ROOSEVELT CITY

HANCOCK COVE SEWER PROJECT

IMPACT FEE FACILITY PLAN & ANALYSIS

October 2017 | Project 1706.044

PREPARED BY

Jones & DeMille Engineering

ENERGY FINANCE GOVERNMENT CONSULTING EFG

IMPACT FEE FACILITY PLAN (IFFP) CERTIFICATION

Jones & DeMille Engineering (JDE) and EFG Consulting (EFG) certify that the attached impact fee facilities plan:

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and,
3. complies in each and every relevant respect with the Impact Fees Act.

IMPACT FEE ANALYSIS (IFA) CERTIFICATION

JDE and EFG certify that the attached impact fee analysis:

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement;
    d. offsets costs with grants or other alternate sources of payment; and,
3. complies in each and every relevant respect with the Impact Fees Act.

JDE and EFG Consulting make this certification with the following caveats:

1. All of the recommendations for implementations of the IFFP made in the IFFP documents or in the IFA documents are followed by City staff and elected officials.
2. If all or a substantial portion of the IFFP or IFA are modified or amended by the City, this certification is no longer valid.
3. All information provided to our team is assumed to be correct, complete, and accurate. This includes information provided by the City as well as outside sources.

Jones & DeMille Engineering EFG Consulting

SECTION 1: EXECUTIVE SUMMARY

The purpose of this Impact Fee Facility Plan (IFFP) and Impact Fee Analysis (IFA) is to fulfill the requirements of the Utah Code Title 11 Chapter 36a (Impact Fee Act) to enable Roosevelt City (City) in enacting a sanitary sewer impact fee for the Hancock Cove Area as defined herein. The following is a summary of the IFFP inputs.

SERVICE AREA:

The service area for this IFFP will include two areas which can be seen on the following map with the legal description provided in the appendix. The first area (Area 1) includes infrastructure needed to serve by a 15" trunk line. The second area (Area 2) includes additional infrastructure to serve the demand in that area. The approximate description of each area is as follows.

Area 1: Area 1 is bounded on the north by South Cove Road, on the west by approximately 2500 West, on the south by 800 south, and the east by approximately 1300 West. Area 1 includes Area 2 which is the existing subdivision.

Area 2: Area 2 is contained entirely within Area 1 and is bounded on the north by South Cove Road, on the east by approximately 1950 West, on the south by approximately 700 South, and on the west by approximately 1300 West.

Much of Area 1 is outside the City's boundaries. When a connection to the City's sewer system is requested in an area outside the City's boundaries, the parcel requesting the connection will need to annex into the City or make other legal arrangements per contract and pay the appropriate impact fee to connect to the system.

DEMAND ANALYSIS:

The demand unit utilized in this analysis was an equivalent residential connection (ERC). Area 1 currently includes 49 ERCs and is estimated to grow to 241 ERCs by 2048. Area 2 has the same 49 ERCs and will grow to 208 ERCs by 2048. As a result of this growth, the City is now planning to develop sewer facilities to connect Area 1 and Area 2 to the City's sewer system at the level of service (LOS) described below.

LEVEL OF SERVICE:

The LOS for this planning document is 330 gallons per day of flow per ERC.

EXCESS CAPACITY:

The Service Area currently has no excess capacity as it is a new extension of service in the City. However, the system is sized for an additional 371 ERCs that will likely develop north of the Area 1. In future years, that excess capacity will be recouped from those users through an impact fee. Until that growth occurs, the users of the system will cover the cost through the user rate.

CAPITAL FACILITIES ANALYSIS:

Based upon the demand and LOS, the City will need to construct the following capital facilities for each Area.

Construction Costs	Area 1	Area 2
Current ERCs	49	49
Proportionate Share to Current ERCs	20%	24%
Total Proportionate Costs to Current ERCs	$173,234	$875,649
Total Proportionate Costs to New ERCs	$678,794	$2,841,393
Proportionate Share of Eligible Costs to Current ERCs	$45,210	$228,523
Proportionate Share of Eligible Costs to Future ERCs	$177,148	$741,533

All costs within each area are system improvements as defined in the Impact Fee Act.

FUNDING OF FUTURE FACILITIES:

User rates for the current 49 users will be implemented to pay the proportionate share of their impact to the system. Impact fees will be used to recoup the remaining cost that serves new growth in Area 1 and 2 as this is a fair and equitable means to fund new growth. The City will receive up to $4m in grants from the Community Impact Board (CIB) and Water Quality Board (WQB) and $190k of in kind contribution from the County to fund this project. These funds are excluded from the impact fee. Only the bonds with a total of $1.192m will be recouped through the impact fee.

PROPOSED SANITARY SEWER IMPACT FEE

Based upon the inputs above, the maximum allowable impact fee for Area 1 is $922.65 per ERC. The maximum impact fee for Area 2 is $5,586.38 (which consists of a fee from Area 2 of $4,663.73 and the Area 1 fee of $922.65) per ERC. The following table provides a summary of the impact fee by connection size. A full summary of the impact fee calculation can be found in the body of the document and the appendix. For connections that produce a flow rate larger than one ERC (330 gpd), the City reserves the right under the Impact Fee Act to use a multiplier to calculate the multiple ERC rate and adjust the impact fee accordingly.

SECTION 2: CAPITAL FACILITY PLAN

SEWER FACILITY PLAN AMENDMENT FOR HANCOCK COVE AREA

Roosevelt City desires to update their Sewer Facility Plan to include the recently annexed area of Hancock Cove for the proposed sewer line extension to the Stonegate Subdivision. In conjunction with the Impact Fee Facility Plan (IFFP) and Impact Fee Analysis, this amendment supplements the 2012 Sanitary Sewer Master Plan (SSMP) and specifically addresses the sections discussing the potential Hancock Cove service area (See Figure 1.2-2 in SSMP illustrating Potential Hancock Cove Service Area). While the entire Hancock Cove area is not included in the proposed project, a portion of the area is being included in the design and sizing of the sewer trunk line. The proposed sewer trunk line will bring sewer service to the south-eastern portion of the Cove, specifically servicing the newly annexed area of Stonegate Subdivision. The following sections attempt to bring several documents together and apply the findings to the proposed 2017 Hancock Cove Sewer Project that Roosevelt City is undergoing and meet the needs for funding agencies, specifically the Utah Water Quality Project Assistance Program.

ADOPTION OF PREVIOUS STUDIES & ALTERNATIVE ANALYSIS

Supplemental to the SSMP, the following documents are proposed to be incorporated into this amendment to the Roosevelt City Sewer Facility Plan for this area of the City:

- Hancock Cove Sewer Feasibility Study (HCSFS) completed in 2014 by Horrocks Engineers on behalf of Duchesne County
- Stonegate Wastewater Alternatives Analysis (SWAA) completed in November 2015 by Sunrise Engineering and commissioned by Tri-County Health Department

The HCSFS presents an analysis of multiple alternatives for sewer collection and treatment in the Hancock Cove area and proposes a separate sewer district, with a recommended alternative to connect the proposed district to Roosevelt City's existing gravity system. The content of the HCSFS adequately addresses many of the Utah Water Quality Project Assistance Program's Capital Facility Plan Review Checklist subjects.

The SWAA specifically hones in on the Stonegate subdivision area, providing a specific cost and effectiveness analysis of several alternatives to address the problems and challenges of sewer and groundwater in the area. The recommended alternative of gravity sewer connecting at Summerall Lane has provided direction and specific information on the proposed project. The alignments are very close to the current proposed trunk line alignment and have the same essential impacts and implications.

This IFFP incorporates the existing conditions, project need, public participation, and analysis of alternatives from these two prior studies. The work accomplished prior to this project has important value and has laid the foundation for this current project and future expansion.

It is proposed in this IFFP study that Roosevelt City adopts the portions of these two documents that apply specifically to their proposed project.

FUTURE CONDITIONS OF STUDY AREA

Building upon the growth projections presented in the HCSFS and carving out a smaller influence area for the current project, the following table illustrates the growth that is considered for the proposed 2017 Hancock Cove Sewer Project:

Growth Rate in Sewer Area		*12.5%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*2.5%*
Date	**2017**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2048**	**2068**
Stonegate Existing ERC	***49***	49	49	49	49	49	49	49	
Area 1 ERC	49	***54***	67	97	125	161	207	**241**	
Area 2 (Stonegate) ERC	49	54	65	84	108	139	179	**208**	
Growth Rate in Non-Sewer Area		*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*3.0%*	*3.0%*	*2.5%*
Future Area ERC	91	106	137	176	226	291	339	371	
Future Area ERCs Connected				44	57	73	170	371	
Composite ERCs Connected	***49***	***54***	***67***	***141***	***182***	***234***	***377***	***612***	**1010**

Growth in this area seldom follows the traditional projections by the Governor's Office of Planning and Budget with the boom and bust cycles due to energy development. This pattern, combined with the tiered growth as system is made available and existing lots are filled up, has led to the proposed growth rates that eventually even out to a 4.5%, similar to the HCSFS projections. The area tends to have lots with a minimum area of an acre in size which provides a method to assume number of lots will follow closely with the acreage of developable area. Current zoning in the newly annexed area is 10,000 square foot lots minimum, however future development plans for property adjacent to Stonegate are showing 1 acre lots, matching the older Duchesne County minimum standard.

It is assumed that the existing subdivided lots in Area 2 will be developed by 2020. Additional lots adjacent to the sewer line are also assumed to be developed in subsequent phases of the subdivision as well as development on the east side of the gulch (Area 1). It is also assumed that in the next 30 years, expansion of the gravity collection system will extend northward with trunk lines running on either side of the gulch. It is also assumed that the trunk line on the West of the gulch serving Area 2 will be supplemented in the future with an additional trunk line in the Cove Area similar to the "North Cove Trunk Line A" presented in the HCSFS that could possibly run along 3000 West and then follow Pole Line Road to State Street. Therefore, the north-western areas of the Cove are not solely to be served by the Area 2 trunk line, but also future line along 3000 West. See Appendix B for maps of areas being served by current project and proposed for an impact fee.

SUMMARY OF ALTERNATIVES

The combined alternatives analyzed by the HCSFS and SWAA include the following:

- No Action Alternative (individual septic systems remain)
- Upgrading Existing Systems
- Cluster Onsite Treatment (Regionalization)
- Step or Pressurized System (Treatment by Roosevelt City)
- Gravity or Centralized Sewer (Treatment by Roosevelt City)
- Conventional Local Sewer System (Separate Treatment outside of current City lagoons)

The preferred alternative in both studies was a gravity system connecting to the Roosevelt City system for treatment. The alignments proposed for both studies overlaps closely with the selected alignment and

lengths and sizes are such that the options are all very closely related, enough for the City to feel comfortable that the selected plan has been analyzed and proven feasible.

COST & EFFECTIVENESS ANALYSIS

A thorough cost analysis and cost estimate of alternatives can be found in both the HCSFS and SWAA, with the latter specifically focused on servicing Stonegate subdivision, with a 12-inch trunk line of length similar to the selected alternative Roosevelt is pursuing. Current total probable cost for the 2017 Hancock Cove Sewer project, including roadway resurfacing, storm drainage piping, and all sewer elements is $4.57m.

SELECTED PLAN

The preferred alternative follows the recommendations of prior studies (HCSFS & SWAA) and includes a gravity fed sewer trunk line that services sewer mains placed within the roadways of Stonegate Subdivision. The sewer main line will connect to the existing manhole at Summerall Lane and 800 South (see maps in Appendix B). Sewer mains will run inside of the roadways within the subdivision, along with storm drain piping. Septic systems will be connected to the sewer main line running nearest the home and then properly abandoned.

A slight variation of the traditional alignments is proposed for the Stonegate area to minimize depth, decrease construction risk due to deep trenching, and allow groundwater to be captured prior to entering subdivision. This variation of the collection system would begin by running an 8-inch line along the west side of the subdivision so that cul-de-sacs which slope towards the west will benefit by not having to go as deep or as far. Optimizing the depth of excavation will minimize imported fill required, increase constructability, and accelerate schedule.

SECTION 3: DEMAND ANALYSIS

The purpose of this section is to establish the proposed LOS in the Area 1 and 2 which will match the LOS of the City.

DEMAND UNITS & FUTURE DEMAND

Demand units are measured in equivalent residential connections. The growth in ERCs is outlined in the previous section.

LEVEL OF SERVICE

The level of service utilized in this analysis is 330 gallons per day of flow per ERC which matches the current level of service in the City as documented in the 2012 Master Plan.

SECTION 4: CAPITAL FACILITY AND FUNDING ANALYSIS

CAPITAL FACILITIES ANALYSIS:

Based upon the demand and LOS, the City will need to construct the following capital facilities for each Area.

Construction Costs	Area 1	Area 2
Current ERCs	49	49
Proportionate Share to Current ERCs	20%	24%
Total Proportionate Costs to Current ERCs	$173,234	$875,649
Total Proportionate Costs to New ERCs	$678,794	$2,841,393
Proportionate Share of Eligible Costs to Current ERCs	$45,210	$228,523
Proportionate Share of Eligible Costs to Future ERCs	$177,148	$741,533

All costs within each area are system improvements as defined in the Impact Fee Act.

FUNDING PLAN

The City has received approval from the WQB for up to $2m in grant and $1.167m in 0% interest bond with a term of 30 years. In addition, the City has received approval from the CIB for up to $2m in grant and $500k in 0% interest bond with a term of 30 years. The Duchesne County has committed to provide $190k of in-kind contribution in the form of gravel toward this project. The City has excluded the grant revenues and in-kind contribution from the impact fee analysis. The total available funding is more than the cost of the project; therefore, the City has maintained the total CIB funding and proportionately reduced the WQB grant and loan to meet the reduced costs. See the summary of the funding sources in the next section.

The City will charge a user charge to the 49 current users to cover their proportionate share of the costs within Area 1 and Area 2. The impact fee is calculated to recoup the remaining expense. From a practical matter, the City will charge a user rate necessary to cover the debt service on the two bonds. As impact fees are collected, the user rates for the 49 users will be reduced annually to cover the debt costs.

SECTION 5: IMPACT FEE CALCULATION

The maximum supportable impact fee for Area 1 is $922.65. The maximum supportable impact fee for Area 2 is $5,586.38 ($4,663.73 for Area 2 improvements and $922.65 for Area 1). The following tables detail the impact fee methodology.

Construction Cost & Funding Allocation	Total	Area 1	Area 2
Total Project Cost	$ 4,569,071	$ 852,028	$ 3,717,043
PCIB GRANT	$ 2,000,000	$ 372,955	$ 1,627,045
WQB GRANT	$ 1,186,657	$ 221,285	$ 965,372
County In Kind Contribution (Grant)	$ 190,000	$ 35,431	$ 154,569
Net Costs	$ 1,192,414	$ 222,358	$ 970,056
CIB LOAN	$ 500,000	$ 93,239	$ 406,761
WQB LOAN	$ 692,414	$ 129,120	$ 563,295
Total Eligible Cost	$ 1,192,414	$ 222,358	$ 970,056
ERCs	612	241	208
Cost per ERC		$ 922.65	$ 4,663.73
Total Impact Fee for Area 1			$ 922.65
Total Impact Fee for Area 2			$ 5,586.38

NON-STANDARD IMPACT FEES

For connections that produce a flow rate larger than one ERC (330 gpd), the City reserves the right under the Impact Fee Act to use a multiplier to calculate the multiple ERC rate and adjust the impact fee accordingly.

OTHER CONSIDERATIONS

As future development occurs outside the City's boundaries which desires to connect to the City's sewer system, the development will need to annex into the City or enter into a contract to join the system. Project improvements needed to connect to the infrastructure described herein will be the responsibility of the developer or property owner.

The Impact Fee Act requires that impact fees be spent or incumbered within 6 years of collection. The City will use impact fees to pay back the 30-year bond payments as described herein.

The Impact Fees Act allows for the inclusion of a time price differential to ensure that the future value of costs incurred are accurately calculated to include the costs of construction inflation. The capital projects described herein will be built in 2017-2018 and thus no inflation component is included in the costs. All debt is non-interest bearing so no carry cost is included.

APPENDIX A – DRAFT IMPACT FEE ENACTMENT

Impact Fee

Ordinance Roosevelt

City, Utah Ordinance No.

ORDINANCE ADOPTING AN IMPACT FEE FACILITIES PLAN AND IMPACT FEE ANALYSIS AND IMPOSING CERTAIN IMPACT FEES FOR SANITARY SEWER; PROVIDING FOR THE CALCULATION AND COLLECTION OF SUCH FEES; PROVIDING FOR APPEAL, ACCOUNTING AND SEVERABILITY OF THE SAME, AND OTHER RELATED MATTERS

WHEREAS, On October 3, 2017 Roosevelt City, Utah (the "City") posted notice as to its intention to prepare an impact fee facilities plan ("IFFP") and impact fee analyses ("IFA") for sanitary sewer impact fees and invited all interested parties to participate in the impact fee preparation process, consistent with UCA Section 11-36a-501;

WHEREAS, the City is a municipality in the State of Utah, authorized and organized under the provisions of Utah law and is authorized pursuant to the Impact Fees Act, Utah Code Ann. 11-36a-101 et seq. to adopt impact fees; and

WHEREAS, on October 3, 2017, the City posted notice of a public hearing on Utah's Public Notice Website, the City's Website, and at the City's administrative building, library, and public works facility to consider the assumptions and conclusions of the Impact Fee Facilities Plans and the Impact Fee Analyses;

WHEREAS, the Roosevelt City Council (the "Council") met in regular session on October 17, 2017, to convene a public hearing and to consider adopting the IFFP and IFA, imposing sanitary sewer impact fees, providing for the calculation and collection of such fees, and providing for an appeal process, accounting and reporting method and other related matters; and

WHEREAS, in October 6, 2017, Jones & DeMille Engineering Inc. and EFG-Consulting LLC (the "Consultants") certified their work under UCA section 11-36a-306(1);

WHEREAS, on October 17, 2017, after considering the input of the public and stakeholders and relying on the professional advice and certification of the Consultants, the City adopted the findings, conclusions, and recommendations of the sanitary sewer IFFP prepared by the Consultants, a copy of which is attached hereto as Exhibit "A" and incorporated herein by reference; and

WHEREAS, on October 6, 2017 the Consultants certified their work under UCA Section 11-36a-306(2);

WHEREAS, based on the input of the public and stakeholders and relying on the professional advice and certification of Consultants; and

WHEREAS, on October 6, 2017, a copy of the IFFP and IFA and the proposed Impact Fee Ordinance, along with a summary of the analyses that was designated to be understood by a lay person, were made available to the public and deposited at the Roosevelt Branch of the County public library, City administrative office, on the Utah public notice website, and on the City Website; and

WHEREAS, on October 3, 2017, the City posted notice of the date, time and place of the public hearing to consider the IFA in three public places and on the public notices website, and on the City Website; and

WHEREAS, on October 17, 2017, the Council held a public hearing regarding the IFA and the Impact Fee Ordinance; and

WHEREAS, the Consultants in connection with the City prepared a schedule of impact fees for each type of development activity that specifies the amount of the impact fee to be imposed for each type of system improvement. A copy of such Schedule of Fees is attached hereto as Exhibit "B" and incorporated herein by reference; and

WHEREAS, after careful consideration and review of the comments at the public hearing, the Council has determined that it is in the best interest of the health, safety and welfare of the inhabitants of the City to adopt the findings and recommendations of the IFFP and IFA to address the impacts of development upon the sanitary sewer system, to adopt the IFFP as proposed, to approve the IFA as proposed, to adopt sanitary sewer impact fees, to provide for the calculation and collection of such fees, and to provide for an appeal process, and an accounting and reporting method of the same.

NOW, THEREFORE, BE IT ORDAINED by the Council as follows:

Section 1. **Findings.** The Council finds and determines as follows:

1.1. All required notices have been given and made and public hearings conducted as requested by the Impact Fees Act with respect to the IFFP, the IFA, and this Impact Fee Ordinance (this "Ordinance").

1.2. Growth and development activities in the City will create additional demands on its infrastructure. The facility improvement requirements that are analyzed in the IFFP and the IFA are the direct result of the additional facility needs caused by future development activities. The persons responsible for growth and development activities should pay a proportionate share of the costs of the facilities needed to serve the growth and development activity.

1.3. Impact fees are necessary to achieve an equitable allocation to the costs borne in the past and to be borne in the future, in comparison with the benefits already received and yet to be received.

1.4. In enacting and approving the IFA including the impact fees

recommended and this Ordinance, the Council has taken into consideration, and may consider on a case-by-case basis in the future, the future capital facilities and needs of the City, the capital financial needs of the City that are the result of the City's future facilities' needs, the distribution of the burden of costs to different properties within the City based on the use of sanitary sewer of the City by such properties, the financial contribution of those properties and other properties similarly situated in the City at the time of computation of the required fee and prior to the enactment of this Ordinance, all revenue sources available to the City, and the impact on future facilities that will be required by growth and new development activities in the City.

1.5. The provisions of this Ordinance shall be liberally construed in order to carry out the purpose and intent of the Council in establishing the impact fee program.

Section 2. **Definitions.**

2.1. Except as provided below, words and phrases that are defined in the Impact Fees Act shall have the same meaning in this Ordinance.

2.2. "Service Area" shall mean that geographic area designated within the City's boundaries as exhibited in the appendix of the IFFP and IFA.

2.3. "Project Improvement" does not mean system improvement and includes, but is not limited to, those projects identified in the plans for the benefit of growth.

2.4. "Utah State Impact Fees Act" shall mean Title 11, Chapter 36a, Utah Code Annotated or its successor state statute if that title and chapter is renumbered, recodified, or amended.

Section 3. **Adoption.**

The Council hereby approves and adopts the IFA including the recommended impact fees attached and the analyses reflected therein. The IFFP and the IFA are incorporated herein by reference and adopted as though fully set forth herein.

Section 4. **Impact Fee Calculations.**

4.1. *Impact Fees.* The impact fees imposed by this Ordinance shall have one component; a future facilities impact fee. The Impact Fee shall be calculated as set forth below.

4.2. *Developer Credits/Developer Reimbursements.* A developer, including a school district or charter school, may be allowed to receive a credit against or proportionate reimbursement of impact fees if the developer dedicates land for a system improvement, builds and dedicates some or all of a system improvement, or dedicates a public facility that the City and the developer agree will reduce the need for a system improvement. A credit against impact fees shall be granted for any dedication of land for, improvement to, or new construction of, any system improvements provided by the developer if the facilities are system improvements to the respective utilities, or are dedicated to the public and offset the need for an identified future

improvement.

4.3. *Adjustment of Fees.* The Council may adjust either up (but not above the maximum allowable fee) or down the standard impact fees at the time the fee is charged in order to respond to an unusual circumstance in specific cases and to ensure that the fees are imposed fairly. The Council may adjust the amount of the fees to be imposed if the fee payer submits studies and data clearly showing that the payment of an adjusted impact fee is more consistent with the true impact being placed on the system.

4.4. *Impact Fee Accounting*. The City shall establish a separate interest-bearing ledger account for the cash impact fees collected pursuant to this Ordinance. Interest earned on such account shall be allocated to that account.

(a) Reporting. At the end of each fiscal year, the City shall prepare a report generally showing the source and amount of all monies collected, earned and received by the fund or account and of each expenditure from the fund or account. The report shall also identify impact fee fund by the year in which they were received, the project from which the funds were collected, the capital projects from which the funds were budgeted, and the projected schedule for expenditure and be provided to the State Auditor on the appropriate form found on the State Auditor's Website.

(b) Impact Fee Expenditures. Funds collected pursuant to the impact fees shall be deposited in such account and only be used by the City to construct and upgrade the respective facilities to adequately service development activity or used as otherwise approved by law.

4.5. *Refunds*. The City shall refund any impact fee paid when:

(a) the fee payer has not proceeded with the development activity and has filed a written request with the Council for a refund within one (1) year after the impact fee was paid;

(b) the fees have not been spent or encumbered within six (6) years of the payment date; and

(c) no impact has resulted.

Section 5. **Appeal.**

5.1. Any person required to pay an impact fee who believes the fee does not meet the requirements of the law may file a written request for information with the Council.

5.2. Within two (2) weeks of the receipt of the request for information the City shall provide the person or entity with a copy of the reports and with any other relevant information relating to the impact fee.

5.3. Any person or entity required to pay an impact fee imposed under this

article, who believes the fee does not meet the requirements of law may request and be granted a full administrative appeal of that grievance. An appeal shall be made to the Council within thirty (30) calendar days of the date of the action complained of, or the date when the complaining person reasonably should have become aware of the action.

5.4 The notice of the administrative appeal to the Council shall be filed and shall contain the following information:

(a) the person's name, mailing address, and daytime telephone number;

(b) a copy of the written request for information and a brief summary of the grounds for appeal; and

(c) the relief sought.

5.5 The City shall schedule the appeal before the Council no sooner than five (5) days and no later than fifteen (15) days from the date of the filing of the appeal. The written decision of the Council shall be made no later than thirty (30) days after the date the challenge to the fee is filed with the City and shall, when necessary, be forwarded to the appropriate officials for action.

Section 6. **Recitals.** The recitals set forth above are adopted and incorporated herein.

This Ordinance shall be effective as of January 17, 2018 (90 days after its adoption by the Council as outlined in the Impact Fee Act)**.**

_____

Vaun Ryan, Mayor

Attested By:

_____

Carolyn Wilcken, City Recorder

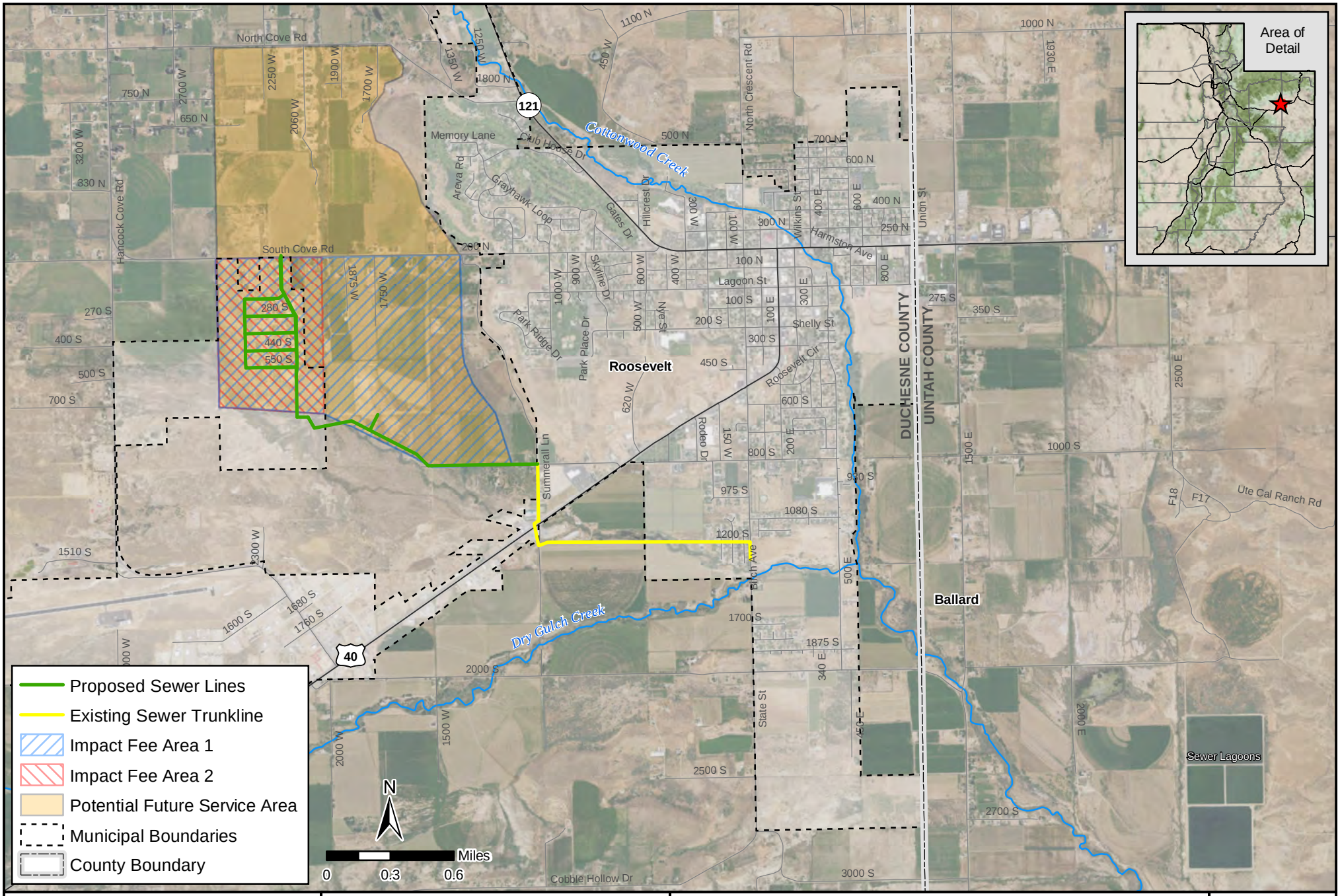
Exhibit A – IFFP & IFA

Exhibit B – Impact Fee Schedule

Impact Fee Calculation Schedule		
	Area 1	Area 2
One ERC	$922.65	$5,586.38

For connections that produce a flow rate larger than one ERC (330 gpd), the City reserves the right under the Impact Fee Act to use a multiplier to calculate the multiple ERC rate and adjust the impact fee accordingly.

APPENDIX B – MAP AND LEGAL DESCRIPTION OF SERVICE AREAS



Jones & DeMille Engineering

- Shaping the Quality of Life -

800.748.5275 www.jonesanddemille.com

Roosevelt City

Hancock Cove Sewer
Impact Fee Study Overview

Map Name: H:\JD\Proj\1706-044\Design\GIS\Maps\Impact_Fee_Study_Overview.mxd

Project Number: 1706-044 | Drawn by: JEM 10-17 | Last Edit: 10/05/2017

Duchesne County

Scale: 1 " = 0.6 Miles

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APPENDIX C – CONSTRUCTION ESTIMATES, IMPACT FEE CALCULATION

Roosevelt City
2017 Hancock Cove Sewer Project
October 12, 2017

www.jonesanddemille.com

ENGINEERS OPINION OF PROBABLE COST SUMMARY			
	ITEM DESCRIPTION		**TOTAL COST**
Stonegate Subdivision - Area 2 Costs			
	8" PVC Sewer Pipe (Pipe, Manholes, Dewatering, Geotextile, Borrow-Trench)		$ 640,000.69
	12" PVC Sewer Pipe (Pipe, Manholes, Dewatering, Geotextile)		$ 535,232.08
	Residential Connections		$ 390,179.00
	Roadway (Pulverization, Shaping, Asphalt, Rolled Gutter, Mailboxes, etc.)		$ 1,153,219.10
	Storm Drain System (18" Pipe, 24" Pipe, Boxes, Discharge		$ 518,208.00
	Other Costs (Wash Crossing, CUWCD Crossing, Mobilization, Traffic)		$ 229,321.94
	Engineering, Legal, and Other Indirect Costs		$ 260,057.96
	SUBTOTAL Stonegate Subdivision - Area 2 Costs		**$ 3,717,042.76**
Sewer Trunk Line - Area 1 Costs			
	12" PVC Sewer Pipe (Pipe, Manholes, Dewatering, Geotextile)		$ 84,594.98
	15" PVC Sewer Pipe (Pipe, Manholes, Dewatering, Geotextile)		$ 405,886.26
	Other Costs (Mobilization, Rock Excavation, Tree Removal, etc.)		$ 163,605.06
	Engineering, Legal, and Other Indirect Costs		$ 197,942.04
	SUBTOTAL Sewer Trunk Line - Area 1 Costs		**$ 852,028.34**
	TOTAL PROBABLE PROJECT COST		**$ 4,569,071.10**

ENGINEERS OPINION OF PROBABLE COST

Roosevelt City - 2017 Hancock Cover Sewer Project - 1706-044

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
	BID SCHEDULE				
1	MOBILIZATION	LUMP	1	$ 332,470.00	$ 332,470.00
2	TRAFFIC CONTROL	LUMP	1	$ 18,565.00	$ 18,565.00
3	EXPLORATORY EXCAVATION	EACH	5	$ 209.00	$ 1,045.00
4	RELOCATE SIGN	EACH	20	$ 136.00	$ 2,720.00
5	REMOVE MAILBOX	EACH	49	$ 84.90	$ 4,160.10
6	ROADWAY EXCAVATION (PLAN QUANTITY)	CU. YD.	8,040	$ 12.30	$ 98,892.00
7	SOFT SPOT SUBGRADE EXCAVATION	CU. YD.	2,500	$ 37.60	$ 94,000.00
8	BORROW - TRENCH (PLAN QUANTITY)	CU. YD.	6,300	$ 24.60	$ 154,980.00
9	GRANULAR BORROW	CU. YD.	2,600	$ 24.40	$ 63,440.00
10	UNTREATED BASE COURSE	CU. YD.	1,300	$ 33.20	$ 43,160.00
11	HOT MIX ASPHALT, 1/2" MAX.	TON	5,060	$ 77.80	$ 393,668.00
12	RELOCATE FIRE HYDRANT	EACH	1	$ 1,676.00	$ 1,676.00
13	RECONSTRUCT VALVE BOX	EACH	10	$ 415.00	$ 4,150.00
14	ROLLED RESIDENTIAL GUTTER	L.F.	14,040	$ 23.70	$ 332,748.00
15	6 INCH CONCRETE FLATWORK	S.F.	4,000	$ 8.80	$ 35,200.00
16	4" PVC SEWER PIPE	L.F.	8,200	$ 29.70	$ 243,540.00
17	8" PVC SEWER PIPE	L.F.	6,900	$ 61.00	$ 420,900.00
18	12" PVC SEWER PIPE	L.F.	6,020	$ 67.00	$ 403,340.00
19	15" PVC SEWER PIPE	L.F.	4,460	$ 71.00	$ 316,660.00
20	SEWER MANHOLE	EACH	48	$ 5,208.00	$ 249,984.00
21	DROP SEWER MANHOLE	EACH	2	$ 5,500.00	$ 11,000.00
22	SEWER SERVICE CONNECTION	EACH	65	$ 1,153.00	$ 74,945.00
23	SEWER CLEANOUT	EACH	35	$ 500.00	$ 17,500.00
24	ABANDON SEPTIC SYSTEM	EACH	49	$ 1,106.00	$ 54,194.00
25	WATER MAINLINE LOOP	EACH	2	$ 4,000.00	$ 8,000.00
26	WATER SERVICELINE LOOP	EACH	10	$ 1,000.00	$ 10,000.00
27	NEW MAILBOX TYPE A	EACH	49	$ 330.00	$ 16,170.00
28	STORM DRAIN JUNCTION BOX	EACH	10	$ 4,006.00	$ 40,060.00
29	DROP INLET BOX	EACH	14	$ 2,694.00	$ 37,716.00
30	18" STORM DRAIN PIPE	L.F.	3,700	$ 55.70	$ 206,090.00
31	24" STORM DRAIN PIPE	L.F.	3,210	$ 70.20	$ 225,342.00
32	TRENCH DEWATERING	L.F.	2,429	$ 6.00	$ 14,574.00
33	TREE REMOVAL	EACH	10	$ 726.00	$ 7,260.00
34	ROCK EXCAVATION	CU. YD.	80	$ 57.90	$ 4,632.00
35	ROADWAY PULVERIZATION - 8"	SQ. YD.	21,600	$ 2.40	$ 51,840.00
36	GEOTEXTILE - DRAINAGE	L.F.	13,000	$ 5.10	$ 66,300.00
37	GEOGRID	SQ. YD.	1,500	$ 2.30	$ 3,450.00
38	GEOTEXTILE - SOFT SPOT	SQ. YD.	1,500	$ 4.60	$ 6,900.00
39	REMOVE EXISTING CULVERT	EACH	2	$ 400.00	$ 800.00
40	WASH CROSSING	LUMP	1	$ 15,000.00	$ 15,000.00
41	STORM DRAIN OUTFALL	LUMP	1	$ 9,000.00	$ 9,000.00
42	BIG SAND WASH - ROOSEVELT PIPELINE CROSSING	LUMP	1	$ 15,000.00	$ 15,000.00
	Contingency Items Removed for Impact Fee Study Projected Final Cost	%	0%	$ -	$ -
				TOTAL CONSTRUCTION PROBABLE COST	**$ 4,111,071.10**

LEGAL/ORIGINATION FEE	$ 40,000.00
DESIGN ENGINEERING/SURVEY/PERMITTING/CONSTRUCTION MANAGEMENT	$ 418,000.00
TOTAL PROJECT PROBABLE COST	**$ 4,569,071.10**

FUNDING SUMMARY			
		LOCAL IN KIND CONTRIBUTION (GRAVEL)	**$ 190,000.00**
		PCIB GRANT	**$ 2,000,000.00**
		PCIB LOAN	**$ 500,000.00**
	63%	**WQB GRANT**	**$ 2,000,000.00**
	37%	**WQB LOAN**	**$ 1,167,000.00**
		TOTAL FUNDING	**$ 5,857,000.00**
		DIFFERENCE FROM BASE BID	***$ 1,287,928.90***
		Current Contingency (Funding vs. Cost)	*21.99%*

Roosevelt City

Hancock Cove Area

Sewer Collection Impact Fee

Growth Rate in Sewer Area		*12.5%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*2.5%*
Date	**2017**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2048**	**2068**
Stonegate Existing ERC	***49***	49	49	49	49	49	49	49	
Area 1 ERC	49	***54***	67	97	125	161	207	**241**	
Area 2 (Stonegate) ERC	49	54	65	84	108	139	179	**208**	
Growth Rate in Non-Sewer Area		*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*3.0%*	*3.0%*	*2.5%*
Future Area ERC	91	106	137	176	226	291	339	371	
Future Area ERCs Connected				44	57	73	170	371	
Composite ERCs Connected	***49***	***54***	***67***	***141***	***182***	***234***	***377***	***612***	**1010**

Roosevelt City

Hancock Cove Area

Sewer Collection Impact Fee

Level of Service (ERC)	330	gpd

			Build Out Years	ERC/YR	Growth Rate
Number of Total ERCs	612				
Number of Current ERCs	49	8.0%			
Number of Growth ERCs	563	92.0%	30	18.77	3.3%

		19%	81%	
Construction Cost & Funding Allocation	**Total**	**Area 1**	**Area 2**	
Total Project Cost	$ 4,569,071	$ 852,028	$ 3,717,043	
PCIB GRANT	$ 2,000,000	$ 372,955	$ 1,627,045	
WQB GRANT	$ 1,186,657	$ 221,285	$ 965,372	
County In Kind Contribution (Grant)	$ 190,000	$ 35,431	$ 154,569	
Net Costs	$ 1,192,414	$ 222,358	$ 970,056	
CIB LOAN	$ 500,000	$ 93,239	$ 406,761	
WQB LOAN	$ 692,414	$ 129,120	$ 563,295	
Total Eligible Cost	$ 1,192,414	$ 222,358	$ 970,056	
ERCs	612	241	208	371
Cost per ERC		$ 922.65	$ 4,663.73	
Total Impact Fee for Area 1			$ 922.65	
Total Impact Fee for Area 2			$ 5,586.38	

Proportionate Analysis	**Area 1**	**Area 2**
Current ERCs	49	49
Proportionate Share to Current ERCs	20%	24%
Total Proportionate Costs to Current ERCs	$ 173,234	$ 875,649
Total Proportionate Costs to New ERCs	$ 678,794	$ 2,841,393
Proportionate Share of Eligible Costs to Current ERCs	$ 45,210	$ 228,523
Proportionate Share of Eligible Costs to Future ERCs	$ 177,148	$ 741,533

Growth Projections	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**Total**
Area 1 (New ERCs)			5	2	2	3	3	3	6	6	6	6	6	5	5	6	6	6	7	7	7	7	8	9	9	9	9	10	11	11	12	192
Area 2 (Stonegate New ERCs)*			5	2	2	2	2	3	3	4	4	4	4	4	5	5	5	5	6	6	6	6	7	8	8	8	8	8	9	10	10	159
Future Service Area New ERCs									8	9	9	9	9	2	2	3	3	3	3	3	3	3	4	19	19	19	20	20	67	67	67	371
Total New (Area 1 + Future Area)	-	-	5	2	2	3	3	3	14	15	15	15	15	7	7	9	9	9	10	10	10	10	12	28	28	28	29	30	78	78	79	563
Total New ERCs (cumulative)	-	-	5	7	9	12	15	18	32	47	62	77	92	99	106	115	124	133	143	153	163	173	185	213	241	269	298	328	406	484	563	
Current Connections (in Area 1&2)	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	
Total ERCs (cumulative)	49	49	54	56	58	61	64	67	81	96	111	126	141	148	155	164	173	182	192	202	212	222	234	262	290	318	347	377	455	533	612	

*Area 1 includes all of Area 2

Area 1 Growth Rate	0.00%	0.00%	10.20%	3.70%	3.57%	5.17%	4.92%	4.69%	8.96%	8.22%	7.59%	7.06%	6.59%	5.15%	4.90%	5.61%	5.31%	5.04%	5.60%	5.30%	5.04%	4.79%	5.23%	5.59%	5.29%	5.03%	4.79%	5.08%	5.31%	5.05%	5.24%	
Area 2 Growth Rate	0.00%	0.00%	10.20%	3.70%	3.57%	3.45%	3.33%	4.84%	4.62%	5.88%	5.56%	5.26%	5.00%	4.76%	5.68%	5.38%	5.10%	4.85%	5.56%	5.26%	5.00%	4.76%	5.30%	5.76%	5.44%	5.16%	4.91%	4.68%	5.03%	5.32%	5.05%	
Future Service Area Growth Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	112.50%	52.94%	34.62%	25.71%	4.55%	4.35%	6.25%	5.88%	5.56%	5.26%	5.00%	4.76%	4.55%	5.80%	26.03%	20.65%	17.12%	15.38%	13.33%	39.41%	28.27%	22.04%	
Total Growth Rate	0.00%	0.00%	10.20%	3.70%	3.57%	5.17%	4.92%	4.69%	20.90%	18.52%	15.63%	13.51%	11.90%	4.96%	4.73%	5.81%	5.49%	5.20%	5.49%	5.21%	4.95%	4.72%	5.41%	11.97%	10.69%	9.66%	9.12%	8.65%	20.69%	17.14%	14.82%	

Cashflow Projections	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**Total**
Revenue																																
Impact Fee (Area 1)	$0	$0	$4,613	$1,845	$1,845	$2,768	$2,768	$2,768	$5,536	$5,536	$5,536	$5,536	$5,536	$4,613	$4,613	$5,536	$5,536	$5,536	$6,459	$6,459	$6,459	$6,459	$7,381	$8,304	$8,304	$8,304	$8,304	$9,226	$10,149	$10,149	$11,072	$177,148
Impact Fee (Area 2)	$0	$0	$23,319	$9,327	$9,327	$9,327	$9,327	$13,991	$13,991	$18,655	$18,655	$18,655	$18,655	$18,655	$23,319	$23,319	$23,319	$23,319	$27,982	$27,982	$27,982	$27,982	$32,646	$37,310	$37,310	$37,310	$37,310	$37,310	$41,974	$46,637	$46,637	$741,533
Needed User Rate Revenue*	$46,080	$46,080	$18,149	$34,908	$34,908	$33,985	$33,985	$29,321	$26,553	$21,890	$21,890	$21,890	$21,890	$22,812	$18,149	$17,226	$17,226	$17,226	$11,640	$11,640	$11,640	$11,640	$6,053	$467	$467	$467	$467	-$456	-$6,042	-$10,706	-$57,709	$463,733
Total Revenue	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$46,080	$0	$1,382,414
User Rate Impact																																
Total User Rate ERCs	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	
User Rate Annual Added Charge**	940	940	370	712	712	694	694	598	542	447	447	447	447	466	370	352	352	352	238	238	238	238	124	10	10	10	10	(9)	(123)	(218)	(1,178)	9,464
User Rate Monthly Added Charge	$78.37	$78.37	$30.86	$59.37	$59.37	$57.80	$57.80	$49.87	$45.16	$37.23	$37.23	$37.23	$37.23	$38.80	$30.86	$29.30	$29.30	$29.30	$19.80	$19.80	$19.80	$19.80	$10.29	$0.79	$0.79	$0.79	$0.79	-$0.78	-$10.28	-$18.21	-$98.14	$788.66
Current Monthly User Rate Charge	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$620.00
Total Monthly User Rate Charge	$98.37	$98.37	$50.86	$79.37	$79.37	$77.80	$77.80	$69.87	$65.16	$57.23	$57.23	$57.23	$57.23	$58.80	$50.86	$49.30	$49.30	$49.30	$39.80	$39.80	$39.80	$39.80	$30.29	$20.79	$20.79	$20.79	$20.79	$19.22	$9.72	$1.79	-$78.14	$1,408.66
Expenditures																																-
CIB Bond Debt Service	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ 16,667	$ -	500,000
WQB Bond Debt Service	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ 23,080	$ -	692,414
Repay City	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ 6,333	$ -	190,000
Total Expenditures	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ 46,080	$ -	$ 1,382,414
Revenue - Expenditures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* This amount is caluculated to by subtracting Total Expenditures by the Impact Fee Revenue.

** This is calculated by dividing the total users (49) by the Needed User Rate Revenue to derive the annual revenue requirement from the 49 users.

APPENDIX D – HANCOCK COVE SEWER FEASIBILITY STUDY (DUCHESNE COUNTY)

HANCOCK COVE

SEWER FEASIBILITY STUDY

HORROCKS
ENGINEERS

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EXECUTIVE SUMMARY

The purpose of this study is to determine the feasibility of a public wastewater collection and treatment system for Hancock Cove. Currently individual septic systems are used at each residence. Multiple instances of the septic systems failing have been documented. The failing septic systems present a significant risk to the public health and safety of the community.

The Hancock Cove community, in general, is supportive of a sanitary sewer collection system. Duchesne County along with a local community action committee commissioned this feasibility study. Conventional and nonconventional systems were analyzed in this study for physical and financial feasibility. Current and future conditions of Hancock Cove were also considered, as well as existing facilities.

Several alternatives have been evaluated in the preparation of this feasibility study. These alternatives include a conventional sanitary sewer collection system installed throughout the Hancock Cove and other non-conventional collection and treatment technologies. Final treatment of collected sewer flows was evaluated both in using the existing excess capacity of Roosevelt City's sewer lagoons and as via a new sewer lagoon system to be constructed.

The preferred alternative is to construct a new conventional gravity collection system throughout the proposed Hancock Cove Sewer District and treat the wastewater in the existing Roosevelt lagoons. The new sewer collection system would connect to Roosevelt's existing system at the 24 inch trunk line at the intersection of Pole Line Road and State Street. Via this trunk line Hancock Cove's wastewater would be conveyed to the Roosevelt Lagoons to be treated. At the time of this report, the proposed sanitary sewer collection system is estimated to cost approximately $7,675,000. This alternative has been chosen because it best fits the current needs of Hancock Cove for the cost and allows for additional future expansion of the area.

For funding, a grant/loan mix from the Permanent Community Impact Board (PCIB) would be sought for a $3,000,000 Grant / $2,000,000 Loan @ 2.5% for 30yrs. A grant/loan mix from the Division of Water Quality would be sought for a $1,337,500 Grant / $1,337,500 Loan @ 0% for 30 yrs. This would total the estimated construction cost of $7,675,000. The project will be feasible if this funding can be obtained. To meet the requirements for funding HCSD users would have to pay a monthly sewer fee of $51.40 per connection. This rate was determined based on the Median Adjusted Gross Income (MAGI) of the area.

1.0 INTRODUCTION

AREA HISTORY

The Hancock Cove area is located West of Roosevelt City in eastern Duchesne County, Utah approximately 140 miles east of Salt Lake City at the foot of the Uinta Mountain Range. Hancock Cove is the general area West of Roosevelt from 5500 W to 1500 W, and between 3000 S and 1500 N. See Exhibit 1 – Appendix A (Exhibits 1A-1D are segments of Exhibit 1 at a larger scale). Currently, all sewage systems are private septic systems. Roosevelt City, just east of the Cove, is served by a gravity flow sanitary sewer system with treatment in wastewater lagoons south and east of town (Exhibit 1 – Appendix A). These lagoons are composed of 3 treatment lagoons, a winter storage lagoon, and 5 irrigation pivots for land application of treated effluent. The treatment lagoons and storage pond cover an area of 268 acres. The current treatment facilities were constructed in 1976, with significant upgrades in 2011.

The Hancock Cove area does not have a public or centralized wastewater system and the residents are required to install onsite wastewater systems. These private onsite septic systems using drain fields for treatment have had mixed results and problems. In some areas, bedrock and shallow groundwater limits the type of system residents must install to meet Utah Department of Environmental Quality (DEQ) requirements. Multiple instances of septic systems failing due to high groundwater have been documented in the past and also during the survey. The Tri-County Health Department oversees all installations in this area and has expressed concern with health issues as development continues and challenges arise. See Exhibit 2 in Appendix A for a map of existing developed properties and future lots for potential growth.

COMMUNITY INVOLVEMENT/CONCERNS

This feasibility study was commissioned by Duchesne County with the help of a local community action committee. This study is to determine if the development of a public sewer collection system in Hancock Cove is both physically and economically viable.

In August 2011, the local action committee surveyed over 108 Hancock Cove residents living in the proposed Hancock Cove Sewer District (HCSD) area. The majority of residents surveyed expressed support for a sewer district and when asked if they would be willing to pay a monthly sewer utility fee of $51.40, 83 of the 105 respondents were supportive. The $51.40 monthly rate was calculated as 1.40% of the Median Adjusted Gross Income (MAGI) of the area.

For the purpose of soliciting input from interested agencies, private entities and the general public, a public hearing was held September 15, 2011 for the project proposed by this feasibility

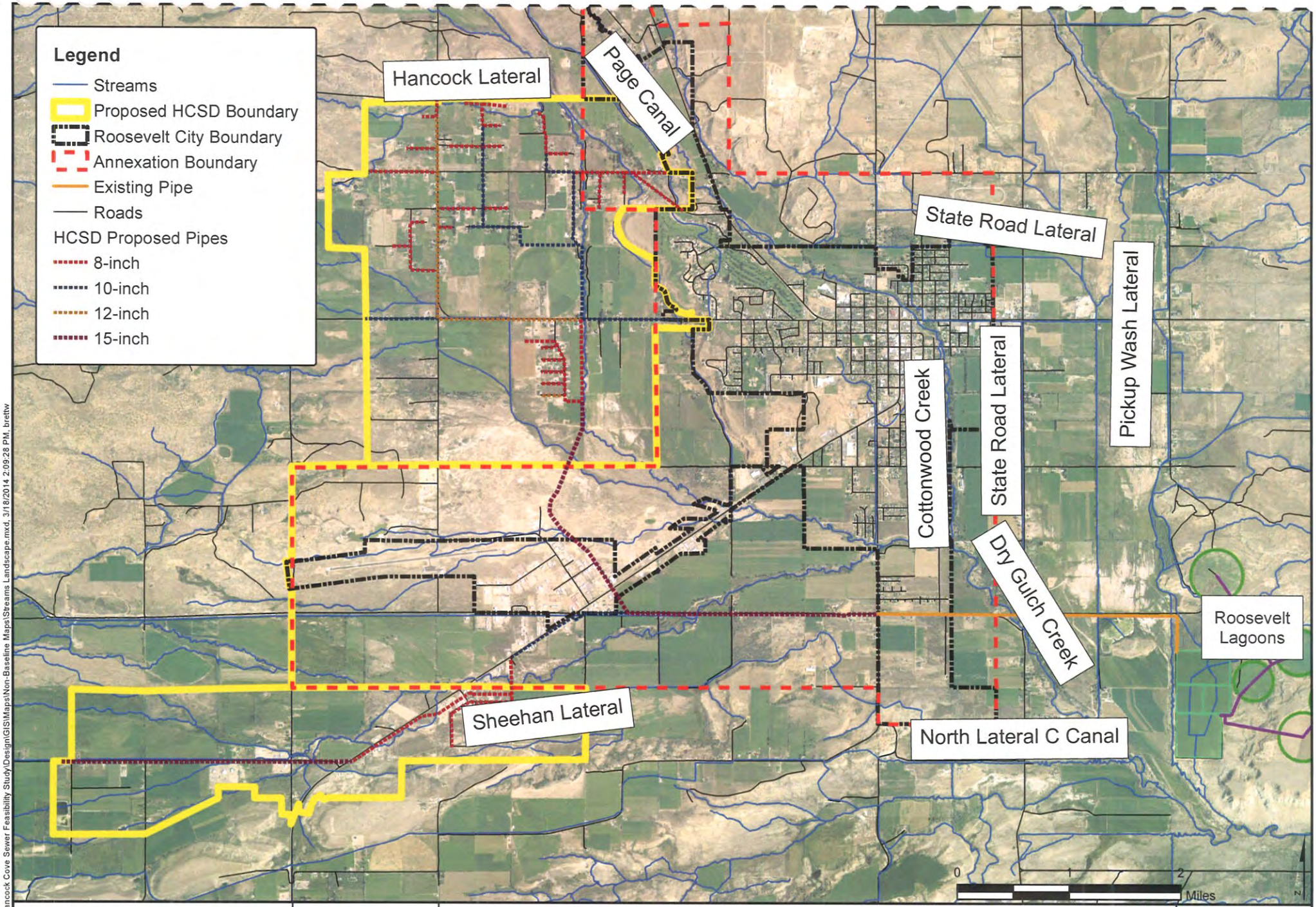
study. There were over 80 participants attending and during that meeting a decision was made to retain Horrocks Engineers to conduct a feasibility study funded by Duchesne County.

2.0 EXISTING CONDITIONS

SURFACE AND GROUND WATER HYDROLOGY

The Hancock Cove region is generally characterized as having shallow ground water. Depth to ground water ranges from 2 feet to 6 feet below the surface. Sources of the ground water in the region include naturally occurring ground water, irrigation and septic system discharges. In many locations, shallow ground water is the primary cause for onsite septic system failure. Ground water will be discussed in greater detail in Section 5.

Figure 1, on the following page, shows the natural waterways within the Hancock Cove area. This information was obtained from the Utah Automated Geographic Reference Center (AGRC). Generally, surface water in Hancock Cove towards the Southeast and is used mainly for irrigation. Currently, the Federal Emergency Management Agency (FEMA) has not mapped the project area. Other than localized potential flooding, there is no published information on flood plains in the area.



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HORROCKS ENGINEERS

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Hancock Cove Surface Water

DATE 3/18/2014

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Figure 1

PHYSIOGRAPHY, TOPOGRAPHY, GEOLOGY AND SOILS

The Uintah Basin is a structural, topographic and hydrologic basin oriented east to west. It is bounded on the west and northwest by high plateaus and the eastern slopes of the Wasatch Mountains, on the north by the Uintah Mountains, on the south by the Tavaputs Plateau and, more generally, on the east by the cliffs west of Douglas Creek Arch. Elevations range from 13,528 feet at Kings Peak in the Uintah Mountains to 4,600 feet near the Green River in Duchesne County.

The elevations of the area covered by the HCSD range from approximately 5,000 to 5,300 feet. The cove is a relatively flat area that generally slopes towards the Southeast. The USDA Natural Resource Conservation Service (NRCS) has not mapped soil types in the project area; however, from site visits and construction experience in the area, the soils appear to be a red sandy, silty material with bedrock outcroppings.

PRECIPITATION, TEMPERATURE AND PREVAILING WINDS

According to the National Weather Service's statistics published for Roosevelt City's city, the climate is semiarid to arid with an average annual precipitation of 9.43 inches. The average summer high temperature is 88 degrees Fahrenheit and the average winter high temperature is 30 degrees Fahrenheit. The average annual temperature is 47 degrees Fahrenheit. The prevailing winds are from the West.

TERRESTRIAL AND AQUATIC PLANTS, ANIMALS AND NATURAL COMMUNITIES

The US Fish and Wildlife Service (USFWS) maintains a listing of threatened and endangered species under the Endangered Species Act (ESA). The Utah Division of Wildlife Resources (UDWR) maintains a list of state sensitive species. As part of this study both lists were reviewed for Duchesne County because the project area is within the county boundaries. Table 1 includes the Threatened and Endangered Species that are listed for Duchesne County and Table 2 includes the state sensitive species that are listed for Duchesne County. The Information, Planning, and Conservation (IPaC) system lists USFWS threatened and endangered species that potentially occur within a defined area. Species that were shown on the IPaC system to potentially occur within the project area are highlighted in Table 1. In coordination with the United States Fish & Wildlife Service (USFWS) and Utah Division Water Resources (UDWR), a field survey to locate the physical presence of threatened and endangered species within the project area will need to be conducted before construction on the proposed project begins.

Table 1: Threatened, Endangered and Candidate Species in Duchesne County, Utah

Common Name	Scientific Name	Status
Yellow-billed Cuckoo	Coccyzus americanus	Proposed Threatened
Greater sage-grouse	Centrocercus urophasianus	Candidate
Mexican spotted owl	Strix occidentalis lucida	Threatened
Humpback chub	Gila cypha	Endangered
Colorado pikeminnow	Ptychocheilus lucius	Endangered
Bonytail chub	Gila elegans	Endangered
Razorback sucker	Xyrauchen texanus	Endangered
Graham beardtongue	Penstemon grahamii	Proposed Threatened
Shrubby reed-mustard	Schoenocrambe suffrutescens	Endangered
Barneby ridge-cress	Lepidium barnebyanum	Endangered
Clay reed-mustard	Schoenocrambe argillacea	Threatened
Ute ladies'-tresses	Spiranthes diluvialis	Threatened
Pariette cactus	Sclerocactus brevispinus	Threatened
Uinta Basin hookless cactus	Sclerocactus wetlandicus	Threatened
Canada Lynx	Lynx canadensis	Threatened

Source: USFWS – IPaC, Accessed on: 2/20/2014

Table 2: State Sensitive Species in Duchesne County, Utah

Common Name	Scientific Name	Status
Bald Eagle	Haliaeetus leucocephalus	Species of Concern
Black Swift	Cypseloides niger	Species of Concern
Bluehead Sucker	Catostomus discobolus	Conservation Agreement Species
Bonneville Cutthroat Trout	Oncorhynchus ClarkII Utah	Conservation Agreement Species
Burrowing Owl	Athene cunicularia	Species of Concern
Colorado River Cutthroat Trout	Oncorhynchus clarkia pleuriticus	Conservation Agreement Species

Common Name	Scientific Name	Status
Eureka Mountainsnail	Oreohelix eurekensis	Species of Concern
Ferruginous hawk	Buteo regalis	Species of Concern
Flannelmouth Sucker	Catostomus latipinnis	Conservation Agreement Species
Fringed myotis	Myotis thysanodes	Species of Concern
Greater Sage-grouse	Centrocercus urophasianus	Species of Concern
Kit Fox	Vulpes macrotis	Species of Concern
Lewis's Woodpecker	Melanerpes lewis	Species of Concern
Long-billed Curlew	Numenius americanus	Species of Concern
Mountain Plover	Charadrius montanus	Species of Concern
Northern Goshawk	Accipiter gentilis	Conservation Agreement Species
Roundtail Chub	Gila robusta	Species of Concern
Short-eared Owl	Asio flammeus	Species of Concern
Smooth Greensnake	Opheodrys vernalis	Species of Concern
Spotted Bat	Euderma maculatum	Species of Concern
Three-toed Woodpecker	Picoides tridactylus	Species of Concern
Townsend's Big-eared Bat	Corynorhinus townsendii	Species of Concern
Western Toad	Bufo boreas	Species of Concern
White-tailed Prairie-dog	Cynomys leucurus	Species of Concern

Source: UDWR Utah Sensitive Species List, Accessed on: 2/18/2014

AIR QUALITY AND NOISE

Currently, the project area is not designated as a non-attainment or maintenance area by the Utah Department of Environmental Quality, Air Quality Division. This means the air quality in the project area is currently above air quality standards. However, there are several air quality

studies currently underway. At this time, there are no air quality problems associated with the continued operation of the Roosevelt Wastewater Treatment Facility; nor does the facility emit air emissions that would violate federal, state, or local air quality standards. The addition of HCSD sewer flows to the facility should not adversely affect air quality.

LAND USE AND DEVELOPMENT

From visiting the project area the land use is known to be agricultural or residential, with some light commercial property. Duchesne County current zoning within the Hancock Cove area primarily consists of Agricultural 2.5 and Agricultural 5. Meaning that individual lot sizes are generally limited to 2.5 acres and 5 acres respectively. If parcels have access to culinary water from either Roosevelt City or Johnson Water, zoning has allowed 1.0 acres minimum lots. South of 800 South Street is zoned as Industrial. For the purposes of this report, it is assumed that future land use and development is consistent with the current zoning. Once sewer utility service is available in Hancock Cove, higher density development (i.e. smaller minimum allowed lot size) could safely be allowed.

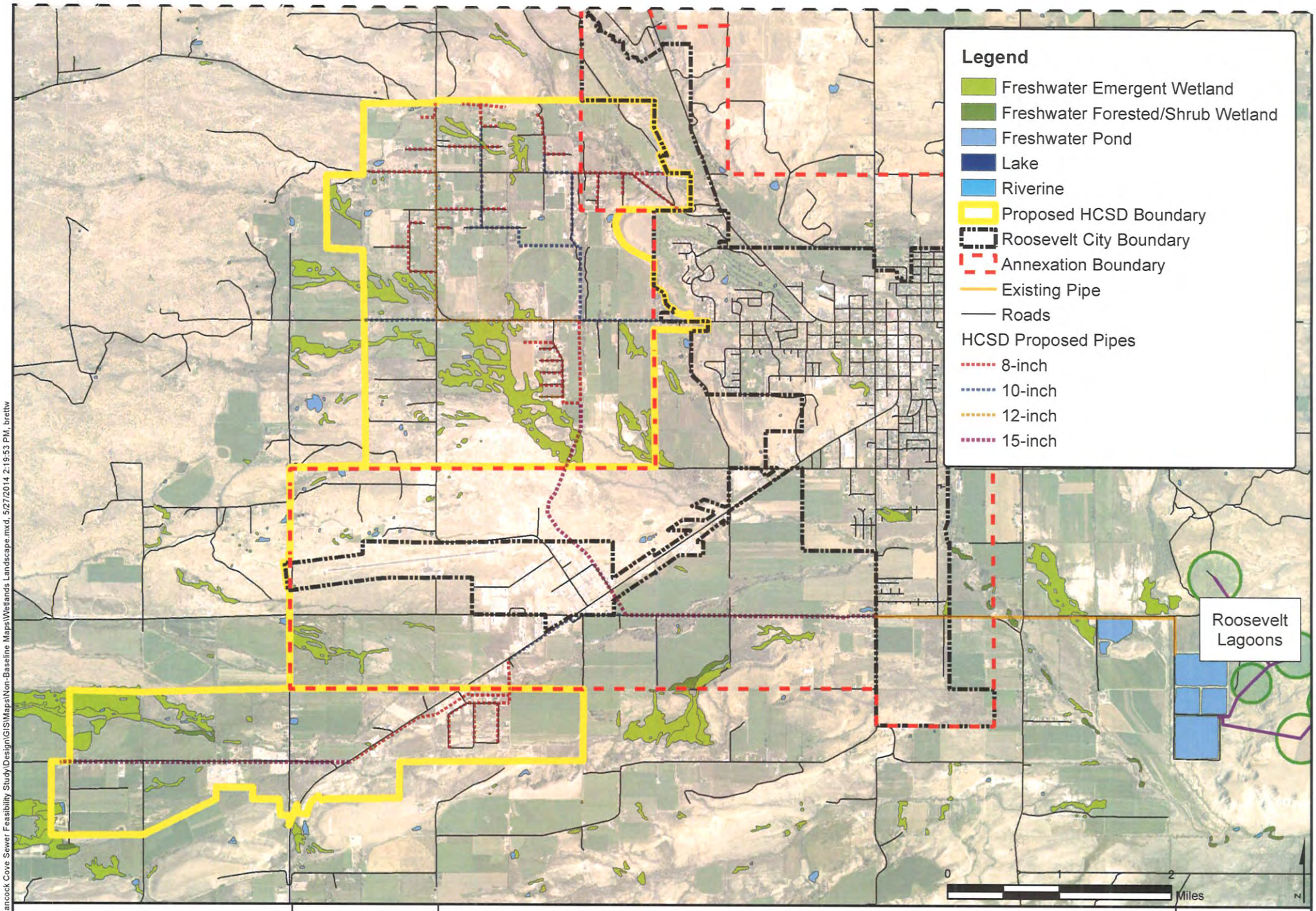
EXISTING WATER QUALITY AND PUBLIC HEALTH PROBLEMS

As mentioned previously in Section 1, the Tri-County Health Department oversees all septic system installations in this area and has expressed concern with health issues as development continues and challenges arise. The availability of Roosevelt City culinary water has allowed some of the residents to abandon private wells. However, there are still residents who use private wells for drinking water. As growth continues in this area, the concentration of septic systems and the possibility of pumping septic water through private wells will increase. This will be a health risk to the area if not addressed.

ENVIRONMENTALLY SENSITIVE AREAS

WETLANDS

According to the USFWS National Wetlands Inventory, there are areas that are designated as Freshwater Emergent Wetlands with the classification code PEMA (Palustrine system with emergent plants and surface water present for brief times during the growing season) within the project area. See Figure 2. As alignments are identified in the design of HCSD's future system, wetlands delineations will need to be conducted along the system corridors. Should the US Army Corps of Engineers identify jurisdictional wetlands, project impacts to wetlands will either need to be avoided or mitigated.



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Hancock Cove Wetlands

DATE 5/27/2014

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Figure 2

Wild and Scenic Rivers

The proposed project area does not contain a designated or proposed wild and scenic river as listed on the National Wild and Scenic Rivers System

Prime and Unique Farmlands

The presence of Prime and Unique Farmlands or State Important Farmlands is not able to be determined at this time as the USDA Natural Resources Conservation Service (NRCS) has not mapped Hancock Cove. Prime Agricultural Land locations and impacts will be investigated further before the beginning of the proposed project as part of the environmental document.

Cultural Resources

A large portion of the project area has yet to be developed or is agricultural land. Due to the potential for cultural resources to be present in the project area, a project specific cultural survey will need to be performed as part of the environmental document.

3.0 EXISTING WASTEWATER TREATMENT SYSTEMS

Currently, all sewage systems in Hancock Cove are private septic systems. Roosevelt City, just east of the Cove, is served by a gravity flow sanitary sewer system with treatment in wastewater lagoons south and east of town. This system is owned and maintained by Roosevelt City. It serves Roosevelt City residents as well as some Ballard City residents. The lagoon treatment system utilizes land application and evaporation to dispose of treated wastewater (See Exhibit 1D – Appendix A).

CURRENT POPULATION (ERU'S)

The equivalent residential connections (ERCs) or equivalent residential units (ERUs) of Roosevelt and Ballard are approximately 2,342 and 424 respectively. The HCSD is projected to have approximately 321 equivalent residential units (ERUs) (See Appendix B).

MAJOR INFLUENT CHARACTERISTICS

The Roosevelt City sewer system is mostly residential, with some commercial and industrial waste. The composition of the proposed HCSD influent is expected to be consistent with existing Roosevelt City waste.

MUNICIPAL TREATMENT PLANT AND SERVICE AREA

Roosevelt's wastewater treatment system is located south and east of town (See Exhibit 1D – Appendix A). It serves Roosevelt City residents as well as Ballard City residents. The system is composed of 3 treatment lagoons, a winter storage lagoon, and 5 irrigation pivots for land application of treated effluent. Existing lagoon storage capacity is 552 acre-ft of treatment in

Ponds 1, 2, and 3 and 880 acre-ft of storage for the Winter Storage Pond for a total of 1,432 acre-ft of storage. Table 3 below shows the depths, area, and volumes of each pond along with the evaporation rate for an annual evaporation loss. Evaporation data was taken over a period of 1948 to 1992 in nearby Ft. Duchesne and reported in the Utah Climate Center. Average evaporation loss was 51.7 inches annually. Adding the average annual precipitation of 7.1 inches gives a net loss of approximately 45 inches of water over the surface areas of the treatment ponds.

Table 3: Treatment Pond Capacity and Evaporation Loss

Treatment Pond	Depth [ft]	Area [acres]	Storage Volume [acre-feet]	Estimated Annual Evap. Depth [in]	Surface Area [acres]	Annual Evap. Volume [acre-feet]
Pond 1	6	51	306	45	51	190
Pond 2	6	20.5	123	45	20.5	76
Pond 3	6	20.5	123	45	20.5	76
Winter Storage Pond	16	55.5	880	45	55.5	206
Total Storage Capacity			***1,432***	***Total Evaporation Loss***		***548***

WASTEWATER DISPOSAL – LAND APPLICATION

Roosevelt's treatment system has a current general permit from the state allowing it to collect, treat, and dispose of municipal wastewater via land application (General Permit No. UTOP00204).

As wastewater flows through the sewer lagoon system and accumulate in the winter storage pond, Roosevelt City disposes of this water through land application. In other words, Roosevelt City utilizes the treated wastewater as irrigation water. Roosevelt City has a total of 268.3 acres of crop land dedicated to the use of disposing waste water.

The land application of treated wastewater is through the use of five (5) irrigation pivots and a pump station. The pivot system designed maximum application rate is calculated to be approximately 7.6 acre-ft per acre. Currently, wastewater flows through the sewer lagoons provide less than 3 acre-feet per acre. Seasonal fluctuations are expected as the Roosevelt area experiences wet and dry years. For example, the summer of 2011 experienced high flows and provided approximately 3.75 acre-feet per acre. Based on published data, the water required to meet the crop needs is approximately 4 acre-ft per acre. Therefore, for maximum crop yield on the Roosevelt City property, current average wastewater flows will likely not meet optimal crop-water requirements for alfalfa in all five pivot fields.

Predicted flows into the lagoons, the resulting lagoon capacity utilized, and the resulting land application of effluent is discussed in Section 11.

AREAS SERVED BY ONSITE SYSTEMS

Currently, areas outside of the Roosevelt City boundary and some areas that are geographically isolated from the existing Roosevelt City sewer system are served by onsite wastewater systems. All of the proposed HCSD connections currently use a type of onsite wastewater treatment system. For locations of known homes within the district boundary see Exhibit 1A-1D – Appendix A).

4.0 ANALYSIS OF AVERAGE, PEAK, DRY AND WET WEATHER FLOWS

In the 2011 Roosevelt City Sanitary Sewer Master Plan Update, the average daily inflow to the wastewater lagoons for the months of June through December were calculated. Table 4 below contains the results of the study. Based upon this data, the winter average is estimated tp be 636 gallons per minute. This flow rate equates to approximately 330 gallons per connection per day. The 2011 summer average equates to 590 gallons per day per connection. The difference between the summer and winter flows are due to additional water entering Roosevelt City's sewer collection system related to irrigation activities.

Utilizing these calculated summer and winter per connection flows, future sewer flow rates can be projected. A detailed analysis of projected flows will be discussed in Section 11. Included will be projected flows for HCSD. HCSD's projected flows were calculated using Roosevelt's winter average flows.

Table 4: Daily Inflow Averages from June to December 2011

Month	Avg. Daily Inflow [gpm]	Avg. Daily Inflow [Mgd]	Total Daily Inflow Volume [acre-ft]
June	1362	1.96	6.02
July	1150	1.66	5.08
August	893	1.29	3.95
September	712	1.03	3.15
October	687	0.99	3.03
November	528	0.76	2.33
December	617	0.89	2.73
Summer Average	**1135**	**1.63**	**5.0**
Winter Average	**636**	**0.92**	**2.8**
Annual Average	**927**	**1.34**	**4.10**

EFFLUENT LIMITATIONS

Since treated waste water can only leave Roosevelt's sewer lagoon system in two ways, land application and evaporation, seasonal limitations exist. During the months of October through April each year, treated waste water will accumulate in the winter storage pond. Therefore, the amount of waste water the sewer lagoons can effective manage is limited by the volume of the winter storage pond. Effluent is limited to land application during non-winter months. A winter storage pond retains treated effluent for the winter months until land application can resume each spring. The existing winter storage pond has a total capacity of 880 acre-feet. Using a calculated average winter inflow is 2.8 acre-feet per day and 180 day winter season, the current current needed winter storage volume is approximately 504 acre-feet, 376 acre-feet less than the current pond capacity. See Table 5.

Table 5: Current Winter Storage

Winter Duration	180	days
Average Winter Flows	2.8	acre-ft/day
Winter Storage Required	504	acre-ft
Pond Capacity	880	acre-ft
Excess Winter Storage	376	acre-ft

EXISTING ROOSEVELT CITY TRUNK LINE CAPACITY

The capacity of the existing Roosevelt City 36-inch sewer line on 2000 South conveying sewage to the sewer lagoons is approximately 28 mgd at 75% full. Currently, with a peaking factor of 2.5, summer flows are approximately 4 mgd or 14% of capacity. The 24-inch sewer collector in Pole Line Road between State Street and 1500 East will be shown to be a limiting factor for the HCSD, the capacity at 75% full is 7.4 mgd, with current average flows peaking at 2 mgd or 27% of capacity. Current flow rates were obtained using meters in manholes. The location of the manhole used to measure the flows in this 24 inch line is shown in Exhibit 1D – Appendix A.

The capacity of the existing Roosevelt City 12-inch sewer line at 1000 W US 40 is 1100 gpm. Existing flow rate through the line is 65 gpm or 6% of capacity. The peak flow it has seen is 300 gpm or 27% of capacity. This twelve inch line is operating at about the same capacity levels as the 24-inch line just discussed. The location of the manhole used to measure the flows in this 12 inch line is shown in Exhibit 1D – Appendix A.

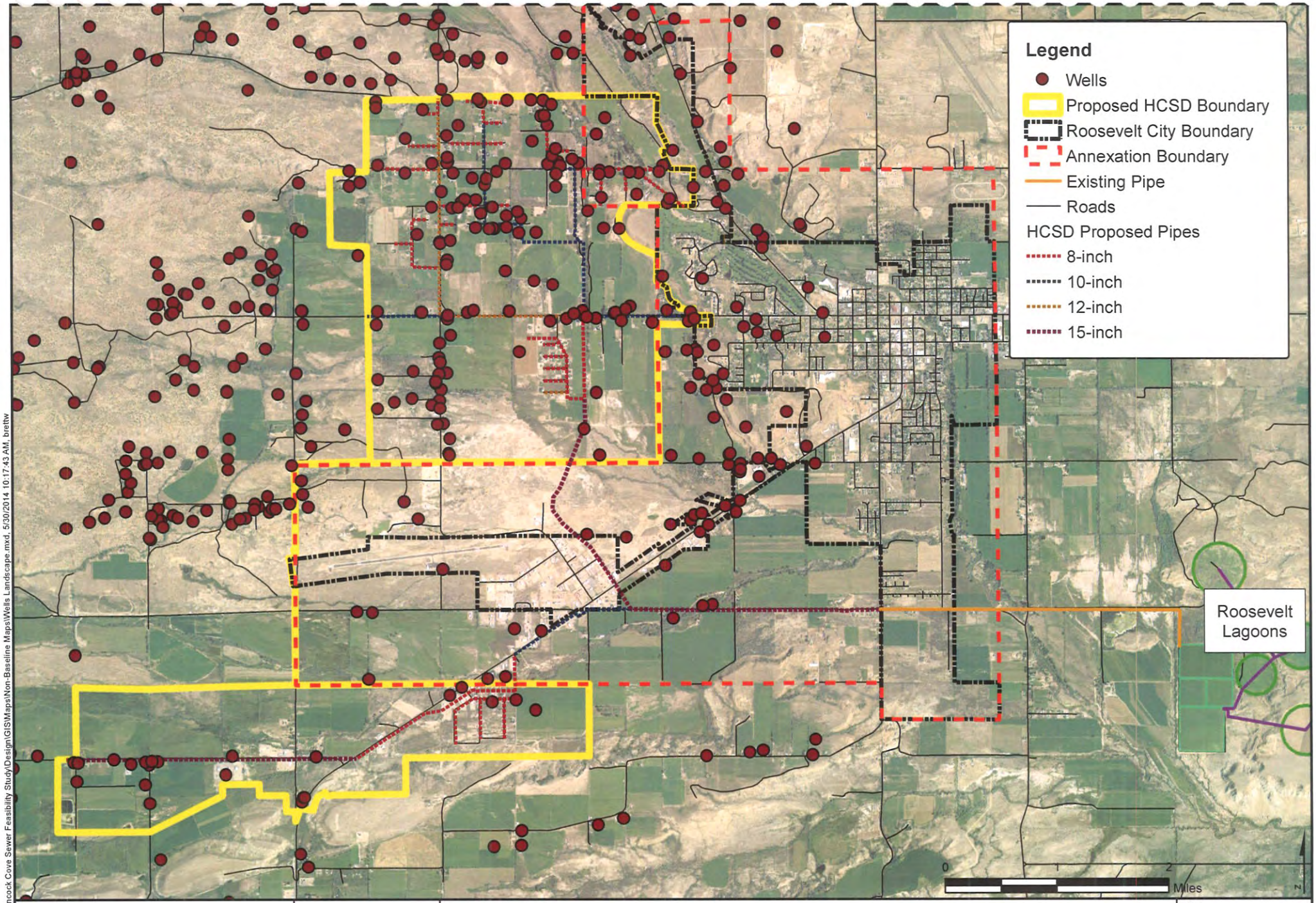
5.0 GROUND WATER

Figure 3, located on the following page, shows current known groundwater wells within the Hancock Cove Sewer District. See Appendix D for a detailed information for each of these wells. This information was obtained from the Utah Division of Water Rights website.

Groundwater in the area generally flows to the southeast. Groundwater recharge within the Hancock Cove occurs in three methods. 1) Natural groundwater inflow, 2) Irrigation and 3) discharges from septic tanks. As mentioned previously, shallow groundwater is a primary cause of septic system failure within the Hancock Cove area. Recently, several of the irrigation canals have been replaced with piped systems. By piping these systems, groundwater levels may be reduced. Any prediction on the impact of piping of irrigation canals on the groundwater elevations in the Hancock Cove area are outside of the scope of this project. Additional studies will be required to determine if any reduction of groundwater is realized.

If a sewer collection system is constructed in the Hancock Cove, there would be a significant reduction of discharge activities to groundwater are from residents' septic systems. (See existing homes displayed in Exhibits 1A-1D – Appendix A.) The proposed alternative (See Section 11) could potentially reduce groundwater elevations and improve groundwater quality as more HCSD users abandon their existing septic systems for the use of the gravity flow collection system.

Figure 4 shows the springs located around the HCSD, obtained from the Utah AGRC.



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Hancock Cove Wells

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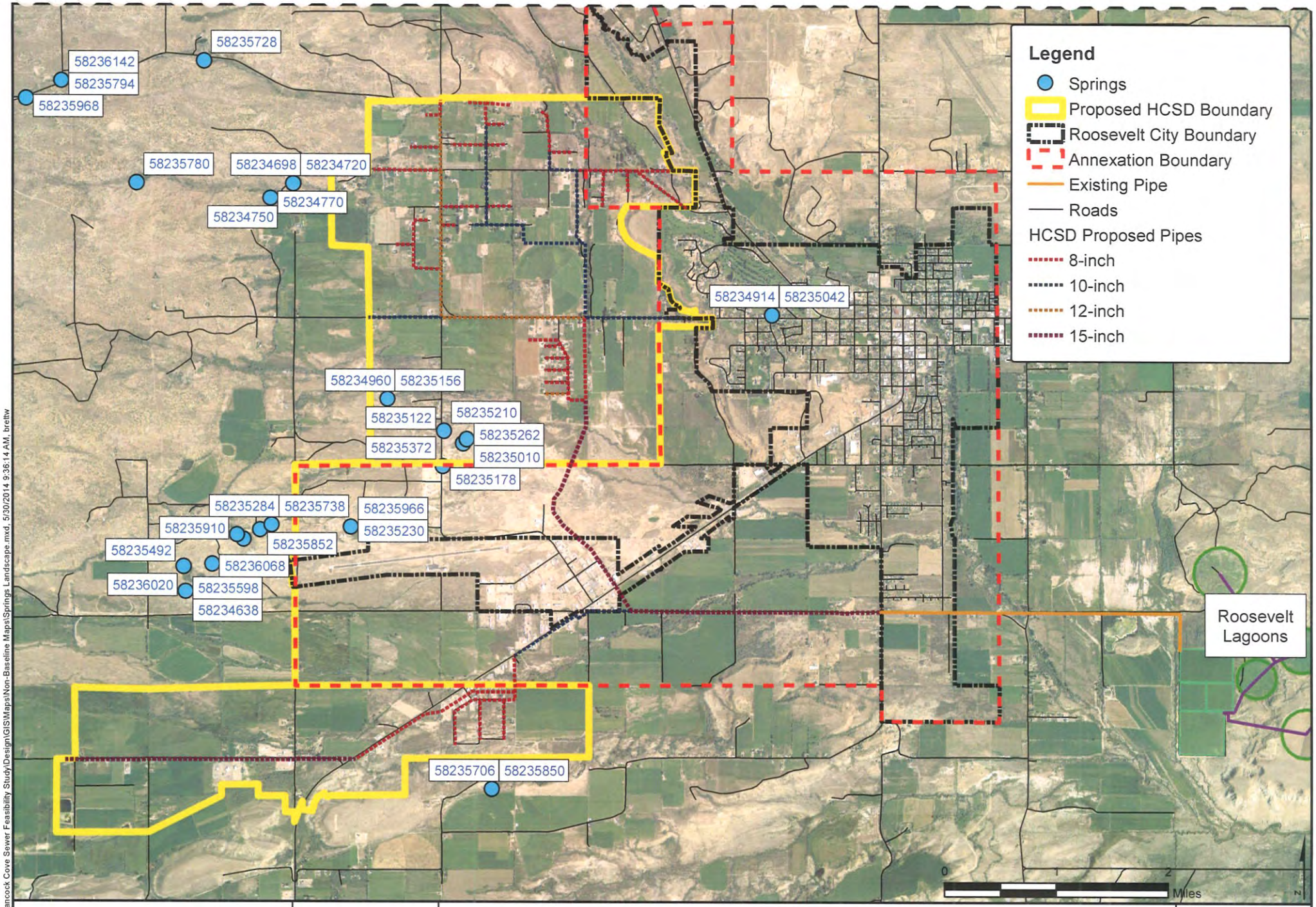
Figure 3



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Hancock Cove Springs

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Figure 4

6.0 INFILTRATION AND INFLOW

Roosevelt City actively repairs and maintains its sewer collection system. Routine maintenance and repair is done to mitigate infiltration or non-sewer inflows into the sewer collection system. The Roosevelt City Sewer Master Plan Update contains recommendations for replacement of lines with high I&I and a further study to locate problem areas to reduce I&I in the future.

The proposed sewer system piping to serve the Hancock Cove area will be required to have watertight gaskets or joints that will minimize the potential for infiltration. It is assumed that the proposed HCSD will have provisions against drains being allowed to tie into new sewer lines. I&I for the HCSD was assumed to be negligible.

7.0 FUTURE CONDITIONS

The Roosevelt City existing sewer facilities have a design capacity for a population of 12,000. The treatment facilities currently serve a population near 6,300. The population for the area has been projected to be 7,525 in the year 2030. This means with proper maintenance, the current facilities can continue to operate below capacity for at least 20 more years at the current projections without the addition of HCSD connections.

AREA POPULATION PROJECTIONS

The population of Roosevelt was 4,299, according to the 2000 U.S. Census, and projections from the Governor's Office of Planning and Budget indicate a slow but steady growth through the foreseeable future. See Table 6.

Table 6: Population Estimates for Roosevelt and Ballard, Utah

Area	Population						
	Census 2000	2005	2010	2020	2030	2040	2050
Roosevelt	4,299	4,462	4,716	5,642	6,377	6,976	7,577
Ballard	566	NA	801	958	1,010	1,049	1,138
Total	4,865	NA	5,517	6,600	7,387	8,025	8,715

The anticipated population growth does not exceed the previous projections prepared for the 2007 Capital Facilities Plan. See Figure 5. The existing Roosevelt wastewater treatment facilities were built to provide service to a population of approximately 12,000 people. Therefore, the existing wastewater facilities are anticipated to be able to serve the existing and future needs of Roosevelt and Ballard through 2050. Section 11 discusses the projected capacity of Roosevelt's facilities with the addition of HCSD wastewater.

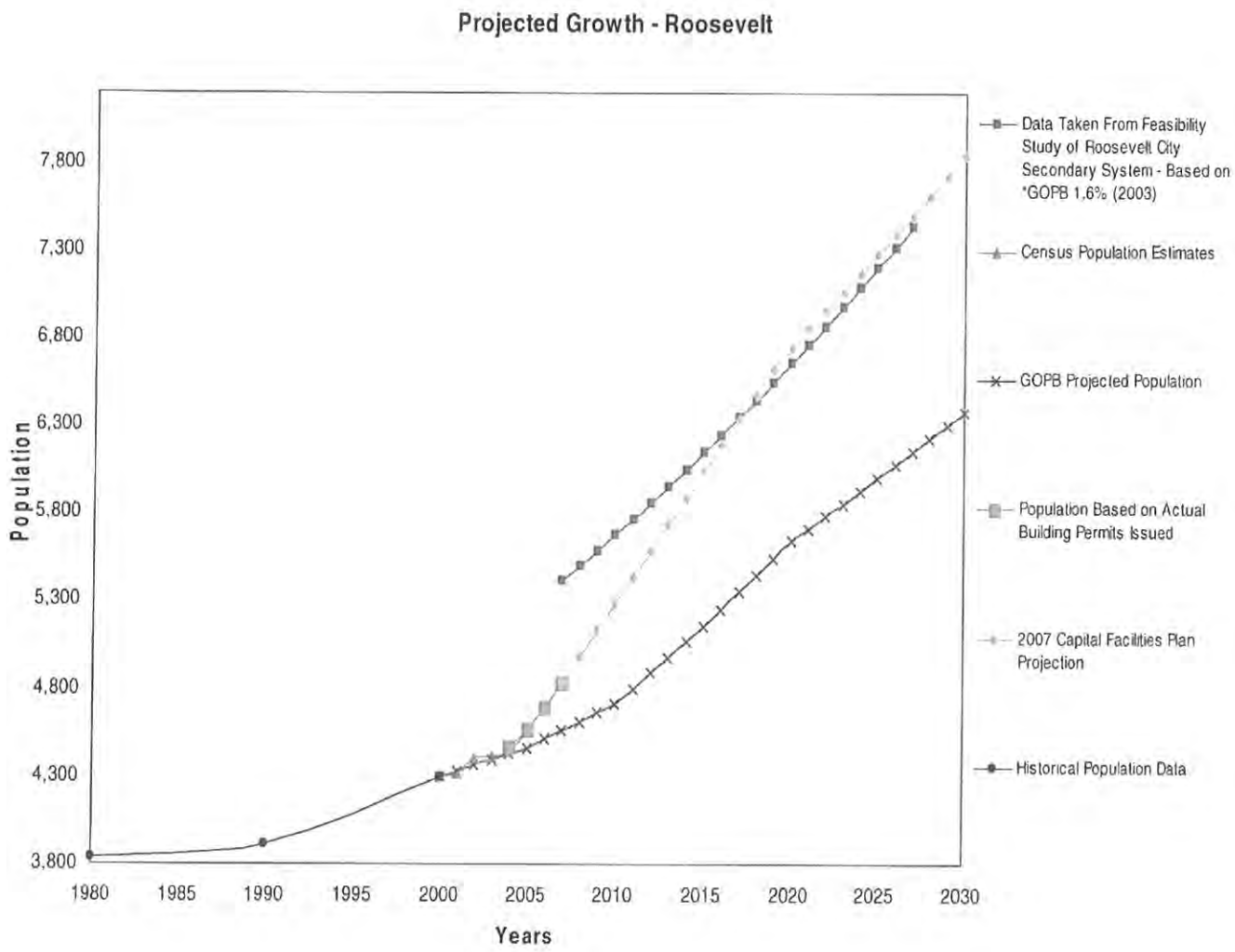


Figure 4: Projected Population Growth for Roosevelt, Utah

The proposed HCSD has approximately 321 existing homes and connections. Growth rates for additional connections were applied at 12.5% to the year 2020, 5% to the year 2040, and 2.5% to

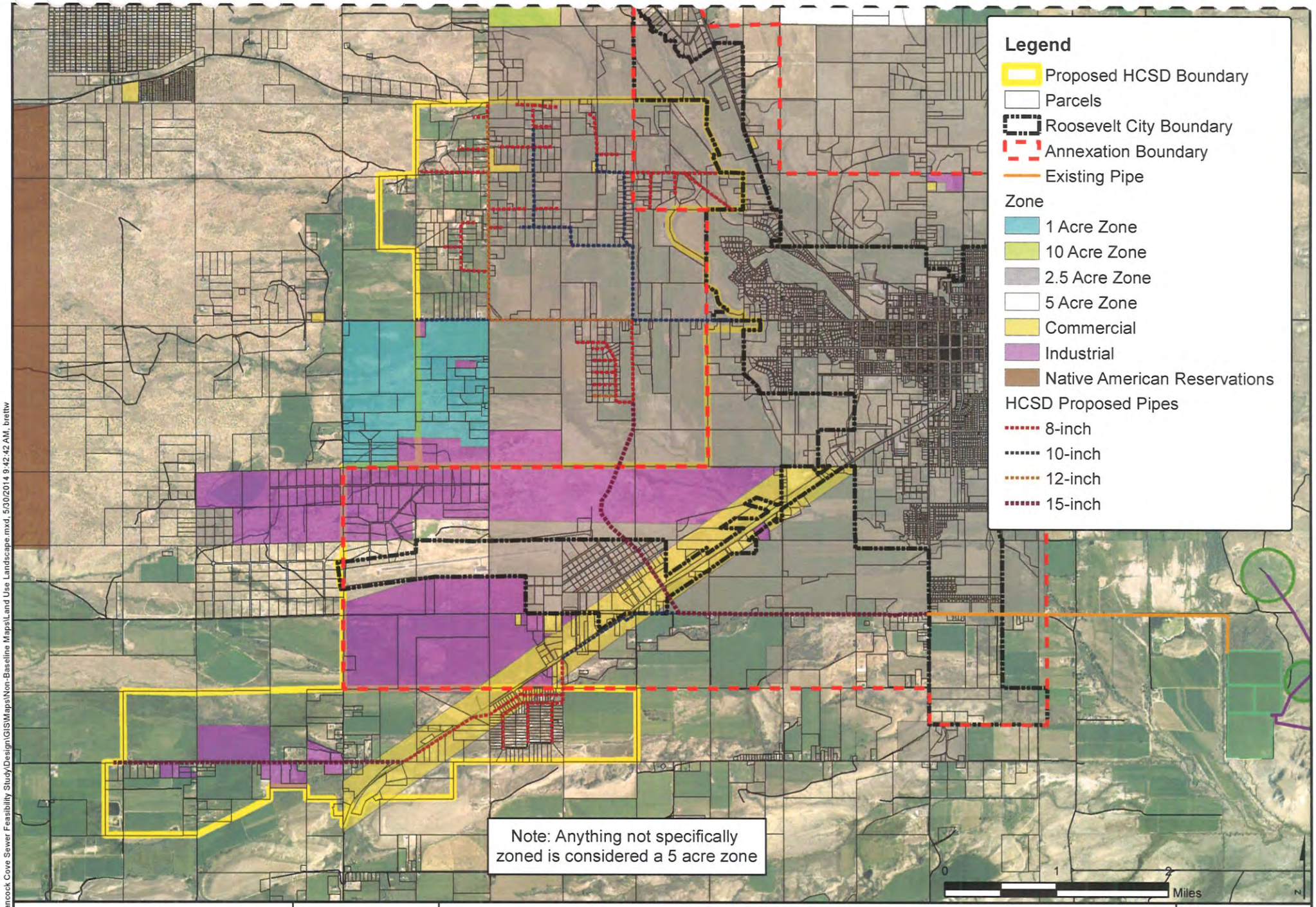
the year 2060. See Table 7 on the following page. This aggressive growth rate was assumed for the Hancock Cove area based on the number of lots already subdivided that could be available for development should a public sewer system be available.

Table 7: Connection Estimates for Hancock Cove, Utah

Area	Connections						
	2013	2015	2020	2025	2030	2035	2040
Hancock Cove	321	406	683	872	1,113	1,421	1,770

LAND USE PROJECTIONS

The proposed project is very compatible with the land use plans of the area. Figure 6 on the following page shows the land use plans for the Hancock Cove area, obtained from Duchesne County. There are areas in Hancock Cove that are already subdivided but not developed. See Exhibit 2 in Appendix A for a map of existing developed properties and future lots for potential growth. Lots in these areas continue to be developed as residents move into the Hancock Cove area. As lots are developed there will be a need for a wastewater treatment system. From a planning perspective, these lots could easily be developed with the introduction of a wastewater treatment system. Similarly there is potential for expansion in the industrial sector. Areas are already zoned as industrial and could also be developed easily with the introduction of a wastewater treatment system. The collection system will not conflict with agricultural land uses of Hancock Cove. Once constructed the sewer lines will be underground and within the right of way area of the roadways as much as possible to avoid conflicts with differing land uses. There may be temporary impacts to land use during construction. Roosevelt City land use plans already incorporate the existing use of the Roosevelt treatment facility and the surrounding areas into their current and long-range planning.



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Hancock Cove Land Use Plans

DATE 5/30/2014

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Figure 6

WATER CONSERVATION AND MANAGEMENT

As previously discussed, an active role should be taken by Roosevelt City and HCSD to eliminate inflow and infiltration (I & I) to reduce non-sewer flows. Based on projections, however, there will not be sufficient water during dry years to fully operate the Roosevelt City pivot sprinkler systems until approximately 2027 with HCSD flows and 2053 with only Roosevelt and Ballard effluent. If the time comes that flow exceeds the land application rates, then conservation efforts may be needed.

WASTELOAD ANALYSIS

The existing wastewater facility is designed so that it does not discharge into any Waters of the US or into any other body of water. Wastewater is treated onsite and used for agricultural irrigation of the surrounding alfalfa fields that are also part of the existing facility. Therefore, the proposed project would not have a negative impact on water quality in the area.

8.0 ANALYSIS OF ALTERNATIVES

The purpose of this study is to determine if it is financially and physically feasible to install a sewer system in the Cove that would allow current residents to hook into a system with capacity for projected growth in the area. The study uses a proposed system with infrastructure that would serve the more dense areas in the cove where connections will be most economical for a first phase. Two areas were identified and called the North and South Hancock Cove collection. Alternative collection and treatment options were also included in the cost estimates and alternatives.

A. NO ACTION

The no action alternative would be to keep all sewage systems in the Hancock Cove area as septic systems. This would be the cheapest option but it is not a great alternative. Each year approximately 10-20 septic system either fail completely or require significant maintenance. Each time a septic system fails, raw, untreated sewage is discharged and represents a significant risk to the health and safety of the residents of Hancock Cove.

Benefits of the no action alternative are that residents would not have to pay the costs associated with abandoning septic tanks and constructing sewer laterals to connect their homes to sewer mains. Residents also would not have to pay the monthly fee or connection fee for the new system. Residents, however, would continue to have frequent failures in septic systems leading to high operation and maintenance costs.

B. UPGRADE EXISTING SYSTEM

Sewage systems in Hancock Cove could be upgraded to advanced onsite wastewater treatment systems. These systems would reduce the area needed for a drain field and the problems associated with them. However, there are disadvantages to using them. Advanced onsite wastewater treatment systems fail to operate well at temperatures below 30 degrees Fahrenheit. Using these systems in Hancock Cove would be problematic as the average maximum temperature in the winter is only 30 degrees Fahrenheit. These types of systems are expected to cost approximately $30,000 per resident. In addition, they required constant ongoing maintenance that further increases the total overall cost of this alternative. Due to the costliness of these systems and the other temperature limitation issues, these systems have been determined to not be suitable for use in the Hancock Cove area.

C. CENTRALIZED SEWER COLLECTION SYSTEM

Roosevelt City's sewer collection system is located within acceptable distance to the Hancock Cove area. In Addition, current analysis has determined that both Roosevelt City's conveyance and lagoons have sufficient capacity for the flows anticipated within the HCSD.

This alternative evaluates the regionalization HCSD's wastewater treatment by adding its wastewater to Roosevelt City's to be treated at Roosevelt's lagoon system. Two options were considered when evaluating regionalization of the HCSD. Both options involve creating a gravity collection system in the Hancock Cove area and connecting this system to the existing Roosevelt City collection system. Roosevelt's collection system would then convey HCSD's wastewater to the treatment lagoons. Both options would serve the same number of connections in the HCSD, but the systems would be arranged differently.

Option 1 includes a North Cove Area Collection System, North Cove Area Trunk Line (A) to Pole Line Rd, a South Cove Area Collection System, and Pole Line Road Trunk Line (1) to State Street. See Exhibits 1-1D – Appendix A. This option connects to the Roosevelt system's 24 inch line at 2000 S State Street.

Option 2 includes a North Cove Area Collection System, North Cove Area Trunk Line (B) to US 40 1000 W, a South Cove Area Collection System, and Pole Line Road Trunk Line (2) to State Street. See Exhibits 1-1D – Appendix A. This option connects to the Roosevelt system's 12 inch line at 1000 W US 40 and to the Roosevelt system's 24 inch line at 2000 S State Street. Pole Line Road Trunk Line (1) to State Street is a 15 inch line whereas Line (2) is a 10 inch line.

HCSD would manage their system up to the point it connects to Roosevelt's system in both options. HCSD would pay a $15 a month fee per connection for the use of the Roosevelt City

treatment lagoons. Roosevelt City would continue to manage the operation and maintenance of their lagoons and existing sewer pipes.

Regionalization of the HCSD has a many advantages. They include:

1. New discharge points for treated effluent would not be created.
2. HCSD would not have to construct a new wastewater treatment plant.
3. Health concerns would be mitigated by converting from the failing septic tanks to a centralized collection system.
4. Abandoning septic systems would free up the congestion of septic systems allowing future development.

D. CONVENTIONAL COLLECTION SYSTEM

An alternative to regionalization considered was creating a gravity collection system with a new treatment facility in the Hancock Cove area. This was analyzed as Option 3 and would serve the same number of connections as Options 1 & 2.

SYSTEM DETAILS

Option 3 includes a North Cove Area Collection System, North Cove Area Trunk Line (A), a South Cove Area Collection System, Hancock Cove Sewer Lagoons, and Pole Line Road Trunk Line to Sewer Lagoons. The new sewer lagoons would potentially be located Southeast of 1000 W 2000 S and cover approximately 46 acres. See Exhibit 1-1D – Appendix A.

HCSD would manage their entire system including the new treatment lagoons.

This system would have the advantage of mitigating health concerns by converting from failing septic tanks to a conventional collection system. It would also have the benefit of HCSD not being required to pay Roosevelt for the use of Roosevelt's system. HCSD would have a higher degree of freedom by owning its own treatment lagoons. Once again, abandoning septic systems would free up the congestion of septic systems allowing future development. The disadvantage of this option is that HCSD would be responsible for the operation and maintenance of a treatment plant.

9.0 LOCAL TREATMENT ALTERNATIVE

Listed below are the summarized cost estimates of Options 3. See Appendix B for the breakdown of these costs.

Option 3: Hancock Cove Sewer with New Sewer Lagoons

Hancock Cove Sewer Lagoons.....$ 5,345,000
North Cove Area Collection System.....$ 4,848,000
North Cove Area Trunk Line (A) .....$ 774,000
South Cove Area Collection System.....$ 1,349,000
Pole Line Road Trunk Line to Sewer Lagoons .....$ 405,000
TOTAL.....$ 12,721,000

This option is the most expensive of the three. The construction of the Hancock Cove Sewer Lagoons adds $5.3 million to the total construction costs. The anticipated cost of Option 3 is not economically feasible for the number of connections anticipated in the Hancock Cove area. This option is not considered viable and not further studied. See Appendix C for this projected sewer treatment cost.

10.0 PREFERED ALTERNATIVE – OPTION 1 (TREATMENT WITH ROOSEVELT CITY)

Listed below are the summarized cost estimates of Options 1 & 2. See Appendix B for the breakdown of these costs.

Option 1: Hancock Cove Sewer District using Roosevelt City Lagoons (Preferred)

North Cove Area Collection System.....$ 4,848,000
North Cove Area Trunk Line (A) to Pole Line Rd ..$ 774,000
South Cove Area Collection System.....$ 1,349,000
Pole Line Road Trunk Line (1) to State Street.....$ 704,000
TOTAL.....$ 7,675,000

North Cove Trunk Line A in Option 1 achieves the goals of collecting sewer flows form the Hancock Cove area and connects to Roosevelt City's system. It can be designed to accommodate future expansion for both HCSD as well as Roosevelt City. As additional phases of the HCSD are installed, they will utilize phase 1 as the trunk lines. Roosevelt City, through coorperative agreement with HCSD should be able to expand their sewer service areas along Pole Line Road and the industrial park.

11.0 MORE DETAILS ON PREFERRED ALTERNATIVE

Option 1, creating a new gravity collection system in the HCSD area and treating the wastewater using Roosevelt City lagoons, was chosen as the preferred alternative. A layout of the proposed project can be seen in Exhibits 1-1D – Appendix A. As part of the project, laterals would be constructed from sewer mains up to property lines for each current residence. Residents would be individually responsible for connecting their homes to the lateral at their property line. A loan pool has been developed in the financial plan to assist low income families with the financial obligation that connecting their homes would create.

Environmental Impacts

During construction of the proposed alternative there will be a minor impact to air quality and noise due to construction activities. Once constructed the alternative will have a positive environmental impact improving ground water quality. The additional treated waste water will be used for irrigation and will bring the quantity of water closer to optimal crop-watering requirements. The only energy required for this alternative is the energy already used to operate the pivots.

Roosevelt City Lagoon Capacity

Figure 6 shows the annual volume and capacity of the existing Roosevelt lagoon treatment system with scenarios for Roosevelt and Ballard growth and adding HCSD. Assumptions are included below the figure and the legend indicates color coding and inflow rates. Figure 6 illustrates that with the addition of the proposed HCSD flows as early as 2014, the optimal land application rate and winter storage capacity could be exceeded as early as 2029. The assumed growth rates for the Hancock Cove area were 12.5% to 2020, 5% to 2040 and 2.5% to 2060. HCSD growth below this threshold will extend the timeframe for system expansion. It was assumed that 243 homes would be connected to the system within the first year of construction. It was also assumed that existing piping and manholes with high infiltration rates within Roosevelt City's system would be replaced by year 2040 and I&I rates would be brought down to a normal rate of 40 gpd per ERC. Without HCSD, Roosevelt and Ballard flows with a growth rate of 1.1% will be able to be treated until year 2047 when winter storage capacity would need to be increased. Also

noted on the graph is the maximum amount of water that could be land applied if pivots were to run steadily from May to September. Both scenarios do not exceed this limitation in the projected period.

Based on Utah climate data for an alfalfa crop in Roosevelt, the net ET requirement to be supplied by irrigation is approximately 4 acre-ft per acre. Currently, average annual inflow is such that less than 3 acre-feet per acre can be applied. The summer of 2011 was a very high year for I&I and provided enough flows for approximately 3.75 acre-feet per acre based on evaporation losses. Therefore, for maximum crop yield, current average flows will likely not meet optimal crop-water requirements for alfalfa in all five pivot fields. Due to the fact that irrigation cannot take place in the winter months, increasing the land application rate in the summer does not decrease the requirements for winter storage. The limiting factor for winter storage is the number of days that effluent has to be stored until irrigation can begin again. Increasing the land application rate will not extend the date when winter storage requirements are surpassed.

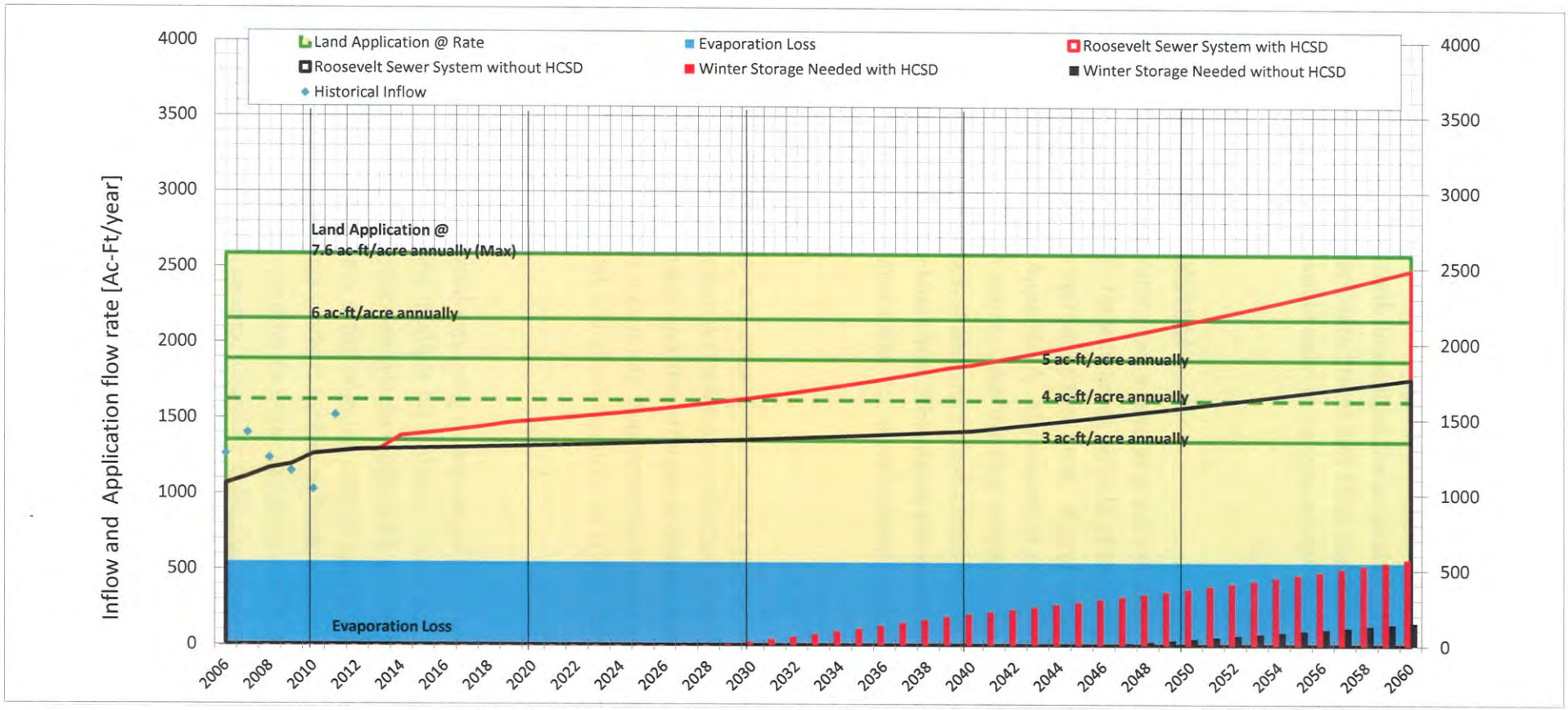


Figure 7: Roosevelt Sewer Lagoon Capacity, Inflow, and Land Application Rates

Assumptions & Inflow Rates:

Roosevelt & Ballard Sewer Flow = 330 gpd per ERC which includes 40 gpd of inflow & infiltration
Current I&I rates decrease over time with sewer replacement projects to 2040
Actual flow data from 2006 to 2011 from Roosevelt City, 2011 I&I averaged a high 185 gpd per ERC
HCSD Sewer Flow = 330 gpd per ERC

Evaporation & Crop Evapotranspiration data from "Utah Climate" from Utah Climate Center from data in Roosevelt/Ft Duchesne over a period between 1948 to 1992
Pan Evaporation depth over free-surface lagoon area = 51.7 inches annually
less Average Annual Precip = 7.1 inches = 45 inches net atmospheric loss
Evapotranspiration is 48.48 inches annually = 3 to 4 acre-ft per season crop use (Optimal)
Maximum Land Application with current pivot/sprinkler setup is 3036 gpm or 7.6 acre-ft/annually

Growth Rates: Roosevelt & Ballard City Connections @ 1.1% per year
HCSD Connections @ 12.5% in the next 8 years, 5% to 2040, and 2.5% to 2060

Time of Concentration with current I & I rates in the summer high of 2011 (590 gpd/ERC) stay above 120 days until 2056 with the addition of HCSD. Average flows (485 gpd) with HCSD are greater than 120 days beyond year 2060. TC is sufficient for sewer flows up to 11.89 ac-ft/d

Winter Storage with winter flow average of 330 gpd and 213 days of non-irrigation or storage time, current capacity is 880 acre-ft Expansion required when ERCs reach 4080 or 13,900 res

Roosevelt City Trunk Line Capacity

Additional HCSD flows to the Roosevelt City 36-inch sewer line in 2000 South do not exceed the capacity of the 36-inch trunk line during the projected timeframe. The 24-inch sewer collector in Pole Line Road between State Street and 1500 East is the limiting factor for the HCSD. Based on projections, this line would need to be upsized before the 36-inch, but still beyond year 2060.

12.0 COLLECTION

REGULAR GRAVITY SYSTEM

The collection of wastewater from a regular gravity system for the HCSD area was evaluated for the proposed HCSD area. Nearby areas outside of the proposed HCSD area are not feasible to include in the collection system at this time. A preliminary layout of the collection system is shown in Exhibits 1-1D – Appendix A. Alignments of sewer lines were determined using elevation data to ensure sufficient slope. Also existing roadways were followed as much as possible to minimize impacts. All sewer mains were sized a minimum of 8 inches in diameter up to 15 inches in diameter for the main trunk line. This sizing will meet the future needs of the HCSD beyond the year 2050. It will also allow for development options in the development area to the southwest of Roosevelt.

STEP/STEG SYSTEM

The Step/Steg wastewater treatment system was analyzed as an alternative to a regular gravity system. In a Step/Steg system wastewater is collected in an underground tank at each residence. The solids settle in the tank and the effluent is either pumped or gravity fed to a treatment facility. A determination was made that constructing a new regular gravity system would be more feasible than the cost and effort required to install a new step/steg system throughout the proposed HCSD.

VACUUM SYSTEM

Another alternative analyzed was using a vacuum collection system. These systems work well in flat areas rather than using multiple lift stations. However, Hancock cove has enough slope to efficiently use a gravity collection system without lift stations. The largest disadvantage of using a vacuum collection system is the ongoing cost of operating the vacuum facilities. Specialized operators and maintenance workers for the collection system and the vacuum facilities are also required. Operating the vacuum facilities would result in a small carbon footprint that is not needed. In view of these factors, a vacuum collection system would not be the best alternative for the Hancock Cove area.

13.0 TREATMENT

BUILDING OWN TREATMENT SYSTEM

The estimate of construction costs of new Hancock Cove Sewer Lagoons is $5,345,000 as shown in Section 9. See Appendix B for a breakdown of the construction costs. This does not include the additional costs of operation and maintenance.

TREATMENT WITH ROOSEVELT

It will cost HCSD approximately $388,377 to use Roosevelt's sewer lagoons for 40 years at $15 per connection per month as shown in Section 9. See Appendix C for the projected costs.

14.0 PREFERRED PLAN COST ANALYSIS

Operational income and expenses associated with Option 1 are shown in Appendix C. The operational income includes connection fees and monthly service charges for the projected population. The operational expenses include construction financing payments, operation and maintenance expenses, and sewer treatment costs for the projected population. It can be seen that all loans will be paid off within 33 years and the HCSD will have a surplus of funds.

16.0 FINANCIAL – FUNDING5

To meet the requirements for funding HCSD, users would have to pay a monthly sewer fee of $51.40 per connection. This rate was determined by taking 1.4% of the 2010 Median Adjusted Gross Income (MAGI) of the area of $44,057/year.

A grant/loan mix from the Permanent Community Impact Board (PCIB) would be sought for a $3,000,000 Grant / $2,000,000 Loan @ 2.5% for 30yrs. A grant/loan mix from the Division of Water Quality would be sought for a $1,337,500 Grant / $1,337,500 Loan @ 0% for 30 yrs. This would total the estimated construction cost of $7,675,000. See Table 8.

Table 8: Funding Totals

Hancock Cove Sewer Project -Option 1	Grant	Loan	Total	Interest	Term (yr)	Annual Payment
PCIB	$3,000,000	$2,000,000	$5,000,000	2.50%	30	$95,555
Division Water Quality (2013 Allocation)	$1,337,500	$1,337,500	$2,675,000	0.00%	30	$44,583
Totals	$4,337,500	$3,337,500	$7,675,000			$140,138

Residents will be responsible for connecting their homes to sewer laterals at property lines. To assist low income families with the financial obligation this will incur, a loan pool has been developed in the financial plan. $50,000 has been included in HCSD's Operation & Maintenance costs for the first 4 years in the row labeled Loan Pool Seed Funds as shown in Appendix C. A number of $2,500 loans will be offered each year from these funds. The table in Appendix C shows the financial plan for these Loan Pool Seed Funds and the number of loans available each year.

17.0 INVESTIGATE CDBG FOR LOW INCOME HELP

CDBG was not investigated for low income help. A loan pool was already developed in the financial plan to assist low income families. As previously discussed, an additional operation and maintenance cost included in HCSD's financial plan is the source of revenue for this loan pool.

18.0 RECOMMENDATIONS

Of the alternatives considered in this study, Option 1 is recommended as the best alternative. This option best meets the needs of the HCSD for the lowest price. It utilizes existing facilities in Roosevelt to greatly reduce costs and construction. Along with this alternative both Roosevelt City and HCSD should implement a Water Conservation Plan. They should take efforts to reduce infiltration and inflow.

19.0 SUMMARY

To meet the existing and future needs of the Hancock Cove Sewer District, a gravity flow collection system conveying wastewater to the Roosevelt treatment lagoons is recommended. A new collection system resolves the problems currently encountered with frequent failures of septic systems in Hancock Cove and it can be constructed in such as way to allow for future expansion and needs of the area.

The selected alternative is physically feasible. It also appears to be financially feasible depending on A) The ability to obtain necessary funding, B) Roosevelt City Agreements, C) The successful creation of the Hancock Cove Sewer District. Environmental impacts resulting from the recommended system are expected to be minimal and will be studied at the time of system design. In addition, Roosevelt City may benefit from the additional wastewater flows for several years.

APPENDIX A – TREATMENT SYSTEM EXHIBITS

EXHIBIT 1 - LOCATION MAP & PROJECT AREA

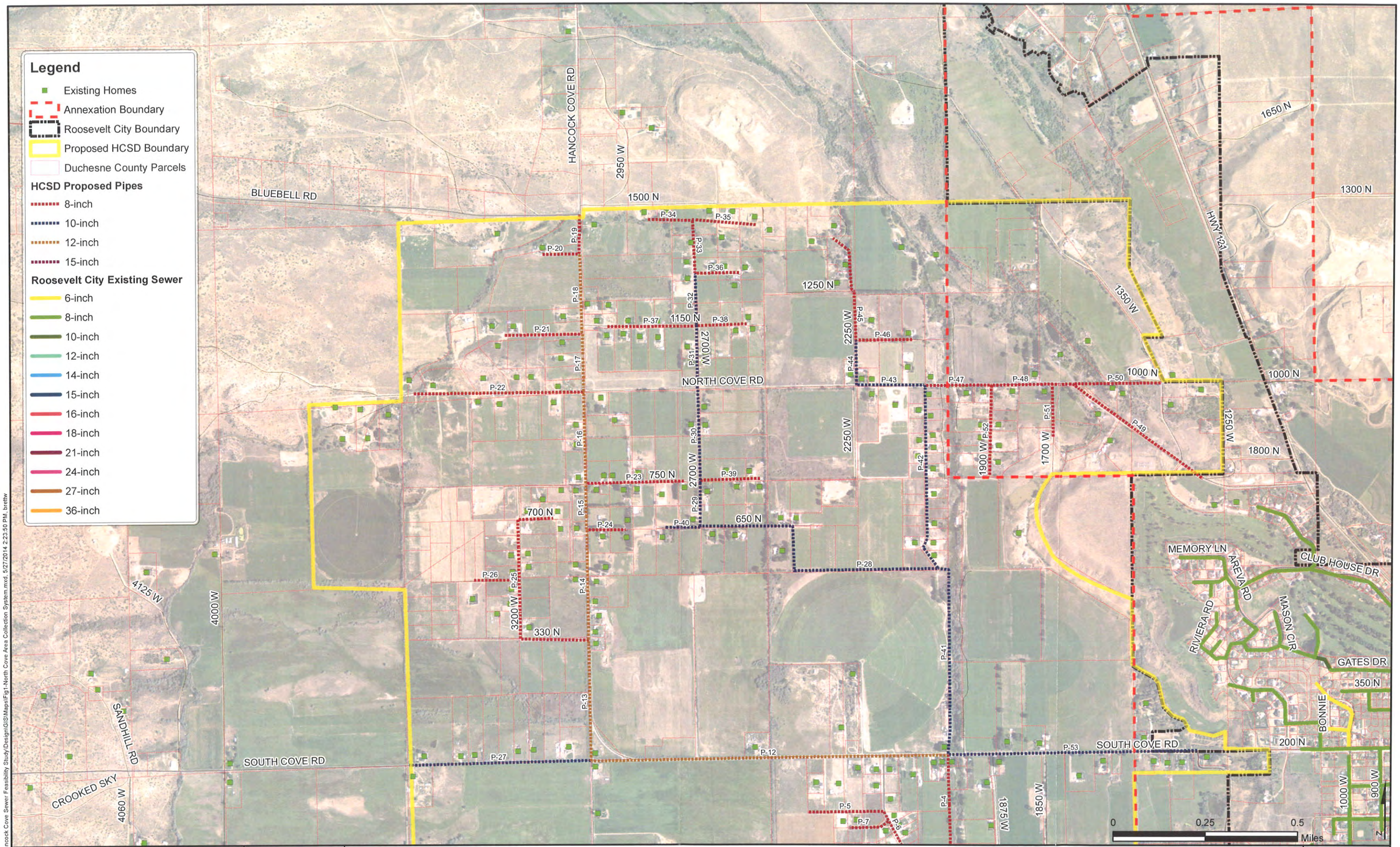
EXHIBIT 1A - NORTH COVE AREA COLLECTION SYSTEM

EXHIBIT 1B - NORTH COVE AREA COLLECTION SYSTEM & TRUNK LINES

EXHIBIT 1C - SOUTH COVE AREA COLLECTION SYSTEM & TRUNK LINES

EXHIBIT 1D - PROPOSED HCSD & EXISTING CITY TRUNK LINES

EXHIBIT 2 - EXISTING & FUTURE PARCELS FOR GROWTH



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HORROCKS ENGINEERS

157 South 300 East
PO Box 562
Roosevelt, UT 84066
(435) 722-0968

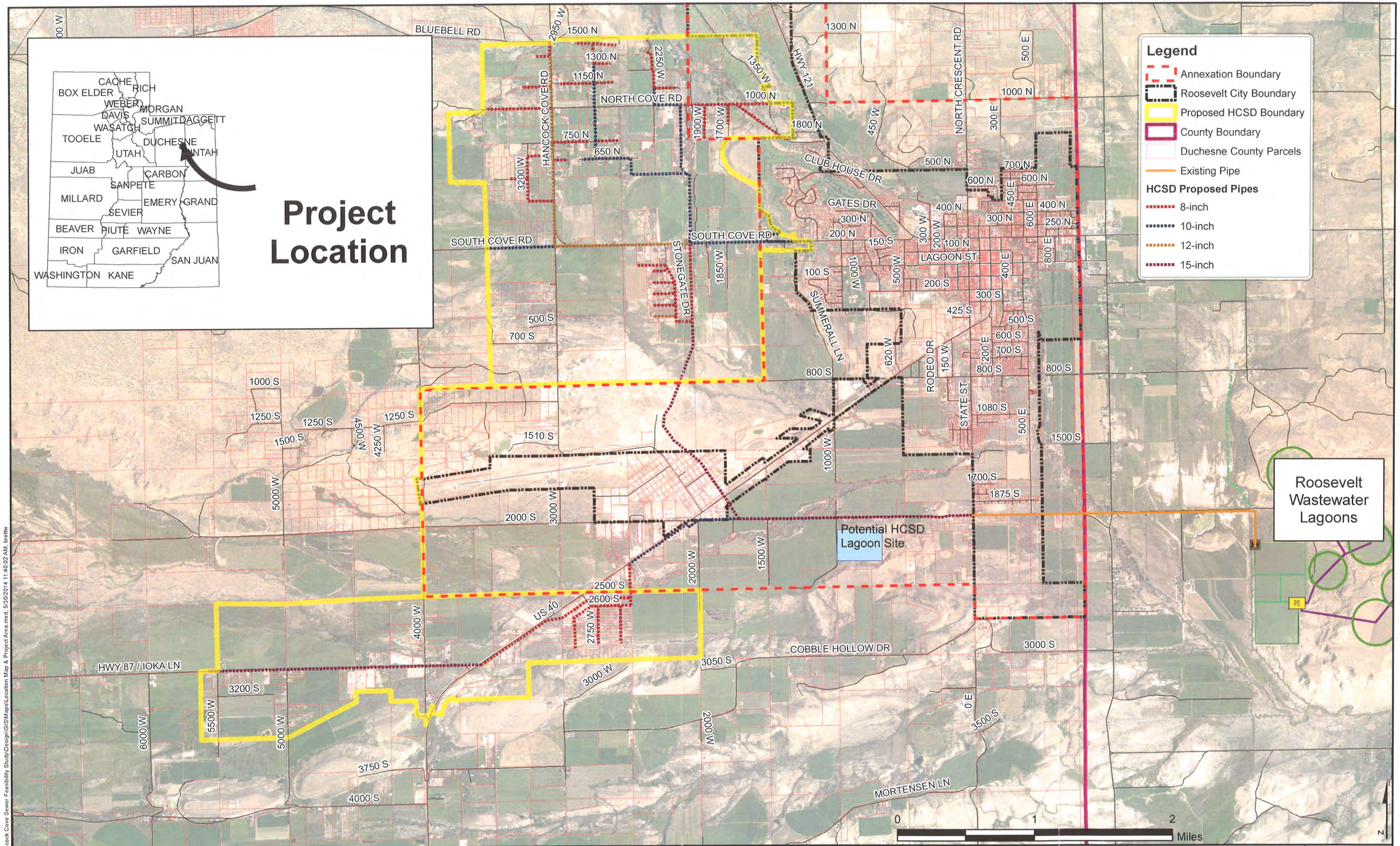
North Cove Area Collection System

Proposed Hancock Cove Sewer District

DATE 5/27/2014

DRAWN BW

Exhibit 1A



HORROCKS ENGINEERS

157 South 300 East
PO Box 562
Roosevelt, UT 84066
(435) 722-0968

Location Map and Project Area

Proposed Hancock Cove Sewer District

DATE 5/30/2014
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Exhibit 1

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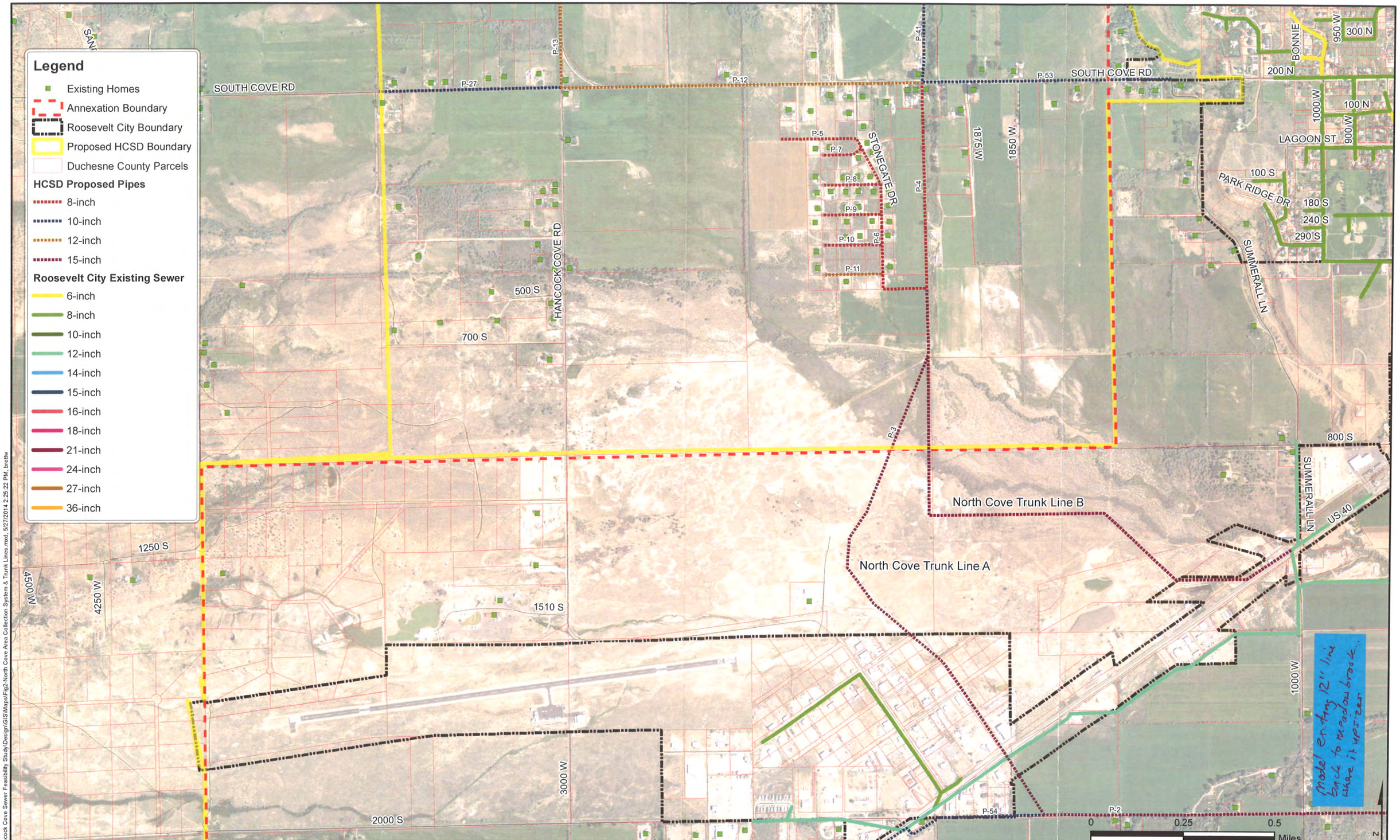

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North Cove Area Collection System and Trunk Lines

Proposed Hancock Cove Sewer District

DATE 5/27/2014

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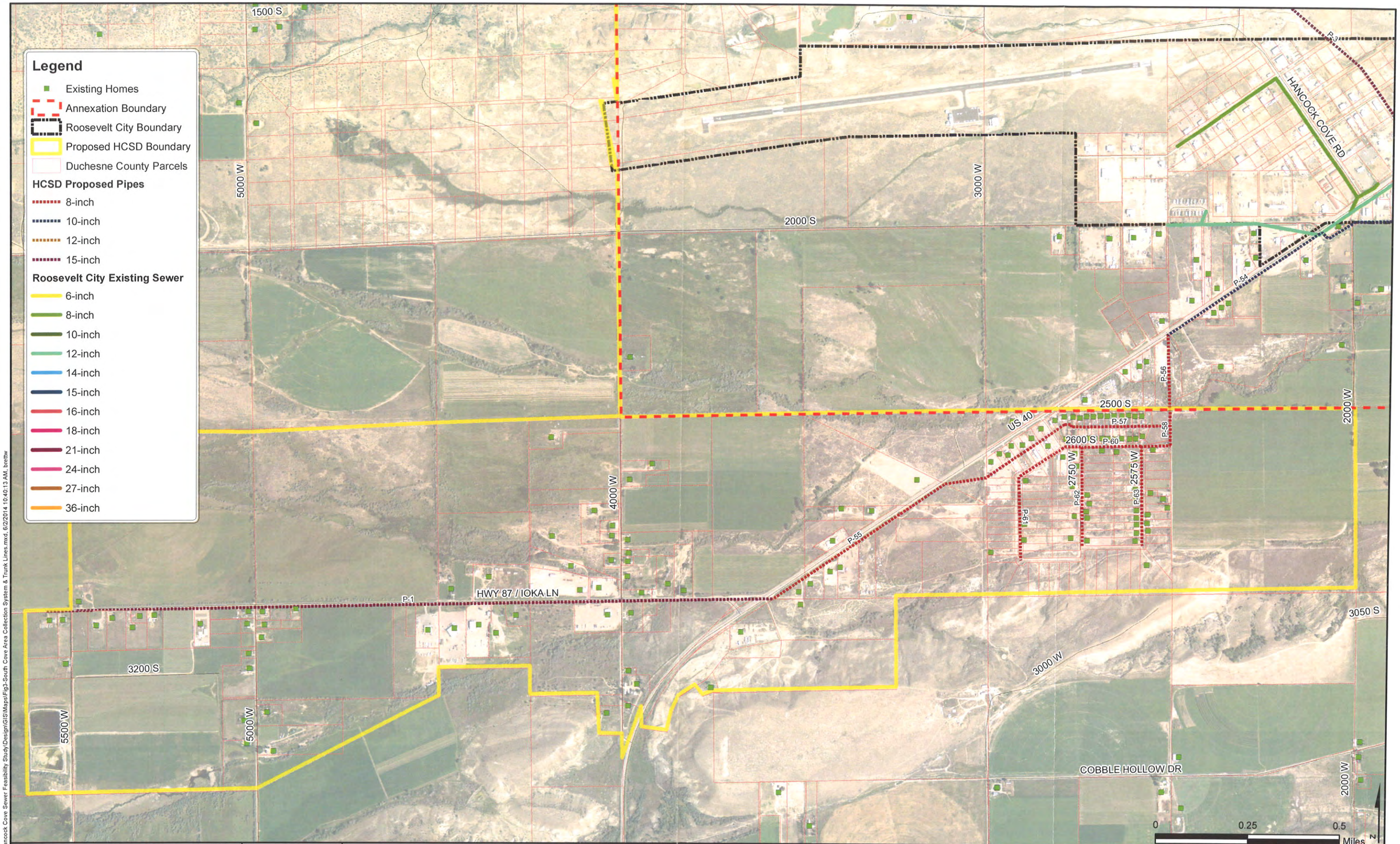
Exhibit 1B



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South Cove Area Collection System

Proposed Hancock Cove Sewer District

DATE 6/2/2014

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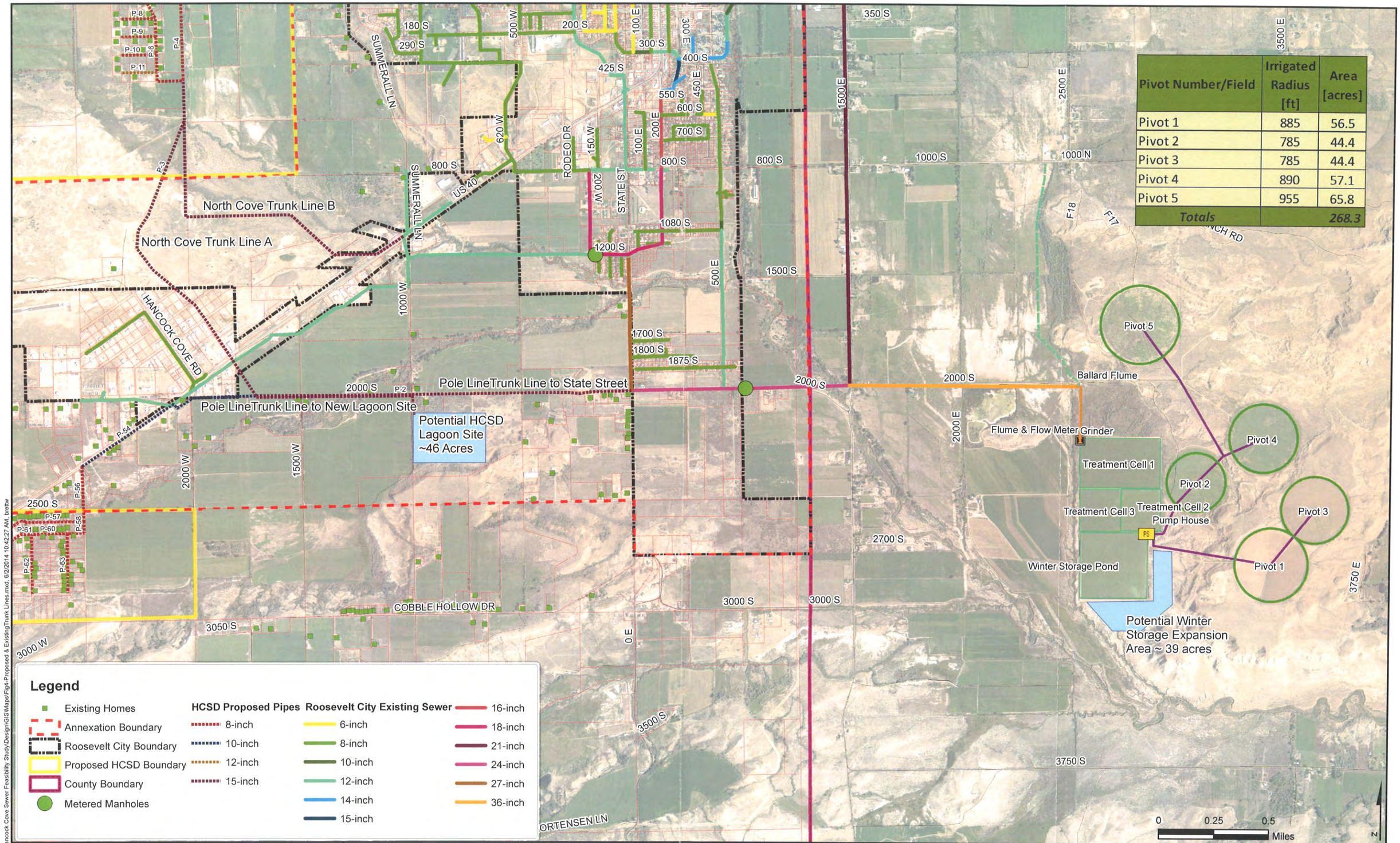
Exhibit 1C



Pivot Number/Field	Irrigated Radius [ft]	Area [acres]
Pivot 1	885	56.5
Pivot 2	785	44.4
Pivot 3	785	44.4
Pivot 4	890	57.1
Pivot 5	955	65.8
Totals		*268.3*

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Proposed HCSD and Existing City Trunk Lines

Proposed Hancock Cove Sewer District

DATE 6/2/2014
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Exhibit 1D

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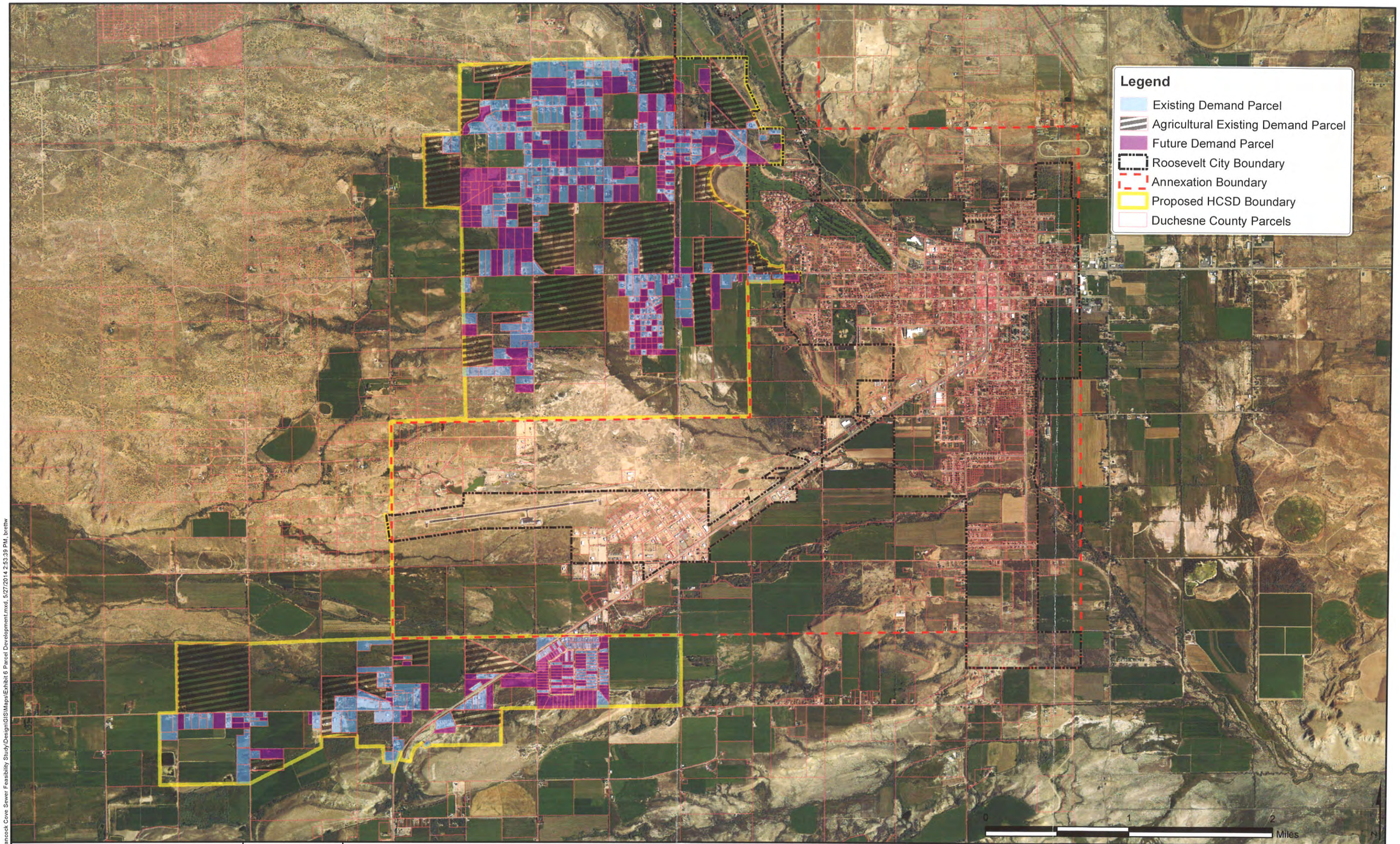

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Existing and Future ERC Parcels

Proposed Hancock Cove Sewer District

DATE 5/27/2014

DRAWN BW

Exhibit 2

APPENDIX B – COST ESTIMATES

Option 1: Hancock Cove Sewer District using Roosevelt City Sewer Ponds

North Cove Area Collection System.....$ 4,848,000
North Cove Area Trunk Line (A) to Pole Line Rd.....$ 774,000
South Cove Area Collection System.....$ 1,349,000
Pole Line Road Trunk Line (1) to State Street.....$ 704,000
TOTAL..... $ 7,675,000

Option 2: Hancock Cove Sewer District using Roosevelt City Sewer Ponds

North Cove Area Collection System.....$ 4,848,000
North Cove Area Trunk Line (B) to US 40 1000 W.....$ 644,000
South Cove Area Collection System.....$ 1,349,000
Pole Line Road Trunk Line (2) to State Street.....$ 642,000
TOTAL..... $ 7,483,000

Option 3: Hancock Cove Sewer with New Sewer Lagoons

Hancock Cove Sewer Lagoons.....$ 5,345,000
North Cove Area Collection System.....$ 4,848,000
North Cove Area Trunk Line (A).....$ 774,000
South Cove Area Collection System.....$ 1,349,000
Pole Line Road Trunk Line to Sewer Lagoons.....$ 405,000
TOTAL..... $ 12,721,000

Hancock Cove Sewer					
Sewer Hookups by Area					
	Number of Connections Existing ERC (2012)	Immediate Future ERC's (2015)	Monthly Connection @ $51.40/mo	Per Year	Percent of Total
North Cove Collection Area	224	88	$11,514	$138,168	0.698
South HWY 40 Collection Area	79	62	$4,061	$48,732	0.246
Pole Line Road Trunk Line	16		$822	$9,864	0.050
North Cove Trunk Line	2		$103	$1,236	0.006
Project Totals	**321**	**150**	**$16,500**	**$198,000**	

North Cove Area Sewer Collection System

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 176,000
2	Traffic Control	1	%	3%	$ 106,000
3	8-inch Sewer Pipe	40,320	lf	$ 25.00	$ 1,008,000
4	10-inch Sewer Pipe	16,890	lf	$ 31.70	$ 536,000
5	12-inch Sewer Pipe	12,970	lf	$ 34.05	$ 442,000
6	15-inch Sewer Pipe	2,950	lf	$ 36.55	$ 108,000
7	4-foot Sewer Manhole	176	ea	$ 2,500.00	$ 440,000
8	5-foot Sewer Manhole	8	ea	$ 2,750.00	$ 22,000
9	4-inch Service w/Cleanout	224	ea	$ 1,500.00	$ 336,000
10	Class A Road Repair	2,770	lf	$ 24.67	$ 69,000
11	Class B Road Repair	55,470	lf	$ 8.00	$ 444,000
12	Class C Trench Repair	14,890	lf	$ 5.00	$ 75,000
13	ROW Acquisition	14,890	lf	$ 2.50	$ 38,000
14	Contingent Pay Sum	1	%	15%	$ 528,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 4,328,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 520,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 4,848,000**

North Cove Area Sewer Collection System (A) to Pole Line Rd.

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 28,000
2	Traffic Control	1	%	3%	$ 17,000
3	15-inch Sewer Pipe	8,850	lf	$ 40.00	$ 354,000
4	5-foot Sewer Manhole	23	ea	$ 2,750.00	$ 64,000
5	4-inch Service w/Cleanout	2	ea	$ 1,500.00	$ 3,000
6	Highway Crossing	1	ls	$ 75,000.00	$ 75,000
7	Class B Road Repair	1,500	lf	$ 8.00	$ 12,000
8	Class C Trench Repair	7,350	lf	$ 5.00	$ 37,000
9	ROW Acquisition	7,350	lf	$ 2.50	$ 19,000
10	Contingent Pay Sum	1	%	15%	$ 82,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 691,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 83,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 774,000**

North Cove Area Sewer Collection System (B) to US 40 1000 W.

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 23,000
2	Traffic Control	1	%	3%	$ 14,000
3	15-inch Sewer Pipe	9,100	lf	$ 36.55	$ 333,000
4	5-foot Sewer Manhole	23	ea	$ 2,750.00	$ 64,000
5	4-inch Service w/Cleanout	2	ea	$ 1,500.00	$ 3,000
6	Class B Road Repair	800	lf	$ 8.00	$ 7,000
7	Class C Trench Repair	8,300	lf	$ 5.00	$ 42,000
8	ROW Acquisition	8,300	lf	$ 2.50	$ 21,000
9	Contingent Pay Sum	1	%	15%	$ 68,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 575,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 69,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 644,000**

South Cove Area Sewer Collection System

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 49,000
2	Traffic Control	1	%	3%	$ 30,000
3	8-inch Sewer Pipe	10,880	lf	$ 25.00	$ 272,000
4	10-inch Sewer Pipe	8,550	lf	$ 31.70	$ 272,000
5	12-inch Sewer Pipe	0	lf	$ 34.05	$ -
6	15-inch Sewer Pipe	0	lf	$ 36.55	$ -
7	4-foot Sewer Manhole	49	ea	$ 2,500.00	$ 123,000
8	5-foot Sewer Manhole	0	ea	$ 2,750.00	$ -
9	4-inch Service w/Cleanout	79	ea	$ 1,500.00	$ 119,000
10	Class A Road Repair	2,130	Lf	$ 24.67	$ 53,000
11	Class B Road Repair	16,200	Lf	$ 8.00	$ 130,000
12	Class C Trench Repair	1,100	Lf	$ 5.00	$ 6,000
13	ROW Acquisition	1,100	Lf	$ 2.50	$ 3,000
14	Contingent Pay Sum	1	%	15%	$ 147,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 1,204,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 145,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 1,349,000**

Poleline Road Trunk Line (1) (1700 W to State Street)

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 26,000
2	Traffic Control	1	%	3%	$ 16,000
3	15-inch Sewer Pipe	9,020	Lf	$ 37	$ 330,000
4	5-foot Sewer Manhole	23	Ea	$ 2,750	$ 64,000
5	Connect to Existing Manhole	2	Ea	$ 1,000	$ 2,000
6	4-inch Service w/Cleanout	16	Ea	$ 1,500	$ 24,000
7	Class A Road Repair	60	Lf	$ 25	$ 2,000
8	Class B Road Repair	8,960	Lf	$ 8	$ 72,000
9	Meter Station	1	ea	$ 15,000	$ 15,000
10	Contingent Pay Sum	1	%	15%	$ 77,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 628,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 76,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 704,000**

Poleline Road Trunk Line (2) (1700 W to State Street)

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 24,000
2	Traffic Control	1	%	3%	$ 14,000
3	10-inch Sewer Pipe	9,020	Lf	$ 31.70	$ 286,000
4	5-foot Sewer Manhole	23	Ea	$ 2,750	$ 64,000
5	Connect to Existing Manhole	2	Ea	$ 1,000	$ 2,000
6	4-inch Service w/Cleanout	16	Ea	$ 1,500	$ 24,000
7	Class A Road Repair	60	Lf	$ 25	$ 2,000
8	Class B Road Repair	8,960	Lf	$ 8	$ 72,000
9	Meter Station	1	ea	$ 15,000	$ 15,000
10	Contingent Pay Sum	1	%	15%	$ 70,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 573,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 69,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 642,000**

Hancock Cove Sewer Lagoons

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization (5%)	1	ls	5%	$ 119,000
2	Primary Sewage Lagoons (20 MG Capacity)	1	ls	$ 1,500,000	$ 1,500,000
3	Secondary Sewage Lagoon (10 MG Capacity)	1	ls	$ 862,000	$ 862,000
4	Land Acquisition for Phase I Lagoons	16	acre	$ 50,000	$ 800,000
5	Land Acquisition for Future Lagoons	30	acre	$ 50,000	$ 1,500,000
6	Contingent Pay Sum	1	%	10%	$ 237,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 5,018,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 327,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 5,345,000**

Poleline Road Trunk Line (1700 W to New Sewer Lagoons)

Item No.	Item Description	Qty	Unit	Unit Price	Total Price
1	Mobilization	1	%	5%	$ 15,000
2	Traffic Control	1	%	3%	$ 9,000
3	15-inch Sewer Pipe	4,520	lf	$ 37	$ 166,000
4	5-foot Sewer Manhole	12	ea	$ 2,750	$ 33,000
5	4-inch Service w/Cleanout	16	ea	$ 1,500	$ 24,000
6	Class A Road Repair	1,060	lf	$ 25	$ 27,000
7	Class B Road Repair	3,460	lf	$ 8	$ 28,000
8	Meter Station	1	ea	$ 15,000	$ 15,000
9	Contingent Pay Sum	1	%	15%	$ 44,000
				TOTAL ESTIMATED CONSTRUCTION COSTS:	**$ 361,000**
				ENGINEERING, SURVEY, & CM COSTS (12%):	$ 44,000
				TOTAL ESTIMATED PROJECT COSTS	**$ 405,000**

APPENDIX C – FUNDING AND FINANCIAL PLAN

APPENDIX D – HANCOCK COVE WELL DATA

Well Logs within 18545 ft of North 10560 West 2640 from the SE corner of section 36 township 2S range 2W USbm.

Listed below is information on wells which are tied to water rights or non-production well permits. Wells older than 1992 may not be connected to the permit database. Wells showing a depth of zero feet are generally missing well log data.

Table 1. Hancock Cove Well Data

WRNUM/Appl. No.	Distance From Point (ft)	Diameter	Depth	Drilled Date	Location
43-10289	1931	6	23	10/21/1991	N 1930 W 2454 SE 24 2S 2W US
43-10692	2271	4	90	2/9/1998	N 2175 W 1846 SE 24 2S 2W US
43-10878	2421	8	20	-	N 648 E 390 SW 24 2S 2W US
43-8890	2531	6	34	3/8/1981	N 612 W 1011 E4 25 2S 2W US
43-8907	2662	8	45	06//1987	N 300 E 150 SW 19 2S 1W US
43-12462	2882	4	150	5/23/2012	N 2080 W 500 SE 24 2S 2W US
43-2980	2900	7.9	120	9/2/1978	S 1087 E 92 NW 25 2S 2W US
43-8351	2941	6	150	6/9/1979	S 1550 E 300 NW 25 2S 2W US
43-8018	2982	7	20	7/6/1980	N 330 W 2440 E4 24 2S 2W US
43-8350	2996	6	200	7/23/1974	N 1310 E 10 SW 24 2S 2W US
a20628	3048	8	30	10/26/2004	S 50 W 300 NE 26 2S 2W US
43-7917	3171	4	220	10/20/1973	S 868 E 100 W4 24 2S 2W US
43-2938					
43-10275	3185	6	30	6/27/1991	S 407 W 221 E4 24 2S 2W US
43-7781	3462	0	75	1/17/1976	S 1433 W 367 NE 26 2S 2W US
43-8650	3545	7	30	9/11/1980	N 641 W 1167 E4 24 2S 2W US
43-3838	3592	7	30	-	N 241 W 351 E4 24 2S 2W US
43-9035					
43-7551	3899	6	26	3/16/1978	N 540 W 240 E4 24 2S 2W US
43-2994	4105	4	76	6/19/1975	N 1020 W 1020 E4 26 2S 2W US

43-12543	4109	4	150	1/18/2013	S 1168 W 1168 NE 26 2S 2W US
43-6816	4274	6	197	12/27/1971	N 970 W 210 E4 24 2S 2W US
43-8510	4318	0	0	11/5/1979	N 620 W 140 E4 23 2S 2W US
43-11739	4632	4	100	3/18/2006	S 1450 W 1625 NE 26 2S 2W US
43-9654	4725	0	0	6/24/1985	S 1650 W 1650 NE 26 2S 2W US
43-12413	4855	4	250	9/15/2011	S 1000 W 217 NE 24 2S 2W US
43-8968	5307	4	230	11/23/1983	S 710 E 193 NW 19 2S 1W US
43-9579	5328	7.9	120	4/8/1985	S 1879 E 491 N4 26 2S 2W US
43-12240					
a9720	5390	4	63	7/20/1977	S 76 W 50 N4 36 2S 2W US
43-8035					
43-8034					
43-3832	5429	6	20	-	N 175 E 200 S4 13 2S 2W US
43-2979	5453	0	0	8/2/1997	S 1290 E 150 N4 26 2S 2W US
a20628					
43-11962	5482	4	100	8/22/2007	S 1220 E 100 N4 26 2S 2W US
43-9742	5635	4	150	9/16/1985	N 100 W 866 SE 13 2S 2W US
43-8879	6165	4	200	12/11/1981	N 840 W 2361 E4 23 2S 2W US
43-12498	6271	0	0	-	N 650 E 1779 SW 23 2S 2W US
43-8253	6328	4	200	6/23/1983	N 125 E 788 SW 18 2S 1W US
43-7732	6948	4	74	3/1/1976	N 772 E 1420 W4 26 2S 2W US
43-12470	7231	4	250	11/27/2012	N 360 W 1798 SE 14 2S 2W US
43-10978	7328	4	204	11/29/1999	S 235 W 40 N4 23 2S 2W US
43-11695	7400	4	100	11/10/2005	S 1573 E 1513 NW 23 2S 2W US
43-8926	7425	7	155	3/30/1981	N 883 E 886 W4 26 2S 2W US
43-9487	7449	4	117	4/1/1992	N 650 E 600 SW 23 2S 2W US
43-11794	7521	6.6	200	4/9/2007	N 441 E 350 S4 14 2S 2W US
43-9017	7556	4	220	6/15/1984	N 1834 E 17 SW 18 2S 1W US
43-8889	7578	7	24	3/20/1981	N 980 E 700 W4 26 2S 2W US
43-8885	7776	4	170	7/8/1983	S 970 W 952 E4 14 2S 2W US
43-8381	7781	0	0	-	N 1300 W 1450 SE 14 2S 2W US
43-8381	7789	4	150	-	N 1290 W 1480 SE 14 2S 2W US
43-10851	7806	4	156	6/15/1999	N 588 E 821 W4 23 2S 2W US

43-12603	7827	4	120	8/5/2013	N 1295 E 1122 W4 23 2S 2W US
43-12236	7872	4	120	7/6/2010	N 240 E 170 SW 23 2S 2W US
43-7488	8009	10	22	6/6/1974	N 50 W 225 E4 30 2S 1W US
43-9326	8035	4	160	1/27/1983	S 1420 E 200 NW 26 2S 2W US
43-8852	8054	4	90	5/31/1983	N 550 E 330 W4 26 2S 2W US
43-12499	8073	6.8	100	3/25/2013	S 230 W 1520 NE 19 2S 1W US
43-10510	8108	4	160	3/15/1995	N 800 E 200 W4 26 2S 2W US
43-5090	8218	6	133	9/12/1968	S 35 W 195 E4 13 2S 2W US
43-10433	8296	4	120	11/12/1993	N 600 W 250 SE 22 2S 2W US
43-7703	8314	6	23	7/8/1977	S 25 E 75 W4 23 2S 2W US
43-12027	8323	4	200	5/9/2008	N 590 W 635 S4 14 2S 2W US
43-11051	8334	4.5	150	7/27/2005	N 271 W 1022 E4 13 2S 2W US
43-8884	8363	4	170	7/20/1983	S 330 W 1000 E4 14 2S 2W US
43-10683	8374	4	145	6/22/1998	N 165 W 330 SE 22 2S 2W US
43-9031	8604	4	140	9/12/1981	N 100 W 100 E4 27 2S 2W US
43-9133	8635	0	225	-	N 150 W 150 E4 27 2S 2W US
43-11096	8663	4	250	7/12/2003	N 1202 W 2102 SE 18 2S 1W US
43-9534	8721	4	45	7/25/1984	N 200 E 1460 W4 31 2S 1W US
43-3246	8863	4	230	-	S 1958 W 88 NE 14 2S 2W US
43-8403	8880	6	160	5/9/1979	S 495 W 800 NE 27 2S 2W US
43-8411	8936	4	140	5/10/1979	N 825 W 880 SE 22 2S 2W US
43-4942	8961	0	0	7/29/1934	N 2280 W 2108 SE 14 2S 2W US
43-8402	9016	0	0	9/23/1981	S 825 W 900 NE 27 2S 2W US
43-8128	9021	4	260	8/9/1977	N 1070 W 1430 SE 18 2S 1W US
43-3607	9053	11	503	1/25/1983	N 1153 W 3625 SE 14 2S 2W US
43-9120	9073	4	180	6/7/1984	N 1000 E 1250 SW 14 2S 2W US
43-9119					
43-11152	9090	4	200	8/6/2001	N 545 E 858 SW 14 2S 2W US
43-10262	9173	4	180	6/7/1984	N 1019 E 1135 SW 14 2S 2W US
43-11281	9174	10	285	9/9/2002	N 3172 E 1048 SW 18 2S 1W US
43-10855	9216	4	160	8/20/1998	N 1087 W 1008 E4 27 2S 2W US

43-8866	9221	4.5	360	-	S 70 W 200 NE 19 2S 1W US
43-9116					
43-9196	9395	4.5	280	10/16/1982	S 1387 W 473 NW 18 2S 1W US
0343616P00	9419	4.5	140	9/18/2003	N 500 E 1740 W4 18 2S 1W US
43-11406					
43-9058	9451	4	180	-	N 125 E 125 SW 14 2S 2W US
43-3477	9487	7	85	6/24/1953	S 110 E 150 NW 20 2S 1W US
43-8276	9518	6	36	6/30/1978	N 1990 W 1072 S4 31 2S 1W US
43-9553	9676	6	220	11/15/1984	S 2081 E 2214 NW 18 2S 1W US
43-11219	9680	4	200	3/29/2002	N 633 E 191 SW 14 2S 2W US
43-9758	9738	4	220	11/12/1985	S 2300 E 50 N4 18 2S 1W US
43-10671	9743	4	175	12/22/1996	S 1103 W 1595 NE 27 2S 2W US
43-9134	9851	6	300	9/17/1982	S 1195 E 585 NW 18 2S 1W US
43-10190	9975	6	35	6/18/1990	S 571 W 831 N4 13 2S 2W US
43-9143	9990	4	423	6/2/1986	S 1090 E 710 NW 18 2S 1W US
43-9947	9999	10	18	12/8/1986	S 1769 W 1735 NE 27 2S 2W US
43-11924	10079	4	400	10/28/1983	S 1393 W 948 N4 18 2S 1W US
43-3237	10081	0	0	-	S 431 W 446 N4 13 2S 2W US
43-9405	10084	4	400	10/28/1983	S 1360 E 1675 NW 18 2S 1W US
43-11083	10091	4	455	10/8/2005	N 325 W 2000 E4 18 2S 1W US
43-9353	10094	4	400	10/28/1983	S 1384 W 931 N4 18 2S 1W US
43-9637					
43-9529					
43-9482					
43-9132	10121	4	429	6/20/1986	S 1093 E 1116 NW 18 2S 1W US
43-10360	10227	4.5	200	-	S 1779 E 131 N4 18 2S 1W US
43-9655	10368	4	240	6/11/1985	S 1542 W 1 N4 18 2S 1W US
43-10280	10455	6	27	5/23/1991	S 81 E 1184 N4 13 2S 2W US
a14270	10552	4	180	5/10/1987	N 150 E 1248 SW 17 2S 1W US
43-9036	10558	4	260	3/5/1982	N 230 E 1205 SW 17 2S 1W US
43-9620	10562	4	120	9/17/1984	S 1571 E 716 N4 22 2S 2W US

43-10494	10568	0	230	9/6/1998	S 1900 E 360 N4 27 2S 2W US
43-6852	10590	4	120	9/17/1984	S 1650 E 660 N4 22 2S 2W US
a16777					
43-10834	10679	4	260	2/16/1999	N 188 E 194 S4 12 2S 2W US
43-11258	10750	10	360	9/15/2002	S 600 W 3800 NE 18 2S 1W US
43-11808	11476	4	90	11/2/2006	S 1430 W 200 N4 22 2S 2W US
0441001M00	11501	8	22	10/4/2004	N 526 W 1777 E4 29 2S 1W US
0441001M00	11600	0	0	10/4/2004	N 724 W 1645 E4 29 2S 1W US
43-8213	11649	4	140	4/24/1978	N 30 W 1745 E4 20 2S 1W US
43-12077	11676	4	250	4/26/2008	N 1144 E 1194 S4 12 2S 2W US
43-12227	11834	4	420	6/20/1984	N 180 E 62 S4 17 2S 1W US
43-9435					
0441001M00	11850	0	0	10/4/2004	N 790 W 1382 E4 29 2S 1W US
43-8899	11865	4	380	3/21/1982	S 645 W 1250 NW 17 2S 1W US
43-8459	12015	6	200	6/16/1981	N 1180 E 50 SW 07 2S 1W US
43-3533	12052	4	180	-	S 2105 W 1420 NE 20 2S 1W US
43-8476	12196	6	240	6/7/1979	S 1240 W 1550 NE 20 2S 1W US
43-7663	12247	6	185	4/17/1975	S 1340 W 1460 NE 20 2S 1W US
43-8478					
43-8556	12252	6	30	12/13/1979	S 194 W 1242 NE 18 2S 1W US
43-10797	12279	4	117	2/3/1998	S 13 W 522 N4 22 2S 2W US
43-8514	12304	6	30	3/18/1980	S 1425 E 100 NW 01 3S 2W US
43-6839	12361	6	123	3/11/1973	S 200 E 840 N4 20 2S 1W US
0843014M00	12443	0.3	100	7/25/2008	S 593 W 71 N4 02 3S 2W US
43-7462	12496	6	200	6/3/1974	N 300 W 940 E4 20 2S 1W US
43-8855	12539	4	300	7/9/1981	S 1017 E 394 NW 17 2S 1W US
43-7296	12544	4	280	4/23/1973	N 10 W 820 E4 20 2S 1W US
43-8223	12574	4	140	3/15/1978	N 100 W 1105 SE 07 2S 1W US
43-3315	12583	4	300	-	S 125 W 1593 NE 20 2S 1W US
43-9577					

43-10251	12674	7	30	11/26/1990	N 254 W 1167 SE 07 2S 1W US
43-10391	12702	6	53	10/19/1993	S 101 W 387 NE 29 2S 1W US
43-9162	12732	4	315	6/18/1984	N 450 W 1390 SE 07 2S 1W US
43-10924	12782	0	270	7/22/1999	S 450 W 800 E4 12 2S 2W US
43-12302	12943	4	350	4/23/2010	S 190 W 2480 E4 12 2S 2W US
43-8516	13010	6	0.4	10/20/1979	N 200 W 450 SE 07 2S 1W US
43-11612	13061	4	100	12/15/2007	S 640 E 1020 NW 22 2S 2W US
43-1101	13088	5	83	3/28/1953	N 850 W 125 E4 29 2S 1W US
43-8077	13155	6	285	-	S 170 E 320 NW 17 2S 1W US
43-7492	13156	6	520	5/25/1974	N 860 W 1955 E4 15 2S 2W US
43-10154	13414	0	0	-	S 1240 E 463 NW 22 2S 2W US
a15103	13503	6	243	8/28/1990	S 1500 E 300 NW 22 2S 2W US
43-9365	13567	4	234	7/23/1984	S 98 E 1203 W4 07 2S 1W US
43-8343	13594	6	55	11/2/1978	S 140 W 330 NE 03 3S 2W US
43-6872	13602	5	60	5/30/1972	N 280 W 128 E4 12 2S 2W US
43-10232	13609	4	60	6/11/1990	S 255 W 204 NE 03 3S 2W US
43-10431	13613	6.3	20	5/15/1994	N 1547 W 1577 SE 07 2S 1W US
43-2937	13745	6	700	7/25/1973	S 1947 W 1933 NE 12 2S 2W US
43-6890	13752	5	156	6/16/1973	N 150 E 660 SW 21 2S 1W US
0943004M00	13800	0	0	7/15/2009	S 510 E 707 NW 28 2S 1W US
43-10622	13815	5.5	310	2/1/1997	S 767 W 1767 E4 07 2S 1W US
43-8963	13857	4	260	3/26/1984	S 120 E 2240 W4 07 2S 1W US
43-9794	13901	4	230	3/7/1987	S 89 E 1405 NW 17 2S 1W US
43-8930	13987	6	55	6/23/1981	S 232 W 850 NE 03 3S 2W US
43-3278	14127	0	0	09//1939	S 402 E 198 NW 21 2S 1W US
0743031M00	14160	0.3	100	10/17/2007	N 303 W 56 SW 16 2S 1W US
43-6847	14242	5	152	1/2/1973	N 150 E 1150 SW 21 2S 1W US
43-7576	14262	6	51	10/26/1974	S 62 W 1480 NE 03 3S 2W US
43-11618	14349	4	200	4/15/2005	S 210 W 1700 E4 07 2S 1W US
43-8591	14353	6	500	1/29/1981	S 350 W 1390 E4 07 2S 1W US
43-474	14559	5	153	4/12/1961	S 80 E 1470 NW 28 2S 1W US

43-2531	14572	6	26	7/14/1960	S 140 W 100 NE 33 2S 2W US
43-3465	14628	4.5	5	-	S 140 E 634 NW 21 2S 1W US
43-7717					
43-7745	14635	4	400	7/30/1975	S 90 W 170 N4 17 2S 1W US
43-7689					
43-12118	14792	4	150	8/7/2008	N 1280 E 720 W4 07 2S 1W US
43-6876	14834	6	365	-	S 1006 W 224 NE 12 2S 2W US
43-11569	14842	4	135	2/28/2005	S 1378 E 1207 NW 07 2S 1W US
43-12341	14888	4	550	9/9/2010	N 130 W 35 S4 08 2S 1W US
0743018M00	14903	8	30	5/12/2007	S 806 E 1723 W4 21 2S 1W US
t89-43-8	15014	6	820	12/15/1960	N 1400 E 1188 W4 07 2S 1W US
43-12097					
43-11136					
43-7320					
43-3598					
43-10317					
43-9064	15244	0	0	11/4/1981	S 150 W 130 N4 03 3S 2W US
43-8069	15346	6	48	4/18/1977	S 145 W 280 N4 03 3S 2W US
43-12606	15382	4.5	225	8/11/2013	N 473 W 297 S4 10 2S 2W US
43-3522	15513	0	0	5/7/1955	N 550 W 215 S4 21 2S 1W US
43-12491	15524	4	180	10/15/2013	N 660 E 330 S4 08 2S 1W US
43-11790	15867	4	150	10/30/2006	N 60 W 400 SE 01 2S 2W US
43-12433					
43-8691	15929	7	135	9/14/1981	S 269 W 1548 E4 10 2S 2W US
43-12022	15962	4	240	7/29/1996	N 250 W 1440 SE 01 2S 2W US
43-8804					
43-7255	16032	4	620	3/28/1973	S 600 W 470 NE 17 2S 1W US
43-9081	16086	4	576	2/26/1983	N 447 E 688 W4 16 2S 1W US
43-9790	16091	4	200	4/19/1986	S 1165 W 1180 NE 07 2S 1W US
43-9543	16131	4	250	5/29/1984	N 300 W 200 SE 01 2S 2W US
43-8675	16138	4	580	3/18/1983	N 205 E 896 W4 16 2S 1W US
43-7655	16151	10	442	5/23/1979	N 100 W 900 SE 02 2S 2W US
a8216					
43-11046	16391	6	175	1/9/2001	S 306 E 2150 NW 11 2S 2W US
43-10907	16519	6	21	6/9/1999	N 700 E 200 SW 01 2S 2W US

43-12023					
43-8196	16545	6	105	8/15/1975	S 320 W 868 N4 11 2S 2W US
43-8179					
43-7573					
43-10248					
43-2982	16595	4	220	8/12/1978	N 238 W 440 SE 08 2S 1W US
43-1996	16679	6	78	5/18/1971	N 90 E 30 S4 02 3S 2W US
43-3264	16683	4	668	-	S 177 E 26 NW 16 2S 1W US
43-12053	16771	4	230	9/12/2008	S 550 W 890 NE 07 2S 1W US
43-3581	16786	8	400	-	N 30 E 1926 SW 02 2S 2W US
43-9934	16812	4	305	8/15/1986	N 977 W 105 S4 16 2S 1W US
43-8296	16823	10	400	-	0 W 2640 E4 10 2S 2W US
43-3291	16828	6	50	-	N 990 W 100 SE 01 2S 2W US
43-8188	16833	6	210	12/2/1977	N 770 W 600 SE 08 2S 1W US
43-3241	16851	0	0	-	N 220 E 63 SW 34 2S 2W US
0543009M00	16975	1.3	318	9/21/2005	N 78 E 412 S4 16 2S 1W US
a10587	17073	10	440	5/15/1979	N 1210 W 100 SE 02 2S 2W US
43-8369					
43-8870	17115	4	98	2/28/1981	S 200 W 470 N4 11 3S 2W US
0543006M00	17214	1	300	9/3/2006	N 900 W 1500 E4 21 2S 1W US
0543001M00	17277	0	0	2/3/2005	N 891 W 1433 E4 21 2S 1W US
0543010M00	17278	0	0	9/21/2005	N 126 E 716 S4 16 2S 1W US
43-8998	17304	6	33	6/27/1981	N 230 E 769 SW 33 2S 1W US
0743024M00	17311	1.3	300	8/31/2007	N 128 E 750 S4 16 2S 1W US
43-10343	17375	4	158	6/26/1995	N 900 W 2400 E4 10 2S 2W US
43-11854					
43-8431	17505	0	0	5/22/1979	S 90 E 920 NW 11 3S 2W US
43-8839	17516	4	370	3/21/1981	S 2100 W 300 N4 16 2S 1W US
43-8840					
0643005M00	17601	1	0	6/7/2006	N 120 W 950 W4 22 2S 1W US
0643005M00	17602	1	0	6/7/2006	N 117 W 948 W4 22 2S 1W US
0643005M00	17603	1	0	6/7/2006	N 123 W 948 W4 22 2S 1W US
0643005M00	17605	1	0	6/7/2006	N 114 W 945 W4 22 2S 1W US
0643005M00	17607	1	0	6/7/2006	N 125 W 945 W4 22 2S 1W US

0643005M00	17607	1	0	6/7/2006	N 115 W 943 W4 22 2S 1W US
0643005M00	17610	1	0	6/7/2006	N 118 W 940 W4 22 2S 1W US
0643005M00	17611	1	0	6/7/2006	N 123 W 940 W4 22 2S 1W US
0643005M00	17614	1	0	6/7/2006	N 120 W 937 W4 22 2S 1W US
43-9536	17638	4	200	8/17/1984	N 1000 W 2700 E4 10 2S 2W US
43-10355	17669	4	150	8/1/1995	S 1672 W 345 N4 10 2S 2W US
43-11833	17675	4	350	10/15/2006	N 794 E 961 S4 06 2S 1W US
43-1418	17871	6	24	5/3/1960	S 1386 E 102 NW 03 3S 2W US
43-11542	17910	4	150	6/16/2004	S 514 W 1162 N4 08 2S 1W US
a8216	17930	10	400	1/13/1977	N 1210 E 1800 SW 02 2S 2W US
43-7655					
43-12119	17979	4	100	3/24/2010	S 650 W 800 N4 08 2S 1W US
43-12559	17994	4	120	5/13/2013	S 500 E 640 W4 01 2S 2W US
0143003P00	18024	0	0	5/20/2001	S 200 W 1200 NE 33 2S 1W US
43-7313	18035	10	340	2/19/1973	N 2392 E 1600 SW 01 2S 2W US
43-7503					
a8217	18065	8	400	-	N 666 E 216 SW 02 2S 2W US
43-3581					
43-12551	18086	4	120	4/12/2013	S 240 W 1870 E4 01 2S 2W US
0943011M00	18171	2	45	9/18/2009	S 405 W 292 W4 22 2S 1W US
43-8862	18196	0	140	-	S 100 W 650 NE 10 3S 2W US
43-40	18198	0	160	10/25/1983	S 2900 E 2650 NW 01 2S 2W US
43-11266	18217	0	0	3/21/2003	S 1200 W 140 NE 28 2S 1W US
43-8695	18383	4	141	4/30/1983	S 54 W 258 E4 01 2S 2W US
43-8803					
1043006M00	18457	0	0	9/9/2010	S 4483 E 4458 NW 16 2S 1W US
43-5002	18474	4	300	-	N 1269 E 81 SW 22 2S 1W US
43-5002	18475	0	0	-	N 1279 E 81 SW 22 2S 1W US

Source: Utah Division of Water Rights, Accessed on: 2/18/14

APPENDIX E – STONEGATE WASTEWATER ALTERNATIVES ANALYSIS (TRI-COUNTY HEALTH DEPARTMENTS)

STONEGATE WASTEWATER ALTERNATIVES ANALYSIS

Prepared for the TriCounty Health Department
November 2015

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2 EXECUTIVE SUMMARY

High groundwater in the Stonegate Subdivision has led to at least one septic system failure, and water in crawl spaces and one basement would lead to the assumption that other septic systems may not be operating correctly or are near failure as well.

The TriCounty Health Department has taken the lead to find a solution and address the wastewater issues in the Stonegate subdivision. Following discussions between TriCounty Health and the Utah Division of Water Quality, it was determined that this alternatives analysis was needed to consider options to address wastewater in the Stonegate Subdivision. This report intends to provide information so that an informed decision can be made as to the best course of action to follow and fund. Alternatives considered here were developed cooperatively.

Wastewater Alternatives considered in this report:

- Cluster Onsite Treatment System (7-10 homes septic and leach lines, or mechanical/filtration treatment for the entire subdivision)
- Pressurized or Step System Collection and Transmission (Roosevelt Treatment)
- Gravity Sewer (Roosevelt Treatment)

In addition to the technical information concerning alternatives listed, costs, future planning, political considerations and additional considerations are included with each alternative.

With consideration of all information included in this report, it is recommended that a gravity sewer option be pursued to address the wastewater issues in the Stonegate Subdivision. The following is a summary of highlights included in this recommendation:

- A no action alternative would not address current failed or failing septic systems in the subdivision and could potentially harm groundwater as failed systems could contaminate groundwater passing through the subdivision.
- The pressurized or step system may have a construction cost that is less than gravity sewer, but the O+M costs required would negate this advantage over time.
- Addressing a portion or all of the subdivision through a cluster system could be more cost effective from an initial cost standpoint, but in the long term, O+M and management costs for a small collection and treatment system would be significantly more than the gravity sewer alternative.
- Advantages of the Gravity Sewer that separate it as the preferred alternative include:
    - Lowest O+M costs of the alternatives considered
    - Engineering is feasible and straightforward
    - Planning for future growth is built into the design and feasibility of future expansion is easily determined
    - Treatment is addressed at an existing approved and operational treatment facility (Roosevelt City)
    - Roosevelt city prefers this alternative, and would operate and maintain this alternative if annexation takes place, otherwise another body politic would need to be created

3 INTRODUCTION

3.1 BACKGROUND

The Stonegate Subdivision is located in Duchesne County, Utah approximately 1 mile west of the current Roosevelt City, Utah city limits. The subdivision is accessed from 200 North in Roosevelt, and contains one main North/South roadway and 5 cul-de-sacs off of the main road. There are approximately 62 lots in the subdivision, of which approximately 42 currently have homes built on them. The area of the subdivision is approximately 70 acres and it is currently surrounded by agricultural lands on all sides. The area surrounding the subdivision is zoned A 2.5 or 2.5 acre Agricultural.

Homes have been built in the Stonegate Subdivision since 2006 and the number of homes has increased since that time. In 2011 and possibly prior to this time, some homes in the subdivision experienced high groundwater in crawl spaces and locations around the homes. About this time, at least one home started having problems with their onsite wastewater system. The high groundwater prevented the leach field from discharging water from an onsite wastewater system. Efforts have been made by the county to lower groundwater through drilling sumps which some property owners have pumped. At least one other property owner has also installed additional sump pumps with temporary positive results but no long term solution to solve the problem has been identified and implemented.

At least in the case of the one residence, the owner has determined it unlivable. Other residents may not have problems with onsite systems that are noticeable, but they are not able to sell their homes and new homes cannot be built in the subdivision until a solution is found and implemented.

In 2011 an effort was requested by residents and started by Duchesne County to address wastewater issues in the Stonegate Subdivision and surrounding area. This effort developed into a proposed Hancock Cove Service District which would address wastewater issues in the more broad Hancock Cove area. A sewer feasibility study was completed and in the fall of 2014 a public meeting was hosted by Duchesne County to present the results of the study and discuss creation of a Hancock Cove Sewer Service District. Broad support for the creation of the District was not found, in fact opposition ultimately lead to the Hancock Cove Service District concept being abandoned in early 2015. As a part of this process, an exploratory committee was created and the recommendations of that committee were that a localized solution/study for just the Stonegate area be sought. Residents outside the Stonegate Subdivision did not see a need for a sewer system at this time, nor were they favorable to the associated fees and rates which would be part of a Sewer District.

Wastewater issues in the Stonegate Subdivision remain a concern, specifically to some of the residents and the TriCounty Health Department. In the spring of 2015, TriCounty Health began exploring funding options for construction of a wastewater collection and treatment system that could address the issues within the Stonegate Subdivision. With the encouragement of the Utah Division of Water Quality, the TriCounty Health Department pursued and was awarded a grant monies for an alternatives study that could identify the most cost effective and reasonable solution to address the wastewater issues in the Stonegate Subdivision. Tri county Health retained Sunrise Engineering to complete this analysis which contains the findings and recommendations to be delivered to the Utah Division of Water Quality.

3.2 PREVIOUS REPORTS COMPLETED

The Hancock Cove Sewer Feasibility Study was completed by Horrocks Engineers in the fall of 2014. Horrocks Engineers is also consulting Engineers for Roosevelt City, the nearest existing Municipal Sewer Collection and Treatment system; thus the Sewer Feasibility Study incorporated possible connection points for gravity or pressurized sewer. The Hancock Cove Sewer Feasibility Study also serves as a master plan for the area so that any improvements made can consider the bigger picture and collection for this area. The physical and financial feasibility of a number of options were examined in the study and it was recommended that a special service district for the Hancock Cove area be formed and a gravity flow system be constructed for the entire area. The proposed system would connect to the existing Roosevelt wastewater system. The wastewater would then be treated by the existing Roosevelt facilities.

As previously mentioned, public opinion in the larger Hancock Cove area was against implementation of the recommendations included in the study. Consequently, the Hancock Cove Service District was not formed and no progress was made to implement any wastewater system in the Hancock Cove Area (surrounding the Stonegate Subdivision).

3.3 ANALYSIS GOALS

This report will present the following three wastewater alternatives as they could be implemented in the Stonegate Subdivision to allow for proper wastewater treatment.

- Cluster Onsight Treatment System
- Pressurized or Step System
- Gravity Sewer System

Each section will include the following in regards to each alternative:

- Basic Description of the Alternative
- Cost Estimates
- O+M Estimates
- Advantages and Challenges
- Engineering Considerations
- Other Considerations

The goal of this report is two-fold:

1. Present information concerning the alternatives discussed in such a way that stakeholders in this process can make informed decisions about how best to proceed with addressing the current wastewater issues in the Stonegate Subdivision while keeping in mind planning for future needs in the area.

2. Provide a document that can be used as the basis for a Construction Assistance funding application for a project that will address the wastewater issues in the Stonegate Subdivision if funding is sought to address these issues.

4 GROUNDWATER MONITORING

In association with this analysis, and at the request of the Division of Water Quality, a groundwater monitoring study was implemented. The purpose of the study was to compile information on the condition of the groundwater in the subdivision, provide information to assess whether lowering the groundwater was feasible and to access whether additional septic systems, other than the one currently known, may be in failure. Secondly, the results of the groundwater monitoring study include such topics as anticipated groundwater flow rates, potentiometric surface (water table elevations), flow directions, and potential fluctuation of groundwater; which will assist in development of a solution to the wastewater issues in the Stonegate Subdivision.

The Goundwater Monitoring study is included as an appendix to this report, with the following information from the summary below.

Eight locations exist in and around the subdivision where groundwater levels can be monitored. These existing water levels were recorded and the groundwater Monitoring study added three additional ports that were constructed. Core samples were taken and recorded at these three sites and slug tests were completed on each of the 3 wells. Using collected data, a potentiometric surface was created showing groundwater levels in and near the subdivision.

Depth to water measurements for all locations in the subdivision varied from 3.32 ft to 7.73 ft below the top of the monitoring ports (12”-18” above ground surface). Groundwater generally flows south-southeastward across the site with an average estimated hydraulic gradient of 0.75%. Slug test results show a geometric mean of 0.94 ft/day hydraulic conductivity.

Results of the groundwater monitoring efforts show that there is potential for additional onsite septic systems to have issues even if they have not manifested issues currently. These results also show that with the hydraulic conductivity of the soils in the area, lowering the groundwater will not be accomplished on a short timeframe or with a small number of sumps. If gravel is installed in wastewater collection trenches to act as a French drain, it will still take a number of months to lower the groundwater table and provide a level of confidence that the water table is below existing septic system leach fields.

The source/cause of the high groundwater is likely a combination of factors including, irrigation up gradient and locally within the subdivision, shallow bedrock underlying the Stonegate Subdivision (12-15’ in depth varying), natural runoff (2014 and 2015 have been wet years), and the leach fields from existing homes. It is unclear how much of a factor each of these influences play in contributing to the high groundwater, but each one does contribute.

Gravel installed in the wastewater collection system trenches may or may not lower the high groundwater table sufficient to insure that the existing onsite systems would function correctly and not contribute to groundwater contamination. There is no question the groundwater table would be lowered and bring benefit to the area, but the extent of the groundwater lowering is unclear from the data collected and the scope of unquantifiable influences.

5 SUMMARY OF ALTERNATIVES

Following review of the previous study completed, consultation with the State of Utah Division of Water Quality Duchesne County and Roosevelt City, three different broad alternatives for approaching collection and treatment of wastewater in the Stonegate Subdivision are included in this analysis. Additional information concerning each alternative and sub-alternatives within are included in corresponding sections. Information concerning alternatives not considered feasible are summarized at the end of each section as a reference, with a short explanation of why the option was eliminated. The base alternatives and sub-alternatives outlined are as follows:

- Cluster Onsite Treatment
    - Collection
        - Gravity to treatment location
    - Treatment
        - At Grade Systems, earth fill and mound systems (up to 10 homes)
        - Mechanical systems, sand filter and media filter systems (10 or more homes)
- Step or Pressurized System (Treatment by Roosevelt City)
    - Gravity Collection and Pressurized Main
    - Pressurized Collection and Main
- Gravity Sewer (Treatment by Roosevelt City)

Details of the final recommendation are included as the final section of the report. Each of the alternatives includes possible sub-alternatives that could be considered. Final recommendations are made at the end of this analysis and details of a final solution will be included in design of the selected, funded and approved alternative.

This analysis will recommend gravity sewer as the preferred alternative. As will be seen in the analysis, several factors favor this conclusion including management of improvements, cost (construction and O+M), future planning and feasibility of implementation.

5.1 CLUSTER ONSITE TREATMENT SYSTEM OPTIONS

Alternative Basis - The Stonegate Subdivision is located approximately 1 mile from the nearest existing Roosevelt City sewer collection system manhole. Although treatment using an existing facility would be preferred, the feasibility of addressing wastewater needs in or adjacent to the Stonegate subdivision should be explored. This section addresses the local treatment possibilities with collection from a few homes or the entire subdivision. Treatment systems must be designed for the flows to be treated and as such, treatment could be accomplished by a large scale onsite treatment system which would cluster a number of homes (just homes with issues), or through a larger mechanical system that could serve the entire subdivision. Onsite treatment (septic and leach fields) can only be scaled so large, and mechanical treatment systems have disadvantages below a certain level of flow, so options in this section will be divided by 10 or less homes and 10 or more homes.

Further narrowing feasible cluster onsite treatment options, the existing groundwater conditions and limited elevation change near the Subdivision, would require pumping, additional levels of treatment prior to discharge and/or above grade absorption or evaporation facilities. All of these additional considerations make treatment options more costly. First, cluster collection and large onsite treatment will be considered, followed by larger scale mechanical methods of treatment.

5.1.1 CLUSTER SYSTEM TREATMENT OPTIONS (10 HOMES OR LESS)

With the high groundwater levels primarily determining feasibility of a treatment system, there are a variety of substitutes for cluster conventional onsite wastewater treatment systems which can provide environmentally sound alternatives for onsite treatment of sewage effluent; these are often termed "alternative onsite wastewater systems". The State of Utah Administrative Code, Rule R317-4-11, addresses the design and permitting of alternative onsite treatment systems.

These alternative systems are most commonly used for single residences or businesses, but they have also been adapted for multiple homes which would address the needs of the homes in the Stonegate Subdivision that have identified problems with onsite treatment. In order to cluster the residences to a single treatment location, a collection system would need to be installed. The collection system could be a gravity system or a pressurized system. A gravity collection system will be included in association with the cluster treatment options. A pressurized system is not recommended with this alternative given that gravity collection is feasible in the Stonegate Subdivision, gravity sewer decreases the potential for groundwater contamination and the increased O+M costs of pressurized over the life of the system are undesirable when a better alternative (gravity) is considered feasible.

Rule R317-4-6 allows alternative onsite wastewater treatment systems under the conditions that the local health department reviews and approves sufficient design, installation and operating information to produce a successful, properly operating installation from a designer certified at Level 3 in accordance with the requirements of Rule R317-11. The designer must provide a detailed basis of design of all components including necessary and relevant calculations and must provide operation and maintenance instructions for the system to both the local health department and the owner which describe the activities necessary to properly operate, maintain and troubleshoot the system. Rule R317-4-6 currently designates four styles of alternative onsite treatment systems. They include At-Grade or Earth-Fill Systems, Mound Systems, Packed Bed Media Systems, and Sand Lined Trench systems. These options in various forms are discussed later in this section.

The Utah Administrative Code generally requires that the elevation of the anticipated maximum groundwater table shall be at least 24 inches below the bottom of the absorption system excavation and at least 48 inches below finished grade. Where alternative (or experimental) onsite wastewater treatment systems may be considered, the maximum groundwater table shall be determined by regular monitoring of an observation well for a period of one year or for the period of maximum groundwater fluctuation.

The most feasible location for a small cluster treatment system serving the Stonegate Subdivision would be the area south of the subdivision (See Appendix C map labeled Collection and Local Treatment). Collected groundwater data in this area shows that groundwater to be a minimum of 24 inches below the ground surface. This depth is suitable for an alternative system in the area, and additional provisions can be taken if it were found that the groundwater was higher at the selected leach field location.

Regardless of the regulatory requirements, an alternative (or experimental) onsite wastewater small cluster treatment system should only be permitted in the Stonegate area if the system can be shown to adequately protect the public health and water quality through proper design, installation, maintenance and monitoring. The system must function properly within the local environment, particularly with respect to geology, hydrology and climate. The following subsections address various forms of alternative onsite wastewater treatment systems and summarize the advantages and disadvantages of each. Additional experimental and miscellaneous treatment were also considered, but given the site conditions, costs, complexity, etc., those shown immediately below were considered the most feasible. Additional reference information on the experimental and miscellaneous treatment is included as section 5.1.4.

5.1.1.1 At-Grade Systems

This system would essentially collect multiple homes wastewater, deliver it to a central location and use a group septic system and pump system to allow leach lines to distribute effluent sufficiently above the existing groundwater. Feasibly this option would only apply to a portion of the homes in the subdivision, specifically those with current issues or suspected issues, 7-10 homes.

An “at-grade system” is an alternative type of onsite wastewater treatment system where the bottom of the absorption system is placed at or below the elevation of the existing site grade, the top of the distribution pipe is above the elevation of existing site grade, and the absorption system is contained within a fill body that extends above that grade. The system normally consists of a conventional septic tank, a pump chamber placed in series with the septic tank, and an absorption system located as described previously. The State of Utah Administrative Code, Rule R317-4-6.15.C.1, addresses the design requirements and construction details pertaining to the installation of at-grade systems in the State of Utah. Figure 5-1 illustrates a typical at-grade system that could address multiple homes in the Stonegate Subdivision.

The primary advantage of an at-grade system is the ability to raise the absorption field above the level of that typical in a conventional septic system configuration. This solution is attractive where groundwater tables are higher than normal or where there is inadequate separation between the absorption field and a limiting soil feature. Raising the level of the absorption field can in some cases

provide the necessary soil horizon for appropriate effluent treatment and otherwise provide the conditions necessary to reach compliance with regulatory authority requirements. Additional advantages are that the system is usually less costly than a mound system since sand fill is not required, the natural soil utilized in at-grade system is usually the permeable top layer, construction damage can be minimized since there is little excavation required in the absorption area, and the systems can be utilized in most climates.

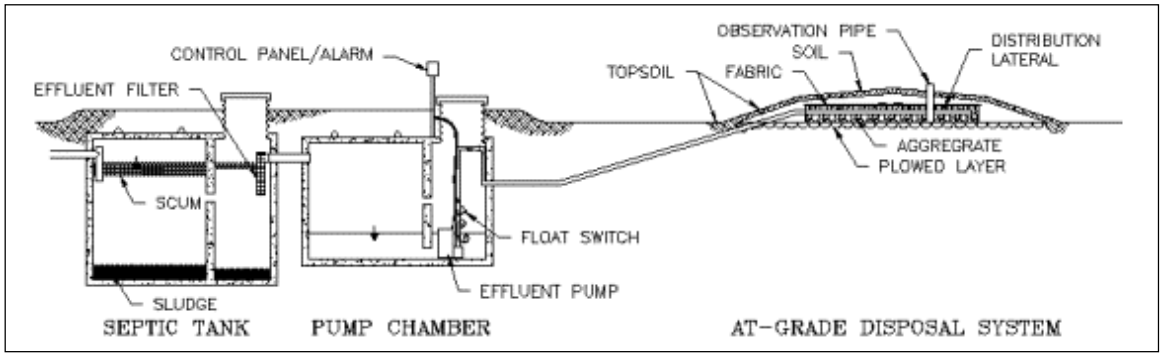

Figure 5-1: At-Grade System addressing multiple homes in a high groundwater area

The primary disadvantage of at-grade systems is the limited ability of the systems to substantially denitrify nitrates within the absorption field and prior to the wastewater effluent reaching either the groundwater table or a limiting geologic formation. The denitrifying capabilities of an at-grade system are somewhat but not substantially better than those of a conventional onsite treatment system. Moreover, Rule R317-4-6 stipulates that there must be a minimum of 24 inches between the anticipated maximum groundwater table and the bottom of the absorption system excavation, there must be at least 48 inches of suitable percolating soil between the bedrock or impervious strata and the bottom of the absorption system excavation, and the native ground surface cannot slope more than four percent.

At-grade systems may be feasible for the Stonegate treatment system, but groundwater monitoring should continue and be consulted to confirm that that maximum water level remains more than 24 inches below the existing ground surface in the proposed location.

5.1.1.2 Earth-Fill Systems

This option is very similar to the previously outlined at grade system. Similarly it would only be feasible with a portion of the homes in the Stonegate Subdivision and would be required if soil tests for existing soils necessitated removal and replacement. Likely import soils would not be needed, but complete analysis would confirm this assumption. It is possible that further evaluation of the groundwater elevations would require this option over an at grade system.

An “earth-fill system” is an onsite wastewater treatment system which may be in the form of a conventional (not feasible because of the water table) or at-grade system and which is characterized by an absorption field which consists of excavated, imported or otherwise disturbed soil with an

appropriate thickness and percolation rate; the volume of excavated, imported or otherwise disturbed soil is generally a replacement for native soils which were not appropriate as receiving media for wastewater discharge. The State of Utah Administrative Code, Rule R317-4-11.3, addresses the design requirements and construction details pertaining to the installation of earth-fill systems in the State of Utah.

The advantage of earth-fill systems is that unsuitable site conditions can sometimes be mitigated by introducing replacement materials to the site. The primary disadvantage of earth-fill systems is, similar to conventional and at-grade systems, the limited ability of the systems to substantially denitrify nitrates within the absorption field prior to the wastewater effluent reaching either the groundwater table or a limiting geologic formation. Moreover, Rule R317-4-11 stipulates that there must be a minimum of 24 inches between the anticipated maximum groundwater table and the bottom of the absorption system excavation, there must be at least 48 inches of suitable percolating soil between the bedrock or impervious strata and the bottom of the absorption system excavation, and the native ground surface cannot slope more than four percent.

Earth-fill systems may be feasible for the Stonegate treatment system, but groundwater monitoring would need to continue and results consulted to confirm that that maximum water level remains more than 24 inches below the existing ground surface in the proposed location.

5.1.1.3 Mound Systems

Similar to the at grade system a mound system is raised even higher to avoid groundwater. With additional monitoring in the selected treatment area for Stonegate it could be determined that an at-grade system was not possible and a mound system would be required instead.

A “mound system”, also known as a NODAK System or Wisconsin Mound System, is an alternative onsite wastewater system where the bottom of the absorption system is placed above the elevation of the existing site grade, and the absorption system is contained in a mounded fill body above that grade. The three main components in a mound system include a treatment unit such as a septic tank or secondary treatment device, a pump chamber or dosing system, and the mound disposal system. The State of Utah Administrative Code, Rule R317-4-6.15.C.2, addresses the design requirements and construction details pertaining to the installation of mound systems in the State of Utah.

A mound system enables use of sites that would otherwise be unsuitable for conventional or at-grade onsite treatment systems by creating acceptable soil conditions above the existing ground surface which are not naturally available at the site. Mounds were developed to overcome three limiting site conditions including slow or fast permeable soils, shallow soil cover over creviced or porous bedrock, and high water tables.

Advantages of mound systems include the facts that the natural soil utilized in the system is the uppermost soil layer which is typically the most permeable, construction damage is minimized since there is little excavation required in the mound area, and mounds can be utilized in most climates. Only 24 inches of unsaturated soil is required below the bottom of the absorption bed and mound systems can be constructed, by State rules, on native slopes up to 25 percent. Figure 5-2 illustrates a mound system.

The primary disadvantage of mound systems is the limited ability of the systems to substantially denitrify nitrates within the absorption field. Furthermore, extreme care must be taken not to damage the permeable topsoil with construction equipment during the construction process, the location of the mound may affect drainage patterns and limit land use options, the mound may have to be partially rebuilt if seepage or leakage occurs, all systems require pumps or siphons in order to distribute the effluent over the seepage field, and mound systems may not be aesthetically pleasing unless properly landscaped and maintained.

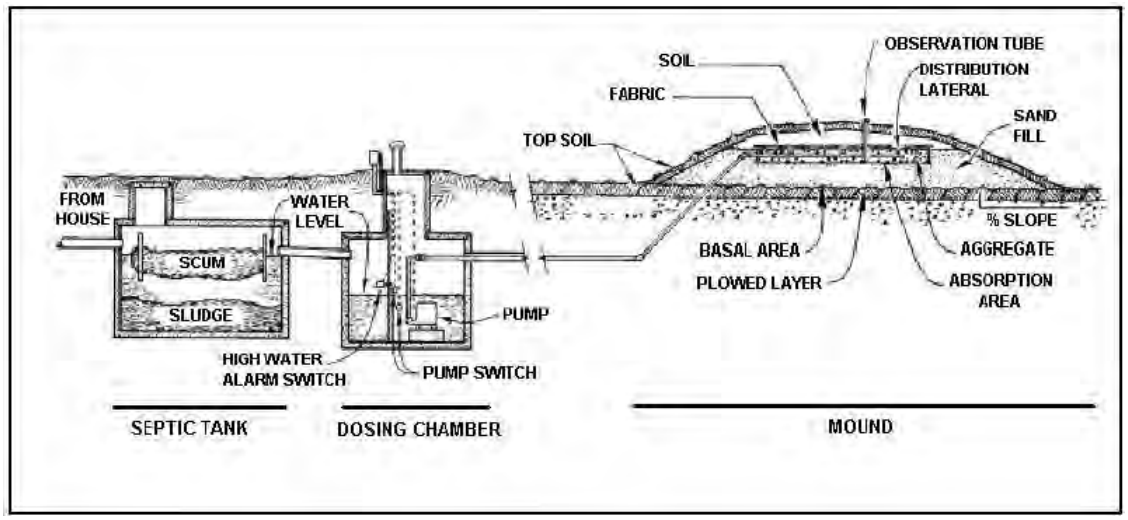

Figure 5-2 Mound System

For the area south of the Stonegate Subdivision, where treatment would be located if this alternative were considered, a mound system must be assumed in order to address the groundwater and soil conditions found in this area. As a secondary option, an at grade system could be considered if the water table is monitored for an extended time and found to be acceptable. As previously mentioned these alternatives are not preferred given that the capacity for treatment would be limited and not feasibly accommodate the wastewater for the entire subdivision.

5.1.2 MECHANICAL TREATMENT SYSTEM OPTIONS (10 HOMES OR MORE)

Each of the following systems are essentially different types of filter systems used in differing wastewater applications around the world. Determination of the best option for the Stonegate Subdivision would be made during the design process and include more detailed assumptions, calculations, disposal and other outside conditions and likely some preference from the operating entity.

Four different means of mechanical treatment are considered here as feasible options worth consideration during the design process if this larger alternative were selected for implementation.

5.1.2.1 Intermittent Sand Filter Systems

Intermittent sand filters, also known as single-pass sand filters, are one of several forms of packed bed media systems specifically approved, under certain circumstances, by the Utah Administrative Code, Rule R317-4-6. The basic components of intermittent sand filter systems include a septic tank, a dose tank with a pump and controls, a filter bed with an underdrain system, a discharge pump, and an absorption system. Rule R317-4-6.15.C.3 addresses the design requirements and construction details pertaining to the installation of intermittent sand filter systems in the State of Utah.

Sand filter beds are used to provide advanced treatment of settled wastewater or septic tank effluent. They consist of a lined excavation or watertight structure filled with uniformly sized washed sand placed over an underdrain system. Wastewater effluent is dosed onto the surface of the sand through a distribution network and is allowed to percolate through the sand to the underdrain system. The underdrain collects the filtrate for further discharge through the absorption system. [16] A schematic of a typical intermittent sand filter is provided as Figure 5-3. Sand filters are essentially aerobic, fixed film bioreactors used to treat septic tank effluent.

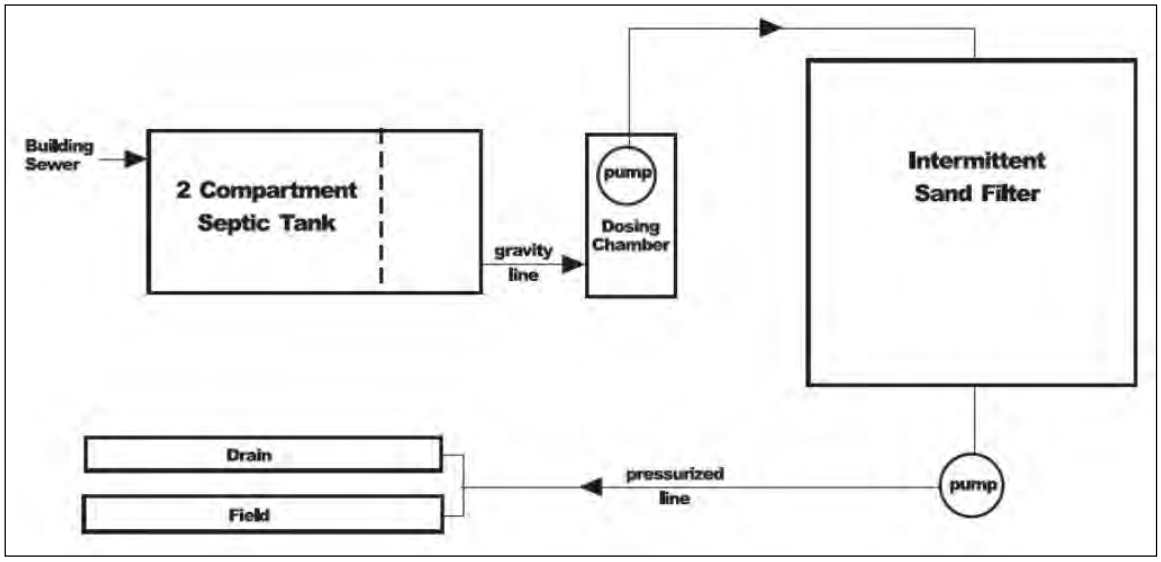

Figure 5-3 Intermittent Sand Filter

Intermittent sand filters produce a high quality effluent that can be used for drip irrigation or can be surface discharged after disinfection. In addition, absorption fields can be small and shallow, energy requirements are low, the systems are easily accessible for monitoring and do not require skilled personnel to operate, no chemicals are required, construction costs are relatively low, and treatment capacity can be expanded through modular designs. Intermittent sand filters typically produce effluent of less than 10 mg/L for both BOD and TSS. [16]

The primary disadvantage of intermittent sand filters is the limited total nitrogen removal that occurs. In most cases, effluent is nearly completely nitrified, but some variability can be expected in total

nitrogen removal capability (i.e. the level of denitrification is questionable). [16] In addition, the performance of intermittent sand filters is susceptible to extremely cold temperatures. Other disadvantages include the requirement for regular maintenance, occasional occurrence of odors resulting from open filter configurations, and clogging of the filter media. Filter media must be disposed of and replaced periodically with a cost to replace the sand media, this can be costly, but less costly than some of the other media used in filtration treatment. This alternative could be considered a viable form of mechanical treatment if mitigation measures for temperature are developed in the design.

5.1.2.2 Recirculating Sand Filter Systems

Recirculating sand filters are similar to intermittent sand filters in treatment mechanism, but whereas intermittent sand filters discharge treated septic tank effluent after one pass through the filter medium, recirculating sand filters collect and recirculate the filtrate through the filter medium several times before discharging it. The basic components of recirculating filters are a septic tank, a recirculation/dosing tank, a pump and controls, a filter bed with an underdrain system, a discharge pump and an absorption field. Recirculating sand filters are one of several forms of packed bed media systems specifically approved, under certain circumstances, by the Utah Administrative Code, Rule R317-4-6. Rule R317-4-6.15.C.3 addresses the design requirements and construction details pertaining to the installation of recirculating sand filter systems in the State of Utah. Figure 5-4 below illustrates the common configuration of a recirculating sand filter system.

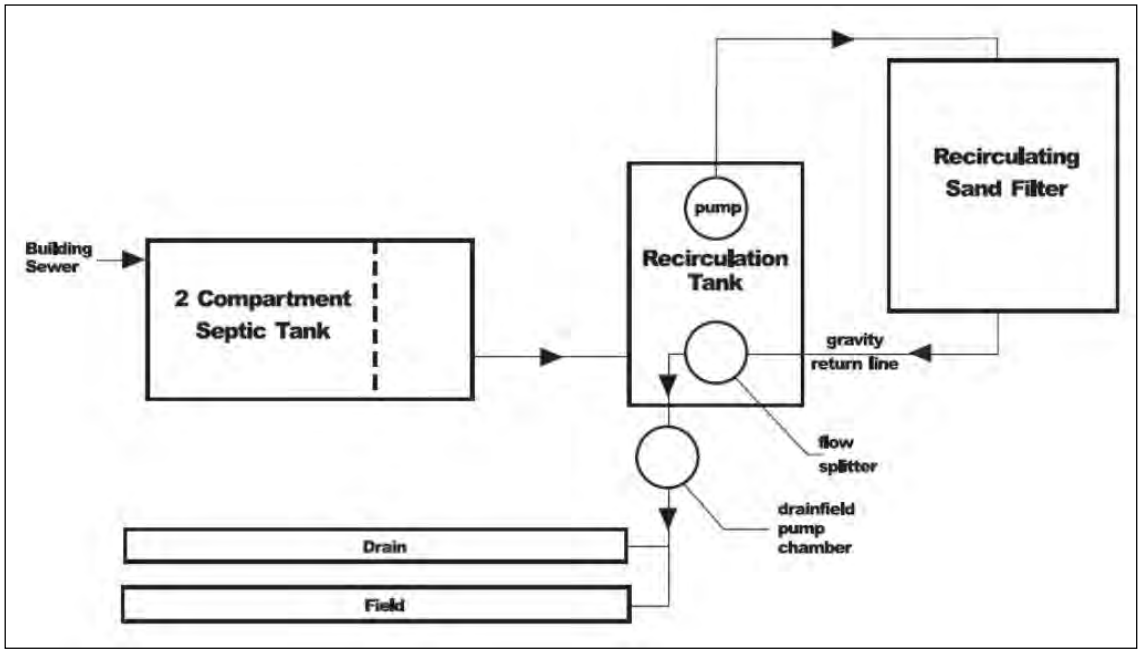

Figure 5-4 Recirculating Sand Filter

Recirculating sand filters can be used for a broad range of applications, including single-family residences, large commercial establishments, and small communities. They are frequently used to

pretreat wastewater prior to subsurface infiltration on sites where soil has insufficient unsaturated depth above groundwater or bedrock to achieve adequate treatment. Recirculating filters are used for both large and small flows and are frequently used where nitrogen removal is necessary. [16]

Recirculating sand filters generally match or outperform intermittent sand filters in removal of BOD, TSS, and nitrogen. Typical effluent concentrations for domestic wastewater treatment are less than 10 mg/L for both BOD and TSS, and nitrogen removal is approximately 50 percent. [16] Denitrification, the transformation of nitrate into nitrogen gas, occurs when the effluent is recirculated and nitrates in the effluent are exposed to the anaerobic (oxygen depleted) environment present in the recirculation tank. In this environment, nitrates may be reduced partially to nitrites or completely to nitrogen gas. Complete reduction requires an organic carbon source, which is usually abundant in the septic tank effluent, or may be provided artificially. At-grade recirculating sand filters typically achieve the highest total nitrogen reduction of packed bed media systems.

The disadvantages of recirculating sand filter systems are similar to those outlined for intermittent sand filters. Particularly, the performance of recirculating sand filters is susceptible to extremely cold temperatures. Other disadvantages include the requirement for regular maintenance, the occasional occurrence of odors resulting from open filter configurations, and clogging of the filter media. One particular disadvantage is the fact that fecal coliform removal is somewhat less than in intermittent (single-pass) filters because hydraulic loadings are typically greater and coarser filter media is often used in the recirculating filters.

In cold climates, recirculating sand filters can be placed in the ground and otherwise designed to prevent freezing. Placing a cover on a recirculating sand filter system can be done to reduce odors and provide insulation in cold climates. Where increased nitrogen removal is necessary, various adjustment and/or additions to the recirculating system can be made such as recycling effluent through the septic tank or an Anaerobic Upflow Filter (see Subsection 5.1.4) or supplementing the system with carbon from artificial sources. Finally, calibration of the recirculation pump and controls and inspection and maintenance of the whole system can be completed as part of an onsite system management program operated by a local governing entity. Therefore, recirculating sand filter treatment systems could be considered a viable alternative for wastewater treatment in the Stonegate Subdivision.

5.1.2.3 Miscellaneous Packed Bed Media Filter Systems

In addition to intermittent and recirculating sand filter systems, the Utah Administrative Code, Rule R317-4-6, allows other types of packed bed media filter systems. Other systems allowed by the Code include recirculating gravel filter systems, textile filter systems, and peat filter systems. Each system has its advantages and disadvantages, but all rely on the same basic theory; each system is essentially a fixed film aerobic bioreactor.

Recirculating gravel filter systems are nearly identical in operation to recirculating sand filter systems. Sand filters were formally the most common, but pea gravel has been a frequently used filter medium in recent times. Because of the larger pore size and greater permeability, gravel filters can be loaded more heavily than most of the other packed bed media filter types. However, because of the large pore size, gravel filters are not as efficient as sand filters in removing solids. In addition, gravel filters perform best in warmer climates. Two strong advantages of both sand and gravel filters are that the filter media

(sand and gravel) are readily available from local sources and neither media is proprietary. The same limitations that govern recirculating sand filter systems apply to the operation of recirculating gravel filter systems.

Textile filter systems are similar to recirculating sand filter systems (see Subsection 6.15.C.3.e) except that the filter medium generally consists of textile chips known as "coupons". The textile medium is placed in a filter enclosure similar to that of a sand filter system, with wastewater being applied by dispersing it at the top of the filter. A modification of this design uses layers of textile material with a break between layers or a series of textile filter tubes.

Textile filter packed bed media systems are usually more expensive than conventional septic systems or recirculating sand and gravel filter systems. In addition, the successful operation of a textile filter system generally requires that the system be inspected and serviced on a regular basis; this could be addressed by the implementation of an onsite system management program which could be operated by a local governing entity. Other potential problems with textile filter systems are that the filter medium may be unique and/or proprietary and may not be readily available when it must be replaced, or the medium may not be consistent from supplier to supplier or batch to batch.

The specific brand names Geotextile and AdvantTex® (see Subsection 6.15.C.3.e) and their approved equals are listed as approved textile filter packed bed media systems by Rule R317-4-11 in the Utah Administrative Code. These systems, though generally more expensive than recirculating sand and gravel filter systems, offer promising capabilities for wastewater treatment, especially where the removal of nitrogen is concerned, as long as it can be shown that the life cycle and regeneration capability of the filter biofilm is appropriate for the expected usage patterns of the treatment system. As stated in the discussion for recirculating sand filter systems, the primary concern with use of fixed film aerobic bioreactors is the ability to sustain the filter biofilm under seasonal use patterns. If textile filter media systems are approved for use in the study area, it should be shown beforehand that the filter media is locally available, is non-proprietary, and will be manufactured indefinitely.

The final filter medium specifically authorized by Rule R317-4-6 is peat. Peat is a permeable, naturally occurring, absorbent medium which is an accumulation of partially decayed vegetation matter. Although peat appears to be a promising filter medium, little long term data currently exists on the ability of peat filters to consistently remove wastewater contaminants. Additionally, because peat is natural material, significant variations in composition have been noted; these contribute to the uncertainty of treatment capabilities.

5.1.2.4 AdvanTex® Onsite Treatment Systems

AdvanTex® treatment systems are specifically listed in the Utah Administrative Code, Rule R317-4-6.15.C.3.e as approved alternative treatment systems. Manufactured by Orenco Systems, Inc., the patented AdvanTex® treatment system is a compact and efficient recirculating packed bed filter that uses a non-woven textile material for the treatment media. The units are able to handle higher loading rates than sand or gravel units and therefore have a smaller footprint.

The process of the AdvanTex® system is essentially that of a typical recirculating packed bed media filter system. Raw sewage enters a two compartment tank through a standard inlet. The first compartment of the tank, similar to a septic tank, separates the sewage into sludge, scum, and clear fluid layers. The

clear fluid of the tank is then routed to the second compartment which is the recirculating basin of the system. The clear fluid is pumped to the AdvanTex® filter module where it is allowed to trickle down through the filter medium. The filtered effluent is then split with a percentage being re-routed through the system and the remaining fluid being routed to final discharge. Depending on system configuration, AdvanTex® systems can remove up to 75% of total nitrogen.

AdvanTex® systems are a promising solution for onsite wastewater treatment in the study area because of their ability to complete the nitrification and denitrification processes prior to final effluent discharge and because they can be constructed in a smaller footprint area than standard recirculating sand or gravel filter systems. In addition, the AdvanTex® and Orenco products are becoming quite common and can be obtained through a variety of suppliers.

The limiting factor with the use of AdvanTex® systems is the same as that with sand and gravel filters; aerobic biologic systems are not well suited to seasonal use applications. Full efficiency of the nitrifying and denitrifying processes can take up to eight weeks to develop, especially in high altitudes and cold climates. Therefore, AdvanTex® treatment systems could be considered a viable alternative for wastewater treatment in the Stonegate area if a number of full time residences were connected to the system and temperature mitigation measures were taken. This option should be considered secondary to other treatment alternatives previously discussed due to costs and limitations listed above.

5.1.3 OPINIONS OF PROBABLE COST

Two different cost estimates are shown for the Cluster Onsite Treatment System Options. Both include a gravity collection system to the treatment location since this is the preferred alternative for collection and is feasible. The first probable cost shown is for the alternative treatment option that would address some homes in the Stonegate Subdivision (up to 10), but not all homes. As mentioned above, unless proven otherwise through extended groundwater monitoring, the mound option is the recommended alternative for alternative treatment. See Figure 6-6 in Appendix A for a detailed opinion of probable cost. The estimated cost totals about $1.6M.

The second opinion of cost is made for the mechanical treatment alternative. As stated above, this alternative would allow for treatment using a variety of filter media that would address wastewater for the entire subdivision. Each of the mechanical/filter options have advantages and disadvantages to them and they are initially similar in cost. Estimates included in this report assume that a final option would be selected during design of the system (when ongoing costs should also be considered), and cost estimates have been prepared to reflect this flexibility. See Figure 6-5 in Appendix A for a detailed opinion of probable cost. The estimated cost totals about $2.7M.

5.1.3.1 CONSTRUCTION ESTIMATES

Construction estimates shown do not include the costs associated with connecting homes to the sewer line at each home. Each existing home will have a different current configuration and thus a different cost for connecting to or abandoning the existing septic system and connecting to the new main wastewater line. For general reference, and based upon conversations with local contractors, these costs could range from $5,000 to $7,000.

5.1.3.2 O+M ESTIMATES

Annual and recurring costs associated with the gravity collection and a large septic/mound system would include:

- Annual collection line inspections - $1,200
- Annual septic tank inspection and periodic pumping - $5,000
- Pump cost - $5,000 annually
- Additional Operations and maintenance of system - $2,500 annually
- Replacement of Pump (10-15 years)
- Replacement of leach lines (20 years)
- Replacement of septic tank (20 years)
- Replacement of collection system (40 years)

Annual and recurring costs associated with the gravity collection and a mechanical means of treatment would include:

- Annual collection line inspections - $1,200
- Operations and Maintenance of mechanical treatment system - $8,000 – $10,000 annually
- Replacement of mechanical treatment system (20-30 years)
- Replacement of collection system (40 years)

5.1.3.3 ADVANTAGES AND CHALLENGES

Advantages of the gravity collection and septic/mound system

- Most cost effective solution
- Most focused solution – only addresses homes with issues
- Collection and treatment remains localized to currently known problem areas

Challenges of the gravity collection and septic/mound system

- Expansion ability is limited.
- Localized operations and maintenance must be taken on by an entity, existing or new.
- Land used for this purpose could not be used for any other purpose, the size of the required mound would be determined in the design process, but it could be significant given conditions of the land surrounding the subdivision and the known groundwater elevations.

Advantages of the Mechanical Treatment Option

- The entire Stonegate Subdivision could be included in the design of the treatment equipment, initially or expanded to meet needs as growth occurs.
- Addressing treatment locally addresses current issues quickly with minimal impacts to surrounding areas.

Challenges of the Mechanical Treatment Option

- High level of Operations and Maintenance required
- Trained operator required for operation

- Disposal of sludge/disposal and replacement of filter media
- Localized operations and maintenance must be taken on be an entity, existing or new

5.1.3.4 ENGINEERING CONSIDERATIONS

- High groundwater in and around the subdivision would likely require the mound system for absorption after a septic system.
- A land drain should be installed with the collection system in the subdivision, but it is unknown to what extent the groundwater may be lowered until after the land drain is installed and in operation for a time.
- The collection system design criteria should include the possibility of a gravity sewer transmission line to Roosevelt City or other entity treatment facility going in at a future.

5.1.3.5 FUTURE EXPANSION AND PLANNING

Gravity collection could be made compatible with a future collection system in the larger area, any acceptance of any outside flows through the gravity system would need to be incorporated into the design of the lines.

The cluster septic/mound system would not be expandable beyond the designed capacity without significant costs and upgrades.

The mechanical treatment may be expandable at a cost, but significant flow increases would not be feasible to add to the mechanical treatment system.

5.1.3.6 RIGHTS OF WAYS

The collection system would be constructed within the existing platted roads in the subdivision. Once on the southern end of the subdivision, easements would need to be obtained for a line to the proposed treatment location. In the case of the septic/mound system, an area up to an acre in size would likely need to be purchased in order to provide adequate area for absorption.

In the case of the mechanical treatment, a small footprint could be used for the building, but a larger area would need to be purchased in order to handle the absorption lines or other effluent disbursement from the treatment facility. An easement to an approved discharge location would also be needed.

5.1.3.7 POLITICAL

Currently there is no body politic willing to take on the operations and maintenance of either of these localized systems. If approved by the State, the homeowners association could take on the O+M for either system, but this is not a good long term solution. An existing entity would need to step forward to take this project on, or a special service district would need to be formed in order to create an entity responsible for either proposed system. An SSD of this size has its challenges, but may be the only viable option to manage and monitor a localized Wastewater system in the Stonegate Subdivision.

For future planning, the Stonegate Subdivision is in the future annexation area of Roosevelt City, but not currently being considered for annexation unless the residents file a formal request for annexation. This request for annexation could be made to Roosevelt at any time. Roosevelt does not look favorably upon alternative or mechanical means of treatment as they already operate a lagoon system south and east of Roosevelt.

5.1.4 MISCELLANEOUS ONSITE TREATMENT TECHNOLOGIES

Various onsite treatment technologies are available in addition to the specific technologies allowed by rule in the State of Utah and highlighted in the previous subsections. Although these other various technologies are effective and economical in particular environments, none were considered viable for implementation in the Stonegate area due to their complexity. The less complex and less costly systems outlined previously in this section are considered viable. Nevertheless, a brief discussion of the additional technologies is provided in the following paragraphs. The information is primarily taken from the United States Environmental Protection Agency's *Onsite Wastewater Treatment Systems Manual*.

- In addition to the designated alternative onsite treatment systems, Rule R317-4-9 specifies that, where unusual conditions exist (i.e. where conventional or designated alternative onsite treatment systems cannot be properly sited), experimental onsite wastewater systems may be employed provided they are acceptable to the Division of Water Quality and to the local health department. The rule requires that experimental systems be designed, installed and operated under the following conditions. Groundwater requirements shall be as determined by the Utah Administrative Code, Rule R317-4-4.1.B.3. (and the local health department supplemental rules)
- The local health department must advise the owner of the system of the experimental or alternative status of the system.
- The local health department and the homeowner shall be provided with sufficient design, installation, and operation information which will result in a properly operating system.
- The local health department is responsible for approved installation, inspection, maintenance and a monitoring program for the system.
- The local health department may impose more stringent design, installation, operating and monitoring conditions than those required by the Division of Water Quality.
- All failures, repairs, or alterations to the system shall be reported to the local health department.
- All repairs and alterations to the system shall be approved by the local health department.

From all available information, the previously discussed options will work in the Stonegate area. Should an unforeseen issue arise during design of a system, the following options could be considered viable.

Continuous Flow Suspended Growth Aerobic Systems (CFSGAS) is an activated sludge, aerobic, suspended growth process that maintains a relatively high population of microorganisms by recycling settled biomass back to the treatment process. Preliminary treatment to remove settleable solids and floatable materials is usually provided by a septic tank and effluent discharge is usually accomplished through a subsurface absorption field. Several modifications of the basic process are commercially available and can be purchased in onsite package treatment units. The systems are not considered viable primarily because they must be managed and maintained by trained personnel rather than homeowners or a small system operator.

Fixed film systems are biological treatment processes that employ a medium such as rock, plastic, wood, or other natural or synthetic solid material that will support biomass on its surface and within its porous structure. The sand, gravel, textile, and peat filter systems discussed in previous subsections are types of fixed film systems. Two basic styles of fixed film systems exist – one in which the medium is

stationary relative to the liquid (i.e. trickling filters) and the other in which the medium is in motion relative to the liquid (i.e. rotating biological contactors). Fixed film systems can be purchased commercially in onsite package plants and are effective in removing BOD and TSS. The use of exposed and submerged stages in multiple tanks to create aerobic and anoxic conditions may be employed in applications where nitrogen removal is required. In addition, the units can be installed above ground to avoid high groundwater or high bedrock concerns as long as the equipment is properly housed and protected against weather conditions. In spite of these advantages, the process still requires semi-skilled management personnel to ensure proper operation of the systems. Furthermore, startup of the bacterial cultures can require up to 12 weeks for effective performance. Finally, the units are normally at least as expensive to install and maintain as recirculating filter systems.

The Sequencing Batch Reactor (SBR) process is a sequential suspended growth (activated sludge) process in which all major steps occur in the same tank in sequential order. The two major classifications of SBRs are intermittent flow reactors and continuous flow reactors. SBRs can be designed and operated to remove nitrogen, phosphorus, ammonia, BOD and TSS. Various manufacturers carry commercially available SBR treatment systems in packaged configurations for onsite applications. SBRs are less susceptible to flow and quality loading changes than other aerobic biological treatment systems, but they are still not suitable for seasonal applications. They are also quite susceptible to extreme cold and must be buried or otherwise insulated.

Aquatic systems are large basins filled with wastewater undergoing a combination of physical, chemical and/or biological treatment processes. Facultative lagoons, aerated lagoons, and free water surface constructed wetlands are examples of aquatic systems used for wastewater treatment. Facultative lagoons are not widely used for onsite wastewater treatment since they are large in size, expensive to build, produce large quantities of algae, and don't operate well under cold weather conditions. Aerated lagoons and constructed wetlands also require a relatively large footprint (though smaller than that of a facultative lagoon) and are also susceptible to cold weather. In addition, each of these facilities should be fenced to prevent unwanted access and hazard protection. Aquatic systems are therefore not considered to be viable solutions for onsite wastewater treatment in the study area.

A Vegetated Submerged Bed (VSB) reactor is a high specific surface reactor filled with solid media. Wastewater discharged to the VSB experiences a high hydraulic retention time. Although often identified as subsurface constructed wetlands, a VSB does not fit the strict definition of a constructed wetland. Even though VSBs are fully capable of meeting secondary BOD and TSS effluent requirements, they would be considered a pretreatment technology when used in conjunction with a septic tank and a subterranean absorption field.

Anaerobic Upflow Filters (AUFs) operate under the same scientific principles as VSBs and are useful as tertiary treatment behind aerobic processes to remove nitrates from the wastewater. VSBs require a significant amount of land and are susceptible to malfunction in cold weather, though some studies have shown that dead vegetation may provide sufficient insulation in cold climates. Since AUFs can more easily be protected from temperature constraints, they are considered the more optimal tertiary treatment method in the study area, particularly for use in conjunction with a recirculating sand filter system.

5.2 PRESSURIZED OR STEP SYSTEM

Being one mile from the nearest existing sewer collection system manhole, significant initial cost would be required to connect a sewer collection system to existing infrastructure. The land between the Stonegate Subdivision and the existing sewer system has little elevation change limiting potential alignments for gravity sewer. With these two considerations in mind, it is beneficial to consider construction cost savings associated with a pressurized or step system of collection and transmission of wastewater. These pressurized methods include various forms which could include effluent pump systems, grinder pump systems and vacuum systems.

Pressurized wastewater collection and conveyance systems can, in certain cases, be more cost effective than conventional gravity systems. Pressurized conveyances are typically characterized by smaller diameter pipes; smaller pipes can be used because a pressurized pipe can convey more fluid than a similar pipe under free flow conditions. The smaller diameter pipe represents a cost savings since the expense of pipe is related to material costs and there is less material in a small diameter pipe. In addition, the bury depth of pressurized systems need only be sufficient to keep the pipe from freezing due to surface weather conditions or being damaged from surface loading conditions. In the Stonegate Subdivision area, the pressurized lines would be buried to a depth of approximately five feet with drain gravel installed below the collection pipe. Moreover, pressurized systems can be installed at varying grades; this eliminates the cost of maintaining constant grades through deep excavations. Additional savings are realized in the elimination of manholes, reduced installation times, and minimized treatment costs due to the riddance of infiltration and inflow.

5.2.1 GRAVITY COLLECTION AND PRESURIZED MAIN

The first pressurized system option considered in this analysis is gravity collection and a pressurized main. This alternative would include gravity collection lines (including gravel bedding to drain groundwater away from wastewater lines) within the Stonegate subdivision streets. The topography of the land dictates that the collection point for the gravity sewer would be at the southeast corner of the subdivision. A sump sized with the design capacity would be located here with a grinder pump to pressurize a small diameter line that would deliver the wastewater to a Roosevelt Sewer manhole. Two alignment and delivery manhole options have been considered (See Appendix C map labeled Pressurized Sewer Alignment Map).

5.2.2 PRESSURIZED COLLECTION AND MAIN

The pressurized collection and main option could be designed and installed in 3 different ways:

1. Effluent Pump System – each home's septic tank would be left in place, but effluent from the system would be pumped into a main collection and transmission line from each individual home.

2. Grinder Pump System – a sump would be installed at each home and a grinder pump would deliver wastewater into the main collection and transmission line.

3. Vacuum Collection System – a localized vacuum collection system would include a sump at each home with a centralized vacuum/pump station (or 2-3 smaller stations). Similar to the

pressurized main option, once the wastewater is collected at the vacuum/pump station it is pressurized into the transmission line.

Each of these three options is unique and has advantages and disadvantages under varying conditions, but they are similar in purpose and implementation. Because they are similar, additional information concerning details of the above listed options can be found in Section 5.2.11.

5.2.3 OPINIONS OF PROBABLE COST

Each of the pressurized line options are similar in initial cost, thus only one opinion of probable cost shows the range of the different options possible. See Figure 6-4 in Appendix A for a detailed opinion of probable cost. The estimated cost totals about $4.1M.

5.2.4 CONSTRUCTION ESTIMATES

Construction estimates shown do not include the costs associated with connecting homes to the sewer line or sump at each home. Each existing home will have a different current configuration and thus a different cost for connecting to or abandoning the existing septic system and connecting to the new main wastewater line. For general reference, and based upon conversations with local contractors, these costs could range from $3,000 to $7,000.

5.2.5 O+M ESTIMATES

Estimating operations and maintenance pressurized wastewater systems can be a challenge given the variety of ways a system can be organized and the management plan implemented by the governing entity. Some of the variables associated with the operations and maintenance that will affect cost include:

- In an effluent or grinder pump situation, is the initial portion of the system gravity fed or are individual pumps used. Individual pumps would be connected to each home and thus consume power that each connection owner would pay through their monthly power bill. Those individual costs could range from $30/month to $60/month depending on usage and power rates.
- Centralized sump/grinder pump and vacuum systems could have power bill associated with them from $200/month to $1500/month depending on actual usage and power rates.
- The largest costs associated with any of these systems will be the maintenance for maintaining the lines and pumps and also replacing the pumps. An estimated breakdown of these costs could include:
    - Certified operator, part time – $15,000 to $20,000/yr
    - Replacement fund for new pumps/vacuum $1,000 to $2,000/yr
    - Individual pump O+M fund – this could be left to the individual owners or could be included as O+M for the system depending on the management plan $1,000 to $2,000/yr
    - Estimated total O+M/yr ~$17,000 to ~ $24,000
- Expected life of Components
    - Replacement of Pumps (10-15 years)
    - Replacement of collection system pipes (20-30 years)

5.2.6 ADVANTAGES AND CHALLENGES

Advantages

- Pressurized systems allow for smaller diameter pipe (likely 2", 4" or 6") to be installed after pumps.
- Pressurized systems allow pipe to follow the topography of the land instead of maintaining grade such as in a gravity sewer.
- Depending on the pressurized option chosen, a connections to existing septic systems could be minimal and decrease the initial cost to homeowners.
- Decreased cost of construction

Disadvantages

- Significant O+M costs either for the managing entity or for the home owners, or both depending on the management plan and options chosen.
- Certified operator for pressurized system required and significant knowledge of system and continual required maintenance of the system.
- Management issues associated with pumps on each property or a pump/vacuum system more complex than gravity sewer.
- Limited growth and expansion of system
- New connections require more coordination and planning
- Pump operation costs and maintenance
- The line breaks or dig ins have the potential to be more common and require immediate attention

5.2.7 ENGINEERING CONSIDERATIONS

One of the main advantages of a pressurized system is the ability to collect and transmit wastewater regardless of the topography of the collection area. Groundwater should be taken into consideration in the design, but with the proposed gravel drain associated with pipework, the existing groundwater should not have an adverse effect on the design or operation of a system. Other existing conditions within the subdivision would not significantly limit the ability of a pressurized system to be designed or operate correctly.

5.2.8 FUTURE EXPANSION AND PLANNING

A pressurized system should be designed with the current and future flows considered. Care should also be taken that a system is not overdesigned which would cause the initial costs to escalate and the system to run inefficiently. Inefficiency could lead to increased O+M costs. Portions of the system could be designed such that additional improvements could be made which are compatible with the initial system, but the challenge of anticipating growth and not overdesigning the system would be a real concern.

5.2.9 RIGHTS OF WAYS

Of the potential alignments shown for pressurized sewer, one does include an option that remains within existing county road rights of ways and would only require that property be acquired for the location of the sump/grinder/vacuum/pump location. The second alignment would require negotiation

with several property owners to obtain the necessary easements for construction and operation of the system.

5.2.10 POLITICAL

Initial discussions with the City of Roosevelt about pressurized sewer were that they were unwilling to accept pressurized sewer into their system. Follow-up discussion has been that Roosevelt may be open to accepting the wastewater from a pressurized system into one of their manholes, but that the system would need to be independent and O+M would be the responsibility of an entity other than Roosevelt.

Given that the Roosevelt potential annexation area includes the Stonegate subdivision, it is also realized that even if Roosevelt City was not the initial body politic to manage the system, there could come a point in time in the future when Roosevelt City would inherit any system that is installed. In this context, Roosevelt City would prefer that a pressurized sewer not be considered as an option for addressing wastewater in the Stonegate subdivision.

5.2.11 PRESSURIZED SYSTEM ADDITIONAL DETAIL

As discussed in Section 5.2.2, a variety of options exist to facilitate a pressurized system, they are similar in scope and cost. For implementation in the Stonegate Subdivision, additional information would need to be gathered to determine which option may be the best. Existing septic tank locations, availability of power, accessibility to mainlines, homeowner's preference and other considerations should be gathered in order to determine the best pressurized sewer option for the Stonegate Subdivision and residents. Additional information for the 3 alternatives for pressurized sewer are provided here.

5.2.11.1 Effluent Pump Systems

In an effluent pump wastewater system, sewage from the residence enters a watertight chamber similar in design to a conventional septic tank. The sewage is there separated into layers of sludge, effluent, and scum. Solids remain in the tank and are treated by passive, natural processes. Solids removal from the tank is necessary on a periodic basis, similar to that of a conventional septic system. Liquid effluent from the tank is pumped through a small diameter service line (usually one inch in diameter) to a small diameter main line (approximately four inches in diameter depending on the flow volume and application) and is then conveyed to a neighborhood or regional treatment facility. If effluent is taken from homes at higher elevations than the main lines, onsite pumping of effluent may not be required. Because no solids are conveyed to the treatment facility, the design and complexity of the treatment works are generally simpler than those of a conventional treatment plant.

An effluent pump collection system is attractive for implementation in the study area primarily because it has the ability to keep contaminants from entering ground and surface waters while avoiding the limitations and challenges of installing a conventional gravity collection system in the study area. Orenco Systems, Inc., a leading manufacturer and designer of effluent pump wastewater systems was contacted to provide a preliminary feasibility analysis, recommendations and estimates for the implementation of an effluent pump system in the study area. A diagram of the Orenco ProSTEP™ effluent sewer system, taken from the Orenco Systems, Inc. website, is provided as Figure 5-5 below.

The collection system main lines in an effluent pump system are designed and installed in a manner similar to that used for the design and construction of pressurized culinary water lines. Pipe materials

normally used include PVC and HDPE (in colder climates). The main lines are installed with the contour of the terrain and pressures in the main lines generated by the onsite pump systems alone are often sufficient; however, in some cases pressure sustaining stations may be necessary. Pigging ports are required to facilitate cleaning if necessary, and gate valves and air release valves should be included in the same manner as with a culinary water system. One of the primary advantages of implementing an effluent pump system in the study area is the capacity of the system to pressurize itself and eliminate the need for larger pumping stations that would be required on a normal gravity wastewater collection system.

Figure 5-5 Orenco ProSTEP Effluent Sewer System

Disadvantages of effluent pump systems include the fact that septic tanks still have to be monitored and the solids removed on a periodic basis as with a conventional septic tank system. Furthermore, pressurized systems must be carefully designed and constructed. Absolute water-tightness is essential for both the tank and the pipe segments of the system since hydraulic overloading may diminish the detention time (necessary for settling and biological processes) in the tank and may diminish the ability of the pipe system to carry design wastewater flows. A watertight system allows for smaller line sizes, ensures maximum connection capacity, reduces treatment requirements, and eases operation and maintenance of the system components. Power outages, if not properly planned for, can cause major disruptions to the operation of the system and components of the system exposed to the weather must be protected from freezing. In summary, the general disadvantage of effluent pump systems is their complexity and resulting need for increased levels of oversight, operation and maintenance. Notwithstanding these disadvantages, an effluent pump system is still considered a viable solution for wastewater collection in the study area.

5.2.11.2 Grinder Pump Systems

In a grinder pump wastewater collection system, household sewage flows through a standard residential outlet to a vault where either a dry sump or submersible grinder pump grinds the solids, blends them

with the wastewater fluid base, and discharges the sewage into a pressurized pipe system. Grinder pump systems do not require a conventional septic tank for effluent separation as effluent pump systems do, but can require more horsepower in the pump since the grinding process requires more effort. Wastewater effluent is discharged from the pump through a small diameter pipe (typically one inch in diameter) to a main line which is approximately four inches in diameter, depending on required capacity. The main line delivers the ground effluent to either neighborhood or regional treatment and dispersal systems.

As with effluent pump systems, a significant portion of the costs of a grinder pump system is in the on-lot facilities. If a relatively large number of existing septic systems must be replaced, the grinder pump system is generally more cost effective than an effluent pump system. Since infiltration and inflow is virtually eliminated by the closed, pressurized grinder pump system, the concentration of Total Suspended Solids (TSS) may be higher than is acceptable at a downstream facility. This would not be an issue in any approved Stonegate Subdivision grinder system since the treatment works will be designed in conjunction with the collection system. Grinder pump systems are advantageous over effluent pump systems since there is no worry about the water-tightness of onsite septic tanks and because there are no septic tanks which must be pumped on a regular basis.

There are disadvantages to grinder pump systems. In grinder pump systems, greases, oils, fats and solids are discharged through the pipeline; thus, hydraulic design is critical and scouring velocities must be maintained to keep the pipe walls clean. Air release valves in grinder pump systems require regular maintenance and cleaning due to grease buildup. In addition, during low velocity periods, greases and oils can accumulate on the crown of pipes and can gradually restrict the flow capacity of the system. Power outages can be a bigger problem with grinder pump systems than with effluent pump systems since there is no septic system which acts as a detention basin during the power outage. Finally, treatment works must be designed to handle highly concentrated loadings caused by the fact that all wastes leaving the residence ultimately reach the treatment plant; such is not the case with effluent pump systems. This may actually be an advantage since treatment plants normally operate at higher efficiencies when constituent concentrations are greater.

Grinder pump systems offer similar advantages that effluent pump systems do. They are especially attractive for implementation in the study area because they avoid shallow groundwater and bedrock levels, because much of the onsite system expense can be deferred to the property owner and delayed until actual development of the property, because a conventional gravity sewer would require multiple lift stations anyway, and because the cost of installation and disturbance of a small diameter, shallow (bury depth would be approximately five feet) main line system would be minimal.

Delco Western, a company based in Salt Lake City, UT, which represents Environment One, a manufacturer of grinder pump system components, was contacted to provide a preliminary feasibility report and estimate of implementation, operation and maintenance costs. A partial estimate was provided, which was very similar in cost to the effluent pump system. It is also expected, that the overall capital and operation and maintenance costs of the grinder pump system will be similar to those of the effluent pump system.

5.2.11.3 Vacuum Collection Systems

Vacuum collection systems utilize centralized or neighborhood vacuum stations (which create suction in the collection system) to convey wastewater flows. In typical applications, an amount of wastewater (usually 10-15 gallons) is allowed to collect at a residential connection. When the specified volume is reached, a valve opens and the sewer is sucked out in the direction of the vacuum station. Because air and wastewater flow together, the wastewater and its constituents generally travel at high velocities; this effectively prevents blockages from occurring and prevents the buildup of sediments or other accumulations in the system.

Onsite vacuum interface valves operate automatically using pneumatic controls which means that onsite facilities do not use electricity. Another advantage of the vacuum system is that it allows the pipe to be laid in a manner that follows the contours of the land, similar to effluent pump and grinder pump systems. As with other pressure systems, pipelines are typically smaller in diameter than those of conventional gravity systems and are buried at shallow depths. The disadvantage of a vacuum system is that pressure differences introduced in a vacuum system are usually not significant enough to allow wastewater to overcome large changes in elevation or long distances. Vacuum systems are more appropriate in flat areas where low head differentials are sufficient for wastewater transport.

5.3 GRAVITY SEWER

Gravity collection systems are the most desirable type of collection systems if they are properly designed and constructed. They require the least maintenance and are usually the least problematic of any type of collection system. Conventional gravity sewer systems have been used for many years and procedures for their design are well established. When properly designed and constructed, conventional gravity systems perform reliably. Properly designed and constructed gravity sewers have the ability to convey grit and solids, and they can maintain a minimum velocity at design flow, thereby reducing the production of hydrogen sulfide and methane. This reduces odors, blockages, pipe corrosion, and the potential for gaseous explosions.

A particular disadvantage of gravity sewer systems is the requirement to maintain slopes which facilitate appropriate flow velocities. This can require deep excavations in hilly terrain; deep excavations drive up construction costs. Sewage pump or lift stations may also be necessary at points of minimum inflection in the vertical alignment of the pipe or in long segments of relatively flat slopes. Pumping and lift stations substantially increase the initial capital and perpetual operation and maintenance costs of the collection system. Additionally, manholes in the line are a source of inflow and infiltration which increase the volume of wastewater which must be processed at the treatment plant. This also results in higher costs, as do larger pipe diameters and materials prices for manholes.

In the Stonegate Study area, a true gravity sewer system is feasible from an elevation standpoint, minimal grades and a general downhill slope toward the existing Roosevelt Collection and Treatment System would make construction of such a system possible. Key to this feasibility and cost analysis of this alternative is the ability of the Stonegate gravity collection system to connect into the existing Roosevelt collection system and to utilize the existing Roosevelt Treatment facilities. This alternative does not consider a separate alternative for treatment.

Advantages for the gravity sewer include all those listed above. While the general slope of the land does make gravity sewer feasible in the Stonegate area, the specific alignment will affect the depth of trench construction and thus the cost of the project. It should also be noted that the high groundwater in the area could be an issue for construction and ongoing operation of the system. Included in the construction should be drain gravel installed beneath the collection pipe that would allow groundwater to be conveyed away from the gravity sewer system.

Additional considerations for the feasibility and other determining factors are shown below:

5.3.1 ALIGNMENT ALTERNATIVES

Within the Stonegate Subdivision the gravity collection system would most feasibly be constructed and maintained within or adjacent to the existing roads. Although alignments across back lot lines may make for shorter lateral connections from existing septic systems, no other advantage for using the back lot lines exists. Thus the alignment alternatives shown will only include the option of using existing roads within the subdivision.

Based upon elevations, potential connection points, property lines and potential ROW locations, the following maps have been prepared showing alternative alignments for a gravity collection system from

the Stonegate Subdivision to the Roosevelt City Collection System (See Appendix C map labeled Gravity Sewer Alignment Map).

5.3.2 LINE SIZING ALTERNATIVES

The Hancock Cove Sewer Feasibility Study completed by Horrocks Engineers in 2014 included an option to address wastewater in not only the Stonegate Subdivision, but also the greater Hancock Cove area. The alternatives discussed in that report included different line sizes governed by wastewater flows and by existing ground elevations and connection points. The overlapping portions of these two study areas included 8", 12" and 15" lines in the Horrocks study for the Stonegate area and connection.

With just the Stonegate area included in this alternative analysis, two alignments exclusive of the Hancock Cove master area may be considered. Given the anticipated flows and topography of the land, 8" and 10" sewer lines could be utilized to address the Stonegate Wastewater needs. Roosevelt City could choose to upsize the line to address additional needs in the area, but for the current needs, 8" and 10" lines would be sufficient.

5.3.3 OPINIONS OF PROBABLE COST

Costs for the conceptual gravity collection alternatives were determined by identifying unit material quantities within each scenario and then multiplying those quantities by appropriate unit prices. Pipe sizes for the gravity system were determined using a pipe size calculating spreadsheet with average slopes between manholes. A printout of the calculations is given in Appendix B. It was assumed for the calculations that the gravity system would be buried approximately 5-6 feet deep; in some locations the excavations will be deeper and in some areas shallower. Allowances for imported pipe bedding, imported fill material, and problems associated with construction in areas with high groundwater tables were also included. See Figure 6-1, Figure 6-2, and Figure 6-3 in Appendix A for detailed opinions of probable cost. The three different cost estimates reflect the three different feasible alignments. The estimated costs total about $3.3M, $3.7M, and $3.5M. The final alignment used will need to include negotiations with property owners and Rights of Ways acquisition. A side by side comparison of the prices of the gravity system scenarios with other wastewater treatment alternatives is also provided in Appendix A.

5.3.4 CONSTRUCTION ESTIMATES

Construction estimates shown do not include the costs associated with connecting homes to the sewer line. Each existing home will have a different current configuration and thus a different cost for abandoning the existing septic system and connecting to the new main wastewater line. For general reference, and based upon conversations with local contractors, these costs could range from $4,500 to $7,000.

5.3.5 O+M ESTIMATES

Gravity Sewer with treatment addressed through the existing Roosevelt City Treatment facility minimizes the operations and maintenance of the proposed improvements significantly. The O+M costs are variable based upon several factors including:

1. Grades and pipe sizes of the final designed gravity sewer system

2. Several homes in the Stonegate Subdivision currently pump groundwater from their crawl spaces or a sump location, if this were to be discharged into the gravity sewer and depending on the location(s) and quantity of water, it could minimize the need to flush the gravity sewer system periodically.
3. Final design of the wash crossing(s), depending on the grades, design and layout of the wash crossing (or crossings depending on alignment), additional flushing and cleaning, heat tape or checking the crossing for debris pileup could all be part of routine maintenance for the proposed line.

Given the likely scenario of periodic flushing of the lines being needed, an annual estimate for utilizing Roosevelt City Staff and resources would be $3,000 - $6,000 based upon flushing occurring every other month within the proposed improvements area.

5.3.6 ADVANTAGES AND CHALLENGES

Advantages

- Gravity sewer is the most cost effective O+M solution.
- Gravity sewer can be designed to meet current needs and is easily expandable as growth facilitates expansion of the system.
- Gravity sewer is the preferred alternative for Roosevelt City and DEQ.

Disadvantages

- All of the proposed gravity sewer alignments must cross a wash or washes, options to accomplish this exist, but they will need to be designed properly with an elevated pipeline complete with protection or a buried solution. Any of the likely options for this crossing will be expensive.
- All of the proposed gravity sewer alignments would require easements to be obtained from property owners and other utility conflicts will exist.
- The initial construction costs of the gravity sewer are not the least expensive option available.

5.3.7 ENGINEERING CONSIDERATIONS

In addition to the disadvantages listed above, the following should also be considered in design of a gravity system for the Stonegate Subdivision.

- Current and buildout within the subdivision
- Compatibility with future growth in surrounding areas
- Topography of land within the subdivision and along possible alignments
- ROW feasibility
- Connection points with Roosevelt City System

5.3.8 FUTURE EXPANSION AND PLANNING

Within the context of the Hancock Cove Wastewater Study, the Stonegate wastewater collection system could be designed to be compatible with and complementary to a future expansion in the rest of the Hancock Cove area. Population density in the remainder of Hancock Cove is relatively low with some higher density areas and subdivisions. As growth occurs and additional sewer connections are required or requested, evaluation should be made as to whether that expansion should attach to the Stonegate wastewater collection lines, or create a new collection line to the west of the Stonegate Subdivision. There exists Rights of Ways that could facilitate future alignments outside the subdivision that would be more beneficial to the area and Roosevelt depending on where the growth occurs.

5.3.9 RIGHTS OF WAYS

Gravity Sewer Alignment 1 and 2 share an alignment south of Stonegate Subdivision and collection area. There is some flexibility through the piece of property south of the existing subdivision dependent upon Engineering feasibility and preferred location of the wash crossing. This initial section of both alignments could be negotiated with the one property owner south of the Subdivision and West of the wash.

After the wash crossing, alignment 1 continues generally east to Summerall Lane. A Sewer line in this location could be constructed on the north or south side of a property line, or the South side of the property line. Currently there are two individual property owners between the wash and Summerall Lane north of the property line and two individual property owners south of the property line. North of the property line there also exists conflicts with an irrigation waterline and a gas line, while the south side of the property line appears to be unencumbered currently. A future gas well access road and possibly a well pad may also conflict with the alignment 1 on the north side of the property line. Initial contact with each of these property owners yielded an openness to talk, but further detail and negotiation on the part of the entity to manage the project would need to be included in further discussions when the governing body politic for leading this project is determined.

After the wash crossing, alignment 2 could also be on either side of multiple property lines, if it remained on the south and west it would cross multiple properties which all have one owner.

Discussions with any of the property owners mentioned above will need to include Roosevelt City and a design/ROW engineer so that information can be given to the property owners and negotiations can occur.

5.3.10 POLITICAL

Feasibility of a project must include discussion of the governing entity, interaction with property owners and other involved entities. Background for the project area and the currently observed pathway forward are key to this discussion.

Current Conditions – The Stonegate subdivision is located within Duchesne County. The Roosevelt City limits currently are located a little less than 1 mile to the east and south of the Stonegate subdivision. Roosevelt City is in the process of moving the potential annexation area beyond the Stonegate Subdivision to the west. Residents within the Stonegate subdivision will soon (November 2015) have the ability to petition Roosevelt City to annex if they desire.

Body Politic for Project Alternatives – Currently there is no County entity in Duchesne County to address sewer in the Stonegate Area. At the conclusion of the Horrocks Hancock Cove Wastewater Study, a public meeting was held to explore the possibility of creation of a Sewer Special Service District, this was rejected by the residents of the area and a committee formed from this meeting suggested that a more focused report be created looking just at the Stonegate Subdivision. Either an existing entity would need to take on the Sewer System (Roosevelt City is the only nearby existing Sewer System area) or a new Sewer District would need to be created to manage and maintain the Sewer System.

Sewer District Creation Alternative – Creation of a sewer district which only serves the Stonegate Subdivision is an option to address the sewer needs in Stonegate. The District would be small and limited in scope, but would need to have the ability to collect fees and operate and maintain a system. The sewer district responsibilities could be adapted to any of the 3 alternatives suggested in this report. Challenges of a small sewer district include costs, O+M, having a certified operator, and day to day management of the system to keep it in compliance with state standards. It is possible, but challenging to the residents and others involved.

Roosevelt City Alternative – Roosevelt City has the ability to administer a wastewater system in the Stonegate Subdivision. Based upon discussions with Roosevelt City, in order for this to happen Roosevelt City would require that the area being serviced and connecting line properties will need to be annexed into the city. Roosevelt City has also been clear that the resulting debt service from project improvements would need to be borne by the residents within the served area currently outside the city limits.

Easement Considerations – Based upon the position of Roosevelt City to not accept wastewater without annexation, discussion with property owners for easements must include discussion or annexation as well. Preliminary discussion with property owners has yielded an openness do discussion, but an understandable hesitation until further information is known. Several property owners are open to the easement consideration, but have reservations about annexation.

5.4 RECOMMENDATIONS

5.4.1 ENGINEERING ANALYSIS RECOMMENDATION

Summary of Alternatives

- Cluster Onsite Treatment System
- Pressurized or Step System Collection (Roosevelt Treatment)
- Gravity Sewer (Roosevelt Treatment)

With consideration of all information included in this report, it is the recommendation that a gravity sewer option be pursued to address the wastewater issues in the Stonegate Subdivision. The following is a summary of the analysis included in this recommendation:

- A no action alternative would not address current failed or failing septic systems in the subdivision and could potentially harm groundwater as failed systems could contaminate groundwater passing through the subdivision.
- The pressurized or step system analyzed in this report may have a construction cost that is less than gravity sewer, but the O+M costs required would negate this advantage over time. Ongoing O+M costs, increased management due to individual pumps or sumps, limited ability to address growth and no clear advantage over gravity sewer alignments all prevent this alternative from being considered as the preferred alternative.
- The cluster treatment system alternative does have the advantages that it can be adaptable to address the wastewater needs in the Stonegate Subdivision and that associated costs would be customized to address the level desired. Addressing a portion or all of the subdivision could be more cost effective from an initial cost standpoint, but in the long term, O+M and management costs for a small collection and treatment system would be significantly more than the gravity sewer alternative. Expansion of the system beyond the initial construction could be considered in the design, but anticipating the facilitation of future growth may or may not be of benefit to the initially designed system and the users initially involved.
- Advantages of the Gravity Sewer that separate it as the preferred alternative include:
    - Lowest O+M costs of the alternatives considered
    - Engineering is feasible and straightforward
    - Planning for future growth is built into the design and feasibility of future expansion is easily determined
    - Treatment is addressed at an existing approved and operational treatment facility (Roosevelt City)
    - Roosevelt city prefers this alternative, and would operate and maintain this alternative if annexation takes place, otherwise another body politic would need to be created

5.4.2 DESCRIPTION

It is recommended that the Gravity Sewer option become the preferred alternative to address wastewater issues in the Stonegate Subdivision. The following advantages outweigh the advantages to the other considered alternatives:

- O+M costs and straightforward maintenance
- Compatibility with future political situation and planning in the area
- Treatment utilizes an existing wastewater system with the capacity to receive Stonegate wastewater
- Long term solution

5.4.3 ADDITIONAL CONSIDERATIONS

Gravity sewer is also the preferred alternative for the Division of Water Quality and currently for the City of Roosevelt. As a potential funding agency and project advocate, pursuing the preferred alternative for the Division of Water Quality is in the best interest of the project. Roosevelt City prefers gravity sewer ad with the potential for annexation in this area, the most logical solution is to include Roosevelt City in the process and pursue a solution that includes Roosevelt being the body politic to pursue construction and debt service on this project.

5.4.4 FINANCING SUMMARY

Discussions with the Division of Water Quality have been ongoing throughout the planning process associated with this analysis. Financing for this analysis has been provided by the Division of Water Quality. For financing construction of the selected improvements alternative, several options could be pursued.

The challenge in funding a project to address the wastewater issues in the Stonegate Subdivision is that the construction cost of the project is large for the amount of new connections that will be expected to carry the debt incurred by such a project. 42 existing connections and 20 additional future connections cannot carry a large amount of debt unless the user rates were elevated to a level that residents could not afford to pay the user rates. A large amount of grant money provided in a funding package may be the only solution that will make a solution feasible.

In addition to making the project cashflow is the question of who the sponsoring entity will be. Any of the funding agencies considered here will require the sponsoring entity to be the entity that will collect the fees, operate the system and oversee the maintenance of the infrastructure. With the likelihood that Roosevelt City will annex the Stonegate Subdivision before debt service is paid off, Roosevelt City is the logical choice to be the sponsoring entity. Should Roosevelt City choose to not to be the sponsoring entity for the Stonegate Wastewater improvements, either Duchesne County or a Special Service District would need to become the sponsoring entity.

Below are possible alternatives for funding a Stonegate Wastewater Improvements projects.

Division of Water Quality Funding – Funding a selected alternative for addressing wastewater issues in the Stonegate Subdivision could come from the Division of Water Quality. Funding provided by the Division of Water Quality can be in grant form if grant money is available and users in the system pay toward operating costs and debt service to 1.4% of the areas' MAGI. In the case of Stonegate, the MAGI will likely be determined to be equivalent to Roosevelt's at 2013 numbers of $54,914. 1.4% of the Roosevelt MAGI is $64.07/month. The Roosevelt City cost of O+M including treatment is $35/month leaving $29.07/month/connection that could be used to pay debt service. With 42 homes in the

subdivision and the previously listed numbers, for the project to cashflow, a large amount of grant money, 80%-90% will be needed.

The Division of Water Quality does not have in their budget grant money enough to meet the needs of the Stonegate Subdivision project and keep user rates in the affordable range. DWQ may have loan funds available to meet the needs of this project, but not grant funds to the extent that would be needed to make the project affordable.

Community Impact Board – Funding through the Community Impact Board may be available to meet the needs of the Stonegate Subdivision, dependent upon availability and support from DWQ. CIB often consults DWQ on project details and appreciates coordination between funding agencies where practical.

USDA Rural Development – Funding may also be available through the USDA Rural Development funding program, similar rules to DWQ for user rates and grant/loan splits would apply, but with numbers supplied from the federal government rather than the MAGI given here. We do not know those federal numbers until an application is made. Due to the federal approval process, applying for and receiving money associated with Rural Development could take 2 years or longer to procure.

5.5 COMMUNITY AND PUBLIC SUPPORT

5.5.1 WITHIN STONEGATE

Several residents of the Stonegate Subdivision have been involved in different aspects of this planning process, some with the irrigation company and groundwater investigation, others with discussions with Roosevelt and still others with communication and coordination.

The largest participation has been in the public meeting held on November 10th, 2015 in Roosevelt. Approximately 60 people attended this meeting which was advertised by the TriCounty Health Department to all Stonegate Residents and those owning property between Stonegate and the existing Roosevelt City limits. This meeting was informational, but following the presentation of the results of this report, comments were taken and public allowed to express concerns and questions.

Following the November 10th meeting, a number of residents from the Stonegate subdivision have attended and participated in Roosevelt City Council meetings, expressing concerns associated with and/or support for Roosevelt City being the leading body politic for a project to address current issues in the subdivision.

5.5.2 COVE AREA/DUCHESNE COUNTY

Prior to the process for the Stonegate Subdivision beginning, the Hancock Cove area Study and associated public meeting gave the residents in the cove area a chance to voice concerns and be heard. Many took that opportunity and expressed their opinions, generally the sentiment has been included in this report. A few residents outside Stonegate did attend the November 10th, 2015 meeting and were interested in the progress of a proposed solution and how it might affect their properties and homes. Annexation was at the route of the majority of these questions.

5.5.3 ROOSEVELT

- Meetings – Multiple meetings with Roosevelt City have taken place in association with the Stonegate Subdivision Wastewater Alternatives Analysis. Most meetings have included Mayor Ryan and Staff, but presentations have been made to the City Council as well. Generally speaking, Roosevelt City understands the area in question is within the potential annexation area of Roosevelt City, they also have been clear that current residents should not shoulder the debt of the issues currently in the Stonegate Subdivision.

- Preferences – Roosevelt City prefers the gravity sewer option as it is compatible with their current system and is the best long term solution for the area.

- Desired locations and configuration – Roosevelt understands that the topography defines where the gravity sewer alignment is feasible, and that associated connection points are part of the design process.

- Funding situation – Roosevelt city has indicated that they are open to becoming the body politic for a project to provide wastewater collection in the Stonegate Subdivision if the residents request annexation, the annexation process is underway and the resulting outcome does not negatively affect the existing residents in Roosevelt City.

6 APPENDIX A – ENGINEER'S OPINIONS OF PROBABLE COST

SUNRISE ENGINEERING, INC.
363 East Main Street Suite 201, Vernal, Utah 84078
Tel: (435) 789-7364 Fax: (435) 622-9090
Engineer's Opinion of Probable Cost

PROJECT NAME: STONEGATE SUBDIVISION SEWER — 31-Dec-15
Client: TRICOUNTY HEALTH DEPARTMENT — JAM/ala
GRAVITY SEWER ROUTE 1

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 115,800.00	$ 115,800.00
3	Pre-Construction DVD	1	EA	$ 1,000.00	$ 1,000.00
4	Traffic Control	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	75	HR	$ 250.00	$ 18,800.00
6	Materials Sampling & Testing	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control Compliance	1	LS	$ 15,000.00	$ 15,000.00
10	12" SEWER LINE	6,420	LF	$ 45.00	$ 288,900.00
11	8" SEWER LINE	8,420	LF	$ 35.00	$ 294,700.00
12	DRAIN GRAVEL	3,742	CY	$ 41.00	$ 153,400.00
13	REINFORCED CONCRETE MANHOLE	16	EA	$ 4,500.00	$ 72,000.00
14	SEWER LATERAL AND CONNECTION	42	EA	$ 1,500.00	$ 63,000.00
15	IMPORT TRENCH BACKFILL	26,382	CY	$ 36.00	$ 949,800.00
16	PAVEMENT CUTTING	13,800	LF	$ 2.00	$ 27,600.00
17	4" HOT MIX	4,600	SY	$ 49.00	$ 225,400.00
18	UNTREATED BASE COURSE	767	CY	$ 120.00	$ 92,000.00
19	IMPORT PIPE BEDDING	2,853	CY	$ 32.00	$ 91,300.00
			SUBTOTAL		$ 2,431,200.00
			CONTINGENCY	15%	$ 364,700.00
			CONSTRUCTION TOTAL		$ 2,795,900.00
INCIDENTALS					
1	Funding & Adminstrative Services	0.5%	HR	$ 14,000.00	$ 14,000.00
2	Engineering Design	5.8%	LS	$ 162,700.00	$ 162,700.00
3	Bidding & Negotiating	1.0%	HR	$ 28,000.00	$ 28,000.00
4	Engineering Construction Services	7.0%	HR	$ 194,500.00	$ 194,500.00
12	Environmental Report (EIS,EA, CATEX, ...)	1.3%	EST	$ 35,000.00	$ 35,000.00
16	Geotechnical Report	0.5%	EST	$ 15,000.00	$ 15,000.00
25	Land & RoW Acquisition	0.9%	EST	$ 25,000.00	$ 25,000.00
27	GIS Mapping	0.3%	EST	$ 9,000.00	$ 9,000.00
39	Bond Attorney	0.4%	EST	$ 12,500.00	$ 12,500.00
			SUBTOTAL		$ 495,700.00
			TOTAL PROJECT COST		$ 3,291,600.00

In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

Figure 6-1: Gravity Sewer Route 1

SUNRISE ENGINEERING, INC.
363 East Main Street Suite 201, Vernal, Utah 84078
Tel: (435) 789-7364 Fax: (435) 622-9090
Engineer's Opinion of Probable Cost

PROJECT NAME: STONEGATE SUBDIVISION SEWER — 31-Dec-15
Client: TRICOUNTY HEALTH DEPARTMENT — JAM/ala
GRAVITY SEWER ROUTE 2

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 129,100.00	$ 129,100.00
3	Pre-Construction DVD	1	EA	$ 1,000.00	$ 1,000.00
4	Traffic Control	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	83	HR	$ 250.00	$ 20,700.00
6	Materials Sampling & Testing	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control Compliance	1	LS	$ 15,000.00	$ 15,000.00
10	12" SEWER LINE	8,155	LF	$ 45.00	$ 367,000.00
11	8" SEWER LINE	8,420	LF	$ 35.00	$ 294,700.00
12	DRAIN GRAVEL	3,742	CY	$ 41.00	$ 153,400.00
13	REINFORCED CONCRETE MANHOLE	20	EA	$ 4,500.00	$ 90,000.00
14	SEWER LATERAL AND CONNECTION	64	EA	$ 1,500.00	$ 96,000.00
15	IMPORT TRENCH BACKFILL	29,467	CY	$ 36.00	$ 1,060,800.00
16	PAVEMENT CUTTING	13,800	LF	$ 2.00	$ 27,600.00
17	4" HOT MIX	4,600	SY	$ 49.00	$ 225,400.00
18	UNTREATED BASE COURSE	767	CY	$ 120.00	$ 92,000.00
19	IMPORT PIPE BEDDING	3,624	CY	$ 32.00	$ 116,000.00
			SUBTOTAL		$ 2,711,200.00
			CONTINGENCY	15%	$ 406,700.00
			CONSTRUCTION TOTAL		$ 3,117,900.00
INCIDENTALS					
1	Funding & Adminstrative Services	0.5%	HR	$ 15,600.00	$ 15,600.00
2	Engineering Design	5.8%	LS	$ 180,100.00	$ 180,100.00
3	Bidding & Negotiating	0.9%	HR	$ 28,000.00	$ 28,000.00
4	Engineering Construction Services	7.0%	HR	$ 216,900.00	$ 216,900.00
12	Environmental Report (EIS,EA, CATEX, ...)	1.1%	EST	$ 35,000.00	$ 35,000.00
16	Geotechnical Report	0.5%	EST	$ 15,000.00	$ 15,000.00
25	Land & RoW Acquisition	0.8%	EST	$ 25,000.00	$ 25,000.00
27	GIS Mapping	0.3%	EST	$ 9,000.00	$ 9,000.00
39	Bond Attorney	0.4%	EST	$ 12,500.00	$ 12,500.00
			SUBTOTAL		$ 537,100.00
			TOTAL PROJECT COST		$ 3,655,000.00

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Figure 6-2: Gravity Sewer Route 2

SUNRISE ENGINEERING, INC.
363 East Main Street Suite 201, Vernal, Utah 84078
Tel: (435) 789-7364 Fax: (435) 622-9090
Engineer's Opinion of Probable Cost

PROJECT NAME: STONEGATE SUBDIVISION SEWER — 31-Dec-15
Client: TRICOUNTY HEALTH DEPARTMENT — JAM/ala
GRAVITY SEWER ROUTE 3

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 122,900.00	$ 122,900.00
3	Pre-Construction DVD	1	EA	$ 1,000.00	$ 1,000.00
4	Traffic Control	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	77	HR	$ 250.00	$ 19,200.00
6	Materials Sampling & Testing	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control Compliance	1	LS	$ 5,000.00	$ 5,000.00
10	15" SEWER LINE	6,975	LF	$ 52.50	$ 366,200.00
11	8" SEWER LINE	8,420	LF	$ 35.00	$ 294,700.00
12	DRAIN GRAVEL	3,742	CY	$ 41.00	$ 153,400.00
13	REINFORCED CONCRETE MANHOLE	18	EA	$ 3,500.00	$ 63,000.00
14	SEWER LATERAL AND CONNECTION	64	EA	$ 1,200.00	$ 76,800.00
15	IMPORT TRENCH BACKFILL	27,369	CY	$ 37.00	$ 1,012,600.00
16	PAVEMENT CUTTING	13,800	LF	$ 2.00	$ 27,600.00
17	4" HOT MIX	4,600	SY	$ 49.00	$ 225,400.00
18	UNTREATED BASE COURSE	767	CY	$ 120.00	$ 92,000.00
19	IMPORT PIPE BEDDING	3,100	CY	$ 32.00	$ 99,200.00
			SUBTOTAL		$ 2,581,500.00
			CONTINGENCY	15%	$ 387,200.00
			CONSTRUCTION TOTAL		$ 2,968,700.00
INCIDENTALS					
1	Funding & Adminstrative Services	0.5%	HR	$ 14,800.00	$ 14,800.00
2	Engineering Design	5.8%	LS	$ 172,100.00	$ 172,100.00
3	Bidding & Negotiating	0.9%	HR	$ 28,000.00	$ 28,000.00
4	Engineering Construction Services	7.0%	HR	$ 206,500.00	$ 206,500.00
12	Environmental Report (EIS,EA, CATEX, ...)	1.2%	EST	$ 35,000.00	$ 35,000.00
16	Geotechnical Report	0.5%	EST	$ 15,000.00	$ 15,000.00
25	Land & RoW Acquisition	0.8%	EST	$ 25,000.00	$ 25,000.00
27	GIS Mapping	0.3%	EST	$ 9,000.00	$ 9,000.00
39	Bond Attorney	0.4%	EST	$ 12,500.00	$ 12,500.00
			SUBTOTAL		$ 517,900.00
			TOTAL PROJECT COST		$ 3,486,600.00

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Figure 6-3: Gravity Sewer Route 3

SUNRISE ENGINEERING, INC.

363 East Main Street Suite 201, Vernal, Utah 84078

Tel: (435) 789-7364 Fax: (435) 622-9090

Engineer's Opinion of Probable Cost

PROJECT NAME: STONEGATE SUBDIVISION SEWER — 31-Dec-15

Client: TRICOUNTY HEALTH DEPARTMENT — JAM

GRAVITY COLLECTION AND PRESSURE SEWER

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 146,000.00	$ 146,000.00
3	Pre-Construction DVD	1	EA	$ 1,000.00	$ 1,000.00
4	Traffic Control	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	81	HR	$ 250.00	$ 20,300.00
6	Materials Sampling & Testing	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control Compliance	1	LS	$ 5,000.00	$ 5,000.00
10	4" SEWER LINE FORCEMAIN (HDPE)	9,500	LF	$ 22.50	$ 213,800.00
12	8" SEWER LINE	6,705	LF	$ 35.00	$ 234,700.00
13	DRAIN GRAVEL	2,980	CY	$ 41.00	$ 122,200.00
14	REINFORCED CONCRETE MANHOLE	12	EA	$ 4,500.00	$ 54,000.00
15	SEWER LATERAL AND CONNECTION	42	EA	$ 1,500.00	$ 63,000.00
16	IMPORT TRENCH BACKFILL	28,809	CY	$ 36.00	$ 1,037,100.00
17	IMPORT PIPE BEDDING	4,222	CY	$ 32.00	$ 135,100.00
18	WASTEWATER LIFT STATION	1	EA	$ 200,000.00	$ 200,000.00
19	PAVEMENT CUTTING	32,410	LF	$ 2.00	$ 64,800.00
20	4" HOT MIX	10,803	SY	$ 49.00	$ 529,400.00
21	UNTREATED BASE COURSE	1,801	CY	$ 120.00	$ 216,100.00
			SUBTOTAL		$ 3,065,000.00
			CONTINGENCY	15%	$ 459,800.00
			CONSTRUCTION TOTAL		$ 3,524,800.00
INCIDENTALS					
1	Funding & Adminstrative Services	0.5%	LS	$ 17,600.00	$ 17,600.00
2	Engineering Design	4.9%	LS	$ 202,000.00	$ 202,000.00
3	Bidding & Negotiating	0.7%	HR	$ 28,000.00	$ 28,000.00
4	Engineering Construction Services	6.0%	HR	$ 245,200.00	$ 245,200.00
12	Environmental Report (EIS,EA, CATEX, ...)	0.6%	EST	$ 25,000.00	$ 25,000.00
16	Geotechnical Report	0.4%	EST	$ 15,000.00	$ 15,000.00
25	Land & RoW Acquisition	0.2%	EST	$ 10,000.00	$ 10,000.00
27	GIS Mapping	0.2%	EST	$ 9,000.00	$ 9,000.00
39	Bond Attorney	0.3%	EST	$ 12,500.00	$ 12,500.00
			SUBTOTAL		$ 564,300.00
			TOTAL PROJECT COST		$ 4,089,100.00

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Figure 6-4: Pressure Sewer

SUNRISE ENGINEERING, INC.

363 East Main Street Suite 201, Vernal, Utah 84078

Tel: (435) 789-7364 Fax: (435) 622-9090

Engineer's Opinion of Probable Cost

PROJECT NAME: STONEGATE SUBDIVISION SEWER — 31-Dec-15

Client: TRICOUNTY HEALTH DEPARTMENT — JAM/ala

MECHANICAL SEWER

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 92,400.00	$ 92,400.00
3	Pre-Construction DVD	1	EA	$ 1,000.00	$ 1,000.00
4	Traffic Control	1	LS	$ 7,500.00	$ 7,500.00
5	Subsurface Investigation	42	HR	$ 250.00	$ 10,500.00
6	Materials Sampling & Testing	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control Compliance	1	LS	$ 5,000.00	$ 5,000.00
11	8" SEWER LINE	8,420	LF	$ 35.00	$ 294,700.00
12	DRAIN GRAVEL	3,742	CY	$ 41.00	$ 153,400.00
13	REINFORCED CONCRETE MANHOLE	14	EA	$ 3,500.00	$ 49,000.00
14	SEWER LATERAL AND CONNECTION	64	EA	$ 1,200.00	$ 76,800.00
15	IMPORT TRENCH BACKFILL	14,969	CY	$ 36.00	$ 538,900.00
16	PAVEMENT CUTTING	13,800	LF	$ 2.00	$ 27,600.00
17	4" HOT MIX	4,600	SY	$ 49.00	$ 225,400.00
18	UNTREATED BASE COURSE	767	CY	$ 120.00	$ 92,000.00
19	STM equipment	1	LS	$ 127,000.00	$ 127,000.00
20	STM building	1	LS	$ 175,000.00	$ 175,000.00
21	Earthwork for Infiltration Basins	1	LS	$ 50,000.00	$ 50,000.00
			SUBTOTAL		$ 1,941,200.00
			CONTINGENCY	15%	$ 291,200.00
			CONSTRUCTION TOTAL		$ 2,232,400.00
INCIDENTALS					
1	Funding & Adminstrative Services	0.5%	HR	$ 11,200.00	$ 11,200.00
2	Engineering Design	5.0%	LS	$ 132,400.00	$ 132,400.00
3	Bidding & Negotiating	0.8%	HR	$ 20,000.00	$ 20,000.00
4	Engineering Construction Services	5.8%	HR	$ 155,300.00	$ 155,300.00
12	Environmental Report (EIS,EA, CATEX, ...)	0.9%	EST	$ 25,000.00	$ 25,000.00
16	Geotechnical Report	0.6%	EST	$ 15,000.00	$ 15,000.00
25	Land & RoW Acquisition	1.7%	EST	$ 45,000.00	$ 45,000.00
27	GIS Mapping	0.3%	EST	$ 9,000.00	$ 9,000.00
39	Bond Attorney	0.5%	EST	$ 12,500.00	$ 12,500.00
			SUBTOTAL		$ 425,400.00
			TOTAL PROJECT COST		$ 2,657,800.00

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Figure 6-5: Mechanical Sewer

SUNRISE ENGINEERING, INC.

363 East Main Street Suite 201, Vernal, Utah 84078

Tel: (435) 789-7364 Fax: (435) 622-9090

Engineer's Opinion of Probable Cost

PROJECT NAME: STONEGATE SUBDIVISION SEWER — 31-Dec-15

Client: TRICOUNTY HEALTH DEPARTMENT — JAM

MOUND SEWER

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
GENERAL CONSTRUCTION					
1	Mobilization	5%	LS	$ 53,600.00	$ 53,600.00
3	Pre-Construction DVD	1	EA	$ 1,000.00	$ 1,000.00
4	Traffic Control	1	LS	$ 5,000.00	$ 5,000.00
5	Subsurface Investigation	24	HR	$ 250.00	$ 5,900.00
6	Materials Sampling & Testing	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control Compliance	1	LS	$ 5,000.00	$ 5,000.00
11	8" SEWER LINE	4,710	LF	$ 35.00	$ 164,900.00
12	DRAIN GRAVEL	2,093	CY	$ 41.00	$ 85,800.00
13	REINFORCED CONCRETE MANHOLE	8	EA	$ 3,500.00	$ 28,000.00
14	SEWER LATERAL AND CONNECTION	7	EA	$ 1,200.00	$ 8,400.00
15	IMPORT TRENCH BACKFILL	8,373	CY	$ 37.00	$ 309,800.00
16	PAVEMENT CUTTING	13,800	LF	$ 2.00	$ 27,600.00
17	4" HOT MIX	4,600	SY	$ 49.00	$ 225,400.00
18	UNTREATED BASE COURSE	767	CY	$ 120.00	$ 92,000.00
19	Mound system equipment	1	LS	$ 20,000.00	$ 20,000.00
20	Mound system leach field (4" pipe)	1,100	LF	$ 25.00	$ 27,500.00
21	Earthwork for mound	1	LS	$ 50,000.00	$ 50,000.00
			SUBTOTAL		$ 1,124,900.00
			CONTINGENCY	15%	$ 168,700.00
			CONSTRUCTION TOTAL		$ 1,293,600.00
INCIDENTALS					
1	Funding & Adminstrative Services	1.0%	LS	$ 12,900.00	$ 12,900.00
2	Engineering Design	5.1%	LS	$ 82,900.00	$ 82,900.00
3	Bidding & Negotiating	1.0%	HR	$ 16,000.00	$ 16,000.00
4	Engineering Construction Services	5.6%	HR	$ 90,000.00	$ 90,000.00
12	Environmental Report (EIS,EA, CATEX, ...)	1.6%	EST	$ 25,000.00	$ 25,000.00
16	Geotechnical Report	0.9%	EST	$ 15,000.00	$ 15,000.00
25	Land & RoW Acquisition	3.4%	EST	$ 55,000.00	$ 55,000.00
27	GIS Mapping	0.6%	EST	$ 9,000.00	$ 9,000.00
39	Bond Attorney	0.8%	EST	$ 12,500.00	$ 12,500.00
			SUBTOTAL		$ 318,300.00
			TOTAL PROJECT COST		$ 1,611,900.00

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Figure 6-6: Mound Sewer

7 APPENDIX B – GRAVITY SEWER SIZING CALCULATIONS

8 APPENDIX C – ALTERNATIVES MAPS

9 APPENDIX D – GROUNDWATER MONITORING STUDY