SAN BERNARDINO COUNTY

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SECTION I

BASIS OF DESIGN TECHINCAL MEMORANDUM

LAKEVIEW LIFT STATION RENOVATION PROJECT

FOR

COMMUNITY SERVICES AREA 64
SPRING VALLEY LAKE, CA.

PROJECT NO.: 30.30.0023

PART 2

ALBERT A. WEBB ASSOCIATES

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WEBB W.O.: 2021-0127

November 16, 2021

Mr. Nelson Sarti, P.E.
Project Manager
SAN BERNARDINO COUNTY
Department of Public Works, Special Districts
PO Box 11969
San Bernardino, CA 92423

RE: CSA 64 Sewer System Calibration based on June – July 2021 Sewer Flow Monitoring.

Dear Mr. Sarti:

Two previous sewer modeling studies were performed for upcoming developments within County Service Area 64. The two studies are listed below:

- Previous Study 1 - CSA 64 Victor Valley College – New Stadium and Educational Event Center Sewer Study (April 09, 2021)
- Previous Study 2 - Sewer Study Letter for TR 17049 – APN 0482-031-01,-02,-07, and -08 (July 20, 2021)

The two previous studies utilized a hydraulic model created by WEBB to perform the CSA 64 Easterly Sewer System Modeling / Hesperia Sewer Study in 2017. This model used generally accepted sewer generation factors for the existing land uses. The sewer generation factors are intended to size sewer systems to ensure there are no sanitary sewer overflows in the system and account for variability in the anticipated sewer generated by yet to be constructed development. Now that CSA 64 is close to build-out, the sewer generation for the actual constructed development can be determine by flow monitoring. The previous modeling studies recommended that sewer flow monitoring be conducted to confirm the model's flow and d/D projections. From June 25, 2021 to July 8, 2021, field sewer monitoring was conducted at Manholes 8031-3, 8099-5, and 8030-12. **Table 1** summarizes the flows previously calculated in the model at the three monitoring locations, the actual field monitoring flows and the differential between the model and actual flows at the monitoring locations.

Table 1: Previous Model vs Field Monitoring flow Comparison

Manhole ID	Pipe Diameter (in)	Previous Model [1]		Field Monitoring [2]		Differential [3]	
		Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)
8031-3	12	0.278	0.780	0.063	0.175	0.21[illegible]	0.605
8099-5	15	0.562	1.572	0.150	0.380	[illegible]412	1.192
8030-12	21	1.263	3.537	1.092	2.1[illegible]7	0.1[illegible]1	1.400

(1) From the model utilized in Previous Study 1 and Previous Study 2 described in this report.
(2) From the field sewer monitoring conducted from June 25, 2021 to July 8, 2021.
(3) From the difference between value of (1) and value of (2)

It is evident that the previously calculated model flows are significantly higher than the actual field flows experienced by the CSA 64 wastewater collection system. Therefore, after reviewing the field monitoring flow data, the model flows were recalibrated and adjusted to more closely resemble the actual sewer flows experienced in the system by evenly lowering the model's sewer loading. *The method used is a conservative approach that can be applied District-wide and avoids the creation or need for parcel-specific factors.* During the recalibration process, it was important to consider that the updated flows needed to remain slightly conservative to provide a factor of safety to prevent the system from becoming hydraulically deficient if higher than anticipated peak flows are experienced in the future. **Table 2** below summarizes the updated model flows at the monitoring locations, with an updated flow differential.

Table 2: Updated Model vs Field Monitoring flow Comparison

Manhole ID	Pipe Diameter (in)	Updated Model [1]		Field Monitoring [2]		Differential [3]	
		Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)	Ave Flow (mgd)	Peak Flow (mgd)
8031-3	[illegible]	0.131	0.263	0.063	0.175	0.068	0.088
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8030-12	[illegible]1	1.116	2.232	1.092	2.137	0.024	0.095

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The flow differentials show that after recalibration, the model flow rates remain higher than the recorded field flow rates, especially in Manhole 8099-5. Model flow rates remain higher for Manhole 8099-5 because reducing flows at Manhole 8099-5 would result in proportionally lowering the model flows at Manholes 8031-3 and 8030-2 to the point where they are considerably lower than the field

flow rates at those locations. Therefore, although inconsistencies remain between field measurements and model results, the flow reduction was conducted such that the modeled flows always generated more flow than the field measurements. Notably, model results and field measurements were very consistent at the most downstream point of the system (MH 8030-12).

San Bernardino Special Districts Department standards specify that pipelines that are 8 inches in diameter and smaller shall be sized to carry the peak flow when fifty percent full (d/D=0.50), while pipelines larger than 8-inches in diameter shall be sized to carry the peak flow when seventy-five percent full (d/D=0.75). The updated model flows do not approach the maximum d/D capacity, as summarized in **Table 3**.

Table 3: Updated Model vs Field Monitoring flow Comparison

Manhole ID	Pipe Diameter (in)	Field Monitoring Peak d/D [1]	Updated Model Peak d/D [2]	Maximum d/D Standard [3]	Available Peak Flow Capacity per Model (mgd) [4]
8031-3	12	0.23	31	0.75	1.121
8099-5	15	0.29	0.4	0.75	1.125
8030-12	21	0.49	0.50	0.75	1.858

(1) Calculated from field sewer monitoring conducted from June 25, 2021 to July 8, 2021
(2) From the updated CSA 64 InfoSewer model
(3) From the Department's Design Standards
(4) From the difference of the full capacity calculated using Manning's equation and the updated model peak flow.

The peak flows measured in the field monitoring are lower than the previously calculated model flows. Therefore, in the system's existing situation, there is additional available capacity to receive flows from new development projects.

It appears that the Lakeview Lift Station and force main system may be undersized for any additional peak flow as the model indicates there may be a 6-in diameter force main at this location. This lift station is equipped with a screw pump and may not actually have a 6-diameter force main.

The District can consider accepting sewage flows from these proposed projects without upgrading the existing collection system pipelines, however the Lakeview Lift Station should be reviewed in detail for its capability for this increased flowrate.

Should you have any questions, please call me.

ALBERT A. WEBB ASSOCIATES

Gustavo Gomez, PE
Associate Engineer

cc: Bradley Sackett, Webb Associates
Bruce Davis, Webb Associates

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WEBB W.O.: 2021-0215

November 29, 2021

Mr. Nelson Sarti, P.E.
Project Manager
SAN BERNARDINO COUNTY
DEPARTMENT OF PUBLIC WORKS, SPECIAL DISTRICTS
PO Box 11969
San Bernardino, CA 92423

RE: Sewer Service Feasibility Study
APN 0482-043-08 (17876 Bear Valley Road)

Dear Mr. Sarti:

Pursuant to the District's request, we have performed a sewer study for the above referenced project that includes a review of how the proposed project affects the District's existing facilities and identifies any required system improvements. The proposed project consists of one commercial lot with a gas station, mini-mart and car wash. The proposed facility will require sewer service from County Service Area 64.

Project Wastewater Generation

The project's wastewater flow generation is calculated using comparable Eastern Municipal Water District wastewater generation factors, and reference car wash calculations prepared by Carwash Services of Arizona ©. The wastewater generation calculation is summarized in **Table 1**.

Table 1

Type	Size	Average Day Generation
Car Wash	1,125 Sq. Ft. (0.03 AC)	3,310 gpd [1]
Mini Mart & Gas Station	0.96 AC	1,640 gpd [2]
Project Totals	**0.99 AC**	**4,950 gpd (0.005 MGD)**

[1] This is the Average Daily Demand for a comparable Car Wash attached to Gas Station in the EMWD Service Area.
The comparable car wash is part of PM No. 37612, located at the southwest corner of Murrieta Hot Springs Road and Del Haven Street. The calculations for the car wash were performed by Carwash Service of Arizona ©
[2] Average Daily Generation based on 1,700 gpd/acre per Table 1 of the 2015 EMWD Wastewater Collection System
Master Plan Update

The estimated peak flow for this project is 9,900 gpd or 6.88 gpm based on the peaking factor consistent with the sewer monitoring study.

Project Connection Point

In preparation of this sewer study, we have reviewed available data to find a project sewer connection point. Available data includes District atlas maps and a hydraulic model of the existing CSA 64 sewer system created by WEBB to perform previous studies. The identified connection point for the proposed project is an existing 8-in sewer line in Tamarisk Road that fronts the property.

Hydraulic Model Information

A hydraulic model of the CSA 64 Easterly Sewer System was created by WEBB to perform a previous sewer study dated October 20, 2017. In 2021, WEBB was asked to perform two additional sewer studies, and in each study, WEBB recommended field flow monitoring in the CSA 64 easterly system to verify if current field sewer flows match WEBB's 2017 hydraulic model flows. Field flow monitoring was conducted from June to July 2021, and the hydraulic model was re-calibrated in August 2021 after the field flow monitoring. The re-calibrated CSA 64 sewer model is used for this analysis.

Analysis Load Input

To include the proposed project flows in the system's existing model, an average daily sewer load of 0.005 MGD, as calculated in **Table 1**, was applied to the 8-inch diameter sewer line in Tamarisk Road. In addition, the following modeled point wastewater loads summarized in **Table 2** were added to the system's model to account for other development in the CSA 64 system. **Figure 1** shows a map of the proposed project location, point load locations, and the system's model sewer facilities.

Table 2

Point Load Source	Sewer Flow (gpd) – Average Flow	Sewer Flow (gpm) – Peak Flow
Victor Valley College (w/ Stadium)[2]	147,000	204.17
Lakeview Middle School[1]	8,820	12.25
Endeavour School of Exploration[1]	8,330	11.57
Excelsior Charter School[1]	14,700	20.42
APN 0482-031-01,-02,-07, and -08 [3]	13,680	19.00
Victor Valley College Stadium[2]	N/A	47.22

[1] From the CSA 64 Easterly Sewer System Modeling/Hesperia Sewer Study (10/20/2017)
[2] From the CSA 64 Victor Valley College – New Stadium and Education Event Center Sewer Study (04/09/2021)
[3] From the CSA 64 APN 0482-031-01,-02,-07, and -08 Sewer Study (11/29/2021)

Analysis Results

The model's sewer pipelines from the proposed development location to the downstream Lakeview Lift Station were analyzed for high depth-over-Diameter (d/D) ratios. The downstream pipelines with the highest d/D ratios are listed in **Table 3** below.

Table 3

Pipe ID	Diameter (in)	Total Peak Flow (mgd)	Total Peak Flow (cfs)	d/D
12-8030-11	21	2.338	3.62	0.509
14-8030-13	21	2.207	3.41	0.492
13-8030-12	21	2.211	3.42	0.490
15-8030-14	21	2.17	3.36	0.455
1-8099-6	15	0.935	1.45	0.455
6-8099-5	15	0.935	1.45	0.455

The peak flow at the Lakeview Lift Station is estimated at 2.34 MGD or 3.62 cfs. The model analysis concludes that downstream sewer pipe segments from the proposed development experience flow d/D ratios that are below the maximum d/D standards, with the model inputs summarized in this letter. The District can consider accepting sewage flows from these proposed projects without upgrading the existing collection system pipelines, however the Lakeview Lift Station should be reviewed in detail for its capability for this increased flowrate.

Should you have any questions, please call me.

ALBERT A. WEBB ASSOCIATES

Bradley Sackett, Webb Associates
Senior Engineer

cc: Gustavo Gomez, Webb Associates
Bruce Davis, Webb Associates

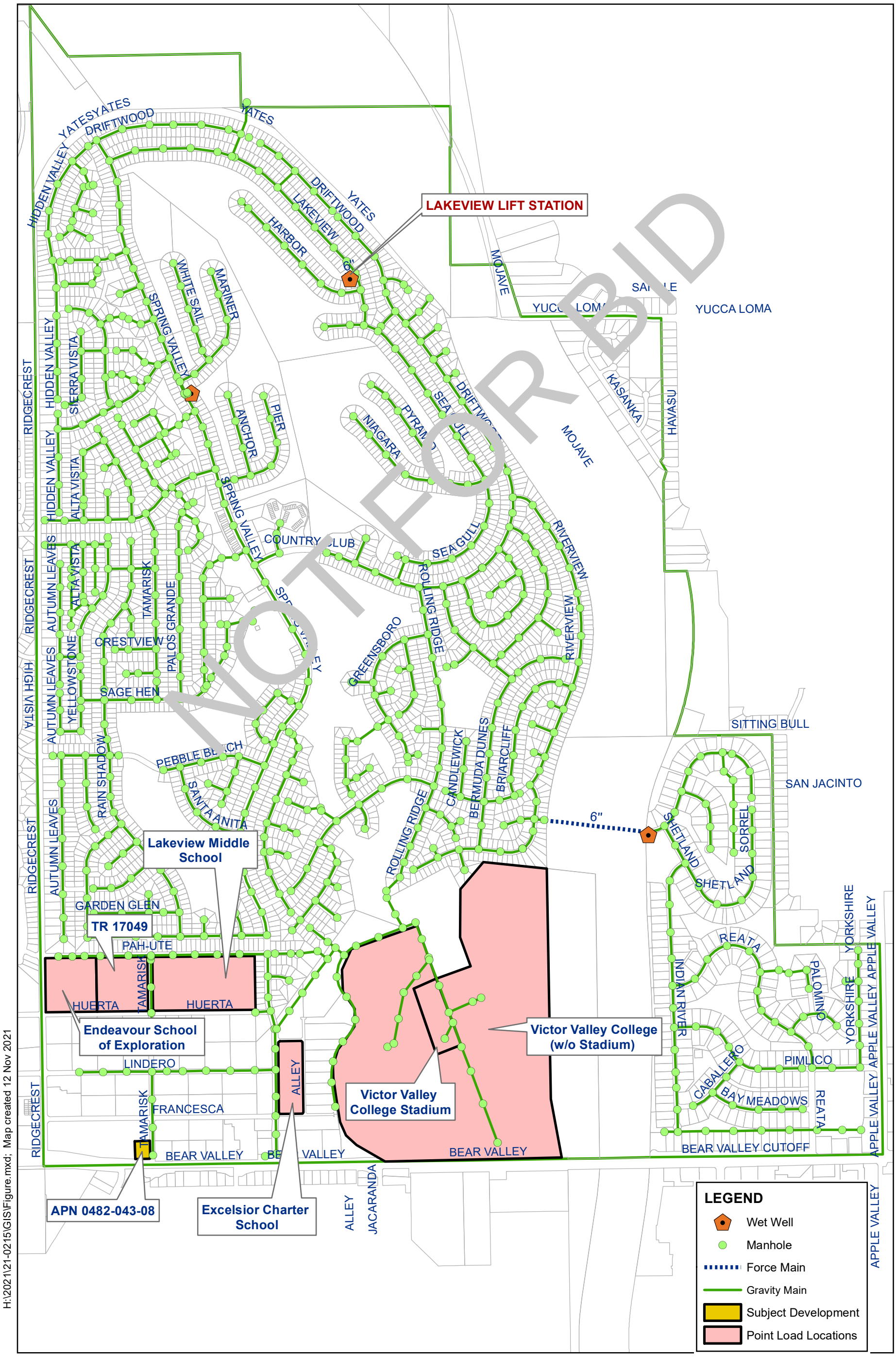

FIGURE 1 - EXISTING SEWER SYSTEM
CSA 64

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WEBB W.O.: 2021-0014

December 9, 2021

Mr. Nelson Sarti, P.E.
Project Manager
SAN BERNARDINO COUNTY
DEPARTMENT OF PUBLIC WORKS, SPECIAL DISTRICTS
PO Box 11969
San Bernardino, CA 92423

RE: Sewer Study Letter for Victor Valley College – New Stadium and Educational Event Center, located on the west side of Fish Hatchery Road and north of Bear Valley Road.

Dear Mr. Sarti:

Pursuant to the District's request, we have performed a sewer study for the above referenced project that includes a review of how the proposed project affects the District's existing facilities and identifies any required system improvements. The New Stadium and Educational Event Center is located on the west side of Fish Hatchery Road and north of Bear Valley Road in the City of Victorville and proposes sewer service from County Service Area 64.

Project Wastewater Generation

The project's wastewater flow generation is calculated using comparable wastewater generation factors. As a stadium is not a typical sewer service, we have investigated sewer generation rates used by other districts.

Method 1

A sewer generation value of 3 gpd/seat is used by Miami Dade County (Miami-Dade Chapter 24.43) for Stadiums, Sporting Facilities, and Auditoriums. A sewer generation of 3 gpd/seat is also used by the City of Los Angeles Bureau of Engineering (Sewage Generation Factors Chart, Revised 06-10-2019) for Auditoriums, Community Centers, School Stadiums. We would recommend the use of this generation rate for Method 1.

TABLE 1 EXISTING WASTEWATER FLOW ESTIMATE (METHOD 1)

Description	Value
Calculation Parameters	
Total Event Center Occupants	372 [1]
Total Stadium Occupants	4,094 [1]
Total Occupants	4,466 [1]
Stadium/Event Center Sewer Generation Rate (gpd/occupant)	3 [2]
Peak Factor	3.4 [3]
Calculation Results	
Average Sewer Generation (gpd)	13,398
Peak Sewer Generation (gpd)	45,553

[1] From Architecture Plans

[2] A sewer generation value of 3 gpd/seat is used by Miami Dade County (Miami-Dade Chapter 24 - 3) for Stadiums, Sporting Facilities, and Auditoriums. A sewer generation of 3 gpd/seat is used by the City of Los Angeles Bureau of Engineering (Sewage Generation Factors Chart, Revised 06-10-2019) for Auditoriums, Community Centers, and School Stadiums.

[3] Based on County of San Bernardino Special Districts Department "Standards for Sanitary Sewer"

Method 2

The second method utilized to calculate the projected peak wastewater generation by this development uses the known plumbing fixtures and accompanying flowrates to calculate wastewater generation. To estimate the peak flow scenario, the flow from all plumbing fixtures was combined to recreate a complete use of fixtures during a facility event. This method calculates a higher, more conservative flow value, as shown in Table 2.

TABLE 2 EXISTING WASTEWATER FLOW ESTIMATE (METHOD 2)

Plumbing Fixtures Provided	Fixtures [1]	Wastewater Flow Rate Factor (gpm/fixture) [2]	Wastewater Flow (gpm)
Water Closet	25	1.28	32.00
Urinals	9	0.125	1.13
Lavatories	18	0.50	9.00
Drinking Fountain	7	0.75	5.25
Total Peak Flow			**47.38 gpm (68,230 gpd)**

[1] From Architecture Plans

[2] From California Plumbing Code

Project Connection Point

In preparation of this sewer study, we have reviewed available data related to the proposed sewer connection point. Available data includes District atlas maps and a hydraulic model of the existing CSA 64 sewer system created by WEBB to perform previous studies. The identified connection

point for the proposed project is an existing 8-in sewer line in Fish Hatchery Road that fronts the property per the Civil plans provided by the applicant.

Hydraulic Model Information

A hydraulic model of the CSA 64 Easterly Sewer System was created by WEBB to perform a previous sewer study dated October 20, 2017. In 2021, WEBB was asked to perform two additional sewer studies, and in each study, WEBB recommended field flow monitoring in the CSA 64 easterly system to verify if current field sewer flows match WEBB's 2017 hydraulic model flows. Field flow monitoring was conducted from June to July 2021, and the hydraulic model was re-calibrated in August 2021 after the field flow monitoring. The re-calibrated CSA 64 sewer model is used for this analysis. Please see the attached analysis for the re-calibrating the sewer model using the field flow monitoring.

Analysis Load Input

To include the proposed project flows in the system's existing model, an average daily sewer load of 0.06832 MGD, as calculated in **Table** was applied to the 8-inch diameter sewer line in Fish Hatchery Road. In addition, the following other point wastewater loads summarized in **Table 2** were added to the system's model to account for other development in the CSA 64 system. **Figure 1** shows a map of the proposed project location, point load locations, and the system's model sewer facilities.

Table 2

Point Load Source	Sewer Flow (gpd) – Average Flow	Sewer Flow (gpm) – Peak Flow
Victor Valley College (w/o Stadium) [1]	147,000	204.17
Lakeview Middle School [1]	8,820	12.25
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APN 0482-031-01,-02,-07, and -08 [3]	13,680	19.00
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Victor Valley College Stadium[2]	N/A	47.22

[1] From the CSA 64 Easterly Sewer System Modeling/Hesperia Sewer Study (10/20/2017)
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Should you have any questions, please call me.

ALBERT A. WEBB ASSOCIATES

REGISTERED PROFESSIONAL ENGINEER
BRADLEY A. SACKETT
NO. C65862
CIVIL
STATE OF CALIFORNIA

Bradley Sackett, Webb Associates
Senior Engineer

cc: Gustavo Gomez, Webb Associates
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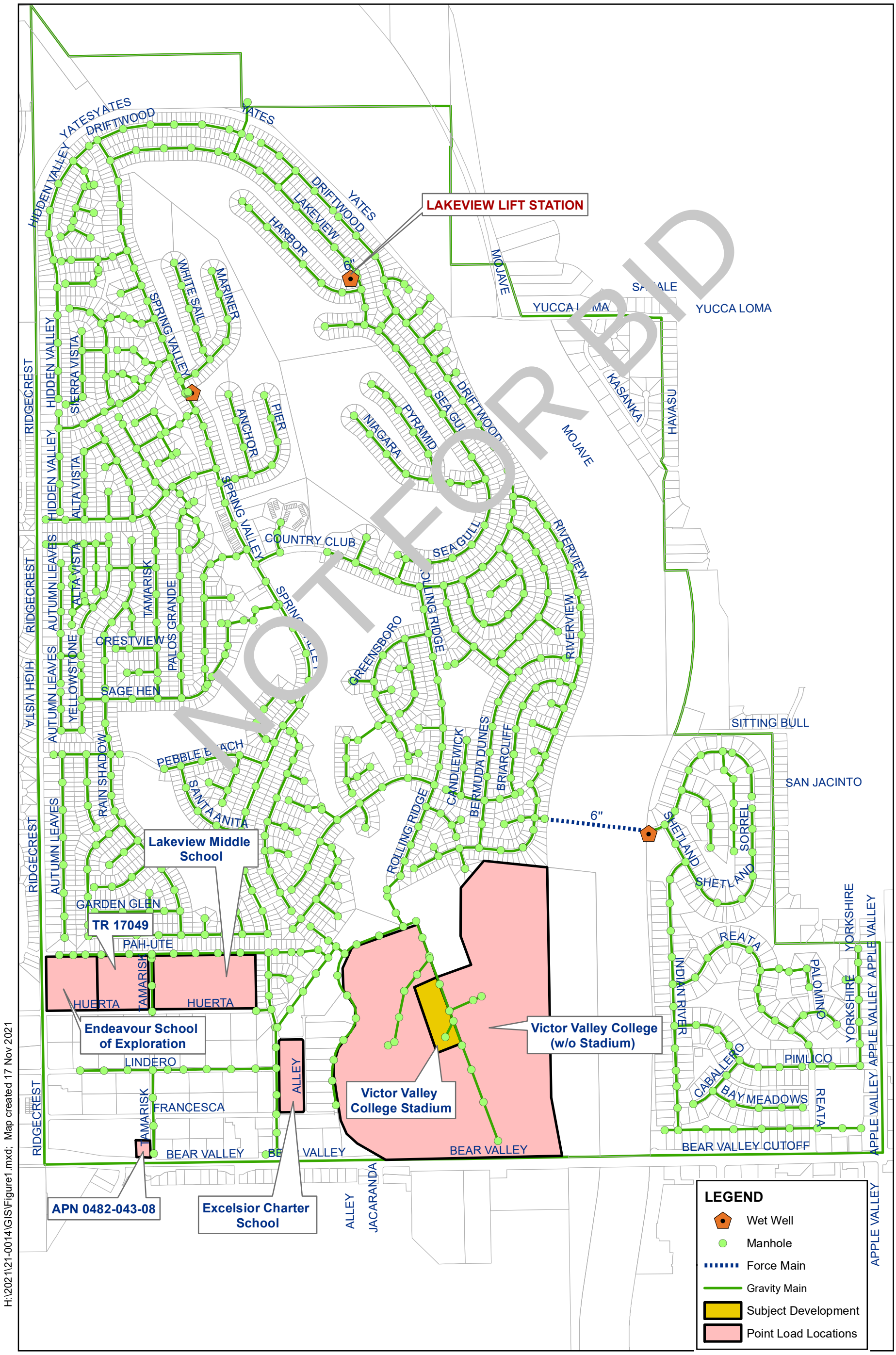

FIGURE 1 - EXISTING SEWER SYSTEM
CSA 64

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Table 2: Updated Model vs Field Monitoring flow Comparison

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San Bernardino Special Districts Department standards specify that pipelines that are 8-inches in diameter and smaller shall be sized to carry the peak flow when fifty percent full (d/D=0.50), while pipelines larger than 8-inches in diameter shall be sized to carry the peak flow when seventy-five percent full (d/D=0.75). The updated model flows do not approach the maximum d/D capacity, as summarized in **Table 3**.

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It appears that the Lakeview Lift Station and force main system may be undersized for any additional peak flow as the model indicates there may be a 6-in diameter force main at this location. This lift station is equipped with a screw pump and may not actually have a 6-diameter force main.

The District can consider accepting sewage flows from these proposed projects without upgrading the existing collection system pipelines, however the Lakeview Lift Station should be reviewed in detail for its capability for this increased flowrate.

Should you have any questions, please call me.

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Bruce Davis, Webb Associates

APPENDIX D

SEWER FLOW CALCULATIONS

Lakeview Lift Station Flow Calculations

Overview

SCADA Results

2017-2019		
Avg Run time/Start	0.039	hrs
	2.36	min
Pump Flow Rate	130.4612642	gpm
	0.18786422	mgd

2017-2021		
Avg Run time/Start	0.038	hrs
	2.29	min
Pump Flow Rate	134.594285	gpm
	0.19381577	mgd

Land Use Flow Results

	Value	Unit
Total Residential Households	4215	homes
Population Density	2.98	people/home
Sewer Generation Rate	100	gpd/person

Sewer Generation (avg)	1256070	gpd
	872.2708333	gpm
	1.943419417	cfs
	1.25607	mgd

Additional Flows (from Sewer Feasibility Studies)

	Value	Units
Victor Valley College (w/o stadium)	147000	gpd
Lakeview Middle School	8820	gpd
Endeavour School of Exploration	8330	gpd
Excelsior Charter School	14700	gpd
APN 0482-031-01,-02,-07,-08	13680	gpd
APN 0482-043-08	4950	gpd
Victor Valley College Stadium	24284	gpd
Total	221764	gpd
	154.0027778	gpm
	0.343118189	cfs
	0.221764	mgd

*only n… …ded. Peak flow divided … to get average flow.

Total Flows

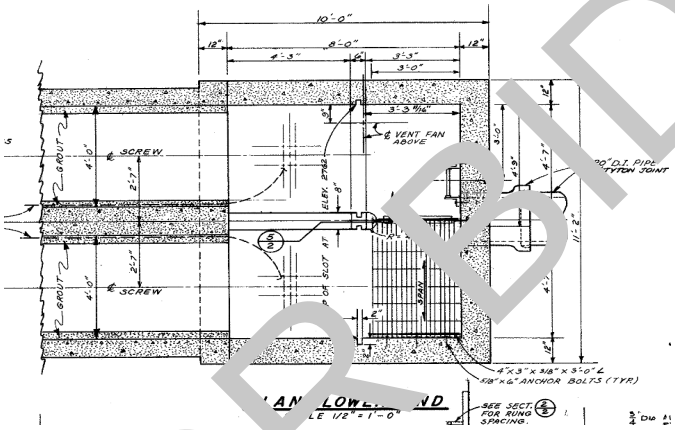
Sum of existing SCADA flows and additional flows

Total Average Flows	Total P… …ws	…Values
0.42	1.1…	…GD
415579.77	1163623.…	gpd
288.60	808.07	gpm
0.64	1.80	cfs

*peaking factor of 2.8 for flows ranging from 0.3-0.5 mgd

Assumptions

1. System is completely static - no influent flow affecting pump cycling
2. Pump and dividing wall volume in existing wet well is negligible
3. One pump operating at a time



Existing lift station plan

Pump Operating Ranges	
Pump 1 on:	15"
Pump 1 off:	8"
Lag Start (if needed)	18"

Existing Lift Station Volume Calculations		
Length	8	ft
Cross Section Area	5.14	sq ft

Operating Range Volume	41.12	cu ft
	307.599	gal

Average Flow (mgd)	Peak Factor
0.0 - 0.01	4.0
0.05	3.4
0.10	3.2
0.20	3.0
0.30	2.8
0.50	2.7
0.8	2.6
1.0	2.5
1.5	2.4
2.5	2.3
4.0	2.2
6.0	2.1
10	2.0
15	1.9
30	1.8

APPENDIX E

OPINION OF PROBABLE COSTS

Kimley-Horn and Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**County of San Bernardino Special Districts**	**Date:**	4/12/2022
Project:	**Lakeview Lift Station**	**Prepared By:**	SW
KHA No.:	**195068122**	**Checked By:**	SM/SS

Title: Lakeview Lift Station Rehabilitation Alternatives 1 & 2

No.	Item	Spec. #	Quantity	Unit	Unit Price	Cost
1	Flygt Submersible Pumps-Equipment		3	EA	$20,000.00	$60,000
2	Pump Installation		1	LS	$50,000.00	$50,000
3	12-inch DIP Force Main		100	LF	$400.00	$40,000
4	Misc Piping Spools and Fittings		1	LS	$50,000.00	$50,000
5	Electrical - Control Panel fabrication and installation		1	LS	$35,000.00	$35,000
6	Electrical - RTU control panel and installation		1	LS	$15,000.00	$15,000
7	Electrical - Conduit Trenching		1	LS	$10,000.00	$10,000
8	Electrical - Service Entrance Equipment and Installation		1	LS	$10,000.00	$10,000
9	Electrical - Sensors and Installation		1	LS	$10,000.00	$10,000
10	Electrical - Grounding and Bonding		1	LS	$10,000.00	$10,000
11	Electrical - New Installation and Servicing		1	LS	$10,000.00	$10,000
12	Demolition - Existing Pumps, Vents, Supports, Platforms		1	LS	$75,000.00	$75,000
13	Epoxy Coating Wet Well and Discharge Manhole		1	LS	$15,000.00	$15,000
14	Wet Well Sloped Concrete Invert Removal		1	LS	$3,000.00	$3,000
15	Temporary Bypass Plugs		2	EA	$2,000.00	$4,000
16	Site Restoration		1	LS	$10,000.00	$10,000
17	Mobilization		1	LS	$50,000.00	$50,000

**Electrical generator not required for this facility*

Subtotal:		$457,000
Conting. (%,+/-)	30	$137,100
Total		**$600,000**

- [x] Conceptual Design
- [ ] Preliminary Design
- [ ] Final Design

Title: Optional Upgrades

No.	Item	Spec. #	Quantity	Unit	Unit Price	Cost
1	Odor Control Components		1	LS	$50,000.00	$50,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

APPENDIX F

PRELIMINARY PUMP DESIGN CALCULATIONS AND PUMP CURVE

By: SDW	Date:		03/11/22	Subject:	Lakeview Sewer Lift Station
Checked: SLM	Date:		03/11/22	Job No.:	

Nominal Diameter of Force Main	10.00	IN
Length of Force Main	55.00	FT
Nominal Diameter of Yard Piping (1)	10.00	IN
Length of Yard Piping (1)	0.00	FT
Nominal Diameter of Yard Piping (2)	10.00	IN
Length of Yard Piping (2)	0.00	FT
Lowest Water Level	2.00	FT
Highest Water Level	6.00	FT
Highest Elevation in System	20.00	FT
Hazen Williams C (Force Main)	130.00	Unitless
Hazen Williams C (Yard Piping 1)	130.00	Unitless
Hazen Williams C (Yard Piping 2)	130.00	Unitless
Area of Force Main	0.55	SF
Area of Yard Piping (1)	0.55	SF
Area of Yard Piping (2)	0.55	SF

SYSTEM CURVE POINTS (Lowest Water Level, Max Elev Head)

FLOW (GPM)	Flow (CFS)	Pressure Pipe Headloss (FT)	Fitting Headloss (FT)	TDH (FT)	Velocity (FT/SEC)	TDH (PSI)
0	0.000	0.00	0.00	18.0	0.0	[illegible]
150	0.334	0.01	0.01	18.0	0.6	[illegible]
300	0.668	0.04	0.06	18.1	[illegible]	7.[illegible]
450	1.003	0.08	0.13	18.2	1.8	7.9
600	1.337	0.13	0.24	18.4	2.5	8.0
750	1.671	0.20	0.37	18.6	3.1	8.0
815	1.816	0.23	0.44	18.7	3.3	8.1
925	2.061	0.30	0.57	19.[illegible]	3.8	8.2
1075	2.395	0.39	0.76	[illegible].2	[illegible].4	8.3
1225	2.730	0.50	0.99	19.5	[illegible]	8.4
1375	3.064	0.62	1.25	19.9	5.6	8.6

SYSTEM CURVE POINTS (Highest Wate[illegible]vel, Min El[illegible]ead)

FLOW (GPM)	Flow (CFS)	Pressure Pipe Headloss (FT)	Fitting Headloss (FT)	TDH (FT)	Velocity (FT/SEC)	TDH (PSI)
0	0.000	0.00	0.00	14.0	0.0	6.1
150	0.334	0.01	0.01	14.0	0.6	6.1
300	0.668	0.04	0.02	14.1	1.2	6.1
450	1.003	0.08	0.05	14.1	1.8	6.1
600	1.337	0.1[illegible]	[illegible].09	14.2	2.5	6.2
750	1.671	0.20	0.[illegible]	14.3	3.1	6.2
815	1.816	0.23	0.[illegible]	14.8	3.3	6.4
925	2.061	[illegible]	0.27	14.6	3.8	6.3
1075	2.395	0.39	0.35	14.7	4.4	6.4
1225	2.730	0.50	0.4	14.9	5.0	6.5
1375	3.064	0.62	0.5	15.2	5.6	6.6

Flow	2.061	CFS	How many pumps are operating?
Velocity in Force Main	3.78	FPS	1
Velocity in Yard Piping (1)	3.78	FPS	
Velocity in Yard Piping (2)	3.78	FPS	

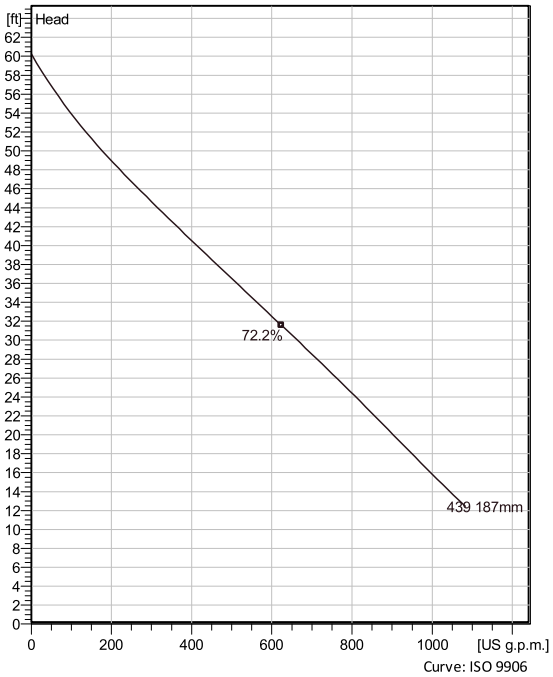
	FITTING	DIAMETER (IN)	NUMBER IN SYS	K	$V^2/2G$ (FT)	$V^2/2G$	HL
Fittings in Lift Station							
							0.00
Fittings in Force Main	Exit		1	1	0.22	0.22	0.22
	Cast 90-Deg Bend		3	0.25	0.22	0.06	0.17
	Cast, 11.25-Deg Bend		1	0.0933	0.22	0.02	0.02
	Cast 45-Deg Bend		2	0.18	0.22	0.04	0.08
	Entrance, Bellmou	1	1	0.05	0.22	0.01	0.01
	Tee, Line Flow	10		0.3	0.22	0.07	0.07
							0.57
						Total Fitting Headloss	**0.57**

NP 3127 MT 3~ Adaptive 439

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure Water, pure [100%], 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3127.070 21-10-4AL-W 7.5hp

Installation type
P - Semi permanent, Wet

Impeller diameter
187 mm

Discharge diameter
4 inch

Pump information

Impeller diameter
187 mm

Discharge diameter
4 inch

Inlet diameter
100 mm

Maximum operating speed
1750 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project		**Created by**	Alan Dahlqvist	
Block		**Created on**	3/3/2022	**Last update** 3/3/2022

NP 3127 MT 3~ Adaptive 439

Technical specification

Motor - General

Motor number N3127.070 21-10-4AL-W 7.5hp	**Phases** 3~	**Rated speed** 1750 rpm	**Rated power** 7.5 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 9.6 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 070			

Motor - Technical

Power factor - 1/1 Load 0.88	**Motor efficiency - 1/1 Load** 83.8 %	**Total moment of ine** 1.01 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.85	**Motor efficiency - 3/4 Load** 84.7 %	**Starting curre direct sta** 58 A	
Power factor - 1/2 Load 0.77	**Motor efficiency - 1/2 Load** 83.7 %	**ting curr star-de** 9.3 A	

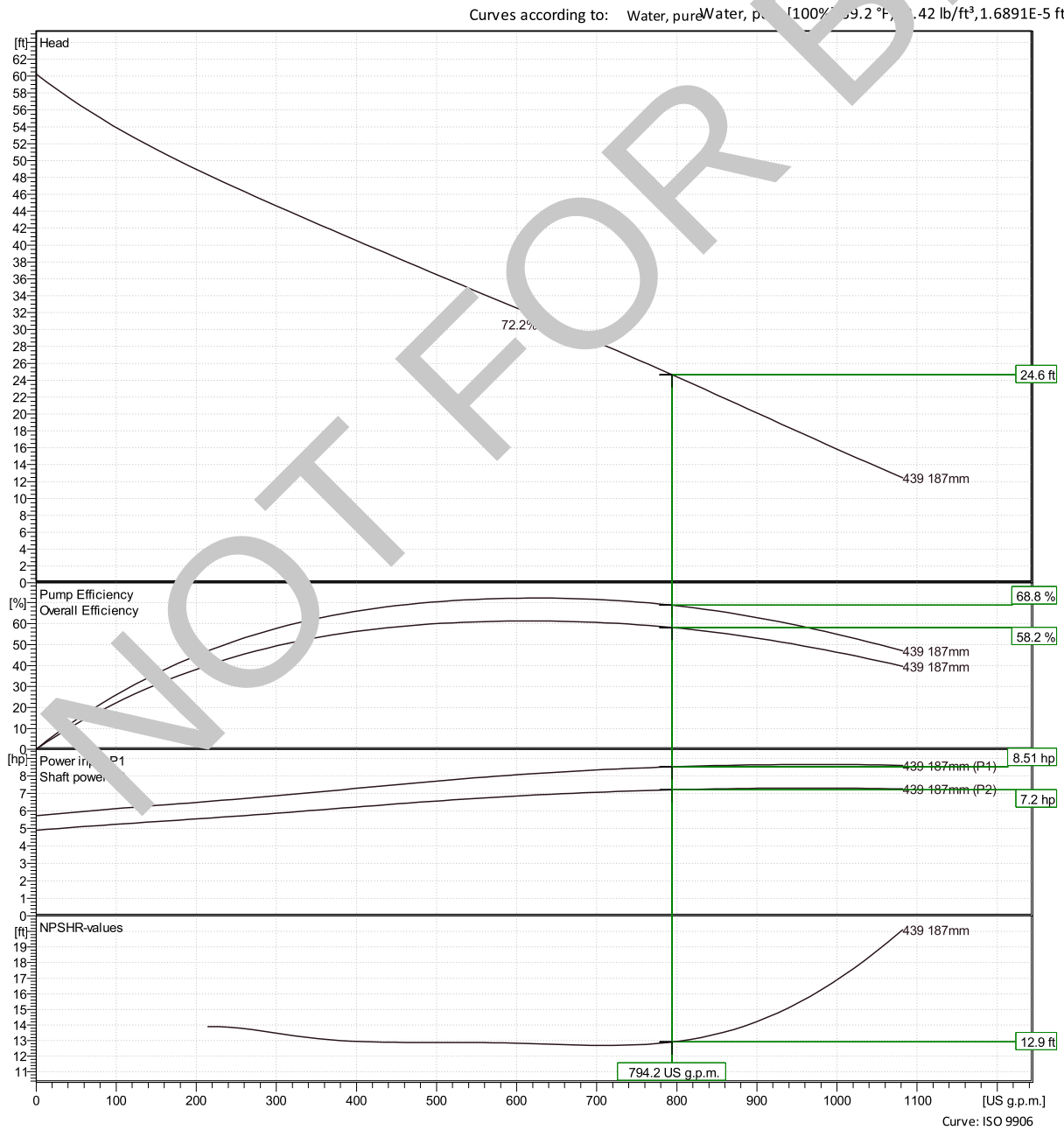
Project		**Created by**	Alan Dahlqvist		
Block		**Created on**	3/3/2022	**Last update**	3/3/2022

NP 3127 MT 3~ Adaptive 439

Performance curve

Duty point

Flow	Head
794 US g.p.m.	24.6 ft



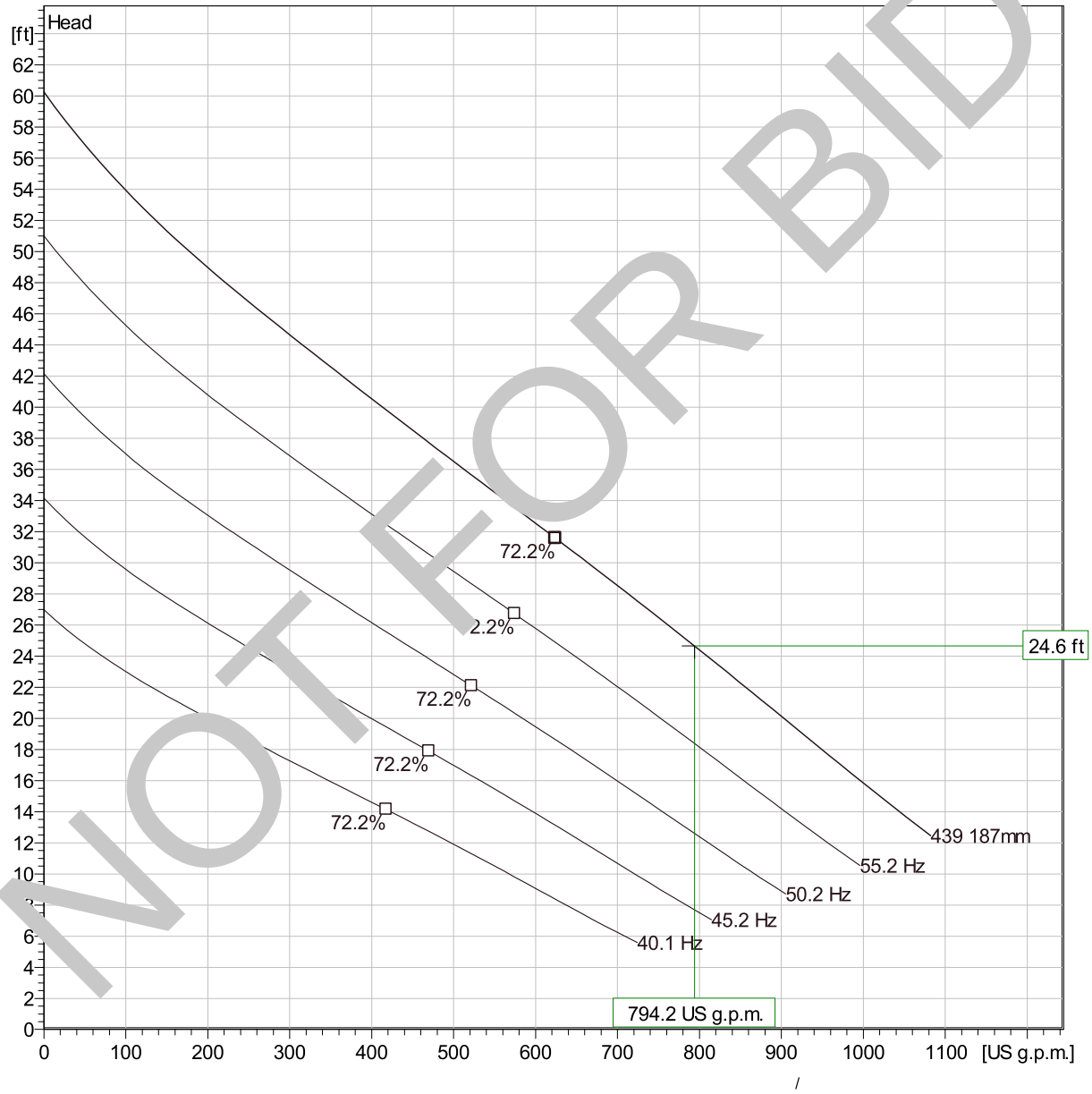
Alan Dahlqvist

Created on 3/3/2022 **Last update** 3/3/2022

NP 3127 MT 3~ Adaptive 439

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.4[illegible] lb/ft³; 1.6[illegible]-5ft²/s



Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	794	24.6	7.2	794	24.6	7.2	68.8 %	133	12.9

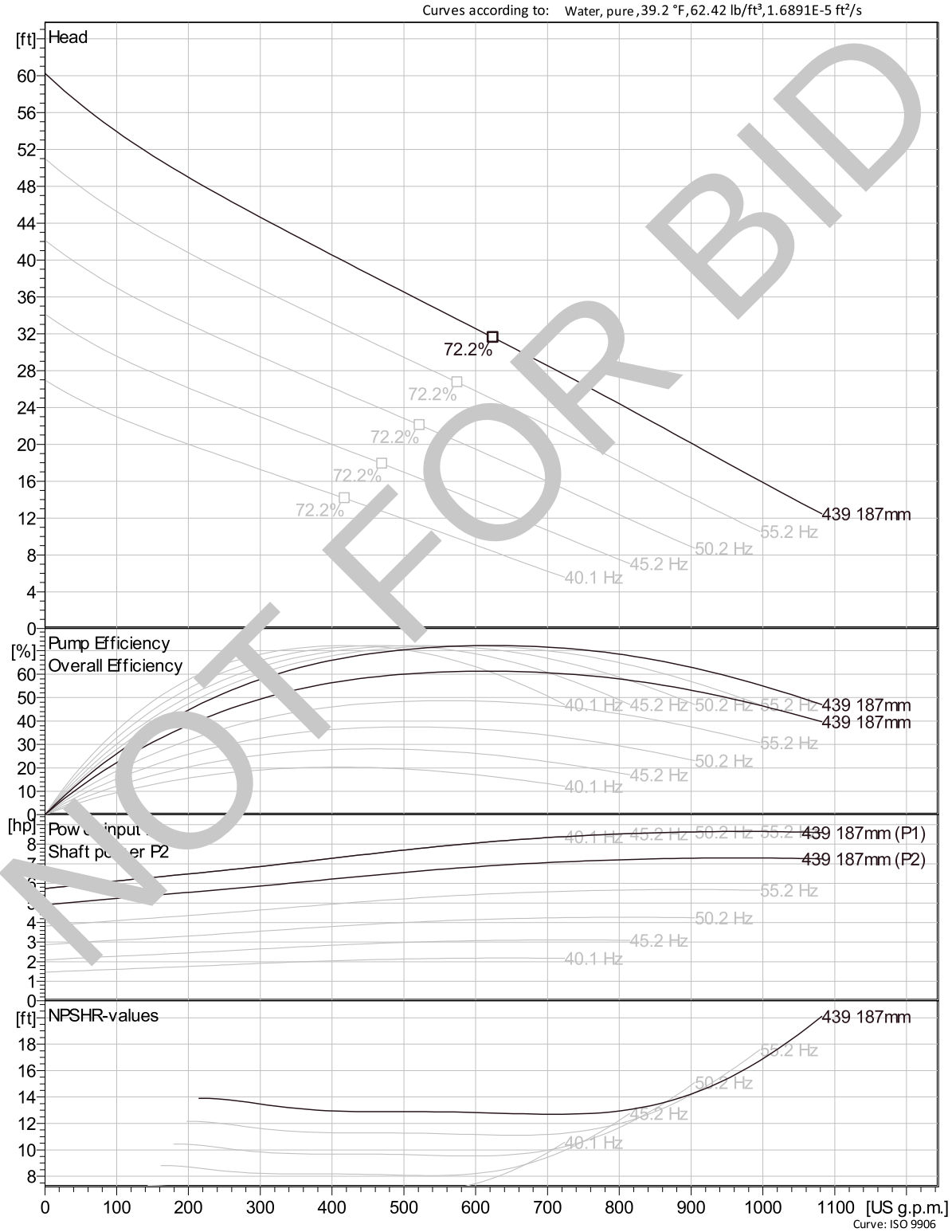
Project		**Created by**	Alan Dahlqvist		
Block		**Created on**	3/3/2022	**Last update**	3/3/2022

NP 3127 MT 3~ Adaptive 439

VFD Curve

FLYGT a xylem brand

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

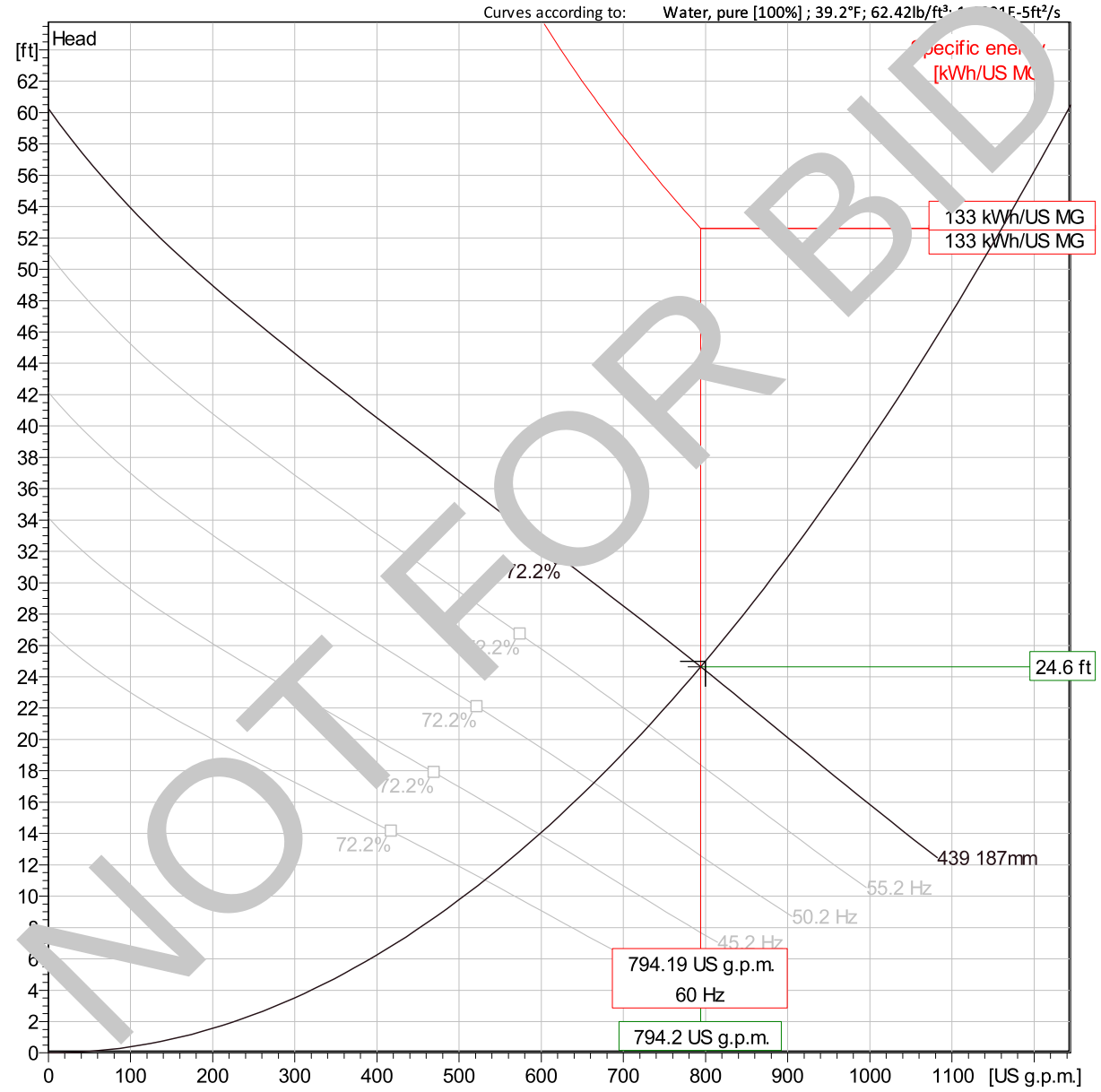


Curve: ISO 9906

Project		**Created by**	Alan Dahlqvist		
Block		**Created on**	3/3/2022	**Last update**	3/3/2022

NP 3127 MT 3~ Adaptive 439

VFD Analysis



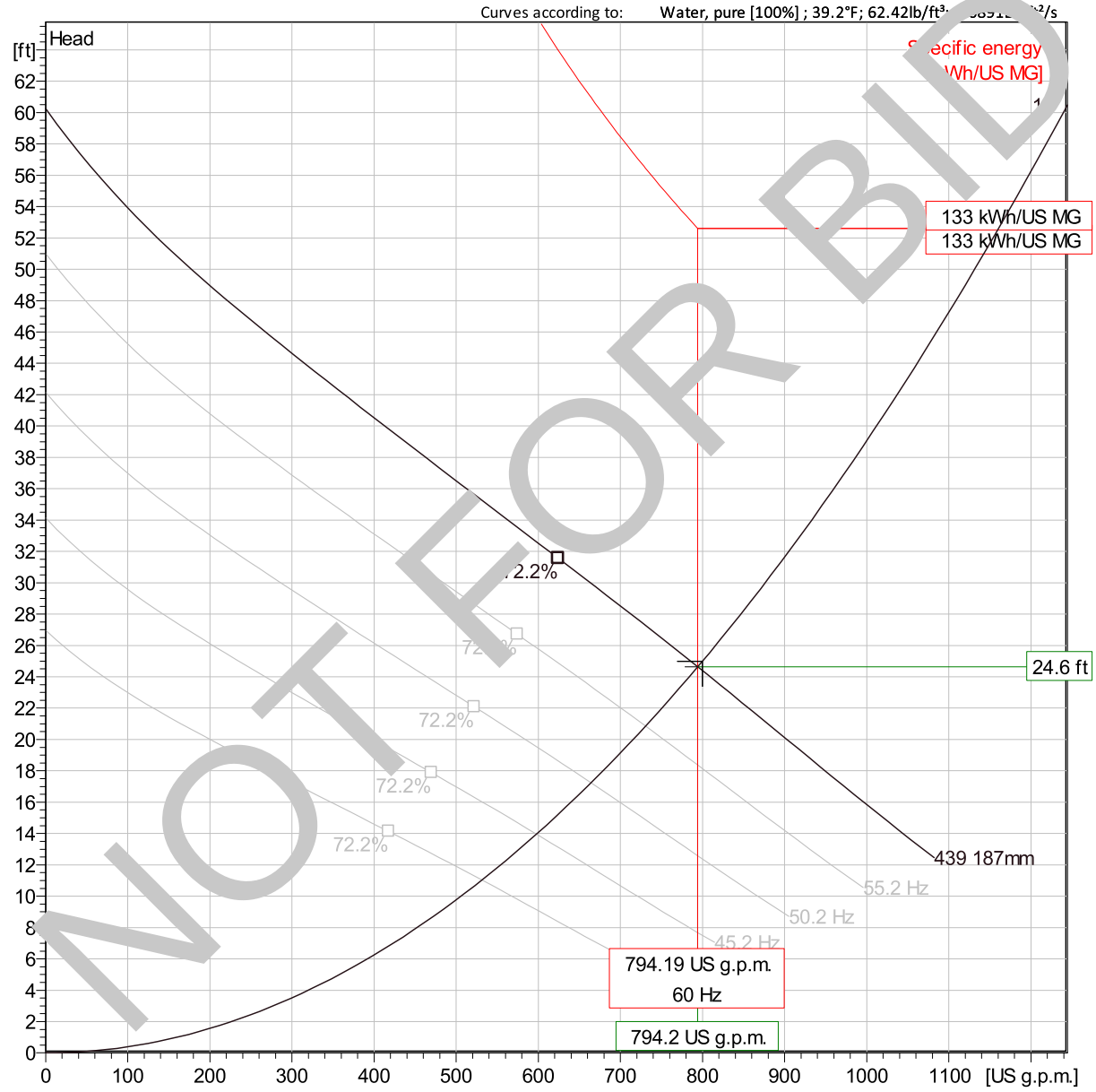
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	794	24.6	7.2	794	24.6	7.2	68.8 %	133	12.9
1	55.2 Hz	731	20.9	5.61	731	20.9	5.61	68.8 %	143	11.3
1	50.2 Hz	664	17.2	4.21	664	17.2	4.21	68.8 %	154	9.7
1	45.2 Hz	598	14	3.07	598	14	3.07	68.8 %	167	8.2

Project		**Created by**	Alan Dahlqvist		
Block		**Created on**	3/3/2022	**Last update**	3/3/2022

NP 3127 MT 3~ Adaptive 439

VFD Analysis



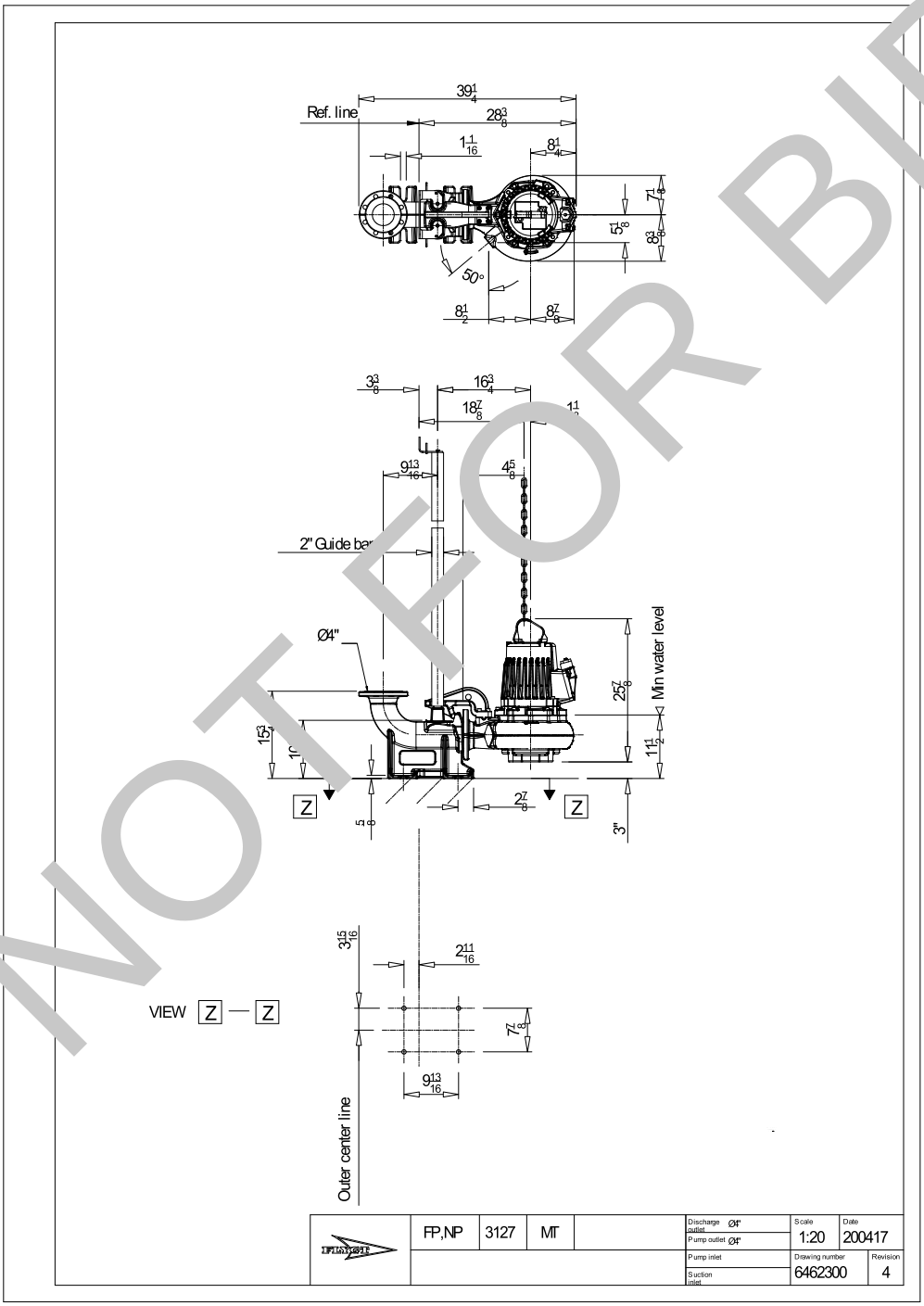
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40.1 Hz	531	11	2.16	531	11	2.16	68.8 %	183	6.79

Project		**Created by**	Alan Dahlqvist		
Block		**Created on**	3/3/2022	**Last update**	3/3/2022

NP 3127 MT 3~ Adaptive 439

Dimensional drawing



Project	**Created by**	Alan Dahlqvist	
Block	**Created on**	3/3/2022	**Last update** 3/3/2022