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Sunrise Terrace

GRR-01

Sewer Basin Capacity Analysis

June 22, 2015 (REV)

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ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

SUNRISE TERRACE May 26, 2015
SEWER BASIN CAPACITY ANALYSIS

BACKGROUND

Ed Greer, Consultant, has submitted an application entitled Sunrise Terrace to the City of La Center on behalf of RK Land Development. The proposal is to subdivide approximately 35 acres in the LDR-7.5 zone into 121 residential lots. The city has requested that a sewer basin analysis be prepared to evaluate the impact of this proposal on the existing collection system and to establish what the future capacity requirements will be for the sewer collection system serving the project area. In particular the city has requested the analysis to address system capacity required to accommodate build out in sewer sub-basins D2 and D3 as identified in the La Center General Sewer Plan dated July 2006, hereinafter "GSP".

APPROACH

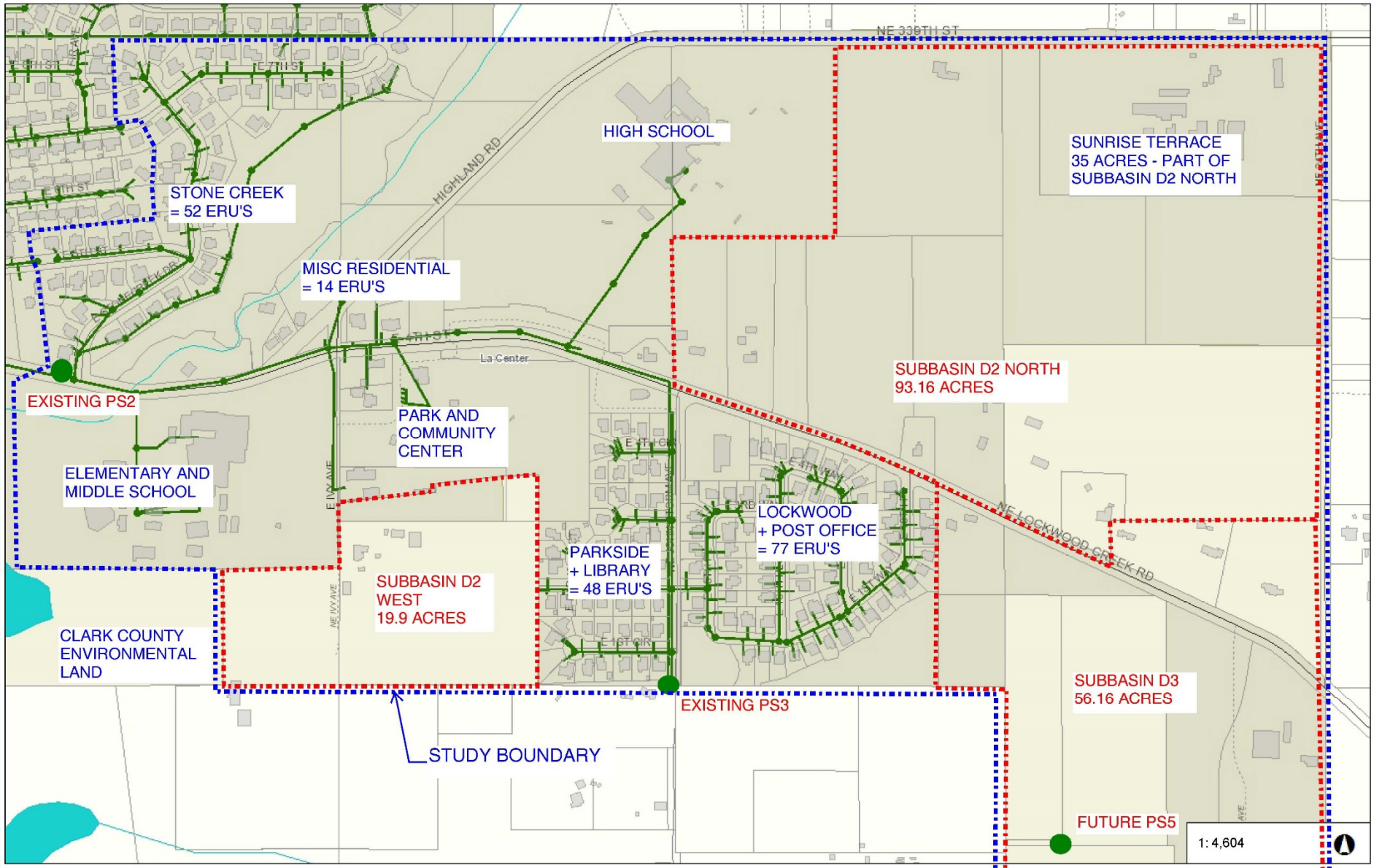
The analysis uses measure basin flows rather than the flows estimated by the GSP. To establish future flows, the current average flow rates were determined using pump station records. City of La Center provided data that was used to evaluate average pump run times and pump capacity. The current "equivalent residential unit" (ERU) flow rate was calculated for residential properties and per capita flows were established for the schools. The future condition is based on estimated residential densities for developable properties and uses the calculated ERU. For the schools, a future condition of 10 percent growth is used with the assumption that growth in excess of 10 percent will require constructing new schools at alternate locations. Required capacities of the various system elements have been determined in accordance with criteria established in the Washington Department of Ecology "Criteria for Sewage Works Design", hereinafter "DOE Design Manual".

BASIN INFORMATION

The study area is shown on Figure 1 and primarily consists of Basin D2 and D3 as defined in the La Center GSP. A portion of Basin C contributes to Pump Station 2 and has been included in the study area in order to evaluated future pumping needs at PS2. As shown on Figure 1, the study area has been divided into 10 sub-basins as follows:

Sub-basin	Approximate Area	Description
D3	56.16 ac	Future LDR 7.5 Residential areas
D2 North	93.16 ac	Future LDR 7.5 includes Sunrise Terrace
Lockwood	24 ac	Existing Residential 77 ERU's
Parkside	13 ac	Existing Residential 48 ERU's
D2 West	19.9 ac	Future LDR 7.5
High School	29.4 ac	High School – Population 602
City of La Center	11.5 ac	Park/Comm Center and Shop
Elem/Mid School	26 ac	Elem/Mid School Population 1150
Misc Residential	+/- 30 ac	14 residences generally on E 4th Street
Stone Creek	+/- 20 ac	52 units in subdivision contribute to PS2

FIGURE 1 LA CENTER SEWER BASIN STUDY AREA



The collection system components are shown on Figure 2. The elements of the system to be evaluated include:

- Lift Station #2 on the downstream end of the basin and the associated force main;
- an existing 8 inch gravity sewer in E 4th Street;
- the 4 inch force main from Lift Station #3 which discharges to the upstream end of the 8 inch gravity sewer;
- Lift Station #3
- A future Lift Station #5 (as designated in the current La Center Sewer Plan) and associated force main.

PUMP STATION DATA

City of La Center provided pump station SCADA records for several one week periods over the past year. Each of the data sets provides minute by minute pump run data (i.e. 1440 lines of data per day). Beginning with the records from February 2015, wetwell liquid level is also include in the data files. The records were used to determine the average annual pumping rate for pump stations #2 and #3. To balance the data, four seasonal averages were calculated and from the seasonal numbers, the annual average pump run time was calculated. A spreadsheet that demonstrates the summary of these calculation is included in Appendix 1. The one-year average run time for the two pump stations from these calculations are:

Pump Station	Average Run Time Minutes/Day
No. 2	374.6
No. 3	353.2

The city conducted drawdown tests at the two pump station to determine the pumping rates for the stations. This information was compared to calculations made from the SCADA records using the wetwell liquid levels. By processing the data for change in liquid level, a weekly in-flow volume was calculated. When divided by pump run time, a pumping rate was calculated: (i.e. gal per week / minutes per week = pumping rate, gpm). The SCADA data generally supported the city's findings from draw down testing and as a result, the following current pumping rates are used:

Pump Station	Average Pump Rate - gpm
No. 2	130
No. 3	58

On the basis of the above data, the one-year average amount pumped each day for each of the pump station is as follows:

Pump Station	Average Daily Pumped Gallons
No. 2	48,697
No. 3	20,484

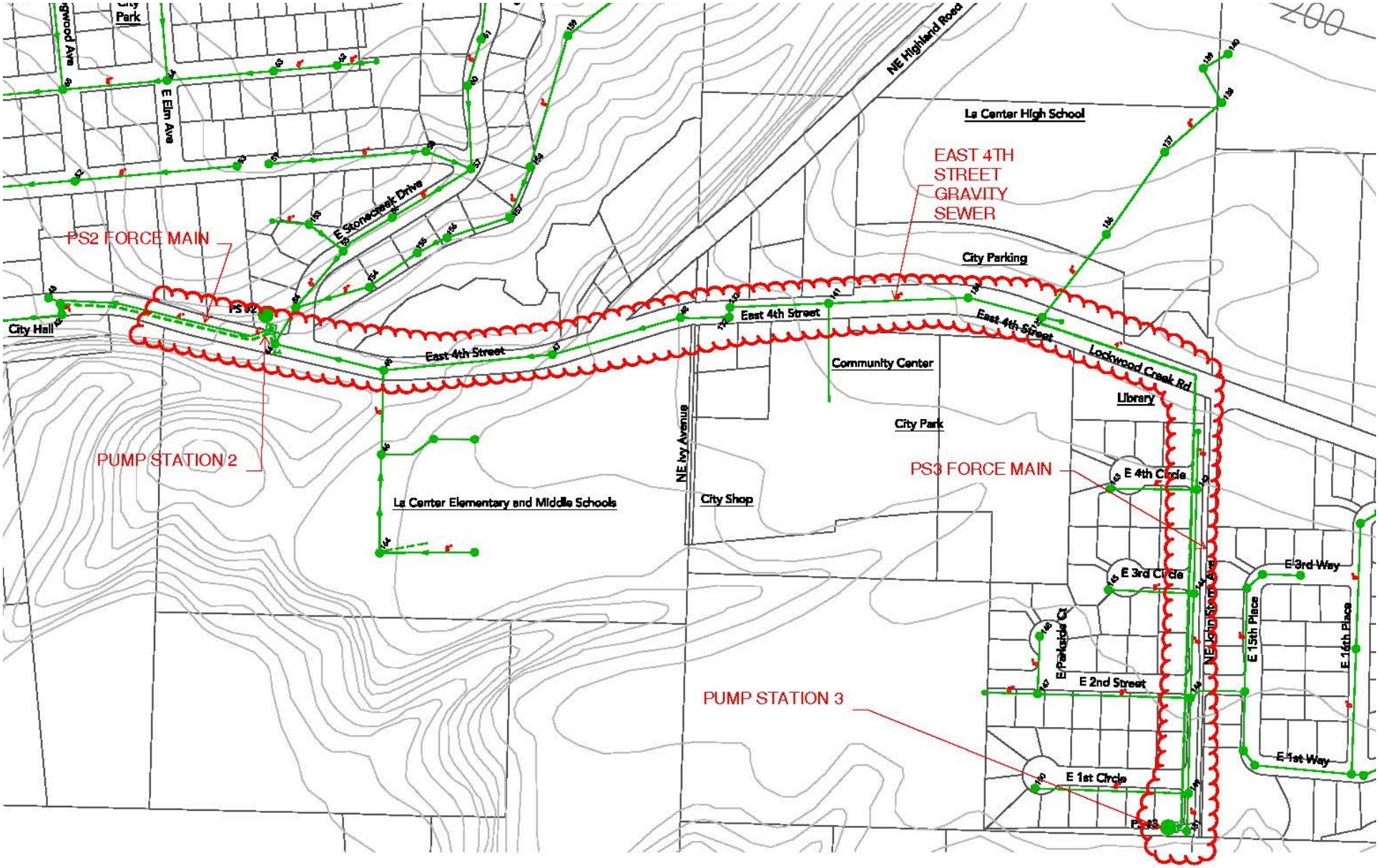


FIGURE 2 – SEWER COLLECTION SYSTEM ELEMENTS

ERU CALCULATION FOR BASIN D

The majority of the development in Basin D consists of newer homes or homes recently connected to sewer. Recently constructed sewer collection systems within the basin are primarily PVC with rubber gasket joints. Because of this, the collection system is tighter and less subject to infiltration and inflow than the city-wide system average. The system-wide ERU flow rate from the GSP is not applicable to this basin.

To establish a specific ERU for Basin D, the average flow rate from pump station No. 3 is divided by the number of contributing units (Parkside and Lockwood) as follows:

ERU = 20,484 gallons per day / 125 units = 164 gpd

At 2.7 person per ERU the per capita flow rate for the basin is: 164 gpd/2.7 = 61 gpcd

SCHOOL DISTRICT FLOWS

Populations for the school facilities were received from the La Center School District office and are included in the sub-basin information shown above. To estimate flows, a per capita flow rate was first estimated from guidelines in the DOE Design Manual (Table G2.1 Design Basis for New Sewage Works). The per capita flow rate was then refined using pump station records in order to arrive at a representative per capita flow from the schools. The High School meets the condition for schools with showers and cafeteria as shown in the DOE Manual. The Elementary/Middle School meets the condition for schools without showers and with cafeteria. The rates from the DOE Manual and the calculated flow rates are as follows:

Campus	DOE Manual gpd/cap	Calculated gpd/cap
High School	16	13
Elem/Mid	10	8

The calculated flow rates were used to estimate future design flows for the basin.

SPLASH PAD

A recreational feature contributes substantial flows to the sewer system from the public park. Information provided by Tony Cooper at City of La Center indicates that the splash pad discharges 9,000 gallons per day over 8 hours or 18.8 gallons per minute. Since the splash pad generally operates when school is not in session, it is appropriate to compare splash pad flows with school district flows including application of the peaking factor. The average day flow from the combined elementary/middle/high school facilities is 17,026 gpd. Using a peaking factor of 3.8, the dedicated share of pump station capacity for the school system is 64,700 gpd or 45 gpm.

For this analysis, the contribution from the splash pad is not included because the total flow rate, and therefore the dedicated pump station capacity required, will be substantially lower during times when school is out.

FUTURE DEVELOPMENT DENSITIES

To determine the required system capacity for the fully developed Basin D, development density was estimated for the currently undeveloped areas within Sub-basins D3, D2 North and D2 West. The zoning

in these areas is LDR 7.5 with a required Minimum Net Density of 4 units per acre (LCMC 18.130.080). Net density by definition is calculated after deducting right-of-way areas. For this analysis, estimated units per gross acre is needed. The existing Parkside Subdivision within the study area has a lot layout that is very close to the maximum possible density. Parkside has an overall density of (47 units / 11.9 acres) 3.95 units per gross acre. Lockwood Creek Subdivision which contains common property and environmental buffers has an overall density of (76 units / 24 acres) 3.17 units per gross acre. In consideration of the impacts to future development due to environmental constraints and shapes of properties, a density for future development of 3.5 units per gross acre has been assumed.

FLOW PROJECTIONS AND CAPACITIES

A spreadsheet file within Appendix 1 contains calculated current and future flows for each sub-basin and for each pump station. Future flows include two sets of calculations: one for capacities required by the addition of Sunrise Terrace to the existing condition and one for future or ultimate full build out capacity. Existing and required pump station capacities are summarized below:

Pump Station Number	Existing Capacity	Current Req'd Capacity	With Sunrise Terrace	Future Req'd Capacity
PS2	130 gpm	129 gpm	177 gpm	370 gpm
PS3	58 gpm	57 gpm	110 gpm	304 gpm
PS5	N/A	0 gpm	0 gpm	88 gpm

The calculations indicate that both PS2 and PS3 are presently very near capacity and there is not significant available pumping capacity to address additional flows. Any new flows will require upgrades to the current pumping capacity.

FORCE MAINS

The DOE Design Manual recommends force mains be sized so that velocities in the force main fall between a minimum of 2 feet per second (fps) which is the fluid velocity required for flushing to an optimum high velocity of 5 fps. The range of velocities results in pipe capacities as follows:

FM Pipe Size	Low (2 fps) Rate	High (5 fps) Rate
4 inch	75 gpm	200 gpm
6 inch	175 gpm	450 gpm
8 inch	310 gpm	790 gpm

Based on the pumping rates indicated above, the existing 4 inch force main from PS3 will be adequate for the build out of the Sunrise Terrace Subdivision but will require upgrading to a 6 inch in the future to accommodate full build out of basin D. The 4 inch force main from PS2 is adequate now but will be very close to capacity with the added flows from Sunrise Terrace. This will impact the ability of PS2 to operate with 2 pumps running. Upgrading the force main to 6 inch should be considered at such time as improvements to the pump station are being implemented. A 4 inch main for the future PS5 will be adequate for full build out of the subbasin.

PUMP STATION WET WELLS

Both PS2 and PS3 are 6 foot diameter wetwells. To determine if the existing pump station wetwells will have adequate capacity for future flows, the available wetwell volume between pump on and pump off levels is compared to the recommended volume in accordance with the DOE Design Manual. For constant speed pumps the manual recommends use of the following formula:

$$V = tQ/4 \qquad \text{(Section C2-1.2.5)}$$

Where V = minimum volume (gallons)
t = minimum time between starts
Q = pump capacity in gpm

Submersible pumps are generally recommended to be limited to not more than 10 starts per hour or one start every 6 minutes. With two pumps alternating the minimum time between starts is 3 minutes. The available wetwell volume for pumping is the capacity from the top limit at 6 inches below the invert elevation of the influent pipe to the bottom limit maintaining 18 inches of liquid above the floor. The available wetwell volume was determined from pump station as-built information provided by the city. The high end of the pump station capacity "Q" for each pump station was calculated with the above formula as follows:

Pump Station	Wetwell Height	Wetwell Volume	Calculated Max Pumping Rate
PS2	3.9 feet	930 gal	1100 gpm
PS3	3.0 feet	635 gal	847 gpm

Based on the above calculations, the existing 6 foot diameter pump station wetwells will be adequate for the future build out of the contributing basins.

CAPACITY OF GRAVITY SEWER

The gravity sewer in East 4th Avenue was evaluated for present and future capacity beginning from manhole 135 on the upstream to manhole 44 on the downstream. Pipe capacities based on existing diameter and slope were used from the GSP where they are shown on Table A-3. The calculations for existing and future conditions are included in Appendix 1. All pipes have adequate capacity for current flows and for flow that includes the additional 121 ERU's from Sunrise Terrace. The downstream gravity pipe segment from manhole 45 to manhole 44 will need to be upgraded for the full build out condition.

SUMMARY AND CONCLUSIONS

- Pump Station No. 5 will be require for the future condition. To meet the full build out of Basin D3 the pump station will require a capacity of 88 gpm and a 4 inch force main.
- Pump Station No. 3 is presently near its pumping capacity. The pump station will need to be upgraded to a capacity of 110 gpm to address the additional flow from Sunrise Terrace. The capacity for the full build out condition is 304 gpm. The wetwell will not need to be upgraded.
- The 4 inch force main from PS3 will be adequate through completion of Sunrise Terrace and will need to be upgraded to a 6 inch to accommodate build out.

- The gravity sewer in East 4th Street has adequate capacity for the completion of Sunrise Terrace. The downstream portion of the gravity sewer will need to be upgraded as the basin approaches build out.
- Pump Station No. 2 is presently near capacity. The pump station will need to be upgraded to a capacity of 177 gpm to address the additional flow from Sunrise Terrace. The capacity for the full build out condition is 370 gpm. The wetwell will not need to be upgraded.
- The 4 inch force main from PS2 will require velocities on the order of 4.5 feet per second to carry the 177 gpm flows after completion of Sunrise Terrace. The ability of the pump station to operate with two pumps running during high flow periods will be greatly restricted with a 4 inch force main. It is recommended that the force main be upgraded to a 6 inch to accommodate the Sunrise Terrace flows.

APPENDIX 1

CALCULATION OF AVERAGE FLOW RATE FROM LA CENTER PUMP STATION RECORDS

WEEK ENDING	RUN TIME MINUTES PER DAY				CALC AVE	CALC	CALC PUMP
DATE	PUMP 2A	PUMP 2B	PUMP 3A	PUMP 3B	DAILY FLOW	INFLOW GPM	RATE GPM
7/12/2014	260.3	229.3					
7/12/2014			65.9	148.3			
10/8/2014	143.1	150.1					
10/8/2014			140.4	208.4			
11/8/2014	196.6	200.9					
11/8/2014			245.7	276.3			
12/8/2014	194.1	210.1					
12/8/2014			253.9	230.6			
1/28/2015	161.0	163.1					
1/28/2015			209.0	114.3			
2/8/2015	200.4	205.1			50223.2	34.9	123.8
2/8/2015			251.6	114.6	31891.6	22.2	87.1
2/12/2015	235.6	240.7			54952.1	38.2	115.4
2/12/2015			283.0	123.1	34984.4	24.3	86.1
5/2/2015	141.4	150.6			40459.7	28.1	138.6
5/2/2015			171.7	240.0	22498.1	15.6	54.6
5/6/2015*	109.7	120.0			46669.8	32.4	139.1
5/6/2015*			142.4	182.1	27274.8	18.9	56.6

FOUR SEASONS FOR ANNUAL AVERAGE MINUTES/DAY		
	PS2	PS3
PS2 SUMMER	489.6	
PS3 SUMMER		214.1
PS2 FALL	345.4	
PS3 FALL		435.4
PS2 WINTER	402.6	
PS3 WINTER		395.0
PS2 SPRING	260.9	
PS3 SPRING		368.1

	PS2	PS3
AVE PS MINUTES/DAY	374.6	353.2
PUMPING RATE (GPM)	130	58
AVERAGE DAILY FLOW (GPD)	48697	20484

* 4 DAY PERIOD

BASIN CALCULATIONS - CURRENT AND FUTURE FLOWS

PUMP STATION CAPACITY REQUIRED

SYSTEM ELEMENT	AREA ACRES	ERU'S PER ACRE	TOTAL ERU'S	TOTAL PERSONS	GPD PER CAP	AVE DAY FLOW PRESENT	EXIST'G WITH SUNRISE TERR.	AVE DAY FLOW FUTURE	PEAKING FACTOR	DESIGN FLOW MGD	PS ERU'S SERVED	AVE DAY GAL	PEAKING FACTOR	DESIGN FLOW GPM
SUBBASIN D3	56.16	3.5	197	532	61	0	0	32452	3.9	0.000				
PS5 CURRENT											N/A	N/A	N/A	N/A
PS5 FUTURE											197	32452	3.9	88
SUBBASIN D2 NORTH	93.16	3.5	326	880	61	0	0	53680	3.8	0.000				
ADD SUNRISE TERRACE			121	327	61	0	19947							
SUBBASIN D2 WEST	19.9	3.5	70	189	61	0	0	11529	4.1	0.000				
PARKSIDE SUB			48	130	61	7930	7930	7930	4.2	0.033				
LOCKWOOD CR SUB			77	208	61	12688	12688	12688	4.1	0.052				
PS3 CURRENT											125	20618	4	57
PS3 WITH SUNRISE TERR.											246	40565	3.9	110
PS3 FUTURE											718	118279	3.7	304
HIGH SCHOOL			48	602	13	7826		8609						
PARK + COMM CENTER			2	5	61	305		305	4.3	0.001				
14 ERU'S ADJACENT			14	38	61	2318		2318	4.3	0.010				
ELEM + MIDDLE SCHOOL			56	1150	8	9200		10120						
STONE CREEK			52	140	61	8540		8540	4.2	0.036				
PS2 CURRENT											297	48807	3.8	129
PS2 WITH SUNRISE TERR.											418	68754	3.7	177
PS2 FUTURE											890	148171	3.6	370

INPUT DATA	
ERU (UNITS) PER ACRE	3.5
RESIDENTIAL ERU GPD/C	61
PERSONS/ERU	2.7
ELEM/MIDDLE SCHOOL GPD/C	8
HIGH SCHOOL GPD/C	13

EAST 4TH STREET GRAVITY SEWER CAPACITY ASSESSMENT

MH/MH	CAPACITY FROM GSP	PRESENT FLOW gpm	PRESENT % OF CAP	FLOW W/ SUNRISE	W/ SUNRISE % OF CAP	FUTURE FLOW gpm	FUTURE % OF CAP	CONTRIBUTING FLOWS
135/134	0.55	0.113	21%	0.189	34%	0.472	86%	PS3 AND HIGH SCHOOL
134/141	1.08	0.113	10%	0.189	18%	0.472	44%	
141/133	1.53	0.124	8%	0.2	13%	0.483	32%	ADDED ERU'S
133/132	2.21	0.124	6%	0.2	9%	0.483	22%	
132/48	1.11	0.124	11%	0.2	18%	0.483	44%	
48/47	1.64	0.124	8%	0.2	12%	0.483	29%	
47/45	1.95	0.124	6%	0.2	10%	0.483	25%	
45/44	0.49	0.161	33%	0.237	48%	0.523	107%	ADD ELEM/MID
44/PS2								
contributions								
PS3		0.082		0.158		0.438		
HIGH SCHOOL		0.031		0.031		0.034		
RES AND PARK ERU'S		0.011		0.011		0.011		
ELEM/MID SCHOOL		0.037		0.037		0.04		

APPENDIX 2

APPENDIX 2: City of La Center comments and **Responses.**

Pump station data and flow calculations

1. *The report uses a per capita flow rate of 61 gpcd, which is less than the 110 gpcd required in City standards. The 61 gpcd rate was developed using actual pumping data from pump station #2 and #3 and applied a peaking factor to determine projected peak flows with the Sunrise Terrace Development. This methodology of flow rate calculation is acceptable to the city since it is based on actual data on not theoretical data.*
   a. *Wallis Engineering comments that the comparison of the two per capita flow rates should be discussed and the appropriateness of the selected rate.*
   b. *Wallis Engineering suggests that the calculated flow rate may be subject to D.O.E. review. The City will ask D.O.E. if review is needed for upgrading pumps and force main.*

   RESPONSE:

   Department of Ecology makes specific recommendations for wastewater design flow rates in Table G2-1 in the Orange Book. The recommended flow rate for "Dwellings" is 100 gpd per person. La Center has adopted 110 gpd per person for the system-wide flow rate based on flow measurements specific to the city on a city-wide basis. Paragraph G2-1.2.4 of the Orange Book states with regard to use of Table G2-1 "Any deviation should be based on sound engineering judgement substantiated in the engineering report". Use of 61 gpd per person as well as the calibrated specific rates for the schools has been substantiated in the report and is representative of a basin with much less impact due to infiltration. The flow rates were calculated based on the best available data from existing pumped flow rates.

2. *Wallis Engineering comments that the precipitation used for the past three years has been lower than the average and that the analysis should take this into account. The precipitation given to HHPR was part of the data collected near the pump station by the City and is reflective of actual rainfall amount. The peaking factor should provide enough factor of safety for peak flow analysis with I&I but HHPR should check if higher averages of rainfall might affect the per capita flow.*

   RESPONSE:

   USGS rainfall records from Portland airport for the one year period that matches the pump station data used show a rainfall total of 35.2 inches. In comparison to the annual rainfall for the previous 20 years at the same source, the rainfall data set was less than the annual rainfall for eleven of the previous 20 years and more than the rainfall for nine of the years. The conclusion is that an adjustment for the water year is not warranted.

3. *Wallis Engineering comments that the population density increase per the General Sewer Plan be used for the future projected flows. Future UGA expansion is shown in the north and west portion of La Center and the eastern boundary will likely not occur. The applicant will not need*

to include the 50-year UGA for the purpose of the analysis for the Sunrise Development. For future development that occurs, the city will require developers analyze the upstream and downstream sewer system.

Pump station and gravity capacity

1. *Wallis Engineering notes that it is not clear that calculated capacities include pump station 5 discharging into pump station 3 and then to pump station 2. Submit a diagram or figure showing the anticipated build out flow to help resolve the flow path.*

   RESPONSE:

   See Figure 3 – Sub Basin Schematic, attached.

2. *The report did not analyze the gravity flow system downstream of the proposed connection of the Sunrise Terrace sanitary sewer system to the main in Lockwood Creek Road. Please include analysis of the downstream gravity system to pump station 3.*

   RESPONSE:

   An 8 inch gravity sewer at minimum slope (.004 ft/ft) has a capacity of 0.491 mgd. The combined contributing area of the gravity system that discharges to PS3 at ultimate buildout will include 451 ERU's. The maximum flow (with peaking factor) for this population is 0.28 mgd. The 8 inch gravity sewer at any slope will have adequate capacity.

3. *Wallis Engineering comments that the City has identified that pump stations #2 and #3 currently operate at capacity. The possibility of the City increasing capacity and efficiency of the existing pump stations was discussed in meeting. Since the meeting, operation adjustments were discussed and reviewed by the City. We believe that pump station #3 cannot be modified to provide additional capacity of the system.*

   The pumps in station #3 will need to be replaced to accommodate the Sunrise Terrace Development, as well as existing flows, and the control panel will need to be modified to support the use of the new pumps. The City may make modifications to the existing pump station panel at the time of upgrade for the development. The City will be pay for any additional maintenance upgrade beyond the modifications required for the development.

   Pump station #2 has had some modifications including a new impeller and it will likely work efficiently in the near future. The City has conducted some preliminary hydraulic analysis of pump station #2 with the existing 4-inch force main and found that by increasing the existing force main from a 4-inch diameter to a 6-inch diameter pipe, this will likely give enough capacity to operate up to 200 gallons per minute. The engineer will need to submit supporting calculations to support this change in pipe size.

In addition, there is currently no generator at this East 4th Street at Stonecreek Drive station and at a minimum; the developer will need to install a portable generator for pump station #2 operation for Sunrise Terrace Development. The control panel will need to be modified to allow for easy access with the generator and ability to "plug in" the portable generator during emergency conditions.

a. *Wallis Engineering comments that discussing these elements in the report is beneficial to identifying potential capacity upgrades. These modifications should be discussed in the report.*

RESPONSE:

Design of pump station improvements will require a detailed assessment of current operations and conditions and is beyond the scope of this analysis. Available information on the current pump curves provides some insight.

Pump station No. 2 shows a design point of 200 gpm at 45 ft of head. The actual pumping rate was calculated at 130 gpm. This rate would indicate a design point on the curve of 48 ft of pumping head. At 130 gpm, the head loss in 600 feet of 4 inch force main is about 8 feet with fittings and therefore the pumps are seeing 40 feet of elevation head. Replacement with a 6 inch force main would result in about 4 feet of friction loss and potentially would result in a design point for the existing pumps of 210 gpm at 44 feet of head. Since the force main will ultimately need to be upgraded to a 6 inch. Upgrading the force main could create additional capacity without changing out the pumps and panel. The Flygt NP3102 pump curve is attached with the indicated points.

Pump station No. 3 shows a design point of 144 gpm at 55 ft of head. Current performance would indicate an operating condition of 58 gpm at 62 ft. of head based on the calculated rate. Information from the General Sewer Plan sets the discharge manhole invert at elevation 145. The as built for station 3 shows a pumping elevation of about 83. If the elevation information is on the same datum, this would represent a pumping head of 62 feet before friction is considered. It would appear that the pumps in station 3 may be performing to specifications. All information and assumptions will need to be field verified. The solution to the capacity of Pump station No. 3 will be to reassess the elevation and friction and select pumps for the required condition. This may require upsizing of pumps and panel. The PACO curve RC-5834 with the design and estimated actual performance points is attached.

4. *Wallis Engineering suggests that pump station design and selection should consider future wear and tear on the pumps, per the D.O.E requirements considering the future growth within the 20-year design life. This should be included in the report.*

RESPONSE:

In the basin analysis and report, future pump station requirements were developed based on "ultimate" buildout of the basin. It is not known at this time what the expected

rate of development is for the balance of the basin. Given that both pump stations have already been constructed, it is anticipated that interim upgrades to stations No. 2 and 3 will be implemented prior to the ultimate buildout. For the interim pumping condition as well as for the ultimate condition, the specific pump design point should include consideration of additional capacity to address wear. At the time of pump selection, the designer should allow for a factor on the order of 5 percent of flow to address capacity for pump wear.

Pump station and gravity capacity

Wallis Engineering notes that revision of the report may be necessary to include the following:

1. *The analysis and capacity calculations should also include a minimum of 1-hour of storage of peak flows per D.O.E manual.*

   RESPONSE:

   Paragraph C2-1.8.5 of the Orange Book addresses additional wetwell capacity for "remote sewage pump stations". The La Center stations are not remote and response times will generally be short. Appropriate measures to address reliability include: high level alarm and monitoring capability; fixed or portable generators and pump panel transfer switch; by-pass pumping connection point; a portable gas engine pump should be considered for use in the event of damage to electric pumps.

2. *The report should discuss the potential for upgrade of the wet wells based on the potential of future build-out conditions.*

   RESPONSE:

   Six foot diameter wetwells are generally large enough for 10 HP submersible pumps and will be adequate for most 15 HP pumps. The pump conditions for station No. 2 and 3 assuming ultimate flow rates and installation of replacement 6 inch force mains is approximated in the table below. Flow rates include a 5 percent allowance for pump wear. Pump sizing calculations assume 50 percent pump efficiency.

Lift Station No.	Future Flow Required	Approx. Pumping Head	Estimated HP
2	389 gpm	49	9.6
3	320 gpm	72	11.6

Based on the estimates above, future pumps will not exceed 15 HP and it will be possible to select pumps for the six foot diameter wetwells at each of the pump stations. The above estimates are preliminary and should be confirmed with additional field investigation of the specific pumping conditions.

Attachments include Figure 3 and pump curves for station 2 and 3

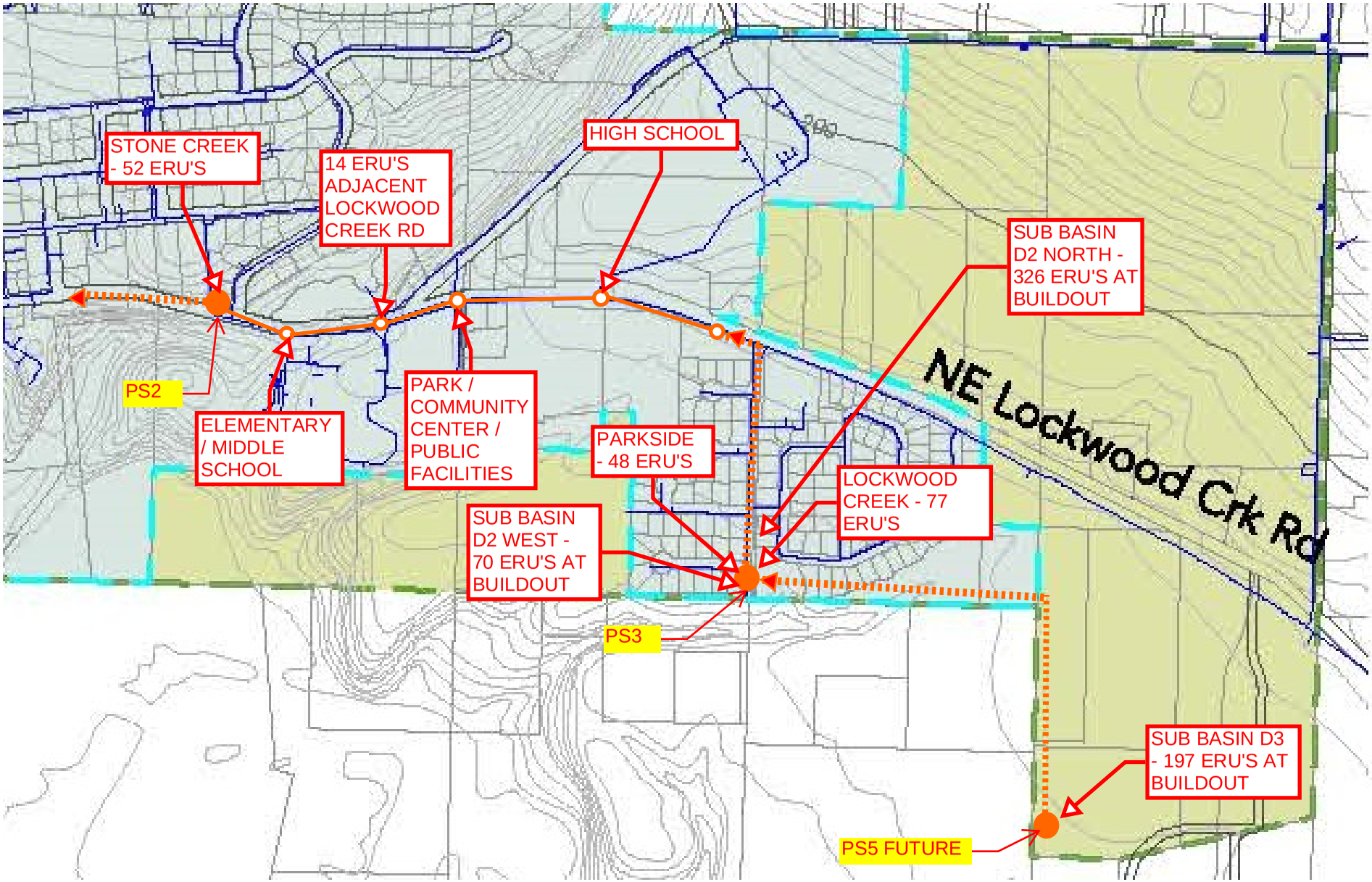


Figure 3 - Sub-Basin Schematic

Pump Station 2

090

PERFORMANCE CURVE

PRODUCT: NP3102.181	TYPE: MT		
DATE: 2013-07-11	PROJECT:	CURVE NO: 63-462-00-3703	ISSUE: 9

IMPELLER DIAMETER: 182 mm

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.64
EFFICIENCY	85.0 %	85.5 %	84.0 %
MOTOR DATA	---	---	---

COMMENTS

INLET/OUTLET: -/ 4 Inch

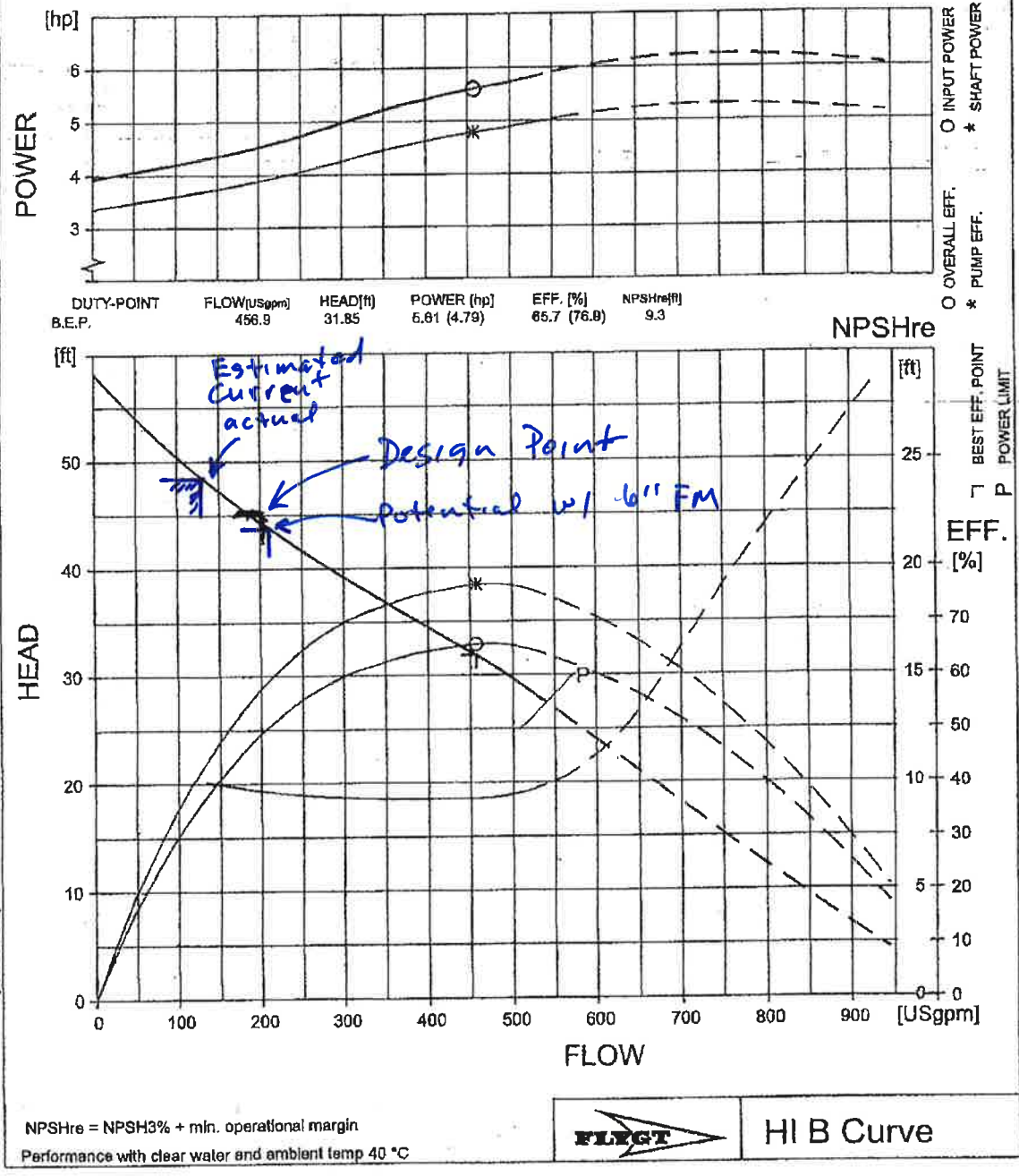
IMP. THROUGHLET: ---

RATED POWER	5	hp
STARTING CURRENT ...	41	A
RATED CURRENT ...	6.7	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.028	kgm2
NO. OF BLADES	2	

MOTOR #	STATOR	REV
18-11-4AL	61D	10

FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE: --- RATIO: ---



FLYPS3.1.6.6 (20090313)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

HI B Curve

PUMP STATION 3

Project: SOUTHVIEW HEIGHTS IV
by: JOANNE NYLANDER

File: (untitled)
Date: 12/02/96

CURVE: RC-5834 PUMP DATA SHEET Catalog: PACO-WW v. 1

TYPE - SPEED: QDC/TP - 1800

PUMP Size: 495-21
Speed: 1740 rpm
Imp dia: 8.2 in

Maximum tmp: 150 °F
pres: 87 psi
Minimum flow: - % of BEP
Suction size: 4 in
Discharge size: 4 in

FLUID Water tmp: 60 °F
SG: 1
vsc: 1.1 cpois
vapor: 0.26 psi
atm: 14.7 psi

AVAILABLE HEAD NPSHa: - ft

PIPING Pressure: - psi
Suction elev: - ft
size: - in
Discharge size: - in

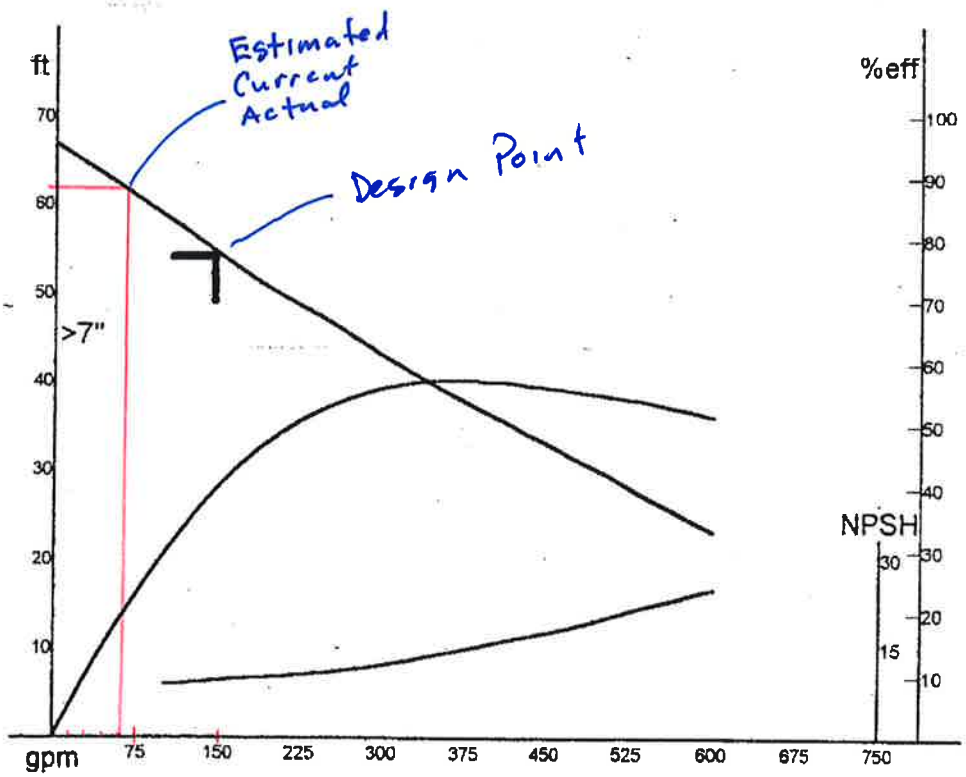
>9.3"

DESIGN CONDITIONS

FLOW: 144 gpm
TDH: 54.77 ft
EFF: 39 %
POWER: 5.106 bhp
NPSHr: 9.63 ft ***

DESIGN NOTES

BEP: 57%eff @ 400
MAX: 6.91 bhp @ 550
SHUTOFF: 67.01 ft
MIN FLOW: - gpm
SPECIFIC Speed: 2370
Suction: 4350



PERFORMANCE EVALUATION

	FLOW gpm	SPEED rpm	TDH ft	PUMP %eff	POWER bhp	NPSHr ft	MOTOR %eff	POWER kWh	HRS/YR	COST
120%	172.8	1740	52.29	44	5.186	10				
100%	144	1740	54.77	39	5.106	9.63				
80%	115.2	1740	57.29	33	5.05	9.22				
60%	86.4	1740	59.76	26	5.015	9				
40%	57.6	1740	62.18	17	5.32	9				

CHANGED CONDITIONS