NIPOMO COMMUNITY SERVICES DISTRICT

BLACKLAKE SEWER SYSTEM CONSOLIDATION STUDY

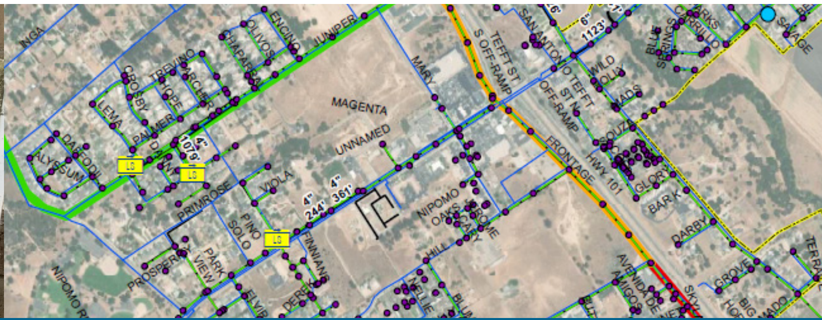
OCTOBER 2019

PREPARED FOR:

NIPOMO COMMUNITY SERVICES DISTRICT
148 SOUTH WILSON STREET
NIPOMO, CA 93444

PREPARED BY:

mkn



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Nipomo Community Services District

Blacklake Sewer System
Consolidation Study

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1.0 Introduction

Nipomo Community Services District (District) is considering decommissioning the existing Blacklake Water Reclamation Facility (WRF) and conveying wastewater from the Blacklake community to the Southland Wastewater Treatment Facility (WWTF). The District hired MKN & Associates, Inc. (MKN) to refine the project description, cost opinion, and implementation schedule for a new lift station and force main connecting the Blacklake Sewer System to the Town Sewer System.

2.0 Existing Facilities

The District sewer system includes two service areas: Blacklake and Town Sewer Systems. The Vicinity Map (Figure 2-1) provides an overview of the study area.

2.1 Blacklake Sewer System

The existing Blacklake gravity sewer collection system consists of seven miles of gravity pipeline ranging in size from 6-inch to 12-inch, and 174 concrete manholes. Three lift stations with approximately 1,800 feet of 4-inch and 500 feet of 6-inch PVC force main are also part of the collection system. All flow is conveyed to the Blacklake Water Reclamation Facility.

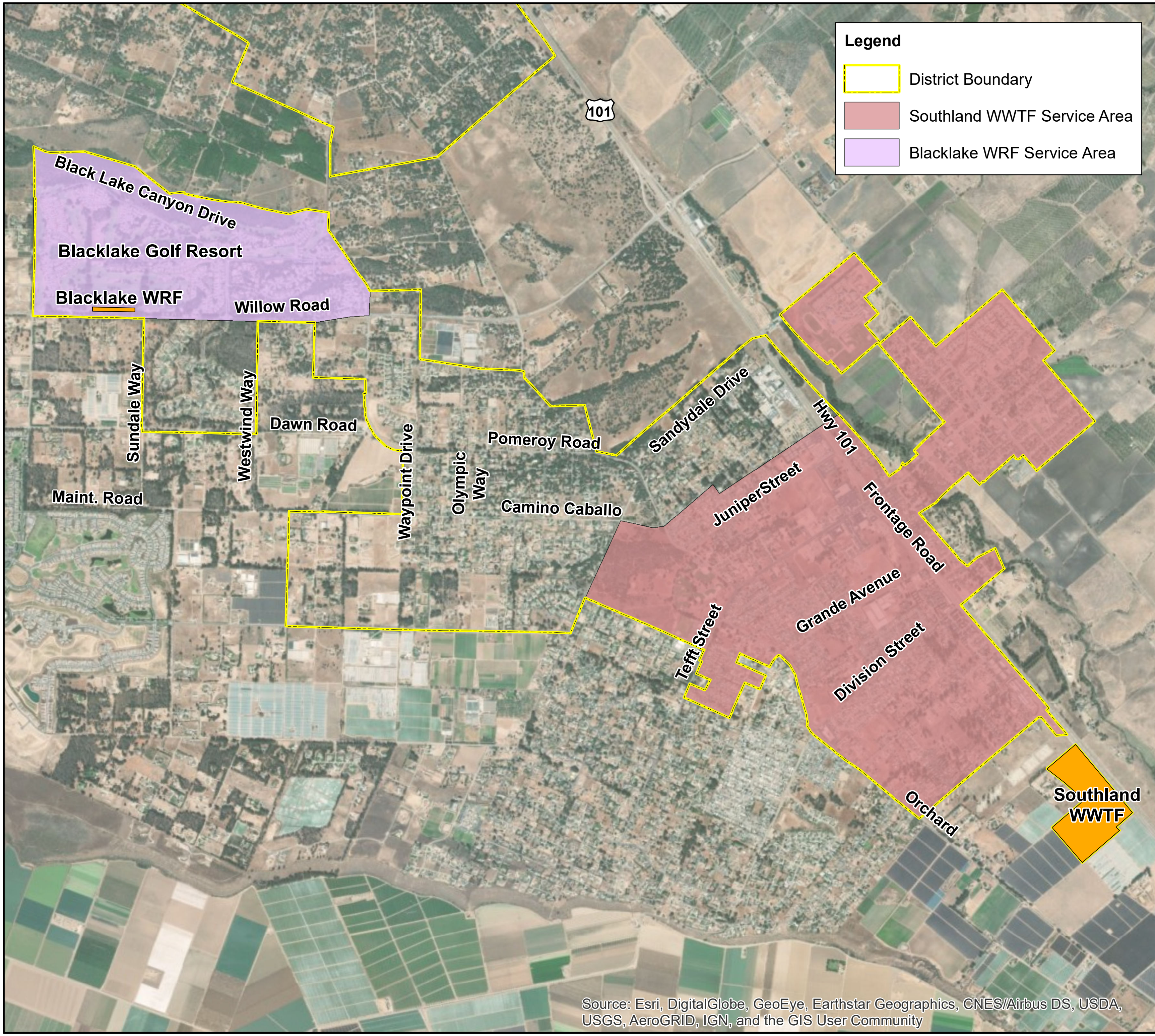
The Blacklake Water Reclamation Facility was constructed as part of the Blacklake development (1984) to process raw wastewater produced by the development and provide for the disposal of the treated effluent on the golf course.

The WRF consists of a manual bypass bar screen, two comminutors, three (3) lined ponds with surface aerators, two (2) chlorine contact basins, a sodium hypochlorite storage and feed system, and a citric acid storage and feed system that can be used to maintain pH within effluent limitations.

2.2 Town Sewer System

The Town sewer collection system consists of approximately 30 miles of gravity sewer ranging in size from 6-inch to a 24-inch. The system also includes 10 District lift stations and four miles of force main. All flow from the Town system is conveyed to the Southland Wastewater Treatment Facility (WWTF).

The WWTF consists of a mechanical screening system with washing and compaction equipment, grit removal, a lined Biolac™ wave oxidation pond with aeration system, two secondary clarifiers, sludge thickening, and concrete-lined drying beds. The facility also includes a blower/control building. Treated water is percolated onsite.



Nipomo Community Services District

Blacklake Sewer System Consolidation Study

Figure 2-1
Vicinity Map

Note: Service Area south of Southland WWTF not shown

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1 inch = 3,000 feet

0 1,500 3,000

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3.0 Force Main Alignment

3.1 Recommended Alignment

The force main begins at Willow Road and continues along Sundale Way, Camino Caballo, and Pomeroy Road to Juniper Street, connecting to an existing section of gravity sewer along Juniper Street, then conveys flow through the Frontage Road trunk main to the Southland WWTF.

Visible Utilities:

Fiber optic cable is located along the east shoulder of Sundale Way. Gas pipeline markers were observed on the west side of Sundale Way. Underground electric cables are marked near Dawn Road. A high pressure gas main crosses Camino Caballo near Pomeroy Road. Underground TV cables and storm drain pipes also extended across the road in some areas. District water mains are installed in all roads. Gravity sewer, force main, and underground electric cables are located along Juniper Street.

Road Conditions:

All roads along this alignment are paved with the exception of an 1810 LF segment along Sundale Way between Dawn Road and Camino Caballo and 520 LF segment of Camino Caballo near Sundale Way. Pipelines would require pavement repair per San Luis Obispo County standards. The following table summarizes the road segments, pavement condition index (PCI) per the County's 2015 Pavement Management Plan, and road repair requirements per the County's Design Standards.

Table 3-1 - Pavement Repair Required

Road Name	From	To	Length (LF)	PCI	Pavement Repair Requirement
Willow Road	Blacklake WRF	Sundale Way	890	85	Full Lane Width Overlay
Sundale Way	Willow Road	Dawn Road	2,639	73	Half Lane Width Overlay
Sundale Way [Unpaved]	Dawn Road	Camino Caballo	1,810	-	-
Camino Caballo [Unpaved]	Sundale Way	Begin Co. Maint. Road	519	-	-
Camino Caballo	Begin Co. Maint. Road	Waypoint Drive	5,808	80	Half Lane Width Overlay
Camino Caballo	Waypoint Drive	Pomeroy Road	5,865	58	12" min. T-Section
Pomeroy Road	Camino Caballo	Juniper Street	846	82	Half Lane Width Overlay
Juniper Street	Pomeroy Road	Frontage Road	3,550	89	Full Lane Width Overlay
		Total:	**21,927**		

Topography:

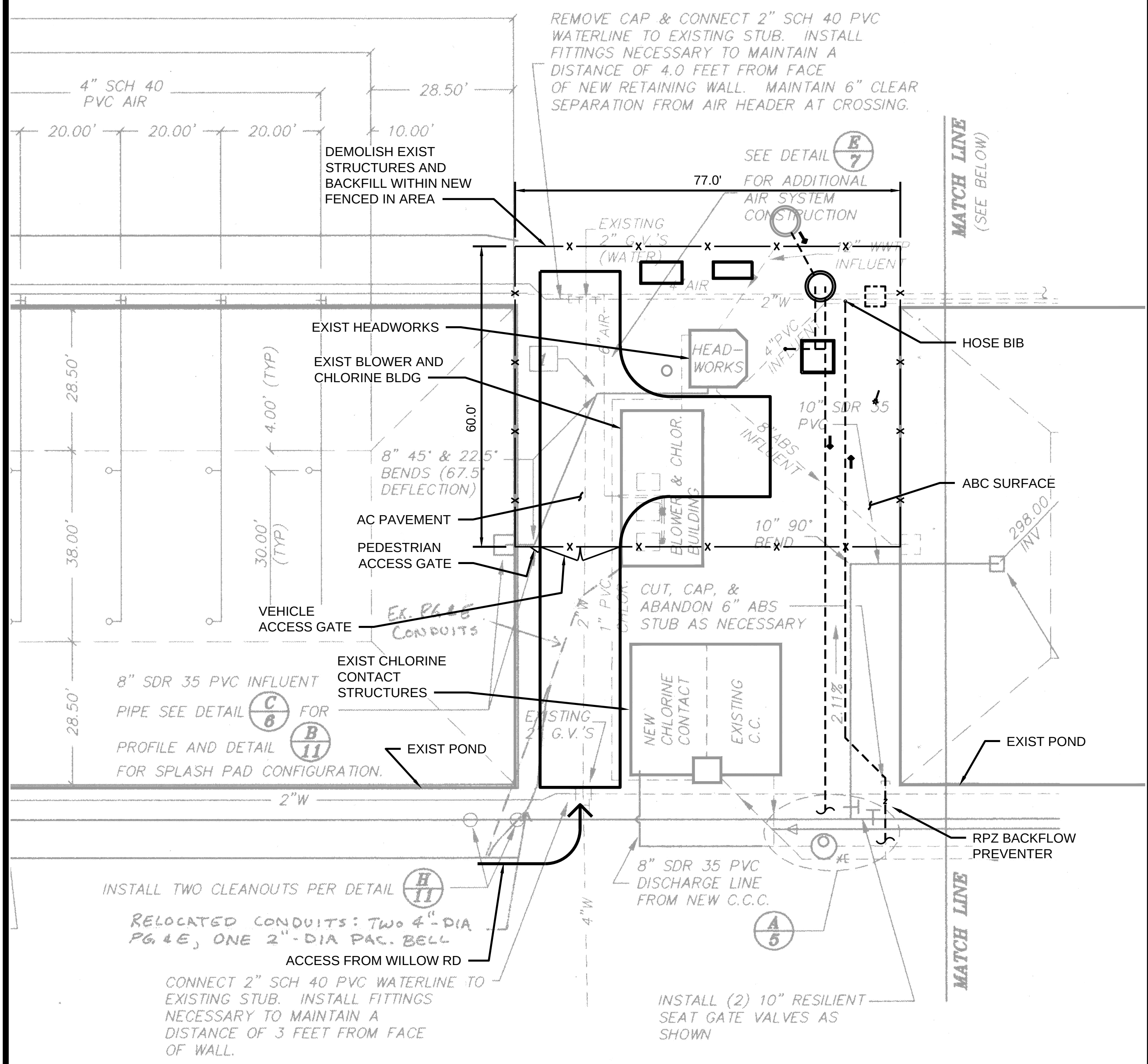
The surface alignment varies from the lowest elevation of approximately 250-260 feet mean sea level (MSL) at the intersection of Sundale Way and Camino Caballo to a high elevation of approximately 380 feet MSL along Juniper Street. More accurate elevations will be confirmed during the design phase.

4.0 Lift Station Site

The existing Blacklake WRF is located at the end of the Blacklake wastewater collection system. It is assumed the new lift station would be constructed where shown on Figure 4-1. This area is near the northwest corner of the control building and was selected to minimize cost and disturbance of the existing WRF during construction.

The new wetwell, valves, piping, and appurtenances would be located in this area since it is close to the existing influent wetwell, allows the WRF to continue operation during construction without site conflicts, and it allows vehicle access for wetwell and pump maintenance. Figure 4-2 provides a conceptual site plan.

Freestanding controls and communications cabinets and generator will be installed.



NOTES:

1. PROTECT EXISTING ANTENNA.
2. DEMOLISH AND BACKFILL EXISTING UTILITIES AND STRUCTURES ON SITE - INCLUDING EXISTING PONDS, HEADWORKS, BLOWER, CHLORINE BLDG, AND CONTACT STRUCTURES.
3. FENCING AND SITE WORK TO BE COMPLETED AFTER WRF IS DECOMMISSIONED AND EXISTING FACILITIES ARE DEMOLISHED AND REMOVED WHERE NECESSARY.

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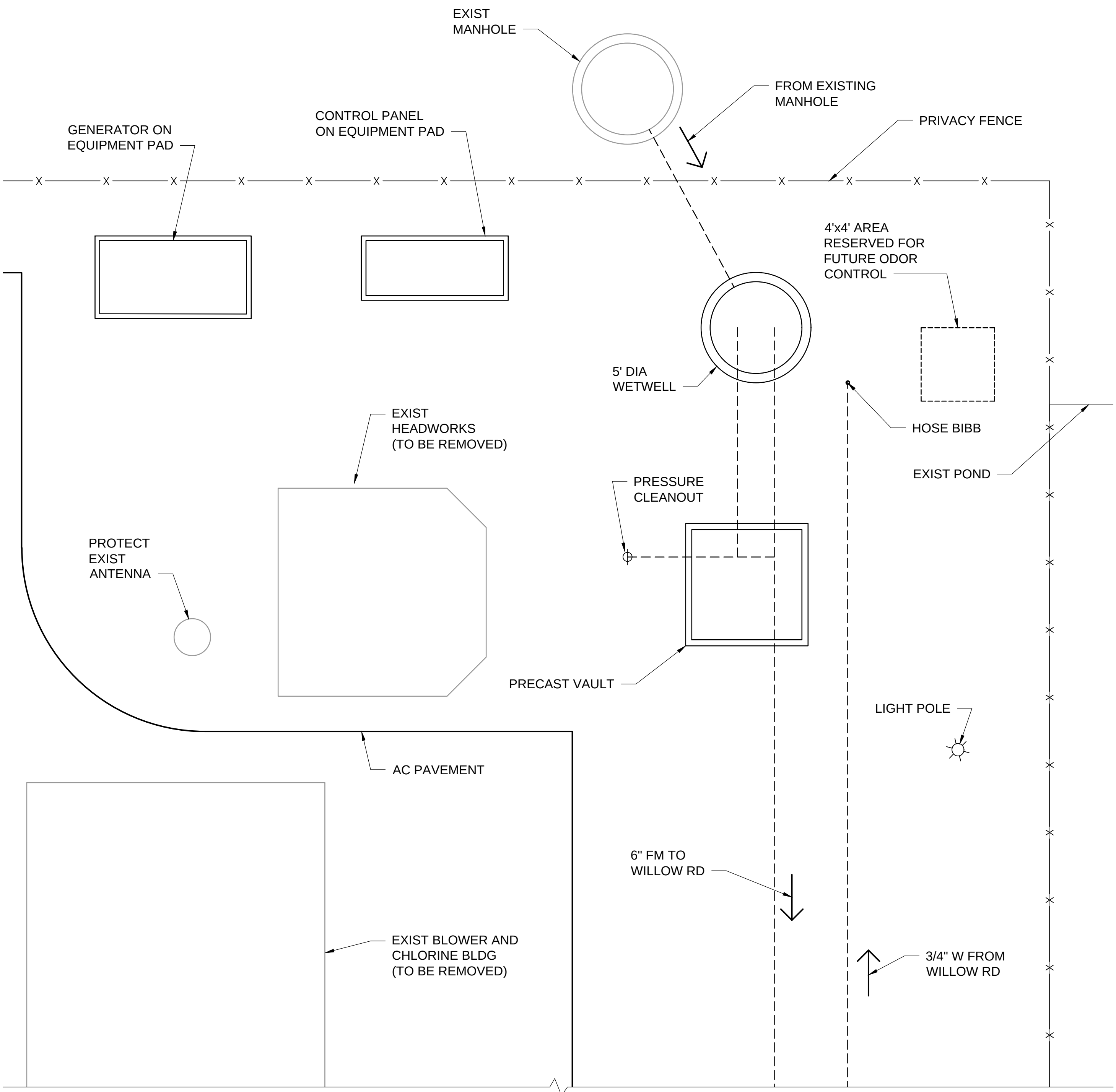
BLACKLAKE WRF SITE

POTENTIAL LIFT STATION SITE PLAN

FIGURE

4-1



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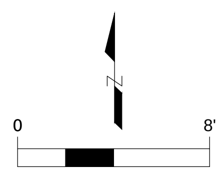

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BLACKLAKE WRF SITE

POTENTIAL LIFT STATION SITE DETAIL

FIGURE 4-2

5.0 Lift Station Conceptual Design

5.1 Design Criteria

The primary factors affecting wetwell design include the volume, type, and configuration of the selected pumps. The selection of pump size is dependent on inflow to wetwell, the number of pumps in operation, and target velocities in the force main. For the Blacklake Lift Station, a duplex lift station housing two pumps operating in a 1 plus 1 (lead/lag) configuration is recommended. This type of configuration is the same as existing District lift stations and has proven to operate satisfactorily with adequate redundancy.

5.2 Current and Projected Flows Summary

Current and projected flows presented in the Blacklake Sewer Master Plan (ibid.) were used in this report for developing preliminary design criteria and project cost opinions. Flow criteria are presented in Table 6-1.

Table 5-1 – Blacklake Lift Station Flows

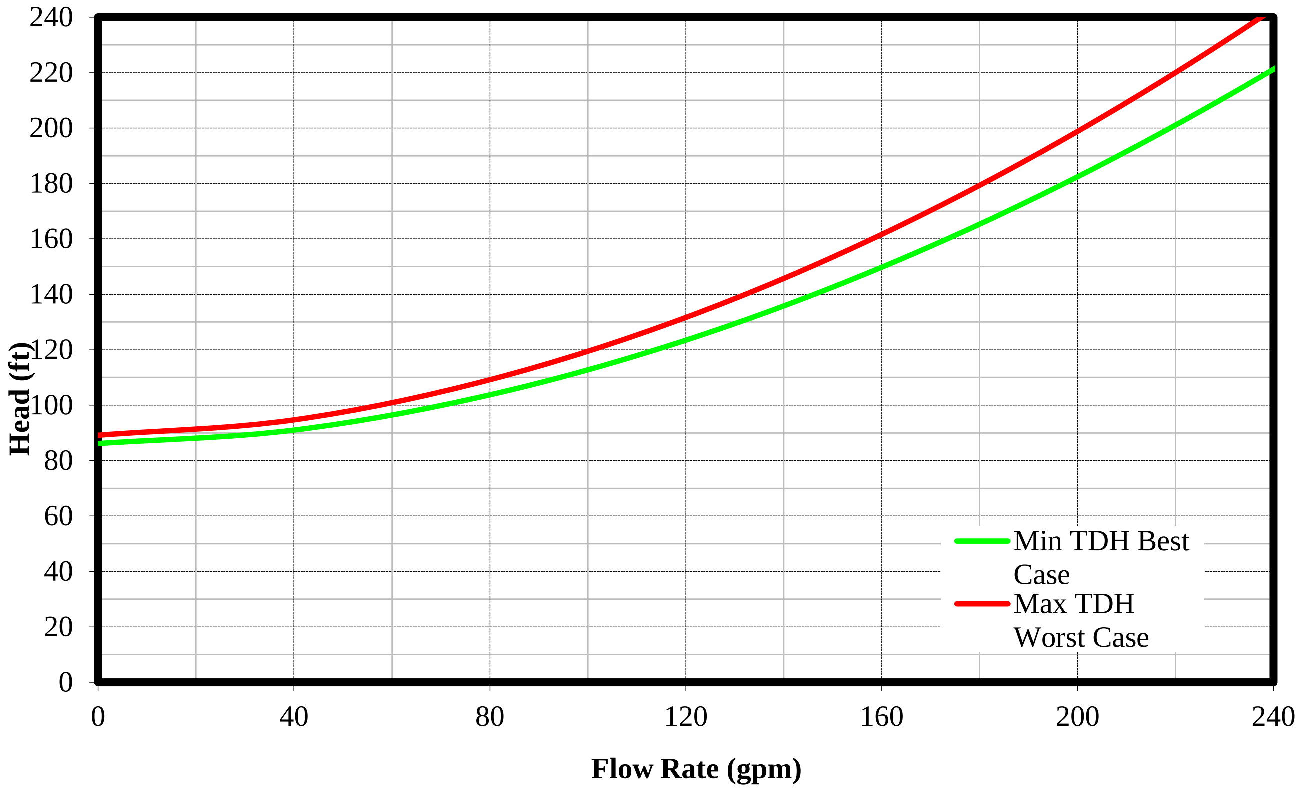
	Existing (2012) Flows from Blacklake Sewer Master Plan	Design Flow (gpm)
Average Annual Daily Flow (AADF)	38	40
Peak Hour Flow (PHF)	152	160

5.3 TDH Requirements

The Total Dynamic Head (TDH) is the total equivalent height that a fluid is to be pumped and is represented by a system curve. The system curve includes friction losses within the system as well as the elevation differential between the fluid level in the wetwell and the discharge point. Figure 6-1 displays a preliminary system curve for the Blacklake Lift Station. For development of the system curve it has been assumed that AWWA C900 DR 25 PVC pipe would be used for replacement of the force main. Using the low water surface elevation and elevations of the proposed force main alignment, a maximum elevation difference of 90 feet (static lift) was estimated and used in the system curve calculations.

The design point for the pump is 160 gpm at approximately 165 ft TDH, based on a conservative Hazen Williams roughness coefficient of C = 130. Assuming a combined motor and pump efficiency of 70%, the preliminary motor size is estimated at 10 hp for this pump.

Figure 5-1 – Blacklake Lift Station System Curve



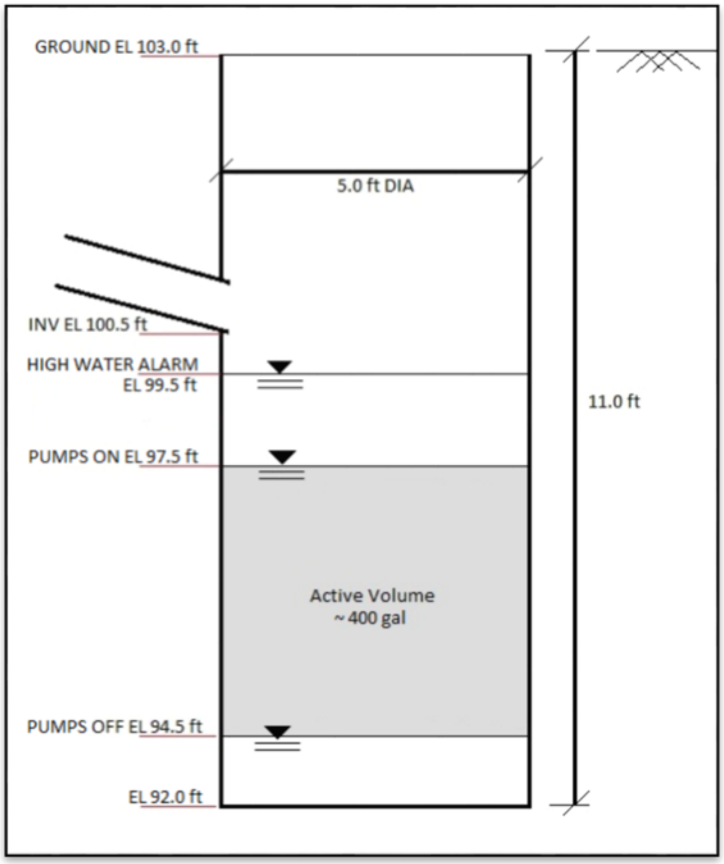
5.4 Wetwell Size

A 5-foot diameter, 11-foot-deep wetwell with submersible, solids-handling pumps is recommended. The preliminary sizing of the lift station pumps and wetwell are based on future projected flows. The lift station will need sufficient capacity to pump the future PHF of 0.23 MGD or 160 gpm. A duplex lift station, where one pump is capable of pumping 160 gpm, would provide redundancy at the future peak hour flow.

It is important that wetwells are sized with the correct volume and controls for optimized pump station operation. Wetwells should be large enough to prevent rapid pump cycling, and small enough to reduce residence time and minimize odors and settling/accumulation of solids.

The wetwell's active volume is defined as the amount of storage available between pump cycles. To protect the pumps from overheating, the recommended minimum cycle time is 10 minutes per pump. Under this condition, assuming each pump is rated at 160 gpm, the minimum wetwell active volume for the lift station is 400 gallons, or 53 cubic feet. Assuming a 5-foot diameter wetwell, the active depth is approximately 3 feet. The active depth is defined as the distance between the set point elevation at which the lead pump is called on and the set point at which the pumps are called off. Allowing space for additional set points such as a high-water alarm and a call for the lag pump beneath the influent sewer invert is important for operational flexibility. Additionally, pump manufacturers require minimum submergence for the pumps, typically between 4 and 12 inches. The influent sewer invert at the Blacklake WRF is 3.5 feet below grade. Assuming a similar invert for the lift station and estimating the required submergence for the pumps and elevations for the control set points, a total wet depth of 11 feet would be recommended for a 5-foot diameter wetwell. Figure 5-2 shows wet well dimensions and liquid levels.

Figure 5-2 – Wetwell Dimensions and Liquid Levels



Note: Elevations are based on an assumed vertical datum.

5.5 Site Access and Design

The new lift station access will tie into the existing WRF access road. A new fence will be constructed around the lift station with a gate at the driveway entrance. Adequate space to allow a chemical delivery truck or vacuum truck to turn around will be provided within the site. Trees and the existing berm south of the proposed site will be left in place to provide visual screening of the site from Willow Road. It is assumed all unpaved areas within the fenced area will have an aggregate base course (ABC) surface.

Figure 5-3 – View from proposed site toward existing trees and berm along Willow Road

5.6 Decommissioning and Demolition of Blacklake WRF

The existing Blacklake WRF will be decommissioned after the new lift station is completed and operating, and before final site repair, paving, and fencing is completed. Wastewater from Pond 1 will be pumped through the existing treatment facility, disinfected, and disposed. This will require intermediate pumping from Pond 1 to Pond 2, then the pump can be moved from Pond 2 to Pond 3 to allow Pond 2 to be drained; then Pond 3 can be drained. It is assumed District staff will operate the ponds during this period until decommissioning can begin.

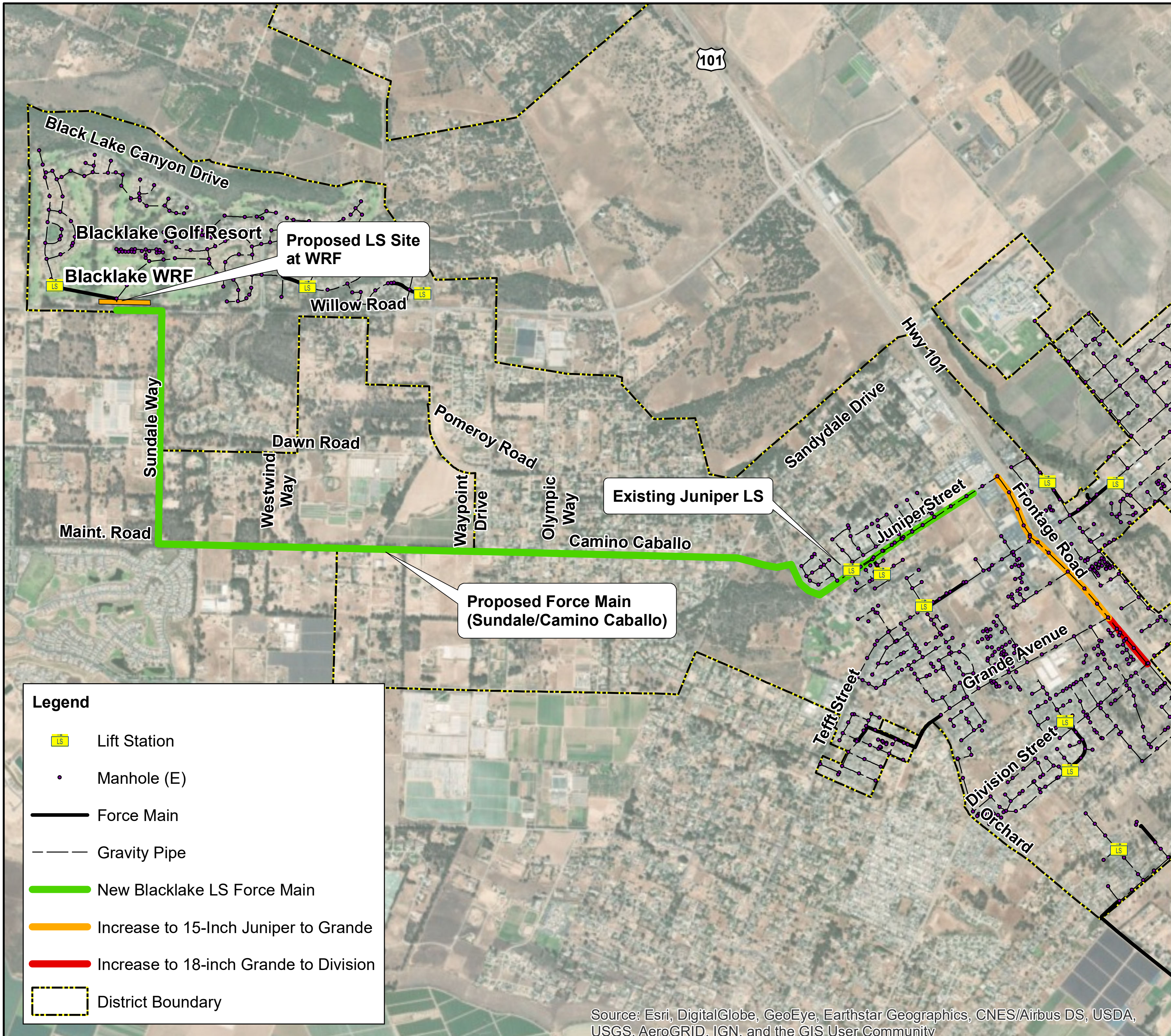
MKN recommends including the decommissioning, demolition, and disposal of treatment system buildings and facilities in the construction package for the Blacklake Lift Station. After District staff has drained and treated wastewater from the ponds, the remaining sludge at the bottom of the ponds will be dredged and disposed of by a Contractor. The scope of work for the Contractor will include the following efforts:

- Sludge disposal;
- Removing and disposing of the HDPE pond liners;
- Demolishing and removing any buried structures, conduits, and piping to six (6) feet below grade, including the chlorine contact basin walls and baffles;
- Demolishing and removing the WRF Control Building;
- Filling all pipelines located more than six (6) feet below grade with concrete slurry;
- Removing and disposing of all surface improvements, paving, walkways, fencing;
- Filling ponds and depressions with engineered fill and graded to a smooth finish to match adjacent surfaces; and
- Completion of final site paving and fencing.

6.0 Project Description

The recommended project includes the following components, as identified on Figure 6-1:

- New 160-gpm Blacklake Lift Station at Blacklake WRF Site with 5-ft diameter, 11-foot-deep wetwell, valve vault, backup generator, fencing, access road, pavement, and appurtenances;
- Decommissioning and demolition of existing WRF;
- Approximately 21,930 LF of new 6-in AWWA C900 force main with pressure cleanouts, combination air/vacuum valves, and appurtenances:
    - 890 LF along Willow Road
    - 4,450 LF along Sundale Road
    - 12,200 LF along Camino Caballo
    - 850 LF along Pomeroy Road
    - 3,550 LF along Juniper Street



Nipomo Community Services District

Blacklake Sewer System Consolidation Study

Figure 6-1
Recommended Project

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1 inch = 2,500 feet

0 1,500 3,000

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7.0 Preliminary Opinion of Probable Project Cost

To develop cost opinions for the proposed improvements, MKN utilized the Association for Advancement of Cost Estimating International (AACE) guidelines for cost estimating practices and classification. The Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries (AACE International Recommended Practice No. 18R-97) provides guidelines for applying the principles of estimate classification to projects. A summary of the recommended classification system is presented in Table 7-1 below.

Table 7-1 - Cost Estimate Classification Matrix

Estimate Class	Primary Characteristic	Secondary Characteristic			
	Level of Project Definition	**End Usage**	**Methodology**	**Expected Accuracy Range**	**Preparation Effort**
	Expressed as % of complete definition	Typical purpose of estimate	Typical estimating method	Typical variation in low and high ranges [a]	Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50%, H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

[a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

[b] If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

The cost opinions developed for this study are considered Class 4 Estimates, which is defined by AACE International as follows:

> *Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams (PFDs) for main process systems, and preliminary engineering process and utility equipment lists. Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval to proceed to next stage. Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. American National*

Standards Institute (ANSI) Standard Reference Z94.2-1989 references this class as a "Budget Estimate", with an accuracy range between -15% to +30%.

The cost opinions for this study are anticipated to be within an accuracy of -20% to +30%. The accuracy reflects the level of confidence that an estimate will be near the actual project cost. This concept should not be confused with the application of a project contingency (which is applied for unknown or unforeseen project conditions). As the proposed project is refined during future phases of implementation, the accuracy range of the cost estimates will narrow to reflect an increased confidence in the estimating data.

Materials, equipment, and labor costs were based on recent bids, actual project costs, or cost opinions developed for similar projects. Other costs such as design, construction management, administration, permitting, and escalation to midpoint of construction were also incorporated as described in the cost opinion tables.

Table 7-2 summarizes the project cost opinions for the Blacklake Regionalization Project. Costs were escalated by 5% per year over 3.5 years to the midpoint of construction of the Blacklake Regionalization Project.

Table 7-2 - Preliminary Project Cost Opinion					
Item	**Description**	**Quantity**	**Unit**	**Unit Price**	**Amount**
1	**Blacklake Lift Station**	1	LS	$526,500	$526,500
2	**Force Main**	1	LS	$4,488,168	$4,489,000
3	**Existing WRF Demolition**	1	LS	$795,675	$796,000
				Subtotal Construction Cost (Rounded)	$5,812,000
	Escalation to Midpoint of Construction (5% per Year over 3 Yrs)*				$871,800
	Permitting (2% Allowance)				$116,240
	Engineering and Construction Management (30%)				$1,743,600
	Contingency (30%)				$1,743,600
			Total Project Cost (Rounded)		$10,300,000

*5% per year represents the highest quarterly escalation per the ENR CCI-LA in the past 15 years extrapolated over one year.

The opinion of probable construction cost presented here is only an opinion of possible construction costs for budgeting purposes. This opinion is limited to the conditions existing at issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to, local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events and developing bidding conditions, etc. may affect the accuracy of this estimate. MKN & Associates, Inc., is not responsible for any variance from this budgetary opinion of construction cost or actual prices and conditions obtained. The opinion of probable construction cost is based on the conceptual layout; addition or subtraction of design elements will impact the final project cost. Construction cost opinion was developed in July 2019. Use ENR CCI-LA June 2019 = 12130.66 to escalate estimated cost to present value.

8.0 Project Schedule

Figure 8-1 summarizes the project schedule. Next steps in implementation will include selection and authorization of an assessment engineer to determine the financial impact of the proposed project on property owners within the Blacklake Community. District staff will schedule an assessment hearing and voting period to approve property assessment as an approach to funding the project. It is assumed voting will occur in March 2020 per District staff. A delay in that process will result in a delay in the overall schedule.

If the assessment vote is successful, District staff will procure a design consultant and environmental consultant to proceed with design and permitting. It is assumed the design process will follow the typical procedure for major District projects with a Concept Design Report with 30% design then 60%, draft final, and final plans, specifications, and cost opinions. Environmental work will proceed with selection of a California Environmental Quality Act (CEQA) consultant. The schedule was developed assuming a Mitigated Negative Declaration would be developed since the project involves construction in disturbed areas and wastewater treatment at an existing, permitted facility. However, this will be reviewed by the District and consultant after the Initial Study is prepared.

As shown, implementation of the project is expected to require over four years until completion of construction. At this early stage of project development, schedule could be affected by many factors including outcome of the assessment vote, CEQA compliance and permitting, and construction issues. Project schedule will be maintained and updated as the project proceeds.

Figure 8-1 – Project Schedule

Task Name	**'19**	**2020**				**2021**				**2022**				**2023**				**2024**	
	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
Project Financing	■	■	■	■	■	■	■	■	■	■	■								
Design			■	■	■	■	■	■	■	■									
Permitting				■	■	■	■	■	■										
Bid Phase										■	■								
Construction												■	■	■	■	■	■	■	

9.0 References

Blacklake Sewer Master Plan (MKN, 2017)

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