CITY OF SCOTTSDALE

Abbreviated Water and Sewer Needs

PRELIMINARY WATER & SEWER REPORT

for the Zoning Case

FIESTA RANCH

136th Street and Rio Verde Drive
Scottsdale, Arizona

Prepared For:

Lyle Anderson Companies
8777 N. Gainey Center Drive
Scottsdale, AZ 85258

PRELIMINARY Basis of Design Report
☐ ACCEPTED
☑ ACCEPTED AS NOTED
☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE
SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If accepted; the preliminary approval is granted under the condition that a final basis of design report will also be submitted for city review and approval (typically during the DR or PP case). The final report shall incorporate further water or sewer design and analysis requirements as defined in the city design standards and policy manual and address those items noted in the preliminary review comments (both separate and included herein). The final report shall be submitted and approved prior to the plan review submission.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY rrahman DATE 10/23/2019

Prepared by:

PRELIMINARY – FOR REVIEW AND COMMENT ONLY. October 4, 2019

SEG

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Project Number: 171081

Zoning Submittal Dates:
1st - March 4, 2019
2nd - July 8, 2019
3rd – August 30, 2019
4th – October 4, 2019

Case No.: 576-PA-2018 6-ZN-2019 Plan Check No.: TBD

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1. EXECUTIVE SUMMARY

Fiesta Ranch is located south of Rio Verde Drive, easterly of 136th Street, and will plat six parcels of land totaling 273 acres +/-. The property is largely undisturbed desert and was annexed into the City in the early 1990's. Unincorporated Maricopa County surrounds the site on the north, east and south. Reata Ranch, within the City of Scottsdale, abuts the site along shared frontage to 136th Street.

A preliminary plat with 176 single family residential lots was approved on November 6, 2000 through case number 9-PP-2000 complying with the existing R1-43 zoning. The property was subsequently rezoned to a mix of R1-190 ESL and R1-70 through zoning case numbers 14-ZN-2001 and 2-ZN-2004. Another preliminary plat with 141 single-family residential homes was prepared and a 30-acre parcel was later rezoned for an additional 9 lots bringing the total lot count to 150.

A Settlement Agreement and Development Agreement was recorded in 2004 (MCR 2004-0442075) stating 132 lots could be developed on the property utilizing individual on-site wastewater systems if compliant to Maricopa County Environmental Services Department (MCESD) requirements. Further language describes reimbursement considerations for the extension of water to the property.

This rezoning request will be for a mix of R1-18 ESL and R1-43 ESL with a maximum 260 single-family residential lots.

2. INTRODUCTION

2.1 PLAN OBJECTIVE:

The purpose of this report is to a) provide an overview of potential site development, b) show the water and sewer demands representing proposed zoning impacts, and c) describe the necessary water and sewer improvements to support the requested zoning.

2.2 SITE LOCATION

The project's six parcels of land are in a portion of Section 31, Township 5 North, Range 6 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. Parcel ID numbers are 219-39-010M, -010N, -010G, -010U, -010V and -010P. Refer to **EXHIBIT 1 – Vicinity Map – Context Aerial** for the project's location with respect to major cross streets and **EXHIBIT 2 – Aerial – Constraints Map**.

2.3 PROPOSED DEVELOPMENT

2.3.1 Existing Site Description:

This site is vacant desert land generally sloping from west (elevation 2480+/-) to east (elevation 2370 +/-) at approximately 2.5%. Presently there are no City

owned water or sewer lines or facilities on or adjacent to the site (See reference 1).

The applicable City Quarter Section Maps included in **Exhibit 4** are 50-61, 49-61, 49-62 and 50-62 for the site. Maps 51-54, 51-55 and 51-66 are included to show existing infrastructure to the west and Map 47-58 shows existing infrastructure to the south along 128th Street..

2.3.2 Proposed Site Development:

All water and sewer improvements will be designed and constructed to the most recent City of Scottsdale and MCESD design standards and policies. Refer to **EXHIBIT 3** for the Conceptual Site Plan and Development Land Use Budget. Detailed water and sewer pipe alignments along with sizes will be included in the design reports submitted with the Preliminary Plat case.

Per DSPM 6-1.201 & 7-1.201, preliminary water and sewer utility plans are required for Zoning cases.

3. DESIGN CRITERIA

3.1 DEVELOPMENT CRITERIA

Existing zoning: R1-190 ESL and R1-70 ESL
Proposed zoning: R1-18 ESL and R1-43 ESL

Demands, system layout, system pressures, velocities, head losses and fire flow will be all be in accordance with the COS DS&PM (see reference 2), the Arizona Administrative Code, Title 18, Chapter 9 along with data taken from the accepted design reports for Scottsdale National Golf Club and Reata Ranch.

Fire Flow Requirement: A 1000 gpm demand will be utilized in the final calculations based on preliminary development concepts.

4. ONSITE DEMANDS

4.1 PROJECT USE DESCRIPTION

Refer to **Tables 1 and 2** below for the proposed maximum demand calculations.

Table 1: PROPOSED FIESTA RANCH WATER DEMAND

Units	Zoning	DU/Acre	ADD (gpm)	Max Day Peaking Factor	Peak Hr. Peaking Factor	Avg. Day Demand (gpm)	Max. Day Demand (gpm)	Peak Demand (gpm)
206	R1-18	1.5	0.69	2	3.5	142	284	497
54	R1-43	1.0	0.69	2	3.5	37	75	130
					Totals	179	359	628

Note: ADD from DS+PM Figure 6.1-2 based on the Development and Land Use Budget in Exhibit 3

EXHIBIT 3 indicates 206 residential units are proposed on 135.5 acres so the density will be adjusted to 1.5 DU/Acre. R1-18 typically indicates a density of 2.4 DU/Acre (43,560/18,000).

Table 2: PROPOSED FIESTA RANCH SEWER DEMAND

Units	ADD (gal/person)	Persons per unit	Peaking Factor	Avg. Day Demand (gpd)	Avg. Day Demand (gpm)	Peak Dry Weather Flow (gpm) (1)	Peak Flow w/ Pool Allowance (gpm) (2)
260	100	2.5	4.0	65,000	45	181	216

(1) Peaking Factor = 4.0 per COS DS+PM

(2) Wet weather, infiltration and pool allowance is 35 gpm or approximately 20% of peak dry weather day flow

4.2 WATER ZONE

This project will fall within water pressure Zone 10 requiring PRVs where connecting to pressure zone 11 to the west at 136th Street and pressure Zone 12 at 128th Street.

4.3 PHASING OF DEMANDS

The project is likely to develop in phases. Engineering plans, along with the related design reports, will be prepared for each phase and will be coordinated with an overall final master plan to be prepared after approval of the zoning.

4.4 SUMMARY NARRATIVE OF DEMANDS

The water demand scenario governing system design will be maximum day plus fire flow.

Sewer flows will be collected in a public gravity system and conveyed to a new lift station located at the southeast corner of the site.

5. EXISTING FACILITIES / CONDITIONS

5.1 PREVIOUS MASTER PLANS

A Water Master Plan entitled "Scottsdale National Water Supply System" was approved for the site on May 7, 2001. At that time the project was proposing individual onsite wastewater treatment systems. As noted earlier, several iterations of plat densities were submitted and resulted in the settlement agreement.

The "Design Concept Report for Reata Ranch Wastewater Pumping Station" was accepted on June 5, 2015. No improvements to Reata Ranch have been constructed.

A sewer lift station and force main serving the Scottsdale National Golf Club development has been constructed. The "Basis of Design Update: Lift Station #47" prepared by Wilson Engineers, is dated 10/19/2016.

5.2 OFFSITE WATER AND SEWER INFRASTRUCTURE

The public water and sewer systems from the west along Rio Verde Drive terminate at 122nd Street. The public water and sewer systems from the south along 128th Street terminate near Ranch Gate Road. Relevant Sewer Q-S Maps are included in **Exhibit 4**.

6. OVERVIEW OF PROPOSED FACILITIES

Per DSPM 6-1.201 & 7-1.201, preliminary on-site and off site water and sewer utility plans are required for Zoning cases. Submit proposed facility plans in the final BOD.

6.1 WATER SYSTEM

6.1.1 Onsite:

The onsite distribution system will be in Pressure Zone 10 and designed to provide redundant sourcing within the development by connections to Rio Verde Drive and 136th Street. PRVs will be required for connections to Pressure Zone 11 at the intersection of 136th and Rio Verde and a secondary connection into the Reata Ranch development further south of Rio Verde at 136th Street. Onsite water lines will consist of 12, 8 and 6" ductile iron pipe with no dead-ends greater than 1200 feet. Where needed, automated flushing valves will be provided near terminal sewer manholes to improve water quality and provide supplemental service water to the proposed lift station. The site has approximately 110 feet of fall allowing the static pressure of Zone 10 to range from 65 to 115 psi as set by the PRVs at 136th Street. A water sampling station will be located as requested by the city per DS+PM Sec. 6-1.418.

6.1.2 Offsite:

Presently a 16" water line in Rio Verde Drive terminates at 122nd Street. Plans have been approved with the Reata Ranch project to extend this 16" line to 128th Street through a PRV and then continue as a 12" line to 136th Street. Construction of this line is not presently scheduled. Flow testing on the 16" Rio Verde water system near 122nd Street on May 30, 2019 indicated a sufficient source of water is available to provide service within this area of Scottsdale (see **Exhibit 5**). Refer to **APPENDIX 4** for the hydraulic max day + fire flow demand calculations (1500 + 880 = 1380 gpm) along the 12" pipe between 128th and 136th Streets. The demands associated with the hydraulic calculation follow in Table 5.

2,380

Table 5: PROPOSED DEMANDS ON 128th to 136th STREET WATERLINE

	# of Units	ADD (gpm)	Max Day Peaking Factor	Peak Hr. Peaking Factor	Avg. Day Demand (gpm)	Max. Day Demand (gpm)	Peak Demand (gpm)
Fiesta Ranch	260	0.69	2	3.5	179	359	628
Reata Ranch	330	0.69	2	3.5	228	455	797
Other	48	0.69	2	3.5	48	66	168
				Totals	455	880	1593

EXHIBIT 9 shows the overall skeletonized water system in the East Dynamite area along with the local LAIPs indicating line sizes and construction responsibilities.

Not shown on Exhibit 9

If Reata Ranch develops first, Fiesta Ranch will construct a PRV at its sole cost near the intersection of 136th and Rio Verde Drive and extend the 12" waterline east from 136th Street along Rio Verde as needed to serve the property. It is not anticipated that the line will benefit any adjacent County parcels.

Any recorded payback agreements for the shared frontage along 136th Street will be satisfied prior to the recording of the plat for Fiesta Ranch Plat.

As master planned, two sources of water will become available to this area as Reata Ranch develops and a Capital Project completes the 128th Street water line between Rio Verde and Ranch Gate Road. Refer to **EXHIBIT 9.**

Should the development of Fiesta Ranch precede Reata Ranch, Fiesta Ranch will need to construct the offsite water line from 122nd to its eastern boundary and south along its 136th Street frontage. Reimbursement arrangements may be requested for the following per Scottsdale's Revised Code:

- Credit eligibility for the 16" pipe along Rio Verde Drive between 122nd and 128th Street.
- Payback eligibility for the PRV assembly and 12" pipe along the Rio Verde Drive frontage from 128th to 136th .
- Payback eligibility for the 12" water pipe installed along the Fiesta Ranch 136th Street frontage.

The PRV assembly and 12" water pipe along the Rio Verde Drive frontage to Fiesta Ranch is not eligible for any reimbursement agreement and is the sole cost of the Fiesta Ranch developer.

6.2 SEWER SYSTEM

6.2.1 Onsite Gravity System:

The onsite collection system will consist of 8" pipes gravity flowing to the southeast corner of the development where a sewer lift station will be constructed. Design and construction of the gravity lines, the lift station and force main will comply with City and MCESD requirements. After acceptance, all public improvements will be owned, operated and maintained by the City.

Backwater valves on individual lots will be required where the finish floor level is not a minimum 12"es higher than the next upstream manhole rim elevation.

Phasing within Fiesta Ranch may require supplemental water to the lift station to assure adequate operation and flushing of the force main. Additionally, this water will assist in turnover of the potable system and potentially alleviate some water quality concerns. Alternately, chemical treatment may be provided at the lift station to mitigate septicity and odors..

The Fiesta Ranch force main will follow roadway alignments west where it will discharge into the 136th Street gravity line that flows to the Reata Ranch lift station. Final pipe alignments will be provided with the Preliminary Plat submittal.

6.2.2 Lift Station and Force Main Discussion:

If Fiesta Ranch precedes Reata Ranch, Fiesta Ranch developer shall be financially responsible for all on-site and off-site sewer infrastructure developments. Fiesta Ranch also needs to secure Reata Ranch LS lot from the Reata Ranch Developer.

Completion of the Reata Ranch lift station (LS #48) and force main is favorable prior to Fiesta Ranch obtaining sewer service. The design report accepted for this facility included capacity for 150 residential units within the Fiesta Ranch development (Reference 3). The original concept was for two force mains from Reata Ranch LS to connect to the two force mains from Scottsdale National Golf Club (SNGC) LS #47 and jointly discharge to the downstream gravity system.

Subsequent events including:

- development of the SNGC LS with a higher pump capacity,
- consideration for providing sewer service to properties south of Reata Ranch,
- this zoning for 260 lots within Fiesta Ranch,
- City staff requiring a revision to the demands for Reata Ranch and the surrounding area using a 4.0 peaking factor,
- Increased demands at the Reata Ranch LS requiring redesign, and
- meetings with Scottsdale Water Resources staff

have opened the following **Options** for design and operation of the LS #47 and LS #48 and respective force mains serving the east Rio Verde area.

1) Redesign the Reata Ranch LS to operate as originally planned, but at higher capacity, with both the Reata Ranch and SNGC lift stations discharging to a common force main and upgrade capacity of the SNGC LS as needed.

2) Install a separate force main from the Reata Ranch LS to parallel the existing force main from the SNGC LS and directly discharge to the downstream gravity system.

3) Design the Reata Ranch LS to discharge into the SNGC wet well and upgrade that facility as needed.

The three options are illustrated in **EXHIBIT 8**.

Discussion of Options: With any of these Options, the Reata Ranch LS and force main will require redesign to accommodate the increased flow from Fiesta Ranch, the increased demand for Reata Ranch and the offsite flow from properties south of Reata Ranch.

Option 1): Both the Reata Ranch LS #48 and SNGC LS #47 discharge to a common force main as was the intent of the accepted Reata Ranch Design report. The SNGC LS will require evaluation and both facilities redesigned to account for variable total dynamic heads including multiple operating scenarios as phased development occurs and the facilities operate independently or concurrently. Evaluating these Options becomes complex and will likely necessitate variable speed. The Reata Ranch facility will likely require two pumps in a series configuration (one submerged/one dry) based on available pumps and desired operating pressures. The use of VFDs and pumps in series will require approval from Scottsdale Water Operations.

Option 2): Design the Reata Ranch lift station to separately connect its own force main to the downstream gravity system allowing both lift stations to operate independently. This will require construction of a second set of force mains between 122nd and the downstream gravity system. Again, two pumps in series, one submersed and one dry, will likely be necessary for Reata Ranch LS to meet the high head and flow conditions. The installation of two new force mains to the point of gravity outfall may require stacking of the pipes as available corridor space is limited.

Option 3): The Reata Ranch lift station discharges directly into the SNGC wet well requiring redesign of the SNGC facility including new pumps and electric components. A larger wet well will be required. The SNGC site may be of adequate size allowing for construction without disrupting existing service (field verification will be provided prior to final design). With this option, the Reata Ranch LS will only require a duplex setup. Four alternatives are evaluated for the increased discharge from the SNGC LS.

a) One pump discharging to one existing 6" force main with the second 6" main as backup,
b) One pump discharging to a new 8" force main with both existing 6" mains as backup,
c) Two pumps with each discharging to each of the existing 6" force mains which may require the installation of a third force main for backup, or construction of additional storage in the event one of the mains is taken out of service.
d) Two pumps discharging to one existing 6" force main with the second 6" force main as backup.

Per DSPM Section 7-1.303, max allowed velocity in force main is 6 fps. With this velocity, max conveyance capacity of a 6" force main is approximately 529 gpm. If the flow from SNGC LS (including flow from Reata & Fiesta LS) exceeds 6 fps velocity criteria within one 6" force main, will require installation of a third larger force main (sized to be determined) at the sole cost of the developer/owner.

The COS DS+PM limits force main velocity to 6 fps. The shaded sections on the Tables in **APPENDIX 1** reflect this design requirement.

This report recommends **Option 3** based on existing conditions, relevant design criteria, pump availability and an opportunity to minimize the complexity of the operational scenarios.

The following section expands on the pumping and force main alternatives presented for **Option 3.**

The developer shall be financially responsible for the modifications to the Lift stations, particularly, SNGC and any on-site or off-site force main and gravity sewer lines that will be impacted by the flow from Fiesta Ranch.

Preliminary pump, wet well, and force main sizing is provided in **Appendices 1 and 2**. No portion of the sewer improvements are credit eligible per SRC Sec. 49-83. The cost of all improvements to the gravity systems, the sewer lift stations, and associated force mains are the developer's sole responsibility. A facility cost sharing agreement may be initiated, by and between, the developers of Reata Ranch, Fiesta Ranch and any adjacent users to recover the system costs.

6.2.3 Lift Station and Force Main Recommendations:

Table 3 and **APPENDIX 1** present the increased flows and TDHs for the various areas and facilities. **APPENDIX 2** presents preliminary pump selections for Options 2 and 3. The implications of Option 1 were described and detailed in the 2015 Reata Ranch Design Report.

Table 3: SEWER DEMAND UPDATE AT THE REATA RANCH LIFT STATION

	Units	ADD (gal/person)	Persons per unit	Projected Population	Avg. Day Demand (gpd)	Avg. Day Demand (gpm)	Peak Dry Weather Flow (gpm)	Peak Flow w/ Pool Allowance (gpm) (1)
Reata Ranch SFR	255	100	2.5	638	63,750	44	176	
Reata Ranch Resorts	75	100	3.8	285	28,500	20	80	
Potential Off-site	48	100	2.5	120	12,000	8	32	
Reata Ranch Area Totals (2)				1,043	104,250	72	288	323
Lift Station From Fiesta Ranch				650	65,000	45	181	216
Totals				1693	169,250	118	469	539

(1) Wet weather, infiltration and pool allowance is 35 gpm for each facility
(2) Reata Ranch Wastewater Pumping Station Report peaking factor modified to 4.0

Preliminarily it appears 4" force mains will be required to discharge the Fiesta Ranch LS and 8" force mains to discharge the Reata Ranch LS. Retention time within the force mains will be evaluated and supplemental treatment or flushed water may be necessary to minimize septic conditions, provide odor control and scour the mains. Biofilter facilities will be constructed where the force mains connect to the gravity system.

The **Fiesta Ranch LS** will use a duplex submerged 38 hp pump system discharging 221 gpm into a single 4" force main (with a second as backup) and will required a 6-foot diameter wet well. The force main will discharge to a gravity line in 136th Street.

The **Reata Ranch LS** will use a duplex submerged 62 hp pump system discharging 570 gpm into a single 8" force main (with a second as backup). The previous accepted design report recommended 10 hp pumps at 179 gpm.

Option 3, discharging the Reata Ranch force main into the SNGC wet well is being recommended as:

- the increased demands of Reata Ranch combined with those of Fiesta Ranch elevate pump pressures in the other two Options at the Reata Ranch LS to near 150 psi.
- The TDH in the other two options will likely require a series pump configuration with one wet and one dry.
- The complexity of combining flows from the Reata Ranch LS and the SNGC LS at a common pressurized junction.
- The available corridor space presenting challenges for new force mains between 122nd and the gravity outfall.

The Reata Ranch LS will require a redesign for the increased flow to SNGC's LS and larger pumps will be necessary at both facilities.

SNGC LS: Four design alternatives at this station with **Option 3** follow:

a) Duplex submerged 100 hp pumps discharging 817 gpm into one of the existing 6" force mains. The second 6" force main is backup. This alternative exceeds the COS velocity criteria and thus not viable.

b) Duplex submerged 34 hp pumps discharging 765 gpm into a new 8" force main with the existing two 6" mains as backup. This pump would need to run a little left on the curve.

814 gpm?

c) Submerged 25 hp pumps each discharging 449 gpm into each of the two 6" force mains for a total of 898 gpm. An emergency storage vault would be constructed at the LS site in the event one pump or main is take out of service.

d) Both submerged 50 hp pumps discharging 814 gpm into one existing 6" main. A resulting 9.2 fps velocity exceeds the recommended COS maximum. Or - run each pump into each force main at a reduced frequency at adequate velocities and if one force main fails utilize both pumps into the single main. A third pump may be needed for backup.

Summary: The recommendation of this report is Option 3 with Alternative c) using both the existing 6" force mains, installing two new 25 hp pumps and constructing an emergency storage vault. If sufficient space is not available for the storage vault a new force main will be required and Alternative b) may be necessary. VFDs may be desirable on all lift stations to account for phased development and offset operational periods but will require concurrence from

Scottsdale Water Operations staff. Allowable operational storage depths within the wet wells will be analyzed as an option to the VFDs.

6.2.4 Downstream Gravity System:

The gravity system near 118th Street and Rio Verde Drive receiving flow from LS #47 is dedicated to the force main discharge and continues west to combine with a local gravity collection system near 111th Place. From that location the combined flows continue west within an 8" system to Alma School Road.

Scottsdale Water Resources staff is evaluating the impact of new development within the east Dynamite Character Area in the forthcoming Integrated Water / Wastewater Master Plan. City staff has stated Fiesta Ranch's responsibility for any required system improvements as a result of this zoning case is limited to the Dynamite/Rio Verde Road sewer system.

Table 4 adjusts the flow in the Dynamite Road gravity sewer to account for the force main discharges and flow from adjacent subdivisions.

Table 4: SEWER FLOW UPDATE ALONG DYNAMITE GRAVITY LINE TO ALMA SCHOOL

	Units	ADD (gpd)	Persons per Unit	Peak Day Factor	Avg. Day Demand (gpd)	Peak Demand (gpm)	Force Main Discharge (gpm)
Reata LS							539
Golf Club LS							275
Flow in gravity segment between force main and 111th							**814**
Pinnacle Foothills	31	100	2.5	4.0	7,750	22	
Crown View Estates	46	100	2.5	4.0	11,500	32	
Desert Crown	53	100	2.5	4.0	13,250	37	
Flow in gravity segment between 114th and 111th						**90**	
Combined flow in gravity segment between 111th and Alma School							**904**

The gravity line along Dynamite Road between Alma School and the force main consists of 8 and 10" pipe. **APPENDIX 3 – Sewer Rating Tables** includes calculations for various diameters of sewer representing the shallowest existing sewer slope at an assumed d/D of 0.65 which allows for inflow and infiltration along the gravity system in Dynamite Road.

Preliminary analysis of the rating tables suggests a 12" sewer pipe is needed to replace the existing lines in Dynamite Road between Alma School and connection with the force mains. (approximately 4,200 LF). Shallow sewer slopes may require this line to be upsized to 15". The older 8" gravity pipe serving Pinnacle Foothills appears to have sufficient capacity. All sewer improvements to the existing gravity system east of Alma School Road will be the developer's sole cost.

Sewer flow monitoring was completed from June 7 to June 17, 2019 at the first in-line manhole along Rio Verde Drive east of Alma School Road (see **Exhibit 6**).

Peak flow results indicate the SNGC lift station was not operating and the monitored maximum flow rate was less than half the calculated design demand.

6.3 FINANCIAL OBLIGATION

Reata Ranch and/or Fiesta Ranch will be solely responsible for the design, construction and costs of all needed onsite and off-site infrastructure east of the Alma School Road interceptor to provide water and sewer service to their projects. Cost sharing agreements may be considered between the developers to construct off-site improvements and related sewer lift stations. The City of Scottsdale will evaluate and construct any needed sewer improvement along Alma School Road through a capital improvement project.

7. FUTURE COMPUTATIONS

7.1 WATER MODELING

An overall Master Plan will be prepared for Fiesta Ranch and be supplemented by design reports for each phase of development. The proposed water system will be designed to meet the criteria of City's Design Standards and Policies Manual, the Arizona Department of Environmental Quality ("ADEQ"), and Maricopa County Environmental Services Department ("MCESD"). Water modeling will utilize Bentley WaterCAD®. A preliminary hydraulic calculation for the max day + fire flow demand on the 12" reach of pipe between 128th and 136th Streets in provided in **APPENDIX 4**.

7.2 SEWER MODELING

An overall Master Plan will be prepared for Fiesta Ranch and be supplemented by design reports for each phase of development. The proposed sewer system will be designed to meet the criteria of City's Design Standards and Policies Manual and supplemental Lift Station Design document, the Arizona Department of Environmental Quality ("ADEQ"), and Maricopa County Environmental Services Department ("MCESD").

The final design report will utilize spreadsheets to evaluate the gravity and pressurized sewer hydraulics. Individual design reports will be prepared for all new and existing sewer lift stations and related appurtenances.

8. SUMMARY / CONCLUSIONS

8.1 Summary:

All proposed infrastructure will be designed in accordance with all City, County and State design standards.

8.2 Conclusions:

With pending water infrastructure construction, enough water capacity is available to serve this rezoning request.

Providing a public sewer system and lift station for Fiesta Ranch will require significant onsite infrastructure and offsite upgrades to the Reata Ranch LS #48, the Scottsdale National Golf Club LS #47, associated force mains and the downstream gravity system.

Discussions of an onsite wastewater treatment option are summarized in **Exhibit 7 – MCESD Correspondence.** The project's developer has not expressed interest in pursuing the onsite treatment option.

9. REFERENCES

1. COS Q-S MAPS 50-61, 49-61, 49-62 and 50-62
2. City of Scottsdale Design Standards & Policies Manual, 2018 (Chapter 7 – Wastewater)
   City of Scottsdale Design Standards & Policies Manual, 2018 (Chapter 6 – Water)
3. Accepted Design Concept Report for Reata Ranch Wastewater Pumping Station, Rev. 4/17/2015
4. Design Report Update SNGC Lift Station #47 prepared by Wilson Engineers, October 19, 2016

10. EXHIBITS:

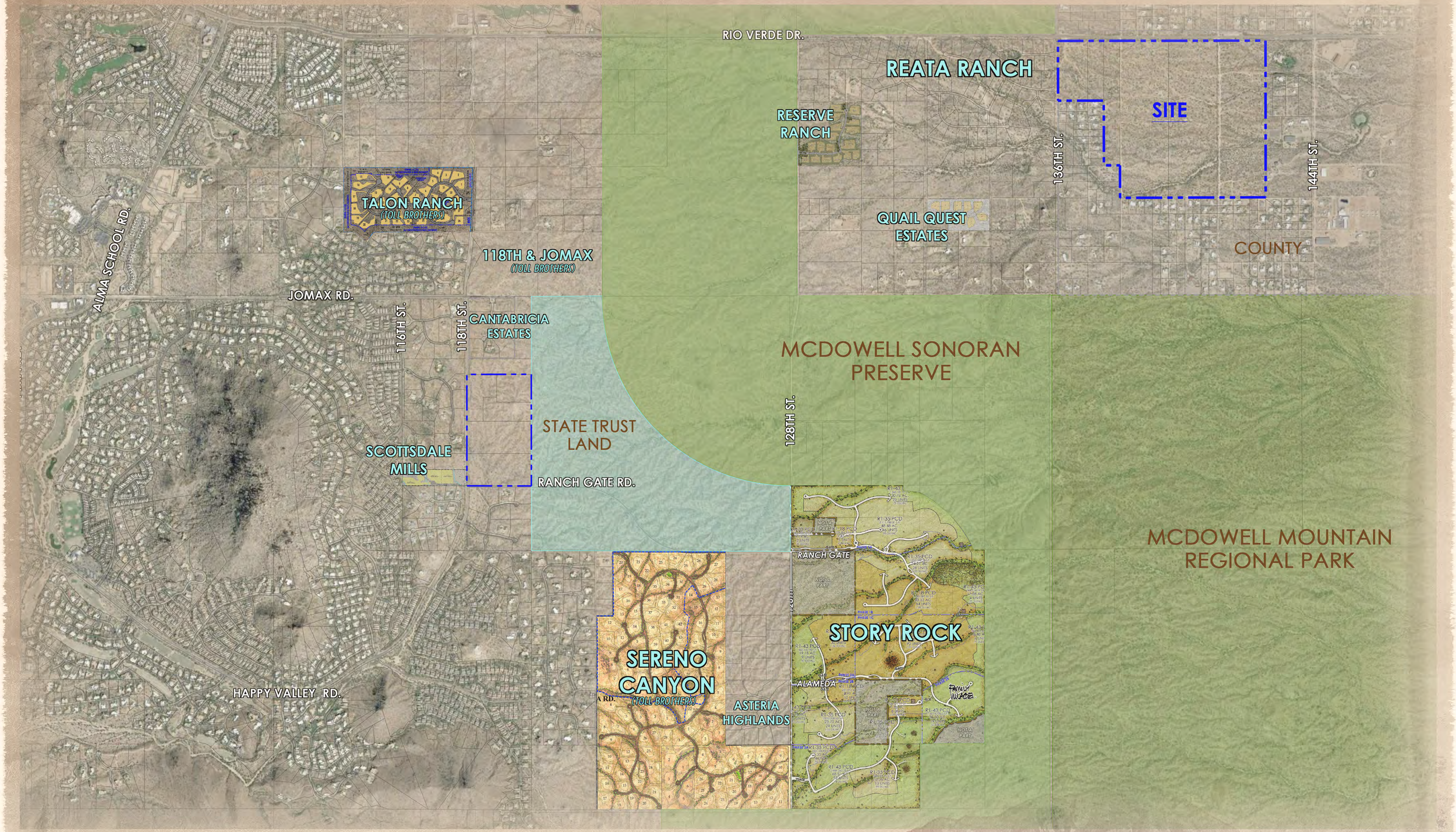
EXHIBIT 1 - Vicinity Map-Context Aerial
EXHIBIT 2 - Aerial-Site Constraints Map
EXHIBIT 3 - Conceptual Site Plan and Development Land Use Budget
EXHIBIT 4 - Q-S Maps
EXHIBIT 5 - Fire Hydrant Flow Test
EXHIBIT 6 - Sewer Monitoring Data and Site Plan
EXHIBIT 7 - MCESD Correspondence
EXHIBIT 8 - Sewer Pumping Options 1), 2) and 3)
EXHIBIT 9 - Skeletonized Water Layout/LAIPs

11. APPENDICIES:

APPENDIX 1 - Preliminary TDH and Wet Well Calcs
APPENDIX 2 - Preliminary Pump Selection
APPENDIX 3 - Gravity Sewer Rating Tables
APPENDIX 4 - Water Hydraulics 128th to 136th Streets

Exhibits

1 - Vicinity Map-Context Aerial
2 - Aerial-Site Constraints Map
3 - Conceptual Site Plan / Land Use Budget
4 - Quarter Section Maps
5 - Fire Hydrant Flow Test
6 - Sewer Monitoring and Site Data
7 - MCESD Correspondence
8 - Sewer Pumping Options 1), 2) and 3)



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118TH & RANCH GATE

CONTEXT AERIAL

NORTH

EXHIBIT 1

0000 DRAWN BY: AC 10/25/17

VICINITY MAP

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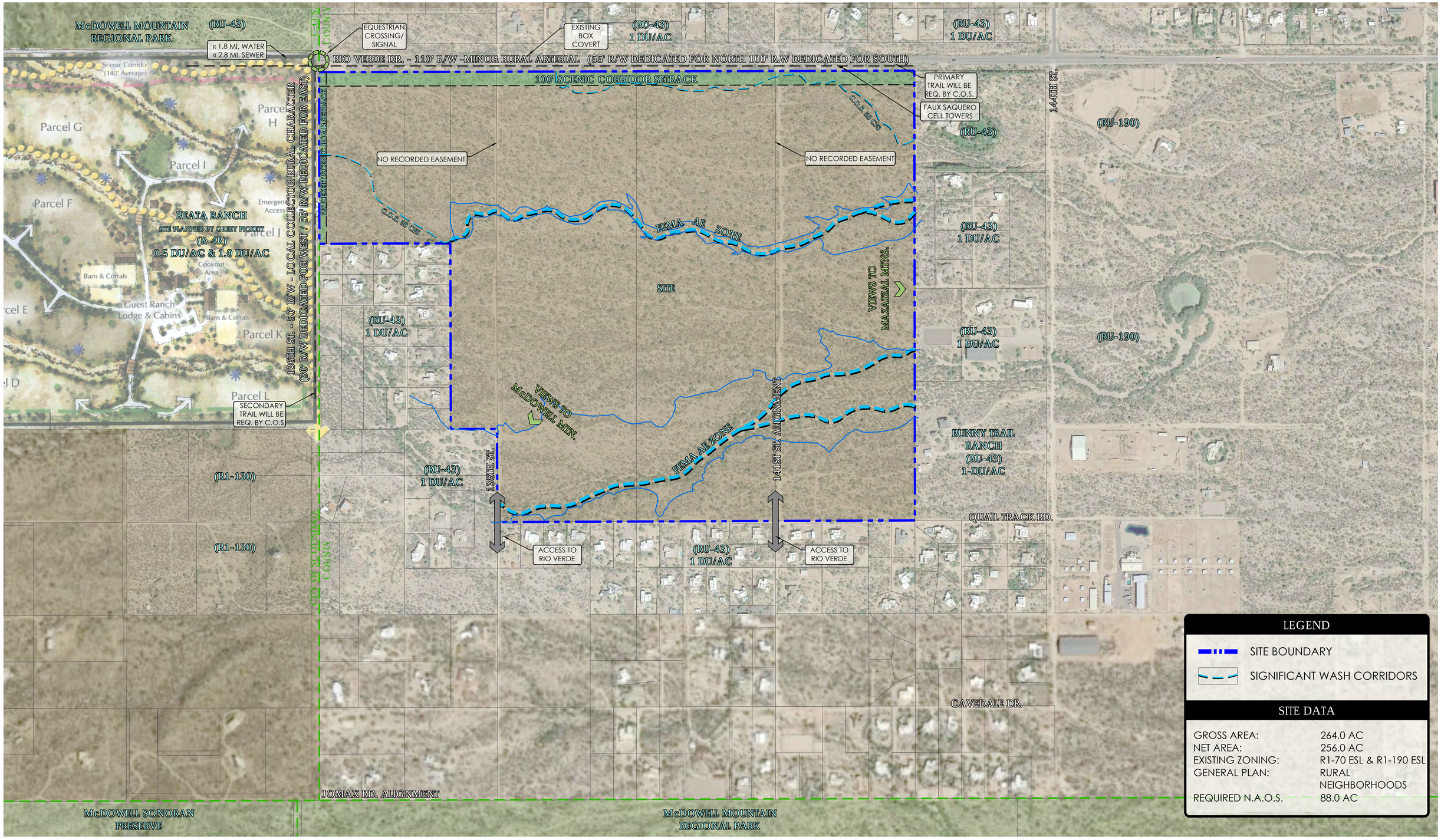

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RIO VERDE
CONSTRAINTS MAP

EXHIBIT 2

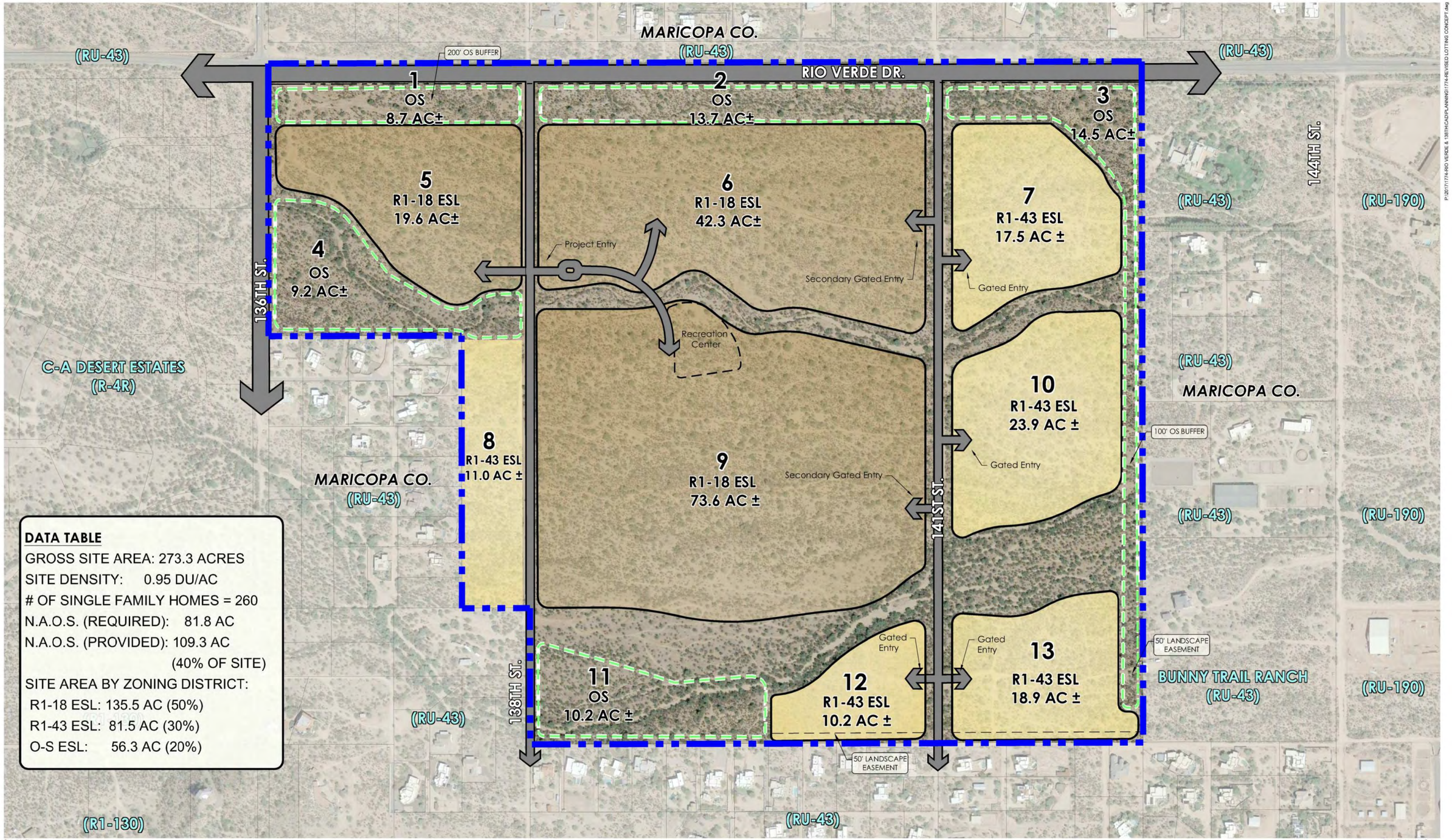
APPROX. SCALE: 1"=300' NORTH

0' 150' 300' 600'

1774 DRAWN BY: PR 10/26/17

AERIAL-SITE CONSTRAINTS MAP

P:\2017\1774-RIO VERDE & 138TH\CAD\PLANNING\LVA-1774-CONSTRAINTS MAP.dwg Oct 26, 2017



Aerial Photography Date:

RVi
120 S. Ash Avenue
Tempe, Arizona 85281
Tel: 480.994.0994
www.rviplanning.com

RIO VERDE • **CONCEPTUAL SITE PLAN**

Rio Verde
2019-01-23
1774

EXHIBIT 3
CONCEPTUAL SITE PLAN

0 100' 200' 400'

PARCEL #	ZONING	GROSS AREA (ACRES)	MAX DENSITY PER E.S.L.	MAX # ALLOWED UNITS	# OF LOTS
1	OS	8.7	0	0	0
2	OS	13.7	0	0	0
3	OS	13.1	0	0	0
4	OS	9.2	0	0	0
5	R1-18	19.6	1.87	37	31
6	R1-18	42.3	1.87	79	70
7	R1-43	17.5	0.83	15	11
8	R1-43	11	0.83	9	9
9	R1-18	73.4	1.87	137	105
10	R1-43	23.9	0.83	20	15
11	OS	10.2	0	0	0
12	R1-43	10.2	0.83	8	7
13	R1-43	20.3	0.83	17	12
TOTAL		**273.1**			**260**

EXHIBIT 3

DEVELOPMENT & LAND USE BUDGET

50-61

PEAK

77-037

49-60

268

ROW/Y.E. 82/007/0821

49-62

48-61

24-FEB-19

GENERAL NOTES:

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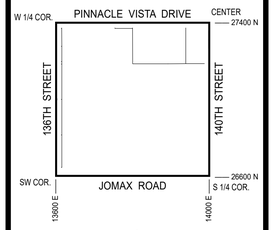
LEGEND:

- Water Valve
- Non-potable Water Valve
- Fire Hydrant
- Water Blowoff
- Water Main Reducer
- Water Sample Station
- Water Air Release Valve
- Non-potable Water Air Release Valve
- Water Pressure Reducing Valve
- Water Vault
- Water Manhole
- Non-Potable Water Manhole
- Water Pump
- Water Main
- Non-Potable Water Main
- Fire Line
- Water Service
- Non-Scottsdale Water Main
- Sewer Manhole
- Sewer Cleanout
- Sewer Lift Station
- Sewer Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Non-Scottsdale Sewer Main
- Sewer Service

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

WATER & SEWER

QUARTER SECTION MAP

49-61

SW 1/4 SEC. 31 T5N R6E

ON - SITE

EXHIBIT 4

Sht. 1 of 4

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

50-62

49-61

49-63

48-62

ROW/P.E. 62.00 ft

GENERAL NOTES:

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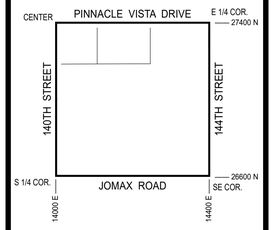
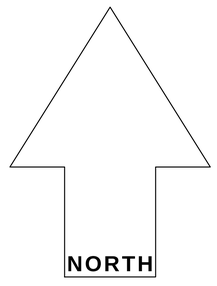
- Non-Potable Water Manhole
- Water Pump
- Water Main
- Non-Potable Water Main
- Fire Line
- Water Service
- Non-Scottsdale Water Main
- Sewer Manhole
- Sewer Cleanout
- Sewer Lift Station
- Sewer Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Non-Scottsdale Sewer Main
- Sewer Service

VICINITY MAP





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WATER & SEWER

QUARTER SECTION MAP

49-62

SE 1/4 SEC. 31 T5N R6E

ON-SITE

EXHIBIT 4

Sht. 2 of 4

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

24-FEB-19

51-61

VERDE DRIVE EAST

RDWY.E. 62/0070821

'ATES

STREET

219-39-010M
(13701)

219-39-010N

219-39-010G

219-39-010U

50-60

136TH

RDWY.E. 62/0070821

NORTH

PEAK

50-62

49-61

24-FEB-19

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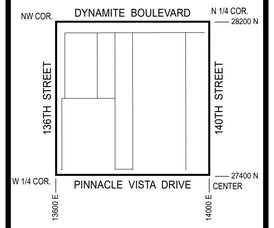
- Water Pressure Reducing Valve
- Water Vault
- Water Manhole
- Non-Potable Water Manhole
- Water Pump
- Water Main
- Non-Potable Water Main
- Fire Line
- Water Service
- Non-Scottsdale Water Main
- Sewer Manhole
- Sewer Cleanout
- Sewer Lift Station
- Sewer Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Non-Scottsdale Sewer Main
- Sewer Service

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

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WATER & SEWER

QUARTER SECTION MAP

50-61

NW 1/4 SEC. 31 T5N R6E

ON-SITE

EXHIBIT 4

Sht. 3 of 4

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

51-62

ST RIO VERDE DRIVE

RDWY E. 62/0070821

219-39-010V

219-39-010P

50-61

50-63

49-62

24-FEB-19

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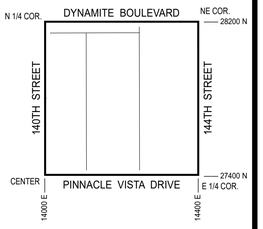
- Fire Hydrant
- Water Blowoff
- Water Main Reducer
- Water Sample Station
- Water Air Release Valve
- Non-potable Water Air Release Valve
- Water Pressure Reducing Valve
- Water Vault (WVT)
- Water Manhole (WMH)
- Non-Potable Water Manhole (NPWMH)
- Water Pump (WP)
- Water Main
- Non-Potable Water Main (NP)
- Fire Line
- Water Service
- Non-Scottsdale Water Main
- Sewer Manhole (SMH)
- Sewer Cleanout
- Sewer Lift Station (SLS)
- Sewer Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force (Force)
- Non-Scottsdale Sewer Main
- Sewer Service

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

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WATER & SEWER

QUARTER SECTION MAP

50-62

NE 1/4 SEC. 31 T5N R6E

ON-SITE

EXHIBIT 4

Sht. 4 of 4

CITY OF SCOTTSDALE

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

52-54

51-53

51-55

50-54

GEIIERALIIOIES:

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LEGEND:

- Clear,;lut
- UftSlation
- Manhole
- Non-OPSPoWt
- Plug
- Sewer Servke Poinl
- SeweiTapPoInt
- SewuV.ilt!
- Treatment Plant
- Sower Main• Gravitt
- Sewer f,lain. Force
- Sewer M,In. PITIIte

VICINITY MAP

NORTH

SCALE: 1" = 100'

0 50 100 200

Iho rNP ,ailo of r = 100 is band onafj;siz.eprintof30"x3o

SEWER

QUARTER SECTION MAP

51-54

SE 1/4 SEC. 28 T5N R5E

OFF SITE

EXHIBIT 4

Sht. 1 of 4

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 txlit Orlnl,,,,lw 8s11lsnrd S<'1hdah. Alitons '52'1

N O T I C E

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DA-FEB-10

52-55

50-55

51-54

51-56

RANCH

UNIT 1

VIEWS

EAST

VIA

GOLF

SCOTTS

UNIT THREE

RANCH

PINNACLE

CROWN

DESERT

FOOTHILLS

ESTATES

DYNAMITE BOULEVARD

PEAK VIEW ROAD

DALE LANE

QUARRY TRAIL

MONUMENT DRIVE

SOUTH WIND LANE

PLACE

VERDE

RIO

CROWN

NORTH

SCALE: 1" = 100'

0 50 100 200

VICINITY MAP

W 1/4 COR.

CENTER

E 1/4 COR.

SW COR.

SE COR.

116TH STREET

112TH STREET

LEGEND:

Clnr'lelllt	e
LiftSlation	(;]
Unhofe	(,)
Ilon-OPS Polol	0
Pllig	
StWCl StNlcO Point	•
St:WI Tap Potnl	•
Sewt1Vat1e	-ID
Trea nIPUrit	MAI
s,w,1Maln-Gra.,.Wy	
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GEIIERAL NOTES:

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SEWER

QUARTER SECTION MAP

51-55

SW 1/4 SEC. 27 T5N R5E

OFF SITE

EXHIBIT 4

Sht. 2 of4

SCOHSDALE *GEOGRAPHIC INFORMATION SYSTEMS*

3629 Horth DrtlWwllef Boiln11td Scousd,Ajltorn:1 as2s1

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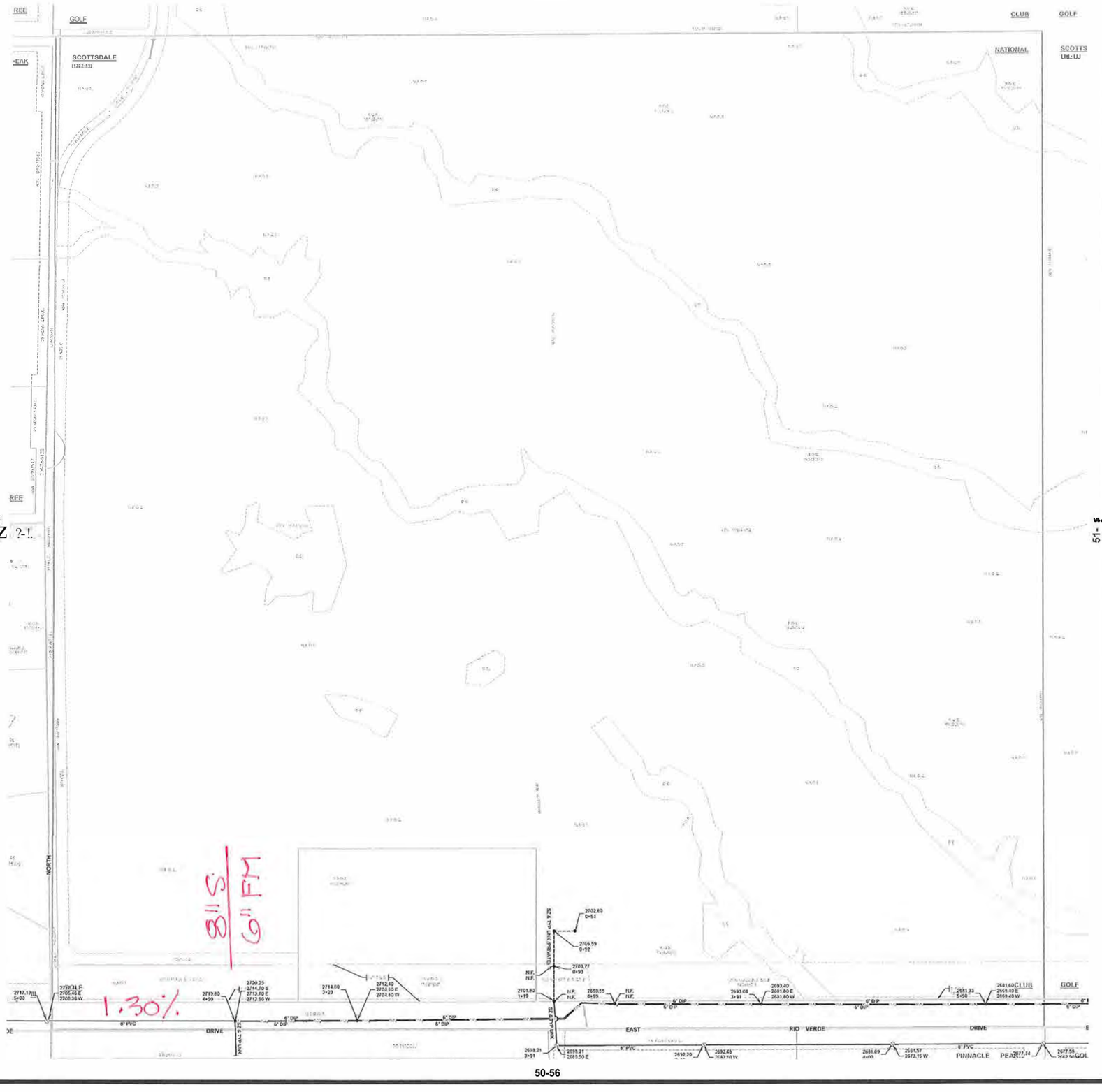
THE CITY OF SCOTTSDALE

84-FEB-16

52-56



GEHERAL NOTES:

• Ht\ttTI\CO\'\'U.11XCIEEAA1E0CN.:.\"IG.foit'-'ff IEV1508FSF\.EASfown_c1nEC1YCf'OT1:SCW.f. WOUMn'::.IT3IT(UII-)]II-TT7I.

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LEGEND:

Cklanout	●
Lift Station	[s]
Manhole	Ⓢ
tion-OPS Poiol	0
Plug	⊐
Sewer SaNk11 Point	■
Sewer Tip Poini	•
Stl"t"erV lle	⊗
Treatment Plant	
Sewer Main - Gravity	
Sewer Main - Force	Force
Sewer Main - Printo	

VICINITY MAP

"'"'DPEAXVIISVIROAI> '.".

S\'ICOL.I DYIJAVITE

NORTH

SCALE: 1" = 100'

0 50 100 200

The map sc;illof 1" = 100 B based cn1fi.Alsileplintot30'x36'

SEWER

QUARTER SECTION MAP

51-56

SE 114 SEC. 27 TSN RSE

OFF SITE

EXHIBIT 4

Sht. 3 of 4

CITY OF SCOTTSDALE — SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3829 Nolh Dlllu.w Ehvbs5cl Scrjl..t_ ..A.I,ona557S1

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THE CITY OF SCOTTSDALE

04-FEB-18

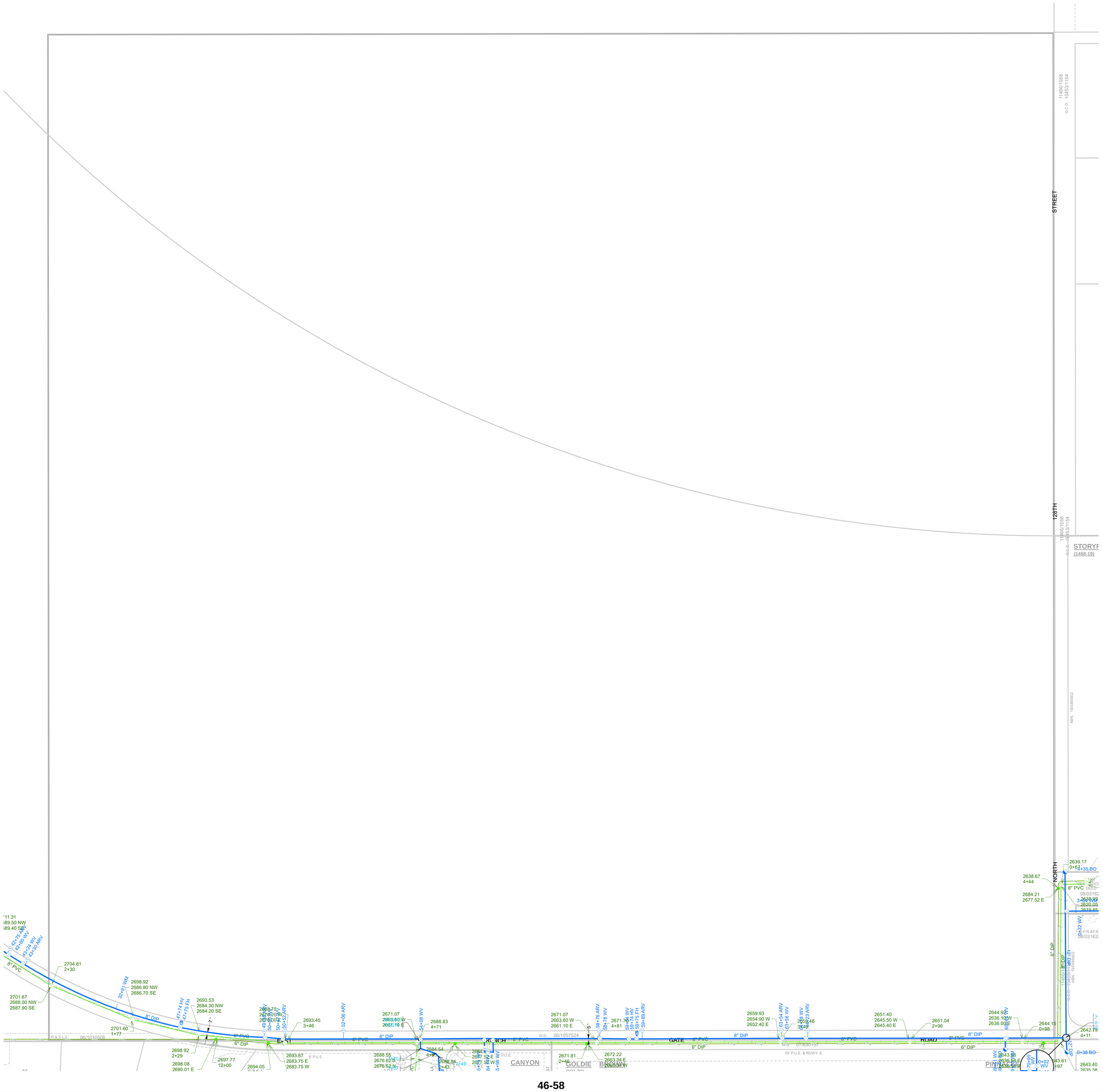
50-56

48-58

47-57

47-59

46-58



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- Sewer Lift Station
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- Sewer Main - Gravity
- Sewer Main - Force
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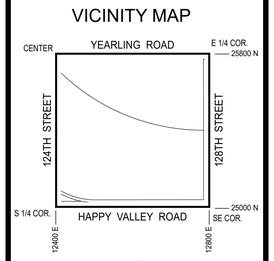
VICINITY MAP



NORTH

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0 50 100 200

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WATER & SEWER

QUARTER SECTION MAP

47-58

SE 1/4 SEC. 2 T4N R5E

OFF SITE

EXHIBIT 4

Sht. 4 of 4

CITY OF SCOTTSDALE

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard

Scottsdale, Arizona 85251

18-AUG-19

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT

Project Name:	Fiesta Ranch
Project Address:	122nd Street and Dynamite Road, Scottsdale, Arizona 85262
Arizona Flow Testing Project No.:	19211
Client Project No.:	Not Provided
Flow Test Permit No.:	C58404
Date and time flow test conducted:	May 30, 2019 at 7:30 AM
Data is current and reliable until:	November 30, 2019
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	Phil Cipolla – City of Scottsdale-Inspector (602-828-0847)

Raw Test Data

Static Pressure: **70.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **60.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **50.0 PSI Each**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: Two 2 ½ inch diffusers
(Measured in inches)

Coefficient of Diffuser: 0.9

Flowing GPM**:** **2,374 GPM**
(Measured in gallons per minute)
1,187 GPM + 1,187 GPM = 2,374 GPM

GPM @ 20 PSI: **5,661 GPM**

Data with 10% Safety Factor

Static Pressure: **63.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **53.0 PSI**
(Measured in pounds per square inch)

Distance between hydrants: Approx. 1,290 feet

Main size: Not Provided

Flowing GPM: **2,374 GPM**

GPM @ 20 PSI**:** **5,218 GPM**

Flow Test Location **North**

52-54

51-53

50-54

51-55

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LEGEND:

- Cleanout
- Lift Station
- Manhole
- Non-GPS Point
- Plug
- Sewer Service Point
- Sewer Tap Point
- Sewer Valve
- Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Sewer Main - Private

VICINITY MAP

SCALE: 1" = 100'

0 50 100 200

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SEWER

QUARTER SECTION MAP

51-54

SE 1/4 SEC. 28 T5N R5E

EXHIBIT 6 - FLOW MONITORING

04-FEB-18

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

Monitor Flow
Min 9 days including
2 weekends

Sustainability Engineering Group
8280 E Gelding Dr Suite 101
Scottsdale, AZ 85260

Flow Monitoring Service

Flow Report Project: SL543 Fiesta Ranch

Quarter Section (QS) 51-54 Manhole #: 104

Location of monitoring site: Dynamite/Alma School, Scottsdale, just east of Alma School Rd

Geo Coordinates: 33.742594, -111.842634

Installation structure: Manhole with ring and cover

Rim to pipe invert: 14'6'' Flow Direction: West

Pipe Type: 8" PVC White Pipe size Nominal: 8" Actual pipe size: 8" Scum line: 3.75

Lateral pipes none

Total number of meters to be installed: One

Data title in meter: 8" 51-54 MH104

Type of meter/Logger: HACH 900 series Type of Sensor: Flo Dar

Unit Measurements: Flow: GPM Level: Inches Velocity: Feet per second (FPS)

Data logging intervals: 5 minutes (one reading per 5 minutes, no averaging)

Remote monitoring No

Duration of monitoring required: 9 days over two weekends

Data Start date & time: 0630 on 6/7/2019 Ending data and time: 0630 on 6/17/19 (11 days total)

Report Summary:
The equipment was installed with confined space entry, pipe size confirmed, sensor calibrated and level depth confirmed to the flow level at time of install and removal.
The flow was very low throughout the monitoring including an few -0- flows. The scum line was dry and indicate considerably higher flow at some point in time, but no evidence in this monitoring.
Attached are the excel sheet showing all Level, Velocity and Flow using the Manning equation within the loggers. Below are the data summaries for the site.

Randy Helfrich
Senior Manager
(602) 381-1960

EXHIBIT 6 - FLOW MONITORING

MH-104 LEVEL (inches)			
Date	Maximum	Minimum	Average
6/7/2019	0.76	0.13	0.32
6/8/2019	0.79	0.11	0.31
6/9/2019	0.93	0.13	0.32
6/10/2019	0.92	0.08	0.32
6/11/2019	0.94	0.19	0.33
6/12/2019	0.83	0.11	0.31
6/13/2019	0.91	0.13	0.34
6/14/2019	0.98	0.11	0.33
6/15/2019	1.13	0.10	0.34
6/16/2019	0.95	0.09	0.33
6/17/2019	0.44	0.09	0.21

MH-104 VELOCITY (fps)			
Date	Maximum	Minimum	Average
6/7/2019	2.66	1.46	1.94
6/8/2019	2.77	0.00	1.88
6/9/2019	2.85	1.45	1.90
6/10/2019	2.82	0.00	1.89
6/11/2019	2.82	0.00	1.89
6/12/2019	3.24	0.00	1.84
6/13/2019	2.66	0.00	1.88
6/14/2019	2.75	0.00	1.81
6/15/2019	2.87	0.00	1.79
6/16/2019	2.74	0.00	1.87
6/17/2019	2.06	0.00	1.45

MH-104 FLOW (gpm)			
Date	Maximum	Minimum	Average
6/7/2019	20.20	0.79	4.41
6/8/2019	22.35	0.00	4.40
6/9/2019	28.91	0.83	4.66
6/10/2019	28.37	0.00	4.61
6/11/2019	28.75	0.00	4.74
6/12/2019	22.61	0.00	4.19
6/13/2019	26.15	0.00	4.80
6/14/2019	29.80	0.00	4.79
6/15/2019	38.73	0.00	4.90
6/16/2019	28.82	0.00	5.06
6/17/2019	6.96	0.00	1.98

Monthly Summary		
Measures	Value	Unit
Max Total Flow	7286.400	GPD
Avg Total Flow	6354.327	GPD
Min Total Flow	2851.200	GPD
Total Flow	69897.600	gal

EXHIBIT 6 - FLOW MONITORING

Sent: Thursday, February 15, 2018 1:48 PM
To: Doug Mann <doug@azseg.com>
Subject: RE: East Rio Verde area

Maricopa County's position has changed over the years based on feedback from ADEQ and interactions with municipalities and private citizens.

Our current stance is this:

- There must be adequate room for the design of a primary septic system and reserve area.
- There is no restriction to lot size for properties outside a subdivision other than the appropriate design and setback requirements.
- Subdivisions with public water can have no more than 1 septic system per developed acre area. I have heard that Maricopa County Planning and Development requires a minimum of 35,000 square feet for subdivision lots under this condition.
- Subdivisions with private wells must be a minimum of 1 acre per parcel.

Let me know if you have further questions.

Thomas Hanson, R.S.
Environmental Health Supervisor | Water and Waste Management Division
Maricopa County Environmental Services Department
1001 N Central Avenue, Suite 150, Phoenix, AZ 85004
Desk: 602.506.0372 | Cell: 602.525.3489 | Fax: 602.506.6925
hansont@mail.maricopa.gov | esd.maricopa.gov

From: Doug Mann [mailto:doug@azseg.com]
Sent: Thursday, February 15, 2018 12:35 PM
To: Thomas Hanson - ENVX <HansonT@mail.maricopa.gov>
Subject: East Rio Verde area

Tom – I was preparing a developer response for the 264 acre parcel of land within the Scottsdale's city limits east of 136th and Rio Verde. I recall the following in previous discussions with previous MCESD staff but wanted to have some concurrence or noted exceptions from current staff. I retired from Scottsdale's Water Resources Department a few years back and was actively involved in projects developing in the east Dynamite corridor. Presently the plan is to pump this 264 acre site up to a lift station proposed south of Rio Verde at 136th then pump east to a force main out of the Scottsdale National Golf Club at 122nd. The developer is asking for a position on utilizing septic systems for the 264 acre site with potentially 220 single family residential properties zones between R1-190 and clusters of R1-10 and R1-7. My summary response to him follows:
Approximately 15 years ago the 141-lot preliminary plat for Wildcat proposed individual septic systems for each residential lot. Initial conversations with MCESD brought up water quality issues as nitrogen levels appear to be increasing in the neighboring County resident's wells. The installation of 141 more septic systems may not directly impact their water quality but would certainly give County residents additional opportunity to place blame.

MCESD requirements generally state the lot size must be one-acre minimum, have sufficient area to site a second backup system, and the soils must be conducive to the type of system proposed. The Wildcat area has significant drainageways and some shallow rock tables. These elements limit the types of available treatment and may require evapotranspiration techniques involving significant bed size.

The County does not support packaged community septic treatment systems as they must be owned , operated and maintained by a property owners association and historically have not been properly operated or maintained.

Rio Verde Utilities stated at that time their treatment and reuse programs were at capacity and they had no plans to expand. So the concept of sewering the entire area east of the ridgeline to Rio Verde plant was not pursued.

The Reata Ranch rezoning stipulation was to provide sewer pumping for that development and provide additional design capacity for the 141-lot preliminary plat of Wildcat. A preliminary design report is being prepared for the proposed rezoning of Wildcat and will imply the improvements necessary to the Reata facility, the discharging force mains and the receiving gravity sewer.

Sorry for the long email but I thank you for your input. Feel free to call if more convenient to discuss.

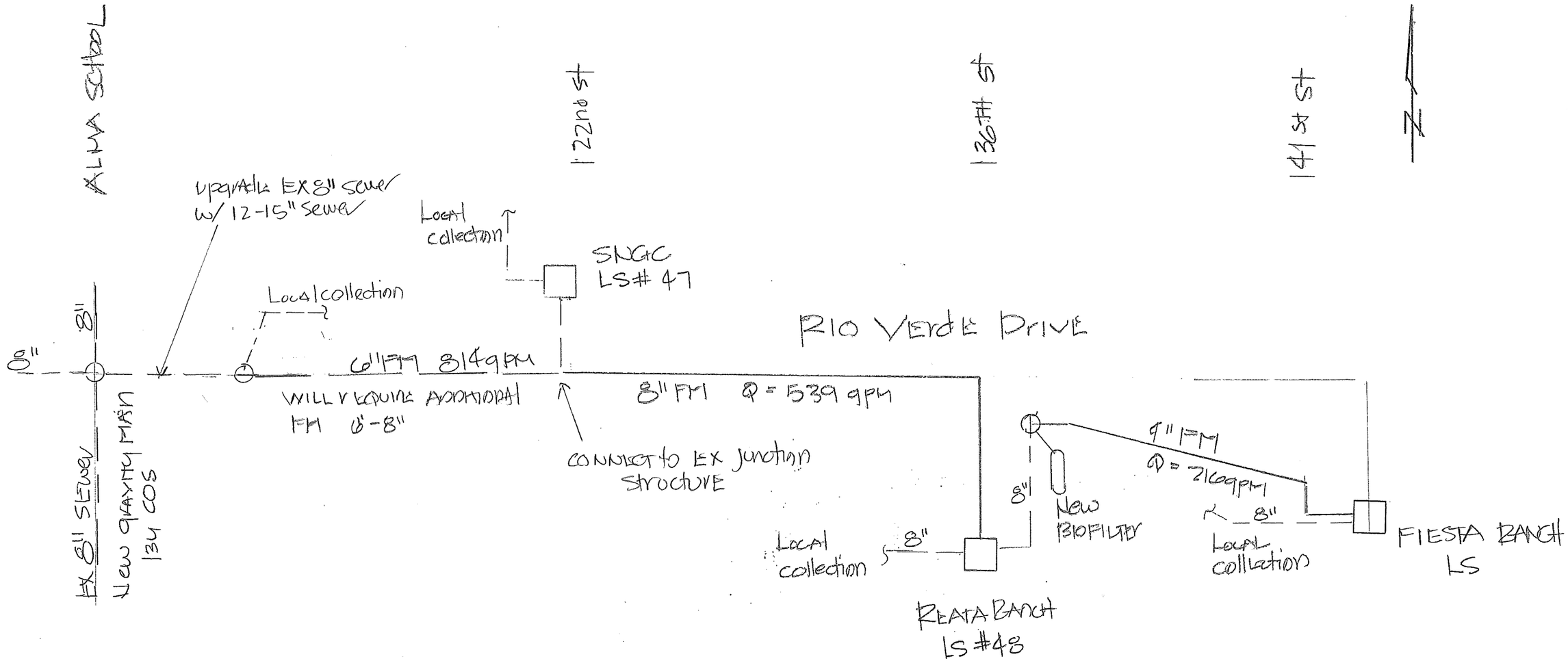
Douglas L. Mann
Senior Project Manager

SEG

8280 E. Gelding Dr., Suite 101.
Scottsdale, AZ 85260
480 588 7226

D 480.237.2537
M 480.265.5349
doug@segaz.com

"LEEDing and Developing Smart Projects"

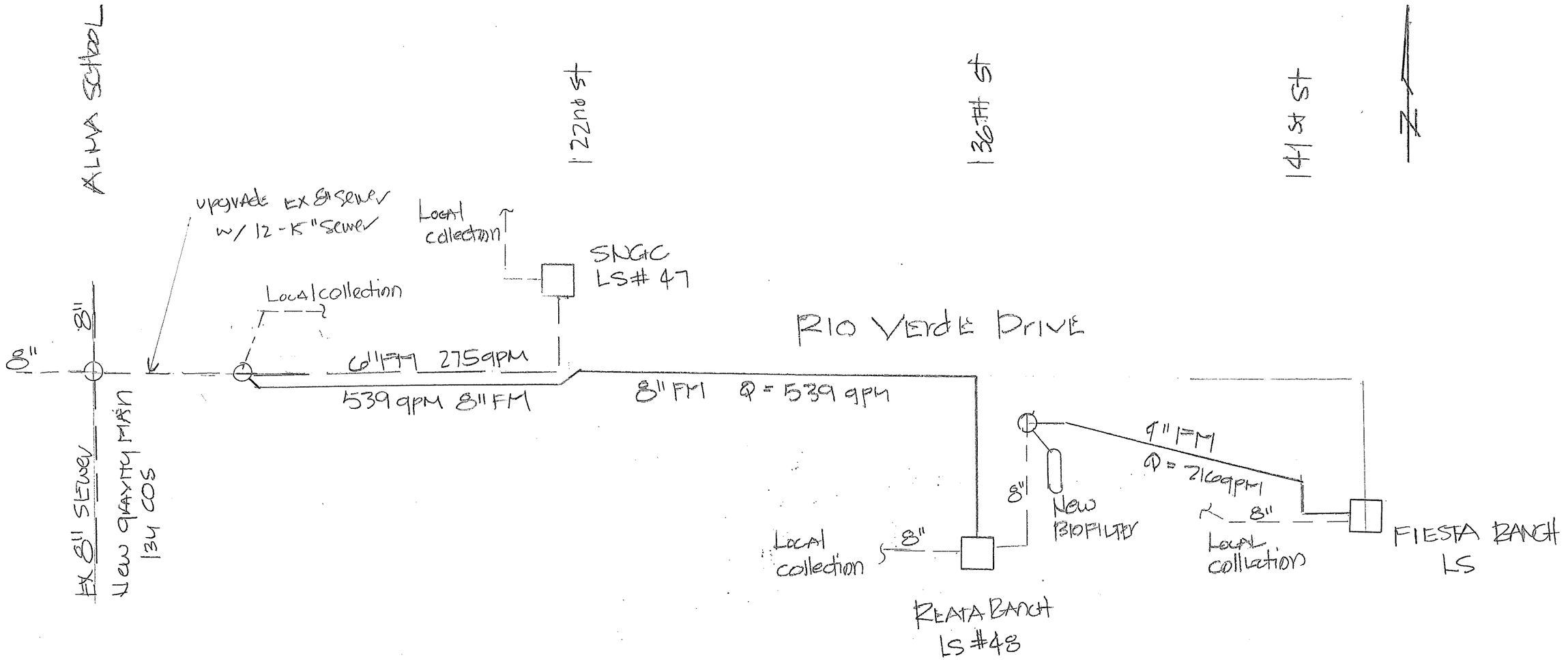


EX GRAVITY SEWER
EX FORCE MAIN
NEW FORCE MAIN
MANHOLE
LIFT STATION

NOTE: IF FIESTA RANCH CONSTRUCTS PRIOR TO RIATA RANCH, ALL ALL NEEDED IMPROVEMENTS UP TO ALMA SCHOOL WILL BE THE SOLE COST OF FIESTA RANCH. (SEE Report)

EXHIBIT 8

LS/FM OPTION 1)

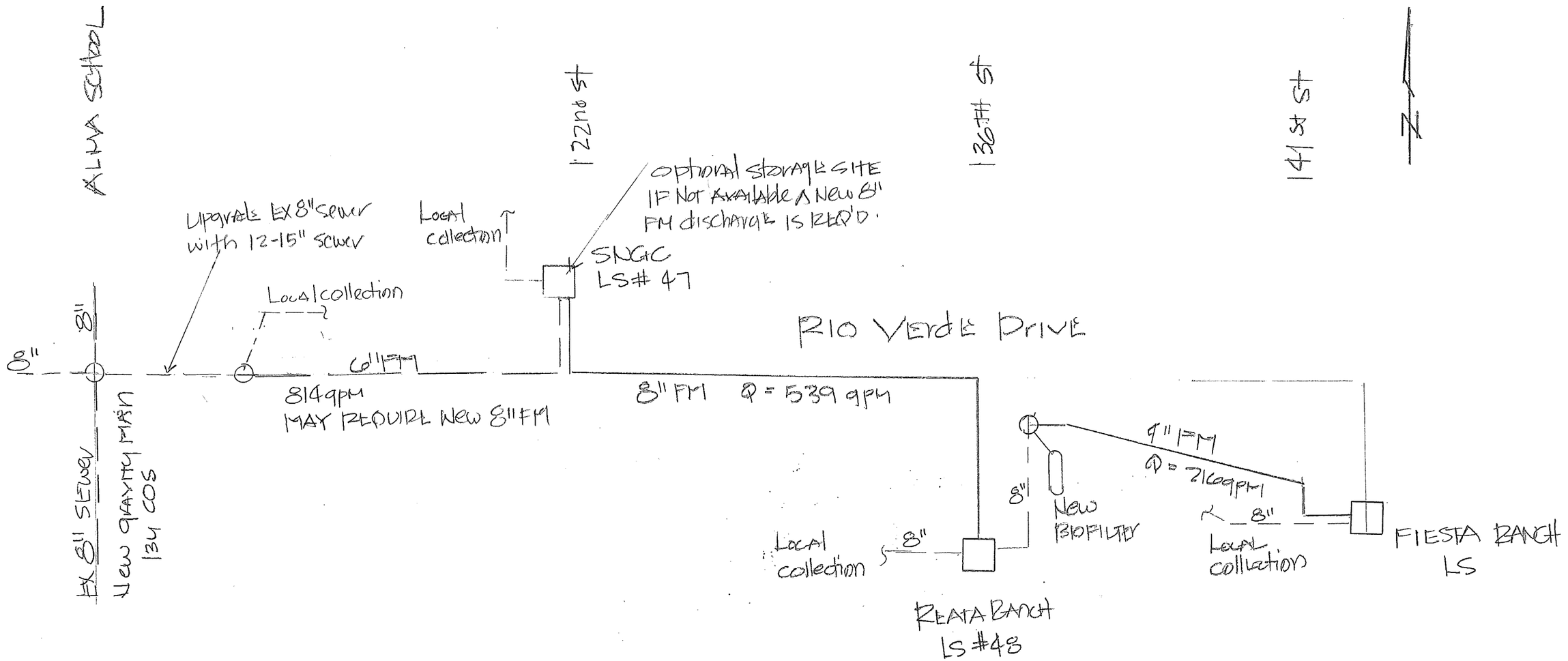


EX GRAVITY SEWER
EX FORCE MAIN
NEW FORCE MAIN
MANHOLE
LIFT STATION

NOTE: IF FIESTA RANCH CONSTRUCTS PRIOR TO RIATA RANCH, ALL ALL NEEDED IMPROVEMENTS UP TO ALMA SCHOOL WILL BE THE SOLE COST OF FIESTA RANCH. (SEE Report)

EXHIBIT 8

LS/FM OPTION 2)



EX GRAVITY SEWER
EX FORCE MAIN
New Force MAIN
MANHOLE
LIFT STATION

NOTE: IF FIESTA RANCH CONSTRUCTS PRIOR TO RIATA RANCH, ALL ALL NEEDED IMPROVEMENTS UP TO ALMA SCHOOL WILL BE THE SOLE COST OF FIESTA RANCH. (SEE Report)

EXHIBIT 8

LS/FM OPTION 3)

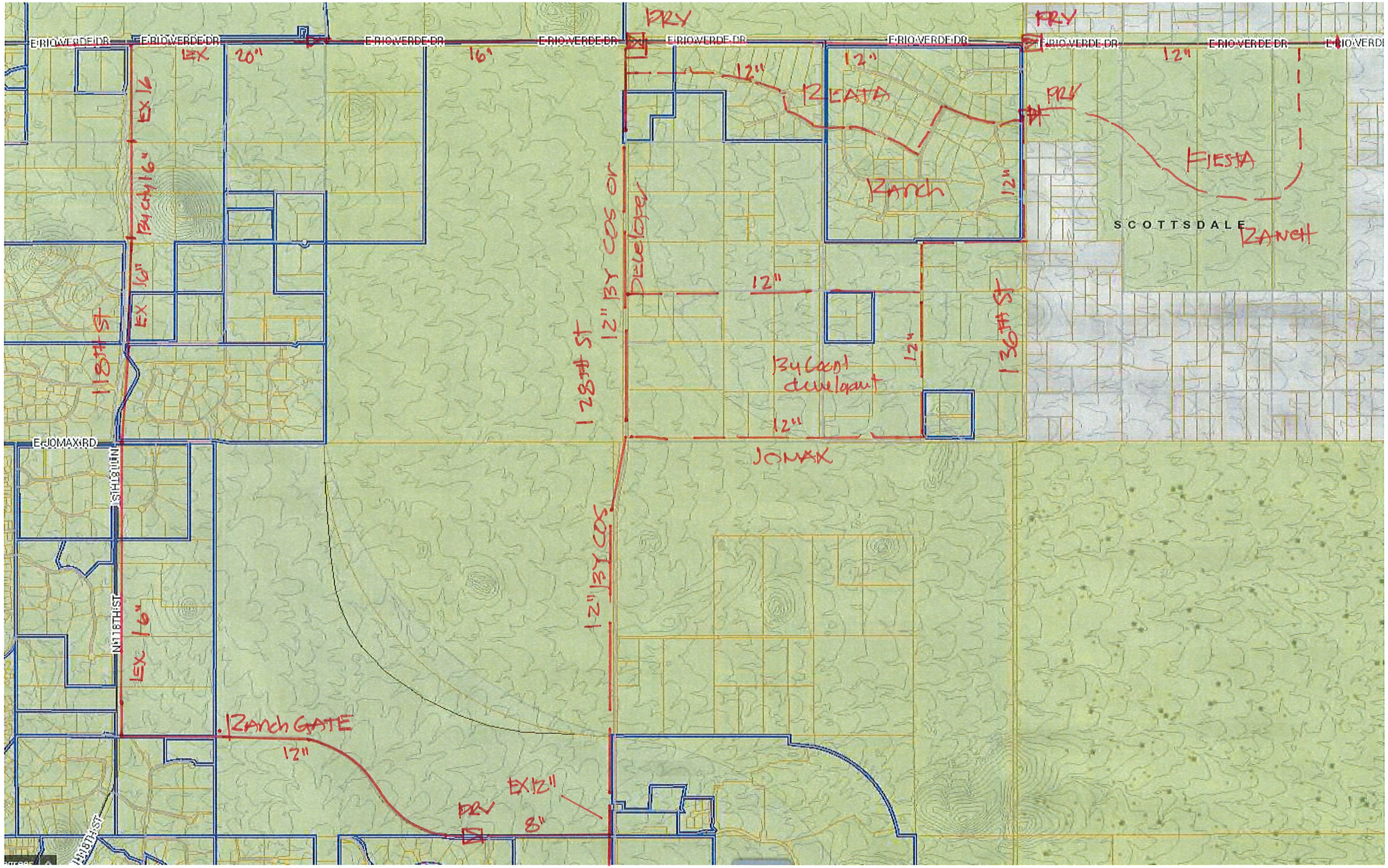
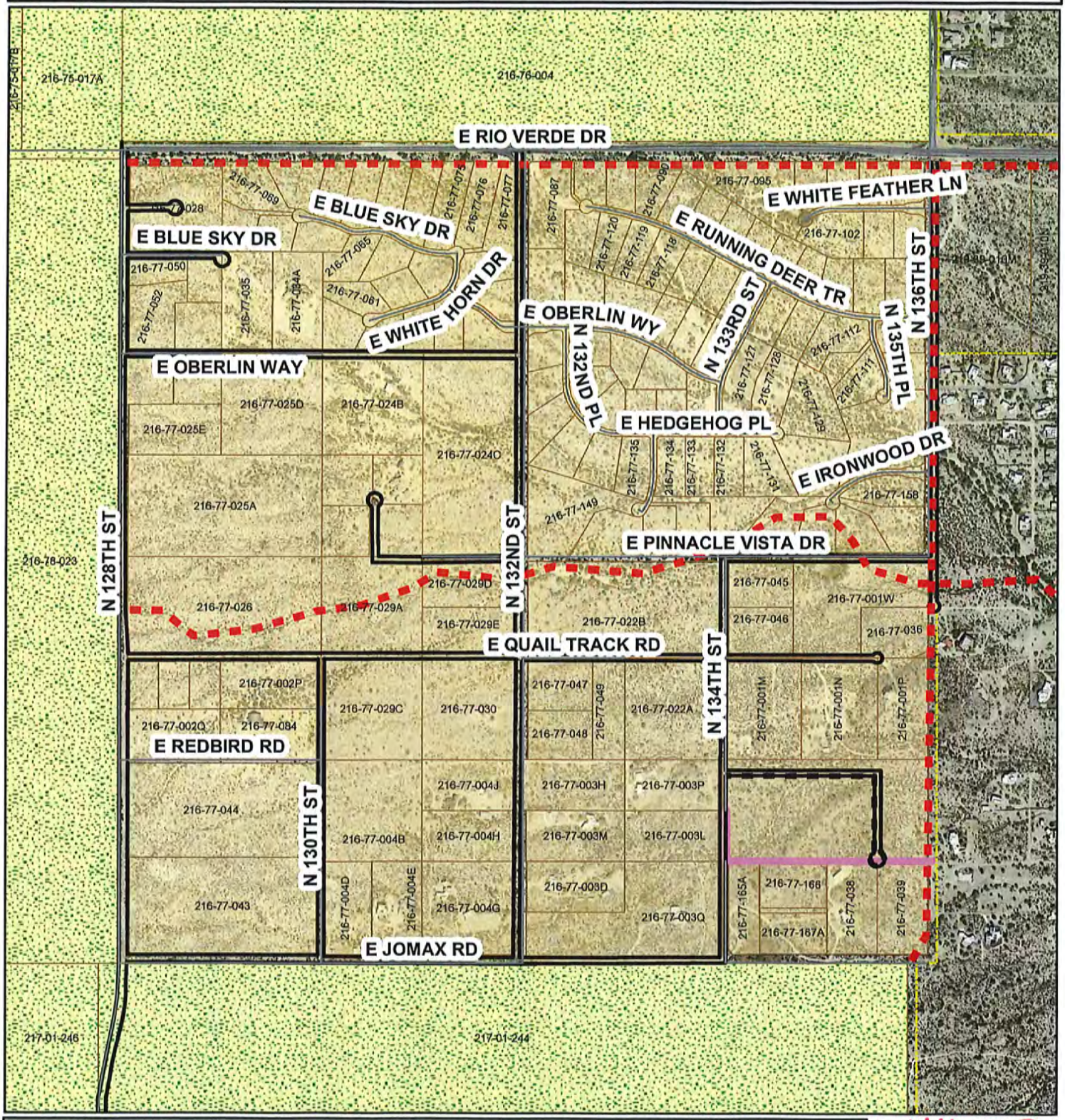

E RIO VERDE DR
EX 20"
16"
12"
FRY
FIESTA
RANCH
SCOTTSDALE RANCH
EX 16
BY CITY 16"
EX 16"
118TH ST
128TH ST
12" BY COS or Developer
136TH ST
BY Cactus development
JOMAX
E JOMAX RD
N 118TH ST
N 118TH LN
12" BY COS
EX 16"
Ranch GATE
EX 12"
DEV
8"

EXHIBIT 9

Dynamite Foothills Area 3
Local Area Infrastructure Plan



Parcels
Preserve
Proposed Street
City Boundary
Existing Trail
Planned Trail
Water/Sewer ROW

Feet
0 362.5 725 1,450

Notice: This document is provided for general information purposes only. The City of Scottsdale does not warrant its accuracy, completeness, or suitability for any particular purpose. It should not be relied upon without field verification.

N

EXHIBIT 9

CITY OF SCOTTSDALE

Last updated 10/2/2018

Document Path: V:\Transportation\TransportationWorkgroups\TransportationGIS\LAIPS\Dynamite Foothills\LAIPS_DynamiteFoothills3-10-2-2018_r.mxd

Appendices

1 - Preliminary TDH and Wet Well Calcs 2 - Preliminary Pump Selection

3 - Gravity Sewer Rating Tables

4 - Water Hydraulics 128th to 136th Streets

FULLY DEVELOPED FORCE MAIN SEGMENT ANALYSIS

	Units	Fiesta Ranch LS to Reata Gravity Line		Reata LS #48 to Gravity Line		Reata Ranch to SNGC		SNGC to Gravity Line (w/ Fiesta and Reata)		
Force Main Diameter:	in	4	6	6	8	6	8	6	8 (3)	Both 6
Flow	gpm	216	216	539	539	539	539	814	814	407
Pipe area	sf	0.09	0.2	0.2	0.35	0.2	0.35	0.2	0.35	0.2
Pipe velocity	fps	5.7	2.5	6.1(1)	3.4	6.1(1)	3.4	9.2 (1)	5.2	4.6
Headloss/100 ft	ft	2.16	0.46	1.6	0.74	2.6	0.65	1.6	0.41	0.46
Force main length	lf	6500	6500	14390	14390	11120	11120	3270	3270	3270
Friction headloss	ft	140	30	340	84	262	65	166	41	46
Pump elevation	ft	2370	2370	2466	2466	2466	2466	2630	2630	2630
Discharge elevation	ft	2470	2470	2714	2714	2630	2630	2714	2714	2714
Static Head	ft	100	100	248	248	164	164	84	84	84
TDH	ft	240	130	588 (2)	332 (4)	442	244	250	125	130

Notes: Pipe Material = Ductile Iron

Hazen-Willimams Coeff = 130

(1) velocity exceeds Title 18-09 criteria and COS criteria

(2) specific pump not found

(3) requires replacement of existing 6" force mains

(4) pumps are in series required - 1 wet, 1 dry

ESTIMATED WET WELL SIZING

	Units	Fiesta Ranch	Reata Ranch	SNGC
Cycle time (buildout)	min	10	10	10
q pump	gpm	216	539	814
Well diameter	ft	6	8	8
X-S area	sf	28.26	50.24	50.24
Well volume (min)	gal	540	1348	2035
Volume (min)	cf	72.2	180.1	272.1
Working depth (min)	ft	2.6	3.6	5.4

PIPE VOLUMES / RETENTION TIME

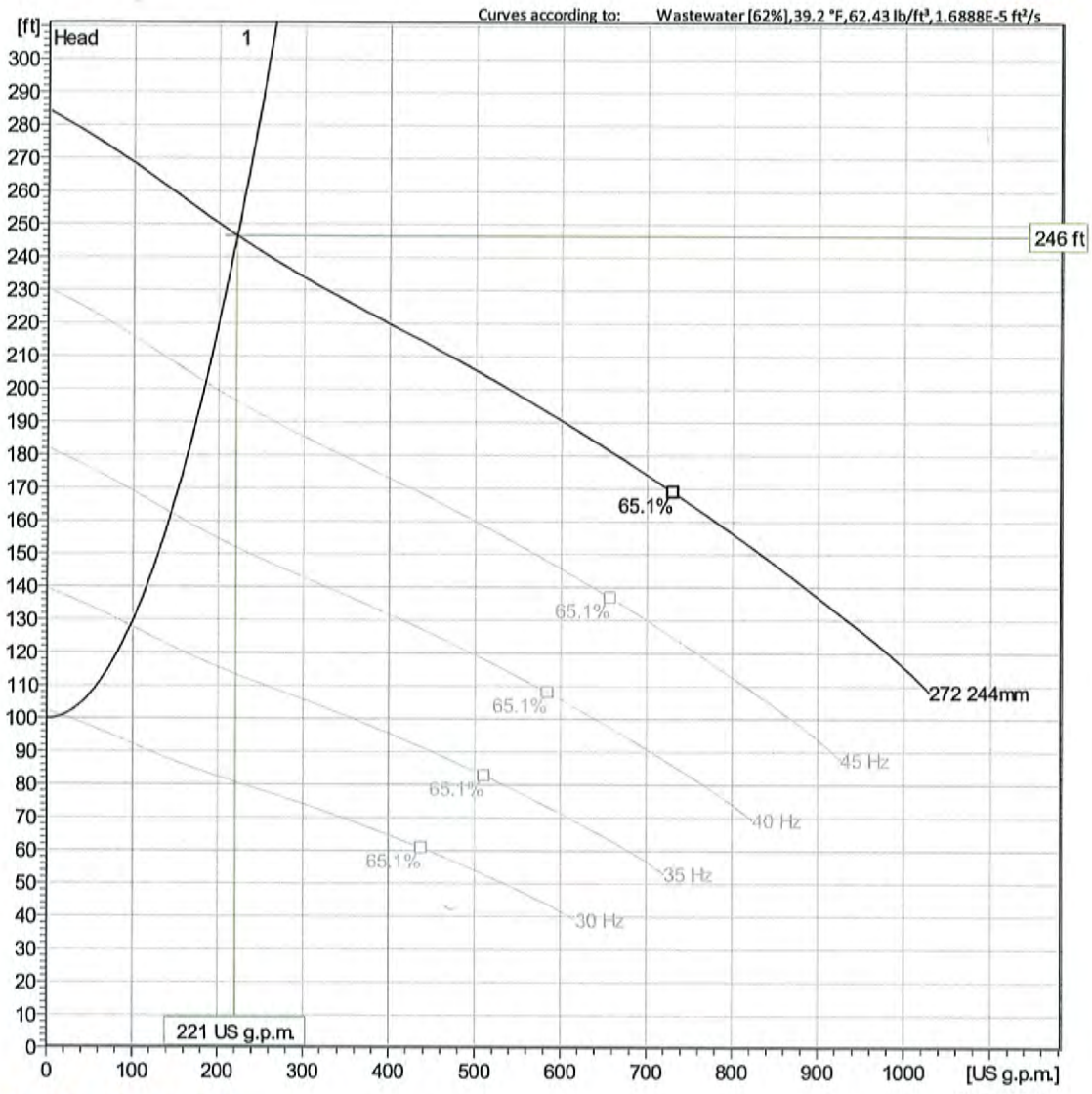
	Units	Fiesta Ranch to Reata Ranch		Reata Ranch to Gravity Outfall		Reata Ranch to SNGC		SNGC to Gravity Outfall		
Pipe diameter	in	4	6	6	8	6	8	6	8	Both 6
Pipe area	sf	0.0873	0.2	0.2	0.35	0.2	0.35	0.2	0.35	0.2
Pipe length	ft	6500	6500	14390	14390	11120	11120	3270	3270	3270
Pipe volume	cf	567.45	1300	2878	5036.5	2224	3892	654	1144.5	654
Pipe volume	gal	4250.2	9737	21556	37723	16658	29151	4898	8572	4898
Discharge	gpm	216	216	539	539	539	539	814	814	407
Retention time	min	20	45	40	70	31	54	6	11	12

APPENDIX 1 - PRELIMINARY TDH AND WET WELL CALCSA

NP 3202 SH 3~ 272

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	50 Hz	221 US g.p.m.	246 ft	38.3 hp	221 US g.p.m.	246 ft	38.3 hp	36 %	2310 kWh/US M	14.5 ft
1	45 Hz	184 US g.p.m.	202 ft	27.7 hp	184 US g.p.m.	202 ft	27.7 hp	34 %	2010 kWh/US M	12.3 ft
1	40 Hz	144 US g.p.m.	162 ft	19.2 hp	144 US g.p.m.	162 ft	19.2 hp	30.8 %	1810 kWh/US M	10.2 ft
1	35 Hz	96.8 US g.p.m	128 ft	12.7 hp	96.8 US g.p.m	128 ft	12.7 hp	24.8 %	1810 kWh/US M	8.26 ft
1	30 Hz	17.2 US g.p.m	101 ft	7.55 hp	17.2 US g.p.m	101 ft	7.55 hp	5.8 %	6480 kWh/US M	6.7 ft

Project	Created by		Last update
Block	Created on	8/15/2019	

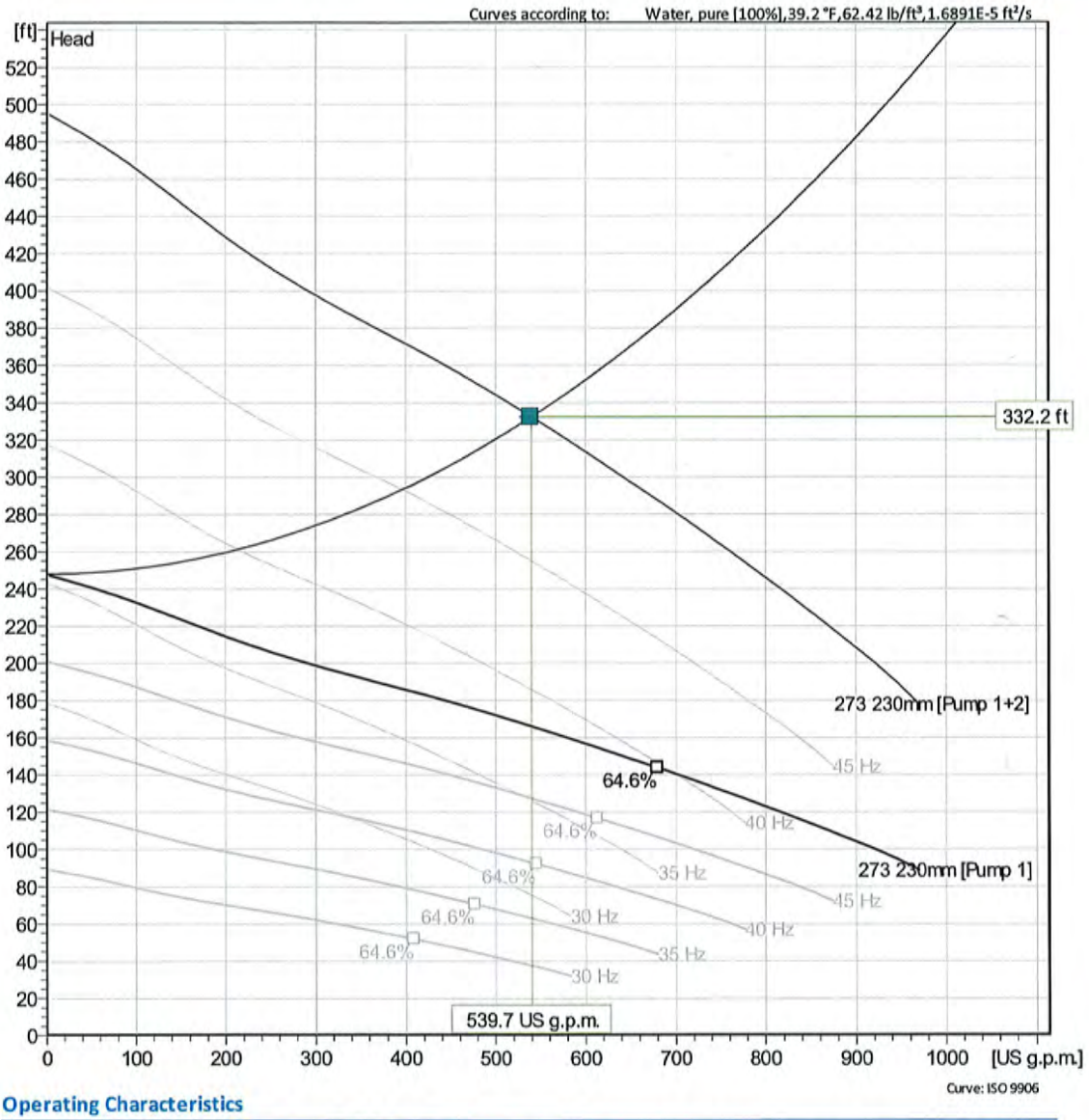
APPENDIX 2

Fiesta Ranch

NP 3202 SH 3~ 273

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
2	50 Hz	540 US g.p.m.	332 ft	36.7 hp	540 US g.p.m.	332 ft	73.3 hp	61.9 %	1800 kWh/US M	16.3 ft
2	45 Hz	396 US g.p.m.	293 ft	25.7 hp	396 US g.p.m.	293 ft	51.5 hp	57.1 %	1710 kWh/US M	12.9 ft
2	40 Hz	214 US g.p.m.	261 ft	16.3 hp	214 US g.p.m.	261 ft	32.6 hp	43.3 %	2010 kWh/US M	10.2 ft
2	35 Hz									
2	30 Hz									
1	50 Hz									
1	45 Hz									

Project	Created by		Last update
Block	Created on	8/15/2019	

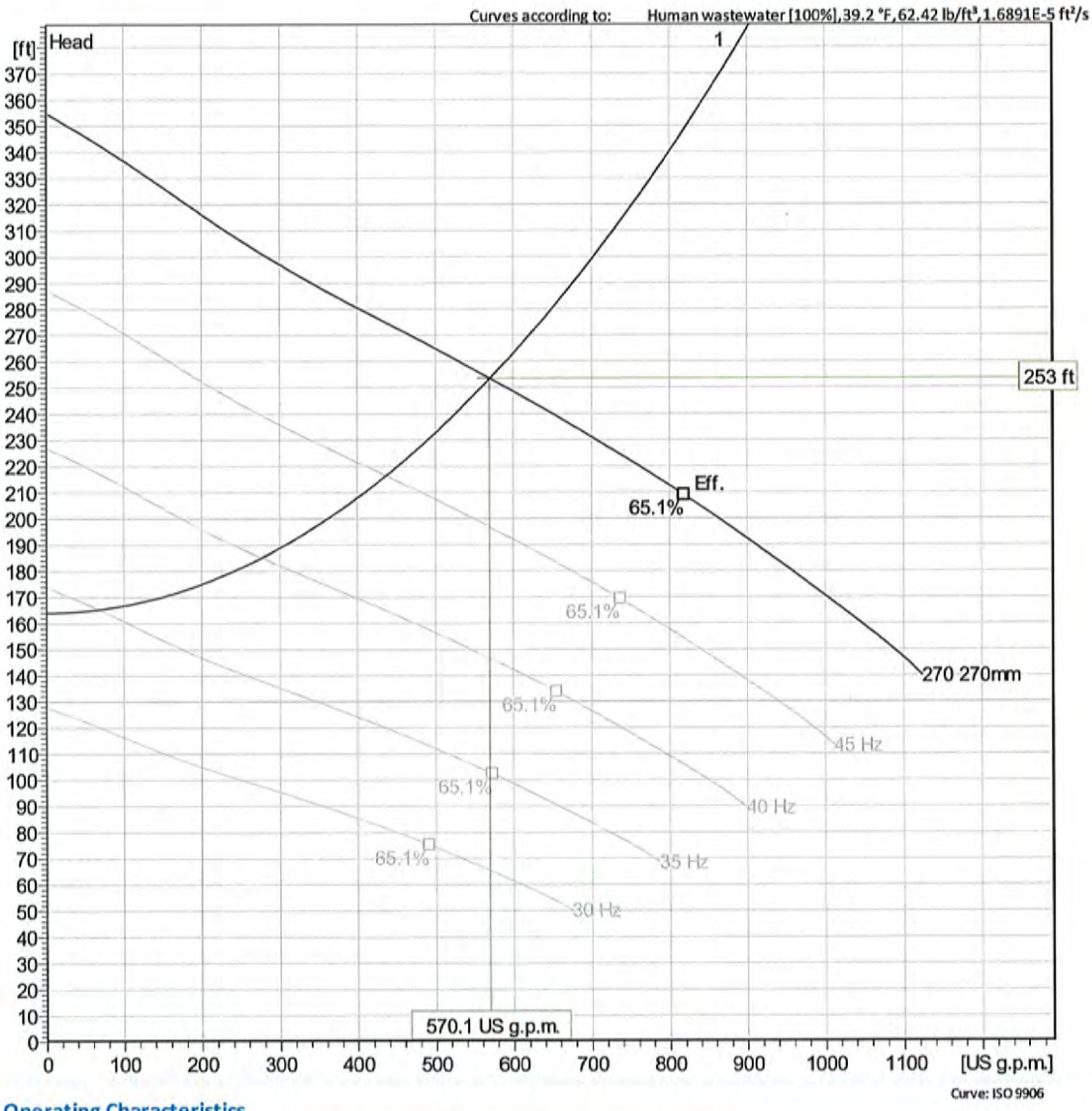
APPENDIX 2

Reata Ranch to Gravity Outfall

NP 3202 SH 3~ 270

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	50 Hz	570 US g.p.m.	253 ft	62.1 hp	570 US g.p.m.	253 ft	62.1 hp	58.9 %	1470 kWh/US M	16.7 ft
1	45 Hz	436 US g.p.m.	216 ft	43.9 hp	436 US g.p.m.	216 ft	43.9 hp	54.5 %	1340 kWh/US M	13.2 ft
1	40 Hz	277 US g.p.m.	185 ft	28.9 hp	277 US g.p.m.	185 ft	28.9 hp	44.8 %	1400 kWh/US M	10.2 ft
1	35 Hz	67.7 US g.p.m	165 ft	17.6 hp	67.7 US g.p.m	165 ft	17.6 hp	16.1 %	3520 kWh/US M	8.27 ft
1	30 Hz									

Project	Created by		Last update
Block	Created on	8/15/2019	

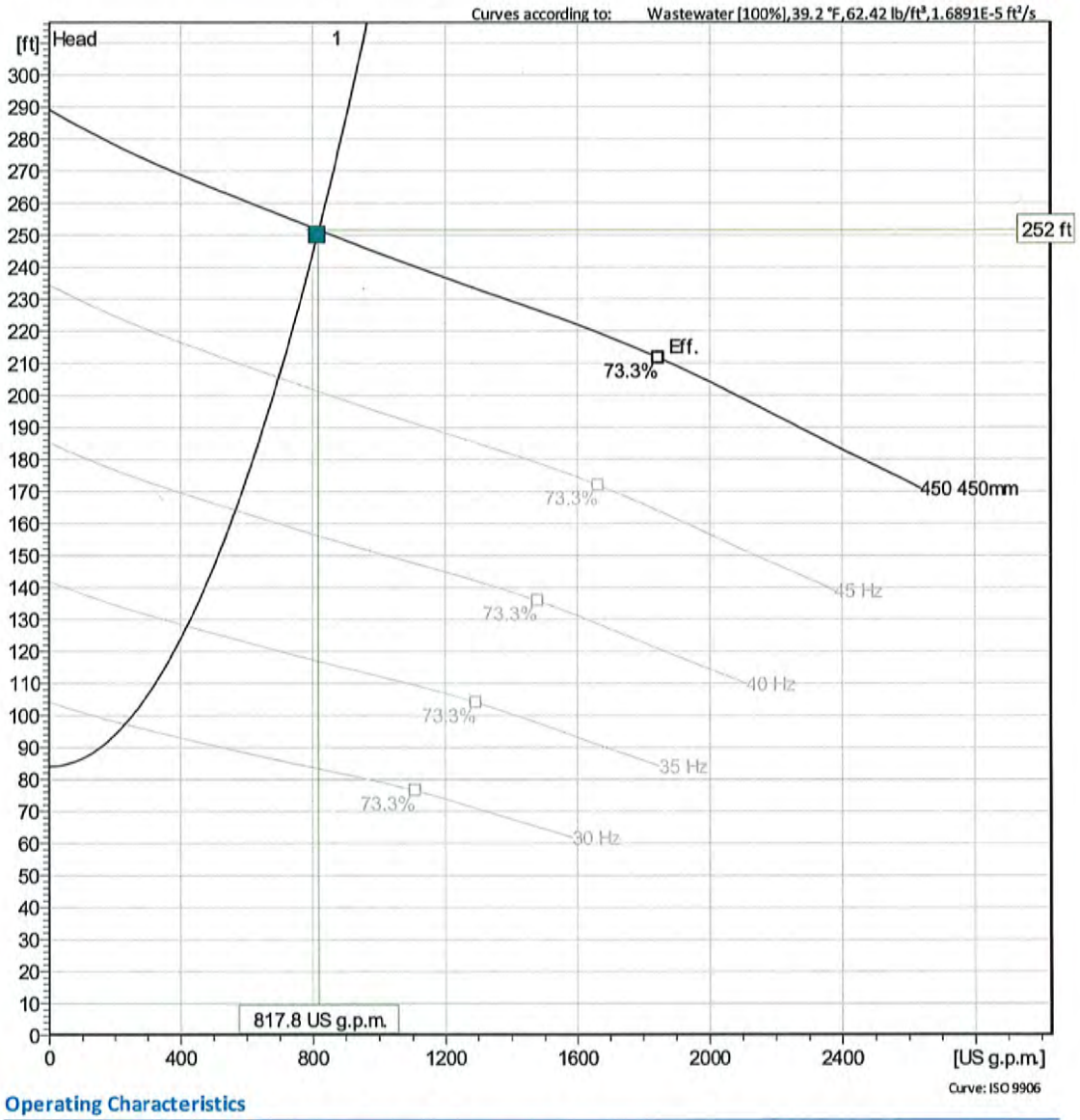
APPENDIX 2

Reata Ranch to SNGC

NP 3315 HT 3~ 450

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	50 Hz	818 US g.p.m.	252 ft	99.7 hp	818 US g.p.m.	252 ft	99.7 hp	52.2 %	1600 kWh/US M	7.7 ft
1	45 Hz	697 US g.p.m.	206 ft	71.9 hp	697 US g.p.m.	206 ft	71.9 hp	50.4 %	1350 kWh/US M	6.5 ft
1	40 Hz	566 US g.p.m.	164 ft	49.4 hp	566 US g.p.m.	164 ft	49.4 hp	47.6 %	1140 kWh/US M	5.39 ft
1	35 Hz	419 US g.p.m.	128 ft	31.9 hp	419 US g.p.m.	128 ft	31.9 hp	42.4 %	1010 kWh/US M	4.38 ft
1	30 Hz	230 US g.p.m.	97.2 ft	18.7 hp	230 US g.p.m.	97.2 ft	18.7 hp	30.2 %	1110 kWh/US M	3.65 ft

Project	Created by		Last update
Block	Created on	8/15/2019	

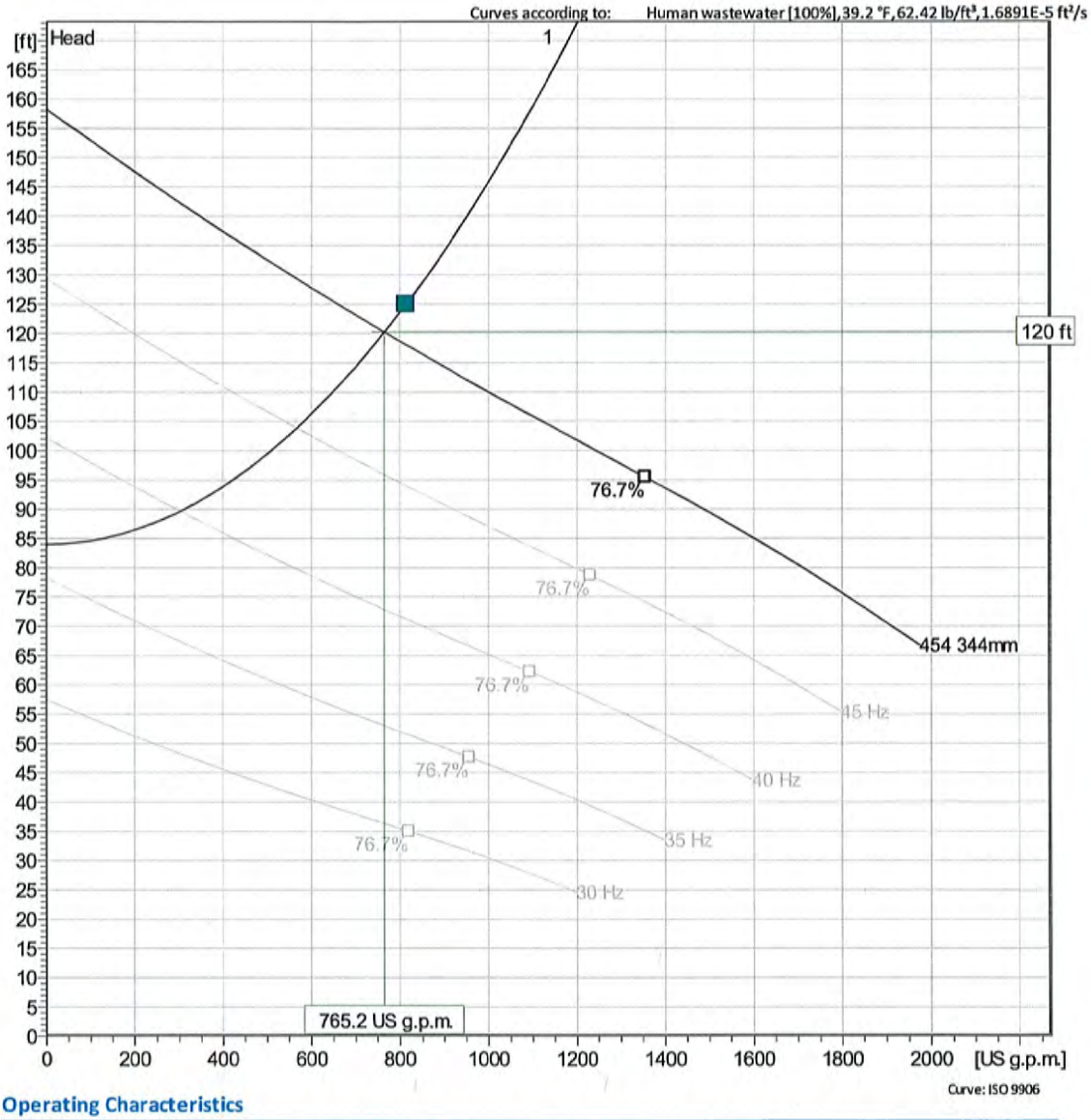
APPENDIX 2

SNGC – Alt. a)

NP 3202 HT 3~ 454

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	50 Hz	765 US g.p.m.	120 ft	34.8 hp	765 US g.p.m.	120 ft	34.8 hp	67 %	620 kWh/US M	11.1 ft
1	45 Hz	567 US g.p.m.	104 ft	24.3 hp	567 US g.p.m.	104 ft	24.3 hp	61.2 %	581 kWh/US M	9.38 ft
1	40 Hz	303 US g.p.m.	89.7 ft	15.2 hp	303 US g.p.m.	89.7 ft	15.2 hp	45.2 %	686 kWh/US M	7.98 ft
1	35 Hz									
1	30 Hz									

Project	Created by		Last update
Block	Created on	8/16/2019	

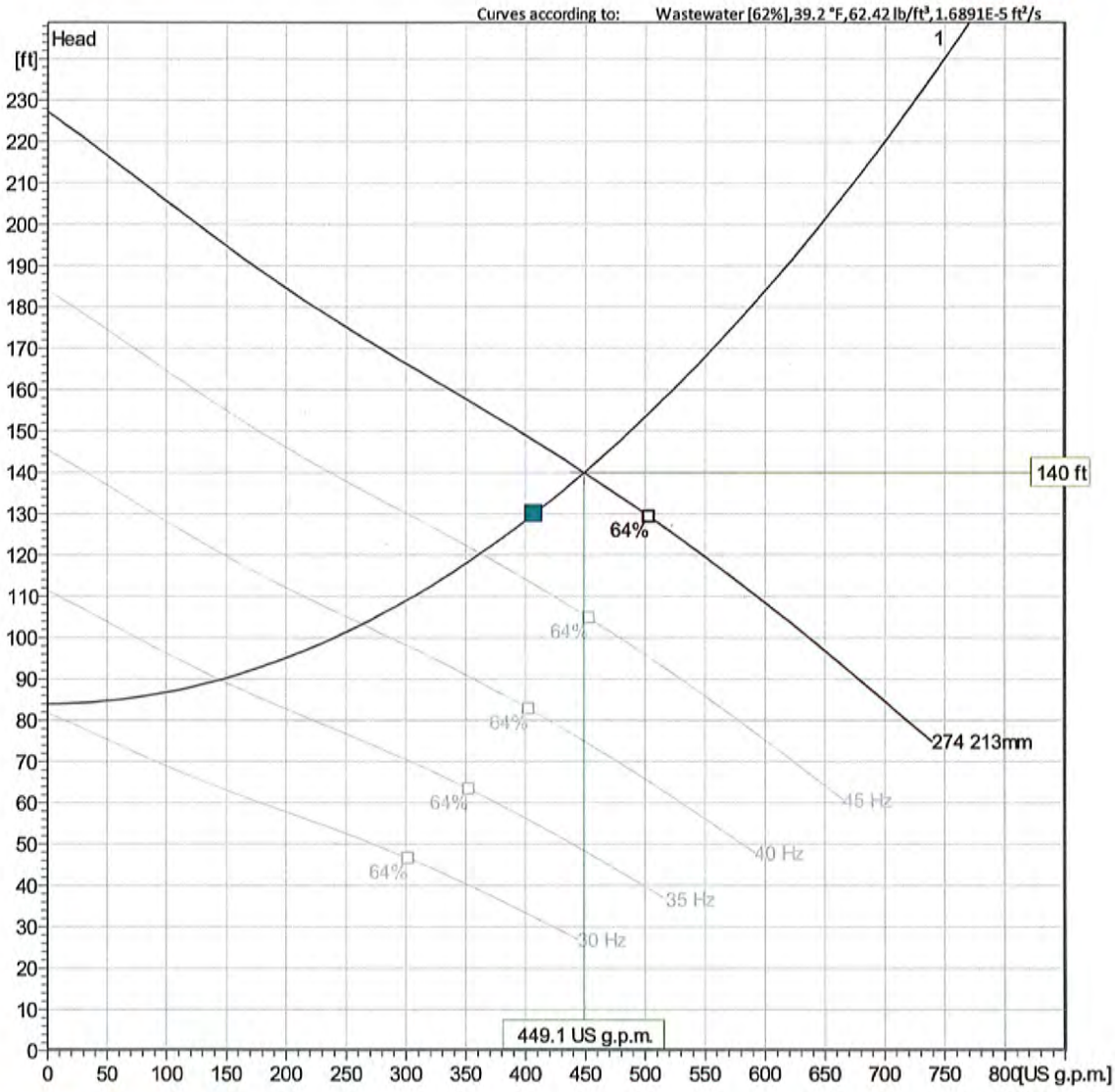
APPENDIX 2

SNGC – Alt. b)

NP 3171 SH 3~ 274

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	50 Hz	449 US g.p.m.	140 ft	25.1 hp	449 US g.p.m.	140 ft	25.1 hp	63.4 %	761 kWh/US M	15 ft
1	45 Hz	362 US g.p.m.	120 ft	17.8 hp	362 US g.p.m.	120 ft	17.8 hp	62 %	663 kWh/US M	10.9 ft
1	40 Hz	263 US g.p.m.	103 ft	11.8 hp	263 US g.p.m.	103 ft	11.8 hp	58.1 %	612 kWh/US M	7.47 ft
1	35 Hz	145 US g.p.m.	89.8 ft	7.19 hp	145 US g.p.m.	89.8 ft	7.19 hp	45.7 %	688 kWh/US M	5.29 ft
1	30 Hz									

Project	Created by		Last update
Block	Created on	8/15/2019	

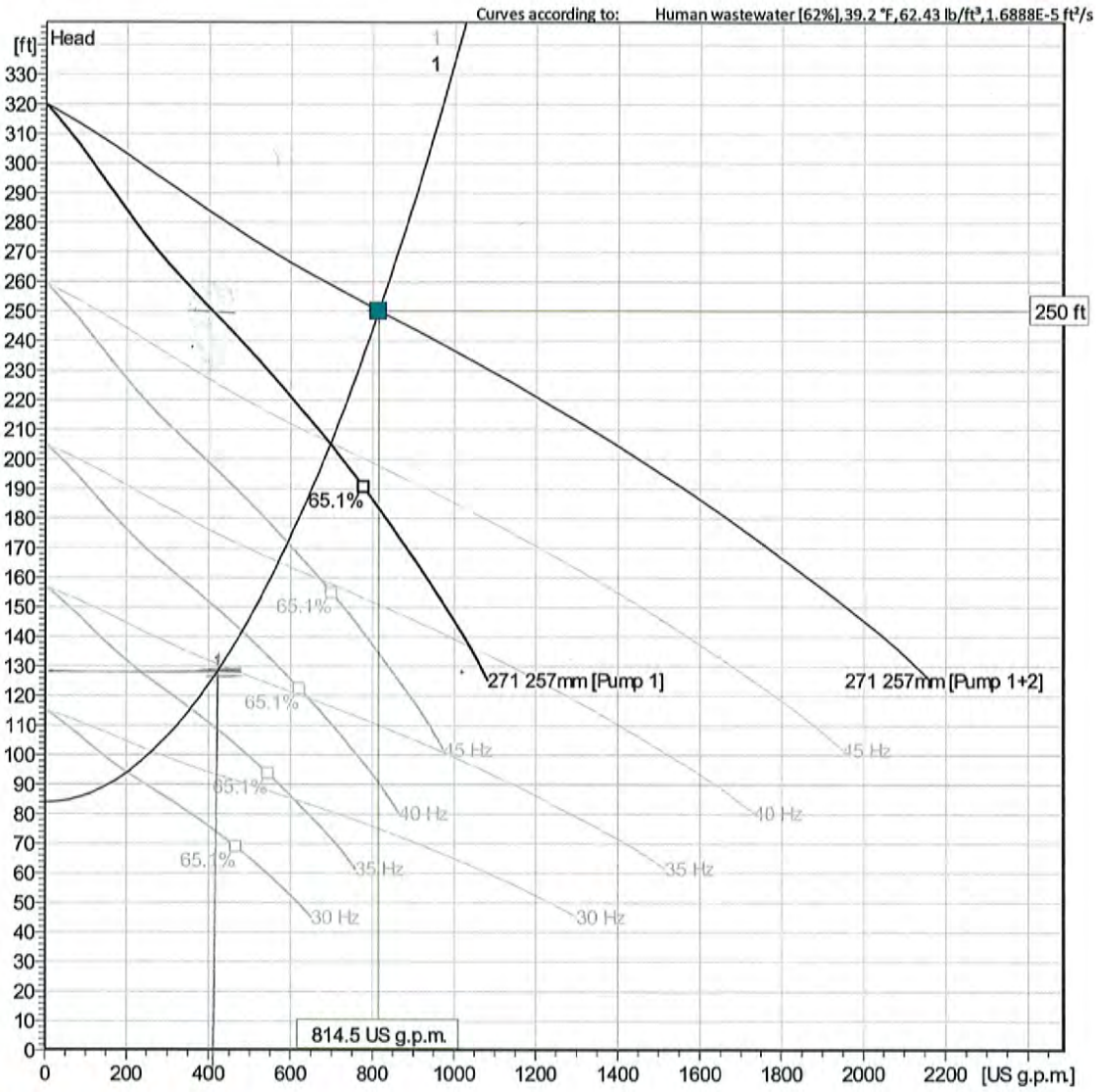
APPENDIX 2

SNGC – Alt. c)

NP 3202 SH 3~ 271

VFD Analysis

FLYGT
a xylem brand



Operating Characteristics

Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
2 / 1	50 Hz	407 US g.p.m.	250 ft	50.4 hp	814 US g.p.m.	250 ft	101 hp	51.2 %	1620 kWh/US M	15.1 ft
2 / 1	45 Hz	348 US g.p.m.	206 ft	36.4 hp	697 US g.p.m.	206 ft	72.9 hp	49.7 %	1370 kWh/US M	12.7 ft
2 / 1	40 Hz	285 US g.p.m.	165 ft	25.2 hp	570 US g.p.m.	165 ft	50.4 hp	47.3 %	1170 kWh/US M	10.4 ft
2 / 1	35 Hz	215 US g.p.m.	130 ft	16.4 hp	430 US g.p.m.	130 ft	32.9 hp	43.1 %	1020 kWh/US M	8.3 ft
2 / 1	30 Hz	131 US g.p.m.	101 ft	9.92 hp	262 US g.p.m.	101 ft	19.8 hp	33.7 %	1050 kWh/US M	6.42 ft
1 / 1	50 Hz	695 US g.p.m.	205 ft	56.1 hp	695 US g.p.m.	205 ft	56.1 hp	64.3 %	1060 kWh/US M	20.1 ft
1 / 1	45 Hz	592 US g.p.m.	172 ft	40.6 hp	592 US g.p.m.	172 ft	40.6 hp	63.4 %	896 kWh/US M	15.9 ft

Project	Created by		Last update
Block	Created on	8/16/2019	

APPENDIX 2

SNGC – Alt. d)

Rating Table for 8" PVC Sewer

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	5.20	in
Diameter	8	in

Channel Slope (ft/ft)	Discharge (gal/min)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	290.1	2.69	0.24	1.25	0.64
0.01000	410.2	3.81	0.24	1.25	0.64
0.01500	502.4	4.66	0.24	1.25	0.64
0.02000	580.2	5.38	0.24	1.25	0.64
0.02500	648.6	6.02	0.24	1.25	0.64

Rating Table for 10" PVC Sewer

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	6.50	in
Diameter	10	in

Channel Slope (ft/ft)	Discharge (gal/min)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	525.9	3.12	0.38	1.56	0.79
0.01000	743.8	4.42	0.38	1.56	0.79
0.01500	911.0	5.41	0.38	1.56	0.79
0.02000	1051.9	6.24	0.38	1.56	0.79
0.02500	1176.1	6.98	0.38	1.56	0.79

Rating Table for 12" PVC Sewer

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	7.80	in
Diameter	12	in

Channel Slope (ft/ft)	Discharge (gal/min)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.00500	855.2	3.53	0.54	1.88	0.95
0.01000	1209.5	4.99	0.54	1.88	0.95
0.01500	1481.3	6.11	0.54	1.88	0.95
0.02000	1710.5	7.05	0.54	1.88	0.95
0.02500	1912.4	7.88	0.54	1.88	0.95

APPENDIX 3 - Gravity Sewer

12" Water - 128th to 136th

Project Description			
Friction Method	Hazen-Williams Formula		
Solve For	Pressure at 2		
Input Data			
Pressure 1	75.00	psi	
Elevation 1	2570.00	ft	
Elevation 2	2480.00	ft	
Length	5280.00	ft	
Roughness Coefficient	130.000		
Diameter	12	in	
Discharge	2380.0	gal/min	
Results			
Pressure 2	85.10	psi	
Headloss	66.71	ft	
Energy Grade 1	2743.70	ft	
Energy Grade 2	2676.99	ft	
Hydraulic Grade 1	2742.99	ft	
Hydraulic Grade 2	2676.28	ft	
Flow Area	0.79	ft²	
Wetted Perimeter	3.14	ft	
Velocity	6.75	ft/s	
Velocity Head	0.71	ft	
Friction Slope	0.01263	ft/ft	

Bentley Systems, Inc. Haestad Methods Solution Center
Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03]
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APPENDIX 4