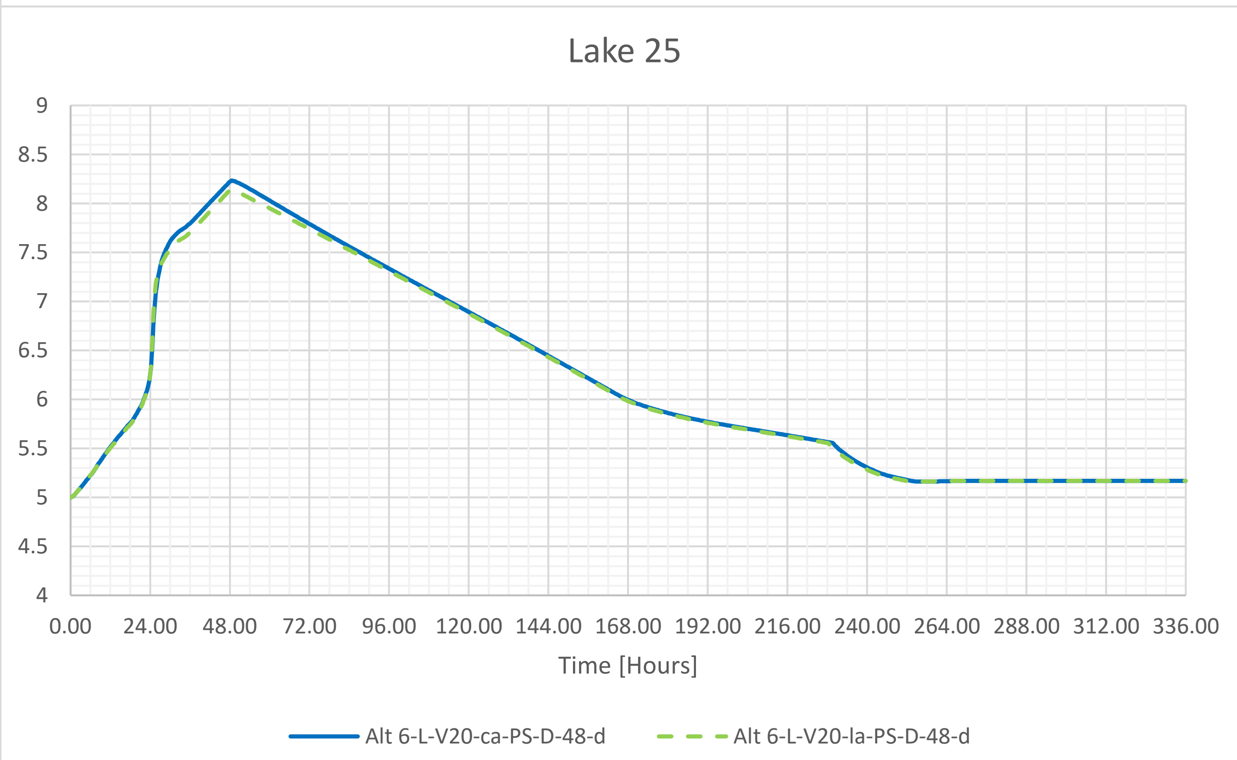
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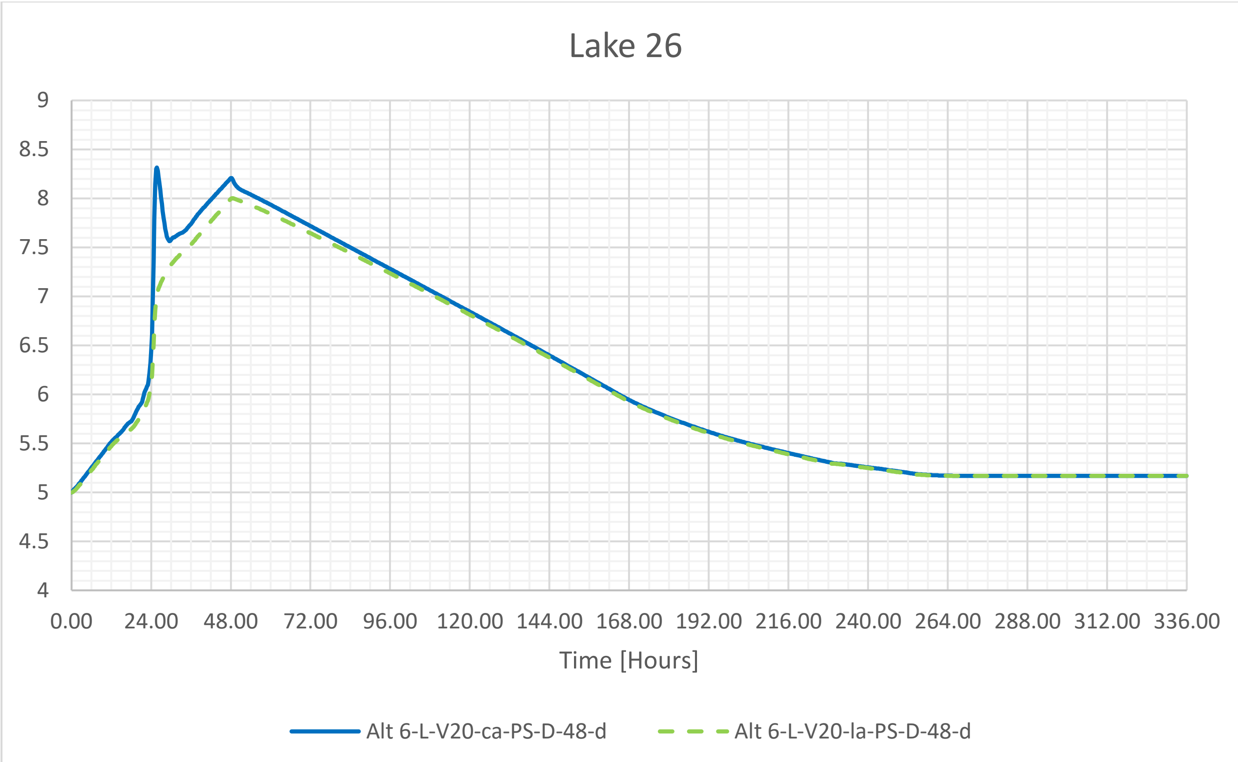
Time [Hours]
Alt 6-L-V20-ca-PS-D-48-d
Alt 6-L-V20-la-PS-D-48-d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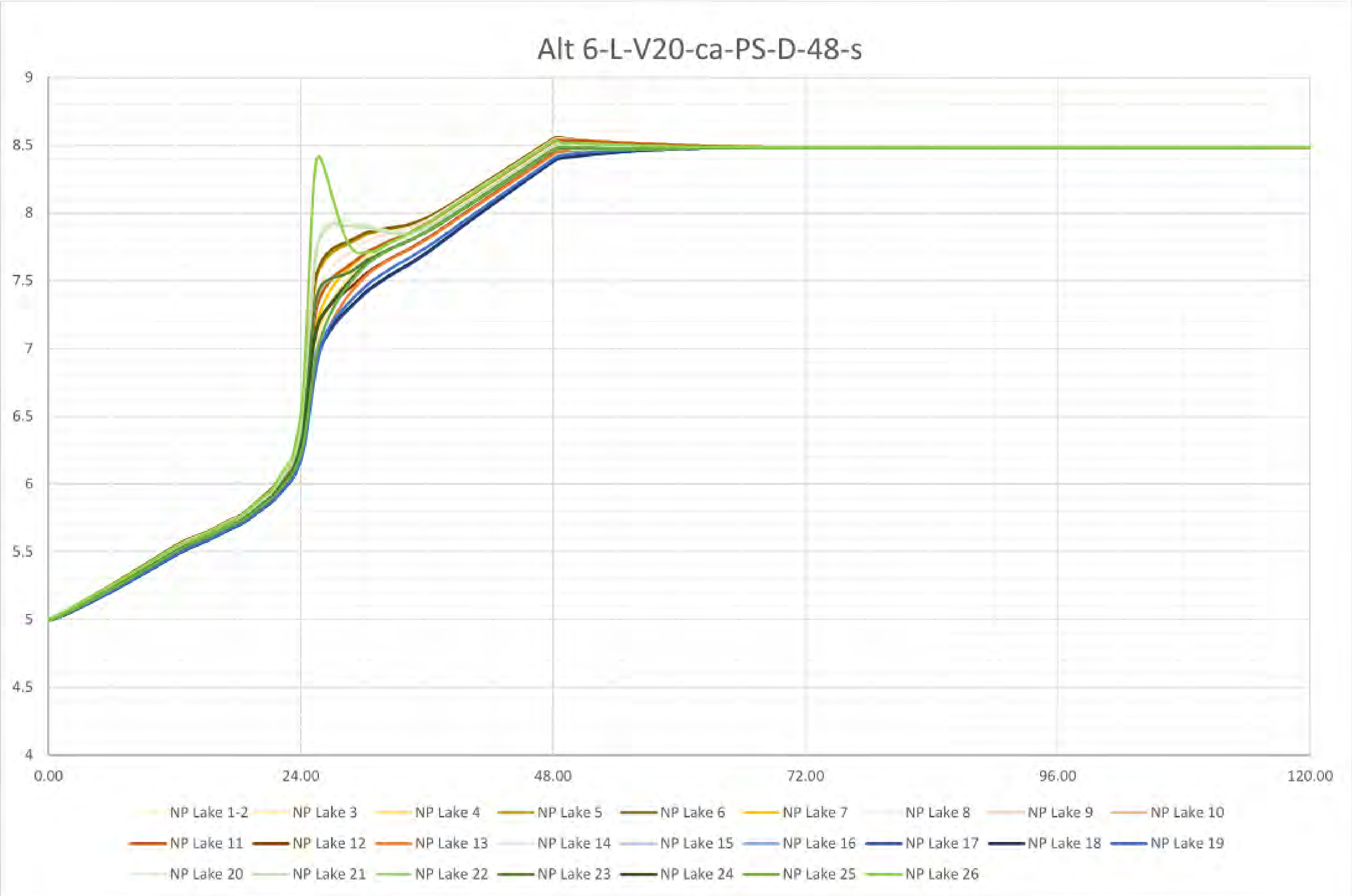
72.00
96.00
120.00
144.00
168.00
192.00
216.00
240.00
264.00
288.00
312.00
336.00
Time [Hours]
Alt 6-L-V20-ca-PS-D-48-d
Alt 6-L-V20-la-PS-D-48-d

F

Appendix F: All lakes graphs for static analyses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6
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4
0.00
24.00
48.00
72.00
96.00
120.00
NP Lake 1-2
NP Lake 3
NP Lake 4
NP Lake 5
NP Lake 6
NP Lake 7
NP Lake 8
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NP Lake 13
NP Lake 14
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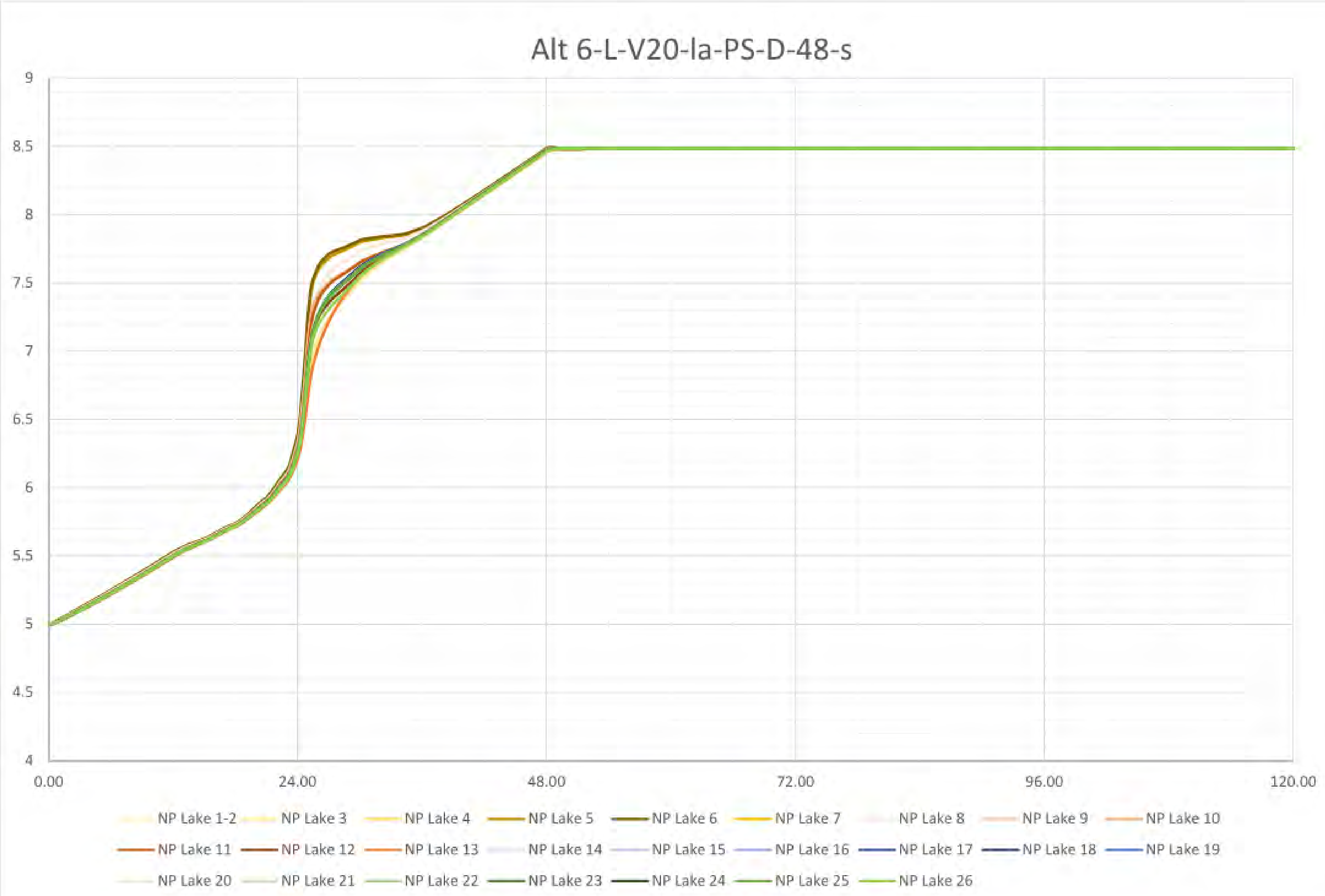
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24.00
48.00
72.00
96.00
120.00
NP Lake 1-2
NP Lake 3
NP Lake 4
NP Lake 5
NP Lake 6
NP Lake 7
NP Lake 8
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NP Lake 12
NP Lake 13
NP Lake 14
NP Lake 15
NP Lake 16
NP Lake 17
NP Lake 18
NP Lake 19
NP Lake 20
NP Lake 21
NP Lake 22
NP Lake 23
NP Lake 24
NP Lake 25
NP Lake 26

G

Appendix G: XPSWMM Results For Phase 1 Lakes

APPENDIX G: XPSWMM RESULST FOR PHASE 1 LAKES

Lake	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Alt6-LAKE-V20-la-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-B-48	Phase 1 model Alt 1-Farm Pump-C-48	Phase 1 model Alt 1-Gravity-B-48	Phase 1 model Alt 1-Gravity-C-48	Phase 1 model Alt 2-Gravity-D-48	Model with the highest PEAK WSEL	Model with the lowest PEAK WSEL	Difference between the Phase 2 model with the HIGHEST WSELand the Phase 1 model with the LOWEST WSEL	Difference between the Phase 2 model with the LOWEST WSEL and the Phase 1 model with the HIGHEST WSEL	Lake
	PEAK WSEL	PEAK WSEL	PEAK WSEL	PEAK WSEL	PEAK WSEL	PEAK WSEL	PEAK WSEL	MODEL	MODEL	Δ_{WSEL}	Δ_{WSEL}	
	[FEET]	[FEET]	[FEET]	[FEET]	[FEET]	[FEET]	[FEET]	[-]	[-]	[FEET]	[FEET]	
1-2	8.0	7.9	7.5	7.5	7.6	7.5	7.3	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 2-Gravity-D-48	0.7	0.3	**1-2**
3	8.0	7.9	7.5	7.5	7.6	7.5	7.3	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 2-Gravity-D-48	0.7	0.3	**3**
4	8.1	8.0	7.7	7.7	7.8	7.8	7.8	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-C-48	0.4	0.2	**4**
5	8.1	8.0	7.7	7.7	7.8	7.8	7.8	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-C-48	0.4	0.2	**5**
6	8.1	8.0	7.8	7.7	7.9	7.8	7.8	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-C-48	0.4	0.2	**6**
7	8.0	7.9	7.6	7.6	7.7	7.6	7.6	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-B-48	0.4	0.2	**7**
8	8.1	8.0	7.7	7.7	7.8	7.7	7.7	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-C-48	0.4	0.2	**8**
9	8.1	8.0	7.7	7.8	7.9	8.0	7.8	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-B-48	0.4	0.0	**9**
10	8.1	8.0	7.7	7.8	7.9	8.0	7.8	Alt6-LAKE-V20-ca-Phase 2 PS-D-48	Phase 1 model Alt 1-Farm Pump-B-48	0.4	-0.1	**10**
11	8.1	8.0	7.7	7.9	7.9	8.1	7.8	Phase 1 model Alt 1-Gravity-C-48	Phase 1 model Alt 1-Farm Pump-B-48	0.4	-0.1	**11**
12	7.7	7.7	7.4	7.3	7.9	8.0	7.9	Phase 1 model Alt 1-Gravity-C-48	Phase 1 model Alt 1-Farm Pump-C-48	0.4	-0.3	**12**
13	7.7	7.7	7.4	7.3	7.9	8.0	7.9	Phase 1 model Alt 1-Gravity-C-48	Phase 1 model Alt 1-Farm Pump-C-48	0.4	-0.25	**13**
Lake	**PEAK WSEL**	**PEAK WSEL**	**PEAK WSEL**	**PEAK WSEL**	**PEAK WSEL**	**PEAK WSEL**	**PEAK WSEL**	**MODEL**	**MODEL**	**ΔWSEL**	**ΔWSEL**	**Lake**

Notes:

→Alt 6: 2 active pumps by lake 3 and an equivivalent of 6 active pumps at the Phase 2 Pump Station; ; Alt 1:2 active pumps by lake 3; Alt 2: 3 active pumps by lake 3.

→ L: Pumps in watershed A (by lake 3) pumping into lake 25 in watershed C.

→ ca: Hydrograph scaled based on approximated contributary drainage area; la: Hydrograph scaled based on contributary drainage area relative to lake size.

→V20: Layout of the Phase 2 lake piping version 2.0

→ Phase 2 Pump Station: Lake 12 is connected to the Phase 2 Pump Station (as is lake 19 and 22); Gravity: Lake 12 in Phase 1 connected by gravity pipe to lake 19 in Phase 2; Farm Pump: Temporary pump pumping to farm ditch from Lake 12 in Phase 1.

→ B: Pipelayout according to "Model B" for Phase 1 lake interconnection pipes; C: Pipelayout according to "Model C" for Phase 1 lake interconnection pipes; D: Pipelayout according to "Model D" for Phase 1 lake interconnection pipes.

** See River Islands Phase 1 Stormwater Mitigation Report dated April 2020.*

→ 48: 48-hour 100-year storm is analyzed.

Phase 1 model Alt-2-Gravity-D-48 is the phase 1 model the phase 2 models are based on, though alterations has been made to the number of pumps by lake 3 and to the lake 12 connection to phase 2.

Models run on: *10/30/2020*
Results extracted: *11/4/2020*
Models run by: *FC*
Models location: *W:\B520\Engineering\Modeling\SW River Islands Phase 2 XPSWMM\2020-10-29*

RIVER ISLANDS AT LATHROP
POTABLE WATER TECHNICAL REPORT
Revision 3

Prepared for:

River Islands

Prepared by:

Pacific Advanced Civil Engineering, Inc.
17520 Newhope Street #200
Fountain Valley, CA 92708

January 2021
#B520

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Appendices:

List of Abbreviations

ADD	Average Day Demands
City	City of Lathrop
City Standards	City of Lathrop's Design and Construction Standards 2019
City Water Master Plan	City of Lathrop's Water System Master Plan December 2018
DU	Dwelling Unit
FF	Finished Floor
FG	Finished Grade
ft	Feet
GPD	Gallons per Day
GPM	Gallons per Minute
HGL	Hydraulic Grade Line
hp	Horsepower
in	Inches
LMFD	Lathrop Manteca Fire District
MDD	Maximum Day Demands
MG	Million Gallons
MGD	Million Gallons per Day
MSL	Mean Sea Level
PACE	Pacific Advanced Civil Engineering
PHD	Peak Hour Demands
PS	Pump Station
psi	Pounds per Square Inch
PSV	Pressure Sustaining Valve
PW	Potable Water
SCWSP	South County Water Supply Program
Site A	SSJID Potable Water Storage and Transfer Pump Station at River Islands
Site B	City of Lathrop Potable Water Storage and Booster Pump Station at River Islands
SS	Soft Starter
SSJID	South San Joaquin Irrigation District
TDH	Total Dynamic Head
VFD	Variable Frequency Drive

1 Introduction

1.1 Background

River Islands, located on the Stewart Track in the City of Lathrop, is a 4,905-acre, master planned community to be constructed southwest of the San Joaquin River. The River Islands development will consist of low, medium and high density residential, schools (institutional), parks and commercial land uses. River Islands will be constructed in two separate phases known as Phase I and Phase II. Phase I is currently being constructed over 4 separate stages and Phase II is entering the master planning stages.

The River Islands development is located within the southwest area of the City of Lathrop's service area and will utilize the City's Potable Water (PW) distribution system for domestic, commercial, specific irrigation areas, and school PW demands. The distribution system will also service fire flows within the development. The City's distribution system operates as a single pressure zone, pressurized from different booster pump stations and storage sites spread throughout the City. The River Islands development will expand the City's distribution system to contain two additional City owned and operated Potable Water (PW) booster pump stations and water storage tank sites at full buildout conditions, in addition to the SSJID Turnout #2 and 1 MG Tank currently under construction.

River Islands PW distribution system will be required to be planned, designed, and constructed per the City of Lathrop's Design and Construction Standards (City Standards) and the 2018 City of Lathrop's Water System Master Plan (City's Water Master Plan). The City Standards and Water Master Plan were created to provide the minimum requirements for all facilities and appurtenances to be turned over to the City for operation and maintenance. This report will be the basis for a required update to the City's Water Master Plan, including an update of the City's water system model, due to the increased level of detail now available, and due to City's determination that the water use per unit has decreased, the number of residential units has increased and the acres of commercial uses have decreased, together reducing the anticipated demand.

1.2 Report Objectives

The objectives of the River Islands Potable Water Technical Report are as follows:

- Provide updates to the previous Phase I Potable Water Master Plan prepared by PACE in 2017.
- Analyze and quantify the land uses for Phase I and II.
- Analyze and model the Average Day Demands (ADD) for Phase I and II in accordance with the City of Lathrop's Standards, Water Master Plan and historical water uses provided by River Islands under Steady State Conditions.
- Analyze and model the Maximum Day Demand (MDD) for Phase I and II in accordance with the City of Lathrop's Standards and Water Master Plan under Steady State Conditions.
- Analyze and model the Peak Hour Demands (PHD) for Phase I and II in accordance with the City of Lathrop's Standards and Water Master Plan under Steady State Conditions.
- Analyze and model the available fire flows for Phase I and II after potable water demands have been satisfied in accordance with the City of Lathrop's Standards and Water Master Plan.
- Analyze and describe the overall River Islands PW Distribution System
- Provide preliminary performance requirements for the Phase II potable water distribution system.
- Present the potential impact Phase II potable water demands on Phase I.

- Provide a preliminary improvement implementation schedule for the River Islands Development.

This technical report does not address permitting and environmental review/compliance requirements as those activities are not included in this scope of work.

2 Potable Water Supply Requirements

2.1 River Islands Land Uses

The City's Standards and Master Plans provide the minimum design standards for all potable water facilities and appurtenances to be installed in the City of Lathrop. O'Dell Engineering, serving as the civil engineer for the River Islands Development, provided land use exhibits showing each parcel's boundaries and land uses for Phases I and II (see **Appendix A**) in accordance with the City's requirements. The River Islands development will consist of low, medium and high density residential, schools/institutional, parks, and commercial land uses. The employment centers located in the south of River Islands are categorized as commercial land uses.

To be described in **Section 2.2**, the potable water demands for each parcel are determined by each parcel's land use and the number of dwelling units or applicable service area. Considering a parcel's entire gross area for potable water demands has the potential to unnecessarily oversize the potable water distribution system, especially in cases where non-potable water will be used for outdoor irrigation demands within the parcel. Based on irrigation coverage exhibits (see **Appendix B**) and conversations with River Islands for the design of future infrastructure, the following **Table 2-1** lists the percent of a parcel's area to be satisfied by the potable water distribution system. This table does not apply to residential land uses as they are estimated by the number of individual dwelling units.

Table 2-1: River Islands Land Uses – Applicable Parcel Area

Land Use	Percent of Parcel's Gross Area to be Used for Potable Water Demands Calculations
Phase I and II Commercial[1]	100% now, 85% intended in the future
Phase I and II Industrial	Not applicable as there are no industrial land uses within the River Islands Development
Phase I Parks	As dictated by the irrigation coverage exhibit as specific irrigation areas within each parcel having already been determined.
Phase II Parks[1]	65% of 10% of the total parks gross area. The rest of the park will be designed and constructed as hard scape or irrigated by non-potable water
Phase I and II Schools[1]	35%
Phase I and II Institutional (Police Station etc.)	100%

Notes

1. Based on conversations with River Islands for the preliminary design of future parcels with the indicated land use as these parcels are still in the planning phases. Non-potable is planned to be utilized in accordance with the State and City requirements to offset parcel potable demands, such as irrigation. Applicable parcel areas listed here will be updated in the model when improvement plans become available. Although there has been no discussion with RWQCB about using Reclaimed Water on private commercial property, that is a future goal. This report does not anticipate on-site use of Reclaimed Water at this time.

Table 2-2 shows the total number of dwelling units or applicable service acreage of each land use within the River Islands development. The acreage shown in **Table 2-2**, reflects the parcels gross area listed in **Table 2-1**.

Table 2-2: River Islands – Phase I and II Land Uses

Land Use	Phase I No. of Units or Acreage	Phase II No. of Units or Acreage	Phase I & II (Total) No. of Units or Acreage
Low Density Residential (per DU)	3,130	4,061	**7,191**
Medium Density Residential (per DU)	486	3,150	**3,636**
High Density Residential (per DU)	668	3,515	**4,183**
Commercial (per acre)	172.0	115.2	**287.2**
Industrial (per acre)	0.0	0.0	**0.0**
Parks (per acre)	42.3	22.8	**65.1**
Schools / Institutional (per acre)	19.4	42.4	**61.8**

2.2 Average Day Demands

The ADDs are determined by each parcel's average day demand factor, listed in the City of Lathrop August 2020 Updated Demand Projections (See **Appendix C**), multiplied by the total number of dwelling units or applicable acreage (refer to **Table 2-1**). Per the City's Water Master Plan, an additional 5% water loss factor shall be applied to the ADD to account for non-revenue water and preventing the system from being undersized.

Table 2-3 presents the Average Day Demand for Phase I and II of River Islands which is estimated to be **4,392,756 gallons per day (GPD)** or **3,051 gallons per minute (GPM)**.

Table 2-3: River Islands – Phase I and II Average Day Demands

Land Use	Phase I & II (Total) No. of Units or Acreage	ADD Demand Factor (GPD per DU or Acre)	ADD Demand Factor (GPD per DU or Acre) W/ 5% Loss Factor	ADD (GPD) W/ 5% Loss Factor	ADD (GPM) W/ 5% Loss Factor
Low Density Residential (per DU)	7,191	315.0	330.8	2,378,423	1,652
Medium Density Residential (per DU)	3,636	235.0	246.8	897,183	623
High Density Residential (per DU)	4,183	135.0	141.8	592,940	412
Commercial (per acre)	287.2	860.0	903.0	259,328	180
Industrial (per acre)	0.0	1,200.0	1,260.0	0	0
Parks (per acre)	65.1	2,450.0	2,572.0	167,547	116
Schools / Institutional (per acre)	61.8	1,500.0	1,575.0	97,335	68
			Subtotal	**4,392,756**	**3,051**

2.3 Maximum Day Demands and Peak Hour Demands

Per Section 4-4.2B in the City's Standards, MDD is defined as **1.7** times the ADD, while PHD is defined as **3.4** times the ADD. **Table 2-4** and **Table 2-5** show the maximum day and peak hour demands which equates to **7,467,686 GPD** (**5,186 gpm**) and **14,935,372 GPD** (**10,372 GPM**) respectively.

Table 2-4: River Islands – Phase I and II Maximum Day Demands (Peaking Factor = 1.7)

Land Use	Phase I & II (Total) No. of Units or Acreage	ADD Demand Factor (GPD per DU or Acre) W/ 5% Loss Factor	MDD Demand Factor (GPD per DU or Acre) W/ 5% Loss Factor	MDD (GPD) W/ 5% Loss Factor	MDD (GPM) W/ 5% Loss Factor
Low Density Residential (per DU)	7,191	330.8	562.3	4,043,320	2,808
Medium Density Residential (per DU)	3,636	246.8	419.5	1,525,211	1,059
High Density Residential (per DU)	4,183	141.8	241.0	1,007,998	700
Commercial (per acre)	287.2	903.0	1,535.1	440,858	306
Industrial (per acre)	0.0	1,260.0	2,142.0	0	0
Parks (per acre)	65.1	2,572.0	4,373.3	284,830	198
Schools / Institutional (per acre)	61.8	1,575.0	2,677.5	165,470	115
			Subtotal	**7,467,686**	**5,186**

Table 2-5: River Islands – Phase I and II Peak Hour Demands (Peaking Factor = 3.4)

Land Use	Phase I & II (Total) No. of Units or Acreage	ADD Demand Factor (GPD per DU or Acre) W/ 5% Loss Factor	PHD Demand Factor (GPD per DU or Acre) W/ 5% Loss Factor	PHD (GPD) W/ 5% Loss Factor	PHD (GPM) W/ 5% Loss Factor
Low Density Residential (per DU)	7,191	330.8	1,124.6	8,086,639	5,616
Medium Density Residential (per DU)	3,636	246.8	839.0	3,050,422	2,118
High Density Residential (per DU)	4,183	141.8	482.0	2,015,997	1,400
Commercial (per acre)	287.2	903.0	3,070.2	881,715	612
Industrial (per acre)	0.0	1,260.0	4,284.0	0	0
Parks (per acre)	65.1	2,572.0	8,746.5	569,660	396
Schools / Institutional (per acre)	61.8	1,575.0	5,355.0	330,939	230
			Subtotal	**14,935,372**	**10,372**

2.4 Fire Flow Requirements

Fire flows are required to meet the Lathrop-Manteca Fire Protection District (LMFPD) requirements and as outlined in Table 4-2 in the City's Standards (see **Appendix D** & **Table 2-6**). The required fire flows must be provided in conjunction with MDDs for a minimum 2-hour duration, while maintaining a system-wide residual pressure of 20 psi (including at the flowing hydrant).

Table 2-6: Fire Flow Requirements

Land Use	Fire Flow Required (GPM)
Low Density Residential	1,250
Medium Density Residential	1,250
High Density Residential	2,000
Commercial	3,000
Industrial	4,000

2.5 Potable Water Pumping Capacity Requirements – Phase I City of Lathrop Potable Water Storage and Booster Pump Station at River Islands

Per Section 4-4.2 in the City Standards, PW distribution systems shall be sized to adequately, dependably, and safely supply potable water demands under maximum conditions. The City Standards define maximum conditions as the higher of either the maximum day demands plus the largest fire flow requirement or peak hour demands. At full buildout, the largest fire flow requirement is **3,000 GPM** and the MDD is **5,186 GPM**. This is equal to **9,186 GPM** which is less the **PHD of 10,372 GPM**. Therefore, at full buildout conditions, the required firm pumping capacity of the River Islands distribution system must be at least **10,372 GPM (PHD)** as required by the City's Standards. Section 4-5.7 and Appendix H in the City Standards defines firm pumping capacity at a pump station as the total pumping capacity of all the pumps minus the capacity of the largest pump.

The Phase I City of Lathrop PW Pump Station at River Islands (also known as Phase I BPS and previously referred to as Site B) was designed with a firm pumping capacity equal to 10,000 GPM at full build out conditions. **Table 2-7** below lists the rated capacities and number of pumps the Phase I BPS will be installed with at full build out conditions.

Table 2-7: Phase I City of Lathrop Potable Water Storage and Booster Pump Station at River Islands – Firm Pumping Capacity

Pump Number	Pumping Capacity (gpm) @ 197' TDH	Motor Rated Horsepower	Motor Drive	Status
Small Booster Pump #1	2,000	125	Variable Frequency Drive	Duty
Small Booster Pump #2	2,000	125	Variable Frequency Drive	Duty
Small Booster Pump #3	2,000	125	Variable Frequency Drive	Duty
Large Booster Pump #1	4,000	250	Soft Starter	Duty
Large Booster Pump #2	4,000	250	Soft Starter	Standby
Total Firm Pumping Capacity Phase I BPS	**10,000**			

Notes:

1. Phase I BPS will be designed to operate in a 4 duty + 1 standby configuration, with one of the large booster pumps acting as the standby pump.

2.6 Potable Water Pumping Capacity Requirements – Proposed Phase II City of Lathrop Potable Water Storage and Booster Pump Station at River Islands

As of November 2020, the total PHD for Phase I and II is 10,372 GPM which is greater than the MDD + Fire Flow. With Phase I BPS's 10,000 GPM firm pumping capacity, the minimum required firm pumping capacity of the proposed Phase II pump station is **372 GPM**. However, as discussed further in **Section 3**, the Phase I site alone will not be able to provide the required PW storage for the development. Additional PW storage will need to be provided in Phase II to offset the storage deficiencies under full buildout conditions. Because the River Islands distribution system requires booster pump stations to draw from localized storage to pressurize the distribution system, installing a 372 GPM booster pump station with the proposed 3.47 MG of storage will not be ideal as the booster pump station will not be able to adequately draw and transmit the stored PW.

As shown in **Table 2-8**, it is recommended that the Proposed Phase II City of Lathrop PW Storage and Booster Pump Station at River Islands (also referred to as Phase II BPS) be sized with a minimum firm pumping capacity of 4,000 GPM from 2 duty + 1 standby pumps. A firm pumping capacity of 4,000 GPM will not only satisfy the firm pumping capacity requirement of 10,372 GPM, but will also be able to supplement PW demands and fire flows in Phase II, should an emergency situation occur at the Phase I BPS.

Table 2-8: Proposed Phase II City of Lathrop Potable Water Storage and Booster Pump Station at River Islands - Firm Pumping Capacity

Pump Number	Pumping Capacity (gpm) @ 197' TDH	Motor Rated Horsepower	Motor Drive	Status
Phase II – Small Booster Pump #1	2,000	125	Variable Frequency Drive	Duty
Phase II – Small Booster Pump #2	2,000	125	Variable Frequency Drive	Duty
Phase II – Small Booster Pump #3	2,000	125	Variable Frequency Drive	Standby
Total Firm Pumping Capacity Phase II	**4,000**			
Total Firm Pump Capacity Phase I + Phase II	**14,000**			

Notes:

1. Proposed Phase II BPS will be designed to operate in a 2 duty + 1 standby configuration with Small Booster Pump #3 designed as standby.

3 Potable Water Storage Requirements

3.1 Potable Water Storage Requirements

Per Section 6.2.3 in the City's Water Master Plan, the required PW storage capacity shall include equalization storage, fire storage and emergency storage.

Equalization storage shall be provided for the purposes accounting for varying water use through the year. The City's Water System Master Plan recommends an equalization storage volume to be 25% of MDD be provided, which equates to 1,866,922 gallons.

Emergency storage is required to meet demands during various emergencies, such as natural disasters, pipeline failures or pump station failure. The City's current emergency storage requirement is 75% of MDD, which equates to 5,600,765 gallons.

Fire storage requirements are based on storage volumes needed to supply the largest concurrent fire event (industrial land uses) and a high-density residual fire event within the City for a duration of 2 hours. The required fire storage volume shall be stored throughout the City's PW distribution system in addition to the required equalization and emergency storage volumes (Water Master Plan). These two fire flow events result in in a total City-wide storage requirement of 0.72 MG as shown in **Table 3-1**.

The final PW storage capacity provided at River Islands will need to include a proportional fire storage volume based on the developments impact on the City's overall distribution system. Currently this volume is not known, but the maximum River Islands Fire Storage Capacity Requirement is approximately 0.60 MG which is equivalent to a simultaneous commercial (largest fire flow requirements in River Islands) and high density residential fire flow event for a 2-hour duration (see **Table 3-1**). Prior to the start of the proposed Phase II BPS and Tank Site, the City will provide the required fire storage capacity requirement to be included at River Islands.

Table 3-1: City of Lathrop and River Islands Fire Storage Requirements

Parameter	Volume (gallons)
City of Lathrop	
Required Industrial Fire Flow Storage Volume[1]	480,000
Required High Density Residential Fire Flow Storage Volume[2]	240,000
Total Required City-Wide Fire Flow Storage Volume	**720,000**
River Islands	
Required Commercial Fire Flow Storage Volume[3]	360,000
Required High Density Residential Fire Flow Storage Volume[2]	240,000
Maximum Required River Islands Fire Flow Storage Volume	**600,000**

Notes:

1. In accordance with the City's Standards, industrial fire events will require a fire flow of 4,000 GPM for a 2-hour duration. This is equal to 480,000 gallons as shown above.
2. In accordance with the City's Standards, high density residential fire events will require a fire flow of 2,000 GPM for a 2-hour duration. This is equal to 240,000 gallons as shown above.
3. In accordance with the City's Standards, commercial fire events will require a fire flow of 2,000 GPM for a 2-hour duration. This is equal to 360,000 gallons as shown above.

Including the City required equalization and emergency storage volumes, and assuming the maximum fire storage requirement of 0.60 MG, the total Phase I and II River Islands PW Storage requirement is **8.1 MG or 8,067,686 gallons**.

Table 3-2: River Islands Phase I and II – Total Potable Water Storage Requirement

Storage Capacity Requirement	Volume (gallons)
Equalization Storage	1,866,922
Emergency Storage	5,600,765
Fire Storage	600,000
Total River Islands Potable Water Storage Requirement	**8,067,686**

3.2 Potable Water Storage Requirements – Phase I City of Lathrop Potable Water Storage and Booster Pump Station at River Islands

The Phase I BPS site was initially constructed with a single 1.5 million gallons (MG), 106-foot diameter, welded steel storage tank with provisions for future 1.5 MG and 1.6 MG tanks. At final buildout, the site would provide a total of **4.6 MG** of PW storage. The proposed welded steel tanks should be designed and installed with the same hydraulic parameters (working height, overflow elevations etc.) as the existing 1.5 MG, 106-foot diameter tank. This will prevent excessive short circuiting between the tanks and or additional infrastructure to accommodate different working heights.

3.3 Potable Water Storage Requirements – Proposed Phase II City of Lathrop Potable Water Storage and Booster Pump Station at River Islands

The Phase II BPS site will be required to provide an additional **3.47 MG** to meet the City's storage requirements. Two additional 1.86 MG, 115-foot diameter, welded steel tanks are recommended for the Phase II BPS site. The tanks shall utilize the same hydraulic parameters as Phase I BPS site for commonality purposes and to reduce the visual impact of the additional tanks.

4 River Islands Potable Water Distribution System and Model

4.1 WaterGEMS Model

Bentley's WaterGEMS for AutoCad 2019 water distribution analysis and design software, was used to conduct a steady state analysis of the River Islands PW distribution system under ADD, MDD, and PHDs. A steady-state analysis determines the operating behavior of the system at a specific point in time under steady-state conditions (flow rates and hydraulic grades remain constant over time). The results of the steady-state analysis helped determine the following performance criteria as required by the City's Standards and Water Master Plans.

- Distribution System Pressures under ADD, MDD, and PHDs
- Pipeline Velocities under ADD, MDD, and PHDs
- Pipeline Headloss Gradients under ADD, MDD, and PHDs

4.1.1 WaterGems Model Basis and Assumptions

The River Islands WaterGEMs model was created from a combination of as built drawings, issued for construction improvement plans, or preliminary PW utility exhibits. The AutoCad drawings were imported into WaterGEMS for AutoCad 2019 and the PW lines were converted into a hydraulic model. If improvement plans or as built drawings were available, the elevation of the PW lines, location and size of valves, and the location and size of fire hydrants were imported into the hydraulic model. As recommended in Section 7 of the City's Water Master Plan, the following baseline assumptions were used in the steady-state analysis.

- All valves were assumed to have a minor loss coefficient equal to K=0.4.
- All pipes were assigned a Hazen-Williams friction loss coefficient of 140.
- The location of PW demands were assigned to the nearest applicable junction based on the location of the parcel's service lateral. No pipe laterals were modeled in this analysis.

4.1.1.1 Areas Without Finalized Improvement Plans Assumptions

In locations where improvement plans or as built drawings were not available, the following was assumed in order to conduct a steady-state analysis.

- The location of all PW lines were assumed to match the preliminary PW utility exhibits
- The elevation of all PW lines were assumed to be 4 feet below the finished grade
- Valves or fire hydrants were placed into the distribution model in accordance with the City Standards.
- All unknowns needed to run a steady-state analysis, such as minimum pipe sizes, were assumed to the minimum requirements listed in the City Standards or Water Master Plan.

The following areas did not have finalized improvement plans and the assumptions listed above were utilize in order to model these demands. The total number of dwelling units or acreage of these areas was assigned based on projected quantities provided by River Islands. **Ultimately, the model results should be revisited when the improvement plans for these areas become available.** Please reference **Appendix A** for the location of these areas.

- Employment Centers in Phase 1B
- Town Center in Phase 1B
- Village R in Phase 1B
- Village CC in Stage 2A
- Village X in Stage 2A
- Village KK and II in Stage 2B
- All of Phase II

4.1.2 Fire Flow Analysis

WaterGEMS has a fire flow analysis feature which determines the available fire flows under steady-state conditions at each junction or hydrants at a time. The available fire flows at a single junction/hydrant are determined after system wide demands have been satisfied and as long as specific operating criteria are satisfied. In other words, the fire flow analysis determines the available fire flows for a single fire event if it were to occur at each of the selected junctions or hydrants.

Per Section 6 in City's Water Master Plan, the following operating constraints/requirements were inputted into the fire flow analysis.

- The calculated available fire flows must also be provided in conjunction with the baseline demands.
  - For the purposes of seeing the performance of the system, fire flows were analyzed in conjunction with MDDs as required by the City requirements.
- A minimum residual pressure at each junction or hydrant tested must be greater than or equal to 20 psi as fire flows are being extracted.
- A minimum system wide pressure at each junction or hydrant must be greater than or equal to 20 psi during fire flow analysis.
- The fire flow analysis shall simulate one 4,000 GPM fire flow event at each of the tested junctions or hydrants. If 4,000 GPM cannot be provided the model will determine the maximum available fire flows.
  - For the purposes of seeing the performance of the distribution system, the upper limit of the fire flow analysis was set at 4,000 GPM, even though the highest fire flow requirement for River Islands is 3,000 GPM. This will allow for future planning if the parcel's land uses are reclassified.
- The maximum velocity in any distribution (non-service lateral) and transmission pipe shall not exceed 10 feet per second.

4.2 City of Lathrop's Potable Water Distribution System – River Islands

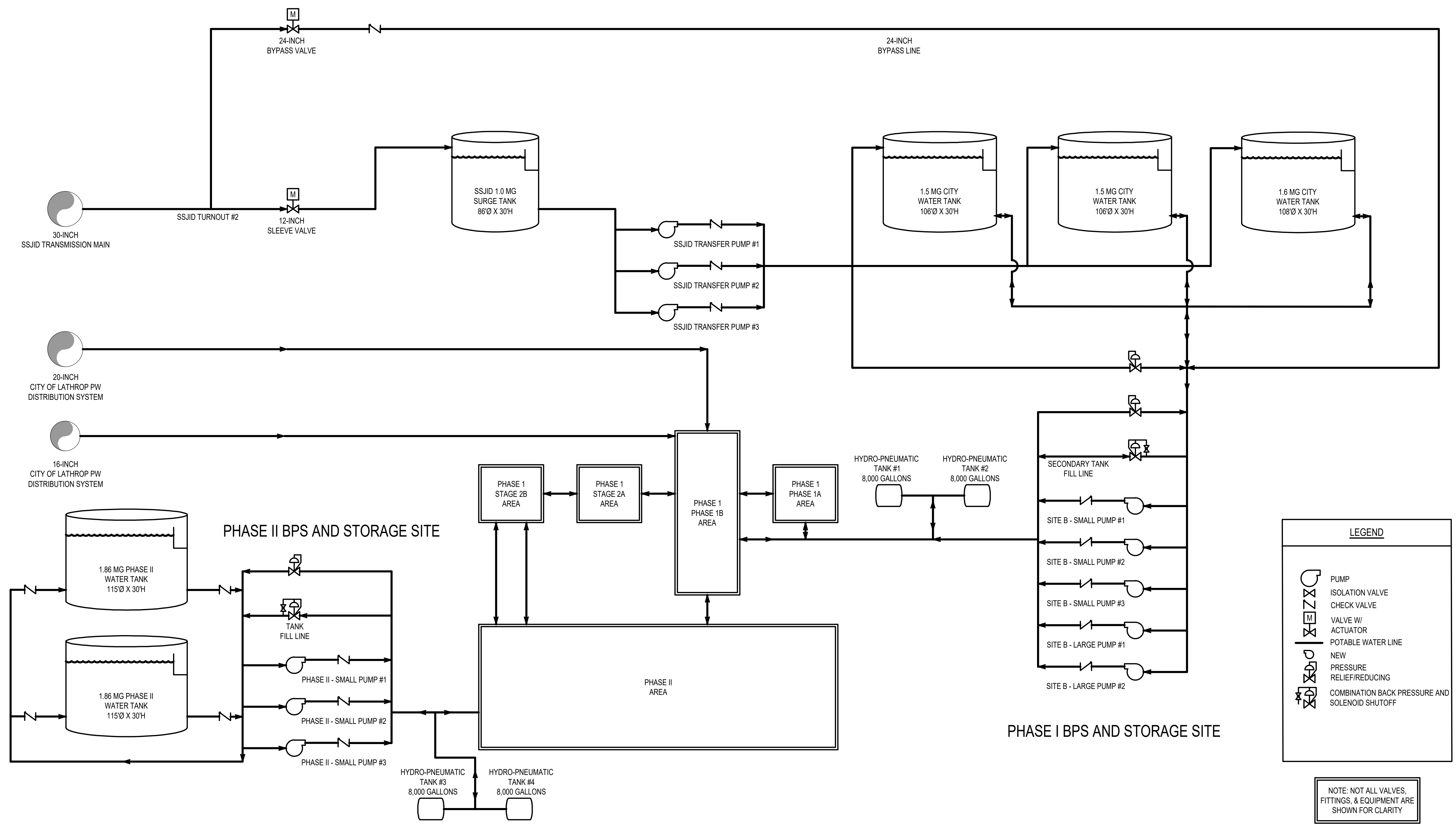
The River Islands development is located within the southwest area of the City of Lathrop's service area and will utilize the City's PW distribution system for domestic, commercial, specific irrigation areas, and school PW demands. The distribution system will also service fire flows within the development. The City's distribution system operates as a single pressure zone, pressurized from different booster pump stations and storage sites spread throughout the City. The River Islands development will expand the City's distribution system to contain two additional City owned and operated PW booster pump stations and water storage tank sites at full buildout conditions, in addition to the SSJID Turnout #2 and 1 MG Tank currently under construction. The following sections will describe the exist/proposed infrastructure, as of the City's PW distribution system, to supply potable water supply, store, and pressurize the system within River Islands and the associated modeling assumptions under steady state conditions.

4.2.1 Potable Water Supply – City of Lathrop's Potable Water Distribution System

River Islands currently has two connections to the City PW distribution system (see **Figure 5-1**). The first connection is the 16-inch line under Stewart Road, installed as part of first stage (Stage 1A) of the Phase I development. In June 2017, the second 20-inch connection was installed beneath River Islands Parkway which connected River Islands with the City's PW distribution network east of Bradshaw Crossing Bridge. These connections allow for the City's distribution system to supply PW directly to end users, or to on-site storage tanks. While the City's distribution has the ability to supply water directly to the end users, this operating scenario shall not be considered under normal operating conditions at full buildout, and the City's distribution system within River Islands shall be designed to be pressurized from the proposed Phase I and II BPS and Storage sites.

As described in **Section 4.2.3.1.1**, the City's distribution system will supply potable water to the on-site Phase I and Phase II storage tanks during off-peak windows. As long as sufficient distribution pressure is maintained, a combination back pressure sustaining tank fill valve will allow for the distribution system to backfill the tanks.

The two connections to the City's PW distribution system were modeled as elevated reservoirs with a hydraulic grade line (HGL) of 107.6 feet with a check valve preventing flow from entering the reservoir. The HGL of 107.6 feet was chosen as it models an approximate pressure of 40 pounds per square inch (psi) at the points of connection, which will allow for the model to determine if the Phase I and II BPS can supply (pressurize) the City's distribution system within River Islands.



RIVER ISLANDS
POTABLE WATER DISTRIBUTION
SYSTEM SCHEMATIC
FULL BUILD OUT

JOB
RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL
LATHROP CA

SCALE	
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

FIGURE
4-1

4.2.2 Potable Water Supply – South San Joaquin Irrigation District / South County Water Supply Program

The City purchases imported surface water from SSJID through the South County Water Supply Program (SCWSP) which supplies treated Stanislaus River Water. The SCWSP is planned to be implemented in two phases. Phase 1 was completed in 2005 and the improvements provided a total SCWSP capacity of 31,500 acre-ft per year (AFV), of which 8,007 AFV is allocated to the City of Lathrop. The Phase 2 improvements will increase the total SCWSP capacity to 43,000 AFV, of which 11,791 AFV is allocated to the City of Lathrop. Implementation of the Phase 2 improvements is unknown at this time (Water Master Plan). In 2013, the City sold 1,120 AFY of SCWSP water to the City of Tracy (Water Master Plan). Therefore, the City's remaining SSJID allocation is 6,887 AFV for Phase 1 and a total of 10,671 AFV after completion of Phase 2. The SCWSP allows for seasonal increased flows based on peaking factors determined by each City, which equates to 2.1 and 2.0 for Phase 1 and 2 respectively for the City of Lathrop (Section 5.2.1 from 2002 SCWSP BODR). The remaining peak flow shall be 14,462 AFV and 21,342 AFV for Phase 1 and 2 respectively.

Table 4-1: City of Lathrop – Allocated SCWSP Potable Water from SSJID

City of Lathrop SCWSP Design Flows	Phase 1			Phase 2		
	(AFY)	(MGD)	(GPM)	(AFY)	(MGD)	(GPM)
Contractual Allocation[1]	8,007	7.1	4,964	11,791	10.5	7,310
Sale to City of Tracy[2]	-1,120	-1.0	-694	-1,120	-1.0	-694
Remaining Allocation	**6,887**	**6.1**	**4,270**	**10,671**	**9.5**	**6,616**
Peaking Factors[3]	2.1			2.0		
Remaining Peak Flow Allocation	**14,462**	**12.9**	**8,967**	**21,342**	**19.1**	**13,232**

Notes
1. From Table 5-1 in the 2002 South County Water Supply Program Basis of Design Report
2. Per Section 5 of the City's Master Plan, the City sold 1,120 AFY of its Phase 1 SCWSP allocated flows to the City of Tracy in 2013.
3. The SCWSP allows for seasonal increased flows based on peaking factors determined by each City, which equates to 2.1 and 2.0 for Phase 1 and 2 respectively for the City of Lathrop (Section 5.2.1 from 2002 SCWSP BODR)

Purchased water from the SCWSP is currently delivered to the existing SSJID Turnout #1, located at the eastern edge of the City along Lathrop Road. Turnout #1 was designed to provide a maximum flow of 8,401 AFV (7.5 MGD) under both Phase 1 and 2 of the SCWSP. The proposed SSJID Turnout #2 is currently under construction and will be adjacent to Phase 1 BPS and Storage Site. Flow from SSJID Turnout #2 will feed the Phase 1 BPS and Storage site which will serve as the primary source of pressure for River Islands. According to the City's Master Plan, the planned operating capacity of the proposed Turnout #2 will be designed to supply the remaining of the allocated SCWSP flows, after Turnout #1 reaches its capacity of 8,401 AFV (7.5 MGD) per year. Under the peak flows listed in **Table 4-1**, the planned operating capacity of the proposed Turnout #2 for Phase 1 and 2 is approximately 6,061 AFV (5.1 MGD) and 12,938 AFV (11.55 MGD) respectively.

Table 4-2: City of Lathrop – Design SSJID Turnout Capacities

City of Lathrop SCWSP Design Flows	Phase 1			Phase 2		
	(AFY)	(MGD)	(GPM)	(AFY)	(MGD)	(GPM)
Remaining Peak Flow Allocation	14,462	12.9	8,967	21,342	19.1	13,232
SSJID Turnout #1 Design Capacity	8,401	7.5	5,209	8,401	7.5	5,209
SSJID Turnout #2 Design Capacity	**6,604**	**5.4**	**3,758**	**12,941**	**11.6**	**8,023**

According to the City's Master Plan, due to the relatively high cost of SCWSP water, the potential uncertainty of the reliability of the City's full SCWSP allocation (due to adopted revisions in the Water Quality Control Plan for the Bay-Delta Region), and to simplify operations of the City's Louise Avenue Water Treatment Facility (LAWTF), the City has historically relied upon its groundwater wells as the primary source of water to the distribution system. The operation of the City's potable water supply sources is beyond the scope of work of this report, as an extended state model situation with diurnal demand curves and specific operating parameters from the City's maintenance team would be required. However, to be described in **Section 5**, the full buildout MDD and PHDs are approximately 5,186 and 10,372 GPM respectively. If the City desired to utilize Turnout #2 as the primary source of water for River Islands, at a minimum, the Phase 2 SCWSP improvements would need to be constructed and the City would have to utilize off-peak windows to fill the River Islands storage tanks.

According to SSJID, the 30-inch transmission main feeding Turnout #2 was designed to have a normal operating pressure of 35-40 PSI. For the purposes of providing a steady state model simulation, the SSJID connection feeding Turnout #2 was modeled as an elevated reservoir supplying a pressure of 40 psi. A flow control valve was added to the reservoir outlet to limit the SSJID supply to 8,023 GPM. Upon completion of the SSJID turnout #2, the pressure at the point of connection shall be verified at different flows rates and the hydraulic model shall be updated to verify the SSJID supply capacity.

4.2.2.1 SSJID Turnout #2 / SSJID Potable Water Storage and Transfer Pump Station at River Islands (Site A)

The Site A SSJID PW Storage and Pump Station will consist of the 24-inch SSJID Turnout #2, a 1.0 MG SSJID surge tank, SSJID transfer pump station, and a 24-inch bypass line. Site A will be owned, operated, and maintained by SSJID. The storage capacity of the 1.0 MG SSJID surge tank shall not be included as part of the City's PW storage capacity. Inflow from the 30-inch SSJID transmission mainline will be connected to the 24-inch SSJID turnout #2 structure located within Site A. Under normal operating conditions, a maximum flow of 8,023 gpm (with a pressure range of 35-40 psi) from the turnout structure will fill the 1.0 MG SSJID surge tank. The rate at which the tank is filled will be based on the current water level in the surge tank and controlled by an electric actuated, 12-inch sleeve valve. During high demands or maintenance periods, a 24-inch bypass line will be installed upstream of the 12-inch sleeve valve to bypass Site A and direct water to the Phase I BPS. A check valve will be installed downstream of the 24-inch motorized valve to prevent potential backflows from River Islands to SSJID.

A 1.0 MG gravity surge tank shall be constructed at Site A, upstream of the Phase I BPS storage tanks to serve as interim storage during high demand windows. The bolted steel surge tank will be approximately 86 feet in diameter and 30-feet tall with a maximum surface water level of 27 feet (43 feet MSL as the tank finished floor (FF) elevation is 16 feet). The tank is supplied with separate inlet and outlet lines with the inlet entering just below the maximum surface water elevation.

Three 25 horsepower (hp) constant speed transfer pumps (two on duty and one standby) will be installed to transfer potable water from the surge tank to the Phase I BPS storage tanks. Each pump will have a capacity of 2,000 gpm at 30 feet total dynamic head (TDH). The transfer pumps shall be vertical turbine pumps that have ON/OFF control based on the current water level in the tanks.

Table 4-3: SSJID PW Storage and Transfer Pump Station at River Islands (Site A) – Firm Pumping Capacity

Pump Number	Pumping Capacity (gpm) @ 30' TDH	Motor Rated Horsepower	Motor Drive	Status
SSJID Transfer Pump #1	2,000	25	Across the Line Motor Starter	Duty
SSJID Transfer Pump #2	2,000	25	Across the Line Motor Starter	Duty
SSJID Transfer Pump #3	2,000	25	Across the Line Motor Starter	Standby
Total Firm Pumping Capacity[1]	**4,000**			

Notes
1. Total Firm Pumping Capacity excludes Standby Pump #3

4.2.2.2 Hydraulic Model Assumptions – Steady State Analysis

- 12 – inch sleeve valve

  For the purposes of the hydraulic model, the 12-inch sleeve valve is set to open when the water level in the surge tank reaches an elevation of 20 feet (4 feet from the FF of the tank) and close at an elevation of 40 feet which is the invert elevation of the tank's inlet.

- 1.0 MG SSJID Surge Tank Starting Water Level

  For the purposes of a steady state hydraulic analysis, the SSJID surge tank is to start full, with a water level elevation of 39 feet (just below the invert elevation of the tank's inlet).

- SSJID Transfer Pumps

  The transfer pumps are designed to turn on or off based on low and high level set points in Phase I BPS 1.5 MG Tank #1. Both the 2,000 GPM pumps will turn on and operate at 100% speed when the water level in Tank #1 reaches an elevation 20 feet (4 feet from FF) and turn off at an elevation of 39 feet which is the invert elevation of the tank's inlet.

- 24-inch bypass

  Site A does not have enough capacity to handle peak hour demand at full buildout conditions. When the water level in the Phase I BPS storage tanks reaches a low low water level elevation of 19 feet (3 feet from FF), a 24-inch electric actuated valve, upstream of the 12-inch sleeve valve, will open allowing flow from SSJID turnout #2 to flow directly to Phase I BPS storage tanks.

4.2.3 Sources of Distribution Pressure and Storage – Phase I City of Lathrop Potable Water Storage and Pump Station at River Islands (Phase I BPS)

The River Islands area of the City's PW distribution system is/will continue to be designed to be pressurized from the Phase I and the proposed Phase II BPS located within the development. Each of these booster pump stations will pump stored, on-site PW out to the distribution system based on maintaining a set pressure range in the system. Other booster pump stations in the City have the ability to pressurize the

River Islands' area of the distribution system as the City's distribution system operates as a single pressure zone, however, this operating scenario shall not be considered under normal operating conditions.

At full buildout, Phase I BPS will consist of a 10,000 GPM firm pumping capacity pump station, 4.6 MG of storage through three separate tanks, secondary tank fill line, a free chlorine residual system and two 8,000-gallon hydro-pneumatic tanks on the pump station's discharge. The secondary tank fill line allows for the City's distribution system to back fill the storage tanks. Once completed, Phase I BPS will be owned, operated, and maintained by the City of Lathrop.

4.2.3.1 Phase I BPS Potable Water Storage Tanks

As part of a steady-state analysis, all the potable water storage tanks were modeled as full (starting water level at each tank's high water level). **It is recommended that prior to the start of the design of the proposed Phase II BPS and storage tank site that an extended state analysis be conducted to verify the storage tanks can be refilled during off-demand windows.** This is because the Phase I and II PHD will exceed with maximum supply flow rate allocated from SSJID (see **Section 5**), which will result in a negative storage volume unless the tanks are filled during off-demand windows from the City's distribution system.

The Phase I BPS storage tanks were originally designed to provide equalization, emergency, and fire storage for Phase I across three welded steel storage tanks. At final buildout, a total of 4.6 MG of PW storage will be provided through two 1.5 MG, and one 1.6 MG welded steel tanks. The two City of Lathrop PW distribution system connections allow River Islands to initially utilize the citywide fire storage of 0.72 MG, but over time, the River Islands storage tanks need to provide their share of fire storage which the maximum storage capacity is approximately 0.60 MG (see **Section 3**).

The 1.5 MG storage tanks will be approximately 106-feet in diameter with a height of 30-feet and maximum surface water level of 27 feet (43 feet MSL as the tank FF elevation is 16 feet). The tanks are supplied with separate inlet and outlet lines with the inlet entering just below the maximum surface water elevation. The 1.6 MG tank will have the same design parameters as the 1.5 MG tank with the exception that the tank is approximately 108-feet in diameter.

4.2.3.1.1 Hydraulic Model Assumptions – Steady State Analysis

As discussed in **Section 4.2.2.2,** one of the methods of filling the Phase I BPS storage tanks will be from the Site A SSJID transfer pumps and the 24-inch bypass pipeline respectively.

The secondary method of filling the Phase I BPS tanks will be to utilize the connection to the City's distribution system to back feed/fill the tanks during off-peak windows. A combination back pressure sustaining and solenoid shut-off valve (PSV) will be installed to connect the distribution system and the tank's outlet line. Please note that the tank's outlet is not equipped with a check valve to allow for all three tanks to be backfilled and equalize. During operator adjustable windows the combination PSV will open allowing the distribution system to fill the tanks as long as a minimum back pressure is maintained. In other words, the combination back PSV will only be allowed to fill the tanks if a minimum distribution pressure is present, the booster pumps are off, and the tank has entered a fill cycle determined by the operators.

For Phase I BPS PW storage tanks, the following assumptions were inputted into the model.

- Secondary tank fill combination PSV

  The secondary tank fill combination PSV was assumed to be closed as the SSJID turnout #2 was modeled to be the primary source of water supply. Alarms were configured to indicate if the tanks were emptied during the analysis.

- 2 x 1.5 MG and 1 x 1.6 MG Phase I BPS Potable Water Storage Tanks

  For the purposes of a steady state hydraulic analysis, all three Phase I BPS tanks are assumed to start full, with a water level elevation of 39 feet (just below the invert elevation of the tank's inlet).

4.2.3.2 Phase I BPS Potable Water Booster Pump Station

The Phase I BPS will have a combination of five vertical turbine pumps: three 2,000 GPM small booster pumps and two 4,000 GPM large booster pumps. The small booster pumps will be equipped with variable frequency drives (VFD) designed to maintain an operator adjustable distribution pressure. The large booster pumps are equipped with soft starters and are designed to be turned off and on during high demand windows.

Due to the flat topography of the City's distribution system and to prevent excess cycling of the booster pumps, two 8-foot diameter, 8,000-gallon hydro-pneumatic tanks will provide pressurized storage for the distribution system. The tanks will be provided with a control panel to regulated the amount of compressed air needed to maintain the desired pressure range and volume.

4.2.3.2.1 Hydraulic Model Assumptions – Steady State Analysis

According to the City Standards, the minimum and maximum distribution system pressure shall be 40 psi and 80 psi, respectively under all demand scenarios. The minimum system wide pressure required during fire flow events shall be 20 psi. The following control strategy was taken from the Phase I BPS basis of design report and inputted into the hydraulic model.

- Total number of pumps

  The Phase I BPS was modeled at full buildout conditions with three small and two large booster pumps installed.

- Phase I BPS small booster pumps

  All three small booster pumps were modeled to operate as lead pumps using their VFDs to maintain a distribution pressure of 67.5 psi. The small booster pump curves were taken from manufacturer shop drawings of the installed pumps as the site is currently under construction.

- Phase I BPS large booster pumps

  The control strategy for the large booster pumps in the Phase I BPS basis of design report, stated the large booster pumps shall be operated as lag pumps to turn on when the distribution pressure drops below 52.5 psi and off at 65 psi. In order to model this control strategy appropriately, the large booster pumps were modeled as lag pumps and provided with VFDs to not exceed 65 psi. Without the inclusion of the VFDs, the large booster pumps would over pressurize the hydraulic model under steady state conditions.

- Two 8,000 gallons hydro-pneumatic tanks

  For the purposes of a steady state analysis, the discharge hydro-pneumatic tanks were not included in the model.

4.2.3.3 Proposed Phase II City of Lathrop Potable Water Storage and Booster Pump Station at River Islands (Phase II BPS)

The Phase II BPS is proposed to be installed along River Islands Parkway in Phase II. As described in **Section 2.6,** the total required firm pumping capacity for River Islands is **10,372 GPM**. With Phase I BPS 10,000 GPM firm pumping capacity, the minimum required firm pumping capacity of the proposed Phase II BPS is **372 GPM**.

As discussed in **Section 3.3**, it is recommended that the Phase II PW storage and booster pump station site be designed to provide a minimum of 4,000 GPM as this will satisfy the firm pumping capacity requirements, allow for future Phase II PW storage, and provide redundant pumping capacity in the distribution system. As shown in **Table 2-8**, the proposed installation of three small 2,000 GPM booster pumps will provide a total system wide firm pumping capacity of **14,000 GPM** for River Islands.

The Phase II PW Storage and Booster Pump Station site will need to be designed to add an additional **3.5 MG** of storage in order to satisfy the projected Phase I and II storage requirements. It is recommended that two parallel 1.86 MG, 115-feet diameter, welded steel storage tanks be installed to provide the remaining storage needed for River Islands. The tanks shall be provided with separate inlet and outlet lines with a maximum height of 30 feet to match the Phase I BPS storage tanks.

4.2.3.3.1 Hydraulic Model Assumptions – Steady State Analysis

It is recommended that the Phase II BPS tanks be designed with a similar combination PSV tank fill line as Phase I BPS. For Phase II PW storage tanks, the following assumptions were inputted into the model under the steady state analysis.

- Tank fill combination PSV

  For the purposes of the hydraulic model, a 24-inch combination PSV is set to open when the water level in the Phase II Tank #1 reaches an elevation of 17 feet (4 feet from the FF of the tank) and close at an elevation of 36 feet.

- 2 x 1.86 MG Phase II BPS Potable Water Storage Tanks

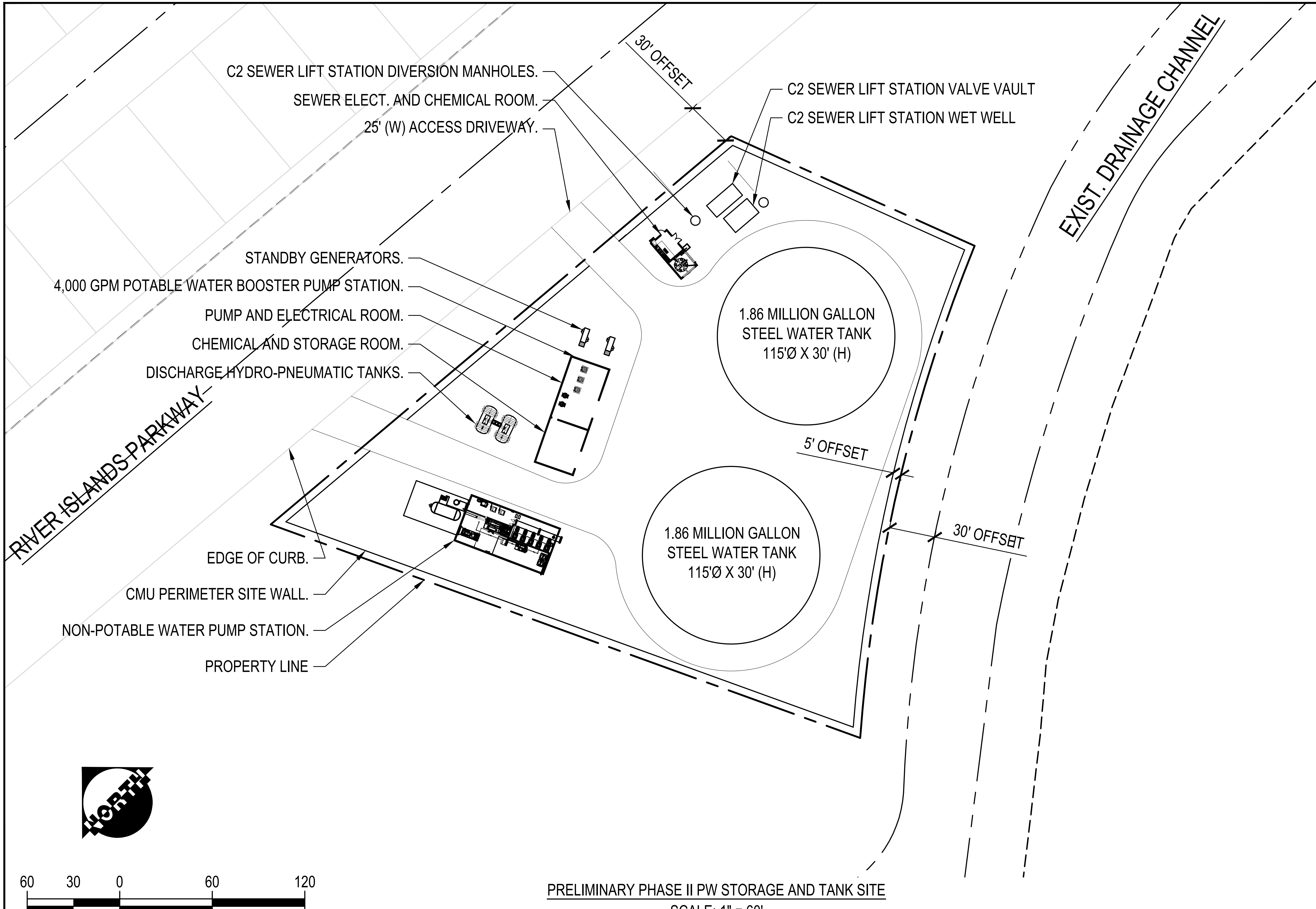
  For the purposes of a steady state hydraulic analysis, all Phase II tanks are assumed to start full, with a water level elevation of 36 feet. The site is assumed to be graded to provide a tank FF elevation of 13 feet.

- Phase II small booster pumps

  Two out of the three Phase II small booster pumps were modeled to operate as lead pumps using their VFDs to maintain a distribution pressure of 67.5 psi, similar to Phase I BPS.

- Two 8,000-gallons hydro-pneumatic tanks

  For the purposes of a steady state analysis, the proposed discharge hydro-pneumatic tanks were not included in the model.



PRELIMINARY PHASE II PW STORAGE AND TANK SITE

SCALE: 1" = 60'

PROPOSED PRELIMINARY PHASE II PW STORAGE AND BOOSTER PUMP STATION SITE PLAN

JOB

RIVER ISLANDS POTABLE WATER DISTRIBUTION MODEL

LATHROP CA

SCALE	
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

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FIGURE

4-2

5 River Islands Potable Water Distribution Model - Results

5.1 Steady State Analysis Results – Average Day Demands

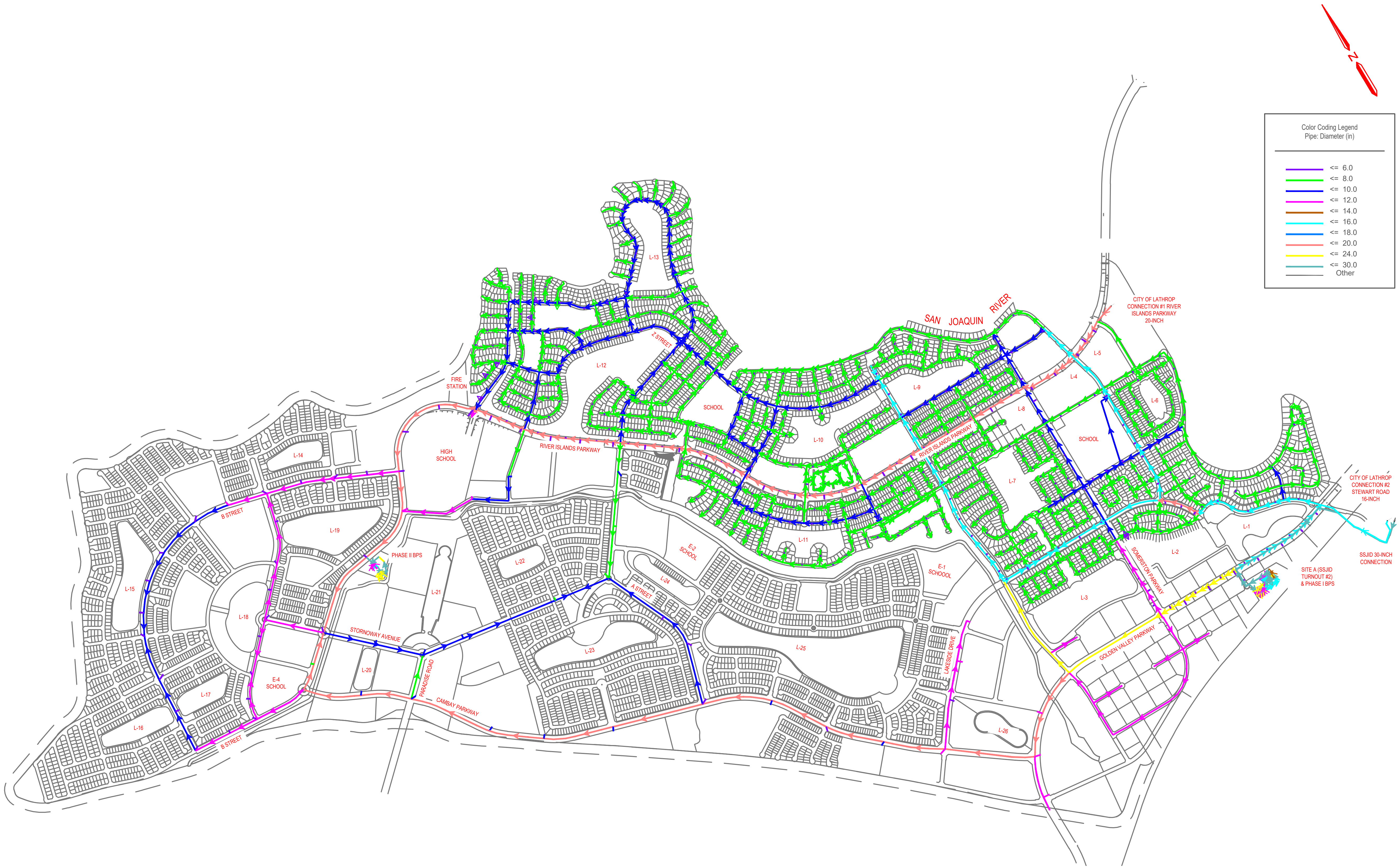
Figure 5-2, **Figure 5-3,** and **Figure 5-4** shows the steady state analysis results of each pipe velocities (feet per second (ft/s)), headloss gradients (in feet of headloss per every 1000-feet) and the junction pressures (in psi) under ADD. **Table 5-1** shows the specific minimum and maximum values for the model and their corresponding location under ADD.

As described in **Section 4.2.2**, the modeling of the City's potable water supply sources is beyond the scope of work of this report, as an extended state model situation with diurnal demand curves and specific operating parameters from the City's maintenance team would be required.

Table 5-1: Steady State Analysis Results – Average Day Demands

Model Result Category	Unit	Result	City Requirements	Location
Minimum Pipe Velocity	ft/s	0.01	N/A	Several locations
Maximum Pipe Velocity	ft/s	1.68	10	P-1223, 24-inch main along Golden Valley Parkway
Minimum Headloss Gradient	ft/1000ft	0.01	N/A	Several locations, all lines except for the 24-inch line along Golden Valley Parkway and a portion of the 12-inch line in Somerton Parkway
Maximum Headloss Gradient	ft/1000ft	0.75	N/A	P-1223, a pipe segment of the 24-inch main along Golden Valley Parkway
Minimum System Pressure	psi	60	40	Approximately 2 junctions located in east of Phase 1A and 1B along the San Joaquin River.
Maximum System Pressure	psi	71-70	80	Several locations, primarily in the larger transmission type lines.
Flow Supplied[1]	GPM	Varies	N/A	
Flow Demand[2]	GPM	3,051	N/A	Average Day Demand
Flow Stored[3]	GPM	Varies	N/A	

NOTES:
[1]Flow supplied is the total flow supplied from either the SSJID connection (SSJID turnout #2) or the City PW Distribution System.
[2]Flow Demand is equal to the sum of the total potable water demands met.
[3]Flow Stored is equal to the total net flow rate of water stored in the River Islands storage tanks and is dependent on an extended state model situation to fill the tanks.



NOTES

1. RIVER ISLANDS POTABLE WATER DISTRIBUTION MODEL IS BASED ON UTILITY IMPROVEMENT AND AS BUILT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
2. LOCATION AND ELEVATION OF ALL PIPES, FITTINGS, VALVES, AND HYDRANTS ARE APPROXIMATED FROM UTILITY IMPROVEMENT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
3. FOR LOCATIONS WHERE FINALIZED OR AS BUILT UTILITY IMPROVEMENT PLANS ARE NOT AVAILABLE, POTABLE WATER DEMANDS AND THE LAYOUT OF THE DISTRIBUTION SYSTEM FOLLOW THE MINIMUM REQUIREMENTS IN THE CITY OF LATHROP'S 2019 DESIGN AND CONSTRUCTION STANDARDS.
4. POTABLE WATER DEMANDS UTILIZED WATER DEMAND AND PEAKING FACTORS LISTED IN THE CITY OF LATHROP'S DESIGN AND CONSTRUCTION STANDARDS. WATER DEMANDS WHERE ASSIGNED BASED ON EACH PARCEL'S LAND USE PROVIDED BY ODELL ENGINEERING.
5. THE PRESENTED POTABLE WATER MODEL RESULTS ARE FOR STEADY STATE SITUATIONS (I.E. NOT FOR EXTEND TIME FRAMES).
6. THE CITY OF LATHROP POTABLE WATER CONNECTION ALONG RIVER ISLANDS PARKWAY AND STEWART ROAD IS ASSUMED TO HAVE A 40 PSI STATIC PRESSURE AND WILL SERVE AS A BACKUP SUPPLY OF POTABLE WATER FOR RIVER ISLANDS.
7. THE SSJID CONNECTION ALONG STEWART ROAD IS ASSUMED TO HAVE A 40 PSI STATIC PRESSURE.
8. LAYOUT AND CONTROL STRATEGY OF THE SSJID TURNOUT #2, 1.0 MG SURGE TANK, AND THE SSJID TRANSFER PUMPS IS TAKEN FROM THE SITE A SSJID 100% ISSUED FOR CONSTRUCTION PLANS AND SPECIFICATIONS.
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11. THE FIRE FLOW STEADY STATE ANALYSIS WAS MODELED TO PROVIDE A RESIDUAL PRESSURE OF 20 PSI IN THE AREA OF THE SIMULATED FIRE UNDER MAXIMUM DAY OR PEAK HOUR DEMANDS.
12. THE RIVER ISLANDS AND PHASE II PUMP STATIONS ARE DESIGNED TO MAINTAIN A DISCHARGE PRESSURE OF 67.5 PSI.
13. AS REQUIRED BY CITY OF LATHROP'S 2018 WATER MASTER PLAN, A 5% WATER LOSS (NON-REVENUE WATER) FACTOR IS APPLIED TO THE WATER DEMANDS PROJECTIONS TO ESTIMATE AVERAGE DAY DEMANDS.

PHASE I & II
OVERALL POTABLE WATER SYSTEM

JOB
RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL
LATHROP CA

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

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FIGURE
5-1

W:\B520\Engineering\Modeling\2020-08 PW River Islands Model\2020-04_RIVER ISLANDS PW DISTRIBUTION NETWORK MODEL.dwg - Tab: Overall - by tmihara on 11/12/20 at 11:23:28 AM

NOTES

1. RIVER ISLANDS POTABLE WATER DISTRIBUTION MODEL IS BASED ON UTILITY IMPROVEMENT AND AS BUILT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
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3. FOR LOCATIONS WHERE FINALIZED OR AS BUILT UTILITY IMPROVEMENT PLANS ARE NOT AVAILABLE, POTABLE WATER DEMANDS AND THE LAYOUT OF THE DISTRIBUTION SYSTEM FOLLOW THE MINIMUM REQUIREMENTS IN THE CITY OF LATHROP'S 2019 DESIGN AND CONSTRUCTION STANDARDS.
4. POTABLE WATER DEMANDS UTILIZED WATER DEMAND AND PEAKING FACTORS LISTED IN THE CITY OF LATHROP'S DESIGN AND CONSTRUCTION STANDARDS. WATER DEMANDS WHERE ASSIGNED BASED ON EACH PARCEL'S LAND USE PROVIDED BY ODELL ENGINEERING.
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PHASE I & II
STEADY STATE ANALYSIS
AVERAGE DAY DEMANDS
PIPE VELOCITIES

RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL

LATHROP CA

JOB

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

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FIGURE
5-2

NOTES

1. RIVER ISLANDS POTABLE WATER DISTRIBUTION MODEL IS BASED ON UTILITY IMPROVEMENT AND AS BUILT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
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PHASE I & II
STEADY STATE ANALYSIS
AVERAGE DAY DEMANDS
HEADLOSS GRADIENTS

RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL
LATHROP CA

JOB	
SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

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FIGURE
5-3

NOTES

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PHASE I & II
STEADY STATE ANALYSIS
AVERAGE DAY DEMANDS
PRESSURES

RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL
LATHROP CA

JOB

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

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FIGURE
5-4

W: \B520\Engineering\Modeling\2020-08 PW River Islands Model\2020-04_RIVER ISLANDS PW DISTRIBUTION NETWORK MODEL.dwg -- Tab: PHI & II -- ADD -- Pressure -- by tmihara on 01/22/21 at 1:12:

5.2 Steady State Analysis Results – Maximum Day Demands

Figure 5-5, Figure 5-6, and **Figure 5-7** shows the steady state analysis results of each pipe velocities, headloss gradients, and the junction and hydrant pressures under MDD.

Table 5-2 shows the specific minimum and maximum operating values for the model and their corresponding location under MDD.

Table 5-2: Steady State Analysis Results – Maximum Day Demands

Model Result Category	Unit	Result	City Requirements	Location
Minimum Pipe Velocity	ft/s	0.01	N/A	Several locations
Maximum Pipe Velocity	ft/s	1.95	10	P-1223, 24-inch main along Golden Valley Parkway
Minimum Headloss Gradient	ft/1000ft	0.01	N/A	Several locations, all lines except for the larger transmission type lines
Maximum Headloss Gradient	ft/1000ft	1.0-1.4	N/A	Several segments of the 24-inch main along Golden Valley Parkway
Minimum System Pressure	psi	60	40	4 junctions in east of Phase 1A and 1B along the San Joaquin River.
Maximum System Pressure	psi	71-70	80	Several locations, primarily in the larger transmission type lines.
Flow Supplied[1]	gpm	Varies	N/A	
Flow Demand[2]	gpm	5,186	N/A	Maximum Day Demand
Flow Stored[3]	gpm	Varies	N/A	

<u>*NOTES*</u>:
[1]See **Section 5.1**
[2]Flow Demand is equal to the sum of the total potable water demands met.
[3]See **Section 5.1**

5.3 Steady State Analysis Results – Maximum Day Demands Plus Fire Flows

Figure 5-8 and **Table 5-3** show the available fire flows at the specified junctions or hydrants after MDD have been satisfied and meeting specific operational/performance criteria listed in **Section 4.1.2**. Under MDD, the distribution system can provide each land use's required fire flows.

Table 5-3: Steady State Analysis Results – Maximum Day Demands Plus Fire Flows

Model Result Category	Unit	Result	Location
Minimum Fire Flow Available	gpm	1,533-<2,000	All located in low and medium density residential areas.
Maximum Fire Flow Available	gpm	$\geq$ 3,000	All locations (with exception to the location above) specifically in the commercial areas.

NOTES

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PHASE I & II
STEADY STATE ANALYSIS
MAXIMUM DAY DEMANDS
PIPE VELOCITIES

JOB

RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL
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FIGURE
5-5

W:\B520\Engineering\Modeling\2020-08 PW River Islands Model\2020-04_RIVER ISLANDS PW DISTRIBUTION NETWORK MODEL.dwg – Tab: PHI & II – MDD – Velocity – by tmihara on 11/12/20 at 11:27:

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PHASE I & II
STEADY STATE ANALYSIS
MAXIMUM DAY DEMANDS
PIPE HEADLOSS GRADIENTS

RIVER ISLANDS
POTABLE WATER
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FIGURE
5-6

NOTES

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PHASE I & II
STEADY STATE ANALYSIS
MAXIMUM DAY DEMANDS
PRESSURES

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FIGURE
5-7

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PHASE I & II
STEADY STATE ANALYSIS
MAXIMUM DAY DEMANDS +
AVAILABLE FIRE FLOWS

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FIGURE
5-8

5.4 Steady State Analysis Results – Peak Hour Demands

Figure 5-9, **Figure 5-10**, and **Figure 5-11** shows the results of the steady state analysis for each pipe velocities, headloss gradients and the junction and hydrant pressures under PHD.

Table 5-4 shows the specific minimum and maximum model results and their corresponding location under PHD. For Phase II, the preliminary pipe sizes were estimated based on the minimum requirements listed in the City's Standards and Water Master Plan. The pipe sizes shown Phase II are recommended to be revisited when Phase II land use plan has been finalized or revised to verify the system's performance.

The results of the steady state analysis under PHDs determined that PW supply from SSJID turnout #2 will not be sufficient to instantaneously meet Phase I and II PHD. It is recommended that an extended state analysis be conduct over a couple of days to verify if the tanks can be re-filled during off peak windows utilizing the City's distribution system.

Table 5-4: Steady State Analysis Results – Peak Hour Demands

Model Result Category	Units	Result	City Requirements	Location
Minimum Pipe Velocity	ft/s	0.01	N/A	Several locations, all in tributary areas
Maximum Pipe Velocity	ft/s	3.28	10	P-1223, 24-inch main in Golden Valley Parkway
Minimum Headloss Gradient	ft/1000ft	0.01	N/A	Several locations, all in tributary areas
Maximum Headloss Gradient	ft/1000ft	2.5-2.7	N/A	Several segments of the 24-inch and 16-inch water lines along Golden Valley Parkway
Minimum System Pressure	psi	58-<60	40	Several Junctions in Phase 1A and 1B of Phase I along the San Joaquin River and at the location of the Phase II High School
Maximum System Pressure	psi	<67.5-70	80	Junctions along J-7 street immediate downstream of the Phase I BPS
Flow Supplied[1]	gpm	Varies	N/A	
Flow Demand[2]	gpm	10,372	N/A	Peak Hour Demand
Flow Stored[3]	gpm	Varies	N/A	

NOTES:
[1]See **Section 5.1**
[2]Flow Demand is equal to the sum of the total potable water demands met.
[3]See **Section 5.1**

NOTES

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PHASE I & II
STEADY STATE ANALYSIS
PEAK HOUR DEMANDS
PIPE VELOCITIES

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RIVER ISLANDS
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FIGURE
5-9

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PHASE I & II
STEADY STATE ANALYSIS
PEAK HOUR DEMANDS
PIPE HEADLOSS GRADIENTS

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FIGURE
5-10

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PHASE I & II
STEADY STATE ANALYSIS
PEAK HOUR DEMANDS
PRESSURES

RIVER ISLANDS
POTABLE WATER
DISTRIBUTION MODEL

LATHROP CA

JOB

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FIGURE
5-11

6 Preliminary Improvement Implementation Schedule

6.1 Preliminary Improvement Implementation Schedule

The River Islands PW demands should be regularly monitored to help update and confirm the installed distribution system can reliable meet the system demands. The design of improvements should begin when the installed system has reached 60-80 percent of its rated capacity, depending on the complexity of the improvement. As described in **Section 5 & 3,** distribution systems must have a firm pumping capacity capable of supplying the greater of the MDD + Fire Flow or PHD, and must have enough PW storage to meet emergency, operational, and fire flow storage requirements.

Construction of River Islands is estimated to be completed by 2040, and will continue to be constructed over separate stages. Based on conversations and planning documents provided by River Islands, **Table 6-1** shows the preliminary construction schedule of the River Islands development and the associated ADD, MDD, and PHDs.

Table 6-1: Preliminary River Islands Construction Schedule & Associated Demands

Land Use	No of Units or Acreage Completed & Connected				
	2014-2020	**2020-2025**	**2025-2030**	**2030-2035**	**2035-2040**
Low Density Residential (per DU)	2,000.0	3,536.0	4,754.3	5,972.6	7,190.9
Medium Density Residential (per DU)	125.0	801.0	1,746.0	2,690.9	3,635.9
High Density Residential (per DU)	0.0	0.0	1,394.4	2,788.8	4,182.8
Commercial (per acre)	0.0	0.0	95.8	191.5	287.3
Industrial (per acre)	0.0	0.0	0.0	0.0	0.0
Parks (per acre)	10.8	17.4	24.0	30.5	65.1
Schools / Institutional (per acre)	15.8	38.4	43.8	49.0	61.8
Average Day Demand (GPD)	**744,933**	**1,472,306**	**2,418,002**	**3,363,407**	**4,392,724**
Average Day Demand (GPM)	**517**	**1,022**	**1,679**	**2,336**	**3,051**
Maximum Day Demand (GPD)	**1,266,386**	**2,502,920**	**4,110,603**	**5,717,792**	**7,467,631**
Maximum Day Demand (GPM)	**879**	**1,738**	**2,855**	**3,971**	**5,186**
Peak Hour Demand (GPD)	**2,532,772**	**5,005,840**	**8,221,206**	**11,435,584**	**14,935,262**
Peak Hour Demand (GPM)	**1,759**	**3,476**	**5,709**	**7,941**	**10,372**

Notes:

1. Based on River Islands Village Detail (Phase 1 and 2) – Final V2.0 Spreadsheet showing the preliminary construction schedule for the River Islands Development.

The Phase I BPS site is nearing completion and will be initially installed with a firm pumping capacity of 6,000 GPM and a PW Storage Capacity of 1.5 MG. Based on the preliminary construction schedule and associated demands shown in **Table 6-1**, **Table 6-2** below shows the minimum preliminary improvement implementation schedule in order for the River Islands distribution system to meet the firm pumping capacity and PW storage requirements. It is recommended to coordinate the implementation of the improvements to efficiency service the expanding development (i.e. install the 1.5 MG and 1.6 MG Phase I BPS tanks at once instead of piece meal).

Currently the City has allowed River Islands to utilize the existing City-wide fire storage capacity until the future 1.5 and 1.6 MG tanks are installed at the Phase I BPS and Storage site. As shown below, the current 2014-2020 potable water storage requirement is equal to the approximate maximum day demand of 1,266,386 GPD (no dedicated fire storage required within River Islands).

Table 6-2: Minimum Preliminary Improvement Implementation Schedule

Parameter	2014-2020	2020-2025	2025-2030	2030-2035	2035-2040
Firm Pumping Capacity Requirement (GPM)	2,129[1]	3,476[2]	5,855[3]	7,941[4]	10,372[4]
River Islands Installed Firm Pumping Capacity[5]	*6,000*	*10,000*	*14,000*	*14,000*	*14,000*
Firm Pumping Capacity Recommended Improvement	**No Improvements required as the PW storage requirements will dictate the improvement schedule. Recommend installing the future large booster pump at the Phase I BPS when the tanks are constructed**	**No Improvements required as the PW storage requirements will dictate the improvement schedule. Recommend installing the 4,000 GPM Phase II BPS when the storage capacity requirement is reached**	**None**	**None**	**None**
Potable Water Storage Requirement (Gallons)[8]	1,266,386[10]	2,892,920[6]	4,710,603[7]	6,317,792[7]	8,067,631[7]
River Islands Installed Potable Water Storage Capacity	*1,500,000*	*4,600,000*	*8,320,000*	*8,320,000*	*8,320,000*
Potable Water Storage Capacity Recommended Improvement	**Start the design of future 1.5 & 1.6 MG tanks at Phase I BPS**	**Install the future 1.5 & 1.6 MG tanks at Phase I BPS. Recommended to start the design and finish the construction of the Phase II BPS Site towards the start of 2025-2026 as the projected development will excess Phase I BPS site capacity of 4.6 MG**	**Phase II BPS site shall be completed in the beginning of 2025-2030 timeframe as the development will exceed the installed capacity of Phase I BPS**	**None**	**None**

Assumptions:

1. Since only low and medium density residential land uses will be constructed and connected during this timeframe, the fire flow requirement for the site is 1,250 GPM. From 2014-2020, the MDD + 1,250 GPM FF is the governing firm pumping capacity requirement.
2. With no commercial or high density residential land uses constructed, the PHD is the governing firm pumping capacity requirement during this time frame.
3. Construction of the high density and commercial land uses will increase the fire flow requirement (specifically 3,000 GPM for commercial). Therefore, the MDD + 3,000 GPM fire flow will be the governing firm pumping capacity requirement during this time frame.
4. Peak Hour Demand is the governing firm pumping capacity requirement during this time frame.
5. Installed firm pumping and PW storage capacity follows the previous time frames recommended improvement schedule (i.e. assumes recommended improvements were constructed).
6. Since only low and medium density residential land uses will be constructed during this timeframe, the fire flow storage requirement will be for a low and high density residential land uses (390,000 gallons).
7. With the construction of commercial land uses, the fire flow storage requirement increases to 600,000 gallons.
8. See **Section 3.1** for the potable water storage requirements.
9. See **Section 2.5** for the potable water firm pumping capacity requirements.
10. The City has allowed River Islands to utilize the city-wide fire storage capacity until the future 1.5 and 1.6 MG storage tanks are installed at the Phase I BPS and storage site. As shown above, the current 2014-2020 potable water storage requirement is equal to the approximate maximum day demand of 1,266,386 GPD (no dedicated fire storage required within River Islands).

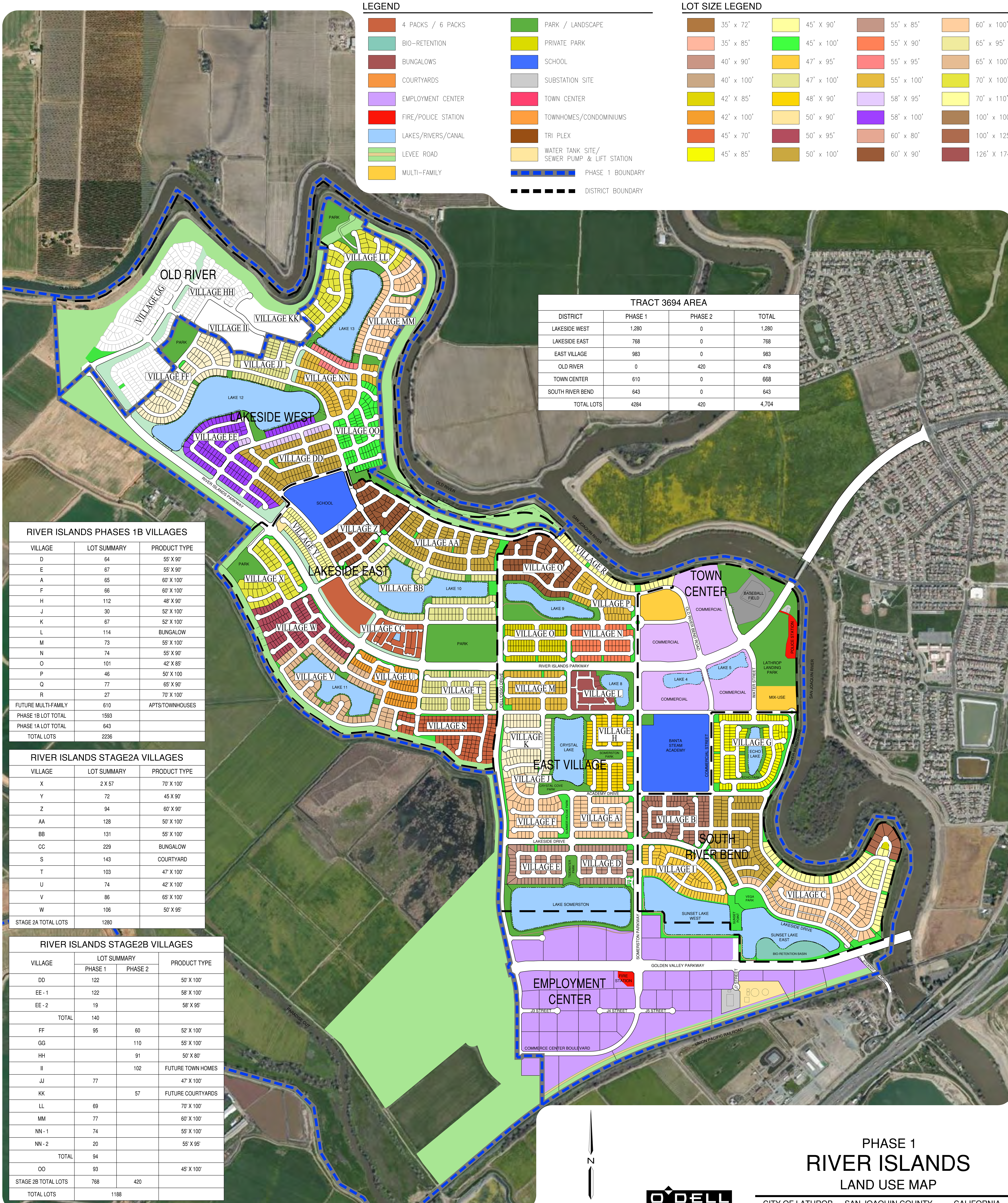
Appendix A – Land Uses

LEGEND

4 PACKS / 6 PACKS	PARK / LANDSCAPE
BIO–RETENTION	PRIVATE PARK
BUNGALOWS	SCHOOL
COURTYARDS	SUBSTATION SITE
EMPLOYMENT CENTER	TOWN CENTER
FIRE/POLICE STATION	TOWNHOMES/CONDOMINIUMS
LAKES/RIVERS/CANAL	TRI PLEX
LEVEE ROAD	WATER TANK SITE/ SEWER PUMP & LIFT STATION
MULTI–FAMILY	PHASE 1 BOUNDARY
	DISTRICT BOUNDARY

LOT SIZE LEGEND

35' x 72'	45' X 90'	55' x 85'	60' x 100'
35' x 85'	45' x 100'	55' X 90'	65' x 95'
40' x 90'	47' x 95'	55' x 95'	65' X 100'
40' x 100'	47' x 100'	55' x 100'	70' X 100'
42' X 85'	48' X 90'	58' x 95'	70' x 110'
42' x 100'	50' x 90'	58' x 100'	100' x 100'
45' x 70'	50' x 95'	60' x 80'	100' x 125'
45' x 85'	50' x 100'	60' x 90'	126' X 174'



TRACT 3694 AREA			
DISTRICT	PHASE 1	PHASE 2	TOTAL
LAKESIDE WEST	1,280	0	1,280
LAKESIDE EAST	768	0	768
EAST VILLAGE	983	0	983
OLD RIVER	0	420	478
TOWN CENTER	610	0	668
SOUTH RIVER BEND	643	0	643
TOTAL LOTS	4284	420	4,704

RIVER ISLANDS PHASES 1B VILLAGES		
VILLAGE	LOT SUMMARY	PRODUCT TYPE
D	64	55' X 90'
E	67	55' X 90'
A	65	60' X 100'
F	66	60' X 100'
H	112	48' X 90'
J	30	52' X 100'
K	67	52' X 100'
L	114	BUNGALOW
M	73	55' X 100'
N	74	55' X 90'
O	101	42' X 85'
P	46	50' X 100
Q	77	65' X 90'
R	27	70' X 100'
FUTURE MULTI-FAMILY	610	APTS/TOWNHOUSES
PHASE 1B LOT TOTAL	1593	
PHASE 1A LOT TOTAL	643	
TOTAL LOTS	2236	

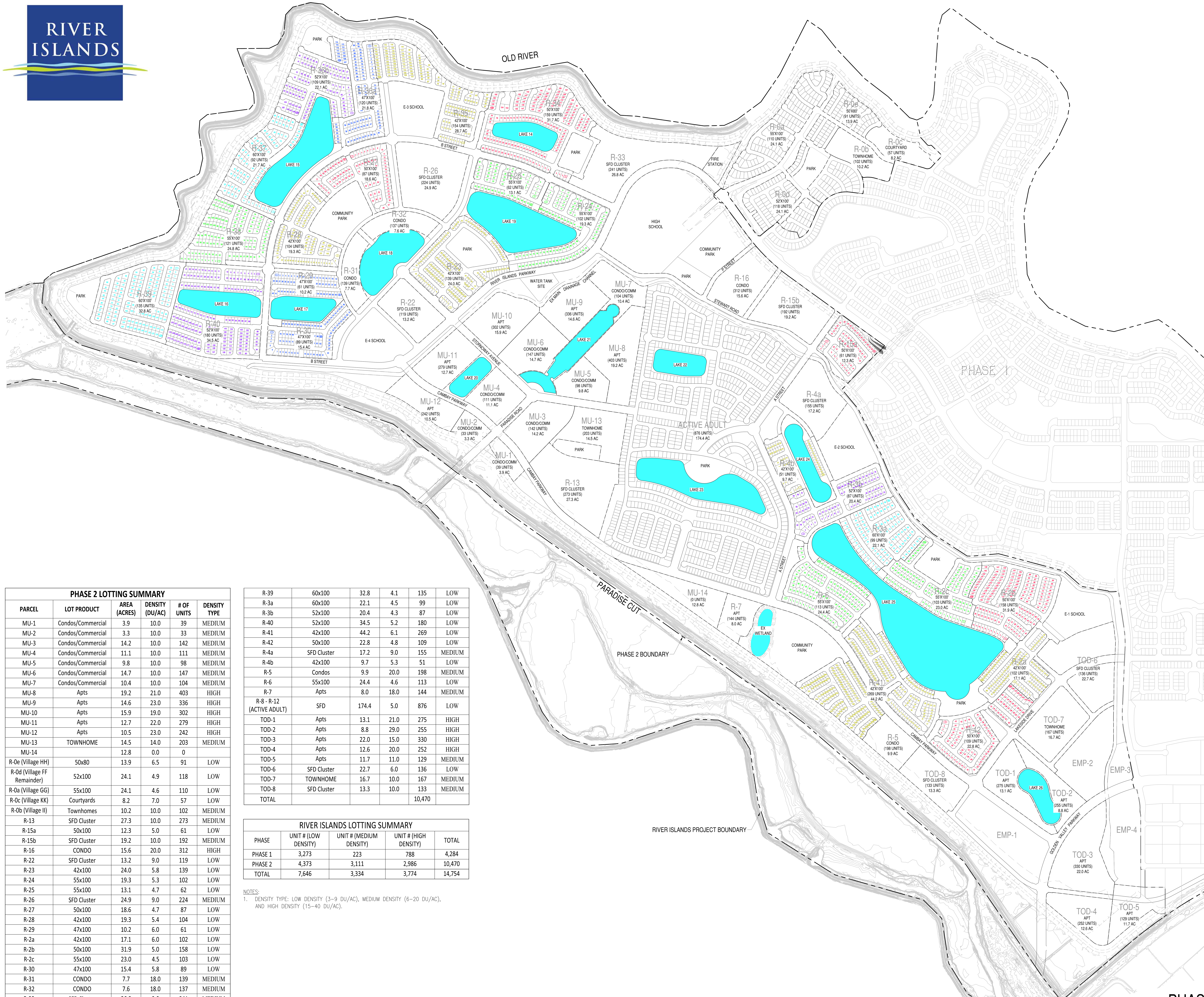
RIVER ISLANDS STAGE2A VILLAGES		
VILLAGE	LOT SUMMARY	PRODUCT TYPE
X	2 X 57	70' X 100'
Y	72	45 X 90'
Z	94	60' X 90'
AA	128	50' X 100'
BB	131	55' X 100'
CC	229	BUNGALOW
S	143	COURTYARD
T	103	47' X 100'
U	74	42' X 100'
V	86	65' X 100'
W	106	50' X 95'
STAGE 2A TOTAL LOTS	1280	

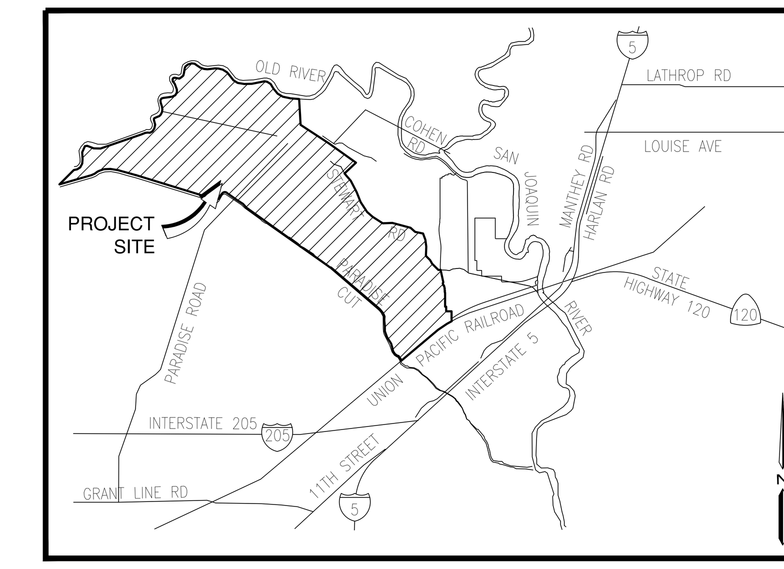
RIVER ISLANDS STAGE2B VILLAGES			
VILLAGE	LOT SUMMARY		PRODUCT TYPE
	PHASE 1	PHASE 2	
DD	122		50' X 100'
EE - 1	122		58' X 100'
EE - 2	19		58' X 95'
TOTAL	140		
FF	95	60	52' X 100'
GG		110	55' X 100'
HH		91	50' X 80'
II		102	FUTURE TOWN HOMES
JJ	77		47' X 100'
KK		57	FUTURE COURTYARDS
LL	69		70' X 100'
MM	77		60' X 100'
NN - 1	74		55' X 100'
NN - 2	20		55' X 95'
TOTAL	94		
OO	93		45' X 100'
STAGE 2B TOTAL LOTS	768	420	
TOTAL LOTS	1188		

O'DELL ENGINEERING

PHASE 1
RIVER ISLANDS
LAND USE MAP

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA
JANUARY 22, 2021





VICINITY MAP
NOT TO SCALE

SCALE: 1" = 500'

PHASE 2 LOTTING SUMMARY					
PARCEL	LOT PRODUCT	AREA (ACRES)	DENSITY (DU/AC)	# OF UNITS	DENSITY TYPE
MU-1	Condos/Commercial	3.9	10.0	39	MEDIUM
MU-2	Condos/Commercial	3.3	10.0	33	MEDIUM
MU-3	Condos/Commercial	14.2	10.0	142	MEDIUM
MU-4	Condos/Commercial	11.1	10.0	111	MEDIUM
MU-5	Condos/Commercial	9.8	10.0	98	MEDIUM
MU-6	Condos/Commercial	14.7	10.0	147	MEDIUM
MU-7	Condos/Commercial	10.4	10.0	104	MEDIUM
MU-8	Apts	19.2	21.0	403	HIGH
MU-9	Apts	14.6	23.0	336	HIGH
MU-10	Apts	15.9	19.0	302	HIGH
MU-11	Apts	12.7	22.0	279	HIGH
MU-12	Apts	10.5	23.0	242	HIGH
MU-13	TOWNHOME	14.5	14.0	203	MEDIUM
MU-14		12.8	0.0	0	
R-0e (Village HH)	50x80	13.9	6.5	91	LOW
R-0d (Village FF Remainder)	52x100	24.1	4.9	118	LOW
R-0a (Village GG)	55x100	24.1	4.6	110	LOW
R-0c (Village KK)	Courtyards	8.2	7.0	57	LOW
R-0b (Village II)	Townhomes	10.2	10.0	102	MEDIUM
R-13	SFD Cluster	27.3	10.0	273	MEDIUM
R-15a	50x100	12.3	5.0	61	LOW
R-15b	SFD Cluster	19.2	10.0	192	MEDIUM
R-16	CONDO	15.6	20.0	312	HIGH
R-22	SFD Cluster	13.2	9.0	119	LOW
R-23	42x100	24.0	5.8	139	LOW
R-24	55x100	19.3	5.3	102	LOW
R-25	55x100	13.1	4.7	62	LOW
R-26	SFD Cluster	24.9	9.0	224	MEDIUM
R-27	50x100	18.6	4.7	87	LOW
R-28	42x100	19.3	5.4	104	LOW
R-29	47x100	10.2	6.0	61	LOW
R-2a	42x100	17.1	6.0	102	LOW
R-2b	50x100	31.9	5.0	158	LOW
R-2c	55x100	23.0	4.5	103	LOW
R-30	47x100	15.4	5.8	89	LOW
R-31	CONDO	7.7	18.0	139	MEDIUM
R-32	CONDO	7.6	18.0	137	MEDIUM
R-33	SFD Cluster	26.8	9.0	241	MEDIUM
R-34	50x100	31.7	5.0	159	LOW
R-35	42x100	28.7	5.4	154	LOW
R-36a	47x100	21.8	5.5	120	LOW
R-36b	52x100	22.1	4.9	109	LOW
R-37	60x100	21.7	4.2	92	LOW
R-38	55x100	24.8	4.9	121	LOW
R-39	60x100	32.8	4.1	135	LOW
R-3a	60x100	22.1	4.5	99	LOW
R-3b	52x100	20.4	4.3	87	LOW
R-40	52x100	34.5	5.2	180	LOW
R-41	42x100	44.2	6.1	269	LOW
R-42	50x100	22.8	4.8	109	LOW
R-4a	SFD Cluster	17.2	9.0	155	MEDIUM
R-4b	42x100	9.7	5.3	51	LOW
R-5	Condos	9.9	20.0	198	MEDIUM
R-6	55x100	24.4	4.6	113	LOW
R-7	Apts	8.0	18.0	144	MEDIUM
R-8 - R-12 (ACTIVE ADULT)	SFD	174.4	5.0	876	LOW
TOD-1	Apts	13.1	21.0	275	HIGH
TOD-2	Apts	8.8	29.0	255	HIGH
TOD-3	Apts	22.0	15.0	330	HIGH
TOD-4	Apts	12.6	20.0	252	HIGH
TOD-5	Apts	11.7	11.0	129	MEDIUM
TOD-6	SFD Cluster	22.7	6.0	136	LOW
TOD-7	TOWNHOME	16.7	10.0	167	MEDIUM
TOD-8	SFD Cluster	13.3	10.0	133	MEDIUM
TOTAL				10,470	

RIVER ISLANDS LOTTING SUMMARY				
PHASE	UNIT # (LOW DENSITY)	UNIT # (MEDIUM DENSITY)	UNIT # (HIGH DENSITY)	TOTAL
PHASE 1	3,273	223	788	4,284
PHASE 2	4,373	3,111	2,986	10,470
TOTAL	7,646	3,334	3,774	14,754

NOTES:
1. DENSITY TYPE: LOW DENSITY (3–9 DU/AC), MEDIUM DENSITY (6–20 DU/AC), AND HIGH DENSITY (15–40 DU/AC).

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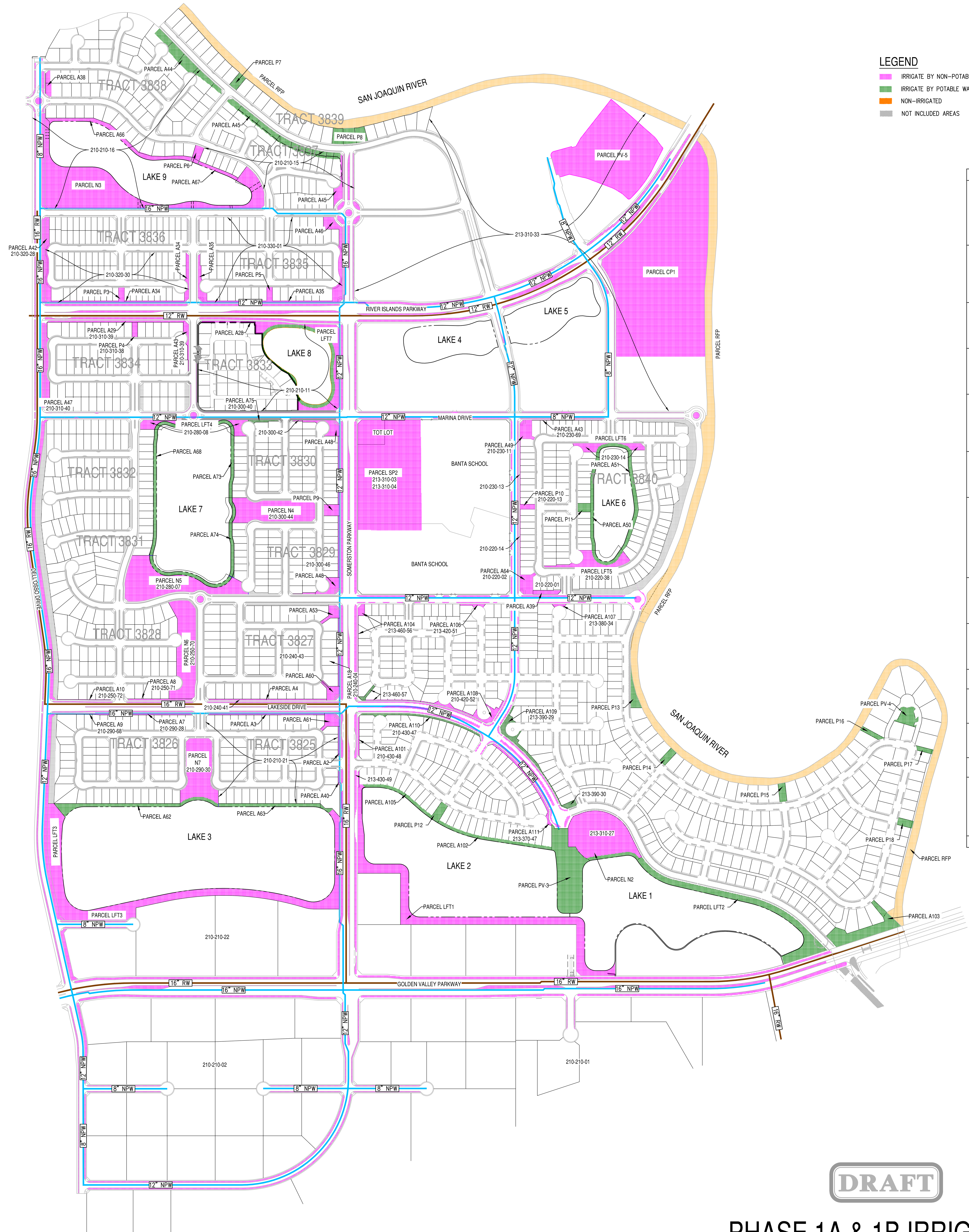
PHASE 2
LOTTING SUMMARY
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: APRIL 24, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

Appendix B – Irrigation Coverage Exhibits



N

0' 150' 300' 600'
SCALE: 1" = 300'

LEGEND

- IRRIGATE BY NON-POTABLE WATER
- IRRIGATE BY POTABLE WATER
- NON-IRRIGATED
- NOT INCLUDED AREAS

MAIN ROAD	IMPROVEMENT	ACREAGES	NOTES
LAKESIDE DRIVE	LANDSCAPE PARCELS	2.47	A3, A4, A7, A8, A9, A10, A60, A61, A108, A109, A110, A111
	MEDIAN	0.78	A112
	LANDSCAPE STRIPS	1.45	A113
	PARKS	5.06	N2, N6
	SUB-TOTAL	9.76	
SOMERSTON PKWY	LANDSCAPE PARCELS	1.47	A2, A18, A40, A48, A53, A101, A104
	MEDIAN	0.99	A114
	LANDSCAPE STRIPS	2.86	A115
	PARKS	8.18	SP2, P9
	SUB-TOTAL	13.50	
SOMERSTON PKWY (NORTH)	LANDSCAPE PARCELS	0.87	A45, A46
	MEDIAN	0.07	A116
	LANDSCAPE STRIPS	0.75	A117
	SUB-TOTAL	1.69	
ACADEMY DRIVE	LANDSCAPE PARCELS	0.20	A39, A106, A107
	MEDIAN	0.09	A118
	LANDSCAPE STRIPS	0.60	A119
	SUB-TOTAL	0.89	
COMMERICAL STREET	LANDSCAPE PARCELS	0.64	A49, A64
	MEIDAN	0.03	A120
	LANDSCAPE STRIPS	0.66	A121
	PARKS	0.08	P10
	SUB-TOTAL	1.42	
MARINA DRIVE	LANDSCAPE PARCELS	0.13	A43, A75
	MEDIAN	0.09	A122
	LANDSCAPE STRIPS	1.40	A123
	SUB-TOTAL	1.62	
RIVER ISLANDS PKWY	LANDSCAPE PARCELS	1.38	A28, A29, A34, A35
	MEDIANS	1.73	A124
	LANDSCAPE STRIPS	2.40	A125
	PARKS	0.27	P3, P4, P5
	BIOSWALES	0.79	A126
	BASEBALL STADIUM	6.62	PV-5
	SUB-TOTAL	13.19	
INTERIOR LEVEE ROAD (NORTH)	LANDSCAPE SLOPES	0.53	A38, A42
	LANDSCAPE STRIPS	0.49	A127
	BIOSWALES	0.71	A128
	SUB-TOTAL	1.73	
INTERIOR LEVEE ROAD	LANDSCAPE SLOPES	0.54	A47
	LANDSCAPE STRIPS	0.81	A129
	BIOSWALES	2.26	A130
	SUB-TOTAL	3.61	
INTERIOR LEVEE ROAD (EMPLOYMENT CENTER)	LANDSCAPE STRIPS	0.55	A131
GOLDEN VALLEY PARKWAY	MEDIANS	3.40	A132
	LANDSCAPE STRIPS	3.10	A133
	SUB-TOTAL	6.51	
WATER STREET	MEDIANS	0.03	A134
	LANDSCAPE STRIPS	0.24	A135
	SUB-TOTAL	0.27	
COMMERCE CENTER ROAD & J3, J4, J5, J6, J7 STREETS	LANDSCAPE STRIPS	2.22	A136
AREAS NEXT TO LAKES OR RIVER	LANDSCAPE PARCELS	5.97	A44, A45, A50, A51, A62, A63, A66, A67, A68, A73, A74, A102, A103, A105
	PARKS	64.65	CP1, LFT1, LFT2, LFT3, LFT4, LFT5, LFT6, LFT7, N3, N4, N5, N7, P6, P7, P8, P11, P12, P13, P14, P15, P16, P17, P18, PV-3, PV-4, RFP
	SUB-TOTAL	70.62	
TOTAL		127.34	

IRRIGATION AREA BY WATER SOURCE	
WATER SOURCE	ACREAGES
POTABLE	14.61
LANDSCAPE PARCELS	6.13
PARKS	8.48
NON-POTABLE	97.03
LANDSCAPE PARCELS	9.04
MEDIAN	5.24
LANDSCAPE STRIPS	22.20
PARKS	46.01
SCHOOL	7.92
BASEBALL STADIUM	6.62
NON-IRRIGATED	15.70
TOTAL	127.34

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PHASE 1A & 1B IRRIGATION COVERAGE EXHIBIT

RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: MARCH 05, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
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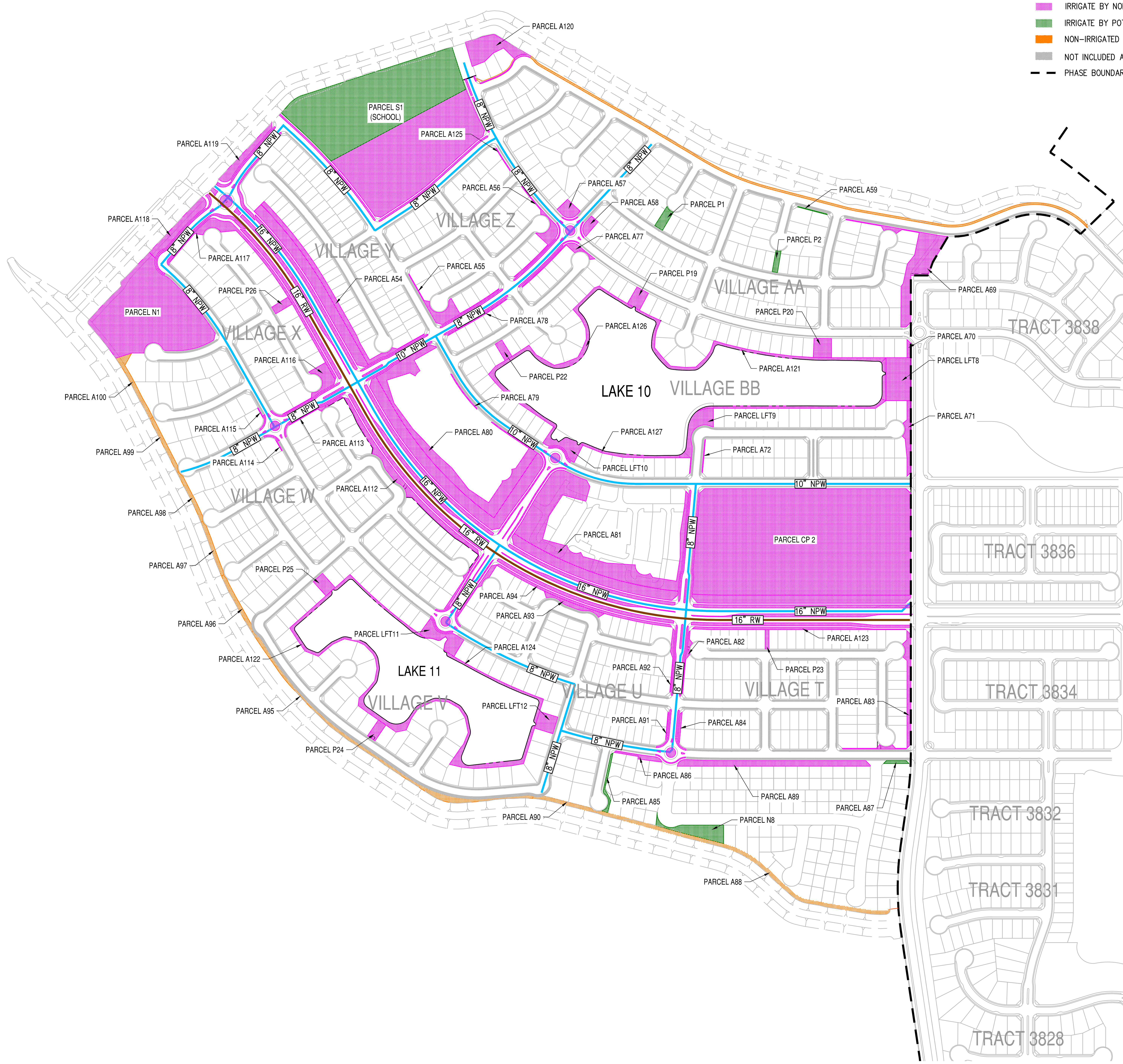

LEGEND

- IRRIGATE BY NON–POTABLE WATER
- IRRIGATE BY POTABLE WATER
- NON–IRRIGATED
- NOT INCLUDED AREAS/IRRIGATED BY OTHERS
- PHASE BOUNDARY

BACKBONE ROADS	IMPROVEMENT	ACREAGES	NOTES
RIVER ISLANDS PARKWAY	LANDSCAPE PARCELS	10.82	A54, A80, A81, A94, A112, A117, A123
	MEDIAN	1.25	
	LANDSCAPE STRIPS	3.15	
	PARKS	15.47	CP2
	SUB-TOTAL	30.70	
S1 STREET & S2 STREET	LANDSCAPE PARCELS	0.67	A118, A119
	MEDIAN	0.00	
	LANDSCAPE STRIPS	0.28	
	PARKS	4.58	N1
	SUB-TOTAL	5.53	
E STREET	LANDSCAPE PARCELS	1.20	A55, A56, A57, A58, A77, A78, A113, A114, A115, A116
	MEDIAN	0.16	
	LANDSCAPE STRIPS	0.63	
	PARKS	0.00	
	SUB-TOTAL	1.99	
X STREET	LANDSCAPE PARCELS	0.00	
	MEDIAN	0.15	
	LANDSCAPE STRIPS	0.27	
	PARKS	0.00	
	SUB-TOTAL	0.42	
F STREET	LANDSCAPE PARCELS	0.16	A82, A84, A91, A92
	MEDIAN	0.10	
	LANDSCAPE STRIPS	0.45	
	PARKS	0.00	
	SUB-TOTAL	0.71	
A STREET	LANDSCAPE PARCELS	1.61	A59, A69, A120
	MEDIAN	0.00	
	LANDSCAPE STRIPS	0.73	
	PARKS	0.00	
	SUB-TOTAL	2.34	
AREA NEXT TO LAKES OR RIVER	LANDSCAPE PARCELS	3.23	A121, A122, A124, A126, A127
	PARKS	2.61	LFT8, LFT9, LFT10, LFT11, LFT12, P19, P20, P22, P24, P25
	SUB-TOTAL	5.84	
IN-TRACTS	LANDSCAPE PARCELS	3.98	A70, A71, A72, A79, A83, A85, A86, A87, A88, A89, A90, A93, A95, A96, A97, A98, A99, A100, A125
	LANDSCAPE STRIPS	0.35	
	PARKS	0.74	N8, P1, P2, P23, P26
	SUB-TOTAL	5.07	
SCHOOL		11.92	
TOTAL		64.50	

IRRIGATION AREA BY WATER SOURCE	
WATER SOURCE	ACREAGES
POTABLE	6.96
LANDSCAPE PARCELS	0.14
MEDIAN	0.00
LANDSCAPE STRIPS	0.00
PARKS	0.60
SCHOOL	6.22
NON-POTABLE	55.28
LANSCAPE PARCELS	19.26
MEDIAN	1.66
LANDSCAPE STRIPS	5.86
PARKS	22.80
SCHOOL	5.70
NON-IRRIGATED	2.27
TOTAL	64.50

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STAGE 2A IRRIGATION COVERAGE EXHIBIT

RIVER ISLANDS

CITY OF LATHROP   SAN JOAQUIN COUNTY   CALIFORNIA

DATE: MARCH 05, 2020

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Ph 925.223.8340   odellengineering.com

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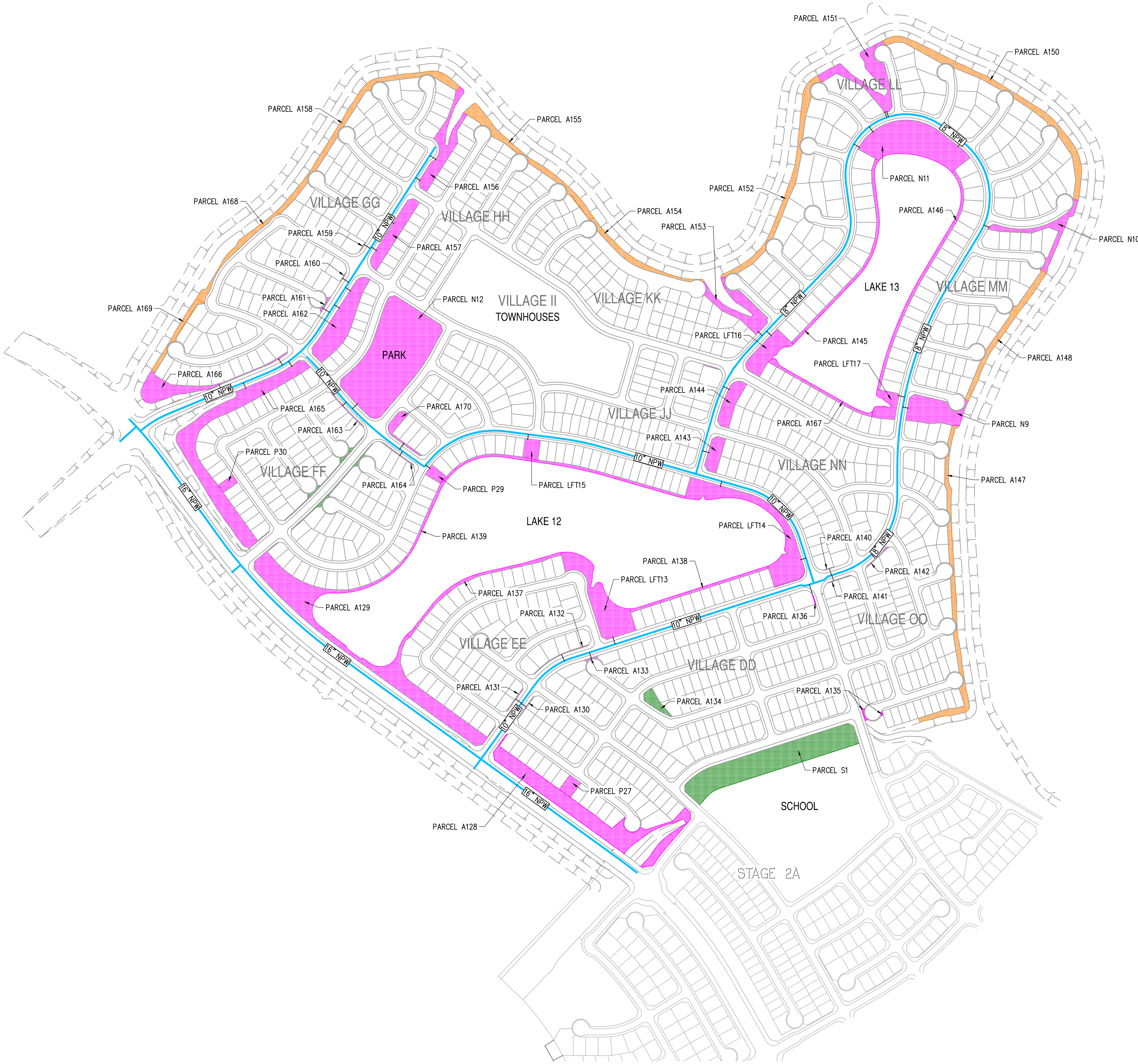

LEGEND

- IRRIGATE BY NON-POTABLE WATER
- IRRIGATE BY POTABLE WATER
- NOT IRRIGATED

IRRIGATION AREA BY WATER SOURCE	
WATER SOURCE	ACREAGES
POTABLE	3.38
LANDSCAPE PARCELS	0.20
MEDIAN	0.00
LANDSCAPE STRIPS	0.20
PARKS	0.00
SCHOOL	2.98
NON-POTABLE	30.17
LANSCAPE PARCELS	17.08
MEDIAN	0.00
LANDSCAPE STRIPS	0.00
PARKS	13.10
SCHOOL	0.00
NON-IRRIGATED	6.26
TOTAL	39.82

N

0' 150' 300' 600'
SCALE: 1" = 300'

DRAFT

STAGE 2B
IRRIGATION COVERAGE EXHIBIT
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: JANUARY 22, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

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Appendix C – City of Lathrop Updated Demand Projections (August 2020)

Table 5
Projected Water Demand by Development Area

Land Use Designation	Updated Demand Factor	Projected New Water Demand (AFY) (a)					
		2020	2025	2030	2035	2040	Buildout
Central Lathrop							
Low Density Residential	330 gpd/du	77	448	738	738	738	2,254
Medium Density Residential	250 gpd/du	0	67	67	67	67	67
High Density Residential	135 gpd/du	0	41	41	41	41	69
Commercial	860 gpd/ac	8	129	166	166	166	268
Parks	2,450 gpd/ac	24	156	183	183	183	316
Schools	1,500 gpd/ac	0	0	0	0	0	92
Public Landscaping	2,450 gpd/ac	59	65	100	100	100	127
	New Central Lathrop Demand	168	906	1,296	1,296	1,296	3,192
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing Central Lathrop Demand	123	123	123	123	123	123
	Projected Central Lathrop Demand	*291*	*1,029*	*1,419*	*1,419*	*1,419*	*3,315*
Mossdale Landing							
Low Density Residential	330 gpd/du	0	0	24	24	24	24
Medium Density Residential	330 gpd/du	0	0	0	0	0	0
High Density Residential	135 gpd/du	9	9	9	9	9	9
Commercial	860 gpd/ac	0	1	1	6	6	6
Community Park	3,500 gpd/ac	0	0	0	0	0	0
Neighborhood Park	3,500 gpd/ac	0	0	0	0	0	0
Schools	1,500 gpd/ac	0	27	27	27	27	27
Public Landscaping	3,500 gpd/ac	0	0	0	0	0	0
	New Mossdale Landing Demand	9	38	63	67	67	67
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing Mossdale Landing Demand	741	741	741	741	741	741
	Projected Mossdale Landing Demand	*751*	*780*	*804*	*808*	*808*	*808*
Mossdale Landing East							
Low Density Residential	330 gpd/du	0	15	15	15	15	15
Medium Density Residential	330 gpd/du	0	0	0	0	0	0
High Density Residential	135 gpd/du	13	15	15	15	15	15
Commercial	860 gpd/ac	0	12	12	28	28	28
Parks	3,500 gpd/ac	0	0	0	0	0	0
Public Landscaping	3,500 gpd/ac	0	0	0	0	0	0
	New Mossdale Landing East Demand	13	41	41	58	58	58
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing Mossdale Landing East Demand	151	151	151	151	151	151
	Projected Mossdale Landing East Demand	*164*	*192*	*192*	*209*	*209*	*209*
Mossdale Landing South							
Medium Density Residential	250 gpd/du	0	18	18	18	18	18
High Density Residential	135 gpd/du	0	18	18	18	18	18
Commercial	860 gpd/ac	0	0	0	0	13	13
Parks	2,450 gpd/ac	0	11	11	11	11	11
Public Landscaping	3,500 gpd/ac	0	0	0	0	0	0
	New Mossdale Landing South Demand	0	47	47	47	60	60
	New Non-revenue Water (5%)	0	0	0	0	0	0
	Existing Mossdale Landing South Demand	50	50	50	50	50	50
	Projected Mossdale Landing South Demand	*50*	*97*	*97*	*97*	*110*	*110*

Table 5 (Cont.)
Projected Water Demand by Development Area

Land Use Designation	Updated Demand Factor	Projected New Water Demand (AFY) (a)					
		2020	2025	2030	2035	2040	Buildout
Mossdale Landing - Other							
Low Density Residential	330 gpd/du	0	0	0	0	0	243
High Density Residential	135 gpd/du	0	11	11	11	11	11
	New Mossdale Landing Sylveria Demand	0	11	11	11	11	254
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing Mossdale Landing Sylveria Demand	0	0	0	0	0	0
	Projected Mossdale Landing Sylveria Demand	*0*	*11*	*11*	*11*	*11*	*254*
River Islands							
Low Density Residential	315 gpd/du	299	841	1,270	1,700	2,130	2,130
Medium Density Residential	235 gpd/du	18	196	444	693	942	942
High Density Residential	135 gpd/du	0	0	211	422	633	633
Town Center	860 gpd/ac	0	0	22	43	65	65
Commercial	860 gpd/ac	0	0	71	141	212	212
Schools	1,500 gpd/ac	0	37	47	55	64	64
Parks	2,450 gpd/ac	0	7	19	31	43	43
Landscape Area	2,450 gpd/ac	0	8	11	14	17	17
Street Landscape Area	2,450 gpd/ac	0	2	5	8	11	11
	New River Islands Demand	316	1,091	2,100	3,108	4,116	4,116
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing River Islands Demand	530	530	530	530	530	530
	Projected River Islands Demand	*846*	*1,621*	*2,629*	*3,638*	*4,646*	*4,646*
South Lathrop							
Light Industrial / R&D Flex	1,200 gpd/ac	122	235	235	235	235	331
Office Commercial	860 gpd/ac	0	8	8	8	8	10
Open Space	2,450 gpd/ac	15	15	15	15	15	58
Public Landscaping	2,450 gpd/ac	3	3	3	3	3	3
	New South Lathrop Demand	140	261	261	261	261	401
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing South Lathrop Demand	67	67	67	67	67	67
	Projected South Lathrop Demand	*207*	*328*	*328*	*328*	*328*	*468*
Lathrop Gateway							
Light Industrial / R&D Flex	1,200 gpd/ac	67	203	203	203	225	225
Office Commercial	860 gpd/ac	0	50	50	50	135	135
Open Space	2,450 gpd/ac	0	7	7	7	11	11
Public Landscaping	2,450 gpd/ac	0	7	7	7	31	31
	New Lathrop Gateway Demand	67	267	267	267	402	402
	New Non-revenue Water (5%)						
	Existing Lathrop Gateway Demand	0	0	0	0	0	0
	Projected Lathrop Gateway Demand	*67*	*267*	*267*	*267*	*402*	*402*
Crossroads							
Industrial	1,200 gpd/ac	0	43	43	43	74	74
Commercial	860 gpd/ac	0	1	1	1	1	1
	New Crossroads Demand	0	44	44	44	75	75
	New Non-revenue Water (5%)	-	-	-	-	-	-
	Existing Crossroads Demand	292	292	292	292	292	292
	Projected Crossroads Demand	*292*	*336*	*336*	*336*	*367*	*367*

Table 5 (Cont.)
Projected Water Demand by Development Area

Land Use Designation	Updated Demand Factor		Projected New Water Demand (AFY) (a)					
			2020	2025	2030	2035	2040	Buildout
Historic Lathrop and Other Development Areas								
Low Density Residential	330	gpd/du	0	2	4	7	9	19
Medium Density Residential	250	gpd/du	0	8	15	22	29	61
High Density Residential	135	gpd/du	0	0	0	0	0	7
Commercial	860	gpd/ac	2	24	35	47	47	47
Industrial	1,200	gpd/ac	0	105	105	105	298	298
Parks	3,500	gpd/ac	0	0	0	0	0	0
Schools	2,100	gpd/ac	0	0	0	0	0	0
New Historic Lathrop / Other Demand			2	138	159	180	383	433
New Non-revenue Water (5%)			-	-	-	-	-	-
Existing Historic Lathrop / Other Demand			2,475	2,475	2,475	2,475	2,475	2,475
Projected Historic Lathrop / Other Demand			*2,477*	*2,613*	*2,634*	*2,655*	*2,858*	*2,908*
Sharpe Army Depot								
AAFES	-	-	16	16	16	16	16	16
California Military Department	-	-	25	41	41	41	41	41
Schools	2,100	0	0	0	0	0	0	0
New Sharpe Army Depot Demand			41	56	56	56	56	56
Existing Sharpe Army Depot Demand			0	0	0	0	0	0
Projected Sharpe Army Depot Demand			*41*	*56*	*56*	*56*	*56*	*56*
Total Projected New Urban Consumption			756	2,901	4,345	5,395	6,785	9,114
Agricultural Consumption (b)			186	0	0	0	0	0
Baseline Urban Consumption			**4,430**	**4,430**	**4,430**	**4,430**	**4,430**	**4,430**
Total Urban and Agricultural Non-revenue Water (5%)			269	367	439	491	561	677
TOTAL PROJECTED DEMAND			**5,640**	**7,697**	**9,213**	**10,316**	**11,775**	**14,221**

Notes:

(a) Projected residential water demand calculated as the total number of projected residential dwelling units (Table 2-1) multiplied by the applicable water demand factor (Table 3-4). Projected non-residential water demand calculated as the total projected acreage (Table 2-1) multiplied by the applicable water demand

(b) Agricultural consumption is assumed to be the average water use during 2017-2019 for the City's single agricultural customer and will be replaced by development at Lathrop Gateway.

Appendix D – Fire Flow Requirements – 2019 City of Lathrop Design and Construction Standards

maximum day demand plus fire flow. Maximum day demand is defined as **1.7** times the average demand, and maximum hourly demand is defined as **3.4** times the average demand. Average demand can be obtained from the City's most current Water Master Plan.

C. Water Supply/Demand: If required, approval of SB 610 Water Supply Assessment and/or a SB 221 Written Verifications of Water Supply report(s) and any necessary updates to the City Urban Water Management Plan and/or the Master Plan shall be completed prior to approval of the project.

D. Fire Flow: Fire flow shall meet the requirements of the LMFD and as outlined in Table 4-2:

TABLE 4-2

FIRE FLOW REQUIREMENTS

Land Use	**Examples of Specific Developments**	**Fire Flow Required (2 Hour Duration) (gpm)**
Very Low Density – Medium Density Residential	All existing single family residential developments as well as Planned Unit Development and Recreation Residential	1,250
High Density Residential	All existing Apartment and Condominium developments	2,000
General Commercial and Office	Highway, Village, Regional, Service, Neighborhood Commercial designations. Includes Professional Offices and Community Commercial designations.	3,000
Heavy Commercial	Areas designated as Recreation and/or Resorts	4,000
Industrial	Limited and General Industrial	4,000

RIVER ISLANDS AT LATHROP
FINAL NON-POTABLE WATER TECHNICAL REPORT
REVISION 2

Prepared for:

River Islands

Prepared by:

Pacific Advanced Civil Engineering, Inc.
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Fountain Valley, CA 92708

January 2021
#B520

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List of Abbreviations

CIMIS	California Irrigation Management Information System
City	City of Lathrop
City Master Plan	City of Lathrop’s Recycled Water System Master Plan December 2018
City Standards	City of Lathrop’s Design and Construction Standards 2019
CTF	Consolidated Treatment Facility
DWR	California Department of Water Resources
ETc	Crop Evapotranspiration
ETo	Reference Evapotranspiration
ft	feet
ft/s	feet per second
GPD	Gallons per Day
GPM	Gallons per Minute
Gross NPW Area	Total NPW Area
in	inches
JPA	Joint Powers Authority
Kc	Crop Coefficient
Main PS	Main Pump Station (also known as Lake 3 Irrigation Pump Station)
MS	Motor Starter
Net NPW Area	Actual NPW Irrigation Area
NPW	Non-Potable Water
O’Dell	O’Dell Engineering
PACE	Pacific Advanced Civil Engineering
Phase II NPW PS	Phase II NPW Pump Station
PMID	Peak Month Irrigation Demands
PS	Pump Station
psi	pounds per square inch
PW	Potable Water
RD 2062	Reclamation District 2062
RI	River Islands
RIPFA	River Islands Public Financing Authority
RW	Recycled Water
SS	Soft Starter
Stage	Development Area of River Islands
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
VFD	Variable Frequency Drive

1 Introduction

1.1 Background

River Islands, located on the Stewart Tract in the City of Lathrop (City), is a 4,905-acre, master planned community to be constructed southwest of the San Joaquin River. The River Islands development will consist of low, medium and high density residential, schools (institutional), parks and commercial land uses. River Islands will be constructed in two separate phases known as Phase I and Phase II. Phase I is currently being constructed over 4 separate stages (1A, 1B, 2A, & 2B) and Phase II is entering the master planning stages.

River Islands is planning on expanding the Non-Potable Water (NPW) distribution system to continue to service the development's NPW irrigation demands. At full buildout, the River Islands NPW distribution system will consist of one pressure zone pressurized from two NPW booster pump stations. Under normal operating conditions, the primary source of water for the River Islands NPW distribution system will be Title 22 recycled water (RW) from the City of Lathrop's RW distribution system. RW entering the development can either be stored in a recycled water storage pond located south of the development, or into air gap manholes feeding the wet well of each pump station. Currently, the Main Pump Station's NPW irrigation pumps are the only source of pressure for the distribution system and has a firm pumping capacity of 2,400 gallons per minute (GPM).

In 2013, the City approved the Third Amendment to the 2003 Amended and Restated Development Agreement by and the City of Lathrop and Califia, LLC. That Third Amendment included Section 6 regarding Infrastructure Maintenance and Section 7 regarding Ownership and Operation of Public Facilities. These Sections specified that "RD 2062 shall own, operate and maintain levees, lakes, pumps and storm drainage equipment related to the lakes". All parties to the Third Amendment have taken this to include a variety of non-potable mains that together meet the needs of the lakes, including:

- Non-potable irrigation lines (purple pipe) that takes Lakes Water, River Water, Recycled Water and potable water and delivers them to urban landscaping on public parks, medians and street side landscaping on the more major roadways. RD 2062 has been approved by the City as a RW user.
- Lake Fill lines to bring water from adjacent rivers into the project lakes,
- Lake Evacuation lines to take water from the lakes and dispose of them outside the developed area,
- Lake Connect lines that connect the various lakes together by gravity,
- Lake Circulation lines that pumps water between lakes for circulation, and
- Lake Aeration lines that pump air into the lakes to keep them healthy.

These lines are sometimes located within the public right of way, and they are owned and operated by Reclamation District 2062 (RD 2062) and the River Islands Public Financing Authority (RIPFA), a Joint Powers Authority made up of RD 2062 and Lathrop Irrigation District.

Separately, the City of Lathrop owns and operates a recycled water system of purple pipes that currently delivers recycled water from the CTF to storage ponds and agricultural sites in the City. That same City system delivers RW to the Lake 3 Pump Station, where it is blended with Lake Water, River Water and/or potable water and then pumped to urban irrigation sites in River Islands.

1.2 Report Objectives

The objectives of the River Islands Non-Potable Water Technical Report are as follows:

- Provide background on the basis for a non-City owned system of pipelines to be owned and operated by RD 2062/RIPFA in City right of way.
- Provide updates to the previous Phase I Non-Potable Water Master Plan prepared by PACE in 2017.
- Analyze and quantify the NPW irrigation areas within Phase I, based on the Irrigation Coverage Exhibits provided by ODell Engineering (see **Appendix A**).
- Analyze and quantify the NPW irrigation areas within Phase II based on land use tables and preliminary irrigation area exhibits provided by River Islands (see **Appendix B**).
- Analyze and quantify the NPW peak month irrigation demand factors for Phase I and II (see **Appendix D**).
- Document the basis of design and assumptions used to create the WaterGEMS River Islands NPW Distribution Model.
- Document and describe the existing and proposed River Islands NPW Distribution System.
- Analyze and model the NPW Peak Month Irrigation Demands (PMID) under steady state conditions over a daily 8-hour irrigation window.
- Identify the City's RW system intended to be constructed by the developer in Phase 2 to provide RW to the proposed Phase II NPW Pump Station (see **Appendix E**).

This technical report does not address permitting and environmental review/compliance requirements as those activities are not included in this scope of work.

2 Non-Potable Water Irrigation Areas

2.1 Non-Potable Water Irrigation Areas – Phase I

RD 2062 and the RIPFA, own and operate a private NPW distribution system to irrigate designated landscaping parcels, strips, traffic medians, schools, and parks throughout the River Islands development. O'Dell Engineering, serving as the Civil Engineer for the development, provided Irrigation Coverage Exhibits (see **Appendix A**) showing the approximate size and location of all Phase I areas that will utilize NPW for irrigation. For the River Islands Development, the town centers, commercial, designated open spaces, lake edges, and street landscaping will utilize a drip style irrigation system, while parks and schools will utilize a spray type irrigation system. **Table 2-1** below, summarizes the gross (total) Phase I, NPW irrigation areas based on their irrigation system and location within Phase I.

Table 2-1: Gross (Total) Non-Potable Water Irrigation Areas – Phase I

NPW Irrigation Area Type	Phase I Stage 1A & 1B Gross NPW Area (acres)	Phase I Stage 2A Gross NPW Area (acres)	Phase I Stage 2B Gross NPW Area (acres)	Phase I Total Gross NPW Area (acres)
Drip Irrigation Systems				
Town Center	46.00	0.00	0.00	**46.00**
Commercial	161.71	0.00	0.00	**161.71**
Open Space - Irrigated	10.26	9.79	10.98	**31.03**
Lake Edge Areas	0.88	3.95	6.08	**10.91**
Street Landscape	37.66	9.23	0.00	**46.89**
Spray Irrigation Systems				
Schools	30.00	15.00	0.00	**45.00**
Parks	56.68	18.48	13.11	**88.27**
Total	**343.19**	**56.44**	**30.18**	**429.81**

Notes:
1. NPW Gross Irrigation Areas and Quantities based on Irrigation Coverage Exhibits (**Appendix A**) or based on Land Use Exhibits for town center and commercial areas (**Appendix B**).

Considering a parcel's entire gross area for NPW irrigation demands has the potential to oversize the NPW distribution system, especially when only a specific area of a parcel will be/is designed as a NPW irrigation area. Additionally, these NPW irrigation areas will have "hard scape" or non-irrigated areas which will further reduce the applicable NPW irrigation area. Therefore, the actual percentage of a parcel that will utilize NPW is listed in **Table 2-2** for each land use type (Net NPW Irrigation Area). These percentages were provided by River Islands and are based on existing and future planned irrigation areas. **Table 2-3** below lists the Net NPW Irrigation Areas for Phase I based on the actual percent area that will utilize NPW for irrigation. The Net NPW irrigation area values will be used for determining the NPW irrigation demands for this report.

Table 2-2: Net Non-Potable Water Percent Irrigation Areas – Phase I

NPW Irrigation Area Type	Phase I % of Gross Area Used for NPW Irrigation (NPW Irrigation Area)	Phase I % of NPW Irrigation Area Used for NPW Irrigation (Net NPW Irrigation Area)
Drip Irrigation Systems		
Town Center	100%	15%
Commercial	100%	15%
Open Space - Irrigated	90%	85%
Lake Edge Areas	90%	95%
Street Landscape	100%	65%
Spray Irrigation Systems		
Schools	65%	100%
Parks	90%	65%

Notes:
1. Based on existing and future planned irrigation areas provided by River Islands

Table 2-3: Net Non-Potable Water Irrigation Areas – Phase I

NPW Irrigation Area Type	Phase I Stage 1A & 1B Net NPW Area (acres)	Phase I Stage 2A Net NPW Area (acres)	Phase I Stage 2B Net NPW Area (acres)	Phase I Total Net NPW Area (acres)
Drip Irrigation Systems				
Town Center	6.90	0.00	0.00	**6.90**
Commercial	24.26	0.00	0.00	**24.26**
Open Space - Irrigated	7.85	7.49	8.40	**23.74**
Lake Edge Areas	0.75	3.37	5.20	**9.33**
Street Landscape	24.48	6.00	0.00	**30.48**
Spray Irrigation Systems				
Schools	19.50	9.75	0.00	**29.25**
Parks	33.16	10.81	5.03	**49.00**
Total	**116.90**	**37.42**	**18.64**	**172.95**

Notes:
1. Based on Gross (Total) NPW Irrigation Areas shown in **Table 2-1** and modified per the actual net NPW irrigation area shown in **Table 2-2.**

2.2 Non-Potable Water Irrigation Areas – Phase II

River Islands is planning on expanding the Phase I NPW distribution system to service irrigation demands within Phase II. For Phase II, irrigation coverage exhibits have not been developed yet, however River Islands has mapped out the approximate location of commercial areas, schools, and parks as shown in Odell Phase II Lotting Exhibit (see **Appendix E**) and the River Islands Preliminary NPW Irrigation Map (see **Appendix H**). Commercial and school property on-site irrigation with NPW has not yet been approved in Lathrop by the regulatory agencies, but this use has been successful in other areas, and there is no reason it cannot be expanded to work in River Islands. Similar to Phase I, **Table 2-4** lists the gross (total) NPW areas, the percent irrigation areas for each land use type, and the Net NPW irrigation areas for Phase II. **Table 2-5** summarizes the total Phase I and II Net NPW Irrigation Areas for the development.

Table 2-4: Net Non-Potable Water Irrigation Percentage and Areas – Phase II

NPW Irrigation Area Type	Phase II Gross NPW Area(acres)	Phase II % of Gross Area Used for NPW Irrigation (NPW Irrigation Area)	Phase II % of NPW Irrigation Area Used for NPW Irrigation (Net NPW Irrigation Area)	Phase II Total Net NPW Area (acres)
Drip Irrigation Systems				
Town Center	33.10	100%	15%	**4.97**
Commercial	101.70	100%	15%	**15.26**
Open Space - Irrigated	33.20	90%	85%	**25.40**
Lake Edge Areas	22.60	90%	95%	**19.32**
Street Landscape	39.70	100%	90%	**35.73**
Spray Irrigation Systems				
Schools	109.60	65%	100%	**71.24**
Parks	246.52	90%	65%	**144.21**
Total	**586.42**			**316.12**

Table 2-5: Net Non-Potable Water Irrigation Areas – Phase I and II

NPW Irrigation Area Type	Phase I Total Net NPW Area (acres)	Phase II Total Net NPW Area (acres)	Phase I & II Total Net NPW Area (acres)
Drip Irrigation Systems			
Town Center	6.90	4.97	**11.87**
Commercial	24.26	15.26	**39.51**
Open Space - Irrigated	23.74	25.40	**49.13**
Lake Edge Areas	9.33	19.32	**28.65**
Street Landscape	30.48	35.73	**66.21**
Spray Irrigation Systems			
Schools	29.25	71.24	**100.49**
Parks	49.00	144.21	**193.21**
Total	**172.95**	**316.12**	**489.08**

3 Non-Potable Water Supply Requirements

3.1 Non-Potable Water Supply Requirements

The River Islands NPW Distribution will be designed to adequately and dependably provide NPW during peak conditions. Peak conditions shall refer to the peak month's irrigation demands (PMID) occurring over a daily 8-hour irrigation window. The following sections will describe the NPW PMID factors, demands, and the subsequent improvements required to meet peak operating conditions.

3.2 Historical Average Year Precipitation and Evapotranspiration Data – California Irrigation Management Information System

The California Irrigation Management Information System (CIMIS) is a unit in the Water Use and Efficiency Branch within the California Department of Water Resources (DWR) that manages a network of over 145 automated weather stations in California. The data provided by CIMIS is intended to assist irrigators in managing their water resources efficiently. Historical average precipitation and evapotranspiration (ET_o) data from CIMIS Station 70, located near the City of Manteca, was used to determine the peak irrigation month. The peak month is defined as the month with the lowest estimated precipitation and the highest reference evapotranspiration as this will result in the highest irrigation demand. Based on historical data from CIMIS Station 70, the peak irrigation month is July which has an average year precipitation and reference evapotranspiration values of 0.02 inches and 7.98 inches respectively.

Table 7-2 in the City's Standards defines common crop coefficients (K_c) which should be used in determining the actual evapotranspiration value for a given crop (ET_c) such as rye grass or turf. The evapotranspiration for a given crop is estimated by multiplying the crop's crop coefficient (K_c) by the reference evaporation (ET_o). For determining the NPW irrigation demands within the River Islands Development, crop coefficients for turf were utilized.

3.3 Non-Potable Water Peak Month Irrigation Demand Factors

For the peak month of July, the irrigation demand factor was determined through the following equation as defined in Section 7-5 J in the City's Standards.

$$July\ Peak\ Month\ Irrigation\ Demand\ Factor = \frac{ET_c - Precipitation}{Irrigation\ Efficieny\ x\ (1 - Leaching\ Requirement)}$$

Where
July Peak Month Irrigation Demand Factor is in units of inches per month
ET_c = Evapotranspiration for turf in July, in inches per month
Precipitation = Month of July precipitation data in Table 7-1 of the City Standards, in inches per month
Irrigation Efficiency = Per Section 492.13 in the California Code of Regulations, drip and spray irrigation systems should have an average irrigation efficiency of 81 and 75 percent respectively.
Leaching Requirement = 10% leaching requirement assumed per Section 7-5 I in the City Standards.

Per the equation above, the July peak month irrigation demand factors for drip and spray type irrigations systems is **10.27** and **11.09** inches per month respectively.

3.3.1 Non-Potable Water Peak Month Irrigation Demand Factors Over 8-Hour Irrigation Window

At full buildout conditions and under PMID, the RI NPW irrigation system will be operated daily during the off-peak windows (night time) to prevent irrigating during the day, reduce exposure to the public, and to provide a factor of safety as increasing the irrigation window will reduce the NPW irrigation demand. As determined in **Section 3.3** the peak month irrigation demand factors for drip and spray type irrigation systems are 10.27 and 11.09 inches per month respectively. Converting the irrigation demand factors to be over a daily 8-hour irrigation time frame (Section 7-12.3 E2 in the City Standards), the peak irrigation demand factors are equal to **26,977** and **29,136** Gallons per Day (GPD) per acre. These values were inputted into the NPW distribution model to verify the performance of the system. **Table 3-1** below, summarizes the peak irrigation demand factors over a daily 8-hour time frame and full water balance calculations are included in **Appendix D**.

Table 3-1: Peak Month Daily Irrigation Demand Factor Over 8 Hours

Parameter	Drip Irrigation Systems	Spray Irrigation Systems
Peak Month Irrigation Demand (inches per month)[1]	10.27	11.09
Peak Month Irrigation Demand (gallons per month per acre)	278,766	301,067
Peak Month Daily Irrigation Demand (GPD per acre)	8,992	9,712
Irrigation Window per Day (hours)	8	8
Peak Month Daily Irrigation Demand over Irrigation Window (GPD per acre)	**26,977**	**29,136**

Notes
1. For the peak month of July

3.4 Non-Potable Water Peak Month Irrigation Demands Over 8-Hour Irrigation Window

The PMID, over a daily 8-hour irrigation window, is equal to the NPW peak month irrigation demand factors (see **Section 3.3.1**), multiplied by the Net NPW Irrigation Area as defined in **Section 2.2.** **Table 3-2** presents the PMID over a daily 8-hour window for Phase I and II of River Islands, which is estimated to be **13,827,827 GPD** or **9,603 GPM**. The PMID could be reduced in the future if portions of the drip irrigation system are operating during day.

Table 3-2: Peak Month Daily Irrigation Demand Factor Over 8 Hours

NPW Irrigation Area Type	Phase I & II Total Net Area Used for NPW Irrigation (acres)	Peak Month Irrigation Demand Factor (GPD/acre)	Peak Month Irrigation Demand (GPD)	Peak Month Irrigation Demand (GPM)
Drip Irrigation Systems				
Town Center	11.87	26,977	320,086	**222**
Commercial	39.51	26,977	1,065,901	**740**
Open Space - Irrigated	49.13	26,977	1,325,532	**921**
Lake Edge Areas	28.65	26,977	772,947	**537**
Street Landscape	66.21	26,977	1,786,131	**1,240**
Spray Irrigation Systems				
Schools	100.49	29,136	2,927,832	**2,033**
Parks	193.21	29,136	5,629,398	**3,909**
		Total	**13,827,827**	**9,603**

Notes

1. The presented Peak Month Irrigation Demands have been modified to reflect a daily and continuous 8-hour irrigation window.

3.5 Non-Potable Water Pumping Capacity Requirements – Existing Main Pump Station

The Existing Main Pump Station (Main PS) (also known as the Lake 3 Irrigation Pump Station) was completed in 2018 and is currently the only source of pressure for River Islands NPW Distribution System. The Main PS is equipped with an irrigation skid approximately 7-feet wide by 16-feet long with 5 pumps providing a firm pumping capacity of **2,400 GPM** as shown below. The Main PS will be primarily responsible for servicing the irrigation needs of Stages 1A, 1B, 2A, and portions of 2B in Phase I. Future expansions of the NPW distribution system exceeding the firm pumping capacity of the Main PS will require an additional NPW pumping station, as the Main PS does not have provisions for additional pumping capacity to be installed.

Table 3-3: Main Pump Station Irrigation Skid – Firm Pumping Capacity

Pump Number	Pumping Capacity (GPM) @ 215 TDH	Motor Rated Horse-power	Motor Drive	Status
Irrigation Pump #1	1,000	75	Variable Frequency Drive	Lead
Irrigation Pump #2	1,000	75	Across the Line Motor Starter	Lag
Irrigation Pump #3	1,000	75	Across the Line Motor Starter	Standby
Jockey Pump	350	30	Variable Frewquency Drive	Lead
Pressure Sustaining Pump	50	5	Across the Line Motor Starter	Lead
Main Pump Station - Total Firm Pumping Capacity	**2,400**			

Notes

1. Firm Pumping Capacity is defined as the pumping capacity of all the pumps minus the capacity of the largest pump (per Appendix H in the City Standards).

3.6 Non-Potable Water Pumping Capacity Requirements – Proposed Phase II NPW Pump Stations

River Islands is planning on constructed a future Phase II NPW Pump Station (Phase II NPW PS) to be located along P-Street in Phase II (see **Figure 4-2**). The pump station will be designed to primarily service Phase II and the remaining Phase I NPW demands. The total PMID for Phase I and II is **9,603 GPM**, which leaves a minimum firm pumping deficiency of 7,203 GPM.

The design of a single large irrigation pump skid not only limits the demand (flow) range the station can serve, but will also result in unused infrastructure during interim conditions, as River Islands is expected to be completed in 2040. It is recommended that two NPW irrigation pump skids be installed as part Phase II NPW Pump Station. **Table 3-4**, shows the proposed irrigation pump skids firm pumping capacity and preliminary design recommendations. Based on the full buildout PMID, it is recommended that River Islands consider operating the drip and spray irrigation systems during separate daily and nightly, 8-hour irrigation window respectively, as this will increase the irrigation window and reduce the site wide firm pumping capacity requirements.

Table 3-4: Proposed Phase II NPW Pump Stations – Firm Pumping Capacity

Pump Number	Pumping Capacity (GPM) @ 215 TDH	Motor Rated Horsepower	Motor Drive	Status
Phase II – Skid #1 - Irrigation Pump #1	1,600	150	Variable Frequency Drive	Lead
Phase II – Skid #1 - Irrigation Pump #2	1,600	150	Across the Line Motor Starter	Lag
Phase II – Skid #1 - Irrigation Pump #3	1,600	150	Across the Line Motor Starter	Standby
Phase II – Skid #1 – Jockey Pump	500	40	Variable Frequency Drive	Lead
Phase II – Skid #1 – Pressure Sustaining Pump	75	7.5	Across the Line Motor Starter	Lead
Skid #1 - Total Firm Pumping Capacity	**3,775**			
Phase II – Skid #2 - Irrigation Pump #1	1,600	150	Variable Frequency Drive	Lead
Phase II – Skid #2 - Irrigation Pump #2	1,600	150	Across the Line Motor Starter	Lag
Phase II – Skid #2 - Irrigation Pump #3	1,600	150	Across the Line Motor Starter	Standby
Phase II – Skid #2 – Jockey Pump	500	40	Variable Frequency Drive	Lead
Phase II – Skid #2 – Pressure Sustaining Pump	75	7.5	Across the Line Motor Starter	Lead
Skid #2 - Total Firm Pumping Capacity	**3,775**			
Phase II NPW PS - Total Firm Pumping Capacity	**7,550**			

Notes
1. Firm Pumping Capacity is defined as the pumping capacity of all the pumps minus the capacity of the largest pump (per Appendix H in the City Standards). For the future Phase II NPW PS, it is recommended to provide each skid with a redundant pump as shown considering the number of pumps and size of the main irrigation pumps.

4 River Islands Non-Potable Water Distribution Model – Basis of Design, Assumptions, & Analysis Parameters

4.1 WaterGEMS Model

Bentley's WaterGEMS for AutoCad 2019 water distribution analysis and design software, was used to conduct a steady state analysis of the River Islands NPW distribution system under PMIDs (see **Section 3.3.1**). A steady-state analysis determines the operating behavior of the system at a specific point in time under steady-state conditions (flow rates and hydraulic grades remain constant over time). The results of the steady-state analysis helped determine the following performance criteria.

- Pipeline Velocities under PMIDs over a daily 8-hour irrigation window.
- Pipeline Headloss Gradients under PMIDs over a daily 8-hour irrigation window.
- Distribution System Pressures under PMIDs over a daily 8-hour irrigation window.

4.2 WaterGEMS Model Basis and Assumptions

The River Islands WaterGEMs NPW distribution model was created from a combination of as built drawings, issued for construction improvement plans, or preliminary NPW utility exhibits. The AutoCad drawings were imported into WaterGEMS for AutoCad 2019 and the NPW lines were converted into a hydraulic model. If improvement plans or as built drawings were available, the elevation of the NPW lines and the location and size of valves were imported into the hydraulic model. The following baseline assumptions were used in the steady-state analysis.

- All valves were assumed to have a minor loss coefficient equal to K=0.4.
- All pipes were assigned a Hazen-Williams friction loss coefficient of 140.
- The location of NPW demands was assigned to the nearest applicable junction based on the location of the parcel's service lateral. No pipe laterals or service meters were model in this analysis.

4.2.1 Hydraulic Model Assumptions - Areas Without Finalized Improvement Plans

In locations were improvement plans or as built drawings were not available the following was assumed in order to conduct a steady-state analysis.

- The location of all NPW lines was assumed to match the preliminary NPW utility exhibits.
- The elevation of all NPW lines was assumed to be 4 feet below the finished grade.
- Valves were placed into the distribution model in accordance with the City's requirements.
- All unknowns needed to run a steady-state analysis, such as minimum pipe sizes, were assumed to be the minimum requirements listed in the City Standards.

The following areas did not have finalized improvement plans and the assumptions listed above were utilize in order to model these demands. The total NPW irrigation acreage of these areas was assigned based on projected quantities provided by River Islands. **Ultimately the model results should be revisited when the improvement plans for these areas become available.** Please reference **Appendix B and E** for the location of these areas.

- Employment Centers in Stage 1B
- Marina Drive in Stage 1B
- Town Center in Stage 1B
- Village R in Stage 1B
- Village CC in Stage 2A
- Village X in Stage 2A
- Village KK and II in Stage 2B
- All of Phase II

4.2.2 Hydraulic Model Assumptions - Stage 2A Irrigation Cover Exhibit Discrepancies

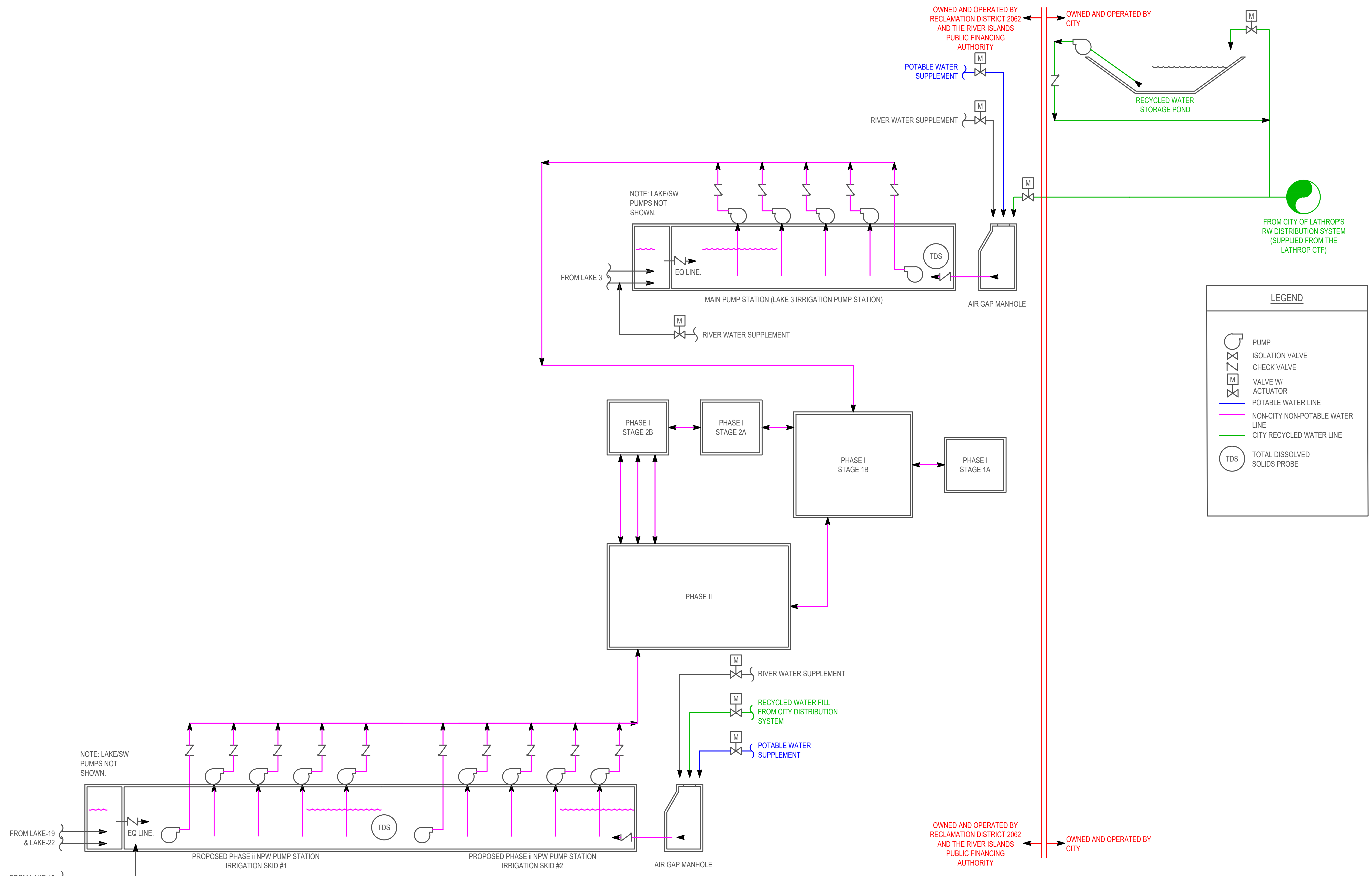
The most recent irrigation coverage exhibit for Stage 2A shows NPW irrigation areas within Village CC and S that are no longer going to require NPW for irrigation. The following landscaping parcels within the Stage 2A irrigation coverage exhibit were not included in the model for analysis.

- Parcel A80
- Parcel A81

4.2.3 River Islands Non-Potable Water Distribution System and Hydraulic Model Assumptions

RD 2062 and the RIPFA, own and operate a NPW distribution system to irrigate specific landscaping parcels, strip, traffic medians, parks, schools, and commercial areas within the development. At full buildout, the NPW distribution system will consist of one pressure zone pressurized from two NPW booster pump stations. The distribution system will consist of a series of large transmission and smaller service lines branching out from each booster pump station to service the development's NPW irrigation demands.

- Existing Main Pump Station (Lake 3 Irrigation Pump Station)
    - The existing 2,400 GPM, Main PS will be the primary source of pressure for the Stage 1A, 1B, 2A, and parts of 2B in Phase I. The existing main pump station is located east of Lake 3 along Somerston Parkway.
- Proposed Phase II NPW Pump Station
    - Phase II and a portion of Stage 2B in Phase I will be primarily pressurized from the proposed Phase II NPW Pump Station located to be along P Street in Phase II.



RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION SYSTEM SCHEMATIC

RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION SYSTEM SCHEMATIC

JOB
RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION MODEL
LATHROP CA

SCALE	
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	01/2021
JOB NO.	B520

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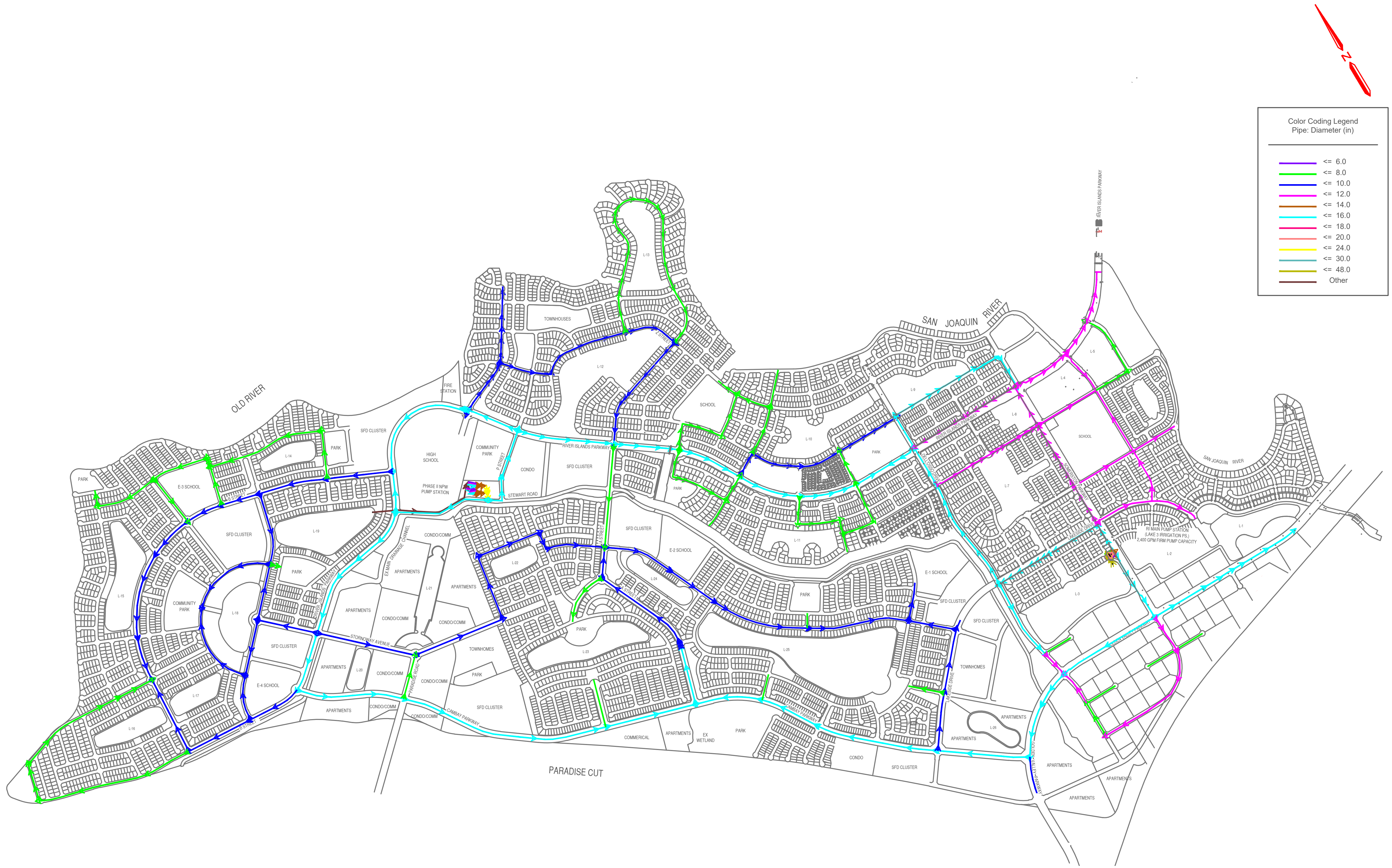
FIGURE
4-1

W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\Figures\Figure 4-1 River Islands NPW Distribution System Schematic.dwg - Tab: Layout1 - by tmihara on 01/22/21 at 2:58:14 PM



NOTES

1. RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION MODEL IS BASED ON UTILITY IMPROVEMENT AND AS BUILT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
2. LOCATION AND ELEVATION OF ALL PIPES, FITTINGS, VALVES, AND HYDRANTS ARE APPROXIMATED FROM UTILITY IMPROVEMENT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
3. FOR LOCATIONS WHERE FINALIZED OR AS BUILT UTILITY IMPROVEMENT PLANS ARE NOT AVAILABLE, NON-POTABLE WATER DEMANDS AND THE LAYOUT OF THE DISTRIBUTION SYSTEM FOLLOW THE MINIMUM REQUIREMENTS IN THE CITY OF LATHROP'S 2019 DESIGN AND CONSTRUCTION STANDARDS.
4. PEAK NON-POTABLE WATER IRRIGATION DEMANDS ARE BASED ON THE 2019 CITY OF LATHROP'S DESIGN AND CONSTRUCTION STANDARDS FOR THE PEAK MONTH OF JULY. TURF CROP COEFFICIENTS WERE USED IN THE DETERMINATION OF THE PEAK IRRIGATION DEMAND.
5. THE PRESENTED NON-POTABLE WATER MODEL RESULTS ARE FOR STEADY STATE SITUATIONS (I.E. NOT FOR EXTEND TIME FRAMES).
6. LAYOUT AND CONTROL STRATEGY OF THE RIVER ISLANDS MAIN PUMP STATION (LAKE 3 IRRIGATION PUMP STATION) IS TAKEN FROM THE MAIN PUMP STATION RECORD PLANS AND SPECIFICATIONS.

RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION SYSTEM OVERALL LAYOUT

RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION MODEL

LATHROP CA

JOB

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	01/2021
JOB NO.	B520

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FIGURE 4-2

W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\2020-08_RI NPW DISTRIBUTION NETWORK MODEL.dwg - Tab: Overview - by tmihara on 11/24/20 at 4:59:18 PM

4.2.3.1 RI NPW Distribution System Hydraulic Model Assumptions - Sources of Non-Potable Water

4.2.3.1.1 Primary Sources of Non-Potable Water – City of Lathrop's RW Distribution System

The primary source of water for the River Islands NPW distribution system will be Title 22 RW from the City's RW distribution system. River Islands will extend the City's RW distribution system to the wet well of the existing Main and the proposed Phase II NPW PS to provide RW based on the level in each wet well. As the irrigation pumps draw from the wet well, the electric actuated, recycled water fill line will be opened allowing the City's RW distribution system to fill the PS wet well through an equalized, air-gap manhole. After the irrigation demand window ends, the recycled water fill line will continue to fill each wet well until a predetermined level and shut off.

For the purposes of determining the performance of the NPW Distribution System under PMIDs, the recycled water supply for each station was not modeled. Instead, each pump station was modeled with a finished floor elevation of 13 feet and wet well water level of 5 feet, which is equal to the minimum wet well water level (Main Pump Station Control Strategy Specification Section 17500). River Islands will be working with the City of Lathrop to model and confirm that the existing City RW pipelines will provide adequate capacity to the RI NPW pump stations.

4.2.3.1.2 Secondary Sources of Non-Potable Water

During high irrigation demand windows, the irrigation pump skids have the potential to draw down the level in the wet well faster than the supply of recycled water. As the level decreases, a level differential between each station's lake recirculation and irrigation wet wells will occur, causing the check valve on the equalizing line to open (see **Figure 4-1**). This will allow for lake water to fill the irrigation wet well to be used as a secondary supply of water for NPW irrigation demands. Each irrigation wet well will is/will be installed with a Total Dissolved Solids (TDS) probe continuously monitoring the TDS of the wet well. If the TDS in the wet well exceeds an acceptable threshold, each stations has/will have a potable water fill line allowing potable water to be used for irrigation and diluting the irrigation wet well.

For the purposes of determining the performance of the NPW Distribution System under PMIDs and steady-state conditions (snap-shot in time), the secondary sources of NPW were not included in the NPW distribution model.

4.2.3.2 RI NPW Distribution System Hydraulic Model Assumptions - Existing Main Pump Station

The Main PS is equipped with five irrigation booster pumps providing a firm pumping capacity of **2,400 GPM** as shown in **Table 3-3**. The pressure sustaining pump, jockey pump, and the lead irrigation pump (Irrigation Pump #1 in **Table 3-3**) are all designed to operate as lead pumps maintaining a constant distribution pressure of 80 psi through a variable frequency drive (VFD). The lag irrigation pump (Irrigation Pump #2 in **Table 3-3**), is designed to operate when a large pressure drop is detected and will turn on and off at operator adjustable low and high set points. In order to model this control strategy appropriately, the lag irrigation pump as modeled with a VFD to not exceed 80 psi. Without the inclusion of the VFDs in the model, the lag booster pump would over pressurize the hydraulic model under steady state conditions leading to misleading model results.

4.2.3.3 RI NPW Distribution System Hydraulic Model Assumptions – Proposed Phase II Non-Potable Water Pump Station

The future Phase II NPW PS was modeled with two 3,775 GPM NPW irrigation pump skids, with each skid equipped with five pumps as depicted in **Table 3-4.** The hydraulic model assumptions for the proposed Phase II NPW PS are similar to the existing Main Pump Station including modeling the lag pumps with VFDs to prevent over-pressurizing the model under steady state conditions.

5 River Islands Non-Potable Water Distribution System Model - Results

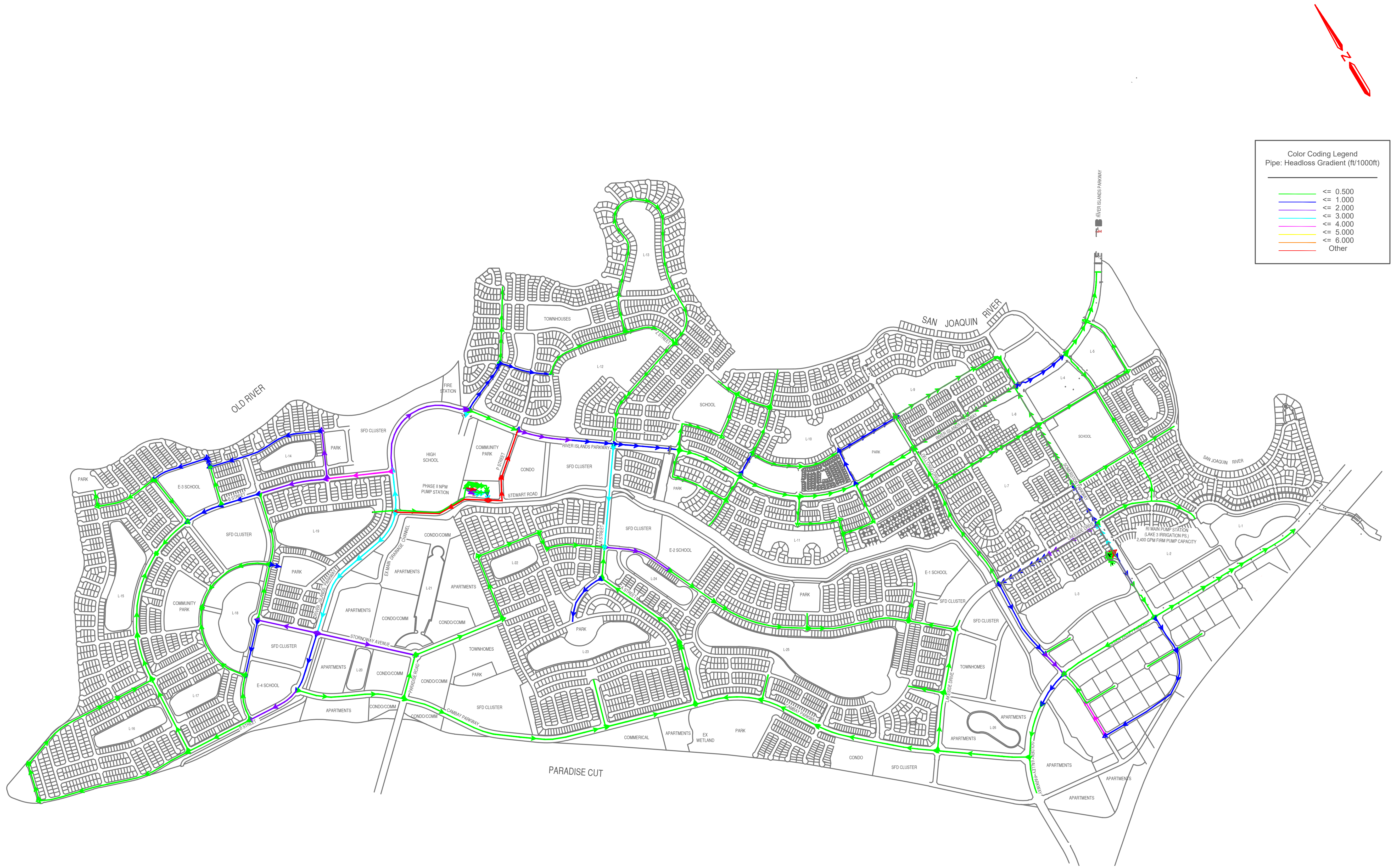
5.1 Steady State Analysis Results – Peak Month Irrigation Demands - Recommendations

As shown in **Appendix F**, the preliminary NPW utility exhibit showed a 16-inch, and an 8-inch NPW line connecting the Phase II NPW PS to the distribution system. The hydraulic model results determined that both the 16-inch and 8-inch mains under P-Street would operate with a velocity range of 6.5-8 feet per second (ft/s) under PMID. While this does not exceed the City's operational requirements, operating with a high velocity range is not recommended for the following reasons.

- The distribution pressures in the system will decrease from 80 psi (see **Figure 5-1**) at the pump stations down to 58-60 psi at the ends of the system. This pressure drop is in result to approximately 10 psi of head losses from the Phase II NPW PS to the respective connections along River Islands Parkway. This will result in additional electrical power usage as well as wear on the irrigation pumps from having to overcome the high friction losses.

- The pressures shown in the model results are for the distribution system and are not the pressures at the individual meters/service laterals. Therefore, the expected pressure at the actual irrigation service can be expected to be lower due to line and meter losses. The lower distribution pressure may result in decreased performance of the connected irrigation systems under PMIDs.

Therefore, it is recommended that the 8-inch NPW main under P-Street be upsized to a 16-inch main to account for the proposed location of the Phase II NPW PS. Furthermore, the existing 8-inch NPW stub out connection under River Islands Parkway is recommended to be upsized to 16-inches as well.



NOTES

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2. LOCATION AND ELEVATION OF ALL PIPES, FITTINGS, VALVES, AND HYDRANTS ARE APPROXIMATED FROM UTILITY IMPROVEMENT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
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4. PEAK NON-POTABLE WATER IRRIGATION DEMANDS ARE BASED ON THE 2019 CITY OF LATHROP'S DESIGN AND CONSTRUCTION STANDARDS FOR THE PEAK MONTH OF JULY. TURF CROP COEFFICIENTS WERE USED IN THE DETERMINATION OF THE PEAK IRRIGATION DEMAND.
5. PER RIVER ISLANDS, ALL PARKS AND SCHOOLS SHALL UTILIZE A SPRAY IRRIGATION SYSTEMS, WHICH HAS AN IRRIGATION EFFICIENCY OF 70% PER RIVER ISLANDS. THIS EQUATES TO A PEAK IRRIGATION DEMAND OF 31,217 GPD PER ACRE FOR AN 8-HOUR IRRIGATION WINDOW.
6. PER RIVER ISLANDS, ALL OTHER NON-POTABLE WATER IRRIGATION AREAS SHALL UTILIZE DRIP IRRIGATION SYSTEMS, WHICH HAS AN IRRIGATION EFFICIENCY OF 81% PER RIVER ISLANDS. THIS EQUATES TO A PEAK IRRIGATION DEMAND OF 26,977 GPD PER ACRE FOR AN 8-HOUR IRRIGATION WINDOW.
7. NON-POTABLE WATER DEMANDS WHERE ASSIGNED BASED ON THE LATEST IRRIGATION COVERAGE EXHIBITS PROVIDED BY ODELL ENGINEERING.
8. THE PRESENTED NON-POTABLE WATER MODEL RESULTS ARE FOR STEADY STATE SITUATIONS (I.E. NOT FOR EXTEND TIME FRAMES).
9. LAYOUT AND CONTROL STRATEGY OF THE RIVER ISLANDS MAIN PUMP STATION (LAKE 3 IRRIGATION PUMP STATION) IS TAKEN FROM THE MAIN PUMP STATION RECORD PLANS AND SPECIFICATIONS.
10. PHASE II NPW DISTRIBUTION SYSTEM SHOWN FOR REFERENCE PURPOSES ONLY AS ONLY THE PHASE I NPW DISTRIBUTION SYSTEM WAS MODELED. ISOLATION VALVES FEEDING PHASE II WERE CLOSED FOR THE PURPOSES OF THIS MODEL RESULTS.

PHASE I AND II
PEAK IRRIGATION DEMAND
16 & 8-INCH P STREET MAINS
PIPE HEADLOSS GRADIENTS

RIVER ISLANDS
NON-POTABLE WATER
DISTRIBUTION MODEL
LATHROP CA

JOB

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	11/2020
JOB NO.	B520

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FIGURE
5-1

W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\2020-08_RI NPW DISTRIBUTION NETWORK MODEL.dwg - Tab: 8-inch HL Gradient - by tmihara on 11/24/20 at 9:01:58 AM

5.2 Steady State Analysis Results – Peak Month Irrigation Demands

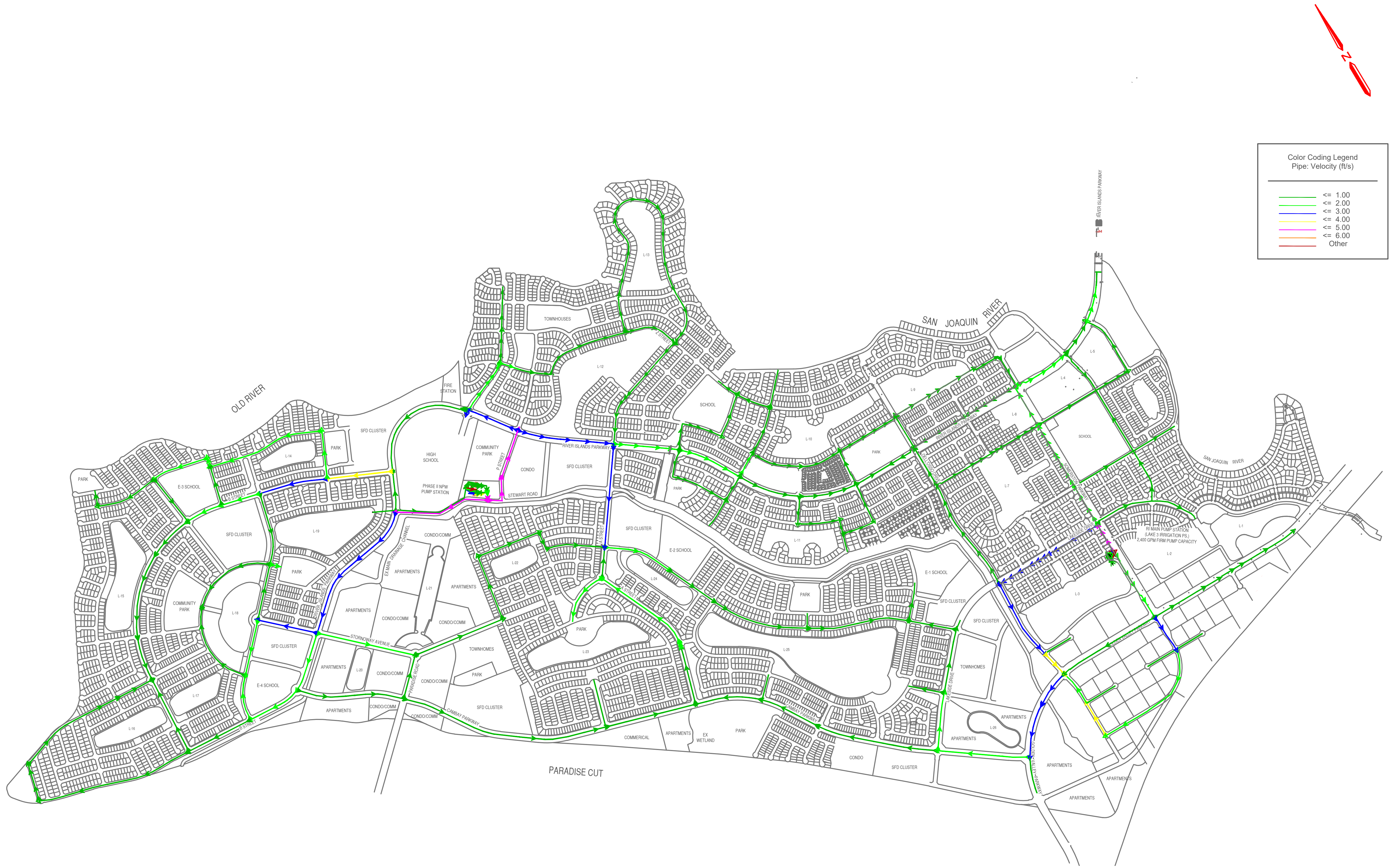
Figure 5-2, **Figure 5-3**, & **Figure 5-4** shows the steady state analysis results with the 8-inch P Street Main increased to a 16-inch main, as recommend in **Section 5.1**. The pipe velocities, headloss gradients (in feet of headloss per every 1000-feet) and junction pressures (in psi) under PMID are shown in these figures as well. **Table 5-1** shows the specific minimum and maximum values for the model and their corresponding location.

Table 5-1: Steady State Analysis Results – Peak Month Irrigation Demands

Model Result Category	Unit	Result	City Requirement	Location/Notes
Minimum Pipe Velocity	ft/s	0.01	None	Several locations
Maximum Pipe Velocity	ft/s	4.80	10	16-inch transmission main under P Street in Phase II.
Minimum Headloss Gradient	ft/1000ft	0.001	None	Several Locations
Maximum Headloss Gradient	ft/1000ft	0.005	None	16-inch transmission main under P Street in Phase II.
Minimum System Pressure	psi	68	45	Junctions located at the eastern edge of River Islands Parkway near the Bradshaw Crossing Bridge.
Maximum System Pressure	psi	80-81	80	Junctions in the larger distributions.
Flow Supplied	gpm	9,603		Required RW Supply
Flow Demand	gpm	9,603		Peak Month Irrigation Demand over an 8-hour irrigation window
Flow Stored[1]	gpm	0		

Notes:

1. There are no specific storage tanks/pond in the NPW distribution system as the Lakes will serve as a secondary source of water.



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4. PEAK NON-POTABLE WATER IRRIGATION DEMANDS ARE BASED ON THE 2019 CITY OF LATHROP'S DESIGN AND CONSTRUCTION STANDARDS FOR THE PEAK MONTH OF JULY. TURF CROP COEFFICIENTS WERE USED IN THE DETERMINATION OF THE PEAK IRRIGATION DEMAND.
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6. LAYOUT AND CONTROL STRATEGY OF THE RIVER ISLANDS MAIN PUMP STATION (LAKE 3 IRRIGATION PUMP STATION) IS TAKEN FROM THE MAIN PUMP STATION RECORD PLANS AND SPECIFICATIONS.

PHASE I AND II PEAK IRRIGATION DEMAND (8-HR) PIPE VELOCITIES

RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION MODEL

LATHROP CA

JOB

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	01/2021
JOB NO.	B520

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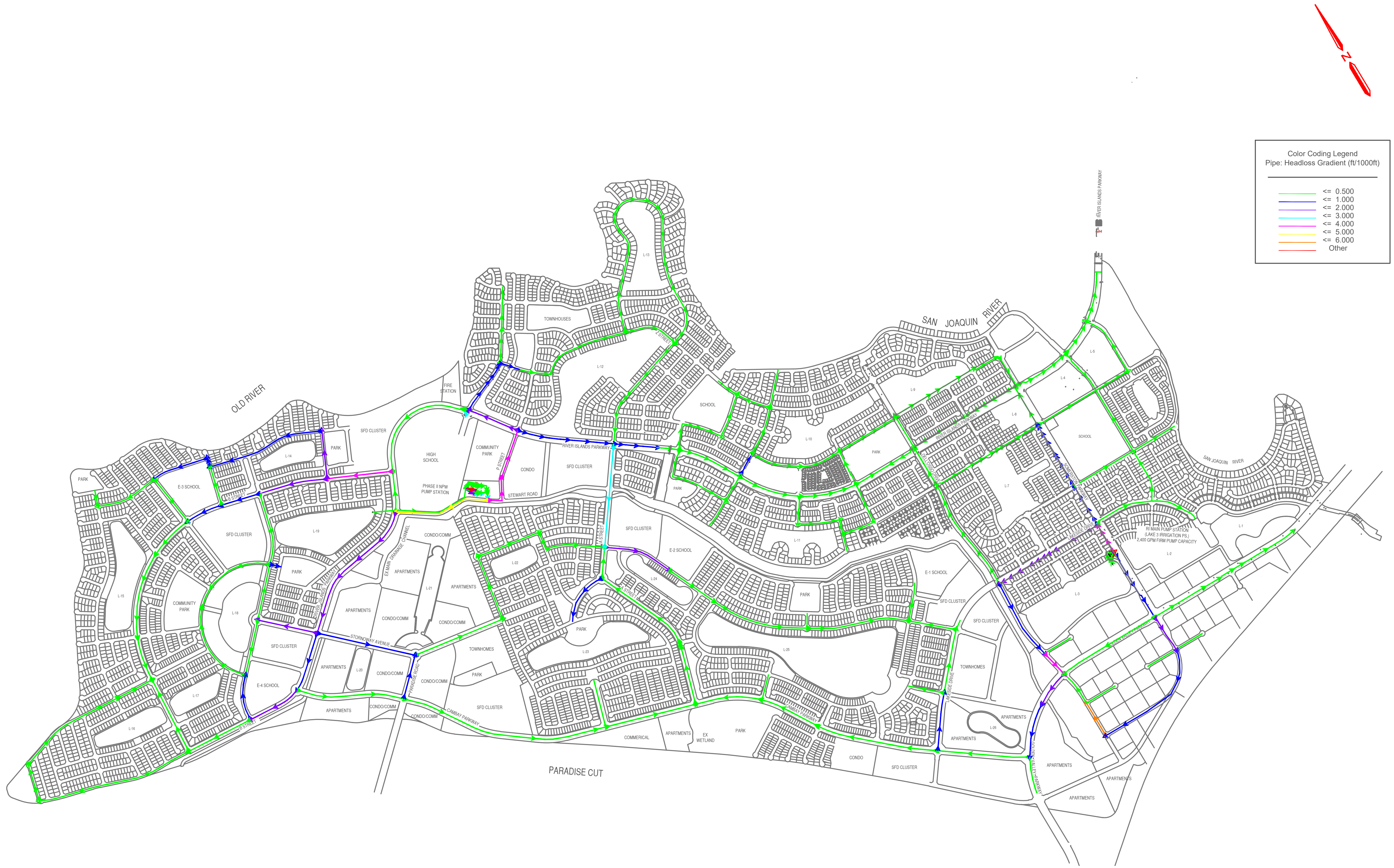
FIGURE 5-2



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5. PER RIVER ISLANDS, ALL PARKS AND SCHOOLS SHALL UTILIZE A SPRAY IRRIGATION SYSTEMS, WHICH HAS AN IRRIGATION EFFICIENCY OF 70% PER RIVER ISLANDS. THIS EQUATES TO A PEAK IRRIGATION DEMAND OF 31,217 GPD PER ACRE FOR AN 8-HOUR IRRIGATION WINDOW.
6. PER RIVER ISLANDS, ALL OTHER NON-POTABLE WATER IRRIGATION AREAS SHALL UTILIZE DRIP IRRIGATION SYSTEMS, WHICH HAS AN IRRIGATION EFFICIENCY OF 81% PER RIVER ISLANDS. THIS EQUATES TO A PEAK IRRIGATION DEMAND OF 26,977 GPD PER ACRE FOR AN 8-HOUR IRRIGATION WINDOW.
7. NON-POTABLE WATER DEMANDS WHERE ASSIGNED BASED ON THE LATEST IRRIGATION COVERAGE EXHIBITS PROVIDED BY ODELL ENGINEERING.
8. THE PRESENTED NON-POTABLE WATER MODEL RESULTS ARE FOR STEADY STATE SITUATIONS (I.E. NOT FOR EXTEND TIME FRAMES).
9. LAYOUT AND CONTROL STRATEGY OF THE RIVER ISLANDS MAIN PUMP STATION (LAKE 3 IRRIGATION PUMP STATION) IS TAKEN FROM THE MAIN PUMP STATION RECORD PLANS AND SPECIFICATIONS.
10. PHASE II NPW DISTRIBUTION SYSTEM SHOWN FOR REFERENCE PURPOSES ONLY AS ONLY THE PHASE I NPW DISTRIBUTION SYSTEM WAS MODELED. ISOLATION VALVES FEEDING PHASE II WERE CLOSED FOR THE PURPOSES OF THIS MODEL RESULTS.

PHASE I AND II
PEAK IRRIGATION DEMAND
(8-HR)
PIPE HEADLOSS GRADIENTS

JOB
RIVER ISLANDS
NON-POTABLE WATER
DISTRIBUTION MODEL
LATHROP CA

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	01/2021
JOB NO.	B520

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Advanced Water Engineering
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P: (714) 481-7300 | www.pacewater.com

FIGURE
5-3

W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\2020-08_RI NPW DISTRIBUTION NETWORK MODEL.dwg - Tab: HL Gradient - by tmihara on 11/24/20 at 5:01:34 PM

NOTES

1. RIVER ISLANDS NON-POTABLE WATER DISTRIBUTION MODEL IS BASED ON UTILITY IMPROVEMENT AND AS BUILT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
2. LOCATION AND ELEVATION OF ALL PIPES, FITTINGS, VALVES, AND HYDRANTS ARE APPROXIMATED FROM UTILITY IMPROVEMENT PLANS PROVIDED BY ODELL ENGINEERING AND RIVER ISLANDS.
3. FOR LOCATIONS WHERE FINALIZED OR AS BUILT UTILITY IMPROVEMENT PLANS ARE NOT AVAILABLE, NON-POTABLE WATER DEMANDS AND THE LAYOUT OF THE DISTRIBUTION SYSTEM FOLLOW THE MINIMUM REQUIREMENTS IN THE CITY OF LATHROP'S 2019 DESIGN AND CONSTRUCTION STANDARDS.
4. PEAK NON-POTABLE WATER IRRIGATION DEMANDS ARE BASED ON THE 2019 CITY OF LATHROP'S DESIGN AND CONSTRUCTION STANDARDS FOR THE PEAK MONTH OF JULY. TURF CROP COEFFICIENTS WERE USED IN THE DETERMINATION OF THE PEAK IRRIGATION DEMAND.
5. PER RIVER ISLANDS, ALL PARKS AND SCHOOLS SHALL UTILIZE A SPRAY IRRIGATION SYSTEMS, WHICH HAS AN IRRIGATION EFFICIENCY OF 70% PER RIVER ISLANDS. THIS EQUATES TO A PEAK IRRIGATION DEMAND OF 31,217 GPD PER ACRE FOR AN 8-HOUR IRRIGATION WINDOW.
6. PER RIVER ISLANDS, ALL OTHER NON-POTABLE WATER IRRIGATION AREAS SHALL UTILIZE DRIP IRRIGATION SYSTEMS, WHICH HAS AN IRRIGATION EFFICIENCY OF 81% PER RIVER ISLANDS. THIS EQUATES TO A PEAK IRRIGATION DEMAND OF 26,977 GPD PER ACRE FOR AN 8-HOUR IRRIGATION WINDOW.
7. NON-POTABLE WATER DEMANDS WHERE ASSIGNED BASED ON THE LATEST IRRIGATION COVERAGE EXHIBITS PROVIDED BY ODELL ENGINEERING.
8. THE PRESENTED NON-POTABLE WATER MODEL RESULTS ARE FOR STEADY STATE SITUATIONS (I.E. NOT FOR EXTEND TIME FRAMES).
9. LAYOUT AND CONTROL STRATEGY OF THE RIVER ISLANDS MAIN PUMP STATION (LAKE 3 IRRIGATION PUMP STATION) IS TAKEN FROM THE MAIN PUMP STATION RECORD PLANS AND SPECIFICATIONS.
10. PHASE II NPW DISTRIBUTION SYSTEM SHOWN FOR REFERENCE PURPOSES ONLY AS ONLY THE PHASE I NPW DISTRIBUTION SYSTEM WAS MODELED. ISOLATION VALVES FEEDING PHASE II WERE CLOSED FOR THE PURPOSES OF THIS MODEL RESULTS.

PHASE I AND II PEAK IRRIGATION DEMAND (8-HR) PRESSURES

JOB

RIVER ISLANDS
NON-POTABLE WATER DISTRIBUTION MODEL
LATHROP CA

SCALE	1" = 1800'
DESIGNED	
DRAWN	TDM
CHECKED	TDM
DATE	01/2021
JOB NO.	B520

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FIGURE
5-4

W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\2020-08_RI NPW DISTRIBUTION NETWORK MODEL.dwg - Tab: Pressure - by tmihara on 11/24/20 at 5:03:29 PM

6 Preliminary Improvement Implementation Schedule

6.1 Preliminary Improvement Implementation Schedule

The River Islands NPW demands should be regularly monitored to help update and confirm the installed distribution system can reliable meet the system demands. The design of improvements should begin when the installed system has reached 60-80 percent of its rated capacity, depending on the complexity of the improvement. As described in **Section 3.1**, the River Islands NPW distribution system will be designed to provide a firm pumping capacity capable of supplying NPW under PMIDs over a daily 8-hour irrigation window.

Construction of River Islands is estimated to be completed by 2040, and will continue to be constructed over separate stages. Based on conversations and planning documents provided by River Islands, **Table 6-1** & **Table 6-2** shows the preliminary construction schedule of the River Islands development and the associated PMIDs for each associated time period. **Table 6-3**, shows the minimum recommended improvement implementation schedule to allow for the NPW distribution system to adequately service the developments NPW irrigation demands.

Table 6-1: Preliminary River Islands Construction Schedule & Associated Net NPW Irrigation Area

NPW Irrigation Area Type	Net NPW Irrigation Area Used for NPW Irrigation (acres)				
	2014-2020	2020-2025	2025-2030	2030-2035	2035-2040
Drip Irrigation Systems					
Town Center	0.00	0.00	4.00	8.00	11.87
Commercial	0.00	0.00	12.80	25.60	39.51
Open Space - Irrigated & Lake Edge Areas	21.00	31.30	47.80	64.30	77.79
Street Landscape	4.50	10.60	20.50	30.40	66.21
Drip Irrigation Systems Subtotal	**25.50**	**41.90**	**85.10**	**128.30**	**195.37**
Spray Irrigation Systems					
Schools	30.00	72.00	82.00	92.00	100.49
Parks	8.00	42.80	98.70	154.60	193.21
Spray Irrigation Systems Subtotal	**38.00**	**114.80**	**180.70**	**246.60**	**293.70**

Notes:

1. Based on the River Islands Detail (Phase 1 and 2) – Final V2.0 Spreadsheet showing the preliminary construction schedule for the River Islands Development.

Table 6-2: Preliminary River Islands Construction Schedule & Associated Peak Month Irrigation Demands over Daily 8-Hour Irrigation Window

NPW Irrigation Area Type	2014-2020	2020-2025	2025-2030	2030-2035	2035-2040
Drip Irrigation Systems					
Drip Irrigation Systems PMID over 8-hour Daily Irrigation Window (GPM)	**478**	**785**	**1,594**	**2,404**	**3,660**
Spray Irrigation Systems					
Spray Irrigation Systems PMID over 8-hour Daily Irrigation Window (GPM)	**769**	**2,323**	**3,656**	**4,989**	**5,943**
Total PMID over 8-hour Daily Irrigation Window (GPM)	**1,247**	**3,108**	**5,250**	**7,393**	**9,603**

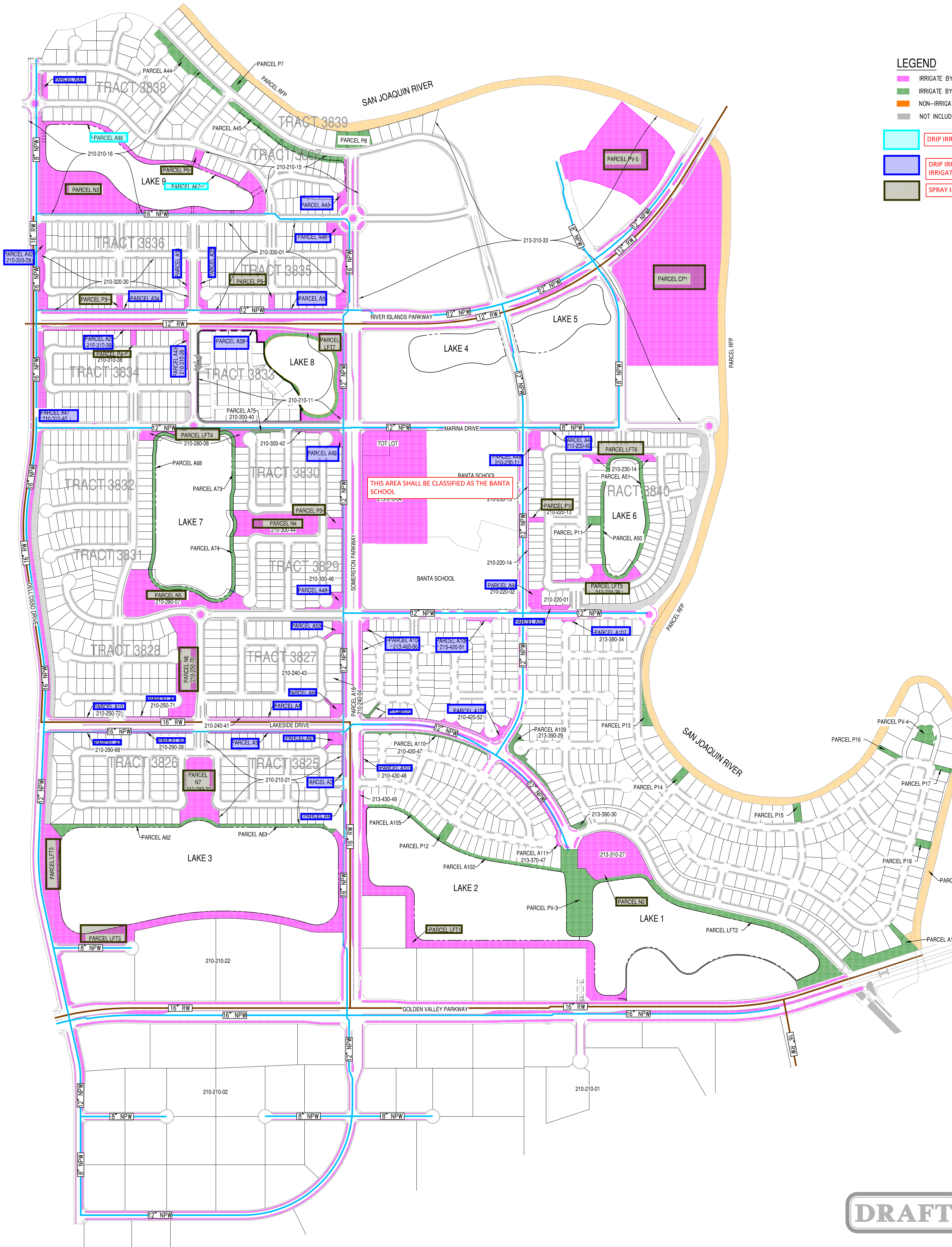
Notes:

1. Based on PMID factors multiplied by the Net NPW Irrigation Areas determined in **Table 6-1.**

Table 6-3: Minimum Preliminary Improvement Implementation Schedule

Parameter	2014-2020	2020-2025	2025-2030	2030-2035	2035-2040
Firm Pumping Capacity Requirement	1,247	3,108	5,250	7,393	9,603
River Islands Installed Firm Pumping Capacity	*2,400*	*6,175*	*6,175*	*9,950*	*9,950*
Firm Pumping Capacity Recommended Improvement	***None***	***The design for the future Phase II NPW PS should start at the beginning of the 2020-2025 time period as the Main PS will be reaching its firm pumping capacity during this time frame. It is estimated that the NPW irrigation demand will exceed the capacity of the Main PS toward the end of this time period. It is recommended that one of the Phase II NPW PS irrigation skids be installed.***	***It is estimated that the NPW irrigation demand will exceed the installed capacity toward the end of this time period. Therefore the design of the future Phase II NPW PS irrigation skid #2 should be completed and ready to be installed by 2030***	***The second irrigation pump skid at the Phase II NPW PS should be installed by 2030.***	***None***

Appendix A – Stage 1A, 1B, 2A, and 2B Irrigation Coverage Exhibits



N

0' 150' 300' 600'
SCALE: 1" = 300'

LEGEND

- IRRIGATE BY NON–POTABLE WATER
- IRRIGATE BY POTABLE WATER
- NON–IRRIGATED
- NOT INCLUDED AREAS
- DRIP IRRIGATION SYSTEMS - LAKE EDGE AREA
- DRIP IRRIGATION SYSTEMS - OPEN SPACE IRRIGATED
- SPRAY IRRIGATION SYSTEMS - PARKS

ALL OTHER AREAS TO BE IRRIGATED BY NON-POTABLE WATER AND NOT HIGHLIGHTED PER ACROSS SHALL BE CONSIDERED AS LANDSCAPE AREA OPEN SPACE

MAIN ROAD	IMPROVEMENT	ACREAGES	NOTES
LAKESIDE DRIVE	LANDSCAPE PARCELS	2.47	A3, A4, A7, A8, A9, A10, A60, A61, A108, A109, A110, A111
	MEDIAN	0.78	A112
	LANDSCAPE STRIPS	1.45	A113
	PARKS	5.06	N2, N6
	SUB-TOTAL	9.76	
SOMERSTON PKWY	LANDSCAPE PARCELS	1.47	A2, A18, A40, A48, A53, A101, A104
	MEDIAN	0.99	A114
	LANDSCAPE STRIPS	2.86	A115
	PARKS	8.18	SP2, P9
	SUB-TOTAL	13.50	
SOMERSTON PKWY (NORTH)	LANDSCAPE PARCELS	0.87	A45, A46
	MEDIAN	0.07	A116
	LANDSCAPE STRIPS	0.75	A117
	SUB-TOTAL	1.69	
ACADEMY DRIVE	LANDSCAPE PARCELS	0.20	A39, A106, A107
	MEDIAN	0.09	A118
	LANDSCAPE STRIPS	0.60	A119
	SUB-TOTAL	0.89	
COMMERICAL STREET	LANDSCAPE PARCELS	0.64	A49, A64
	MEIDAN	0.03	A120
	LANDSCAPE STRIPS	0.66	A121
	PARKS	0.08	P10
	SUB-TOTAL	1.42	
MARINA DRIVE	LANDSCAPE PARCELS	0.13	A43, A75
	MEDIAN	0.09	A122
	LANDSCAPE STRIPS	1.40	A123
	SUB-TOTAL	1.62	
RIVER ISLANDS PKWY	LANDSCAPE PARCELS	1.38	A28, A29, A34, A35
	MEDIANS	1.73	A124
	LANDSCAPE STRIPS	2.40	A125
	PARKS	0.27	P3, P4, P5
	BIOSWALES	0.79	A126
	BASEBALL STADIUM	6.62	PV-5
	SUB-TOTAL	13.19	
INTERIOR LEVEE ROAD (NORTH)	LANDSCAPE SLOPES	0.53	A38, A42
	LANDSCAPE STRIPS	0.49	A127
	BIOSWALES	0.71	A128
	SUB-TOTAL	1.73	
INTERIOR LEVEE ROAD	LANDSCAPE SLOPES	0.54	A47
	LANDSCAPE STRIPS	0.81	A129
	BIOSWALES	2.26	A130
	SUB-TOTAL	3.61	
INTERIOR LEVEE ROAD (EMPLOYMENT CENTER)	LANDSCAPE STRIPS	0.55	A131
GOLDEN VALLEY PARKWAY	MEDIANS	3.40	A132
	LANDSCAPE STRIPS	3.10	A133
	SUB-TOTAL	6.51	
WATER STREET	MEDIANS	0.03	A134
	LANDSCAPE STRIPS	0.24	A135
	SUB-TOTAL	0.27	
COMMERCE CENTER ROAD & J3, J4, J5, J6, J7 STREETS	LANDSCAPE STRIPS	2.22	A136
AREAS NEXT TO LAKES OR RIVER	LANDSCAPE PARCELS	5.97	A44, A45, A50, A51, A62, A63, A66, A67, A68, A73, A74, A102, A103, A105
	PARKS	64.65	CP1, LFT1, LFT2, LFT3, LFT4, LFT5, LFT6, LFT7, N3, N4, N5, N7, P6, P7, P8, P11, P12, P13, P14, P15, P16, P17, P18, PV-3, PV-4, RFP
	SUB-TOTAL	70.62	
TOTAL		127.34	

IRRIGATION AREA BY WATER SOURCE	
WATER SOURCE	ACREAGES
POTABLE	14.61
LANDSCAPE PARCELS	6.13
PARKS	8.48
NON-POTABLE	97.03
LANDSCAPE PARCELS	9.04
MEDIAN	5.24
LANDSCAPE STRIPS	22.20
PARKS	46.01
SCHOOL	7.92
BASEBALL STADIUM	6.62
NON-IRRIGATED	15.70
TOTAL	127.34

DRAFT

PHASE 1A & 1B IRRIGATION COVERAGE EXHIBIT
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: MARCH 05, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

T:\25501-RIVER ISLANDS\ACAD\EXHIBITS\PHASE 1A &1B IRRIGATION COVERAGE EXHIBIT\PHASE 1A & 1B IRRIGATION LANDSCAPING EXHIBIT.DWG

ALL OTHER AREAS TO BE IRRIGATED BY NON-POTABLE WATER AND NOT HIGHLIGHTED PER ACROSS SHALL BE CONSIDERED AS LANDSCAPE AREA OPEN SPACE

DRIP IRRIGATION SYSTEMS - LAKE EDGE AREA

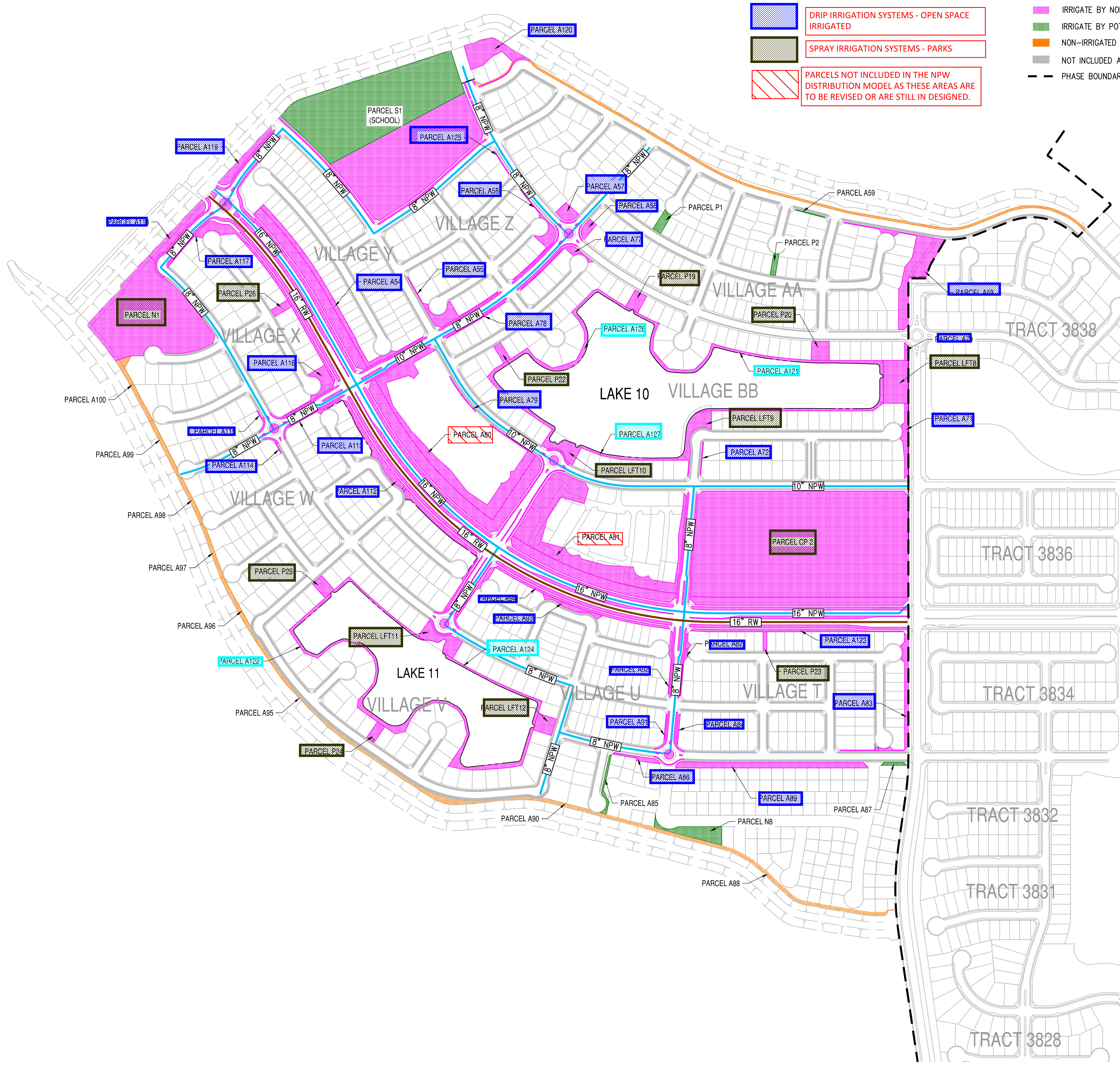
DRIP IRRIGATION SYSTEMS - OPEN SPACE IRRIGATED

SPRAY IRRIGATION SYSTEMS - PARKS

PARCELS NOT INCLUDED IN THE NPW DISTRIBUTION MODEL AS THESE AREAS ARE TO BE REVISED OR ARE STILL IN DESIGNED.

LEGEND

- IRRIGATE BY NON-POTABLE WATER
- IRRIGATE BY POTABLE WATER
- NON-IRRIGATED
- NOT INCLUDED AREAS/IRRIGATED BY OTHERS
- PHASE BOUNDARY



BACKBONE ROADS	IMPROVEMENT	ACREAGES	NOTES
RIVER ISLANDS PARKWAY	LANDSCAPE PARCELS	10.82	A54, A80, A81, A94, A112, A117, A123
	MEDIAN	1.25	
	LANDSCAPE STRIPS	3.15	
	PARKS	15.47	CP2
	SUB-TOTAL	30.70	
S1 STREET & S2 STREET	LANDSCAPE PARCELS	0.67	A118, A119
	MEDIAN	0.00	
	LANDSCAPE STRIPS	0.28	
	PARKS	4.58	N1
	SUB-TOTAL	5.53	
E STREET	LANDSCAPE PARCELS	1.20	A55, A56, A57, A58, A77, A78, A113, A114, A115, A116
	MEDIAN	0.16	
	LANDSCAPE STRIPS	0.63	
	PARKS	0.00	
	SUB-TOTAL	1.99	
X STREET	LANDSCAPE PARCELS	0.00	
	MEDIAN	0.15	
	LANDSCAPE STRIPS	0.27	
	PARKS	0.00	
	SUB-TOTAL	0.42	
F STREET	LANDSCAPE PARCELS	0.16	A82, A84, A91, A92
	MEDIAN	0.10	
	LANDSCAPE STRIPS	0.45	
	PARKS	0.00	
	SUB-TOTAL	0.71	
A STREET	LANDSCAPE PARCELS	1.61	A59, A69, A120
	MEDIAN	0.00	
	LANDSCAPE STRIPS	0.73	
	PARKS	0.00	
	SUB-TOTAL	2.34	
AREA NEXT TO LAKES OR RIVER	LANDSCAPE PARCELS	3.23	A121, A122, A124, A126, A127
	PARKS	2.61	LFT8, LFT9, LFT10, LFT11, LFT12, P19, P20, P22, P24, P25
	SUB-TOTAL	5.84	
IN-TRACTS	LANDSCAPE PARCELS	3.98	A70, A71, A72, A79, A83, A85, A86, A87, A88, A89, A90, A93, A95, A96, A97, A98, A99, A100, A125
	LANDSCAPE STRIPS	0.35	
	PARKS	0.74	N8, P1, P2, P23, P26
	SUB-TOTAL	5.07	
SCHOOL		11.92	
TOTAL		64.50	

IRRIGATION AREA BY WATER SOURCE	
WATER SOURCE	ACREAGES
POTABLE	6.96
LANDSCAPE PARCELS	0.14
MEDIAN	0.00
LANDSCAPE STRIPS	0.00
PARKS	0.60
SCHOOL	6.22
NON-POTABLE	55.28
LANSCAPE PARCELS	19.26
MEDIAN	1.66
LANDSCAPE STRIPS	5.86
PARKS	22.80
SCHOOL	5.70
NON-IRRIGATED	2.27
TOTAL	64.50

DRAFT

STAGE 2A IRRIGATION COVERAGE EXHIBIT

RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: MARCH 05, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

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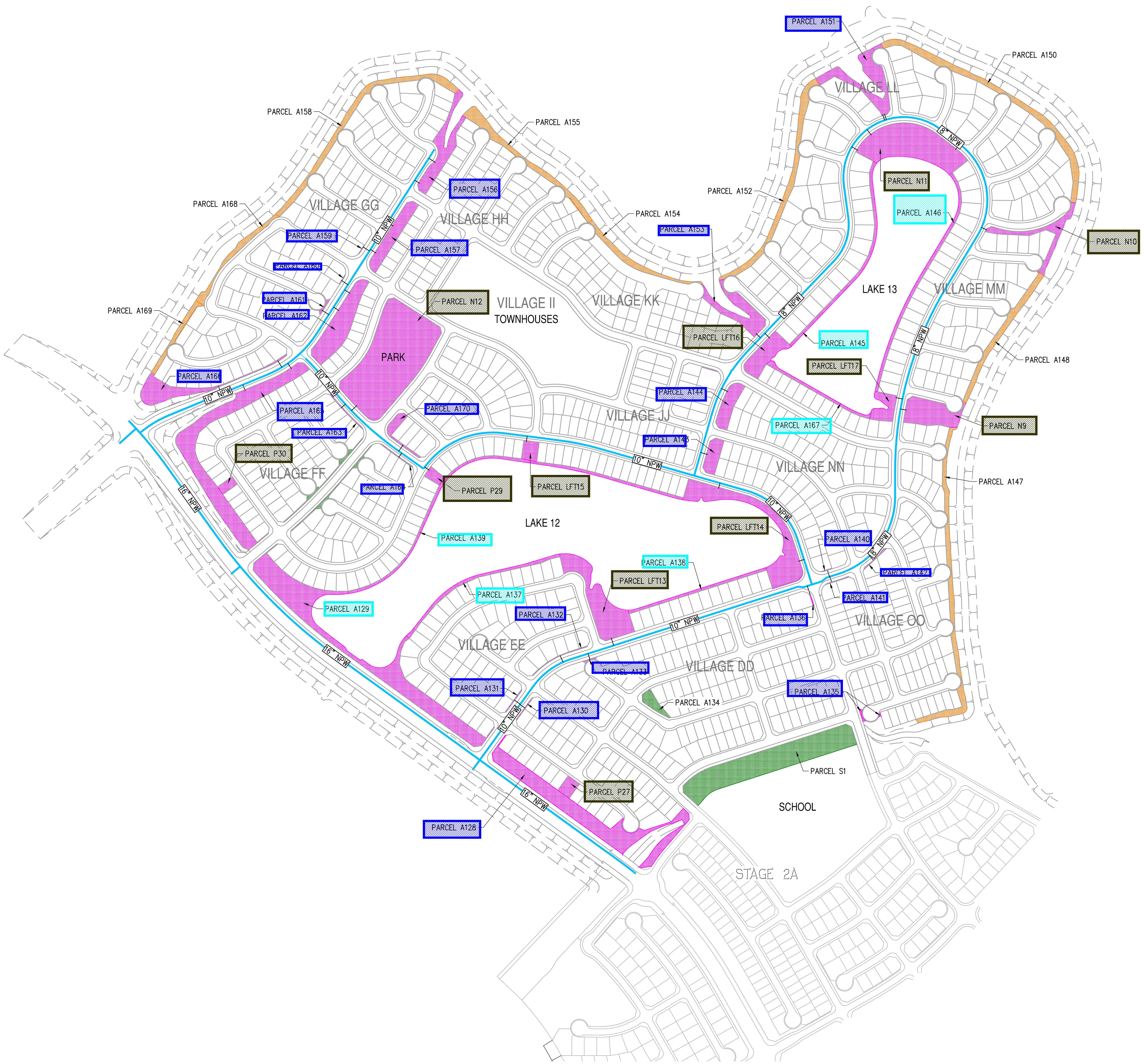


LEGEND

- IRRIGATE BY NON–POTABLE WATER
- IRRIGATE BY POTABLE WATER
- NOT IRRIGATED

SPRAY IRRIGATION SYSTEMS - PARKS

DRIP IRRIGATION SYSTEMS - LAKE EDGE AREA

ALL OTHER AREAS TO BE IRRIGATED BY NON-POTABLE WATER AND NOT HIGHLIGHTED PER ACROSS SHALL BE CONSIDERED AS LANDSCAPE AREA OPEN SPACE

IRRIGATION AREA BY WATER SOURCE	
WATER SOURCE	ACREAGES
POTABLE	3.38
LANDSCAPE PARCELS	0.20
MEDIAN	0.00
LANDSCAPE STRIPS	0.20
PARKS	0.00
SCHOOL	2.98
NON-POTABLE	30.17
LANSCAPE PARCELS	17.08
MEDIAN	0.00
LANDSCAPE STRIPS	0.00
PARKS	13.10
SCHOOL	0.00
NON-IRRIGATED	6.26
TOTAL	39.82

N

0' 150' 300' 600'
SCALE: 1" = 300'

DRAFT

STAGE 2B
IRRIGATION COVERAGE EXHIBIT
RIVER ISLANDS

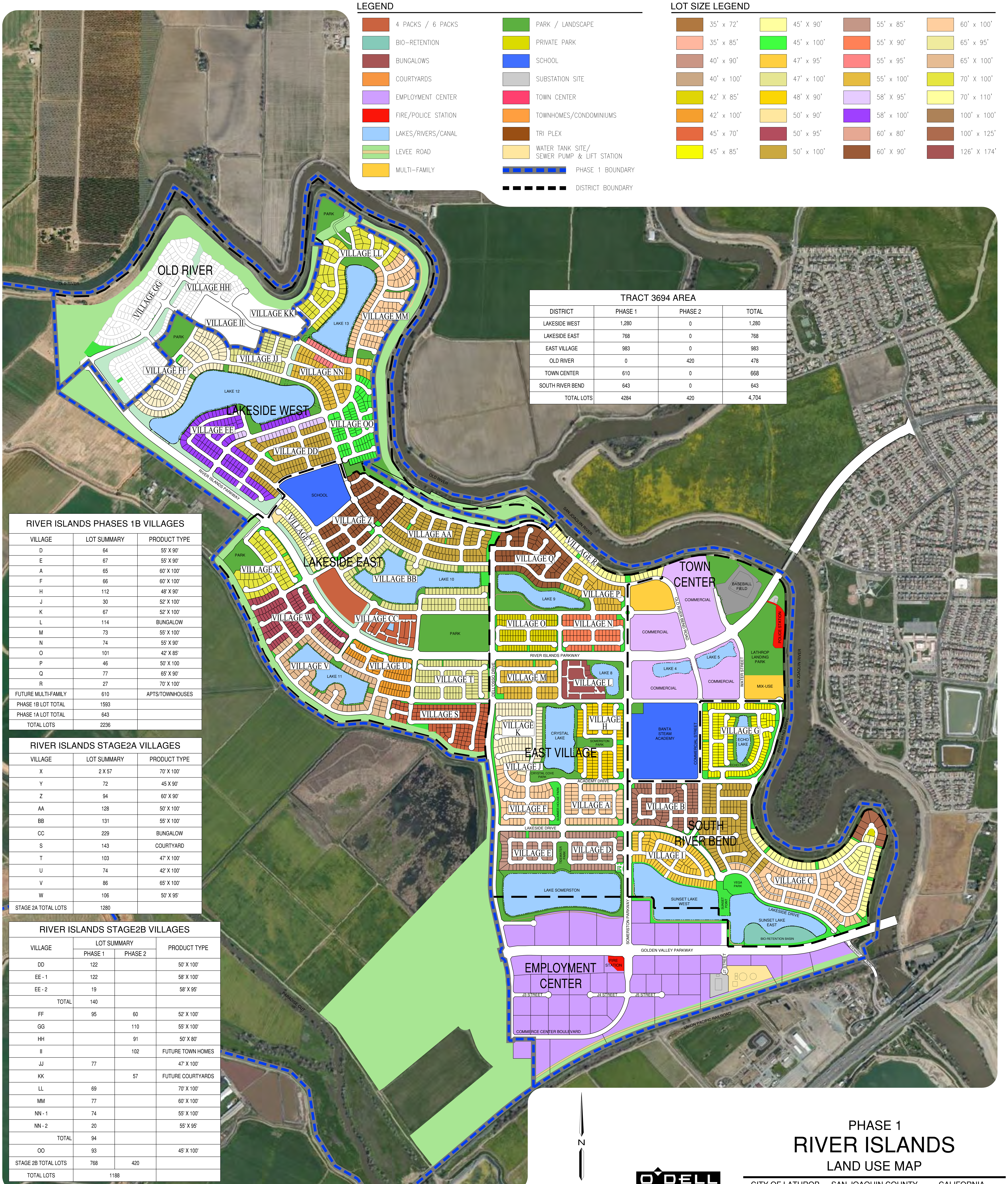
CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: JANUARY 22, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

T:\25503–RIVER ISLANDS\ACAD\EXHIBIT\STAGE 2B IRRIGATION COVERAGE EXHIBIT\25503 STAGE 2B IRRIGATION COVERAGE EXHIBIT[N].DWG

Appendix B – Phase I Land Use Exhibits



TRACT 3694 AREA

DISTRICT	PHASE 1	PHASE 2	TOTAL
LAKESIDE WEST	1,280	0	1,280
LAKESIDE EAST	768	0	768
EAST VILLAGE	983	0	983
OLD RIVER	0	420	478
TOWN CENTER	610	0	668
SOUTH RIVER BEND	643	0	643
TOTAL LOTS	4284	420	4,704

RIVER ISLANDS PHASES 1B VILLAGES

VILLAGE	LOT SUMMARY	PRODUCT TYPE
D	64	55' X 90'
E	67	55' X 90'
A	65	60' X 100'
F	66	60' X 100'
H	112	48' X 90'
J	30	52' X 100'
K	67	52' X 100'
L	114	BUNGALOW
M	73	55' X 100'
N	74	55' X 90'
O	101	42' X 85'
P	46	50' X 100
Q	77	65' X 90'
R	27	70' X 100'
FUTURE MULTI-FAMILY	610	APTS/TOWNHOUSES
PHASE 1B LOT TOTAL	1593	
PHASE 1A LOT TOTAL	643	
TOTAL LOTS	2236	

RIVER ISLANDS STAGE2A VILLAGES

VILLAGE	LOT SUMMARY	PRODUCT TYPE
X	2 X 57	70' X 100'
Y	72	45 X 90'
Z	94	60' X 90'
AA	128	50' X 100'
BB	131	55' X 100'
CC	229	BUNGALOW
S	143	COURTYARD
T	103	47' X 100'
U	74	42' X 100'
V	86	65' X 100'
W	106	50' X 95'
STAGE 2A TOTAL LOTS	1280	

RIVER ISLANDS STAGE2B VILLAGES

VILLAGE	LOT SUMMARY		PRODUCT TYPE
	PHASE 1	PHASE 2	
DD	122		50' X 100'
EE - 1	122		58' X 100'
EE - 2	19		58' X 95'
TOTAL	140		
FF	95	60	52' X 100'
GG		110	55' X 100'
HH		91	50' X 80'
II		102	FUTURE TOWN HOMES
JJ	77		47' X 100'
KK		57	FUTURE COURTYARDS
LL	69		70' X 100'
MM	77		60' X 100'
NN - 1	74		55' X 100'
NN - 2	20		55' X 95'
TOTAL	94		
OO	93		45' X 100'
STAGE 2B TOTAL LOTS	768	420	
TOTAL LOTS	1188		

N

0' 250' 500' 1000'
SCALE: 1" = 500'

O'DELL ENGINEERING

PHASE 1
RIVER ISLANDS
LAND USE MAP

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA
JANUARY 22, 2021

Appendix C – CIMIS Station 70 Historical Precipitation and Evapotranspiration Data

Month	Days	100 Year Precip in.	Effective Precip in	Average Precip in.	Effective Precip in	100 Year ET_o in.	Average ET_o in.
Jan	31	5.13	3.02	2.75	1.24	0.90	1.06
Feb	28	4.37	2.42	2.18	0.87	1.73	1.86
Mar	31	2.85	1.30	1.76	0.62	3.38	3.53
Apr	30	1.53	0.49	0.97	0.21	5.04	4.99
May	31	1.38	0.41	0.58	0.06	6.45	6.73
Jun	30	0.24	0.00	0.12	0.00	7.54	7.56
Jul	31	0.05	0.00	0.02	0.00	8.02	7.98
Aug	31	0.08	0.00	0.03	0.00	7.11	7.08
Sep	30	0.28	0.00	0.14	0.00	5.19	5.23
Oct	31	1.17	0.30	0.68	0.09	3.33	3.39
Nov	30	2.14	0.84	1.29	0.36	1.60	1.66
Dec	31	2.61	1.14	2.05	0.79	0.86	1.01
		21.8	**9.9**	**12.6**	**4.2**	**51.2**	**52.07**

Average precipitation and evapotranspiration (ET) from 1987 to 2013 California Irrigation Management Information System (CIMIS) station 70 located in Manteca, CA

Appendix D – Peak Irrigation Demand Calculations

B520 - Peak Irrigation Demand Basis of Design.xlsx

File Location: W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\Calcs and Docs\Basis of Design for Model\

PACE Project No: B520 DATE 11/24/2020

Calculation By: Thomas Daniel Mihara EIT

Water Balance Using Average Year Precipitation and Reference Eto Values from CIMIS Station 70 1987-2013

Parks and School Peak Irrigation Demand - Spray Irrigation

Irrigation Efficiency	75%	*Per River Islands*
Leaching Requirement	10%	*Required by the City's Stanidards (January 2019)*

Month	**Precipitation Average Year (in)**	**Reference Evapotranspiration ET_o Average Year (in)**	**Turf Crop Coeffients K_c**	**Turf Evapotranspiration ET_c (in)**	**Irrigation Demand (in)**
October	0.68	3.39	0.75	2.54	2.76
November	1.29	1.66	0.69	1.14	0.00
December	2.05	1.01	0.60	0.61	0.00
January	2.75	1.06	0.61	0.64	0.00
February	2.18	1.86	0.64	1.19	0.00
March	1.76	3.53	0.75	2.65	1.31
April	0.97	4.99	1.04	5.19	6.25
May	0.58	6.73	0.95	6.39	8.60
June	0.12	7.56	0.88	6.65	9.68
July	0.02	7.98	0.94	7.50	11.09
August	0.03	7.08	0.86	6.09	8.98
September	0.14	5.23	0.74	3.87	5.53
Total	**12.57**	**52.07**		**44.47**	**54.20**

Peak Month Irrigation Demand	11.09	inches per month	
Peak Month Irrigation Demand	301,067	gallons per month per acre	*Converting peak irrigation demand into gallons per month per acre*
Peak Month	July		
Number of Days in Peak Month	31.00	days	
Peak Month Daily Irrigation Demand	9,712	GPD per acre	*Dividing the Peak Month Irrigation Demand by the number of days in July*
Irrigation Window per Day	8	hours per day	*Minimum irrigation window*
Peak Month Irrigation Demand Adjusted for the Irrigation Demand	**29,136**	**GPD per acre**	*Converting Peak Month Daily Irrigation Demand to be equivalent to an 8 hour irrigation window*

B520 - Peak Irrigation Demand Basis of Design.xlsx

File Location: W:\B520\Engineering\Modeling\2020-09 NPW River Islands Model\Calcs and Docs\Basis of Design for Model\

PACE Project No: B520 DATE 11/24/2020

Calculation By: Thomas Daniel Mihara EIT

Water Balance Using Average Year Precipitation and Reference Eto Values from CIMIS Station 70 1987-2013

Street Landscape Areas Peak Irrigation Demand - Drip Irrigation

Irrigation Efficiency	81%	*Per River Islands.*
Leaching Requirement	10%	*Required by the City's Standards (January 2019)*

Month	**Precipitation Average Year (in)**	**Reference Evapotranspiration ET_o Average Year (in)**	**Turf Crop Coeffients K_c**	**Turf Evapotranspiration ET_c (in)**	**Irrigation Demand (in)**
October	0.68	3.39	0.75	2.54	2.55
November	1.29	1.66	0.69	1.14	0.00
December	2.05	1.01	0.60	0.61	0.00
January	2.75	1.06	0.61	0.64	0.00
February	2.18	1.86	0.64	1.19	0.00
March	1.76	3.53	0.75	2.65	1.22
April	0.97	4.99	1.04	5.19	5.79
May	0.58	6.73	0.95	6.39	7.96
June	0.12	7.56	0.88	6.65	8.96
July	0.02	7.98	0.94	7.50	10.27
August	0.03	7.08	0.86	6.09	8.32
September	0.14	5.23	0.74	3.87	5.12
Total	**12.57**	**52.07**		**44.47**	**50.19**

Peak Month Irrigation Demand	10.27	inches per month	
Peak Month Irrigation Demand	278,766	gallons per month per acre	*Converting peak irrigation demand into gallons per month per acre*
Peak Month	July		
Number of Days in Peak Month	31.00	days	
Peak Month Daily Irrigation Demand	8,992	GPD per acre	*Dividing the Peak Month Irrigation Demand by the number of days in July*
Irrigation Window per Day	8	hours per day	*Minimum irrigation window*
Peak Month Irrigation Demand Adjusted for the Irrigation Demand	**26,977**	**GPD per acre**	*Converting Peak Month Daily Irrigation Demand to be equivalent to an 8 hour irrigation window*

Appendix E – Phase II Lotting Summary Exhibit

PHASE 2 LOTTING SUMMARY					
PARCEL	LOT PRODUCT	AREA (ACRES)	DENSITY (DU/AC)	# OF UNITS	DENSITY TYPE
MU-1	Condos/Commercial	3.9	10.0	39	MEDIUM
MU-2	Condos/Commercial	3.3	10.0	33	MEDIUM
MU-3	Condos/Commercial	14.2	10.0	142	MEDIUM
MU-4	Condos/Commercial	11.1	10.0	111	MEDIUM
MU-5	Condos/Commercial	9.8	10.0	98	MEDIUM
MU-6	Condos/Commercial	14.7	10.0	147	MEDIUM
MU-7	Condos/Commercial	10.4	10.0	104	MEDIUM
MU-8	Apts	19.2	21.0	403	HIGH
MU-9	Apts	14.6	23.0	336	HIGH
MU-10	Apts	15.9	19.0	302	HIGH
MU-11	Apts	12.7	22.0	279	HIGH
MU-12	Apts	10.5	23.0	242	HIGH
MU-13	TOWNHOME	14.5	14.0	203	MEDIUM
MU-14		12.8	0.0	0	
R-0e (Village HH)	50x80	13.9	6.5	91	LOW
R-0d (Village FF Remainder)	52x100	24.1	4.9	118	LOW
R-0a (Village GG)	55x100	24.1	4.6	110	LOW
R-0c (Village KK)	Courtyards	8.2	7.0	57	LOW
R-0b (Village II)	Townhomes	10.2	10.0	102	MEDIUM
R-13	SFD Cluster	27.3	10.0	273	MEDIUM
R-15a	50x100	12.3	5.0	61	LOW
R-15b	SFD Cluster	19.2	10.0	192	MEDIUM
R-16	CONDO	15.6	20.0	312	HIGH
R-22	SFD Cluster	13.2	9.0	119	LOW
R-23	42x100	24.0	5.8	139	LOW
R-24	55x100	19.3	5.3	102	LOW
R-25	55x100	13.1	4.7	62	LOW
R-26	SFD Cluster	24.9	9.0	224	MEDIUM
R-27	50x100	18.6	4.7	87	LOW
R-28	42x100	19.3	5.4	104	LOW
R-29	47x100	10.2	6.0	61	LOW
R-2a	42x100	17.1	6.0	102	LOW
R-2b	50x100	31.9	5.0	158	LOW
R-2c	55x100	23.0	4.5	103	LOW
R-30	47x100	15.4	5.8	89	LOW
R-31	CONDO	7.7	18.0	139	MEDIUM
R-32	CONDO	7.6	18.0	137	MEDIUM
R-33	SFD Cluster	26.8	9.0	241	MEDIUM
R-34	50x100	31.7	5.0	159	LOW
R-35	42x100	28.7	5.4	154	LOW
R-36a	47x100	21.8	5.5	120	LOW
R-36b	52x100	22.1	4.9	109	LOW
R-37	60x100	21.7	4.2	92	LOW
R-38	55x100	24.8	4.9	121	LOW
R-39	60x100	32.8	4.1	135	LOW
R-3a	60x100	22.1	4.5	99	LOW
R-3b	52x100	20.4	4.3	87	LOW
R-40	52x100	34.5	5.2	180	LOW
R-41	42x100	44.2	6.1	269	LOW
R-42	50x100	22.8	4.8	109	LOW
R-4a	SFD Cluster	17.2	9.0	155	MEDIUM
R-4b	42x100	9.7	5.3	51	LOW
R-5	Condos	9.9	20.0	198	MEDIUM
R-6	55x100	24.4	4.6	113	LOW
R-7	Apts	8.0	18.0	144	MEDIUM
R-8 - R-12 (ACTIVE ADULT)	SFD	174.4	5.0	876	LOW
TOD-1	Apts	13.1	21.0	275	HIGH
TOD-2	Apts	8.8	29.0	255	HIGH
TOD-3	Apts	22.0	15.0	330	HIGH
TOD-4	Apts	12.6	20.0	252	HIGH
TOD-5	Apts	11.7	11.0	129	MEDIUM
TOD-6	SFD Cluster	22.7	6.0	136	LOW
TOD-7	TOWNHOME	16.7	10.0	167	MEDIUM
TOD-8	SFD Cluster	13.3	10.0	133	MEDIUM
TOTAL				10,470	

RIVER ISLANDS LOTTING SUMMARY				
PHASE	UNIT # (LOW DENSITY)	UNIT # (MEDIUM DENSITY)	UNIT # (HIGH DENSITY)	TOTAL
PHASE 1	3,273	223	788	4,284
PHASE 2	4,373	3,111	2,986	10,470
TOTAL	7,646	3,334	3,774	14,754

NOTES:
1. DENSITY TYPE: LOW DENSITY (3–9 DU/AC), MEDIUM DENSITY (6–20 DU/AC), AND HIGH DENSITY (15–40 DU/AC).

DRAFT

PHASE 2
LOTTING SUMMARY
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: APRIL 24, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

Appendix F – Phase II NPW Preliminary Utility Exhibit

LEGEND

NPW	PROPOSED NON-POTABLE WATER LINE
EX NPW	EXISTING NON-POTABLE WATER LINE
RW	PROPOSED RECYCLED WATER LINE
EX RW	EXISTING RECYCLED WATER LINE
PS	NON-POTABLE WATER PUMP STATION
	PHASE 2 BOUNDARY

NOTES:

1. NON-POTABLE WATER DESIGN TO BE FINALIZED WITH DESIGN PLANS.

N

0' 300' 600' 1200'
SCALE: 1" = 600'

DRAFT

PHASE 2
NPW & RW EXHIBIT
RIVER ISLANDS

CITY OF LATHROP SAN JOAQUIN COUNTY CALIFORNIA

DATE: NOVEMBER 20, 2020

O'DELL ENGINEERING
6200 Stoneridge Mall Road, Suite 330
Pleasanton, CA 94588
Ph 925.223.8340 odellengineering.com

T:\25504-RIVER ISLANDS\ACAD\EXHIBITS\PHASE 2 MASTER UTILITIES EXHIBIT\PHASE 2 MSTR UTILITIES (PER TM LAYOUT)\PHASE 2 MSTR NPW & RW EXHIBIT.DWG

Appendix G - Pages from 2017 River Islands Main Pump Station Plans

RIVER ISLANDS
MAIN PUMPSTATION PLANS

VICINITY MAP
N.T.S.

NORTH

PLANS PREPARED UNDER DIRECTION OF:

ANDREW T. KOMOR
RCE 64928 EXPIRES 6-30-2017 DATE

THE GEOTECHNICAL ASPECTS OF THE GRADING PLANS HAVE BEEN REVIEWED FOR SUBSTANTIAL CONFORMANCE WITH THE INTENT OF THE RECOMMENDATIONS CONTAINED IN THE GEOTECHNICAL INVESTIGATION REPORT.

SIGNED: ______ DATE: ______

JOSEF J. TOOTLE, PE
ENGEO INC.
RCE 58282

GEOTECHNICAL ENGINEER
EXP. 6-30-16

RECOMMENDED FOR APPROVAL:

DATE:______
RCE NO:______ 31695
LAWRENCE GOSSETT, P.E.
EXP DATE:______

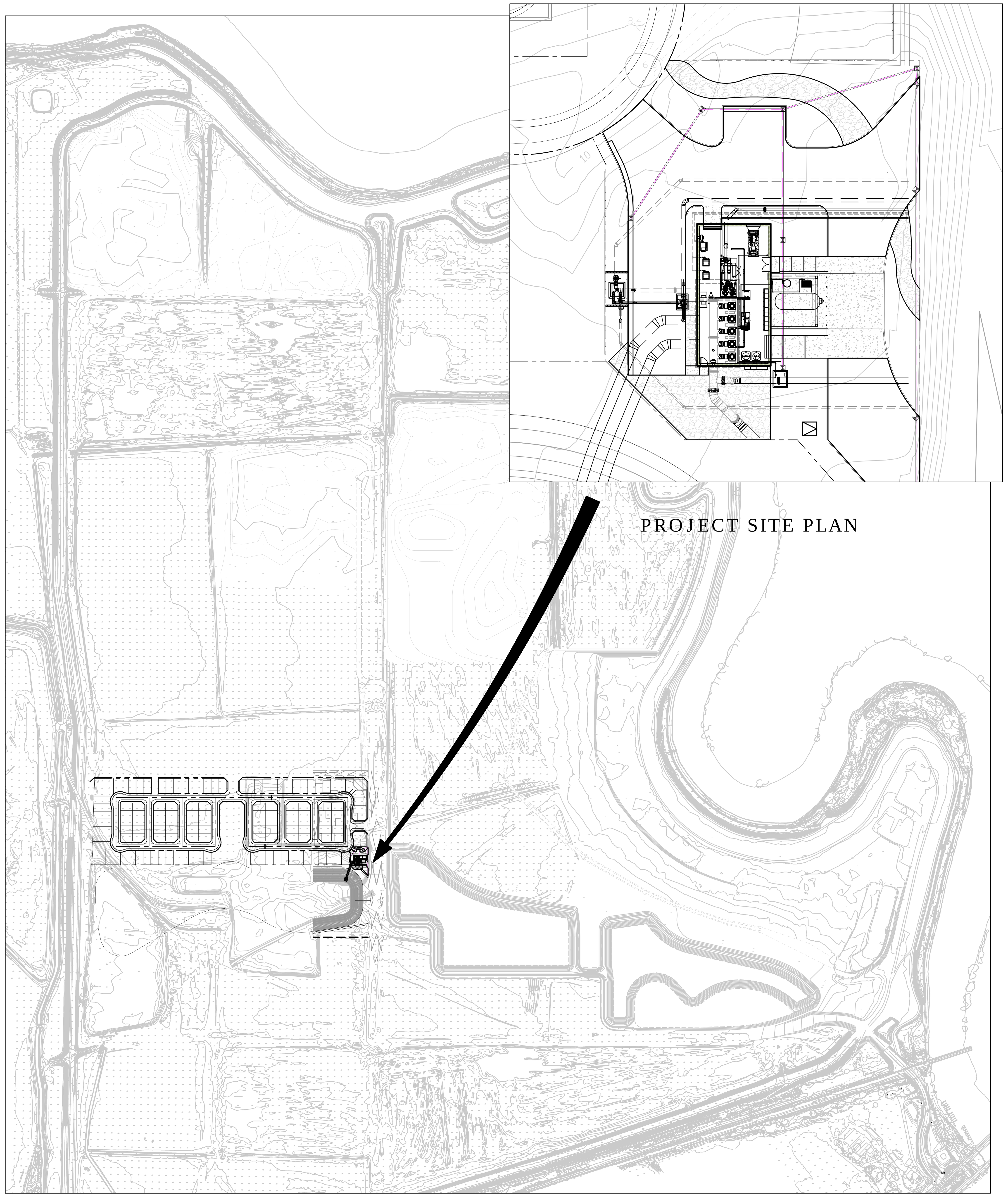
RECOMMENDED FOR APPROVAL:

DATE:______
RCE NO:______ 31695
CITY ENGINEER
EXP DATE:______

RECOMMENDED FOR APPROVAL:

DATE:______ 31695
FIRE MARSHAL

811
Know what's **below.**
Call before you dig.



PROJECT SITE PLAN

NORTH
500 250 0 500 1000

SHEET INDEX

DWG. No.	SHT. No.	DESCRIPTION	4
GENERAL			
1	G1.0	TITLE SHEET	5/10/16
2	G2.0	GENERAL NOTES	5/10/16
3	G3.0	APPLICATIONS CHECKLISTS AND ABBREVIATIONS	5/10/16
CIVIL			
4	C1.0	BOUNDARY AND HORIZONTAL CONTROL	5/10/16
5	C2.0	GRADING AND DRAINAGE PLAN	5/10/16
6	C3.0	UTILITY PLAN	5/10/16
7	C4.0	YARD PIPING PLAN	5/10/16
MECHANICAL			
8	M0.0	EQUIPMENT LIST	5/10/16
9	M1.0	MECHANICAL LAYOUT	5/10/16
10	M1.1	MECHANICAL SECTION	5/10/16
11	M1.2	MECHANICAL SECTIONS	5/10/16
12	M2.0	OZONE GENERATION PLAN	5/10/16
13	M3.0	STATION DRAIN PLAN	5/10/16
14	M4.0	AIR GAP, VALVE VAULT & OZONE INJECTION STRUCTURES	5/10/16
15	M4.1	MECHANICAL DETAILS	5/10/16
16	M4.2	MECHANICAL DETAILS	5/10/16
17	M4.3	MECHANICAL DETAILS	5/10/16
18	M4.4	MECHANICAL DETAILS	5/10/16
ARCHITECTURAL			
19	AS-1	BUILDING FLOOR PLAN	5/10/16
20	AS-2	BUILDING ELEVATIONS	5/10/16
21	AS-3	BUILDING SECTIONS	5/10/16
STRUCTURAL			
22	S1.0	STRUCTURAL GENERAL NOTES	5/10/16
23	S1.1	FOUNDATION PLAN	5/10/16
24	S1.2	FRAMING PLAN	5/10/16
25	S1.3	FRAMING PLAN & DETAILS	5/10/16
26	S1.4	SLAB PLAN	5/10/16
27	S2.1	TYPICAL DETAILS	5/10/16
28	S2.2	TYPICAL DETAILS	5/10/16
29	S2.3	WET WELL FOUNDATION PLAN	5/10/16
30	S3.1	ROOF DETAILS	5/10/16
31	S3.2	ROOF DETAILS	5/10/16
32	S3.3	TYPICAL WALL SECTONS	5/10/16
33	S3.4	HATCH AND TRUSS DETAILS	5/10/16
34	S3.5	CANOPY DETAILS	5/10/16
35	S3.6	HATCH DETAILS	5/10/16
36	S4.1	ELEVATION BUILDING SECTION	5/10/16
37	S4.2	ELEVATION BUILDING SECTION	5/10/16
38	S5.1	STRUCTURAL DETAILS	5/10/16
39	S6.1	GABLE TRUSS LOADING DIAGRAMS	5/10/16
P&ID			
40	I0.0	P&ID SYMBOLS, LEGEND AND ABBREVIATIONS	5/10/16
41	I0.1	NETWORK COMMUNICATION DIAGRAM	5/10/16
42	I1.0	LAKE AND IRRIGATION WET WELLS	5/10/16
43	I2.0	OZONE P&ID	5/10/16
44	I3.0	GENERATOR P&ID	5/10/16
ELECTRICAL			
45	E1.0	ELECTRICAL LEGEND	5/10/16
46	E1.1	ELECTRICAL SINGLE LINE DIAGRAM & LOAD SCHEDULES	5/10/16
47	E1.2	ELECTRICAL CONDUIT SCHEDULES	5/10/16
48	E1.3	ELEMENTARY CONTROL DIAGRAMS	5/10/16
49	E1.4	ELEMENTARY CONTROL DIAGRAMS	5/10/16
50	E1.5	PANEL SCHEDULE	5/10/16
51	E2.0	SITE ELECTRICAL PLAN	5/10/16
52	E2.1	POWER & CONTROL CONDUIT PLAN	5/10/16
53	E2.2	LIGHTING PLAN	5/10/16
54	E2.3	TITLE 24 CALCULATION SHT. 1	5/10/16
55	E3.0	ELECTRICAL DETAILS	5/10/16
56	E3.1	ELEMENTARY CONTROL DIAGRAM	5/10/16

FOR CONSTRUCTION

NO	BY	DATE	REVISIONS	DATE	APP.
1	ZS	10/15	VENTILATION, BUILDING SLAB, ELECTRICAL / CONTROL	10/15	AK
2	ZS	12/15	REVISIONS PER CITY'S 1ST REVIEW	12/15	AK
3	ZS	01/18	REVISIONS PER 2ND PLAN CHECK & FIRE DEPARTMENT'S COMMENTS	01/16	AK
4	ZS	5/10/16	ADDED A VALVE VAULT FOR RIVER WATER TO AIR GAP	05/16	AK

REGISTERED PROFESSIONAL ENGINEER
ANDREW T. KOMOR
No. C64928
Exp. 06-30-17
CIVIL
STATE OF CALIFORNIA

PREPARED BY ANDY KOMOR
PROJECT ENGINEER
R.C.E. NO. — C 64928
EXP. 6/30/17
DRAWN TG
SCALE AS SHOWN
DESIGNED AK,ZS
CHECKED AK
DATE 12/18/15

TITLE
TITLE SHEET

JOB
RIVER ISLANDS
MAIN PUMPSTATION
LATHROP CA

PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

SHEET
G1.0
1 OF 48 SHEETS
JOB NO. 9013-E

MECHANICAL EQUIPMENT LIST				
ITEM	NAME	MANUFACTURER / MODEL	DESCRIPTION	QTY
1	VERTICAL TURBINE PUMP	PRIME PUMP /18M14-17°	MIXED FLOW PUMP, 480V, 3PH, 60 HZ,60 HP, 1180 RPM, WITH SOFT STARTER OPERATE AT 6,000 GPM AT 30' HEAD,18" FLANGE DISCHARGE CONNECTION	3
2	VERTICAL TURBINE PUMP	PRIME PUMP /18M14-17°	OWNER HAS PURCHASED (2) UNITS OF 18M14-11° PUMPS. THESE TWO PUMPS WILL NEED TO BE UPGRADED TO 18M14-17° BY REPLACING THE 50 HP MOTORS WITH NEW 6O HP MOTORS WITH SOFT STARTER AND REPLACING 11° IMPELLERS WITH 17° IMPELLERS, TO OPERATE AT 6,000 GPM AT 30' TDH, 1180 RPM, 480V, 3 PH, 60 HZ	2
3	IRRIGATION PUMP SKID W/ FILTERS AND CONTROLS	MCI	480V, 3PH, 60 HZ, 255 HP TOTAL, (1) 5 HP, (1) 30 HP, AND (3) X 75 HP PUMPS, OPERATE AT 3,000 GPM AT 80 PSI HEAD, 400 AMP MAIN DISCONNECT, (2) 10" VAF MODEL 1500 FILTERS , 6" CLA-VAL AIR RELEAVE VALVE, PRESSURE TRANSDUCER, 10" SHUT OFF VALVE, 8" MAGMETER, WET WELL LEVEL SENSOR/CONTROL, ETHERNET I/P COMMUNICATION	1
4	AIR BLOWER	KAESER / BB52C	85 CFM AT 13 PSI, 460V, 3 PHASE 60 HZ, 10 HP, 2" ANSI DISCHARGE CONNECTION, WITH SOUND ENCLOSURE	2
5	AIR COMPRESSOR/RECEIVER TANK FOR LAKE #3	KAESER / AIR CENTER AM10	10 HP, 480V, 3 PH COMPRESSOR WITH KOR FILTER, LCF CONDENSATE TREATMENT AND RECEIVER TANK, INCLUDING PRESSURE REGULATOR IN THE TANK OUTLET TO LAKE.	1
6	OZONE GENERATOR SKID	OZONIA / OZAT CFV 04	131 lb/d OZONE PRODUCTION AT SKID MOUNTED UNIT, 10% OZONE CONCENTRATION, 26.0 KW, 38 A, 480V/3PH/60HZ, OXYGEN FED, INCLUDING FEED GAS FILTER AND MIXING VALVES / ASSEMBLY, ETHERNET I/P COMMUNICATION	1
7	OZONE INJECTION PUMP SKID	OZONIA	SIDESTREAM PUMP (194 GPM @ 82', 7.5 HP, 460V/3P/60HZ), WITH S.S. MAZZI OZONE GAS INJECTION PORT, WATER DISCHARGE CHECK VALVE, OZONE GAS LINE BACK FLOW PREVENTOR DEVICE	1
8	LIQUID OXYGEN TANK	PRAXAIR / HS-3000	3,000 GAL. HORIZONTAL LIQUID OXYGEN TANK TO DELIVER 1,300 LB/DAY OF OXYGEN. SYSTEM SHALL INCLUDE ALL ACCESSORIES, VALVES, FILL PORT, PIPING AND VAPORIZER. SUPPLIED AND INSTALLED BY PRAXAIR.	1
9	NITROGEN GAS TANK	PRAXAIR / 600 GAL	NITROGEN GAS TANK TO DELIVER 26 LB/DAY OF NITROGEN. SUPPLIED BY PRAXAIR AND INSTALLED BY CONTRACTOR.	1
10	AMBIENT OXYGEN MONITOR	OZONIA OR ATI / D12-4-4-2	FOR OXYGEN GAS MONITORING, C/W SENSOR (00-1014)AND MONITOR, ALARM, AND OUTPUT SIGNAL RANGE 0-25% (INCLUDED IN OZONE SYSTEM PACKAGE)	2
11	AMBIENT OZONE MONITOR	OZONIA OR ATI / D12-4-4-2	FOR OZONE GAS MONITORING, C/W SENSOR (00-1009)AND MONITOR, ALARM, AND OUTPUT SIGNAL RANGE 0-200 PPM (INCLUDED IN OZONE SYSTEM PACKAGE)	1
12	~~EXHAUST FAN~~	~~DAYTON~~	~~36" CABINET SUPPLY FAN, 12,435 CFM@0.125" WC, 460V/3PH/60HZ, 1.5 HP, GALV. STEEL ENCLOSURE~~	2
13	CHLORINE AND ALUM TOTE AND FEED PUMP	BLUE-WHITE/ACE/JUSTRITE	300 GAL. TOTES BY ACE ROTO-MOLD MODEL SP0300-PP, AND 372 GAL. SPILL CONTAINMENT BY JUSTRITE JR-28674 AND BLUE-WHITE FEED PUMP: FLEXPRO A2V24-NH, 8.0 GPH AT 125 PSI, 115VAC/60 HZ, W/ 0-24mA INPUT AND OUTPUT	2
14	LEVEL TRANSDUCER	SIEMENS HYDRORANGER	SINGLE POINT, 1-45 FT MEASUREMENT RANGE, XPS 15F SERIES TRANSDUCER (1-45 FT, 43 KHZ FREQUENCY, 6° BEAM ANGLE. PROVIDE 1 ADDITIONAL XPS-15 TRANSDUCER AS SPEAR.	2
15	ACCESS LADDER		ACCESS LADDER W/ SAFETY EXTENSION. SEE DETAIL C PER SHEET M4.0	2
16	ACCESS SAFETY HATCH	FLYGT / 13-430082	32" X 34 5/8" OPENING WITH SAFE GRATE AND ALUMINUM HATCH ACCESS COVER	2
17	CHECK VALVE	MULLER, KENNEDY, OR EQUAL	18" WAFER CHECK VALVE, CAST IRON BODY	5
18	BUTTERFLY VALVE	KENNEDY VALVE, OR EQUAL	18" BUTTERFLY VALVE , CAST IRON BODY	5
19	MOTORIZED B.V.	KENNEDY VALVE, OR EQUAL	42" MOTORIZED BUTTERFLY VALVE , CAST IRON BODY, 480V,60 HZ, 3 PH.	1
20	MOTORIZED B.V.	KENNEDY VALVE, OR EQUAL	30" MOTORIZED BUTTERFLY VALVE , CAST IRON BODY, 480V,60 HZ, 3 PH.	1
21	AIR RELEASE VALVE	VAL-MATIC / DEZURIK 1800S	8" AIR RELEASE/ VACUUM COMBINATION VALVE WITH 8" GATE SHUT OFF VALVE AND FLANGES	1
22	SPOOL PIECE		42" STEEL SPOOL WITH FLANGES ON BOTH SIDES, LENGTH SHALL MATCH 42" MOTORIZED B.V. VALVE, TO BE PLACED ON SHELVE FOR EMERGENCY REPLACEMENT	1
23	BLIND FLANGE		30" STEEL BLIND FLANGE, TO BE PLACED ON SHELVE FOR EMERGENCY REPLACEMENT FOR 30" MOTORIZED VALVE	1
24	STANDBY POWER GENERATOR	GENERAC / SD 0300KG17103D OR EQUAL	OPEN SET 300 KW STANDBY RATED, 277/480 VAC, 3 PH, 60 HZ, INCLUDING ALL CONTROLS, BATTERY & CHARGER, 600 GAL FUEL BASE TANK, START UP AND TRAINING, AND AIR PERMIT. ALSO INCLUDE EXHAUST SILENCER, EXHAUST PIPE AND CAP, FABRICATED VENTING DUCT FOR RADIATOR	1
25	HORN / STROBE COMBO	USA BLUEBOOK / 35973	120v, RED CLOR, SURFACE MOUNT	1
26	OXYGEN GAS FLOW METER	FCI / ST75	INCLUDED IN OZONE GENERATOR PACKAGE	2
27	NITROGEN GAS SOLEDOIND CONTROL VALVE	ASCO / 8210	1/2" NPT, 120 VAC, NC, BRASS CONSTRUCTION	1
28	OXYGEN GAS DEW POINT SENSOR / TRANSMITTER	MICHELL INSTRUMENTS / EASIDEW PRO XP	INCLUDED IN OZONE GENERATOR PACKAGE	1
29	WAFER STATIC MIXER	WESTFALL / MODEL 2800	30" 316L STAINLESS STEEL WITH FLANGES AND TWO INJECTION PORTS	1
30	STROBE	USA BLUEBOOK / 27903	120v, RED CLOR, SURFACE MOUNT	1
31	NITROGEN GAS FLOW METER	FCI / ST75	1/2" NPT, 316L, FLOW AND TOTALIZER, 120 VAC, WITH LOCAL DISPLAY	1
32	OZONE GAS LINE CHECK VALVE	OZONE SOLUTIONS/ CVST-16	FOR 10% OR GREATER OZONE CONCENTRATION, 1" FNPT, 316L SS WITH PTFE SEALS, 200 PSI (INCLUDED IN OZONE SYSTEM PACKAGE)	2
33	DUCKBILL CHECK VALVE	TIDEFLEX TF-2	20" BUBBER DUCK BILL CHECK VALVE - PIPE END WITH CLAMPS TO BE INSTALLED OVER 20" PIPE	2
34	OXYGEN GAS FLOW CONTROL VALVE	FLOWTEK F15 OR EQUAL	1" CONNECTIONS, V-PORT BALL VALVE, 316L SS BODY, RPTFE SEAT, 150 PSI, FOR FLOW RANGE 0 - 20 CFM, OXYGEN CLEANED, 120V ELECTRIC ACTUATOR. CONTRACTOR TO SUBMIT VALVE SELECTION CALCULATIONS BEFORE PURCHASING. (INCLUDED IN OZONE SYSTEM PACKAGE	1
35	TDS / CONDUCTIVITY SENSOR AND CONTROLLER	HACH / 3433, SC200 OR E+H	ANALOG CONDUCTIVITY SENSOR RANGE 0-10000 µS/cm , NON-METALLIC GENERAL PURPOSE, 3/4" NTP CONNECTION, 40' CABLE MIN. PIPE END INSTALLATION, CONTROLLER POWER SUPPLY:120VAC, 4-20 Ma OUTPUT.	1
36	FLOW CONTROL VALVE AND FLOW METER	CLA-VAL / 643A-01	12" REDUCING PORT DUCTILE IRON ANGLE VALVE WITH 120VAC SOLENOID ON/OFF CONTROL, 10" VALVE PORT AND 8" ID ORIFICE PLATE FOR 0-4000 GPM FLOW CONTROL, OPEING AND CLOSING SPEED CONTROL, 12" 150 PSI FLANGE CONNECTIONS, INSERTION FLOW METER X144 .	1
37	FLOW CONTROL VALVE AND FLOW METER	CLA-VAL / 43A-01	8" DUCTILE IRON ANGLE VALVE WITH ANTI-CAVITATION TRIM, 120VAC SOLENOID ON/OFF CONTROL, ORIFICE PLATE FOR 0-1500 GPM FLOW, OPEING AND CLOSING SPEED CONTROL, 8" 150 PSI FLANGE CONNECTIONS, INSERTION FLOW METER X144 .	1
38	BUTTERFLY VALVE	KENNEDY VALVE, OR EQUAL	12" BUTTERFLY VALVE , CAST IRON BODY, 150 PSI, FOR RECYCLED WATER LINE	1
39	BUTTERFLY VALVE	KENNEDY VALVE, OR EQUAL	8" BUTTERFLY VALVE , CAST IRON BODY, 150 PSI, FOR POTABLE WATER LINE	1
40	~~FLOAT SWITCH~~	~~FLOWLINE OR EQUAL~~	~~BACK-UP LEVEL SWITCHES FOR HIGH LEVEL AND LOW LEVEL CUT OFF~~	2
41	RIVER WATER DIVERSION CONTROL VALVE	DEZURIK OR EQUAL	(1) 12" BUTTERFLY VALVE AND (1) 8" BUTTERFLY VALVE TO BE CONTROLLED BY (1) ACTUATOR - ROTORK IQT2000, 480V, 60 HZ, 3 PH. ONE VALVE IN OPEN POSITION AND THE OTHER VALVE SHALL BE IN CLOSED POSITION.	1

PIPING CONSTRUCTION NOTES:

1. ALL ABOVE GROUND PIPE & FITTINGS SHALL BE CML & EPOXY COATED STEEL PIPE. BURIED STEEL PIPE & FIITINGS SHALL BE CML & COATED. SEE SPECIFICATIONS.
2. HDPE LAP-JOINT FLANGE ASSEMBLY SHALL COMPLY w/ PLASTIC PIPE INSTITUTE TECHNICAL NOTE 38.
3. BECAUSE OF OXYGEN AND OZONE SERVICES, ALL 02 AND O3 GAS PIPES,INSTRUMENTS AND FITTINGS MUST BE COMPLETELY OIL AND GREASE FREE. CLEAN PIPES ACCORDING TO THE COMPRESSED GAS ASSOCIATION (CGA), CHAPTER G-4.1, ƒCLEANING EQUIPMENT FOR OXYGEN SERVICE¤. THE APPROPRIATE METHOD MUST BE DETERMINED AND UTILIZED BASED ON THE CONTAMINATION THAT IS PRESENT. THE RESPONSIBLE CONTRACTOR TO USE A QUALIFIED OXYGEN CLEANING COMPANY FOR THIS SERVICE. ALL ACCESSIBLE PIPING SHALL BE CHECKED WITH A BLACK LIGHT TO ASSURE NO CONTAMINANTS REMAIN.

FOR CONSTRUCTION

NO	BY	DATE	REVISIONS	DATE	APP.
1	ZS	10/15	VENTILATION, BUILDING SLAB, ELECTRICAL / CONTROL	10/15	AK
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4	ZS	5/10/16	ADDED A VALVE VAULT FOR RIVER WATER TO AIR GAP	05/16	AK

PREPARED BY ANDY KOMOR, PROJECT ENGINEER
R.C.E. NO. C 64928 EXP. 6/30/17
DRAWN TG | SCALE AS SHOWN
DESIGNED AK,ZS | CHECKED AK | DATE 12/18/15

TITLE: EQUIPMENT LIST

JOB: RIVER ISLANDS MAIN PUMPSTATION, LATHROP CA

PACE Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

SHEET M0.0
8 OF 48 SHEETS
JOB NO. 9013-E

CONSTRUCTION NOTES:

1. CMU BLOCK BUILDING PER STRUCTURAL AND ARCHITECTURAL DRAWINGS.
2. INSTALL CONCRETE PUMP BASE PER STRUCTURAL PLANS.
3. INSTALL 42"ø CML & EC STEEL HEADER. FABRICATION PER DETAIL D/M4.1
4. INSTALL 42"ø CML & EC STEEL HEADER. FABRICATION PER DETAIL E/M4.1
5. INSTALL 42"x30" CML & EC STEEL TEE, FLG'D.
6. INSTALL 42"ø CML & COATED STEEL PIPE SPOOL. FABRICATION PER DETAIL G/M4.1
7. INSTALL 42" FLG'D CONNECTION BETWEEN CML&C STEEL PIPE & HDPE PIPE FLANGE ADAPTER. FLG'D JOINT SHALL COMPLY w/ PLASTIC PIPE INSTITUTE TECHNICAL NOTE 38.
8. INSTALL 48"x42" DR32.5 HDPE REDUCER.
9. INSTALL 30"-90° CML & COATED STEEL PIPE BEND, FLG'D.
10. INSTALL 30" FLG'D CONNECTION BETWEEN CML&C STEEL PIPE & HDPE PIPE FLANGE ADAPTER. SEE NOTE 2.
11. INSTALL 10"ø CML & EPOXY COATED STL. IRRIGATION HEADER. SEE DETAIL F/M4.1
12. INSTALL ±32 L.F. OF 14" CML & COATED STEEL PIPE.
13. INSTALL 14" FLG'D CONNECTION BETWEEN CML&C STEEL PIPE & HDPE PIPE FLANGE ADAPTER. SEE NOTE 2
14. INSTALL REMOVABLE GENERATOR EXHAUST ACOUSTIC LOUVER DOORS PER A/M4.2 OPENING SIZE: 70"W x 106"H (MIN.).
15. FABRICATE AND INSTALL REMOVABLE EXHAUST DUCT. RADIATOR OUTLET SIZE 44"x48", MATCH LOUVER DOOR
16. INSTALL GENERATOR EQUIPMENT PAD PER STRUCTURAL PLANS.
17. INSTALL HOSE BIB PER DETAIL E/M4.2
18. CONTRACTOR TO INSTALL 1" WATER SERVICE FROM CITY METER TO PUMP STATION.
19. ROLL UP DOOR FOR EQUIPMENT REMOVAL (10'Wx8'H)
20. INSTALL 20" FLEXIBLE STEEL COUPLING OR EQUAL.
21. LIMIT OF CONCRETE PAD FOR LOX TANK AND SERVICE. SEE STRUCTURAL FOUNDATION PLAN.
22. INSTALL PIPE BOLLARD PER DETAIL F/M4.2
23. CONCRETE LANDING PER STRUCTURAL PLANS.
24. INSTALL 2" BALL VALVES.
25. OZONE GENERATION AND INJECTION SYSTEM PLAN PER SHEET M2.0.
26. INSTALL DRAIN SYSTEM PER SHEET M3.1.
28. INSTALL PVDF TUBING (CHLORINE) IN 2" SCH. 40 PVC EMBEDDED IN FLOOR.
29. ROOF OPENINGS FOR PUMP REMOVAL, SEE STRUCTURAL PLANS.
27. INSTALL VALVE VAULT STRUCTURE PER DETAIL C/M4.0

PIPING CONSTRUCTION NOTES:

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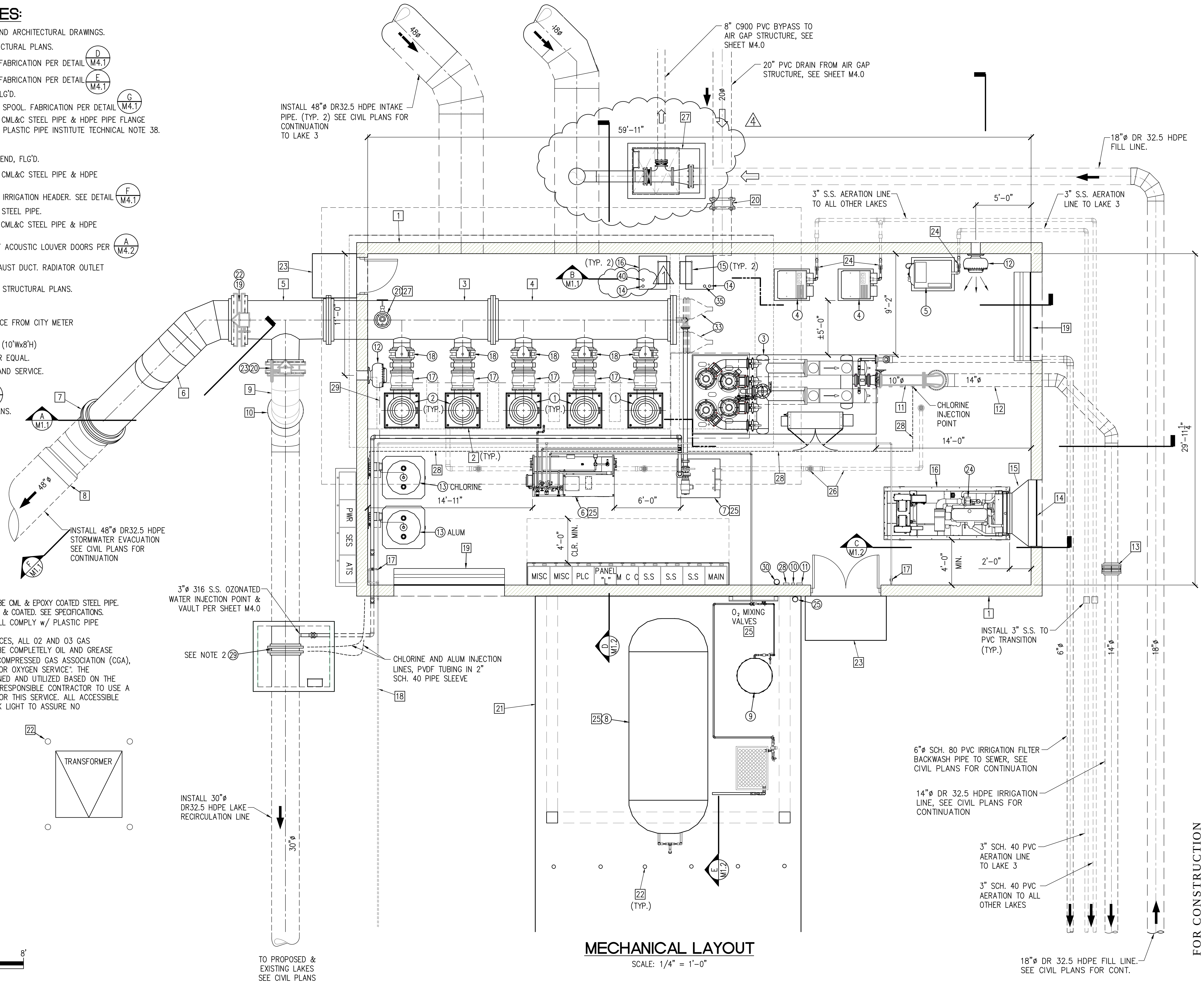

MECHANICAL LAYOUT

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

FOR CONSTRUCTION

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4	ZS	5/10/16	ADDED A VALVE VAULT FOR RIVER WATER TO AIR GAP	05/16	AK

REGISTERED PROFESSIONAL ENGINEER ANDREW T. KOMOR No. C64928 Exp. 06-30-17 CIVIL STATE OF CALIFORNIA

PREPARED BY ANDY KOMOR, PROJECT ENGINEER, R.C.E. NO. C 64928, EXP. 6/30/17
DRAWN TG | SCALE AS SHOWN
DESIGNED AK,ZS | CHECKED AK | DATE 12/18/15

TITLE: MECHANICAL LAYOUT

JOB: RIVER ISLANDS MAIN PUMPSTATION, LATHROP, CA

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SHEET M1.0
9 OF 48 SHEETS
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CONSTRUCTION NOTES:

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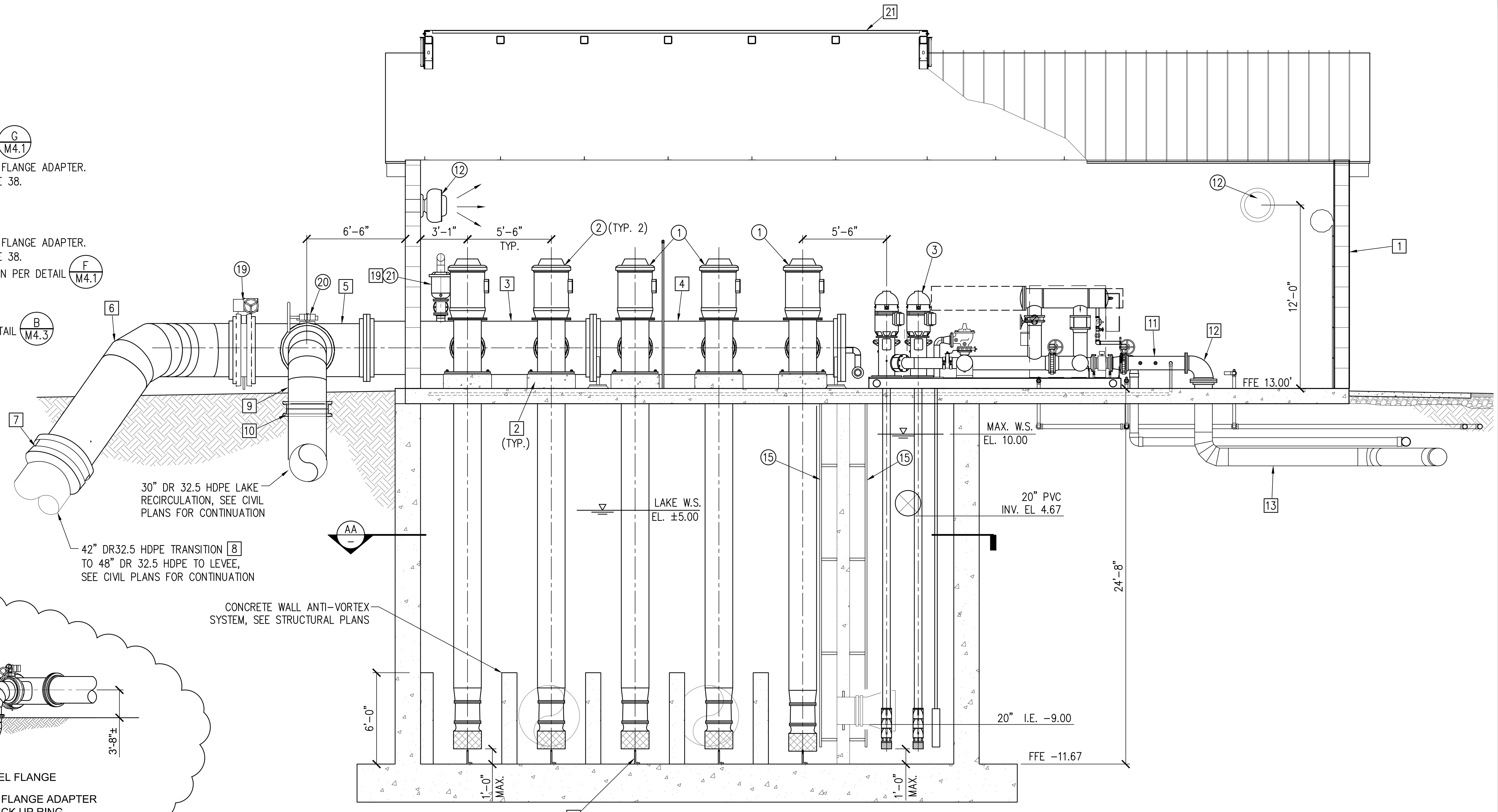
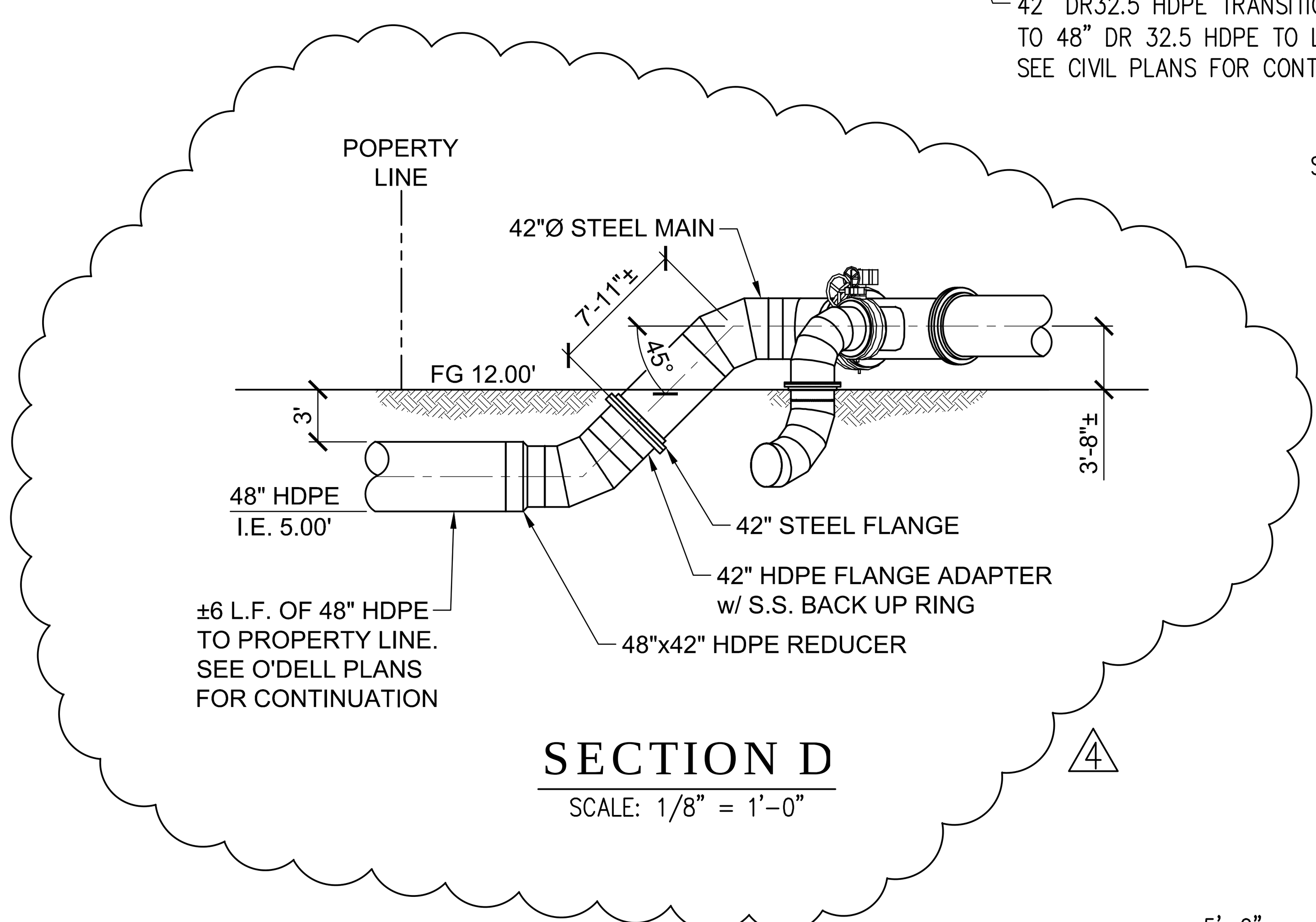
12. INSTALL 14"x10"–90° CML & EPOXY COATED STEEL BEND, FLG'D.
13. INSTALL ±32 L.F. OF 14" CML & COATED STEEL PIPE.
14. INSTALL 20" WALL PIPE SLEEVE (PExPE) w/ RUBBER CHECK VALVE PER DETAIL B/M4.3
15. INSTALL PUMP VANE. FABRICATION PER DETAIL C/M4.1
16. ROLL UP DOOR FOR EQUIPMENT REMOVAL(10'Wx8'H).
17. INSTALL 2" BALL VALVE.
18. INSTALL 3" EQUIPMENT PAD. SEE STRUCTURAL PLANS.
19. INSTALL 6" AIR RELEASE VALVE PER DETAIL H/M4.1
20. ROOF OPENINGS FOR PUMP REMOVAL, SEE STRUCTURAL PLANS.
21. ROOF OPENINGS FOR PUMP REMOVAL, SEE STRUCTURAL PLANS.



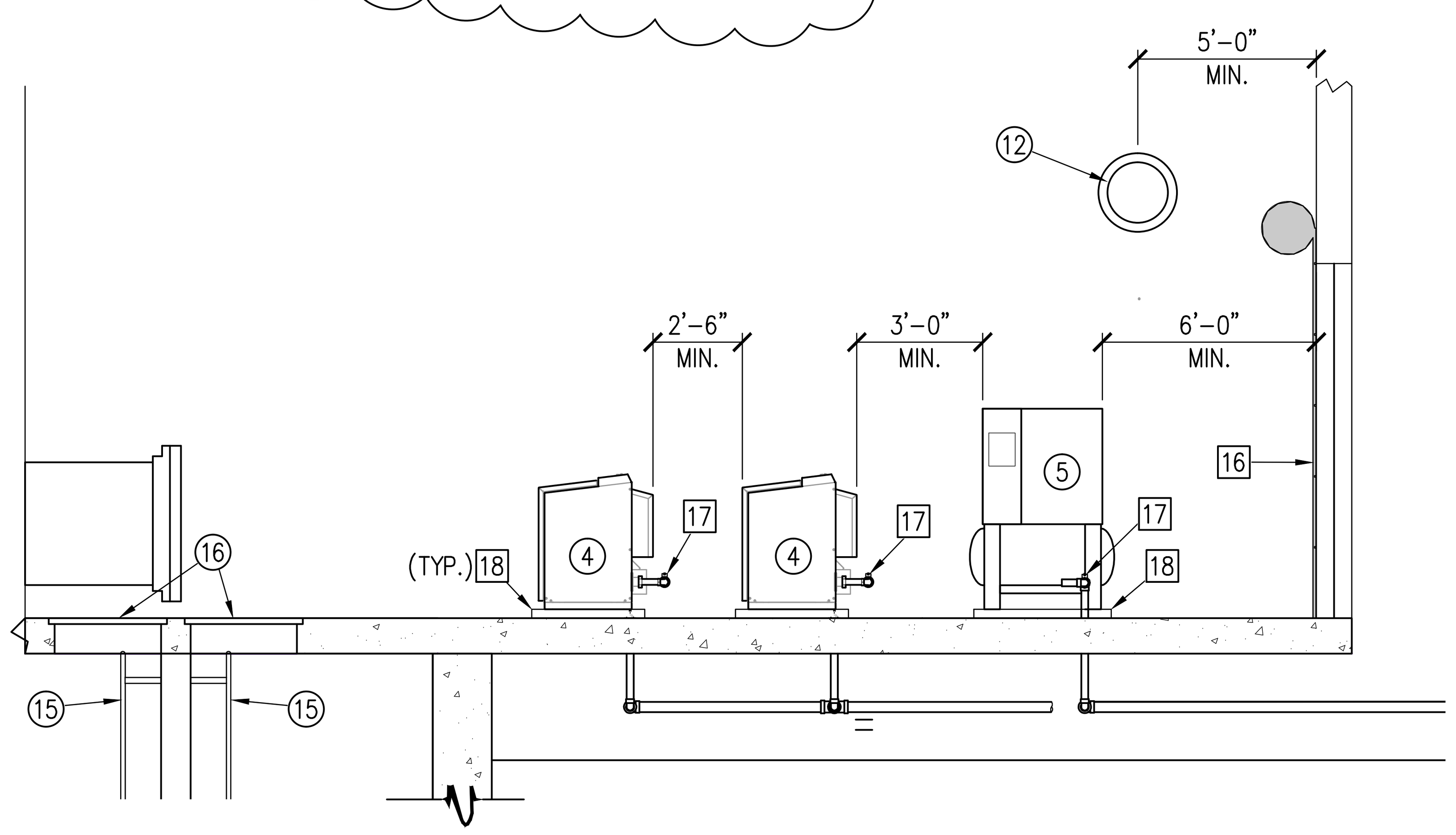
SECTION A

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



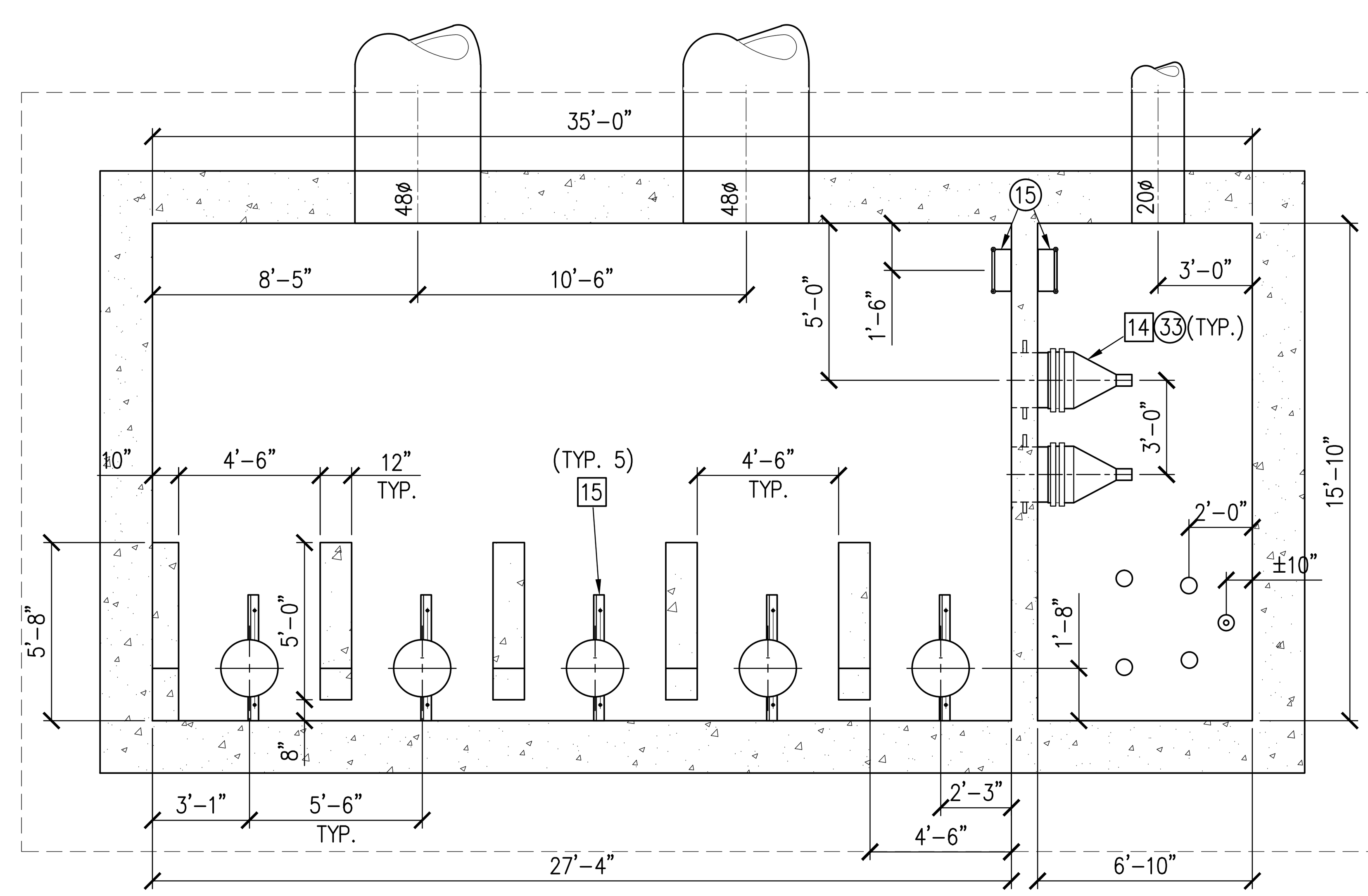
SECTION D

SCALE: 1/8" = 1'-0"



SECTION B

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



SECTION AA - WET WELL BELOW PLAN VIEW

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

FOR CONSTRUCTION

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THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E. AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR BE USED FOR CONSTRUCTION UNLESS STAMPED "ISSUED FOR CONSTRUCTION".

PREPARED BY ANDY KOMOR
PROJECT ENGINEER R.C.E. NO. C 64928 EXP. 6/30/17
DRAWN TG
DESIGNED AK, ZS
CHECKED AK
SCALE AS SHOWN
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JOB: RIVER ISLANDS MAIN PUMPSTATION
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10 OF 48 SHEETS
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Appendix H - Preliminary Phase II NPW Irrigation Map

NON-POTABLE IRRIGATION MAP

PARK #	PARK NAME	ACREAGE
	Neighborhood Parks	69.35
N1	Neighborhood Park 1	5.97
N2	Neighborhood Park 2	6.02
N3	Neighborhood Park 3	4.28
N4	Neighborhood Park 4	4.00
N5	Neighborhood Park 5	5.39
N6	Neighborhood Park 6	7.10
N7	Neighborhood Park 7	5.12
N8	Neighborhood Park 8	7.34
N9	Neighborhood Park 9	5.59
N10	Neighborhood Park 10	4.54
N11	Neighborhood Park 11	4.0
E1-E4	School Sites*	10.0
	Pocket Parks	23.52
P1	Pocket Park 1	0.86
P2	Pocket Park 2	0.36
P3	Pocket Park 3	0.59
P4	Pocket Park 4	0.44
P5	Pocket Park 5	0.38
P6	Pocket Park 6	2.73
P7	Pocket Park 7	0.79
P8	Pocket Park 8	0.59
P9	Pocket Park 9	0.24
P10	Pocket Park 10	1.25
P11	Pocket Park 11	0.57
P12	Pocket Park 12	0.54
P13	Pocket Park 13	0.46
P14	Pocket Park 14	0.76
P15	Pocket Park 15	1.41
P16	Pocket Park 16	0.31
P17	Pocket Park 17	0.49
P18	Pocket Park 18	0.33
P19	Pocket Park 19	0.38
P20	Pocket Park 20	0.89
P21	Pocket Park 21	0.33
P22	Pocket Park 22	0.73
P23	Pocket Park 23	0.29
P24	Pocket Park 24	0.46
P25	Pocket Park 25	0.37
P26	Pocket Park 26	0.78
P27	Pocket Park 27	0.28
P28	Pocket Park 28	0.31
P29	Pocket Park 29	0.22
P30	Pocket Park 30	0.20
P31	Pocket Park 31	0.94
P32	Pocket Park 32	0.86
P33	Pocker Park 33	0.42
P34	Pocket Park 34	0.27
P35	Pocket Park 35	0.20
P36	Pocket Park 36	0.39
P37	Pocket Park 37	1.22
P38	Pocket Park 38	0.12
P39	Pocket Park 39	0.25
P40	Pocket Park 40	0.50

Open Space - - - - - - - - - - - - - - - - - - - 241.8 acres

Non-Irrigated Open Space		186.0
Irrigated Open Space		33.2
Irrigated Lake Edge Area		22.6

PARK #	PARK NAME	ACREAGE
	Community Parks	96.56
C1	Community Park 1	31.46
C2	Community Park 2/High School	22.56
C3	Community Park 3	14.54
	Linear Parks	66.46
LP1	Linear Park 1	16.65
LP2	Linear Park 2	2.04
LP3	Linear Park 3	2.57
LP4	Linear Park 4	1.40
LP5	Linear Park 5	2.45
LP6	Linear Park 6	0.76
LP7	Linear Park 7	5.58
LP8	Linear Park 8	0.91
LP9	Linear Park 9	0.75
LP10	Linear Park 10	1.18
LP11	Linear Park 11	16.88
LP12	Linear Park 12	2.29
LP13	Linear Park 13	1.56
LP14	Linear Park 14	2.51
LP15	Linear Park 15	2.12
LP16	Linear Park 16	1.51
LP17	Linear Park 17	1.91
LP18	Linear Park 18	1.57
LP19	Linear Park 19	1.92
LP20	Linear Park 20	1.13
	Schools	71.15
E1**	K-8	9.39
E2**	K-8	10.01
E3**	K-8	9.75
E4**	K-8	9.5
HS**	High School	34.0
	Streets	40.0
S1***	150'	2.6
S2***	126'	24.0
S3***	104'	10.1
S4***	70' (School Frontage)	3.0
S5***	70' (Neighborhoods)	0
	Lake Edge Area	22.6
L14	Lake 14 Edge Area	1.25
L15	Lake 15 Edge Area	2.3
L16	Lake 16 Edge Area	0.99
L17	Lake 17 Edge Area	0.86
L18	Lake 18 Edge Area	2.64
L19	Lake 19 Edge Area	1.56
L20	Lake 20 Edge Area	1.6
L21	Lake 21 Edge Area	3.97
L22	Lake 22 Edge Area	0.96
L23	Lake 23 Edge Area	1.7
L24	Lake 24 Edge Area	1.05
L25	Lake 25 Edge Area	2.5
L26	Lake 26 Edge Area	1.22

*School Sites Calculation: # of Schools x 2.5 acres = total acres
**E1-4, HS Calculation: total parcel acres x 65%= total irrigated landscape area (acres)
E1-14.45 acres; E2-15.54 acres; E3-15.01 acres; E4-14.62 acres; HS-52.44 acres
***S1-3: Calculation: (road length x landscape width) x 85% = total landscape area (SF)
total landscape area/43,560 SF = total irrigated landscape area (acres)
S4: Calculation: (road length x landscape width) x 95% = total landscape area (SF)
total landscape area/43,560 SF = total irrigated landscape area (acres)
S5: Landscape in front of homes will not be irrigated with non-potable water

8/31/2020

Power Systems Design
2033 N. Main St. STE 200
Walnut Creek, CA 94596
Phone: 925-933-8485

July 27, 2020
River Islands at Lathrop
Attn: Mr. Ramon Batista
73 Stewart Road
Lathrop, CA 95330

Subject: River Islands at Lathrop Master Plan Electric and Natural Gas Utility Loads and Planned Ultimate System Capabilities

Dear Mr. Batista:

Pursuant to our recent discussion, this transmittal is to provide information relevant to the requirements and capabilities of electric and gas utilities within the comprehensive master plan of River Islands at Lathrop as a result of the increased loads expected with the proposed Phase 2 densification/intensification of both residential and non-residential land uses.

Based on the latest programming, the overall requirements of the project are as follows;

- 15,010 residential units

- 5,381,022 square feet of aggregate office, commercial, and retail space.

Utilizing historical and published utility data, Power Systems Design (PSD) has determined that the loads anticipated at full build out of the project appear to be adequate. This adequacy is not does not include reduction of load based on existing or anticipated photovoltaic contributions to the electric distribution system. Such reductions are likely, since recent State building code updates now mandate solar panels on new single family homes.

To summarize electrical demand:

PSD has estimated the residential component load to be about 45MVA design.

PSD has estimated the office, commercial and retail component load to be about 38MVA design (based on two methods of load estimation; municipal and public utility algorithms utilized by Modesto Irrigation District and Pacific Gas and Electric.

Total electric demand for the master plan has been estimated by PSD to be about 83MVA design.

Existing and proposed master plan electrical substation infrastructure (constructed in 2014 through 2016) includes space to accommodate three (3) 115kV/21kV transformers; which will provide adequate capacity for the ultimate build out. Nine (9) 21kV distribution feeders (aggregate rating in excess of the substation transformer bank capacity) are planned to accommodate the ultimate development.

PSD has determined that the electric distribution system capability is adequate for the latest programming.

115kV line (constructed 2015) capacity based on conductor rating is about 112 MVA and will support the proposed ultimate build out of the development.

Please note that the above demands are based on design, actual use will be less than the design values.

To summarize natural gas demand, PSD utilized accepted utility load estimating algorithms to determine the following:

The residential component load is estimated to be about 525Mcfh.

The commercial/retail and industrial component load is about 108Mcfh.

Total natural gas demand for the master plan is estimated to be about 633Mcfh.

PG&E gas facilities in the area consist of a high pressure 8-inch natural gas transmission pipeline that enters the project in River Islands Parkway via the Bradshaw's Crossing Bridge to a gas pressure reducing station near the bridge. From the station, a 6-inch distribution main backbone system serves the project via River Islands Parkway and other arterial streets. Additionally, a 6-inch distribution line enters the southern gateway in Stewart Road/Lakeside Drive via the San Joaquin Bicycle/Pedestrian Bridge. This line provides addtional capacity and redundancy to the backbone system. This capability is adequate for the latest programming as presented to PSD.

Please note that the above demands are based on design, actual use will likely be less than the design values.

In conclusion, PSD has determined that the proposed master plan gas and electric utility provisions are adequate for the latest programming, and address the River Islands Phase 2 SEIR concerns. This letter may be cited as such.

If you have any questions or need any additional information or clarification regarding this transmittal, please contact PSD at 925.933.8485. Thank you for considering Power Systems Design for your electric engineering/dry utility study needs.

Very Truly Yours,

Gerald Jones

Power Systems Design