HUNTSVILLE TOWN
SOUTHERN OGDEN VALLEY
WASTEWATER
COLLECTION AND TREATMENT
CAPITAL FACILITIES STUDY

MARCH 2011

REVISED JULY 2011

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TABLE OF CONTENTS

APPENDIX

1.0 EXISTING AND FUTURE CONDITIONS

1.1 PROJECT NEED AND PLANNING AREA IDENTIFICATION

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. The scope of this study will focus on the Town of Huntsville and the surrounding unincorporated areas in the southernly portion of the Ogden Valley, hereinafter called the Town and County respectively. An Area Map is shown in Exhibit 1.1, and a Location Map of the Town and surrounding areas including the Study Boundary is shown in Exhibit 1.2 which more or less follows the Huntsville annexation boundary, roughly the 5200 foot elevation. Both exhibits are found in Appendix D. According to the US Census Bureau, Huntsville currently has an estimated population of 697 people. Projecting to 2011, it is assumed Huntsville will have a population of 701 people. It is reported that there are 237 homes or ERC's in Huntsville, which equates to an average of 2.96 persons per ERC. No specific data was available for the population of the County area included within the study boundary, however a quick count revealed an estimated 552 ERC's, for an estimated population of 1,634 persons.

The Huntsville Town Council, in coordination with the Weber County Planning Commission, has voted to investigate wastewater collection and treatment options. The residents of the study area currently use septic systems for the treatment of wastewater. This study investigates the possibilities of a collection system and wastewater treatment plant. Both components will be analyzed to determine the most appropriate options for the next 20 years. As part of this wastewater capital facility plan, a Phase 1 environmental review will be conducted, identifying any potential environmental issues that would restrict the progress of a potential project. One purpose of conducting the environmental report is to position the Town in a favorable position for State or Federal funding.

The State of Utah Division of Environmental Quality has expressed concerns over the water quality of Pineview Reservoir and the South Fork of the Ogden River. Both are listed as impaired and protected bodies of water. As such, any means of helping to improve the water quality is encouraged. One of the easiest methods of helping to improve the water quality is to eliminate septic tanks and septic drain fields by means of wastewater treatment.

There is an ongoing study being conducted by Professor Darwin Sorensen and several students at Utah State University. Their research mainly concerns surface and ground water flows through the Ogden Valley into the waters of Pineview Reservoir. While the work is still incomplete, their findings so far are inconclusive that outflow from on-site wastewater systems (septic systems) in Ogden Valley have any detrimental effect on the impairment of Pineview Reservoir.

The primary purpose for this Wastewater Capital Facility Study is to determine whether the installation of a wastewater collection and treatment system is desirable to the residents, if it is feasible, or even possible. Huntsville currently, and historically, has experienced very little growth. The Town Council and County Planning Commission understands that the community and region would benefit from treating wastewater, yet understands and realizes it comes at a cost.

This study examines the feasibility of constructing and operating collection and treatment facilities under current conditions and regulations. The plan will examine cost-effective methods of creating the wastewater collection and treatment services to Huntsville Town and the County. The main focus of the collection system will be the interceptor lines and main trunk lines, and not individual collection lines. Various treatment options will be examined, which include continuing with septic system treatment, pumping to another existing Treatment Facility, installing a lagoon system, building a mechanical treatment plant, and building multiple smaller package treatment facilities. The above mentioned options will be compared to find a cost-effective solution.

1.2 EXISTING ENVIRONMENT OF THE PLANNING AREA

1.2.1 CLIMATE

Huntsville is located in the Ogden Valley in northern Utah. The climate of northern Utah is dry with about 265 days of sunshine a year. Summers are hot and dry, and winters are cold and dry. The bulk of winter moisture comes as snowfall. The substantial differences in elevation within the Ogden Valley watershed render the precipitation patterns markedly different from one area to another. Average annual precipitation ranges from 20 to 50 inches and the highest mountainous areas receive the highest precipitation totals. The closest weather station to Huntsville is the Huntsville Monastery Weather Station. Climate data can be viewed from that weather station in Table 1.1.

The annual precipitation is normally 22.35 inches in the valley. Average snowfall from the months of December through February is 15.7 inches per month. Of the 15.7 inches, 10.0 inches usually remains to cover the valley floor. The frost-free, or growing, season ordinarily lasts about 89 days from mid-June through early September.

TABLE 1.1 TEMPERATURE AND PRECIPITATION DATA

	Extreme High Daily Maximum Temp.	Extreme Low Daily Maximum Temp.	Average Month Temp.	Total Precipitation	Snow Fall	Monthly Average Snow Depth
	(°F)	(°F)	(°F)	(Inches)	(Inches)	(Inches)
Jan	34.6	10.4	22.5	2.60	17.2	11
Feb	40.1	13.4	26.8	2.14	12.0	12
Mar	49.8	22.9	36.4	2.18	6.1	6
Apr	60.6	30.1	45.4	1.96	1.3	-
May	69.2	35.8	52.5	2.37	0.2	-
Jun	79.9	41.1	60.5	1.26	-	-
Jul	88.0	47.2	67.6	0.85	-	-
Aug	87.0	46.7	66.9	0.89	-	-
Sep	77.1	38.5	57.8	1.60	0.1	-
Oct	64.0	29.2	46.6	1.92	0.8	-
Nov	46.4	20.9	33.7	2.29	9.7	1
Dec	35.8	11.9	23.9	2.30	17.8	7
Year	61.1	29.0	45.1	22.35	65.2	3

1.2.2 PHYSIOGRAPHY AND TOPOGRAPHY

The Ogden Valley is in the Middle Rocky Mountains Physiographic Province (Fenneman, 1931), which is characterized mainly by anticlinal mountain ranges and intermontane basin. The Wasatch Range borders the west side of Ogden Valley. Pineview Reservoir is in the southern part of Ogden Valley and is a control for surface water discharge from the valley. The three major tributaries of the Ogden River – the North Fork, Middle Fork and South Fork – flow from the upland areas surrounding Ogden Valley into Pineview Reservoir. The South Fork is located in the project area and is the principal source of water for Pineview Reservoir. A U.S. Geological Survey (USGS) 7.5 Minute Series Quadrangle Map illustrating the physiography and topography in and around the Huntsville area can be viewed in Exhibit 1.3 in Appendix D.

1.2.3 GEOLOGIC CHARACTERISTICS

Rocks in the stratigraphic section were grouped into six hydrogeologic units based on relatively uniform lithology, similarity in values of secondary permeability (Avery, 1994). The hydrogeologic units are the valley-fill deposits of Quaternary age (including fluvial, slope-wash and fanglomerate deposits), Norwood Tuff of Tertiary age, Wasatch Formation of Tertiary age, carbonate rocks of Paleozoic age, clastic rocks of lower Cambrian age, and meta-sedimentary rocks of Precambrian age.

Based on driller's logs and a resistivity survey, the valley-fill deposits are estimated to be greater than 750 feet thick northeast of Huntsville, Utah. A gravity survey by Steward (1958) indicates that the Wasatch Formation, Norwood Tuff and Valley-fill deposits in Ogden Valley may be as much as 5,000 feet.

1.2.4 EARTHQUAKE HAZARDS

In geology, an active fault is a fault which has had displacement or seismic activity during the geologically recent period. In the United States, an active fault is generally defined as a fault which has displaced earth materials during the Holocene Epoch (during the last 11,000 or so years before present). Active faults are the most common sources of earthquakes and tectonic movements.

According to Hecker (1993), there is an active fault cut through the northern edge of the Huntsville area. There is potential for surface rupture to occur closely following the fault line along the valley edge. Exhibit 1.4 in Appendix D illustrates the faults in the area.

1.2.5 SOILS AND LAND USE PATTERNS

According to the U.S. Department of Agriculture Soil Conservation Service (USDA-SCS) (1980), there are ten different soil types in the project area. They are Canburn silt loam (Cb), Eastcan loam (EaA), Hawkins silty clay (HbD), Hawkins-Collinston complex (HcE), Nebeker clay loam (NrA and NrB), Ostler loam (OcG), Parleys loam (PaA), Proebe fine sandy loam (PhA), Sunset loam (SwA) and Utaba cobbly loam (UbA).

Exhibit 1.5 in Appendix D illustrates the USDA-SCS soil survey map of the area. Descriptions of the soil types identified in the survey that are found within the project area are shown in Table 1.2. A complete soil survey can be found in Appendix A.

TABLE 1.2 SOIL TYPES DATA

Map Symbol	Mapping Unit	Section 1.01 Description
Cb	Canburn silt loam	The surface layer is a very dark brown silt loam about 21 inches in thickness. The underlying layer is a dark brown silt loam to a depth 48 inches. Below is a black silt loam to a depth 60 inches. Permeability is moderately slow. The soil is moderately calcareous and moderately alkaline. Runoff is slow and erosion hazard is moderate.
EaA	Eastcan loam, 0-3% slopes	The surface layer is a very brown loam or silt loam about 28 inches thick. The underlying layer is a dark brown silt loam to a depth 60 inches or more. The soil is moderately calcareous and mildly alkaline in the surface layer and moderately alkaline in the underlying layer. Permeability is moderate. Runoff is slow and erosion hazard is moderate.
HbD	Hawkins silty loam, 6-15% slopes	The surface layer is a very dark grayish brown silty clay loam about 8 inches thick. The subsoil is a dark brown clay about 23 inches thick. The substratum is a yellowish brown clay, clay loam, or loam to a depth of 60 inches or more. The surface layer and subsoil are slightly acid. The substratum is moderately and mildly alkaline. Permeability is slow. This soil has a high shrink-swell potential. Runoff is medium and erosion hazard is high.
HcE	Hawkins-Collinston complex, 6-30% slopes	The surface layer is a very dark brown silty clay about 13 inches thick. The subsoil and substratum are a brown heavy silty clay loam to a depth of 60 inches or more. The soil is slightly acid. Permeability is slow. It has a high shrink-swell potential. Runoff is medium and erosion hazard is high.

NrA	Nebeker clay loam, 0-3% slopes	The surface layer is a very dark brown clay loam about 20 inches thick. The subsoil is a dark reddish brown or reddish brown clay in the upper part and yellowish red, sandy clay or clay loam to a depth of 69 inches or more. The surface layer and the upper part of the subsoil are slightly acid, and the lower part of the subsoil is moderately alkaline. Permeability is slow. Runoff is slow and erosion hazard is moderate.
NrB	Nebeker clay loam, 3-6% slopes	The surface layer is a very dark brown clay loam about 8 inches thick. The subsoil is a very dark brown clay loam to a depth of 60 inches or more. The soil is slightly acid. Permeability is slow. Runoff is slow and erosion hazard is moderate.
OcG	Ostler-Causey complex, 20-60% slopes	The surface layer is a very dark brown loam about 10 inches thick. The subsoil is a dark brown or light olive brown silty clay loam about 38 inches thick. Weathered tuffaceous sandstone is at a depth of 48 inches. The depth to the sandstone ranges from 48 to more than 60 inches. The surface layer is slightly acid and the substratum is medium acid. Permeability is slow. Runoff is medium and erosion hazard is high.
PaA	Parleys loam, 0-3% slopes	The surface layer is a very dark grayish brown loam about 13 inches thick. The subsoil is a very dark brown or dark brown silty clay loam or clay loam about 19 inches thick. The substratum is a dark brown, brown, or strong brown silty clay loam or loam to a depth of 60 inches or more. The surface layer and subsoil are slightly acid. The substratum is moderately alkaline and strongly calcareous. Runoff is slow and erosion hazard is moderate.
PhA	Proebe fine sandy loam, 0-3% slopes	The surface layer is a dark brown fine sandy loam about 19 inches thick. The subsoil is a brown fine sandy loam about 27 inches thick. The substratum is a stratified yellowish red or brown silty clay loam and brown loamy fine sand to a depth of 60 inches. This soil is neutral. Runoff is slow and erosion hazard is moderate.
SwA	Sunset loam, very gravelly substratum	The surface layer is a very dark grayish brown loam about 17 inches thick. The upper part of the underlying layer is a dark brown or dark yellowish brown stratified loam, silt loam, or a very fine sandy loam about 28 inches thick. The lower part of the underlying layer is dark brown very gravelly sand to a depth of 63 inches or more. This soil is moderately alkaline and moderately calcareous. Runoff is slow and erosion hazard is moderate.
UbA	Utaba cobbly loam	The surface layer is a very dark brown or dark brown cobbly loam in the upper part and very gravelly sandy clay loam in the lower part and is about 21 inches thick. The underlying layer is dark reddish brown or reddish brown very gravelly loamy sand, very gravelly coarse sand, or very cobbly coarse sand to a depth of 60 inches or more. The soil is slightly acid or medium acid. Runoff is slow and erosion hazard is moderate.

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1.2.6 ENVIRONMENTALLY SIGNIFICANT AGRICULTURAL LANDS

Huntsville is one of three small communities comprising Ogden Valley, and is the only incorporated town of the three; the other two communities are Eden and Liberty. While farming and dairying were the main occupations in years past, today the majority of the populace works outside of town and county in Ogden or in nearby federal installations. Ogden Valley is in the heart of a recreational area with nearby Pineview Reservoir used for fishing, boating, and water skiing; three ski areas also are located close by - Snow Basin, Nordic Valley, and Powder Mountain.

Regarding potential important farmland in the project area, the U.S. Department of Agriculture Natural Resources Conservation Services (USDA-NRCS) was consulted. According to USDA-NRCS, the proposed project will not impact any important farmland resources in the project area.

1.2.7 WETLAND SOIL TYPES

According to the NRCS (1980), the Canburn silt loam (Cb), Eastcan loam (EaA), Sunset loam (SwA) and Utaba cobbly loam (UbA) are hydric soil types. However, since the proposed project would occur primarily in existing roads in residential areas where a prevalence of hydrophytic vegetation and wetland hydrology are likely absent, it is unlikely that proposed improvements would impact wetlands.

1.2.8 GROUNDWATER BASINS AND RECHARGE

The limits of the groundwater basin that includes the Huntsville area are displayed in Exhibit 1.6 in Appendix D. Avery (1994) states that groundwater conditions in Ogden Valley vary throughout the valley. In the northern part and along the margins of the southern part of the valley, the groundwater is unconfined although, locally, perched groundwater may occur above the water table. Near the center of the southern part of the valley, two relatively distinct aquifers are separated by an intervening silty clay layer. Groundwater in the lower aquifer is confined and is pumped intensively in Ogden Valley, and groundwater in the upper aquifer is unconfined and few wells withdraw water from it (Avery, 1994).

Recharge to the groundwater system in the Huntsville area is from precipitation, seepage from streams and canals, excess irrigation water, and subsurface inflow. Direct infiltration from snowmelt and seepage from stream channels are the major sources of recharge during the spring freshet. During the remainder of the year, subsurface inflow from bedrock and infiltration of irrigation water probably are the major sources of recharge.

Exhibit 1.7 in Appendix D shows the groundwater contours in Ogden Valley. Groundwater generally flows towards Pineview Reservoir.

1.2.9 LAND USE ZONING

Currently, there are nine (9) zones defined in Huntsville. These zones consist of two commercial zones, one residential zone, one agricultural zone, one park zone, one open space zone, a recreation zone, a shoreline zone, and a flood plain zone. Most of the developed area is designated as residential.

Weber County has several zones defined, not all of which are in the study area. Those that are within the boundary include an agricultural zone, two commercial zones, a forest zone, three residential zones, a shoreline zone, and a gravel zone. Most of the unincorporated county area within the study boundary is zoned agricultural valley AV-3.

1.2.10 GROUNDWATER QUALITY

The available groundwater quality information is generally presented using total dissolved solids (TDS). According to Avery (1994), the TDS concentration in the groundwater in the Huntsville area is generally below 500 milligrams per liter (mg/l), indicating that the quality of water is generally good with respect to TDS.

It is likely that the local water systems sampled their drinking water sources over the past years. However, the quality data has not been gathered or systematically evaluated in this report.

1.2.11 SURFACE WATER & FLOODING

Surface water bodies in the area include Pineview Reservoir and the South Fork of the Ogden River. The South Fork of the Ogden River is the principal source of water for Pineview Reservoir. Based on the surface water quality, the Utah Division of Water Quality has designated standard classifications for the surface water bodies in Table 1.3.

TABLE 1.3 SURFACE WATER CLASSIFICATION

Surface Water	Classification
Pineview Reservoir	1C, 2A, 2B, 3A and 4
South Fork of Ogden River	1C, 2A, 2B, 3A and 4

The designations used in Table 1.3 are defined as below:

Class 1C = Protected for culinary water
Class 2A = Protected for recreational bathing
Class 2B = Protected for secondary contact recreation such as boating, wading, or similar uses.
Class 3A = Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food

chain.

Class 4	=	Protected for agricultural uses including irrigation of crops and stock watering.

There are three flood zones located in the proposed project area. They are associated with Pineview Reservoir and its tributaries. Exact locations of the floodplains are shown on Exhibit 1.8 in Appendix D.

1.3 PROJECT PRIORITY RATING

The Utah Department of Environmental Quality (DEQ) maintains a priority ranking system to determine those wastewater projects within the State where the limited funds available to assist in construction are most urgently needed. Huntsville Town is currently ranked as the number one top priority on the wastewater treatment project priority list.

1.4 WATER QUALITY REPORT (305(b))

There are no impacted waterways listed in the 2004 Utah Water Quality Assessment Report to Congress (305(b)) that are in the project boundary or that will be affected by a proposed project. However, as recreational and home construction increase in the Ogden River Basin, it would be necessary to monitor for possible effects from these activities (Utah Division of Water Quality, 2006).

1.5 EXISTING WASTEWATER SYSTEM AND FLOWS

Currently the wastewater generated in the Study Area is treated by individual septic systems. For the purpose of this facility plan, and without having measured flows, the influent wastewater will be expected to have the following characteristics:

Expected Influent Wastewater Characteristics

Biochemical Oxygen Demand (BOD)	200 mg/l
Total Suspended Solids (TSS)	200 mg/l.
Ammonia (NH_3)	30 mg/l
pH	6.5

1.6 EFFLUENT LIMITATIONS

Treatment alternatives that discharge to any surface stream or water body must do so within the parameters of the discharge permit. Effluent limitations would be based on the State of Utah Secondary Discharge Standards developed by the State that ultimately indicate the level of treatment required prior to discharge in the receiving water.

State Code requires wastewater to be treated to a level that the point discharge does not degrade the receiving stream water for current beneficial use. Furthermore, treatment must at least occur to the degree that wastewater meets secondary effluent standards. The requirements may perhaps be modified, by the State during the application process for the discharge permit. The State does this in a case-by-case basis. The exact requirements cannot be determined until the permit is given, but secondary water standards will be the minimum requirement. Table 1.4 lists the possible treatment discharge requirements for the treated wastewater.

TABLE 1.4- POSSIBLE DISCHARGE PERMIT REQUIREMENTS

	30 Day Max	7 Day Max	% of Influent	Min	Max	Measurement Frequency	Sample Type
BOD, mg/l	25	35	15	N.A.	N.A.	Weekly	Grab
TSS, mg/l	25	35	15	N.A.	N.A.	Weekly	Grab
Fecal Coliforms, No./100 ml	200	250	N.A.	N.A.	N.A.	Weekly	Grab
E. Coli, No./100 ml	126	158	N.A.	N.A.	N.A.	Weekly	Grab
Total Coliforms, No./100 ml	2000	2500	N.A.	N.A.	N.A.	Weekly	Grab
pH	N.A.	N.A.	N.A.	6.5	9	Daily	Grab
Additionally:							
Nutrients, mg/l	N.A.	N.A.	N.A.	N.A.	10	Weekly	Grab
Phosphorus, mg/l	N.A.	N.A.	N.A.	N.A.	1	Weekly	Grab
Dissolved Oxygen, mg/l	N.A.	N.A.	N.A.	N.A.	5	Weekly	Grab
Disinfection	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

The requirements in the top part of the table are the secondary water standards. The bottom half of the table are requirements that are likely to be added by the review of the permit application. Nutrients and phosphorus in the effluent may need to be removed so as to not impair aquatic life. Dissolved oxygen may need to be added in order to support aquatic life. Disinfection is usually achieved by applying a required dosage of either UV light or chlorine, and would operate continuously.

Since Table 1.3 above lists Pineview Reservoir and the South Fork of the Ogden River as protected water bodies, traditional means of discharge into those water bodies is not likely to be allowed. Therefore alternative discharge methods will be considered, such as Land Application Discharge, Rapid Infiltration, or Total Containment basins.

1.7 INFILTRATION AND INFLOW (I/I)

"Infiltration" is water other than wastewater that enters the wastewater system from the ground through such means as defective pipe joints, leaky service connections and leaky manhole joints. Infiltration is most prevalent in high groundwater conditions. "Inflow" is water other than wastewater that enters the sewer system through cross connections with storm drains, catch basins, roof drains, yard drains, etc. Inflow can also occur through manhole covers. It is a requirement to demonstrate that the collection system and treatment works are not, and will not be, subject to infiltration and inflow. Since the collection system will be newly constructed, I/I will likely not be a significant issue.

1.8 FUTURE CONDITIONS

The alternatives evaluated for treatment are analyzed and cost effectiveness is based on a 20 year planning period. If unexpected growth occurs before the end of the planning period, additional treatment capacity may require enlargement and expansion. If the community experiences sufficient growth to reach the projected wastewater effluent capacity in 20 years or less, the additional income to the system created by such growth through impact fees and user rates, will provide the additional funds to assist in the expansion of any collection or treatment facilities.

1.8.1 POPULATION AND LAND USE PROJECTIONS

An essential element of a wastewater facilities plan is projecting the planning area population growth rate to establish estimated future demands on a proposed wastewater facility. With this in mind, Table 1.5 below shows the historic growth rate within the Town and provides an idea of how the community has developed from 1970 through 2008. The information found in Table 1.5 is taken from the US Census Bureau. The Census Bureau also estimates the population annually, between official census counts, which information is also included.

TABLE 1.5 HUNTSVILLE TOWN HISTORICAL POPULATION DATA

Year	Population	Average Annual Rate of Change (AARC)
1970	553	n/a
1980	577	0.426
1990	561	-0.281
2000	649	1.468
2001	645	-0.616
2002	645	0.000
2003	652	1.085
2004	657	0.767
2005	653	-0.609
2006	650	-0.459
2008	653	0.231

Over the past 40 years, between 1970 and 2011, the population in Huntsville has increased at an annual rate of about 0.416%. Rounding up to 0.50% and using this number with the current population of 701, the population in 20 years (2031) is projected to be about 773 people.

As mentioned above, there is no specific data available for the population of the County; however the estimated population for the residences in the County within the Study Area boundary is currently 1,634 (obtained by counting homes within the study area and applying the 2.96 persons per home). From information obtained from discussions with Weber County, growth in the unincorporated area is double or more than that of Huntsville. In order to project growth, several assumptions must be made which include the historic growth rate and the current population. Assumptions are listed below:

1. Approximately 552 dwellings.
2. Residents per dwelling similar to within Huntsville, 2.96.
3. Annual growth rate double Huntsville, 1.0%.

Assuming that the population in the County area increases at a rate double that of the Town, and that the current population is about 1,634 people, the projected population in 2031 is 1,805 people.

These calculations assume that growth and building density continue as historically experienced and as the current zoning allows. From this data growth projections were estimated through 50 years. A summary of this data can be reviewed in Table 1.6 below.

TABLE 1.6 PROJECTED GROWTH DATA

Year	Huntsville ERCs	Huntsville Population	County ERCs	County Population	Total ERCs	Total Population
2011	237	701	552	1634	789	2335
2016	243	719	580	1717	823	2436
2021	249	737	610	1806	859	2543
2026	255	755	642	1900	897	2655
2031	261	773	675	1998	936	2771
2041	274	811	746	2208	1020	3019
2051	288	852	824	2522	1112	3374
2061	303	897	910	2694	1213	3591

It is important to keep in mind that population projections are based on past growth patterns. Actual growth may occur faster or slower than the projected rate. This growth rate is used for planning purposes.

1.8.2 FORECASTS OF FLOWS

As indicated in the table above there is a current estimated population of 2,335 people living in 789 dwellings within the study area boundary. This equates to 2.96 people per dwelling. Based on 789 ERCs (Equivalent Residential Connections), 2.96 people per ERC, and 100 gallons per capita per day (gpcd) of wastewater generated (UT Admin Code R317-3-2), the current calculated flow is estimated to be 233,500 gallons per day or 0.23 million gallons per day (MGD). Huntsville accounts for approximately 30% of the total flow, which equates to 70,100 gpd, or 0.07 MGD. The county areas in the study boundary account for the remaining 70% of the flow which equates to 163,400 gpd or 0.16 MGD.

Based on current growth patterns, the projected population within the study boundary for the 20-year planning period is 2,771 persons. Using 100 gpcd as outlined in the UT Admin Code the projected wastewater flows at the end of the 20 year planning period are 277,100 gpd, or 0.28 MGD. Again it is projected that Huntsville residents would account for approximately 30% and the county residents would account for approximately 70% of the generated flows. According to the Utah Admin Code, a peaking factor must be used in planning for the wastewater treatment facilities. The peak factor that will be used for the design of treatment facilities will be 2.0 (R317-4.3). Thus, any alternative with a treatment facility serving the study area will be required to be designed for a peak factor of 2.0. Therefore the 20 year design flow for the study area will be 554,200 gpd or 0.6 MGD peak.

1.8.3 FLOW REDUCTION

None of the present discharges from residences or businesses in Huntsville are thought to be of such high volume or type of connection as to warrant flow reduction measures.

REFERENCE LIST

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Utah Division of Water Quality. Design Requirements for Wastewater Collection, Treatment and Disposal Systems. R317-3, Utah Administrative Code.

2.0 ENVIRONMENTAL REVIEW

2.1 ENVIRONMENTAL INFORMATION

Under the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS) must be prepared if it appears that the proposed Wastewater Treatment Facility would have a significant adverse impact on the quality of human health and the environment. Preparation of an EIS is not required if a "categorical exclusion" from 40 CFR Part 6 is granted by EPA, or if a "Finding of No Significant Impact" (FONSI) is granted by the EPA.

Huntsville Town's proposed project does not qualify for a "categorical exclusion". Therefore, an "Environmental Information Package" (EIP) must be prepared as an integral part of the Facilities Plan. The Utah Department of Environmental Quality and the EPA use the EIP to determine if an EIS must be prepared. After a review of the information contained in the EIP, if no significant impact is present, a FONSI will be issued and an EIS will not be required.

The information in the EIP is used in evaluation of potential environmental impacts, both beneficial and adverse, of alternative wastewater collection and treatment systems. The EIP for the Huntsville Wastewater Collection and Treatment Facilities Project is comprised of the remaining paragraphs of this Section and Section 5.3. This section reviews environmental issues and conditions in general within the planning area. Specific environmental impacts and assessments for each wastewater collection and treatment alternative are found in Section 5.3, "Environmental Evaluation".

Environmental information has been sought from all appropriate State and Federal agencies regarding the planning process. Copies of all correspondence to and from each environmental agency are included in Appendix B.

2.2 HISTORICAL AND ARCHAEOLOGICAL SITES

The State of Utah, through the Public Lands Policy Coordination Office (PLPCO), has reviewed the proposed project. Utah Code (Section 63J-4-601, et. seq.) designates PLPCO as the entity responsible to coordinate the review of technical and policy actions that may affect the physical resources of the state, and to facilitate the exchange of information on those actions among federal, state and local government agencies. As part of this process, PLPCO makes use of the Resource Development Coordinating Committee (RDCC). The RDCC includes representatives from the state agencies that are generally involved or impacted by public lands management. The Utah State Historic Preservation Office (SHPO) is one of RDCC agencies and no comment was received from the SHPO on the proposed project.

The Ute Indian Tribe was contacted and no comments were received at the time this report was completed.

The proposed project is not likely to affect any historical properties. However, specifications will be written in the contract documents that will require the contractor to halt work if any archaeological artifact should be encountered in the field. Proper authorities would then be called to the project site to evaluate the findings.

2.3 FLOODPLAINS AND WETLANDS

2.3.1 FLOODPLAINS

A floodplain map is provided as Exhibit 1.8**.** There are three flood zones in the proposed project area. They are all associated with Pineview Reservoir and its tributaries. Wastewater collection lines potentially will run through the zones. Since the lines will be buried, the potential impact on the flood zones will not be significant. A proposed treatment plant option is located in the vicinity of the flood zone where the South Fork of the Ogden River joins Pineview Reservoir. It should be noted that the proposed treatment plant locations are approximate. The exact plant location and dimension will be determined during the design phase and the impact on the flood zone will be avoided or minimized.

2.3.2 WETLANDS

Wetlands are defined as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 Code of Federal Regulations [CFR] 328.3[b], 40 CFR 230.3). For a wetland to qualify as jurisdictional by the U.S. Army Corps of Engineers (ACOE) and therefore be subject to regulation under Section 404 of the Clean Water Act, the site must support a prevalence of hydrophytic vegetation, hydric soils and wetland hydrology. Other waters of the United States are sites that typically lack one or more of the three indicators.

According to the NRCS (1980), the Canburn silt loam (Cb), Eastcan loam (EaA), Sunset loam (SwA) and Utaba cobbly loam (UbA) are hydric soil types. However, since the proposed project would occur primarily on existing roads in residential areas where a prevalence of hydrophytic vegetation and wetland hydrology are likely absent, it is unlikely that proposed improvements would impact wetlands. Nonetheless, in the event that improvements are constructed near wetlands, proper delineations would be performed and a Section 404 permit will be obtained from the ACOE during the design phase. The Section 404 permit allows for utility crossings of wetlands. It is noticed that proposed pipelines would cross several streams in the project area. Once the design for the crossings is completed, a joint permit application would be submitted to the Utah Division of Water Rights to obtain a state stream alteration permit and a Sections 404 and 10 permit from the ACOE.

A letter was sent to the ACOE (Appendix B), but no response was received from the ACOE.

2.4 AGRICULTURAL LANDS

Regarding potential important farmland in the project area, the U.S. Department of Agriculture Natural Resources Conservation Services (USDA-NRCS) was consulted. The response from the USDA-NRCS is attached in Appendix B. According to USDA-NRCS, the proposed project will not impact any State identified prime farmland resource in Utah. The project's impact is primarily limited to those areas already converted to non-agricultural uses, e.g. road corridors. In a few areas where this is not the case, the soils fail to meet the definition due to flooding or lack of irrigation. The treatment portion of the project will likely have an impact on agricultural lands; however they are not identified as prime farmlands according to the letter from USDA-NRCS, included in Appendix B.

2.5 WILD AND SCENIC RIVERS

Currently, there are no rivers in the project impact area, which are included in the National Wild and Scenic Rivers System.

2.6 FISH AND WILDLIFE PROTECTION

As stated in Section 2.2, the State of Utah, through the PLPCO, has reviewed the proposed project. Utah Code (Section 63J-4-601, et. seq.) designates PLPCO as the entity responsible to coordinate the review of technical and policy actions that may affect the physical resources of the state, and to facilitate the exchange of information on those actions among federal, state and local government agencies. As part of this process, PLPCO makes use of the RDCC. The RDCC includes representatives from the state agencies that are generally involved or impacted by public lands management. The Utah Division of Wildlife Resources (DWR) is one of RDCC agencies and no comment was received from the DWR on the proposed project.

It is unlikely that the proposed project will impact any aquatic and terrestrial wildlife because the proposed project is located in the residential area.

2.7 ENDANGERED SPECIES PROTECTION

An inquiry was directed to the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts of the proposed project on threatened (T), endangered (E) and Candidate (C) species. According to the County Lists of Utah's Federally Listed T, E and C Species updated by the DWR on June 24, 2010, there is one T (Ute Ladies'-tresses), one E (June Sucker) and two C (Greater Sagegrouse and Yellow-billed Cuckoo) species that may occur in Weber County. Table 2.1 lists these species.

TABLE 2.1 SPECIES THAT MAY OCCUR IN PROJECT AREA

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T

June Sucker	*Chasmistes liorus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C

The USFWS policy requires that a consultant review the proposed action and a determination be made if the action will affect any listed species or their critical habitat. Once the determination has been made, the determination should be submitted to the Federal agency for review. If it is determined by the Federal agency, with the written concurrence of the USFWS, that the action is not likely to adversely affect listed species or critical habitat, the consultation process is complete, and no further action is necessary." However, if the Federal agency does not concur with the determination further studies will be required and/or a different course of action should be taken.

After reviewing the listed species and inspecting the site conditions in the proposed project area, it has been determined that suitable habitat does not appear to exist for the listed species in the project area since the proposed project would occur in residential areas and mostly on existing roads. Therefore, it is not likely that the proposed project would impact any listed species. The USFWS concurred with the "not-likely to affect" determination in the agency's response dated August 24, 2010.

2.8 AIR QUALITY

The Utah Division of Air Quality (UDAQ) was consulted through the PLPCO, as described in Section 2.2. The UDAQ made no comments on the proposed project. According to a letter received by Ms. Sheila G. Peterson of the Utah Division of Community Development from the UDAQ (Utah Division of Housing and Community Development, 2006), installation or upgrade of water and sewer systems does not require air quality approval.

The proposed construction activities would temporarily generate a small amount of fugitive dust from excavation and backfilling activities. The quantities generated by the project would be relatively small and would affect only a localized area for a brief period. No violations of air quality standards would occur during construction. Therefore, the impact associated with fugitive dust is considered less than significant. During the construction period, watering would be conducted to minimize fugitive dust. Operation of the facility will not significantly affect air quality.

2.9 WATER QUALITY AND QUANTITY

Any alternative treatment process that involves surface discharge will treat water to the extent required by State and Federal Code prior to discharge. See Section 1.6 "Effluent Limitations" for the level of treatment required under the Utah Secondary Treatment Standards. Each alternative treatment process will treat water to the extent that is required by State and Federal Code prior to discharging to a stream or body of water. Surface waters should not be significantly impacted by erosion, either during or after project construction.

2.10 DIRECT AND INDIRECT IMPACTS

The proposed wastewater collection and treatment facilities are not expected to have detrimental environmental impacts.

Any flood zones disturbed where pipelines cross will be restored to their pre-construction condition to minimize impacts.

Any wetlands disturbed where pipelines cross will be restored to their pre-construction condition. In addition, measures will be taken to ensure that wetlands, or high water table areas, are not drained as a result of pipeline installation through installation of clay cutoff walls along the pipeline.

Some fugitive dust will be generated during the construction phase of the proposed project. Proper construction management will limit the amount of dust generated through strict enforcement of the construction specifications, which require dust abatement.

There will be minor disruptions of traffic, which will occur during construction. These disruptions will be temporary. The Contractor will be required to repair all roads and leave trenches in a smooth and clean finished condition.

Wildlife species will not be significantly impacted either positively or negatively by the project.

The Town has limited control over development pressures for those landowners that desire to develop. Currently, many landowners are selling farmland without a community sewer system. For the most part, the Town Council understands the benefit of operating a community wastewater system.

2.11 MITIGATING ADVERSE IMPACTS

It is anticipated that there will be no long-term adverse impacts. No long-term mitigation measures are planned.

2.12 DETERMINING NEED FOR AN EIS

The DWQ is responsible to determine, based on environmental information contained in this Facilities Plan, whether or not an EIS is required in connection with this project. The DWQ must prepare an EIS when any significant environmental impact is present.

Considering the minimal environmental impacts expected, it is the opinion of Sunrise Engineering that a finding of no significant impact (FONSI) would be appropriate. No significant impacts to the environment will be realized from construction and operation of the project. No known archaeological resources, important agricultural land, or federally listed species will be likely impacted by the proposed project. Erosion will be controlled. Water quality during construction of the project will not be degraded and will be improved after construction, due to elimination of groundwater contamination from raw wastewater.

No displacement of households or businesses will occur as a result of the project. Visual impacts will be negligible. Noise and air quality will remain unchanged.

Development will remain the same with or without this project. Vacant land already specified as wetlands will not have easy access to collection lines and should not receive much additional pressure to develop as a result of this wastewater project. The installation of a wastewater treatment system will enhance the water quality by eliminating existing septic systems in the proposed project area.

REFERENCE LIST

Utah Division of Housing and Community Development, 2006, Community Block Grants – CDBG 2006 Handbook.

3.0 DEVELOPMENT & SCREENING OF TREATMENT ALTERNATIVES

There are numerous methods and alternatives for collection, treatment, and disposal of wastewater. These alternatives vary by types of treatment, physical layout of improvements, certain disadvantages and advantages, environmental concerns, site conditions, economics, etc. The primary objective of this section is to identify several alternatives for treatment of wastewater from Huntsville Town and the County, and screen the alternatives into a few, which are most feasible on a general basis. This screening process will reduce detail analyses to only those alternatives which appear to be practical for the size and type of system that would meet the needs of the community.

Each alternative that passes this general screening process must, if implemented, meet effluent limitations established by EPA and the Utah DEQ. The systems must also be affordable, expandable to accommodate future growth, politically acceptable, and must meet environmental and other non-monetary criteria to warrant further evaluation in Section 5.

Several types of wastewater treatment and sludge management techniques are available for consideration. These treatment alternatives are broadly defined and can contain numerous specific treatment processes. Several alternatives that are applicable to this study are listed as follows:

Treatment:

1. No Action.
2. Optimum operation of existing individual on-site disposal systems.
3. Regional mechanical plant treatment.
4. Regional lagoon system treatment.
5. Treatment by multiple package treatment facilities.

3.1 NO ACTION

Historically, private individual septic tanks and drain fields have mainly been the only method of treating wastewater in the study area. The Division of Water Quality TMDL study has indicated that this method of treatment may be impairing the water quality of Pineview Reservoir. Other on-going research is inconclusive regarding this conclusion. Whether or not on-site septic systems are truly contributing to the impairment of the water quality in Pineview Reservoir and the groundwater table, continuing with the individual septic systems as they are, generally will not aide in improving the groundwater quality and Pineview impairment situation. There would however be no additional costs for this option to what is already/should already being spent to maintain existing septic systems.

It is important to understand how septic tanks treat wastewater, so that comparisons can be made with other treatment alternatives. Most septic systems are comprised of two parts. The first part being a storage tank, and the second being a drain or leach field. The storage tank separates out the large solids, while the leach or drain field removes fine solids and allows natural biological and biochemical processes to destroy bacteria associated with wastewater. The storage tank collects solids and should be pumped out periodically to remove the solids that have accumulated over time. The amount of use determines the frequency for this need. The liquid effluent from a septic tank contains nutrients such as nitrogen and phosphorus as well as disease causing bacteria that must be further treated and removed. The drain field provides this treatment through soil absorption and oxygen exchange.

In septic systems, nitrogen nutrient levels are relatively high even in optimal treatment conditions, around 40 mg/l. As a comparison, raw wastewater often has nitrogen levels of around 200 mg/l. Lagoon treatment systems achieve nitrogen levels of approximately 25 mg/l, and mechanical treatment systems achieve nitrogen levels below 10 mg/l. Phosphorus levels are also relatively high in septic tank effluent. Extremely fine soils in the drain field and surrounding soil conditions don't allow enough percolation, so very large drain fields are necessary to provide adequate treatment. Likewise, coarse soils such as sand and gravel, allow the wastewater effluent to pass too quickly through them and don't provide enough treatment, as soil absorption does not occur. High groundwater inhibits oxygen exchange and also does allow for adequate treatment.

Due to the limited ability for septic systems to treat wastewater to high quality standards, often the density in which septic tanks are allowed to be installed is limited. According to Utah Department of Natural Resources, in a report they issued in May of 1998 on the potential impacts of septic tanks in the Ogden Valley, the recommended density of septic tanks Valley wide should not exceed 3acres/system. The report can be found in Appendix A. There are a reported 237 homes in Huntsville, all of which are assumed to be on septic systems. According to the available Town boundary, the approximate acreage in Huntsville is 575 acres. This puts the septic tank density in Huntsville at about 2.5 acres/system, which exceeds the valley wide recommendation of 3 acres/system. The septic system density in the unincorporated study area is 552 homes in approximately 10,000 acres for a density of 18 acres/system.

With Huntsville's close proximity to Pineview reservoir, the higher density of septic systems, the potential for high groundwater and possible sand and gravel layers in the soil matrix, there is possibility that sand and gravel layers could be short circuiting septic system effluent directly into Pineview reservoir. It appears that the sparse density in the county, would limit the amount of short circuiting that would occur.

Advantages of septic system include a "once and done" type of payment, where the initial costs are significant, but then minimal costs are experienced until failure of the system. They work for rural areas and communities where sewer services are not available. Disadvantages include poorer quality effluent, and they can be costly to maintain and repair/replace. Another disadvantage is septic systems limit the amount of growth that can be experienced in an area.

Due to this being the current method of treatment for the majority of the area, this alternative was selected to evaluate further in Section 5.

3.2 OPTIMUM OPERATION OF EXISTING FACILITIES

While this option is very similar to the "No Action" alternative, the difference lies in a more strict regulation of the current septic systems. Optimal operation of existing systems means that home and business owners must continue to use private methods of wastewater disposal at their own expense. However, actions need to include correction of any open discharge, failed or otherwise out of compliance systems. The facts and conclusions of why the existing individual disposal systems are not preferable are summarized as follows:

A) As identified in various studies of the area, including Dr. Darwin Sorensen's ongoing research from the USU Engineering Department, there is a shallow groundwater layer in the valley that appears to have a rapid flow path into Pineview Reservoir.

B) Numerous culinary water wells exist and are utilized in the residence of the area. While it appears that these wells have not been impacted significantly by septic tank leach field discharges, the potential exists that these culinary wells could become contaminated. Unless specialized septic treatment systems are installed, a density of more than 40 systems per square mile has the potential to contaminate groundwater. These specialized systems provide better treatment than traditional septic systems, but require more care, maintenance and testing as well as higher initial investment costs. As the area grows, sustaining traditional septic drain fields, at some point will no longer become possible without further treatment.

The Town and County, along with each home or business owner could consider the following steps for implementation:

1. Establish a program of regular annual or semi-annual septic tank pumping.
2. Home or business owners, whose systems fail or who have building lots too small to build additional systems, could install a holding tank large enough

for 7 days wastewater storage, and then contract with a commercial waste company to empty their tank on a weekly basis.

3. Denitrifying septic systems are available, which reduce the usual discharge of nitrogen to the ground. These systems could be required for any future growth.

This alternative was not selected to evaluate further, due to many variables, including the varying types and conditions of each property owners individual septic systems.

3.3 REGIONAL MECHANICAL PLANT TREATMENT

A mechanical plant has several advantages. These include: small land footprint required; there are typically fewer odors than with other options; a more visually appealing treatment site; expansion of treatment capacity is modular and relatively inexpensive. Disadvantages include: power cost to run the plant (pump liquids, etc.); moderate cost of maintenance; higher initial capital investment costs.

There are several types of mechanical plants, many involving patented processes and techniques. Differing levels of treatment can also be obtained, with higher levels involving more and different processes. There are, however, several components that are common, described below.

Headworks

The headworks is the initial process in a treatment system. The headworks typically consist of a screen, grit removal, and often a grinder. The screen removes material that would damage or interfere with the satisfactory operation of process equipment. Grit is small, coarse particles of sand, gravel, egg shells or other minute pieces of mineral matter. Screenings and grit are removed, washed and compacted, before being dropped into a waste container. The grinder will insure all solids are cut into small pieces that are more conducive to the treatment process.

Pump Station

The Pump Stations lifts wastewater from low points at the plant to an elevation where the treatment starts. Wastewater will then generally flow by gravity through much of the rest of the processes. Pumps are also typically used to recycle wastewater through the treatment process again as necessary. Other pumping may be required depending on the site circumstances.

Biological Reactor

Biological Treatment will occur in tanks where environmental conditions are controlled to produce an active population of bacteria. The bacteria use oxygen to feed upon the nutrients and pollutants in the wastewater. Oxygen needed by the bacteria is provided through methods that vary according to the type of plant, through agitating, mixing, blowers, or other means. Biological organisms will remove the bulk of the pollutants in the wastewater in this stage of the treatment process.

Clarifier

The Clarifier is a circular tank that receives a mixture of treated wastewater and bacteria flocculent. The flocculants are formed as bacteria continue to feed and grow. Contaminants and bacterial flocculent in the water sink to the bottom of the tank and become what is called sludge. Clear water that the flocculent has settled out of, flows through weirs at the top of the tank and is disinfected where pathogens are killed and then typically discharged. The sludge is removed from the bottom, thickened and partially dried before disposal, often in a landfill.

Reuse of treated effluent for irrigation is a potential benefit from a mechanical wastewater treatment plant, but, final filtration must be added to the treatment processes for the water to reach Type I reuse quality. Type I is defined by the State of Utah as reclaimed water that is suitable for reuse where human contact is possible such as public parks and golf courses. Also, a reuse pump station and pressure piping would be required to pump water to its point of use. The amount of water that would be available for reuse would be limited to the State Engineer's evaluation of the consumptive use of the underlying water right. This would be determined after a reuse application is filed with the State Engineer. Reuse typically adds additional costs to the treatment process due to the level of required treatment quality. These costs can vary depending on the type of mechanical treatment process used.

Another alternative to consider is Rapid Infiltration Basins (RIB) and/or Land Application Disposal of treated effluent. Land application disposal would allow treated effluent to be used as irrigation water in an area where public access is prohibited and the crops are not raised for human consumption. This is an appropriate means of disposal when agricultural lands are prevalent near the treatment site, and when other restrictions are placed on the discharge requirements.

With Pineview Reservoir being considered impaired, and due to the restrictions on no surface water effluent discharge for the study area, Land Application Discharge is the preferred means of disposing of the treated wastewater effluent, and will be considered the selected alternative for this report.

Sludge Thickener

As discussed previously, the by-product of treated and clarified effluent water at the mechanical wastewater treatment plant is sludge. Sludge is usually thickened through two processes. First, the sludge removed from the bottom of the clarifier and directed to a digester tank where further biological treatment occurs, often by means of supplying air to it. The air provides a means of feeding the bacteria, where further digestion occurs. Second, the sludge from this digester tank is removed, and mechanically pressed to remove liquid. Once the sludge is pressed, it can then be dried and disposed of. Due to the relatively small amount of sludge that will be produced for the study area, it appears that final disposal of dried sludge would be most cost effectively done in a public landfill.

There are many types of mechanical treatment plants, which differ in the setup of the biological reactor. Several of these are summarized below:

3.3.1 CONVENTIONAL ACTIVATED SLUDGE

A conventional activated sludge system uses a tank or channel to treat the wastewater as well as a media bed for bacteria to attach and grow upon. Air (oxygen) is added to support the bacterial growth that is suspended or floating in the wastewater. Some of the sludge from the end of the treatment process is returned to the inflow in order to boost the level of bacteria and improve growth and treatment. This process has the advantage of being able to treat varying flows and characteristics of wastewater. Some of the disadvantages include larger footprints, since the many processes to treat the wastewater each require a separate basin.

Conventional Activated Sludge Treatment was not selected as an alternative to study further since the same treatment processes can be achieved in a much smaller footprint, thereby cutting down costs.

3.3.2 INTEGRATED FIXED FILM AND ACTIVATED SLUDGE - IFAS

An Integrated Fixed Film and Activated Sludge (IFAS) treatment process combines the conventional activated sludge treatment tank and media bed into one reactor tank, instead of multiple tanks. This significantly cuts down on the footprint of land required. In order to be able to treat more wastewater, and rather than building a larger tank, an IFAS system uses the conventional activated sludge method, but adds media in the biological reactor tank which the bacteria can attach and grow on. The media in the tank provides a stability of treatment, but also increases the amount of bacteria that can live in the tank. To support the organisms, various manners of increasing the oxygen are employed, including air diffusers (blowing air into the bottom of the tank), or rotating drums.

Advantages of and IFAS system include a smaller land requirement, a high degree of treatment, the process is resistant to shock loading (sudden changes of inflow characteristics), reduced sludge production, and a relatively low power consumption requirement, and can easily be designed to treat wastewater to Type I reuse quality. Disadvantages include increased operator training over Lagoons and some other types of treatment processes.

One type of IFAS system is called an STM-Aerotor. This system uses rotating drums as the media used to increase the oxygen content and which the bacteria attach. The IFAS/STM-Aerotor was a selected alternative to evaluate further. This type of treatment process can be observed in nearby Willard, Utah.

3.3.3 MEMBRANE BIOLOGICAL REACTOR - MBR

A Membrane Biological Reactor (MBR) plant uses a biological reactor tank and adds air (oxygen) to the wastewater to help the bacteria grow. It also separates the water from the solids with a membrane which acts as a filter. The membrane is able to more effectively separate the solids than many other types of treatment plants, which allows a higher concentration of solids (organisms) in the bioreactor and therefore reduces the space necessary for that tank. This membrane also generally eliminates the need for secondary clarifiers, and other structures at the treatment plant, and thereby reduces the amount of land required for the plant.

An MBR plant has the advantages of smaller footprints, less odor and high quality effluent. Disadvantages include a high energy requirement, high level of operation and maintenance requirements, high frequency of membrane fouling requiring cleaning or replacement, a high cost of replacement parts, a high initial investment cost, and sophisticated controls requiring a more detailed operator training.

Due to the above referenced factors, an MBR treatment was not selected to evaluate further at this time.

3.3.4 SEQUENCING BATCH REACTOR - SBR

Sequencing Batch Reactors (SBR) are used to treat wastewater in batches. Oxygen is bubbled through the wastewater to make for a suitable discharge or land use disposal. While there are several configurations of SBR's, these plants typically have two identical tanks connected to one common inlet. While one tank is being filled, the other is being used in the treatment process. The wastewater in this way is treated in batches. There are typically 5 stages of an SBR treatment process. They are, Fill, React, Settle, Decant, and Idle. Aeration is performed during the first two stages which feeds the bacteria and encourages nutrient removal.

Advantages of an SBR treatment plant include less required space and a much smaller footprint because all of the biological processes occur in a single tank, it is ideal for small flows or specialized waste, it treats to a high quality effluent, it's a simplified process with no moving parts to replace within the tanks. Disadvantages include high peak flows can disrupt operation unless accounted for, cycle times for small communities can sometimes be difficult to adjust, and sometimes the necessity of precise control of the processes and timing can be difficult.

Due to the small footprint, simplified process and quality of treatment, this alternative was selected to evaluate further. Fluidyne system, a type of SBR, was the selected SBR process to be evaluated further.

3.4 REGIONAL LAGOON SYSTEM TREATMENT

State regulations allow for the treatment of wastewater by impoundment in lagoons, and allowing natural processes to dispose of contamination. The lagoons are essentially large, shallow bodies of water into which untreated sewage is introduced and detained for a period of time sufficient to permit stabilization of sewage by a complex natural process involving sunlight, air, water current and the action of algae and bacteria. Oxygen is supplied to the pond by direct contact with the air and by the normal life processes of algae. The aerobic bacteria then use the available oxygen to decompose organic solids. The pond bottom and lower levels sustain anaerobic bacteria that digest the pollutants, which have settled out.

3.4.1 TOTAL CONTAINMENT LAGOONS

A total containment lagoon alternative for wastewater treatment requires construction of a holding pond or ponds of sufficient capacity that net yearly evaporation and seepage exceed yearly inflow. These ponds are lined with a layer of clay, or other material, that limits the amount of water that will seep out of the pond. The seepage rate depends on the material type and thickness, and how deep the water is in the lagoon. Since water loss occurs only through seepage or evaporation, water flows into the ponds, but it does not flow out. The ponds gradually fill throughout their design life as inflow due to population increase exceeds seepage and evaporation losses. For initial planning and location of a total containment lagoon system, a buffer zone of 1/4 mile from any homes must be planned. After construction, the lagoon area must be securely fenced to restrict access. A relaxation of the buffer zones may be approved by the DEQ on a case-by-case basis, if circumstances warrant.

Total containment lagoon advantages include no effluent or effluent requirements, low to no power costs, low maintenance costs, can handle varying flow amounts, can handle differing inflow characteristics, and are simple to operate. Disadvantages include a very large land requirement for the lagoons, lower efficiency in cold climates, and odors.

Due to the effluent discharge restrictions, a total containment lagoon was selected as an alternative to be evaluated further.

3.4.2 DISCHARGING LAGOONS WITH LAND DISPOSAL

Discharging lagoons treat wastewater much like total containment lagoons. A discharging lagoon system consists of a minimum of three ponds, sized to ensure that wastewater flowing into the ponds has a minimum detention time of 120 days. A land disposal lagoon system typically requires the addition of another lagoon pond to the system. The treated effluent or water that has flowed through the lagoons and undergone the required detention time then flows out of the last pond into a fourth pond called a winter storage pond. Water is stored in the winter storage pond until the irrigation season, and is then applied to a growing crop as a final treatment process. Irrigation with wastewater provides further treatment as the water flows through the soil matrix and is utilized by the crop.

Surface run off of the irrigation water is not allowed and strict regulations must be met. The irrigation site must be suitably isolated and meet State DEQ requirements. These requirements include a stock-tight fence, which is posted to exclude the public. The crops produced are limited to forage crops for animal feed, and dairy animals may not be pastured on the crop. A buffer zone of at least 1,000 feet must be maintained between the disposal site and any place of human occupancy if effluent is applied by sprinkling. Finally, other new requirements as may be deemed necessary by the Utah DEQ must be met.

This treatment process treats wastewater to meet secondary quality effluent standards of concentrations of 25 mg/l BOD and 25 mg/l TSS, which is required in the State of Utah prior to land disposal. Due to algae growth in the lagoons, it is sometimes difficult to maintain these maximum allowable concentrations, since the algae itself sometimes shows up in wastewater samples as BOD and TSS. However, the wastewater would be treated to these standards.

Discharging lagoons have similar pros and cons as total containment lagoons. The differences are discharging lagoons require less land, but also have effluent requirements.
Due to the low maintenance costs associated with lagoons, and the smaller land requirement than total containment lagoons, this alternative was selected to be evaluated further.

3.4.3 AERATED LAGOONS WITH DISCHARGING EFFLUENT

Aerated lagoons are bodies of water into which untreated sewage is introduced and retained for a period of time sufficient to permit stabilization of sewage by a complex process involving sunlight, air, water, and the action of algae and bacteria. Oxygen is supplied to the pond by compressed air released through diffusers at the lagoon bottom or by surface disturbance known as surface aerators. The aerobic bacteria use the available oxygen to decompose organic solids. Land disposal or discharge of wastewater effluent to the soil via surface irrigation may be necessary as a final disposal process. In order to dispose of the effluent in this manner, the discharge must meet all discharge requirements prior to land application. Solids and bacteria are removed by the filtering action of the soil. Plants also remove nutrients. The same restrictions apply to the land application process as outlined for discharging lagoons with land disposal.

Aerated lagoons with discharge have much the same advantages as the discharging lagoons. Even less land is required, but disadvantages include more power and maintenance requirements than other lagoon systems. Due to these factors and its similarity to discharging lagoons, this alternative was not selected to be evaluated further.

3.5 MULTIPLE PACKAGE TREATMENT FACILITIES

The multiple package treatment facilities alternative includes installing small treatment plants, often placed at several locations throughout the area. These are essentially small scale mechanical treatment plants. Each package plant will treat the wastewater of a particular section, or neighborhood. The sum of the wastewater treated by the different plants is equal to the total wastewater generated. The waste discharge generated from each package facility would all be required to meet the restrictions of a discharge permit. As indicated earlier in the report, it is anticipated that discharge to surface water will not be allowed, therefore, land application restrictions would apply, as summarized in section 3.4.2.

There are numerous types of package plants, most of which all use similar methods of treating wastewater. The package system selected to evaluate for this section is the Orenco Advantex package system. There are a few of these systems currently installed within the Southern Ogden Valley, mostly for small neighborhoods. Advantages of package treatment plants include reduced odors to due reduced amounts of concentrated wastewater; however there are more locations throughout the area where odors are generated, expandability with the addition of another plant, areas impacted can be various but relatively small, relatively easy maintenance. Another advantage, is costs for many package plants are very linear, meaning the cost per treatment unit is the same, whether there are 20 units, or 300. Disadvantages include higher initial investment costs than a single centralized plant, high grease/oil loads can foul equipment, if systems are too small and flows are too low these systems can experience bacteria die off, equipment is proprietary and often requires specialized pieces of equipment for treatment process.
The Orenco multiple package plant system was selected as an alternative to evaluate further, due to there already being some in the area.

3.6 REGIONALIZATION WITH EXISTING FACILITIES

Regionalization with existing facilities means that the treatment of the wastewater is done by another entity in the region. The possibility of this option is dependent on whether the accepting treatment plant has the willingness and capacity to accept the additional wastewater. It is also dependent on the feasibility of physically being able to deliver wastewater to such a facility. Easements would be required from the owners of any land used for the placement of pipe from the source to the plant. Pumping the wastewater through a force main is also probable. The benefits of this regionalization option include not needing to maintain any plant.

Central Weber Sewer Improvement District has treatment facilities located in Ogden at 2618 West Pioneer Road (about 800 North). Regionalization with Central Weber would entail one of two options. First, at least 18 miles of pipe, easements, and rights-of-way would need to be placed between Huntsville and the treatment plant in Ogden. Ogden Canyon is very narrow, rocky, and has some existing utilities, all increasing the difficulty of placing a sewer line. Second, the nearest sewer line that Ogden has that may be used as a connection into their system is about 11 miles away at the mouth of the canyon at Valley Drive. While a shorter amount of pipe is necessary for this alternative than for a direct line to the plant, a sewer line down Ogden Canyon must still be installed, as well as purchasing capacity in order to use Ogden's sewer system may be needed, and purchasing capacity at the treatment plant would also have a cost.

Wolf Creek also has an expandable treatment plant, about 8 miles from Huntsville and 160 feet higher in elevation. This option would include pumping the wastewater from the Huntsville area to the Wolf Creek Plant, through either many lift stations, or several force mains. In a pipe line, lift stations can be compared to steps, where force mains would then be compared to an escalator. Either case has power requirements that must be met. Similar to the above regionalization option, the Wolf Creek plant would need to be willing and able to accept the wastewater, and would charge to do the treatment.

There are several issues to overcome with this option. Pumping to existing facilities in the valley would involve a high maintenance line, plus charges to treat the wastewater and expand that plant. Because of several reasons including difficulty of construction, a sewer line down Ogden Canyon is not a reasonable method of wastewater treatment for the study area. For these reasons, this option will not be considered further.

3.7 INTERMITTENT SAND FILTRATION

Intermittent sand filtration is the application of lagoon effluent to a sand filter bed on an intermittent basis. Suspended solids and organic matter are removed through a combination of physical straining and biological degradation as the wastewater passes through the filter bed. The organic particulate matter collects in the top 2-3 inches of the filter bed, and the build-up of organic matter eventually clogs the filter bed, preventing further passage of effluent. The sand filter is then taken out of service for replacement of the media. The spent sand is either discarded, or it can be washed and reused as replacement media.

This treatment process would involve construction of discharging lagoons as described earlier in this section with 120 day detention time in the winter and 90 day detention time in the summer. A winter storage pond would be required because intermittent discharge of treatment lagoon effluent during winter to the sand filters would ice over the filter beds, rendering them useless. Filter bed effluent would be discharged by application to land as described in section 3.4.2.

Based on research about pilot filters in other areas, the intermittent sand filters will treat water for discharge to less than 3 mg/l TSS and less than 1 mg/l BOD. This is satisfactory for discharge as specified by the Secondary Treatment Standards of the State of Utah.

Due to the need of maintenance of sand filters and the need for lagoon construction, this option will not be considered further.

3.8 CLUSTER SYSTEMS

Cluster system wastewater treatment and disposal is essentially a large septic tank and soil absorption system for a number of dwellings in lieu of individual separate septic tanks for each dwelling. Green Hills Water and Sewer District currently operates a system very similar to this. With this alternative, raw wastewater would be discharged from each house to flow into a large septic tank designed with sufficient capacity to serve the cluster of homes that discharge into it. Septic tank supernatant flows into a drain field system sized to handle the hydraulic loading from the cluster of homes, where it then seeps through the subsoil for final disposal.

In Huntsville, purchase of land and rights-of-way in the interior of blocks where homeowner improvements have been constructed, but where the cluster treatment systems would be necessary would be a major economic disadvantage. Further development in the interiors of the blocks would be severely curtailed, and ongoing operation and maintenance would inconvenience residents. Therefore, due to technical construction difficulties, political unacceptability, apparent high cost, and low level of treatment cluster systems offer, cluster systems will not be evaluated as an alternative for wastewater treatment.

3.9 MOUND SYSTEMS

A mound system of wastewater disposal is an on-site individual disposal system, which would be constructed for each household. In a mound system, raw sewage from the house is discharged into a septic tank. Septic tank supernatant flows into a small lift station, from which wastewater is pumped to the top of a mound of soil consisting of sand, stone fill, and topsoil. In this mound, a distribution system of perforated piping discharges the water into the sand, where it is disbursed and lost through percolation and evapo-transpiration. This system is particularly useful in areas that have a high groundwater table or in areas where soil permeability is very slow.

Treatment by use of mound systems is less dependable due to power requirements and the tendency of mounds to plug and seep untreated sewage to the surface, and are not conducive to a community wide system, therefore mound systems will not be considered further in this facility plan.

3.10 OVERLAND FLOW WITH LAND DISPOSAL

Overland flow land treatment is a process where wastewater is applied over the upper reaches of sloped terraces and allowed to flow across the vegetated surface to runoff collection ditches. The wastewater receives treatment by physical, chemical, and biological means as it flows in a thin film down the relatively impermeable slope. Treated water is collected at the toe of the overland flow slopes and must be recycled until sufficient water quality is attained for application in a crop irrigation process.

Pumps are required to circulate the water over the terraces. In addition, very few overland flow systems exist in the United States and the Utah DEQ has never approved such a system. Due to potential ice buildup in the winter and requirements for a winter storage pond, this process does not lend itself well to the Huntsville area. With its limited resources, Huntsville would not be an appropriate location to test such a system in Utah. Therefore, the overland flow process will not be considered further.

3.11 RAPID INFILTRATION WITH LAND DISPOSAL

This process requires application of raw wastewater to soils at high rates by spreading it in basins or by heavy sprinkling. Treatment occurs as the water passes through the soil matrix. This system may simply recharge groundwater if it were to be used in Huntsville. Theoretically, this type of system could be used if under drains were used to collect the infiltration and the collected water were then applied in irrigation processes to a crop for final treatment. This system has the same drawbacks associated with overland flow and therefore will not be considered further for Huntsville.

3.12 INNOVATIVE TREATMENT PROCESSES

By definition, an innovative treatment process is something new, which has not been fully proven, but is promising, based on results in research and demonstration projects. Some innovative technology for treatment processes toxic waste concerns or other unusual circumstances. Innovative technology for treatment of wastewater includes an element of risk. There may be innovative technology treatment processes that are applicable to Huntsville. Some of these new technologies may be considered "green processes", and may be favored as possibilities. However, if any one of these were to be chosen, approval through the Utah Department of Environmental Quality would need to be obtained. Due to the multitude of possibilities, and the uncertainty of DEQ approval, and despite promising test results, this option will not be considered further in this study. Also, toxic wastes or other unusual considerations are not present in Huntsville, and conventional systems can be expected to provide reliable service.

3.13 TREATMENT OF INDUSTRIAL AND FEDERAL FACILITIES' WASTES

There are no known present industrial facilities or federal facilities in the Huntsville area. It is possible that industrial development will occur in the future. If it does, the Town must evaluate the pretreatment requirements for each industry on a case-by-case basis, to prevent an industry from imposing an overwhelming hydraulic or biologic load on the existing wastewater facilities.

3.14 SUMMARY OF ALTERNATIVES

Below is a summary of the treatment processes evaluated in this section. Six alternatives were selected to evaluate in further detail. Some reasons for selecting the six alternatives include: simple operation, low operating costs, similar systems in the area, etc. A summary of the selected alternatives is listed below.

Ten other alternatives were not selected to evaluate any further in this study for various reasons. Some of those reasons include: cost of treatment process, dependability and maintenance issues, less effective treatment alternatives, not favorable to DEQ, etc. The MBR option was not selected due to these reasons. Membrane plants, while producing a high quality effluent, have high initial capital investment costs, require frequent periodic cleaning and replacement of the membrane material, and a higher energy cost. Hence, the MBR option did not seem best-suited to this application, and was not evaluated further.

3.14.1 TREATMENT OPTIONS FOR FURTHER EVALUATION (SEC. 5)

1. No Action.
2. Total Containment Lagoons
3. Discharging Lagoons w/ Land Application Discharge
4. Mechanical Plant (IFAS/STM Aerotors)
5. Mechanical Plant (SBR/Fluidyne)
6. Multiple Package Plants (Orenco Systems)

3.14.2 TREATMENT OPTIONS NOT EVALUATED FURTHER

1. Optimizing Existing Facilities
2. Conventional Activated Sludge
3. Membrane Biological Reactor (MBR)
4. Regionalization w/ Existing Facilities
5. Intermittent Sand Filtration
6. Cluster Systems
7. Mound Systems
8. Overland Flow with Land Disposal
9. Rapid Infiltration w/ Land Disposal
10. Innovative Treatment Processes

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REFERENCE LIST

(*Groundwater Quality Protection Strategy for the State of Utah, State of Utah Department of Health;* Salt Lake City, June 1986; 115 pages).

The Potential Impact of Septic Tank Soil-Absorption Systems on Water Quality in the Principle Valley-Fill Aquifer, Ogden Valley, Weber County, Utah Assessment and Guidelines, 1998, Utah Geological Survey – Janae Wallace and Mike Lowe.

4.0 DEVELOPMENT & SCREENING OF COLLECTION ALTERNATIVES

Generally, two alternatives exist for a collection system that will be examined here. The first alternative is a conventional gravity flow collection system. This system includes manholes and sewer piping installed in which water flows by gravity from the homes to the treatment facility or main pump stations as required. The second non-conventional alternative is a conveyance system consisting of a pressure force main with individual pumps installed at each household, which force wastewater from the households to the treatment facility. Experimental systems will not be evaluated for this facility plan study. The options to be evaluated are as follows:

Collection:

1. No Action.
2. Conventional Collection Systems.
3. Alternative Collection Systems.

4.1 TAKE NO ACTION AT THIS TIME

As collection and treatment are tied together and dependent upon one another, the "do-nothing" and "optimization" treatment alternatives do not require the construction of a wastewater collection system. All other options require a new collection network. As indicated in Section 3, there has been research done, and there is currently ongoing research being done in the valley that seems to indicate that the current method of handling wastewater may be impairing Pineview Reservoir. If this is the case, continuing with individual septic systems as they now are will not remedy the situation. However, this option is the easiest to implement and least expensive alternative for the residents, as there are no additional costs to not change the current system, and relatively minimal costs of optimizing current systems.

4.2 CONVENTIONAL COLLECTION SYSTEMS

The Huntsville area has various options for the implementation of a conventional collection system. This section deals with a conventional collection system as a single option. In the following section implementation options will receive further examination.

The conventional collection system would consist of 8", 10", 12", and 15" collection piping and manholes used for servicing and cleaning of the system. The spacing of the manholes would correspond to the lengths and shapes of the streets of area while meeting state regulatory standards. This distance and alignment would vary, but most lengths are long and straight. The *Administrative Rules for Design Requirements for Wastewater Collection, Treatment and Disposal Systems R317-3 Utah Administrative Code* states that manhole spacing shall not exceed 400 feet for 15" diameter pipe and less without meeting special conditions of adequate cleaning equipment. As the lengths of the blocks in Huntsville exceed 600 feet, manholes would be placed at both main intersections and mid-block locations (alleyway intersections, if possible). Outside of Huntsville, spacing would generally follow this rule as well, where manholes would be placed at intersections, and spaced approximately 400 feet apart where possible/applicable.

Collection piping is to be designed at a slope that provides velocities in excess of 2 feet per second but generally not to exceed 5 to 8 feet per second at full pipe flow. This is to minimize sediment deposition, scouring, and other issues in the pipes. Depending upon location of the treatment facility/facilities, the wastewater would be collected to a minimum of one lift station and pumped to the treatment plant. Due to the contours and lay of the land, it is likely that at least one lift station would be required, and possibly two or three depending on the treatment plant location. It appears that final treatment cannot be located below the grade of the town, therefore a lift station would be required to deliver the effluent to the treatment facilities. The actual type of lift station selected for the wastewater system and its details, if one is needed, will be determined during final design. It is anticipated that at least one lift station would be necessary for the collection system, in order to avoid extremely deep wastewater collection mains.

Should the community elect to move forward with a new sewer system, a new sewer use ordinance would be required to be implemented upon approval of a project, which would require all residents, businesses, and other applicable wastewater sources in the community, with property lines within 300 feet of a collection line, to connect to the municipal sewer system.

4.3 ALTERNATIVE COLLECTION SYSTEMS

An alternative system is essentially the reverse of a potable water distribution system. Instead of pressure applied to a trunk line and extending to the branches, liquid is pumped from smaller branches into larger trunk lines. A small sewage pump is provided at each connection. Sewage from the household is pumped directly into a force main that is installed throughout the area, which would discharge either into a large gravity collection main, or at the treatment facility.

Although such a collection system is not common among communities in the area, it offers some advantages. The benefits are primarily related to installation costs because such a system uses small diameter plastic pipe buried just below the frost penetration depth and manholes are not required. This is especially beneficial in areas of high groundwater. Also, road borings are less time consuming and typically less expensive. Generally no shoring of trench walls is required during construction of the pressure sewer, and service connections are usually easier to accomplish. Because a pressure sewer system utilizes sealed conduits, there is no opportunity for infiltration of groundwater into the system. This type of system is best suited for difficult site conditions such as hilly terrain, rock outcroppings, high water table, and areas where flexibility in sewer alignment is necessary.

As with any technology, certain disadvantages also exist. One disadvantage of the pressure sewer concept includes high operation and maintenance costs related to use of mechanical equipment at each point of entry into the system. Another problem with a pressure system is it would require special air-relief valves on all installations as the lines would tend to siphon. The air relief valves are also a high maintenance item.

Two types of pressure sewers were evaluated. One was a grinder pump (GP) system which involves pumping raw sewage from each household to the pressure piping collection system. The second was a Septic Tank Effluent Pump (STEP) system which pumps septic tank effluent to the collection pressure piping system.

Grinder Pump - GP

The GP system has serious disadvantages compared to the STEP system. In the GP system, fibrous materials have been shown to reduce the pipe cross section area by as much as 40%, and grease causes faulty operation of air release valves.

SEPTIC TANK EFFLUENT PUMP - STEP

The STEP system has many features. Each connection typically has a new, specifically designed septic tank and pump installed. The operation and maintenance of a septic tank is included in the system operation. The tank offers some storage for pump cycling. Most of the capital cost of each system is borne solely by the property owner when the home is built or connected, as the pumping system is purchased, and the home is hooked up to the force main. Electric bills are also the property owner's responsibility. The treatment plant needs to be designed specifically for treating septic tank effluent.

Treatment advantages of a STEP pressure sewer system are significant. Wastewater leaving the septic tanks will have already been partially treated, or lessened negative characteristics. The qualities of wastewater entering the treatment facility include reduced BOD by 30-50%, TSS by 40-60% and grease by 50-70%. This is due to the operation of each on-site individual septic tank prior to pumping into the force main. Flow to the treatment plant can be reduced by up to 30% for some systems due to the total elimination of infiltration and inflow which is commonly experienced with a conventional gravity flow collection system.

It is very strongly recommended that an operating authority be established to monitor and oversee operation of these individual pressure systems. The public must be educated, and during a power outage, water use must be curtailed. Careful inspection of new installations is required, with extra care needed to ensure that the collection system operates properly.

Operation and maintenance costs for pressure collection systems are often significantly higher than for a conventional system due to the mechanical equipment and the need for power at each pump station. Flushing stations and other means of eliminating grease and solids build up in the force mains are required. Odor problems at the treatment plant are generally increased, since the sewage entering the plant is septic. Formation of hydrogen sulfide and methane gas occurs regularly, and this gas must be vented. Venting of the gas may be accomplished by plumbing into the roof vent system of each house, to reduce the odor problems that occur due to pumping septic sewage. Each septic tank will require periodic disposal of build-up.

Other considerations regarding a pressure collection system include the lack of operating experience and limited data available for such systems. Air release valves and other features would have to be designed into the system to eliminate the problem of air and gas entrapment in the force main system due to the septic sewage. The gasses are very corrosive and equipment used in such an environment will require very high maintenance. Since force mains would be relatively shallow, the potential for damage during utility excavation is greater than for a conventional collection system. All motors and electrical equipment must be rated explosion proof. It is also important to color code the force mains, to prevent accidental cross-connections with culinary water. Failure of a pump discharge check valve may result in community sewage flooding the basement or pump station at the affected home.

4.4 COLLECTION SYSTEM AREA

The study area boundary in which the collection system could serve is the Town of Huntsville and its associated annexation boundary, which includes approximately from the north end, being midway between Huntsville and Eden, to the south end, being the Pineview Reservoir dam. A map of this area is included in Exhibit 1.2. There are a few areas where the density of the housing does not make sense at this time; however the majority of the homes in the study area would be included. For a regional treatment facility, all of the collection lines would be directed to that regional facility. For the small package plant treatment alternative, there are a few areas which makes installing a collection system more reasonable. These areas are first, Huntsville itself, second, the existing Green Hills Water and Sewer District and the surrounding neighborhoods, and third, the area surrounding the junction of Snowbasin Road and Highway 39.

4.5 UNSEWERED AREAS

As mentioned previously, there are a few areas within the study boundary where the density of housing does not appear to make sense to be serviced by a municipal wastewater collection system at this time. The collection system would collect wastewater from all practical sources within the Huntsville boundaries, and from feasible surrounding areas, that may be served by the preferred collection and treatment alternative of those discussed above, with few exceptions. Any undeveloped or sparsely developed land lying beyond the reach of the new collection system would not be serviced at this time. Service of these areas would be left to developers, to be constructed as part of their future development as part of the county's land use plan and subsequent development agreement.

4.6 COLLECTION SYSTEM ALIGNMENTS

It is anticipated that the wastewater collection mains will generally be installed within the street rights-of-way on the opposite side of the street from any existing culinary water lines. Existing utilities will be avoided where possible. In most cases the lines will be installed under the paved surface of a street. The cost estimate includes excavation and restoration of streets, where required. Any interceptors will be installed as much as possible along existing road rights-of-way and fence lines, to ensure minimal impact to agricultural or other land.

4.7 COLLECTION LINE SIZING

Alternative collection systems generally have smaller diameter pipe than those that operate by gravity. Too small of a pipe will create problems with solids plugging the lines, and with overworking the motors that are pumping into the system. Too large of pipe is not conducive to timely treatment of the wastewater. Balance is required between needed capacity and size of pipe.

Conventional systems depend on gravity, and pipe slope, size, and material. The pipe slope, size, and material all have an effect on the capacity. Too large of pipe slows the flow of wastewater to the plant, and can change the influent characteristics. Too shallow of a slope has the same effect on the wastewater, and can even stop the flow. The type of pipe also has an influence on the flow, and generally, the smoother the pipe, the faster and easier the flow.

Both types of systems are additionally impacted by the population served by the individual main lines. Generally, the larger the population served by a length of pipe, the larger the size of pipe required. Thus, determining the population that both now, and in the future, will be contributing to the system is essential in determining the size of pipe. Specifics of sizing are discussed in Section 5.

4.8 SUMMARY OF ALTERNATIVES

Below is a summary of the collection alternatives evaluated in this section. Three alternatives were selected to evaluate in further detail.

4.8.1 COLLECTION ALTERNATIVES FOR FURTHER EVALUATION (SEC. 5)

1. No Action.
2. Conventional Collection
3. Alternative Collection (STEP Collection)

5.0 EVALUATION OF VIABLE ALTERNATIVES AND PLAN ADOPTION

In Sections 3 and 4, many alternatives for wastewater treatment and collection were evaluated and screened. A pressure sewer collection system and a conventional gravity flow collection system were analyzed. Primarily due to ease of maintenance, and lower operation and maintenance costs, a conventional gravity flow collection system is recommended as the best alternative for the collection system. The exception to this would be if the multiple package treatment alternative is selected. The Orenco Systems treatment process typically incorporates a STEP collection system. The gravity flow collection system and lift stations will be incorporated in the cost analysis with the selected treatment alternatives, with the exception of the Multiple Package Plants. A summary of the selected alternatives are listed below.

TREATMENT SYSTEM ALTERNATIVES FOR FURTHER EVALUATION

Treatment Alternative # 1 –	Do Nothing
Treatment Alternative # 2 –	Total Containment Lagoons
Treatment Alternative # 2a –	Lagoons w/ Land Application Discharge
Treatment Alternative # 3 –	Regional Mechanical Plant (IFAS/STM Aerotors)
Treatment Alternative #3a –	Regional Mechanical Plant (SBR/Fluidyne)
Treatment Alternative # 4 –	Multiple Package Plants (Orenco Systems)
Treatment Alternative #5 –	Huntsville Only Mechanical Plant (STM Aerotors)
Treatment Alternative #5a –	Huntsville Only Package Plant (Orenco Systems)

COLLECTION SYSTEM ALTERNATIVES FOR FURTHER EVALUATION

Collection Alternative #1 –	Do Nothing
Collection Alternative #2 –	Conventional Collection
Collection Alternative #3 –	Alternative Collection (STEP Collection)

Maps illustrating proposed gravity collection systems and areas, and the different treatment alternatives, can be viewed in Exhibits 5.1 – 5.4. Possible locations of the treatment plants, lift stations, and crossings of Highways 39 & 167 are all identified. The locations that are identified are possible locations which may vary due to property purchase and easement negotiations and detailed design requirements. Actual locations would be identified and negotiated during the design process. With the topography of the Huntsville area, at least some pumping would be required. The amount of pumping required depends on the treatment alternative selected and on the location of the treatment site.

The remaining portions of Section 5.0 contain both a cost-effectiveness analysis and best-fit analysis of the listed alternatives. Based on these analyses, selection of the best overall wastewater collection and treatment facility alternative is made in Section 5.11. The selected alternative must be politically acceptable, environmentally sound, and economically justified when it is compared to the other alternatives. A discussion of reasons for the elimination of certain alternatives is included.

A phased approach was also examined. The first area or Phase evaluated was specifically Huntsville Town, but the same principles and costs can easily apply to any area within the study boundary. Huntsville was selected as the evaluation point due to them already being a defined entity within a specific service area or boundary.

The phased approach would be to construct a treatment facility now that would handle only a portion of the study area population, but be designed to be expandable as future phases would connect to the system. This approach has both benefits and drawbacks.

Some of the benefits of a phased approach include lower initial investment costs, and a focus on higher density areas. For the Huntsville phased analysis, the treatment plant would be sized to treat approximately 1/3rd of the wastewater flows as for the entire study area. This lowers the initial upfront capital costs of construction.

Some of the drawbacks to this approach though include a higher cost per user. Unfortunately, by decreasing the flow by 1/3rd, does not decrease construction costs by that same ratio. It would only decrease construction costs by half and therefore the costs per user were determined to be too high. With only 1/3rd of the population paying for half of the construction costs, it was determined that a phased approach was not an acceptable alternative to pursue further. Opinions of Costs are detailed in Tables 5.2 and 5.3 below.

Also, in a phased approach, once a new phase is ready to be connected, impact fees and connection fees would need to be collected in order to be able to afford the construction of the expansion. Each resident that would connect in future phases would be required to pay the impact and connection fees, unless some agreement was previously reached, or other funding alternatives were obtained for the construction of the expansion, such as forcing new developers to fund the expansion. Those impact fees were calculated to be significantly high, and it was determined that this alternative would not be publicly acceptable. For these reasons, a phased approach was not evaluated further.

5.1 EVALUATION OF MONETARY COSTS

5.1.1 OPINION OF PROBABLE COST

An opinion of probable cost is based on current prevailing market prices for all aspects of a project. These include: capital costs, land costs, and annual costs, such as: operation and maintenance, rights-of-way, construction interest, legal, fiscal, engineering, etc. Opinions of cost are determined from an evaluation of scope and difficulty of work, recent bid prices of similar work in the area, quotations from vendors and contractors, and from engineering judgment. Since the engineer does not control the economic conditions that affect construction costs, such as the current steep increase in oil prices, the opinions of cost are not a guarantee of actual cost. Opinions of cost therefore represent anticipated project costs and indicate the cost range that the Huntsville area should expect for a project.

In the no-action option, the present way of treating wastewater through septic systems will continue. Individual septic systems have a cost associated with them. Often these costs are overlooked, neglected, or forgotten. These costs include maintenance of the system and, depending on the system, annual permit and inspection fees. These costs listed in Table 5.1 below were obtained from the Weber County Health Department. According to the Health Department, the average expected life span of a septic system is about 30 years. This span may be shorter or longer, depending on items such as site conditions, material the system is made of, and maintenance practices. When a septic system needs to be replaced, the cost of replacement would be the cost of a new system. Drain fields for septic systems sometimes require replacement as well.

It is important to keep in mind that often these costs often are felt all at once, when a septic tank fails, rather than as a monthly expense. It is also important to keep in mind that these costs assume regular maintenance as recommended by the Health Department. Regular maintenance may help improve the life span of the septic tank and drain field. Likewise, neglect may shorten the life span of the septic tank and drain field.

TABLE 5.1 SUMMARY OF YEARLY AVERAGE SEPTIC TANK COST

Type of System	Cost of New System	Construction Permit Fees	Annual Maintenance	Annual Permit Fees	Annual Inspection Fees	Average Monthly Cost for expected 30 year life
Normal	$4,000 to $6,000	$322	$200 to $300	$0	$0	$28 to $43
Alternative	$7,000 to $8,000	$322	$200 to $300	$0	$0	$37 to $48
Mound	$10,000 to $12,000	$784	$350 to $500	$132	$200	$87 to $105
Packed Bed	$12,000 to $20,000	$784	$350 to $500	$132	$200 to $300	$87 to $135

Table 5.2 below summarizes the engineer's opinion of probable costs for the treatment alternatives. The full opinion of probable costs for treatment alternatives can be found in Appendix F in Exhibits 5.12 – 5.18. For the sake of simplicity, an SBR Treatment Plant for Huntsville Only was not included in the cost analysis;

however the costs would be fairly linear in nature, so the Opinion of Costs for the Huntsville Only SBR alternative could be easily assumed as being slightly less than an STM Aerotor.

Table 5.3 below summarizes the engineer's opinion of probable costs for the collection alternatives. The full opinion of probable costs for collection alternatives can be found in Appendix F in Exhibits 5.19 – 5.22.

TABLE 5.2 SUMMARY OF TREATMENT OPINION OF COST

Treatment Alternatives		Opinion of Probable Cost
Alternative #1	Do Nothing	No Action
Alternative #2	Total Containment Lagoon	$6,334,000
Alternative #2a	Discharging Lagoon	$3,983,000
Alternative #3	Regional Mechanical Plant (IFAS/STM Aerotor)	$5,800,000
Alternative #3a	Regional Mechanical Plant (SBR Fluidyne)	$5,204,000
Alternative #4	Multiple Package Plants (Orenco)	$8,376,000
Alternative #5	Huntsville Only STM Plant	$2,822,000
Alternative #5a	Huntsville Only ORENCO Plant	$3,541,000

TABLE 5.3 SUMMARY OF COLLECTION OPINION OF COST

Collection Alternatives		Opinion of Probable Cost
Alternative #1	Do Nothing	No Action
Alternative #2	Conventional Collection	$8,957,000
Alternative #3	Alternative (STEP) Collection	$10,092,000
Alternative #2a	Huntsville Only Conventional	$4,833,000
Alternative #3a	Huntsville Only Alternative	$4,052,000

5.1.2 CASH FLOW MODEL

The cash flow model is an extremely powerful tool. The cash flow model is a dynamic tool allowing the analyzer to play "What If" scenarios with either revenues, expenditures, or both. The purpose of the cash flow model is to link the individual users/equivalent residential users (ERUs) and the revenues generated by them with the expenditures of constructing and maintaining a wastewater system. The model projects all the revenues and expenditures year by year of a given alternative for a given period of time (20-years). By using the model, one can determine if the wastewater utility is generating enough revenues to cover the expenditures. The revenues included in the analysis include monthly use rates, hook-up fees, impact fees, treatment fees and other pertinent fees. Projected expenditures that are included in the analysis are the debt payments for the initial cost of the project, personnel cost to do billings and maintenance of the system, equipment repair and replacement costs, and any utility costs, like electrical power, associated with the alternative. The results of the cash flow model can be viewed in Exhibits 5.5 – 5.11 in Appendix E. Any operation and maintenance information needed for a particular alternative can be gathered from the cash flow models.

5.1.3 NET PRESENT VALUE

Monetary evaluation of alternatives will be calculated on a net present value (NPV) basis. The NPV technique of analysis will provide an "apples to apples" dollar comparison of alternatives. Net present value is the sum, if invested now at a given interest rate, that will provide exactly the funds required to make all future payments during the fixed 20 year planning period. The NPV financial formula takes into account the initial purchase value plus the operation and maintenance costs minus the salvage value at the end of the 20 year planning period. A comparison of the net present worth of each alternative will indicate which alternative is the most cost effective. A summary of these net present value comparisons is found below in Table 5.4. Treatment and collection alternatives were combined for each alternative. The data used in the NPV calculation is found within the cash flow model located in Appendix E. The NPV calculations can also be viewed in Appendix G in Exhibit 5.23. Again for the sake of simplicity as mentioned previously, an SBR evaluation for Huntsville Only was not included, but can be easily assumed.

TABLE 5.4 SUMMARY OF NET PRESENT VALUE

Treatment Option		Opinion of Total Cost
Alternative #1	Do Nothing	No Action
Alternative #2	Total Containment Lagoon	$ 15,828,231
Alternative #2a	Discharging Lagoon	$ 13,477,231
Alternative #3	Regional Mechanical Plant (IFAS/STM Aerotor)	$ 16,403,536
Alternative #3a	Regional Mechanical Plant (SBR/Fluidyne)	$ 15,757,479
Alternative #4	Multiple Package Plants (Orenco)	$ 19,332,022
Alternative #5	Huntsville Only STM Plant	$ 8,547,626
Alternative #5a	Huntsville Only ORENCO Plant	$ 8,192,438

Each alternative was evaluated using the same terms (% rate, length of loan) for cost comparison, resulting in comparable net present worth values. The planning period is 20 years, counted from the expected year of completion of facilities (2012). Keep in mind that Alternatives #5 and #5a are for the Town of Huntsville only, while the other Alternatives incorporate both Huntsville and the County.

5.1.4 SUNK COSTS

Sunk costs refer to the value of the current treatment facilities and infrastructure that would be abandoned. Huntsville currently does not own any infrastructure for the collection or treatment of municipal sewage. Because the Town and County do not currently own any wastewater infrastructure, there are no sunk costs to Huntsville or the County resulting from this project. Each proposed connection that currently owns a septic tank, or other on-site wastewater systems that will be abandoned, will incur a sunk cost of the book value of the current system. This cost would vary for each homeowner, depending on the size, age, and condition of the individual septic system. The cost of safely abandoning each system and installing laterals from the home to the sewer main would need to be borne by each system owner. Those costs vary depending on methods chosen for abandoning the septic tank and the length and location of the homeowners sewer lateral. As an example, the Green Hills Water and Sewer District operates a collection and cluster treatment system that would be abandoned if the district were to be connected to a treatment plant, and would be considered sunk costs for the Green Hills Estates.

5.1.5 CAPITAL FINANCING PLAN

A Capital Financing Plan for the selected alternative is found in Section 6.3.

5.1.6 DEMONSTRATION OF FINANCIAL CAPABILITY

Huntsville has the legal authority to own and operate water, sewer, power, and other utility systems. At present, the Town operates a culinary water system, parks, roads, and other services. The Town, therefore, has demonstrated managerial and financial capability to operate these services and systems. The County has demonstrated its ability to operate these services as well. The existing maintenance personnel will manage operation of the sewer system with minimal additional training. In the event that further assistance is needed, more personnel will be hired. Billing procedures are already established, and a managerial staff is already in place.

5.2 RESERVE CAPACITY

Each alternative that is evaluated in detail includes reserve capacity, which is the treatment or collection capability beyond the needs of the population at the present time.

5.2.1 TREATMENT RESERVE CAPACITY

The minimum design life and planning period is 20 years for treatment alternatives. The treatment facilities of each alternative are sized for the 20 year projected growth. However, possible future expansion needs have been considered as well in this study.

5.2.2 COLLECTION SYSTEM RESERVE CAPACITY

The Administrative Rules for *Design Requirements for Wastewater Collection, Treatment and Disposal Systems (R317-3 Utah Administrative Code)* states that "sewers should be designed for the ultimate tributary population or 50 year planning period whichever requires a larger capacity." The Utah State Code also requires a minimum size of sewer pipe of 8-inch for gravity sewer. In the case of the Town and County, using the 8-inch minimum requirement, most portions of the collection system would have excess hydraulic capacity, due to this size requirement, and therefore meet the capacity requirement. Capacity is also a function of pipe slope. The steeper the pipe can be installed, the greater the capacity of the pipe. There are areas within the study boundary where the potential for growth, and/or shallow pipe slopes, requires pipe sizes of up to 15-inches in order to meet the required hydraulic capacity design of 50 years.

5.3 ENVIRONMENTAL EVALUATION

The six treatment alternatives were weighed for a comparison of environmental impact. Alternatives #5 and #5a (Huntsville Only Options) are not shown on the table below for simplicity, but would score the same environmentally as Alternatives #3 and #4 respectively. The treatment alternatives were ranked between 1 and 10 with 1 being the least desirable and 10 being most desirable regarding environmental impact to that particular aspect of environmental sensitivity. The alternatives with higher scores demonstrate having less environmental impacts.

TABLE 5.5 SUMMARY OF ENVIRONMENTAL EVALUATION

Treatment Option	#1 Do Nothing	#2 Total Containment Lagoons	#2a Lagoons w/ Land Discharge	#3 Regional Mechanical Plant (IFAS/ STM Aerotors)	#3a Regional Mechanical Plant (SBR/ Fluidyne)	#4 Multiple Package Plants (Orenco)
Historical and Archeological Sites	10	7	7	8	8	7
Floodplains	10	6	6	7	7	6
Wetlands	10	5	6	7	7	7
Agricultural Lands	10	4	5	8	8	8
Wild and Scenic Rivers	6	5	5	8	8	8
Fish and Wildlife	6	6	6	8	8	8

Protection						
Air Quality	10	7	7	7	7	7
Surface Water Quality	5	6	6	9	9	9
Groundwater Quality	4	5	5	8	8	7
Indirect Impacts	5	5	5	7	7	6
TOTAL:	76	56	58	77	77	73

Alternative#1 (Do nothing), and #3 and #3a, (STM Aerotors or SBR Fluidyne) and even Alternative #4 (Orenco) appears to offer the least environmental impact of any of the alternatives examined. Lagoons, due to their large land requirements, appear to have the most environmental impacts.

As discussed earlier in this report, to continue using septic tank treatment as is currently being done, while it still debated that it is impairing the water quality, continuing as is also does nothing to help improve the environmental quality, whereas Mechanical treatment alternatives (either a Regional Mechanical Plant, or Multiple Package Plants) is a step to improving the environmental quality.

5.4 EVALUATION OF RELIABILITY

5.4.1 RELIABILITY OF TREATMENT

Reliability of treatment is the ability of the facility to meet and maintain effluent limitations set for the Huntsville area. The selected alternative must be able to consistently meet this requirement through the 20 year planning period.

When examining the possibility of a new plant for the treatment of wastewater for the Huntsville area, only proven technologies have been examined. This assures that all of the treatment alternatives can provide an acceptable degree of reliability in order to meet the final effluent requirements.

5.4.2 RELIABILITY OF COLLECTION

A strictly gravity flow system is very reliable because it requires no added mechanical energy, and relies only on pipe slope and condition. However, the gravity collection alternative in this instance requires the use of pump lift stations, which were not used for reliability comparisons. The reliability of a lift station is critical, and each would be equipped with redundant pumps and an on-site backup generator which will switch on in the event of a power outage. The pumps will be redundant in that a minimum of two pumps will be installed, to operate with one pump operating on-line and the other on standby/backup.

The alternative STEP collection system requires the use of pumps typically at each individual connection to the system. Typically these pumps are quite reliable, however most are not equipped with emergency generator backup power in cases of power outages. The individual septic tanks at each home which are part of the STEP system, would serve as an emergency storage reservoir in the case of a power outage.

5.5 EVALUATION OF ENERGY REQUIREMENTS

5.5.1 TREATMENT ENERGY REQUIREMENTS

There obviously are no energy costs associated with the "Do-Nothing" Treatment Alternative. Costs of running the lagoons in Alternative #2 and #2a are minimal and therefore considered insignificant. Mechanical plant energy costs associated with Alternatives #3 and #3a can vary according to the type of plant. The STM Aerotor treatment plants typically operate on low horsepower motors, so energy requirements are limited. Likewise, the energy requirements for the SBR Fluidyne would be similar to the STM Aerotor. They generally consume more energy than those associated with lagoon systems, and in this instance, likely more than the Orenco Systems. Multiple package plant energy requirements depend on the number of plants installed, and vary according the type of package plant, but would be similar to those associated with a mechanical plant. Typically, the Orenco Treatment Systems require fairly minimal amounts of energy.

5.5.2 COLLECTION ENERGY REQUIREMENTS

Energy requirements of the collection system alternatives are limited to when pumping is necessary. All alternatives besides the "do-nothing" require some pumping, due to the topography of the Town and County, as well as the location of the treatment facility. The Alternative STEP Collection has associated required energy costs at each individual connection to operate the pumps. Those energy costs are typically borne by the homeowner where the connection and pump is located, but are usually low energy consumption pumps.

5.5.3 ENERGY ESCALATION COSTS

It is anticipated that the Huntsville area will incur costs resulting from energy use with the selection of any of the proposed treatment alternatives #2 thru #4. The estimated dollar costs of energy use are included as a component of operation and maintenance costs in the examination of each alternative in the Cash Flow Analysis. Future power rates may vary, and will affect the operating cost of the treatment alternative chosen.

5.6 EVALUATION OF IMPLEMENTABILITY

All short-listed alternatives are viable as alternatives. Implementability refers to plan acceptability for all jurisdictions involved, and also refers to the equitable features of the plan. The final test of viability is user costs, and whether citizens have the ability to pay, perceive that they can afford the monthly rate, or are willing to pay the monthly rate.

Both the phased approach and sewering entire study area all at once were evaluated for implementability. As discussed in Section 5.0, a phased approach was determined to be less implementable than incorporating the entire study area.

5.6.1 IMPLEMENTABILITY OF TREATMENT OPTIONS

Alternative #1 (Do-Nothing) involves no change to current treatment, and while it does not remedy any environmental issues, is the easiest option to choose.

Alternatives #2 and #2a (Lagoons) differ little in being equitable. Both are viable options that consolidate the treatment of wastewater to one location. Both alternatives require less operational costs than Alternatives #3 and #4. However, Alternatives #2 and #2a require significantly more land than Alternatives #3 and #4, which is expensive, and would increase the overall costs of treatment.

Alternative #3 and #3a (Mechanical Plant) are viable alternatives. The amount of land required is significantly less than that of alternatives #2 and #2a (lagoons). Operation costs are higher for a mechanical treatment plant and operation and maintenance needs are also higher than lagoons, typically requiring a full time operator to run the facility. Mechanical plants can easily be designed for anticipated growth, and are easily expandable while maintaining a relatively small footprint. Alternative #3and #3a also have the capability, with relative ease and low cost, of potentially treating the wastewater to Re-use quality.

Alternative #4 (Multiple Package Plants) is comparably equitable as the other options.

Alternatives #5 and #5a offer the lower total capital investment costs, and on the surface appear equitable, however as discussed above in the phased approach discussion, when operation and maintenance costs as well as initial investment costs are all added together, there just aren't enough users connected to the system to make it affordable without extraordinary amounts of debt grant/principle forgiveness, or other funds donated to the project.

With that in mind, and all Alternatives except #5 and #5a being equitable, the option with the smallest net present value, (Alternate #2a – Discharging Lagoons) is the least expensive alternative.

5.6.2 IMPLEMENTABILITY OF COLLECTION OPTIONS

Collection Alternative #1 (Do-Nothing) involves no change to current procedures or user costs, and is therefore the easiest option to select. However, it is only an option if the current treatment through septic systems remains unchanged.

Of the remaining alternatives, it is recommended that for both Collection Alternatives #2 and #3, the entire study area be incorporated into a regional sewer district. This makes the most sense, ensures everyone equally shares the costs, and is the easiest to implement. It involves only one jurisdiction. However, should the residents of Huntsville select Alternative #1 (Do-Nothing), the County may, as part of future planning efforts, elect to implement small treatment areas for future clustered developments. Developers would then be responsible for the cost of treatment and collection of the wastewater for those developments.

Collection Alternatives #2 and #3 are both equally implementable. Each alternative has varying components. Collection Alternative #2 utilizes gravity and lift stations, but thereby forces deeper installations and bury depths. Collection Alternative #3 utilizes small individual residential pumps and force mains, thereby allowing for more shallow bury depths, with topography being less of a concern. Ultimately during design, it may be determined that the most feasible alternative to implement, is a combination of Alternatives #2 and #3, utilizing a gravity collection system where possible, and a STEP collection system where gravity collection is not as feasible.

5.7 EVALUATION OF RECREATIONAL OPPORTUNITIES

This project is anticipated to have a beneficial effect on the water quality of Pineview Reservoir, so as to help minimize the degradation of the water quality. All uses of the reservoir will thereby be maintained and/or improved. These include recreational opportunities in and around Huntsville, and fish and wildlife habitat.

5.8 LOCATION AND MANAGEMENT

If Treatment Alternatives #2, #2a (Lagoons), #3, #3a (Mechanical STM or SBR), or #5 (STM Huntsville Only) are chosen, a selection would be made for Collection Alternative #2 (Conventional Gravity Collection). If Treatment Alternative #4 (Orenco), or #5a (Orenco Huntsville Only) are chosen, Collection Alternative #3 (STEP) would be selected, or a combination of the two where possible. Also, a sewer district would need to be formed which would be responsible to operate and maintain the collection system, the gravity interceptors, the lift stations, and treatment facilities. The collection system, lift stations, and treatment system can be maintained by the current Town staff, however it would be recommended to have the sewer district hire staff to maintain and operate the facilities. Additional staff and/or training may be needed after the collection and treatment system is placed in service.

5.9 DEVELOPMENT AND EXPANDABILITY

5.9.1 EXPANDABILITY OF TREATMENT OPTIONS

Treatment Alternative #2 and #2a (Lagoons) do not lend itself well to development or expansion as compared to mechanical plants. Designers of a treatment system should plan for anticipated growth within a certain time period. Once that growth has occurred, expansion becomes imminent. Some processes can be modified to accommodate a little more growth and capacity, but this provides only short-term relief. A lagoon system falls in this category, and is difficult to expand without halting the treatment process during the construction of the expansion, which also requires significant additional land. Historically, the Huntsville area has experienced a slow growth rate (0.5% annually), which would lend itself to the lagoon treatment process. However, surrounding areas could be added to the collection system after the design and construction if, and only if, it was in the lagoon system's capacity. Additionally, lagoon systems, particularly the total containment lagoons, involve large amounts of land, and developments overlooking or near lagoons are not desirable. The combination of these factors indicates that expandability of a lagoon system would not be a good fit for Huntsville and the County.

Treatment Alternatives #3 (IFAS/STM), #3a (SBR/Fluidyne), #4 (Orenco), and #5/5a (Huntsville Only) are similar to each other in their abilities to expand. Treatment Alternative #3, #3a, and #5 are easily expandable, as mechanical plants are often designed with expansion capabilities in mind, and so growth and expansion are easily accommodated. Also, treatment alternatives #3, #3a, and #5 have the ability to reasonably easily treat wastewater to re-use quality. To keep all options on an equal field, re-use was not included in the evaluation of this study, but it is important to keep in mind the capability of this alternative to reach this quality of treatment, especially with the limitation on the allowable discharge, and the cost of land. Should re-use quality be obtained, discharging from the treatment plant may become an option, and the amount of land required for the treatment plant decreases significantly (by approximately 15+ acres). Alternative #4 (Orenco) is also easily expandable when growth overloads a plant, by simply adding another package plant alongside the current plant or located near where the growth has occurred. The treatment plants for these options require substantially smaller amounts of land relative to lagoons, and can be built and landscaped to appear much more pleasing to the eye and match local architecture. These options are favorable for development and expansion.

5.9.2 EXPANDABILITY OF COLLECTION OPTIONS

The collection systems would provide the same expandability for all of the alternatives concerned. With that being said, the pipe lines should be sized with extra capacity so as to provide for the addition of possible development in the next 50 years. The cost of placement of larger pipe typically differs only in the cost of the actual pipe. The placement for any line in Huntsville would be approximately the same depth regardless of size of pipe. The minimum state required size of gravity sewer pipe is 8". In the case of the Town of Huntsville, most of the pipe will have plenty of capacity at that size. Where larger pipe is needed for future possibilities, the difference of the cost in pipe is minimal in comparison to replacing the pipe within the state-required 50-year collection system plan period.

5.10 SELECTION CONSEQUENCES TO RESIDENTS

Each alternative but the "do-nothing" alternative will require all existing service lines from each home or business that are currently using an existing on-site disposal system to be cut and capped or plugged. Each home or business would then need to be connected to the new collection system. Septic tanks would need to be abandoned by the home owner by removal or crushing of any top access and filling with sand.

5.11 SELECTION OF AN ALTERNATIVE

The six treatment alternatives were weighed for comparison for monetary, energy use, reliability, expandability, environmentally, etc. As mentioned previously, Alternatives #5 and #5a were not evaluated further as the cost per connection was not determined to be acceptable without other sources of funding. The treatment alternatives were ranked between 1 and 10 with 1 being the least desirable and 10 being most desirable to that particular aspect. The alternatives with higher scores demonstrate being more desirable. The results are listed below.

TABLE 5.6 SUMMARY OF TREATMENT ALTERNATIVE SELECTION

Treatment	#1 Do Nothing	#2 Total Containment Lagoons	#2a Lagoons w/ Land Application	#3 Regional Mechanical Plant (IFAS/ STM Aerotors)	#3a Regional Mechanical Plant (SBR/ Fluidyne)	#4 Multiple Package Plants (Orenco)
Monetary Considerations	9	4	6	5	5	3
Sunk Costs	10	7	7	7	7	7

Energy Use	10	9	9	5	6	6
Reserve Capacity	3	3	4	7	7	6
Environmental Evaluation	5	5	5	8	8	7
Reliability	6	7	7	8	8	8
Implementability	10	3	3	6	6	6
Expandability	3	3	3	9	9	9
Service Area	5	7	7	8	8	9
Growth and Development	5	4	4	9	9	9
TOTAL:	66	52	55	72	73	70

The three collection alternatives were weighed for comparison for monetary, energy use, reliability, expandability, environmentally, etc. The collection alternatives were ranked between 1 and 10 with 1 being the least desirable and 10 being most desirable to that particular aspect. The alternatives with higher scores demonstrate being more desirable. The results are listed below.

TABLE 5.7 SUMMARY OF COLLECTION ALTERNATIVE SELECTION

Collection	#1 Do Nothing	#2 Conventional Collection	#3 Alternative Collection (STEP)
Monetary Considerations	8	6	5
Sunk Costs	10	7	7
Energy Use	10	6	5
Reserve Capacity	3	10	8

Environmental Evaluation	5	7	7
Reliability	6	8	7
Implementability	10	5	5
Expandability	5	7	7
Service Area	5	7	8
Growth and Development	5	7	7
TOTAL:	67	70	66

An examination of the preceding factors reveals that Treatment Alternative #3a – Regional Mechanical Treatment Plant with SBR/Fluidyne, and Collection Alternative #2 – Conventional Collection, received slightly higher grades when ranked against the other alternatives according to the above criteria, although treatment alternatives #3, #3a, and #4 are all reasonably equivalent. As mentioned previously, another advantage the IFAS/STM Aerotor and the SBR/Fluidyne, is each has the ability to reasonably easily treat the wastewater to re-use quality for irrigation of public parks and recreation areas.

5.12 VIEWS OF THE PUBLIC AND CONCERNED INTEREST GROUPS

PUBLIC PARTICIPATION

Open discussion and citizen involvement is required in preparation of any facility plan. Public meetings also help develop plans reflecting area needs and values. Design plans can be provided at less cost, and a politically acceptable project may result from implementation of suggestions from local residents. In preparation of this Facilities Plan, there will be at least two public meetings held. The first was held to inform the public of the Town's and County's intent to use state supplied funding to perform a Wastewater Capital Facility Study, and hear comments. The second public meeting will be to gather public input and comments regarding the findings of the Study.

RESPONSIVENESS SUMMARY

The first public meeting for the facility plan was held July 29, 2010, at the Huntsville Town Library. This meeting was advertised by mailings to all utility customers, and in the local newspaper prior to the meeting. There were approximately 30 people in attendance at this first meeting.

This meeting was held to inform the citizens of the intent to further evaluate proposed Wastewater Collection and Treatment alternatives. Potential scope of work and the impacts that such a project would have on the community were discussed along with potential financing and cost to consumers. Comments from citizens were encouraged after all presentations were made to maintain order and flow in the meeting, and several people asked questions or gave comments. The comments ranged from support for the study, to opposition to bringing sewer to the area. The Utah DWQ financing guidelines were explained to the citizens regarding sewer bills to be expected in the range of $65.00 per month, depending on the results of the study and the financial package provided by the State.

The Final public meeting was held on April 20, 2011 at the Huntsville Town Library. The meeting was advertised in the local Ogden Valley Newspaper prior to the meeting. There were approximately 60 people in attendance at the public meeting, including Huntsville Town, Weber County Engineering, Sunrise Engineering, Utah Division of Water Quality, Dr Darwin Sorenson (USU), and numerous town and county residents.

The meeting was held to inform the citizens of the results of the Wastewater Collection and Treatment study and to allow citizens the opportunity to comment. Mayor Jim Truett provided a brief explanation on why the study was conducted, in order to inform the residents and the council about the impacts and costs of providing wastewater to the valley. Next a presentation was made summarizing the results of the study, recommending using a gravity collection system and an SBR treatment facility. The financing guidelines were explained that the community would receive a 75/25 split of 0% interest loan/grant financing. The meeting was then opened up to allow for public comments.

Many of the questions and comments were directed to the water quality in Pineview Reservoir, and how septic tanks were the source of the contamination. Dr Sorenson addressed many of these questions since he is doing on-going research monitoring the water quality. While he indicated that septic systems were likely not the only source of pollution, they would be contributing factors to the impairment. The majority of the comments came from residents from the unincorporated county area, and most comments were opposed to a wastewater project. Huntsville Town announced that they would hold a council meeting on June 2, 2011 to vote whether or not to adopt the Facility Plan and move forward with a project or not. Minutes from the meeting can be found in Appendix I.

As scheduled, on June 2, 2011, Huntsville Town held a Council meeting. After several minutes of discussion between the council, input from the Weber County Health Department and Sunrise Engineering, the Council made a motion to Not adopt the Facility Plan and not move forward with a project. The motion carried unanimously.

6.0 SELECTED PLAN, DESCRIPTION, AND IMPLEMENTATION

6.1 JUSTIFICATION AND DESCRIPTION OF SELECTED PLAN

At the conclusion of Section 5.11, Treatment Alternative #3a (Regional Mechanical SBR/Fluidyne Plant) and Collection Alternative #2 (Conventional Gravity Collection) were selected as the best alternative for the Huntsville area, although Alternative #3 (IFAS/STM Aerotors) is reasonably equivalent. The selection was based on both monetary factors and non-monetary factors, evaluating a phased approach, a non-phased approach, environmental impacts, energy consumption requirements etc. With all these factors being considered, it was determined that a Regional Mechanical Plant was the best selected alternative. The following describes the selected plan:

TREATMENT ALTERNATIVE #3a – Regional Mechanical SBR-Fluidyne Plant & COLLECTION ALTERNATIVE #2 – Conventional Collection (Gravity) System

1. Build a 0.3 MGD Average (0.6 peak) SBR/Fluidyne Treatment Plant with Rapid Infiltration Basins/Land Application Discharge.
2. Construct 8” through 15” Gravity Collection and Trunklines
3. Construct Lift Stations and Transmission Line to Treatment Plant

The recommended location for the treatment plant is located near the North Branch of the South Fork Ogden River. With the plant at this location, the majority of the County resident’s wastewater will flow by gravity to the treatment plant or to a localized low point near the treatment plant and then pumped. The majority of Huntsville can also flow to a localized low point near the treatment plant location and then lift to the treatment plant. Discharge from the treatment plant would be Land Application Disposed of. A winter storage pond would be needed for those months when irrigation and crop growth is suspended. Treatment requirements for land application discharge are required to meet secondary standards. The treatment method selected is capable of meeting those standards, and as mentioned, has the capability of being able to treat to re-use standards.

Trunk lines will be sized to meet a 50-year design life capacity based on growth projections as required in the State of Utah peak design requirements for trunk and interceptor lines of 250 gallon per capita per day.

6.2 DESIGN OF SELECTED PLAN

Preliminary design of the selected plan has been completed, in order to identify pipe sizes, etc. All design and construction of the collection and treatment systems will be in accordance with the *Administrative Rules for Design Requirements for Wastewater Collection, Treatment and Disposal Systems (R317-3 Utah Administrative code).*

The following is an estimated schedule of implementation for the selected plan:

TABLE 6.1 SCHEDULE OF IMPLEMENTATION

01/13/11	Deliver Facility Plan Draft to Huntsville, Weber County and Utah DWQ
01/31/11	Submit Funding Applications to DWQ
02/17/11	Receive Comments on Draft Facilities Plan from DWQ
02/23/11	Introduce Project to DWQ Board
03/07/11	Make Facility Plan Available to Public for Review
03/22/11	Funding Commitments Secured from DWQ Board
03/24/11	Submit Final Revisions of Facilities Plan to the DWQ
04/20/11	Hold Final Public Meeting on Facility Plan Report
05/19/11	Final Public Hearing on Funding
06/03/11	Engineering Design Contract Signed, Begin Detail Design
06/03/11	Final Approval of Facilities Plan by DWQ, Pending EPA Concurrence
06/10/11	EPA Approval of Facility Plan and FONSI.
01/27/12	Engineers Submit Design Plans and Specifications for Review to DWQ
02/24/12	Advertise for Bids
03/30/12	Open Bids, Award Contract
04/27/12	Begin Construction
01/31/13	Final Inspection, Begin Using System

6.3 COST ESTIMATES FOR SELECTED PLAN

Exhibit 5.15 and 5.19 found in Appendix F contains a cost estimate of the selected plan including collection, treatment, engineering and other costs necessary to realize the plan.

The current guidelines of the Water Quality Board for the target yearly user fees for wastewater is no more than 1.4% of the median adjusted gross income (MAGI). The most recently available MAGI for Huntsville is from 2009 and equals $49,892; this gives a target yearly fee of no more than $698.49 and a monthly user fee of $58.21 per month per equivalent residential connection.

CAPITAL FINANCING PLAN

The Capital Financing Plan for the selected alternative must estimate projected costs and demonstrate that the proposed funding mechanisms are able to provide adequate funding to complete the project. Appendix E shows the estimated project costs and the proposed funding package to provide for those costs. The project is estimated to require approximately $14,161,000 dollars to complete. The participation of Water Quality grants and loans is projected to provide for these costs.

To assure that the community can operate a viable wastewater utility for the next 20-years, a 20 year Cash Flow projection for the system has been provided in Appendix E. This spreadsheet demonstrates that while charging the projected sewer rates, the community will be able to meet the obligations of all loan payments while maintaining the system and providing for other incidental costs.

6.4 ENERGY REQUIREMENTS OF SELECTED PLAN

The selected plan is designed to conserve where possible. One of the major benefits of the SBR/Fluidyne plant is the fact that it uses minimal energy resources during the treatment process, where all of the treatment processes are completed in a single tank. All proposed trunk lines will be gravity with a few lift stations required. The energy requirements for this system will be met by Huntsville and the County. Energy will also be used in constructing the system in the form of fuel for equipment, but energy consumption for construction equipment ends when construction is completed.

6.5 ENVIRONMENTAL IMPACTS OF SELECTED PLAN

An environmental information package is included in this plan in Section 2. No significant detrimental environmental impacts are associated with this project. However, a 404 permit for a portion of lines through some wetlands will be required from the U.S. Army Corp. of Engineers as described in Section 2.

UNAVOIDABLE ADVERSE IMPACTS

This project will not have foreseeable unavoidable adverse impacts.

IRRETRIEVABLE RESOURCE COMMITMENT

The rights-of-way for the pipelines can be considered irretrievable resource commitments. Since the pipeline will be aligned along fence lines and existing road rights-of-way as much as possible, this impact will be negligible. Where collector or interceptor piping crosses farmland, it will be deep enough that farming operations can continue unaffected. No other significant effects in this area are anticipated by this project.

6.6 ARRANGEMENTS FOR IMPLEMENTATION

6.6.1 FUNDING AGENCIES

The proposed project can only happen with cooperation and assistance among various agencies. The project is greatly enhanced if grants and low interest loans are received from the Utah Water Quality Board and/or the USDA Rural Development.

Utah Water Quality Board (UWQB)
US Department of Agriculture/Rural Development (USDA RD)

It is anticipated the Division of Water Quality (DWQ) will fund the design and construction of the proposed project.

6.6.2 ELECTIONS

The portion of the financing plan that is a loan can be either a voted or non-voted revenue bond. In either case, services from a bond attorney will be acquired to meet the bonding requirements after funding commitments are complete. If the community selects a voted bond, the election will take place before detail design begins or loan closing takes place.

6.6.3 SEWER USE ORDINANCE, USER CHARGE SYSTEM, AND IMPACT FEES

Prior to loan closing for the DEQ construction loan for this project, should the community elect to act implement an alternative, a sewer district would need to be created, and they must create and adopt a Sewer Use Ordinance (SUO) and a User Charge System (UCS). The SUO and UCS must be approved by the Utah Department of Water Quality before being adopted by the sewer district. The sewer district will have great flexibility in how the SUO and UCS is structured as long as the average monthly user fee for the community is 1.4% of the MAGI, which is $58.21 per month.

6.6.4 OTHER PERMITS AND REQUIREMENTS

The U.S. Army Corps of Engineers (ACOE) has jurisdiction over protection of wetlands. The project is expected to impact some wetlands for the trunk lines and a "404" Permit from the ACE will be required. Since it appears that the recommended alternative will require that a pipeline pass through wetlands, a permit will be required. It is anticipated that there will not be problems obtaining this permit from the ACOE for the project. (See Section 2.3).

The DWQ is the responsible agency charged with determining that a wastewater project is ready for construction and will issue the actual construction permit to build the project. The community must also apply for and obtain any other local permits required for implementation of this project, for example, UDOT, etc.

6.6.5 TREATMENT SPECIAL SERVICE DISTRICT

The implementation of this plan will require Huntsville and the County to work together to form a treatment special service district. It is proposed that representation for the district be given in the amount or percentage of the plant paid for by that corresponding community.

6.6.6 CIVIL RIGHTS COMPLIANCE

Huntsville complies with the requirements in the Civil Rights Act of 1964. Required certification will be obtained for EPA EEO compliance, fair labor compliance, and all other applicable regulations as required.

6.6.7 OPERATION AND MAINTENANCE (O&M) REQUIREMENTS

Operation and Maintenance costs have been included in the cost effectiveness analysis and summarized in Appendix H. The O&M costs along with debt service constitute the basis for required user fees. These expenses should be monitored each year and adjustments in the user fees made accordingly.

Operation and Maintenance of the treatment plant will be dealt with more thoroughly as the project progresses. A detailed plan of operation which includes O&M requirements is part of the Project. During construction of the project, a Plan of Operation and an Operation and Maintenance Manual will be completed with detailed instructions for operators of the facilities.

6.6.8 PRE-TREATMENT PROGRAM

It is recommended that once a sewer district is formed, they develop a general basis for a pretreatment program now for inclusion in the Sewer Use Ordinance. This will ensure that when the appropriate pretreatment program is needed, only site specific requirements must be added. The purpose of a pretreatment program is to prevent the introduction into the treatment facilities of pollutants that interfere with the proper operation of the treatment processes. The costs of pretreatment of wastewater will be the responsibility of business owner or developer.

6.7 LAND ACQUISITION

The implementation of Treatment Alternative #3a, (Regional Mechanical SBR/Fluidyne Treatment Plant), will require purchase of the site for the treatment plant and rights-of way for the trunk lines that are not in existing streets or right-of-ways. All other improvements needed for the project will be constructed in right-of-ways or easements publicly owned.

APPENDIX A

SOIL SURVEY
&
SEPTIC TANK DENSITY
STUDY

This soil is important for water supply. Any recreational development or cabin site should be carefully planned and its impact on the environment and water supply fully evaluated. Careful management of the timber resource and understory vegetation is necessary to keep soil losses to a minimum, thus maintaining the watershed potential. Adequate provisions must be made to safeguard the trees from harmful insects and fire.

Recreational use of this soil is mainly hunting. Capability unit VIIe-H, nonirrigated.

Cb—Canburn silt loam. This Canburn soil is very deep and poorly drained. It occurs on nearly level, concave flood plains and valley bottoms at elevations of 4,800 to 6,200 feet. The slopes are 0 to 1 percent and are medium or long in length. This soil formed in alluvium weathered from mixed quartzite, sandstone, and limestone. The average annual precipitation is about 18 inches, mean annual air temperature is about 45 degrees F, and the frost-free season is about 90 days.

Included with this soil in mapping are small areas of Eastcan loam, 0 to 3 percent slopes, Sunset loam, very gravelly substratum, Pringle loam, Crooked Creek silty clay loam, and Cumulic Haploborolls.

In a typical profile, the surface layer is very dark brown silt loam about 21 inches thick. The underlying layer is dark brown silt loam to a depth of 48 inches. Below this it is black silt loam to a depth of 60 inches or more. This soil is moderately calcareous and moderately alkaline. Some pedons are highly stratified silt loam, loam, very fine sandy loam, or clay loam in the underlying layers. Mottles are common in the lower part of the surface layer and in the underlying layers. Depth to the seasonal high water table ranges from 0.5 to 1.5 feet unless this soil is drained. Surface flooding from nearby streams frequently occurs in the late winter and spring during periods of rapid snowmelt.

Permeability is moderately slow. Effective rooting depth is mainly above the water table, generally 1 to 2 feet, but some roots extend to a depth of 60 inches or more. The available water capacity is high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for pasture and grass hay.

If drained, this soil is suitable for irrigated alfalfa and small grain. Drainage is usually difficult due to lack of a drainage outlets. Improved species such as Garrison meadow foxtail, reed canarygrass, and red clover are recommended to increase forage production. Pasture should be properly grazed and fertilized to keep plants vigorous and healthy. Generally, legumes respond readily to phosphate, and grasses respond to nitrogen fertilizer. Border irrigation is desirable in some areas to supplement available water during the late summer to maintain high yields of pasture.

This soil has good potential for growing plants that provide food and cover for muskrats, mallard, and teal ducks. Such species as Russian-olive, reed canarygrass, and tall wheatgrass planted along fence rows and ditchbanks and in odd corners provide food and cover and improve wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather. Food plants provide some of the needed cover.

This soil has low potential for urban or recreational developments because of shallow depth to the water table and the hazard of flooding.

Recreational use is mainly hunting. Capability unit IVw-3, irrigated.

CdG—Causey silt loam, 30 to 60 percent slopes. This Causey soil is deep or very deep and well drained. It occurs on very steep, dominantly south- and west-facing foothills at elevations of 5,200 to 6,500 feet. The slopes are short in length. This soil formed in materials weathered from tuffaceous siltstone. The average annual precipitation is about 18 inches, mean annual air temperature is about 44 degrees F, and the average frost-free season is about 90 days.

Included with this soil in mapping are small areas of Hawkins silty clay, 15 to 30 percent slopes; Choptie silt loam, 30 to 60 percent slopes; Ostler loam, 20 to 50 percent slopes; and some Rock outcrop.

In a typical profile, the surface layer is very dark brown or very dark grayish brown silt loam, about 19 inches thick. The underlying layer is dark grayish brown or pale brown loam to a depth of 40 inches. Below this it is pale brown gravelly or very gravelly loam to a depth of 60 inches. Depth to the layer of strong lime accumulation is 8 to 19 inches. Rock fragment content is 40 to 75 percent below a depth of about 40 inches.

Permeability is moderate. Effective rooting depth is 48 to more than 60 inches. The available water capacity is moderately high. Surface runoff is slow or medium. Erosion hazard is high.

This soil is used for range, water supply, and wildlife habitat.

Potential vegetation is dominantly bluebunch wheatgrass, basin wildrye, bearded wheatgrass, muttongrass, antelope bitterbrush, and some mountain snowberry. When changes occur in the composition of potential vegetation due to grazing by livestock or wildlife or any other disturbances, certain plants decrease and other plants increase. Certain forbs, weeds, and shrubs can be managed through proper grazing, spraying, and other treatments if a reasonable understory of desired plants is present. Where severe range deterioration has occured on slopes of 30 to 40 percent, range seeding is advisable. Species suitable for seeding include smooth brome, Regar brome, mountain brome, slender wheatgrass, orchardgrass, and meadow foxtail.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during fall, winter, and spring. It also is a potential habitat for sage grouse, chukar, ruffed grouse, blue grouse, coyote, bobcat, weasel, and badger.

This soil is important for water supply, but adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

This soil has limited potential for homesites because of steep slopes and inaccessibility.

is dark brown gravelly clay loam about 15 inches thick. Fractured quartzite is at a depth of about 25 inches. The depth to bedrock ranges from 20 to 32 inches. This soil is strongly acid or medium acid. Rock fragment content is about 40 percent in the surface layer and about 45 percent in the subsoil.

Permeability is moderately slow above the bedrock. Effective rooting depth is restricted by bedrock at a depth of 20 to 32 inches. The available water capacity is low. Surface runoff is medium. Erosion hazard is high.

This soil is used for range, water supply, and wildlife habitat.

Potential vegetation is bluebunch wheatgrass, oniongrass, antelope bitterbrush, big sagebrush, Idaho fescue, prairie junegrass, and some arrowleaf balsamroot and birchleaf mountainmahogany. When changes occur in the composition of the potential vegetation due to use by livestock or wildlife or other disturbances, certain plants decrease and other plants increase. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition. Where brush species increase and dominate the vegetation and an understory of desirable grasses and forbs is present, brush management is practical.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during winter and spring. It also is potential habitat for sage grouse, chukar, sharp-tailed grouse, mourning dove, cottontail rabbit, coyote, bobcat, weasel, badger, jackrabbit, and porcupine.

Inaccessibility, steep slopes, concentration of rock fragments, and moderate depth to bedrock are features that limit the potential of this soil for urban developments. Septic tank absorption fields will develop problems in many areas because of the moderately slow permeability, moderate soil depth, and steep slopes.

This soil is important for water supply, but adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of this soil is mainly hunting. Capability unit VIIs-M, nonirrigated.

EaA—Eastcan loam, 0 to 3 percent slopes. This Eastcan soil is very deep and moderately well drained. It occurs on nearly level and gently sloping flood plains, valley bottoms, and stream terraces at elevations of 4,800 to 5,150 feet. This soil formed in alluvium weathered from sandstone, quartzite, and limestone. The slopes are medium or long in length. The average annual precipitation is about 18 inches, mean annual air temperature is about 45 degrees F, and the frost-free season is about 105 days.

Included with this soil in mapping are small areas of Sunset loam, very gravelly substratum, Pringle loam, Canburn silt loam, Redola loam, 0 to 2 percent slopes, Nebeker clay loam, 0 to 3 percent slopes, Parleys loam, high rainfall, 0 to 3 percent slopes, Hawkins silty clay, 3 to 6 percent slopes, and soils that are very gravelly sandy loam or very gravelly loamy fine sand below a depth of 40 inches.

In a typical profile, the surface layer is very dark brown loam or silt loam about 28 inches thick. The underlying layer is dark brown silt loam to depth of 60 inches or more. This soil is moderately calcareous and mildly alkaline in the surface layer and moderately alkaline in the underlying layer. It is dominantly loam, silt loam, or light clay loam stratified with fine sandy loam, clay loam, or silty clay loam. Faint mottles occur at a depth of about 28 inches. The depth to the seasonal high water table ranges from 25 to 36 inches. Surface flooding from nearby streams is rare and occurs during the spring periods of rapid snowmelt.

Permeability is moderate. Intake rate is moderate. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated crops. Hay, pasture, corn for silage, and small grains are the dominant crops.

A suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Fall plowing, crop residue use, weed control, and tillage help control erosion and maintain or improve crop production. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally, all crops respond to nitrogen fertilizers, and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop. Sprinkler irrigation is well suited to most crops. The furrow and corrugation methods are well suited to row crops. Border irrigation is used on alfalfa, small grains, and pasture. Land leveling is necessary in some areas to obtain an even distribution of irrigation water. Irrigation applications, length of runs, and intervals need to be adjusted to the water intake rate and available water capacity of the soil and to crop needs. Stream size should not cause soil movement in furrows, corrugations, and borders. Length of runs should be adjusted so that water reaches the end of field without overirrigating the upper portion. These practices help control erosion and reduce leaching of plant nutrients. Pipe, ditch lining, or drop structures should be used to help prevent excessive ditch erosion.

This soil has potential for providing food and cover for Hungarian partridge, mourning dove, chukar, ring-necked pheasant, cottontail rabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye can be planted along fence rows and ditchbanks and in odd corners to help improve wildlife habitats. Food should be close to cover that will protect the birds from predators and inclement weather.

This soil has good potential for homesites and other types of urban development and is being rapidly converted to this use. The depth to the water table, low load supporting strength, and susceptibility to frost action are features that limit use for urban or recreational developments. Grasses, shrubs, and trees for beautification grow well in this soil. Septic tank absorption fields will develop problems in some areas because of surface water flooding, or flooding from nearby streams. Contamination of ground water is a hazard where cesspools are used.

Recreational uses of this soil are mainly hunting and snowmobiling. A small area in Morgan County is being used for a golf course and recreation complex development. Capability unit IIc-2, irrigated.

EcA—Eastcan loam, cool, 0 to 3 percent slopes. This Eastcan soil is very deep and moderately well drained. It occurs on nearly level and gently sloping flood plains, valley bottoms, and stream terraces at elevations of 5,150 to 5,800 feet. This soil formed in alluvium from weathered quartzite, sandstone, and limestone. The slopes are short or medium in length. The average annual precipitation is about 18 inches, mean annual air temperature is about 43 degrees F, and the average frost-free season is about 90 days.

Included with this soil in mapping are small areas of Utaba cobbly loam, Pringle loam, Canburn silt loam, and Broadhead clay loam, 2 to 5 percent slopes.

In a typical profile, the surface layer is very dark grayish brown loam in the upper part and light clay loam in the lower part and is about 29 inches thick. The underlying layer is dark yellowish brown or dark brown stratified clay loam or sandy loam. This soil is moderately calcareous and strongly alkaline. Rock fragment content is about 2 percent in the surface layer and underlying layer. Commonly, mottles occur below a depth of about 19 inches. The depth to the seasonal high water table varies from about 25 to 36 inches. This soil is dominantly loam, silt loam, or clay loam stratified with fine sandy loam, clay loam, or silty clay loam. Surface flooding from nearby streams is rare and occurs in late winter or early spring during periods of rapid snowmelt.

Permeability is moderate. Intake rate is moderate. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated crops. Hay, pasture, and small grains are the dominant crops.

A suitable crop rotation is 6 to 8 years of alfalfa or pasture and 2 to 3 years of small grains. Fall plowing, crop residue use, weed control, and minimum tillage are practices that help control erosion and maintain or improve crop production. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally, all crops respond to nitrogen fertilizers, and legumes respond readily to phosphate fertilizer. Border, corrugation, and sprinkler irrigation methods are suitable for this soil. The method is generally governed by the crop. Sprinkler irrigation is well suited to most crops. Corrugation and border methods are suited to alfalfa, small grains, and pasture. Land leveling is necessary in some areas to obtain an even distribution of irrigation water. Irrigation applications, length of runs, and irrigation intervals should be adjusted to the water intake rate and available water capacity and to the crop needs. Irrigation streams should not cause soil movement in furrows, corrugations, or borders. Length of runs should be adjusted so that water reaches the end of the field without overirrigating the upper portion. These practices will help control erosion and leaching of plant nutrients. Irrigation ditch laterals that are subject to erosion should be protected by ditch lining, pipe, or drop structures.

This soil has potential for providing food and cover for Hungarian partridge, mourning dove, chukar, cottontail rabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye can be planted along fence rows and ditchbanks and in odd corners to improve wildlife habitat. These plants provide shelter and protect the birds from predators and inclement weather and should be close to the food supply.

The depth to the water table, low load supporting strength, and susceptibility to frost action are features that limit the use of this soil for urban or recreational developments. Grasses, shrubs, and trees for beautification grow well in this soil. Careful selection of species is necessary. Septic tank absorption field problems will develop in some areas because of surface flooding from nearby streams. Contamination of ground water is a hazard where cesspools are used.

Recreational uses of this soil are mainly hunting and snowmobiling. Capability unit IIIc-3, irrigated.

EdC—Eastcan variant loam, 6 to 10 percent slopes. This Eastcan variant soil is very deep and well drained. It occurs on strongly sloping alluvial fans and mountain foot slopes at elevations of 4,900 to 5,200 feet. This soil formed in alluvium weathered from quartzite, sandstone, and limestone. The slopes are short or medium in length. The average annual precipitation is about 18 inches, mean annual air temperature is about 46 degrees F, and the average frost free season is about 105 days.

Included with this soil in mapping are small areas of Nebeker clay loam, 0 to 3 percent slopes, Parleys loam, high rainfall, 0 to 3 percent slopes, and a very deep, well drained, very gravelly soil that has slopes of 3 to 15 percent.

In a typical profile, the surface layer is very dark brown loam in the upper part and gravelly loam or gravelly clay loam in the lower part and is about 16 inches thick. The underlying layer is very dark brown, very dark grayish brown, or dark grayish brown gravelly clay loam or gravelly sandy clay loam to a depth of 60 inches or more. This soil is slightly calcareous and mildly alkaline except the lower part, which is moderately alkaline and moderately calcareous. Rock fragment content is about 10 percent in the upper part of the surface layer, 45 percent in the lower part of the surface layer, and 35 percent in the underlying layer. This soil is highly stratified in texture and ranges from clay loam to sandy loam.

Permeability is moderately slow. Intake rate is moderate. Effective rooting depth is 60 inches or more.

the rate of runoff and reduce soil erosion during periods of rapid snowmelt.

This soil has potential for supporting plants that provide food and cover for Hungarian partridge, mourning dove, chukar, cottontail rabbit, some ringneck pheasant, and porcupine. Such plants as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the cover and habitat for wildlife. Food should be close to shelter that protects the birds from predators and inclement weather.

Some areas of this soil are used for homesites and other urban developments. The limited ability to support a load and the high shrink-swell potential are soil features that limit use for urban or recreational developments. Dwellings and roads can be designed to offset these soil limitations. Septic tank absorption field problems will develop in some areas because of slow permeability.

Recreational uses of this soil are mainly snowmobiling and hunting. Capability unit IIIe-3, irrigated, and IIIe-M, nonirrigated.

HbD—Hawkins silty clay, 6 to 15 percent slopes. This strongly sloping Hawkins soil is very deep and well drained. It occurs on all aspects in concave and convex areas on rolling hills, foothills, and alluvial fans. Slopes are short and medium. Elevation ranges from 5,150 to 6,600 feet. This soil formed in materials weathered mostly from tuffaceous sandstone. The average annual precipitation is about 22 inches, mean annual air temperature is about 45 degrees F, and the average frost-free season is about 90 days.

Included with this soil in mapping are small areas of Hawkins silty clay, 15 to 30 percent slopes, Manila loam, 10 to 25 percent slopes, and Yeates Hollow cobbly loam, 6 to 10 percent slopes. Also included are areas of soils that have a cobbly or very cobbly loam surface layer.

In a typical profile, the surface layer is very dark grayish brown silty clay about 8 inches thick. The subsoil is dark brown clay about 23 inches thick. The substratum is yellowish brown clay, clay loam, or loam to a depth of 60 inches or more. The surface layer and subsoil are slightly acid. The substratum is moderately or strongly calcareous and mildly alkaline. This soil has a high shrink-swell potential. The surface layer is mixed with the underlying layers to a depth of about 41 inches.

Permeability is slow. Effective rooting depth is 60 inches or more. The available water capacity is high or moderately high. Surface runoff is medium. Erosion hazard is high.

This soil is used for nonirrigated crops, range, water supply, and wildlife habitat. When this soil is used for nonirrigated crops, winter wheat and spring barley are the principal crops.

Soil erosion on nonirrigated cropland is a hazard because of the strongly sloping and moderately steep slopes. When cultivated, this soil should be in permanent cover about 75 percent of the time. Alfalfa and intermediate wheatgrass are suitable species for hay and pasture. Nitrogen and phosphate fertilizers should be applied to meet plant needs. Applications should be in agreement with the latest state experiment station recommendations. Soil erosion on cultivated areas can be reduced if fall grain is seeded early and stubble mulch-tillage is used. Terraces, diversions, and grassed waterways should be installed if needed to help control soil erosion. Drop structures are needed in a few places to stabilize the flow of runoff in waterways. All tillage practices should be either on the contour or across the slope. Such practices help slow down the rate of runoff and reduce soil erosion during periods of rapid snowmelt.

Potential vegetation is dominantly bluebunch wheatgrass, prairie junegrass, Idaho fescue, slender wheatgrass, Letterman needlegrass, and some lupine and antelope bitterbrush. When changes occur in the composition of the potential vegetation due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Brush management is practical in areas with excessive shrubs and a reasonable understory of desirable grasses or forbs. Proper grazing is an important management practice in helping to maintain adequate plant cover and in obtaining the desired composition.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during the spring, fall, and summer. It also is potential habitat for chukar, sharp-tailed grouse, cottontail and jackrabbit, coyote, bobcat, weasel, badger, porcupine, and red fox.

This soil has potential for urban and recreational developments. Dwellings and roads can be designed to offset the high shrink-swell potential and limited ability to support a load. Care should be taken in disturbing the soil on the steep slopes because of the susceptibility to hillside slippage. Septic tank absorption field problems will develop in places because of slow permeability. Vegetative slip scars and deep active gullies occur throughout areas of this soil.

Recreational use is mainly hunting and snowmobiling. Capability unit IVe-M, nonirrigated.

HbE—Hawkins silty clay, 15 to 30 percent slopes. This Hawkins soil is very deep and well drained. It occurs on concave to convex, moderately steep and steep rolling hills, foothills, and alluvial fans on all aspects. Elevation ranges from 5,200 to 6,000 feet. The slopes are short or medium in length. This soil formed in materials weathered mostly from tuffaceous sandstone. The average annual precipitation is about 22 inches, mean annual air temperature is about 45 degrees F, and the average frost-free season is about 85 days.

Included with this soil in mapping are small areas of Hawkins silty clay, 6 to 15 percent slopes, Ostler loam, 20 to 50 percent slopes, Causey silt loam, 30 to 60 percent slopes, Choptie silt loam, 30 to 60 percent slopes, and soils with a cobbly or very cobbly loam surface layer.

In a typical profile, the surface layer is very dark grayish brown silty clay about 2 inches thick. The subsoil is very dark grayish brown or dark grayish brown silty clay about 36 inches thick. The substratum is brown or grayish brown clay loam to a depth of 74 inches or more. The surface layer and subsoil are slightly acid. The substratum is moderately calcareous and moderately or strongly alkaline. This soil has a high shrink-swell potential. The surface layer is mixed with the underlying layers to a depth of about 38 inches.

Permeability is slow. Effective rooting depth is 60 inches or more. The available water capacity is high or moderately high. Surface runoff is medium. Erosion hazard is high.

This soil is used mainly for range, watershed, and wildlife habitat.

Potential vegetation is dominantly slender wheatgrass, Letterman needlegrass, bluebunch wheatgrass, prairie junegrass, Idaho fescue, and some Columbia needlegrass, lupine, and antelope bitterbrush. When changes occur in the composition of the potential vegetation due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and in obtaining the desired composition. Brush management is practical in areas of excessive brush with a reasonable understory of desirable grasses or forbs.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during the spring, fall, and summer. It also is potential habitat for chukar, sharp-tailed grouse, cottontail and jackrabbit, coyote, bobcat, weasel, badger, porcupine, and red fox. Streams in the area are potential habitat for beaver.

This soil has potential for urban and recreational developments. Dwellings and roads should be designed to offset the high shrink-swell potential and the limited ability to support a load. High shrink-swell potential can cause damage to buildings and road foundations. Care should be taken in disturbing the soil on the steep slopes because of the susceptibility to hillside slippage. Septic tank absorption field problems will develop in some areas because of slow permeability. Vegetative slip scars and deep active gullies occur throughout this soil.

Recreational uses of this soil are mainly hunting, snowmobiling, and camping. Capability unit VIe-M, nonirrigated.

HcE—Hawkins-Collinston complex, 6 to 30 percent slopes. This complex of Hawkins and Collinston soils occurs generally on rolling hills and foothills at elevations of 5,000 to 5,150 feet. The Hawkins silty clay, 6 to 15 percent slopes makes up about 50 percent of the complex. It occurs dominantly on north- and east-facing, concave, medium and long, strongly sloping and moderately steep side slopes. The Collinston silt loam, 15 to 30 percent slopes makes up about 40 percent of the complex. It occurs dominantly on the south- and west-facing, moderately steep and steep, convex ridges and knolls.

Included with this complex in mapping are small areas of Hawkins silty clay, 15 to 30 percent slopes, Choptie silt loam, 30 to 60 percent slopes, and Causey silt loam, 30 to 60 percent slopes.

Both Hawkins and Collinston soils are very deep and well drained. They formed in materials weathered from tuffaceous sandstone and tuffaceous siltstone. The average annual precipitation is about 20 inches, mean annual air temperature is about 45 degrees F, and the average frost-free season is about 100 days.

In a typical profile of the Hawkins soil, the surface layer is very dark brown silty clay about 13 inches thick. The subsoil and substratum are brown heavy silty clay loam to a depth of 60 inches or more. This soil is slightly acid. It has a high shrink-swell potential. The surface layer has been mixed with the subsoil to a depth of about 48 inches.

Permeability is slow. Effective rooting depth is 60 inches or more. The available water capacity is high or moderately high. Surface runoff is medium. Erosion hazard is high.

In a typical profile of the Collinston soil, the surface layer is very dark grayish brown silt loam about 9 inches thick. The underlying layer is pale olive or light gray silty clay loam or silt loam to a depth of 60 inches or more. This soil is strongly calcareous and moderately or strongly alkaline throughout.

Permeability is moderate. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is medium. Erosion hazard is high.

The soils are used for nonirrigated crops. Principal crops are winter wheat and spring barley.

Soil erosion is a serious problem and these soils should be planted to permanent cover. Species suitable for seeding are intermediate wheatgrass, Regar brome, smooth brome, orchardgrass, and alfalfa. Proper grazing is an important management practice in maintaining adequate plant cover. Fertilizer should be applied to meet plant needs and should be in agreement with the latest State experiment station recommendations. Alfalfa responds readily to phosphate fertilizer.

These soils have potential for supporting plants that provide food and cover for mule deer, primarily during the spring. They also are potential habitat for chukar, sharp-tailed grouse, cottontail and jackrabbit, coyote, bobcat, weasel, badger, and porcupine.

Some areas of this complex are being used for homesites. The Hawkins soil has high shrink-swell potential and limited ability to support a load. Dwellings and roads can be designed to offset these soil features. Care should be taken in disturbing the Hawkins soil on the steep slopes because of susceptibility to hillside slippage. Septic tank absorption fields on the Hawkins soil will develop problems in some areas because of slow permeability.

Recreational uses of these soils are mainly hunting and snowmobiling. Capability unit VIe-M, nonirrigated.

HeD—Henefer loam, 6 to 15 percent slopes. This Henefer soil is very deep and well drained. It occurs on alluvial fans, foothills, and stream terraces at elevations of 5,400 to 6,600 feet. This soil formed in alluvium mostly weathered from a conglomerate of sandstone and

Permeability is moderate above the bedrock. Effective rooting depth is 23 to 32 inches. The available water capacity is low. Surface runoff is medium. Erosion hazard is high.

The Rock outcrop is interspersed throughout the complex. It consists of bare fractured argillite, phyllite, schist, gneiss, and quartzite on very steep mountainsides and canyon walls. It is more than 90 percent barren, but may support sparse amounts of tufted hairgrass, blue wildrye, curlleaf mountainmahogany, or Douglas-fir in pockets and cracks.

Rock outcrop areas have esthetic value and are used with the Nagitsy and Patio soils for wildlife habitat.

This association is used mainly for range, water supply, and wildlife habitat.

Potential vegetation for the Nagitsy soil is slender wheatgrass, bearded wheatgrass, blue wildrye, tufted hairgrass, aster, bluebell, geranium, Louisiana sagewort, and some chokecherry, mountain snowberry, silver sagebrush, and low sagebrush. The potential vegetation for the Patio soil is bluebunch wheatgrass, oniongrass, Idaho fescue, prairie junegrass, antelope bitterbrush, big sagebrush, and some arrowleaf balsamroot, birchleaf mountainmahogany, mountain snowberry, and Gambel oak. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition.

The soils in this association have potential for supporting plants that provide food and cover for mule deer, primarily during the spring, summer, and fall. They also are potential habitat for ruffed grouse, blue grouse, snowshoe hare, cottontail rabbit, porcupine, red fox, coyote, bobcat, weasel, and badger.

Inaccessibility, very steep slopes, depth to bedrock, and rock fragment content on the soil surface and in the soil are features that limit the use of the soils in this association for urban or recreational developments.

The soils in this association are important for watershed. Adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of these soils is mainly hunting. Not placed in a capabiity unit (all in National Forest).

NrA—Nebeker clay loam, 0 to 3 percent slopes. This Nebeker soil is very deep and well drained. It occurs on nearly level and gently rolling terraces at elevations of 4,900 to 5,150 feet. The slopes are short, medium, and long in length. This soil formed in mixed lake sediments. The average annual precipitation is about 18 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Nebeker clay loam, 3 to 6 percent slopes, Hawkins silty clay, 3 to 6 percent slopes, Parleys loam, high rainfall, 0 to 3 percent slopes, and Eastcan variant loam, 6 to 10 percent slopes.

In a typical profile, the surface layer is very dark brown clay loam about 20 inches thick. The subsoil is dark reddish brown or reddish brown clay in the upper part and yellowish red, sandy clay loam or clay loam to a depth of 69 inches or more. The surface layer and the upper part of the subsoil are slightly acid, and the lower part of the subsoil is moderately calcareous and moderately alkaline.

Permeability is slow. Intake rate is moderate. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated crops. Principal crops grown are alfalfa, pasture, corn for silage, and small grains.

A suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Fall plowing, crop residue use, weed control, and minimum tillage are practices that help reduce erosion and maintain favorable tilth and water intake rate. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizer and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop. Sprinkler irrigation is well suited to most crops. The furrow and corrugation methods are well suited to row crops. Border irrigation is used on alfalfa, small grains, and pasture. Land leveling is necessary in some areas to obtain an even distribution of irrigation water. Irrigation applications and intervals should be adjusted to crop needs and the available water capacity and water intake rate. Stream sizes should not cause soil movement in furrows, corrugations, and borders. The length of irrigation runs should be adjusted so that water reaches the end of the field without overirrigating the upper part. These irrigation practices help control soil erosion and excessive leaching of plant nutrients. Pipes, ditch lining, or drop structures should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion.

This soil has potential for supporting plants that provide food and cover for Hungarian partridge, mourning dove, chukar, cottontail and jackrabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

This soil is used for homesites. Slow permeability, clay loam surface layer, clay subsoil, and limited ability to support a load are the soil features that limit the use of this soil for homesites. Dwellings and roads can be designed and modified to offset the limited ability to support a load. Climatically adapted grasses, shrubs, and trees for beautification grow well on Nebeker soils.

Septic tank absorption field problems are likely to develop because of the slow permeability of this soil. Contamination of the ground water supply is a hazard where cesspools are installed.

Recreational use of this soil is mainly snowmobiling. Capability unit IIe-2, irrigated.

NrB—Nebeker clay loam, 3 to 6 percent slopes. This Nebeker soil is very deep and well drained. It occurs on sloping terraces and alluvial fans at elevations of 4,950 to 5,150 feet. The slopes are short, medium, and long in length. This soil formed in alluvium or lake sediments. The average annual precipitation is about 18 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Nebeker clay loam, 0 to 3 percent slopes, Eastcan variant loam, 6 to 10 percent slopes, and Eastcan loam, 0 to 3 percent slopes.

In a typical profile, the surface layer is very dark brown clay loam about 8 inches thick. The subsoil is very dark brown clay loam to a depth of 60 inches or more. This soil is slightly acid.

Permeability is slow. Intake rate is moderate. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated crops. Principal crops grown are alfalfa, pasture, corn for silage, and small grains.

A suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Fall plowing, crop residue use, weed control, and minimum tillage are practices that help control erosion and maintain favorable tilth and water intake rate. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizer and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop grown. Sprinkler irrigation is well suited to most crops. The furrow and corrugation methods are well suited to row crops. Border irrigation is adapted to alfalfa, small grains, and pasture. Regardless of the irrigation method used, water should be applied carefully to avoid soil erosion on the steeper slopes. Irrigation applications should be adjusted to crop needs and the available water capacity and water intake rate to prevent overirrigation and leaching of plant nutrients. Pipe, ditch lining, or drop structures should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion.

This soil has potential for supporting plants that provide food and cover for ring-necked pheasant, mourning dove, Hungarian partridge, cottontail and jackrabbit, mink, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelters that protect the birds from predators and inclement weather.

This soil is used for homesites. Slow permeability, clay loam surface layer, clay subsoil, and limited ability to support a load are soil features that limit its use for urban and recreational developments. Dwellings and road designs can be modified to offset the limited ability to support a load. Adapted grasses, shrubs, and trees for beautification grow well. Septic tank absorption fields develop problems because of slow permeability. Contamination of the ground water supply is a hazard when cesspools are used.

Recreational use of this soil is mainly snowmobiling. Capability unit IIe-2, irrigated.

NsA—Nicodemus gravelly loam, 0 to 3 percent slopes. This soil is very deep and moderately well drained. It occurs on nearly level and gently sloping flood plains or stream terraces at elevations of 4,900 to 5,350 feet. The slopes are long in length. This soil formed in alluvium weathered from argillite, phyllite, schist, and some quartzite. The average annual precipitation is about 20 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Trojan loam, warm, 0 to 3 percent slopes, Cumulic Haploborolls, wet, Fluvaquentic Haploborolls and Fluventic Haploxerolls, 1 to 6 percent slopes, and areas of cobbly or very cobbly loam soils.

In a typical profile, the surface layer is very dark grayish brown gravelly loam in the upper part and very dark grayish brown or dark brown gravelly or cobbly clay loam in the lower part and is about 22 inches thick. The underlying layer is very gravelly loamy sand to a depth of 60 inches or more. This soil is slightly acid. Rock fragment content is about 25 percent in the upper part of the surface layer, about 40 percent in the lower part, and about 70 percent in the underlying layer. Depth to the seasonal high water table ranges from 24 to 48 inches. Flooding from nearby streams during the spring is an occasional hazard.

Permeability is moderate in the surface layer and rapid in the underlying layers. Intake rate is rapid. Effective rooting depth is 60 inches or more. The available water capacity is moderately low. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated improved pasture, alfalfa, or small grains. Some small areas are used for range.

A suitable crop rotation is 6 to 8 years of alfalfa, and 2 to 3 years of small grains. Crop residue use, weed control, and minimum tillage are practices that help reduce erosion and maintain favorable tilth and water intake rate. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizer, and legumes respond readily to phosphate fertilizer. Border, corrugation, and sprinkler irrigation methods are suitable developments. Septic tank filter field problems develop in places because of moderately slow permeability in the Nordic soil and the moderate depth to bedrock in the Patio soil. Water supply pollution is a hazard when these soils are used for septic tank filter fields.

The soils in this association are important for water supply. Adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of these soils is mainly hunting. Not placed in a capability unit (all in National Forest).

OaG—Ostler loam, 20 to 50 percent slopes. This Ostler soil is very deep and well drained. It occurs on all aspects, but is dominantly on north- and east-facing, very steep foothills. The slopes are medium or long in length. Elevation ranges from 5,200 to 6,700 feet. This soil formed in materials weathered from tuffaceous sandstone and tuffaceous siltstone. The average annual precipitation is about 20 inches, mean annual air temperature is about 44 degrees F, and the frost-free season is about 85 days.

Included with this soil in mapping are small areas of Bertag silt loam, 30 to 50 percent slopes, Hawkins silty clay, 6 to 15 percent slopes, Hawkins silty clay, 15 to 30 percent slopes, and Causey silt loam, 30 to 60 percent slopes.

In a typical profile, the surface layer is black or very dark brown loam about 18 inches thick. The subsoil is dark brown and light olive brown clay or clay loam in the upper part and is dark yellowish brown sandy clay loam in the lower part and is about 31 inches thick. The substratum is light brownish gray clay loam to a depth of 60 inches or more. The surface layer is slightly acid and the subsoil and substratum are medium acid.

Permeability is slow. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is medium. Erosion hazard is high.

This soil is used mainly for range, water supply, and wildlife habitat.

Potential vegetation is dominantly Gambel oak, bluebunch wheatgrass, bearded wheatgrass, bigtooth maple, mountain snowberry, serviceberry, Utah snowberry, and some slender wheatgrass and western goldenrod. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Brush management is practical on areas with excessive shrubs if a reasonable understory of desirable grasses and forbs is present. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired vegetation composition.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during the spring, fall, and summer. It also is potential habitat for chukar, sharp-tailed grouse, cottontail and jackrabbit, coyote, bobcat, weasel, badger, porcupine, and red fox.

This soil has potential for urban and recreational developments. Steep and very steep slopes and limited ability to support a load are soil features that limit use for urban and recreational developments. Dwellings and roads can be designed to offset the limited ability to support a load. Care should be taken in disturbing the soil on the steep slopes because of the susceptibility to hillside slippage. Septic tank absorption field problems will develop in some areas because of slow permeability. Vegetated slip scars and deep active gullies occur throughout the delineated areas of this soil.

Recreational use of this soil is mainly hunting. Capability unit VIIe-M, nonirrigated.

OcG—Ostler-Causey complex, 20 to 60 percent slopes. This complex of Ostler and Causey soils occurs on very steep foothills at elevations of 5,200 to 6,500 feet. The Ostler loam, 20 to 50 percent slopes, makes up about 55 percent of the complex. It occurs dominantly on the north- and east-facing, concave, medium and long side slopes. The Causey silt loam, 30 to 60 percent slopes, makes up about 30 percent of the complex. It occurs dominantly on the south- and west-facing, convex, short side slopes.

Included with this complex in mapping are small areas of Hawkins silty clay, 6 to 15 percent slopes, Hawkins silty clay, 15 to 30 percent slopes, Choptie silt loam, 30 to 60 percent slopes, and Bertag silt loam, 30 to 50 percent slopes.

Both the Ostler and Causey soils are deep and well drained. They formed in materials weathered from tuffaceous sandstone and tuffaceous siltstones. The average annual precipitation is about 20 inches, mean annual air temperature is about 44 degrees F, and the frost-free season is about 90 days.

In a typical profile of the Ostler soil, the surface layer is very dark brown loam about 10 inches thick. The subsoil is dark brown or light olive brown silty clay about 38 inches thick. Weathered tuffaceous sandstone is at a depth of 48 inches. The depth to the sandstone ranges from 48 to more than 60 inches. The surface layer is slightly acid and the substratum is medium acid. Rock fragment content is about 40 percent soft gravel in the lower part of the subsoil.

Permeability is slow. Effective rooting depth is 48 to more than 60 inches. The available water capacity is high. Surface runoff is medium. Erosion hazard is high.

In a typical profile of the Causey soil, the surface layer is very dark brown or very dark grayish brown silt loam about 19 inches thick. The upper part of the underlying layer is dark grayish brown loam about 21 inches thick, and the lower part is pale brown gravelly loam or very gravelly loam to a depth of 63 inches or more. The surface layer is generally noncalcareous, but it is slightly or moderately calcareous in places. A layer of strong lime accumulation is in the underlying layer. Bedrock occurs at a depth of 48 to more than 60 inches.

Permeability is moderate. Effective rooting depth is 48 to more than 60 inches. The available water capacity is moderately high. Surface runoff is medium. Erosion hazard is high.

The Ostler and Causey soils are used for range, water supply, and wildlife habitat.

Potential vegetation for the Ostler soil is dominantly Gambel oak, bluebunch wheatgrass, bearded wheatgrass, bigtooth maple, serviceberry, Utah snowberry, mountain snowberry, and some slender wheatgrass and western goldenrod. The potential vegetation for the Causey soil is dominantly bluebunch wheatgrass, basin wildrye, bearded wheatgrass, muttongrass, and some arrowleaf balsamroot, antelope bitterbrush and mountain snowberry. When changes occur in the potential vegetation due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition. Brush management is practical in areas of excessive shrubs, if a reasonable understory of desirable grasses and forbs is present. If the range vegetation has seriously deteriorated, range seeding is practical on the Causey soil. Grasses suitable for seeding include smooth brome, Regar brome, mountain brome, slender wheatgrass, orchardgrass, or Garrison meadow foxtail.

These soils have potential for supporting plants that provide food and cover for mule deer, primarily during spring, summer, and fall. They also are potential habitat for sage grouse, chukar, sharp-tailed grouse, cottontail rabbit, coyote, bobcat, weasel, badger, porcupine, and red fox.

The Ostler soil has potential for urban and recreational developments. Dwellings and roads can be designed to offset the limited ability to support a load. Care should be taken when disturbing this soil on the steep slopes because of the susceptibility to hillside slippage. Septic tank absorption field problems develop in some places because of slow permeability. Vegetated slip scars and deep active gullies occur throughout this complex.

The very steep slope is the soil feature that limits the use of the Causey soil for urban or recreational developments.

Both soils are important for watershed. Adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of these soils is mainly hunting. Capability unit VIIe-M, nonirrigated.

ODG—Ostler-Bertag association, very steep. This association of Ostler and Bertag soils occurs dominantly on moderately steep or steep foothills and mountainsides at elevations of 5,200 to 7,600 feet. Ostler loam, 20 to 50 percent slopes, makes up about 50 percent of the association. It occurs on the medium and long, slightly convex, south- and west-facing side slopes under a cover of oak and grasses. The Bertag silt loam, 30 to 50 prcent slopes, makes up about 30 percent of the association. It occurs on medium and long, slightly concave, north- and east-facing side slopes under a cover of maple and grasses.

Included with these soils in mapping are small areas of Hawkins silty clay, 6 to 15 percent slopes, Hawkins silty clay, 15 to 30 percent slopes, and Causey silt loam, 30 to 60 percent slopes.

The Ostler and Bertag soils are very deep and well drained. They formed in materials weathered from tuffaceous sandstone and limestone. The average annual precipitation is about 24 inches. The mean annual air temperature is about 44 degrees F. The average frost-free season is about 80 days. The slopes are short or medium in length.

In a typical profile of the Ostler soil, the surface layer is black or very dark brown loam about 18 inches thick. The subsoil is dark brown or light olive brown clay or clay loam in the upper part, and dark yellowish brown sandy clay loam in the lower part and is about 31 inches thick. The substratum is light brownish gray clay loam to a depth of 60 inches or more. The surface layer is slightly acid and the subsoil and substratum are medium acid.

Permeability is slow. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is medium. Erosion hazard is high.

In a typical profile of the Bertag soil, the surface layer is black loam in the upper part and very dark brown clay loam in the lower part and is about 18 inches thick. The subsoil is dark brown or brown clay to a depth of 60 inches or more. This soil is slightly acid.

Permeability is slow. Effective rooting depth is 60 inches or more. The available water capacity is moderately high. Surface runoff is medium. Erosion hazard is high.

The soils in this association are used mainly for range, water supply, and wildlife habitat.

Potential vegetation for the Ostler soil is dominantly Gambel oak, bluebunch wheatgrass, bearded wheatgrass, bigtooth maple, mountain snowberry, serviceberry, Utah snowberry, and some slender wheatgrass and western goldenrod. Potential vegetation for the Bertag soil is dominantly bluebunch wheatgrass, bearded wheatgrass, basin wildrye, Gambel oak, slender wheatgrass, muttongrass, bigtooth maple, and mountain snowberry. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition.

These soils have potential for supporting plants that provide food and cover for mule deer, primarily during the spring, summer, and fall. They also are potential habitat for sage grouse, chukar, sharp-tailed grouse, cottontail and jackrabbit, coyote, bobcat, weasel, badger, porcupine, and red fox.

These soils have potential for cabin sites and other recreational developments. Dwellings and roads can be designed to offset the limited ability to support of a load. Care should be taken when disturbing the soil on steep slopes because of the susceptibility to hillside slippage. Vegetated slip scars and deep active gullies occur throughout this association. Septic tank absorption fields develop problems in some areas because of slow permeability and very steep slopes.

The soils in this association are important for watershed. Adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of this soil is mainly hunting. Not placed in a capability unit (all in National Forest).

PaA—Parleys loam, high rainfall, 0 to 3 percent slopes. This Parleys soil is very deep and well drained. It occurs on nearly level and gently sloping lake terraces, stream terraces, and alluvial fans at elevations of 4,900 to 5,150 feet. The slopes are short or medium in length. This soil formed in lake sediments or alluvium. The average annual precipitation is about 20 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Phoebe fine sandy loam, 0 to 3 percent slopes, Stoda loam, 10 to 25 percent slopes, Nebeker clay loam, 0 to 3 percent slopes, Parlo loam, 0 to 3 percent slopes, and Eastcan loam, 0 to 3 percent slopes.

In a typical profile, the surface layer is very dark grayish brown loam about 13 inches thick. The subsoil is very dark brown or dark brown silty clay loam or clay loam about 19 inches thick. The substratum is dark brown, brown, or strong brown silty clay loam or loam to a depth of 60 inches or more. The surface layer and subsoil are slightly acid. The substratum is moderately alkaline and strongly calcareous. There is a strong lime accumulation in the upper part of the substratum.

Permeability is moderately slow. Intake rate is moderate. Effective rooting depth is 60 inches or more. The available water capacity is moderately high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated and nonirrigated crops. Principal irrigated crops are alfalfa, pasture, corn for silage, and small grains.

A suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Fall plowing, crop residue use, weed control, and minimum tillage are practices that help to control erosion and maintain favorable tilth and water intake rate. Applications of commercial fertilizers are comonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizer and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop. Sprinkler irrigation is suited to most crops. The furrow and corrugation methods are suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture. Land leveling is necessary in places to obtain an even distribution of irrigation water. Irrigation applications should be adjusted to crop needs, available water capacity, and infiltration rate. Irrigation streams should not cause soil movement in furrows, corrugations, and borders. Length of irrigation runs should be adjusted so that water reaches the end of field without overirrigating the upper part. These practices help control erosion and excessive leaching of plant nutrients. Pipe, ditch lining, or irrigation drops should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion.

When used for nonirrigated crops, this soil can be used in a continuous cropping system. Winter wheat produces higher yields on this soil than spring wheat varieties. Some areas are planted to pubescent or intermediate wheatgrass and Ladak alfalfa for hay and pasture. This soil should be in alfalfa or pasture about 25 percent of the time to maintain soil tilth and water intake rate. Fertilizer applications should be in agreement with the crop needs, soil tests, and State experiment station recommendations. Soil erosion can be reduced if fall grain is seeded early and stubble mulch tillage is used. All tillage practices should be either on the contour or across the slope to slow the rate of runoff and reduce erosion during periods of rapid snowmelt or high rainfall intensity.

This soil has potential for supporting plants that provide food and cover for ring-necked pheasant, mourning dove, Hungarian partridge, cottontail and jackrabbit, skunk, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

Some areas of this soil are used for homesites. Dwellings and road designs can be modified to offset the limited ability to support a load. Climatically adapted grasses, shrubs, and trees for beautification grow well on this soil.

Septic tank absorption field problems will develop in some areas because of slow permeability. Contamination of the ground water supply is a hazard if cesspools are used.

Recreational use of this soil is mainly snowmobiling. Capability units IIc-2, irrigated, and IIc-M, nonirrigated.

PcA—Parlo loam, 0 to 3 percent slopes. This Parlo soil is very deep and well drained. It occurs on nearly level and gently sloping stream terraces at elevations of 5,000 to 5,100 feet. The slopes are long. This soil formed in alluvium from sandstone, quartzite, and limestone. The average annual precipitation is about 18 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Nebeker clay loam, 0 to 3 percent slopes, Eastcan loam, 0 to 3 percent slopes, Parleys loam, high rainfall, 0 to 3 percent slopes, and Steed loam, 0 to 1 percent slopes.

In a typical profile, the surface layer is very dark brown or dark brown loam about 19 inches thick. The subsoil is dark brown loam about 12 inches thick. The substratum is brown, reddish brown, or dark brown. The upper part is gravelly loam and the lower part is very gravelly loamy sand, very gravelly loamy fine sand, or very gravelly sand to a depth of 70 inches or more. The surface layer and subsoil are neutral. The substratum is moderately or strongly calcareous and moderately or mildly alkaline. A layer of strong lime accumulation is in the lower part of the subsoil or the upper part of the substratum. Rock fragment content is about 70 percent in the substratum.

Permeability is moderately slow. Intake rate is moderate. Effective rooting depth is 60 inches or more. The available water capacity is moderate. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for homesites and other urban and recreational developments. Some small areas are used for irrigated crops of small grains and alfalfa. Homesite gardens are common.

When this soil is used for irrigated crops, a suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Fall plowing, crop residue use, weed control, and minimum tillage are practices that help to reduce erosion and maintain favorable tilth and water intake rate. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally, all crops respond to nitrogen fertilizers and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop. Sprinkler irrigation is well suited to most crops. The furrow and corrugation methods are suitable for row crops. Border irrigation is adapted to alfalfa, small grains and pasture. Land leveling is needed in some places to obtain an even distribution of irrigation water. Irrigation applications should be in agreement with crop needs, available water capacity, and infiltration rate. Irrigation streams should not cause soil movement in furrows, corrugations, and borders. Length of runs should be adjusted so that water reaches the end of the field without overirrigating the upper part. These practices will help control erosion and leaching of plant nutrients. Pipe, ditch lining, or irrigation drops should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion.

This soil has potential for supporting plants that provide food and cover for Hungarian partridge, mourning dove, chukar, ring-necked pheasant, cottontail rabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

This soil is well suited for homesites and other urban and recreational developments. Climatically adapted grasses, shrubs, and trees for beautification grow well in this soil. Septic tank absorption field problems will develop in some areas because of moderately slow permeability. However, if tile lines are placed in the substratum septic tanks will work well, but the effluent is a pollution hazard to water supplies. Capability unit IIc-2, irrigated.

PdG—Patio gravelly loam, 40 to 60 percent slopes. This Patio soil is moderately deep and well drained. It occurs dominantly on south-, west-, and east-facing mountainsides. Elevations range from 5,200 to 7,000 feet. The slopes are short and medium in length. This soil formed in materials weathered from argillite, phyllite, and schist. The average annual precipitation is about 22 inches, mean annual air temperature is about 44 degrees F, and the frost-free season is about 85 days.

Included with this soil in mapping are small areas of Poleline stony loam, 40 to 70 percent slopes, Smarts loam, 40 to 60 percent slopes, Nordic gravelly loam, 30 to 60 percent slopes, and some Rock outcrop.

In a typical profile, the surface layer is very dark brown or dark brown gravelly loam about 13 inches thick. The subsoil is dark yellowish brown very gravelly clay loam about 13 inches thick. Fractured argillite and phyllite are at a depth of 26 inches. The depth to bedrock ranges from 23 to 32 inches. This soil is slightly acid. Rock fragment content is about 40 percent in the surface layer and 55 percent in the subsoil.

Permeability is moderate. Effective rooting depth is about 23 to 32 inches. The available water capacity is low. Surface runoff is slow or medium. Erosion hazard is high.

This soil is used for range, water supply, and wildlife habitat.

Potential vegetation is bluebunch wheatgrass, Idaho fescue, oniongrass, prairie junegrass, antelope bitterbrush, big sagebrush, and some arrowleaf balsamroot, mountain snowberry, and birchleaf mountainmahogany. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition. Brush management is practical in areas of excessive shrubs, if a reasonable understory of desirable grasses and forbs is present.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during winter and spring. It also is potential habitat for sage grouse, chukar, sharp-tailed grouse, mourning dove, cottontail rabbit, coyote, bobcat, weasel, badger, jackrabbit, and porcupine.

Inaccessibility, steep slopes, rock fragment content, and depth to bedrock are soil features that limit the potential of this soil for urban developments. Septic tank absorption field problems develop in some places because of steep slopes and depth to bedrock. Where septic tank absorption fields are close to streams, water supply pollution is a hazard.

This soil is important for watershed but adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of this soil is mainly hunting. Capability unit VIIs-M, nonirrigated.

PhA—Phoebe fine sandy loam, 0 to 3 percent slopes. This Phoebe soil is very deep and well drained. It occurs on nearly level terraces at elevations of about 5,000 feet. This soil formed in alluvium from sandstone, quartzite, and limestone. The slopes are long. The average annual precipitation is about 20 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Parleys loam, high rainfall, 0 to 3 percent slopes, Eastcan loam, 0 to 3 percent slopes, and areas of Phoebe fine sandy loam, 3 to 10 percent slopes.

In a typical profile, the surface layer is very dark brown fine sandy loam in the upper part and dark brown fine sandy loam in the lower part and is about 19 inches thick. The subsoil is brown fine sandy loam about 27 inches thick. The substratum is stratified yellowish red or brown silty clay loam and brown loamy fine sand to a depth of 60 inches or more. This soil is neutral. Mottles occur at a depth of about 46 inches.

Permeability is moderately rapid. Intake rate is rapid. Effective rooting depth is 60 inches or more. The available water capacity is moderate. Surface runoff is slow. Erosion hazard is moderate.

The soil is used mainly for irrigated crops. Alfalfa, hay or pasture, corn for silage, and grain are the principal crops.

A suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Crop residue use, weed control, and minimum tillage are practices that help to control erosion and maintain favorable tilth and water intake rate. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizer and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop. Sprinkler irrigation is well suited to most crops. The furrow and corrugation methods are suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture. Land leveling is needed in some areas to obtain an even distribution of irrigation water. Irrigation applications should be adjusted to crop needs, available water capacity, and infiltration rate. Irrigation streams should not cause soil movement in furrows, corrugations, and borders. Length of runs should be adjusted so that water reaches the end of the field without overirrigating the upper part. These practices help control erosion and excessive leaching of plant nutrients. Pipe, ditch lining, or irrigation drops should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion.

This soil has potential for supporting plants that provide food and cover for Hungarian partridge, mourning dove, chukar, cottontail rabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

This soil is suited for homesites and other urban and recreational developments. Climatically adapted grasses, shrubs, and trees for beautification grow well in this soil. Septic tank absorption field problems develop in some areas because of the silty clay loam strata in the substratum.

Recreational uses of this soil are mainly snowmobiling and hunting. Some areas are adjacent to Pineview Reservoir and may be used for camp grounds to facilitate boating, fishing, water skiing, and swimming. Capability unit IIc-2, irrigated.

PoG—Poleline stony loam, 40 to 70 percent slopes. This Poleline soil is deep and well drained. It occurs on all aspects, but dominantly on north- and east-facing, concave, very steep high mountainsides. Elevations range from 5,700 to 9,000 feet. The slopes are medium and long in length. This soil formed in materials weathered from schist, argillite, phyllite, gneiss, and quartzite. The average annual precipitation is about 30 inches, mean annual air temperature is about 41 degrees F, and the frost-free season is about 60 days.

Included with this soil in mapping are small areas of Patio gravelly loam, 40 to 60 percent slopes, Nordic gravelly loam, 30 to 60 percent slopes, Broad Canyon stony loam, 30 to 70 percent slopes, Nagitsy stony loam, 50 to 70 percent slopes, and some Rock outcrop.

In a typical profile, the surface layer is dark brown stony loam in the upper part and gravelly silt loam or gravelly loam in the lower part and is about 24 inches thick. The subsoil is dark brown very gravelly loam about 24 inches thick. Fractured phyllite is at a depth of 48 inches. Depth to the bedrock ranges from 48 to more than 60 inches. This soil is slightly acid in the upper part of the surface layer and medium acid in the lower part and in the subsoil. Rock fragment content is about 20 percent in the surface layer and 60 percent in the subsoil.

Permeability is moderate. Effective rooting depth is 48 to 60 inches or more. The available water capacity is low or moderately low. Surface runoff is slow. Erosion hazard is high.

This soil is used mainly for range, water supply, and wildlife habitat.

Potential vegetation is dominantly bigtooth maple, blue wildrye, chokecherry, mallow ninebark, Gambel oak, and some mountain brome, bearded wheatgrass, slender wheatgrass, and aster. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during the spring, summer, and fall. It also is potential habitat for sage grouse, sharp-tailed grouse, cottontail and jackrabbit porcupine, red fox, coyote, bobcat, weasel, and badger Streams through the area are potential habitat for beaver.

mulch tillage is used. Terraces, diversions, and grassed waterways should be installed where needed. Drop structures are needed in a few places to stabilize the flow of runoff in waterways. All tillage practices should be on the contour or across the slope. These practices slow the rate of runoff and reduce erosion during periods of rapid snowmelt and high intensity rainfall.

This soil has potential for supporting plants that provide food for mule deer, primarily during the fall, winter, and spring. It also is potential habitat for chukar, sharp-tailed grouse, cottontail and jackrabbit, porcupine, coyote, weasel, and badger.

The moderately steep and steep slopes are features that limit use for urban and recreational developments. Septic tank absorption field problems develop in some areas because of the moderately steep and steep slopes.

Recreational uses of this soil are mainly hunting and snowmobiling. Capability unit is IVe-M, nonirrigated.

SuG—Stoda loam, 40 to 60 percent slopes. This Stoda soil is very deep and well drained. It occurs on very steep, high lake terrace escarpments at elevations of 4,850 to 5,150 feet. The slopes are short in length. This soil formed in lake sediments weathered mostly from tuffaceous sandstone and quartzite. The average annual precipitation is about 18 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Stoda loam, 10 to 25 percent slopes, Mondey clay loam, 8 to 15 percent slopes, Mondey clay loam, 15 to 30 percent slopes, and Richville gravelly loam, 30 to 60 percent slopes.

In a typical profile, the surface layer is very dark grayish brown or dark brown loam about 11 inches thick. The subsoil is dark brown loam about 8 inches thick. The substratum is brown or light brown loam, silt loam, or very fine sandy loam to a depth of 67 inches or more. The surface layer is slightly or moderately calcareous and mildly or moderately alkaline. The subsoil and substratum are strongly calcareous and strongly alkaline.

Permeability is moderate. Effective rooting depth is 60 inches or more. The available water capacity is moderately high. Surface runoff is medium. Erosion hazard is high.

This soil is used mainly for range, water supply, and wildlife habitat.

Potential vegetation is bluebunch wheatgrass, basin wildrye, bearded wheatgrass, muttongrass, and some arrowleaf balsamroot, big bluegrass, antelope bitterbrush, mountain snowberry, and big sagebrush. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition. Brush management is practical in areas of excessive shrubs, if a reasonable understory of desirable grasses and forbs is present. In areas where the vegetation is destroyed or severely deteriorated, aerial or broadcast seeding is advisable. Grasses suitable for seeding include smooth brome, Regar brome, mountain brome, slender wheatgrass, orchardgrass, and Garrison meadow foxtail.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during the winter and spring. It also is potential habitat for sage grouse, chukar, sharp-tailed grouse, cottontail and jackrabbit, porcupine, red fox, coyote, bobcat, weasel, and badger.

The very steep slopes of this soil affect its use for urban and recreational developments. Septic tank absorption field problems will develop in some areas because of very steep slopes.

This soil is important for water supply. Adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed potential.

Recreational use of this soil is mainly hunting. Capability unit VIIe-M, nonirrigated.

SwA—Sunset loam, very gravelly substratum. This Sunset soil is very deep and somewhat poorly drained. It occurs on nearly level flood plains and stream terraces at elevations of 4,800 to 5,150 feet. Slope is 0 to 1 percent. Slopes are long. This soil formed in alluvium from sandstone, quartzite, and limestone. The average annual precipitation is about 18 inches, mean annual air temperature is about 46 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Pringle loam, Eastcan loam, 0 to 3 percent slopes, Canburn silt loam, Redola loam, 0 to 2 percent slopes, Utaba cobbly loam, warm, and Utaba loam, warm.

In a typical profile, the surface layer is very dark grayish brown loam about 17 inches thick. The upper part of the underlying layer is dark brown or dark yellowish brown stratified loam, silt loam, or very fine sandy loam about 28 inches thick. The lower part of the underlying layer is dark brown very gravelly sand to a depth of 63 inches or more. This soil is moderately alkaline and moderately calcareous in the surface layer and the upper part of the underlying layer. The lower part of the underlying layer is slightly calcareous and moderately alkaline. Rock fragment content is about 65 percent below a depth of about 45 inches. Mottles commonly occur at a depth of about 20 inches. The depth to seasonal high water table ranges from 30 to 36 inches. Occasional flooding occurs during the late winter and early spring during periods of rapid snowmelt.

Permeability is moderate to a depth of 45 inches and is moderately rapid below this depth. Intake rate is rapid. Effective rooting depth is 60 inches or more. The available water capacity is moderate or moderately high. Surface runoff is slow. Erosion hazard is moderate.

This soil is used mainly for irrigated hay, pasture, corn for silage, and small grains.

A suitable crop rotation is 4 to 6 years of alfalfa, 2 years of corn, 1 year of small grains, and 1 year of small grains with alfalfa planted in the stubble. Because of the seasonal high water table, stands of alfalfa are difficult to maintain. Fall plowing, crop residue use, weed control, and minimum tillage are practices that help to control erosion and maintain favorable tilth and infiltration rate. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizers, and legumes respond readily to phosphate fertilizer. Border, furrow, corrugation, and sprinkler irrigation methods are suitable for this soil. The method used is generally governed by the crop. Sprinkler irrigation is well suited to most crops. It provides even distribution and efficiency in the application of irrigation water. The furrow and corrugation methods are well suited to row crops. Border irrigation is well suited to alfalfa, small grains, and pasture. Land leveling is required in some areas to obtain an even distribution of irrigation water. Irrigation applications should be adjusted to the crop needs, available water capacity, and infiltration rate. Irrigation streams should not cause soil movement in furrows, corrugations, or borders. Length of runs should be adjusted so that water reaches the end of field without overirrigating the upper part. These practices will help control soil erosion and excessive leaching of plant nutrients. Pipe, ditch lining, or irrigation drops should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion.

This soil has good potential for supporting plants that provide food and cover for Hungarian partridge, mourning dove, chukar, ring-necked pheasant, cottontail rabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners will improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

This soil is rapidly being used for home sites and other urban developments. The depth to the seasonal high water table and the hazard of flooding are features that limit use for urban or recreational developments. Climatically adapted grasses, shrubs, and trees for beautification grow well in this soil. Septic tank absorption field problems develop in some areas because of flooding. Cesspool seepage is a pollution hazard to ground waters.

Recreational uses of this soil are mainly hunting and snowmobiling. Capability unit IIw-2, irrigated.

TaG—Toncana loam, 40 to 60 percent slopes. This Toncana soil is very deep and well drained. It occurs dominantly on north- and east-facing, smooth and concave, very steep mountainsides at elevations of 6,100 to 6,800 feet. The slopes are medium or long in length. This soil formed in materials weathered mostly from a conglomerate of sandstone and quartzite. The average annual precipitation is about 22 inches, mean annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included with this soil in mapping are small areas of Norcan loam, 30 to 60 percent slopes, Schuster loam, 30 to 60 percent slopes, Henhoit gravelly loam, 30 to 60 percent slopes, St. Marys very stony loam, 40 to 60 percent slopes, and some Rock outcrop.

In a typical profile, the surface layer is very dark brown or dark reddish brown loam about 24 inches thick. The subsoil is dark reddish brown or dark red gravelly or very gravelly clay loam to a depth of 60 inches or more. This soil is medium acid. Rock fragment content is about 15 percent in the surface layer and 50 percent in the subsoil.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. The available water capacity is moderate. Surface runoff is slow or medium. Erosion hazard is high.

This soil is used for range, wildlife habitat, and water supply.

Potential vegetation is Gambel oak, bearded wheatgrass, bluebunch wheatgrass, mountain brome, Nevada bluegrass, slender wheatgrass, birchleaf mountain-mahogany, and some arrowleaf balsamroot and antelope bitterbrush. When changes occur in the potential vegetation composition due to use by livestock or wildlife or other disturbances, certain plants increase and others decrease. Proper grazing is an important management practice for helping to maintain adequate plant cover and desired composition. Brush management is practical in areas of excessive shrubs, if a reasonable understory of desirable grasses and forbs is present.

This soil has potential for supporting plants that provide food and cover for mule deer, primarily during the spring, summer, and fall. It also is potential habitat for sage grouse, chukar, sharp-tailed grouse, cottontail and jackrabbit, porcupine, red fox, coyote, bobcat, weasel, and badger. Streams that run through the area are potential habitat for beaver.

The very steep slopes and relative inaccessibility of this soil are features that limit its potential use for urban and recreational developments. Septic tank absorption field problems develop in some areas because of moderately slow permeability and very steep slopes.

This soil is important for water supply. Adequate plant cover should be maintained to keep soil losses to a minimum, thus maintaining the watershed.

Recreational use of this soil is mainly hunting. Capability unit VIIe-MQ, nonirrigated.

TeG—Toone loam, 40 to 60 percent slopes. This Toone soil is very deep and well drained. It occurs dominantly on east-facing, very steep mountainsides at elevations of 5,800 to 6,700 feet. The slopes are medium and long in length. This soil formed in materials weathered from a conglomerate of sandstone and quartzite and some gneiss and schist. The average annual precipitation is about 30 inches, mean annual air temperature is about 42 degrees F, and the frost-free season is about 65 days.

Included with this soil in mapping are small areas of Poleline stony loam, 40 to 70 percent slopes, St. Marys very stony loam, 40 to 60 percent slopes, and Sessions cobbly loam, 15 to 25 percent slopes.

In a typical profile, the surface layer is very dark brown loam about 27 inches thick. The subsoil is dusky red very cobbly clay loam or gravelly clay loam to a irrigation and to reduce seepage losses and excessive ditch erosion. Rock fragments on the soil surface makes normal operation of tillage equipment very difficult. Seeding of these areas to grasses, alfalfa, or both is desirable and improves plant cover, increases forage production, and helps reduce soil erosion. Plants suitable for seeding on irrigated areas include smooth brome, Regar brome, orchardgrass, and alfalfa. The nonirrigated areas are suitable for intermediate wheatgrass, crested wheatgrass, and Ladak alfalfa.

This soil has potential for supporting plants that provide food and cover for mule deer during winter and spring. It also is potential habitat for Hungarian partridge, mourning dove, chukar, ring-necked pheasant, cottontail and jackrabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

Flooding is a problem that limits the use of this soil for urban or recreational developments. However, with present water regulation reservoirs flooding is rare. Septic tank filter fields perform well unless flooded. Climatically adapted grasses, shrubs, and trees for beautification grow, but addition of topsoil improves their available water capacity. Contamination of the ground water supply is a hazard where cesspools are installed.

Recreational uses are mainly hunting and snowmobiling. Capability unit IVs-3, irrigated.

UbA—Utaba cobbly loam, warm. This Utaba soil is very deep and well drained. It occurs on nearly level and gently sloping flood plains and stream terraces at elevations of 4,850 to 5,000 feet. The slopes are long. This soil formed in alluvium mostly from quartzite and sandstone. The average annual precipitation is about 20 inches, mean annual air temperature is about 45 degrees F, and the average frost-free season is about 105 days.

Included with this soil in mapping are small areas of Utaba loam, warm, Eastcan loam, 0 to 3 percent slopes, Sunset loam, very gravelly substratum, Fluvaquentic Haploborolls, 1 to 6 percent slopes, and Fluventic Haploxerolls, 1 to 6 percent slopes.

In a typical profile, the surface layer is very dark brown or dark brown cobbly loam in the upper part and very gravelly sandy clay loam in the lower part and is about 21 inches thick. The underlying layer is dark reddish brown or reddish brown very gravelly loamy sand, very gravelly coarse sand, or very cobbly coarse sand to a depth of 60 inches or more. This soil is slightly acid or medium acid. The soil surface has about 10 percent cover of cobbles and 20 percent gravel. Rock fragments content is about 35 percent in the upper part of the surface layer, and 60 percent in the lower part, and 75 percent in the underlying layer. Flooding from nearby streams commonly occurs during the late winter and spring.

Permeability is moderate in the surface layer and rapid in the underlying layers. Intake rate is rapid. Effective rooting depth is 60 inches or more. The available water capacity is low. Surface runoff is slow. Erosion hazard is moderate.

Most areas of this soil are abandoned or idle cropland. Many areas have been cleared of the surface cobbles.

Alfalfa and small grains, or improved pasture are suitable when the surface cobbles have been removed. Crop residue use, weed control, and minimum tillage are practices that help to control erosion and maintain favorable tilth. Applications of commercial fertilizers are commonly needed in addition to manure and plant residues. Generally all crops respond to nitrogen fertilizers, and legumes respond readily to phosphate fertilizers. Sprinkler irrigation is suited to this soil. This method provides for even distribution and controlled application of irrigation water. Irrigation applications should be in agreement with crop needs and the available water capacity and infiltration rate. Overirrigation should be avoided because it causes excessive leaching of plant nutrients. Pipe, ditch lining, or irrigation drops should be installed in irrigation ditches to facilitate irrigation and to reduce seepage losses and excessive ditch erosion. Rock fragments on the soil surface make the normal operation of tillage equipment difficult. Seeding of these areas to grasses, alfalfa, or both is desirable and improves plant cover and helps reduce soil erosion. Plants suitable for seeding on irrigated areas include smooth brome, Regar brome, orchardgrass, and alfalfa. The nonirrigated areas are suitable for intermediate wheatgrass, crested wheatgrass, and Ladak alfalfa.

This soil has potential for supporting plants that provide food and cover for mule deer during winter and spring. It also is potential habitat for Hungarian partridge, mourning dove, chukar, ring-necked pheasant, cottontail and jackrabbit, and porcupine. Plants such as Russian-olive, multiflora rose, squawbush, tall wheatgrass, and basin wildrye planted along fence rows and ditchbanks and in odd field corners improve the wildlife habitat. Food should be close to shelter that will protect the birds from predators and inclement weather.

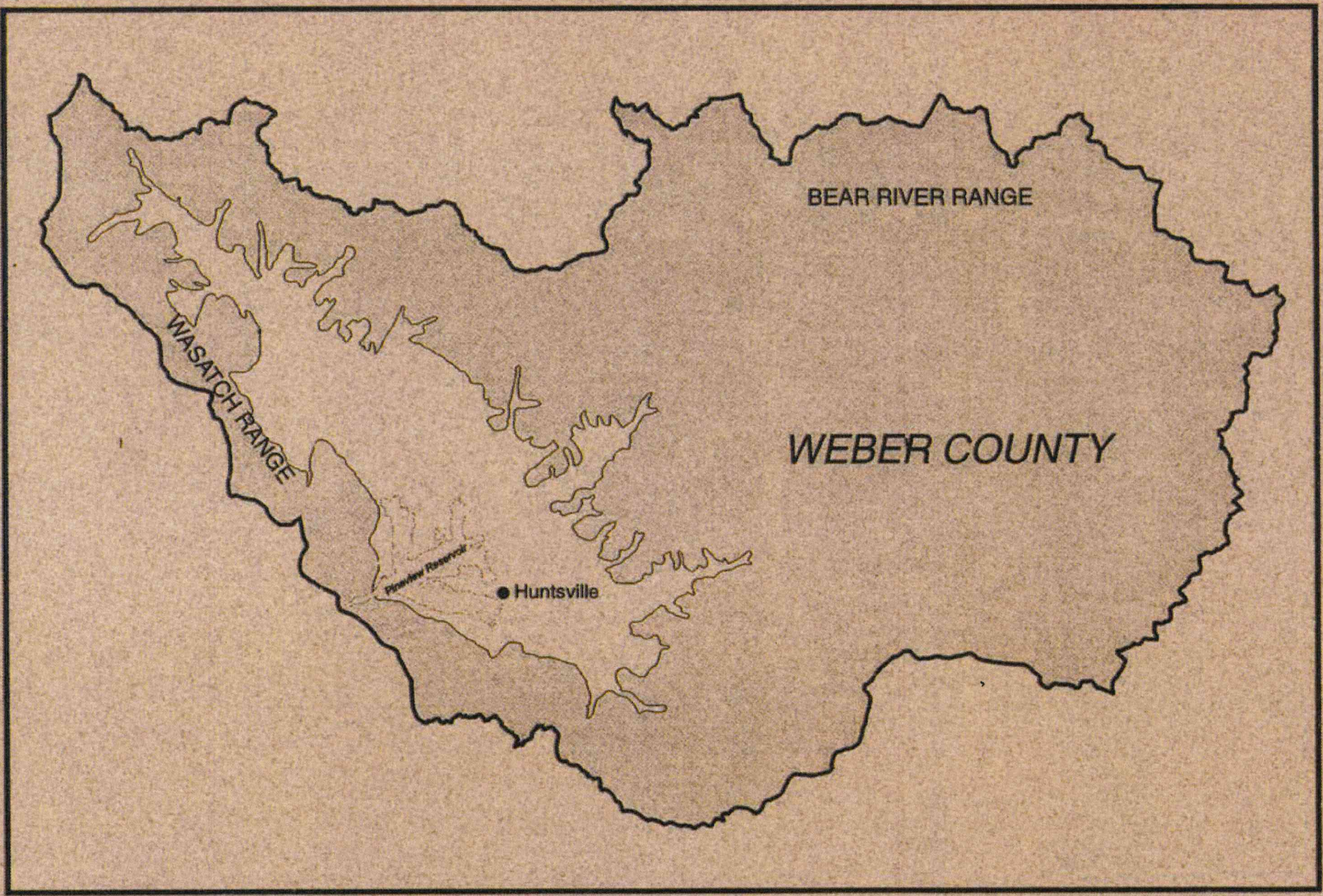
Flooding limits the use of this soil for urban or recreational developments. However, with present water regulatory reservoir, flooding is rare. Septic tanks perform well unless flooded. Climatically adapted grasses, shrubs, and trees for beautification grow well on this soil but additional topsoil improves available water capacity. Contamination of the ground water is a hazard where cesspools are installed.

Recreational uses are mainly hunting and snowmobiling. Capability unit IVs-2, irrigated.

UcA—Utaba loam, warm. This Utaba soil is very deep and well drained. It occurs on nearly level or gently sloping alluvial fans, flood plains, and stream terraces at elevations of 5,300 to 5,650 feet. The slopes are long. This soil formed in alluvium from quartzite and sandstone. The average annual precipitation is about 20 inches, mean annual air temperature is about 45 degrees F, and the average frost-free season is about 105 days.

THE POTENTIAL IMPACT OF SEPTIC TANK SOIL-ABSORPTION SYSTEMS ON WATER QUALITY IN THE PRINCIPAL VALLEY-FILL AQUIFER, OGDEN VALLEY, WEBER COUNTY, UTAH ASSESSMENT AND GUIDELINES

by
Janae Wallace and Mike Lowe
Utah Geological Survey



Report of Investigation 237 May 1998
UTAH GEOLOGICAL SURVEY
a division of
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UTAH GEOLOGICAL SURVEY

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THE POTENTIAL IMPACT OF SEPTIC TANK SOIL-ABSORPTION SYSTEMS ON WATER QUALITY IN THE PRINCIPAL VALLEY-FILL AQUIFER, OGDEN VALLEY, WEBER COUNTY, UTAH– ASSESSMENT AND GUIDELINES

by
Janae Wallace and Mike Lowe

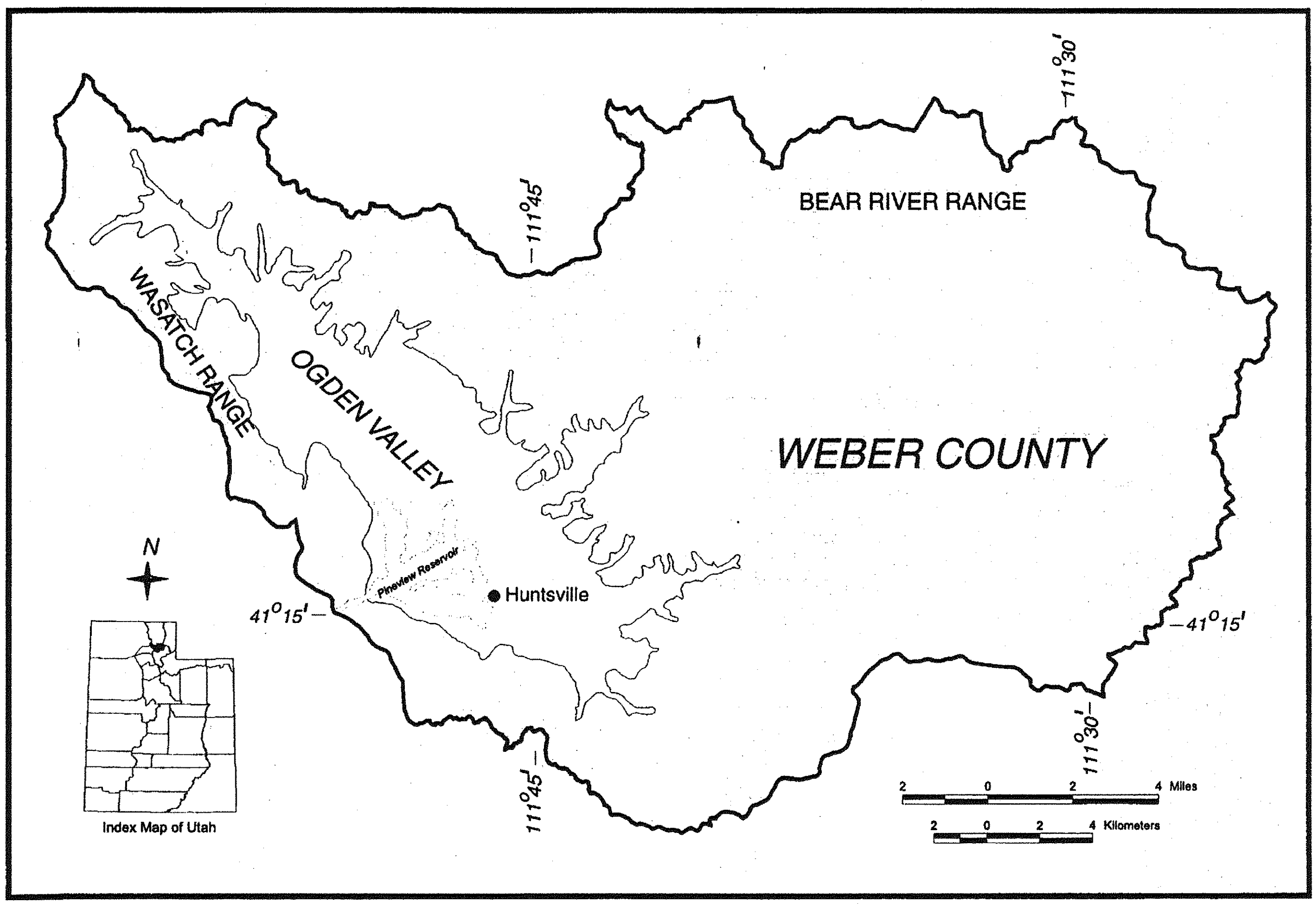
ABSTRACT

Nitrate can be used to identify potential deleterious effects of development using septic tank soil-absorption systems. We use a mass-balance approach to provide a valley-wide assessment of the potential impact of nitrate from septic tank soil-absorption systems on ground-water quality. Approximately 2,300 septic systems exist in Ogden Valley. Our calculations indicate the number of septic tank soil-absorption systems in Ogden Valley should not exceed 9,500, representing a valley-wide average septic-system density of about 3 acres/system (0.012 km^2/system), to maintain an overall nitrate concentration of 1.74 ppm (1.74 mg/L). This allows a 1 mg/L degradation of water quality with respect to nitrate from the current background level of 0.74 ppm (0.74 mg/L). We also provide guidelines for site-specific evaluations of the effects of septic systems on ground-water quality for proposed subdivisions in Ogden Valley.

INTRODUCTION

Ogden Valley, Weber County (figure 1), is experiencing an increase in residential development. Most of this development, which uses septic tank soil-absorption

Figure 1. Location of study area.



systems for waste-water disposal, is on unconsolidated deposits of the principal valley-fill aquifer. Ground water provides almost all of Ogden Valley's drinking-water supply, and also much of the municipal water supply for Ogden City. Preservation of ground-water quality and the potential for ground-water-quality degradation are critical issues which should be considered in determining the extent and nature of future development in Ogden Valley. Local government officials in Weber County have expressed concern about the potential impact that development may have on ground-water quality. This report was prepared as part of a ground-water-quality classification project funded by the Weber-Morgan District Health Department, Ogden City, Central Weber Sewer Improvement District, Weber Basin Water Conservancy District, and Utah Division of Water Quality.

Nitrate from sewers, septic tank soil-absorption systems, fertilizer, and other anthropogenic sources is a useful indicator of human impact on ground-water quality. Nitrate can thus be used to identify potential deleterious effects of development using septic tank soil-absorption systems. The purpose of this document is to: (1) provide a valley-wide assessment of the potential impact of nitrate from an increasing number of septic tank soil-absorption systems on ground water in Ogden Valley using methods similar to those used by Hansen, Allen, and Luce, Inc. (1994) for Heber and Round Valleys, Wasatch County, Utah; and (2) provide site-specific recommendations for evaluating the effects of septic systems on ground-water quality for proposed subdivisions in Ogden Valley. We use the methods of Hansen, Allen, and Luce, Inc. (1994) for valley-wide water-quality degradation assessments because they have been used in other Utah counties (Wasatch, Washington) for land-use planning purposes, and are easily applied and require limited data. We also provide guidelines for site-specific evaluations so that developers may hire ground-water consultants to evaluate specific subdivision sites for cases where valley-wide results do not meet their needs.

VALLEY-WIDE ASSESSMENT

Introduction

Most development in Ogden Valley uses septic tank soil-absorption systems for waste-water disposal. Ammonium from septic-tank effluent under aerobic conditions can convert to nitrate, contaminating ground water and posing potential health risks to humans (primarily very young infants). The U.S. Environmental Protection Agency ground-water-quality standard for nitrate is 10 ppm (10 mg/L). With continued growth and installation of septic tank soil-absorption systems in new developments, the potential for nitrate contamination will increase. One way to evaluate the potential impact of septic-tank systems on ground-water quality is to perform a mass-balance calculation using methodologies developed by Hansen, Allen, and Luce, Inc. (1994). This type of valley-wide analysis may be used as a gross model for evaluating the impact of proposed developments using septic-tank systems for waste-water disposal on ground-water quality and allow planners to more effectively determine appropriate average development densities (lot sizes).

Mass-Balance Approach

In the mass-balance approach of Hansen, Allen, and Luce, Inc. (1994) to compute projected nitrate concentrations, the nitrogen mass from projected new septic tanks is added to the existing, ambient mass of nitrogen in ground water and then diluted with the ground-water flow available for mixing, plus water that is added to the system by septic tanks. The Method of Hansen, Allen, and Luce, Inc. (1994) estimates a discharge of 400 gallons (1,500 L) of effluent/day for a domestic home, and determines a best-estimate nitrogen loading of 40 ppm (40 mg/L) of effluent per domestic septic tank, with 80 ppm (80 mg/L) and 30 ppm (30 mg/L) per septic system as appropriate high and low values, respectively, for nitrogen loadings. Ground-water flow available for mixing is the difference between ground-water recharge and the sum of evapotranspiration and discharge to springs/seeps above the area of septic-system influence. The major control on nitrate concentration in aquifers using the Hansen, Allen, and Luce, Inc. (1994) approach is the amount of ground water available for mixing (Lowe and Wallace, 1997).

Results

Figure 2 shows a plot of projected nitrate concentration in Ogden Valley's aquifer versus septic-tank density and number of septic-tank units. Background concentration for Ogden Valley is 0.74 ppm (0.74 mg/L) (Lowe and Wallace, 1997). Approximately

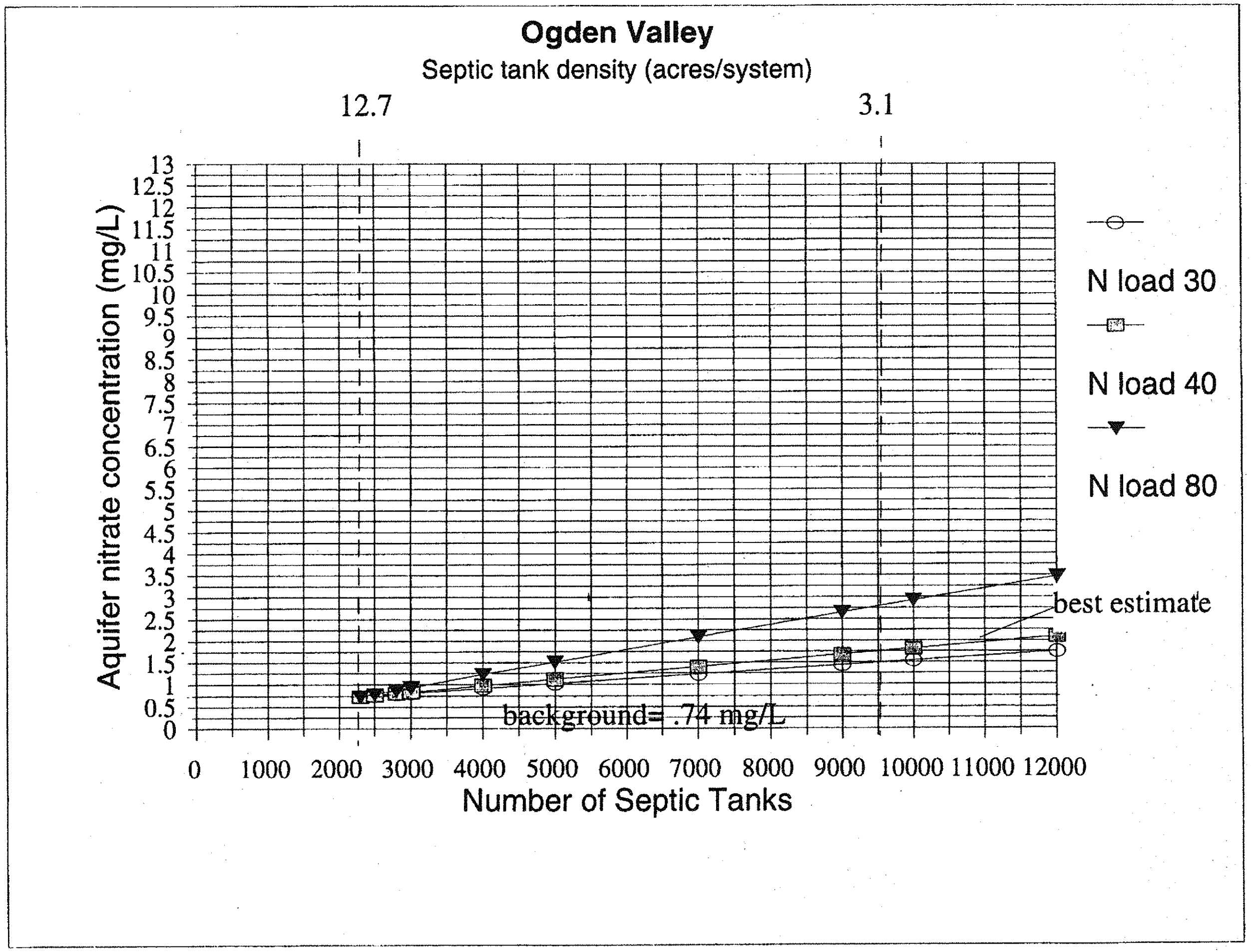


Figure 2. Graph showing projected septic-tank-system density versus nitrate concentration for the principal valley-fill aquifer in Ogden Valley, Weber County, Utah. N load 30, N load 40, and N load 80 refer to the low, best-estimate, and high nitrogen loadings per liter of waste water from septic tanks (Hansen, Allen, and Luce, Inc., 1994).

2,300 septic systems exist in Ogden Valley (Craig Barker, Weber County Planning Department, verbal communication, 1997). Ogden Valley has an area of approximately 29,280 acres (118.5 km^2), so the average septic-system density is about 12.7 acres/system (0.05 km^2/system). The valley also supports three sewage lagoons. Based on Avery's (1994) estimated hydrologic budget for 1985, ground-water flow available for mixing in Ogden Valley is 166 ft^3/s (4.7 m^3/s). For Ogden Valley to maintain an overall nitrate concentration of 1.74 ppm (1.74 mg/L) (which allows 1 mg/L of degradation, a value adopted by Wasatch County as an acceptable level of degradation), the number of new homes using septic tank soil-absorption systems should not exceed 7,200 based on the best-estimate nitrogen load of 40 ppm (40 mg/L) per septic-tank system (figure 2). This corresponds to a valley-wide total of 9,500 septic systems and an average septic-system density of about 3 acres/system (0.12 km^2/system).

Limitations to the Mass-Balance Approach

There are many limitations to this mass-balance approach.

1. Computations are typically based on a short-term hydrologic budget.

2. Background nitrate concentration is attributed to natural sources,

agricultural practices, and septic-tank systems, but projected nitrate concentrations are for septic-tank systems only and do not include nitrate from other potential sources (such as lawn and garden fertilizer).

3. Calculations do not account for localized, high-concentration nitrate plumes associated with individual or clustered septic-tank systems.

4. The procedure assumes negligible denitrification.

5. The procedure assumes uniform, instantaneous ground-water mixing for the entire aquifer below the site.

6. Calculations do not account for pumping water wells.

7. Calculations are based on aquifer parameters for the entire valley (not specifically targeted to areas experiencing growth).

GUIDELINES FOR SITE-SPECIFIC SEPTIC-TANK-DENSITY STUDIES FOR PROPOSED SUBDIVISIONS

The guidelines outlined herein, describe one method for assessing site-specific impact of septic tank soil-absorption systems on ground-water quality for proposed subdivisions in Ogden Valley. The procedure uses a mass-balance approach similar to the analysis conducted by Hansen, Allen, and Luce, Inc. (1994) in Wasatch County and outlined above. The site-specific approach is subject to the limitations listed above, except calculations are based on site-specific rather than valley-wide estimates of aquifer parameters. This refinement of the valley-wide mass-balance approach provides a better understanding of the local effects on ground-water quality of development using septic-tank systems for waste-water disposal.

Site-specific evaluation of the effects of septic-tank systems on ground-water quality requires accurate determination of local aquifer parameters. Steps in the evaluation process include: (1) compiling existing topographic and geologic maps and driller's logs; (2) determining the ground-water-flow transect area (typically the subdivision area) and analyzing water-well driller's logs to determine the geologic characteristics, thickness, and extent of the aquifer; (3) determining the number of existing and proposed septic-tank systems in the area; (4) collecting samples for nitrate and analyzing data to identify background concentration; (5) measuring water levels from selected wells to determine hydraulic gradient and ground-water-flow direction; (6) selecting observation and pumping wells and conducting 24- to 100-hour aquifer tests to determine aquifer transmissivity values; and (7) calculating the projected site-specific nitrate concentration by applying the Hansen, Allen, and Luce, Inc. (1994) mass-balance approach using site-specific parameters obtained from steps 1 through 6 above to determine the existing nitrogen load and amount of ground water available for mixing. Ground water available for mixing (not including water in effluent) can be calculated using the following equation:

$$Q=TLI$$

where:

Q= volume of water in aquifer below subdivision available for mixing,

T= transmissivity,

L= length of flow through aquifer parallel to hydraulic gradient, and

I= hydraulic gradient.

Consultants' reports addressing site-specific effects of proposed developments using septic-tank systems for waste-water disposal and submitted to Ogden County officials for approval should contain: (1) detailed topographic and geologic maps showing the location of all relevant features (property boundaries, septic-tank systems, water wells, and so forth), (2) water-well driller's logs used in the analysis, (3) laboratory data reporting nitrate concentrations, (4) static water-level measurements from wells, (5) tables reporting raw drawdown and recovery data from aquifer tests, (6) explanation of the methods/models used to interpret the aquifer-test data, and (7) all numbers (including conversion factors) and equations used to calculate results.

This site-specific evaluation process using the mass-balance approach can provide developers and Weber County officials with a defendable site-specific evaluation of acceptable septic-tank-system density for proposed subdivisions utilizing septic systems for waste-water disposal. The process also contributes to the protection of ground-water quality in areas experiencing rapid population growth.

REFERENCES

Avery, Charles, 1994, Ground-water hydrology of Ogden Valley and surrounding area, eastern Weber County, Utah, and similation of ground-water flow in the valley-fill aquifer system: Utah Department of Natural Resources Technical Publication No. 99, 84 p.

Hansen, Allen, and Luce, Inc. 1994, Hydrogeologic/water quality study, Wasatch County, Utah: Salt Lake City, unpublished consultant's report, p. III-1 - III-18.

Lowe, Mike, and Wallace, Janae, 1997, The hydrogeology of Ogden Valley, Weber County, Utah, and implications of increased septic-tank-soil-absorption system density: Geological Society of America Abstracts with Programs, v. 29, no. 6, p. A-386.

APPENDIX B

ENVIRONMENTAL LETTERS

SUNRISE ENGINEERING

August 4, 2010

Mr. Kelly Beck
Governor's Office of Planning and Budget
1594 West North Temple, Suite 3710
Salt Lake City, UT 84114-5610

RE: Proposed Huntsville Wastewater Treatment Project
Huntsville, Utah

Dear Mr. Beck:

I am working on an Environmental Information Package, as part of the Capital Facilities Plan for a proposed wastewater treatment project in Huntsville, Utah. This project would be funded by the Utah Water Quality Board and the Capital Facilities Plan is required by the Utah Division of Water Quality.

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. Presently, the wastewater from residents of the Town of Huntsville and the surrounding unincorporated area is treated primarily through individual septic systems. As a result, the quality of the adjacent Pineview Reservoir surface water and groundwater in the area has been degraded. To protect the recreational resources of the reservoir and groundwater quality, the Town of Huntsville and surrounding unincorporated communities plan to construct a wastewater treatment facility in the area. The proposed wastewater treatment project would occur on private land and is shown in Figure 1 – Overall Plan. The proposed project location can be described as Sections 12, 13 and 24, Township 7 North, Range 1 East, Salt Lake Base Line and Meridian (SLBM) and Sections 6, 7, 9, and 14 through 21, Township 7 North, Range 2 East, SLBM. The proposed project would consist of the following:

1. Approximately 32 miles of sewer lines varying in diameter from 8 inches to 15 inches would be installed along existing roads.
2. Two lift stations would be constructed and equipped at road sides in Section 18, Township 7 North, Range 1 East, SLBM.
3. A treatment plant would be constructed in the southeastern quarter of Section 18, Township 7 North, Range 1 East, SLBM.

The treated wastewater may be discharged into Pineview Reservoir or used as secondary irrigation water on public greenscapes.

Please post the project on Governor's Resource Development Coordinating Committee (RDCC) for comments and return comments to me in writing. Thank you for your assistance. If you have any question regarding this request, please contact me at (801) 523-0100. My email address is dyang@sunrise-eng.com.

Sincerely,
Sunrise Engineering, Inc.

Daojiong Yang

Dao Yang, P.E.
Project Engineer
Enclosure: Overall Plan

SUNRISE ENGINEERING

August 5, 2010

Ms. Barbara Thomas, Intergovernmental Coordinator
Wasatch Front Regional Council
295 Jimmy Doolittle Road
Salt Lake City, UT 84116-3706

RE: Proposed Huntsville Wastewater Treatment Project
Huntsville, Utah

Dear Ms. Thomas:

I am working on an Environmental Information Package, as part of the Capital Facilities Plan for a proposed wastewater treatment project in Huntsville, Utah. This project would be funded by the Utah Water Quality Board and the Capital Facilities Plan is required by the Utah Division of Water Quality.

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. Presently, the wastewater from residents of the Town of Huntsville and the surrounding unincorporated area is treated primarily through individual septic systems. As a result, the quality of the adjacent Pineview Reservoir surface water and groundwater in the area has been degraded. To protect the recreational resources of the reservoir and groundwater quality, the Town of Huntsville and surrounding unincorporated communities plan to construct a wastewater treatment facility in the area. The proposed wastewater treatment project would occur on private land and is shown in Figure 1 – Overall Plan. The proposed project location can be described as Sections 12, 13 and 24, Township 7 North, Range 1 East, Salt Lake Base Line and Meridian (SLBM) and Sections 6, 7, 9, and 14 through 21, Township 7 North, Range 2 East, SLBM. The proposed project would consist of the following:

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3. A treatment plant would be constructed in the southeastern quarter of Section 18, Township 7 North, Range 1 East, SLBM.

The treated wastewater may be discharged into Pineview Reservoir or used as secondary irrigation water on public greenscapes.

Please review the attached information and return your comments in writing.

Thank you for your assistance. If you have any questions regarding this request, please contact me at (801) 523-0100. My email address is dyang@sunrise-eng.com.

Sincerely,
Sunrise Engineering, Inc.

Daozhong Yang

Dao Yang, P.E.
Project Engineer
Enclosure: Figure 1 – Overall Plan

SUNRISE
ENGINEERING

August 5, 2010

Mr. Henry R. Maddux
U.S. Fish and Wildlife Service
2360 West Orton Circle, Suite 50
Salt Lake City, UT 84119

RE: Proposed Huntsville Wastewater Treatment Project
Huntsville, Utah

Dear Mr. Maddux:

I am working on an Environmental Information Package, as part of the Capital Facilities Plan for a proposed wastewater treatment project in Huntsville, Utah. This project would be funded by the Utah Water Quality Board and the Capital Facilities Plan is required by the Utah Division of Water Quality.

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. Presently, the wastewater from residents of the Town of Huntsville and the surrounding unincorporated area is treated primarily through individual septic systems. As a result, the quality of the adjacent Pineview Reservoir surface water and groundwater in the area has been degraded. To protect the recreational resources of the reservoir and groundwater quality, the Town of Huntsville and surrounding unincorporated communities plan to construct a wastewater treatment facility in the area. The proposed wastewater treatment project would occur on private land and is shown in Figure 1 – Overall Plan. The proposed project location can be described as Sections 12, 13 and 24, Township 7 North, Range 1 East, Salt Lake Base Line and Meridian (SLBM) and Sections 6, 7, 9, and 14 through 21, Township 7 North, Range 2 East, SLBM. The proposed project would consist of the following:

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3. A treatment plant would be constructed in the southeastern quarter of Section 18, Township 7 North, Range 1 East, SLBM.

The treated wastewater may be discharged into Pineview Reservoir or used as secondary irrigation water on public greenscapes.

According to the County Lists of Utah's Federally Listed Threatened (T), Endangered (E) and Candidate (C) Species updated by the Utah Division of Wildlife Resources on June 24, 2010, there is one T (Ute Ladies'-tresses), one E (June Sucker) and two C (Greater Sage-

12227 South Business Park Drive, Suite 220, Draper, UT 84020 Tel: 801-523-0100 Fax: 801-523-0990

grouse and Yellow-billed Cuckoo) species that may occur in Weber County. It does not appear that suitable habitat exists for the listed species in the project area since the project would occur in residential areas and mostly on existing roads. Therefore, it is unlikely that the proposed project would impact any T, E and C species, if any, in the project area.

Please review the attached information and return your comments in writing.

Thank you for your assistance on this project. If you have any questions, please contact me at (801) 523-0100. My email address is dyang@sunrise-eng.com.

Sincerely,
Sunrise Engineering, Inc.

Daopiong Yang

Dao Yang, P.E.
Project Engineer/Hydrogeologist

Enclosure: Map and Federally Listed Species in Weber County

Weber County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
June Sucker	*Chasmistes liorus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Gray Wolf	*Canis lupus*	E Extirpated

Created by the Utah Division of Wildlife Resources - June 24, 2010

SUNRISE ENGINEERING

August 5, 2010

Mr. D. Floyd Wopsock, Chairman
Ute Indian Tribe
P.O. Box 190
Fort Duchesne, UT 84026

RE: Proposed Huntsville Wastewater Treatment Project
Huntsville, Utah

Dear Mr. Wopsock:

I am working on an Environmental Information Package, as part of the Capital Facilities Plan for a proposed wastewater treatment project in Huntsville, Utah. This project would be funded by the Utah Water Quality Board and the Capital Facilities Plan is required by the Utah Division of Water Quality.

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. Presently, the wastewater from residents of the Town of Huntsville and the surrounding unincorporated area is treated primarily through individual septic systems. As a result, the quality of the adjacent Pineview Reservoir surface water and groundwater in the area has been degraded. To protect the recreational resources of the reservoir and groundwater quality, the Town of Huntsville and surrounding unincorporated communities plan to construct a wastewater treatment facility in the area. The proposed wastewater treatment project would occur on private land and is shown in Figure 1 – Overall Plan. The proposed project location can be described as Sections 12, 13 and 24, Township 7 North, Range 1 East, Salt Lake Base Line and Meridian (SLBM) and Sections 6, 7, 9, and 14 through 21, Township 7 North, Range 2 East, SLBM. The proposed project would consist of the following:

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2. Two lift stations would be constructed and equipped at road sides in Section 18, Township 7 North, Range 1 East, SLBM.
3. A treatment plant would be constructed in the southeastern quarter of Section 18, Township 7 North, Range 1 East, SLBM.

The treated wastewater may be discharged into Pineview Reservoir or used as secondary irrigation water on public greenscapes.

Please review the attached information and return your comments in writing within 30 days upon receipt of this letter.

Thank you for your assistance on this project. If you have any questions, please contact me at (801) 523-0100. My email address is dyang@sunrise-eng.com.

Sincerely,
Sunrise Engineering, Inc.

Dao Yang, P.E.
Project Engineer/Hydrogeologist

Enclosure: Map

SUNRISE
ENGINEERING

August 4, 2010

Mr. Mike Domeier
State Soil Scientist
USDA, Soil Conservation Service
125 South State Street, Room 4402
Salt Lake City, UT 84138

RE: Proposed Huntsville Wastewater Treatment Project
Huntsville, Utah

Dear Mr. Domeier:

I am working on an Environmental Information Package, as part of the Capital Facilities Plan for a proposed wastewater treatment project in Huntsville, Utah. This project would be funded by the Utah Water Quality Board and the Capital Facilities Plan is required by the Utah Division of Water Quality.

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. Presently, the wastewater from residents of the Town of Huntsville and the surrounding unincorporated area is treated primarily through individual septic systems. As a result, the quality of the adjacent Pineview Reservoir surface water and groundwater in the area has been degraded. To protect the recreational resources of the reservoir and groundwater quality, the Town of Huntsville and surrounding unincorporated communities plan to construct a wastewater treatment facility in the area. The proposed wastewater treatment project would occur on private land and is shown in Figure 1 – Overall Plan. The proposed project location can be described as Sections 12, 13 and 24, Township 7 North, Range 1 East, Salt Lake Base Line and Meridian (SLBM) and Sections 6, 7, 9, and 14 through 21, Township 7 North, Range 2 East, SLBM. The proposed project would consist of the following:

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3. A treatment plant would be constructed in the southeastern quarter of Section 18, Township 7 North, Range 1 East, SLBM.

The treated wastewater may be discharged into Pineview Reservoir or used as secondary irrigation water on public greenscapes.

Please review the attached information and demarcate prime and unique farmland, if any, in the proposed construction area and determine if the project would have any impact.

12227 South Business Park Drive, Suite 220, Draper, UT 84020 Tel: 801-523-0100 Fax: 801-523-0990

Thank you for your assistance on this project. If you have any questions, please contact me at (801) 523-0100. My email address is dyang@sunrise-eng.com.

Sincerely,
Sunrise Engineering, Inc.

Daoyong Yang

Dao Yang, P.E.
Project Engineer/Hydrogeologist

Enclosure: Map

State of Utah

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

Office of the Governor
PUBLIC LANDS POLICY COORDINATION

JOHN HARJA
Director

September 2, 2010

Dao Yang
Project Engineer
Sunrise Engineering, Inc
12227 South Business Park Drive, Suite 220
Draper, UT 84020

Subject: Huntsville Waste Water Treatment Scoping Project
RDCC Project No. 22382

Dear Dao Yang:

The State of Utah, through the Public Lands Policy Coordination Office (PLPCO), has reviewed this project. Utah Code (Section 63J-4-601, *et. seq.*) designates PLPCO as the entity responsible to coordinate the review of technical and policy actions that may affect the physical resources of the state, and to facilitate the exchange of information on those actions among federal, state, and local government agencies. As part of this process, PLPCO makes use of the Resource Development Coordinating Committee (RDCC). The RDCC includes representatives from the state agencies that are generally involved or impacted by public lands management.

Division of Water Quality

The Huntsville Wastewater Treatment Project will provide treatment for sewer flows for the Town of Hunstville and surrounding Unincorporated Weber County area known as the South Fork Area. The principle drainage in the area is the South Fork of the Ogden River, which is also the principle source of water for Pineview Reservoir. The South Fork Ogden River and Pineview Reservoir are both classified with for culinary water (1C), recreational bathing (2A), boating and similar recreation (2B), cold water fishery (3A), and agricultural (4) beneficial uses. Pineview Reservoir is on the states 303d list of impaired waters for the Class 3A, cold water fishery because of low dissolved oxygen (DO). Accordingly, the Total Maximum Daily Load (TMDL) that was approved by the EPA in 2002 has a total phosphorus endpoint of .025 mg/l. Furthermore, the reservoir located in a U.S. National Forest and the Utah Water Quality Standards automatically assign Pineview Reservoir a Category 1 Water designation and by definition new point sources discharges are prohibited. The potential receiving waters Category 1 designation and phosphorus limitations will provide a unique challenge to this project.

Ground water in Ogden Valley was classified in 1999 as Class 1A, Pristine. By definition this is the highest quality ground water found with a TDS of less than 500 mg/L and with no contamination concentrations greater than maximum contaminant levels (MCL's) established under the National Primary Drinking Water Regulations. Ogden Valley ground water is suitable for all beneficial uses. Protection levels are a percentage of the water quality standards and for TDS, the background value. For Class 1A, TDS may not increase above 1.1 times the background but no more than 500 mg/L.

As indicated by the vulnerable hydrogeology and pristine ground water quality of valley-fill aquifer system, the present use of onsite wastewater treatment systems (septic tanks) has the potential to degrade both surface and ground water quality of this valuable natural resource. The Utah Division of Water Quality recognizes there are limited wastewater treatment options for the Town of Hunstville and surrounding Unincorporated Weber County area. The Utah Division of Water Quality staff looks forward to working with these entities, the community residents and the supporting engineering firm in defining viable wastewater treatment options.

The State of Utah appreciates the opportunity to review this proposal and we look forward to working with you on future projects. Please direct any other written questions regarding this correspondence to the Public Lands Policy Coordination Office at the address below, or call Judy Edwards at (801) 537-9023.

Sincerely,

John Harja
Director

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
125 South State Street, Room 4402
Salt Lake City, UT 84138-1100
(801) 524-4550
FAX (801) 524-4403

August 16, 2010

Dao Yang, Project Engineer/Hydrogeologist
Sunrise Engineering
12227 South Business Park Drive, Suite 220
Draper, UT 84020

RE: Prime Farmland Status

Dear Mr. Yang:

Please find attached Farmland Conversion Impact Rating (AD-1006) for the proposed Huntsville Wastewater Treatment Project, in Huntsville, Weber County, Utah.

The proposed development project will not impact any important farmland resources in Utah. The project's impact is primarily limited to those areas already converted to non-agricultural uses, e.g. road corridors. In the few areas where this is not the case, the soils fail to meet the definition due to flooding or lack of irrigation.

I hope you find this information helpful. Please do not hesitate to call (801.524.4574) or email (mike.domeier@ut.usda.gov) with any further questions.

Sincerely,

Mike Domeier

MIKE DOMEIER
State Soil Scientist, NRCS, Utah

Enclosure: Form AD-1006, Farmland Conversion Impact Rating

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 8/4/10
Name Of Project Huntsville Wastewater Treatment Project	Federal Agency Involved
Proposed Land Use Wastewater Treatment	County And State Weber County, Utah
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 8/9/10

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☐ No ☑	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %		Amount Of Farmland As Defined in FPPA Acres: %
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS

	Maximum Points	Alternative Site Rating Site A	Site B	Site C	Site D
PART III *(To be completed by Federal Agency)*					
A. Total Acres To Be Converted Directly					
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		0.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide And Local Important Farmland					
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted					
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value					
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		0	0	0	0
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C together with maps indicating locations of site(s), to the Natural Resources Conservation Service (NRCS) local field office and retain copy D for their files. (Note: NRCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field office locations are available from the NRCS State Conservationist in each state).

Step 3 – NRCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

Step '4 – In cases where farmland covered by the FPPA will be converted by the proposed project, NRCS field offices will complete Parts II, IV and V of the form.

Step 5 – NRCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for NRCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal policies.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.

2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as shown in § 658.5 (b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood control, criteria #5 and #6 will not apply and will, be weighed zero, however, criterion #8 will be weighed a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 12 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned relative adjustments must be made to maintain the maximum total weight points at 160.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points, and alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site "A."}$$

SUNRISE ENGINEERING

August 5, 2010

Mr. Henry R. Maddux
U.S. Fish and Wildlife Service
2360 West Orton Circle, Suite 50
Salt Lake City, UT 84119

☐ Concur No Effect

☒ Concur Not Likely to Adversely Affect

☐ No Comment

[signature]
U.S.F.W.S. – Utah Field Supervisor

Date 8-24-10

RE: Proposed Huntsville Wastewater Treatment Project
Huntsville, Utah

Dear Mr. Maddux:

I am working on an Environmental Information Package, as part of the Capital Facilities Plan for a proposed wastewater treatment project in Huntsville, Utah. This project would be funded by the Utah Water Quality Board and the Capital Facilities Plan is required by the Utah Division of Water Quality.

The Town of Huntsville is a rural community located in Weber County, Utah. It is on the east side of Pineview Reservoir in Ogden Valley, which it shares with the Towns of Liberty and Eden. Presently, the wastewater from residents of the Town of Huntsville and the surrounding unincorporated area is treated primarily through individual septic systems. As a result, the quality of the adjacent Pineview Reservoir surface water and groundwater in the area has been degraded. To protect the recreational resources of the reservoir and groundwater quality, the Town of Huntsville and surrounding unincorporated communities plan to construct a wastewater treatment facility in the area. The proposed wastewater treatment project would occur on private land and is shown in Figure 1 – Overall Plan. The proposed project location can be described as Sections 12, 13 and 24, Township 7 North, Range 1 East, Salt Lake Base Line and Meridian (SLBM) and Sections 6, 7, 9, and 14 through 21, Township 7 North, Range 2 East, SLBM. The proposed project would consist of the following:

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3. A treatment plant would be constructed in the southeastern quarter of Section 18, Township 7 North, Range 1 East, SLBM.

The treated wastewater may be discharged into Pineview Reservoir or used as secondary irrigation water on public greenscapes.

According to the County Lists of Utah's Federally Listed Threatened (T), Endangered (E) and Candidate (C) Species updated by the Utah Division of Wildlife Resources on June 24, 2010, there is one T (Ute Ladies'-tresses), one E (June Sucker) and two C (Greater Sage-

12227 South Business Park Drive, Suite 220, Draper, UT 84020 Tel: 801-523-0100 Fax: 801-523-0990

grouse and Yellow-billed Cuckoo) species that may occur in Weber County. It does not appear that suitable habitat exists for the listed species in the project area since the project would occur in residential areas and mostly on existing roads. Therefore, it is unlikely that the proposed project would impact any T, E and C species, if any, in the project area.

Please review the attached information and return your comments in writing.

Thank you for your assistance on this project. If you have any questions, please contact me at (801) 523-0100. My email address is dyang@sunrise-eng.com.

Sincerely,
Sunrise Engineering, Inc.

Daopiong Yang

Dao Yang, P.E.
Project Engineer/Hydrogeologist

Enclosure: Map and Federally Listed Species in Weber County

Weber County

Common Name	Scientific Name	Status
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
June Sucker	*Chasmistes liorus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Gray Wolf	*Canis lupus*	E Extirpated

Created by the Utah Division of Wildlife Resources - June 24, 2010

WASATCH FRONT REGIONAL COUNCIL
295 North Jimmy Doolittle Road · Salt Lake City, Utah 84116 · www.wfrc.org
Phone Salt Lake: 801.363.4250 · Fax: 801.363.4230 · Phone Ogden: 801.773.5559

August 18, 2010

Dao Yang, P.E.
Project Engineer
Sunrise Engineering
12227 South Business Park Drive
Suite 220
Draper, Utah 84020

Dear Dao Yang:

Thank you for your notification letter about the Environmental Information Package for a proposed wastewater treatment project in Huntsville, Utah.

I understand that to protect the Pineview Reservoir and ground water quality, the town of Huntsville and surrounding unincorporated communities plan to build a wastewater treatment facility.

Review of the plan does not seem to indicate there would be an adverse impact to the existing roads.

We wish you well on this project.

Sincerely,

Barbara Thomas
Intergovernmental Coordinator

APPENDIX C

CALCULATIONS

TOTAL CONTAINMENT LAGOON (20 YEAR DESIGN PERIOD)

Total Containment Wastewater Treatment System Lagoon Cell Sizing Criteria:

	Daily Collection system inflow @ End of 20 yr. Planning Period(2030) @ 100gpcd =		220,000 gal/day		
	End of 20 yr. Planning Period Daily MGD Inflow		0.22 MGD		
	Assumed Maximum BOD Loading		35 lb/acre-day		
	Design BOD		200 mg/L		
	Design Percolation Rate	6.2 ft/yr Maximum	0.204 in/day		
	Design Total Suspended Solids (TSS)		250 mg/L		
	Minimum Operating Lagoon Depth		3 feet		
	Maximum Operating Lagoon Depth		6 feet		
	Dike Slope		3 :1		
*	Design Annual Precipitation		22.35 in/yr	-or-	= 1.86 ft/yr
	* Data from http://www.weatherbase.com				
	Evaporation = Pan Evaporation For Morgan Utah x 0.75 Correction Factor		26.4 in/yr	-or-	= 2.20 ft/yr

TOTAL CONTAINMENT TREATMENT SYSTEM

Required Primary Cell Size @ End of Planning Period:

$$\frac{200\text{ mg}}{\text{L}} \times \frac{1\text{ g}}{1000\text{ mg}} \times \frac{1\text{ lb}}{453.6\text{ g}} \times \frac{3.79\text{ L}}{\text{gal.}} \times \frac{220{,}000\text{ gal}}{\text{day}} \times \frac{1\text{ ac-day}}{35\text{ lb}} =$$

10.5 acre
Primary Cell Size

Primary Cell Retention Time @ End of Planning Period:

$$10.5\text{ acre} \times 6\text{ ft} \times \frac{43560\text{ ft}^2}{\text{acre}} \times \frac{7.48\text{ gal}}{\text{ft}^3} \times \frac{1\text{ day}}{220{,}000\text{ gal}} =$$

93 days
Primary Cell Retention time

Minimum Annual Treatment Plant Capacity @ End of Planning Period:

$$\frac{220{,}000\text{ gal}}{\text{day}} \times \frac{365\text{ day}}{\text{yr}} \times \frac{1\text{ ft}^3}{7.48\text{ gal}} \times \frac{1\text{ ac-ft}}{43{,}560\text{ ft}^3} =$$

246 acre-ft/yr
Annual Plant Inflow

TOTAL CONTAINMENT LAGOON (20 YEAR DESIGN PERIOD)

Required Total Containment Lagoon Treatment Plant Area:

Calculation of the Required Lagoon Area (A) is based on the water balance equation: Water In = Water Out

Lagoon losses due to percolation into the ground are calculated using the formula Q=KiA

Lagoon losses due to percolation into the ground are calculated using the formula Q=KiA

Q = Flow (inches/day)
K = Permeability Constant (inches/day, ft/year)
i = Hydraulic gradient (unit less) = water depth/liner thickness
A= Area (Acres) one acre is unit area

Lagoon losses due to percolation into the ground are calculated using the formula Q/A=Ki
The maximum hydraulic conductivity of the lagoon bottom as set by the Department of Water Quality shall not exceed 1.0 X10^-6 cm/second
This equates to a maximum percolation rate of 0.204 @ 6' of water and a 1' thick liner a maximum percolation rate of about 0.102 @3' of water.
It is not possible to construct lagoons that will percolate at exactly 0.204 inches per day. Based on past experience lagoons either percolate at a rate greater or less than 0.204 inches per day regardless of how careful the construction was carried out. If the system is designed for 0.204 inches per day and it percolates at a rate less than that amount, the actual capacity of the treatment plant is reduced and it will not serve as many people as originally planned. If the system is designed for a percolation rate of 0.204 inches per day and it actually percolates at a rate greater than 0.204 inches per day, the DWQ will require that the liner be reinstalled with bentonite added. The addition of bentonite in most cases dramatically reduces the rate of percolation below 0.204 inches per day and once again reduces the life of the treatment plant depending upon the actual percolation rate after bentonite addition.
The total containment lagoons will be sized based on the allowed 0.204 inches per day percolation.

$$\frac{0.204 \text{ in}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}} \times \frac{1 \text{ ft}}{12 \text{ in}} =$$

6.2 ft/yr
Percolation

Therefore:

Annual inflow + precipitation (Area) = Percolation (Area) + Evaporation (Area)

246 ac-ft/yr	+	1.86 ft/yr (Area)	=	6.2 ft/yr (Area)	+	2.20 ft/yr (Area)	
246 ac-ft/yr	=	6.2 ft/yr (Area)	+	2.20 ft/yr (Area)	-	1.86 ft/yr (Area)	
246 ac-ft/yr	=	6.5 ft/yr (Area)					

$$\text{Area} = \frac{246 \text{ ac-ft/yr}}{6.5 \text{ ft/yr}} =$$

38 acres
Total Lagoon Area @ 3'

Area at Top of Lagoon=(sqrt(area at 1/2 depth)+(4 x m x 1/2 depth))^2	=	40.2 acres
area with 3 feet of freeboard		42.5 acres
	use	43 acres

Assume	78 Acre Pond Site Foot Print due to possible waste and 200 ft buffer zone.

Pond Site	78.0 acres
total land needed	78 acres

FACULTATIVE LAGOON WITH LAND APPLICATION DISCHARGE (20 YEAR DESIGN PERIOD)

DESIGN PARAMETERS AND NOMECLATURE		QUANTITY	UNIT
1	Q, Design Flow		0.22 MGD
2	BOD_5, Biological Oxygen Demand		200 mg/l
3	Design Effluent BOD_5		25 mg/l
4	Facility Elevation		4,900 feet
5	Water Temperature	Winter	7 ^{0}C
		Summer	20 ^{0}C
6	Depth of Water		6 feet
7	Slope of ground (m)		3 :1
*	Design Annual Precipitation * Data from http://www.weatherbase.com/weather/weatherall.php3?s=875224&refer=&units=us		1.86 ft/yr
**	Evaporation Evaporation = Pan evaporation x 0.75 correction factor		2.20 ft/yr

TREATMENT LAGOON SIZING

R317-3-10.3.A.1 states "The Design shall be based on BOD5 loading ranging from 15 to 35 lbs per acre per day." Therefore 25lbs/acre-day will be used based on average flow.

BOD loading

200.00 -25 mg/l (ppm) X 0.22 MGD X 8.34 lbs/gal=

321.09 lbs/day / 25.00 lbs/acre (Allowed BOD Loading) = **12.8 acres**

Area at 1/2 depth	=	12.8 acres
area at top=(sqrt(area at 1/2 depth)+(4 x m x 1/2 depth))^2	=	12.9 acres
area with 3 feet of freeboard	=	14.2 acres
Area for determing volume above sludge blanket	=	12.3 acres
Primary Cell Surface Area Needed	=	12.8 acres
Total Treatment Surface Area Required		12.8 acres

Check Minimum Detention Time

Detention Time = Detention time in the lagoon shall be the greater, and exclusive of the capacity provided for sludge build-up (18 inches in primary Cells),

a. 120 days based on winter flow and the maximum operating depth of the entire system; or

b. 60 days based on summer flow and peak monthly infiltration/inflow.

Therefore Detention time = 120 days

WINTER

Volume of Primary Cell Available for Detention Time

Detention Area is between 18 inches and 6 ft therefore Detention Volume is:

12.8 acre x 4.5 feet = 57.80 acer-ft

Required Lagoon Volume = QT

220,000 gal / day x **120** days x 1 ft^3 / 7.48 Gal x 1 acre / 43560 ft^2 = 81.00 ac-ft

Remaining Required Cell Volume = 81.00 -57.80 ac-ft = **23.20 ac-ft**

SUMMER

Volume of Primary Cell Available for Detention Time

Detention Area is between 18 inches and 6 ft therefore Detention Volume is:

12.8 acre x 1.5 feet = 19.27 acer-ft

220,000 gal / day x **60** days x 1 ft^3 / 7.48 Gal x 1 acre / 43560 ft^2 = **40.50 ac-ft**

Remaining Required Cell Volume = 40.50 -19.27 ac-ft = **21.23 ac-ft**

Therefore Required Cell Volume is 23.20 ac-ft

Required Average Lagoon Surface Area

Operating Depth of Lagoon 6 ft

calculated area is the actual area at 1/2 the working depth, as this is the average area, it is determined by dividing the total acres by the working depth.

Area at 1/2 of Depth	=	3.9 acres
area at top=(sqrt(area at 1/2 depth)+(4 x m x 1/2 depth))^2	=	4.6 acres
area with 3 feet of freeboard	=	5.4 acres
Total Lagoon Surface Area Required For Retention Time	=	18.2 acres

Volumetric Difference Between Summer and Winter Capacity

Primary	57.80 ac-ft	-	19.27 ac-ft	=	38.53 ac-ft
Secondary	23.20 ac-ft	-	21.23 ac-ft	=	1.97 ac-ft
Winter Storage	38.53 ac-ft	+	1.97 ac-ft	=	40.50 ac-ft

FACULTATIVE LAGOON WITH LAND APPLICATION DISCHARGE (20 YEAR DESIGN PERIOD)

DISCHARGE/LAND APPLICATION DESIGN

Inflow in acre feet per year:

220,000.00 gal / day x	365 days / 1 year		1 ft^3 / 7.48 Gal x
1 acre / 43560 ft^2	=		246 ac-ft/yr

Losses in acre feet per year:

Design Seepage	0.204	in./day	=	6.21 ft./yr.
Design Annual Precipitation			=	1.86 ft./yr.
Evaporation = Pan evaporation x 0.75 correction factor			=	2.20 ft./yr.
Net Loss			=	6.55 ft./yr.

32.8 acres x 6.55 ac-ft/year = 215 ac-ft/yr

Inflow	246 ac-ft/year
minus losses	215 ac-ft/year
=	31 ac-ft/year

Irrigation Balance = 31 ac-ft per year

Crop Consumptive Use 35.64 inches/season (alfalfa)

35.64 in/yr = 2.97 feet/acre/season needed to apply to crop

31 ac-ft / 2.97 ft = 10.4 acres of land required for crop

CHECK WINTER STORAGE LAGOON SIZING

Estimated Growing season 185 days

Therefore winter storage pond must be sized to hold 180 days of storage, as this is the non growing season for the area

220,000 gal / day x	180 days / 1 non growing period	x	1 ft^3 / 7.48 Gal x
1 acre / 43,560 ft^2	=		122 ac-ft./non growing period

Design Seepage	0.204 =	3.06 ft./non growing period
Design Non-growing Season Precipitation	=	1.20 ft./non growing period
Evaporation =Pan Evaporation For Gunnison Utah × .75 Correction Factor	=	0.00 ft./non growing period
Net Loss	=	1.86 ft./non growing period

32.8 acres x 1.86 ft/yr = 61 ac-ft/non growing period

Inflow	122 ac-ft/non growing period
minus losses	61 ac-ft/non growing period
=	61 ac-ft/non growing period
Available Storage due to detention time is	40.50 ac-ft
Cell Volume Needed	20.50 ac-ft

Required Average Lagoon Surface Area

Assume lagoons have a working depth of 6 feet

calculated area is the actual area at 1/2 the working depth, as this is the average area, it is determined by dividing the total volume by the working depth.

20.50 acre-feet/	6 feet deep =	3.4 acres
area at top=(sqrt(area at 1/2 depth)+(4 x m x 1/2 depth))^2	=	14.6 acres
area with 3 feet of freeboard		16 acres

Total Lagoon Surface Area Required	=	32.8 acres

Assume 0.0 Acre increase in Pond Site Foot Print as surface area required is less than current.

Pond Site	=	32.8 acres
irrigation Area	=	11 acres
total land needed		43.8 acres

IMPACT FEE CALCULATION

Subject: Impact Fee Calculation (STM Aerotor w/ Gravity Collection)

Loan Duration	Interest Rate
20	3.5%

Construction Activity		Project Costs	% due to new growth	New Growth Project Costs	Actual Payment of Growth Project Costs	Actual Growth Total Costs
STM Aerotor Treatment Plant		$ 5,778,000.00	10%	$ 577,800.00	$40,654.63	$813,092.60
Gravity Collection		$ 8,682,500.00	10%	$ 868,250.00	$61,091.00	$1,221,820.10
Total Construction Costs		$ 14,460,500.00		$ 1,446,050.00		$2,034,912.70

Percentage of Debt Service to be paid by Impact Fees 10%

Debt Service to be paid by Impact Fees $2,034,912.70

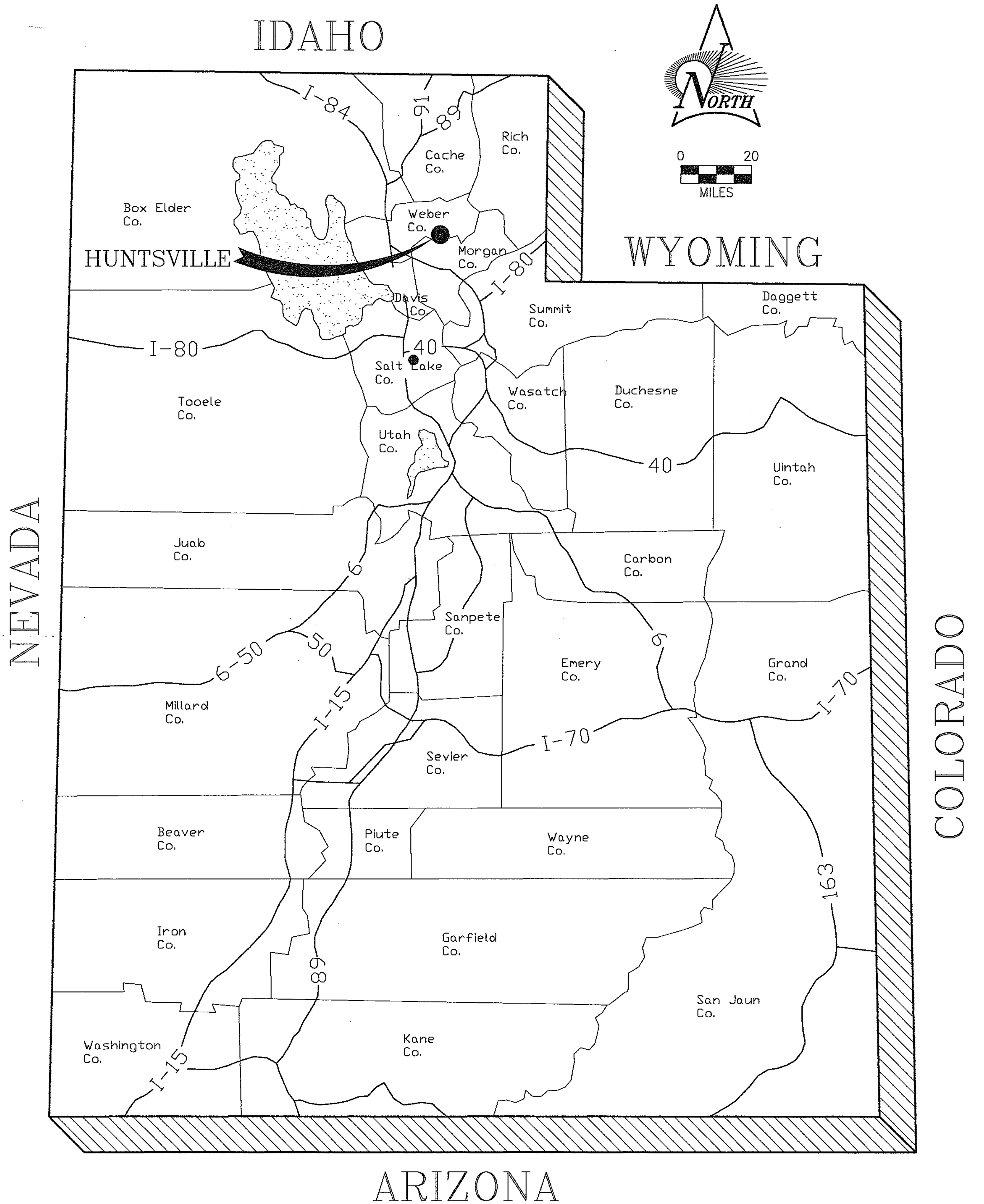
Total Number of Existing Connections	789
Total Number of Proposed Connections (20 yrs)	936
Total number of new connections	147

Impact Fee $ 13,900.00

Improvement	% to New Growth	CIP Cost	New Growth CIP Cost	Actual Annual Payment	New Growth Final Cost For CIP	Impact Fee
STM Aerotor Treatment Plant	10%	$ 5,778,000.00	577,800.00	$40,654.63	$813,092.60	$5,500.00
Gravity Collection System	10%	$ 8,682,500.00	868,250.00	$61,091.00	$1,221,820.10	$8,300.00

APPENDIX D

EXHIBITS
&
MAPS



P:\Huntsville\03656 Huntsville\Design3D\Exhibits\1.1 AREA MAP.dwg Jan 12, 2011 8:21am rbevan

AREA MAP

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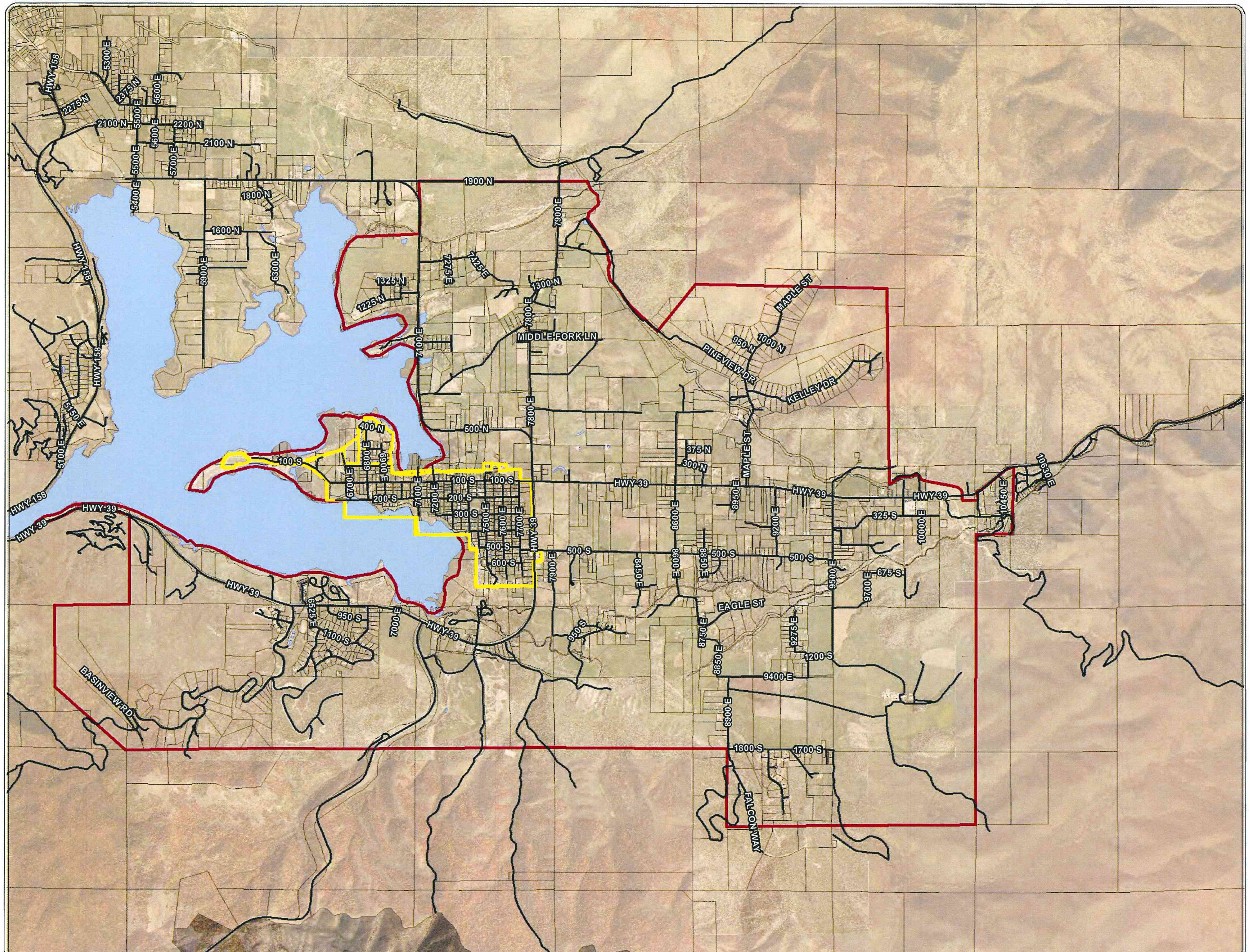
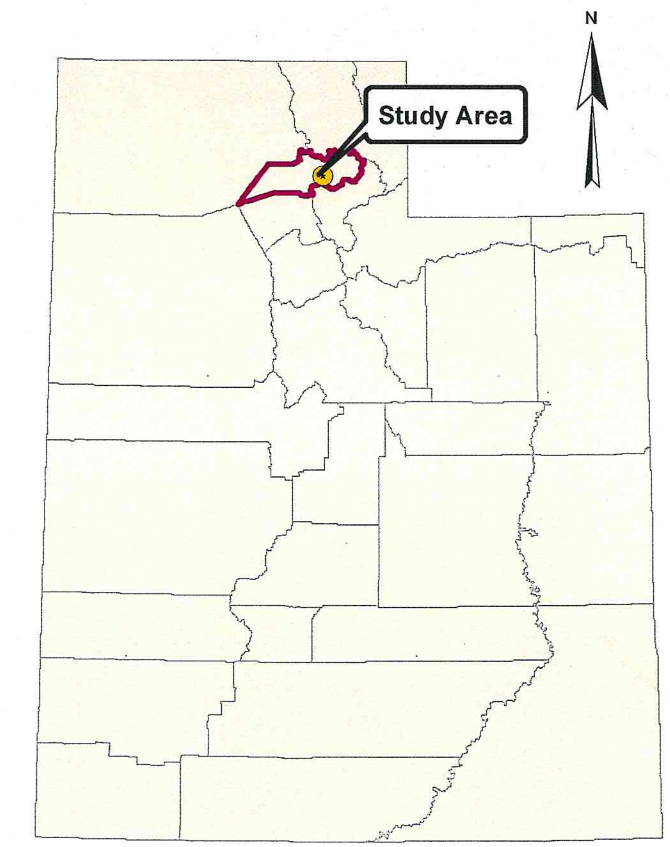
www.sunrise-eng.com

EXHIBIT 1.1





Location Map

Legend

- Roads
- Study Area Boundary
- Huntsville Municipality
- Lakes
- Parcels

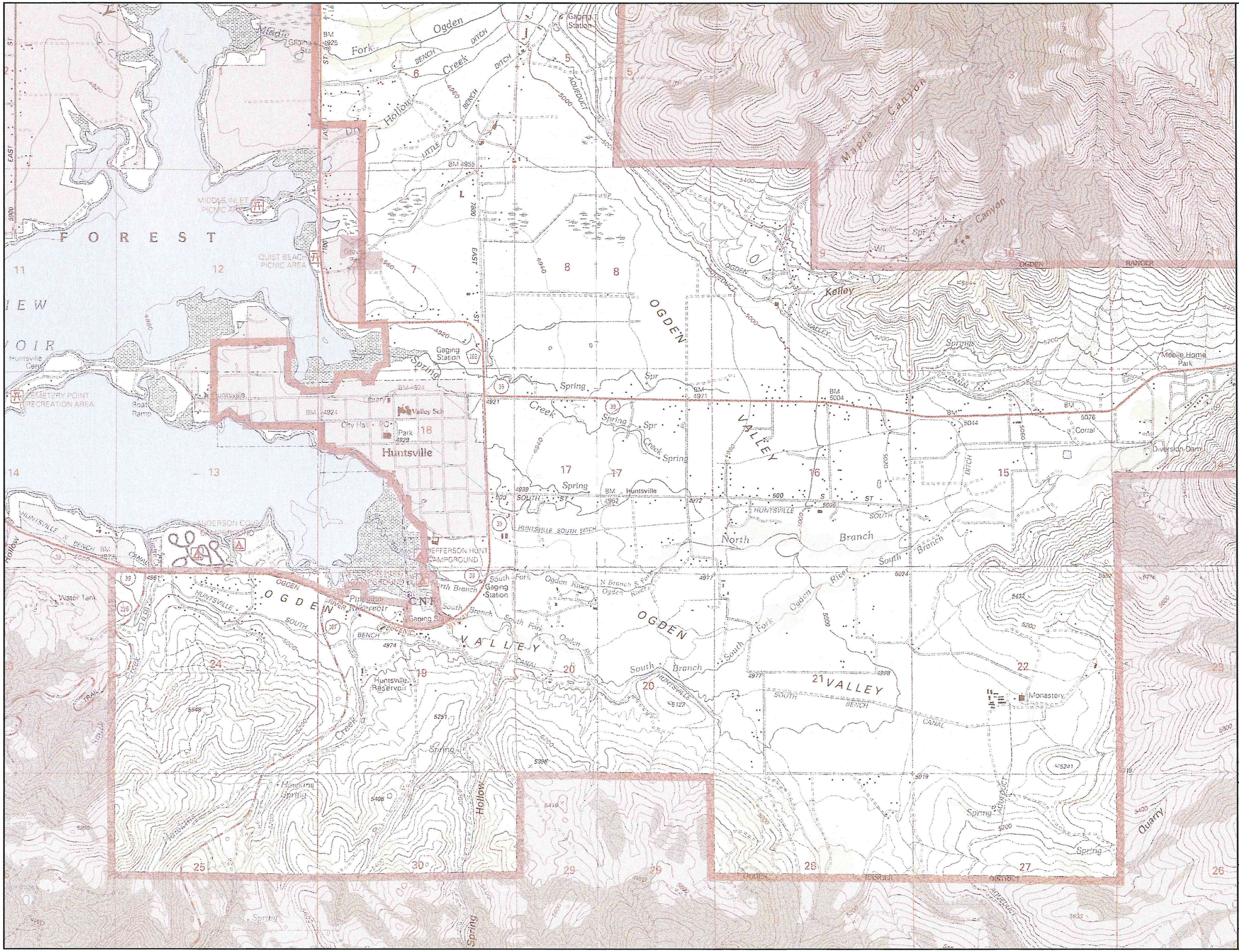
EXHIBIT 1.2

0 0.25 0.5 1 1.5 2 Miles

SUNRISE ENGINEERING

Huntsville and Surrounding Areas

Basemap - Roads, Lakes, Municipality, Parcels, & Study Area Boundary



SCALE
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HORIZ: 1" =1200'

REV NO.	COMMENT	DATE

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12227 SOUTH BUSINESS PARK DRIVE, SUITE 220
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TEL 801.523.0100 · FAX 801.523.0990
www.sunrise-eng.com

HUNTSVILLE, UTAH

EXHIBITS
PHYSIOGRAPHY & TOPOGRAPHY

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
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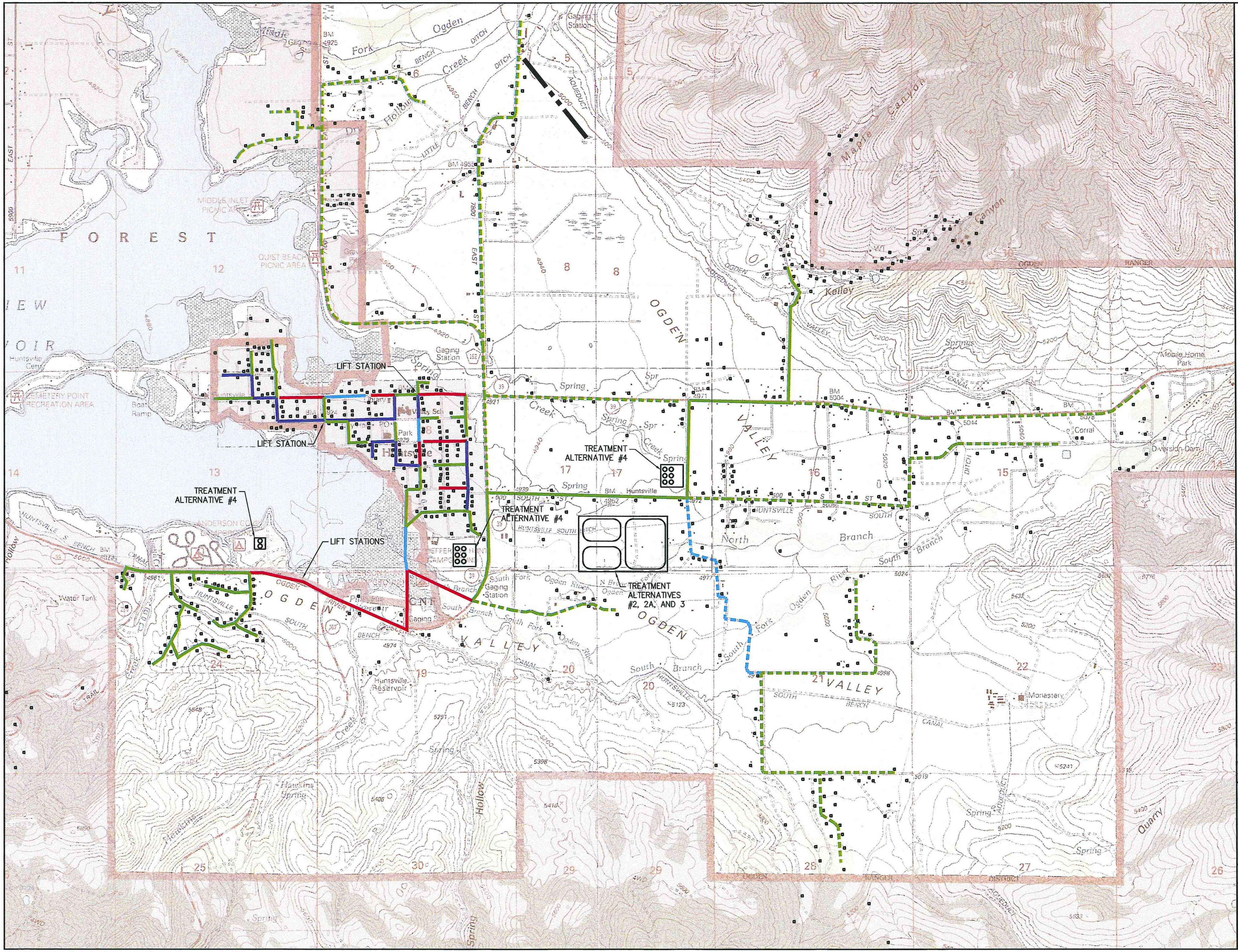

NORTH

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE
- ACTIVE FAULT

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
1200' 0 1200'
HORIZ: 1" =1200'

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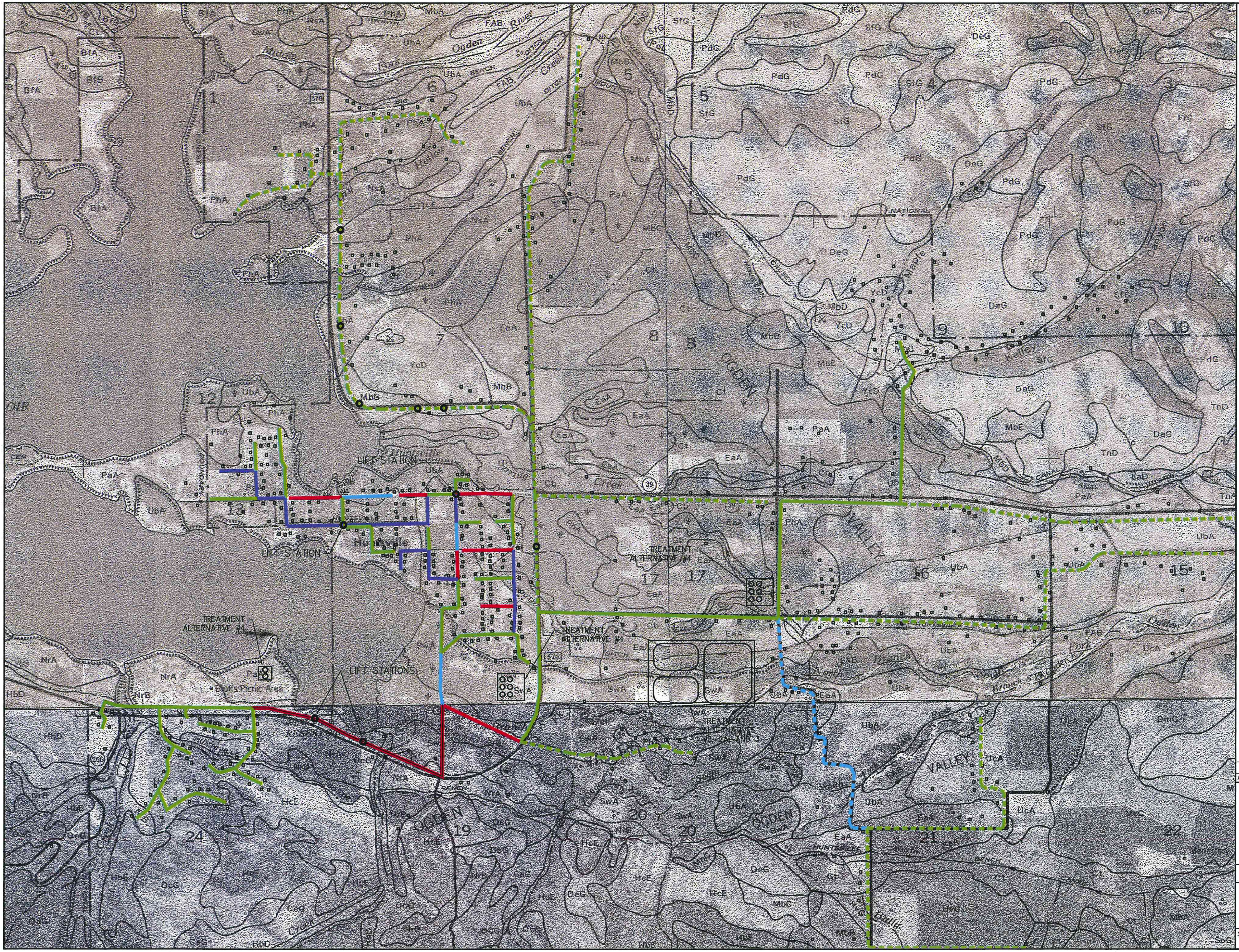
EXHIBITS
GEOLOGICAL HAZARDS

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03656	DT	RMB	DT	4 of 12	Ex-1.4



NORTH

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
2000' 0 2000'
HORIZ: 1" =2000'

REV NO.	COMMENT	DATE

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EXHIBITS
SOIL MAP

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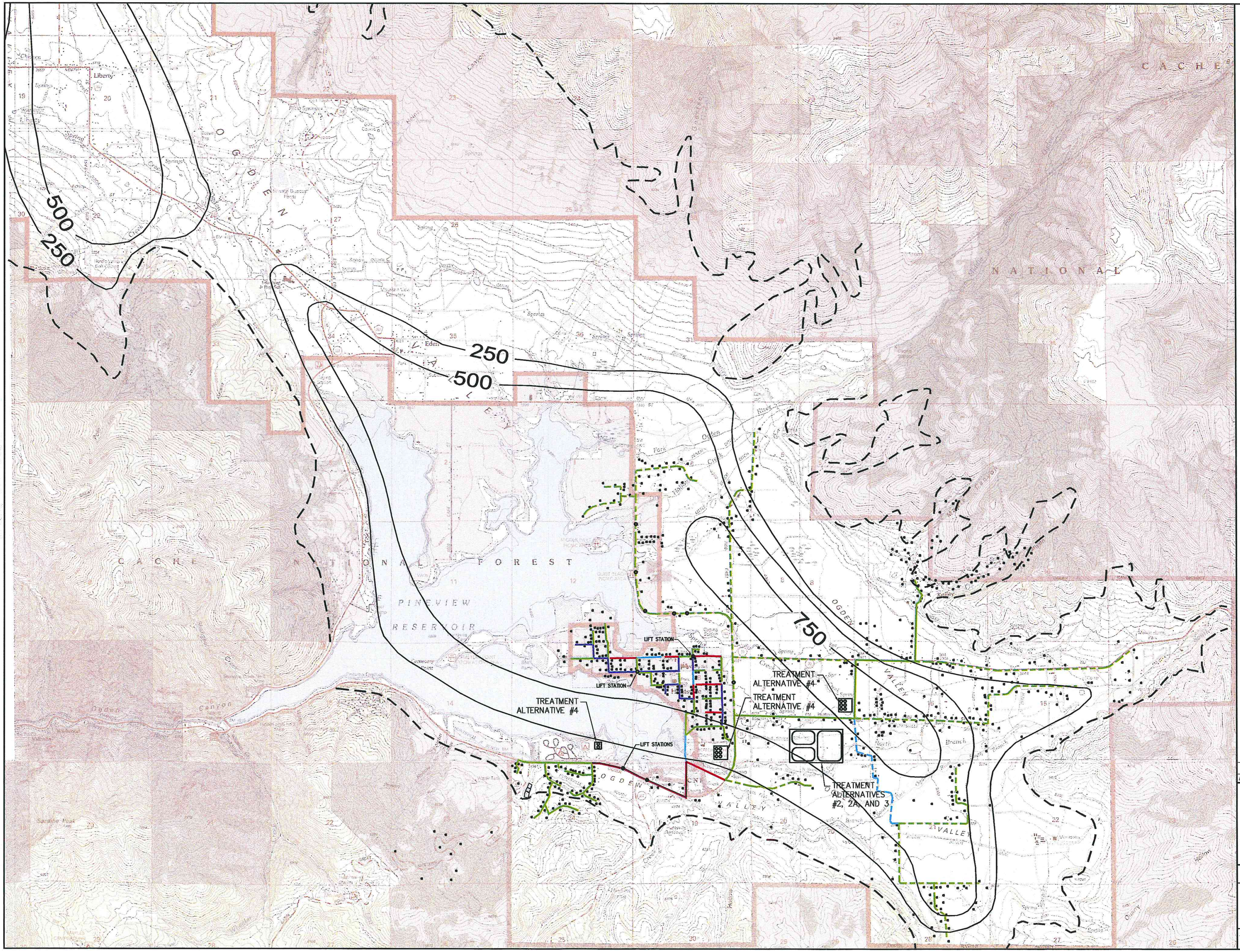

NORTH

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE.
- CONTACT OF VALLEY–FILL DEPOSITS, IN FEET
- 250 LINE OF EQUAL THICKNESS OF VALLEY–FILL DEPOSITS, IN FEET

TREATMENT ALTERNATIVE #2 —TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A —MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3 —MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4 —MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
2000' 0 2000'
HORIZ: 1" =2000'

REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

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EXHIBITS
GROUND WATER BASIN LIMITS

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03656	DT	RMB	DT	6 of 12	Ex-1.6

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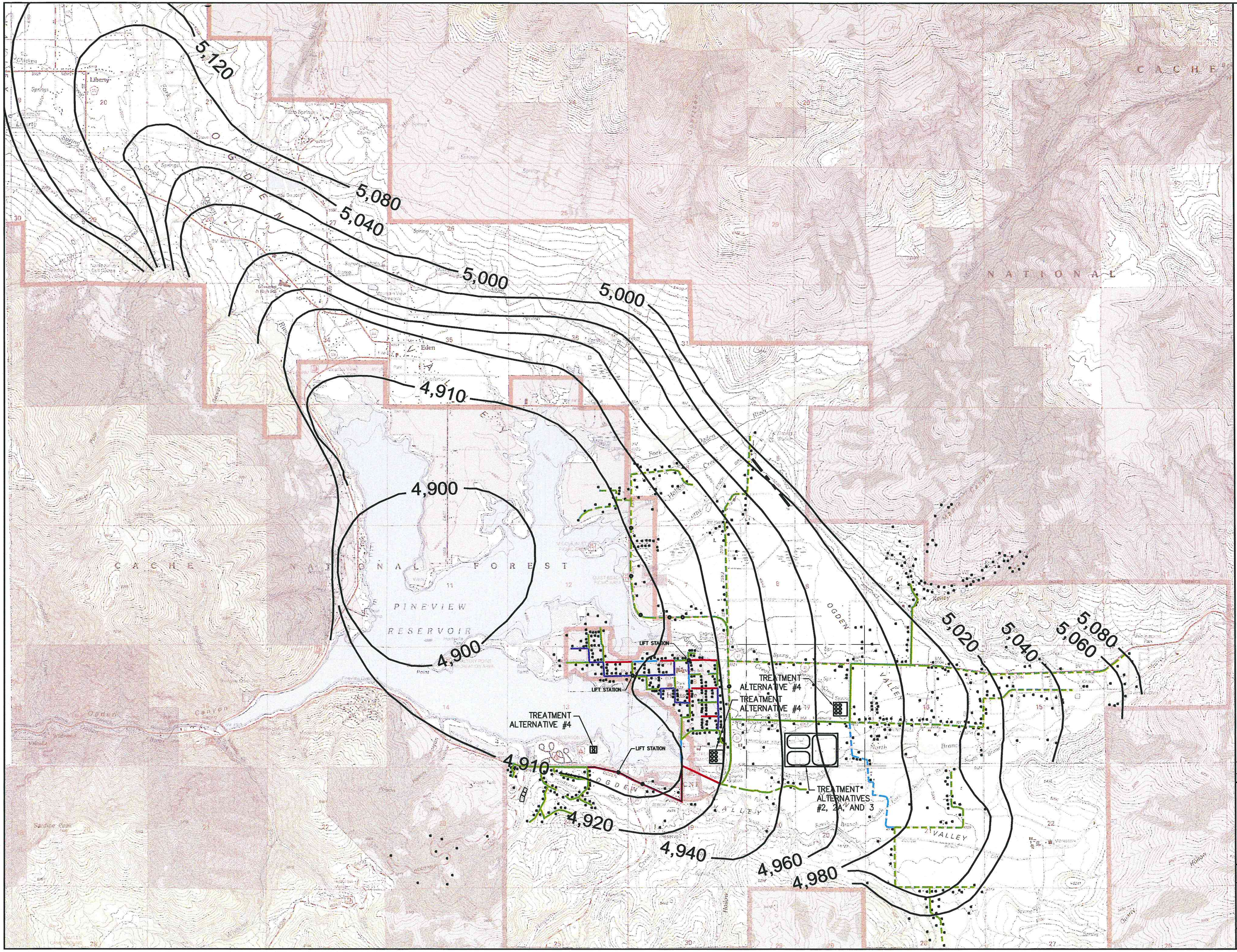

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

5,000 — POTENTIOMETRIC CONTOUR OF PRINCIPAL AQUIFER

SCALE
2000' 0 2000'
HORIZ: 1" =2000'

REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

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EXHIBITS
GROUND WATER CONTOURS

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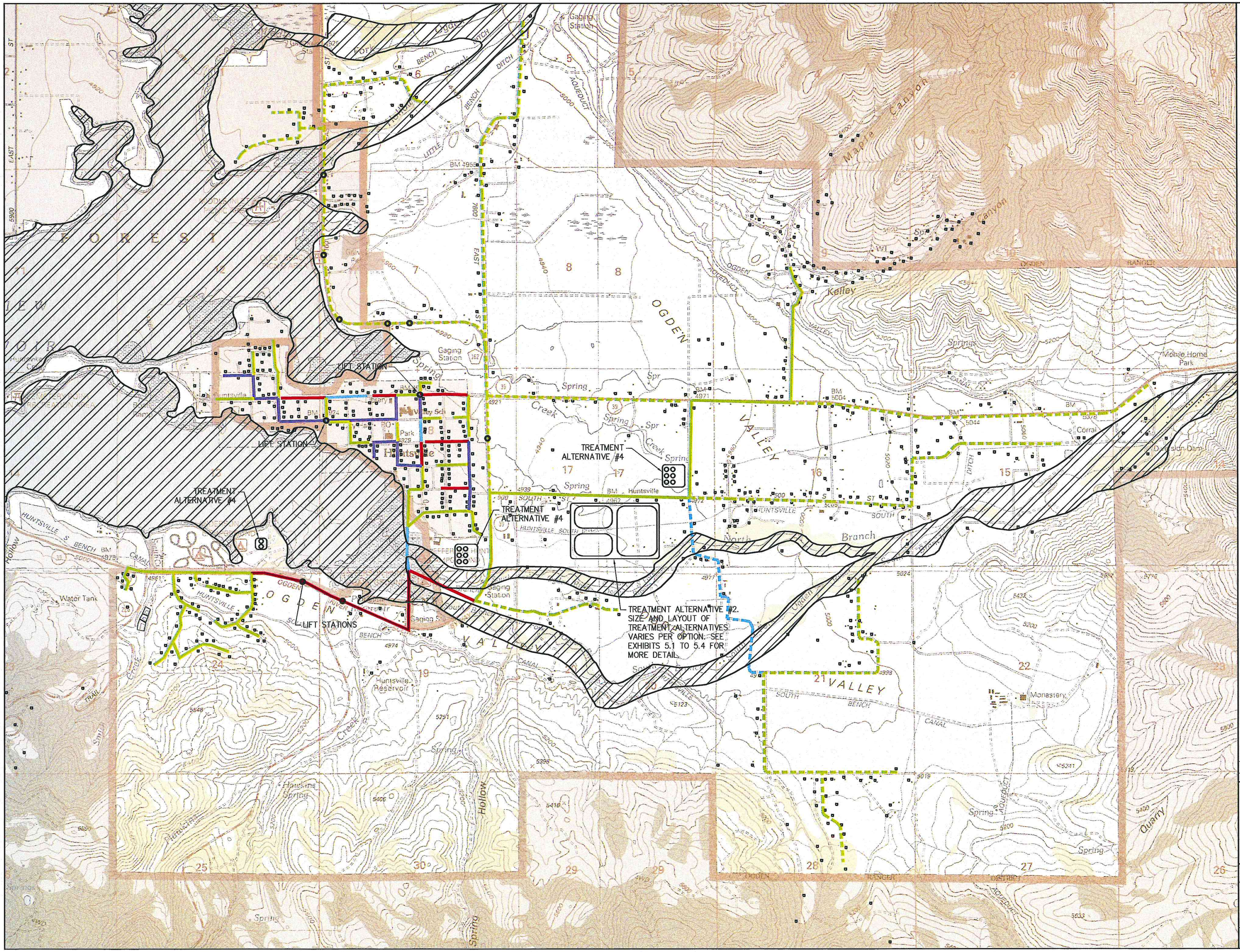

NORTH

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE
- SPECIAL FLOOD HAZARD AREAS

TREATMENT ALTERNATIVE #2
–TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
–DISCHARGING LAGOONS

TREATMENT ALTERNATIVE #3
–MECHANICAL TREATMENT PLANT, (IFAS/STM AEROTORS), LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #3a
–MECHANICAL TREATMENT PLANT, (SBR/FLUIDYNE), LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
–MULTIPLE PACKAGE PLANTS (ORENCO), UNDERGROUND DRIP SYSTEM

TREATMENT ALTERNATIVE #5
–HUNTSVILLE ONLY, MECHANICAL TREATMENT PLANT, (IFAS/STM AEROTORS), LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #5a
–HUNTSVILLE ONLY, PACKAGE TREATMENT PLANT (ORENCO), LAND APPLICATION DISCHARGE

SCALE
1200' 0 1200'
HORIZ: 1" =1200'

NOTE:
LOCATION AND LAYOUT OF THE SPECIFIC TREATMENT PLANTS ARE TO DEMONSTRATE SIZE REQUIREMENTS. EXACT LOCATIONS AND LAYOUTS WILL BE DETERMINED DURING DESIGN.

REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

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HUNTSVILLE, UTAH

EXHIBITS
FLOOD PLAIN MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03656	DT	RMB	DT	03 of 12	Ex-1.8

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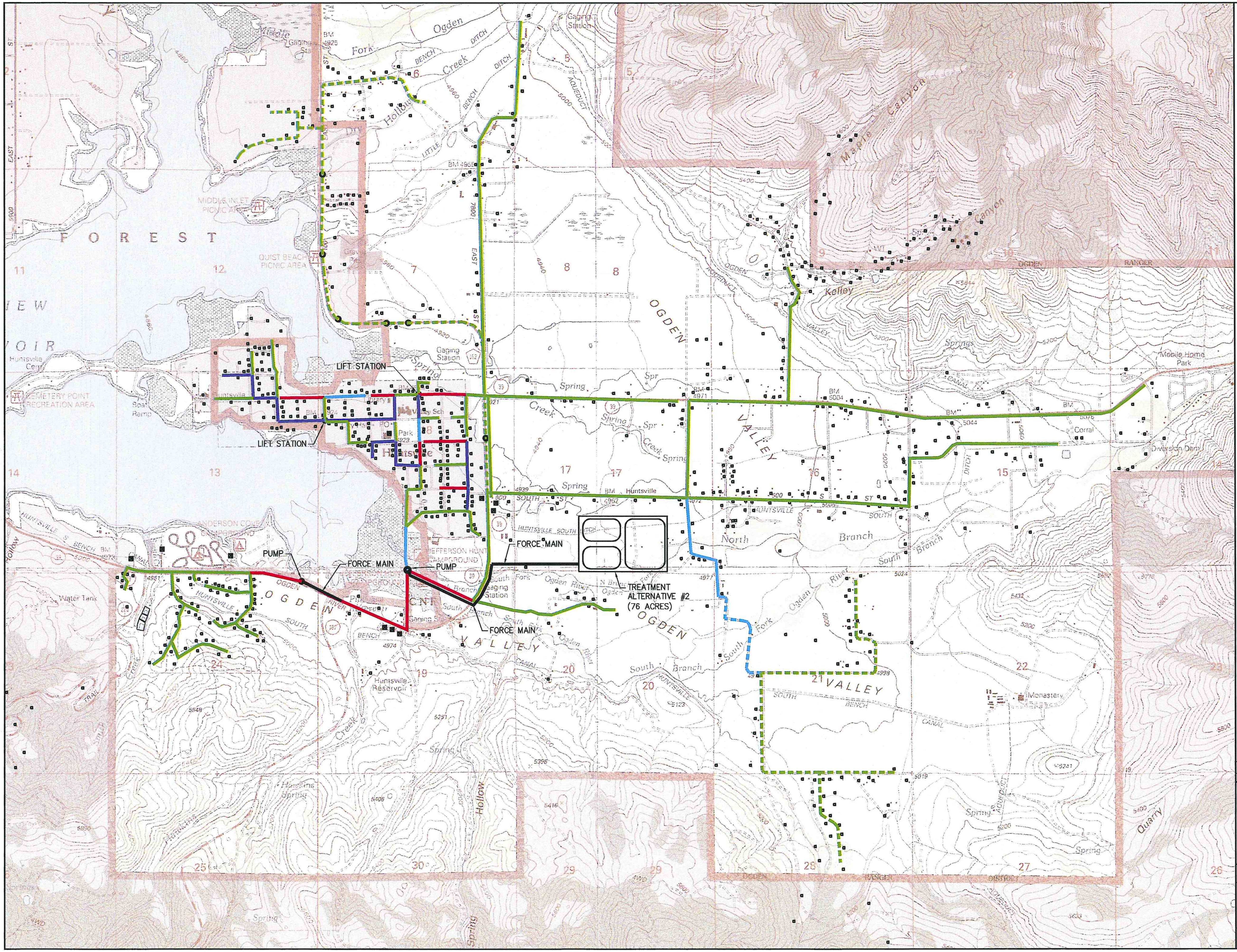

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FORCE MAIN
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
1200' 0 1200'
HORIZ: 1" =1200'

REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

SUNRISE ENGINEERING
12227 SOUTH BUSINESS PARK DRIVE, SUITE 220
DRAPER, UTAH 84020
TEL 801.523.0100 · FAX 801.523.0990
www.sunrise-eng.com

HUNTSVILLE, UTAH

TREATMENT ALTERNATIVE #2
TOTAL CONTAINMENT LAGOONS

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03656	DT	RMB	DT	9 of 12	Ex-5.1

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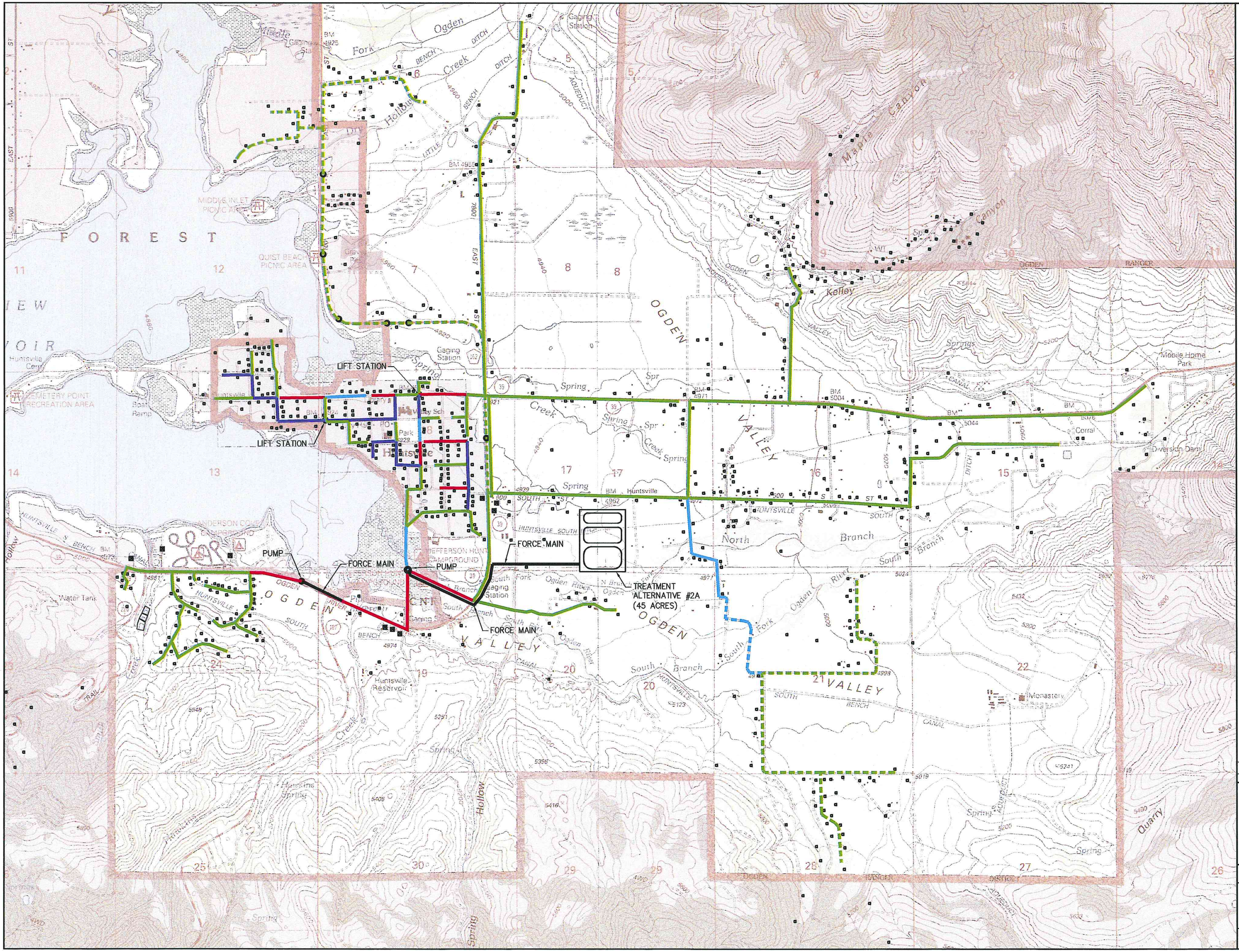

NORTH

LEGEND

- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FORCE MAIN
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
1200' 0 1200'
HORIZ: 1" =1200'

REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

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TREATMENT ALTERNATIVE #2A
DISCHARGING LAGOONS W/ LAND APPLICATION

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03656	DT	RMB	DT	10 of 12	Ex-5.2

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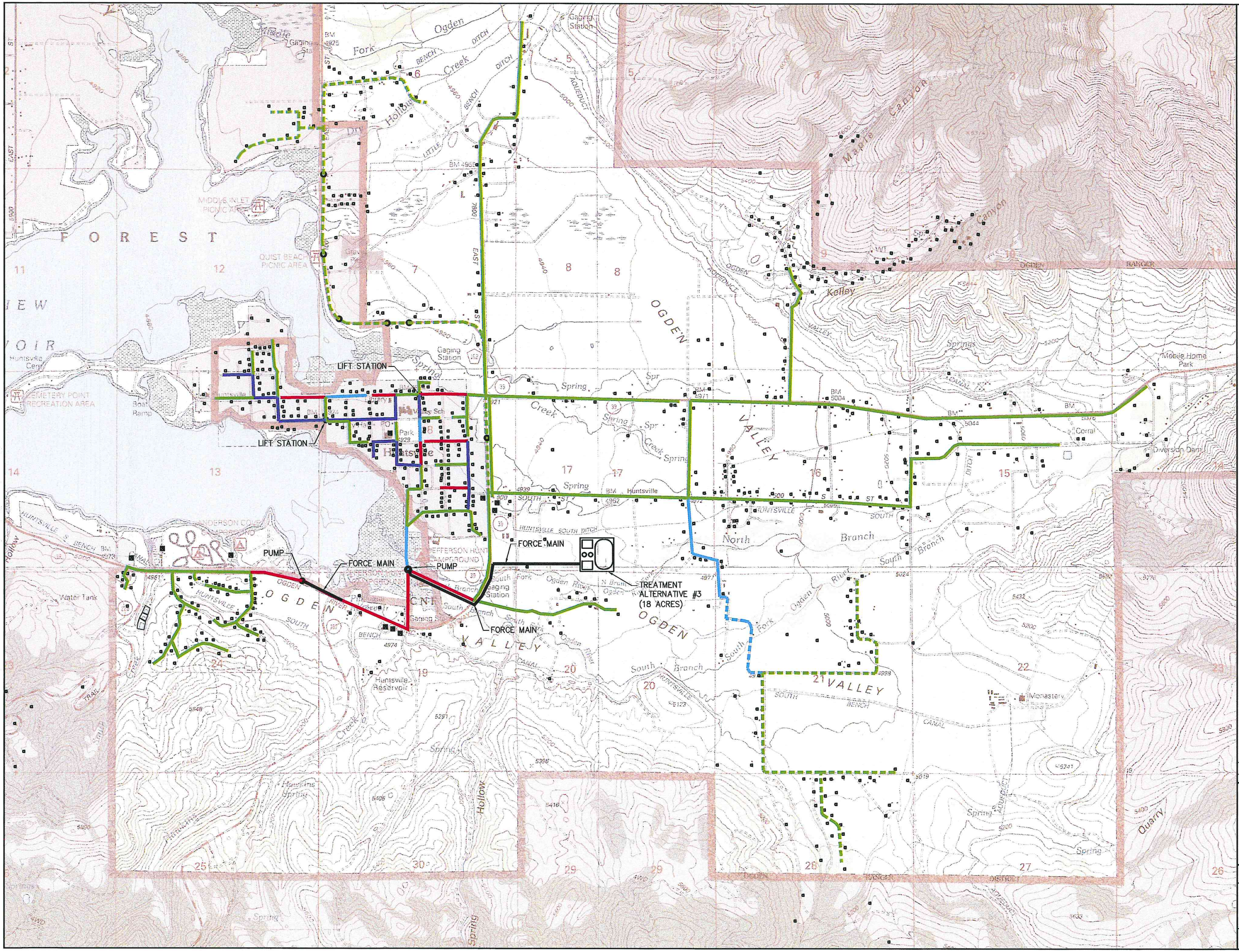

NORTH

LEGEND

(solid green line)	8" PVC
(solid red line)	10" PVC
(solid light blue line)	12" PVC
(solid dark blue line)	15" CONCRETE
(solid black line)	FORCE MAIN
(dashed green line)	FUTURE 8" PVC
(dashed red line)	FUTURE 10" PVC
(dashed light blue line)	FUTURE 12" PVC
(dashed dark blue line)	FUTURE 15" CONCRETE

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
1200' 0 1200'
HORIZ: 1" =1200'

REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

SUNRISE ENGINEERING
12227 SOUTH BUSINESS PARK DRIVE, SUITE 220
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TREATMENT ALTERNATIVE #3
REGIONAL MECHANICAL STM AERATER
TREATMENT PLANT

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03656	DT	RMB	DT	11 of 12	Ex-5.3

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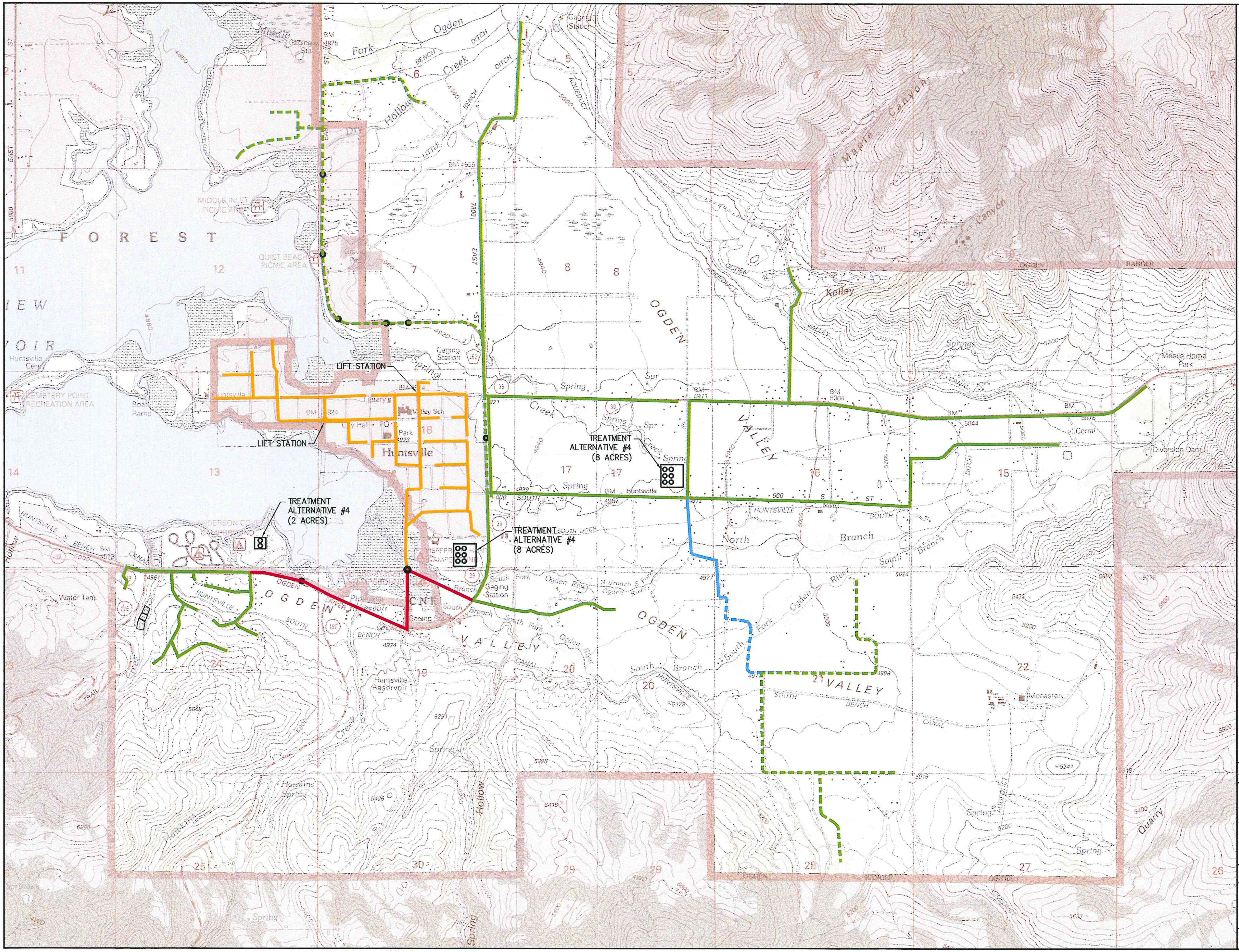

NORTH

LEGEND

- 4" PVC PRESSURIZED
- 8" PVC
- 10" PVC
- 12" PVC
- 15" CONCRETE
- FORCE MAIN
- FUTURE 8" PVC
- FUTURE 10" PVC
- FUTURE 12" PVC
- FUTURE 15" CONCRETE

TREATMENT ALTERNATIVE #2
—TOTAL CONTAINMENT SEWER LAGOONS

TREATMENT ALTERNATIVE #2A
—MECHANICAL TREATMENT PLANT

TREATMENT ALTERNATIVE #3
—MECHANICAL TREATMENT PLANT, LAND APPLICATION DISCHARGE

TREATMENT ALTERNATIVE #4
—MULTIPLE PACKAGE PLANTS UNDERGROUND DRIP SYSTEM

SCALE
1200' 0 1200'
HORIZ: 1" =1200'

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REV NO.	COMMENT	DATE

PRELIMINARY NOT FOR CONSTRUCTION DATE

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12227 SOUTH BUSINESS PARK DRIVE, SUITE 220
DRAPER, UTAH 84020
TEL 801.523.0100 · FAX 801.523.0990
www.sunrise-eng.com

HUNTSVILLE, UTAH

TREATMENT ALTERNATIVE #4
MULTIPLE PACKAGE PLANTS
(ORENCO SYSTEMS)

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03656	DT	RMB	DT	12 of 12	Ex-5.4

APPENDIX E

CASH FLOW MODELS

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #2)

Cash Flow Sewer District- Huntsville Join with County to build Total Containment Lagoon

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Poposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 7,919,000	20	3.5%	40.0%
DWQ Grant Collection	$ 7,372,000	0	0.0%	49.0%
Total Project Cost	$ 15,291,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305
General Information										
Huntsville Town										
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Huntsville - Total Number of ERUs	**237**	**238**	**239**	**241**	**242**	**243**	**245**	**246**	**247**	**249**
Unincorporated										
Unincorporated - Equivalent Residential Connections	552	558	563	569	574	580	586	592	598	604
Unincorporated - New Residential Connections		6	6	6	6	6	6	6	6	6
Unincorporated - Total Number of New ERUs	**0**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Unincorporated - Total Number of ERUs	**552**	**558**	**563**	**569**	**575**	**580**	**586**	**592**	**598**	**604**
Huntsville Percentage of ERU's	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**29%**	**29%**	**29%**	**29%**
Flowrates										
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074
Unincorporated - Wastewater Flowrate - Gallons	163,392	165,050	166,707	168,394	170,082	171,798	173,545	175,291	177,067	178,843
Unincorporated - Wastewater Flowrate - MGD	0.163	0.165	0.167	0.168	0.170	0.172	0.174	0.175	0.177	0.179
Combined Wastewater Flowrate - Gallons	233,544	235,557	237,570	239,642	241,714	243,815	245,946	248,078	250,238	252,399
Combined Wastewater Flowrate - MGD	0.234	0.236	0.238	0.240	0.242	0.244	0.246	0.248	0.250	0.252
Revenues										
New Sewer District										
Residential Fees	-	-	560,632	565,522	570,411	575,371	580,400	585,430	590,529	595,628
Residential Hook-up Fee	-	-	3,400	3,500	3,500	3,550	3,600	3,600	3,650	3,650
Residential Impact Fee	-	51,680	51,680	53,200	53,200	53,960	54,720	54,720	55,480	55,480
Misc., Interest, Equity Investment										
Cash from Savings										
Total Revenues	**-**	**51,680**	**615,712**	**622,222**	**627,111**	**632,881**	**638,720**	**643,750**	**649,659**	**654,758**
Expenses										
Treatment Plant & Collection O&M (STM Aerotor)										
Personnel	-	-	15,000	15,450	15,914	16,391	16,883	17,389	17,911	18,448
Vehicle	-	-	15,000	5,000	5,150	5,305	5,464	5,628	5,796	5,970
Treatment Plant Electrical	-	-	-	-	-	-	-	-	-	-
Treatment Plant Misc. Parts & Supplies	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460
Lab Work	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460
New Equipment Purchase	-	-	-	-	-	-	-	-	-	-
Disposal	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460
Lift Station	-	-	9,000	9,270	9,548	9,835	10,130	10,433	10,746	11,069
Administrative	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460
Subtotal Expenses	**-**	**-**	**47,000**	**37,960**	**39,099**	**40,272**	**41,480**	**42,724**	**44,006**	**45,326**
Debt Service										
Treatment and Collection Loan	-	-	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	**-**	**-**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**
Debt Service Reserve Fund		-	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	**-**	**-**	**659,908**	**650,868**	**652,007**	**653,180**	**654,388**	**655,632**	**656,914**	**658,234**
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Debt Coverage Ratio			**1.02**	**1.05**	**1.06**	**1.06**	**1.07**	**1.08**	**1.09**	**1.09**
Margin after Reserve Set Aside		**51,680**	**(44,196)**	**(28,646)**	**(24,895)**	**(20,299)**	**(15,668)**	**(11,883)**	**(7,255)**	**(3,476)**
Cash On Hand										
Reserve Account										
Debt Service Reserve Fund Account Interest Earned	-	-	-	1,393	2,821	4,284	5,784	7,322	8,898	10,513
Debt Service Reserve Fund Account	-	-	55,719	112,831	171,370	231,374	292,877	355,918	420,535	486,767
Combined Assets										
Margine Interest Earned		-	1,292	219	(491)	(1,126)	(1,662)	(2,095)	(2,444)	(2,687)
Margine Account	-	51,680	8,776	(19,650)	(45,037)	(66,462)	(83,791)	(97,768)	(107,467)	(113,630)
Cash from Savings										
Total Cash On Hand	**-**	**51,680**	**64,495**	**93,180**	**126,333**	**164,912**	**209,086**	**258,150**	**313,067**	**373,137**

	11	12	13	14	15	16	17	18	19	20	21
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information											
Huntsville Town											
Huntsville - Equivalent Residential Connections	249	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Huntsville - Total Number of ERUs	**250**	**251**	**252**	**254**	**255**	**256**	**258**	**259**	**260**	**262**	**263**
Unincorporated											
Unincorporated - Equivalent Residential Connections	610	616	622	628	635	641	647	654	660	667	674
Unincorporated - New Residential Connections	6	6	6	6	6	6	6	6	7	7	7
Unincorporated - Total Number of New ERUs	**6**	**6**	**6**	**6**	**6**	**6**	**7**	**7**	**7**	**7**	**7**
Unincorporated - Total Number of ERUs	**610**	**616**	**623**	**629**	**635**	**642**	**648**	**655**	**661**	**668**	**675**
Huntsville Percentage of ERU's	**29%**	**29%**	**29%**	**29%**	**29%**	**29%**	**28%**	**28%**	**28%**	**28%**	**28%**
Flowrates											
Huntsville - Wastewater Flowrate - Gallons	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	180,649	182,454	184,290	186,154	188,019	189,914	191,838	193,762	195,715	197,698	199,682
Unincorporated - Wastewater Flowrate - MGD	0.181	0.182	0.184	0.186	0.188	0.190	0.192	0.194	0.196	0.198	0.200
Combined Wastewater Flowrate - Gallons	254,590	256,780	259,000	261,250	263,499	265,778	268,087	270,396	272,734	275,132	277,530
Combined Wastewater Flowrate - MGD	0.255	0.257	0.259	0.261	0.263	0.266	0.268	0.270	0.273	0.275	0.278
Revenues											
New Sewer District											
Residential Fees	600,797	605,966	611,205	616,514	621,823	627,201	632,650	638,098	643,616	649,274	654,932
Residential Hook-up Fee	3,700	3,700	3,750	3,800	3,800	3,850	3,900	3,900	3,950	4,050	4,050
Residential Impact Fee	56,240	56,240	57,000	57,760	57,760	58,520	59,280	59,280	60,040	61,560	61,560
Misc., Interest, Equity Investment											
Cash from Savings											
Total Revenues	**660,737**	**665,906**	**671,955**	**678,074**	**683,383**	**689,571**	**695,830**	**701,278**	**707,606**	**714,884**	**720,542**
Expenses											
Treatment Plant & Collection O&M (STM Aerotor)											
Personnel	19,002	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536
Vehicle	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264
Treatment Plant Electrical	-	-	-	-	-	-	-	-	-	-	-
Treatment Plant Misc. Parts & Supplies	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Lab Work	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
New Equipment Purchase	-	-	-	-	-	-	-	-	-	-	-
Disposal	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Lift Station	11,401	11,743	12,095	12,458	12,832	13,217	13,613	14,022	14,442	14,876	15,322
Administrative	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Subtotal Expenses	**46,686**	**48,087**	**49,529**	**51,015**	**52,546**	**54,122**	**55,746**	**57,418**	**59,140**	**60,915**	**62,742**
Debt Service											
Treatment and Collection Loan	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	-	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**	**557,189**
Debt Service Reserve Fund	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	**659,594**	**660,994**	**662,437**	**663,923**	**665,453**	**667,030**	**668,653**	**670,326**	**672,048**	**673,823**	**675,650**
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Debt Coverage Ratio	**1.10**	**1.11**	**1.12**	**1.13**	**1.13**	**1.14**	**1.15**	**1.16**	**1.16**	**1.17**	**1.18**
Margin after Reserve Set Aside	**1,143**	**4,912**	**9,518**	**14,151**	**17,929**	**22,541**	**27,176**	**30,952**	**35,558**	**41,062**	**44,892**
Cash On Hand											
Reserve Account											
Debt Service Reserve Fund Account Interest Earned	12,169	13,866	15,606	17,389	19,217	21,090	23,010	24,979	26,996	29,064	31,184
Debt Service Reserve Fund Account	554,655	624,240	695,565	768,673	843,609	920,418	999,147	1,079,845	1,162,580	1,247,343	1,334,245
Combined Assets											
Margine Interest Earned	(2,841)	(2,883)	(2,832)	(2,665)	(2,378)	(1,989)	(1,476)	(833)	(80)	807	1,854
Margine Account	(115,328)	(113,299)	(106,614)	(95,129)	(79,578)	(59,026)	(33,325)	(3,206)	32,272	74,140	120,886
Cash from Savings											
Total Cash On Hand	**439,327**	**510,941**	**588,951**	**673,544**	**764,031**	**861,392**	**965,822**	**1,076,639**	**1,194,831**	**1,321,483**	**1,455,131**

EXHIBIT 5.5

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #2a)

Cash Flow Sewer District- Huntsville Join with County to build Discharging Lagoon w/ Land Application Discharge

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Poposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 7,919,000	20	3.5%	62.0%
DWQ Grant Collection	$ 5,021,000	0	0.0%	39.0%
Total Project Cost	$ 12,940,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10	11
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344
General Information											
Huntsville Town											
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248	249
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	0	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	237	238	239	241	242	243	245	246	247	249	250
Unincorporated											
Unincorporated - Equivalent Residential Connections	552	558	563	569	574	580	586	592	598	604	610
Unincorporated - New Residential Connections		6	6	6	6	6	6	6	6	6	6
Unincorporated - Total Number of New ERUs	0	6	6	6	6	6	6	6	6	6	6
Unincorporated - Total Number of ERUs	552	558	563	569	575	580	586	592	598	604	610
Huntsville Percentage of ERU's	30%	30%	30%	30%	30%	30%	29%	29%	29%	29%	29%
Flowrates											
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556	73,941
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074	0.074
Unincorporated - Wastewater Flowrate - Gallons	163,392	165,050	166,707	168,394	170,082	171,798	173,545	175,291	177,067	178,843	180,649
Unincorporated - Wastewater Flowrate - MGD	0.163	0.165	0.167	0.168	0.170	0.172	0.174	0.175	0.177	0.179	0.181
Combined Wastewater Flowrate - Gallons	233,544	235,557	237,570	239,642	241,714	243,815	245,946	248,078	250,238	252,399	254,590
Combined Wastewater Flowrate - MGD	0.234	0.236	0.238	0.240	0.242	0.244	0.246	0.248	0.250	0.252	0.255
Revenues											
New Sewer District											
Residential Fees	$ -	-	560,632	565,522	570,411	575,371	580,400	585,430	590,529	595,628	600,797
Residential Hook-up Fee	$ -	-	3,400	3,500	3,500	3,550	3,600	3,600	3,650	3,650	3,700
Residential Impact Fee	$ -	51,680	51,680	53,200	53,200	53,960	54,720	54,720	55,480	55,480	56,240
Misc., Interest, Equity Investment											
Cash from Savings											
Total Revenues	$ -	51,680	615,712	622,222	627,111	632,881	638,720	643,750	649,659	654,758	660,737
Expenses											
Treatment Plant & Collection O&M (STM Aerotor)											
Personnel	$ -	-	15,000	15,450	15,914	16,391	16,883	17,389	17,911	18,448	19,002
Vehicle	$ -	-	15,000	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149
Treatment Plant Electrical	$ -	-	-	-	-	-	-	-	-	-	-
Treatment Plant Misc. Parts & Supplies	$ -	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534
Lab Work	$ -	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534
New Equipment Purchase	$ -	-	-	-	-	-	-	-	-	-	-
Disposal	$ -	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534
Lift Station	$ -	-	9,000	9,270	9,548	9,835	10,130	10,433	10,746	11,069	11,401
Administrative	$ -	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534
Subtotal Expenses	$ -	-	47,000	37,960	39,099	40,272	41,480	42,724	44,006	45,326	46,686
Debt Service											
Treatment and Collection Loan	$ -	-	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	$ -	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	$ -	-	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189
Debt Service Reserve Fund		-	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	$ -	-	659,908	650,868	652,007	653,180	654,388	655,632	656,914	658,234	659,594
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Debt Coverage Ratio			1.02	1.05	1.06	1.06	1.07	1.08	1.09	1.09	1.10
Margin after Reserve Set Aside		51,680	(44,196)	(28,646)	(24,895)	(20,299)	(15,668)	(11,883)	(7,255)	(3,476)	1,143
Cash On Hand											
Reserve Account											
Debt Service Reserve Fund Account Interest Earned	$ -	-	-	1,393	2,821	4,284	5,784	7,322	8,898	10,513	12,169
Debt Service Reserve Fund Account	$ -	-	55,719	112,831	171,370	231,374	292,877	355,918	420,535	486,767	554,655
Combined Assets											
Margine Interest Earned		-	1,292	219	(491)	(1,126)	(1,662)	(2,095)	(2,444)	(2,687)	(2,841)
Margine Account	$ -	51,680	8,776	(19,650)	(45,037)	(66,462)	(83,791)	(97,768)	(107,467)	(113,630)	(115,328)
Cash from Savings											
Total Cash On Hand	$ -	51,680	64,495	93,180	126,333	164,912	209,086	258,150	313,067	373,137	439,327

	12	13	14	15	16	17	18	19	20	21
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information										
Huntsville Town										
Huntsville - Equivalent Residential Connections	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	251	252	254	255	256	258	259	260	262	263
Unincorporated										
Unincorporated - Equivalent Residential Connections	616	622	628	635	641	647	654	660	667	674
Unincorporated - New Residential Connections	6	6	6	6	6	6	6	7	7	7
Unincorporated - Total Number of New ERUs	6	6	6	6	6	7	7	7	7	7
Unincorporated - Total Number of ERUs	616	623	629	635	642	648	655	661	668	675
Huntsville Percentage of ERU's	29%	29%	29%	29%	29%	28%	28%	28%	28%	28%
Flowrates										
Huntsville - Wastewater Flowrate - Gallons	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	182,454	184,290	186,154	188,019	189,914	191,838	193,762	195,715	197,698	199,682
Unincorporated - Wastewater Flowrate - MGD	0.182	0.184	0.186	0.188	0.190	0.192	0.194	0.196	0.198	0.200
Combined Wastewater Flowrate - Gallons	256,780	259,000	261,250	263,499	265,778	268,087	270,396	272,734	275,132	277,530
Combined Wastewater Flowrate - MGD	0.257	0.259	0.261	0.263	0.266	0.268	0.270	0.273	0.275	0.278
Revenues										
New Sewer District										
Residential Fees	605,966	611,205	616,514	621,823	627,201	632,650	638,098	643,616	649,274	654,932
Residential Hook-up Fee	3,700	3,750	3,800	3,800	3,850	3,900	3,900	3,950	4,050	4,050
Residential Impact Fee	56,240	57,000	57,760	57,760	58,520	59,280	59,280	60,040	61,560	61,560
Misc., Interest, Equity Investment										
Cash from Savings										
Total Revenues	665,906	671,955	678,074	683,383	689,571	695,830	701,278	707,606	714,884	720,542
Expenses										
Treatment Plant & Collection O&M (STM Aerotor)										
Personnel	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536
Vehicle	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264
Treatment Plant Electrical	-	-	-	-	-	-	-	-	-	-
Treatment Plant Misc. Parts & Supplies	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Lab Work	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
New Equipment Purchase	-	-	-	-	-	-	-	-	-	-
Disposal	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Lift Station	11,743	12,095	12,458	12,832	13,217	13,613	14,022	14,442	14,876	15,322
Administrative	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Subtotal Expenses	48,087	49,529	51,015	52,546	54,122	55,746	57,418	59,140	60,915	62,742
Debt Service										
Treatment and Collection Loan	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189
Debt Service Reserve Fund	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	660,994	662,437	663,923	665,453	667,030	668,653	670,326	672,048	673,823	675,650
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Debt Coverage Ratio	1.11	1.12	1.13	1.13	1.14	1.15	1.16	1.16	1.17	1.18
Margin after Reserve Set Aside	4,912	9,518	14,151	17,929	22,541	27,176	30,952	35,558	41,062	44,892
Cash On Hand										
Reserve Account										
Debt Service Reserve Fund Account Interest Earned	13,866	15,606	17,389	19,217	21,090	23,010	24,979	26,996	29,064	31,184
Debt Service Reserve Fund Account	624,240	695,565	768,673	843,609	920,418	999,147	1,079,845	1,162,560	1,247,343	1,334,245
Combined Assets										
Margine Interest Earned	(2,883)	(2,832)	(2,665)	(2,378)	(1,989)	(1,476)	(833)	(80)	807	1,854
Margine Account	(113,299)	(106,614)	(95,129)	(79,578)	(59,026)	(33,325)	(3,206)	32,272	74,140	120,886
Cash from Savings										
Total Cash On Hand	510,941	588,951	673,544	764,031	861,392	965,822	1,076,639	1,194,831	1,321,483	1,455,131

EXHIBIT 5.6

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #3)

Cash Flow Sewer District- Huntsville Join with County to build 0.3 Average MGD STM Aerotor Plant

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Poposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 7,919,000	20	3.5%	54.0%
DWQ Grant Collection	$ 6,838,000	0	0.0%	47.0%
Total Project Cost	$ 14,757,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305
General Information										
Huntsville Town										
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	0	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	237	238	239	241	242	243	245	246	247	249
Unincorporated										
Unincorporated - Equivalent Residential Connections	552	558	563	569	574	580	586	592	598	604
Unincorporated - New Residential Connections		6	6	6	6	6	6	6	6	6
Unincorporated - Total Number of New ERUs	0	6	6	6	6	6	6	6	6	6
Unincorporated - Total Number of ERUs	552	558	563	569	575	580	586	592	598	604
Huntsville Percentage of ERU's	30%	30%	30%	30%	30%	30%	29%	29%	29%	29%
Flowrates										
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074
Unincorporated - Wastewater Flowrate - Gallons	163,392	165,050	166,707	168,394	170,082	171,798	173,545	175,291	177,067	178,843
Unincorporated - Wastewater Flowrate - MGD	0.163	0.165	0.167	0.168	0.170	0.172	0.174	0.175	0.177	0.179
Combined Wastewater Flowrate - Gallons	233,544	235,557	237,570	239,642	241,714	243,815	245,946	248,078	250,238	252,399
Combined Wastewater Flowrate - MGD	0.234	0.236	0.238	0.240	0.242	0.244	0.246	0.248	0.250	0.252
Revenues										
New Sewer District										
Residential Fees	-	-	560,632	565,522	570,411	575,371	580,400	585,430	590,529	595,628
Residential Hook-up Fee	-	-	3,400	3,500	3,500	3,550	3,600	3,600	3,650	3,650
Residential Impact Fee	-	51,680	51,680	53,200	53,200	53,960	54,720	54,720	55,480	55,480
Misc., Interest, Equity Investment										
Cash from Savings										
Total Revenues	-	51,680	615,712	622,222	627,111	632,881	638,720	643,750	649,659	654,758
Expenses										
Treatment Plant & Collection O&M (STM Aerotor)										
Personnel	-	-	60,000	61,800	63,654	65,564	67,531	69,556	71,643	73,792
Vehicle	-	-	30,000	10,000	10,300	10,609	10,927	11,255	11,593	11,941
Treatment Plant Electrical	-	-	12,500	12,875	13,261	13,659	14,069	14,491	14,926	15,373
Treatment Plant Misc. Parts & Supplies	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460
Lab Work	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460
New Equipment Purchase	-	-	2,500	2,575	2,652	2,732	2,814	2,898	2,985	3,075
Disposal	-	-	8,000	8,240	8,487	8,742	9,004	9,274	9,552	9,839
Lift Station	-	-	9,000	9,270	9,548	9,835	10,130	10,433	10,746	11,069
Administrative	-	-	8,000	8,240	8,487	8,742	9,004	9,274	9,552	9,839
Subtotal Expenses	-	-	134,000	117,120	120,634	124,253	127,980	131,820	135,774	139,847
Debt Service										
Treatment and Collection Loan	-	-	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	-	-	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189
Debt Service Reserve Fund		-	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	-	-	746,908	730,028	733,542	737,161	740,888	744,727	748,682	752,755
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Debt Coverage Ratio			0.86	0.91	0.91	0.91	0.92	0.92	0.92	0.92
Margin after Reserve Set Aside		51,680	(131,196)	(107,806)	(106,430)	(104,280)	(102,168)	(100,978)	(99,023)	(97,997)
Cash On Hand										
Reserve Account										
Debt Service Reserve Fund Account Interest Earned	-	-	-	1,393	2,821	4,284	5,784	7,322	8,898	10,513
Debt Service Reserve Fund Account	-	-	55,719	112,831	171,370	231,374	292,877	355,918	420,535	486,767
Combined Assets										
Margine Interest Earned		-	1,292	(1,956)	(4,700)	(7,478)	(10,272)	(13,083)	(15,934)	(18,808)
Margine Account	-	51,680	(78,224)	(187,985)	(299,115)	(410,873)	(523,312)	(637,373)	(752,331)	(869,136)
Cash from Savings										
Total Cash On Hand	-	51,680	(22,505)	(75,155)	(127,745)	(179,499)	(230,435)	(281,455)	(331,796)	(382,369)

	11	12	13	14	15	16	17	18	19	20	21
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information											
Huntsville Town											
Huntsville - Equivalent Residential Connections	249	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	250	251	252	254	255	256	258	259	260	262	263
Unincorporated											
Unincorporated - Equivalent Residential Connections	610	616	622	628	635	641	647	654	660	667	674
Unincorporated - New Residential Connections	6	6	6	6	6	6	6	6	7	7	7
Unincorporated - Total Number of New ERUs	6	6	6	6	6	6	7	7	7	7	7
Unincorporated - Total Number of ERUs	610	616	623	629	635	642	648	655	661	668	675
Huntsville Percentage of ERU's	29%	29%	29%	29%	29%	29%	28%	28%	28%	28%	28%
Flowrates											
Huntsville - Wastewater Flowrate - Gallons	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	180,649	182,454	184,290	186,154	188,019	189,914	191,838	193,762	195,715	197,698	199,682
Unincorporated - Wastewater Flowrate - MGD	0.181	0.182	0.184	0.186	0.188	0.190	0.192	0.194	0.196	0.198	0.200
Combined Wastewater Flowrate - Gallons	254,590	256,780	259,000	261,250	263,499	265,778	268,087	270,396	272,734	275,132	277,530
Combined Wastewater Flowrate - MGD	0.255	0.257	0.259	0.261	0.263	0.266	0.268	0.270	0.273	0.275	0.278
Revenues											
New Sewer District											
Residential Fees	600,797	605,966	611,205	616,514	621,823	627,201	632,650	638,098	643,616	649,274	654,932
Residential Hook-up Fee	3,700	3,700	3,750	3,800	3,800	3,850	3,900	3,900	3,950	4,050	4,050
Residential Impact Fee	56,240	56,240	57,000	57,760	57,760	58,520	59,280	59,280	60,040	61,560	61,560
Misc., Interest, Equity Investment											
Cash from Savings											
Total Revenues	660,737	665,906	671,955	678,074	683,383	689,571	695,830	701,278	707,606	714,884	720,542
Expenses											
Treatment Plant & Collection O&M (STM Aerotor)											
Personnel	76,006	78,286	80,635	83,054	85,546	88,112	90,755	93,478	96,282	99,171	102,146
Vehicle	12,299	12,668	13,048	13,439	13,842	14,258	14,685	15,126	15,580	16,047	16,528
Treatment Plant Electrical	15,835	16,310	16,799	17,303	17,822	18,357	18,907	19,475	20,059	20,661	21,280
Treatment Plant Misc. Parts & Supplies	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Lab Work	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
New Equipment Purchase	3,167	3,262	3,360	3,461	3,564	3,671	3,781	3,895	4,012	4,132	4,256
Disposal	10,134	10,438	10,751	11,074	11,406	11,748	12,101	12,464	12,838	13,223	13,619
Lift Station	11,401	11,743	12,095	12,458	12,832	13,217	13,613	14,022	14,442	14,876	15,322
Administrative	10,134	10,438	10,751	11,074	11,406	11,748	12,101	12,464	12,838	13,223	13,619
Subtotal Expenses	144,043	148,364	152,815	157,399	162,121	166,985	171,995	177,155	182,469	187,943	193,582
Debt Service											
Treatment and Collection Loan	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	-	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189
Debt Service Reserve Fund	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	756,951	761,272	765,723	770,307	775,029	779,893	784,903	790,062	795,377	800,851	806,489
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Debt Coverage Ratio	0.93	0.93	0.93	0.93	0.94	0.94	0.94	0.94	0.94	0.95	0.95
Margin after Reserve Set Aside	(96,214)	(95,366)	(93,768)	(92,234)	(91,647)	(90,322)	(89,073)	(88,784)	(87,771)	(85,967)	(85,947)
Cash On Hand											
Reserve Account											
Debt Service Reserve Fund Account Interest Earned	12,169	13,866	15,606	17,389	19,217	21,090	23,010	24,979	26,996	29,064	31,184
Debt Service Reserve Fund Account	554,655	624,240	695,565	768,673	843,609	920,418	999,147	1,079,845	1,162,560	1,247,343	1,334,245
Combined Assets											
Margine Interest Earned	(21,728)	(24,677)	(27,678)	(30,714)	(33,788)	(36,924)	(40,105)	(43,334)	(46,637)	(49,997)	(53,397)
Margine Account	(987,078)	(1,107,121)	(1,228,567)	(1,351,515)	(1,476,950)	(1,604,195)	(1,733,373)	(1,865,492)	(1,999,900)	(2,135,864)	(2,275,208)
Cash from Savings											
Total Cash On Hand	(432,423)	(482,881)	(533,002)	(582,842)	(633,341)	(683,777)	(734,226)	(785,647)	(837,340)	(888,521)	(940,963)

EXHIBIT 5.7

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #3a)

Cash Flow Sewer District- Huntsville Join with County to build 0.3 Average MGD IFAS SBR Plant

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Poposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 7,919,000	20	3.5%	56.0%
DWQ Grant Collection	$ 6,242,000	0	0.0%	45.0%
Total Project Cost	$ 14,161,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305
General Information										
Huntsville Town										
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Huntsville - Total Number of ERUs	**237**	**238**	**239**	**241**	**242**	**243**	**245**	**246**	**247**	**249**
Unincorporated										
Unincorporated - Equivalent Residential Connections	552	558	563	569	574	580	586	592	598	604
Unincorporated - New Residential Connections		6	6	6	6	6	6	6	6	6
Unincorporated - Total Number of New ERUs	**0**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Unincorporated - Total Number of ERUs	**552**	**558**	**563**	**569**	**575**	**580**	**586**	**592**	**598**	**604**
Huntsville Percentage of ERU's	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**29%**	**29%**	**29%**	**29%**
Flowrates										
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074
Unincorporated - Wastewater Flowrate - Gallons	163,392	165,050	166,707	168,394	170,082	171,798	173,545	175,291	177,067	178,843
Unincorporated - Wastewater Flowrate - MGD	0.163	0.165	0.167	0.168	0.170	0.172	0.174	0.175	0.177	0.179
Combined Wastewater Flowrate - Gallons	233,544	235,557	237,570	239,642	241,714	243,815	245,946	248,078	250,238	252,399
Combined Wastewater Flowrate - MGD	0.234	0.236	0.238	0.240	0.242	0.244	0.246	0.248	0.250	0.252
Revenues										
New Sewer District										
Residential Fees	$ -	$ -	$ 560,632	$ 565,522	$ 570,411	$ 575,371	$ 580,400	$ 585,430	$ 590,529	$ 595,628
Residential Hook-up Fee	$ -	$ -	$ 3,400	$ 3,500	$ 3,500	$ 3,550	$ 3,600	$ 3,600	$ 3,650	$ 3,650
Residential Impact Fee	$ -	$ 51,680	$ 51,680	$ 53,200	$ 53,200	$ 53,960	$ 54,720	$ 54,720	$ 55,480	$ 55,480
Misc., Interest, Equity Investment										
Cash from Savings										
Total Revenues	**$ -**	**$ 51,680**	**$ 615,712**	**$ 622,222**	**$ 627,111**	**$ 632,881**	**$ 638,720**	**$ 643,750**	**$ 649,659**	**$ 654,758**
Expenses										
Treatment Plant & Collection O&M (STM Aerotor)										
Personnel	$ -	$ -	$ 60,000	$ 61,800	$ 63,654	$ 65,564	$ 67,531	$ 69,556	$ 71,643	$ 73,792
Vehicle	$ -	$ -	$ 30,000	$ 10,000	$ 10,300	$ 10,609	$ 10,927	$ 11,255	$ 11,593	$ 11,941
Treatment Plant Electrical	$ -	$ -	$ 9,000	$ 9,270	$ 9,548	$ 9,835	$ 10,130	$ 10,433	$ 10,746	$ 11,069
Treatment Plant Misc. Parts & Supplies	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388	$ 2,460
Lab Work	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388	$ 2,460
New Equipment Purchase	$ -	$ -	$ 2,500	$ 2,575	$ 2,652	$ 2,732	$ 2,814	$ 2,898	$ 2,985	$ 3,075
Disposal	$ -	$ -	$ 8,000	$ 8,240	$ 8,487	$ 8,742	$ 9,004	$ 9,274	$ 9,552	$ 9,839
Lift Station	$ -	$ -	$ 9,000	$ 9,270	$ 9,548	$ 9,835	$ 10,130	$ 10,433	$ 10,746	$ 11,069
Administrative	$ -	$ -	$ 8,000	$ 8,240	$ 8,487	$ 8,742	$ 9,004	$ 9,274	$ 9,552	$ 9,839
Subtotal Expenses	**$ -**	**$ -**	**$ 130,500**	**$ 113,515**	**$ 116,920**	**$ 120,428**	**$ 124,041**	**$ 127,762**	**$ 131,595**	**$ 135,543**
Debt Service										
Treatment and Collection Loan	$ -	$ -	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Debt Service Expenses	**$ -**	**$ -**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**
Debt Service Reserve Fund		$ -	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719
Total Expenses	**$ -**	**$ -**	**$ 743,408**	**$ 726,423**	**$ 729,828**	**$ 733,336**	**$ 736,949**	**$ 740,670**	**$ 744,503**	**$ 748,451**
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Debt Coverage Ratio			**0.87**	**0.91**	**0.92**	**0.92**	**0.92**	**0.93**	**0.93**	**0.93**
Margin after Reserve Set Aside		**$ 51,680**	**$ (127,696)**	**$ (104,201)**	**$ (102,717)**	**$ (100,455)**	**$ (98,229)**	**$ (96,920)**	**$ (94,844)**	**$ (93,693)**
Cash On Hand										
Reserve Account										
Debt Service Reserve Fund Account Interest Earned	$ -	$ -	$ -	$ 1,393	$ 2,821	$ 4,284	$ 5,784	$ 7,322	$ 8,898	$ 10,513
Debt Service Reserve Fund Account	$ -	$ -	$ 55,719	$ 112,831	$ 171,370	$ 231,374	$ 292,877	$ 355,918	$ 420,535	$ 486,767
Combined Assets										
Margine Interest Earned		$ -	$ 1,292	$ (1,868)	$ (4,520)	$ (7,201)	$ (9,892)	$ (12,595)	$ (15,333)	$ (18,087)
Margine Account	$ -	$ 51,680	$ (74,724)	$ (180,793)	$ (288,030)	$ (395,685)	$ (503,806)	$ (613,322)	$ (723,499)	$ (835,279)
Cash from Savings										
Total Cash On Hand	**$ -**	**$ 51,680**	**$ (19,005)**	**$ (67,962)**	**$ (116,659)**	**$ (164,312)**	**$ (210,929)**	**$ (257,404)**	**$ (302,964)**	**$ (348,512)**

	11	12	13	14	15	16	17	18	19	20	21
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information											
Huntsville Town											
Huntsville - Equivalent Residential Connections	249	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Huntsville - Total Number of ERUs	**250**	**251**	**252**	**254**	**255**	**256**	**258**	**259**	**260**	**262**	**263**
Unincorporated											
Unincorporated - Equivalent Residential Connections	610	616	622	628	635	641	647	654	660	667	674
Unincorporated - New Residential Connections	6	6	6	6	6	6	6	6	7	7	7
Unincorporated - Total Number of New ERUs	**6**	**6**	**6**	**6**	**6**	**6**	**7**	**7**	**7**	**7**	**7**
Unincorporated - Total Number of ERUs	**610**	**616**	**623**	**629**	**635**	**642**	**648**	**655**	**661**	**668**	**675**
Huntsville Percentage of ERU's	**29%**	**29%**	**29%**	**29%**	**29%**	**29%**	**28%**	**28%**	**28%**	**28%**	**28%**
Flowrates											
Huntsville - Wastewater Flowrate - Gallons	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	180,649	182,454	184,290	186,154	188,019	189,914	191,838	193,762	195,715	197,698	199,682
Unincorporated - Wastewater Flowrate - MGD	0.181	0.182	0.184	0.186	0.188	0.190	0.192	0.194	0.196	0.198	0.200
Combined Wastewater Flowrate - Gallons	254,590	256,780	259,000	261,250	263,499	265,778	268,087	270,396	272,734	275,132	277,530
Combined Wastewater Flowrate - MGD	0.255	0.257	0.259	0.261	0.263	0.266	0.268	0.270	0.273	0.275	0.278
Revenues											
New Sewer District											
Residential Fees	$ 600,797	$ 605,966	$ 611,205	$ 616,514	$ 621,823	$ 627,201	$ 632,650	$ 638,098	$ 643,616	$ 649,274	$ 654,932
Residential Hook-up Fee	$ 3,700	$ 3,700	$ 3,750	$ 3,800	$ 3,800	$ 3,850	$ 3,900	$ 3,900	$ 3,950	$ 4,050	$ 4,050
Residential Impact Fee	$ 56,240	$ 56,240	$ 57,000	$ 57,760	$ 57,760	$ 58,520	$ 59,280	$ 59,280	$ 60,040	$ 61,560	$ 61,560
Misc., Interest, Equity Investment											
Cash from Savings											
Total Revenues	**$ 660,737**	**$ 665,906**	**$ 671,955**	**$ 678,074**	**$ 683,383**	**$ 689,571**	**$ 695,830**	**$ 701,278**	**$ 707,606**	**$ 714,884**	**$ 720,542**
Expenses											
Treatment Plant & Collection O&M (STM Aerotor)											
Personnel	$ 76,006	$ 78,286	$ 80,635	$ 83,054	$ 85,546	$ 88,112	$ 90,755	$ 93,478	$ 96,282	$ 99,171	$ 102,146
Vehicle	$ 12,299	$ 12,668	$ 13,048	$ 13,439	$ 13,842	$ 14,258	$ 14,685	$ 15,126	$ 15,580	$ 16,047	$ 16,528
Treatment Plant Electrical	$ 11,401	$ 11,743	$ 12,095	$ 12,458	$ 12,832	$ 13,217	$ 13,613	$ 14,022	$ 14,442	$ 14,876	$ 15,322
Treatment Plant Misc. Parts & Supplies	$ 2,534	$ 2,610	$ 2,688	$ 2,768	$ 2,852	$ 2,937	$ 3,025	$ 3,116	$ 3,209	$ 3,306	$ 3,405
Lab Work	$ 2,534	$ 2,610	$ 2,688	$ 2,768	$ 2,852	$ 2,937	$ 3,025	$ 3,116	$ 3,209	$ 3,306	$ 3,405
New Equipment Purchase	$ 3,167	$ 3,262	$ 3,360	$ 3,461	$ 3,564	$ 3,671	$ 3,781	$ 3,895	$ 4,012	$ 4,132	$ 4,256
Disposal	$ 10,134	$ 10,438	$ 10,751	$ 11,074	$ 11,406	$ 11,748	$ 12,101	$ 12,464	$ 12,838	$ 13,223	$ 13,619
Lift Station	$ 11,401	$ 11,743	$ 12,095	$ 12,458	$ 12,832	$ 13,217	$ 13,613	$ 14,022	$ 14,442	$ 14,876	$ 15,322
Administrative	$ 10,134	$ 10,438	$ 10,751	$ 11,074	$ 11,406	$ 11,748	$ 12,101	$ 12,464	$ 12,838	$ 13,223	$ 13,619
Subtotal Expenses	**$ 139,609**	**$ 143,797**	**$ 148,111**	**$ 152,555**	**$ 157,131**	**$ 161,845**	**$ 166,701**	**$ 171,702**	**$ 176,853**	**$ 182,158**	**$ 187,623**
Debt Service											
Treatment and Collection Loan	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Debt Service Expenses	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**	**$ 557,189**
Debt Service Reserve Fund	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719	$ 55,719
Total Expenses	**$ 752,517**	**$ 756,705**	**$ 761,019**	**$ 765,463**	**$ 770,039**	**$ 774,753**	**$ 779,609**	**$ 784,610**	**$ 789,761**	**$ 795,066**	**$ 800,531**
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Debt Coverage Ratio	**0.94**	**0.94**	**0.94**	**0.94**	**0.94**	**0.95**	**0.95**	**0.95**	**0.95**	**0.96**	**0.96**
Margin after Reserve Set Aside	**$ (91,780)**	**$ (90,799)**	**$ (89,064)**	**$ (87,389)**	**$ (86,657)**	**$ (85,182)**	**$ (83,779)**	**$ (83,332)**	**$ (82,154)**	**$ (80,182)**	**$ (79,989)**
Cash On Hand											
Reserve Account											
Debt Service Reserve Fund Account Interest Earned	$ 12,169	$ 13,866	$ 15,606	$ 17,389	$ 19,217	$ 21,090	$ 23,010	$ 24,979	$ 26,996	$ 29,064	$ 31,184
Debt Service Reserve Fund Account	$ 554,655	$ 624,240	$ 695,565	$ 768,673	$ 843,609	$ 920,418	$ 999,147	$ 1,079,845	$ 1,162,560	$ 1,247,343	$ 1,334,245
Combined Assets											
Margine Interest Earned	$ (20,882)	$ (23,699)	$ (26,561)	$ (29,452)	$ (32,373)	$ (35,348)	$ (38,362)	$ (41,415)	$ (44,534)	$ (47,701)	$ (50,898)
Margine Account	$ (947,941)	$ (1,062,439)	$ (1,178,064)	$ (1,294,904)	$ (1,413,934)	$ (1,534,464)	$ (1,656,605)	$ (1,781,351)	$ (1,908,039)	$ (2,035,922)	$ (2,166,809)
Cash from Savings											
Total Cash On Hand	**$ (393,286)**	**$ (438,199)**	**$ (482,499)**	**$ (526,231)**	**$ (570,325)**	**$ (614,046)**	**$ (657,457)**	**$ (701,506)**	**$ (745,479)**	**$ (788,579)**	**$ (832,563)**

EXHIBIT 5.8

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #4)
Cash Flow Sewer District- Huntsville Join with County to build Multiple ORENCO System Package Plants

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Proposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 7,919,000	20	3.5%	43.0%
DWQ Grant Collection	$ 10,549,000	0	0.0%	58.0%
Total Project Cost	$ 18,468,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information																					
Huntsville Town																					
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248	249	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	237	238	239	241	242	243	245	246	247	249	250	251	252	254	255	256	258	259	260	262	263
Unincorporated																					
Unincorporated - Equivalent Residential Connections	552	558	563	569	574	580	586	592	598	604	610	616	622	628	635	641	647	654	660	667	674
Unincorporated - New Residential Connections		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7
Unincorporated - Total Number of New ERUs	0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7
Unincorporated - Total Number of ERUs	552	558	563	569	575	580	586	592	598	604	610	616	623	629	635	642	648	655	661	668	675
Huntsville Percentage of ERU's	30%	30%	30%	30%	30%	30%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	28%	28%	28%	28%	28%
Flowrates																					
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	163,392	165,050	166,707	168,394	170,082	171,798	173,545	175,291	177,067	178,843	180,649	182,454	184,290	186,154	188,019	189,914	191,838	193,762	195,715	197,698	199,682
Unincorporated - Wastewater Flowrate - MGD	0.163	0.165	0.167	0.168	0.170	0.172	0.174	0.175	0.177	0.179	0.181	0.182	0.184	0.186	0.188	0.190	0.192	0.194	0.196	0.198	0.200
Combined Wastewater Flowrate - Gallons	233,544	235,557	237,570	239,642	241,714	243,815	245,946	248,078	250,238	252,399	254,590	256,780	259,000	261,250	263,499	265,778	268,087	270,396	272,734	275,132	277,530
Combined Wastewater Flowrate - MGD	0.234	0.236	0.238	0.240	0.242	0.244	0.246	0.248	0.250	0.252	0.255	0.257	0.259	0.261	0.263	0.266	0.268	0.270	0.273	0.275	0.278
Revenues																					
New Sewer District																					
Residential Fees	-	-	560,632	565,522	570,411	575,371	580,400	585,430	590,529	595,628	600,797	605,966	611,205	616,514	621,823	627,201	632,650	638,098	643,616	649,274	654,932
Residential Hook-up Fee	-	-	3,400	3,500	3,500	3,550	3,600	3,600	3,650	3,650	3,700	3,700	3,750	3,800	3,800	3,850	3,900	3,900	3,950	4,050	4,050
Residential Impact Fee	-	51,680	51,680	53,200	53,200	53,960	54,720	54,720	55,480	55,480	56,240	56,240	57,000	57,760	57,760	58,520	59,280	59,280	60,040	61,560	61,560
Misc., Interest, Equity Investment																					
Cash from Savings																					
Total Revenues	-	51,680	615,712	622,222	627,111	632,881	638,720	643,750	649,659	654,758	660,737	665,906	671,955	678,074	683,383	689,571	695,830	701,278	707,606	714,884	720,542
Expenses																					
Treatment Plant & Collection O&M (STM Aerotor)																					
Personnel	-	-	30,000	30,900	31,827	32,782	33,765	34,778	35,822	36,896	38,003	39,143	40,317	41,527	42,773	44,056	45,378	46,739	48,141	49,585	51,073
Vehicle	-	-	20,000	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264
Treatment Plant Electrical	-	-	8,000	8,240	8,487	8,742	9,004	9,274	9,552	9,839	10,134	10,438	10,751	11,074	11,406	11,748	12,101	12,464	12,838	13,223	13,619
Treatment Plant Misc. Parts & Supplies	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Lab Work	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
New Equipment Purchase	-	-	2,500	2,575	2,652	2,732	2,814	2,898	2,985	3,075	3,167	3,262	3,360	3,461	3,564	3,671	3,781	3,895	4,012	4,132	4,256
Treatment Maintenance	-	-	8,000	8,240	8,487	8,742	9,004	9,274	9,552	9,839	10,134	10,438	10,751	11,074	11,406	11,748	12,101	12,464	12,838	13,223	13,619
Lift Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Administrative	-	-	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405
Subtotal Expenses	-	-	74,500	61,135	62,969	64,858	66,804	68,808	70,872	72,998	75,188	77,444	79,767	82,160	84,625	87,164	89,779	92,472	95,246	98,104	101,047
Debt Service																					
Treatment and Collection Loan	-	-	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00	$557,189.00
Treatment and Collection Grant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal Debt Service Expenses	-	-	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189	557,189
Debt Service Reserve Fund		-	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719	55,719
Total Expenses	-	-	687,408	674,043	675,877	677,766	679,712	681,716	683,780	685,906	688,096	690,352	692,675	695,068	697,533	700,072	702,687	705,380	708,154	711,012	713,955
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Debt Coverage Ratio			0.97	1.01	1.01	1.02	1.03	1.03	1.04	1.04	1.05	1.06	1.06	1.07	1.07	1.08	1.09	1.09	1.10	1.11	1.11
Margin after Reserve Set Aside		51,680	(71,696)	(51,821)	(48,766)	(44,885)	(40,991)	(37,966)	(34,121)	(31,148)	(27,359)	(24,446)	(20,720)	(16,994)	(14,151)	(10,501)	(6,857)	(4,102)	(548)	3,873	6,588
Cash On Hand																					
Reserve Account																					
Debt Service Reserve Fund Account Interest Earned	-	-	-	1,393	2,821	4,284	5,784	7,322	8,898	10,513	12,169	13,866	15,606	17,389	19,217	21,090	23,010	24,979	26,996	29,064	31,184
Debt Service Reserve Fund Account	-	-	55,719	112,831	171,370	231,374	292,877	355,918	420,535	486,767	554,655	624,240	695,565	768,673	843,609	920,418	999,147	1,079,845	1,162,560	1,247,343	1,334,245
Combined Assets																					
Margine Interest Earned		-	1,292	(468)	(1,775)	(3,039)	(4,237)	(5,368)	(6,451)	(7,465)	(8,431)	(9,325)	(10,170)	(10,942)	(11,640)	(12,285)	(12,855)	(13,348)	(13,784)	(14,142)	(14,399)
Margine Account	-	51,680	(18,724)	(71,013)	(121,554)	(169,478)	(214,706)	(258,040)	(298,612)	(337,226)	(373,016)	(406,787)	(437,677)	(465,613)	(491,404)	(514,190)	(533,902)	(551,351)	(565,683)	(575,953)	(583,764)
Cash from Savings																					
Total Cash On Hand	-	51,680	36,995	41,818	49,817	61,896	78,171	97,878	121,922	149,541	181,639	217,453	257,888	303,060	352,205	406,228	465,245	528,493	596,877	671,390	750,481

EXHIBIT 5.9

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #5)

Cash Flow Sewer District- Huntsville ONLY to build 0.1 Average MGD STM Aerotor Plant

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Poposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 2,379,000	20	3.5%	32.0%
DWQ Grant Collection	$ 5,276,000	0	0.0%	69.0%
Total Project Cost	$ 7,655,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information																					
Huntsville Town																					
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248	249	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	237	238	239	241	242	243	245	246	247	249	250	251	252	254	255	256	258	259	260	262	263
Unincorporated																					
Unincorporated - Equivalent Residential Connections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - New Residential Connections		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - Total Number of New ERUs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - Total Number of ERUs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Huntsville Percentage of ERU's	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Flowrates																					
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - Wastewater Flowrate - MGD	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Combined Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Combined Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Revenues																					
New Sewer District																					
Residential Fees	$ -	$ -	$ 167,226	$ 168,134	$ 169,042	$ 169,950	$ 170,858	$ 171,766	$ 172,674	$ 173,582	$ 174,490	$ 175,398	$ 176,306	$ 177,215	$ 178,123	$ 179,031	$ 179,939	$ 180,847	$ 181,755	$ 182,733	$ 183,711
Residential Hook-up Fee	$ -	$ -	$ 600	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 700	$ 700
Residential Impact Fee	$ -	$ 9,120	$ 9,120	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 10,640	$ 10,640
Misc., Interest, Equity Investment																					
Cash from Savings																					
Total Revenues	$ -	$ 9,120	$ 176,946	$ 178,664	$ 179,572	$ 180,480	$ 181,388	$ 182,296	$ 183,204	$ 184,112	$ 185,020	$ 185,928	$ 186,836	$ 187,745	$ 188,653	$ 189,561	$ 190,469	$ 191,377	$ 192,285	$ 194,073	$ 195,051
Expenses																					
Treatment Plant & Collection O&M (STM Aerotor)																					
Personnel	$ -	$ -	$ 30,000	$ 30,900	$ 31,827	$ 32,782	$ 33,765	$ 34,778	$ 35,822	$ 36,896	$ 38,003	$ 39,143	$ 40,317	$ 41,527	$ 42,773	$ 44,056	$ 45,378	$ 46,739	$ 48,141	$ 49,585	$ 51,073
Vehicle	$ -	$ -	$ 20,000	$ 5,000	$ 5,150	$ 5,305	$ 5,464	$ 5,628	$ 5,796	$ 5,970	$ 6,149	$ 6,334	$ 6,524	$ 6,720	$ 6,921	$ 7,129	$ 7,343	$ 7,563	$ 7,790	$ 8,024	$ 8,264
Treatment Plant Electrical	$ -	$ -	$ 8,500	$ 8,755	$ 9,018	$ 9,288	$ 9,567	$ 9,854	$ 10,149	$ 10,454	$ 10,768	$ 11,091	$ 11,423	$ 11,766	$ 12,119	$ 12,483	$ 12,857	$ 13,243	$ 13,640	$ 14,049	$ 14,471
Treatment Plant Misc. Parts & Supplies	$ -	$ -	$ 1,500	$ 1,545	$ 1,591	$ 1,639	$ 1,688	$ 1,739	$ 1,791	$ 1,845	$ 1,900	$ 1,957	$ 2,016	$ 2,076	$ 2,139	$ 2,203	$ 2,269	$ 2,337	$ 2,407	$ 2,479	$ 2,554
Lab Work	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388	$ 2,460	$ 2,534	$ 2,610	$ 2,688	$ 2,768	$ 2,852	$ 2,937	$ 3,025	$ 3,116	$ 3,209	$ 3,306	$ 3,405
New Equipment Purchase	$ -	$ -	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159	$ 1,194	$ 1,230	$ 1,267	$ 1,305	$ 1,344	$ 1,384	$ 1,426	$ 1,469	$ 1,513	$ 1,558	$ 1,605	$ 1,653	$ 1,702
Disposal	$ -	$ -	$ 2,500	$ 2,575	$ 2,652	$ 2,732	$ 2,814	$ 2,898	$ 2,985	$ 3,075	$ 3,167	$ 3,262	$ 3,360	$ 3,461	$ 3,564	$ 3,671	$ 3,781	$ 3,895	$ 4,012	$ 4,132	$ 4,256
Lift Station	$ -	$ -	$ 9,000	$ 9,270	$ 9,548	$ 9,835	$ 10,130	$ 10,433	$ 10,746	$ 11,069	$ 11,401	$ 11,743	$ 12,095	$ 12,458	$ 12,832	$ 13,217	$ 13,613	$ 14,022	$ 14,442	$ 14,876	$ 15,322
Administrative	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388	$ 2,460	$ 2,534	$ 2,610	$ 2,688	$ 2,768	$ 2,852	$ 2,937	$ 3,025	$ 3,116	$ 3,209	$ 3,306	$ 3,405
Subtotal Expenses	$ -	$ -	$ 76,500	$ 63,195	$ 65,091	$ 67,044	$ 69,055	$ 71,127	$ 73,260	$ 75,458	$ 77,722	$ 80,054	$ 82,455	$ 84,929	$ 87,477	$ 90,101	$ 92,804	$ 95,588	$ 98,456	$ 101,409	$ 104,452
Debt Service																					
Treatment and Collection Loan	$ -	$ -	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00
Treatment and Collection Grant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Debt Service Expenses	$ -	$ -	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389
Debt Service Reserve Fund		$ -	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739
Total Expenses	$ -	$ -	$ 260,628	$ 247,323	$ 249,219	$ 251,171	$ 253,183	$ 255,254	$ 257,388	$ 259,586	$ 261,850	$ 264,181	$ 266,583	$ 269,057	$ 271,605	$ 274,229	$ 276,932	$ 279,716	$ 282,584	$ 285,537	$ 288,580
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Debt Coverage Ratio			0.60	0.69	0.68	0.68	0.67	0.66	0.66	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58	0.57	0.56	0.55	0.54
Margin after Reserve Set Aside		$ 9,120	$ (83,682)	$ (68,659)	$ (69,647)	$ (70,692)	$ (71,795)	$ (72,958)	$ (74,184)	$ (75,474)	$ (76,829)	$ (78,253)	$ (79,747)	$ (81,312)	$ (82,952)	$ (84,668)	$ (86,463)	$ (88,339)	$ (90,299)	$ (91,464)	$ (93,529)
Cash On Hand																					
Reserve Account																					
Debt Service Reserve Fund Account Interest Earned	$ -	$ -	$ -	$ 418	$ 847	$ 1,287	$ 1,738	$ 2,200	$ 2,673	$ 3,158	$ 3,656	$ 4,166	$ 4,688	$ 5,224	$ 5,773	$ 6,336	$ 6,913	$ 7,504	$ 8,110	$ 8,731	$ 9,368
Debt Service Reserve Fund Account	$ -	$ -	$ 16,739	$ 33,896	$ 51,483	$ 69,509	$ 87,985	$ 106,924	$ 126,336	$ 146,233	$ 166,628	$ 187,532	$ 208,959	$ 230,922	$ 253,434	$ 276,509	$ 300,161	$ 324,404	$ 349,253	$ 374,723	$ 400,830
Combined Assets																					
Margine Interest Earned		$ -	$ 228	$ (1,858)	$ (3,621)	$ (5,453)	$ (7,357)	$ (9,335)	$ (11,393)	$ (13,532)	$ (15,757)	$ (18,072)	$ (20,480)	$ (22,986)	$ (25,593)	$ (28,307)	$ (31,131)	$ (34,071)	$ (37,131)	$ (40,317)	$ (43,612)
Margine Account	$ -	$ 9,120	$ (74,334)	$ (144,852)	$ (218,120)	$ (294,264)	$ (373,416)	$ (455,710)	$ (541,286)	$ (630,292)	$ (722,879)	$ (819,204)	$ (919,431)	$ (1,023,729)	$ (1,132,274)	$ (1,245,249)	$ (1,362,843)	$ (1,485,254)	$ (1,612,684)	$ (1,744,465)	$ (1,881,606)
Cash from Savings																					
Total Cash On Hand	$ -	$ 9,120	$ (57,595)	$ (110,955)	$ (166,637)	$ (224,756)	$ (285,431)	$ (348,786)	$ (414,951)	$ (484,059)	$ (556,252)	$ (631,672)	$ (710,471)	$ (792,807)	$ (878,840)	$ (968,740)	$ (1,062,683)	$ (1,160,850)	$ (1,263,431)	$ (1,369,743)	$ (1,480,776)

EXHIBIT 5.10

HUNTSVILLE TOWN AND SOUTHERN OGDEN VALLEY WASTEWATER (ALTERNATIVE #5a)

Cash Flow Sewer District- Huntsville ONLY to build ORENCO Package Plant w/ STEP Collection

Sewer District Fees	Monthly Rate	Yearly Rate	Connection Fee	Impact Fee
Sewer - ERU's	$58.21	$ 698.52	$ 500.00	$ 7,600.00

Poposed Funding Information

	Loan Amount	Years	Rate	% of Total
DWQ Loan Treatment Plant	$ 2,379,000	20	3.5%	32.0%
DWQ Grant Collection	$ 5,214,000	0	0.0%	69.0%
Total Project Cost	$ 7,593,000			

Flowrate per Capita per Day	100	
People per Connection	2.96	Unincorporated
People per Connection	2.96	Huntsville
Interest Rate on Cash on Hand	2.5%	
Power Inflation Rate	5.0%	
Inflation	3.00%	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Huntsville - Yearly Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Unincorporated - Yearly Growth Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Indexed Inflation Multiplier	1.000	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605	1.653	1.702	1.754	1.806
General Information																					
Huntsville Town																					
Huntsville - Equivalent Residential Connections	237	238	239	241	242	243	244	245	247	248	249	250	252	253	254	255	257	258	259	261	262
Huntsville - New Residential Connections	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of New ERUs	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huntsville - Total Number of ERUs	237	238	239	241	242	243	245	246	247	249	250	251	252	254	255	256	258	259	260	262	263
Unincorporated																					
Unincorporated - Equivalent Residential Connections	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - New Residential Connections		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - Total Number of New ERUs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - Total Number of ERUs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Huntsville Percentage of ERU's	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Flowrates																					
Huntsville - Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Huntsville - Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Unincorporated - Wastewater Flowrate - Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unincorporated - Wastewater Flowrate - MGD	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Combined Wastewater Flowrate - Gallons	70,152	70,507	70,862	71,247	71,632	72,017	72,402	72,786	73,171	73,556	73,941	74,326	74,710	75,095	75,480	75,865	76,250	76,634	77,019	77,434	77,848
Combined Wastewater Flowrate - MGD	0.070	0.071	0.071	0.071	0.072	0.072	0.072	0.073	0.073	0.074	0.074	0.074	0.075	0.075	0.075	0.076	0.076	0.077	0.077	0.077	0.078
Revenues																					
New Sewer District																					
Residential Fees	$ -	$ -	$ 167,226	$ 168,134	$ 169,042	$ 169,950	$ 170,858	$ 171,766	$ 172,674	$ 173,582	$ 174,490	$ 175,398	$ 176,306	$ 177,215	$ 178,123	$ 179,031	$ 179,939	$ 180,847	$ 181,755	$ 182,733	$ 183,711
Residential Hook-up Fee	$ -	$ -	$ 600	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 650	$ 700	$ 700
Residential Impact Fee	$ -	$ 9,120	$ 9,120	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 9,880	$ 10,640	$ 10,640
Misc., Interest, Equity Investment																					
Cash from Savings																					
Total Revenues	$ -	$ 9,120	$ 176,946	$ 178,664	$ 179,572	$ 180,480	$ 181,388	$ 182,296	$ 183,204	$ 184,112	$ 185,020	$ 185,928	$ 186,836	$ 187,745	$ 188,653	$ 189,561	$ 190,469	$ 191,377	$ 192,285	$ 194,073	$ 195,051
Expenses																					
Treatment Plant & Collection O&M (STM Aerotor)																					
Personnel	$ -	$ -	$ 20,000	$ 20,600	$ 21,218	$ 21,855	$ 22,510	$ 23,185	$ 23,881	$ 24,597	$ 25,335	$ 26,095	$ 26,878	$ 27,685	$ 28,515	$ 29,371	$ 30,252	$ 31,159	$ 32,094	$ 33,057	$ 34,049
Vehicle	$ -	$ -	$ 20,000	$ 5,000	$ 5,150	$ 5,305	$ 5,464	$ 5,628	$ 5,796	$ 5,970	$ 6,149	$ 6,334	$ 6,524	$ 6,720	$ 6,921	$ 7,129	$ 7,343	$ 7,563	$ 7,790	$ 8,024	$ 8,264
Treatment Plant Electrical	$ -	$ -	$ 4,000	$ 4,120	$ 4,244	$ 4,371	$ 4,502	$ 4,637	$ 4,776	$ 4,919	$ 5,067	$ 5,219	$ 5,376	$ 5,537	$ 5,703	$ 5,874	$ 6,050	$ 6,232	$ 6,419	$ 6,611	$ 6,810
Treatment Plant Misc. Parts & Supplies	$ -	$ -	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159	$ 1,194	$ 1,230	$ 1,267	$ 1,305	$ 1,344	$ 1,384	$ 1,426	$ 1,469	$ 1,513	$ 1,558	$ 1,605	$ 1,653	$ 1,702
Lab Work	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388	$ 2,460	$ 2,534	$ 2,610	$ 2,688	$ 2,768	$ 2,852	$ 2,937	$ 3,025	$ 3,116	$ 3,209	$ 3,306	$ 3,405
New Equipment Purchase	$ -	$ -	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159	$ 1,194	$ 1,230	$ 1,267	$ 1,305	$ 1,344	$ 1,384	$ 1,426	$ 1,469	$ 1,513	$ 1,558	$ 1,605	$ 1,653	$ 1,702
Treatment Maintenance	$ -	$ -	$ 6,000	$ 6,180	$ 6,365	$ 6,556	$ 6,753	$ 6,956	$ 7,164	$ 7,379	$ 7,601	$ 7,829	$ 8,063	$ 8,305	$ 8,555	$ 8,811	$ 9,076	$ 9,348	$ 9,628	$ 9,917	$ 10,215
Lift Station	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Administrative	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388	$ 2,460	$ 2,534	$ 2,610	$ 2,688	$ 2,768	$ 2,852	$ 2,937	$ 3,025	$ 3,116	$ 3,209	$ 3,306	$ 3,405
Subtotal Expenses	$ -	$ -	$ 56,000	$ 42,080	$ 43,342	$ 44,643	$ 45,982	$ 47,361	$ 48,782	$ 50,246	$ 51,753	$ 53,306	$ 54,905	$ 56,552	$ 58,249	$ 59,996	$ 61,796	$ 63,650	$ 65,559	$ 67,526	$ 69,552
Debt Service																					
Treatment and Collection Loan	$ -	$ -	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00	$167,389.00
Treatment and Collection Grant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Debt Service Expenses	$ -	$ -	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389	$ 167,389
Debt Service Reserve Fund		$ -	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739	$ 16,739
Total Expenses	$ -	$ -	$ 240,128	$ 226,208	$ 227,470	$ 228,771	$ 230,110	$ 231,489	$ 232,910	$ 234,374	$ 235,881	$ 237,434	$ 239,033	$ 240,680	$ 242,376	$ 244,124	$ 245,924	$ 247,778	$ 249,687	$ 251,654	$ 253,680
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Debt Coverage Ratio			0.72	0.82	0.81	0.81	0.81	0.81	0.80	0.80	0.80	0.79	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.76	0.75
Margin after Reserve Set Aside		$ 9,120	$ (63,182)	$ (47,544)	$ (47,898)	$ (48,291)	$ (48,722)	$ (49,193)	$ (49,706)	$ (50,261)	$ (50,861)	$ (51,505)	$ (52,196)	$ (52,935)	$ (53,724)	$ (54,563)	$ (55,455)	$ (56,401)	$ (57,402)	$ (57,581)	$ (58,629)
Cash On Hand																					
Reserve Account																					
Debt Service Reserve Fund Account Interest Earned	$ -	$ -	$ -	$ 418	$ 847	$ 1,287	$ 1,738	$ 2,200	$ 2,673	$ 3,158	$ 3,656	$ 4,166	$ 4,688	$ 5,224	$ 5,773	$ 6,336	$ 6,913	$ 7,504	$ 8,110	$ 8,731	$ 9,368
Debt Service Reserve Fund Account	$ -	$ -	$ 16,739	$ 33,896	$ 51,483	$ 69,509	$ 87,985	$ 106,924	$ 126,336	$ 146,233	$ 166,628	$ 187,532	$ 208,959	$ 230,922	$ 253,434	$ 276,509	$ 300,161	$ 324,404	$ 349,253	$ 374,723	$ 400,830
Combined Assets																					
Margine Interest Earned		$ -	$ 228	$ (1,346)	$ (2,568)	$ (3,830)	$ (5,133)	$ (6,479)	$ (7,871)	$ (9,310)	$ (10,800)	$ (12,341)	$ (13,937)	$ (15,591)	$ (17,304)	$ (19,080)	$ (20,921)	$ (22,830)	$ (24,811)	$ (26,866)	$ (28,977)
Margine Account	$ -	$ 9,120	$ (53,834)	$ (102,724)	$ (153,191)	$ (205,311)	$ (259,166)	$ (314,838)	$ (372,415)	$ (431,987)	$ (493,647)	$ (557,494)	$ (623,627)	$ (692,153)	$ (763,181)	$ (836,824)	$ (913,200)	$ (992,430)	$ (1,074,643)	$ (1,159,091)	$ (1,246,697)
Cash from Savings																					
Total Cash On Hand	$ -	$ 9,120	$ (37,095)	$ (68,828)	$ (101,708)	$ (135,803)	$ (171,181)	$ (207,915)	$ (246,080)	$ (285,754)	$ (327,020)	$ (369,961)	$ (414,668)	$ (461,231)	$ (509,747)	$ (560,315)	$ (613,039)	$ (668,027)	$ (725,391)	$ (784,368)	$ (845,867)

EXHIBIT 5.11

APPENDIX F

OPINION OF PROBABLE COST EXHIBITS

SUNRISE ENGINEERING, INC.

CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project:	Wastewater System Capacity Study	Project No:	3656
Owner:	Huntsville Town & Weber Co.	Date:	19-Jul-11
Option:	Total Containment Lagoons	By:	DAT

Exhibit 5.12

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	L.S.	125,000.00	$ 125,000
2	Clay Liner (Import)	65,000	Cu. Yd	15.00	$ 975,000
3	Lagoon Earthwork (excavation and placement)	78,000	Cu. Yd	8.00	$ 624,000
4	Concrete Influent Discharge Apron	1	Each	2,500.00	$ 2,500
5	Lagoon Site Clearing and Grubbing	1	LS	30,000.00	$ 30,000
6	Loose Riprap	7,000	Sq. Yd.	9.50	$ 66,500
7	12" SDR 35 PVC Sanitary Sewer Pipe	1,500	Lin Ft	38.00	$ 57,000
8	Untreated Base Course 3/4"-Inch or 1-Inch Max	1,000	Ton	13.00	$ 13,000
9	6-Ft Tall Chain Link Fence Type I	7,500	Lin Ft	18.00	$ 135,000
10	Temporary Construction Fence	1,000	Lin Ft	3.00	$ 3,000
11	6-Ft Tall Chain Link Double Swing Gate	1	Each	1,500.00	$ 1,500
12	Facility Sign	10	Each	500.00	$ 5,000
13	Seed	1	L.S.	8,000.00	$ 8,000
14	Lagoon Transfer Structures	1	Each	19,000.00	$ 19,000
15	60" Manhole	5	Each	4,000.00	$ 20,000
16	Lagoon Staff Gauges	2	Each	1,600.00	$ 3,200
17	Miscellaneous	1	L.S.	$ 20,000	$ 20,000
18	**Subtotal**				**$ 2,107,700**
19	**Contingency (20%)**				$ 430,000
20	**CONSTRUCTION TOTAL**				**$ 2,537,700**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
21	Engineering Design	1	L.S.	$ 191,000	$ 191,000
22	Construction Management	1	L.S.	$ 280,000	$ 280,000
23	Additional Engineering Services(Survey, Geotech, Etc)	1	L.S.	$ 77,000	$ 77,000
24	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 64,000	$ 64,000
25	Land Acquisition	1	L.S.	$ 3,120,000	$ 3,120,000
26	DWQ Administration	1	L.S.	$ 64,000	$ 64,000
27					**$ 6,334,000**

SUNRISE ENGINEERING, INC.

CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

SUNRISE ENGINEERING

Project:	**Wastewater System Capacity Study**	**Project No:**	**3656**
Owner:	**Huntsville Town & Weber Co.**	**Date:**	**19-Jul-11**
Option:	**Discharging Lagoons**	**By:**	**DAT**
	w/ Winter Storage Pond		**Exhibit 5.13**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	L.S.	85,000.00	$ 85,000
2	Clay Liner (Import)	37,500	Cu. Yd	15.00	$ 562,500
3	Lagoon Earthwork (excavation and placement)	45,000	Cu. Yd	8.00	$ 360,000
4	Concrete Influent Discharge Apron	1	Each	2,500.00	$ 2,500
5	Lagoon Site Clearing and Grubbing	1	LS	30,000.00	$ 30,000
6	Loose Riprap	10,000	Sq. Yd.	9.50	$ 95,000
7	12" SDR 35 PVC Sanitary Sewer Pipe	1,500	LN. FT.	38.00	$ 57,000
8	Untreated Base Course 3/4"-Inch or 1-Inch Max	5,000	Ton	13.00	$ 65,000
9	6-Ft Tall Chain Link Fence Type I	5,600	LN. FT.	18.00	$ 100,800
10	Temporary Construction Fence	1,000	LN. FT.	3.00	$ 3,000
11	6-Ft Tall Chain Link Double Swing Gate	1	Each	1,500.00	$ 1,500
12	Facility Sign	10	Each	400.00	$ 4,000
13	Seed	1	L.S.	8,000.00	$ 8,000
14	Lagoon Transfer Structures	1	Each	19,000.00	$ 19,000
15	60" Manhole	5	Each	4,000.00	$ 20,000
16	Lagoon Staff Gauges	2	Each	1,600.00	$ 3,200
17	Miscellaneous	1	L.S.	20,000.00	$ 20,000
18	**Subtotal**				**$ 1,436,500**
19	**Contingency (20%)**				$ 290,000
20	**CONSTRUCTION TOTAL**				**$ 1,726,500**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
21	Engineering Design	1	L.S.	$ 130,000	$ 130,000
22	Construction Management	1	L.S.	$ 190,000	$ 190,000
23	Additional Engineering Services (Survey, Geotech, Etc.)	1	L.S.	$ 52,000	$ 52,000
24	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 44,000	$ 44,000
25	Land Acquisition	1	L.S.	$ 1,800,000	$ 1,800,000
26	DWQ Administration	1	L.S.	$ 40,000	$ 40,000
27					**$ 3,983,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
Opinion of Probable Costs

Project: Wastewater System Capacity Study
Owner: Huntsville Town & Weber Co.
Option: 0.3 MGD Mechanical STM Plant

Project No: 3656
Date: 19-Jul-11
By: DAT

Exhibit 5.14

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 205,000	$ 205,000
2	Sub surface Investigation	50	Hrs	$ 200	$ 10,000
3	Clearing & Grubbing	1	L.S.	$ 10,000	$ 10,000
4	Excavation	1	L.S.	$ 30,000	$ 30,000
5	Site Dewatering	1	L.S.	$ 15,000	$ 15,000
6	Foundation Work	1	L.S.	$ 60,000	$ 60,000
7	Yard Piping	1	L.S.	$ 58,000	$ 58,000
8	Influent Meter	1	L.S.	$ 20,000	$ 20,000
9	Lift Station	1	L.S.	$ 150,000	$ 150,000
10	Concrete Basins for STM Aerotors/Clarifiers	450	Cu. Yds.	$ 800	$ 360,000
11	STM Aerotor Equipment	1	L.S.	$ 500,000	$ 500,000
12	STM Aerotor Equipment Installation	1	L.S.	$ 200,000	$ 200,000
13	Sludge Containment Basin	40	Cu. Yds.	$ 800	$ 32,000
14	Sludge Mixers and Aeoration Equipment	1	Each	$ 50,000	$ 50,000
15	Dewatering Equipment	1	L.S.	$ 125,000	$ 125,000
16	Dewatering Equipment Installation	1	L.S.	$ 50,000	$ 50,000
17	Disinfection Structure	1	L.S.	$ 200,000	$ 200,000
18	Disinfection Equipment	1	L.S.	$ 100,000	$ 100,000
19	Effluent Meter Facility	1	L.S.	$ 50,000	$ 50,000
20	RAS Meter & Valving	1	L.S.	$ 20,000	$ 20,000
21	WAS Meter & Valving	1	L.S.	$ 20,000	$ 20,000
22	Building (Office, Lab, Electrical, Dewatering etc.)	1	L.S.	$ 600,000	$ 600,000
23	Site Work & Landscaping	1	L.S.	$ 100,000	$ 100,000
24	SCADA Control System	1	L.S.	$ 60,000	$ 60,000
25	Electrical	1	L.S.	$ 200,000	$ 200,000
26	Generator	1	L.S.	$ 200,000	$ 200,000
27	**Subtotal**				**$ 3,425,000**
28	Contingencey (20%)	1	L.S.	$ 690,000	$ 690,000
29	**CONSTRUCTION TOTAL**				**$ 4,115,000**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
30	Engineering Design	1	L.S.	$ 247,000	$ 247,000
31	Construction Management	1	L.S.	$ 453,000	$ 453,000
32	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 124,000	$ 124,000
33	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 83,000	$ 83,000
34	Land Acquisition	1	L.S.	$ 720,000	$ 720,000
35	DWQ Administration	1	L.S.	$ 58,000	$ 58,000
36					**$ 5,800,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
Opinion of Probable Costs

Project: Wastewater System Capacity Study
Owner: Huntsville Town & Weber Co.
Option: 0.3 MGD Mechanical SBR Plant

Project No: 3656
Date: 19-Jul-11
By: DAT
Exhibit 5.15

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 180,000	$ 180,000
2	Sub surface Investigation	50	Hrs	$ 200	$ 10,000
3	Clearing & Grubbing	1	L.S.	$ 10,000	$ 10,000
4	Excavation	1	L.S.	$ 30,000	$ 30,000
5	Site Dewatering	1	L.S.	$ 15,000	$ 15,000
6	Foundation Work	1	L.S.	$ 60,000	$ 60,000
7	Yard Piping	1	L.S.	$ 15,000	$ 15,000
8	Influent Meter	1	L.S.	$ 20,000	$ 20,000
9	Concrete Basin for SBR System	390	Cu. Yds.	$ 800	$ 312,000
10	ISAM SBR System Equipment	1	L.S.	$ 384,000	$ 384,000
11	ISAM SBR System Installation	1	L.S.	$ 300,000	$ 300,000
12	Dewatering Equipment	1	L.S.	$ 125,000	$ 125,000
13	Dewatering Equipment Installation	1	L.S.	$ 50,000	$ 50,000
14	Disinfection Structure	1	L.S.	$ 200,000	$ 200,000
15	Disinfection Equipment	1	L.S.	$ 100,000	$ 100,000
16	Effluent Meter Facility	1	L.S.	$ 50,000	$ 50,000
17	Building (Office, Lab, Electrical, Dewatering etc.)	1	L.S.	$ 600,000	$ 600,000
18	Site Work & Landscaping	1	L.S.	$ 100,000	$ 100,000
19	SCADA Control System	1	L.S.	$ 60,000	$ 60,000
20	Electrical	1	L.S.	$ 200,000	$ 200,000
21	Generator	1	L.S.	$ 200,000	$ 200,000
22	**Subtotal**				**$ 3,021,000**
23	Contingencey (20%)	1	L.S.	$ 610,000	$ 610,000
24	**CONSTRUCTION TOTAL**				**$ 3,631,000**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
25	Engineering Design	1	L.S.	$ 218,000	$ 218,000
26	Construction Management	1	L.S.	$ 400,000	$ 400,000
27	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 109,000	$ 109,000
28	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 73,000	$ 73,000
29	Land Acquisition	1	L.S.	$ 720,000	$ 720,000
30	DWQ Administration	1	L.S.	$ 53,000	$ 53,000
31					**$ 5,204,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
Opinion of Probable Costs

SUNRISE ENGINEERING

Project:	Wastewater System Capacity Study	Project No:	3656
Owner:	Huntsville Town & Weber Co.	Date:	19-Jul-11
Option:	Multi Package Plants	By:	DAT
	(Orenco Systems)		Exhibit 5.16

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	L.S.	300,000.00	$ 300,000
2	Recirulation Tank	360,000	Gal	2.65	$ 954,000
3	Tank Access Equipment	24	Each	675.00	$ 16,200
4	Pumping Equipment	24	Each	2,500.00	$ 60,000
5	Controls	3	Each	4,800.00	$ 14,400
6	Miscellaneous AdvanTex Equipement	24	Each	375.00	$ 9,000
7	Recirculating Splitter Valve	6	Each	600.00	$ 3,600
8	Ventalation Fan Assembly	6	Each	3,000.00	$ 18,000
9	AdvanTex Equipment	70	Each	22,000.00	$ 1,540,000
10	Drip Dispersal System	1	LS	1,080,000.00	$ 1,080,000
11	Building	1	LS	500,000.00	$ 500,000
12	SCADA Control System	1	LS	60,000.00	$ 60,000
13	Electrical	1	LS	200,000.00	$ 200,000
14	Emergency Generator	1	LS	200,000.00	$ 200,000
15	Miscellaneous Site Improvements	1	Each	90,000.00	$ 90,000
16	**Subtotal**				**$ 5,045,200**
17	**Contingency (20%)**				$ 1,010,000
18	**CONSTRUCTION TOTAL**				**$ 6,055,200**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
19	Engineering Design	1	L.S.	$ 424,000	$ 424,000
20	Construction Management	1	L.S.	$ 667,000	$ 667,000
21	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 303,000	$ 303,000
22	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 122,000	$ 122,000
23	Land Acquisition	1	L.S.	$ 720,000	$ 720,000
24	DWQ Administration	1	L.S.	$ 84,000	$ 84,000
25					**$ 8,376,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

Project: Wastewater System Capacity Study
Owner: Huntsville Town Only
Option: 0.1 MGD Mechanical STM Plant

Project No: 3656
Date: 19-Jul-11
By: DAT
Exhibit 5.17

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 100,000	$ 100,000
2	Sub surface Investigation	40	Hrs	$ 200	$ 8,000
3	Clearing & Grubbing	1	L.S.	$ 8,000	$ 8,000
4	Excavation	1	L.S.	$ 20,000	$ 20,000
5	Site Dewatering	1	L.S.	$ 12,000	$ 12,000
6	Foundation Work	1	L.S.	$ 30,000	$ 30,000
7	Yard Piping	1	L.S.	$ 20,000	$ 20,000
8	Influent Meter	1	L.S.	$ 15,000	$ 15,000
9	Lift Station	1	L.S.	$ 125,000	$ 125,000
10	Concrete Basins for STM Aerotors/Clarifiers	225	Cu. Yds.	$ 800	$ 180,000
11	STM Aerotor Equipment	1	L.S.	$ 200,000	$ 200,000
12	STM Aerotor Equipment Installation	1	L.S.	$ 100,000	$ 100,000
13	Sludge Containment Basin	30	Cu. Yds.	$ 800	$ 24,000
14	Sludge Mixers and Aeoration Equipment	1	Each	$ 35,000	$ 35,000
15	Dewatering Equipment	1	L.S.	$ 50,000	$ 50,000
16	Dewatering Equipment Installation	1	L.S.	$ 15,000	$ 15,000
17	Disinfection Structure	1	L.S.	$ 65,000	$ 65,000
18	Disinfection Equipment	1	L.S.	$ 30,000	$ 30,000
19	RAS Meter & Valving	1	L.S.	$ 12,000	$ 12,000
20	WAS Meter & Valving	1	L.S.	$ 12,000	$ 12,000
21	Building (Office, Lab, Electrical, Dewatering etc.)	1	L.S.	$ 250,000	$ 250,000
22	Site Work & Landscaping	1	L.S.	$ 45,000	$ 45,000
23	SCADA Control System	1	L.S.	$ 60,000	$ 60,000
24	Electrical	1	L.S.	$ 120,000	$ 120,000
25	Generator	1	L.S.	$ 150,000	$ 150,000
26	**Subtotal**				**$ 1,686,000**
27	Contingencey (20%)	1	L.S.	$ 340,000	$ 340,000
28	**CONSTRUCTION TOTAL**				**$ 2,026,000**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
29	Engineering Design	1	L.S.	$ 122,000	$ 122,000
30	Construction Management	1	L.S.	$ 223,000	$ 223,000
31	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 61,000	$ 61,000
32	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 41,000	$ 41,000
33	Land Acquisition	1	L.S.	$ 320,000	$ 320,000
34	DWQ Administration	1	L.S.	$ 29,000	$ 29,000
35					**$ 2,822,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
Opinion of Probable Costs

Project: Wastewater System Capacity Study
Owner: Huntsville Town Only
Option: Multiple Package Plants
(Orenco System)

Project No: 3656
Date: 19-Jul-11
By: DAT
Exhibit 5.18

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	L.S.	125,000.00	$ 125,000
2	Recirulation Tank	150,000	Gal	2.65	$ 397,500
3	Tank Access Equipment	8	Each	675.00	$ 5,400
4	Pumping Equipment	8	Each	2,500.00	$ 20,000
5	Controls	1	Each	4,800.00	$ 4,800
6	Miscellaneous AdvanTex Equipement	8	Each	375.00	$ 3,000
7	Recirculating Splitter Valve	2	Each	600.00	$ 1,200
8	Ventalation Fan Assembly	2	Each	3,000.00	$ 6,000
9	AdvanTex Equipment	24	Each	22,000.00	$ 528,000
10	Drip Dispersal System	1	LS	400,000.00	$ 400,000
11	Building	1	LS	250,000.00	$ 250,000
12	SCADA Control System	1	LS	60,000.00	$ 60,000
13	Electrical	1	LS	120,000.00	$ 120,000
14	Emergency Generator	1	LS	150,000.00	$ 150,000
15	Miscellaneous Site Improvements	1	Each	45,000.00	$ 45,000
16	**Subtotal**				**$ 2,115,900**
17	**Contingency (20%)**				$ 430,000
18	**CONSTRUCTION TOTAL**				**$ 2,545,900**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
19	Engineering Design	1	L.S.	$ 179,000	$ 179,000
20	Construction Management	1	L.S.	$ 281,000	$ 281,000
21	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 128,000	$ 128,000
22	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 51,000	$ 51,000
23	Land Acquisition	1	L.S.	$ 320,000	$ 320,000
24	DWQ Administration	1	L.S.	$ 36,000	$ 36,000
25					**$ 3,541,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
Opinion of Probable Costs

SUNRISE ENGINEERING

Project: Wastewater System Capacity Study
Owner: Huntsville Town & Weber Co.
Option: Conventional Collection (Gravity)

Project No: 3656
Date: 19-Jul-11
By: DAT
Exhibit 5.19

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 365,000.00	$ 365,000
2	Sub surface Investigation	30	Hrs	$ 200.00	$ 6,000
3	Traffic Control	1	L.S.	$ 15,000.00	$ 15,000
4	8" Gravity Sewer Pipe (PVC)	80,000	Ln. Ft.	$ 23.00	$ 1,840,000
5	10" Gravity Sewer Pipe (PVC)	13,000	Ln. Ft.	$ 25.00	$ 325,000
6	12" Gravity Sewer Pipe (PVC)	9,000	Ln. Ft.	$ 30.00	$ 270,000
7	15" Gravity Sewer Pipe (PVC)	12,000	Ln. Ft.	$ 35.00	$ 420,000
8	4" Service Stub	25,000	Ln. Ft.	$ 14.00	$ 350,000
9	Pumping Wet Trench Conditions	55,000	Ln. Ft.	$ 8.00	$ 440,000
10	48" Manhholes	300	Each	$ 3,000.00	$ 900,000
11	Clay Cut-Off Walls	100	Each	$ 250.00	$ 25,000
12	Geotechnical Fabric	8,000	Sq. Yds	$ 1.50	$ 12,000
13	Imported Pipe Bedding	8,500	Cu. Yds.	$ 20.00	$ 170,000
14	Imported Pit Run Borrow	2,800	Cu. Yds.	$ 15.00	$ 42,000
15	Untreated Base Course	4,500	Cu. Yds.	$ 22.00	$ 99,000
16	Property Restoration	25,000	Sq. Yds	$ 1.00	$ 25,000
17	Lift Stations	4	Each	$ 200,000.00	$ 800,000
18	Soil Proctor and Compaction Testing	1	L.S.	$ 10,000.00	$ 10,000
19	**CONSTRUCTION SUBTOTAL**				**$ 6,114,000**
20	Contingencey (20%)	1	L.S.	$ 1,223,000	$ 1,223,000
21	**CONSTRUCTION TOTAL**				**$ 7,337,000**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
22	Engineering Design	1	L.S.	$ 441,000	$ 441,000
23	Construction Management	1	L.S.	$ 734,000	$ 734,000
24	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 221,000	$ 221,000
25	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 74,000	$ 74,000
26	Easements	1	L.S.	$ 60,000	$ 60,000
27	DWQ Administration	1	L.S.	$ 90,000	$ 90,000
28					**$ 8,957,000**

SUNRISE ENGINEERING, INC.

CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

SUNRISE ENGINEERING

Project:	Wastewater System Capacity Study	Project No:	3656
Owner:	Huntsville Town & Weber Co.	Date:	19-Jul-11
Option:	Alternative Collection (STEP)	By:	DAT
			Exhibit 5.20

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 415,000.00	$ 415,000
2	Sub surface Investigation	30	Hrs	$ 200.00	$ 6,000
3	Traffic Control	1	L.S.	$ 15,000.00	$ 15,000
4	STEP On-Lot Connection (Tank, Pump, Etc.)	800	Each	$ 5,350.00	$ 4,280,000
5	Pumping Wet Trench Conditions	1	LS	$ 50,000.00	$ 50,000
6	2" Diameter Mainline (Forcemain)	55,000	Ln Ft	$ 8.00	$ 440,000
7	3" Diameter Mainline (Forcemain)	37,000	Ln Ft	$ 12.00	$ 444,000
8	4" Diameter Mainline (Forcemain)	16,000	Ln Ft	$ 15.00	$ 240,000
9	8" Diameter Mainline (Gravity)	6,000	Ln Ft	$ 25.00	$ 150,000
10	48" Diameter Manholes	150	Each	$ 3,000.00	$ 450,000
11	4" Service Stub	25,000	Ln Ft	$ 14.00	$ 350,000
12	Air Release Assmeblies	20	Each	$ 500.00	$ 10,000
13	Miscellaneous	1	LS	$ 20,000.00	$ 20,000
14	Property Restoration	1	LS	$ 25,000.00	$ 25,000
15	**CONSTRUCTION SUBTOTAL**				**$ 6,895,000**
16	Contingencey (20%)	1	L.S.	$ 1,379,000	$ 1,379,000
17	**CONSTRUCTION TOTAL**				**$ 8,274,000**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
18	Engineering Design	1	L.S.	$ 497,000	$ 497,000
19	Construction Management	1	L.S.	$ 828,000	$ 828,000
20	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 249,000	$ 249,000
21	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 83,000	$ 83,000
22	Easements	1	L.S.	$ 60,000	$ 60,000
23	DWQ Administration	1	L.S.	$ 101,000	$ 101,000
24					**$ 10,092,000**

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
Opinion of Probable Costs

Project: Wastewater System Capacity Study
Owner: Huntsville Town Only
Option: Conventional Collection (Gravity)

Project No: 3656
Date: 19-Jul-11
By: DAT
Exhibit 5.21

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 195,000.00	$ 195,000
2	Sub surface Investigation	30	Hrs	$ 200.00	$ 6,000
3	Traffic Control	1	L.S.	$ 12,000.00	$ 12,000
4	8" Gravity Sewer Pipe (PVC)	25,000	Ln. Ft.	$ 23.00	$ 575,000
5	10" Gravity Sewer Pipe (PVC)	10,000	Ln. Ft.	$ 25.00	$ 250,000
6	12" Gravity Sewer Pipe (PVC)	3,000	Ln. Ft.	$ 30.00	$ 90,000
7	15" Gravity Sewer Pipe (PVC)	12,000	Ln. Ft.	$ 35.00	$ 420,000
8	4" Service Stub	10,000	Ln. Ft.	$ 14.00	$ 140,000
9	Pumping Wet Trench Conditions	35,000	Ln. Ft.	$ 8.00	$ 280,000
10	48" Manhholes	150	Each	$ 3,000.00	$ 450,000
11	Clay Cut-Off Walls	75	Each	$ 250.00	$ 18,750
12	Geotechnical Fabric	6,000	Sq. Yds	$ 1.50	$ 9,000
13	Imported Pipe Bedding	4,500	Cu. Yds.	$ 20.00	$ 90,000
14	Imported Pit Run Borrow	2,000	Cu. Yds.	$ 15.00	$ 30,000
15	Untreated Base Course	3,500	Cu. Yds.	$ 22.00	$ 77,000
16	Property Restoration	25,000	Sq. Yds	$ 1.00	$ 25,000
17	Lift Stations	3	Each	$ 200,000.00	$ 600,000
18	Soil Proctor and Compaction Testing	1	L.S.	$ 10,000.00	$ 10,000
19	**CONSTRUCTION SUBTOTAL**				**$ 3,277,750**
20	Contingencey (20%)	1	L.S.	$ 656,000	$ 656,000
21	**CONSTRUCTION TOTAL**				**$ 3,933,750**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS					
22	Engineering Design	1	L.S.	$ 237,000	$ 237,000
23	Construction Management	1	L.S.	$ 394,000	$ 394,000
24	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$ 119,000	$ 119,000
25	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$ 40,000	$ 40,000
26	Easements	1	L.S.	$ 60,000	$ 60,000
27	DWQ Administration	1	L.S.	$ 49,000	$ 49,000
28					**$ 4,833,000**

SUNRISE ENGINEERING, INC.

CONSULTING ENGINEERS AND SURVEYORS

Opinion of Probable Costs

SUNRISE ENGINEERING

Project: Wastewater System Capacity Study
Owner: Huntsville Town Only
Option: Alternative Collection (STEP)

Project No: 3656
Date: 19-Jul-11
By: DAT

Exhibit 5.22

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE		AMOUNT	
1	Mobilization	1	LS	$	165,000.00	$	165,000
2	Sub surface Investigation	30	Hrs	$	200.00	$	6,000
3	Traffic Control	1	L.S.	$	12,000.00	$	12,000
4	STEP On-Lot Connection (Tank, Pump, Etc.)	250	Each	$	5,350.00	$	1,337,500
5	Pumping Wet Trench Conditions	1	LS	$	12,500.00	$	12,500
6	2" Diameter Mainline (Forcemain)	55,000	Ln Ft	$	8.00	$	440,000
7	3" Diameter Mainline (Forcemain)	37,000	Ln Ft	$	12.00	$	444,000
8	4" Diameter Mainline (Forcemain)	16,000	Ln Ft	$	15.00	$	240,000
9	48" Diameter Manholes	10	Each	$	3,000.00	$	30,000
10	Air Release Assmeblies	20	Each	$	500.00	$	10,000
11	Miscellaneous	1	LS	$	20,000.00	$	20,000
12	Property Restoration	1	LS	$	25,000.00	$	25,000
13	**CONSTRUCTION SUBTOTAL**					**$**	**2,742,000**
14	Contingencey (20%)	1	L.S.	$	549,000	$	549,000
15	**CONSTRUCTION TOTAL**					**$**	**3,291,000**
PROFESSIONAL SERVICES & MISC. PROJECT COSTS							
16	Engineering Design	1	L.S.	$	198,000	$	198,000
17	Construction Management	1	L.S.	$	330,000	$	330,000
18	Additional Engineering Services (Survey, Geotech, Etc)	1	L.S.	$	99,000	$	99,000
19	Attorney Fees (Bonds, Legal, Misc.)	1	L.S.	$	33,000	$	33,000
20	Easements	1	L.S.	$	60,000	$	60,000
21	DWQ Administration	1	L.S.	$	41,000	$	41,000
22						**$**	**4,052,000**

APPENDIX G

NET PRESENT VALUE

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS

SUNRISE ENGINEERING

Net Present Value Comparison
Exhibit 5.23

Design Parameters	
Inflation Rate	3.0%
Discount Rate	6.5%

	Alt #2 -Total Containment Lagoons	Alt #2a -Discharging Lagoons	Alt #3 -STM Treatment Plant	Alt #3a -SBR Treatment Plant	Alt #4 -ORENCO Systems	Alt #5 -Huntsville Only STM	Alt #5a -Huntsville Only ORENCO
Capital Cost	$ 15,291,000	$ 12,940,000	$ 14,757,000	$ 14,161,000	$ 18,468,000	$ 7,655,000	$ 7,593,000
O&M Cost	$ 537,231	$ 537,231	$ 1,646,536	$ 1,596,479	$ 864,022	$ 892,626	$ 599,438
NPV Total	$ 15,828,231	$ 13,477,231	$ 16,403,536	$ 15,757,479	$ 19,332,022	$ 8,547,626	$ 8,192,438

Year	Huntsville Total ERC	County Total ERC	ALT#2 TC Lagoon O&M	Alt #2 O&M PV	ALT #2a Discharge O&M	ALT #2a O&M PV	ALT #3 STM O&M	ALT #3 O&M PV
	#	#	$/Year	$	$/Year	$	$/Year	$
2011	238	563	-	-	-	-	-	-
2012	239	569	-	-	-	-	-	-
2013	241	575	47,000	47,000	47,000	47,000	134,000	134,000
2014	242	580	37,960	35,643	37,960	35,643	117,120	109,972
2015	243	586	39,099	34,472	39,099	34,472	120,634	106,358
2016	245	592	40,272	33,339	40,272	33,339	124,253	102,862
2017	246	598	41,480	32,243	41,480	32,243	127,980	99,482
2018	247	604	42,724	31,184	42,724	31,184	131,820	96,213
2019	249	610	44,006	30,159	44,006	30,159	135,774	93,051
2020	250	616	45,326	29,168	45,326	29,168	139,847	89,993
2021	251	623	46,686	28,209	46,686	28,209	144,043	87,035
2022	252	629	48,087	27,282	48,087	27,282	148,364	84,175
2023	254	635	49,529	26,385	49,529	26,385	152,815	81,409
2024	255	642	51,015	25,518	51,015	25,518	157,399	78,733
2025	256	648	52,546	24,680	52,546	24,680	162,121	76,146
2026	258	655	54,122	23,869	54,122	23,869	166,985	73,643
2027	259	661	55,746	23,084	55,746	23,084	171,995	71,223
2028	260	668	57,418	22,326	57,418	22,326	177,155	68,882
2029	262	675	59,140	21,592	59,140	21,592	182,469	66,619
2030	263	681	60,915	20,882	60,915	20,882	187,943	64,429
2031	264	688	62,742	20,196	62,742	20,196	193,582	62,312
			Total	$537,231	Total	$537,231	Total	$1,646,536

Year	ALT #3a SBR/Fluidyne O&M	ALT #3a O&M PV	ALT #4 ORENCO O&M	ALT #4 O&M PV	ALT #5 STM O&M (Hville Only)	ALT #5 O&M PV	ALT #5a ORENCO O&M (Hville Only)	ALT #5a O&M PV
	$/Year	$	$/Year	$	$/Year	$	$/Year	$
2011	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-
2013	130,500	130,500	74,500	74,500	76,500	76,500	56,000	56,000
2014	113,515	106,587	61,135	57,404	63,195	59,338	42,080	39,512
2015	116,920	103,084	62,969	55,517	65,091	57,388	43,342	38,213
2016	120,428	99,696	64,858	53,693	67,044	55,502	44,643	36,957
2017	124,041	96,420	66,804	51,928	69,055	53,678	45,982	35,743
2018	127,762	93,251	68,808	50,222	71,127	51,914	47,361	34,568
2019	131,595	90,187	70,872	48,571	73,260	50,208	48,782	33,432
2020	135,543	87,223	72,998	46,975	75,458	48,558	50,246	32,333
2021	139,609	84,356	75,188	45,431	77,722	46,962	51,753	31,271
2022	143,797	81,584	77,444	43,938	80,054	45,419	53,306	30,243
2023	148,111	78,903	79,767	42,494	82,455	43,926	54,905	29,249
2024	152,555	76,310	82,160	41,098	84,929	42,482	56,552	28,288
2025	157,131	73,802	84,625	39,747	87,477	41,086	58,249	27,358
2026	161,845	71,376	87,164	38,441	90,101	39,736	59,996	26,459
2027	166,701	69,031	89,779	37,177	92,804	38,430	61,796	25,590
2028	171,702	66,762	92,472	35,956	95,588	37,167	63,650	24,749
2029	176,853	64,568	95,246	34,774	98,456	35,946	65,559	23,935
2030	182,158	62,446	98,104	33,631	101,409	34,764	67,526	23,149
2031	187,623	60,394	101,047	32,526	104,452	33,622	69,552	22,388
	Total	$1,596,479	Total	$864,022	Total	$892,626	Total	$599,438

APPENDIX H

O&M
COMPARISON

SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS

Operation and Maintenance Comparison
Exhibit 5.24

		1	2	3	4	5	6	7	8	9	10
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alternative											
1	Do Nothing										
2	Total Containment Lagoons	$ -	$ -	$ 47,000	$ 37,960	$ 39,099	$ 40,272	$ 41,480	$ 42,724	$ 44,006	$ 45,326
2a	Lagoons w/ Land Application Discharge	$ -	$ -	$ 47,000	$ 37,960	$ 39,099	$ 40,272	$ 41,480	$ 42,724	$ 44,006	$ 45,326
3	Regional Mechanical Plant (STM Aerotors)	$ -	$ -	$ 134,000	$ 117,120	$ 120,634	$ 124,253	$ 127,980	$ 131,820	$ 135,774	$ 139,847
3a	Regional Mechanical Plant (SBR/Fluidyne)	$ -	$ -	$ 130,500	$ 113,515	$ 116,920	$ 120,428	$ 124,041	$ 127,762	$ 131,595	$ 135,543
4	Multiple Package Plants (Orenco Systems)	$ -	$ -	$ 74,500	$ 61,135	$ 62,969	$ 64,858	$ 66,804	$ 68,808	$ 70,872	$ 72,998
5	Huntsville Only Mechanical Plant (STM Aerotors)	$ -	$ -	$ 76,500	$ 63,195	$ 65,091	$ 67,044	$ 69,055	$ 71,127	$ 73,260	$ 75,458
5a	Huntsville Only Package Plant (Orenco Systems)	$ -	$ -	$ 56,000	$ 42,080	$ 43,342	$ 44,643	$ 45,982	$ 47,361	$ 48,782	$ 50,246

		11	12	13	14	15	16	17	18	19	20	21
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Alternative												
1	Do Nothing											
2	Total Containment Lagoons	$ 46,686	$ 48,087	$ 49,529	$ 51,015	$ 52,546	$ 54,122	$ 55,746	$ 57,418	$ 59,140	$ 60,915	$ 62,742
2a	Lagoons w/ Land Application Discharge	$ 46,686	$ 48,087	$ 49,529	$ 51,015	$ 52,546	$ 54,122	$ 55,746	$ 57,418	$ 59,140	$ 60,915	$ 62,742
3	Regional Mechanical Plant (STM Aerotors)	$ 144,043	$ 148,364	$ 152,815	$ 157,399	$ 162,121	$ 166,985	$ 171,995	$ 177,155	$ 182,469	$ 187,943	$ 193,582
3a	Regional Mechanical Plant (SBR/Fluidyne)	$ 139,609	$ 143,797	$ 148,111	$ 152,555	$ 157,131	$ 161,845	$ 166,701	$ 171,702	$ 176,853	$ 182,158	$ 187,623
4	Multiple Package Plants (Orenco Systems)	$ 75,188	$ 77,444	$ 79,767	$ 82,160	$ 84,625	$ 87,164	$ 89,779	$ 92,472	$ 95,246	$ 98,104	$ 101,047
5	Huntsville Only Mechanical Plant (STM Aerotors)	$ 77,722	$ 80,054	$ 82,455	$ 84,929	$ 87,477	$ 90,101	$ 92,804	$ 95,588	$ 98,456	$ 101,409	$ 104,452
5a	Huntsville Only Package Plant (Orenco Systems)	$ 51,753	$ 53,306	$ 54,905	$ 56,552	$ 58,249	$ 59,996	$ 61,796	$ 63,650	$ 65,559	$ 67,526	$ 69,552

APPENDIX I

PUBLIC MEETING MINUTES

MINUTES OF THE HUNTSVILLE TOWN COUNCIL MEETING

Thursday, April 20th, 2011
7:00 p.m.
Ogden Valley Library

Present: Mayor James A. Truett
Council Member Richard Sorensen
Council Member Steve Johnson
Council Member Alan Clapperton
Clerk/Recorder, Gail Ahlstrom

Kevin Brown/Sunrise Engineering
Dave Torgerson/Sunrise Engineering
Curtis Christiansen/Weber County Engineer
Dr. Darwin Sorensen/Professor at USU
Ed Macauley/Division of Water Quality

Citizens:

Steve Clarke	Ralph Keopple	Rex Harris
Beth Wardimu	Kari Lundeen	Craig Kultnly
Leetan Bowes	Robert Seear	Ron Gleason
Chad Meyerhoffer	Chris Hudon	Greg Graves
Kimbal Wheatley	Brad Nelson	Kelly Wangsgard
Frank Cumberland	Larry Zini	Tim Hansen
Janet Muir	David Suehsdorf	Debbie Wilson
Laurie Allen	Brett Allen	Ronald Gault
Fred Smullin	Liz Poulter	Christa Schmid
Laura Warburton	Karen Klein	Sandy Hunter
Tina Olsen	Craig Olsen	Richard Bay
Jeff Burton	R.P. Meld	John Pierotti
Laurie Pierotti	Ernest Goff	Dave Robinson
Richard Jacks		

Mayor Truett called the meeting to order and welcomed all in attendance. Huntsville Town has a quorum present.

The Pledge was led by Steve Clarke.

<u>Explanation of why study was done:</u>
Mayor Truett stated that after he explains why and how this study was done the time will be turned over to Sunrise Engineering for a presentation of their study and the results. Huntsville Town was approached about 2 ½ years ago by the State, after a TMDL (Total Maximum Daily Load) study was done on Pineview Reservoir. The State asked Huntsville Town to participate in a study to see if septic systems in the Huntsville area were adding to the high nitrogen level in the reservoir.

At that time Huntsville Town put together a sewer feasibility committee, the Town wanted to be more informed. The committee found out that there were grants available and that Weber County was also interested in pursuing an additional study on the reservoir. Huntsville Town and Weber County combined their focus and both entities procured grants, W.C.'s grant was for $110,000 and Huntsville's was for $33,000. Sunrise Engineering was hired to do the sewer feasibility study. This study took a while, and the Huntsville Town Council is hearing the report for the first time along with everyone else. Mayor Truett turned the time over to Dave Torgersen, Project Manager from Sunrise Engineering.

Presentation of the results of the Huntsville Town and Southern Ogden Valley wastewater study: Dave Torgersen, Sunrise Engineering/Project Manager. (See Attachment #1)
Dave Torgersen had a power point presentation. Dave explained that Huntsville Town and Weber County with the support of Utah Division of Water Quality wanted to perform a wastewater study. They contracted with Sunrise Engineering for their services. Some of the desired results they wanted to see where: improving groundwater quality in the Valley and Pineview Reservoir, treatment and collection alternatives, potential cost to existing residents, and improved standard of living for existing residents.

Why do a study? To educate and provide knowledge to residents and decision makers, to be informed of the impact and options available, and to provide a plan of direction for the future. The purpose for tonight's presentation is to provide an overview of the study area, review proposed alternatives, discuss recommended alternative, discuss costs, to talk about what's next, to answer questions and to receive public input.

The study area encompassed both the Un-incorporated and the Incorporated Huntsville areas. Huntsville Town has 237 homes and 701 people, and the W.C. Huntsville area has an estimated 552 homes and 1634 people, for a total of 789 homes and 2335 people. Huntsville's data was obtained from census date, and the county area was estimated from counting homes.

Proposed alternatives: The scope of the study was to analyze three waste water treatment plant alternatives. The study actually evaluated more than five alternatives. One of the alternatives was to take no action right now to stay the way things are, lagoons (both total containment and discharging), a regional STM Aerotor plant, a regional SBR plant, Arenco multiple package plants, and a Huntsville only mechanical plant.

The recommended alternative was the SBR (Sequencing Batch Reactor). Some of the benefits to a SBR system are that they are cost effective with upfront Capital Costs, lower operating and maintenance costs, easy to operate, no mechanical parts inside the basin, small footprint, small comparative amount of sludge, and they are very effective in nutrient removal (nitrogen and phosphorus).

The cost for a regional mechanical SBR treatment plant would be $5.5 Million, the regional collection system would be $8.5 Million for a total cost of $14 Million. The cost for a Huntsville only option the cost of a treatment plant would be $3 Million, and the collection system $ $4.5 Million for a total cost of $7.5 Million. Dave explained possible methods of funding.

The State of Utah has funding packages for 75% of the total cost, so they would fund $10.5 Million with 0% interest for 30 year loan, and 25% of the principle, $3.5 Million, with a forgiveness grant. This $3.5 Million would not have to be repaid. If the project was funding with the bonds it would require a $14 Million bond with 5% interest on a 20 year loan, with a $0 in principle forgiveness grant.

What this means is: With the State of Utah's proposed funding package on a $10.5 Million loan with 0% for 30 years would equate to a sewer bill of $58 per month. With the bond funding the monthly sewer bill would be $120 per month. Dave spoke with Weber Morgan Health Department who provided the following information. The life expectancy of a well maintained septic system is 30 years. Costs for a new septic system run approximately $5,000 - $15,000 depending on the type, making the average monthly cost for septic systems over a 30 year period, $35 - $105 per month. Dave understands that septic tank users aren't actually paying $35 per month for their septic system, they pay for their system in a lump sum when it is installed, not spread out monthly. Dave commented that the life expectancy of sewer collection lines is 50+ years. The life expectancy on the sewer plant facility would be longer than 50 years.

Dave finished up his presentation by saying that they will now hold a question and answer period. Public comments will be accepted until May 26th. The Huntsville Town Council will vote on whether or not to adopt the Capital Facilities Plan on June 2nd.

<u>Meeting was opened up for public comment:</u>
Ron Gleason, from Green Hills, stated that the focus tonight has been mainly on Huntsville, what is the process for the un-incorporated area of Huntsville in regards to public comment and the decision making process. Curtis Christiansen said there are a lot of things Weber County (W.C.) doesn't know, and the county commissioners have a copy of this study and they still have a lot of questions. Huntsville Town will be a key player to all of this. As far as a sewer district goes they don't know if it will be Huntsville Town only or a combined district. There will be negotiations between W.C. and Huntsville Town. Curtis stated that written public comments can be mailed to him and he will forward the comments to the commissioners. Ron asked who is making the decision for the county. Curtis answered that this will depend on what the entity eventually becomes. If it's a combined district then it would be leaders of the district would make the decisions. Curtis sees three potential entities: Huntsville Town only, W.C. could run the district, or create a district that takes in multiple cities. The district doesn't need to be contiguous. Ron pushed for further clarity on who will make the final decision on whether to move forward with a sewer system or not. Curtis replied that the W.C. commissioners in conjunction with Huntsville Town would make the decision on how to create a district.

Ron mentioned that in the study there is a diagram showing the actual piping, does the $14 Million quoted tonight include piping to all of the 552 homes outside of Huntsville Town. Dave Torgersen replied that it did include most of the homes but not all homes, about 85%. So there could be additional costs to run trunk lines and laterals. Ron asked about the $58 monthly bill, is that fee based purely on the median average gross income. Ed Macauley answered that the water quality board considers 1.4% of the median adjusted gross income to be an affordable sewer bill.
That sewer bill would include both operating and maintenance costs and debt service on the loan. The O&M cost would be perpetual and the debt service would be for the life of the loan.

If the MAGI number doesn't change then the monthly fee stays the same. What might change is how much money is available for the project itself. The same would apply to Huntsville Town. Ron asked if the MAGI were based on census data collected for Huntsville or for all 789 homes. Dave replied that the data they used was from Huntsville Town only; information wasn't available for the unincorporated area. Ron asked what the actual capacity of the plant being proposed could handle above the initial 732 homes. Dave said it would handle .5% growth for 20 years.

Rex Harris remarked that recently the Town requested money and were given stipulations on what the Town needed to do to receive that money. Rex asked Ed to explain these requirements. Ed explained the requirements. If a sewer project was done in Huntsville Town, then Huntsville would have authority to enact a mandatory connection ordinance within the Town that would ensure repayment of the loan. If a sewer project was done outside of Town the State would have to know there is a dedicated revenue stream. That means the county would have to form a district, such as a special service district, and make sure there was an entity with authority to enforce the mandatory connection ordinance. The way mandatory ordinances are handled for existing lots is if a sewer line comes within 300 feet of your property you would be forced to connect. If your property is over the 300 feet then you do not have to connect. This does not apply to any new subdivisions; subdivisions have their own set of rules within the Town and the county. Ed said that the State can't loan money to Huntsville Town to construct facilities in the county, unless the Town has some form of authority. Usually a form of authority is through individual contracts. If a sewer district was formed and it covered both Huntsville Town and the un-incorporated Huntsville areas that would fill the requirements. If the Town wanted to proceed with their sewer, and the county wanted to proceed with a sewer without Huntsville annexing in that land, it would be two loans. The only way to do a grant with a region with a single loan is to have a single sewer district, or to have the Town accept authority over the sewer district.

Rex asked Ed if Huntsville Town is willing to move ahead with the project and the county was not, would the State allow the Town to move forward without having a regional facility. Ed answered yes, but it would be subject to the water quality board. Ed said this was the State's intention all along. Their intention was to establish a nucleus so that over time there hasn't been an increase to septic systems, and growth could be managed responsibly. Ed commented that they know that septic systems do have some impact on the reservoir.

Steve Clark mentioned that he has worked with most of the people on the panel in the last year or two, in regards to his responsibilities on the GEM Committee. Steve wanted to go on record saying that he is in favor of sewer in the valley, but in a different way than is being proposed with this study. Steve asked Dr. Sorensen if there was any new information about the water quality of the reservoir. The latest information Steve has gleaned has been that the TMDL study conducted a couple years ago was inconclusive. Dr Sorensen agreed there has not been a final conclusion about the study of the reservoir. There is some evidence that the ground water in Huntsville Town may be contaminated to concentrations that are higher than anticipated. There is one well in Town that they have information from and they just put in a second ground well in the Town and an additional well in the county to get more confidence in the concentration levels. They are not only interested in the nitrogen and phosphorous levels but also the potential flow rates of ground water moving into the reservoir. They were surprised at the flow rates that appear to be happening in the valley. They are not prepared to make a final statement about their findings.

Steve asked what would happen to the existing sewer facilities at Trapper's Crossing and Green Hills. Curtis replied that they could be incorporated into the new district, but don't have to be. Steve stated that in the study it shows a step collection system is less expensive than a gravity system why was this particular step system $4 Million greater cost than the other system, and what advantages does a step system offer. Dave replied that he spoke with Aranco today and there had been some miscommunication with the information provided, these numbers will need to be changed. An advantage of the step system in a high ground water area is that when installed it is more shallow, and be less subject for infiltration into ground water. Steve spoke with an Aranco representative Richard Jacks about the disparity in the costs and asked him to come to the meeting tonight. Dave recalled that the size requirement for a sewer facility would be 15 acres regardless of what system was installed, due to restrictions requirements with a discharge permit and for winter storage pond. The actual size footprint of the facility is very small.

Steve Johnson asked who wants the Town to have a system, who is pushing the idea, what's the motivation and shouldn't there be a conclusive study to determine a need before we are pushing a study as to the installation of a sewer system? Ed replied that you don't want to wait until the ground water is contaminated to do a project. It's critically important to understand what's going on with the ground water, but it's equally important to remember that the ground water condition today is not as much of a concern as the ground water conditions in the future. We can be certain that the ground water quality in the future won't be as good as it is today. Ed mentioned that the cost for anyone who builds or already has a septic system that fails and needs to replace it will cost between $6-7,000. The septic systems will continue to treat only a portion of the nitrate. Nitrates along with other contaminates will still go into the ground water. They have a simulation capacity, but you don't want to exceed that capacity. This money could have gone toward a sewer system where the treatment facility would have the ability to get nitrogen levels well below drinking water maximum contaminate levels. SBR plants can get nitrogen levels down as low as 3 or 5 milligrams per liter (mpl), drinking water mpl is 10, a septic system puts out about 35 mpl. Ed stated that by constructing a sewer system you are taking a pro-active measure. The question is whether this pro-active measure is immediate.

The TMDL study (Total Maximum Daily Load) done on the reservoir a few years ago showed that nitrogen and phosphorous levels needed to be reduced, if the quality of the water in the reservoir is to be maintained. This will prevent the reservoir from becoming more algae, more times during the year. There currently is some algae production in the fall. There is the potential for the reservoir to become much greener. Steve asked if this was a bad thing. Dr. Sorensen replied that the State has decided it is, but the residence in the valley will need to decide whether they are going to support the State or not. The side effect of algae is less oxygen in the water, which affects the fish and recreation. Dr. Sorensen encouraged the residence to step up and help keep the reservoir from becoming a less attractive body of water.

As Ed has pointed out there is a high probability that on-site systems have and will continue to contribute substantially to the nutrient loads. However, they don't know that for certain in this case, but there is a lot of reason to suspect that is happening here. Steve asked what if the Town puts in a sewer system and then the nitrate and phosphorous levels don't change. Ed remarked that if nothing changed that would be a good thing, if you don't put one in then it's almost certain that things will get worse.

Ed commented that population pressure will have an effect on the reservoir. With a publicly owned treatment plant you remove more of the pollutants and have more control over the pollutants. Right now with on-site systems there is virtually no control. Once there is a sewer system you can continually improve the performance of the treatment facility. Today treatment plants can do a lot more than just measure BOD or waste strength, and in the future they will be able to do a lot more.

Jim Truett asked if the nitrate levels have been measured seasonally, there are a lot of people who utilize and fertilize in and around the reservoir from Memorial Day to Labor Day that has nothing to do with septic tanks, is this pollution being taken into account. Dr. Sorensen replied that there would be some contribution from the recreational use on and around the reservoir, but they don't have data available that allows them to point to any particular facility or even a seasonal change.

Dr. Sorensen explained that when the TMDL study was done there was a concern raised by personnel at Weber Basin Conservancy District about the feasibility of implementing the necessary programs to reduce the loads called for in the study. Part of their concern was the lack of information. The TMDL was completed with historical data and anecdotal information. Dr. Sorensen was approached, since he works with the Utah water research lab, to do research and was asked to help them understand the growth of the blue/green algae in Pineview Reservoir. Dr. Sorensen stated that they haven't found much blue/green algae in the reservoir. They did find other kinds of algae; there is a high concentration of algae for a short period of time at the end of the summer. What they discovered was in order to bring on the season bloom of algae, much of that is being brought on by the nutrients being recycled by the sediments. The accumulation of sediment has gone on for years. Shutting off the waste water today will not make the reservoir better tomorrow. If it's not shut off soon, the problem will get more serious and last for a much longer period of time.

Dr. Sorensen commented that the reservoir is extraordinary, where it sits in the water shed, it has the potential to be much greener, with a much more dissolved oxygen problem that it has. Part of the reason for this is due to the fact that there is a bottom draw off the reservoir. Dr. Sorensen feels that there is some urgency in this matter. As they studied the reservoir it became obvious that the thing they knew the least about was the input of nutrients from ground water. They can measure the streams, and have been for years. What they see is the quality of the surface water is surprisingly good. Things are being done in the water shed in a way that makes it so the amount of nutrients going in through surface water is substantially lower than they anticipated. What they don't know is what is coming in through ground water. Dr. Sorensen has put in nine ground water wells to monitor the ground water, and what they have seen is a surprising range of concentrations of nitrogen and phosphorous. They are particularly concerned about the phosphorous levels. The phosphorous load, from the single well in Huntsville Town, makes all their other levels from the other wells look small, as well as the extraordinary porosity there. There is a lot of sand and gravel in this area. This makes it so the ground water put into the sub-surface of the South Fork area basically flows underground into the reservoir. That single well suggests that for a big piece of real estate that's a fairly large amount of water moving with a high concentration of phosphorous and nitrogen in it. They put in the additional wells just last week, to help them get better readings. They have just gotten started studying ground water. The picture they have right now is that they need more information, they can't point to a specific location, and they don't know how recreation is contributing to the pollution, but they do know that septic tanks are contributing to the nutrient levels. In Dr. Sorensen's opinion that needs to be slowed down substantially.

Steve asked if the State or County would consider stopping recreation on the reservoir for two years to see if that helps. Dr. Sorensen replied that even if they stopped recreation for ten years there will not be a change. The question is will we continue to add to the load of phosphorous and nitrogen in the reservoir, making it become greener.

Richard Sorensen commented that a few years ago Lake Powell was contaminated, and there are very few septic systems around it. Ed commented that he thought the contamination in Lake Powell was due to ecoli. Dr. Sorensen said he served on Lake Powell's waste water advisory committee and the issues there were related to fecal contamination of the beach lines, not a nutrient issue.

Jeff Burton recalled that about 25 years ago Dr. Miner did a study of the reservoir and there was a proposal that the county ban any development on lake shore property. The conclusion of that study was that they couldn't find any contaminates from the septic systems from Huntsville, the contamination they found was from the surface water of dairy farms. At that time there were a lot of dairy farms in the area. Jeff asked if it takes a long time for nutrient levels to damage or get corrected, could that also mean the dairy farms are still affecting the reservoir. Dr. Sorensen replied that basically this is true. What they have learned in the past couple years of study is that the principle source of phosphorous, which is the growth limiting nutrient, fertilizer for algae, comes from the sediments. They don't have the data to point fingers at any particular source. The agricultural load has decreased substantially. What they are seeing now in the streams is a much lower concentration of phosphorous and nitrogen into the reservoir than they anticipated. Jeff said this could indicate then that there isn't a septic problem along the streams. Dr. Sorensen agreed, in regard to the surface water in the streams. Jeff remembers that at the meeting where Dr. Miner presented his report, the Forest Service was there and they were in favor of enacting the ban against development in order to protect the ground water. At that time someone asked them how many people there are at Cemetery Point on the 4th of July. The answer was 4-5,000 people. Jeff asked how many bathrooms there are at Cemetery Point, the answer is two. So, if you want to help Pineview then put in more restrooms for the recreation use. Jeff understood that the problem with the reservoir was the method of discharge, they take the water off the bottom not the top, leaving the hot water on top. If they changed the method of discharge, that would be a positive benefit to the water quality. Dr. Sorensen said he isn't familiar with this particular study.

Dr. Sorensen remarked that the method of discharge at Pineview is from the bottom of the lake, they have seen that the phosphorous comes into solution as the summer progresses, and the bottom of the reservoir becomes anaerobic, and there is no more oxygen down there. They have measured a large fraction of the phosphorous coming into the reservoir on an annual basis is actually exported during that period. Traditionally the thought was if you left the cold water on the bottom that would improve the fish environment. But in Pineview the bottom water becomes anaerobic and no fish are able to live there. Jeff recalled that the problems with the reservoir are because it is shallow, and the method of discharge. Dr. Sorensen did not accept this statement as appropriate analysis. Jeff would hate to see the residents spend a whole lot of money on something that isn't broken. Dr. Sorensen agreed. The TMDL and the Utah Geological studies have raised serious concerns about the quality of ground water in the valley, as contributions to the problems in the reservoir.

Jeff asked about the $58 monthly sewer bill, if this is based on the 1.4% of the MAGI, which means half of the residents will not be able to afford the fee. Ed replied that what is affordable is determined by each person. This is a standard for the water quality board uses to set a repayment for a community. Ed mentioned that the Div. of Drinking Water uses 1.75% of the MAGI as an affordable water bill. People are willing to pay more for drinking water than sewer. Nationwide Utah actually has some of the lowest rates in the country. Ed stated that if you were to use an Avantex system on a septic system then you would reduce your nitrogen levels from 45 to 20 mpl, if you added additional treatment onto that you could get your levels down to 10, drinking water levels, but this would cost more than building a central sewer plant. A septic system should do two things: first is treatment, the second is disposal. Septic systems do a good job, but not as good as a mechanical treatment facility. Ed stressed that septic systems will put in the ground water nitrogen of 35 mpl, the drinking water standard is less than 10 mpl, so septic systems are polluting. Septic systems are all subsurface making the health hazards minimal. The more people you have the more pollution you have to clean up. As population goes up the percentage of each person's pollution that has to be cleaned up increases, the natural environment can only assimilate so much pollution.

Tim Hansen says that one thing that seems to be missed is how much it is going to cost each home owner to hook up to the sewer system. Most septic systems are in our back yards which mean the pipes will have to run to the back of our homes. That will be a huge expense. Dave commented that when you connect to a sewer system, you have to abandon the septic tank. There are two methods: one, you can pump it out and fill it with sand or gravel, two; you can pump it out and crush the lid and fill it with material, or you can puncture the side. This will all depend upon the county health department. Costs for a contractor to come in and crush the tank and fill it are about $300. Depending on where the lateral needed to be run, costs per foot would run between $12-15 per foot to run the lateral from the sewer line to the connection. Ed stressed that the tanks need to be pumped first.

Dick Loeffler asked about the $58 monthly fee. Ed stated that the fee would cover O & M costs as well as debt services on the loan for capital costs. The Water Quality Board will not protect against inflation. Dick asked if they took into account all the people in Huntsville who are elderly, widows, or without jobs. Ed replied that these things were factored into the MAGI formula. When they have sewered un-sewered communities in order to assist low income people communities have worked with CDBG to get grants to run the laterals to the streets, so the laterals don't need to be totally born by the homeowner.

Leon Fielding asked who is monitoring the sewer systems at Ski Lake on the Old Snowbasin Road, is this system even working. Leon said this study is about the quality of water in the reservoir, so the people who need and will be using the water and are concerned about it live in Ogden, how much are they involved and how much are they paying to take care of the system. Ed answered that Ski Lake is a special service district and it is regulated by the State, but there wasn't much oversight until just recently. About three years ago they got legislative authority to issue operating permits, prior to that time only facilities that discharged to water in the state had regular maintenance inspections requirements included in their permit. The State has issued 160 operating permits in the past year; there are still 25 facilities that do not have an operating permit, Ski Lake is one of them. The State is aware of what is going on at Ski Lake.

Leon asked again if Ogden City will be sharing the cost of the facility since they are the ones who will benefit from it. Ed replied that as explained earlier the fees for sewer would in excess of $120 per month without grants, and $58 per month with grant help. The grant money comes from tax payers like you, including people in Ogden.

Meeting was opened to the Public Hearing section:
Richard Jacks from Aranco Systems commented that there has been some miscommunication on some of the numbers included in the study. He is willing to answer any questions. Richard will work with Dave Torgersen to provide him with additional information on the step system and also with the treatment systems; these numbers are higher than they should be.

Dick Loeffler said this all boils down to the quality of life that we as residents want in the valley; do we want a rural setting or Park City? Over the years Dick has seen impact fees go from $100 to $10,000. If we want the quality of life up here, he recommended putting off the sewer system. If we want to keep things rural, stop issuing permits Weber County, keep things they way they are. Dick suggested charging very high impact fees now and put the money into an escrow account and save it until there is enough money to do a sewer system.

Ron Gleason still has a lot of questions. He's hearing the reservoir water quality being compared to drinking water. He has taken a lot of time to study this report and Ron feels that what is being proposed is too high level. He questioned including only 85% of the homes in the numbers, there should be firm numbers to include every home and every cost. Ron said the Weber County General Plan provides guidelines, objectives, and ways to move forward. This study does not match what is in the general plan directly related to sewer. The County's General Plan addresses sewer very aggressively: on how to distribute and share costs between existing people and new development.

Steve Clarke (See Attachment #2) stated that yes the valley should have sewer for the high density areas, but the sewer should be implemented in a way that doesn't set the stage for unbridled growth. We should be looking at micro-plants, each to serve a high density area of the valley. The offer that DWQ is making is a powerful enticement. Huntsville Town should make its own decision as to whether this is the right time and plan for sewer. If and as Huntsville Town annexes additional property they can make a decision about serving that area with sewer. Weber County should redouble planning efforts to create a long range plan for sewer which accomplishes the goals of their General Plan. Since the plan was updated last with the Recreation Element in 2005 it is likely some amount of refresh is needed and that should occur quickly so a prospective sewer district could do effective planning. A single sewer district in the valley would be a lot more effective than having the 17 separate districts that exist currently. Water Quality studies should continue to more accurately attribute pollution to its sources.

Laura Warburton said she is the type of person who likes to see all the facts and numbers before she makes a decision on something, and she isn't seeing all the facts with this report. She asked the panel to back off of this project until all facts can be studied and reviewed.

Jim Truett asked if the new numbers on the Aranco system would affect the cost of the proposal. Dave replied that it won't change the monthly fee of $58. The overall cost would change but not the monthly fee.

Janet Murr had two comments. She doesn't understand why the Town has to make a decision right now, or if there are cause and relationship between the nutrient level in the reservoir and septic systems. There apparently isn't any conclusive evidence. Janet asked what we want the future of the Ogden Valley to be. If you build a sewer system the people will come.

Leon Fielding stated that years ago Weber County adjusted for the ground water because they rezoned property from 1 acre building lots to only allowing for 3 acre lots. So, if a sewer system is put in will the property be rezoned back into 1 acre lots, and encourage more growth. Leon said that's what they are going to encourage with a sewer system.

Richard Sorensen read from page 27 of the report where it lists the disadvantages of septic systems, septic systems limit the amount of growth allowed in an area. Richard feels that this is an advantage.

Dave Robinson stated that he just bought a home up here and he can't afford another monthly bill. Who is it that's going to impose on him that he can't afford to live here. He knows many people in the valley who don't have this kind of money. Unless there are cold hard facts saying that our septic systems are polluting the dam, we should not do anything. Dave hopes that when a decision is made they are thinking of the whole community.

Richard Sorensen presented some observations he came up with. In 1998 the TMDL study recommended no more than 3 acres per septic system. This current study shows Huntsville as having 575 acres and the W.C. area 10,000 acres. Singly, Huntsville has 2.5 acres per septic system, which equates to more than the required 3 acres. The W.C. area is 18 acres per septic tank. With all the homes and acreage in Huntsville Town and the W.C. areas combined it comes out to 13.4 acres per septic system, well above the 3 acre minimum.

Mayor Truett called the public hearing to a close and adjourned the meeting.

Meeting adjourned at 8:50 p.m.

Gail Ahlstrom, Clerk/Recorder

James A. Truett, Mayor