SANTO DOMINGO PUEBLO

WASTEWATER TREATMENT PLANT

FINAL DESIGN ANALYSIS REPORT

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The technical material and data contained in this Engineering Report was prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.



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All questions about the meaning or intent of this document shall be submitted only to the Engineer of Record, stated above, in writing.

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ABBREVIATIONS AND ACRONYMS

AA	Additive Alternate
A/E	Architect/Engineer
ATS	Automatic Transfer Switch
BBER	Bureau of Business and Economic Research
BOD_5	Biochemical Oxygen Demand
CM	Construction Manager
CMAR	Construction Management at Risk
cfs	cubic feet per second
DAR	Design Analysis Report
DNR	Department of Natural Resources
EPA	Environmental Protection Agency

ABBREVIATIONS AND ACRONYMS (continued)

ft^2	square feet
ft^3	cubic feet
FEMA	Federal Emergency Management Administration
FOG	fats, oils, and grease
fps	foot per second
GMP	Guaranteed Maximum Price
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GWQB	Ground Water Quality Bureau
HP	horsepower
ICEAS®	Intermittent Cycle Extended Aeration System
KVA	kilovolt-ampere
kW	kilowatt
MDP	Main Distribution Panel
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
mL	milliliter
N/A	Not applicable
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
PCBs	Polychlorinated biphenyls
PER	Preliminary Engineering Report
PF	peaking factor
PLC	Programmable Logic Controllers
PNM	Public Service Company of New Mexico
RFP	Request for Proposals

ABBREVIATIONS AND ACRONYMS (continued)

ROW	right-of-way
SBR	sequencing batch reactor
SCADA	Supervisory Control and Data Acquisition
SCL	Sandoval County Landfill
SE	southeast
TCLP	toxicity characteristic leaching procedure
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
TUA	Tribal Utility Authority
UNM	University of New Mexico
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
V	volt
VFDs	variable frequency drives
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION AND PURPOSE

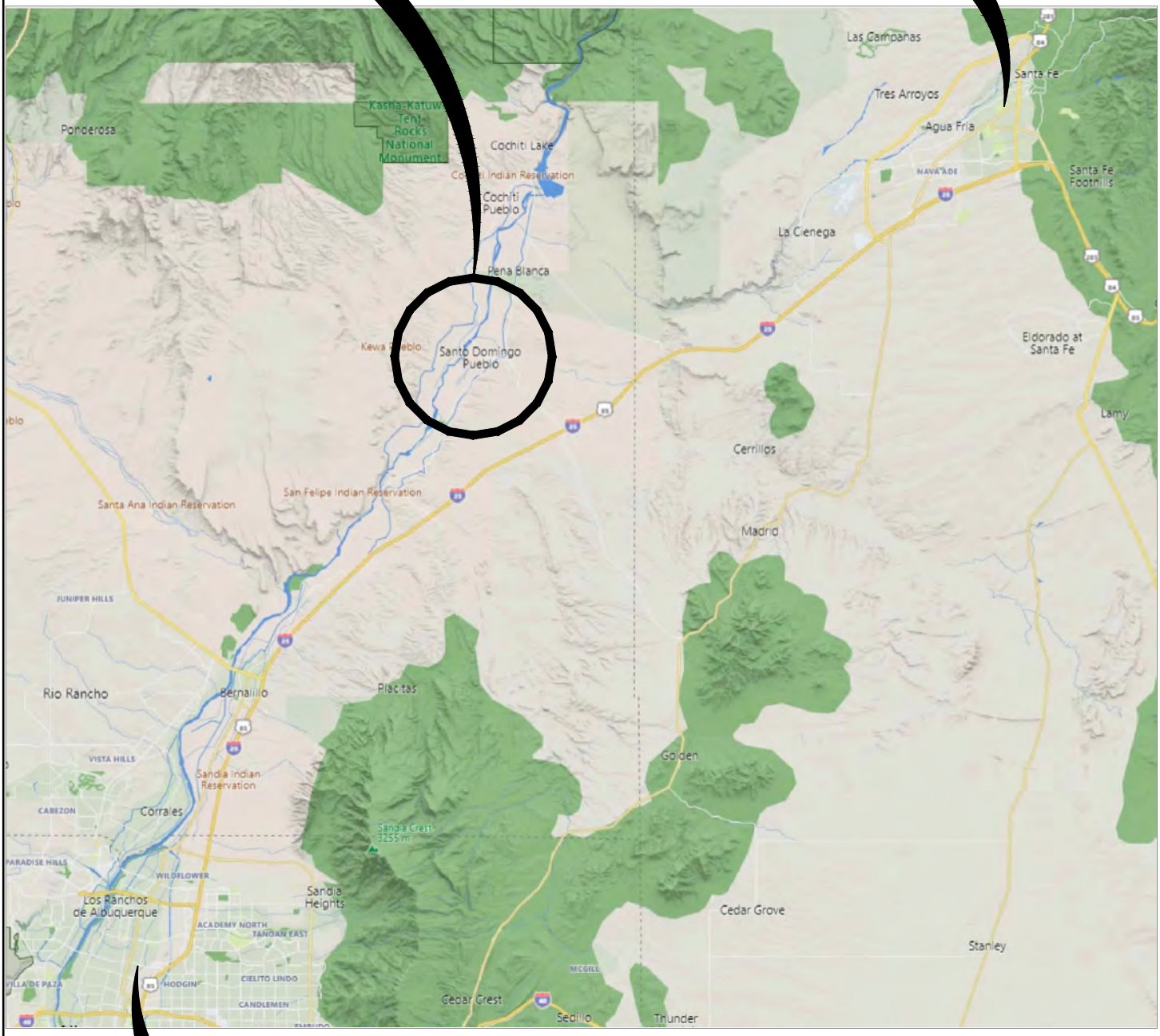
Santo Domingo Pueblo (Santo Domingo) is located between Albuquerque and Santa Fe, New Mexico near Interstate 25 and along State Road 22 (the road to Cochiti Lake), as illustrated in Figure 1-1. Santo Domingo is seeking to implement a long-term solution to replace the existing wastewater collection, treatment, and disposal facilities. Santo Domingo, particularly its Tribal Utility Authority, has conducted preliminary research into the type of wastewater treatment facility to implement, and a site has been selected for the location of the new Wastewater Treatment Plant (WWTP). The proposed site for the new WWTP will be located approximately 1/2 mile south of the Kewa Station – Rail Runner adjacent to Indian Service Route 88, as shown in Figure 1-2.

The purpose of this Design Analysis Report (DAR) is to evaluate population and growth trends to determine the capacity of the new WWTP, estimate the wastewater characteristics in the absence of wastewater analysis results, establish wastewater treatment component sizing and treatment plant layout, consider effluent disposal and reuse alternatives, determine solids handling facility requirements, program administrative and shop / storage facilities, civil and electrical site improvements, and consider solid waste transfer facility components. In addition, the DAR includes implementation considerations, particularly the design and construction delivery method, determination of geotechnical, permitting, easement and right-of-way (ROW) requirements, consideration of environmental and cultural aspects, and development of cost estimates. Two additional planning documents are being developed concurrently with this DAR: (1) the Lift Stations, Forcemains, and Gravity Sewer Preliminary Engineering Report (PER), and (2) the Main Village Sewer Rehabilitation and Extension PER.

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SANTA FE

SANTO DOMINGO PUEBLO



ALBUQUERQUE

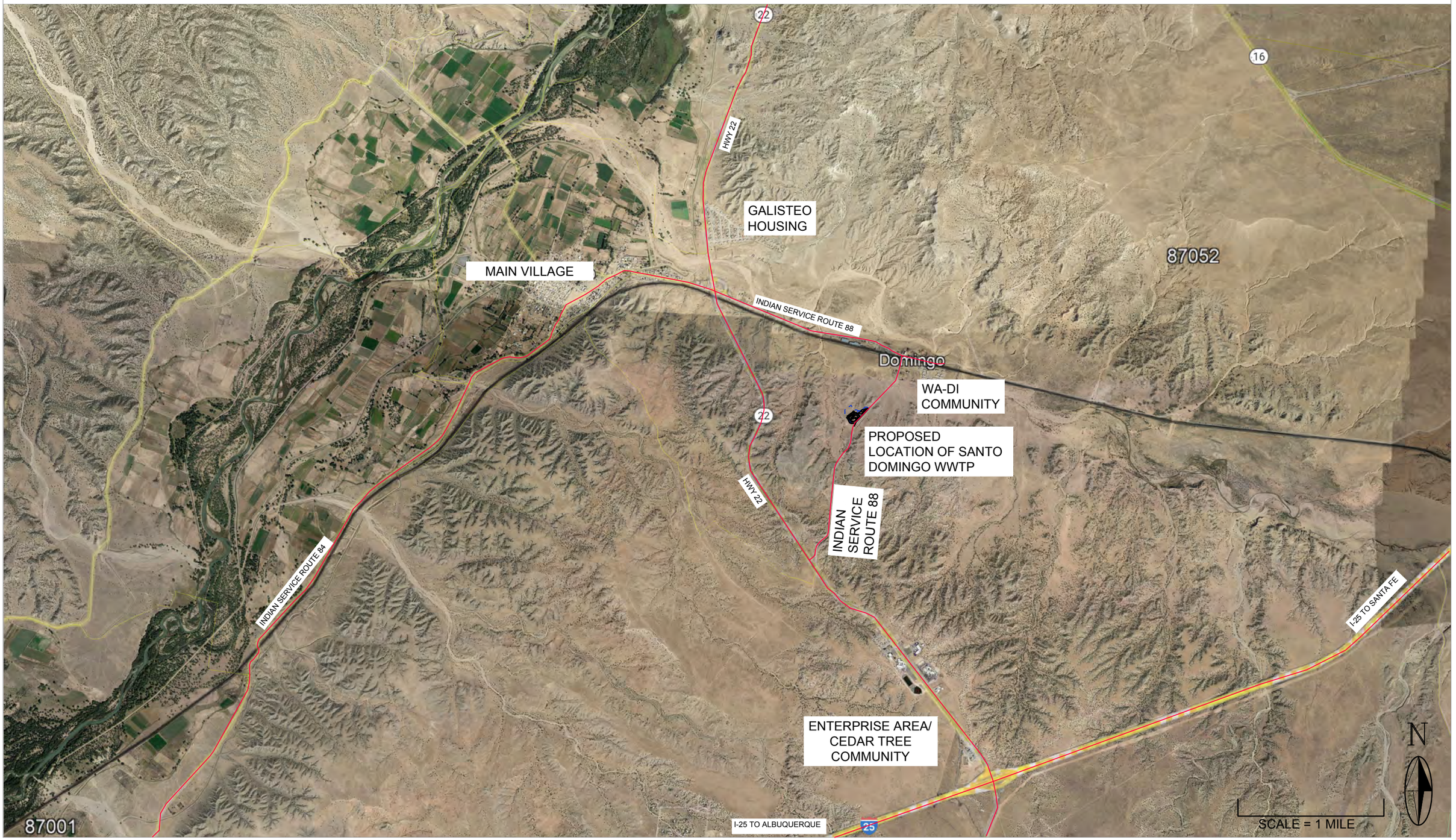
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SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

AREA MAP & SITE LOCATION
FIGURE 1-1

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SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

PROPOSED WWTP SITE PLAN
FIGURE 1-2

2.0 EXISTING CONDITIONS

There are four main population centers within Santo Domingo, consisting of the Main Village, Galisteo Housing, Wa-Di Community, and the Enterprise Area that includes the Cedar Tree Community. The four population centers are illustrated in Figure 2-1. Each of the four population centers currently has its own wastewater collection and treatment facilities. This Section of the DAR includes estimates of the current population and wastewater flows, descriptions of the service areas for each population center, and descriptions of the existing wastewater treatment infrastructure and their condition.

2.1 Population

Santo Domingo estimates there were 4,032 persons within the Pueblo as of 2021. Based on aerial photography from Google Earth to estimate the number of houses and buildings in each population center, counting the number of sewer connections from sewer video logs in the Main Village, and using 4.9 persons per dwelling based on the 2020 Census (see Appendix E), the estimated current population distribution is presented in Table 2-1.

TABLE 2-1
ESTIMATED CURRENT POPULATION

POPULATION CENTER	ESTIMATED STRUCTURES	ESTIMATED POPULATION [1]
Main Village	648 [2]	3,175
Galisteo Housing	107	524
Wa-Di Community	47	230
Cedar Tree Community in the Enterprise Area	21	103
TOTAL:	**823**	**4,032**

[1] Estimated population based on 4.9 persons per dwelling from 2020 Census.

[2] Based on 623 service connections counted during review of sewer video logs plus an estimated 25 additional homes assumed not to be accounted for in the video log review.

2.2 Service Area

The service areas for each of the four existing population centers, as defined by the current wastewater collection systems, are illustrated in Figure 2-1.

2.3 Wastewater Flows

Wastewater flows can be estimated by establishing a per-capita wastewater flow and multiplying that flow rate times the population in the community, plus any flow contributions from commercial areas that add to the residential component of the flow. The estimated existing wastewater flows are established in this section and will form the basis for projected wastewater flows as presented in Section 3.0.

2.3.1 Estimated Residential Wastewater Flows

Wastewater flows can be estimated for a community based on water production data, particularly for a community with limited landscape irrigation. Water production data from Santo Domingo was obtained for the calendar year of 2019 to approximate the current water production under normal conditions (i.e., the last full year prior to the onset of the COVID-19 pandemic). This water production data is presented graphically in Figure 2-2. As shown in Figure 2-2, the average water production for 2019 was 215,242 gallons per day (gpd) and the peak day was 408,722 gpd. This data yields a peak day to average day peaking factor (PF) of 1.90. The modest increase (about 25%) of summertime water use compared to the rest of the year suggests there is limited outdoor watering from the potable system. For a community with very limited landscape irrigation, the wastewater flows can be estimated by assuming that 90% of the water pumped in the wells is discharged into the sewers as wastewater flow. As such, for the current population of 4,032 from Table 2-1, this equates to a per-capita wastewater flow rate of:

Per-Capita Wastewater Flow = (215,242 gpd) x 90%

Per-Capita Wastewater Flow = 48 gallons per capita per day (gpcd)

Per-Capita Wastewater Flow (rounded) = 50 gpcd

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EXISTING SERVICE AREAS FOR MAIN VILLAGE, GALISTEO, WA-DI, ENTERPRISE AREA/CEDAR TREE
FIGURE 2-1

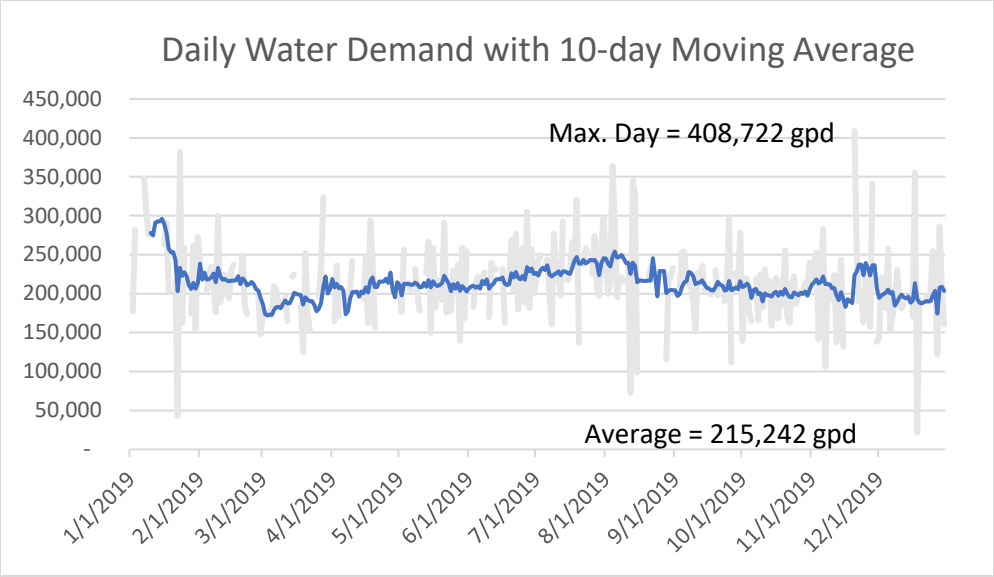


FIGURE 2-2
SANTO DOMINGO WATER DEMAND FROM WELL PRODUCTION DATA

Peaking factors to estimate peak month, peak day, and peak hour wastewater flows can be established from several resource documents, including *Wastewater Engineering Treatment and Reuse, 5th Edition, Metcalf & Eddy, Inc., Recommended Standards for Wastewater Facilities, 2014 Edition*, published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, and known as the "Ten State Standards", the Maryland Department of the Environment Engineering and Capital Projects Program, and others. The Maryland Design Guidelines for Wastewater Facilities provides a useful approach to estimate all the peaking factors indicated above, and is summarized below:

Daily PF = 75% of Hourly Peak Flow
Monthly PF = 50% of Hourly Peak Flow (but not below 1.2)

2.3.2 Estimated Wastewater Flows from the Commercial Portion of the Enterprise Area

The Enterprise Area of Santo Domingo includes several commercial establishments, along with a residential area known as the Cedar Tree community. The growth of the commercial portion of the Enterprise Area is anticipated to occur at a greater rate than the residential areas. As such, the estimated wastewater flows from the commercial portion of the Enterprise Area is considered

separately from the other areas of Santo Domingo and is summarized in Table 2-2. As shown in Table 2-2, for planning purposes, the current wastewater flows from the commercial portion of the Enterprise Area is estimated at 80,000 gpd.

2.3.3 Estimated Current Wastewater Flows

Based on the estimated current populations from Table 2-1 for each of the population centers in Santo Domingo and the average day wastewater flow rate of 50 gpcd, along with the peaking factors established above, the current wastewater flows can be established. In addition, based on the estimated wastewater flows from the commercial portion of the Enterprise Area and applying the same peaking factors, the estimated average day, peak month, peak day, and peak hour wastewater flows can be established, as summarized in Table 2-3.

TABLE 2-2
ESTIMATED WASTEWATER FLOWS FROM ENTERPRISE AREA [1]

DESCRIPTION	UNIT	UNIT FLOW RATE	ESTIMATED WASTEWATER FLOW (gpd)
Health Center	60,000 sf [2]	0.62 gpd/sf [3]	37,572
Elementary School	261 students	25 gpd/student [4]	6,525
Middle School	87 students	25 gpd/student [4]	2,175
Early Childhood Learning Center	215 children	25 gpd/student [4]	5,375
Safety Complex	20 staff	25 gpd/staff [5]	500
Gas Station / Travel Center	two complexes	5,000 gpd each [6]	10,000
		Subtotal:	62,147
		TOTAL (ROUNDED UP FOR CONSERVATISM):	**80,000**

1 The Enterprise Area also includes a residential component, which is not included here.
2 Dimensions approximated from Google Earth image.
3 From Maryland Department of the Environment Engineering and Capital Projects Program.
4 Per United States Environmental Protection Agency (USEPA) Onsite Wastewater Treatment Systems Manual.
5 As recommended in the North Carolina Admin. Code 2T.0114, Wastewater Design Flow Rates.
6 Assumed amount.

TABLE 2-3
ESTIMATED CURRENT WASTEWATER FLOWS

POPULATION CENTER	ESTIMATED POPULATION	AVERAGE DAY (gpd)	PEAK MONTH (gpd) (1)(2)	PEAK DAY (gpd) (1)(3)	PEAK HOUR (gpd) (1)(4)
Main Village	3,175	158,750	201,000	302,000	402,000
Galisteo Housing	524	26,200	34,000	50,000	67,000
Wa-Di Community	230	11,500	15,000	22,000	30,000
Cedar Tree Community in the Enterprise Area	103	5,150	7,000	10,000	13,000
SUBTOTAL	4,032	201,600	257,000	384,000	512,000
Enterprise Area		80,000	101,000	152,000	203,000
TOTAL:	**4,032**	**282,000** (1)	**358,000**	**536,000**	**715,000**

[1] Rounded to nearest 1,000 gpd.
[2] Peak hour multiplied by 0.5 (per Maryland Design Guidelines, see Section 2.3.1).
[3] Average day multiplied by 1.9 based on well production records for 2019.
[4] Peak day divided by 0.75 (per Maryland Design Guidelines, see Section 2.3.1).

2.4 Existing Infrastructure and Condition

Existing wastewater treatment facilities and their condition for the Main Village, Galisteo Housing area, Wa-Di Housing area, and the Enterprise Area are described in the following paragraphs.

2.4.1 Main Village

The Main Village lagoons consist of six cells with a total volume of approximately 33 million gallons (MG). The Main Village lagoons are illustrated in Figure 2-3. The Pueblo reports that the lagoons are inadequately sized for current flows, and that wastewater periodically has to be pumped and hauled to an offsite disposal facility.

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EXISTING LAGOONS AT MAIN VILLAGE

FIGURE 2-3

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2.4.2 Galisteo Housing

The Galisteo Housing lagoons consist of a three-cell lagoon system with a total volume of approximately 23 MG. The Galisteo Housing lagoons are also illustrated in Figure 2-4. Santo Domingo suspects there are a significant number of leaking water fixtures in the Galisteo Housing area, increasing flows to the lagoons that have exceeded the capacity of the lagoons, causing overflow events and the need to pump wastewater to the Main Village lagoons.

2.4.3 Wa-Di Housing

A WWTP for the Wa-Di Housing area was considered in a PER dated November 22, 2016, by Forsgren Associates, Inc. However, lack of funding to implement the treatment plant resulted in on-site wastewater treatment being the only solution at the time of construction. The large on-site wastewater disposal system for the Wa-Di Housing area consists of a 20,000-gallon septic tank and approximately 7,000-feet of leach line for infiltration of septic tank effluent. Field observations show a substantial amount of fats, oils, and grease (FOG) in this septic tank and it is believed that the leach field has failed because of the FOG. As a result, Santo Domingo routinely pumps out the septic tank to maintain wastewater service to the Wa-Di area.

2.4.4 Enterprise Area

The Santo Domingo Health Center, Santo Domingo Early Childhood Learning Center, Santo Domingo Elementary, Fire and Emergency Medical Services, and the Cedar Tree Community are each on their own on-site wastewater disposal systems. The lagoon serving the Kewa Gas Station, Santo Domingo Housing Office and other facilities are undocumented.

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EXISTING LAGOONS FOR GALISTEO HOUSING

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FIGURE 2-4

3.0 FUTURE CONDITIONS

Population projections for Santo Domingo within the anticipated service area are developed in this section of the DAR, along with projected wastewater flows. These projected wastewater flows include peak flows that must be considered in the design of the wastewater treatment facilities. Estimated influent wastewater characteristics and required effluent quality targets are also established in this section to form a basis of design for the WWTP.

3.1 Population Projections

Projecting populations for a community can be accomplished by reviewing census data, historical building activity, utility accounts, and published sources that specialize in socioeconomic data and forecasting. The University of New Mexico (UNM) Bureau of Business and Economic Research (BBER) is recognized as an expert in providing socioeconomic data and forecasting in New Mexico, with more than 70 years of experience. Although the BBER does not have population projections specifically for Santo Domingo, there are projections for Sandoval County. The projected population growth rates for Sandoval County are available in 5-year increments within the 20-year planning period of this DAR and are summarized in Table 3-1. For the purposes of this DAR, the annual growth rates from Table 3-1 have been used to estimate the population from current to 2042 (20-year planning period) in Table 3-2. Also presented in Table 3-2 is an approximated ultimate population of 10,200 which corresponds closely to the ultimate population indicated in the Request for Proposals (RFP) for this project, as issued by the Santo Domingo Tribal Utility Authority.

TABLE 3-1
PROJECTED GROWTH RATES FOR SANDOVAL COUNTY

RANGE OF YEARS IN PLANNING PERIOD	PROJECTED ANNUAL GROWTH RATE [1]
2020 to 2025	0.967%
2026 to 2030	0.868%
2031 to 2035	0.751%
2036 to 2040	0.658%

[1] Based on projections from the UNM BBER.

TABLE 3-2
POPULATION PROJECTIONS FOR SANTO DOMINGO PUEBLO

YEAR	PROJECTED POPULATION [1]
2021	4,032
2022	4,071
2023	4,110
2024	4,150
2025	4,190
2026	4,227
2027	4,263
2028	4,300
2029	4,338
2030	4,375
2031	4,408
2032	4,441
2033	4,475
2034	4,508
2035	4,542
2036	4,572
2037	4,602
2038	4,632
2039	4,663
2040	4,693
2041	4,724
2042	4,755
Ultimate [2]	10,200

[1] Based on projections from the UNM BBER for Sandoval County and 2021 population provided by Santo Domingo Pueblo

[2] The RFP for Professional Engineering Services issued by Santo Domingo Pueblo Tribal Utility Authority indicates an anticipated population of as much as 10,000.

3.2 Service Area

The service areas for the Main Village, Galisteo Housing, Wa-Di Housing, and the Enterprise Area are illustrated in Figure 3-1. Since there are no adjacent jurisdictions to Santo Domingo, the service areas can be expanded in the future as growth occurs in the community and to accommodate expansion of the Enterprise Area.

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FUTURE SERVICE AREAS FOR MAIN VILLAGE, GALISTEO, WA-DI, ENTERPRISE AREA/CEDAR TREE
FIGURE 3-1

3.3 Flow Projections

Based on the population projections from Table 3-2 and the same methodology used to establish the wastewater flow projections presented in Table 2-3, the projected wastewater flows throughout the planning period, including ultimate build-out, are presented in Table 3-3. As shown in Table 3-3, the projected residential wastewater flows are estimated by year based on the projected population and a per-capita wastewater flow of 50 gpcd. The Enterprise Area is assumed to triple in size at a linear rate over the 20-year planning period. Adding the residential flow to the projected Enterprise Area flows yields an average day wastewater flow by year for the planning period, including the ultimate build-out scenario. Estimated flows for maximum month, maximum day, and peak hour are also presented in Table 3-3 for each year in the planning period. Key flow projections from Table 3-3 are summarized below:

- Current Average Day Flow = 282,000 gpd
- 20-Year Average Day Flow = 478,000 gpd
- Ultimate Average Day Flow = 750,000 gpd
- Ultimate Peak Hour Flow = 1.9 million gallons per day (mgd)

The key flow projections above are useful for determining potential phased implementation of wastewater treatment facilities, capacity requirements for treatment modules, and hydraulic capacity requirements.

TABLE 3-3
WASTEWATER FLOW PROJECTIONS

YEAR	POPULATION (UNM BBER)	RESIDENTIAL FLOW (gpd)	ENTERPRISE AREA (gpd)	FLOW (gpd)			
				AVG. DAY	MAX. MONTH	MAX. DAY	PEAK HOUR
2021	4,032	201,600	80,000	282,000	358,000	536,000	715,000
2022	4,071	203,549	84,297	288,000	365,000	548,000	730,000
2023	4,110	205,518	88,824	295,000	374,000	561,000	748,000
2024	4,150	207,505	93,594	302,000	383,000	574,000	766,000
2025	4,190	209,512	98,621	309,000	392,000	588,000	783,000
2026	4,227	211,330	103,918	316,000	401,000	601,000	801,000
2027	4,263	213,165	109,499	323,000	410,000	614,000	819,000
2028	4,300	215,015	115,380	331,000	420,000	629,000	839,000
2029	4,338	216,881	121,577	339,000	430,000	645,000	859,000
2030	4,375	218,764	128,106	347,000	440,000	660,000	880,000
2031	4,408	220,407	134,987	356,000	451,000	677,000	902,000
2032	4,441	222,062	142,236	365,000	463,000	694,000	925,000
2033	4,475	223,730	149,876	374,000	474,000	711,000	948,000
2034	4,508	225,410	157,925	384,000	487,000	730,000	973,000
2035	4,542	227,103	166,407	394,000	500,000	749,000	999,000
2036	4,572	228,597	175,344	404,000	512,000	768,000	1,024,000
2037	4,602	230,101	184,761	415,000	526,000	789,000	1,052,000
2038	4,632	231,615	194,684	427,000	541,000	812,000	1,082,000
2039	4,663	233,139	205,140	439,000	557,000	835,000	1,113,000
2040	4,693	234,673	216,158	451,000	572,000	857,000	1,143,000
2041	4,724	236,217	227,767	464,000	588,000	882,000	1,176,000
2042	4,755	237,772	240,000	478,000	606,000	909,000	1,211,000
Ultimate	10,200	510,000	240,000	750,000	950,000	1,425,000	1,900,000

3.4 Influent Quality

As of the time this DAR was being prepared, the available data for influent wastewater characteristics is very limited. It is recommended that representative influent wastewater samples be collected and analyzed prior to the implementation of the design phase of this project. However, for the purposes of this DAR, the assumed influent wastewater characteristics are summarized in Table 3-4.

TABLE 3-4
ASSUMED INFLUENT WASTEWATER CHARACTERISTICS

DESCRIPTION	VALUES
Biochemical Oxygen Demand (BOD_5) [1]	300 milligrams per liter (mg/L)
Total Suspended Solids (TSS) [1]	250 mg/L
Total Kjeldahl Nitrogen (TKN) [1]	50 mg/L
Total Phosphorus (TP) [1]	8 mg/L
Temperature Range, Influent [2]	10 to 20 ºC
Min. Wastewater Temperature in WWTP [2]	12 ºC
Temperature Range, Air [2]	-10 to 38 ºC

[1] Values derived by typical ranges published in the Wastewater Engineering Treatment Reuse, 5th Edition, Metcalf & Eddy, Inc. and in the Ten State Standards

[2] Temperatures obtained from basis of design for the nearby Santa Ana WWTP.

3.5 Effluent Quality Targets

Treated effluent from the Santo Domingo wastewater treatment lagoons is currently disposed of via evaporation, by land application, or by hauling to other facilities. It is not anticipated that treated effluent from the new WWTP will be discharged to a surface water body, so a National Pollutant Discharge Elimination System (NPDES) permit will not be required. In addition, although a permit from the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) will not be required, their regulations for above ground use of reclaimed domestic wastewater can be used as a guide to establish effluent quality targets. Many classifications of reclaimed wastewater are identified by the NMED, but the two considered for the Santo Domingo facility are: (1) Class 1A and (2) Class 1B. Class 1A reclaimed wastewater is the highest quality and can be most broadly utilized, except for direct consumption. Class 1B reclaimed wastewater is the second highest quality and is suitable for uses in which public

exposure is likely. The required water quality requirements per NMED for these two classifications of reclaimed wastewater are summarized in Table 3-5.

TABLE 3-5
EFFLUENT QUALITY TARGETS

WASTEWATER QUALITY PARAMETER	CLASS OF RECLAIMED WASTEWATER	
	CLASS 1A	CLASS 1B
BOD_5	10 mg/L	30 mg/L
TSS	not applicable (N/A)	30 mg/L
Turbidity	3 Nephelometric Turbidity Units (NTU)	N/A
Total Nitrogen (TN)	10	10
Fecal Coliform	5 colonies/100 milliliters (mL)	100 colonies/100 mL

4.0 RECOMMENDED IMPROVEMENTS

4.1 Overall Site Plan

The desired site features and functions related to the WWTP site are presented below, along with a summary of the environmental suitability of the site and a conceptual layout of the WWTP site.

4.1.1 Desired Site Features and Functions

Santo Domingo has identified a site for the WWTP located approximately 1/2 mile south of the Kewa Station – Rail Runner adjacent to Indian Service Route 88, as shown in Figure 1-2. The site is intended to serve multiple functions, as follows:

- Wastewater treatment facilities and related process structures.
- Treated effluent disposal facilities.
- Accommodations for effluent reuse facilities.
- Administration / Laboratory Building.
- Transportation Yard and Utilities Shop.
- Natural Resources Department Yard.
- Solid Waste Transfer Station.

4.1.2 Environmental Suitability of Proposed Site

The site selected by Santo Domingo appears to be well-suited for the intended functions and is not likely encumbered by any environmental or cultural constraints that would limit the use of the proposed site. An Environmental Scoping Report was commissioned as part of this DAR, which was conducted by Epsilon Systems Solutions, Inc. A copy of the Environmental Scoping Report is included in Appendix E and is summarized in Section 5.5 of this DAR.

4.1.3 Proposed Site Plan

The proposed site plan to accommodate the desired site features and functions described above is illustrated in Figure 4-1. Each feature and component of the proposed site plan is discussed in detail in this section of the DAR.

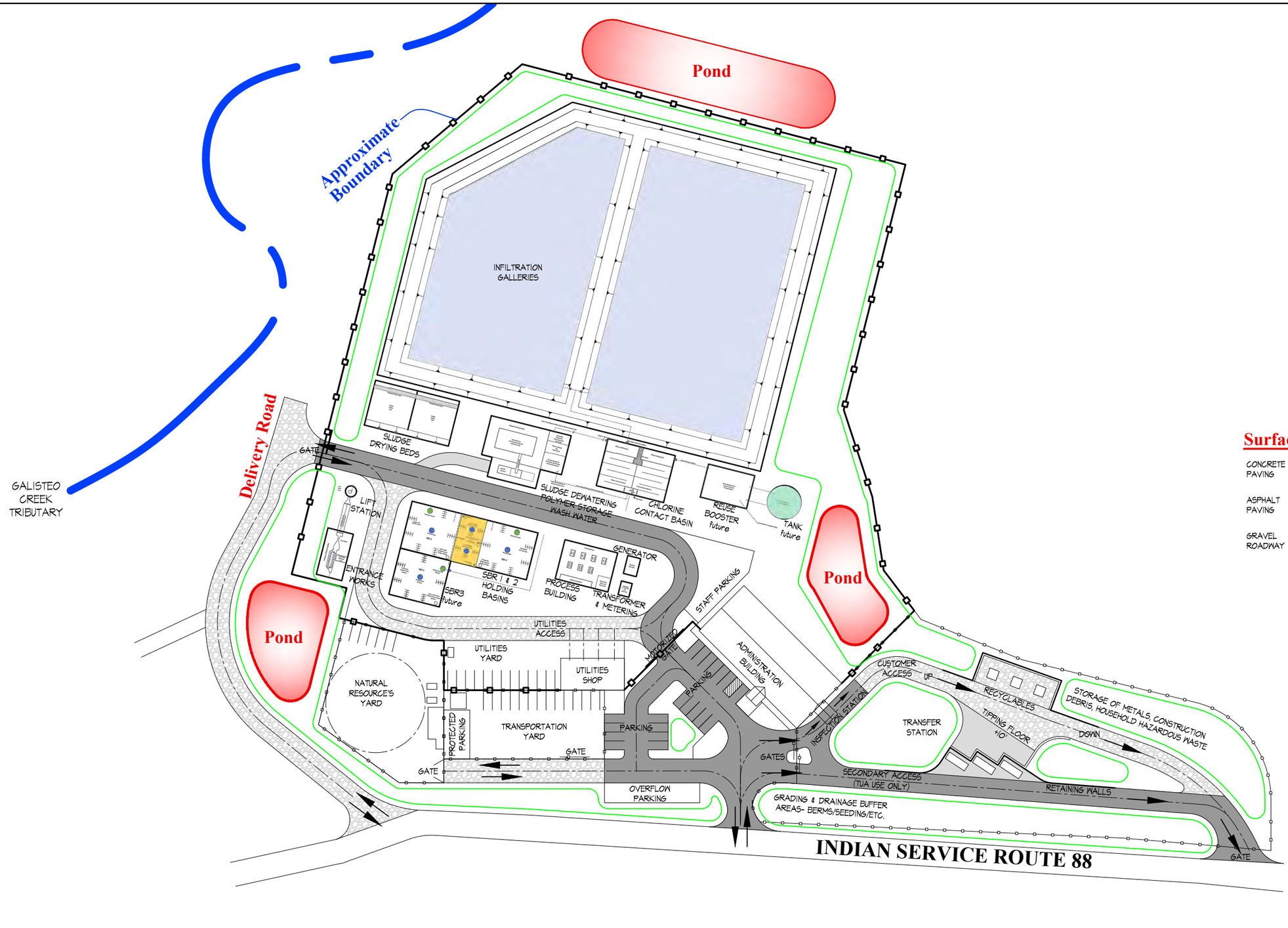
4.2 WWTP

The wastewater treatment portion of the WWTP facility includes liquid treatment facilities, facilities related to the disposal and potential reuse of treated effluent, and solids handling facilities. Each of these components of the WWTP are evaluated in this section of the DAR.

4.2.1 Liquid Treatment Facilities

The unit processes related to the liquid treatment facilities include the entrance works facility, the primary lift station and potentially a plant drain lift station, the biological treatment facility consisting of a sequencing batch reactor (SBR) facility, the process building required for the treatment facility blowers and control equipment, effluent disinfection, washwater system, and electrical and controls facilities. Each of these unit processes and systems are described further in this Section.

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SD-WWTP-SITE PLAN
FIGURE 4-1

4.2.1.1 Entrance Works

The Entrance Works facility generally consists of influent wastewater metering, screening, and grit removal. The location and position of the Entrance Works are influenced significantly by the type(s) of influent flows to the WWTP. For Santo Domingo, there are three primary sources of wastewater influent to the WWTP, two of which are pumped flows from off-site lift stations. The Galisteo Lift Station and the Wa-Di Lift Station can be designed to pump to an Entrance Works facility at any location and height within the WWTP site. Wastewater flows from the Enterprise Area, on the other hand, will enter the WWTP site via gravity through a relatively shallow sewer main. The Entrance Works facility could either be elevated and incorporated into the SBR structure to allow for gravity flow through the rest of the treatment plant process units or the Entrance Works facility could be designed at grade to accommodate the gravity flow from the Enterprise Area, with the pumped flows from Galisteo and Wa-Di being discharged to the Entrance Works facility essentially at ground level.

For the elevated Entrance Works facility option, influent flows from the Galisteo and Wa-Di Lift Stations would be pumped to the WWTP, and with flows from the Enterprise Area being pumped via the Plant Lift Station, all influent flows to the elevated Entrance Works facility would enter the Entrance Works through a single pipe. This provides for an option to consider related to influent flow measurement of using a flow meter such as an electromagnetic flow meter. While this would likely minimize the footprint needed for influent flow measurement, it would not allow for an independent mechanism to calibrate and confirm the accuracy of the influent flow meter. Another option for influent flow measurement is to construct an open channel flow meter such as a Parshall flume. This option would apply to the at-grade Entrance Works facility option, also. A Parshall flume, with proper design related to approach and exit conditions, is inherently accurate and the flows can be measured electronically using a device such as an ultrasonic flow meter and manually by viewing the water level on a staff gauge built into the Parshall flume. Due to the long-term reliability, and the ability to measure influent flows even if the electronic devices are malfunctioning, it is recommended that the Entrance Works facility be designed to accommodate a Parshall flume for influent flow measurement. To

accommodate the range of flows estimated in Section 3.3 of this DAR, a 12-inch Parshall flume is recommended.

Screening of the raw wastewater is essential to protect downstream processes and equipment from the adverse effects of the accumulation of rags and other solid wastes that are often found in raw wastewater. Options for screening include mechanically cleaned bar screens, inclined cylindrical fine screens, drum screens, etc. Since screenings can be a source of odors at a WWTP and considering the potential that the Entrance Works facility at the Santo Domingo WWTP may not be enclosed, it is important to consider screening equipment that effectively removes screenings, washes them to remove residual organic materials, conveys, compacts, and potentially bags the screenings for ease of collection and disposal. An inclined cylindrical fine screen meets all these desired features and can be equipped with coverings over the equipment to minimize the potential for odor production. Based on these features and to accommodate the peak flows estimated in Section 3.3 of this DAR, a 2-foot-wide inclined cylindrical screen is recommended for the Santo Domingo WWTP. To allow for periodic removal of the mechanical bar screen from service for maintenance, repair, and replacement, a bypass channel with a manually cleaned bar screen is recommended. To facilitate the transition of flow from one channel to the other, sluice gates with hand wheel gear or motor operators are recommended.

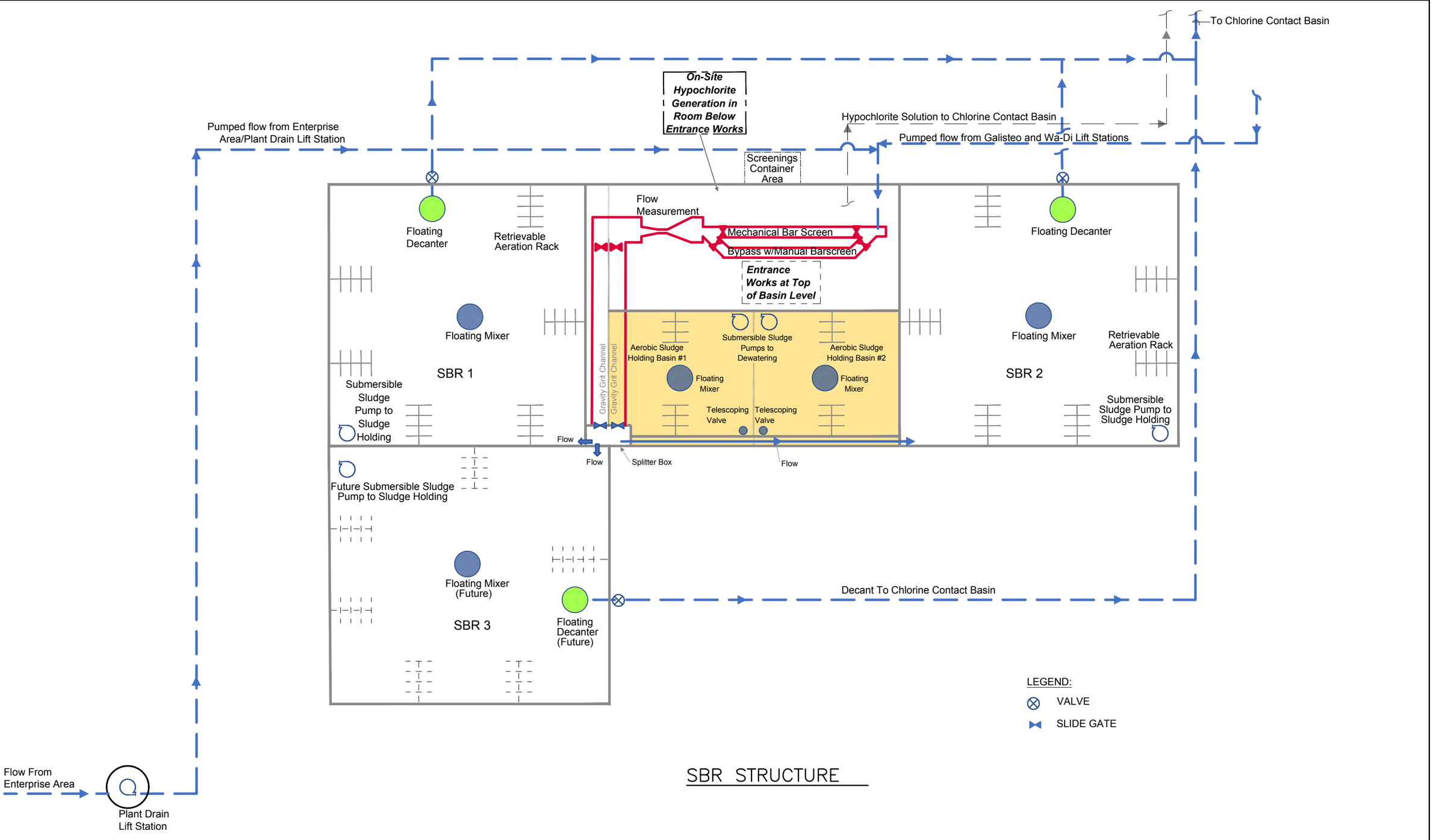
Removal of grit is important to protect downstream pumps and equipment at a WWTP and to prevent unwanted accumulation of material in the process basins. Grit removal can be accomplished through aerated grit chambers, vortex grit removal equipment, or by simply allowing the grit to settle out in a channel with low velocity flow conditions. Based on input from Santo Domingo and the desire to simplify the treatment processes as much as possible, a gravity grit channel is preferred over mechanical grit removal equipment. With a gravity grit channel, it is important to provide dual channels so one channel is available for service while the other is being drained, cleaned, and made ready for the next operational cycle. At the peak hour flow projected in Section 3.3 of 1.9 mgd, and to limit the velocity of the wastewater to no more than 1 foot per second (fps) to allow for grit settling, dual 3-foot wide by 1-foot-deep gravity grit channels would be required.

A conceptual arrangement with an elevated Entrance Works facility incorporated into the SBR structure is illustrated in Figure 4-2. Figure 4-3 shows the Entrance Works in a separate facility at grade level. Figure 4-4 illustrates how the SBR structure would be simplified if the Entrance Works facility is constructed separately at grade. The SBR features are explained in more detail later in this DAR. Each of the two options for locating the Entrance Works has its own advantages and disadvantages. A comparison of the elevated and grade-level Entrance Works options is presented in Table 4-1. The channels associated with the Entrance Works facility could be covered with solid plating and the equipment could largely be enclosed to aid in odor mitigation in either the elevated option or the grade-level option.

TABLE 4-1
COMPARISON OF ELEVATED VS. GRADE-LEVEL ENTRANCE WORKS

ELEVATED ENTRANCE WORKS	GRADE-LEVEL ENTRANCE WORKS
Off-site lift stations can be sized to pump to elevated facility, eliminating the need to re-pump a significant portion of the flow	Requires re-pumping of flows from Galisteo and Wa-Di Lift Stations
Plant Lift Station capacity reduced to accommodate only the Enterprise Area and plant drain flows	Primary Lift Station and associated WWTP emergency generator must be sized for full flow to WWTP
Creates a space for on-site hypochlorite generation within the SBR structure, eliminating the need for another site building	Separate building required for on-site hypochlorite generation equipment
Flow splitting can be accomplished with open channels and motorized gates, which facilitates cleaning and maintenance	Flow splitting accomplished by motorized plug valves
Grit removal from gravity grit channel may be labor intensive due to its location on the top of the SBR structure	Simplifies the SBR structure, which reduces the cost of construction
Potential retrofit to mechanical grit removal, it needed in the future, is limited	Potential retrofit to mechanical grit removal, it needed in the future, is feasible
Not easily able to enclose entrance works facility in a building for odor control	Able to enclose entrance works in a building for odor control if proper electrical and ventilation equipment is utilized
Elevated entrance works would allow for dispersal of any odors and minimize the perception of odors at ground level	Building for enclosing the entrance works could be planned for, but not implemented until later if needed for odor control or due to budgetary constraints at initial construction

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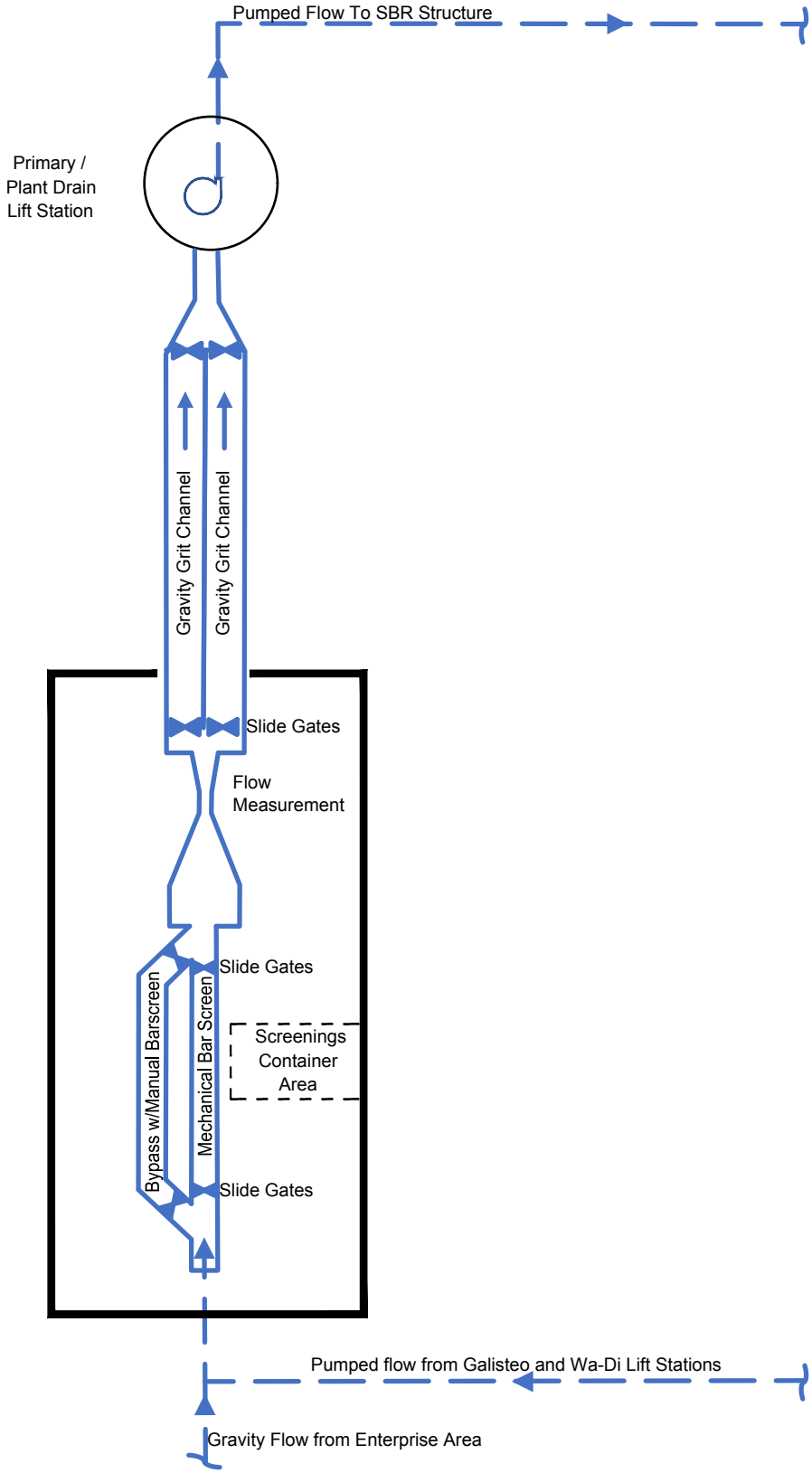


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CONCEPTUAL SBR BASIN LAYOUT WITH INTEGRAL ELEVATED ENTRANCE WORKS
FIGURE 4-2

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ENTRANCE WORKS FACILITY

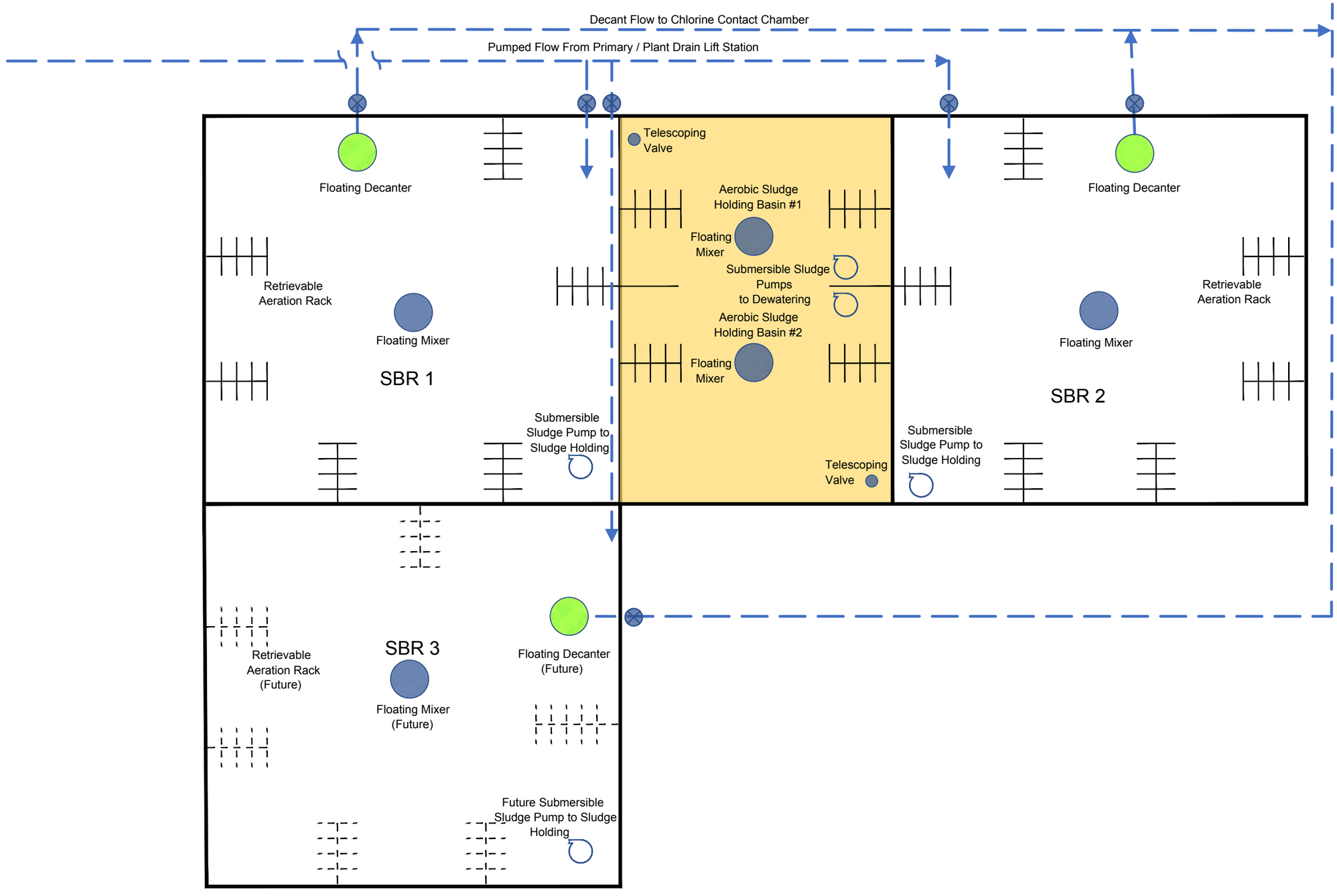
SANTO DOMINGO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

CONCEPTUAL AT-GRADE ENTRANCE WORKS FACILITY

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FIGURE 4-3

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SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

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CONCEPTUAL SBR BASIN LAYOUT WITH SEPARATE GRADE-LEVEL ENTRANCE WORKS

FIGURE 4-4

Based on the potential for enclosing the Entrance Works facility in a building (either initially or later), easier access to the screenings and grit for removal and disposal, and the potential for adding mechanical grit removal at a future date if needed, the grade-level Entrance Works facility is preferred over the elevated option. For the purposes of this DAR, a grade-level Entrance Works facility will be incorporated into the site planning for the WWTP.

4.2.1.2 Primary / Plant Drain Lift Station

Estimated flows for maximum month, maximum day, and peak hour are presented in Table 3-3 in Section 3.0 of this DAR for each year in the planning period. Key flow projections from Table 3-3 related to influent pumping are summarized below:

- Current Average Day Flow = 282,000 gpd (196 gallons per minute [gpm])
- Current Peak Hour Flow = 715,000 gpd (497 gpm)
- 20-Year Peak Hour Flow = 1,211,000 gpd (841 gpm)
- Ultimate Peak Hour Flow = 1.9 mgd (1,319 gpm)

Based on these projected influent flows, a four-pump Primary Lift Station with each pump nominally sized to accommodate 25% of the ultimate peak hour flow would result in pumps with a capacity of 330 gpm each. At this capacity, two pumps would be adequate to accommodate the current peak hour flow and three pumps would accommodate the 20-year peak hour flow. The Primary Lift Station should be designed to accommodate the fourth pump, but its installation could be deferred until later once the influent flows justify the cost of its installation. As influent flows increase in the future beyond the 20-year projected flows, it is recommended that a fifth pump be purchased and stored on site for installation if one of the installed pumps requires maintenance, repair, or replacement.

The Primary Lift Station can be designed be deep enough to accommodate the sludge dewatering process drains and other structure drains at the WWTP. However, a Plant Lift Station may be required to accommodate waste flows from the Administration / Laboratory Building, depending on the depth of the influent sewer from the Enterprise Area, the distance from the Entrance Works facility to the Administration / Laboratory Building, and the site terrain. The Plant Lift

Station would be small and could be located on the site as needed to accommodate WWTP waste flows.

4.2.1.3 Sequencing Batch Reactor (SBR)

The two general types of SBR systems being considered for the Santo Domingo Pueblo WWTP are the True Batch System and the Continuous Flow Intermittent Discharge System.

In a True Batch System, the entire influent wastewater flow is directed to a reactor (basin) where mixing and/or aeration occurs during the filling phases. Two or more basins are typically used in a True Batch System. Where there are two basins, 100% of the flow is directed to each basin 50% of the time. If there are three basins, 100% of the flow is directed to each basin 33% of the time, and so on. Upon completion of the filling phases, the wastewater flow is directed to a companion basin for the filling phases of that reactor. After the flow is directed to the companion basin, the initial basin continues through additional phases of operation that likely include a react phase that includes mixing with intermittent aeration as needed to meet treatment requirements, sedimentation (settle phase), effluent discharge (decant phase), wasting of sludge, and potentially an idle period prior to initiating the next cycle of operation. A well-known manufacturer of True Batch System SBRs is Aqua-Aerobic Systems, Inc., with their AquaSBR® system. Key equipment components of the AquaSBR® are summarized below:

- Aqua Decanter: A floating fiberglass structure that supports an electro-mechanical weir actuator enclosed in a protective hood, submerged weir that is supported below the float structure, discharge piping with flexible fittings to allow for decanting at various liquid levels in the basin, flow control valve located outside the basin, and guide posts to maintain the decanter in the correct position.
- AquaDDM® Mixer: Directly driven from motor shaft to impeller, mounted on a fiberglass or stainless-steel float, with cable moorings to maintain proper position in the basin while accommodating varying liquid levels.
- Aeration System: Typically consisting of coarse-bubble or fine-bubble diffused aeration racks that are retrievable at the periphery of the basin for inspection or maintenance without dewatering the basin. Other aeration systems are also available, including fixed

fine-bubble diffused aeration, surface mechanical aerators, and combined aerator / mixer / decanter units.

- Sludge Pump: Flygt submersible pumps, which allow for removal from the basin for inspection, maintenance, or replacement without dewatering the basin.

In a Continuous Flow Intermittent Discharge System, the influent wastewater flow is split equally between the number of operating basins. That is, in a two-basin system, 50% of the influent flow is directed to each basin 100% of the time; in a three-basin system, 33% of the influent flow is directed to each basin 100% of the time; and so on. The basins are sequenced through the fill, sedimentation, and decant phases and incorporate storage of influent wastewater in the basins for treatment between each decant cycle. In a Continuous Flow Intermittent Discharge System, influent wastewater continues to enter the basins during the sedimentation (settle) and decant phases. Typically, rectangular basins are used in a Continuous Flow Intermittent Discharge System with 3:1 length-to-width ratios (or longer) to provide separation between the inlet and the outlet due to the continuous flow basis of operation, particularly during the settle and decant phases. A well-known manufacturer of Continuous Flow Intermittent Discharge System SBRs is Sanitaire, with their Intermittent Cycle Extended Aeration System (ICEAS®). Key equipment components of the ICEAS® SBR are summarized below:

- Pre-React Zone: An area at the head of a rectangular basin created by construction of a baffle wall with submerged ports near the bottom of the wall.
- Decanter: Stainless steel decanter allows for gravity flow without the need for effluent valves, positively controlled decant rate via operator-selected setpoint, with baffle float to minimize entrainment of floating solids in discharge.
- Aeration System: Fine-bubble Silver Series Sanitaire diffusers fixed to an aeration grid attached to the basin floor.
- Mixing: Flygt submerged mixers allow for retrieval from the basin without dewatering for inspection and maintenance.
- Sludge Pump: Flygt submersible pumps, which allow for removal from the basin for inspection, maintenance, or replacement without dewatering the basin.

Table 4-2 is a summary of the two types of SBR systems considered for the Santo Domingo WWTP. Since the WWTP layout is dependent upon the configuration of the SBR basins, the two types of SBR systems were presented to Santo Domingo. Based on the features and perceived advantages and disadvantages of each system, the True Batch System was selected in consultation with Santo Domingo to use as the basis of design for the facility layout.

TABLE 4-2
SUMMARY OF FEATURES FOR SBR TYPES CONSIDERED

TRUE BATCH SYSTEMS	CONTINUOUS FLOW INTERMITTENT DISCHARGE SYSTEM
Influent flow directed to one reactor basin at a time requires motorized valves or gates	Influent flow equally split between operational basins without motorized valves or gates
No flow during React, Settle, and Decant phases eliminates potential for wash-out during Decant phase	Pre-react zone with baffle wall needed to minimize impact of continuous inflow to basin; may require return activated sludge pumping to promote denitrification and phosphorus removal
Direct drive mixer in center of basin effectively completely mixes contents with rapid cessation of movement at shutoff, promotes rapid transition to quiescent settling	Influent flows continue during Settling phase, requiring long rectangular basin shape to maximize influence of influent flows on settling action
Floating decanter with submerged effluent weir minimizes potential for discharge of floatables during Decant phase	Peak hydraulic loads may cause sludge blanket to be stirred up and exit the basin during Decant phase
Flow control valve traps high quality effluent in discharge pipe, eliminating the need for discharge to waste at beginning of Decant phase	Submersible mixers create horizontal movement of basin contents that may continue for some time after shutoff
Aeration systems can be installed as retrievable racks to allow for inspection and maintenance without dewatering the basin	Motorized decanter has baffle tube for floatable retention, but may allow floatables to exit during Decant phase
Inspection and maintenance of aeration system can be accomplished by valving off the unit to be inspected / maintained while the other units in the basin remain functional, allowing the basin to remain in service	Aeration systems are usually mounted to the floor of the basin, requiring dewatering of the basin for inspection and maintenance
-	Inspection and maintenance of aeration system requires the basin to be removed from service

To accommodate Santo Domingo's long-term goal of implementing treated effluent reuse facilities, it is recommended that the SBR facilities be designed to achieve effluent quality results corresponding to the Class 1A criteria listed in Table 3-5. Achieving this level of quality in the treated effluent will also minimize any adverse impacts on effluent disposal and storage facilities. Wastewater treatment facilities designed to achieve biological nutrient removal are recommended to achieve these goals. Design analyses based on the Aqua-Aerobic Systems, Inc. AquaSBR® Design Manuals (1986 and 1995 versions) were developed using an Excel spreadsheet to determine SBR basin features. A copy of this analysis is included in Appendix A. To accommodate the ultimate design capacity of 0.75 mgd, it is recommended that three SBR basins be designed, with each basin capable of accommodating a flow of 0.25 mgd. With this arrangement, two of the three basins would provide 0.50 mgd of treatment capacity, which matches closely to the 20-year projected flow conditions. The third SBR could be constructed with the initial construction, but not equipped until flows increase, or the construction of the third SBR basin could be deferred to a later date to reduce the initial cost of the WWTP construction. Key results of the conceptual SBR design analysis from Appendix A are summarized in Table 4-3. A conceptual layout of the SBR facility, which would include aerobic sludge holding basins, is illustrated in Figure 4-4.

TABLE 4-3
KEY RESULTS OF SBR DESIGN ANALYSIS [1]

DESCRIPTION	RESULT
Number of SBR Basins [2]	Three
SBR Basin Plan Dimensions	48 feet by 48 feet
Minimum Liquid Level	15.5 feet
Maximum Liquid Level (approximate)	21 feet
Decant Flow Rate	1,900 gpm
Decant Duration at Design Capacity	50 minutes
Number of Cycles per Day per SBR Basin	Five
Retrievable Aeration Racks	Fine Bubble
Sludge Transfer Pump	Flygt Submersible, one per basin

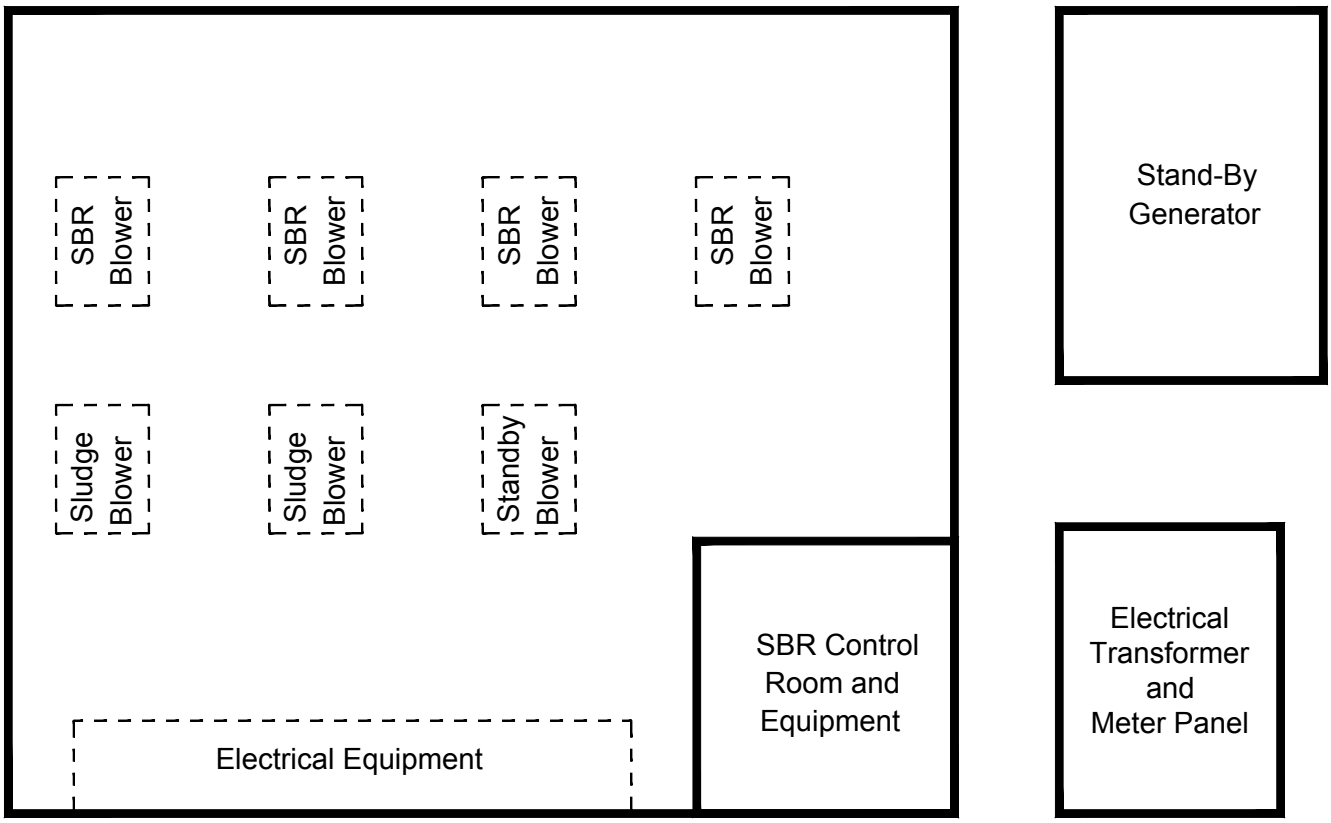
[1] Refer to Appendix A for basis of design calculations.
[2] Two SBR basins required for 20-year projected flows; third basin could be constructed initially if funding allows, but not equipped until needed, or third basin construction can be deferred.

4.2.1.4 Process Building

The Process Building is proposed to be located adjacent to the SBR structure for the blowers needed to supply air to the SBR reactor basins and the aerobic sludge holding basins. As indicated in Appendix A, seven blowers are recommended. Due to the variable water levels that will occur in the SBR and sludge basins, positive displacement blowers are required. Five 125 horsepower (HP) blowers and two 75 HP blowers are recommended by the SBR manufacturer. Positive displacement blowers are quite noisy, so inlet and discharge silencers are recommended. The process control equipment for the SBR process is proposed to be in the Process Building. Even though intake and discharge silencers are to be provided, it is anticipated the Process Building will be noisy and a separate well-insulated control room is recommended for the comfort of the operators that are required to access the control equipment on a regular basis.

Since much of the electrical load for the WWTP will be located at the Process Building, the electrical service equipment and metering, along with an emergency standby generator, are proposed to be located in close proximity to the Process Building, as shown in Figure 4-5.

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PROCESS BUILDING

SANTO DOMINGO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

CONCEPTUAL PROCESS BUILDING

MOLZENCORBIN

FIGURE 4-5

4.2.1.5 Effluent Disinfection

Disinfection of the effluent from the SBR treatment process is an essential step in achieving the desired effluent quality goals for the WWTP. Chlorine is the most common chemical used for wastewater disinfection. Chlorine is available as a gas or in liquid form as hypochlorite. Other disinfectants, such as chlorine dioxide, ozone, or ultraviolet light could be considered for the Santo Domingo WWTP. However, Santo Domingo uses hypochlorite (a strong bleach solution) for disinfection of the potable water system. Based on the familiarity with liquid hypochlorite, and the safety of hypochlorite compared to gaseous chlorine, hypochlorite is recommended for the WWTP. Hypochlorite is available commercially in two concentrations, nominally a 10% solution or a 12.5% solution. Alternatively, hypochlorite can be generated on-site by imparting an electric current to a salt solution. On-site hypochlorite generation units typically create a weak hypochlorite solution with concentrations in the range of 0.5% to 0.8% free available chlorine. For effective generation of hypochlorite, on-site generation units typically require feed water that has hardness levels between zero and 17 mg/L. Water softeners are often used in on-site hypochlorite generation units to achieve the required feed water hardness. Santo Domingo has expressed a preference to use on-site hypochlorite generation, so the facilities related to effluent disinfection are based on this type of process in this DAR.

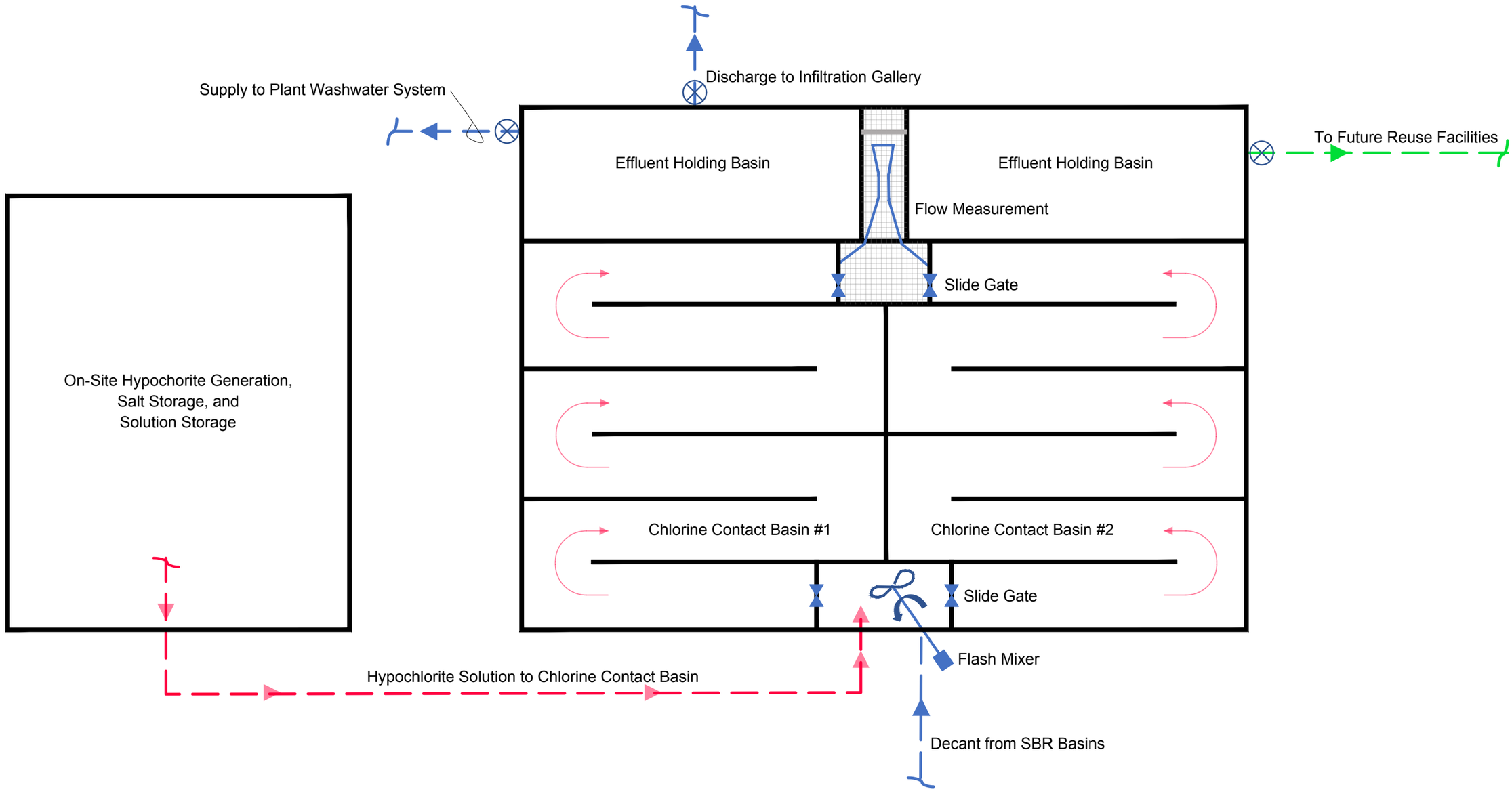
Decant flow rates from an SBR treatment facility are influenced by the number of cycles per day per basin and the time required to accomplish the desired level of treatment and achieve optimal liquid-solid separation. Appendix A includes the conceptual basis of design calculations for this WWTP. As shown in Appendix A, five cycles per day per SBR basin are planned, which equates to a cycle time of 4.8 hours. Decant durations in the range of 45 to 60 minutes are common for this cycle time and the anticipated level of treatment required. Based on input from the SBR manufacturer, a 50 minute decant duration at design flows is recommended. This equates to a flow rate of 1,900 gpm.

A United States Environmental Protection Agency (USEPA) Design Guide for Disinfection by Chlorination recommends a disinfection detention time of 60 minutes at average flow rates and 30 minutes at peak hourly flow rates, whichever is greater, for proper disinfection. However, for

a plug flow regime such as that generated by an SBR treatment plant, it is reasonable to size the chlorine contact basin to contain the volume discharged during the decant cycle and allow that volume to be exposed to the disinfectant until the next batch is processed. Based on the 1,900-gpm flow rate and 50-minute duration identified above, the required chlorine contact basin capacity is 95,000 gallons. The USEPA recommends a length-to-width ratio of 40:1 in the chlorine contact chamber to minimize any short-circuiting potential. Based on these criteria and selecting a dual basin arrangement to allow for periodic cleaning, two basins that are nominally 32 feet wide by 35 feet long are required. Calculations related to the effluent disinfection facilities are included in Appendix B. These plan view dimensions are based on an assumed water depth of 8 feet in the chlorine contact basin and are illustrated in Figure 4-6.

As shown in Figure 4-6, it is recommended that the decant flow from the SBR plant be directed initially to a rapid mix chamber in which the hypochlorite solution is injected and completely mixed using a mechanical mixer. This will assure that all the decant flows from the SBR are equally exposed to the disinfectant. After the mixing, flows would be directed through the serpentine arrangement of the contact basin before exiting through a flow measurement device. For the same reasons previously described for the WWTP influent flow meter, the effluent flow meter is recommended to be a Parshall flume. Disinfected effluent from the effluent flow meter would then be directed to an effluent holding basin in the chlorine contact basin, as shown in Figure 4-6, for disposal via infiltration in the infiltration gallery, use in the plant washwater system, or supply to the reuse facilities.

LAST MODIFIED: Mar 17, 2022 - 4:06pm BY USER: djenson
DWG. LOCATION: I:\Santo Domingo Pueblo\SDP211-11 WWTP\DWGS\FIGURES\
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EFFLUENT DISINFECTION FACILITIES

MOLZENCORBIN

SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

CONCEPTUAL EFFLUENT DISINFECTION FACILITIES

FIGURE 4-6

Ten State Standards recommends chlorine dosage rates for effluent disinfection ranging from 6 mg/L for nitrified effluent to 8 mg/L for activated sludge effluent. For the purposes of this DAR, a chlorine dosage rate of 7 mg/L is used. As stated above, on-site hypochlorite generation units produce a solution concentration in the range of 0.5 to 0.8%. An average of 0.65% is used here, as presented in Appendix B, to determine the hypochlorite solution dosage flow of approximately 2.05 gpm. Two options are available for redundancy to accommodate hypochlorite equipment maintenance, repair, or replacement: (1) store generated hypochlorite for a long enough period to place the generation equipment back in service, or (2) install a redundant hypochlorite generation unit. With current supply chain issues, it could take weeks to obtain the necessary parts to repair or replace the hypochlorite generation equipment. As such, storing generated hypochlorite for that period would not be practical. It is recommended that a redundant hypochlorite generation unit be installed for effluent disinfection. Storage of generated hypochlorite is reasonable to allow for a relatively short period of time to pass before switching to the alternate hypochlorite generation unit. For the purposes of this analysis, assume that two days of hypochlorite solution is adequate. At the dosage flow rate identified above, approximately 3,100 gallons of hypochlorite storage is recommended. In addition, as indicated in Appendix B, 3.0 pounds of salt is required per pound of free available chlorine generated. At the ultimate design capacity of 0.75 mgd, approximately 67 pounds of salt would be required per day. At the projected initial flow rate of 0.282 mgd, the daily salt requirement would be about 25 pounds per day.

4.2.1.6 Washwater System

A robust washwater system that provides adequate flow rates at high pressure is essential for conducting ongoing cleaning and maintenance at a wastewater treatment facility. For the Santo Domingo WWTP, washwater is recommended to be sourced from the effluent holding basin in the chlorine contact basin, as described above and shown in Figure 4-5. Although this source of water is expected to be of good quality, it is recommended that in-line strainers be incorporated into the washwater supply system. The washwater system is a relatively straight-forward system that can be supplied as a skid mounted system consisting of booster pumps, strainers, hydropneumatic or bladder tank, and controls. It is recommended that the washwater system be incorporated into the sludge dewatering facility, which is described in Section 4.2.3 of this DAR.

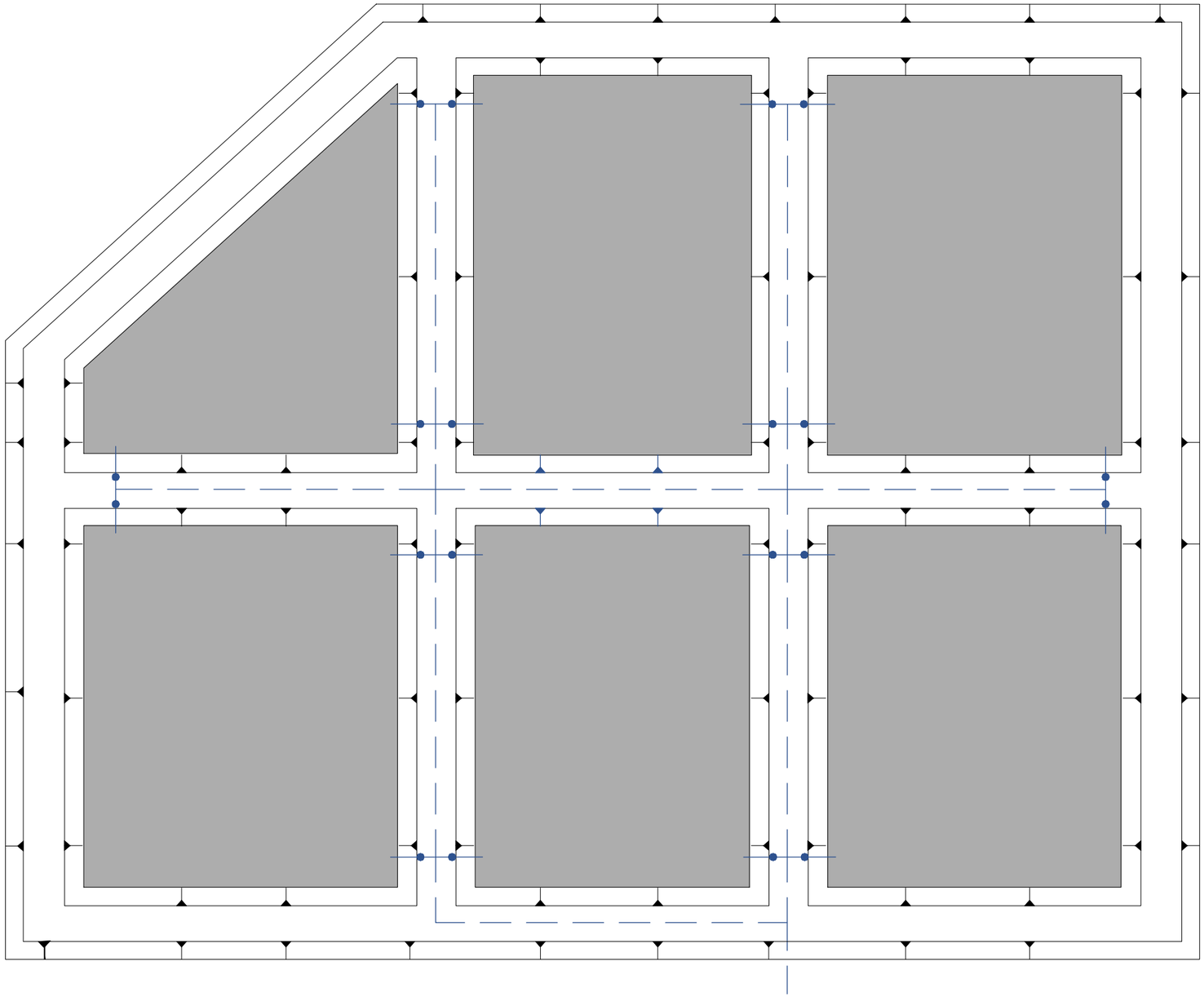
4.2.2 Effluent Disposal and Reuse

Santo Domingo selected the site for the WWTP to allow for infiltration of treated effluent at the WWTP site and for potential future reuse of the treated effluent as a recycled water source. This approach eliminates the need to obtain a National Pollutant Discharge Elimination System (NPDES) permit for the WWTP and greatly simplifies the potential monitoring and reporting requirements for the WWTP. The infiltration gallery requirements are identified in this Section of the DAR, along with potential reuse areas and treated effluent pumping and filtration site requirements. Due to the limited reuse areas currently available, a phased implementation plan is presented below.

4.2.2.1 Infiltration Gallery

The primary mechanism for treated effluent disposal from the Santo Domingo WWTP is through infiltration into the ground at the WWTP site. Based on a table-top analysis (i.e., using available data), the geologists estimate an infiltration rate at the WWTP site of 0.8 to 1.0 inches per hour. A copy of the geotechnical study is included in Appendix C for reference. Based on the lower end of this infiltration rate range, approximately 62,700 ft^2 (1.44 acres) of area would be required for the ultimate design flow of 0.75 mgd. Peak day flows in excess of this ultimate design flow would add 0.675 MG, resulting in 1.44 feet of surplus treated effluent in the infiltration gallery for subsequent disposal via infiltration and evaporation. Based on this, it is recommended that the infiltration gallery be constructed with 3-foot-high berms to accommodate the resulting free water depth plus a freeboard. The initial concept for the infiltration gallery is illustrated in Figure 4-7. As shown in Figure 4-7, six separate cells are proposed for the infiltration gallery, creating substantial flexibility for effluent disposal process operations. With this arrangement, some of the cells could be out of service for maintenance to remove accumulated solids or scarify the soil to enhance infiltration. However, the costs associated with this flexibility is substantial because of the extra piping and valving needed along with the added cost for the additional berms. A simplified concept for the infiltration gallery is illustrated in Figure 4-8, with two cells for the infiltration gallery. In this simplified version, one of the two cells could be removed from service for maintenance while the other remains in operation.

LAST MODIFIED: Feb 23, 2022 - 4:15pm BY USER: djensen
DWG. LOCATION: I:\Santo Domingo Pueblo\SDP21I-11 WWTP\DWGS\FIGURES\
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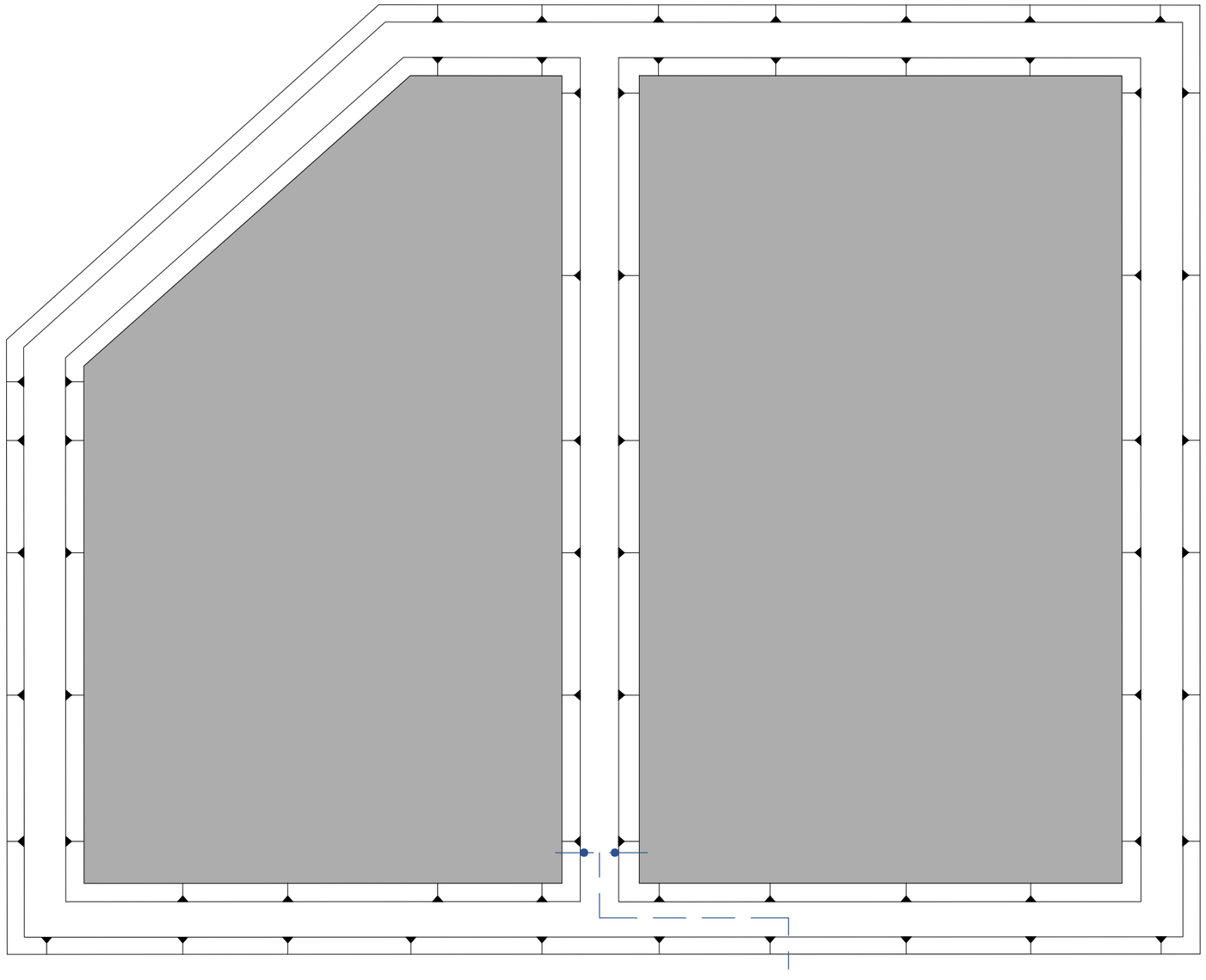


SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

MOLZENCORBIN

CONCEPTUAL INFILTRATION GALLERY
FIGURE 4-7

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DWG. NAME: SD-FIGURE-4-8.dwg



SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

MOLZENCORBIN

SIMPLIFIED INFILTRATION GALLERY
FIGURE 4-8

4.2.2.2 Reuse Areas

At this time, the only area identified for potential use of treated effluent for irrigation are the two softball fields located approximately 1,600 feet northeast of the WWTP site, as illustrated in Figure 4-9. Other potential reuse areas may be identified or created in the future.

4.2.2.3 Treated Effluent Pumping and Filtration

Filtration of the treated effluent is recommended to achieve the quality criteria for Class 1A reclaimed water standards as listed in Table 3-5. Various types of filters are available for consideration, including pressure filters, disk filters, single or dual media gravity filters, and others. Pressure filters are simple in concept and relatively easy to operate and maintain. For the purposes of this DAR, pressure filters are recommended to illustrate the site requirements for effluent reuse. Conceptually, treated effluent could be withdrawn from the effluent holding basin in the chlorine contact basin, pumped through pressure filters, and discharged into a ground storage tank at the WWTP site. Filtered effluent could be pumped from the ground storage tank for distribution to the reuse sites at Santo Domingo.

LAST MODIFIED: Apr 01, 2022 - 11:31am BY USER: djensen
DWG. LOCATION: I:\Santo Domingo Pueblo\SDP211-11 WWTP\DWGS\FIGURES\
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INDIAN SERVICE ROUTE 88

Kewa

Domingo

EXISTING DIRT
SOFTBALL FIELDS -
POTENTIAL REUSE SITE

WA-DI
COMMUNITY

PROPOSED
WWTP SITE

Indian Service Rte 88

SCALE: 600 FEET

N

SANTO DOMINGO PUEBLO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

MOLZENCORBIN

POTENTIAL RECYCLED WATER USE AREA NEAR WWTP SITE
FIGURE 4-9

4.2.2.4 Phased Implementation

Implementation of a recycled water program adds a layer of complexity, management, operation, and maintenance to the duties associated with those associated with the wastewater treatment facilities. Often, a recycled water program is pursued to replace landscape irrigation that has been historically accomplished using potable water, thereby preserving the precious potable water resources, or to establish a new irrigated use that had not previously been feasible due to limited water supplies. For Santo Domingo, there currently are very few irrigated areas that currently use potable water which could be replaced with recycled water. One area located approximately 1,600 feet northeast of the WWTP site currently includes two softball fields that are bare dirt. This area could be planted with grass and irrigated with recycled water. However, the amount of water needed for this small area is very limited and the cost of constructing the effluent reuse facilities described above at the WWTP, along with the pipe needed to convey the recycled water, is not likely to compare favorably to the benefits received. As such, it is recommended that the WWTP site plan be established to allow for the future implementation of effluent reuse facilities, but that these facilities be constructed in a future phase once the need for recycled water increases to the point that the investment in the recycled water program is warranted.

4.2.3 Solids Handling

Residuals from the wastewater treatment process must be properly handled for the successful ongoing operation of the WWTP. Disposal options for the sludge generated at the WWTP are identified in this Section of the DAR and the associated sludge treatment requirements are established. Sludge dewatering options and recommendations are also included.

4.2.3.1 Disposal

The disposal of solids generated at the Santo Domingo WWTP will dictate the level and type of sludge treatment required. Options available include landfill disposal, land application, and composting or other advanced treatment for beneficial reuse of biosolids. Santo Domingo has

expressed a desire for the simplest method of sludge disposal, which would be hauling sludge to a landfill for disposal. Landfill disposal of sludge, which will likely be at a regional landfill, will be regulated by NMAC 20.9.8.16, New Mexico's Environmental Protection Regulations for Solid Waste, Special Waste Requirements for Sludge Disposal, which generally requires the following criteria be met:

- No free liquids as determined by the paint filter liquids test (USEPA test method 9095).
- pH within the range of 2.0 to 12.5.
- Polychlorinated biphenyls (PCBs) less than 50 mg/Kg.
- Pass the toxicity characteristic leaching procedure (TCLP) (USEPA test method 1311) for the parameters and maximum allowable concentrations listed in Table 4-4.

TABLE 4-4
TCLP [1] PARAMETERS AND LIMITS FOR LANDFILL DISPOSAL OF SLUDGE

PARAMETER	MAXIMUM ALLOWABLE CONCENTRATION
Arsenic	5.0 mg/L
Benzene	0.5 mg/L
Cadmium	1.0 mg/L
Chlordane	0.03 mg/L
Chromium	5.0 mg/L
2,4-Dichlorophenoxy-acedic acid	10.0 mg/L
Lead	5.0 mg/L
Lindane	0.4 mg/L
Mercury	0.2 mg/L
Methyl ethyl ketone	200.0 mg/L
Toxaphene	0.5 mg/L

[1] TCLP refers to toxicity characteristic leaching procedure (USEPA test method 1311).

The sources of wastewater at the Santo Domingo WWTP are primarily domestic. As such, it is not anticipated that any of the parameters listed in Table 4-4 will be of concern for landfill disposal. So, the primary goal for sludge treatment will be to achieve a sludge solids concentration through dewatering such that the paint filter liquids test can be passed routinely. Testing for the parameters listed in Table 4-4 and for pH will be as determined by the landfill operator.

4.2.3.2 Aerobic Sludge Holding Basins

Since there is not a specific level of treatment required for sludge disposal at the landfill, the sludge processing portion of the WWTP basically consists of the following functions:

- Serve as a repository for sludge pumped from the SBR basins at the end of each cycle.
- Hold sludge until it can be dewatered in the mechanical dewatering facility.
- Allow for thickening through periodic settling and decanting to minimize the amount of sludge that is processed through the mechanical dewatering facility.
- Provide aeration and mixing to stabilize the sludge and minimize any odor production potential.

Calculations for sizing the aerobic sludge holding basins are included in the SBR design calculations included in Appendix A. At the ultimate design flow of 0.75 mgd, an aerated sludge holding capacity of 180,000 (24,064 ft^3) is recommended.

4.2.3.3 Sludge Dewatering

In order to pass the paint filter liquids test for disposal of sludge at the landfill, it will be necessary to dewater the sludge to a dry solids concentration of 15 to 18%. Mechanical dewatering facility options available include vacuum filters, centrifuges, frame filter presses, belt filter presses, screw presses, and others. Santo Domingo staff has experience with and have expressed a preference for a belt filter press type of mechanical sludge dewatering system. Sludge production and dewatering calculations are included in Appendix D for the estimated initial flow conditions corresponding to an average flow rate of 0.282 mgd and for the ultimate design flow rate of 0.75 mgd. At the initial flow rate, and assuming a dewatered sludge solids concentration of 15%, approximately 626 dry pounds of sludge would be processed per hour for 6 hours per week. This production period could either be accomplished in one 6-hour session per week or two 3-hour sessions per week. At the ultimate design flow, approximately, 666 dry pounds of sludge would be processed per hour for 15 hours per week. This future processing time could be accomplished in three 5-hour sessions per week. These recommended processing times would allow for equipment start-up and clean-up to occur for each processing session

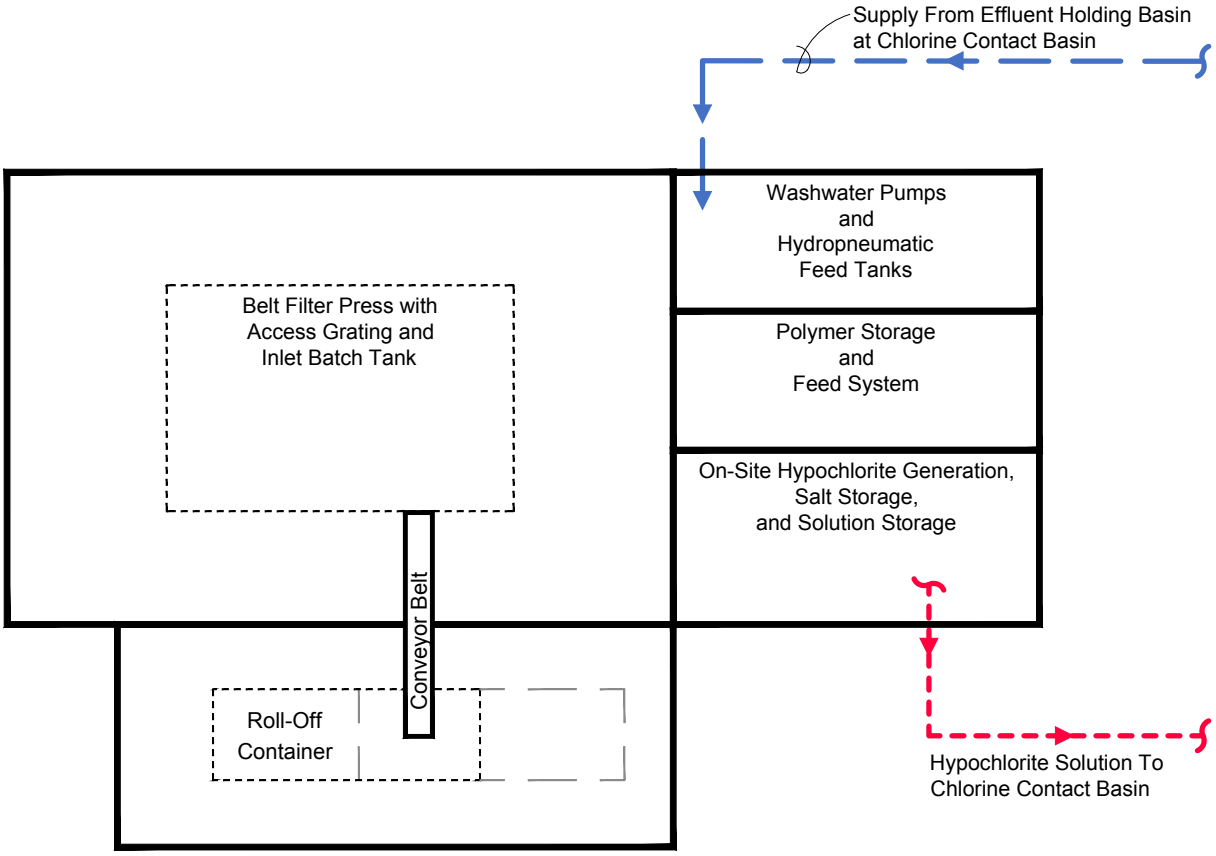
within a standard 8-hour work shift. These solids handling rates are within the processing capacity of a 1.1-meter belt filter press. As shown in Appendix D, the estimated polymer usage would range from 0.62 drums per month initially to 1.64 drums per month at the ultimate design flow.

Ancillary facilities and equipment related to the belt filter press include cationic polymer storage, polymer feeder with integral serpentine piping assembly for aging of polymer, drum dolley, access grating around the belt filter press, and either a belt conveyor or screw conveyor to transfer dewatered sludge from the belt filter press to the roll-off container that will be used to transport the dewatered sludge to the landfill. A conceptual layout of the sludge dewatering facility is illustrated in Figure 4-10.

4.2.3.4 Sludge Drying Beds

While the primary mechanism for sludge disposal is planned to be mechanical dewatering with landfill disposal, it would be advantageous to have another means to handle sludge if the mechanical dewatering facility is out of service for repair or replacement. Dual sludge drying beds could be incorporated into the site plan to serve as an alternative means of sludge dewatering. Since the area required for sludge drying via evaporation is anticipated to be significant, it is recommended that the polymer feed system used for the belt filter press be piped to allow for injection of polymer to the pipe that would feed the sludge drying beds and that wedgewire filter panels be incorporated into the sludge drying beds, as shown in Figure 4-11, to facilitate the dewatering of sludge. The sludge drying beds could also be used to experiment with composting if Santo Domingo wants to explore this as a partial sludge handling option.

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SLUDGE DEWATERING FACILITY

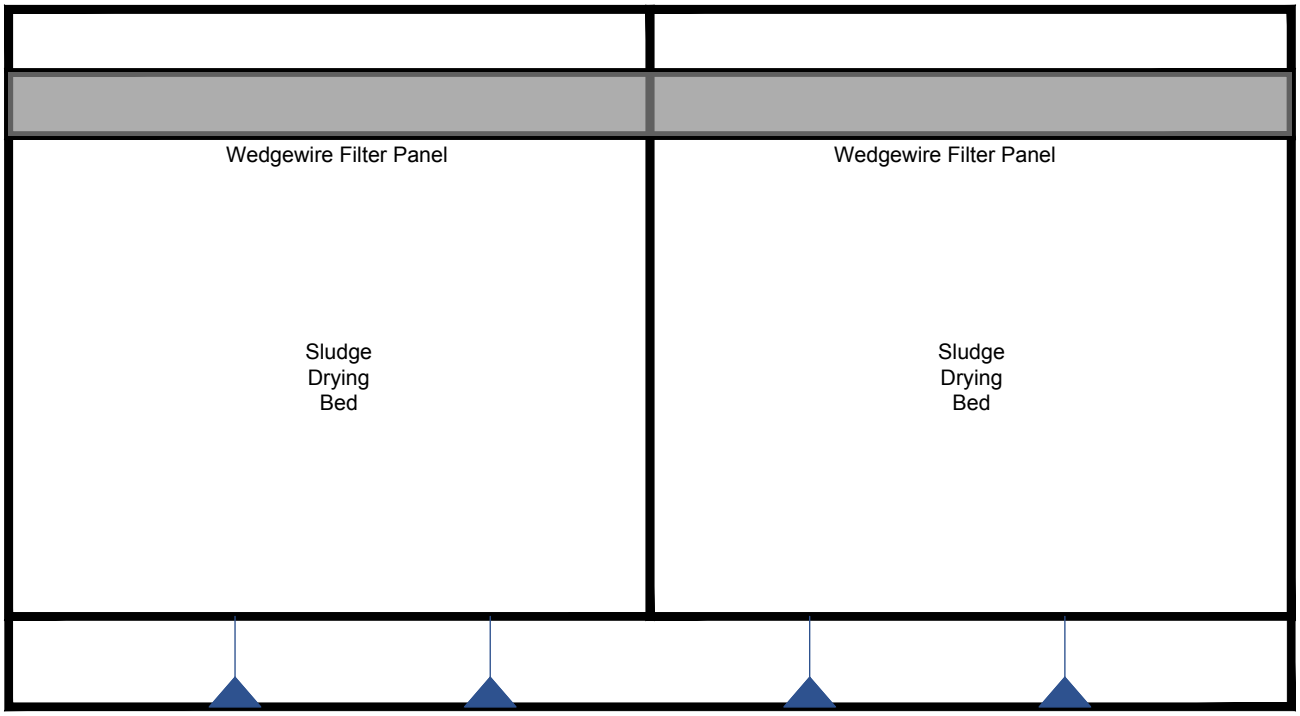
SANTO DOMINGO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

CONCEPTUAL SLUDGE DEWATERING FACILITY

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FIGURE 4-10

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SANTO DOMINGO WWTP - SANTO DOMINGO PUEBLO, NEW MEXICO

CONCEPTUAL SLUDGE DRYING BEDS

FIGURE 4-11

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4.3 Administration / Transportation / Department of Natural Resources (DNR) Building

A single structure is planned to house: WWTP Operations, Laboratory, Utilities Administration, the Transportation Department, the Department of Natural Resources, and shared support and meeting spaces. A drive-thru and walk-up window will be incorporated for utility payments and transfer station access. Parking for public access and staff will be provided. Initial space planning suggests a 8,140 ft^2 of interior space.

4.4 Shop / Equipment Storage Facility

The Utilities Department will have an enclosed shop area with garage space for four vehicles, tool storage, parts storage, and maintenance operations. A fenced access yard for equipment and fuel storage is provided.

The Transportation Department Shed will have a storage shed, protected parking for select vehicles, and a fenced access yard.

The Department of Natural Resources will have a variety of storage shed sheds, fuel storage, and a fenced access yard.

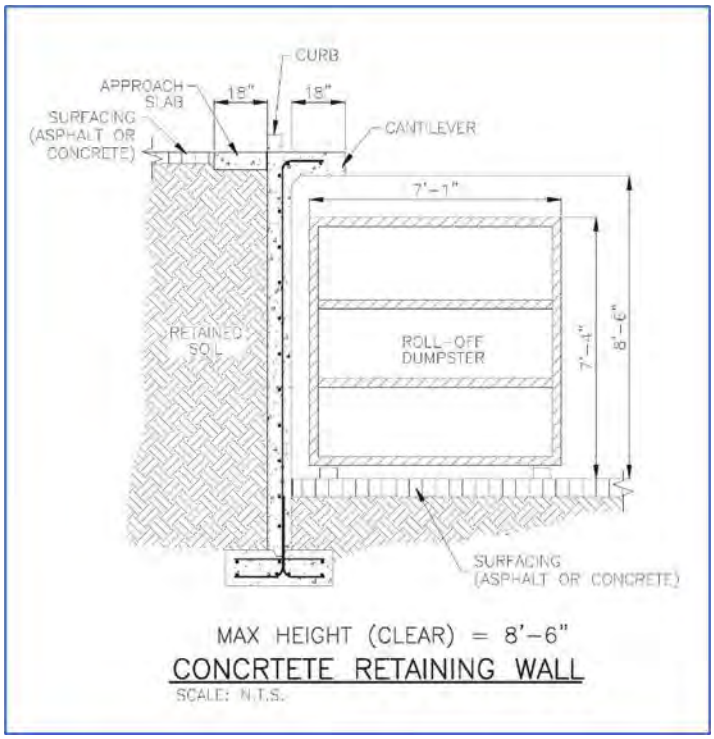
4.5 Transfer Station

The Pueblo of Santo Domingo currently collects household refuse from curbside collection trucks and transports that waste directly to the Sandoval County Landfill (SCL) for final disposal. This new transfer station, will allow the Pueblo to utilize much larger roll-off disposal containers for the transfer to the SCL, thereby reducing the number of trips. It will also allow for the public to utilize a tipping floor to dispose of larger household waste volumes over the size of their curbside cart.

Entrance to the site will begin at an inspection station for residential and commercial customers (see Figure 4-1). The inspection station will be attached to the WWTF multi-purpose

administration building and will allow Tribal Utility Authority (TUA) staff to perform preliminary inspection of the waste. Customers will be directed to the various stations on or adjacent to the tipping floor, depending on the nature of their waste. There is a secondary access, which is for TUA use only for the setting and removal of the roll-off containers. All access gravel roads are one-way into and exiting the transfer station.

The Tipping Floor will allow for reverse dumping of solid waste collection trucks into 40-cubic yard containers. The elevation of the tipping floor will be 8 feet-6 inches above the elevation of the roll-off floor, and will allow for a roll-off container approximately 7.5-feet high. The grade differential will be made up using a vertical retaining wall. The Tipping Floor will include an 18-inch cantilever extension over the roll-off container to minimize trash falling between the retaining wall and the roll-off dumpster. It will also include a safety 6-inch high curb to prevent trucks from backing off the wall.



Across the tipping floor will be three (3) 4 to 8 cubic yard front loading containers for recyclables as determine by TUA. The recyclables can either be sorted or non-sorted, also as

further determined by TUA. The recyclables can be front loaded into a larger collection vehicle and transported to SCL.

The site will also include areas where metals, construction debris, and household hazardous waste can be stored as determined by TUA as needed. The TUA can impose source separation of these materials on customers prior to dumping at the tipping floor. The entire site will include a chain-link fence around the perimeter to secure the facility. It will be gated to separate the public entrance and the TUA entrance for the roll-off vehicles. The fencing will also provide a perimeter barrier to catch wind-blown trash that can be collected to minimize regional litter. All areas will be graded to minimize surface water run-off in the event there is some unwanted waste product that accidentally spills on the site. It will allow for proper clean-up and disposal.
A full cost estimate can be found in Appendix F.

4.6 Civil Site Improvements

4.6.1 Existing Conditions

The 12-acre site is bounded on the west by an arroyo (a tributary to the Galisteo Creek) and on the east by Indian Service Route 88. The site slopes from south to north at 3% to 7%. Stormwater from the site drains north to small arroyos that drain the site to the north. A portion of the site also drains west to the Galisteo Creek tributary. Offsite flows enter the site from the south.

4.6.2 Proposed Conditions

A road network will connect the wastewater facilities (See Figure 4.1). The Administration Building parking lot will be paved. Heavy truck routes will also be paved. Light traffic routes will be surfaced with base course. The sludge truck loading drive and the transfer station tipping floor will be surfaced with concrete. The site will be fenced. Gates will secure the transfer station and wastewater facility. Sidewalks will be constructed adjacent to the Administration Building and other buildings.

Existing drainage patterns will be maintained. Stormwater from the site will drain to the small arroyos north of the site and to the Galisteo Creek tributary west of the site. The site will be graded such that the large part of the stormwater runoff is directed to the arroyo to the west. Small ponds will be located where needed on site to minimize the need for stormwater collection infrastructure. Offsite flows from the south will need to be managed.

A Preliminary Hydrology Analysis using United States Geological Survey (USGS) Streamstats program indicates that the arroyo to the west of the site (the Galisteo Creek tributary) has a 100-year / 24-hour peak flow of 1,090 cubic feet per second (cfs). A hydraulic analysis will need to be performed to determine the Base Flood Elevation of the arroyo.

The Federal Emergency Management Administration (FEMA) recommends that finish floors of buildings, and electrical and mechanical equipment at wastewater facilities be elevated 2 feet above the Base Flood Elevation.

A Geotechnical Report will be required for structure, foundation and pavement design, as well as projected earthwork shrink.

4.7 Electrical and Controls

4.7.1 Electrical Site Improvements

Power to the site will be provided by the Public Service Company of New Mexico (PNM). A three-phase feeder will be connected at the nearest accessible location which is near the Santo Domingo Trading Post in the Cedar Tree Community in the Enterprise Area. Power from this location will be provided at 12,470 volts (V) and will be reduced to 480V, three-phase power at the plant by way of a pad mounted 1,000 kilovolt-ampere (kVA) transformer.

Power to separate components and facilities will be from a Main Distribution Panel (MDP) which will incorporate overcurrent protection for each of the circuits it feeds and will be the central switching location for all power to the plant.

From the MDP, power will be fed to separate distribution panels located at the Entrance Works Facility, the Primary Lift Station, the SBR, the Process / Blower Building and the Solids Handling Building which will contain the plant Washwater System and the Effluent Disinfection Facilities. A distribution panel for the future Effluent Pumping and Filtration System would be installed when those facilities are implemented. The MDP will be located in a climate controlled Electrical Room inside the Process / Blower Building which will provide security and overheating protection for the electrical switchgear and blower variable frequency drives (VFDs).

At each of the distribution panels, a step-down transformer and lighting panel will be incorporated to provide 208V, three-phase and 120V, single-phase as needed to ensure power to the lights, receptacles, and additional process equipment requiring less power. A 1,000 kilowatt (kW) generator and Automatic Transfer Switch (ATS) will also be provided at the plant to ensure plant operation can continue should there be a power outage on the feed from PNM.

4.7.2 Instrumentation and Controls Improvements

The plant will incorporate a complete Supervisory Control and Data Acquisition (SCADA) system which will allow plant operations staff to monitor process variables and control various pumps, valves, and other pieces of equipment from a Central Control Room located in the Administration Building.

Instruments to measure flow, pressure, level, dissolved oxygen, etc., will be located at various locations in the WWTP. These sensors and analyzers are necessary to make sure plant equipment is working as intended and that the plant effluent meets the desired water quality standards. Information from these devices will be displayed on workstation screens located in the Central Control Room and will be recorded on computer servers for trend analysis and report generation.

Communication of information throughout the plant will be over fiber optic cable which will provide the most secure and dependable form of data transfer to / from the central SCADA system servers and devices located in the field. With this system, automatic operation of the plant can be maintained. Operations staff will also be able to override certain automatic functions and perform manual control of valves and pumps if so desired. An uninterruptible power supply (UPS) will provide backup power to the main server equipment in the Central Control Room and to the Programmable Logic Controllers (PLCs) located at each facility and incorporated into each package system to ensure continued monitoring of data should a power outage occur.

5.0 IMPLEMENTATION

5.1 Design and Construction Delivery Method

5.1.1 Available Methods

Three of the most common methods of implementing a WWTP such as that being considered by Santo Domingo are: (1) Design / Bid / Build, (2) Design / Build, and (3) Construction Management at Risk (CMAR). Each of these methods are illustrated in this section of the DAR.

5.1.2 Design / Bid / Build

The Design / Bid / Build delivery method is a traditional method of project implementation in which the Architect/Engineer (A/E) firm or team prepares Contract Documents consisting of a Project Manual (Bidding Documents, instructions, Contract requirements, and Technical Specifications) and Plans for the project. The project is then advertised for Bids and potential Contractors prepare Bids for the Work. Often, the lowest responsive and responsible Bidder is selected to construct the project. Advantages and disadvantages of this delivery method are summarized in the following paragraphs.

5.1.2.1 Advantages

Time savings can be realized in the Design / Bid / Build delivery method under certain circumstances because of competition through the Bidding process and shortening of the construction schedule as a result of the phenomenon of "time is money" to the Construction Contractor. Familiarity with the process reduces unknowns in the overall project schedule. However, this is the least time-compressing method of project development because no design, Bidding, or construction tasks can be performed simultaneously.

Cost savings are possible in the Design / Bid / Build delivery method because the competition on Bid day is used to obtain the best prices. The design team prepares documents on which all

General Contractors place Bids. This provides an even playing field of complete Construction Documents on which all qualified Contractors can Bid. The A/E is available for Contractor questions during Bidding, giving Bidders the clearest possible picture of the requirements of the project. The Design / Bid / Build delivery method ensures fairness to potential Bidders and improves decision-making by the Owner by providing a range of potential options. Familiarity and reduction of unknowns can reduce Contractor contingencies on Bid day.

Improved quality can be realized in a Design / Bid / Build delivery method project because the design team is impartial and looks out for the interests of the Owner and never answers to the Contractor. The project components, materials, products, and specifications are set by the Owner's requirements and not generally negotiable during Bidding.

5.1.2.2 Disadvantages

During Bidding, Contractors undercut the competition, setting up an atmosphere in which the Contractors and their subcontractors find every available method to cut costs by attempting to substitute inferior products and cutting corners on specifications. Quality of the end product can be compromised because during Bidding, Contractors assume they can attain a competitive edge by cutting corners during construction. Cost estimating during design is less effective as the A/E does not have access to real subcontractor costs, often resulting in surprising Bid results. Any changes during construction can cause project delays in addition to unpredictable pricing.

5.1.3 Design / Build

In the Design / Build delivery method, a concept design of the project scope, perhaps to a 30% level of completion, is developed then General Contractors in association with A/E firms will Bid on the project. Advantages and disadvantages of the Design / Build method of delivery are summarized in the following paragraphs.

5.1.3.1 Advantages

Time savings can be achieved in the Design / Build delivery method through early Contractor involvement that enables construction design and engineering considerations to be incorporated into the design phase, which enhances the constructability of the project. Fast-tracking of the design and construction portions of the project contributes to time savings on a Design / Build project, with overlapping of design and construction phases for different segments of the project. In addition, the elimination of a separate construction Contractor Bid phase following completion of the design phase reduces the required project time.

Cost savings can occur on a Design / Build project because of communication efficiencies and integration between design, construction engineering, and construction team members throughout the project schedule. When quality control activities and risks are transferred to the Design / Build team, the costs for construction engineering and inspection activities can be reduced to the contracting agency. Cost savings from fewer change and extra work orders can be realized from more complete field data and earlier identification and elimination of design error or omissions that might otherwise show up during the construction phase. Cost savings are also possible due to the reduced potential for claims and litigation after project completion, as issues are resolved by the members of the Design / Build team. In addition, cost savings result from shortened project timelines and the corresponding reduction in the level of staff commitment by the Design / Build team.

Improved quality through greater focus on quality control and quality assurance due to continuous involvement by the design team throughout project development is possible in a Design / Build project, and project innovations can be uniquely fashioned by project needs and Contractor capabilities.

5.1.3.2 Disadvantages

Implementation of a Design / Build project often reduces competition for construction services by excluding smaller firms that are unable to lead the larger projects most amenable to the

Design / Build delivery method. Design / Build favors large A/E and construction firms in competing for larger contracts that are too big for smaller local or regional firms to pursue. Depending on how the Design / Build selection is implemented, there may be an opportunity for favoritism to enter into the contract award process by including non-price factors in the basis for selection and the procurement process can be cumbersome for Owners without administrative staff. Another disadvantage of the Design / Build delivery method is that it undermines the inherent checks and balances between design and construction teams in the traditional Design / Bid / Build delivery system, with the design team no longer independent of the construction Contractor. The Design / Build delivery method strikes at the foundation of the traditional quality assurance / quality control roles through the combination of engineering and construction, including a potential lack of adequate checks and balances to ensure product quality. Overall project costs can also increase in a Design / Build project due to the elimination of the low bid Contractor selection criteria.

5.1.4 Construction Management at Risk (CMAR)

CMAR is a qualifications-based selection process like a standard RFP process for both Design and Construction. Cost is usually a small component in the RFP for the Construction Manager (CM) based on a service cost, and not the cost of the entire construction Contract. The Contractor fee is negotiated after selection, and the Designer (licensed A/E) is selected separately. The CMAR contracts directly with the Owner and the designer (A/E) contracts directly with the Owner; no contract exists between the CMAR and the Designer. The CM may be selected based on qualifications and personnel, and later converted to "at-risk" position.

CMAR entails a commitment by the CM to deliver the project within a Guaranteed Maximum Price (GMP). The CM acts as a consultant to the Owner in the development and design phases (often referred to as "Preconstruction Services"), but as the equivalent of a General Contractor during the construction phase. When a CM is bound to a GMP, the most fundamental character of the relationship is changed. In addition to acting in the Owner's interest, the CM must manage and control construction costs to not exceed the GMP, which would a financial hit to the CM company.

Typically, a CMAR arrangement eliminates a "Low Bid" construction project. A GMP agreement is a typical part of the CM and Owner agreement somewhat comparable to a "Low Bid" contract. After preliminary design, the CM is involved with estimating the cost of constructing the project based on the preliminary plan from the Designer based on the Owner's programmatic requirements. Upon completion of initial cost estimates by the CM, a decision can be made to modify the design concept instead of having to spend a considerable amount of time, effort, and money re-designing and/or modifying completed construction documents. The CM provides value input to the Designer for modifications and efficiencies. The Owner may decide to spend more money or obtain greater financial support for the project. It is a more efficient use of everyone's time, effort, Designer's costs, and the CM's General Conditions costs, all while delivering to the Owner a design within its budget.

5.1.4.1 Advantages

CMAR provides cost certainty through a fixed GMP. Multiple Bid packages provide greater opportunity for participation of local subcontractors. Subcontractors are procured through the familiar competitive Bidding process with responsible Bidders. Cost certainty is also achieved through the ability to Re-Bid over-budget work packages or subcontract Bids. CMAR offers the ability to value engineer all aspects of the project during design and construction with the input of all team members that can gauge quality and end results. Cost estimating during design is primarily performed by the CM, who has better access to real costs based on an assumed scope of work with trusted subcontractors.

Time savings can be achieved since work packages can be released based on the construction schedule and not having to wait for completion of the entire project, allowing more flexibility in bidding, scheduling, and multiple phases. Efficient use of time is realized since all design work need not be completed prior to solicitation of the construction contract and scheduling is more effective as the CM has access to subcontractors' time commitments earlier in the project because the Designer may have limited ability to assess potential Contractor scheduling ramifications as the design is developed, which can extend the construction schedule.

The CM provides construction expertise to assist in the entire planning, permitting, design, and construction process, resulting in improved project quality. The Owner generally faces less exposure to Contractor claims over design and constructability issues since the CM is integral to the design process and commits to a GMP based on that design. Relationships tend to be less adversarial as the process can engender cooperation or coordination among the Contractor, the Designer, and the Owner. The CM's input into the project design may enhance the effectiveness and constructability. Important design decisions affecting both the types of materials specified and the means of construction may be made without full consideration of a construction perspective.

5.1.4.2 Disadvantages

The disadvantages of a CMAR method of delivery are summarized in the listing below:

- As with low-Bid projects, the Contractor pursues a least-cost approach to completing the project, requiring increase oversight and quality review by the Owner and A/E.
- The Owner pays for the CM's assumption of risk.
- Insurance and bonding responsibilities are less familiar.
- Not all CMs bond the total project and individual subcontract bonds may be expensive.
- There are no common standards to CM at Risk methods.
- CM relationship to Owner changes during the process.
- More work packages for the CM (and the Owner and A/E) to administer.
- Possibility of overlaps or gaps in the scopes of work.
- Greater effort is required on the part of the A/E during construction because of the continuous value engineering being performed in conjunction with the Contractor and Owner.

5.1.5 Recommended Design and Construction Delivery Method

The various delivery methods available were discussed with Santo Domingo, along with the advantages and disadvantages of each method. Based on the scope of the WWTP project, Santo Domingo prefers to pursue the CMAR method of delivery.

5.2 Geotechnical Study

Terracon Consultants, Inc. prepared a Preliminary Geotechnical Report for the proposed WWTP site adjacent to Indian Service Route 88. A copy of Terracon's report is included in Appendix C. The Preliminary Geotechnical Report represents the results of literature research activities and site reconnaissance, and provides preliminary geotechnical recommendations concerning the evaluation and preliminary design of the geotechnical-related phases of the project. Geotechnical considerations include site soils, groundwater, construction and excavation, earthwork and slopes, foundations, and pavement. In general, no geotechnical fatal flaws were identified with the selected site and the site appears to be well suited for the intended uses.

5.3 Permits

All work associated with this WWTP project will be implemented within the sovereign jurisdiction of Santo Domingo Pueblo. As such, no construction permits are anticipated for the project. In addition, since none of the treated effluent from the WWTP will be discharged to a waters of the United States, a NPDES permit will not be required.

5.4 Easement and Right-of-Way (ROW)

The WWTP site is located within the sovereign lands of Santo Domingo Pueblo. No easements or Rights-of-Way are anticipated for the project.

5.5 Environmental and Cultural

An Environmental Scoping Report was prepared for this DAR by Epsilon Systems Solutions, Inc., a copy of which is included in Appendix E. The Environmental Scoping Report includes a summary of the existing environmental setting, including geology and soils, floodplains, wetlands, water resources (surface and ground water), air quality and climate, and biological resources (threatened and endangered species, critical habitat, and rare plants). In addition, existing cultural resources were reviewed. Due to the potential sensitive nature of cultural

resources, all cultural resource data has been redacted from the Environmental Scoping Report. In summary, the proposed site for the WWTP appears to be well-suited for the intended purposes and no cultural resource management considerations are warranted except, of course, any monitoring or management requirements of Santo Domingo.

5.6 Cost Estimates

Conceptual project costs for the scope of work identified in the DAR for the WWTP site are presented in Table 5-1. Three cost-saving measures have been incorporated into the conceptual design of the WWTP site. First, the original layout of the infiltration gallery, with six cells that would provide for substantial operational flexibility, has been simplified to minimize the earthwork and piping. Second, the Entrance Works Facility has been conceptually designed to be an outdoor facility. Additive Alternate (AA)-A is shown in Table 5-1 to enclose the Entrance Works Facility in a building, primarily for odor control. Third, the WWTP site has been established based on the ultimate wastewater flow of 0.75 mgd, resulting in three SBR basins. The third SBR basin could be deferred to a later construction phase if funding is an issue. AA-B is shown in Table 5-1 for the third SBR basin and related equipment. Based on the conceptual costs, the project costs are summarized below:

- Base Project Conceptual Construction Cost $ 24,766,000
- Professional Services $ 3,715,000
- Total Base Project with Professional Services $ 28,481,000
- Base Project with Prof. Services and AA-A (Entrance Works Building) $ 28,805,000
- Base Project with Prof. Services and AA-B (Third SBR) $ 29,916,000
- TOTAL – Base Project with Prof. Services and AA-A and AA-B $ 30,240,000

Note that inflation has not been factored into these conceptual costs. With the current economic environment, it may be prudent to include at least a 10% markup for inflation.

TABLE 5-1
CONCEPTUAL WWTP AND RELATED FACILITY COSTS

DESCRIPTION	CONCEPTUAL COST
BASE PROJECT CONSTRUCTION	
Entrance Works Facility	$ 782,000
Primary Lift Station	$ 738,000
SBR Facility	$ 6,328,000
Chlorine Contact Basin	$ 1,321,000
Infiltration Gallery	$ 443,000
Process / Blower / Electrical Building	$ 1,398,000
Dewatering/Disinfection / Washwater Building	$ 3,346,000
Sludge Drying Beds	$ 178,000
Yard Piping	$ 1,015,000
Site Work	$ 1,241,000
Administration / Laboratory Building	$ 3,369,000
Utilities Shop Building	$ 884,000
Plant Lift Station	$ 391,000
Plant Electrical Work	$ 797,000
Electrical – Instrumentation, Integration, Controls	$ 203,000
Transfer Station	$ 911,000
SUBTOTAL:	$ 23,345,000
Mobilization, Insurance, and Bonds	$ 934,000
Demobilization and Project Closeout	$ 117,000
Storm Water Pollution Prevention Plan	$ 25,000
Construction Staking	$ 25,000
Structural Fill, Ordinary Fill, Testing Allowance	$ 120,000
Contingencies During Construction	$ 200,000
BASE PROJECT CONSTRUCTION SUBTOTAL:	$ 24,766,000
PROFESSIONAL SERVICES	
Design Services @ 11%	$ 2,724,000
Specialty Services (Survey, Geotech, etc.) @ 1%	$ 248,000
Construction Administration @ 1%	$ 248,000
Construction Observation @ 2%	$ 495,000
PROFESSIONAL SERVICES SUBTOTAL:	$ 3,715,000
BASE PROJECT CONSTRUCTION PLUS PROFESSIONAL SERVICES:	$ 28,481,000
ADDITIVE ALTERNATES	
AA-A – Entrance Works Building	$ 324,000
AA-B – Third SBR Structure	$ 1,435,000
BASE PROJECT CONSTRUCTION AND PROFESSIONAL SERVICES PLUS AA-A SUBTOTAL:	$ 28,805,000
BASE PROJECT CONSTRUCTION AND PROFESSIONAL SERVICES PLUS AA-B SUBTOTAL:	$ 29,916,000
TOTAL – BASE PROJECT CONSTRUCTION AND PROFESSIONAL SERVICES PLUS AA-A AND AA-B:	**$ 30,240,000**

APPENDIX A

SBR SIZING CALCULATIONS

Santo Domingo Pueblo, NM WWTP - SBR Sizing Calculations

DESIGN CONDITIONS

Based on AquaSBR Design Manuals (1986 and 1995 versions) and Input from Aqua Aerobic Systems, Inc.

A. REFERENCE DATA - GIVEN OR ASSUMED

1. Influent Characteristics

BOD_5	300	mg/L
TSS	250	mg/L
NH_3 - N	30	mg/L
TKN	50	mg/L
TP	8	mg/L
Temperature Range, Influent	10 to 20	°C
Min. Wastewater Temperature	12	°C
Temperature Range, Air	-10 to 38	°C
Average Day Flow	0.75	MGD
Max Day Peaking Factor	1.90	
Site Elevation above Sea Level	5,330	feet

2. Effluent Criteria/Anticipated Performance (Prior to Filtration) for Class 1A - Reuse

BOD_5	10	mg/L
TSS	10	mg/L
Turbidity	3	NTU
NH_3 - N	2	
Total Nitrogen	10	mg/L
Fecal Coliform	5	colonies/100 mL

3. DESIGN LOADING

BOD_5 Daily Loading	1,877	lb/day
Suspended Solids Daily Loading	1,564	lb/day
Ammonia Daily Loading	188	lb/day
Nitrogen Daily Loading	313	lb/day
Phosphorus Daily Loading	50	lb/day

4. BASIS OF DESIGN ASSUMPTIONS

Select F:M Ratio based on design loading conditions:

Enter selected F:M Ratio	0.0625	Typical range of 0.05 - 0.10 lb BOD_5 per day per lb MLSS for **Low Load Design**
		Typical range of 0.15 - 0.40 lb BOD5 per day per lb MLSS for **Conventional Load Design**

Select Desired MLSS at Low Water Level

Enter desired MLSS concentration	4,500	Typical range of 4,000 - 4,500 mg/L for **Low Load Design**
		Typical range of 2,000 - 2,500 mg/L for **Conventional Load Design**

Number of Cycles per Day	5			
Number of Basins	3			
Desired Decant Duration	50	minutes		
Maximum Side Water Depth	21.02	feet	0	If cell G45 is not zero, follow instructions below.
Minimum Side Water Depth	15.5	feet	21.02	Calculated total SWD (ft)
Length-to-Width Ratio of Basins	1	: 1	5.52	Depth for Max. Decant Volume **9 FEET MAXIMUM**

Carbonaceous Oxygen Demand	1.25	lb O_2/lb BOD_5 at Average Conditions
Oxygen Peaking Factor	1.9	
Nitrogenous Oxygen Demand	4.6	lb O_2/lb TKN at Average Conditions
Sludge Growth Rate	0.8	lb solids/lb BOD_5 Removed
MLVSS percentage of MLSS	65%	
Oxygen Demand for Sludge Aeration	2.0	lb O_2/lb volatile solids

NOTE: You must use Excel's "Goal Seek" to find the Max. SWD as follows: Place the cursor on Cell G45 and click on "goal seek" under "Data - What If Analysis". Enter values to "Set cell:" G45, "To value:" 0, "By changing cell:" C45, and click on "OK". The calculated value of Max SWD will appear in cell C45.

Sludge Retention Time	20.0	days - Typical range of 10 - 30 days: Use mid-range of 20 days
Aerated Sludge Holding Basin Solids Conc.	2.0%	After decanting supernatant

B. REACTOR BASIN SIZING

5. DETERMINE LOW WATER LEVEL VOLUME

BOD_5 Daily Loading	1877	lb/day
MLSS Content	30,024	lb MLSS at selected F:M Ratio
Volume at Low Water Level (MG)	0.80	MG
Volume at Low Water Level (CF)	106,952	cu. ft.

6. DETERMINE DECANT VOLUME

Gallons of liquid per decant = (gallons per day at maximum day flow)/(Decants per day per basin x number of basins)

Max. Gallons of liquid per decant =	95,000	gal
Max. Decant volume =	12,701	cu. ft.
Decant Flow Rate =	1,900	GPM
Decant volume at average day flow =	50,000	gal
Decant volume at average day flow =	6,684	cu. ft.
Water level prior to decant at avg. flow =	18.4	feet

7. CALCULATE REACTOR SIZE

Volume per basin at low level (at end of Decant Phase) = Low Level Volume/# of basins

Volume per basin at low level =	35,651	cu. ft.

Total volume required per basin = Low water volume + Decant volume

Total volume required per basin =	48,351	cu. ft.

Total area per basin = Total volume per basin/Maximum depth

Total area per basin =	2,300	sq. ft.

Basin dimensions based on Length:Width Ratio selected

Basin width =	48.0	feet
Basin length =	48.0	feet
Basin height (assume 2 ft freeboard) =	23.02	feet
Number of Basins =	3	

8. DETERMINE HYDRAULIC RETENTION TIME

Detention Time at Maximum Level =	1.45	days
Detention Time at Maximum Level =	34.7	hours
Detention Time at Minimum Level =	1.07	days
Detention Time at Minimum Level =	25.6	hours

C. AERATION EQUIPMENT SIZING

9. DETERMINE OXYGEN REQUIREMENTS

O_2 required for BOD_5 (daily)	8,468	lb O_2 per day
O_2 required for BOD_5 (hourly)	353	lb O_2 per hour
O_2 required for TKN (daily)	1,439	lb O_2 per day
O_2 required for TKN (hourly)	60	lb O_2 per hour
TOTAL O_2 Required =	413	lb O_2 per hour A.O.R.

STANDARD OXYGEN RATE (S.O.R.)

S.O.R. = Actual Oxygen Rate (A.O.R.)/Correction Factor

Correction Factor = $$\alpha(1.024^{T-20})\beta \left[\frac{(1+D/67.8)\ (aP/(b+T)) - C}{(1+D/67.8)\ (9.092)} \right]$$

Where:

S.O.R. = Standard Oxygen Requirement (lb/hr)

A.O.R. =	413	lb O_2 per hour A.O.R.
C =	2.0	mg/L Residual Dissolved Oxygen
α =	0.85	
β =	0.95	
T =	12	°C Wastewater Temperature
P =	630.2	mm Hg atmospheric pressure
D =	15.95	Average depth of diffusers, assuming 1-ft off basin floor

a & b = Numerical constants with the following values:

Temp Range (°C)		a	b
5	15	0.578	29
16	25	0.658	35
26	33	0.738	44

Correction Factor = 0.5275

S.O.R. = 782.5 lb O_2 per hour if operated continuously

Adjust for blower operation per day:

Assume the blowers operate part time 50% Enter percentage of time blowers operate per day

S.O.R. = 1565.1 lb O_2 per hour

9. DETERMINE AIR REQUIREMENTS

Conc. of O_2 in Air 0.0175 lb O_2 per cu. ft. of air

O_2 Transfer Efficiency 1.8% Efficency per ft. of immersion (typ. 1.8% for fine bubble and 1.0% for coarse bubble)

Average immersion depth (see above) 15.95 feet

Air Required = 5,191 SCFM

Correction for Inlet Conditions:

Standard Atmospheric Pressure (P) = 14.696 P.S.I.A.

Inlet Pressure due to altitude (P_1) = 12.18 P.S.I.A. = 14.696 - (Alt. in feet/2116.3)

Standard Temperature (T) = 528 °R = 68°F + 460

Inlet Temperature (T_1) = 528 °R = Avg. of Min./Max. Air Temp. ≈ 68°F

Calculate Mass Flow Rate from PQ = MRT

M = PQ/RT = 390.3 lb. m/min.

$Q_2 = MRT_1/P_1$ = 6,264 I.C.F.M.

Determine Brake Horsepower at Average Inlet Conditions:

BHP = (0.227 x ICFM x $[(P_2/P_1)^{0.283}-1]$)/Blower Efficiency

Assumed Blower Efficiency = 70%

Inlet Pressure due to altitude (P_1) = 12.18 P.S.I.A.

Static Pressure at Diffuser Submergence 6.91 P.S.I.A.

Blower Discharge Pressure (P_2) = 21.08 P.S.I.A. = P_1 + static pressure at diffuser submergence + assumed 2 PSI for line losses

BHP = 341.4 BHP

Number of Blowers =	4	(One per basin plus one standby)
Required BHP per Blower =	113.8	HP
Blower HP (minimum) =	125	HP (Note: Enter the next higher available motor horsepower above required BHP above)
Air Capacity of Each Blower =	2,088	I.C.F.M.
At Discharge Pressure of	10.7	P.S.I.G.

D. AERATED SLUDGE HOLDING BASIN(S)

10. DETERMING AERATED SLUDGE HOLDING BASIN CAPACITY
Sludge Production = (BOD_5 Loading Rate x Sludge Growth Rate)/(Sludge Solids Concentration x 8.34)

BOD_5 Loading (see above)	1,877	lb/day
Sludge Growth Rate (Design Assumptions)	0.8	lb solids/lb BOD_5 Removed
Aerated Sludge Holding Basin Solids Conc.	2.0%	After decanting supernatant
Sludge Production =	9,000	gal/day
Capacity Required at Selected Det. Time	180,000	gal
Capacity Required =	24,064	cu. ft.

11. ESTIMATE AERATION REQUIREMENTS FOR SLUDGE HOLDING BASIN
Air Requirements = (BOD_5 Loading Rate x Sludge Growth Rate x Volatile Fraction x Sludge Oxygen Requirement)

Volatile Fraction (see Design Assumptions)	65%	
Sludge Oxygen Reqmt (Design Assumptions)	2.0	lb O_2/lb volatile solids
Air Requirements =	1,952	lb O_2 per day A.O.R.
Assume Blower Operation per day =	21	hours (allows for settling and decant)
Air Requirement per hour =	92.9	lb O_2 per hour A.O.R.
Apply Correction Factor (see Aeration Calcs)	176.2	lb O_2 per hour S.O.R.
O_2 Transfer Efficiency	1.0%	Efficency per ft. of immersion (typ. 1.8% for fine bubble and 1.0% for coarse bubble)
Average immersion depth in Sludge Basin	15.95	feet (assume to be same as Reactor Basins)

Air Required =	1,052	SCFM

Calculate Mass Flow Rate from PQ = MRT

M = PQ/RT =	79.1	lb. m/min.
$Q_2 = MRT_1/P_1$ =	1,269	I.C.F.M.

Determine Brake Horsepower at Average Inlet Conditions:

BHP = (0.227 x ICFM x $[(P_2/P_1)^{0.283}-1]$)/Blower Efficiency

Assumed Blower Efficiency =	70%	
Inlet Pressure due to altitude (P_1) =	12.18	P.S.I.A.
Static Pressure at Diffuser Submergence	6.91	P.S.I.A.
Blower Discharge Pressure (P_2) =	20.08	P.S.I.A. = P_1 + static pressure at diffuser submergence + assumed 1 PSI for line losses
BHP =	62.6	BHP

Number of Blowers =	3	(One per basin for 2-basin arrangement plus one standby)
Required BHP per Blower =	31.3	HP
Blower HP (minimum) =	50	HP (Note: Enter the next higher available motor horsepower above required BHP above)
Air Capacity of Each Blower =	635	I.C.F.M.
At Discharge Pressure of	9.7	P.S.I.G.

NOTE: Preliminary calculations from Aqua Aerobics includes blower sizing that is different from that included here, with a total of seven blowers for the SBR and the Aerobic Sludge Holding Basin, but with five 125 hp blowers for the SBR (4 duty plus a shared standby for the sludge basin) and two 75 hp blowers for the sludge basin. These differences will be reconciled during the design phase.

APPENDIX B

EFFLUENT DISINFECTION CALCULATIONS

Santo Domingo Pueblo, NM WWTP - Effluent Disinfection Calculations

DESIGN CONDITIONS

A. CHLORINE CONTACT BASIN SIZING

From EPA Design Guide for Disinfection:

Detention Time: 60 min. minimum at Avg. Flow or 30 min. at Peak Flow, whichever is greater

Length-to-Width Ratio (minimum) for serpentine layout = 40:1

For SBR WWTP, size the Chlorine Contact Basin to contain at least one decant volume, provided the above criteria are met.

From SBR Design Calculations:

Decant Flow Rate =	1,900	gpm
Decant Duration at Design Flow =	50	min.
Number of Cycles per Day at Design Conditions =	15	cycles/day (5 cycles for three SBR basins)

Determine Required Volume of Chlorine Contact Basin:

Volume (V) = Decant Flow Rate (Q) x Decant Duration (T) =	95,000	gal.
Volume (V) = Decant Flow Rate (Q) x Decant Duration (T) =	12,701	cu. ft.
Set Water Depth in Chlorine Contact Basin:	8	feet
Required Area of Chlorine Contact Basin =	1,588	sq. ft.
Required Area of Chlorine Contact Basin =	1,600	(rounded)
Set Number of Chambers in Chlorine Contact Basin:	2	each
Set Number of Internal Baffle Walls in Contact Basin:	5	each (must be an odd number)
Set Distance Between Baffle Walls in Contact Basin:	5	feet
Calculate Baffle Wall Length =	27	feet
Required Basin Width =	32	feet (each)
Calculate Length-to-Width Ratio =	39.9	
Approximate Basin Length =	35	feet (assuming 12-inch thick baffle walls)

B. CALCULATE CHLORINE DOSAGE REQUIREMENTS

From 10-State Standards:

Chlorine Dosage for Effluent Disinfection = 6 mg/L for nitrified effluent to 8 mg/L for activated sludge effluent

Select Desired Chlorine Dosage =	7	mg/L

Desired Source of Chlorine for Disinfection is On-Site Hypochlorite Generation

Range of Hypochlorite Concentration for On-Site System = 0.5% to 0.8% free chlorine

Select Anticipated Hypochlorite Concentration =	0.65	percent
Anticipated Hypochlorite Concentration =	6,500	mg/L

Calculate Mass Balance for Hypochlorite Solution Dosage:

$(C_s \times Q_s) + (C_e \times Q_e) = C \times Q$

Where:

C_s = Hypochlorite Solution Concentration

Q_s = Hypochlorite Solution Dosage Rate

C_e = Chlorine Concentration in Effluent Prior to Disinfection (=0)

Q_e = Effluent Flow Rate Prior to Disinfection

C = Desired Chlorine Concentration in Effluent After Disinfection

Q = Combined Flow Rate After Disinfection

And:

$Q = Q_s + Q_e$

Solving for Q_s Yields:

$Q_s = Q_e/((C_s/C)-1)$ =	2.05	gpm
Daily Volume of Hypochlorite Needed at Design Conditions =	1,536	gal/day

C. CALCULATE HYPOCHLORITE PRODUCTION CAPACITY REQUIRED

Determine Instantaneous Hypochlorite Generation Rate (HGR_i) to Match Decant Rate:

$HGR_i = (C_s \times Q_s) \times (1440/10^{o}) \times 8.34$ =	159.9	lb/day

Determine Daily Hypochlorite Generation Rate (HGR_d) at Design Conditions:

HGR_d = HGR_i x (Cycles per day) / (24 hrs/day) =	99.9	lb/day

With storage of hypochlorite solution, the generation rate can be set = HGR_d

Two options are available for redundancy to accommodate hypochlorite equipment maintenance, repair, or replacement: Store generated hypochlorite for a long enough period to place the generation equipment back in service, or install a redundant hypochlorite generation unit.

With current supply chain issues, it could take weeks to obtain the necessary parts to repair or replace the hypochlorite

generation equipment. As such, storing generated hypochlorite for that period of time would not be practical.

Storage of generated hypochlorite is reasonable to allow for a relatively short period of time to pass before switching to the alternate hypochlorite generation unit. For the purposes of this analysis, assume that two-days of hypochlorite solution is adequate.

Storage Requirement for Hypochlorite Solution =	3,073	gal.

D. DETERMINE SALT SUPPLY REQUIREMENTS

Base the salt requirements on the Peak Monthly Flows:

Peak Day to Peak Month Factor (from Flow Projections) =	1.5	

From MIOX (DE NORA) Specification Sheet:

Salt Conversion =	3.0	lb salt/lb free available chlorine

Determine Salt Supply Requirements:

Daily Salt Needs at Design Peak Monthly Flow =	66.6	lb salt/day
Monthly Salt Needs at Design Peak Monthly Flow =	2,027	lb salt/month
Number of 50-lb Salt Bags at Design Peak Monthly Flow =	41	50-lb bags salt/month

APPENDIX C

GEOTECHNICAL STUDY

Preliminary Geotechnical Report

New Wastewater Treatment Plant

Indian Service Route (ISR) 88 and 841

Santo Domingo (Kewa) Pueblo, Sandoval County, New Mexico

February 23, 2022

Terracon Project No. 66215133

Prepared for:

Molzen-Corbin

Albuquerque, New Mexico

Prepared by:

Terracon Consultants, Inc.

Albuquerque, New Mexico

Offices Nationwide
Employee-Owned
Established in 1965
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Terracon
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February 23, 2022

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Attn: Mr. Casey Cook, P.E.
P: (505) 242-5700
E: CCook@molzencorbin.com

Re: Preliminary Geotechnical Report
New Wastewater Treatment Plant
Indian Service Route (ISR) 88 and 841
Santo Domingo (Kewa) Pueblo, Sandoval County, New Mexico
Terracon Project No. 66215133

Dear Mr. Cook:

Terracon Consultants, Inc. (Terracon) has completed the Preliminary Geotechnical Report for the above referenced project. These services were performed in general accordance with our Proposal Number P66215133B dated June 28, 2021 and the Molzen-Corbin Task Order No. SDP211-11 Terracon dated December 16, 2021. This preliminary geotechnical engineering report presents the results of the literature research and site reconnaissance, and provides preliminary geotechnical recommendations concerning the evaluation and preliminary design of the geotechnical-related phases of the project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Elliott M. Gordon, E.I.
Staff Engineer

Michael E. Anderson, P.E.
Principal

Copies to: Addressee (1 via email, 3 via mail)

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Exhibit No.

Appendix A – Overview
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Appendix B – Geologic Map
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EXECUTIVE SUMMARY

This geotechnical executive summary should be used in conjunction with the entire report for preliminary design purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled General Comments should be read for an understanding of the report limitations.

A geologic and geotechnical literature search, and site reconnaissance have been performed and a Preliminary Geotechnical Report prepared for the proposed new wastewater treatment plant located near the SWC of Indian Service Route 88 and 841 in Santo Domingo (Kewa) Pueblo, Sandoval County, New Mexico.

Based on the information obtained from our literature search, site reconnaissance, and our experience near the project site, it is our opinion that the project is suitable for the planned wastewater treatment plant (WWTP) project. The following geotechnical considerations were identified:

Site Soils: The site surface and subsurface will likely consist of interbedded clays, silts, and sands. The surface and shallow subsurface soils at the project site will likely exhibit a low to high tendency for compression/consolidation with increasing load and when elevated in moisture content. We anticipate the shallow soils will exhibit low to moderate bearing capacity. The deeper subsurface soils are anticipated to exhibit a low tendency for compression/consolidation with increasing load and when elevated in moisture content. We anticipate the deeper soils will exhibit moderate to high bearing capacity. The soils may be recompacted to increase bearing capacity and reduce settlement. It is our opinion that the soils will have relatively poor to good quality pavement support characteristics.

Groundwater: Groundwater depth in the region is expected to be greater than about 70 feet below existing site grade.

Construction and Excavation: On-site soils are anticipated to be suitable for use as structural fill beneath footings, floor slabs, and pavements. On-site clay, silt, and clayey sand soils will likely require additional effort, moisture-conditioning, and processing to provide a uniform structural fill material. Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment. Caving soils should be anticipated due to loose, granular soil conditions.

Earthwork and Slopes: For permanent slopes in compacted fill and cut areas with maximum heights of less than about 8 to 10 feet, recommended preliminary maximum configurations for on-site materials range from 2:1 to 3:1 (horizontal:vertical).

Foundations: For low to moderate structural loads, the proposed structures are anticipated to be supported on shallow foundations consisting of spread/continuous footings or mat foundations bearing on a zone of structural fill/recompacted native soils. For moderate to heavy vertical and lateral loads or movement sensitive structures, the proposed structures are anticipated to be supported on deep foundations consisting of drilled shafts. The retaining walls and other ancillary structures are anticipated to be supported on shallow foundations bearing on a zone of structural fill/recompacted native soils.

Pavement: The anticipated pavement thickness will be based upon the subgrade materials and traffic types and volumes along the project alignment. Thicker pavement sections will be associated with poorer quality subgrades associated with the clays, silts and clayey sands. Thinner pavement sections will be associated with higher quality subgrades associated with the poorly to well graded sands and silty sands.

Terracon should be retained to provide supplemental geotechnical services and review the preliminary design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the preliminary design and specifications.

PRELIMINARY GEOTECHNICAL REPORT
NEW WASTEWATERTREATMENT PLANT
INDIAN SERVICE ROUTE (ISR) 88 AND 841
SANTO DOMINGO (KEWA) PUEBLO
SANDOVAL COUNTY, NEW MEXICO

Terracon Project No. 66215133
February 23, 2022

1.0 INTRODUCTION

This report presents the results of our preliminary geotechnical engineering services performed for a proposed new wastewater treatment plant located near the SWC of Indian Service Route 88 and 841 in Santo Domingo (Kewa) Pueblo, Sandoval County, New Mexico. The report addresses the following:

- Subsurface soil conditions
- Groundwater levels
- Geologic conditions that could impact the design of the proposed project
- Possible impacts, effects, and possible mitigation measures associated with improvements within the project area
- Construction difficulties
- Preliminary foundation considerations
- Preliminary pavement construction considerations
- Preliminary soil infiltration rates

The scope of the work performed for this project included site reconnaissance by a Terracon geological engineer, a search of available geologic literature, and review of geotechnical data from previous projects performed by Terracon within or near the project area.

2.0 PROJECT INFORMATION

2.1 Site Location and Description

Item	Description
Parcel Information	The new WWTP project site is located near the SWC of Indian Service Route 88 and 841 in Santo Domingo Pueblo, Sandoval County, New Mexico. Site location: 35.5044^0 N and 106.3264^0 W (approximate) The WWTP site is on the order of about 6 acres.

Item	Description
Existing Improvements	Undeveloped parcel
Current Ground Cover	Soil and vegetation
Existing Topography	The site slope down to the west, south and southwest (assumed)

2.2 Project Description

Item	Description
Information Provided	Information was provided by Molzen-Corbin (Molzen) in emails from June 24, 2021 to February 16, 2022, which included "Request For Proposals, professional Engineering Services for Preliminary Engineering Report, Santo Domingo Pueblo, Tribal Utility Authority, Wastewater Treatment Facility", SDTUA Project No. 21-014 and other project information.
Project Description	The project will include the design and construction of Project A. This includes a new sequential batch reactor wastewater treatment plant (WWTP).
Proposed Structures	The WWTP will likely consist of the following: ■ Support Building – 2,000 square feet in plan area ■ Blower Building – 1,000 square feet in plan area ■ Solids Handling Building – 1,000 square feet in plan area ■ Overflow Pond – 0.5 acres ■ Other miscellaneous structures
Building Construction	Precast or cast-in-place concrete or masonry load bearing walls
Building Foundation	Mat foundation or footings
Finished Floor Elevation	About 2 to 3 feet from existing site grade (assumed)
Maximum Structure and Building Loads	Assumed to be up to about 500 to 1,500 pounds per lineal feet and 2,000 to 3,000 pounds per square foot.
Grading/Slopes	At or near existing site grade (assumed)
Overflow Pond Depth	4 to 6 feet (assumed)
Estimated Start of Construction	2023

3.0 GEOLOGIC CONDITIONS

3.1 Regional Geology

The site occupies a portion of the Santo Domingo Basin situated between the Española Basin and the Northern Albuquerque Basin as related to the evolution of the Rio Grande Rift. The Rio Grande Rift is a major continental rift system that separates the Colorado Plateau microplate on the west from the stable North American craton underlying the Great Plains the east. The Santo Domingo Basin is part of an interconnected series of north-south aligned grabens and structural basins which have subsided between mountain and highland uplifts comprising the Rio Grande Rift. The complex structural basin was formed during the Tertiary Period, more than seven million years ago, when the Sandia-Manzano fault block was uplifted and tilted. The basin is approximately 25 to 30 miles long and varies from about 15 to 20 miles wide.

3.2 Site Geology

Site geologic conditions at the project site are consistent with the regional geology. The surficial geologic formations at or near the project site are comprised of the following.

- Qal: Alluvium deposited by the Rio Grande Tributaries (Holocene to Upper Pleistocene)
  Poorly sorted gravelly sand, sandy gravel, eolian sand

- QT_{slp}: sand, mud, and gravel deposited by eastern piedmont streams (Upper Miocene to Lower Pleistocene)
  Deposits consisting of sand, silt, clay and gravel

A geologic map and descriptions of the geologic units is included on the Geologic Map Legend in Appendix B.

Review of geologic information from the U.S. Geological Survey and New Mexico Bureau of Mines and Mineral Resources, 1997, Quaternary fault and fold database for the United States, accessed February 22, 2022, from USGS web site: https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=5a6038b3a1684561a9b0aadf88412fcf indicates that there are three (3) branches of a fault zone (San Francisco Fault) and another fault (Faults of Cochiti Pueblo) passing within 6 miles (10 kilometers) of the project site. A branch of the San Francisco Fault Zone passes along the western boundary of the project site.

The Quaternary Fault Map is included in Appendix B.

3.3 Soil Conservation Service - Soil Maps

The soils at the proposed project site have been surveyed and classified by the U.S. Soil Conservation Service. The soil survey maps of this site indicate that the soils in the area are as follows:

- Harvey-Cascajo Association deposits make up 68 percent of the map unit. Slopes are 5 to 15 percent. This component is located on plateaus, mesas, and bajadas. The parent material consists of eolian deposits derived from igneous and sedimentary rock. Depth to a root restrictive layer (bedrock) is greater than 80 inches. Depth to water table is more than 80 inches. The natural drainage class is somewhat poorly drained. The AASHTO soil classification is A-4. Concrete risk of corrosion potential is considered low. Steel risk of corrosion potential is considered moderate.

- Zia Sandy Loam makes up 32 percent of the map unit. Slopes are 3 to 6 percent. This soil group is located on alluvial fans. The parent material consists of eolian deposits over fan alluvium derived from sedimentary rock. Depth to a root restrictive layer (bedrock) is greater than 80 inches. Depth to water table is more than 80 inches. The natural drainage class is well drained. The AASHTO soil classification is A-2-4. Concrete risk of corrosion potential is considered low. Steel risk of corrosion potential is considered moderate.

4.0 SURFACE AND SUBSURFACE CONDITIONS

4.1 Typical Site Conditions



Figure 1. Indian Service Route 88 looking NW at SEC of site.



Figure 2. Indian Service Route 88 looking SW along eastern boundary of site.

4.2 Typical Subsurface Profile

A summary of the subsurface conditions encountered near the project alignment is outlined below:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency/Density
Stratum 1	5 to 10	Clay and Silt. The sand and gravel content varied	Medium Stiff to Stiff
Stratum 2	10 to 20	Sand. The silt and gravel content varied	Loose to Medium Dense
Stratum 3	20 to 80	Sand. The clay, silt and gravel content varied	Loose to Very Dense

4.3 Laboratory Testing

A summary of the pertinent laboratory index testing performed on the soils located near the project alignment is outlined below:

Soil Type	USCS Soil Classification	Soil Class AASHTO	Percent Fines	Liquid Limit/ Plasticity Index
Clay	CL	A-4, A-6	62 to 80	27 to 44/ 9 to 28
Silt	ML	A-4	51 to 62	NV/ NP
Sand	SP-SM, SM, SC-SM, SC	A-1-a, A-1-b, A-2-4, A-4, A-7-6	8 to 49	NV to 47/ NP to 20

A summary of the corrosivity testing performed on soils located near the project site is outlined below:

Soil Type	USCS Soil Classification	Soil Class AASHTO	pH	Water Soluble Sulfates (mg/kg)	Minimum Resistivity (ohm-cms)
Silt	ML	A-4	N/A	N/A	N/A
Clay	CL	A-4, A-6	7.8 to 8.0	560 to 3,300	314 to 747
Sand	SP-SM, SM, SC-SM, SC	A-1-a, A-1-b, A-2-4, A-4, A-7-6	8.7 to 9.1	29 to 48	2,210 to 6,260

The surface and shallow subsurface soils at the proposed project site are relatively low to moderate strength soils and will likely exhibit a moderate to high tendency for compression/consolidation with increasing load and when elevated in moisture content. The deeper subsurface soils are anticipated to exhibit a low tendency for compression/consolidation with increasing load and when elevated in moisture content. The shallow existing soils exhibit low to moderate bearing capacity. The deeper soils exhibit moderate to high bearing capability.

It is our opinion that the shallow subgrade soils will have relatively poor to good quality pavement support characteristics.

4.4 Groundwater

Based upon review of geotechnical data near the project site, groundwater was encountered in one boring at a depth of about 70 feet below existing site grade. Based upon review of the New Mexico Office of State Engineer water well data, regional groundwater was encountered at depths

exceeding about 80 to 100 feet below existing site grade. However, shallower groundwater conditions should be anticipated at or near existing drainages. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

Groundwater conditions should be anticipated to change with varying seasonal and weather conditions, and other factors. Fluctuations in groundwater levels can best be determined by implementation of a groundwater monitoring plan. Such a plan would include installation of groundwater monitoring wells, and periodic measurement of groundwater levels over a sufficient period of time.

5.0 PRELIMINARY RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

The geotechnical conditions encountered at the site appear to be suitable for the proposed project. Shallow soft/loose and/or low bearing soils will require particular attention in the design and construction.

5.1 Preliminary Geotechnical Design and Construction Considerations

Preliminary geotechnical engineering recommendations for the design of earth connected phases of the project are outlined below. The preliminary recommendations contained in this report are based upon the results of our literature research, review of existing reports, our experience in the area, geotechnical field exploration laboratory testing, and our current understanding of the proposed project.

The surface and shallow subsurface soils at the proposed project site are relatively low to moderate strength soils and will exhibit a low to high tendency for compression/consolidation and/or non- to low expansion potential with increasing load and when elevated in moisture content. The shallow existing soils exhibit low to moderate bearing capacity. The deeper subsurface soils are anticipated to exhibit a low tendency for compression/consolidation with increasing load and when elevated in moisture content. The deeper soils exhibit moderate to high bearing capability.

Based on the geological literature study, site reconnaissance, review of existing geotechnical reports and data, and our experience in the area, the structures can likely be supported on shallow and/or deep foundation systems. For low to moderate structural loads, the proposed structures are anticipated to be supported on shallow foundations consisting of spread/continuous footings or mat foundation. For moderate loads to high vertical and/or lateral loads or structures sensitive

to movement, deep foundations consisting of drilled shafts are anticipated for support. Slab-on-grade floor systems can be used, provided that some movement can be tolerated and accepted.

5.2 Construction and Excavation

On-site soils are anticipated to be suitable for use as structural fill beneath foundations, floor slabs, and pavements. On-site clay, silt, and clayey sand soils will likely require additional effort, moisture-conditioning, and processing to provide a uniform structural fill material.

Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment.

Based on the results from previous explorations in the area, we do not anticipate groundwater control measures will be necessary for the anticipated construction depths; however, elevated moisture contents were observed within some boring locations.

Based upon the subsurface conditions determined from previous geotechnical explorations near the project site, excavations into the on-site sand soils may encounter loose or caving conditions. The stability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unstable conditions develop, workability may be improved by scarifying and drying. Overexcavation of wet zones and replacement with granular materials may be necessary. Lightweight excavation equipment may be required to reduce subgrade pumping.

5.3 Earthwork and Slopes

For balancing grading plans, preliminary estimated shrink or swell of soils when used as compacted fill following recommendations in this report are as follows:

Estimated Shrink/Swell	
Soil Type	**Based on ASTM D698**
Silts and Clays	-10% to -20%
Sands	-15% to -30%

For permanent slopes in compacted fill and cut areas with maximum heights of about 8 to 10 feet, recommended preliminary maximum configurations for on-site materials are as follows:

Maximum Slope Configuration	
Soil Type	**Horizontal:Vertical (H:V)**
Clays	2.5:1 to 3:1
Sands	2:1 to 2.5:1

If steeper slopes are required for site development, we recommend the use of retaining walls/systems comprised of mechanically stabilized earth (MSE) retaining walls, soil nails, or cast-in-place (CIP) retaining walls.

Temporary excavations and shoring are to be designed for the contractor by a New Mexico Registered Professional Engineer to maintain existing reinforced soil prism and meet OSHA requirements.

5.4 Preliminary Foundation Recommendations

5.4.1 Buildings and Major Structures

A shallow foundation system consisting of shallow spread/ continuous footings or mat foundation may be considered feasible, provided that some movement can be tolerated. However, due to the potential for compression anticipated in the near surface soils in some areas, shallow foundations bearing on or a zone of structural fill/recompacted native soils may be required for support of the proposed structures. The thickness of structural fill below footings is anticipated to be on the order of about 2 to 4 feet.

Areas of loose or soft soils may be encountered at shallow foundation bearing depth after excavation is completed for foundations. When such conditions exist beneath planned foundation areas, the subgrade soils should be surficially compacted prior to placement of the foundation system. If sufficient compaction cannot be achieved in-place, the loose or soft soils should be removed and replaced as engineered fill.

If drilled shafts are used for structure support, casing and/or drilling slurry may be required for shaft installation due to caving soils. In addition, difficult shaft excavation may be encountered in dense to very dense large gravel and/or cobble zones.

5.4.2 Retaining Walls and Ancillary Structures

A shallow foundation system consisting of shallow spread/continuous footings may be considered feasible, provided that some movement can be tolerated. However, due to the potential for compression anticipated in the near surface soils in some areas, shallow foundations bearing on

or a zone of structural fill/recompacted native soils may be required for support of the proposed structures. The thickness of structural fill below footings is anticipated to be on the order of about 1 to 2 feet.

5.5 Preliminary Floor System Recommendations

Slab-on-grade floor systems supported on a zone of structural fill/recompacted native soils can be used provided that some movement can be tolerated and accepted. The thickness of structural fill below floor slabs is anticipated to be on the order of about 1 to 3 feet.

5.6 Pavement Design Considerations

The anticipated pavement thickness will be based upon the subgrade materials and traffic types and volumes at the project site.

Thicker pavement sections will be associated with poorer quality subgrades associated with the clays, silts, and clayey sands. Thinner pavement sections will be associated with higher quality subgrades associated with the poorly graded to well graded sands and silty sands. Subgrade stabilization may be required in lower quality subgrade soils and/or in areas or elevated moisture contents present within the subgrade soils at the project site.

The depth of remediation and/or replacement would be based upon the magnitude of instability of the subgrade. Placement of geotextile fabrics or geogrids could also be considered to improve subgrade strength and stability and/or reduce long term maintenance. Chemical treatment (lime or cement) could be considered as a potential option for expansive soils (if encountered). Additional chemical tests of the subgrade materials will need to be performed to verify the feasibility and use of lime for subgrade stabilization measures. High sulfate contents would preclude the use of lime treated subgrade.

5.7 Corrosion Potential

Based upon our experience in the area, the on-site soils are considered to have low to high soluble sulfate concentrations. The lower concentrations will likely be associated with the sands and the higher concentrations will likely be associated with the clays and silts. Therefore, ASTM Type I to Modified II Portland cement could be required for all concrete on and below grade. Foundation concrete will need to be designed for low to high sulfate exposure in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

The results of the pH and minimum resistivity testing in the area indicate a low to moderate corrosion potential to metal piping or conduits.

5.8 Preliminary Soil Infiltration Rate

Based upon the anticipated subsurface soil conditions, we estimate that the preliminary soil infiltration rate will be on the order of about 0.8 to 1 inch/hour.

6.0 GENERAL COMMENTS

Terracon should be retained to provide supplemental geotechnical services and review the preliminary design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the preliminary design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The preliminary recommendations presented in this report are based upon the data obtained from information discussed in this report. This report does not reflect variations that may occur across the corridor study areas, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until further corridor specific studies have been completed or during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This preliminary report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

7.0 REFERENCES

Halka Chronic. “Roadside Geology of New Mexico.” Mountain Press Publishing Company, Missoula, 1987.

Natural Resources Conservation Service, August 12, 2019; "Custom Soil Resource Report for Sandoval County Area, New Mexico , Parts of Los Alamos, Sandoval and Rio Arriba Counties" retrieved from the United States Department of Agriculture-Natural Resources Conservation Service web site: http://websoilsurvey.nrcs.usda.gov

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Kuhle Andrika J. and Smith, Gary A., April 1998, New Mexico Bureau of Mines and Mineral Resources "Geology of Santo Domingo Pueblo and Santo Domingo Pueblo SW Quadrangles, Sandoval County, New Mexico"

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APPENDIX A

SITE LOCATION MAP AND

TERRACON HISTORICAL PROJECTS

SITE LOCATION and TERRACON HISTORICAL PROJECTS

Santo Domingo (Kewa) Pueblo Wastewater Treatment Plant ■ Sandoval County, NM
February 23, 2022 ■ Terracon Project No. 66215133

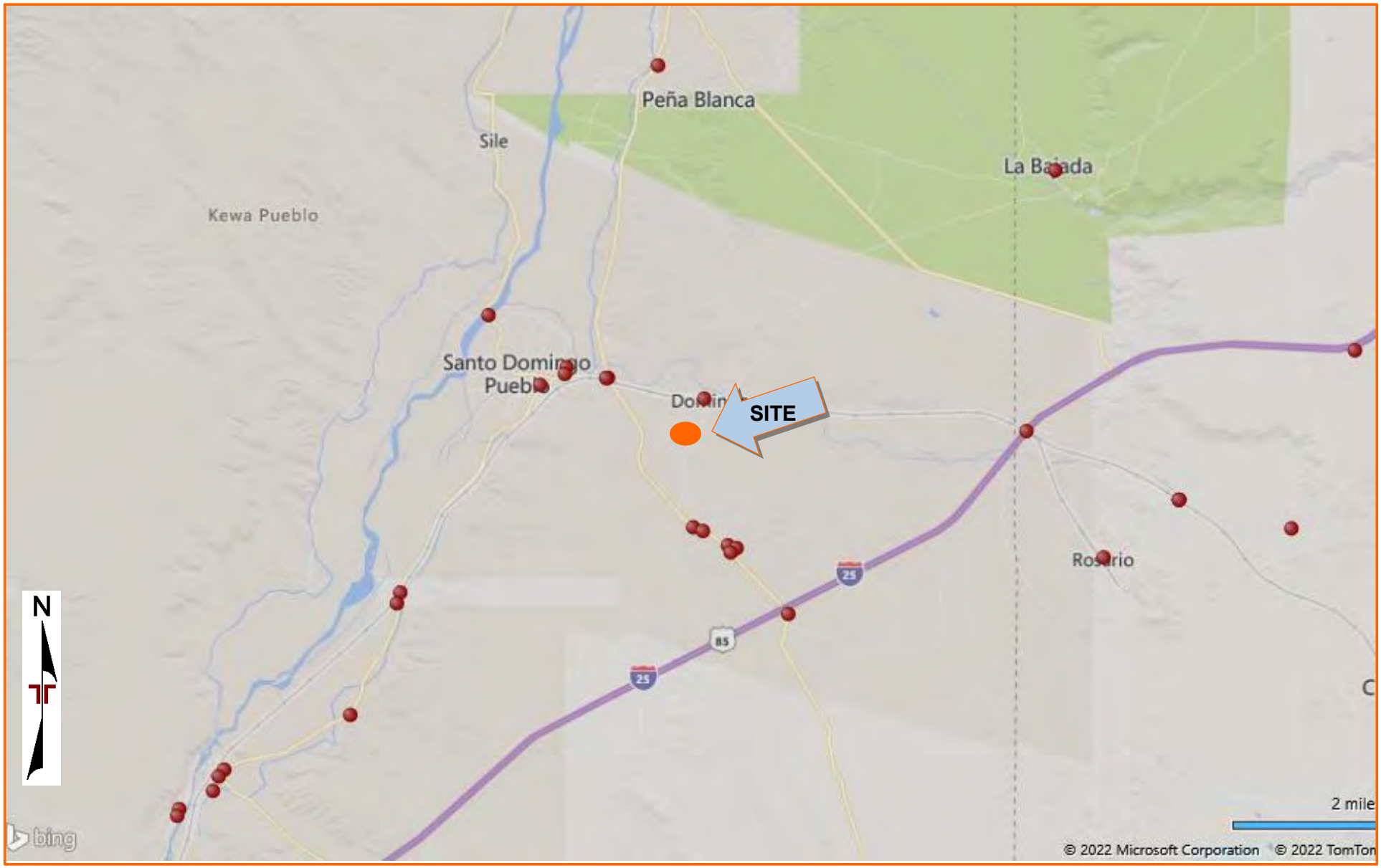


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

ROAD MAPS PROVIDED BY MICROSOFT BING MAPS

APPENDIX B

GEOLOGIC MAPS

GEOLOGIC MAP

Santo Domingo (Kewa) Pueblo Wastewater Treatment Plant ■ Sandoval County, NM
February 23, 2022 ■ Terracon Project No. 66215133

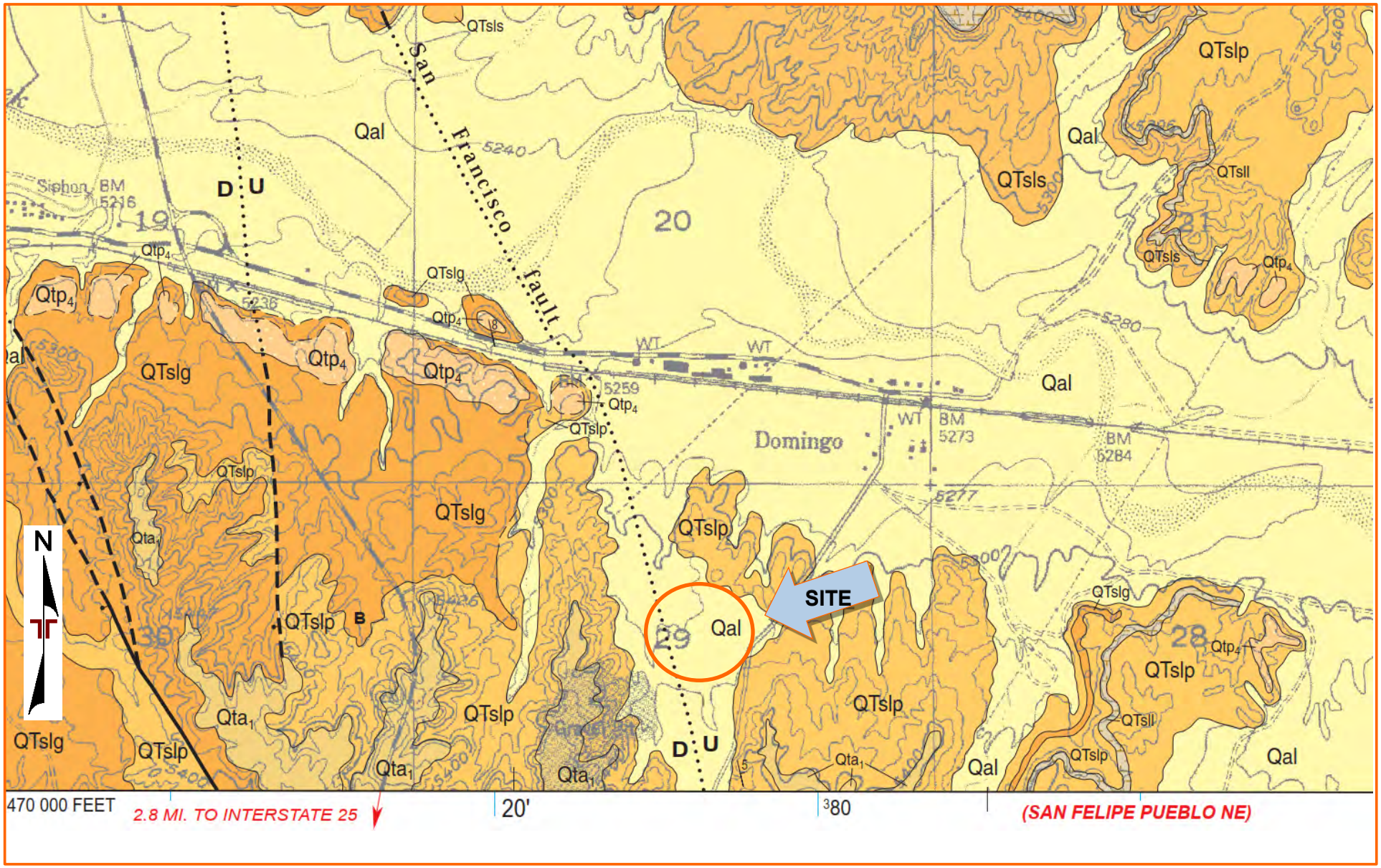


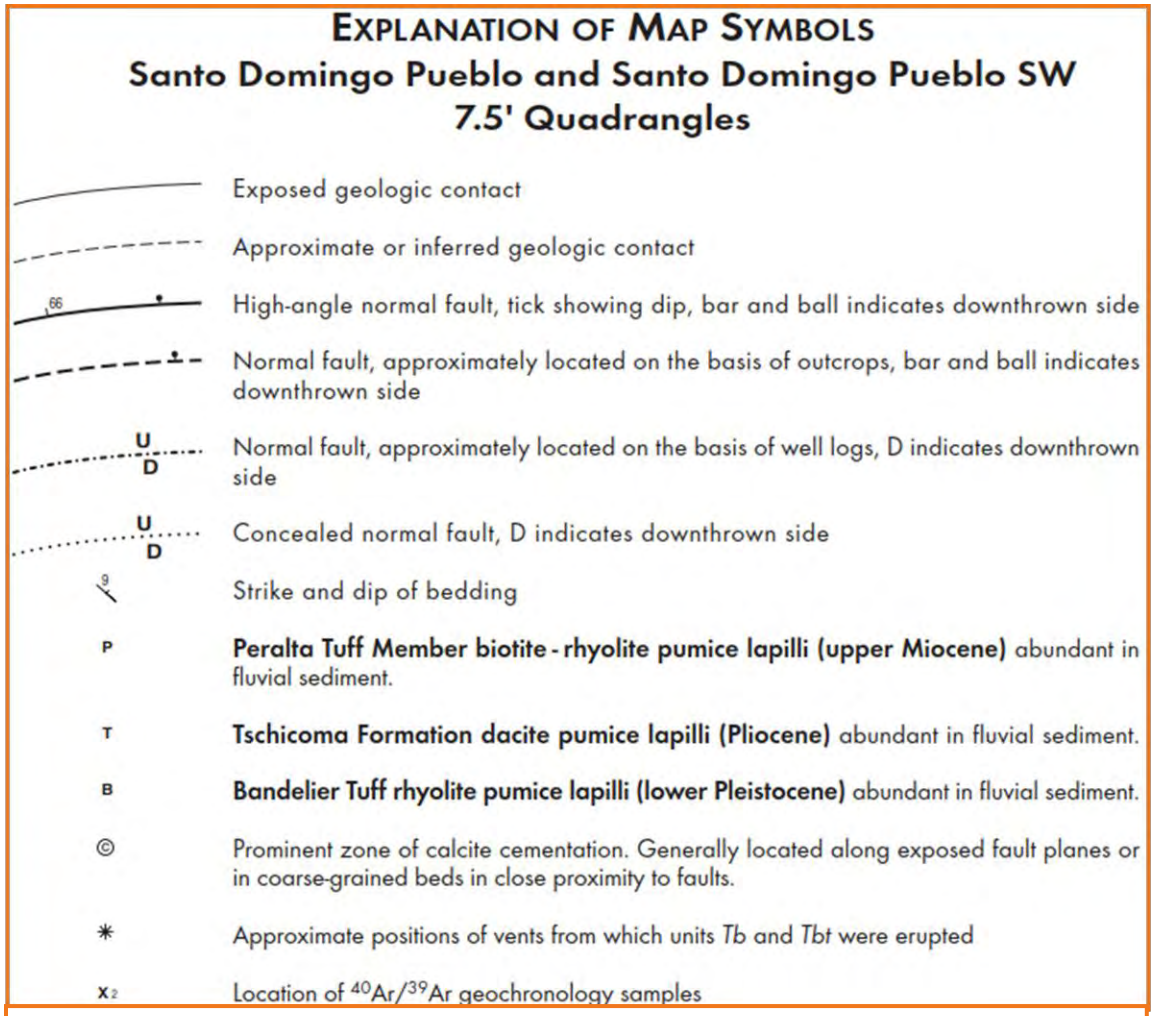
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

GEOLOGY OF SANTO DOMINGO PUEBLO AND SANTO DOMINGO PUEBLO SW QUADRANGLES, SANDOVAL COUNTY, NM. APRIL 1998 6 APRIL 2000 REVISION, PLATE 1 OF 2. GARY A. SMITH AND ANDRIKA J. KUHLE

GEOLOGIC MAP LEGEND

Santo Domingo (Kewa) Pueblo Wastewater Treatment Plant ■ Sandoval County, NM
February 23, 2022 ■ Terracon Project No. 66215133

Terracon GeoReport



Qal – Alluvium deposited by Grande tributaries (upper Pleistocene? And Holocene)
QTslp – Sand, mud, and gravel deposited by eastern piedmont streams (upper Miocene to Lower Pleistocene)

QUATERNARY FAULT MAP

Santo Domingo (Kewa) Pueblo Wastewater Treatment Plant ■ Sandoval County, NM
February 23, 2022 ■ Terracon Project No. 66215133

Terracon GeoReport

U.S. Geological Survey Quaternary Faults



2/22/2022, 8:48:13 AM

1:72,224

0 0.75 1.5 3 mi
0 1 2 4 km

Bureau of Land Management, Texas Parks & Wildlife, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, METI/NASA, NGA, EPA, USDA

Fault Areas
- Class B
- historic
- late Quaternary
- latest Quaternary
- middle and late Quaternary

National Database
- Historic (< 150 years), well constrained location
- Historic (< 150 years), moderately constrained location
- Historic (< 150 years), inferred location
- Latest Quaternary (<15,000 years), well constrained location
- Latest Quaternary (<15,000 years), moderately constrained location
- Latest Quaternary (<15,000 years), inferred location
- Late Quaternary (< 130,000 years), well constrained location
- Late Quaternary (< 130,000 years), moderately contrained location
- Late Quaternary (< 130,000 years), inferred location
- Middle and late Quaternary (< 750,000 years), well constrained location
- Middle and late Quaternary (< 750,000 years), moderately constrained location
- Middle and late Quaternary (< 750,000 years), inferred location
- Undifferentiated Quaternary (< 1.6 million years), well constrained location
- Undifferentiated Quaternary (< 1.6 million years), moderately constrained location
- Undifferentiated Quaternary (< 1.6 million years), inferred location
- Unspecified age, well constrained location
- Unspecified age, moderately constrained location

USGS

USGS | Bureau of Land Management, Texas Parks & Wildlife, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, METI/NASA, NGA, EPA, USDA |

APPENDIX D

SLUDGE CALCULATIONS

Santo Domingo Pueblo, NM WWTP - SBR followed by ….Belt Filter Press

CURRENT CONDITIONS

Date:		14-Feb-22	
Average Current Flow Rate:	ADF, equals:	0.282	MGD
Design BOD5 loading:		300	mg/l
Estimated solids yield factor, equals:		0.8	lbs solids/lb BOD applied
Estimated daily solids that will be produced at the design flow rate, will be:		564	dry lbs/day
Assumed solids concentration in aerated sludge holding with decanting -- source solids for Belt Press:		20,000	mg/l
This will give us a factor at:		0.02	
Now calculate the estimated design wet solids rate for this facility, as follows:		28,223	wet lbs/day currently
Daily wet solids produced, will be:		3,384	gals/day currently
Now calculate the weekly design wet solids produced, as:		23,688	gals/week currently
Assumed weekly operating schedule, will be:		6	hours/week
Assumed weekly operating schedule, will be:		360	minutes/week
Now calculate the estimated feed rate to the Belt Filter Press:		65.8	gpm
Estimated recovery for this type of operation is:		95	%
	Factor, equals:	0.95	
Based on the numbers calculated above, the instantaneous feed rate is:		0.09	MGD currently
The instantaneous solids loading rate to the machine would be:		658.6	dry lbs/hour
The estimated thickened sludge concentration, will be:		15	%
	Factor equals:	0.15	
The estimated amount of cake, to be handled, will be:		4,171	wet lbs/hour
The estimated amount of cake, to be handled, will be:		8.34	gpm at thickened

	Conc.	
The estimated amount of cake, to be handled, will be:	625.6	dry lbs/hour
The estimated amount of filtrate to be recycled to the WWTP will be about:	57.5	gpm
Estimated Polymer dosage will be about:	14	lbs/dry ton
The instantaneous solids feed rate to the Belt Press will be:	0.33	dry tons/hour
The estimated Polymer dosage rate, will be, about:	4.61	dry lbs. equiv./hour
Typical max. Polymer solution strength delivered to the jobsite will be, about:	40	%
Factor equals:	0.4	
This will give a wet Polymer solution requirement at:	11.52	wet lbs. Polymer per hour
Assume a Polymer Specific Gravity at:	8.84	lbs/gallon
The Polymer Feeder feed pump size will be:	1.30	gph
Now figure the dilution water requirement:		
Assume a delivered solution concentration at:	0.1	%
Now estimate the dilution water required, as:	521.5	gph
The estimated dilution water feed will be about:	8.69	gpm
Estimated annual Polymer consumption is:	406.8	gals/year
Estimated annual Polymer consumption is:	7.40	drums/year
Estimated Monthly Polymer consumption is:	0.62	drums/month

Summary of Calculations:

Estimated WAS pump sizing	65.8	gpm
Estimated Cake to conveyor belt	8.34	gpm
Estimated Cake to conveyor belt	625.6	dry lbs/hour
Estimated Cake to conveyor belt	4,171	wet lbs/hour
Estimated liquid polymer pump sizing	1.30	gph
Estimated Filtrate Return Rate	57.5	gpm
Estimated Filtrate Return Rate	0.08	MGD
Estimated Belt Press Solids Design Rate	658.6	lbs. DS/hour
Estimated Belt Press Hydraulic Design Rate	65.8	gpm
Estimated dilution water requirement (avg.)	8.69	gpm
Estimated Liquid Polymer consumption is	0.62	drums/month

Santo Domingo Pueblo, NM WWTP - SBR followed by ….Belt Filter Press

DESIGN CONDITIONS

Date:		14-Feb-22	
Average Plant Design Flow Rate:	ADF, equals:	0.75	MGD
Design BOD5 loading:		300	mg/l
Estimated solids yield factor, equals:		0.8	lbs solids/lb BOD applied
Estimated daily solids that will be produced at the design flow rate, will be:		1,501	dry lbs/day
Assumed solids concentration in aerated sludge holding with decanting -- source solids for Belt Press:		20,000	mg/l
This will give us a factor at:		0.02	
Now calculate the estimated design wet solids rate for this facility, as follows:		75,060	wet lbs/day at design
Daily wet solids produced, will be:		9,000	gals/day at des. Conc.
Now calculate the weekly design wet solids produced, as:		63,000	gals/week at des. Conc.
Assumed weekly operating schedule, will be:		15	hours/week
Assumed weekly operating schedule, will be:		900	minutes/week
Now calculate the estimated feed rate to the Belt Filter Press:		70.0	gpm
Estimated recovery for this type of operation is:		95	%
	Factor, equals:	0.95	
Based on the numbers calculated above, the instantaneous feed rate is:		0.10	MGD at des. Conc.
The instantaneous solids loading rate to the machine would be:		700.6	dry lbs/hour
The estimated thickened sludge concentration, will be:		15	%
	Factor equals:	0.15	
The estimated amount of cake, to be handled, will be:		4,437	wet lbs/hour
The estimated amount of cake, to be handled, will be:		8.87	gpm at thickened

	Conc.	
The estimated amount of cake, to be handled, will be:	665.6	dry lbs/hour
The estimated amount of filtrate to be recycled to the WWTP will be about:	61.1	gpm
Estimated Polymer dosage will be about:	14	lbs/dry ton
The instantaneous solids feed rate to the Belt Press will be:	0.35	dry tons/hour
The estimated Polymer dosage rate, will be, about:	4.90	dry lbs. equiv./hour
Typical max. Polymer solution strength delivered to the jobsite will be, about:	40	%
Factor equals:	0.4	
This will give a wet Polymer solution requirement at:	12.26	wet lbs. Polymer per hour
Assume a Polymer Specific Gravity at:	8.84	lbs/gallon
The Polymer Feeder feed pump size will be:	1.39	gph
Now figure the dilution water requirement:		
Assume a delivered solution concentration at:	0.1	%
Now estimate the dilution water required, as:	554.8	gph
The estimated dilution water feed will be about:	9.25	gpm
Estimated annual Polymer consumption is:	1081.8	gals/year
Estimated annual Polymer consumption is:	19.67	drums/year
Estimated Monthly Polymer consumption is:	1.64	drums/month

Summary of Calculations:

Estimated WAS pump sizing	70	gpm
Estimated Cake to conveyor belt	8.87	gpm
Estimated Cake to conveyor belt	665.6	dry lbs/hour
Estimated Cake to conveyor belt	4,437	wet lbs/hour
Estimated liquid polymer pump sizing	1.39	gph
Estimated Filtrate Return Rate	61.1	gpm
Estimated Filtrate Return Rate	0.09	MGD
Estimated Belt Press Solids Design Rate	700.6	lbs. DS/hour
Estimated Belt Press Hydraulic Design Rate	70.0	gpm
Estimated dilution water requirement (avg.)	9.25	gpm
Estimated Liquid Polymer consumption is	1.64	drums/month

APPENDIX E

ENVIRONMENTAL SCOPING REPORT

Santo Domingo Pueblo Wastewater Treatment Plant Environmental Scoping Report

Prepared for:

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February 2022

Environmental Screening Criteria
Santo Domingo Wastewater Treatment Plant – Scoping Report

Like many New Mexico Tribes, Communities, and Utilities, the Pueblo of Santo Domingo started out with basic sewage collection and treatment. Over time, as the Pueblo's Enterprise Area and population centers have grown, continued use of on-site septic systems and unlined/lined lagoons have resulted in overloaded conditions creating health and sanitation concerns. The Pueblo has identified the need for a comprehensive solution to provide long term, safe management of the wastewater generated.

Looking to the future, Santo Domingo has plans for population growth and development of commercial enterprises. Implementing a centralized collection system and a new Wastewater Treatment Plant (WWTP) will ensure that the intended growth/development can happen in an environmentally friendly and sustainable manner.

1. EXISTING CONDITIONS AND CONSTRAINTS

1.1 Location and Setting

The proposed WWTP is located on undeveloped land approximately 0.5 miles south of the Wa-Di Community along the west side of Indian Service Route 88 (Figure 1).

1.2 Existing Environmental Setting

The following subsections provide information regarding the existing environmental setting in the vicinity of the project area.

Geology and Soils

Santo Domingo Pueblo is located adjacent to the Rio Grande within the Albuquerque Basin. The Albuquerque Basin is part of the Rio Grande Rift, which formed in conjunction with the uplifting of the Sandia and Manzano Mountains during the Tertiary Period. The project area falls within the Mexican Highland Section of the Basin and Range Physiographic Province (Parsons 2006).

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was queried to identify the soils within the vicinity of the project area. All soils within the planned WWTP footprint are comprised of the Harvey-Cascajo association, with 5 to 15 percent slopes. The land is considered "not prime farmland." The soils are considered well-drained (NRCS 2022). Soil data reports for the project area are provided in Appendix A.

Floodplains

The project area falls within areas designated as Zone D by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) No. 35043C1475D. Zone D represents areas with a potentially moderate to high risk of flooding, but the probability has not been determined. Some flood risk remains, but the probability has not been quantified (FEMA 2022). There is an existing wash west of the proposed WWTP construction site. Data obtained from FEMA for the project area is provided in Appendix B.

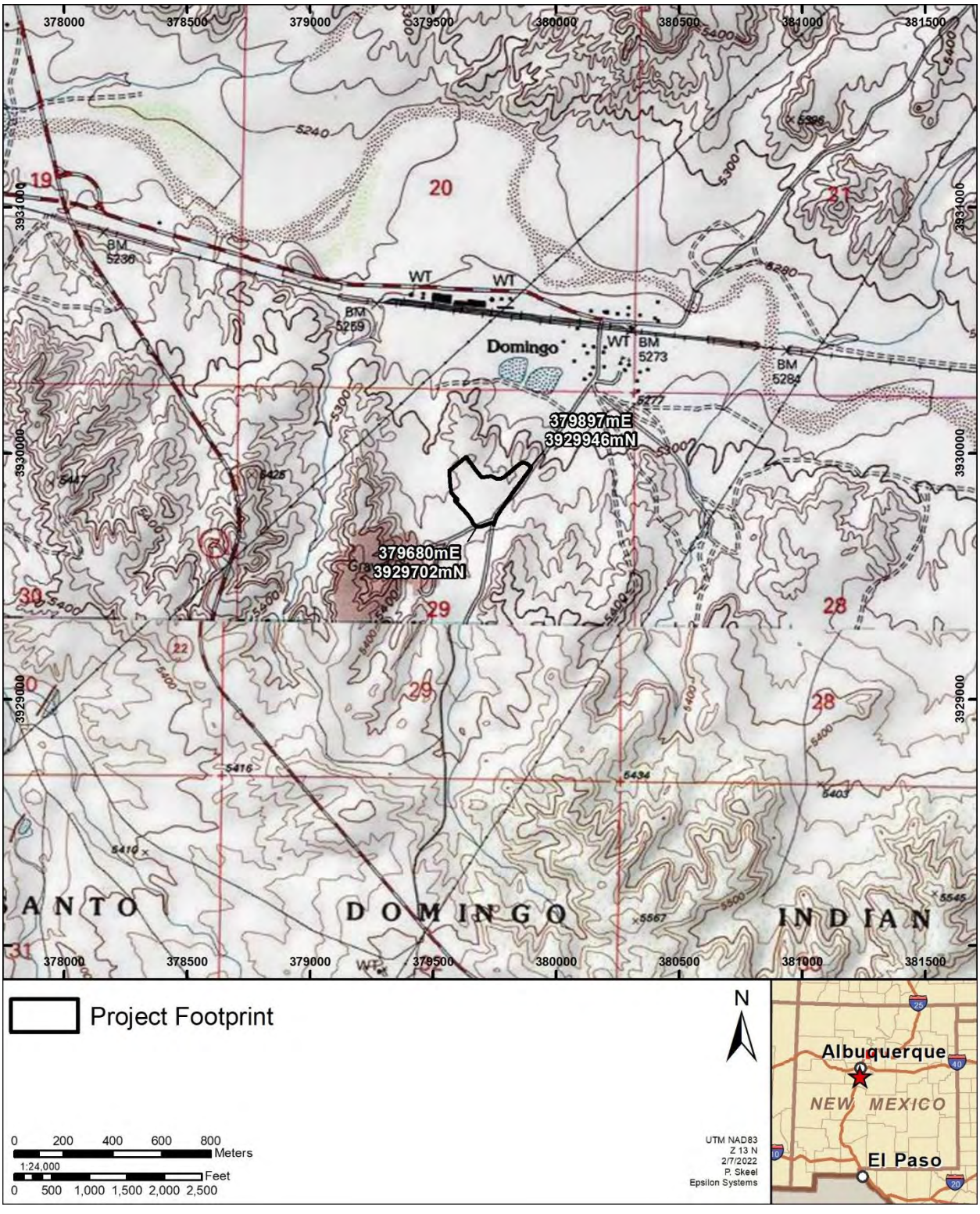


Figure 1. Project location on map.

Wetlands

Wetlands are lowland areas inundated or saturated with water for a sufficient time to allow a prevalence of hydrophytic vegetation to develop. Jurisdictional wetlands, those protected from unauthorized dredge-and-fill activities under Section 404 of the Clean Water Act (CWA) and Executive Order (EO) 11990, *Protection of Wetlands*, have the following three essential characteristics: dominance by hydrophytic vegetation, hydric soils, and wetland hydrology. Hydrophytic vegetation requires inundated or saturated soil for its existence. Hydric soils are ponded or flooded for a sufficient time during the growing season to develop anaerobic conditions. Wetland hydrology is the availability of surface water or ground water to create the wetland environment.

A query of the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory indicates that there are no federal or state listed wetlands within the vicinity of the project (USFWS 2022). There are no hydric soils present at the project site (NRCS 2022). NWI data reports for the project area are provided in Appendix C.

Water Resources

Surface Water

Surface water includes any permanent or temporary body of water or drainage that collects and holds or transports water. Surface water sources can originate from ground water, such as springs, aquifers, and seeps; or can be generated after a rain or stormwater event, typically in the form of run-off. Intermittent and ephemeral arroyos in particular contain water only for limited periods of time following storms. Perennial surface-water bodies contain water year-round.

Galisteo Creek is located north of the project area and runs through portions of the Pueblo. There is one wash along the west side of the project area that flows north into Galisteo Creek. The creek empties into the Rio Grande, roughly 3.5 miles west of the project area.

Groundwater

The project area is underlain by the Santo Domingo Basin, located within the Rio Grande rift in northern New Mexico. The basin is topographically subdued and structurally distinct compared with the adjacent Espanola and northern Albuquerque rift basins, yet it contains structural elements in common with both neighboring basins (Minor et. al, 2006).

Air Quality & Climate

National Ambient Air Quality Standards

The principal framework of national, state, and local efforts to protect air quality in the U.S. is the Clean Air Act (42 U.S.C. § 7401 et seq., [CAA]). Under the CAA, the U.S. Environmental Protection Agency (EPA) has set health-based standards known as National Ambient Air Quality Standards (NAAQS) for six criteria pollutants considered to be key indicators of air quality: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and two categories of particulate matter—namely particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) and particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2\,5}$) (40 CFR Part 50).

Sandoval County, including the Santo Domingo Pueblo and the project area, are in attainment with all NAAQS (EPA 2022).

Regional Meteorology

Air quality is closely intertwined with day-to-day meteorological weather conditions and the influences of longer-term climate. Concentrations of atmospheric air pollutant gases/species can be influenced by meteorological variables, e.g., wind speed, which affects dispersion of particulates from soils; wind direction and speed, which affects transportation; mixing depths and stability, which affect dispersion; and temperature, humidity, sunlight, and cloud water, which can play a role in the chemical formation of certain air pollutants. The table below provides a summary of the climate within the Santo Domingo Pueblo area.

Santo Domingo Regional Climate Summary

Averages	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Max Temp[1]	45.8	52.7	58.9	63.4	73.7	87.1	90.1	87.7	79.7	69.1	55.9	47.3	67.6
Min Temp[1]	17.6	21.1	26.3	31.5	41.1	48.6	54.8	55.1	46.9	32.1	26.6	17.7	35.0
Precipitation[2]	0.50	0.52	0.75	0.61	1.07	1.05	1.92	2.29	1.51	1.06	0.79	0.69	12.77
Snowfall[2]	4.8	4.2	3.3	1.5	0.0	0.0	0.0	0.0	0.0	0.7	2.9	5.4	22.9

1. In degrees Fahrenheit
2. In inches

Source: WRCC 2022

Biological Resources

Threatened and Endangered species

A review of the USFWS Information for Planning and Consultation (IPaC) resource list (Appendix D) indicates one mammal, three birds, and one fish as potential species to occur on or within the project area.

The species and their status are as follows: New Mexico Jumping Mouse (Endangered), Mexican Spotted Owl (Threatened), Southwestern Willow Flycatcher (Endangered), Yellow-billed Cuckoo (Threatened), and the Rio Grande Silvery Minnow (Endangered).

Critical Habitat

A review of the USFWS IPaC resource list (Appendix D) indicates that no mapped critical habitat is present on the site.

Rare Plants

A review of the New Mexico Rare Plant Technical Council (NMRPTC) list of rare plants for Sandoval County identifies 11 species classified as Rare by the NMRPTC as well as two species classified as Endangered by the State of New Mexico, but dropped by the NMRPTC (Appendix E).

1.3 Existing Cultural Resources Setting

A records search of the New Mexico Cultural Resource Information System (NMCRIS) in addition to the current listings of the National Register of Historic Places (NRHP) and the New Mexico State Register of

Cultural Properties (NMSRCP) in order to determine the presence of any cultural resources or districts within 500 meters of the project Area of Potential Effect (APE). The search of the current NRHP and the SRCP listings identified no listed historic properties or districts within 500 meters of the current project. The results of the NMCRIS search indicated that 10 previous cultural resource surveys have been conducted within 500 meters of the current APE, five of which intersects with the current APE (Table 1). [redacted] A map showing the locations of all of these [redacted] surveys is provided as Figure 2.

Previous Cultural Resource Surveys Within 500 meters of the Project APE

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Note: "*" indicates those activities that intersect with the current project APE.

Cultural Resources Within 500 meters of the Project APE

[redacted]

Based on a review of the available data, [redacted] As the resource does not fall within the footprint of the current project, it is unlikely that the resource or elements that may contribute to its significance would be impacted by the proposed project. As such, no further management consideration is warranted.

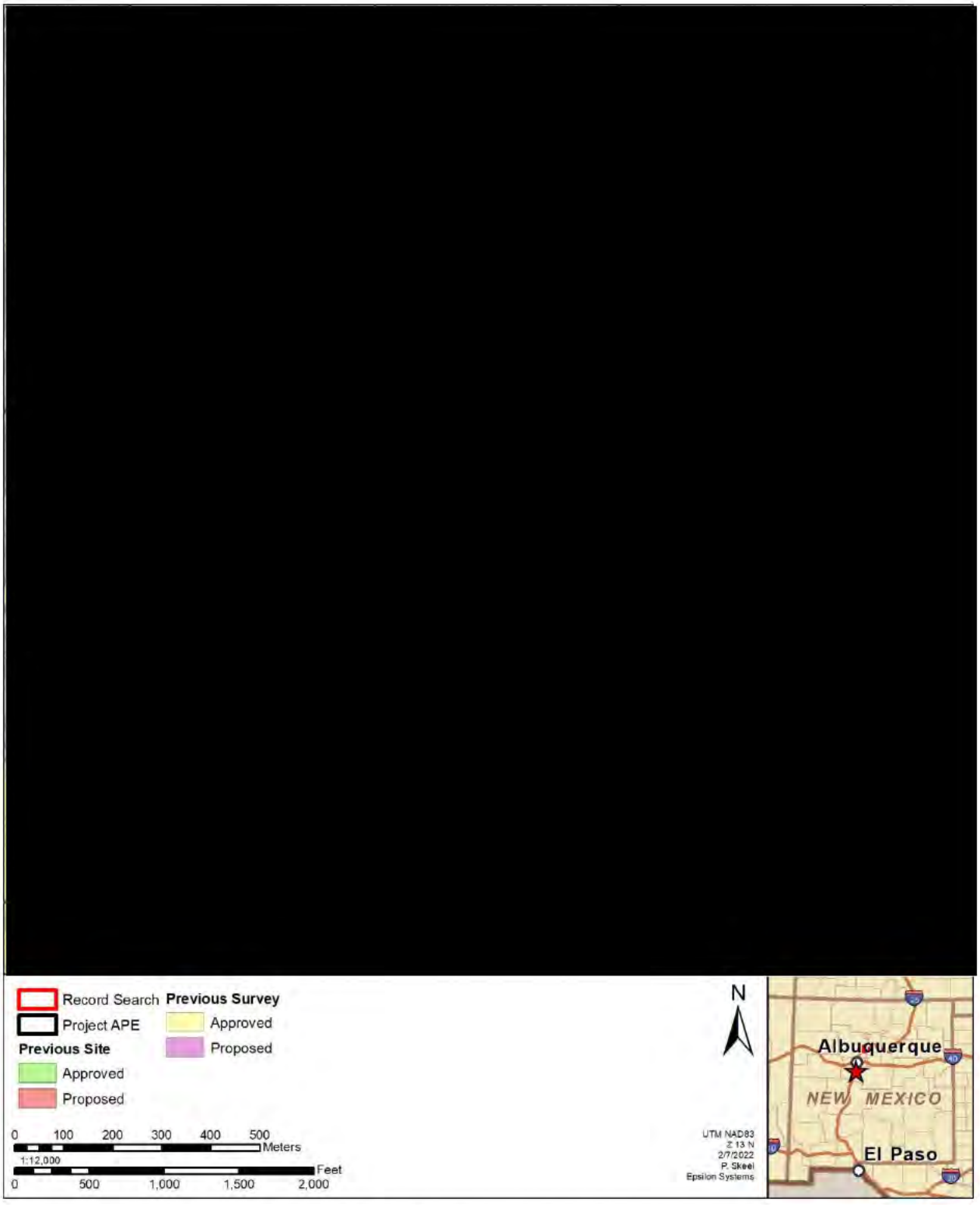


Figure 2. NMCRIS Records Search Results.

1.4 Community Features

Santo Domingo Pueblo is located in Sandoval County, New Mexico. It is located between Albuquerque and Santa Fe, New Mexico, west of Interstate 25.

Demographics

The table below provides population statistics and demographic information for Santo Domingo Pueblo, Sandoval County, and the state of New Mexico. The information was obtained from queries of U.S. Census Bureau databases (Appendix F).

Demographic Characteristics

	New Mexico [1]	Sandoval County [1]	Santo Domingo Pueblo [2]
Total Population [1]	2,115,877	148,834	2,941
Racial and Age Characteristics [1]	**New Mexico [1]**	**Sandoval County [1]**	**Santo Domingo Pueblo [2]**
White	81.9%	78.2%	0.9%
Black	2.6%	2.7%	0.1%
American Indian/Alaska Native	14.1%	11.0%	88.6%
Asian	1.7%	1.8%	--
Native Hawaiian/Other Pacific Islander	0.2%	0.2%	--
Hispanic or Latino Origin	39.9%	49.3%	10.2%
Other/Two or More Races	3.1%	3.1%	0.2%
White Persons not Hispanic	42.5%	39.9%	--
Persons under 5 Years	5.4%	5.8%	4.7%
Persons under 18 Years	22.8%	22.7%	31.4%
Persons 65 Years and Over	18.5%	18.0%	4.5%
Income Statistics [2]	**New Mexico**	**Sandoval County**	**Santo Domingo Pueblo**
Per Capita Income (2019)	$27,230	$29,255	$12,238
Persons per Household	2.63	2.78	4.9
Median Household Income	$49,754	$63,802	$34,356
Persons Below Poverty Level	16.8%	10.4%	27.3%

Sources: USCB 2019, 2022.

Notes:

1. Based upon Census 2020 data.
2. Based on 2015-2019 data.

1.5 Existing Land Use and Land Use Patterns

The site for the proposed WWTP is located on Santo Domingo Pueblo lands. Construction of the proposed WWTP would not require acquisition of new land. No easements or rights-of-way would need to be obtained to build the facility at the site.

The land is currently unoccupied and appears to be undeveloped. It is assumed that construction of the WWTP would be consistent with Tribal planning documents.

2. AGENCY COORDINATION AND PUBLIC INVOLVEMENT

The following direct or indirect federal or state actions may be required as a result of the proposed action:

- Consultation with the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA, if any waters of the U.S. may be impacted by the proposed action;
- Coordination with the EPA regarding acquisition of an Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES), which is the permit required for discharge of treated water from the planned wastewater treatment plant (WWTP); and
- Consultation with EPA regarding a NPDES General Permit Associated with Construction Activity (Construction General Permit. [CGP]), administered by the New Mexico Environment Department (NMED) Construction Bureau.

These coordination measures are in support of the CWA. Permitting and oversight authorities under the CWA wetlands program remain with the federal government, as the state of New Mexico or Santo Domingo Pueblo have not assumed authority.

3. PURPOSE AND NEED FOR THE PROPOSED PROJECT

There are four main population centers within the Pueblo:

- The Main Village, with about 528 occupied homes;
- Galisteo Housing, with about 113 occupied homes;
- Wa-Di Community with about 50 occupied homes and apartments; and
- Cedar Tree Community with about 19 occupied homes.

The Pueblo's population is anticipated to grow dramatically over the next 20 years, posing increased demand on community infrastructure.

The current Santo Domingo Pueblo wastewater treatment system includes three separate lagoon systems, two community septic systems, and four large facility septic systems. The purpose of the proposed project is to construct a WWTP that can treat the wastewater for all existing and foreseeable future users, removing the need for the septic systems.

4. CONCLUSIONS

As proposed, with no state or federal funding, the level of environmental coordination or consultation associated with the construction of the WWTP is minimal. It is recommended that the contractor conducting the WWTP construction coordinate with the NMED Construction Programs Bureau to obtain a CGP for the project, including the need for a stormwater pollution prevention plan (SWPPP) as the ground disturbance will be greater than one acre.

Prior to bringing the WWTP online, the Pueblo will need to consult with the EPA to obtain an NPDES permit to operate and discharge treated effluent.

REFERENCES CITED

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Appendix A:

NRCS Results

Prime and other Important Farmlands

This table lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Unique farmland is not based on national criteria. It commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be *farmland of local importance* for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Report—Prime and other Important Farmlands

Prime and other Important Farmlands–Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties		
Map Symbol	**Map Unit Name**	**Farmland Classification**
54	Harvey-Cascajo association, 5 to 15 percent slopes	Not prime farmland

Data Source Information

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 15, Sep 12, 2021

Hydric Soil List - All Components

This table lists the map unit components and their hydric status in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 2002).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes in the table (for example, 2). Definitions for the codes are as follows:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
   B. Show evidence that the soil meets the definition of a hydric soil;
3. Soils that are frequently ponded for long or very long duration during the growing season.
   A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
   B. Show evidence that the soil meets the definition of a hydric soil;
4. Map unit components that are frequently flooded for long duration or very long duration during the growing season that:
   A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
   B. Show evidence that the soil meets the definition of a hydric soil;

Hydric Condition: Food Security Act information regarding the ability to grow a commodity crop without removing woody vegetation or manipulating hydrology.

References:

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Report—Hydric Soil List - All Components

Hydric Soil List - All Components–NM656-Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
54: Harvey-Cascajo association, 5 to 15 percent slopes	Harvey	45	Plateaus,mesas,bajadas	No	—
	Cascajo	40	Ridges,knolls,hills	No	—
	La Fonda	10	—	No	—
	Witt	5	—	No	—

Data Source Information

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 15, Sep 12, 2021

Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

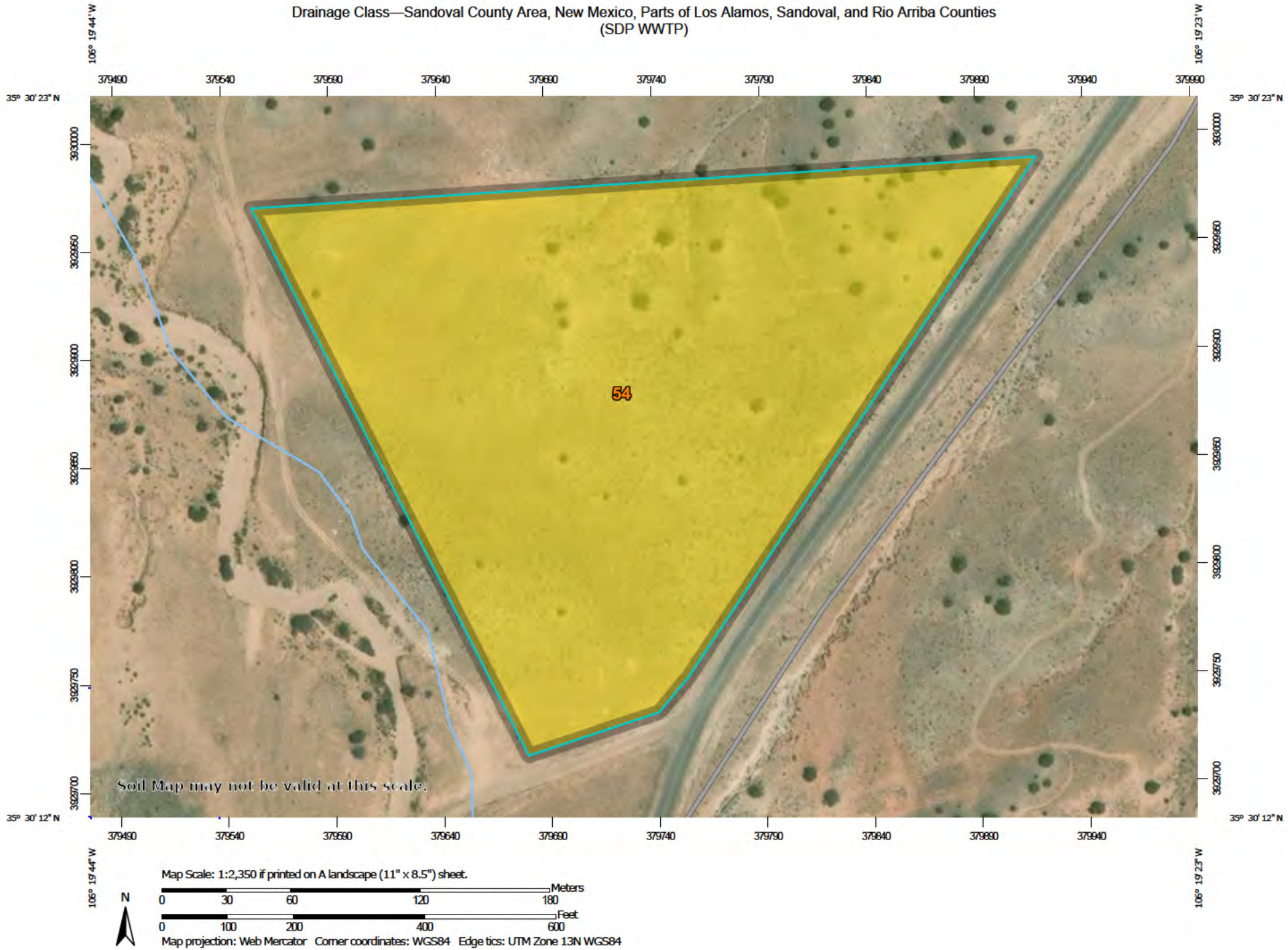
Hydrologic Soil Group and Surface Runoff–Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**

Hydrologic Soil Group and Surface Runoff–Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**
54—Harvey-Cascajo association, 5 to 15 percent slopes			
Harvey	45	Medium	C
Cascajo	40	Low	A

Data Source Information

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 15, Sep 12, 2021

Drainage Class—Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
(SDP WWTP)



Map Scale: 1:2,350 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 15, Sep 12, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 3, 2015—Oct 13, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Drainage Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
54	Harvey-Cascajo association, 5 to 15 percent slopes	Well drained	13.4	100.0%
Totals for Area of Interest			**13.4**	**100.0%**

Description

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix B:

FEMA Results

National Flood Hazard Layer FIRMette

FEMA

106°19'54"W 35°30'32"N



106°19'16"W 35°30'2"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/1/2022 at 6:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix C:

NWI Results

U.S. Fish and Wildlife Service

National Wetlands Inventory

Santo Domingo WWTP Site



January 31, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Appendix D:

USFWS IPaC Results

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Sandoval County, New Mexico



Local office

New Mexico Ecological Services Field Office

(505) 346-2525
(505) 346-2542

2105 Osuna Road Ne
Albuquerque, NM 87113-1001

http://www.fws.gov/southwest/es/NewMexico/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NOT FOR CONSULTATION

NAME	STATUS
New Mexico Meadow Jumping Mouse Zapus hudsonius luteus Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/7965	Endangered

Birds

NAME	STATUS
Mexican Spotted Owl Strix occidentalis lucida Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/8196	Threatened
Southwestern Willow Flycatcher Empidonax traillii extimus Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/6749	Endangered
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Rio Grande Cutthroat Trout Oncorhynchus clarkii virginalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/920	Candidate
Rio Grande Silvery Minnow Hybognathus amarus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/1391	Endangered

Insects

NAME	STATUS

NOT FOR CONSULTATION

Monarch Butterfly Danaus plexippus — Candidate

Wherever found

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9743

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.p

THERE ARE NO MIGRATORY BIRDS OF CONSERVATION CONCERN EXPECTED TO OCCUR AT THIS LOCATION.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

NOT FOR CONSULTATION

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

NOT FOR CONSULTATION

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

NOT FOR CONSULTATION

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

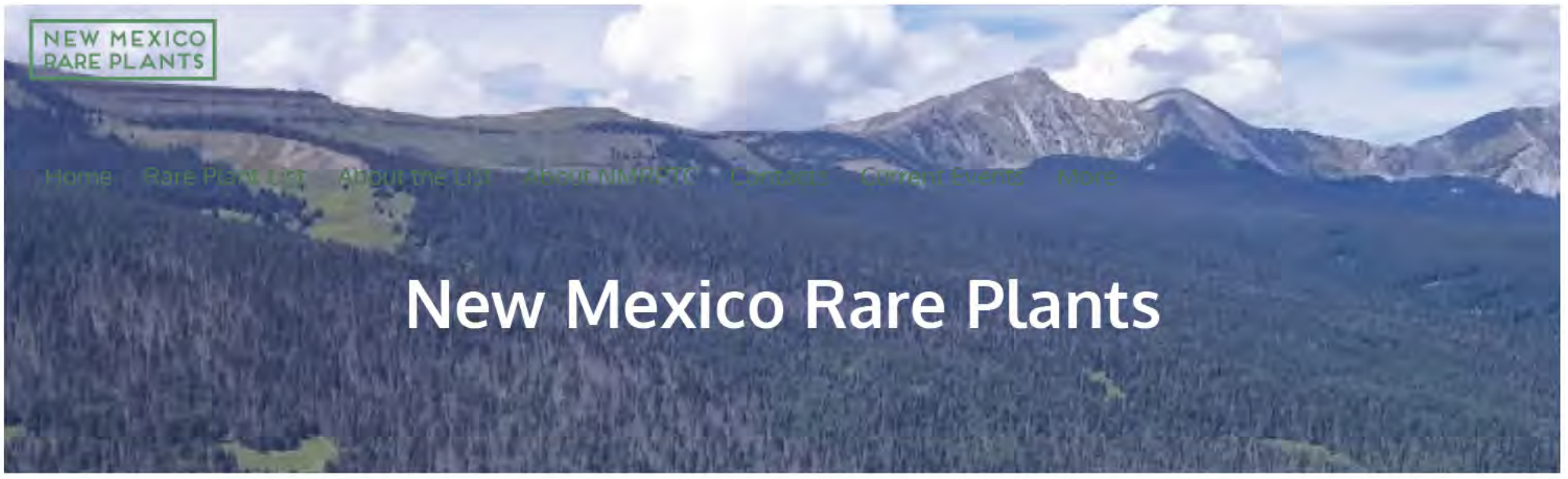
Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in

activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Appendix E:

NM Rare Plants List



Rare Plant List

Search Parameters:
This search is not limited by plant name
Counties: SANDOVAL

Results found: 21

Export CSV | Modify Search

Scientific Name	NMRPTC	FWS	State of NM	USFS	BLM	Navajo Nation	State Rank	Global Rank	Counties
Abronia bigelovii	R			SEN	SEN		S2	G2	RIO ARRIBA,SAN JUAN,SANDOVAL,SANTA FE
Astragalus cliffordii	R						S1	GNR	MCKINLEY,SAN JUAN,SANDOVAL
Astragalus feensis	R						S3	G3	BERNALILLO,HIDALGO,SANDOVAL,SANTA FE,TORRANCE
Astragalus knightii	R				SEN		S2	G2	SANDOVAL
Camissonia scapoidea	D						S4	G5	MCKINLEY,SAN JUAN,SANDOVAL
Dalea scariosa	D						S3	G3	BERNALILLO,SANDOVAL,SOCORRO,VALENCIA
Delphinium robustum	R			SEN			S2	G2G3	COLFAX,RIO ARRIBA,SANDOVAL,TAOS
Delphinium sapellonis	D						S3	G3	BERNALILLO,COLFAX,LOS ALAMOS,MORA,SAN MIGUEL,SANDOVAL,SANTA FE,TAOS,TORRANCE
Epipactis gigantea	D						S2?	G4	EDDY,GRANT,GUADALUPE,HARDING,LOS ALAMOS,OTERO,RIO ARRIBA,SAN JUAN,SAN MIGUEL,SANDOVAL,SANTA FE,SIERRA,TAOS,TORRANCE
Grindelia havardii	D						S3?	G4	CHAVES,EDDY,LINCOLN,SANDOVAL
Heuchera pulchella	R			SEN			S2	G2	BERNALILLO,SANDOVAL,TORRANCE

Scientific Name	NMRPTC	FWS	State of NM	USFS	BLM	Navajo Nation	State Rank	Global Rank	Counties
Lilium philadelphicum var. andinum			E				S3?	G5T4T5	COLFAX,LOS ALAMOS,OTERO,SAN MIGUEL,SANDOVAL,SANTA FE
Mentzelia springeri	R			SEN			S3	G3	LOS ALAMOS,SANDOVAL,SANTA FE
Muhlenbergia arsenei	D						S3	G5	BERNALILLO,LOS ALAMOS,MCKINLEY,SANDOVAL,SANTA FE
Phacelia sivinskii	R						S3	G3	CIBOLA,SANDOVAL,SANTA FE,SOCORRO,VALENCIA
Puccinellia parishii	R		E	SEN	SEN	GP 4	S1	G2G3	CATRON,CIBOLA,GRANT,HIDALGO,MCKINLEY,SA JUAN,SANDOVAL
Sclerocactus cloverae	D		E		SEN	GP 3	S3	G3	RIO ARRIBA,SAN JUAN,SANDOVAL
Sclerocactus papyracanthus	D						S4	G4	BERNALILLO,CIBOLA,DONA ANA,GRANT,LINCOLN,LOS ALAMOS,OTERO,RIO ARRIBA,SANDOVAL,SANTA FE,SIERRA,SOCORRO,TORRANCE
Silene plankii	R						S2	G2	BERNALILLO,DONA ANA,SANDOVAL,SIERRA,SOCORRO,TORRANCE
Spiranthes romanzoffiana	D						S2?	G5	RIO ARRIBA,SAN MIGUEL,SANDOVAL,SANTA FE,TAOS
Townsendia gypsophila	R		E		SEN		S2	G2	SANDOVAL

Click on any name in the list below or type any portion of the scientific or common name into the search box. The search uses wild cards before and after your terms, so for example, typing “vetch” (without the quotation marks) into the search box will bring up all records with vetch in either the scientific or common name. The search also allows for the use of the % and _ wild cards with the same behavior as a SQL LIKE clause

Note: This search function includes synonyms of scientific names. If you are familiar with a New Mexico rare plant under a certain scientific name, but do not see it in the list, try typing in the name you know, or any portion of it, to see if its nomenclature has been updated (e.g., Lesquerella aurea is now Physaria aurea).

Click here for more information about the list.

Scientific Name

Type a Scientific Name

Common Name

Type a Common Name

Strategy Species

Abronia bigelovii
Acarospora clauzadeana
Agalinis calycina
Agastache cana

Dropped Species

Abronia bolackii
Abutilon mollicomum
Abutilon wrightii
Acacia angustissima

County

MCKINLEY
MORA
OTERO
QUAY

Status

- ☐ USFWS
- ☐ State of NM
- ☐ USFS
- ☐ BLM
- ☐ Navajo Nation
- ☐ NMRPTC Rare
- ☐ Strategy Species

Conservation Ranks

NatureServe Global

G1
G1?
G1?Q
G1G2

Heritage State

S1
S1?
S1S2
S2

Overall Conservation Status

NONE
EFFECTIVELY CONSERVED
MODERATELY CONSERVED
UNDER CONSERVED

Search Reset

" Citation: New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. https://nmrareplants.unm.edu (Latest update: 01 Feb 2022).

Natural Heritage New Mexico

New Mexico Rare Plants

Contact Us

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Appendix F:

US Census Data

An official website of the United States government

United States Census Bureau

QuickFacts

Sandoval County, New Mexico; New Mexico; United States

QuickFacts provides statistics for all states and counties, and for cities and towns with a ***population of 5,000 or more.***

Table

All Topics	Sandoval County, New Mexico	New Mexico	United States
Population Estimates, July 1 2021, (V2021)	**⚠ NA**	**⚠ 2,115,877**	**⚠ 331,893,745**
PEOPLE			
Population			
Population Estimates, July 1 2021, (V2021)	**⚠ NA**	**⚠ 2,115,877**	**⚠ 331,893,745**
Population estimates base, April 1, 2020, (V2021)	⚠ NA	⚠ 2,117,522	⚠ 331,449,281
Population, percent change - April 1, 2020 (estimates base) to July 1, 2021, (V2021)	⚠ NA	⚠ -0.1%	⚠ 0.1%
Population, Census, April 1, 2020	148,834	2,117,522	331,449,281
Population, Census, April 1, 2010	131,561	2,059,179	308,745,538
Age and Sex			
Persons under 5 years, percent	⚠ 5.4%	⚠ 5.8%	⚠ 6.0%
Persons under 18 years, percent	⚠ 22.8%	⚠ 22.7%	⚠ 22.3%
Persons 65 years and over, percent	⚠ 18.5%	⚠ 18.0%	⚠ 16.5%
Female persons, percent	⚠ 50.9%	⚠ 50.5%	⚠ 50.8%
Race and Hispanic Origin			
White alone, percent	⚠ 78.2%	⚠ 81.9%	⚠ 76.3%
Black or African American alone, percent (a)	⚠ 2.7%	⚠ 2.6%	⚠ 13.4%
American Indian and Alaska Native alone, percent (a)	⚠ 14.1%	⚠ 11.0%	⚠ 1.3%
Asian alone, percent (a)	⚠ 1.7%	⚠ 1.8%	⚠ 5.9%
Native Hawaiian and Other Pacific Islander alone, percent (a)	⚠ 0.2%	⚠ 0.2%	⚠ 0.2%
Two or More Races, percent	⚠ 3.1%	⚠ 2.6%	⚠ 2.8%
Hispanic or Latino, percent (b)	⚠ 39.9%	⚠ 49.3%	⚠ 18.5%
White alone, not Hispanic or Latino, percent	⚠ 42.5%	⚠ 36.8%	⚠ 60.1%
Population Characteristics			
Veterans, 2015-2019	10,956	144,977	18,230,322
Foreign born persons, percent, 2015-2019	5.3%	9.4%	13.6%
Housing			
Housing units, July 1, 2019, (V2019)	58,146	948,473	139,684,244
Owner-occupied housing unit rate, 2015-2019	78.6%	67.7%	64.0%
Median value of owner-occupied housing units, 2015-2019	$200,900	$171,400	$217,500
Median selected monthly owner costs -with a mortgage, 2015-2019	$1,385	$1,280	$1,595
Median selected monthly owner costs -without a mortgage, 2015-2019	$381	$356	$500
Median gross rent, 2015-2019	$1,117	$844	$1,062
Building permits, 2020	834	5,219[1]	1,471,141
Families & Living Arrangements			
Households, 2015-2019	51,001	780,249	120,756,048
Persons per household, 2015-2019	2.78	2.63	2.62
Living in same house 1 year ago, percent of persons age 1 year+, 2015-2019	89.3%	86.7%	85.8%
Language other than English spoken at home, percent of persons age 5 years+, 2015-2019	26.5%	34.0%	21.6%
Computer and Internet Use			
Households with a computer, percent, 2015-2019	89.9%	85.9%	90.3%
Households with a broadband Internet subscription, percent, 2015-2019	82.7%	74.6%	82.7%
Education			
High school graduate or higher, percent of persons age 25 years+, 2015-2019	89.9%	85.6%	88.0%
Bachelor's degree or higher, percent of persons age 25 years+, 2015-2019	30.5%	27.3%	32.1%
Health			

With a disability, under age 65 years, percent, 2015-2019	8.9%	10.5%	8.6%
Persons without health insurance, under age 65 years, percent	⚠ 9.0%	⚠ 12.0%	⚠ 10.2%
Economy			
In civilian labor force, total, percent of population age 16 years+, 2015-2019	59.4%	57.3%	63.0%
In civilian labor force, female, percent of population age 16 years+, 2015-2019	55.0%	53.6%	58.3%
Total accommodation and food services sales, 2012 ($1,000) (c)	160,981	4,349,672	708,138,598
Total health care and social assistance receipts/revenue, 2012 ($1,000) (c)	284,828	11,236,630	2,040,441,203
Total manufacturers shipments, 2012 ($1,000) (c)	D	29,102,352	5,696,729,632
Total retail sales, 2012 ($1,000) (c)	942,290	25,179,274	4,219,821,871
Total retail sales per capita, 2012 (c)	$6,950	$12,073	$13,443
Transportation			
Mean travel time to work (minutes), workers age 16 years+, 2015-2019	28.0	22.3	26.9
Income & Poverty			
Median household income (in 2019 dollars), 2015-2019	$63,802	$49,754	$62,843
Per capita income in past 12 months (in 2019 dollars), 2015-2019	$29,255	$27,230	$34,103
Persons in poverty, percent	⚠ 10.4%	⚠ 16.8%	⚠ 11.4%
BUSINESSES			
Businesses			
Total employer establishments, 2019	1,764	43,804	7,959,103
Total employment, 2019	24,998	644,537	132,989,428
Total annual payroll, 2019 ($1,000)	1,045,583	28,177,071	7,428,553,593
Total employment, percent change, 2018-2019	3.8%	2.1%	1.6%
Total nonemployer establishments, 2018	8,567	125,925	26,485,532
All firms, 2012	8,666	151,363	27,626,360
Men-owned firms, 2012	3,570	71,132	14,844,597
Women-owned firms, 2012	3,967	59,044	9,878,397
Minority-owned firms, 2012	3,368	60,622	7,952,386
Nonminority-owned firms, 2012	4,908	83,857	18,987,918
Veteran-owned firms, 2012	761	14,096	2,521,682
Nonveteran-owned firms, 2012	7,449	128,693	24,070,685
GEOGRAPHY			
Geography			
Population per square mile, 2010	35.5	17.0	87.4
Land area in square miles, 2010	3,710.65	121,298.15	3,531,905.43
FIPS Code	35043	35	1

About datasets used in this table

Value Notes

1. Includes data not distributed by county.

⚠ Estimates are not comparable to other geographic levels due to methodology differences that may exist between different data sources.

Some estimates presented here come from sample data, and thus have sampling errors that may render some apparent differences between geographies statistically indistinguishable. Click the Quick Info icon to the row in TABLE view to learn about sampling error.

The vintage year (e.g., V2021) refers to the final year of the series (2020 thru 2021). Different vintage years of estimates are not comparable.

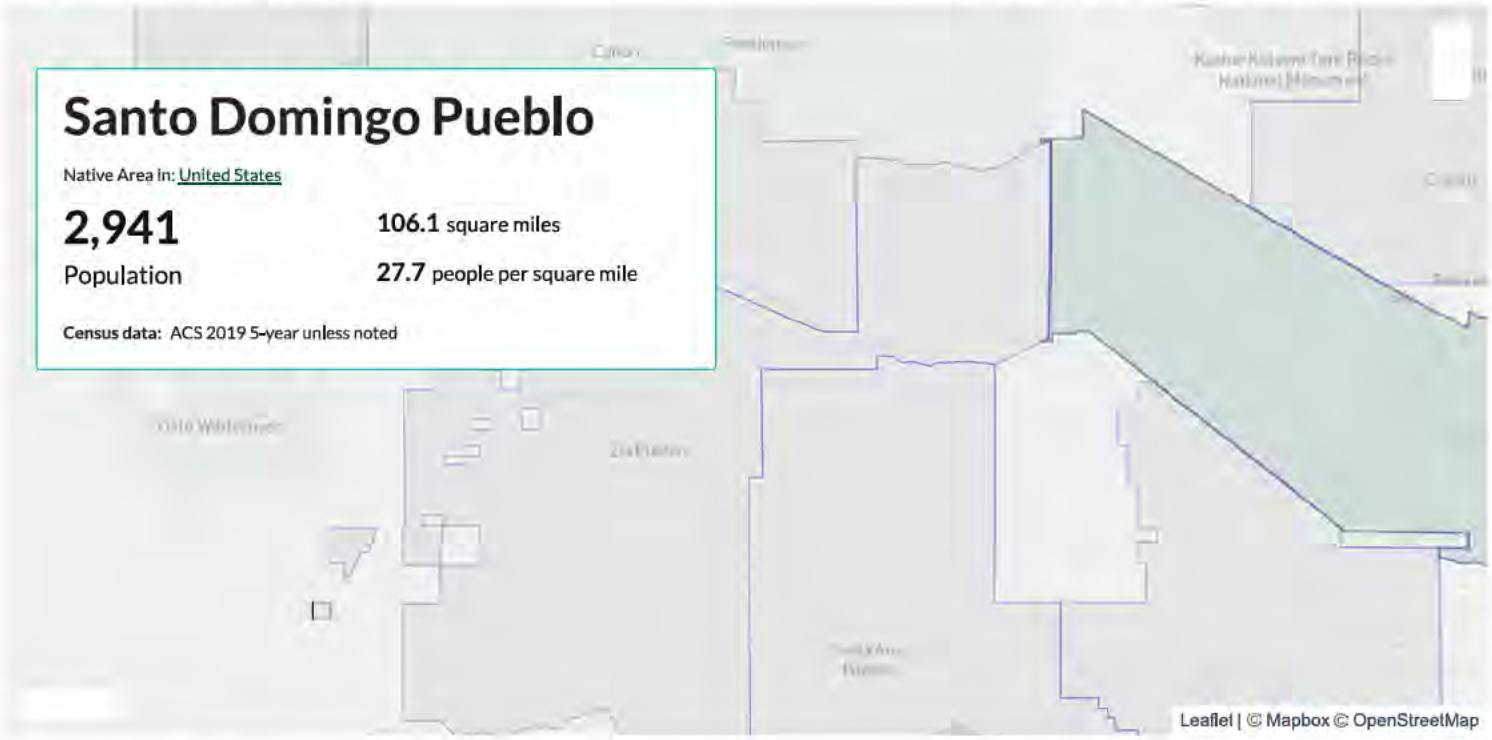
Fact Notes

(a) Includes persons reporting only one race
(c) Economic Census - Puerto Rico data are not comparable to U.S. Economic Census data
(b) Hispanics may be of any race, so also are included in applicable race categories

Value Flags

- Either no or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest or upper int open ended distribution.
F Fewer than 25 firms
D Suppressed to avoid disclosure of confidential information
N Data for this geographic area cannot be displayed because the number of sample cases is too small.
FN Footnote on this item in place of data
X Not applicable
S Suppressed; does not meet publication standards
NA Not available
Z Value greater than zero but less than half unit of measure shown

QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey, Small Area Health Insurance Estimates, Small Area Income and P Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.



Santo Domingo Pueblo

Native Area In: United States

2,941
Population

106.1 square miles

27.7 people per square mile

Census data: ACS 2019 5-year unless noted

Find data for this place Search by table or column name...

Hover for margins of error and contextual data.

Demographics

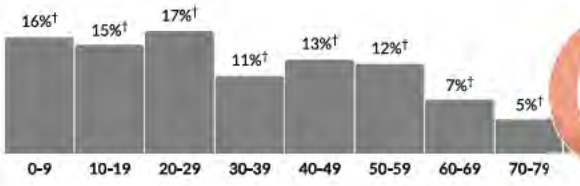
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Age

30.8 ±3.2
Median age

about 80 percent of the figure in United States: 38.1 ±0.1

Population by age range



Show data / Embed

Population by age category



Show data / Embed

Population by age range (Table B01001) View table

Column	Santo Domingo Pueblo				United States			
0-9	16.3%†	±2.3%	480	±92.8	12.3%	±0%	39,925,147	±26,195.8
10-19	15.1%†	±2.1%	444	±84.5	13%	±0%	42,135,464	±26,795.9
20-29	17.1%†	±2.2%	504	±92	13.9%	±0%	45,084,428	±35,540.4
30-39	10.9%†	±1.5%	321	±60.5	13.3%	±0%	43,032,400	±26,537.4
40-49	13.1%†	±1.7%	385	±71.1	12.5%	±0%	40,635,296	±27,254.3
50-59	12.5%†	±1.4%	367	±62.1	13.2%	±0%	42,999,105	±23,100.1
60-69	7.4%†	±1.3%	218	±47.5	11.4%	±0%	36,942,958	±34,900.4
70-79	4.8%†	±1.2%	140	±39.5	6.7%	±0%	21,615,403	±24,082.7
80+	2.8%†	±0.9%	82	±28.2	3.8%	±0%	12,327,594	±18,791.9

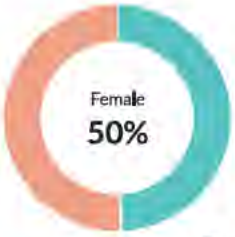
Hide data

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Sex

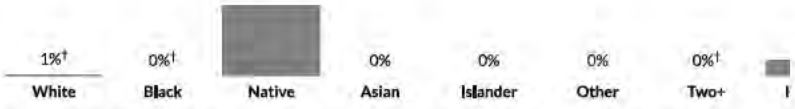
Race & Ethnicity





Male
Female

Show data / Embed



* Hispanic includes respondents of any race. Other categories are non-Hispanic.

Show data / Embed

†
†

†
†

Economics

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Income

$12,238

Per capita income

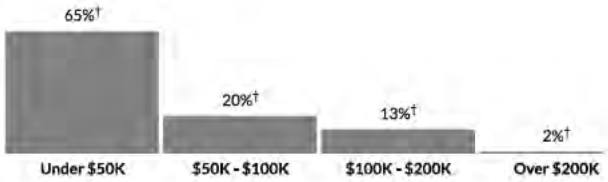
about one-third of the amount in United States: $34,103

$34,356

Median household income

about half the amount in United States: $62,843

Household income



Show data / Embed

Poverty

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

27.3%

Persons below poverty line

about double the rate in United States: 13.4%

Children (Under 18)



Show data / Embed

Seniors (65 and over)



Show data / Embed

Transportation to work

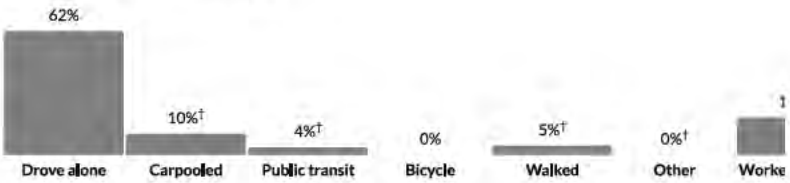
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

35.4 minutes

Mean travel time to work

about 1.3 times the figure in United States: 26.9

Means of transportation to work



* Universe: Workers 16 years and over

Show data / Embed

Families

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Households

601

Number of households

United States: 120,756,048

4.9

Persons per household

nearly double the figure in United States: 2.6

Population by household type



Show data / Embed

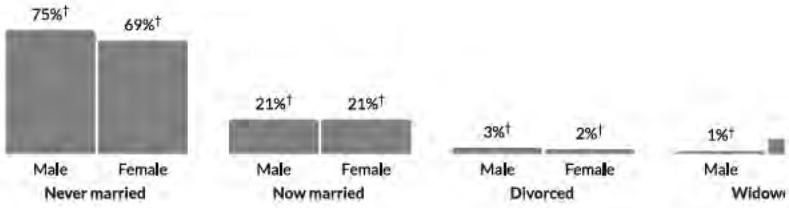
Marital status



* Universe: Population 15 years and over

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Marital status, by sex



Show data / Embed

Fertility

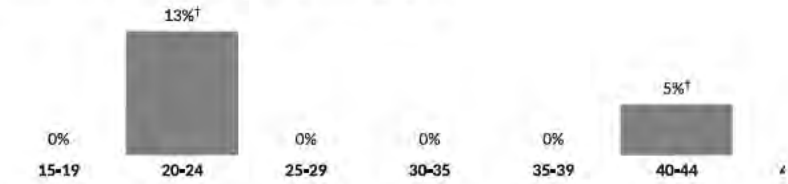
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

3.4%

Women 15-50 who gave birth during past year

about two-thirds of the rate in United States: 5.2%

Women who gave birth during past year, by age group



* Universe: Women 15 to 50 years

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Housing

Units & Occupancy

703

Number of housing units

United States: 137,428,986

Occupied vs. Vacant



Show data / Embed

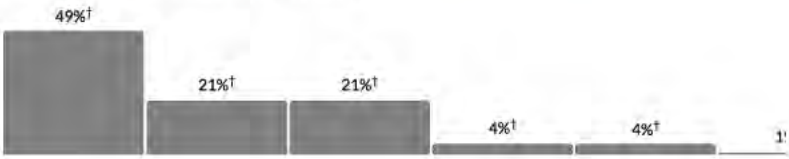
Ownership of occupied units

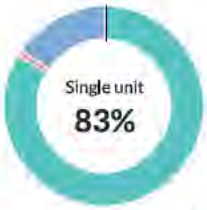


Show data / Embed

Types of structure

Year moved in, by percentage of population





Single unit
Multi-unit
Mobile home
Boat, RV, van, etc.

Before 1990 | 1990s | 2000s | 2010-2014 | 2015-2016 | Since

Show data / Embed

Show data / Embed

Value

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

$161,300

Median value of owner-occupied housing units

about three-quarters of the amount in United States: $217,500

Value of owner-occupied housing units



Show data / Embed

Geographical mobility

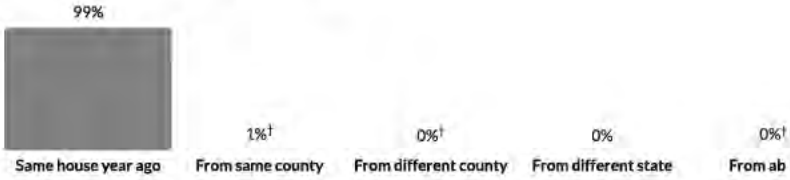
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

1.3%

Moved since previous year

about 10 percent of the rate in United States: 14.2%

Population migration since previous year



Show data / Embed

Social

Educational attainment

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

80.8%

High school grad or higher

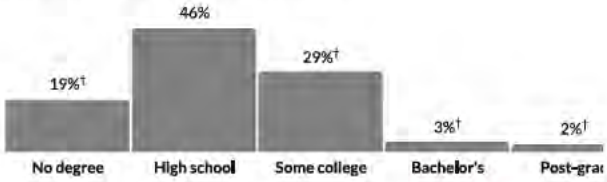
about 90 percent of the rate in United States: 88%

5.8%

Bachelor's degree or higher

about one-fifth of the rate in United States: 32.2%

Population by highest level of education



* Universe: Population 25 years and over

Show data / Embed

Language

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

N/A

Persons with language other than English spoken at home

Language at home, children 5-17



English only
Spanish
Indo-European
Asian/Islander
Other

Show data / Embed

Language at home, adults 18+



English only
Spanish
Indo-European
Asian/Islander
Other

Show data / Embed

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

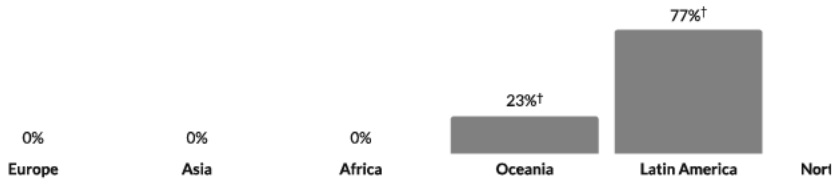
Place of birth

0.4%

Foreign-born population

less than 10 percent of the rate in United States: 13.6%

Place of birth for foreign-born population



Show data / Embed

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Veteran status

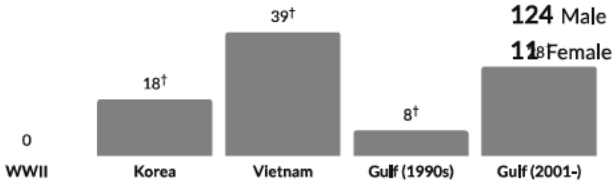
6.4%

Population with veteran status

about 90 percent of the rate in United States: 7.3%

Veterans by wartime service

135 Total veterans
124 Male
11 Female



* Civilian veterans who served during wartime only

Show data / Embed

Hover for margins of error and contextual data.

Citation: U.S. Census Bureau (2019). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Santo Domingo Pueblo* <http://censusreporter.org/profiles/25000US3585-santo-domingo-pueblo/>

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Census Reporter on GitHub

Census Reporter is a free, open-source project. Your donations help us add new data to the site and keep it running.

APPENDIX F

COST ESTIMATES

SANTO DOMINGO PUEBLO WASTEWATER TREATMENT PLANT
ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS FOR DESIGN ANALYSIS REPORT

Updated: 3/30/22

Item	Description	Unit	Estimated Quantity	Unit Price	Amount
WWTP, EFFLUENT DISPOSAL, SUPPORT FACILITIES, SOLID WASTE TRANSFER STATION					
1	Entrance Works Facility. Construct influent screening, flow measurement, and gravity grit channels. Include all excavation, foundation requirements, subgrade preparation, select fill, ordinary fill, structural work, process equipment, piping systems, metal work, coatings, all incidental work, and all associated appurtenances to complete the work in place.	LS	1	$782,000	$782,000
2	Primary Lift Station: Construct primary lift station and valve vault. Include earthwork, structure, piping, fittings, pumps, valves, metal work, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$738,000	$738,000
3	SBR Structure. Construct dual SBR structure with two aerobic sludge holding basins. Include all excavation, foundation requirements, subgrade preparation, select fill, ordinary fill, structural work, process equipment, piping systems, metal work, coatings, all incidental work, and all associated appurtenances to complete the work in place.	LS	1	$6,328,000	$6,328,000
4	Chlorine Contact Basin: Construct chlorine contact basin with effluent flow meter structure. Include earthwork, structure, piping, fittings, flow meter, metal work, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$1,321,000	$1,321,000
5	Infiltration Gallery: Construct infiltration gallery. Include earthwork, select fill, piping, fittings, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$443,000	$443,000
6	Process/Blower/Electrical Building. (a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place. (b) Building Systems: Include materials and installation for building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place. (c) Process/Blower/Electrical Rooms: Include air blowers and piping, SBR control room, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$1,398,000	$1,398,000
7	Dewatering/On-Site Hypochlorite Generation Building. (a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place. (b) Sludge Dewatering Facility: Include materials and installation for gravity belt thickener, polymer feed system, belt conveyor, and all incidental work and associated appurtenances to complete the work in place. (c) On-Site Hypochlorite Generation: Include materials and installation for on-site hypochlorite generation system, salt storage tank and facilities, hypochlorite storage and feed system, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$3,346,000	$3,346,000
8	Sludge Drying Beds. For construction of paved beds, include earthwork, concrete structure, inlet piping, trench drain system, filter panels, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$178,000	$178,000

Item	Description	Unit	Estimated Quantity	Unit Price	Amount
9	Yard Piping. Construct all yard piping including trenching, backfill and compaction, buried piping, outdoor overhead piping, fittings, valves, manholes, flushing, pressure testing, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$1,015,000	$1,015,000
10	Site Work. Include clearing, all earthwork, grading, purchase and hauling of suitable borrow material, drainage, culverts, paved asphalt roads, concrete drive pads, parking, holding pond, riprap work, sidewalks, reclamation seeding, fencing, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$1,241,000	$1,241,000
11	Administration/Laboratory Building. (a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place. (b) Building Systems: Include materials and installation for: building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place. (c) Laboratory: Include all equipment, furnishings, accessories, all piping systems, all incidental work, and associated appurtenances to complete the work in place. (d) Administration: Include all furnishings, accessories, all incidental work, and associated appurtenances to complete the work in place. (e) Electrical: Include all electrical work, instrumentation, controls, SCADA system, and all incidental work and associated appurtenances to complete the work in place. (f) HVAC and Plumbing Work: Include all HVAC equipment and systems, plumbing, all incidental work, and all associated appurtenances to complete the work in place.	LS	1	$3,369,000	$3,369,000
12	Utilities Shop Building. (a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place. (b) Building Systems: Include materials and installation for building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$884,000	$884,000
13	Plant Lift Station: Construct plant lift station and valve vault. Include earthwork, structure, piping, fittings, pumps, valves, metal work, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$391,000	$391,000
14	Plant Electrical Work. Electrical Service and Electrical Site Work: Include electrical service, pad-mounted electrical gear, placing conduits systems between structures, area lighting, on-site generator system, automatic transfer switch, all incidental work, and associated appurtenances to complete the work in place.	LS	1	$797,000	$797,000
15	Electrical - Instrumentation, Integration, and Controls. Include all system programming, instrumentation, controls, SCADA system, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$203,000	$203,000
16	Transfer Station. Construct solid waste transfer station. Include clearing, all earthwork, grading, purchase and hauling of suitable borrow material, drainage, culverts, paved asphalt roads, concrete drive pads, parking, holding pond, riprap work, sidewalks, reclamation seeding, fencing, retaining walls, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$911,000	$911,000
			Subtotal Items 1 to 16		$23,345,000

Item	Description	Unit	Estimated Quantity	Unit Price	Amount
Other Project Construction Requirements					
17	Mobilization, Insurance, and Bonds	LOT	1	$934,000	$934,000
18	Demobilization and Submittal of all Closeout Documents	LOT	1	$117,000	$117,000
19	Prepare and execute Storm Water Pollution Prevention Plan (SWPPP) Compliance per requirements in Section 01 74 17, including all materials and labor, complete in place, for duration of construction period.	LS	1	$25,000	$25,000
20	Construction Staking Services by New Mexico Registered Surveyor	LS	1	$25,000	$25,000
21	Structural Fill and Ordinary Fill additional costs based on quantities beyond those indicated in the Drawings required by unanticipated soil conditions and measured by Professional Surveyor under the requirements of Section 01 71 23.17 and subject to acceptance by the Engineer; and invoiced unit prices.	ALLOW	1	$60,000	$60,000
22	Contingency Allowance During Construction	ALLOW	1	$200,000	$200,000
23	Testing Allowance	ALLOW	1	$60,000	$60,000
			Subtotal Items 17 to 23		$1,421,000.00
Professional Services					
	Design Services @ 11%	LS	1	$2,724,000	$2,724,000
	Specialty Services (Survey, Geotech, etc.) @ 1%	LS	1	$248,000	$248,000
	Construction Administration @ 1%	LS	1	$248,000	$248,000
	Construction Observation @ 2%	LS	1	$495,000	$495,000
			Subtotal Professional Services		$3,715,000
Additive Alternate "A" for Entrance Works Building					
24	Entrance Works Building. (a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place. (b) Building Systems: Include materials and installation for building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place.	LS	1	$324,000	$324,000
Additive Alternate "B" for Construction of Third SBR Basin (Not Equipped)					
25	Third SBR Structure. Include all excavation, foundation requirements, subgrade preparation, select fill, ordinary fill, structural work, piping systems, metal work, coatings, all incidental work, and all associated appurtenances to complete the work in place.	LS	1	$1,435,000	$1,435,000
TOTAL BASE AMOUNT: ITEMS 1 TO 23 and PROFESSIONAL SERVICES (Exclusive of NM Gross Receipts Tax)					**$28,481,000**
TOTAL BASE AMOUNT WITH ADDITIVE ALTERNATE "A": ITEMS 1 TO 23 and PROF. SVCS PLUS ITEM 24 (Exclusive of NM Gross Receipts Tax)					**$28,805,000**
TOTAL BASE AMOUNT WITH ADDITIVE ALTERNATE "B": ITEMS 1 TO 23 and PROF. SVCS PLUS ITEM 25 (Exclusive of NM Gross Receipts Tax)					**$29,916,000**
TOTAL BASE AMOUNT WITH ADDITIVE ALTERNATES "A" and "B": ITEMS 1 TO 23 and PROF. SVCS PLUS ITEMs 24 and 25 (Exclusive of NMGRT)					**$30,240,000**

Note: Includes 10% Local Contractor Factor

01 - Exterior Entrance Works Facility DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 1 - Exterior Entrance Works Facility					
Construct influent screening, flow measurement, and gravity grit channels. Include all excavation, foundation requirements, subgrade preparation, select fill, ordinary fill, structural work, process equipment, piping systems, metal work, coatings, all incidental work, and all associated appurtenances to complete the work in place.					
Structural					
Excavation		cy	335	$30	$10,050
Building Structural Fill		cy	290	$50	$14,500
Foundation Concrete		cy	69	$1,000	$69,000
Cast in Place Concrete		cy	50	$1,200	$60,000
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$168,090	$168,090
Equipment					
Fine Screeen (Quote: 2/24/22)		ls	1	$98,000	$98,000
Parshall Flume		ls	1	$8,000	$8,000
Manual Bar Screen		ls	1	$5,000	$5,000
Fabricated SS Gates		ls	1	$44,000	$44,000
24" Channel Gates quantity: 4					n/a
24" Flush Mounted Channel Gates quantity: 4					n/a
Installation		ls	0.3	$155,000	$46,500
Contractor Markup		ls	0.15	$155,000	$23,250
Portable Sampler:		ls	1	$8,500	$8,500
Interior Walls/Channels Coatings					
Service Condition C2 (walls and floor)		sf	1,260	$13	$16,380
Service Condition C7 (non skid)		sf	450	$9	$4,050
SUBTOTAL					**$575,320**
Undefined Elements	20%				$115,064
General Conditions	5%				$28,766
Shakedown	1%				$5,753
Local Bid Factor	10%				$57,532

TOTAL	$782,000

02 - Primary Lift Station DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 2 - Primary Lift Station					
Construct primary lift station and valve vault. Include earthwork, structure, piping, fittings, pumps, valves, metal work, all incidental work, and associated appurtenances to complete the work in place.					
Structural					
Excavation		cy	968	$30	$29,040
Building Structural Fill		cy	911	$50	$45,550
Foundation Concrete		cy	22	$1,000	$22,000
Cast in Place Concrete		cy	41	$1,200	$49,200
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$191,100	$191,100
Equipment					
Submersible Pumps		ea	3	$25,000	$75,000
Plug Valves		ea	3	$5,500	$16,500
Ball Check Valves		ea	3	$8,500	$25,500
Piping and Misc. Metal		ls	1	$25,000	$25,000
Installation		ls	0.3	$142,000	$42,600
Contractor Markup		ls	0.15	$142,000	$21,300
SUBTOTAL					**$542,790**
Undefine	20.00%				$108,558
General	5.00%				$27,140
Local Bic	10.00%				$54,279
Shakedo	1.00%				$5,428

TOTAL	$738,000

03 - SBR Structure and Equipment DATE: 03/11/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 3 - SBR Structure and Equipment					
Construct dual SBR structure with two aerobic sludge holding basins. Include all excavation, foundation requirements, subgrade preparation, select fill, ordinary fill, structural work, process equipment, piping systems, metal work, coatings, all incidental work, and all associated appurtenances to complete the work in place.					
Structural					
Excavation		cy	5485	$30	$164,550
Building Structural Fill		cy	4097	$50	$204,850
Foundation Concrete		cy	813	$1,000	$813,000
Cast in Place Concrete		cy	870	$1,200	$1,044,000
Handrailing		lf	854	$30	$25,620
Stairs		ls	1	$20,000	$20,000
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$391,625	$391,625
Equipment					
Aqua Aerobics Equipment (3 SBRs)	Quote: 2/10/22	ls	1	$1,205,480	$1,205,480
3 ea. 10" motor operated influent PVs					
3 ea. 15 HP DDM Mixers for SBRs					
3 ea. Floating Decanter Assemblies					
3 ea. Submersible Transfer Pumps					
18 ea. Retrievable Fine Bubble Diffuser Assemblies					
1 ea. Portable Electric Winch					
5 ea. 125 HP PD Blowers					
4 ea. 10" motor operated air control valves					
3 ea. Pressure transducer assemblies					
3 ea. Level sensor assemblies					
3 ea. Dissolved Oxygen probes and assemblies					
2 ea. 10 HP DDM Mixers for Sludge Holding Basins					
2 ea. 3 HP submersible sludge transfer pumps					
4 ea. Retrievable Coarse Bubble Diffuser Assemblies					
2 ea. 75 HP PD Blowers					
2 ea. Level sensor assemblies					
Controls Package					
Quote for 3 SBRs: $1,403,770					
Quote for 2 SBRs (3/8/22): $1,205,480					
Telescoping Valves for Sludge Basins (2 ea)		ls	1	$30,000	$30,000
				$1,235,480	
Equipment Installation		ls	0.3	$1,235,480	$370,644
Contractor Mark Up		ls	0.15	$1,235,480	$185,322
Piping Systems					
Influent Feed Piping		ls	1	$8,000	$8,000
SBR and Sludge Basin Aeration Piping		ls	1	$18,000	$18,000
Sludge Piping		ls	1	$12,000	$12,000
Interior Wall Coatings					
Full height of interior walls		sf	12,276	$13	$159,588
SUBTOTAL					**$4,652,679**
Undefined Elements	20.00%				$930,536
General Conditions	5.00%				$232,634
Shakedown	1.00%				$46,527
Local Bid Factor	10.00%				$465,268

TOTAL	$6,328,000

04 - Chlorine Contact Basin DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 4 - Chlorine Contact Basin					
Construct chlorine contact basin with effluent flow meter structure. Include earthwork, structure, piping, fittings, flow meter, metal work, all incidental work, and associated appurtenances to complete the work in place.					
Structural					
Excavation		cy	1033	$30	$30,990
Building Structural Fill		cy	780	$50	$39,000
Foundation Concrete		cy	318	$1,000	$318,000
Cast in Place Concrete		cy	283	$1,200	$339,600
Handrailing		lf	530	$30	$15,900
Stairs		ls	1	$15,000	$15,000
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$98,670	$98,670
Equipment					
Flash Mixer		ls	1	$9,000	$9,000
Piping and fittings		ls	1	$9,000	$9,000
Parshall Flume		ls	1	$8,000	$8,000
Sluice Gates		ea	4	$6,000	$24,000
Aluminum Grating		sf	170	$40	$6,800
Fabricated SS Gates		ls	1	$22,000	$22,000
24" Flush Mounted Channel Gates quantity: 4					n/a
Contractor Markup		ls	15%	$78,800	$11,820
Contractor Installation		ls	30%	$78,800	$23,640
SUBTOTAL					**$971,420**
Undefined Elements	20.00%				$194,284
General Conditions	5.00%				$48,571
Local Bid Factor	10.00%				$97,142
Shakedown	1.00%				$9,714

TOTAL	$1,321,000

05 - Infiltration Gallery DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 5 - Infiltration Gallery					
Construct infiltration gallery. Include earthwork, select fill, piping, fittings, all incidental work, and associated appurtenances to complete the work in place.					
Site Clearing		sy	14400	$5	$72,000
Berm Construction		cy	4120	$50	$206,000
Road Base		sy	2747	$10	$27,470
16" PVC Pipe		lf	900	$500	$450,000
16" Butterfly Valves and Valve Boxes		ea	20	$7,500	$150,000
Rip Rap at Pipe Outlets		sy	267	$75	$20,025
SUBTOTAL					**$925,495**
Undefined Elements	20.00%				$185,099
General Conditions	5.00%				$46,275
Local Bid Factor	10.00%				$92,550
Shakedown	1.00%				$9,255

TOTAL	$1,259,000

05A - Infiltration Gallery DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 5 - Infiltration Gallery - Simplified Version w/Two Cells and Minimal Piping					
Construct infiltration gallery. Include earthwork, select fill, piping, fittings, all incidental work, and associated appurtenances to complete the work in place.					
Site Clearing		sy	14400	$5	$72,000
Berm Construction		cy	2936	$50	$146,800
Road Base		sy	1957	$10	$19,570
16" PVC Pipe		lf	140	$500	$70,000
16" Butterfly Valves and Valve Boxes		ea	2	$7,500	$15,000
Rip Rap at Pipe Outlets		sy	27	$75	$2,025
SUBTOTAL					**$325,395**
Undefined Elements	20.00%				$65,079
General Conditions	5.00%				$16,270
Local Bid Factor	10.00%				$32,540
Shakedown	1.00%				$3,254

TOTAL	$443,000

Cost Savings Compared to Initial Version: ($816,000)

06 - Process/Blower/Electrical Building DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 6 - Process/Blower/Electrical Building					
(a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place.					
(b) Building Systems: Include materials and installation for building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place.					
(c) Process/Blower/Electrical Rooms: Include air blowers and piping, SBR control room, and all incidental work and associated appurtenances to complete the work in place.					
Building and Structural					
Note: Unit costs based on Anthony WWTP Cost Estimate					
Structural (unit cost from QPEC 3/9/22)		sf	2,000	$45	$90,000
Architectural		sf	2,000	$81	$162,000
Mechanical		sf	2,000	$47	$94,000
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$460,395	$460,395
Equipment					
1 ton monorail trolley and hoist (manual) for blowers (installed)		ls	1	$12,000	$12,000
Contractor Markup		ls	0.15	$12,000	$1,800
Air Piping and Valves (from Anthony WWTP Cost Estimate)					
14" steel pipe (welded), hot dipped galvanized:					
Spool, pe x pe, 3" long		ea	2	$144	$288
Spool, pe x pe, 20ft long		ea	1	$4,343	$4,343
Spool, pe x flg, 10'-3" long		ea	1	$3,067	$3,067
Spool, pe x flg, 5'-3" long		ea	1	$1,899	$1,899
Spool, pe x pe, 4'-4" long		ea	4	$305	$1,220
Spool, pe x flg, 9'-10" long		ea	1	$2,974	$2,974
Spool, pe x flg, 5'-0" long		ea	1	$1,840	$1,840
14" steel, 90 degree bend, pe ends, HDG		ea	4	$991	$3,964
14x14x8 steel, reducing tee, 6" branch flg, HDG		ea	5	$1,851	$9,255
14" full lug butterfly valve, stainless steel, high temperature servcie, chain wheel operator		ea	2	$11,110	$22,220
14" steel expansion joints with control rods, HDG		ea	2	$950	$1,900
8" steel pipe (welded), hot dipped galvanized:					
Spool, pe x flg, 1'-4" long		ea	5	$503	$2,515
Spool, pe x flg, 8'-3" long		ea	5	$1,334	$6,670
8" steel base elbow, flg ends, HDG		ea	5	$996	$4,980
8" rubber expansion joint, high temperature, flg ends		ea	5	$1,825	$9,125
8" steel, 90 degree bend, pe ends		ea	5	$249	$1,245
8" full lug butterfly valve, stainless steel, high temperature service, lever operator		ea	5	$4,200	$21,000
8" steel expansion joint with control rods, HDG		ea	6	$580	$3,480
Fixed pipe supports, 11ft high, HDG		ea	5	$1,360	$6,800
Adjustable pipe supports		ea	5	$100	$500
Installation		ls	0.6	$109,285	$65,571
Contractor Markup		ls	0.3	$109,285	$32,786
SUBTOTAL					**$1,027,837**
Undefined Elements	20.00%				$205,567
General Conditions	5.00%				$51,392
Local Bid Factor	10.00%				$102,784
Shakedown	1.00%				$10,278
TOTAL					$1,398,000

07 - Dewatering/On-Site Hypochlorite Generation Building DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 7 - Dewatering/On-Site Hypochlorite Generation Building					
(a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place.					
(b) Sludge Dewatering Facility: Include materials and installation for gravity belt thickener, polymer feed system, belt conveyor, and all incidental work and associated appurtenances to complete the work in place.					
(c) On-Site Hypochlorite Generation: Include materials and installation for on-site hypochlorite generation system, salt storage tank and facilities, hypochlorite storage and feed system, and all incidental work and associated appurtenances to complete the work in place.					
Building and Structural					
Note: Unit costs based on Anthony WWTP Cost Estimate					
Structural (unit cost from QPEC 3/9/22)		sf	2,800	$45	$126,000
Architectural		sf	2,800	$80	$224,000
Mechanical		sf	2,800	$47	$131,600
Canopy Over Rolloff Container		sf	920	$90	$82,800
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$103,090	$103,090
Equipment					
Belt Filter Press (Quote: 3/14/22)		ls	1	$797,000	$797,000
Access Platform Around BFP		ls	1	$45,000	$45,000
Polymer Feed System (Quote: 2/16/22)		ls	1	$30,000	$30,000
Belt Conveyor (Quote: 2/25/22)		ls	1	$72,000	$72,000
Skid-Mounted Washwater System		ls	1	$156,000	$156,000
On-Site Hypochlorite Gen. System (Quote: 3/2/22)		ls	1	$187,250	$187,250
		ls	1		$0
Installation		ls	0.3	$1,287,250	$386,175
Contractor Markup		ls	0.15	$797,000	$119,550
SUBTOTAL					**$2,460,465**
Undefined Elements	20.00%				$492,093
General Conditions	5.00%				$123,023
Shakedown	1.00%				$24,605
Local Bid Factor	10.00%				$246,047
TOTAL					$3,346,000

08 - Sludge Drying Beds DATE: 03/01/22

Santo Domingo Pueblo

ITEM			UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Bid Item 6 - Sludge Drying Beds						
For construction of paved beds, include earthwork, concrete structure, inlet piping, trench drain system, filter panels, all incidental work, and associated appurtenances to complete the work in place.						
Concrete Work						
Perimeter and Interior Wall Footings			cy	40.0	$1,000	$40,000
Entrance Ramps			cy	18.0	$700	$12,600
Earthwork and Grading			ls	1.0	$10,000	$10,000
Other Items						
SS Wedgewire Filter Panel Assembly in Galv Frame			sf	480	$100	$48,000
Asphalt Pavement						
Area =	356 sy	for 2 beds	sy	356.0	$60	$21,360
SUBTOTAL						**$131,960**
Undefined Elements		20%				$26,392
General Conditions		5%				$6,598
Shakedown		0% not applicable				$0
Local Bid Factor		10%				$13,196
TOTAL						$178,000

09 - Yard Piping DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 9 - Yard Piping					
Construct all yard piping including trenching, backfill and compaction, buried piping, outdoor overhead piping, fittings, valves, manholes, flushing, pressure testing, all incidental work, and associated appurtenances to complete the work in place.					
Yard Piping					
Influent Sewer - 16" PVC, C900, DR18		lf	300	$500	$150,000
Forcemain from Primary LS to SBR - 12" PVC, C900		lf	214	$450	$96,300
Decant from SBR to Cl2 Basin - 16" PVC, C900, DR18		lf	250	$500	$125,000
Sludge to Dewatering - 6" PVC, C900		lf	100	$300	$30,000
Sludge to Drying Beds - 6" PVC, C900		lf	160	$300	$48,000
Washwater - CL2 to WW Skid - 3" PVC, C900		lf	70	$150	$10,500
Site Washwater - 2" PVC, C900		lf	760	$90	$68,400
Building and Structure Drains to Primary LS - 6" PVC, C900		lf	500	$300	$150,000
Forcemain from Plant LS to Primary LS - 4" PVC, C900		lf	370	$200	$74,000
SUBTOTAL					**$752,200**
Undefined Elements	20.00%				$150,440
General Conditions	5.00%				$37,610
Local Bid Factor	10.00%				$75,220
Shakedown	0.00% not applicable				$0
TOTAL					$1,015,000

10 - Site Work DATE: 03/01/22

Santo Domingo Pueblo

	ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 10 - Site Work						
Include clearing, all earthwork, grading, purchase and hauling of suitable borrow material, drainage, culverts, paved asphalt roads, concrete drive pads, parking, holding pond, riprap work, sidewalks, reclamation seeding, fencing, and all incidental work and associated appurtenances to complete the work in place.						
	SDP WWTP - WWTP AND ADDITIONAL BUILDINGS					
1	Site Clearing and Grubbing		AC	9.7	$2,500.00	$24,250.00
2	Site Grading less than 2'		S.Y.	25000	$5.00	$125,000.00
3	Earthen Pond Excavation		C.Y.	3220	$15.00	$48,300.00
4	12" Subgrade Prep, to 95% Compaction, CIP		S.Y.	10120	$3.50	$35,420.00
5	6" Base Course - Access Road and Other areas		S.Y.	9500	$12.00	$114,000.00
6	3" SP III Asphalt Pavement, CIP		S.Y.	3280	$25.50	$83,640.00
7	4" Concrete Sidewalk - Admin Building		S.Y.	400	$72.00	$28,800.00
8	6" Reinforced Concrete Slab		S.Y.	230	$107.00	$24,610.00
9	6" Standard Curb and Gutter, CIP		L.F.	100	$45.00	$4,500.00
10	24" CMP Culvert, incl. Trenching, installation, and backfill. CIP		L.F.	220	$165.00	$36,300.00
11	24 CMP End Section, incl. all appurtenances, and installation, CIP.		EA	16	$1,300.00	$20,800.00
12	3-4" Nominal Rip Rap for Slopes incl Filter Fabric and Placement, CIP		CY	35	$85.00	$2,975.00
13	9" Nominal Rip Rap for Rundown incl Filter Fabric and Placement, CIP		CY	10	$165.00	$1,650.00
14	6" Dia. DIP Pipe Bollard, 5', concrete filled, 2'8" Embedment, CIP		EA	20	$1,000.00	$20,000.00
15	New 7' Chain-link Security Fencing, complete in place.		L.F.	2570	$45.00	$115,650.00
16	New 7' Chain-link Security Gate, complete in Place		EA	6	$5,500.00	$33,000.00
17	New 7' Motorized Security Gate, CIP		EA	1	$25,000.00	$25,000.00
18	Parking bumpers		EA	30	$500.00	$15,000.00
19	Facility Signing and Striping		LS	1	$20,000.00	$20,000.00
20	Mobilization		LS	1	$45,000.00	$45,000.00
21	SWPPP Preparation and Installation		LS	1	$10,000.00	$10,000.00
22	Traffic Control		LS	1	$10,000.00	$10,000.00
23	Material Testing		ALLOW	1	$10,000.00	$10,000.00
24	Construction Staking		LS	1	$15,000.00	$15,000.00
25	Preauthorized Construction Changes		ALLOW	1	$30,000.00	$30,000.00
26	Utility Relocation and Connection		ALLOW	1	$20,000.00	$20,000.00
Retaining Walls (included in Structrual Estimate)						
SUBTOTAL						**$918,895**
Undefined Elements		20.00%				$183,779
General Conditions		5.00%				$45,945
Local Bid Factor		10.00%				$91,890
Shakedown		0.00%	not applicable			$0

TOTAL	$1,241,000

11 - Administration/Laboratory Building DATE: 03/01/22

Santo Domingo Pueblo .

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 11 - Administration/Laboratory Building					
(a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place.					
(b) Building Systems: Include materials and installation for: building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place.					
(c) Laboratory: Include all equipment, furnishings, accessories, all piping systems, all incidental work, and associated appurtenances to complete the work in place.					
(d) Administration: Include all furnishings, accessories, all incidental work, and associated appurtenances to complete the work in place.					
(e) Electrical: Include all electrical work, instrumentation, controls, SCADA system, and all incidental work and associated appurtenances to complete the work in place.					
(f) HVAC and Plumbing Work: Include all HVAC equipment and systems, plumbing, all incidental work, and all associated appurtenances to complete the work in place.					
Building and Structural					
Note: Unit costs based on Anthony WWTP Cost Estimate					
Structural (unit cost from QPEC 3/9/22)		sf	8,140	$55	$447,700
Architectural		sf	8,140	$180	$1,465,200
Mechanical		sf	8,140	$48	$390,720
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$192,140	$192,140
SUBTOTAL					**$2,495,760**
Undefined Elements	20.00%				$499,152
General Conditions	5.00%				$124,788
Local Bid Factor	10.00%				$249,576
Shakedown	0.00% not applicable				$0
TOTAL					$3,369,000

12 - Utilities Shop Building DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 12 - Utilities Shop Building					
(a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place.					
(b) Building Systems: Include materials and installation for building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place.					
Building and Structural					
Note: Unit costs based on Anthony WWTP Cost Estimate					
Structural (unit cost from QPEC 3/9/22)		sf	1,800	$45	$81,000
Architectural		sf	1,800	$180	$324,000
Mechanical		sf	1,800	$48	$86,400
Sheds for Natural Resources Department		sf	600	$90	$54,000
Canopy for Covered Parking		sf	800	$90	$72,000
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$37,505	$37,505
SUBTOTAL					**$654,905**
Undefined Elements	20.00%				$130,981
General Conditions	5.00%				$32,745
Local Bid Factor	10.00%				$65,491
Shakedown	n/a				n/a
TOTAL					**$884,000**

13 - Plant Lift Station DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 13 - Plant Lift Station					
Construct plant lift station and valve vault. Include earthwork, structure, piping, fittings, pumps, valves, metal work, all incidental work, and associated appurtenances to complete the work in place.					
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$89,700	$89,700
Precast Structure: 6ft Dia x 12ft D					
Excavation, imported backfill, select fill, concrete, foundation prep		ls	1	$56,000	$56,000
Concrete, foundation prep		ls	1	$53,400	$53,400
Equipment					
Submersible Pumps		ea	2	$13,000	$26,000
Plug Valves		ea	2	$4,000	$8,000
Ball Check Valves		ea	2	$6,500	$13,000
Piping and Misc. Metal		ls	1	$14,000	$14,000
Contractor Markup		ls	15%	$61,000	$9,150
Contractor Installation		ls	30%	$61,000	$18,300
SUBTOTAL					**$287,550**
Undefined Elements	20.00%				$57,510
General Conditions	5.00%				$14,378
Local Bid Factor	10.00%				$28,755
Shakedown	1.00%				$2,876
TOTAL					$391,000

14 - Plant Electrical Work DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 14 - Plant Electrical Work					
Electrical Service and Electrical Site Work: Include electrical service, pad-mounted electrical gear, placing conduits systems between structures, area lighting, on-site generator system, automatic transfer switch, all incidental work, and associated appurtenances to complete the work in place.					
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$586,300	$586,300
SUBTOTAL					**$586,300**
Undefined Elements	20.00%				$117,260
General Conditions	5.00%				$29,315
Local Bid Factor	10.00%				$58,630
Shakedown	1.00%				$5,863

TOTAL	$797,000

15 - Electrical - Instrumentation, Integration, and Controls DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 15 - Instrumentation, Integration, and Controls					
Include all system programming, instrumentation, controls, SCADA system, and all incidental work and associated appurtenances to complete the work in place.					
Electrical					
From Electrical Estimate dated 3-7-22		ls	1	$149,500	$149,500
SUBTOTAL					**$149,500**
Undefined Elements	20.00%				$29,900
General Conditions	5.00%				$7,475
Local Bid Factor	10.00%				$14,950
Shakedown	1.00%				$1,495
TOTAL					$203,000

16 - Transfer Station DATE: 03/01/22

Santo Domingo Pueblo

ITEM			UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item 16 - Transfer Station						
Construct solid waste transfer station. Include clearing, all earthwork, grading, purchase and hauling of suitable borrow material, drainage, culverts, paved asphalt roads, concrete drive pads, parking, holding pond, riprap work, sidewalks, reclamation seeding, fencing, retaining walls, and all incidental work and associated appurtenances to complete the work in place.						
	SDP WWTP - TRANSFER STATION					
1	Site Clearing and Grubbing		AC	1.8	$2,500.00	$4,500.00
2	Site Grading less than 2'		S.Y.	4400	$5.00	$22,000.00
3	Earthen Pond Excavation		C.Y.	400	$15.00	$6,000.00
4	Tipping Floor Pad Fill, hauled from excavation		C.Y.	7000	$7.00	$49,000.00
5	12" Subgrade Prep, to 95% Compaction, CIP		S.Y.	3200	$3.50	$11,200.00
6	6" Base Course - Driveway / Temp Access Road		S.Y.	2988	$12.00	$35,856.00
7	3" SP III Asphalt Pavement, CIP		S.Y.	1380	$21.00	$28,980.00
8	6" Reinforced Concrete Slab		S.Y.	215	$80.00	$17,200.00
9	6" Standard Curb and Gutter, CIP		L.F.	60	$45.00	$2,700.00
10	24" CMP Culvert, incl. Trenching, installation,		L.F.	75	$165.00	$12,375.00
11	24 CMP End Section, incl. all appurtenances, and		EA	6	$1,300.00	$7,800.00
12	3-4" Nominal Rip Rap for Slopes incl Filter Fabric		CY	35	$85.00	$2,975.00
13	9" Nominal Rip Rap for Rundown incl Filter		CY	5	$105.00	$525.00
14	New 7' Chain-link Security Fencing, complete in		L.F.	1300	$45.00	$58,500.00
15	New 7' Chain-link Security Gate, complete in		EA	6	$5,500.00	$33,000.00
16	Retaining Wall 1' -5' Tall, Cast Concrete gravity		L.F.	250	$364.00	$91,000.00
17	Retaining Wall 5' -10' Tall, Cast Concrete gravity		L.F.	170	$654.00	$111,180.00
18	Cantilever Retaining Wall 10' Tall, Cast Concrete		L.F.	100	$654.00	$65,400.00
19	Parking bumpers		EA	15	$500.00	$7,500.00
20	Facility Signing and Striping		LS	1	$10,000.00	$10,000.00
21	6" Dia. DIP Pipe Bollard, 5', concrete filled, 2'8"		EA	20	$1,000.00	$20,000.00
22	Mobilization		LS	1	$35,000.00	$35,000.00
23	SWPPP Preparation and Installation		LS	1	$5,000.00	$5,000.00
24	Traffic Control		LS	1	$5,000.00	$5,000.00
25	Material Testing		ALLOW	1	$5,000.00	$5,000.00
26	Construction Staking		LS	1	$12,000.00	$12,000.00
27	Preauthorized Construction Changes		ALLOW	1	$10,000.00	$10,000.00
SUBTOTAL						**$669,691**
Undefined Elements		20.00%				$133,938
General Conditions		5.00%				$33,485
Local Bid Factor		10.00%				$66,969
Shakedown		1.00%				$6,697

TOTAL	$911,000

A - Entrance Works Building DATE: 03/01/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item A - Entrance Works Building					
(a) Building Structure and Shell: Construct pre-engineered metal building structure, including all excavation, foundation requirements, subgrade preparation, select fill, and ordinary fill, structural work, all incidental work, and associated appurtenances to complete the work in place. (b) Building Systems: Include materials and installation for building work, metal work, coating systems, and all incidental work and associated appurtenances to complete the work in place.					
Building and Structural					
Note: Unit costs based on Anthony WWTP Cost Estimate					
Structural		sf	1,152	$45	$51,840
Architectural		sf	1,152	$80	$92,160
Mechanical		sf	1,152	$47	$54,144
Electrical		sf	1,152	$35	$40,320
SUBTOTAL					**$238,464**
Undefined Elements	20.00%				$47,693
General Conditions	5.00%				$11,923
Local Bid Factor	10.00%				$23,846
Shakedown	1.00%				$2,385
TOTAL					**$324,000**

B - Third SBR Basin DATE: 03/11/22

Santo Domingo Pueblo

ITEM		UNIT	QUANT	UNIT PRICE	COST ESTIMATE
Item B - Third SBR Basin					
Include all excavation, foundation requirements, subgrade preparation, select fill, ordinary fill, structural work, piping systems, metal work, coatings, all incidental work, and all associated appurtenances to complete the work in place.					
Structural					
Excavation		cy	1656	$30	$49,680
Building Structural Fill		cy	1127	$50	$56,350
Foundation Concrete		cy	303	$1,000	$303,000
Cast in Place Concrete		cy	272	$1,200	$326,400
Handrailing		lf	288	$30	$8,640
Stairs		ls	1	$20,000	$20,000
SBR Equipment					
Difference between 3-Basin and 2-Basin Quotes (See SBR Cost Estimate Worksheet)		ls	1	$198,290	$198,290
Piping Systems					
Influent Feed Piping		ls	1	$10,000	$10,000
SBR and Sludge Basin Aeration Piping		ls	1	$10,000	$10,000
Sludge Piping		ls	1	$10,000	$10,000
Decant from SBR to Cl2 Basin - 16" PVC, C900, DR18		lf	150	$500	$75,000
Structure Drain to Primary LS - 6" PVC, C900		lf	130	$300	$39,000
Interior Wall Coatings					
Full height of interior walls		sf	4,224	$13	$54,912
SUBTOTAL					**$1,055,242**
Undefined Elements	20.00%				$211,048
General Conditions	5.00%				$52,762
Local Bid Factor	10.00%				$105,524
Shakedown	1.00%				$10,552
TOTAL					$1,435,000