



Santa Rita Wastewater Treatment Plant Alternative Site Investigation

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Prepared by:
Mulhern MRE, Inc. and Hatch Mott MacDonald
2 Inverness Drive East, Suite 200
Englewood, CO 80112
303-649-9857
303-414-0671 (f)

City of Durango

Santa Rita Wastewater Treatment Plant
Alternative Site Investigation

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SANTA RITA WASTEWATER TREATMENT PLANT ALTERNATIVE SITING INVESTIGATION

EXECUTIVE SUMMARY

The City of Durango recently completed the study entitled “City of Durango, Nutrient Engineering Report, Wastewater Treatment Plant Facility Plan (“BNR Study”), prepared by Dewberry Engineers, Inc. in October, 2014. The study determined that the existing Santa Rita Wastewater Treatment Plant (“Santa Rita Plant”) was “operating at capacity and is in need of improvements to meet future growth and regulatory requirements.” The BNR Study identified improvements required and provided a cost estimate for renovation and expansion of the Santa Rita Plant at its existing site, including biological nutrient removal that will be required by the plant at its next permit renewal in February of 2018. The project cost of improvements was estimated at \$58.2 million.

Prior to authorizing this study, Members of the City Council and the Utilities Commission, in its advisory role to Council, questioned whether this major renovation should occur at the existing treatment plant site, which is located at the southern edge of the downtown area as shown in **Figure 1**. This location is at the City’s southern gateway along Highway 160, and is directly adjacent to one of the City’s primary recreational features, the Animas River. The Animas River in this reach has a long run of white water rapids used extensively by whitewater rafting companies and kayakers. The City has constructed a competition kayak park in the river at this location, which also abuts the City’s Santa Rita Park. In addition, throughout the year the river is a focal point of activity with a biking/walking trail beginning at this location and continuing south for the next 3.7 miles.

In response to those concerns, the BNR Study scope was modified to include a cursory review of an alternative to move the plant about 4 miles downstream of this sensitive recreational area. This requires a lift station and over 4 miles of wastewater conveyance facilities. The study was done at a very conceptual level and a project cost of \$95.2 million was estimated for this alternative.

After the study, concerns were raised that the relocation alternative was not studied in sufficient depth, and that the costs provided seemed conservatively high. This resulted in City Council directing the City Manager to request proposals for a more detailed study of an alternative to relocate the existing plant to a new downstream site. Mulhern MRE, Inc. was retained to complete this investigation with Hatch Mott MacDonald as a sub-consultant. This study was to identify potential downstream sites for a plant, to investigate in detail 3 pipeline conveyance alternatives to transport wastewater to a new site, and to provide cost estimates for the total relocation including treatment plant, pipeline and pumping system necessary to relocate the plant.

This study identified and investigated two alternatives to move the plant to a new location. The La Posta Alternative would move the plant approximately 4.5 miles downstream to the La Posta

Area south of the Rivera Bridge on the Koshak Mesa. Ten acre sites to relocate the plant were available at several locations on the Koshak Mesa generally across the river from the existing South Durango Treatment Plant as shown on **Figure 5**. This alternative would move the plant to a location on the mesa, away from the river, to an area that could benefit from the City’s investment in wastewater treatment and conveyance pipelines by providing infrastructure needed for future development. These facilities would be in addition to ongoing water infrastructure investment in the La Posta Area as the City extends water pipelines to a new water treatment plant planned near Nighthorse Reservoir. This infrastructure development is beneficial to this area, and could be a catalyst for development of new residential and commercial projects since there is little available land for these uses closer to the City.

In addition to this alternative, the study identified the possibility of relocating the plant closer to the existing plant by pumping the wastewater to a new location off the river. The only site identified that could potentially work for this use is what is called the Pepsi Site, the site of an old Pepsi Distributing Company that is now owned by La Plata County. This site is directly north of the La Plata County Jail, as shown on **Figure 7**. The site is not currently “for sale” and La Plata County does not currently have an identified use for the site, although it is being studied as part of a county facilities master plan. This alternative, which includes two potential pipeline alignments, would either require an easement across the Animas La Plata Conservancy District pumping station site across the river from the Santa Rita Plant as shown on **Figure 18** if Alignment PS-A on this plan is selected, or would require a new wastewater lift station on a portion of the Cundiff Park property, adjacent to the BMX track as shown on **Figure 21**, if Alignment PS-B shown on **Figure 19** is selected.

A comparison of costs for rehabilitating and expanding the plant on the Santa Rita Site versus the cost of relocating the plant per the alternatives described above is contained in the following **Table A**.

Table A – Capital Costs for Alternative Treatment Plant Locations

Alternative	Treatment Plant Cost	Lift Station Costs	Conveyance Pipelines	Land	Total Project Cost
Santa Rita	\$58,194,000				\$58,194,000
La Posta	\$62,370,000	\$5,010,000	\$20,511,000	\$5,857,000	\$93,748,000
Off-River*	\$63,110,000	\$5,010,000	\$7,320,000	\$3,833,000	\$79,273,000

* Assumes interceptor/force main alignment through Cundiff Park, Alignment PS-B. If easement can be acquired through the La Plata Water Conservancy District Pumping Plant Site, cost reduction could be as much as \$2 million.

The costs of relocating the plant downstream to the La Posta Site would require an investment of approximately \$93.8 million, which is about \$35.6 million greater than the cost of renovating and expanding the existing Santa Rita Plant. A plant at La Posta, however, would generate future tap fees as development occurs and the City could expect, over time, to recover additional investment of an estimated \$3.5 million at today’s current City tap fee. Operating costs for the conveyance

and lift station to convey wastewater onto the Koshak Mesa are as shown in **Table B**, and would add a net present value cost of \$8.4 million as the operating cost of conveyance over the next 20 years. If the plant is not moved to this location, the best means of serving this area is likely through the South Durango Sanitation District.

Table B – La Posta Site Operating Cost

Parameter	Construction Cost	O&M Factor	Annual Operating/O&M Cost	20-Yr Net Present Value
Lift Station	a	b	c = (a*b)	d = c*20
Structure	\$975,000	0.02	\$19,500	\$390,000
Equipment	\$2,715,000	0.04	\$108,600	\$2,172,000
Lighting Cost			\$631	\$13,000
Heating/Cooling Cost			\$1,080	\$22,000
Pumping Power			\$60,000	\$1,200,000
Conveyance Pipelines				
Conveyance Pipelines	\$16,310,000	0.014	\$228,340	\$4,566,800
		TOTAL	\$419,000	\$8,364,000

If the Pepsi Site were to be available through La Plata County, the alternative to relocate the plant to that site would require an investment estimated at \$79.3 million, or a cost of about \$21.1 million more than renovating and expanding the existing plant. Operating costs for this alternative are shown in **Table C**, and would add an additional \$6.2 million in operating costs over the next 20 years.

Table C – Off-River Pepsi Site Operating Cost

Parameter	Construction Cost	O&M Factor	Annual Operating/O&M Cost	20-Yr Net Present Value
Lift Station	a	b	c = (a*b)	d = c*20
Structure	\$975,000	0.02	\$19,500	\$390,000
Equipment	\$2,715,000	0.04	\$108,600	\$2,172,000
Lighting Cost			\$631	\$13,000
Heating/Cooling Cost			\$1,080	\$22,000
Pumping Power			\$95,000	\$1,900,000
Conveyance Pipelines				
Conveyance Pipelines	\$6,090,000	0.014	\$85,260	\$1,705,200
		TOTAL	\$311,000	\$6,203,000

The major objective of moving the wastewater treatment plant from its existing site and away from the recreational uses of the river are achieved by either of these alternatives. The added benefit of the La Posta Alternative is that the investment in the plant and facilities may be a catalyst to allow

development in this area for residential and commercial uses that are in demand. The downside of this alternative is the high cost, and construction of some 4.5 miles of large capacity sewer mains in difficult and environmentally sensitive areas. There will need to be several new river crossings and the new pipelines will require operation and maintenance by the City. Any time large pipelines are located adjacent to or crossing rivers, there is an increased risk of failures that could result in spills to the river.

The benefit of the Pepsi Site, if it were to be available, is that the large diameter conveyance system to reach the site is only about 1.5 miles compared to 4.5 miles to the La Posta Site, and only about half of that distance is along the river corridor.

Costs estimated for the La Posta Alternative are similar to those reported for a relocation in the BNR Study (\$93.8 million versus \$95.2 million). Costs estimated for the Pepsi Site Alternative are significantly less than the La Posta Alternative but are still \$21.1 million greater than the cost of renovating and expanding the plant at the Santa Rita Site, before considering additional operating costs. Costs estimated for the treatment plant are less than those reported in the BNR Study. This cost differential is largely due to 3 factors as follows: First, this study estimates lower costs for excavation from new plant sites where excavation could be done by large earthmoving equipment that could not be used at the existing Santa Rita Site. Second, the elimination of odor control covers and ventilation systems on facilities such as the secondary treatment basins and the clarifiers where odors are often not a problem in less sensitive areas. Third, there are construction efficiencies on a new site where there is more room to work and where concrete forms and other construction materials can be effectively reused.

However, in regard to the wastewater conveyance systems, more detailed study identified many issues associated with constructing sewers in rugged terrain and across rivers. This resulted in cost estimates higher than those of the BNR Study to relocate to the La Posta Site. These costs are much less, however, for the Pepsi Alternative because of the shorter distance to a relocation site.

The lowest cost alternative by a large margin is the Santa Rita Alternative to maintain the plant in its current location. The plant can be moved downstream to the La Posta Area at an additional capital cost of \$35.6 million, and an additional net present value of \$8.4 million in operating costs over the next 20 years. This is an extremely high cost to relocate the plant, and the additional benefits of moving the plant to this location appear minor, given that the South Durango District is in a position to serve this site.

The plant can also be moved off-river to the Pepsi Site at an additional capital cost of \$21.1 million, and an additional net present value of \$6.2 million in operating costs over the next 20 years. However, this option is subject to the availability of the property which is owned by La Plata County.

The BNR Study indicates that the existing Santa Rita facility can be renovated, expanded and operated at this site, and odor control can be very effective with the plant as proposed. The benefit

to moving the plant is primarily one of aesthetics, and must be weighed against the additional capital and operating costs.

DRAFT

INTRODUCTION AND PURPOSE

In 2012, the Colorado Department of Public Health and Environment (“CDPHE”) issued new regulations for nutrient discharges from wastewater treatment plants. In 2014, the City of Durango was awarded a grant to study the options for biological nutrient removal at its wastewater treatment plant. The City retained Dewberry Engineers, Inc. (“Dewberry”) to complete the study and in October of 2014, Dewberry published the “City of Durango, Nutrient Engineering Report, Wastewater Treatment Plant Facility Plan” (“BNR Study”) under contract to the City. This report indicated that the Santa Rita Wastewater Treatment Plant (“Santa Rita Plant”), although consistently meeting its discharge permit requirements and operating below its rated capacity, “is operating at capacity and is in need of improvements to meet future growth and regulatory requirements.”

The study then identified and analyzed a number of treatment alternatives, and recommended a major plant rehabilitation and revision at the existing site to provide capacity for build-out of the service area, and to meet the upcoming requirements for nutrient removal. The study recommended that the City begin immediate implementation of the new wastewater facility that would be completed in two phases.

The BNR Study presents costs as “Construction Costs” and “Project Costs”. Construction costs are the contractor costs, including labor and materials, to construct the facility. Project costs add engineering design, construction services and other administrative costs associated with a project. For consistency in presentation and comparisons, costs in this report are all project costs, unless otherwise noted.

In the BNR Study, Phase 1, which is the major plant rehabilitation, is estimated to cost \$58.2 million, and implementation is estimated at 39 months. Phase 2 is tertiary treatment for nutrient removal which is estimated to cost an additional \$7.2 million. Phase 2 would be implemented when, and if required, once the CDPHE has determined the specific requirements for nutrient removal at the Durango Plant. The City has subsequently modified the phasing plan whereby Phase 1 was divided into 2 phases, the first being Secondary Treatment and Capacity Improvements at a cost of \$41 million, and the second being Odor Control Improvements amounting to about \$17 million, with tertiary treatment to follow as required.

Since the proposed plant revisions are very extensive and require this very large investment in the Santa Rita Plant at a Project Cost of \$58.2 million, the City of Durango questioned whether this renovation should occur at the existing treatment plant site which is located at the southern edge of the downtown area as shown in **Figure 1**. This location is at the City’s southern gateway along Highway 160, and is directly adjacent to one of the City’s primary recreational features, the Animas River. The Animas River in this reach has a long run of white water rapids used extensively by commercial whitewater rafting companies as well as recreational rafters and kayakers. The City has constructed a competition kayak park in the river at this location, which also abuts the City’s Santa Rita Park. In addition, throughout the year the river is a focal point of



FIGURE
1

JULY 2015

SANTA RITA PLANT
EXISTING PLANT



Mulhern
MRE, Inc
2 Inverness Drive East, Suite 200
Durango, CO 81312
(303) 648-9827

activity with a biking/walking trail beginning at this location and continuing south for the next 3.7 miles.

Hence, the Animas River is a valuable resource and focal point for recreation for the City of Durango, and the location of the City’s wastewater treatment plant adjacent to this area is undesirable and problematic. The primary concern voiced by residents relates to odors from the plant experienced by the many recreational users of the river corridor. In addition, the plant buildings, while designed to mask and conceal the use, are very industrial in nature and utilize land that could be available for expansion of the park and an improved recreational experience.

In addition, the City of Durango is largely landlocked by its surrounding topography, and areas where the potential for expansion continues to exist are largely south of town. While wastewater treatment for much of this area is currently provided by the South Durango Sanitation District (“South Durango”), a City treatment plant located further south could serve as a catalyst to open additional land for development, and located far enough south, would be away from primary recreational areas.

This led the City to revise the scope of the BNR Study to add an alternative that looked at moving the wastewater treatment plant to a location near the existing South Durango wastewater plant, approximately 4.5 miles downstream. The analysis provided a cursory, or “high level” review of a plant relocation, and estimated Project Costs for a new plant at \$72.7 million, and an additional \$22.5 million for a lift station and force mains to transport the wastewater. With a very rough cost estimate of \$95.2* million in total, compared to \$58.2 million, the BNR Study recommended renovation and expansion of the plant at the Santa Rita Site. These costs are summarized in **Table 1**.

Table 1. BNR Study Cost Summary

Site	Treatment Plant Cost (millions)	Conveyance/Lift Station (millions)	Total Cost (millions)
Santa Rita (existing)	\$58.2		\$58.2
Near So. Durango Plant	\$72.7*	\$22.5	\$95.2*

*Original cost presented in BNR Study was \$99.0 million. This cost was reduced by \$3.8 million due to there being two dewatering equipment options included. Only one option is needed.

When results of the alternative analysis were presented, concerns were raised that the alternative was not studied in sufficient depth to reach the conclusion that a relocation was not economically viable. Specifically, concerns were raised that costs for the alternative seemed conservatively high and lacked detail. In response, the City decided to complete a more in-depth study of potential sites, capital and operating costs, and the benefits of relocating the plant well to the south of town.

Mulhern MRE, Inc., with Hatch Mott MacDonald as sub-consultant, was retained by the City to complete this more in-depth analysis of the option of relocating the wastewater treatment plant

further south. The City had previously identified 3 additional sites located between the existing Santa Rita Plant and the “High Bridge” on Highway 160 over the Animas River, approximately 1.5 miles downstream. These sites have been eliminated, prior to this study, because of their encroachment on sensitive river environment and because of proximity to commercial and retail businesses. Therefore, this study was to investigate sites located south of the High Bridge.

Specifically, this study identifies alternative sites, determines alternative alignments for wastewater conveyance through gravity or force main pipelines, and evaluates capital costs for treatment and both capital and operating costs for conveyance. The study compares the option of moving the plant south to maintaining the plant on the current site, and presents the costs as well as the advantages and disadvantages of each alternative.

In considering the relocation of the plant, it is important that the extended conveyance systems for wastewater be located and installed in a manner that allows for safe and proper operation and maintenance of pipelines, provides for redundancy where access is difficult, such as at river crossings, and provides safety features in the event of pipeline or pumping system failures. Precautions are proposed throughout the system to provide facilities to minimize the potential for wastewater spills into the river.

Simply stated, the purpose of this study is to provide additional information to the City for policy makers to decide whether the City should consider relocating the Santa Rita Plant to a downstream site. While there appears to be consensus among City leaders that it is desirable to move the plant, the key considerations are the capital cost, the long term operating costs and the ability to move the plant and convey wastewater in an environmentally safe and cost effective manner. If the City determines that it is not economically viable to move the plant at this time, this study provides recommendations for pursuing relocation at the later date. In that case, the existing Santa Rita Plant must be utilized for a minimum of 20 years in order to justify the use of borrowed funds that will be invested in the existing facility.

NUTRIENT ENGINEERING REPORT – WASTEWATER TREATMENT PLANT FACILITY PLAN, REVIEW AND SUMMARY

Plant Requirements – The Colorado Water Quality Control Commission adopted nutrient control regulations in 2012 that, collectively, set water quality standards for Colorado’s surface waters and numeric nutrient effluent limits for wastewater dischargers. Regulation 85 – Nutrients Management Control Regulation, is a new regulation that requires wastewater dischargers to meet effluent limits for Total Inorganic Nitrogen (TIN) and Total Phosphorus (TP). The TIN and TP limits are to be implemented during normally scheduled discharge permit renewals. The Santa Rita Plant currently operates under discharge permit number CO-0024082 which is set to expire at midnight on February 28, 2018. Upon renewal of this permit, the Santa Rita Plant will be required to meet projected nutrient effluent limits of 15 mg/L TIN and 1 mg/L TP. The Santa Rita Plant

does not currently have any TIN or TP limits and is not equipped, upon analysis of the existing treatment process, to meet the future effluent limits.

Proposed Processes – The BNR Study analyzed several liquid and solid stream treatment/processing alternatives to meet the projected nutrient effluent limits as well as upgrade the Santa Rita Plant’s solid residuals from Class B to Class A biosolids. Planning level estimates for construction and total project costs, annual operation and maintenance (O&M), and net present values for the alternatives were presented in the study to form a basis for comparison.

The secondary process stream is critical for biological nutrient removal and received thorough consideration in the BNR Study. The BNR Study identified the Johannesburg process, membrane bioreactors (MBR), and integrated fixed-film activated sludge (IFAS) as appropriate technologies for the needed biological nutrient removal. Of the three technologies, the Johannesburg process was chosen as the recommended alternative because of its “ease of operation, its perceived greenness, its low construction and operational cost, and its ability to be modified to meet potentially more strict effluent requirements in the future.” The BNR Study recommended the Johannesburg process for both the major plant rehabilitation at the Santa Rita Plant site and for a new WWTP constructed elsewhere.

The solids at the Santa Rita Plant are currently treated by anaerobic digestion, producing a thin (two-percent solids) liquid classified as Class B biosolids. The BNR Study assessed four technologies that can treat the solids residual stream to produce Class A biosolids: pasteurization, lime addition, thermophilic digestion, and drying. Of the four technologies, drying was chosen despite its higher cost because it produces a dry pellet that is more likely to be accepted and used by the general public than the “semi-solid toothpaste like product” produced by the other alternatives. Using a dryer to produce Class A biosolids necessitates a second anaerobic digester being built at the Santa Rita Site for redundancy, or two new anaerobic digesters constructed at a new WWTP.

Alternative Siting – The BNR Study primarily focused on implementing the Johannesburg process and other required upgrades at the existing Santa Rita Plant site. The Study also provided some information and a planning level cost estimate for a new WWTP located approximately four miles south of the Santa Rita Plant at the existing South Durango Sanitation District plant. The proposed location, however, is ill-suited for a WWTP of the necessary size due to the topography of that area. An estimated 10 acres of generally flat land is needed for a WWTP of sufficient size to treat Durango’s projected build-out wastewater flows. The South Durango Sanitation District plant sits on approximately three acres of flat land.

Cost Estimates – Planning level opinions of probable construction and project costs for the rehabilitation/upgrade of the Santa Rita Plant and a new WWTP constructed at a different site were provided in the BNR Study. The plant upgrades recommended in the BNR Study come in two phases. Phase I includes all of the improvements necessary to meet the projected nutrient effluent limits when the discharge permit is renewed. Phase II includes an additional secondary clarifier and tertiary filtration, facilities that are potentially necessary if further nutrient regulations are

enforced as part of Regulation 31 – The Basic Standards and Methodologies for Surface Water. An analysis of the Phase II improvements is not included in this study. The BNR Study’s project cost estimate for the Phase I improvements at the existing Santa Rita Plant is shown in **Table 2**.

Table 2. BNR Study’s Project Costs for Santa Rita Plant Improvements

Description	Total Project Cost
Headworks	\$4,184,000
Septage/FOG Receiving	\$1,948,000
Primary Clarifier Rehab	\$2,868,000
Johannesburg Secondary Process	\$22,858,000
Sidestream Treatment	\$1,908,000
Redundant Anaerobic Digester	\$6,640,000
Solids Dewatering	\$4,148,000
Class A Biosolids - Sludge Drying	\$3,719,000
Administration/Lab Building	\$6,714,000
UV Disinfection	\$3,207,000
Total Project Cost	\$58,194,000

The BNR Study’s project cost estimate for a new WWTP located near the South Durango Sanitation District plant is shown in **Table 3**.

Table 3. BNR Study’s Project Costs for a New WWTP

Description	Total Project Cost
Headworks	\$4,185,000
Primary Clarifiers	\$4,551,000
Secondary Process/Thickening	\$28,161,000
Anaerobic Digestion	\$13,280,000
Dewatering – Screw Press	*
Sidestream Treatment	\$1,908,000
Class A Biosolids - Sludge Drying	\$3,719,000
UV Disinfection	\$3,208,000
Lift Station	\$4,434,000
Forcemain	\$18,027,000
Chemical Building	\$881,000
Administration/Lab Building	\$6,714,000
Septage/FOG Receiving	\$1,948,000
Dewatering - Fourneir	\$4,149,000
Total Project Cost	\$95,165,000*

*Original cost presented in BNR Study was \$99.0 million. This cost was reduced by \$3.8 million due to there being two dewatering equipment options included. Only one option is needed.

In reviewing the cost estimate for the relocated WWTP, it was noted that 2 dewatering options were apparently inadvertently included in the Project Costs. This report has eliminated one of those options, maintaining the Fournier dewatering technology. Therefore, the Project Costs for this alternative in **Table 3** were reduced from \$98,969,000 in the original study to the \$95,165,000 shown herein. This study has then made additional revisions to costs at a new site to reflect construction efficiencies and the elimination of some odor control facilities felt to be unnecessary at a relocated site. More specifically, large earth movers can be used at open, green-field sites for excavations that cannot be used at the existing site, decreasing excavation costs. Due to the constrained nature of the existing WWTP site, temporary shoring and sheeting is anticipated to be required for deeper excavations. Green-field sites can often eliminate the need for temporary shoring and sheeting of excavations which can be a significant portion of excavation costs. In addition, facilities such as the primary clarifiers, BNR, and secondary clarifiers can be constructed partially above-grade, further reducing excavation costs. Cost efficiency is typically realized with new construction on a green-field site as multiple structures and tanks of same configuration can utilize the same construction methods, such as gang forms for concrete placement. Additionally, construction material delivery and staging and construction operations can be scheduled to maximize efficiencies without being impacted by on-going daily operations at an existing plant site. Finally, if the WWTP is located in a relatively undeveloped area, or industrial area, covers and odor control facilities for the primary clarifiers and secondary treatment may not be necessary. These revisions were incorporated into the development of opinions of probable project costs for alternatives developed as part of this report.

Review and Discussion of the BNR Study – A review of the BNR Study was conducted as part of this report. The following presents a review of the treatment process.

Johannesburg BNR Process - The Johannesburg biological nutrient removal (BNR) process was selected for the upgrade of the existing WWTF. This process was selected by the City as the option that best aligned with City goals of being environmentally conscious and providing for sustainability. BNR can be accomplished using a variety of activated sludge processes. BNR's typically use rectangular, plug-flow reactors and have been successfully used in Colorado for biological nutrient removal to meet similar nutrient effluent limits when coupled with secondary clarifiers. The Johannesburg process, and others, for BNR operation provides a configuration that allows for biological removal of both nitrogen and phosphorus. Other configurations of a BNR, such as the Modified Ludzack Ettinger process (MLE), may be used for nitrogen removal only. The Johannesburg process is one of several suspended growth BNR processes that are configured to provide anaerobic, anoxic, and aerobic zones to achieve the desired carbon, nitrogen, and phosphorus treatment limits. As Durango is facing nutrient limits with the upcoming permit renewal in 2018 for both nitrogen and phosphorus, the Johannesburg process is a reasonable process selection for Durango.

Other Treatment Processes - In addition to using traditional rectangular, plug-flow reactors with secondary clarifiers, BNR processes can also be accomplished using other basin configurations, such as oxidation ditches with secondary clarifiers. Variations of the common suspended growth processes, such as integrated fixed film activated sludge (fixed film), and

membrane bioreactors (MBR's), which can reduce the treatment basin footprint, were also evaluated by Dewberry. The underlying biological treatment mechanisms for each of the alternatives are fundamentally the same, so the selection of the preferred process ultimately comes down to considerations such as capital and operating costs, energy efficiency, land area, operability, scalability, ability to meet future regulations, and other factors that are specific to each application, in addition to other factors that are important to the owner, such as perceived greenness.

Oxidation Ditches with Secondary Clarifiers – Oxidation ditches were discussed by City staff as being an alternative that was developed after the BNR Study was completed. The following discussion is included to review that alternative.

Typically, when seeking to achieve biological nutrient removal for both nitrogen and phosphorus an oxidation ditch is not a preferred technology. This is not to say that they will not work, but only to say that other technologies have been shown to be more suitable. Here are a few items to consider if an oxidation ditch is selected for treatment of Durango's wastewater:

- Oxidation ditches typically require more land area than a BNR process to achieve the same level of treatment. Additionally, multiple tanks may be necessary in addition to the oxidation ditch.
- Oxidation ditches may not be as energy efficient.
- Oxidation ditch process modifications can be more difficult and when adjustments are required to achieve the desired effluent, additional tanks or partitions may need to be constructed after the facility is in operation.
- Future plant capacity expansion is more difficult.

Conclusions and Assumptions for this Study

Process Selection and Cost – The City's selection of the Johannesburg process appears sound and this process will be used for development of the opinion of probable cost for a new WWTF at a new site. Class A Bio-solids are assumed for each alternative using the drying process selected for use at the Santa Rita Site.

- Growth and buildout population will not change based upon WWTP location.
- Projected wastewater flow and strength will not change based upon WWTP location.
- The same number of process trains and process tanks of similar size and configuration, and equipment size and type as identified in the BNR Study are used for this study.
- Generally the same number, footprint, and purpose of buildings identified in the BNR Study are used for this study. Estimates were made for the size of new buildings where existing buildings were being repurposed at the existing WWTP site.

- Equipment, process, and facility costs presented in the Dewberry BNR Study were generally used, where appropriate, for development of the opinion of probable cost for a new WWTP.

Demolition/Decommission - Several assumptions were made while producing opinions of probable cost for the demolition/decommission of the Santa Rita Plant:

- Where applicable, existing facilities were re-purposed. For example, the primary clarifiers would remain to provide emergency storage to aid in maintenance and repair of downstream facilities.
- Concrete structures would be demolished to three feet below-grade. Backfill and top soil would then cover the concrete that is remaining.
- Concrete rubble would be processed on-site and would be used for pipe bedding. Steel rebar recovered in the process would be salvaged and sold for recycled use. Structures with substantial below-grade components would be filled with the concrete rubble generated on-site. Some hauling may prove to be necessary but was not explicitly included in the opinions of probable cost generated for this report.

Construction of New WWTP - Several assumptions were made while producing opinions of probable cost for the construction of a new WWTP:

- Covers and odor control systems are not necessary for many facilities at a WWTP located outside of the developed portions of the City. Offensive odors at a WWTP often originate from the headworks and solids handling portions of the facility. These odors can be putrid and travel significant distance generating odor complaints from neighboring land users. While the secondary treatment process such as the BNR and secondary clarifiers do produce odors, these are generally earthy or musty and remain in close proximity to the tanks. Odor control was included in the alternative site evaluations to minimize the impact of offensive odors from the headworks and solids handling portions of the WWTP. Tank covers and odor control for the primary and secondary processes was not included. If odors become problematic in the future, odor control can be added at that time.
- Excavation is more economical at an unconstrained site. Large earth movers can be used to reduce excavation costs.
- Several facilities can be constructed partially above-grade to further reduce excavation costs.
- Approximately 10 acres of relatively flat land is required.

Operation and Maintenance Cost for New WWTP - As a new wastewater treatment plant at a different location will use the same processes, the operation and maintenance costs are anticipated to be approximately the same regardless of where the treatment plant is located. Thus, operation and maintenance costs are not considered in the treatment plant evaluation. Operational costs for a new lift station will be an additional cost that must be

considered in the relocation of the WWTP. Operation and maintenance costs were developed for the lift stations and conveyance pipelines associated with each alternative.

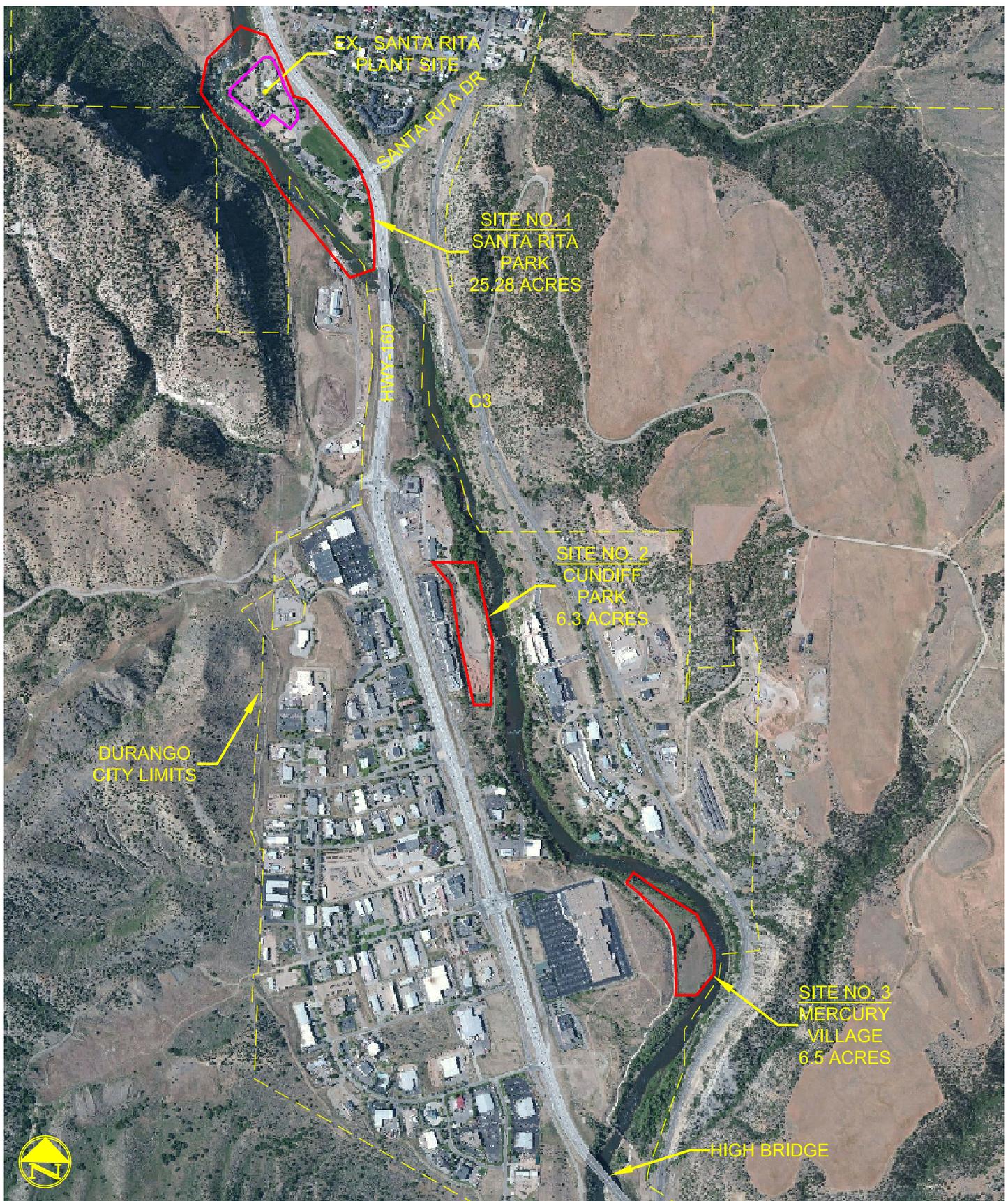
During the course of this project the City (and/or its representatives) provided the consultant team with a variety of technical data including reports, drawings, costs, presentations and other data. The consultant team did not independently assess or test for the accuracy of such data – historic or projected. We have relied on this data in the formulation of our findings and subsequent recommendations, as well as in the preparation of this report. As is often the case, there will be differences between actual and projected data, and actual and projected costs, and these differences may be significant. Costs are presented in today’s value and no effort was made to project costs to future time. Therefore, the consultant team takes no responsibility for the accuracy of data or projections provided by or prepared on behalf of the City, or future cost increases or decreases.

SITING ALTERNATIVES

In recent consideration of moving the wastewater treatment plant to a downstream location, 3 potential sites were identified by the City of Durango Utilities Commission. These include Site No. 1, portion of Santa Rita Park; Site No. 2, Cundiff Park located on the west side of the Animas River approximately 1.3 miles downstream; and Site No. 3, Mercury Village Open Space, again located on the west side of the Animas River approximately 1.8 miles downstream and just east of the Mercury Office Building. These sites are all shown on **Figure 2**.

These sites were all considered by the City prior to authorizing this study. Relocation of the plant to any of these 3 sites all raised environmental and recreational concerns similar to those experienced at the existing Santa Rita site. That is, a new plant would encroach upon park and recreational property along the river, and would impact property dedicated as either active or passive open space with high visibility to recreational users. In addition, these sites, the largest of which is 6.5 acres, are too small and awkward in shape to accommodate the requirements of a new plant as identified in the BNR Study. The small sites would unduly restrict the development of a new plant and would leave little room for future revision or expansion. Therefore, this study concurs with previous findings that these 3 sites should not receive further consideration given the lack of usable property and the goals to relocate the plant in an area of impact to recreational uses.

In considering potential sites for a relocation, the land requirements for a new plant were developed using the final recommendations from the BNR Study. A layout of these facilities was prepared for an efficient, rectangular site, as shown in **Figure 3**. In considering a new facility at a new location, which is intended to meet the needs for treatment over the next 30 to 50 years, the site should include sufficient land for easy and efficient construction, and should have sufficient excess land within the site for future revisions or expansions that may be necessary to meet future regulations or accommodate unforeseen development. This site plan meets these requirements and can be readily accommodated on a 10 acre site. Therefore, while the plant could be sited on a smaller amount of property, this study looked for 10 acre parcels as the desired site area.



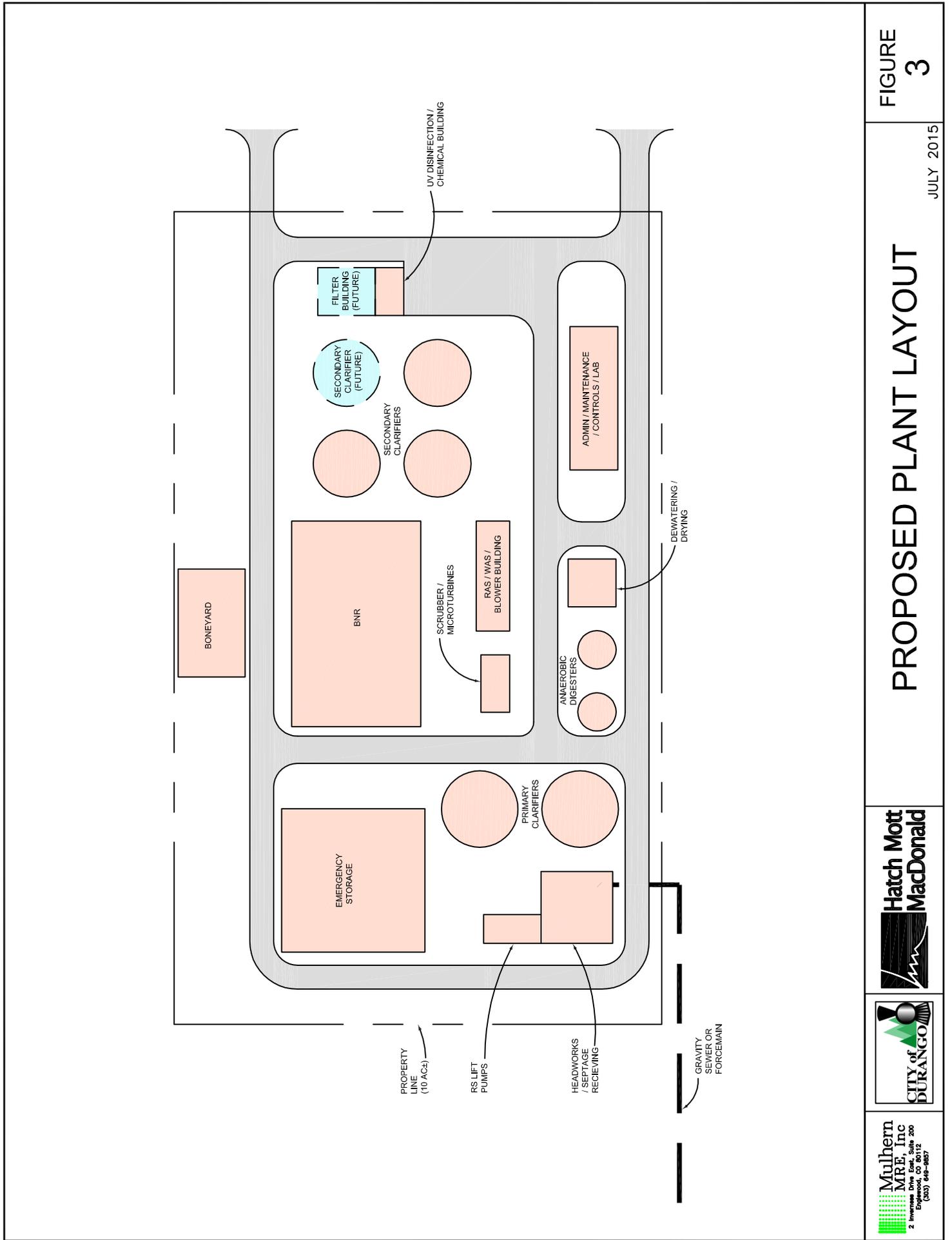


FIGURE 3

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PROPOSED PLANT LAYOUT



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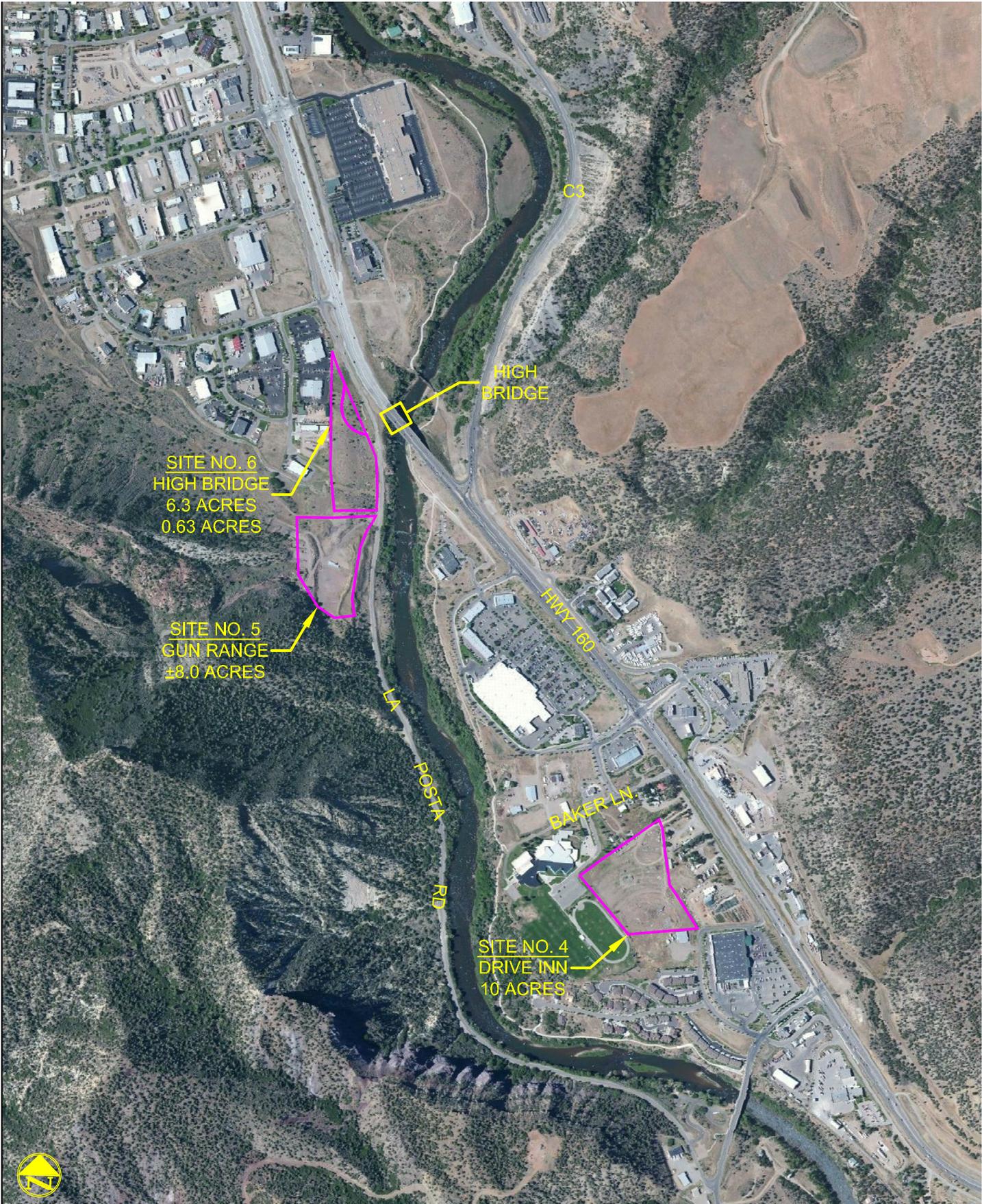
In the area south of the High Bridge on Highway 160, and north of the Rivera Bridge, three potential sites were identified as shown on **Figure 4**. These sites are identified as Site No. 4, the “Drive-Inn” site, Site No. 5, the “Gun Range Site”, and Site No. 6, the “High Bridge Site”.

The Drive-Inn Site contains approximately 10 acres and is located just north of Home Depot, and just south of Escalante Middle School. This site, while meeting the desired land area, is located in the middle of a developed area and adjacent to a school. It is also a site that has been identified for much needed multi-family housing since available sites reasonably close to town are very limited. The site would also be impacted by requirements for the extension of Escalante Avenue through the site. This extension would reduce the site area and costs associated with the road extension, if required for development, would be a burden adding to plant costs. Therefore Site No. 4, the Drive-Inn Site, was eliminated from further consideration.

The Gun Range Site, while off of the river and therefore requiring pumping to convey wastewater to the site, is an active gun range owned by La Plata County. This site is located on an old landfill with methane gas seeps associated with trash biodegradation. It is also located in an area where the geology is known to be unstable and in which there is also known hydrogen sulfide gas seeps from coal seams. Finally, any use of this site would require environmental remediation related to lead on the site from spent ammunition. With all of these factors, Site No. 5, the Gun Range Site was quickly eliminated from further consideration.

The High Bridge Site, located immediately west of the High Bridge, a short distance off of Highway 160, is a vacant commercial site. This site contains only 6.3 acres and the northern portion of the property is too narrow and is encroached upon by a small parcel owned by the Colorado Department of Transportation (“CDOT”). The site also has substantial topography that would require the excavation and export of soil and rock, and walls would need to be constructed to gain full use of the property. While the area of the site might be expanded through a potential acquisition of the 0.7 acre CDOT parcel, the site does not contain sufficient land in a configuration that would accommodate the plant relocation. Therefore, Site No. 6, the High Bridge Site was eliminated.

South of the Rivera Bridge, on the west side of the Animas River, there is sufficient vacant property to accommodate a wastewater treatment plant at several locations. The land use in this area is mixed and varied including small resort cabins, light industrial properties, a nursery and landscape materials’ company, high value homes, and resort homes. This area is known as the La Posta Area (**Figure 5**). While this area is located south of and outside the boundaries of the City, the City has recently completed a master plan for potential development of the area. That study, the “La Posta Area/District Plan” (“La Posta Study”) addressed a large amount of land for which development and growth is limited primarily because of the lack of utility services including water and wastewater, as well as roadway access. This includes land on both the lower Koshak Mesa and the upper Animas Airpark Mesa. The City is already extending water service through this



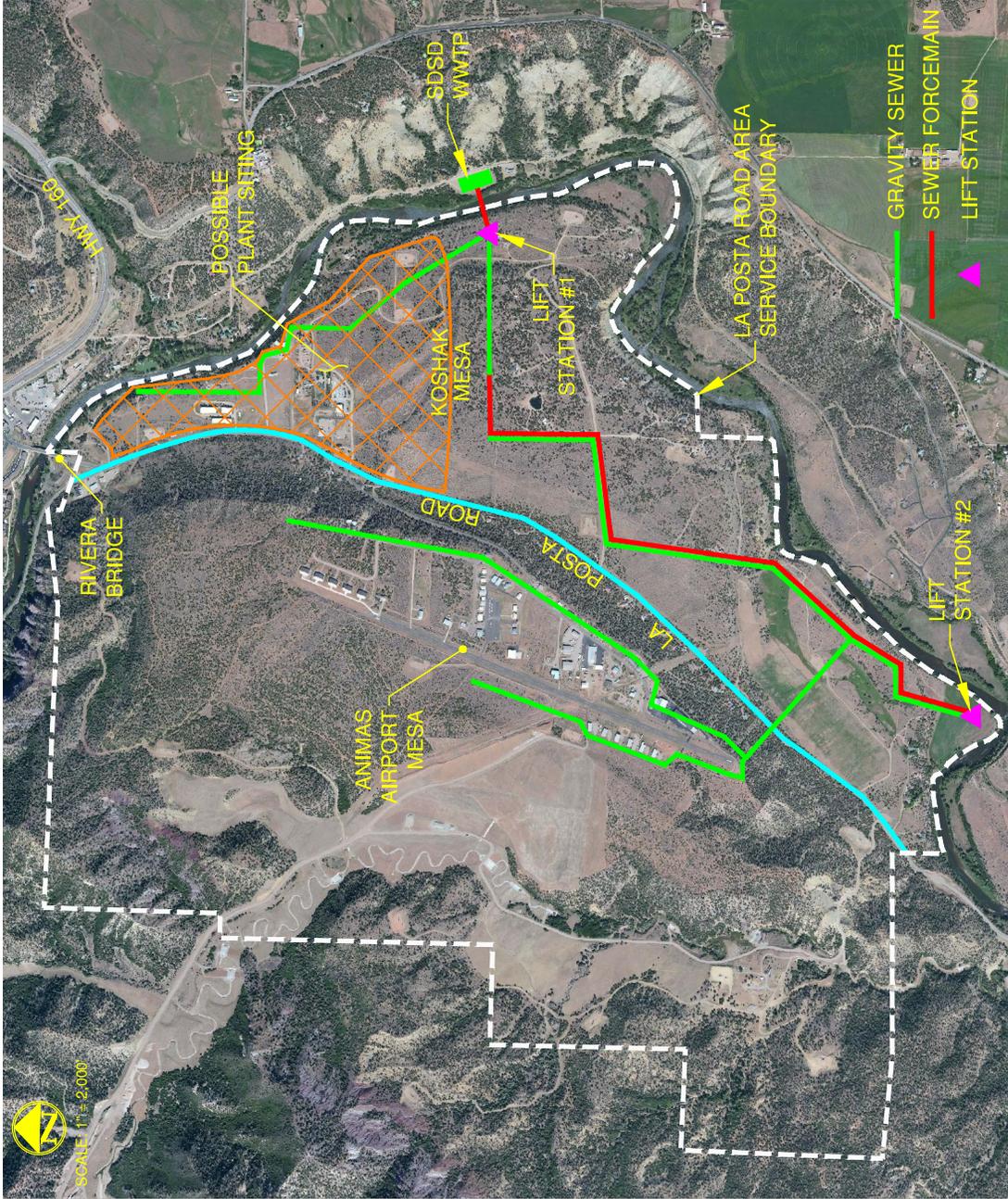


FIGURE
5

LA POSTA AREA
PLANT RELOCATION SITE 7

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area, and if a City wastewater treatment plant were also to be located within the area, it would be another significant asset for development.

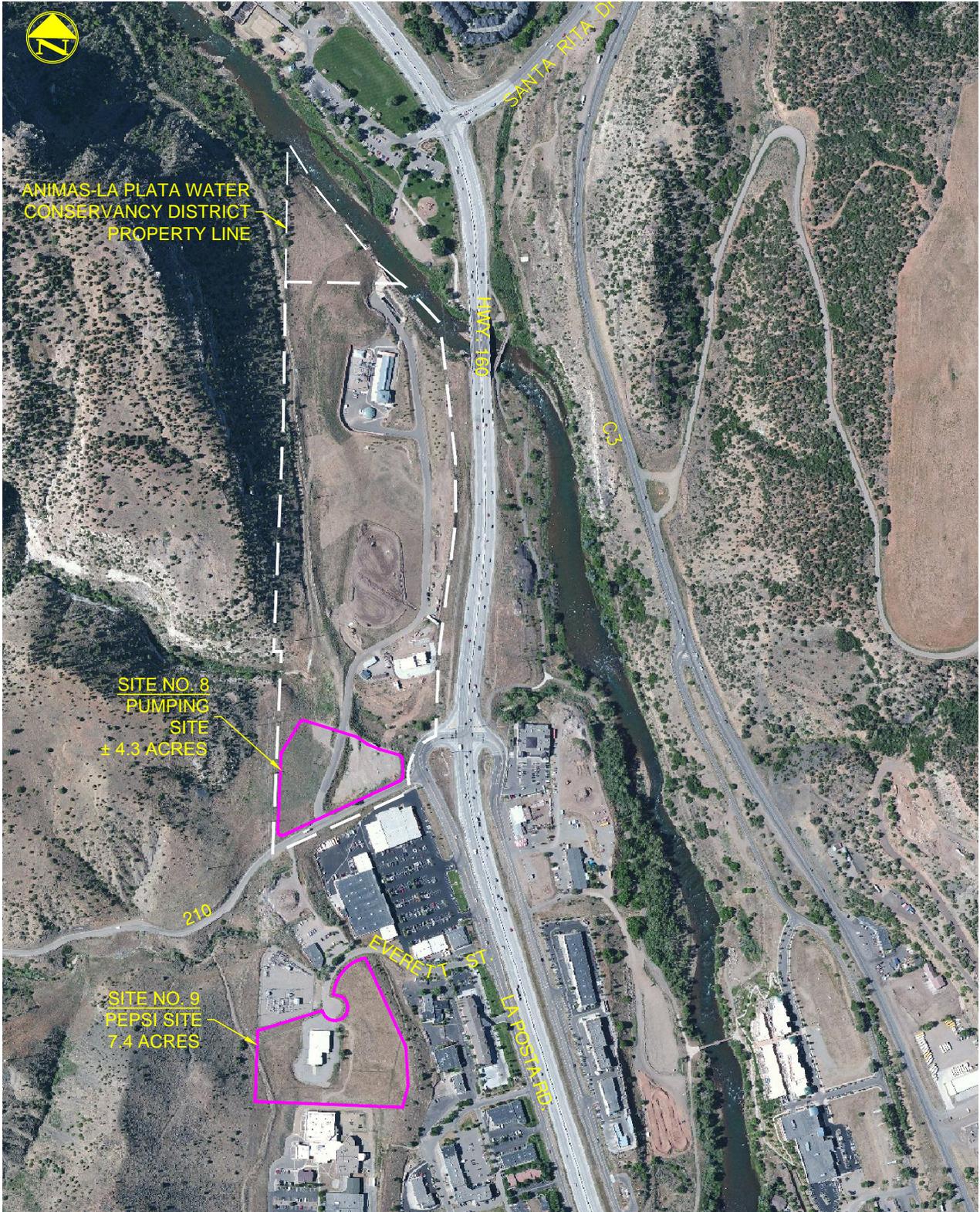
Site No. 7, the La Posta Site, is a ten acre parcel that could be chosen anywhere in the general area shown in **Figure 5**. The area is on the Koshak Mesa from just downstream of the Rivera Bridge to sites located across the river from the South Durango wastewater plant as shown. The further the plant is located to the south of this area, the more of the Koshak Mesa could be served by gravity sewer. However, with any of the plant sites in this area, southern portions of the Koshak Mesa, and flows from development on the Animas Airpark Mesa would need to be pumped via force main to the treatment plant site consistent with the “La Posta Study”. While the La Posta Site could be moved farther to the south, the wastewater coming from the Santa Rita Plant would have to be pumped over a ridge to reach additional sites. Since it will be more cost effective to pump smaller volumes of wastewater from southern portions of the La Posta Area back to the La Posta Site than to pump the entire volume of City wastewater in the other direction, sites further south were not considered.

With this review of potential sites for relocation of the Santa Rita Plant, Site No. 7, the La Posta Site, is the site selected for further analysis. However, since this site is located between 4.0 and 4.5 miles downstream of the existing plant and because the capital and operating cost of conveyance facilities is very substantial, consideration was given to two other sites located closer to the existing facility. While the initial study scope directed that only sites south of the High Bridge be investigated, the option of pumping wastewater to nearer sites off of the river had not previously been considered. While this alternative would include substantial operating costs for lifting wastewater to the plant site, there would be large savings in capital costs by not having to convey the wastewater long distances.

Two potential “Off-River” sites were identified. Site No. 8, the “Pumping Station Site” was identified on property across the Animas River from the existing Santa Rita Plant. Site No. 9, the “Pepsi Site” is a site located directly north of the La Plata County Jail. Both sites are shown on **Figure 6**.

The Pumping Station Site is located on property owned by the La Plata Water Conservancy District (“LPWCD”) which contains the Bureau of Reclamation pumping plant that diverts water from the Animas River to Nighthorse Reservoir. The portion of the site outside of the operation and maintenance easement of the Bureau of Reclamation is shown on **Figure 6**. This site contains about 4.3 acres, and is too small to accommodate the plant.

The Pepsi Site is at the location of a previous Pepsi Distribution Facility. It contains 7.4 acres and includes a warehouse in the middle of the parcel. The property is currently owned by La Plata County. While this parcel is smaller than desirable, the plant could be reasonably located as shown in **Figure 7**. La Plata County does not have an immediate plan to utilize this property, however the County is currently completing a facilities master plan that is considering future use of the site. Since the County owns the adjacent jail, this is a logical location for a County facilities’ campus.



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PLANT RELOCATION
SITES 8 & 9

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FIGURE
6



FIGURE
7

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PROPOSED PLANT LAYOUT
PEPSI SITE 8



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Even though the site is smaller than desired and is not currently available for purchase, this study investigates the potential to develop this site as an alternate to the La Posta Site. If this alternative is identified as a desirable option by the City, the City would need to further review its availability with the County.

In summary, this study has looked at sites south of Durango for potential relocation of the Santa Rita Plant. Two potential sites have been developed for investigation to compare capital and operating costs of relocation of the Santa Rita Plant with the existing plan to renovate and expand the plant on the existing site. The alternatives associated with these sites will be described in the following sections.

WASTEWATER TREATMENT PLANT ALTERNATIVES

The primary purpose of this study is to compare the present plan for renovating and expanding the Santa Rita Wastewater Treatment Plant with alternatives that would construct a new facility at a new location. Three primary alternatives were considered in this study. These include:

1. **Maintain the Santa Rita Plant at the Existing Site (Santa Rita Alternative)** – This is the alternative that was developed as part of the BNR Study completed by Dewberry Engineers. This alternative is presented for economic comparison with the other identified alternatives. The information provided is consistent with the BNR Study, but with the modifications identified in “Nutrient Engineering Report – Wastewater Treatment Plant Facility Plan, Review and Summary”, presented previously in this report. It also recognizes that while this alternative may be dictated today through economics, it is not the most desirable option to maintain the plant in this location.
2. **Relocate the Santa Rita Plant South of High Bridge to Site No. 7 (La Posta Alternative)** As described previously under “Siting Alternatives”, a plant relocation area was identified south of the Rivera Bridge, on the west side of the Animas River on the Koshak Mesa as shown in **Figure 5**. A new treatment plant would be constructed on a 10 acre site within this area, and the wastewater from the Santa Rita Plant would be conveyed to the site via gravity and force main pipelines.
3. **Relocate the Santa Rita Plant Off-River (Off-River Alternative)** – A third alternative is to relocate the Santa Rita Plant to a site more proximate to the existing facility. This may be achievable by pumping the wastewater to a site that is away from the Animas River in a more industrial area, i.e., Site No. 9, the Pepsi Site.

The following is a presentation and discussion of each alternative. Supporting analysis and information is provided in the Appendix.

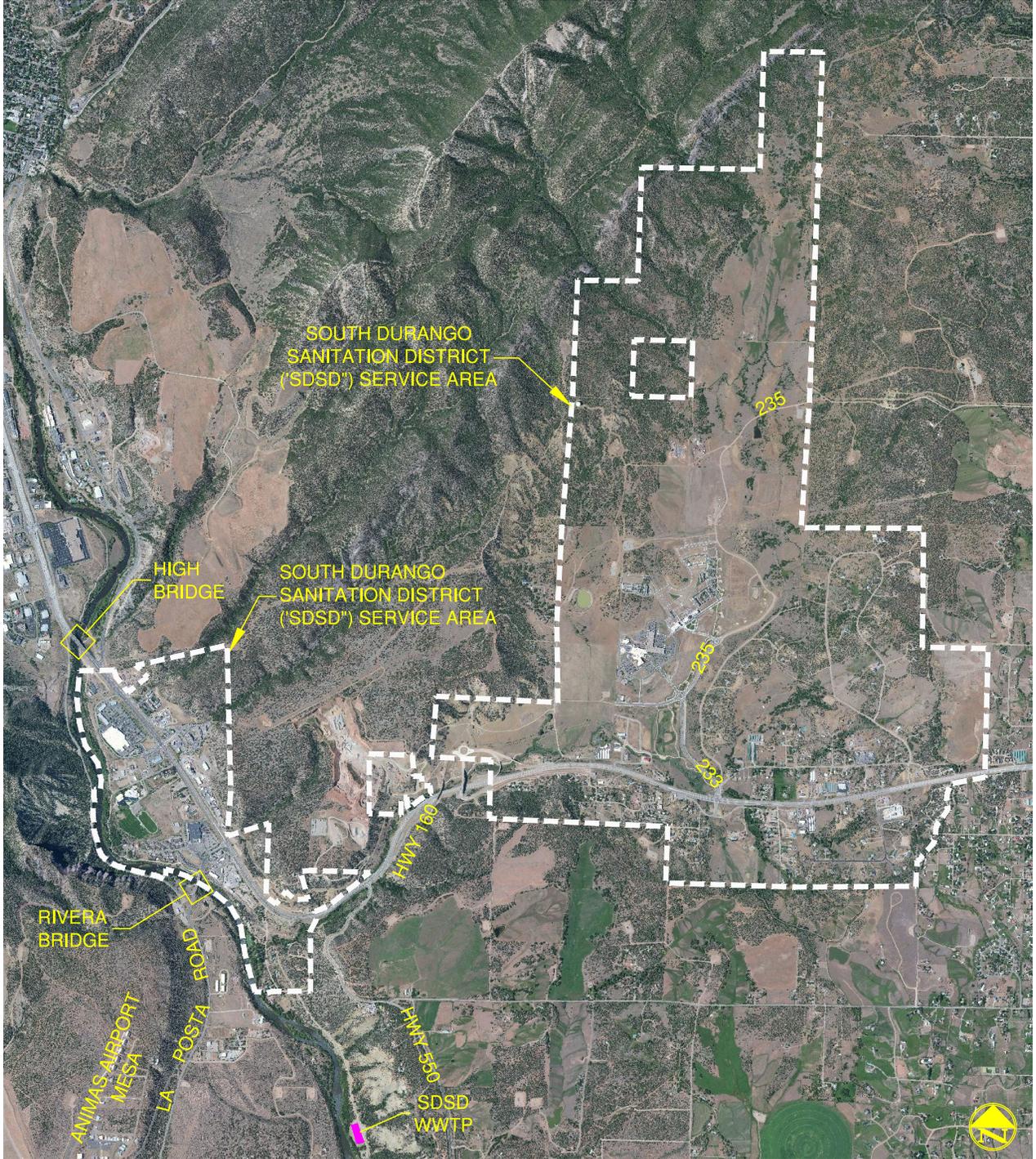
SANTA RITA ALTERNATIVE

Maintaining the wastewater treatment plant at the Santa Rita site is a prime alternative for a renovation and expansion because of the existing investment in the facilities as described above. In addition, even though there is substantial development south of the plant which is downriver, much of the sewer flows to the plant by gravity both north and south of the Santa Rita Site. While there are a number of lift stations throughout this area, this is often the case in communities with the mountain topography of Durango. Therefore, moving the plant to the south with the intent of providing a location where pumping is minimized may not result in any substantial reduction in the pumping necessary to capture wastewater from the broad service area.

A potential disadvantage to the Santa Rita site is that it is difficult and costly to provide wastewater treatment at this site for future areas of development south of the High Bridge. However, this is not practical or likely. Much of the area south of the High Bridge is already served, or service is available from the South Durango Sanitation District (“District”) with their plant located on the east side of the Animas River about 1.3 miles south of the Rivera Bridge. The location of the South Durango Wastewater Treatment Plant (South Durango Plant) and the service area of the District are shown on **Figure 8**. If additional areas were to develop east of the river and south of the District’s service area, they would likely be best served by inclusion into the District with expansion of the South Durango Plant if necessary. The La Posta Area west of the river could potentially be served through an inclusion into the District, as well, by pumping to the South Durango Plant across the river. This is already contemplated by the La Posta Area/District Plan (“La Posta Study”), as shown on **Figure 9**. Even if the South Durango District did not agree to provide service to the area, the more likely option would be for the City to serve the area with a small satellite treatment facility similar to that of the South Durango District. This is because of the high operating costs and problems associated with transporting large volumes of wastewater over long distances.

The South Durango Treatment Plant currently has capacity of 450,000 gallons per day, and is using only about 35% of that capacity. South Durango reports that the facility is operating well and they do not anticipate a problem in providing wastewater collection and treatment for their service area. They also indicate that they have the ability to expand the service area to provide treatment for the La Posta Area, and they have recently been able to reduce their wastewater tap fee for customers within their service area from \$8,000 per tap to \$5,500 per tap. Therefore, under this alternative, it is assumed that future development in areas south of the High Bridge including the La Posta Area (both the Koshak and Animas Airport Mesas) would be served by South Durango. The downside of this option is that even at \$5,500 per sewer tap, the cost of wastewater tap fees are substantially higher than the City’s fee of \$2,023 to \$2,194 per tap.

As previously noted, the City’s selection of the Johannesburg process appears sound and the opinion of probable costs developed by Dewberry for the Santa Rita Site appear reasonable. Thus, both the treatment process and costs developed by Dewberry are used for the Santa Rita Alternative.




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 2 Inverness Drive East, Suite 200
 Englewood, CO 80112
 (303) 616-9857

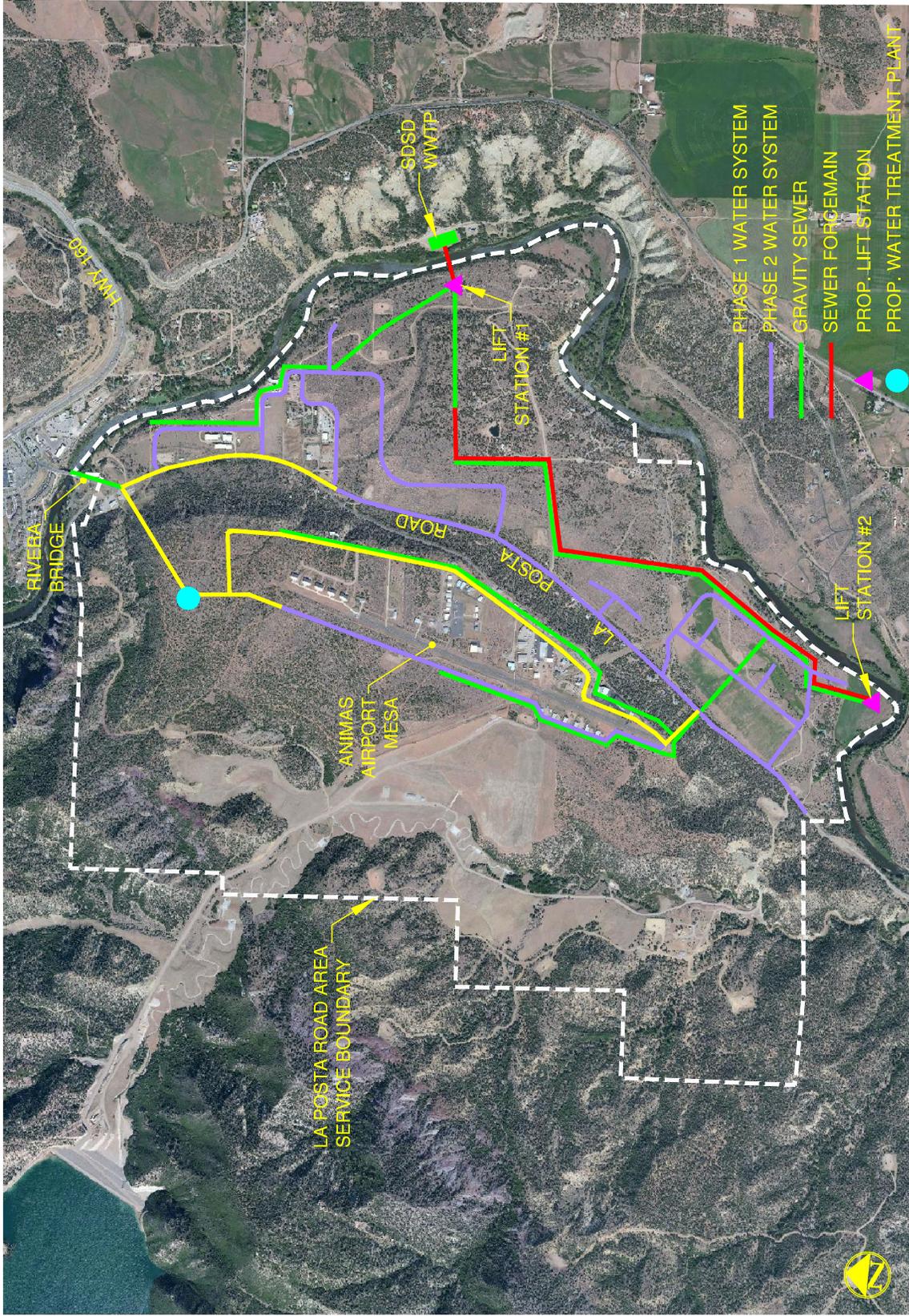

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**Hatch Mott
MacDonald**

**SOUTH DURANGO
SANITATION DISTRICT
SERVICE AREA**

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**FIGURE
8**



LA POSTA STUDY
UTILITY PLAN

FIGURE
9

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An opinion of probable costs was developed by Dewberry to construct the necessary improvements to meet the project nutrient effluent limits that will be enforced under Regulation 85 when the Plant’s discharge permit is renewed. The costs were presented and explained in the BNR Study and are shown in **Table 4**.

Table 4. Opinion of Probable Costs for Santa Rita Plant Improvements

Description	Total Project Cost
Headworks	\$4,184,000
Septage/FOG Receiving	\$1,948,000
Primary Clarifier Rehab	\$2,868,000
Johannesburg Secondary Process	\$22,858,000
Sidestream Treatment	\$1,908,000
Redundant Anaerobic Digester	\$6,640,000
Solids Dewatering	\$4,148,000
Class A Biosolids - Sludge Drying	\$3,719,000
Administration/Lab Building	\$6,714,000
UV Disinfection	\$3,207,000
Total Project Cost	\$58,194,000

Future improvements to the Santa Rita Plant include a fourth secondary clarifier and a tertiary filtration system. These improvements may not be necessary unless additional nutrient regulations are enforced and are not included in this study.

LA POSTA ALTERNATIVE

Overview - This alternative would relocate the City’s existing Santa Rita Plant to a location south of the Rivera Bridge in the area identified as Site No. 7 on **Figure 5**. The primary basis for the alternative is to move the wastewater treatment plant off of the Santa Rita site because of the perceived detriment to aesthetics and recreational activities at the current location. A secondary reason for moving the plant would be for the City to provide wastewater treatment services for additional land development that could occur south of the existing city limits. The La Posta Area has been identified as a valuable area for future commercial, light industrial and multi-family development in the La Posta Study completed for the City in 2013. This area has been planned to include as much as 607 acres of mixed commercial/light industrial development, and 341 acres of mixed types of residential area, which is very important for a community that is largely landlocked today.

The City is extending City water facilities and service into this area, and if City sewer were also brought into this area, the additional investment in utility facilities could well serve as a catalyst to open areas for residential and commercial development that is currently restrained by lack of vacant, serviceable property.

While this area could potentially be served by South Durango, the tap fees from the La Posta Area could be meaningful in collecting revenues through tap fees and service fees to assist in recovering the costs of relocating and expanding the Santa Rita Plant. That is, with a plant re-location to this area, the additional capacity to serve La Posta could be provided at the plant at a very low incremental cost, and tap fees from this area would be substantial. At today's City sewer tap fee, net revenue of an estimated \$3.5 million would be expected over time.

From the La Posta Study, the amount of wastewater generated from the La Posta Area could reach as much as 500,000 gallons per day as an average. The peak month associated with this flow would be approximately 600,000 gallons per day, or 0.6 MGD. This flow capacity would need to be added to the build-out projection of 4.0 MGD in the BNR Study, and hence a plant at this location should be sized for 4.6 MGD. However, after the BNR Study was published in October 2014 the proposed development known as Ewing Mesa has been identified as no longer viable, and capacity for the Ewing Mesa project was included in the flow projections in the BNR Study. While the La Posta Area may contribute to future wastewater flow, for this report it was estimated that the development in the Ewing Mesa was approximately equivalent to the potential La Posta Area and thus no increase in the future plant size was included.

Plant Layout and Description – The City's selection of the Johannesburg process appears sound and this process was used for development of a WWTP configuration and opinion of probable cost for a new WWTF at a new site in the La Posta Area.

Due to the undeveloped nature of the La Posta Road area, a new WWTP could be constructed in a more ideal layout. **Figure 3** shows a theoretical layout for a new WWTP constructed in the La Posta Road area utilizing most of the available land on a ten acre site. Key features of the layout include an administration building located near the plant entrance, road access to every facility on-site, and sufficient land between facilities to avoid congestion during construction/operation. The UV Disinfection/Chemical Building would receive chemical deliveries so it was given wider road access. An emergency storage pond located near the headworks and raw sewage lift pumps allows for influent sewage storage should the headworks, raw sewage lift pumps, or other treatment process facilities fail and cause a backup. A boneyard located on-site provides a storage area for vehicles, maintenance equipment, etc.

Wastewater Conveyance – Wastewater conveyance to a La Posta Site is a key consideration when evaluating this alternative. The wastewater conveyance system proposed must transport the peak day flow, in this case 12.0 MGD to this location, in a cost effective manner. The route proposed is often adjacent to the river and includes river crossings. It is desirable to convey flows by gravity whenever possible to reduce pumping costs and to avoid mechanical facilities that can fail and require additional capital expenditures for emergency power and storage. Since the cost for both capital facilities and operations are very critical in evaluating the viability of relocating the treatment plant downstream, a substantial analysis was completed to identify pipeline alternatives, and profiles were developed throughout to evaluate the amount of excavation required to install these facilities.

In the event of river crossings, each crossing is proposed as an inverted siphon with a triple pipeline section under the river. The first two pipe segments are provided to allow for alternate use and maintenance since inverted siphons often clog over time with an accumulation of solids. The third pipe is provided as an emergency pipeline in the event of a system failure.

Wherever lift stations are proposed and hence force mains are required, emergency power generators are included in the costs, and dual force main piping is provided for operating redundancy and for maintenance. In addition, storage is proposed at key locations to allow some time to address operational problems and line failures. However, because these lines will at times be flowing up to 12 MGD, the amount of response time will be less than desirable even with the considerable volume of storage that is proposed.

Three potential pipeline alignments are proposed for conveyance to the La Posta Area. These are all a combination of gravity and pumped systems to varying degree as will be described in the following. Different types of alignments were investigated in search of the most cost effective solution. In each case, an effort was made to maintain the depth to pipe invert at no more than 18 feet for ease of construction and future access to the pipe in the event of a failure. However, in each of these options, deeper cuts are encountered, and while undesirable, are necessary in the terrain that is being traversed. Where this occurs, additional costs are included to reflect the more extreme installation conditions that will be encountered.

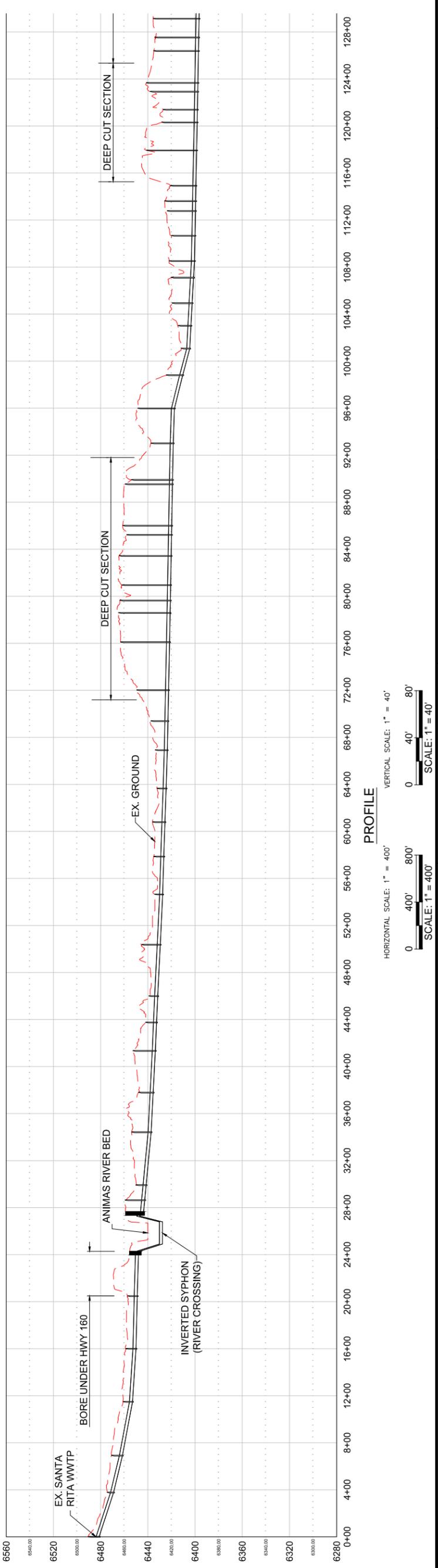
Easement requirements are shown on the plan and profile figures provided for each alternative. For depths to pipe inverts of 18 feet or less, a 30 foot easement is assumed. For depths greater than 18 feet, 50 foot easements are assumed.

Alignment A – This alternative to the La Posta Site would be entirely gravity flow to the vicinity of the Rivera Bridge, and is shown on **Figures 10&11**. This alignment was developed to limit the conveyance system to one lift station, and to minimize the number of river crossings. This alignment begins at the existing Santa Rita Plant, continues through Santa Rita Park, is bored under Highway 160, and crosses the river in an inverted siphon immediately east of the Highway 160 Bridge. The alignment continues along the Animas River Trail on the west side of the river to the north side of the High Bridge where it crosses under Highway 160 in the road that connects Mercury Village Drive and the La Posta Road, and then follows La Posta Road on the west side of the river to the west side of the Rivera Bridge.

At the east side of the Rivera Bridge, a lift station is required to lift the wastewater onto the Koshak Mesa. The amount of the lift is about 40 feet, occurring over a distance of about 2,000 feet. A general location of the lift station is shown on **Figure 11**, but it could be located anywhere in this general area. Approximately a 1 ½ acre site is required for the lift station and emergency storage. This would require acquisition of this amount of property in the area which is included in project costs. Storage provided at the site would be in a buried tank, and would serve as emergency storage in the event of a pumping failure. This siting is admittedly not desirable, and in the event that this alternative is selected, this siting should be further analyzed.



PLAN
 SCALE: 1" = 400' 800'
 0 400' 800'
 SCALE: 1" = 400'



PROFILE
 HORIZONTAL SCALE: 1" = 400' 800'
 0 400' 800'
 SCALE: 1" = 400'
 VERTICAL SCALE: 1" = 40'
 0 40' 80'
 SCALE: 1" = 40'

CITY OF DURANGO
ALIGNMENT - A

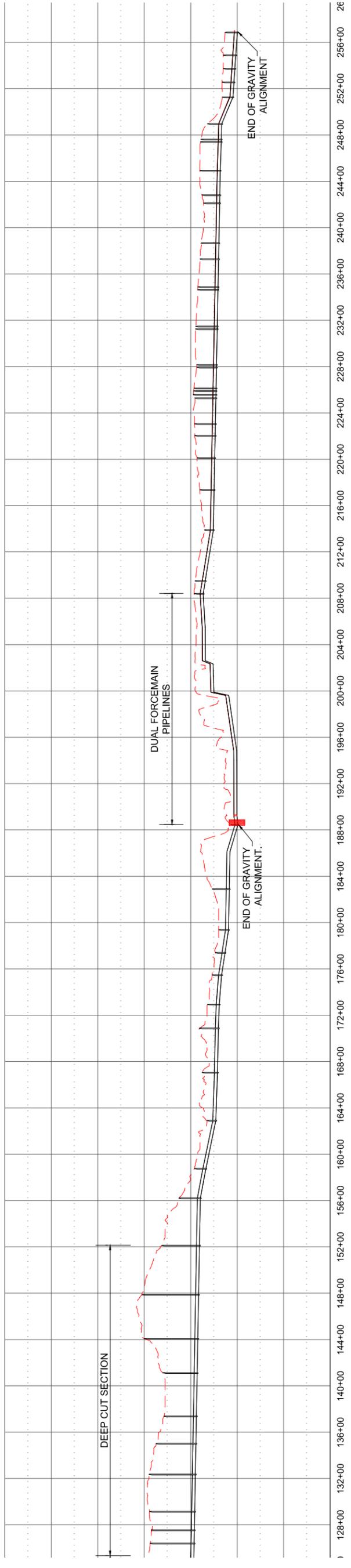
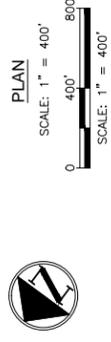


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 (303) 649-9857



FIGURE
10

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CITY OF DURANGO
ALIGNMENT - A

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FIGURE 11

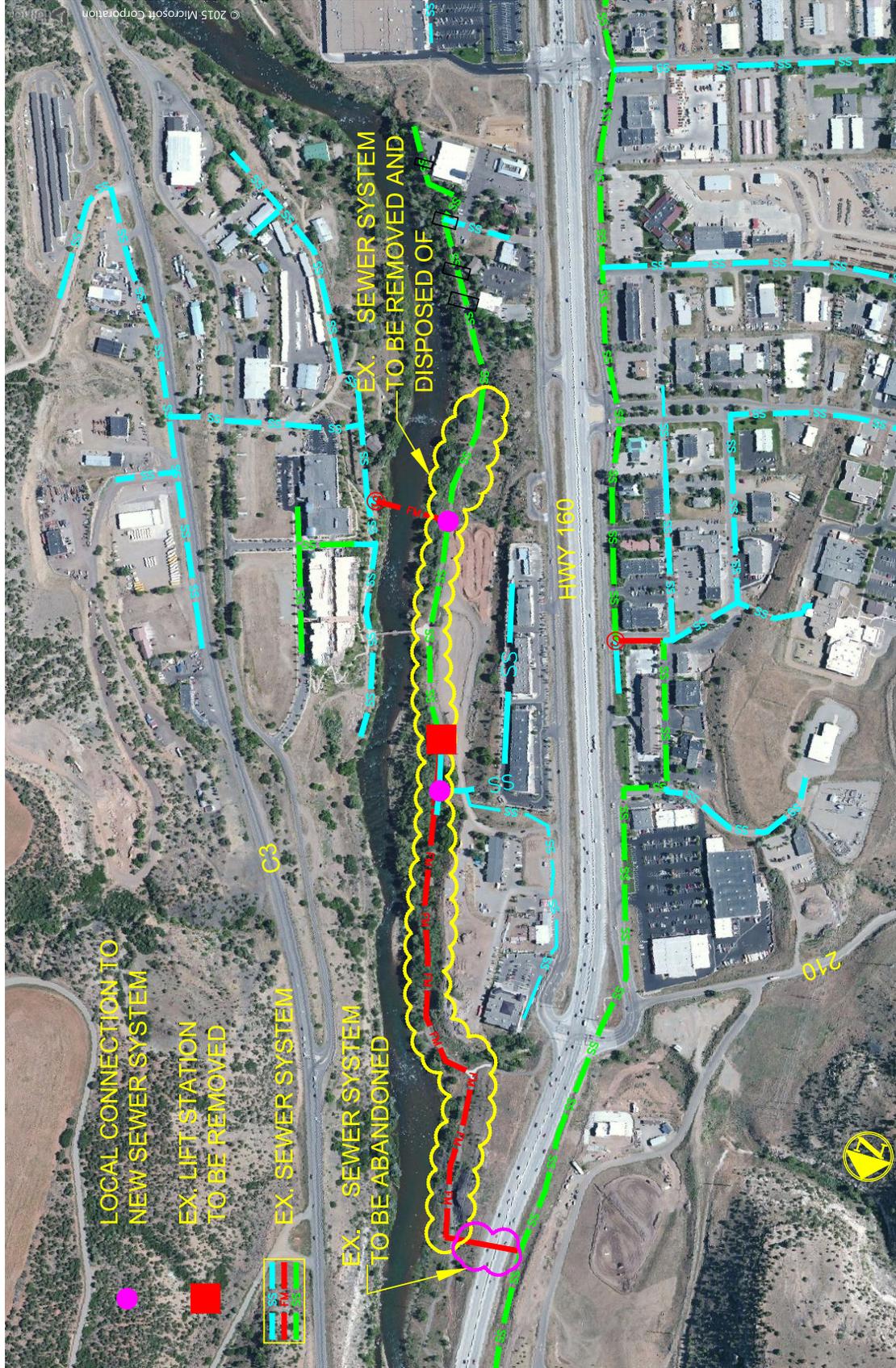
The wastewater will discharge to a gravity main, with average depths of cover of 10 feet that will convey flow to the location of the wastewater treatment plant, once determined. The proposed pipeline is shown to the southern limit of where a treatment plant may be located. The cost of the gravity main will increase as it is extended to plant sites located further south along the Koshak Mesa.

This alignment requires modifications to the existing sewer systems in the area between the north end of the Highway 160 Bridge just below the Santa Rita Site, and the High Bridge (“the Bodo East Area”) as shown on **Figure 12**. The plan is to capture flow from a portion of the local sewer systems located to the east of Highway 160 and divert them into the new conveyance main at convenient locations. In addition, approximately 3,400 feet of 8” forcemain pipelines will be removed as part of constructing the new sewer conveyance main in this area.

This alignment includes about 23,800 feet of 30 inch pipeline with an average cut over the pipe of 27.5 feet. There are several areas where the pipeline cover would exceed 30 feet as shown on **Figures 10&11**. These areas cover a distance of some 6,500 feet. Installation in these areas will be very challenging as the majority of these large cuts would occur under La Posta Road. This alignment contains one river crossing, and follows along or under the Animas Trail for a distance of 7,880 feet. For the most part, this alignment will follow the Animas Trail from the south end of Santa Rita Park to the east side of High Bridge. Once the alignment goes under the High Bridge, the pipelines will head south to the proposed lift station location along La Posta Road for about 1.4 miles.

In summary, this alignment will be the most challenging for installation of the pipelines due to the deep cuts under both the Animas River Trail and more so under La Posta Road. In addition, this alternative is disruptive to the Animas River Trail, and construction activities in the deep cuts areas under La Posta may well require full closure of the road. Hence, costs associated with this alternative and construction of the alignment in La Posta Road south of the High Bridge area may not be feasible.

Alignment B – This alternative to the La Posta Site would again be entirely by gravity flow to the vicinity of the Rivera Bridge, and is shown on **Figures 13&14**. This alignment also begins at the existing Santa Rita Plant, continues through Santa Rita Park and with a bore, crosses Highway 160 to a location near the pedestrian bridge, just east of the Highway 160 Bridge. The bore will be for a 42-inch pipeline inside a 60-inch metal casing. The larger pipeline bored under Highway 160 is proposed in anticipation of the inverted siphon immediately east of the Highway 160 Bridge. The alignment continues along the Animas River Trail on the west side of the river to Cundiff Park where there is a crossing of the river to the east side. The pipeline then parallels the river for approximately 2,200 feet before another river crossing to the Mercury Village Open Space Area. Just northeast of the High Bridge, the river is crossed again and the alignment follows the Animas River Trail after going under the High Bridge south embankment with a bore to accommodate a 30-inch gravity line. Once on the south side of the High Bridge, the pipelines will



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CONNECTIONS/REVISIONS
BODO EAST AREA

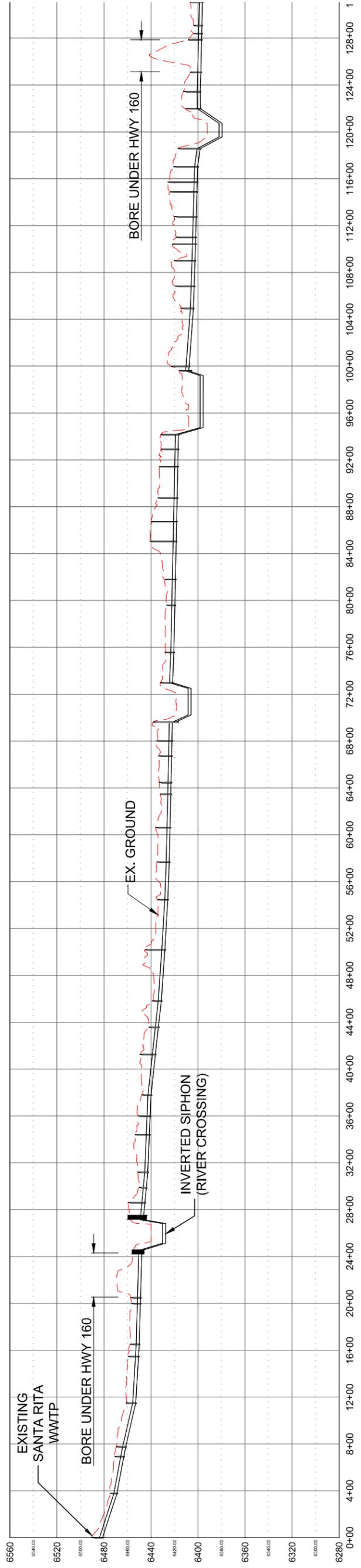
FIGURE
12

JULY 2015



PLAN

SCALE: 1" = 400'
 0 400' 800'
 SCALE: 1" = 400'



PROFILE

HORIZONTAL SCALE: 1" = 400'
 0 400' 800'
 SCALE: 1" = 400'

VERTICAL SCALE: 1" = 40'
 0 40' 80'
 SCALE: 1" = 40'

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ALIGNMENT - B

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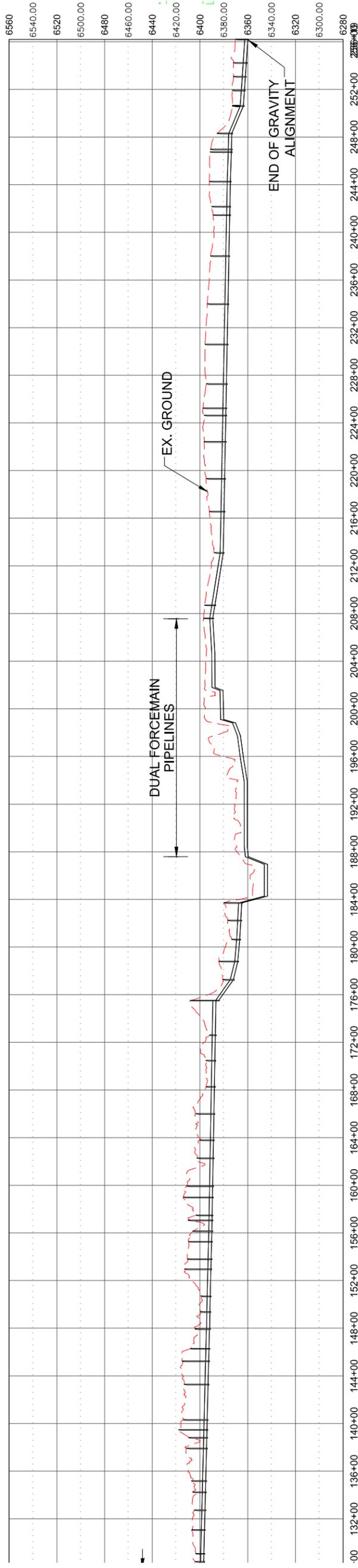
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FIGURE 13



PLAN
SCALE: 1" = 400'
0 400' 800'



PROFILE
HORIZONTAL SCALE: 1" = 400'
0 400' 800'
SCALE: 1" = 400'

VERTICAL SCALE: 1" = 40'
0 40' 80'
SCALE: 1" = 40'

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FIGURE
14

JULY 2015

follow the trail on and off for approximately 1,700 feet to a location just east of Escalante Middle School, where the pipeline will continue south across the west end of the school property. In an effort to minimize the disturbance of the Animas River Trail and to keep reasonable depths of cover, the alignment will exit the trail path towards the river, wherever possible, while keeping the pipelines outside the 100-yr floodplain. In addition, the pipelines will travel south along the west end of the school property for about 760 feet through native areas. The alignment will then need go through the residential area located at the end of River Oaks Drive as shown on **Figure 14** before it crosses to the west side of the river to end in the same location at a lift station on the west side of Rivera Bridge.

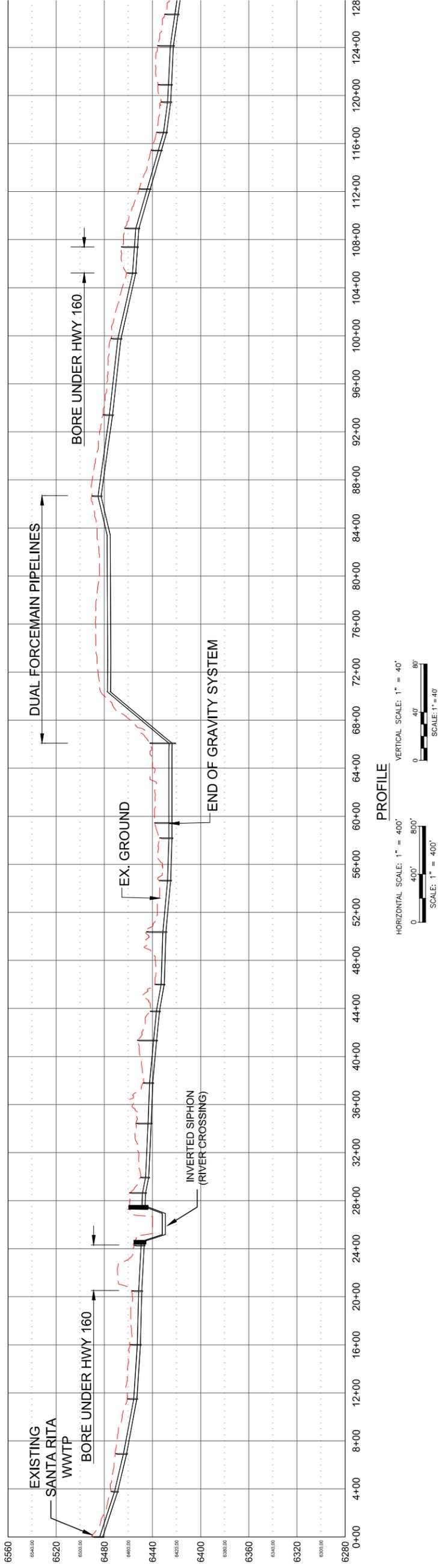
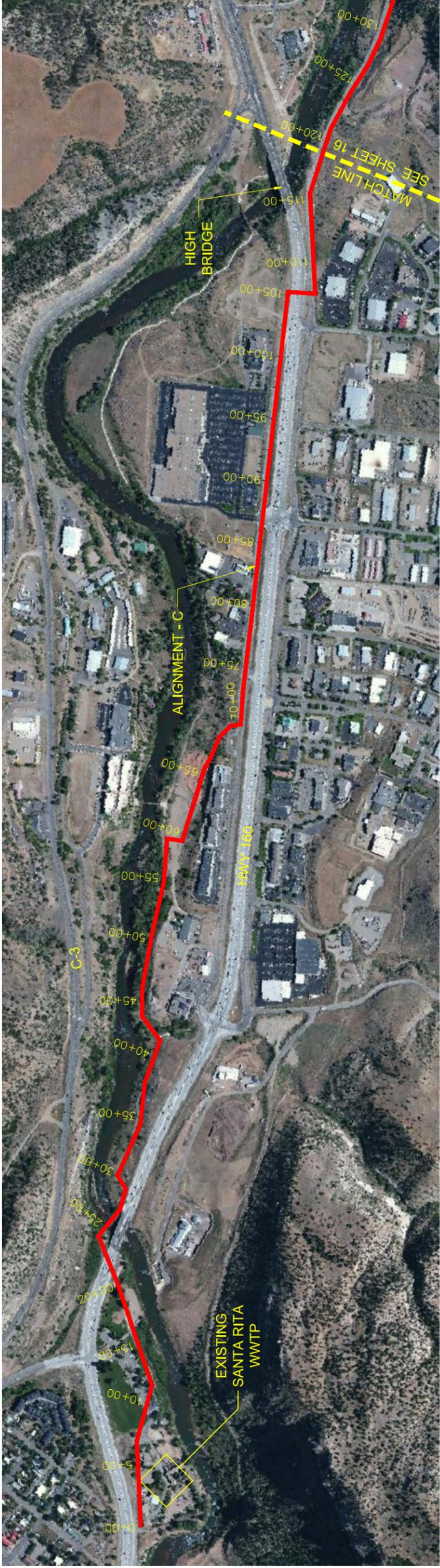
There are 5 inverted siphon crossings of the Animas in this alignment alternative. These crossings all include 2 rectangular vaults at each edge of the river. The vaults are sized to accommodate parallel pipelines, and include a redundant pipeline for emergencies. These river crossings will require a 404 permit from the US Army Corps of Engineers which has been granted for past projects in this area. However, river crossings are disruptive to the environment and are not desirable. Submittals will need to show alternatives and the need for these crossings in support of the project. Since the Animas River in this area is a Gold Medal Trout Stream, additional concerns with construction will be raised, and may require an individual permit. Hence, if this alignment is selected, the City will need to further explore the likelihood of permitting and potential requirements thereof.

This alignment, to the extent possible, minimizes the depth of cover required to install the pipeline which reduces costs when compared to Alignment A. While the 5 river crossings add substantially to the costs, there is a benefit to this alignment to the extent that it presents no impact to traffic.

At the south side of the Rivera Bridge, this plan becomes the same as that described under Alignment A. That is, a lift station is proposed to lift the flow onto Koshak Mesa where the wastewater would flow by gravity to the treatment plant location. Again this plan includes the similar connections from the local sewer systems east of Highway 160, between the north end of Highway 160 and the High Bridge.

The alignment includes about 19,600 feet of 30 inch pipeline with an average cut over the pipe of 12 feet. There is a stretch within the Koshak Mesa area within the alignment where the pipeline cover would be between 20 and 25 feet as shown on **Figure 14**. These areas cover a distance of some 2,400 feet. While installation of the pipelines at this depth is challenging, these sections are in vacant property which will make the excavation and construction of the lines far more feasible than the same scenario under infrastructure such as roads or trails.

Alignment C - This alternative to the La Posta Site includes a combination of gravity mains and 2 lift stations and force mains, and is shown on **Figures 15&16**. This alignment begins at the existing Santa Rita Plant, continues through Santa Rita Park and crosses the river in an inverted siphon immediately east of the Highway 160 Bridge. The alignment continues along the Animas River Trail on the west side of the river to Cundiff Park. At Cundiff Park, a lift station would be



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ALIGNMENT - C

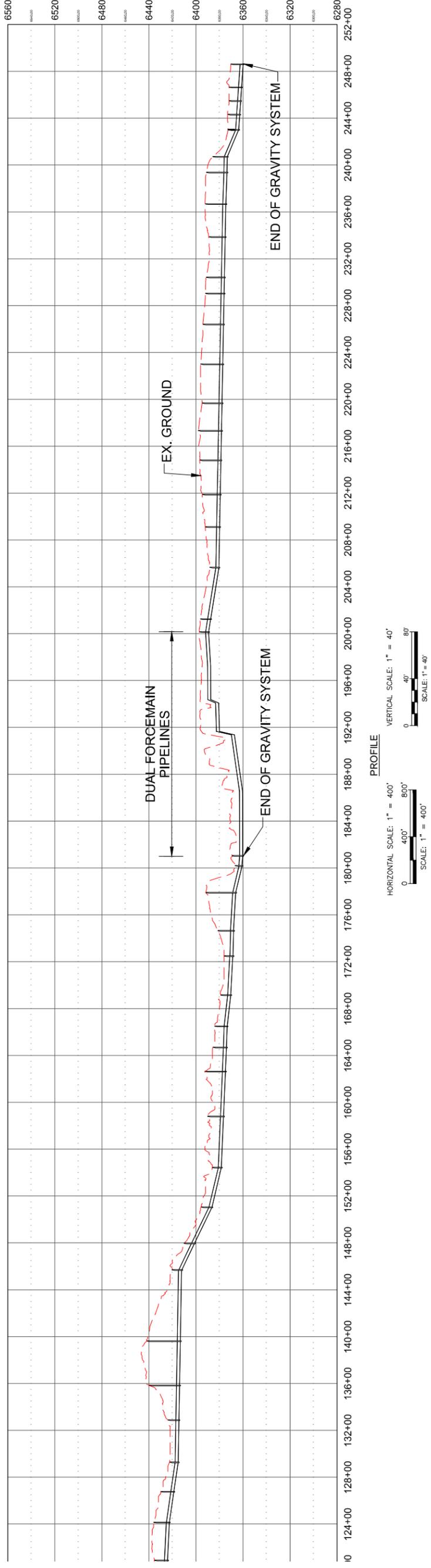
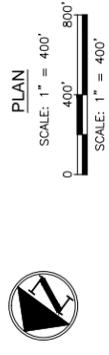
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FIGURE 15



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ALIGNMENT - C

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FIGURE
16

constructed to lift the flows about 43 feet over a distance of 3,100 feet to the frontage road on the east side of Highway 160. This site has sufficient space for a lift station. The forcemain pipeline then tracks along the Frontage Road for about 2,870 feet to a location just north of Zumiez Mall's northern entry way. At this location, the system turns into a gravity pipeline as it continues to head south under the Frontage Road. As soon as the pipeline goes under Mercury Village Drive, which is accomplished with a bore, the alignment then turns west under Highway 160 to La Posta Road with another bore. Once the alignment is under La Posta Road, it continues south to the lift station site east of the Rivera Bridge. South of the Rivera Bridge, this plan is the same as that described under Alignments A & B. Again, local sewers are connected to this alignment.

This alignment includes about 19,000 feet of 30 inch pipeline with an average cut over the pipe of 15 feet. In addition, there is about 5,060 feet of 18 inch dual forcemain pipelines. There are areas where the pipeline cover would exceed 25 feet as shown on **Figures 15 & 16**. These areas cover a distance of some 590 feet.

This alternative uses lift stations to reduce the depth of pipelines since pipelines under pressure may follow the topography, as opposed to needing to maintain slope for gravity systems. This greatly reduces installation costs, but costs for a second lift station results in greater costs overall. This alternative also requires installation in La Posta Road, where there are additional costs related to roadway repairs and traffic control.

Pumping and Storage – For each of these alignment alternatives, consideration must be given to pumping and storage facilities. For this alternative, the two existing clarifiers at the Santa Rita Plant will be converted into an estimated 700,000 gallons of emergency storage. These will be the only remaining facilities at the Santa Rita Site as shown on **Figure 17**. All other facilities at the Santa Rita Plant site will be abandoned and demolished. A maintenance/storage area would also be retained at the existing Santa Rita Plant to allow operations a location to store equipment and materials that is more centrally located to the City.

This storage will provide about 4 hours of response time during a peak month average day flow. Additional emergency storage will be provided at the Rivera Bridge Lift Station.

Electrical Service – La Plata Electric Company has the capability to provide power to a new pump station and wastewater treatment plant in the La Posta Area. However, the electric will need to be extended to the site at the cost of the project.

La Posta Cost Estimates - The opinion of probable costs developed for this study for a new WWTP constructed in the La Posta Road area are shown in **Table 5**.

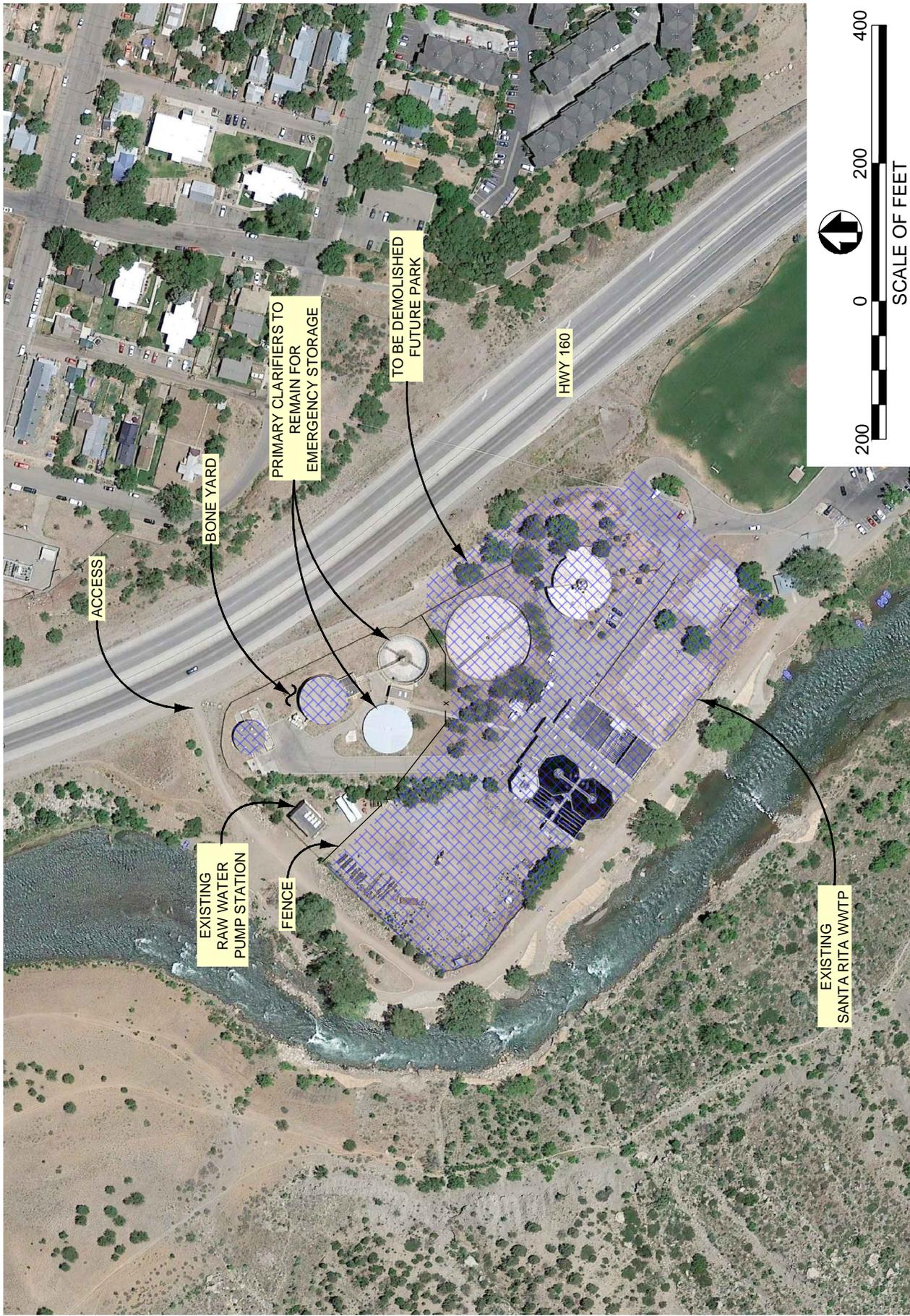


FIGURE 17

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DEMOLITION AT EXISTING WWTP
LA POSTA ALTERNATIVE



Table 5. Opinion of Probable Costs for a New WWTP Located near La Posta Road

Description - Base	Project Cost
<i>New WWTP - La Posta Road</i>	
Santa Rita WWTP Demolition	\$1,430,000
Site/Civil	\$5,480,000
Headworks	\$4,100,000
Primary Clarifiers	\$3,740,000
Secondary Process + Thickening	\$21,800,000
Anaerobic Digestion	\$6,580,000
Dewatering - Fournier Rotary Press	\$3,080,000
Sidestream Treatment	\$1,360,000
Class A Biosolids - Heat Dryer	\$3,660,000
UV Disinfection	\$2,260,000
Chemical Building	\$660,000
Admin/Lab Building	\$6,480,000
FOG/Septage Receiving	\$1,740,000
WWTP Subtotal	\$62,370,000

The primary treatment process configuration of the new WWTP includes: Headworks/Septage Receiving Station, Raw Sewage Lift Pumps, two Primary Clarifiers, BNR, four Secondary Clarifiers, UV/Chemical Treatment Building, two Anaerobic Digesters, Sludge Thickening and Sludge Drying and Micro Turbine Power Generation. In addition to the primary treatment process, other significant facilities were included for emergency wastewater storage, buildings for Maintenance, Lab, Administration, Blowers, RAS pumping, WAS pumping and access roads for chemical delivery and solids handling and loadout. Odor control was provided for the headworks and for solids dewatering and drying facilities. Itemized cost tables for the treatment plant facilities are included in Appendix A.

This WWTP Cost is approximately \$10.3 million, or 14%, less than the WWTP Cost for the relocation alternate in the BNR Study. Of this amount, approximately \$4 million is due to elimination of some of the odor control facilities, \$5 million is due to a reduction in the anaerobic digester cost due to a duplication of facilities and equipment beyond two anaerobic digesters, and the remainder is the result of anticipated cost efficiencies due to construction on a vacant site.

Conveyance system costs were developed for each of the alignment alternatives. These cost estimates were determined by preparing detailed plan and profile sheets, and using the information to develop a detailed listing of construction items and quantities. The comparison of alternatives also includes associated lift station costs. Itemized cost sheets for the conveyance facilities are also provided in **Appendix A**.

The cost summary for each of the three alignments is shown on **Table 6** for this Alternative.

Table 6. La Posta Conveyance Alternative – Summary of Total Costs

Alignment	Conveyance Cost	Pump Station Costs	Total Costs
A	\$27,663,000	\$5,010,000	\$32,673,000
B	\$20,511,000	\$5,010,000	\$25,521,000
C	\$18,144,000	\$10,020,000	\$28,144,000

Recommended Alignment – The most cost effective alignment is Alignment B at \$25.5 million. This alignment minimizes cuts for pipe installation without requiring a second, costly lift station. Alignment A is significantly more expensive, and its constructability for a distance of approximately 400 feet in La Posta Road where cuts reach 40 feet in depth is questionable, and could require a total road closure for an extended period of time to complete the construction. Alignment C is a preferable alignment over Alignment B, but the requirement for a second lift station makes it the most expensive option, and also adds the operational and maintenance responsibilities of a another large scale lift station.

The disadvantage of Alignment B is that 5 river crossings are required. While these all will include triple barrel crossings for operational and maintenance redundancy, it is not desirable to have river crossings because of the potential for failure and the consequences of raw wastewater reaching the river. These river crossings will require 404 Permits which could add requirements which increase costs, and there is some risk that a permit could be denied. Despite this concern, Alignment B is the recommended alternative, but an additional 10% contingency has been added to the overall project cost to account for risk and uncertainty.

Total costs for the La Posta Alternative are shown in **Table 7**. This total cost of \$93.8 million compares with a total estimated project cost from the BNR Study of \$95.2 million.

Table 7. La Posta Alternative – Summary of Total Project Cost

Treatment Plant Cost	Pump Station Costs	Conveyance Pipelines	Land	Total Project Cost
\$62,370,000	\$5,010,000	\$20,511,000	\$5,857,0000	\$93,748,000

Wastewater Conveyance System Lift Station Operational Cost - Conveyance of the wastewater to the new site will require operation of the gravity and forcemains, and a lift station. The operating cost for these facilities will be an ongoing cost. The estimated operating cost for this alternative is provided in **Table 8** below and includes an estimated net present value of these costs amounting to \$8.4 million over the next 20 year period.

Table 8. La Posta Alternative – Estimated Operational Costs

Parameter	Construction Cost	O&M Factor ⁵	Annual Operating/O&M Cost	20-Yr Net Present Value
Lift Station	a	b	c = (a*b)	d = c*20
Structure	\$975,000	0.02	\$19,500	\$390,000
Equipment	\$2,715,000	0.04	\$108,600	\$2,172,000
Lighting Cost ^{1,2}			\$631	\$13,000
Heating/Cooling Cost ³			\$1,080	\$22,000
Pumping Power ^{2,4}			\$60,000	\$1,200,000
Conveyance Pipelines				
Conveyance Pipelines ⁶	\$16,310,000	0.014	\$228,340	\$4,566,800
		TOTAL	\$419,000	\$8,364,000

Notes:

- 1 - Based on BNR Study Assumptions: 1 kW/1000sf
- 2 - Power Cost Based on BNR Study: \$0.12/kWh
- 3 - Based on BNR Study Assumptions: \$1.80/sf
- 4 - 90' Total Dynamic Head, 3 MGD used for 20 year average flow
- 5 - O&M Factors Based on BNR Study Assumptions
- 6 - Based on 70 year life

OFF-RIVER ALTERNATIVE

The Off-River Alternative allows for the relocation of the Santa Rita Plant to a site off of the river where the plant characteristics are less objectionable. Only one suitable site has been identified for an off-river location, and that is the “Pepsi Site” as described under the “Site Alternatives”. This site is at higher topography and hence a lift station and a force main are required to convey the flow. The proximity of this site to the existing plant greatly reduces the length of conveyance facilities compared to the La Posta Alternative.

Siting Options – Since Durango is landlocked by its topography and most areas close to town are already developed, siting options are limited. The only site identified that met project requirements of the project is the Pepsi Site, owned by La Plata County adjacent to the County Jail as shown on **Figure 7**. This site contains approximately 7.4 acres, and hence is well below the desired acreage, and there is also an existing metal warehouse building on the site which is currently vacant. This site and building would need to be acquired, and the building removed to accommodate the plant. The site is not currently available for purchase, and hence, if this alternative is determined to be the preferred plan, La Plata County would need to be approached regarding its availability.

Plant Layout and Description – The City’s selection of the Johannesburg process appears sound and this process was used for development of a WWTP configuration and opinion of probable cost for a new WWTF at an Off-River site as well.

A new WWTP could be constructed in a more ideal layout. **Figure 7** shows a theoretical layout for a new WWTP constructed at the Pepsi Site adjacent to the La Plata County Jail, utilizing most of the available land on a 7.4 acre site.

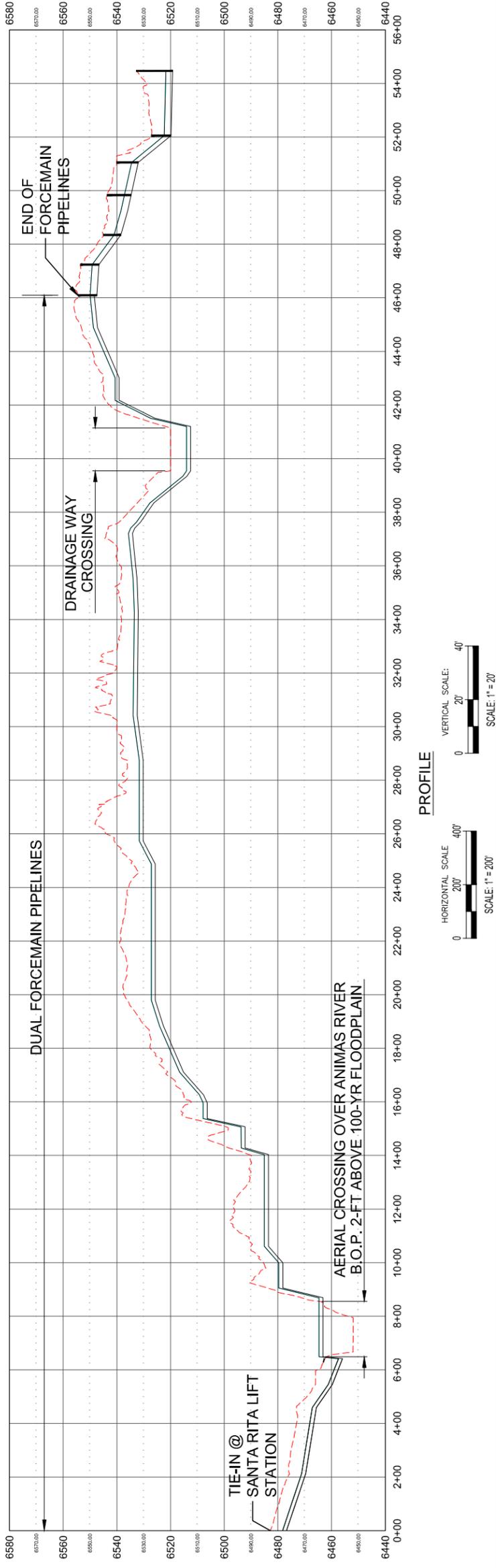
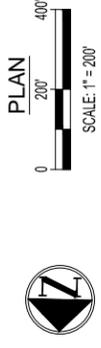
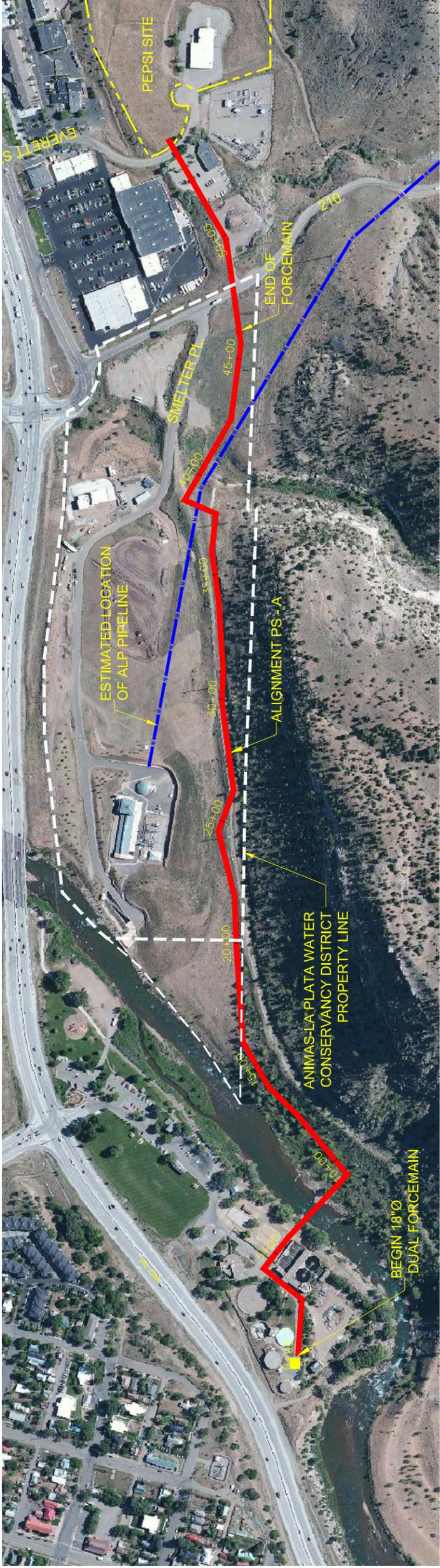
Wastewater Treatment Plant – The primary treatment process configuration of the new WWTP includes: Raw Sewage Lift Pumps, two Primary Clarifiers, BNR, three Secondary Clarifiers, UV/Chemical Treatment Building, two Anaerobic Digesters, Sludge Thickening and Sludge Drying and Micro Turbine Power Generation. In addition to the primary treatment process, other significant facilities include buildings for Maintenance, Lab, Administration, Blowers, RAS pumping, WAS pumping and access roads for chemical delivery and solids handling and loadout. Odor control was provided for the headworks, primary clarifiers and solids dewatering and drying due to the location of business adjacent to the site.

Wastewater Conveyance – Wastewater conveyance to the Pepsi Site requires the same design parameters and other considerations as described under the La Posta Alternative. Wastewater conveyance to the Pepsi Site will require pumping, and the system proposed must transport the peak day flow of 12.0 MGD to this location. Two alignments are proposed, Pepsi Site Alignment A (PS-A) and Pepsi Site Alignment B (PS-B).

Alignment PS-A – Alignment PS-A would include a lift station located on the existing Santa Rita Site. Wastewater would then be pumped across an aerial bridge crossing of the Animas River directly west of the Santa Rita Site, and would cross City and Animas La Plata Conservancy District property to reach the Pepsi Site. The alignment and profiles for this pipeline is shown on **Figure 18**.

This alignment includes 4,600 feet of 18-inch diameter dual forcemain and 840 feet of 30-inch diameter gravity main. The pipelines are all constructed at depths of approximately 6 feet. The pipeline will need to cross the US Bureau of Reclamation Pipeline that is the transmission main from the Animas River to Nighthorse Reservoir. This is the shortest and most desirable alignment to reach the Pepsi Site. However, this alignment is dependent on an easement from the Animas La Plata Water Conservancy District. It will also require approvals of the Animas La Plata Operation Maintenance and Replacement Association and the US Bureau of Reclamation. The easement would need to be purchased and the ability to complete this alignment will depend on consideration by these agencies.

For this alignment, a return flow pipeline is required to convey treated return flows to the Animas River. This would be a 24-inch diameter pipeline in Everett Street to La Posta Road and Highway 160 where it would be bored under these roads. It would then continue down the access road to Cundiff Park to reach the River as shown on **Figure 19**.



CITY OF DURANGO
ALIGNMENT PS - A

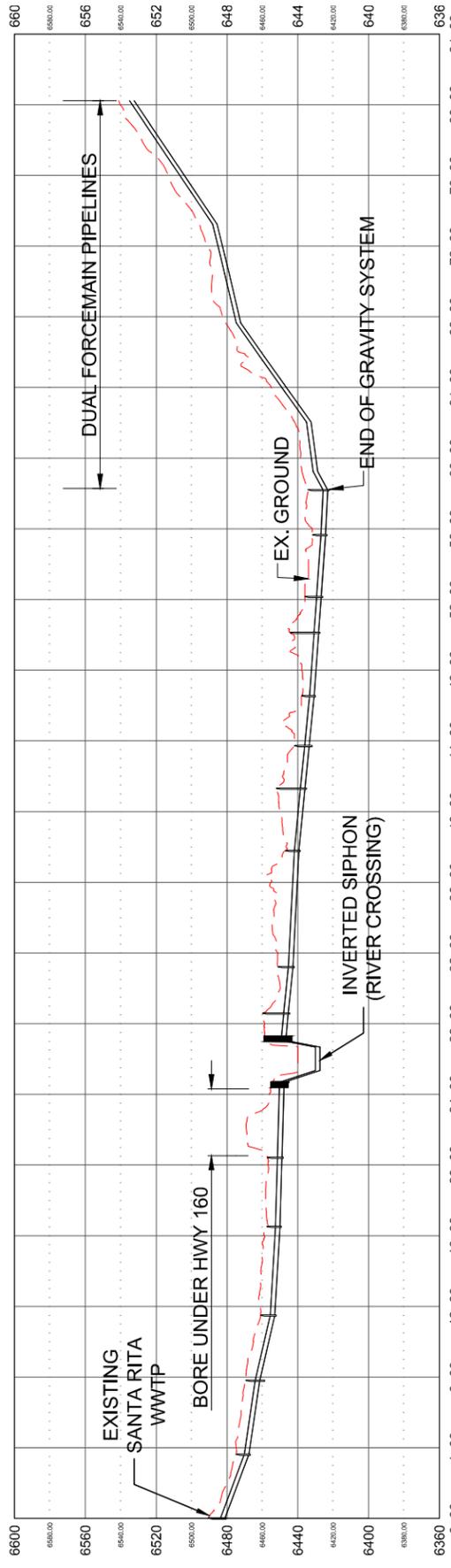
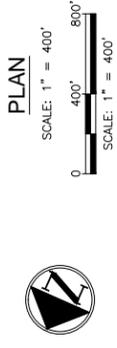
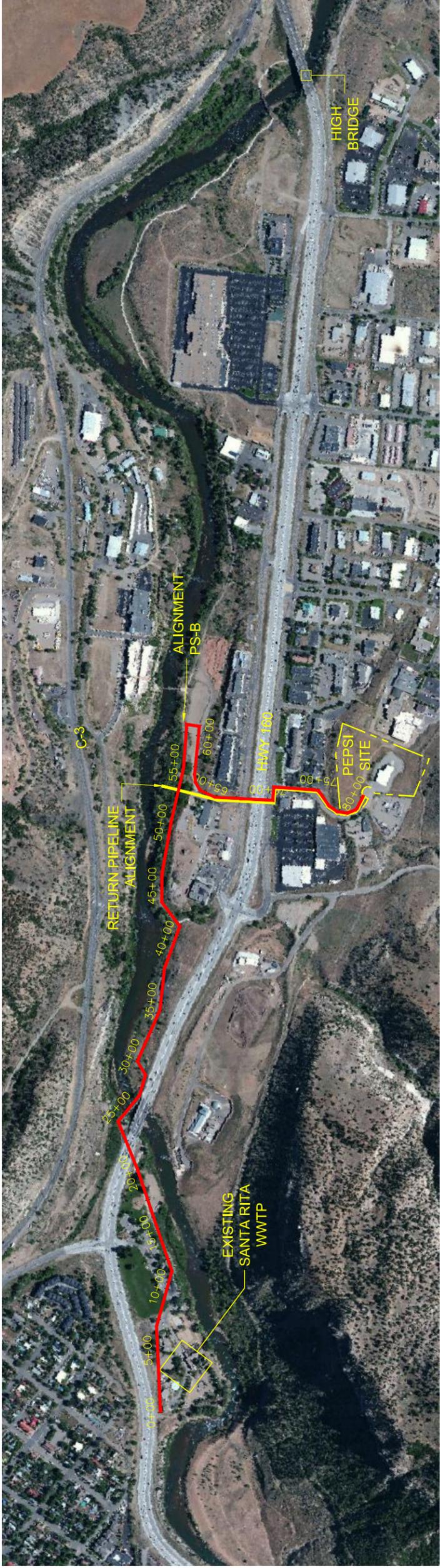


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FIGURE
18

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PROFILE



**CITY OF DURANGO
ALIGNMENT PS - B**

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**FIGURE
19**

Alignment PS-B -This alignment begins at the existing Santa Rita Plant, continues through Santa Rita Park and is bored under Highway 160 as shown on **Figure 19**. The pipeline then crosses under the river in an inverted siphon immediately east of the Highway 160 Bridge. The alignment continues along the Animas River Trail on the west side of the river to Cundiff Park. The system is a gravity pipeline to this location.

To deliver flow to the Pepsi Site, a lift station will be required at Cundiff Park. The forcemain portion of this alignment will head north and west under the access road for the park to the Highway 160 frontage road. In order for the alignment to cross both the Frontage Road and Highway 160, bores will be completed to avoid any traffic disruption. In addition, a third bore will be completed to install a 24-inch Return Line (gravity) which is to bring treated wastewater back to the Animas River for discharge. The length of each bore is estimated at 320 feet. Once the pipelines reach the west side of Highway 160 and La Posta Road, the lines will head south for a short distance and then turn west onto Everett Street. The alignment will continue west on Everett Street to the north end of the Pepsi Site. **Figure 19** depicts the location of the gravity and forcemain system in plan and profile as well as the location of the lift station.

This alignment includes 5,300 feet of 30-inch pipeline with an average cut over the pipe of 12 feet. The amount of cover is maintained fairly consistently throughout this alignment.

Pumping and Storage – For this alternative, there are different pumping and storage options for each alignment. For Alignment PS-A, facilities on the Santa Rita Site will include a new headworks and septage receiving facility with appropriate odor control, the new lift station, a boneyard storage area and the existing clarifiers would be converted to emergency storage. The clarifiers would provide 700,000 gallons of volume, or approximately 4 hours of storage at peak month average day rates. **Figure 20** shows a proposed layout of these facilities. Other existing facilities on this site would be demolished.

For Alignment PS-B, this plan provides the new headworks facility and emergency storage at the Santa Rita Site, as shown on **Figure 21** for a new lift station odor control at the Cundiff Park site. The existing primary clarifiers at the Santa Rita Site would be used for emergency storage.

Electrical Service – Electric service through La Plata Electric Company is available at this site.

Cost Estimates – Off-River Alternative – Cost estimates were developed to provide a comparable relocation cost to that of the La Posta Alternative. Wastewater Treatment Plant costs are provided in **Table 9**. Itemized cost sheets for the WWTP are provided in Appendix A.

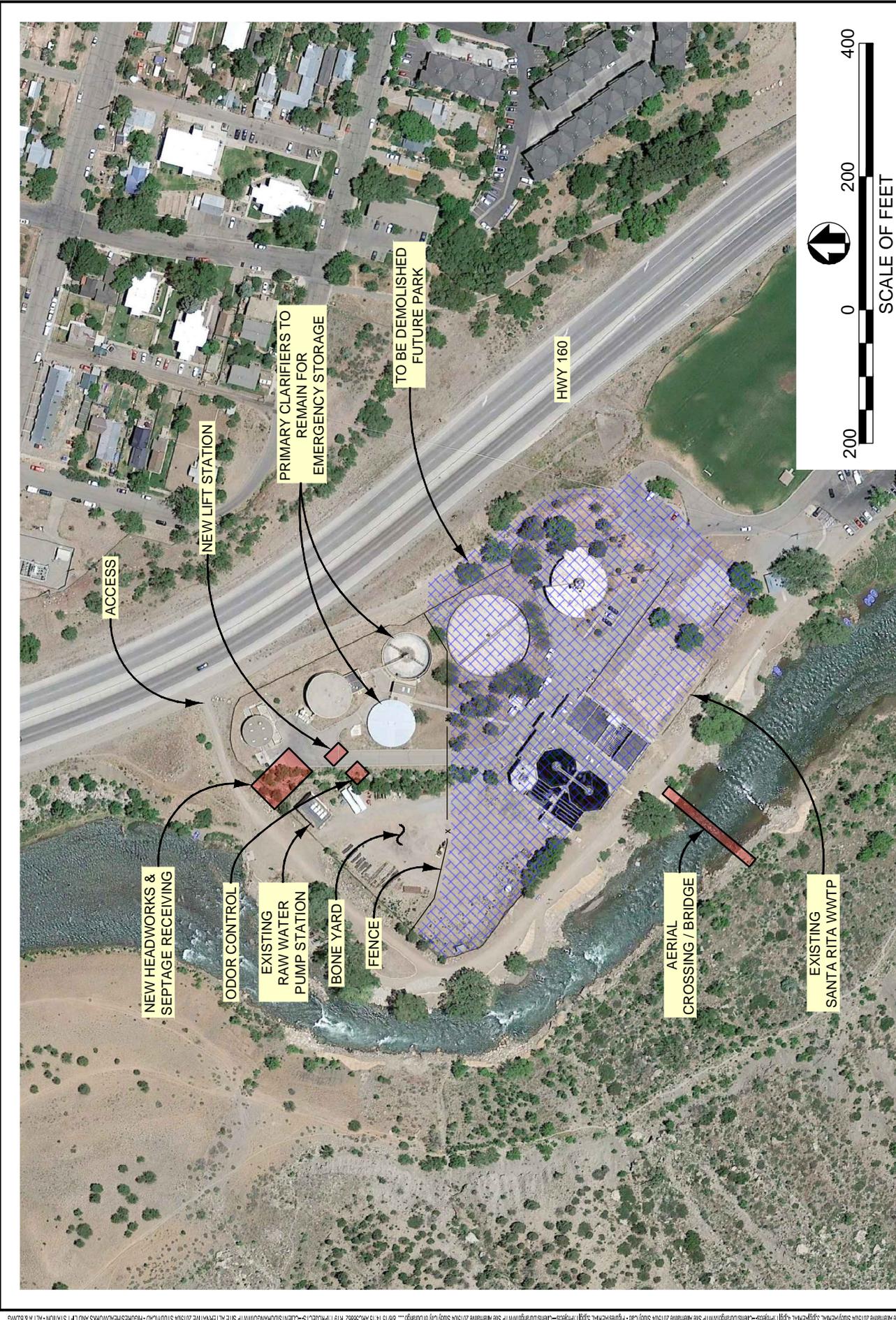


FIGURE 20

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HEADWORKS AND LIFT STATION
OFF - RIVER ALTERNATIVE A



Table 9. Opinion of Probable Costs for an Off-River WWTP at the Pepsi Site

Description - Base	Project Cost
<i>New WWTP - Off-River at Pepsi Site</i>	
Santa Rita WWTP Demolition	\$1,380,000
Site/Civil	\$5,260,000
Headworks	\$4,100,000
Primary Clarifiers	\$3,740,000
Secondary Process + Thickening	\$21,800,000
Anaerobic Digestion	\$6,580,000
Dewatering - Fournier Rotary Press	\$3,080,000
Sidestream Treatment	\$1,360,000
Class A Biosolids - Heat Dryer	\$3,660,000
UV Disinfection	\$2,260,000
Chemical Building	\$660,000
Admin/Lab Building	\$6,480,000
FOG/Septage Receiving	\$1,740,000
Odor Control	\$1,010,000
<i>WWTP Subtotal</i>	<i>\$63,110,000</i>

Conveyance System Costs – Conveyance system costs were developed for Alignments PS-A and PS-B in **Table 10**. This cost estimate was prepared in the same manner as that provided for the La Posta conveyance system. The itemized cost sheets are also provided in **Appendix A**.

Table 10. Off-River Conveyance Alternatives – Summary of Costs

Alignment	Conveyance Cost	Lift Station Costs	Total Costs
PS-A	\$7,320,000	\$5,010,000	\$12,330,000
PS-B	\$5,160,000	\$5,010,000	\$10,170,000

Off-River Total Costs - Total costs for the Off-River Alternative are shown in **Table 11**. The costs in this table are for Alignment PS-B since the ability to use Alignment PS-A, which is estimated to be more than \$2.0 million less, is unknown at this time. This total cost of \$79.3 million compares with a total estimated project cost for relocation from the BNR Study of \$95.2 million.

Table 11. Off-River Alternative – Summary of Total Costs

Treatment Plant Cost	Lift Station Costs	Conveyance Pipelines	Land	Total Cost
\$63,110,000	\$5,010,000	\$7,320,000	\$3,833,000	\$79,273,000

Conveyance System and Lift Station Operational Costs - Conveyance of the wastewater to the new site, including pipelines and a lift station will result in substantial annual operating costs. These costs, together with a net present value of operating costs are presented in **Table 12** for the Off-River Alternative assuming Alignment E. These operating costs add a net present value cost of approximately \$6.2 million for operating over the next 20 year period.

Table 12 – Net Present Value Operating Costs for the Off-River Alternative

Parameter	Construction Cost	O&M Factor⁵	Annual Operating/O&M Cost	20-Yr Net Present Value
Lift Station	a	b	c = (a*b)	d = c*20
Structure	\$975,000	0.02	\$19,500	\$390,000
Equipment	\$2,715,000	0.04	\$108,600	\$2,172,000
Lighting Cost ^{1,2}			\$631	\$13,000
Heating/Cooling Cost ³			\$1,080	\$22,000
Pumping Power ^{2,4}			\$95,000	\$1,900,000
Conveyance Pipelines				
Conveyance Pipelines ⁶	\$6,090,000	0.014	\$85,260	\$1,705,200
		TOTAL	\$311,000	\$6,203,000

Notes:

1 - Based on BNR Study Assumptions: 1 kW/1000sf

2 - Power Cost Based on BNR Study: \$0.12/kWh

3 - Based on BNR Study Assumptions: \$1.80/sf

4 - 150' Total Dynamic Head, 3 MGD used for 20 year average flow

5 - O&M Factors Based on BNR Study Assumptions

6 - Based on 70 year life

ALTERNATIVE COMPARISONS AND PROJECT PERMITTING

Table 13 provides a comparison of costs for each of the three alternatives.

Table 13 – Alternative Project Cost Summary

Alternative	Treatment Plant Cost	Lift Station Costs	Conveyance Pipelines	Land	Total Cost
Santa Rita	\$58,194,000				\$58,194,000
La Posta	\$62,370,000	\$5,010,000	\$20,511,000	\$5,857,000	\$93,748,000
Off-River*	\$63,110,000	\$5,010,000	\$7,320,000	\$3,833,000	\$79,273,000

* Assumes interceptor/force main alignment through Cundiff Park, Alignment E. If easement can be acquired through the La Plata Water Conservancy District Pumping Plant Site, cost reduction could be as much as \$2 million.

Table 14 provides the Total Project Cost and the Net Present Value of Operating Costs for the lift stations and conveyance pipelines over a 20 year period for the three alternatives for plant siting.

Table 14 – Total Project Cost and NPV for LS & Pipelines (20 years)

Alternative	Total Project Cost	NPV Operating Costs for LS & Pipelines (20 years)	Total Capital and Operating Cost for LS & Pipelines (20 years)
Santa Rita	\$58,194,000	N/A	\$58,194,000
La Posta	\$93,748,000	\$8,364,000	\$102,112,000
Off-River	\$79,273,000	\$6,203,000	\$85,476,000

The least cost alternative is to maintain the Santa Rita Plant. For an additional investment of approximately \$21.1 million plus the annual operating costs, the plant could be relocated to the Pepsi Site if the site could be acquired for this purpose. This requires either acquisition of an easement and construction approvals across the Animas La Plata Conservancy District property on the pumping plant site located west side of the Animas River across from Santa Rita Park, or the construction and operation of a lift station in Cundiff Park to lift the wastewater to the Pepsi Site.

For an additional investment of approximately \$35.6 million over the cost of the Santa Rita Plant Renovation, plus the annual operation costs, the plant could be relocated to a La Posta Site. This again requires operation of a lift station near the Rivera Bridge at the northern end of the La Posta Area. However, through collection of the City's wastewater tap fees, \$3.5 million in costs would be recovered over time as the La Posta Area develops. This would reduce the net additional investment to about \$32.1 million over the Santa Rita Alternative, although it does not reduce the initial investment of \$93.8 million.

Anticipated Steps for Permitting a New WWTP and Timeline

If the City elects to relocate the WWTP to a new site the permitting effort will be greater than expanding capacity at the existing Santa Rita Site. Many of the permits required for the pipelines will also be required for a new WWTP site. In addition to those permits, a new site will require the City to complete the CDPHE Site Location and Approval Process for Wastewater Treatment Works, Regulation 1002-22. This process is commonly referred to as the Site Approval Process, or Regulation 22. For a new WWTP location it is typical that Preliminary Effluent Limitations (PELs) are obtained prior to submitting the Site Location and Approval application. Additionally, in order to submit the required application and engineering report for the Site Approval Process, the applicant must show ownership of the property prior to the application being approved. This will require the City to obtain the property prior to the approval process. The approval process often requires 6 months to complete.

Once the Site Approval Process has been completed, the WWTP will require two submittals to CDPHE. The first submittal is the process design report (PDR) process. This process requires the submission of an engineering report identifying the treatment processes and other technical data for the proposed facility. The approval process often requires 3 months to complete. The second submittal is the final design for approval by the CDPHE. This approval process often requires 3 months to complete. There are a total of three submittals to the CDPHE and these must all be approved prior to construction commencing.

Following approval of final design by CDPHE, construction can start. For a new WWTP, construction is expected to require 2.5 years. This construction period includes initial startup, testing, and establishing a biological mass of suitable size and activity level to achieve the required level of treatment.

In addition to permitting required for the plant, the process to approve and install pipelines will also be extensive. To begin, a large amount of easements must be acquired, and all should be obtained before beginning construction. Once easements are obtained, design drawings will be prepared for the City and CDOT review and approvals for necessary permits. Pipeline crossings will require 404 Permits through the Corps of Engineers, and submittals will require environmental studies and identification of alternatives. In addition, there is a potential for some of the facilities to encroach upon floodplain areas and permits may be required through the City and potentially the Federal Emergency Management Agency (“FEMA”).

The following provides a general timeline for permitting and constructing a new WWTP at a new site:

Table 15. New WWTP Permitting and Timeline

Description	Estimated Time Required
City Obtains Property and Easements	6 months – 2 years
Obtain PELs and Site Approval Process	6 months
Preliminary Design and PDR Process	6 months
Final Design and Final Design Approval Process and City/CDOT/COE Permitting	6 months
Construction and Startup	2.5 years
Estimated Total Time	4.5 years - 6 years

It should be noted that in the general timeline above multiple items are occurring at the same time, but have been simplified for presentation. For example, final design is expected to start during the PDR process.

Implementation

The existing WWTP permit expires on February 28, 2018. As can be seen from **Table 15** the required time to complete a new WWTP will be at least two years beyond that date. Likely it will be three or more years. This will require that the City enter into a compliance schedule with CDPHE, which will most likely be part of a compliance order. The compliance order will require that the City demonstrate progress and meet the schedule, or possibly face potential administrative/civil and criminal penalties.

One additional item that must be noted is that during the period required to permit and construct a new WWTP at a new site, the City must maintain the existing facility and meet the discharge permit. It was reported to us by City staff that in early July 2015 the existing WWTP failed to meet certain limits of the existing discharge permit. The reasons for this are unknown, but it may be an indication that interim improvements are required at the existing WWTP while a new WWTP at a new site is being permitted and constructed.

Santa Rita Alternative

Advantages:

1. **Maintains Investment** – The City has a large value of investment at the existing facility, and some of these facilities, with appropriate care and maintenance, will have an extended life as part of the renovated facility. This is reflected in the project costs associated with the renovated plant versus a new plant.
2. **Avoids Conveyance Systems** – Under this alternative, there are no new conveyance systems subject to failure and requiring maintenance. Conveyance

systems to move the plant are large in size and difficult and costly to construct. They require ongoing maintenance and present the potential for failure resulting in sewage spills. Their location along and near to the river leads to concerns with the environmental impacts of spills.

3. **Minimizes Rates both for Tap and Operating Costs** - Total capital cost is \$21.1 million less than any of the alternatives presented. 20 year operating costs are also the lowest without operating costs of pumping and conveyance system maintenance. The City has had large recent fee increases, and this alternative will minimize future costs.

Disadvantages

1. **Maintains Poor Plant Location** – The wastewater treatment plant remains in operation adjacent to the City Gateway and a popular City Park including river kayak park and river rafting facilities. Wastewater treatment plant odors and the aesthetics of the industrial type facilities are undesirable. Odors, however, will be largely eliminated under the proposed plan.
2. **Plant Location is Committed** - Additional investment required for this facility at this time will extend the plant at this location for at least another 20 years since this will be a requirement of the financing.
3. **Operation During Construction** - Renovation and expansion while maintaining the existing facility is challenging and costly.

La Posta Alternative

Advantages:

1. **Removes Plant from Gateway/Recreational Area** - Moves the plant from its location at the City Gateway, and eliminates odors and aesthetics associated with the plant.
2. **New Location Away from River** - Moves the plant away from the river, and the recreational areas associated with it by moving onto the Koshak Mesa.
3. **Opens New Area to meet Residential/Commercial Demand** – Sewer infrastructure in addition to water infrastructure investment in this area by the City may serve as the catalyst for development of additional residential and commercial property.
4. **Tap Fee Revenue** – Sewer tap fee revenue as the La Posta area develops over time will far exceed the cost of providing additional treatment capacity to serve the area.

Disadvantages

1. **Extensive Conveyance System** - Requires some 23,000 feet of wastewater conveyance pipelines increasing the risk of pipeline failures and sewage spills. Requires continual maintenance and operation responsibilities and costs to reduce risks.

2. **River Crossings** - Requires 5 additional inverted siphon river crossings which are costly and subject to failure increasing the risk of sewage releases to the river environment. Requires continual maintenance and operational responsibilities and costs to reduce risks.
3. **Lift stations** - Requires ongoing operation and maintenance of pumping facilities. Annual operations and maintenance costs are substantial.

Off-River Alternative

Advantages:

1. **Removes Plant from Gateway/Recreational Area** - Moves the plant from its location at the City Gateway, and largely eliminates odors and aesthetics associated with the plant.
2. **New Location Away from River** - Moves the plant away from the river, and the recreational areas associated with it by moving it onto a bench north of the County Jail.

Disadvantages:

1. **Extends Conveyance System** - Requires some 6,760 feet of wastewater conveyance pipelines increasing the risk of pipeline failures and sewage spills. Requires continual maintenance and operational responsibilities and costs to reduce risks.
2. **River Crossings** - Requires an additional inverted siphon river crossing which is costly and subject to failure increasing the risk of sewage releases to the river environment. Requires continual maintenance and operational responsibilities and costs to reduce risks.
3. **Lift station** - Requires ongoing operation and maintenance of pumping facilities and associated costs. Annual operating costs are substantial.
4. **Plant Approvals** - Places plant in a new, already developed area that will likely oppose the use, although much of the development is industrial and much more suited to a plant than the existing site.

CONCLUSION AND SUMMARY

The primary purpose of this study was to identify and provide costs for options that would relocate the Santa Rita Plant from its existing location. The previous BNR Study had provided a very conceptual review of an alternate to move the plant to the La Posta Area, south of the Rivera Bridge Crossing of the Animas River. The cost presented for this relocation was \$95.2 million, or about \$37 million in excess of the costs of renovating and expanding the plant on the existing site. Concerns were expressed that the costs for relocation were conservatively high and that the decision as to whether to relocate the plant was important and deserved a more detailed analysis.

This study identified two alternatives to relocate the plant. The La Posta Alternative would relocate the plant south of the Rivera Bridge, in a manner similar to that presented in the BNR Study. The Pepsi Site Alternative would move the plant to a site west of the river a relatively short distance south and west of the existing plant. A cost comparison of alternatives is presented in **Table 13**. Advantages and disadvantages of each of the plans are provided in the previous section.

The La Posta Relocation could be made at a cost of about \$35.6 million more than maintaining the Santa Rita Site, rather than the \$37 million estimated previously. In addition, since new areas would have accessibility to wastewater treatment at the plant, and because the cost of providing the additional capacity to serve these areas is minimal, the City could recover up to \$3.5 million in tap fees as this area developed. This would reduce the net cost to move the plant to about \$32.1 million. This plan has the added benefit of providing infrastructure that will likely serve to encourage land uses that are in demand for the City. However, the total investment that must be funded is \$93.8 million, and the approximately 4.5 miles of large scale gravity and force mains present operational and maintenance challenges, increase the risk of failures and spills and increase the operational costs due to pumping of wastewater, and benefits other than that of moving the plant from a sensitive recreational area are minimal. Therefore, this alternative is not recommended.

The Off-River Alternative presents an intermediate option at an investment of \$79.3 million, or about \$21.1 million more than the cost of remaining at the Santa Rita Site, plus the additional operating costs identified in **Table 14**. Conveyance lines are extended but for about 1.5 miles compared to the 4.5 miles in the La Posta Alternative, and one additional river crossing is proposed rather than 5. This alternative requires an additional lift station, as does the La Posta Alternative. This site, however, is not currently available for purchase and is only an option if the current owner, La Plata County, would consider offering the property.