FINAL

WASTEWATER TREATMENT & COLLECTION SYSTEM FEASIBILITY STUDY for the TOWN OF PARADISE DOWNTOWN COMMUNITY CLUSTER SYSTEM

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April 21, 2010
by

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EXECUTIVE SUMMARY

The Town of Paradise is the largest un-sewered city in California, relying on over 11,000 individual septic systems to treat and disperse of wastewater generated by its residents and commercial establishments. As the Town has grown, so has the knowledge and understanding of septic systems and their key role in shaping the future of the community. The current sewage disposal ordinances in place help assure that new individual systems installed are designed, constructed and maintained as to provide a sustainable decentralized wastewater infrastructure and protect public health and safety.

While new wastewater systems are being addressed, many existing systems are found to be in distress, due to age and the old mindset that septic systems were a temporary solution to waste disposal until a conventional municipal sewer is constructed. Many of the systems serving the areas under study in this report are situated on very small lots in the commercial corridors with little room for expansion and repair. In many cases, the current ordinance restricts the use of existing buildings and facilities to uses far below their potential due to limits on wastewater flow. The Onsite Division is actively pursuing efforts to provide a new and higher level of service to these downtown commercial corridors and has been evaluating the feasibility of a clustered wastewater system to serve the downtown commercial district.

A clustered wastewater system would provide collection, transport, and treatment of wastewater generated within the limits of the Downtown Revitalization Area (DRA) as well as other commercial corridors for dispersal to an offsite location. Such a system would create a downtown corridor no longer dependant on standard septic systems serving businesses, multifamily, and affordable housing developments. A clustered wastewater system would allow a level of business operation and expansion that has not previously been available to these areas. A clustered wastewater system would promote vitality to these areas by making it possible for entrepreneurs to maximize resources based on the functionality of buildings and facilities rather than be limited to the number of flushes. This cutting edge approach is indicative of the Town's commitment to provide services to the residents and business owners while being an ever vigilant guardian of the environment.

This report is a compilation of recent study work and the results on an intense two day meeting with Town staff, industry experts and stakeholders. NorthStar Engineering's findings and recommendations are summarized below.

Findings:

- *A conventional municipal sewer system is not feasible at this time.*
- *The key to success of providing a wastewater solution to serve the DRA and the Redevelopment Area (RDA) is finding and securing adequate dispersal capacity to meet the needs of the DRA and RDA areas.*
- *Predicted Wastewater Flows for the Downtown Revitalization Area are 106,000gpd using assumptions for potential buildout densities with the total flow for all the areas analyzed at 534,000gpd.*

Recommendations:

- *Dispersal - The Blue Oaks site should be used to the fullest extent of its projected 100,000 gpd dispersal capacity. Although preliminary studies did not show the site has adequate capacity to accommodate the total predicted flow from Phase 1; it does have significant capacity in close proximity to the Town of Paradise. Assuming the*

Blue Oaks site has the capacity to disperse 100,000 gpd of effluent year-round, the site has the capacity to serve approximately half of the adjusted projected wastewater flows from Phase 1 and would not reach full capacity until the year 2017. Preliminary evaluations for the Blue Oaks site have already been performed; however, additional field testing and coordination with regulatory agencies is required to verify the reported capacity.

- *Treatment - While the Sequenced Batch Reactor (SBR) wastewater treatment system was selected as the preferred alternative by Questa, NorthStar recommends that the Town consider a Membrane Bio Reactor (MBR) wastewater treatment system for the treatment of Phase 1 wastewater flows. In Questa's alternative analysis the SBR and MBR options were separated by one point with the SBR gaining favor based primarily on capital and operations and maintenance costs. While the SBR may still be a less expensive alternative, the reliability and effluent quality produced by the MBR makes this alternative more attractive. The effluent from an MBR provides additional options for dispersal since it is meets the definition of filtered wastewater; coupled with disinfection and turbidity monitoring this meets the standards under California Title 22 for recycled water and therefore fulfills the Town's desire for water reuse.*
- *Collection - A Septic Tank Effluent Pump (STEP) collection system is recommended. The main advantage to a STEP collection system includes the near elimination of infiltration and inflow (I&I) as compared to conventional gravity sewers by use of pressure conveyance. With an onsite dispersal system this is a critical point. Every gallon collected must be treated and dispersed to the soil. An increase in unnecessary treatment and dispersal capacity, increases costs. Another benefit of STEP collection is a reduction in installation time and costs compared to conventional gravity sewers. Inexpensive, small diameter collection lines can be buried shallow, just below the frost line, reducing material and excavation costs. Other jurisdiction looking at upgrading their collection systems have passed on STEP as the solution despite its advantages. The primary reason being the inclusion of STEP tanks into the infrastructure. STEP tanks are an unknown to many municipalities who do not see them in their inventory and are concerned about building a program to manage them. This is the most promising advantage of a STEP collection system. The Town already has in place a program that oversees the inspection, service, and maintenance of septic tanks and pump packages. This is a very valuable asset which isn't typically in place when a community considers STEP collection. Based on the analysis of collection options and the impacts the various collection options have to the Town during construction and capital investment for the project as a whole the most desirable alternative is a STEP collection system.*
- *Reuse - Although water reuse is an important goal of Town Staff, many decisions need to be made before an accurate cost estimate can be provided. Necessary information includes, identification of the treatment location, areas to be served by recycled water, and recycled water demands.*
- *Septage Receiving - NorthStar concurs with the Butte County Septage Master Plan's option for region co-treatment of septage in Butte County. Septage receiving is an integral part of operating and maintaining the septic systems on which the Town relies to meet its wastewater dispersal needs. NorthStar recommends that the Town of Paradise incorporate septage receiving as part of their treatment system.*

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PROJECT HISTORY

In August of 2003, the Town of Paradise Redevelopment Agency commissioned 7H Technical Services Group of Grass Valley, CA (7H) to prepare a clustered wastewater treatment system master plan (Downtown Community Cluster System) for the Downtown Revitalization Area (DRA). The effort resulted in the March 2004 report entitled ***Town of Paradise Downtown Revitalization Area Clustered Wastewater Treatment System(s) Master Plan*** (Master Plan). The Master Plan segregated the DRA into several tributary areas for the collection of wastewater and reviewed various treatment alternatives and effluent dispersal methods. Specifics of the collection, treatment, and dispersal methods proposed can be found in the 7H Master Plan.

In April of 2005, the Town of Paradise (Town) contracted with Questa Engineering of Point Richmond, CA (Questa) and NorthStar Engineering of Chico, CA (NorthStar) to further develop the concept of a clustered wastewater treatment system as proposed in the 7H Master Plan. The resulting ***Cluster Wastewater Treatment and Collection System for the Town of Paradise Downtown Revitalization Area*** (Draft Progress Report) was published in June of 2006 and developed several alternatives for collection, treatment, and dispersal of wastewater within the DRA. Alternatives for collection included conventional gravity sewers and small diameter effluent sewers; alternatives for treatment included secondary and tertiary treatment using MBR and SBR technologies; effluent dispersal alternatives included subsurface drip, conventional pressure dosed dispersal trenches, spray irrigation, and surface water discharge.

In June of 2008, NorthStar prepared the ***Preliminary Wastewater Capacity Assessment for APN 055-540-037 & 016 Totaling 228.59 Acres for the Town of Paradise,*** (Preliminary Capacity Assessment) for the Blue Oaks Phase III site identified in the Questa Draft Progress Report as the most suitable location for effluent dispersal. Based on the Preliminary Capacity Assessment, the subject property demonstrated sufficient capacity for dispersal of approximately 100,000 gpd of treated effluent from the proposed Downtown Community Cluster System.

CURRENT WORK EFFORT

In July of 2009, NorthStar was tasked by Town of Paradise Staff (Town Staff) to conduct a feasibility study based on the Questa Draft Progress Report for the purpose of expanding the original project scope to include collection areas outside the DRA and to review alternative methods and locations for effluent dispersal. Collection areas evaluated for inclusion in the project primarily included the high density corridors along Skyway from Pearson Road to Clark Road, as well as along Pearson Road from Skyway to Clark Road. All of the areas proposed for inclusion in the collection system lie within the boundary of the Paradise Redevelopment Area (RDA) and are considered essential for the successful redevelopment of the Town. Figure 1 shows the extents of July 2009 study area including the DRA and RDA areas considered for inclusion into the overall project.

In addition, the 2007 Butte County Septage Management Plan prepared by Kennedy/Jenks Consultants (K/J) was reviewed in context of the issues relating to septage receiving facing the county. The report anticipates that the Neal Road septage ponds will need to be decommissioned in 5 to 8 years to make room for the land fill expansion. The report estimates that by 2030 nearly 2,614,000 gallons of septage; some 31 percent of the total septage produced in Butte County will be generated by systems serving the Town of Paradise. However, actual generation rates may be as high as 3,475,000 gallons annually, as described in a January of 2007 memo from Lloyd Hedenland, the former Onsite Sanitary Official for the Town of Paradise. As such, Town Staff consider incorporating facilities for septage receiving an important addition to the project scope moving forward.

WASTEWATER FLOW ANALYSIS

Questa's Draft Progress Report, which referenced the flow analysis from 7H's Master Plan, stated that wastewater systems within the DRA had permitted flows of 80,000 gpd and assumed a total wastewater flow at build-out of 100,000 gpd. Using water records from Paradise Irrigation District (PID) collected during the preparation of the Draft Progress Report, NorthStar averaged the total bi-monthly consumption over the period from 2000 to 2005; the result was an average daily flow of approximately 95,000 gpd.

This value corresponds well with projected wastewater design flows from previous reports; however, it should be noted that exaggerated consumption between June and September is generally the result of irrigation demands and do not contribute to actual wastewater flows. Figure 2 presents the typical consumption pattern and average water consumption for the DRA during the period 2000 through 2005.

While the flows derived using PID consumption data are useful in estimated wastewater flows based on current development density and practices, NorthStar believes this method does not provide a full accounting of future wastewater flows given the potential for redevelopment of the downtown corridors following completion of the Downtown Community Cluster System, and likely alterations in land use restrictions currently in effect within the Town of Paradise Onsite Wastewater Management Zone. As such, NorthStar evaluated wastewater flows based on density limits, land use patterns described in the General Plan, and wastewater design flow rates (including inflow and infiltration (I&I) rates) for a typical conventional sewer system design. This method of analysis is believed to represent the gross wastewater flows possible from the project.

In the case of residential land use, projected gross wastewater flows were derived by summing the total parcel acreage from each residential zoning designation (e.g. RR 1/3, TR 1/2, MF) and applying a value of 225 gpd/unit to the maximum permitted density (units/acre) for the respective designation. Where secondary dwellings are permitted, a value of 113 gpd was applied to the respective acreage. For the purposes of this study it was assumed that 100 percent of the density for primary, and 10 percent of the density for secondary dwellings would be realized.

For the case of commercial land use, projected gross wastewater flows were calculated using the total acreage for each commercial zoning designation (e.g. NC, CC, CS) and applying a value of 1,200 gpd/ac for high flow (restaurants/medical/dental) uses and 600 gpd/ac for low flow (office/retail) uses. Where commercial zoning permitted residential uses, such as CC, 10 percent of the total acreage in that zone was calculated as residential flow, the remaining 90 percent was divided between high and low flow, respectively. For the purposes of this study it was assumed that 40 percent of the designated commercial acreage would serve high flow commercial with the remaining 60 percent serving low flow commercial uses.

Based on the method of analysis described above, the total projected gross wastewater flow for the project was estimated at 667,891 gpd. However, given the existing density of the DRA and considering the assumed densities are unlikely to be fully realized, NorthStar is of the opinion that this method of analysis overestimates the actual design flows by as much 20 percent. Therefore, projected gross wastewater flows were reduced by 20 percent to arrive at the adjusted wastewater flow projections. The adjusted wastewater flow projections are believed to more accurately represent future design flows and were thus used in evaluating the feasibility of alternatives and costs moving forward. Table 1 summarizes the project area by section and land use, as well as projected gross wastewater flows and adjusted wastewater flow projections.

Table 1 – DRA and RDA Acreage Totals and Projected Wastewater Flows.

SECTION	ACREAGE			PROJECTED GROSS WASTEWATER FLOW	ADJUSTED WASTEWATER FLOW PROJECTIONS
	LAND USE				
	RESIDENTIAL	COMMERCIAL	COMBINED		
DRA	15.2 Ac	77.7 Ac	92.9 Ac	131,998 gpd	105,598 gpd
RDA-1	29.7 Ac	67.1 Ac	96.8 Ac	97,729 gpd	78,184 gpd
RDA-2	52.7 Ac	24.2 Ac	76.9 Ac	61,485 gpd	49,188 gpd
RDA-3	26.9 Ac	58.5 Ac	85.4 Ac	110,820 gpd	88,656 gpd
RDA-4	16.8 Ac	71.4 Ac	88.1 Ac	95,599 gpd	76,480 gpd
RDA-5	12.9 Ac	43.8 Ac	56.7 Ac	82,564 gpd	66,051 gpd
RDA-6	35.6 Ac	13.3 Ac	48.9 Ac	56,809 gpd	45,447 gpd
RDA-7	3.8 Ac	15.7 Ac	19.4 Ac	30,885 gpd	24,708 gpd
Totals	193.7 Ac	343.9 Ac	565.2 Ac	667,891gpd	534,313 gpd
PHASE I (DRA + RDA-1)	44.9 Ac	144.8 Ac	189.7 Ac	229,728 gpd	184,782 gpd

Note: Adjusted Wastewater Flow Projections are calculated as 80% of Projected Gross Wastewater Flow.

DIRECTION OF PROJECT MOVING FORWARD

On July 21st and 23rd, 2009, NorthStar and Town Staff participated in a meeting to review results of the feasibility and impacts of expanding the project as discussed above, and to outline project milestones moving forward. The consensus among Town Staff following that meeting was to limit the scope of the project to the following: collection of wastewater from the DRA and RDA Section 1 (hereinafter collectively referred to as Phase I), incorporate septage receiving into the project scope, and continue to evaluate suitable effluent dispersal areas within close proximity of the Town. Phase I project boundaries are shown on Figure 3.

REVIEW OF DISPERSAL OPTIONS

Historically, decentralized wastewater systems have lacked the treatment capability and operational oversight necessary for discharge to surface water, assuming a suitable surface water body is available. In addition, permitting under the National Pollution Discharge Elimination System (NPDES) is cumbersome and generally cost prohibitive for such systems. As a result, subsurface dispersal has typically been the preferred method of effluent dispersal. Such is the case with the downtown community cluster.

Given the Town's highly developed downtown areas and physical topography, locating sufficient dispersal area within, or near, the Town has proven to be one of the main hurdles facing implementation of a clustered wastewater collection, treatment and dispersal system. One of the most significant challenges faced by the Town is locating sufficient area for the dispersal of treated effluent. Constraints at the dispersal site and method of dispersal generally dictate the level of treatment required; knowing the level of treatment necessary, determines the treatment options available. Given this, the dispersal site and treatment method are integral in determining the overall system components.

Previous studies have been focused with effluent dispersal either within the Town (7H Master Plan) or in close proximity (Questa Draft Progress Report). The Preliminary Capacity Assessment evaluated the ability of the Blue Oaks site to provide dispersal of treated effluent utilizing pressure dosed trenches and subsurface drip. Based on the Preliminary Capacity Assessment, the site was estimated to have a total dispersal capacity of approximately 214,000 gpd. This capacity was sufficient to accommodate the 100,000 gpd in wastewater flows projected in the original DRA wastewater analysis while providing for 100 percent replacement area and provisions for setbacks and site construction conflicts.

However, with the project area expanding to cover Phase I with adjusted wastewater flows increasing to approximately 184,000 gpd, and Town Staff's objective to not limit the option of servicing other sections of the RDA in the future; additional dispersal capacity is required. As such, NorthStar took a broader look at potential dispersal sites to meet both near and long term dispersal needs from the project.

SUBSURFACE DISPERSAL OPTIONS AND PRELIMINARY OPTION OF COSTS

Probably the most common method of effluent dispersal for decentralized wastewater treatment plants is subsurface dispersal. In general, subsurface effluent dispersal relies on either pressure distribution, in the case of drip or pressure dosed trenches, or gravity distribution. In either case, the distribution field is broken down into zones to prevent excessive head loss in the distribution network and to facilitate maintenance and repairs. Application rates are generally tied to either percolation rates or soil types and are in most cases limited by code. Assuming there are no requirements for the mitigation of high seasonal groundwater, application rates are typically unaffected by environmental weather conditions. Subsurface dispersal techniques generally rely on a trench or field piezometers to verify adequate separation from seasonal groundwater.

Advantages to using subsurface dispersal include consistent seasonal effluent application and a high degree of familiarity and comfort from both regulators and contractors. Some of the disadvantages associated with subsurface dispersal include soil depth requirements, maintenance of the dispersal piping, and the relatively high cost and intensive labor to install.

Subsurface dispersal options are suitable for use in areas where adequate soil depth is present (typically 6 to 7-feet) to meet minimum separation requirements of the Regional Water Quality Control Board (RWQCB). In addition, suitability of subsurface dispersal is largely dependant on soil type and effluent quality. Based on current RWQCB guidelines, 5-feet of separation between the infiltrative surface and any seasonal groundwater or restrictive layer is required, although separation requirements can be reduced by providing supplemental treatment and/or disinfection.

Given these requirements and a projected wastewater flow of 184,000 gpd for Phase I, NorthStar prepared preliminary dispersal field sizing estimates using existing data taken from the Preliminary Capacity Assessment. The preliminary sizing was based solely on the Blue Oaks Terrance site and was the basis for developing the Preliminary Opinion of Costs shown. The following subsurface dispersal options were considered.

Pressure Dosed Trenches

Total land area required for the installation of subsurface trenches capable of accommodating the projected wastewater flow of approximately 184,000 gpd was estimated at approximately 78-acres. Preliminary sizing and cost estimates for subsurface trenches were based in part on assumptions and design criteria necessary to maximize useable area and mitigate shallow soils and high seasonal groundwater or other restrictive features. In general, areas selected for subsurface trenches will consist of clay loams and loams. Assumption included trenches 2-feet wide and 1-foot deep, with effluent application rates not exceeding 0.50 gpd/sf for the bottom and sidewall infiltrative surfaces. Land area required included 100 percent of the primary dispersal area for replacement field, and an additional 40 percent of surface area to accommodate setbacks and layout conflicts arising from existing features and topography of the selected site. The Preliminary Opinion of Costs including; land acquisition, engineering and permitting, materials and installation, and a 25 percent contingency, was estimated at approximately $7.8 million.

Drip

Total land area required for the installation of subsurface drip field capable of accommodating the projected wastewater flow of 184,000 gpd was estimated at approximately 46-acres. Preliminary sizing and cost estimates for subsurface drip were based in part on assumptions and design criteria necessary to maximize useable area and mitigate shallow soils and high seasonal groundwater or other restrictive features. In general, areas selected for subsurface drip will consist of clay loams and loams. Assumption included drip tubing at 2-foot intervals and 1-foot deep and effluent application rates not exceeding 0.20 gpd/sf. Land area required included, 100 percent of the primary dispersal area for replacement field, and an additional 20 percent of surface area to accommodate setbacks and layout conflicts arising from existing features and topography of the selected site. The Preliminary Opinion of Costs including; land acquisition, engineering and permitting, materials and installation, and a 25 percent contingency, was estimated at approximately $3.4 million.

SPRAY DISPERSAL OPTIONS AND PRELIMINARY OPTION OF COSTS

Surface spray of treated wastewater is not a new concept for effluent dispersal; though it is more commonly used for effluents which do not carry pathogens such as agricultural and industrial waste streams. In general, dispersal of effluent via surface spray relies on a concept similar to that of common landscape irrigation. A network of transport lines and above ground spray nozzles are constructed with the intent of evenly distributing effluent over a specified area. Application rates are generally tied to evapotranspiration (Eto) rates; the result is higher dispersal rates in the summer and fall, lower application rates in the winter and early spring. Soil moisture is an effective means of measuring and monitoring the application rate.

Because spray dispersal relies heavily on evapotranspiration the amount of effluent dispersal achieved during the winter and early spring is relatively low. To accommodate the variability of effluent dispersal, storage ponds are required to store effluent (and precipitation) which cannot be dispersed due to restrictions preventing discharge prior to forecasted precipitation or periods with high soil moisture.

Significant advantages are realized when using surface spray, including greater separation from groundwater and higher application rates. Greater separation is achieved because there is no depth associated with a trench or drip tubing; greater application rates are realized because evaporation and plant transpiration (Eto) are taken into consideration. Additional benefits are realized in costs savings during construction since trenching is limited to the installation of transport lines which are typically installed in shallow, narrow trenches (4-inches wide and 12-inches deep). Thrust blocking of spray nozzles is required; however, blocking is limited and can be installed at grade. Lastly, maintenance costs are reduced since moving components of the system (nozzles) are above grade and visible, making visual inspection possible and repairs relatively quick and easy.

Some of the disadvantages associated with surface spray include maintenance of the spray field and limitation of spray during wet weather; permits generally restrict operation of spray fields during and within 24-hours of a rain event. As a result, effluent storage is required for periods when spray fields are non-operational (i.e. rain events and maintenance); a 30 to 60-day minimum capacity is typical. The overall footprint of the pond becomes an issue too, as a shallower pond will have a larger surface area which catches more rainfall which needs to be stored until spray fields are operational. Additional considerations in sizing the storage pond include requirements of the California Department of Water Resources Division of Safety of Dams (DSOD). Exceptions to DSOD jurisdiction for dams and reservoirs are given for municipal wastewater ponds which have dams less than 15-feet in height, have a maximum storage capacity of 1500-acrefeet or less, are off-stream, and the operating public agency adopts resolutions governing the dam construction and operation, as defined in the California Water Code.

Specific to this project, and perhaps one of the more significant non-technical hurdles with respect to moving forward with spray fields, is the current restriction on ponds within Butte County. This policy is currently under review as part of Butte County's General Plan update. Outcome of the pond ordinance will have significant bearing on the feasibility and location of storage ponds as they relate to this project. In addition, should surface spray be selected as the primary method of effluent dispersal for this project it is anticipated that a higher (disinfected tertiary) level of treatment would be required from the RWQCB. Assuming a disinfected tertiary effluent was produced from the proposed wastewater treatment plant, this would allow for a broader window with respect to rain events, thereby reducing total storage requirements and cost.

The two primary areas large enough to handle the projected flows of Phase 1 while providing adequate open space to construct and operate facilities necessary to serve future RDA sections lie along the Skyway and Neal Road corridors as shown on Figure 4. In general, soil resources (primarily depth) decline along both the Skyway and Neal Road corridors as one moves west toward Highway 99. Therefore, in order to fully utilize potential areas along the western reaches of these corridors NorthStar considered the use of spray dispersal as a technique increase useable dispersal areas.

Two basic scenarios for the spray dispersal of treated effluent were evaluated: complete wintertime storage (October through March) with dry season spray and year-round spray with wet period storage for the annualized average and 100-year precipitation events, respectively. Wintertime storage requires the respective pond to have adequate capacity to store daily effluent flows from the treatment plant as well as precipitation during the winter months (October through March) without the benefit of spray dispersal, the wet period storage requires storage for daily effluent flow and periods when spray dispersal is not permitted due to forecasted storm events.

Wintertime Storage and Dry Season Spray (Average Precipitation)

Total land area required for the installation of a storage pond and spray field necessary to support complete wintertime storage utilizing only dry season spray for average annual precipitation and a design flow of 184,000 gpd was estimated at approximately 104-acres. The area required included approximately 65-acres for spray fields, approximately 21-acres for the storage pond, and a 20 percent contingency. Total pond capacity was approximately 98-acrefeet and was sized to accommodate daily effluent flows and average annual precipitation assuming no spray during the months October through March. Assumptions in sizing included a pond depth not exceeding 8-feet (including 1.5-feet of free board), a reserve capacity of 1.5 times the average monthly wastewater flow, and constructed using a 60-mil HDPE liner. Spray fields were sized to disperse at least 100 percent of the accumulated volume each year based on approximately 75 percent of local Eto rates. The Preliminary Opinion of Costs including land acquisition, material, installation, engineering, and a 25 percent contingency were estimated at approximately $6.8 million.

Wintertime Storage and Dry Season Spray (100-year Precipitation)

Total land area required for the installation of a storage pond and spray field necessary to support complete wintertime storage utilizing only dry season spray for the 100-year annual precipitation and a design flow of 184,000 gpd was estimated at approximately 232-acres. The area required included approximately 156-acres for spray fields, approximately 37-acres for the storage pond, and a 20 percent contingency. Total pond capacity was approximately 226-acrefeet and was sized to accommodate daily effluent flows and the 100-year annual precipitation assuming no spray during the months October through March. Assumptions in sizing included a pond depth not exceeding 8-feet (including 1.5-feet of free board), a reserve capacity of 1.5 times the average monthly wastewater flow, and constructed using a 60-mil HDPE liner. Spray fields were sized to disperse at least 100 percent of the accumulated volume by the end of the first year following the 100-year event based on approximately 40 percent of local Eto rates. The Preliminary Opinion of Costs including land acquisition, material, installation, engineering, and a 25 percent contingency were estimated at approximately $10.2 million.

Year-round Spray and Wet Period Storage (Average Precipitation)

Total land area required for the installation of a storage pond and spray field necessary to support year-round spray and wet period (24-hours prior to, during, and following precipitation events) storage for average annual precipitation and a design flow of 184,000 gpd was estimated at approximately 92-acres. The area required included approximately 63-acres for spray fields, approximately 12-acres for the storage pond, and a 20 percent contingency. Total pond capacity was approximately 56-acrefeet and was sized to accommodate daily effluent flows and average annual precipitation assuming spray fields were in operation throughout the year except during periods of forecasted precipitation. Assumptions in sizing included a pond depth not exceeding 8-feet (including 1.5-feet of free board), a reserve capacity of 1.5 times the average monthly wastewater flow, and constructed using a 60-mil HDPE liner. Spray fields were sized to disperse at least 100 percent of the accumulated volume each year based on approximately 75 percent of local Eto rates. The Preliminary Opinion of Costs including land acquisition, material, installation, engineering, and a 25 percent contingency were estimated at approximately $4.4 million.

This option would necessitate treating effluent to a level consistent with disinfected tertiary recycled water.

Year-round Spray and Wet Period Storage (100-year Precipitation)

Total land area required for the installation of a storage pond and spray field necessary to support year-round spray and wet period storage for the 100-year annual precipitation and a design flow of 184,000 gpd was estimated at approximately 204-acres. The area required included approximately 154-acres for spray fields, approximately 16-acres for the storage pond, and a 20 percent contingency. Total pond capacity was approximately 92-acrefeet and was sized to accommodate daily effluent flows and the 100-year annual precipitation assuming no spray during the months October through March. Assumptions in sizing included a pond depth not exceeding 8-feet (including 1.5-feet of free board), a reserve capacity of 1.5 times the average monthly wastewater flow, and constructed using a 60-mil HDPE liner. Spray fields were sized to disperse at least 100 percent of the accumulated volume by the end of the first year following the 100-year event based on approximately 40 percent of local Eto rates. The Preliminary Opinion of Costs including land acquisition, material, installation, engineering, and a 25 percent contingency were estimated at approximately $8.4 million.

REVIEW OF COLLECTION OPTIONS

Historically, conventional gravity collection systems have been the preferred method of raw wastewater collection. And while conventional gravity collection systems have enjoyed a long and successful track record for municipal wastewater collection, alternative collection systems in the form of small diameter gravity collection and septic tank effluent pump (STEP) systems are gaining favor where variable topography and deep excavations are a concern. Additionally, these alternative collection systems may be preferred in areas of high groundwater where inflow and infiltration (I&I) are high, thus increasing the amount of wastewater to be treated. Areas where small lot sizes, poor soil conditions, or other site-related limitations make conventional gravity options inappropriate or expensive may also benefit from alternative wastewater collection systems.

Several options for the collection of wastewater have been proposed throughout the various studies. In general, the alternatives to date have focused on providing the DRA with a gravity collection system. The 7H Master Plan provided options for a main collection line extending to the Town owned property on Black Olive Drive where treatment and dispersal were proposed. The Questa Draft Progress Report expanded on the Master Plan by extending conveyance of wastewater to the Blue Oaks Terrace site on Skyway south of Town limits where treatment and dispersal were proposed; and further included an option for small diameter effluent gravity collection.

Previous studies based the collection sizing and costs on gravity collection and peak flows of 100,000 gpd. However, with the collection area expanding to Phase I and design flows increasing to 184,000 gpd coupled with Town Staff's stated objective to not limit the option of servicing other sections of the RDA in the future; a comprehensive review of suitable collection options was believed necessary. Given the added flows and desired outcomes, NorthStar reviewed the costs for *Gravity Collection and Conveyance* and *Small Diameter Effluent Collection and Conveyance* reported in the Draft Progress Report and included an analysis of costs for STEP collection.

GRAVITY COLLECTION OPTION AND PRELIMINARY OPTION OF COSTS

Conventional gravity wastewater collection systems are the most popular method to collect and convey wastewater. Pipes are installed on a slope, allowing wastewater to flow by gravity from the point of generation to a treatment facility. Pipes are sized and designed with straight alignment and uniform gradients to maintain self-cleansing velocities. Manholes are installed between straight runs of pipe to ensure that stoppages can be readily accessed. Pipes are generally eight inches or larger and are typically installed at a minimum depth of three feet and a maximum depth of 25-feet. Manholes are typically located no more than 400-feet apart or at changes of direction, slope, or depth.

While conventional gravity sewers have a long and successful track record, they are not always the best solution for all problems, especially in hilly or extremely flat terrain where maintaining the necessary gradients result in excessive excavation. One of the major disadvantages with gravity sewer collection is that of infiltration and inflow (I&I) which can exceed 100 percent of the actual design flow in conventional collection systems resulting in dramatic over sizing of conveyance lines, treatment components, and in the case of this project dispersal area. In addition, conventional gravity sewers require large up-front capital expenses, requiring complete installation of large conveyance lines to accommodate relatively small flows from phased projects. Conventional gravity systems also require specialized equipment for servicing, and trained maintenance personnel.

Similar to conventional gravity collection, small diameter collections small diameter gravity collection (SDGC) convey effluent by gravity from an interceptor tank (or septic tank) to a centralized treatment location or pump station for transfer to another collection system or treatment facility. Most suspended solids are removed from the waste stream by the septic tanks, reducing the potential for clogging to occur and allowing for smaller diameter piping both downstream of the septic tank in the lateral and in the sewer main. Cleanouts are used to provide access for flushing; manholes are rarely used. Air release risers are required at or slightly downstream of summits in the sewer profile. Odor control is important at all access points since the SDGC carries odorous septic tank effluent. Because of the small diameters and flexible slope and alignment of the SDGC, excavation depths and volumes are typically much smaller than with conventional sewers. Minimum pipe diameters can be three inches and plastic pipe is typically used because it is economical in small sizes and resists corrosion.

Conventional Gravity Collection

The conventional gravity collection system proposed for Phase I of the project is projected to cover approximately 190-acres. Based on current conditions, the collection system would serve 368 connections, of which 300 are commercial and 68 residential with a total design flow of approximately 184,000 gpd. Costs presented in the Draft Progress Report for *Gravity Collection and Conveyance* were updated to reflect 2009 market prices; raw collection costs were normalized to estimate collection cost per unit acre. The normalized cost estimates were then used to extrapolate anticipated costs for a conventional gravity collection system serving the expanded Phase I project area. Additional assumptions used in the development of cost estimates included 150-feet of 4-inch service lateral for each lot and a 25 percent contingency.

The Preliminary Opinion of Costs for Phase I conventional gravity collection system averages approximately $9.9 million, with low and high estimates of approximately $8.8 and $11.0 million, respectively. The average connection cost was estimated at approximately $28,400, with low and high estimates of approximately $25,300 and $31,500, respectively. This compares with the rough cost of conventional gravity collection reported in the Draft Progress Report and updated for 2009 of approximately $6.0 million and an estimated raw cost of approximately $65,000/acre of service area.

Small Diameter Gravity Collection

The small diameter gravity collection system proposed for Phase I of the project is projected to cover approximately 190-acres. Based on current conditions the collection system would serve 368 connections, 68 residential lots and 300 commercial lots, with a total design flow of 184,000 gpd. Costs presented in the Draft Progress Report for *Small Diameter Effluent Collection and Conveyance* were updated based on 2009 market prices; raw collection costs were normalized to estimate collection cost per unit acre. The normalized cost estimates were then used to extrapolate anticipated costs for a small diameter gravity collection system serving Phase I. Additional assumptions used in the development of cost estimates included 150-feet of 4-inch service lateral for each lot, 50 percent tank replacement, 25 percent of tank receiving new pump packages, and a 25 percent contingency.

A Preliminary Opinion of Costs for a Phase I small diameter gravity collection system averages approximately $11.8 million, with a low and high estimate of approximately $10.3 and $13.2 million, respectively. The average connection cost was estimated at approximately $38,800, with low and high estimates of approximately $29,600 and $39,100, respectively. This compares with the rough cost of small diameter gravity collection reported in the Draft Progress Report and updated for 2009 of approximately $5.3 million. The 2009 estimated raw per acre cost based on assumptions in the Draft Progress Report averaged approximately $57,600/acre of collection line installed.

STEP COLLECTION OPTION AND PRELIMINARY OPTION OF COSTS

The concept of a STEP system has existed since the early 1970's. STEP systems were rather rudimentary at first but have evolved into a highly engineered and cost effective wastewater collection system. A modern engineered STEP package facilitates long pump life and easy maintenance that translates into low O&M costs. The concept of a STEP system is very simple. Wastewater is collected in a water tight septic tank prior to being discharged via small diameter pressure conveyance lines to advanced treatment, either onsite, or more commonly, offsite at a decentralized or centralized wastewater treatment plant. A STEP system combines the most favorable attribute of a septic tank, free primary treatment of the wastewater, with advanced treatment options that are intended to satisfy today's treatment standards. Each STEP septic tank is designed to intercept the wastewater and create a clear zone within the detained wastewater. This clear zone is achieved when solids settle to the bottom of the tank and floatables rise to the surface of the tank. Wastewater is removed from the clear zone in the tank and conveyed by a pump to the treatment facility.

Another advantage to the STEP collection system is that the on-lot equipment, generally the largest portion of the overall cost, can be installed as each new residence or business is ready to connect. Therefore, a significant portion of the cost of a STEP collection system is a deferred capital expense, spread out over the parcels connected and the lifetime build-out of the project. In addition, downstream treatment costs are significantly reduced because only low-strength effluent is collected as solids stay behind to decompose in watertight septic tanks. This is an added benefit when considering a septage receiving station. The pressurized, closed system means expensive manholes and lift stations are eliminated, and because STEP collection sewers are designed as watertight, there's virtually no infiltration and inflow, reducing capacity requirements for treatment and dispersal systems; further lowering capital costs by allowing a smaller treatment plant and reducing the area required for dispersal.

STEP Collection

The STEP collection system proposed for Phase I of the project is projected to cover approximately 190-acres. Based on current conditions the collection system will serve 368 connections, 68 residential lots and 300 commercial lots, with a total design flow of 184,000 gpd. Assumptions used in the development of cost estimates included replacing 50 percent of the existing tanks including pumps, installing pump packages in the remainder of tanks, and assuming 150-feet of 1-inch service lateral for each lot.

A Preliminary Opinion of Costs for a Phase I STEP collection system is estimated to average approximately $6.6 million, with a low and high estimate of approximately $5.2 and $7.9 million, respectively. The cost per connection for residential and commercial connections averaged approximately $24,400, with low and high estimates of approximately $18,400 and $29,400, respectively.

REVIEW OF TREATMENT OPTIONS

Historically, decentralized wastewater treatment plants have not been viewed as the solution of choice for meeting the wastewater needs of small and large communities. Several reasons have contributed to this attitude, with one of the most vocal being regulatory bodies who enjoy the single point of responsibility when treatment is not meeting set limits. However, in the past few decades attitudes and perceptions of decentralized wastewater treatment have started to shift and decentralized or 'clustered' treatment plants are beginning to be viewed as cost effective and environmentally sound alternatives to centralized treatment plants.

Small and rural communities often cannot afford the expense of centralized facilities, and their populations may be too spread out to make centralized treatment a realistic option. Additionally, some existing onsite systems may function effectively, so they don't need to be replaced. In circumstances like these, decentralized wastewater treatment is often the best solution for wastewater management. Decentralized treatment involves using a combination of treatment technology options, both traditional and innovative, where they are most appropriate in a community. Conventional onsite systems, alternative onsite systems, cluster systems for groups of homes and businesses, and some use of centralized treatment can all be included when considering decentralized community wastewater management. The decentralized system is then managed (with varying degrees of control) to ensure each component functions properly.

Decentralized treatment systems have several advantages over traditional centralized wastewater treatment systems; infrastructure costs are significantly reduced, most treatment components are modular in nature and therefore easily expandable for phased projects. In addition, by treating wastewater onsite or locally, decentralized options can reduce energy consumption. Numerous treatment technologies are available to accommodate decentralized strategies and which have the capability to consistently meet effluent quality suitable for subsurface dispersal and for reclamation following disinfection. Some of the most common decentralized treatment options consist of textile filters, activated sludge, and various combinations of these technologies incorporating ultra filtration.

Textile filters are based on packed bed filter technology which is a reliable and proven method for achieving secondary treatment of wastewater. Typical filters are constructed of a synthetic textile with high surface area per unit volume as compared to sand. The result is the ability to treat the same amount of wastewater in a fraction of the space that a sand filter requires. Textile filters rely on the concept of recirculation where pumps recirculate partially treated effluent through and between the textile sheets. In this moist, oxygen-rich (aerobic) environment, naturally occurring microorganisms remove impurities from the effluent. After several (typically 4 or 5) cycles, the treated effluent is suitable for subsurface dispersal, using trenches or drip, or advanced treatment processes if necessary. Additional benefits associated with textile filters are low energy use and low sludge generation. Effluent quality typical of textile filters includes biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) to 10 mg/L each. Textile filters also have limited capacity for the removal of common nutrients such as nitrogen.

The Sequencing Batch Reactor (SBR) is a fill-and-draw activated sludge process designed to operate under non-steady state conditions. An SBR operates in a true batch mode with aeration and sludge settlement both occurring in the same tank. The SBR process is best characterized as an activated sludge system is that carries out the functions of equalization, aeration, and sedimentation in time rather than in space as in conventional continuous-flow systems. The SBR system can be designed with the ability to treat a wide range of influent volumes and is uniquely suited for wastewater treatment applications characterized by low or intermittent flow conditions. Effluent quality of SBR treatment process is typically below 10 mg/L BOD_5 and TSS, respectively. Removal of common nutrients such as nitrogen is possible with alterations in treatment.

The MBR process relies on a combination of technologies that consist of a suspended growth biological reactor integrated with an ultrafiltration membrane system. The MBR process combines the unit operations of aeration, secondary clarification and filtration into a single process, producing a high quality effluent, simplifying operation and greatly reducing space requirements. The ultrafiltration system replaces the solids separation function of secondary clarifiers and sand filters used in a conventional activated sludge systems. An MBR system can maintain very high biomass/solids concentrations in the bioreactor (5,000 / 15,000 mg/L), allowing the volume requirement of the biological system to be reduced. The ultrafiltration membranes are immersed in the aeration tank, in direct contact with mixed liquor. Through the use of a permeate pump, a vacuum is applied to a header connected to the membranes. The vacuum draws the treated water through the ultrafiltration membrane and resulting permeate (filtered water) is then directed to disinfection or discharge facilities. Intermittent airflow is introduced to the bottom of the membrane module, producing turbulence that scours the external surface of the membrane which moves solids away from the membrane surface. Besides delivering a very high effluent quality suitable for reuse applications, MBR reduces biomass/solids production and eliminates sludge settle-ability problems. Effluent quality typical of MBR systems include total suspended solids (TSS) of less than 1mg/L, turbidity less than 0.2 NTU, and up to 4 log removal of virus (depending on the membrane nominal pore size).

Different treatment methods and level of treatment have been considered in each of the previous studies. Considerations in determining what method of treatment to utilize and what level of treatment will be required are significantly influenced by the method of collection, dispersal, and site selected. It's generally accepted that secondary treatment is required as a minimum; as such the Draft Progress Report recommended use of an SBR. The detailed alternative analysis prepared by Questa can be found in the Draft Progress Report.

Textile Filter Treatment

A decentralized treatment system utilizing textile filter technology with adequate capacity to serve Phase I of the project at a total design flow of 184,000 gpd. The proposed treatment system would occupy approximately 0.5-acres for Phase I, with additional acre required to serve future expansion. Assumptions used in the development of cost estimates included treatment tankage and equipment, tertiary filtration, disinfection, and laboratory equipment. Septage receiving could be accommodated using this treatment technology; however, would result in approximately a 10 percent increase in size and cost to accommodate additional equipment and increases in waste strength.

A Preliminary Opinion of Costs for a textile treatment system to serve Phase I is estimated to average approximately $6.3 million, with a low and high estimate of approximately $6.1 and $6.6 million, respectively.

SBR Treatment

A decentralized treatment system utilizing MBR technology with adequate capacity to serve Phase I of the project at a total design flow of 184,000 gpd would occupy an overall footprint of less than 0.25-acres. Assumptions used in the development of cost estimates included treatment equipment, septage receiving, disinfection, and laboratory equipment.

A Preliminary Opinion of Costs for a Phase I treatment system using an MBR is estimated to average approximately $7.1 million, with a low and high estimate of approximately $6.2 and $7.6 million, respectively.

MBR Filter Treatment

A decentralized treatment system utilizing MBR technology with adequate capacity to serve Phase I of the project at a total design flow of 184,000 gpd could be installed in a building of 2,000sf and occupy an overall footprint of less than 0.25-acres. The proposed treatment system would utilize parallel modules and filters configured for future expansion. Assumptions used in the development of cost estimates included treatment equipment, septage receiving, disinfection, and laboratory equipment.

The Preliminary Opinion of Costs for the proposed Phase I treatment system averages approximately $6.7 million, with a low and high estimate of approximately $6.2 and $7.2 million, respectively.

BENEFICIAL REUSE OPTIONS AND PRELIMINARY OPTION OF COSTS

As noted in previous studies, the beneficial reuse of treated effluent as a means of dispersal is considered a high priority by Town Staff. Numerous technologies are available for the reclamation of wastewater including microfiltration and conventional mixed media filtration. However, given current capital and operational costs, the use of a conventional mixed media filter provides the most cost effective solution at present.

Typical tertiary treatment plants used for wastewater reclamation consist of parallel filters (either mixed media or ultrafiltration), followed by redundant disinfection (such as ultraviolet). Provisions can, and should, be included in the initial design for an additional filter which is normally off-line to facilitate maintenance without limiting throughput. Reclaimed water is subject to jurisdiction of the Title 22 of the California Water Code. Title 22 outlines several levels of treatment achieved through tertiary filtration and disinfection and the resulting uses. Based on current regulation, effluent standards of 2.2 MPN for Total Coliforms and less than 0.2 NTU for Turbidity are common. Discharge requirements for disinfected tertiary wastewater and recycled water uses in California are shown in Table 2 and Table 3, respectively.

Table 2: Disinfected Tertiary Treatment Requirements

Parameter	Units	Discharge Specifications		
		Weekly Median	Maximum Daily	Does Not Exceed
Total Coliform Organisms	MPN/100mL	2.2	23	240

Table 3: Recycled Water Uses Allowed in California

Irrigation	Disinfected Tertiary	Disinfected Secondary-2.2	Disinfected Secondary-23	Undisinfected Secondary
Food crops where recycled water contacts edible portion of crop, including all root crops	Allowed	Not allowed	Not allowed	Not allowed
Parks and playgrounds	Allowed	Not allowed	Not allowed	Not allowed
School yards	Allowed	Not allowed	Not allowed	Not allowed
Residential landscaping	Allowed	Not allowed	Not allowed	Not allowed
Unrestricted access golf courses	Allowed	Not allowed	Not allowed	Not allowed
Any other irrigation uses not prohibited by other provisions of Calif. Code of Regulations	Allowed	Not allowed	Not allowed	Not allowed
Food crops where edible portion is produced above ground and not contacted by recycled water	Allowed	Allowed	Not allowed	Not allowed
Cemeteries	Allowed	Allowed	Allowed	Not allowed
Freeway landscaping	Allowed	Allowed	Allowed	Not allowed
Restricted access golf courses	Allowed	Allowed	Allowed	Not allowed
Ornamental nursery stock and sod farms	Allowed	Allowed	Allowed	Not allowed
Pasture for milk animals	Allowed	Allowed	Allowed	Not allowed
Non-edible vegetation w/ access control to prevent use as a park, playground or school yard	Allowed	Allowed	Allowed	Not allowed
Orchards w/ no contact between edible portion & recycled water	Allowed	Allowed	Allowed	Allowed
Vineyards w/ no contact between edible portion and recycled water	Allowed	Allowed	Allowed	Allowed
Nonfood-bearing trees incl. Christmas trees not irrigated <14 days before harvest	Allowed	Allowed	Allowed	Allowed

Note: Partial Excerpt of Recycled Water Uses Allowed in California

A dual plumbing system will be required, with conventional water pipe utilized for potable water distribution and purple pipe utilized for recycled water distribution. Regulations restrict any physical connections between the two distribution systems, including using the potable water system as backup for the recycled water irrigation system, which may necessitate the installation of a dedicated irrigation well as a backup for the system.

General requirements for the use of recycled water include appropriate signage indicating the water in use is recycled and not for consumption. In addition, no hose bibs are allowed on recycled water lines in areas accessible to the general public. The use of recycled water shall be contained to the area of use, unless it is deemed the recycled water poses no threat to public health by the regulatory authority (RWQCB). Appropriate rules and regulations regarding the maintenance and use of the recycled water system should be established jointly by the RWQCB and system owner.

REVIEW OF SEPTAGE RECEIVING

In March 2007, the report prepared by K/J and entitled ***Butte County Septage Master Plan (Septage Master Plan)*** evaluated the option of co-treatment of septage, where each regional facility in the County would accept that region's septage. Specifically, the report recommended that *'… a third facility at the future Paradise Facility would be advisable if Paradise does move forward with building a WWTP. This option makes each region responsible for managing the septage generated in their proximity. In addition, by treating the septage near the sources, the cost of hauling the liquid would be reduced.'*

In August 2007, a report prepared by Quad Knopf entitled ***The Town of Paradise Municipal Service Review*** (Town MSR) recommended, *'The Town of Paradise should work with the County to address the Feasibility of incorporating septage into any future plans for wastewater treatment.'*

The Septage Master Plan report projected the annual septage volume generated from the Town of Paradise at 2,614,000 gallons. However, in a memorandum to Town staff dated January 12, 2007, Mr. Lloyd Hedenland points out that approximately 861,000 gallons per year of septage hauled from Paradise were not accounted for in the Septage Master Plan. Therefore, adding this quantity to the projected volume presented in the Septage Master Plan results in an estimated 3,475,000 gallons of septage generated annually from the Town of Paradise. Annualized, this is equivalent to 9,500 gpd; roughly 3 truckloads per day.

Septage is a general term for the contents removed from septic tanks, portable vault toilets, privy vaults, holding tanks, and the like. Compared to raw domestic wastewater from a conventional sewer collection system, septage usually is quite high in organics, grease, hair, stringy material, scum, grit, solids, and other extraneous debris. Substantial quantities of phosphorus, ammonia nitrogen, bacterial growth inhibitors, and cleaning materials may be present in septage depending on the source. Special design considerations prior to the acceptance of septage are necessary as septage may represent a shock loading or have other adverse impacts on plant processes and effluent quality unless proper engineering planning and design is provided

In general, the smaller the plant design capacity relative to the septage loading, the more subject the plant will be to upset; it is essential that an adequate engineering evaluation be made prior to receiving septage. At a minimum design of the septage receiving station at the plant should provide for the following elements: a suitable unloading ramp, a source of washdown water, screening for grit and grease removal, secure access, and access to laboratory facilities.

Preliminary cost estimates for sludge receiving have been included in the *Review of Treatment Options* section.

RECOMMENDATIONS

Based on the outcome of the two days of meetings with Town Staff regarding the direction of the project and the analysis discussed herein, NorthStar gives the following recommendations:

DISPERSAL RECOMMENDATIONS

The Blue Oaks site should be used to the fullest extent of its projected 100,000 gpd dispersal capacity. Although preliminary studies did not show the site has adequate capacity to accommodate the total predicted flow from Phase 1; it does have significant capacity in close proximity to the Town of Paradise. Assuming the Blue Oaks site has the capacity to disperse 100,000 gpd of effluent year-round, the site has the capacity to serve approximately half of the adjusted projected wastewater flows from Phase 1 and would not reach full capacity until the year 2017. Preliminary evaluations for the Blue Oaks site have already been performed; however, additional field testing and coordination with regulatory agencies is required to verify the reported capacity.

Provided the Blue Oaks site has adequate dispersal capacity for 100,000 gpd and that 25 percent of the Phase 1 projected flow is received in the first year of operation with 10 percent of flows added each year thereafter; it is estimated the site will reach its maximum dispersal capacity 4 years after the initial connections are made. During this period, operation of the system will provide a revenue base and allow for the collection of actual flow data from the Phase I project area. Analyzing this flow data and the response of the dispersal area will provide an opportunity to review the site's ability to disperse wastewater which may provide an opportunity to extend the site's capacity. In addition, the Town can use the time during which the Blue Oaks site is serving Phase 1 to investigate additional dispersal sites along the Skyway and Neal Road corridors to accommodate the balance of Phase 1 flows and projected flows from future expansion. In addition, the Blue Oaks site is located such that treated effluent can be conveyed to alternate dispersal areas along both the Skyway and Neal Road corridors (via Skyway) with minimal effort.

If additional dispersal area is identified along the Skyway or Neal Road corridors, it would be advantageous to convert the reserve area of the Blue Oaks site to active dispersal area. Assuming the capacity of the site is doubled, the added capacity at Blue Oaks could then be used to provide the additional capacity to serve all of Phase 1 and allow for future expansion. A total capacity of 200,000 gpd would be sufficient to meet the projected flow for all of Phase 1 and include the connection of RDA- 2. On going evaluation of the Blue Oaks site is recommended in order to maximize dispersal options.

TREATMENT RECOMMENDATIONS

While the SBR was selected as the preferred alternative by Questa, use of a membrane bioreactor (MBR) was considered favorable. In Questa's alternative analysis the SBR and MBR options were separated by one point with the SBR gaining favor based primarily on capital and operations and maintenance costs. Since publication of Draft Progress Report, costs associated with MBR technology have come down, and while the SBR may still be a less expensive alternative, the reliability and effluent quality produced by the MBR makes this alternative more attractive. The effluent from an MBR provides additional options for dispersal since it is meets the definition of filtered wastewater; coupled with disinfection and turbidity monitoring this meets the standards under California Title 22 for recycled water and therefore fulfills the Town's desire for water reuse.

One of the significant advantages of the MBR process is the presence of a physical barrier (membrane) in the treatment process. The membrane provides a more reliable means of filtering treated effluent than previous filtration processes such as mixed media (sand) filters. Effluent quality typical of MBR systems include total suspended solids (TSS) of less than 1mg/L, turbidity less than 0.2 NTU, and up to 4 log removal of virus (depending on the membrane nominal pore size). In addition, the microfiltration of membranes provides a barrier to certain chlorine resistant pathogens such as Cryptosporidium and Giardia. As a result of the high quality effluent from an MBR, dispersal options are significantly increased over secondary treatment options. Based on reliability, high quality effluent, ease of scalability, and overall reduction in foot print and maintenance the MBR is considered the best treatment alternative for the project. It is tor these reasons, NorthStar recommends that the Town consider an MBR for the treatment of Phase 1 wastewater flows.

COLLECTION RECOMMENDATIONS

Many of the disadvantages associated with retrofitting an existing community using conventional gravity collection could be reduced or eliminated with installation of a STEP collection system. Advantages to the STEP collection system include the near elimination of I&I as compared to conventional gravity sewers by use of pressure conveyance. Generally the only point at which I&I occurs is at the septic tank as apposed to each manhole as is common with conventional gravity sewers. Another benefit of STEP collection is a reduction in installation time and costs compared to conventional gravity sewers. Inexpensive, small diameter collection lines can be buried shallow, just below the frost line, reducing material and excavation costs. Since maintaining strict grade on the collection lines isn't necessary, installation can be performed using horizontal boring methods which greatly reduce the disruption to communities, allowing businesses to operate normally during construction.

Perhaps the most promising advantage of a STEP collection system is the fact that the Town is already setup to inspect, service, and maintain septic tanks and pump packages. This is a very valuable asset which isn't typically in place when a community considers STEP collection. Based on the analysis of collection options and the impacts the various collection options have to the Town during construction and capital investment for the project as a whole the most desirable alternative is a STEP collection system.

REUSE RECOMMENDATIONS

Although water reuse is an important goal of Town Staff, many decisions need to be made before an accurate cost estimate can be provided. Necessary information includes, identification of the treatment location, areas to be served by recycled water, and recycled water demands.

SEPTAGE RECEIVING RECOMMENDATIONS

NorthStar concurs with the Butte County Septage Master Plan's option for region co-treatment of septage in Butte County. Septage receiving is an integral part of operating and maintaining the septic systems on which the Town relies to meet its wastewater dispersal needs. NorthStar recommends that the Town of Paradise incorporate septage receiving as part of their treatment system.

PROJECT SCHEDULE

Working with Town staff, Northstar has developed a project schedule for the DCCS project. A copy of the schedule is attached. In order to keep the project moving forward with the proposed timeline, the following critical tasks have been identified. Critical tasks involve; developing a work plan for an anti-degradation analysis, additional monitoring well installations, and wetland delineation at the dispersal site. These tasks are seasonally dependant, and must be completed in the fall and winter months. As shown in the project schedule, if these tasks are not completed in 2009, the project will slip by a calendar year. Details of the near term study needs can be found below.

ADDITIONAL STUDIES AND WORK

Assuming that the Town moves forward with the recommendations in this report, there are a series of seasonally sensitive studies that need to be conducted, particularly at the Blue Oaks Site. These studies and work will verify the site capacity to disperse treated effluent and provide information to the RWQCB as part of their analysis. One of the most important tasks to be completed in the near-term is coordination with RWQCB to determine the parameters and extent of an anti-degradation analysis for this project.

Within the last six months the RWQCB has changed the requirements for study work necessary to move a project through the regulatory process for the issuance of Waste Discharge Requirements (WDR.) WDRs are the equivalent of a discharge permit from the RWQCB. These changes can be described in an all-inclusive term called an anti-degradation analysis. This analysis stems from a State Legislature Resolution (Resolution 68-16) part of which states; "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

In complying with this resolution, the RWQCB is requiring that an anti-degradation analysis be completed to demonstrate that "…a pollution or nuisance will not occur…" and "…the highest water quality consistent with maximum benefit to the people of the State will be maintained." It appears the current position of the

RWQCB is that the “receiving water” (be it shallow perched groundwater or a deep aquifer below a subsurface dispersal field) quality must be known in order to determine that it is not being degraded.

Based on our recent discussions with RWQCB staff, there is no standard protocol developed for the Anti-degradation analysis, leaving the required testing and analysis vague. NorthStar recommends actively engaging with the RWQCB to develop a work plan that would serve as a tool for defining and documenting the information and analytical requirements that the RWQCB will use as part of analyzing the Report of Waste Discharge and issuing Waste Discharge Requirements for the project. With recent input from RWQCB staff, the following field work is anticipated for subsurface dispersal:

- Long term infiltration testing and saturated hydraulic conductivity (K_{sat}) testing to determine the ability of the soil to move water away from the dispersal area. K_{sat} will be used to demonstrate what level of separation from seasonal groundwater can be expected at the site
- Installation of Geo-probes to refine groundwater levels for mounding analysis and sampling of seasonal the water table to determine background water quality for anti-degradation analysis. These probes must be installed prior to the wet-season so they can be monitored and sampled after significant rainfall events
- Testing of potable water sources in the area to establish background constituent levels of the deep water for use in anti-degradation analysis
- Monitoring and sampling of shallow groundwater to establish background levels for use in anti-degradation analysis

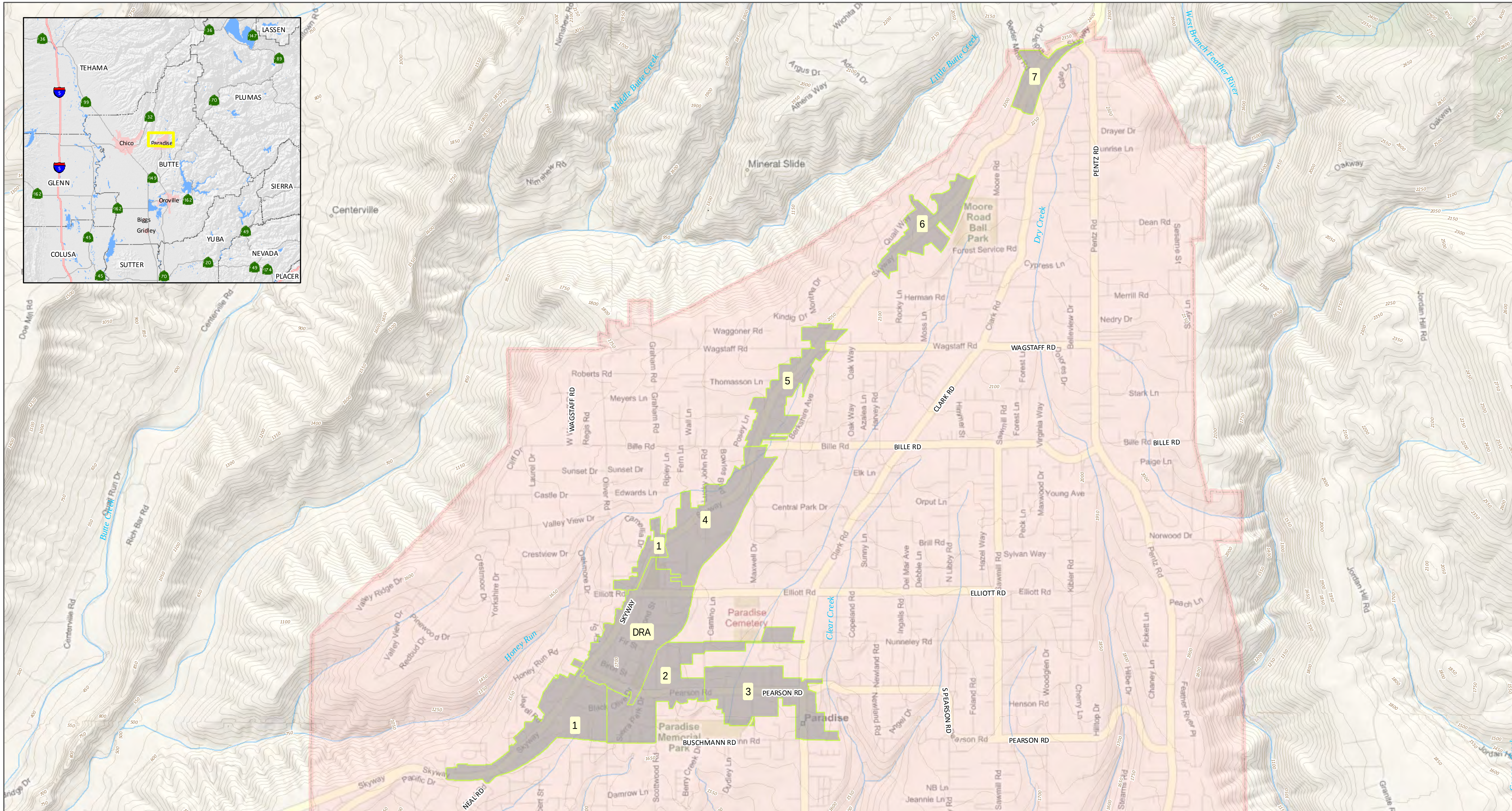
In addition to an anti-degradation analysis work plan and testing, NorthStar has identified other studies that may need to be completed in the near-term to keep the project moving forward; these primarily relate to CEQA compliance and include:

- Develop a Complete Project Description defining the project for use in the CEQA process
- Complete Seasonally Sensitive Environmental Field Work - Field work will need to be performed on the dispersal site to identify the presence (or absence) of threatened and/or endangered species
- Conduct a wetland delineation to determine the presence (or absence) of any jurisdictional wetlands on the site
- Conduct a cultural resource survey of the dispersal site
- Conduct a geologic study
- Conduct a hydrology study

Pending the outcome of current studies and those pending, the project can proceed forward.

FIGURES

July 2009 Study Area



Data Source: Parcels - BCAG, Town of Paradise
Topographic: Microsoft Virtual Earth
Map Date: April 26, 2010

N

Figure 1

Town of Paradise Limits | 50 ft. contours | Rivers and streams | Study Area (July 2009)

0 0.25 0.5 1 Miles

0 1,000 2,000 4,000 Feet

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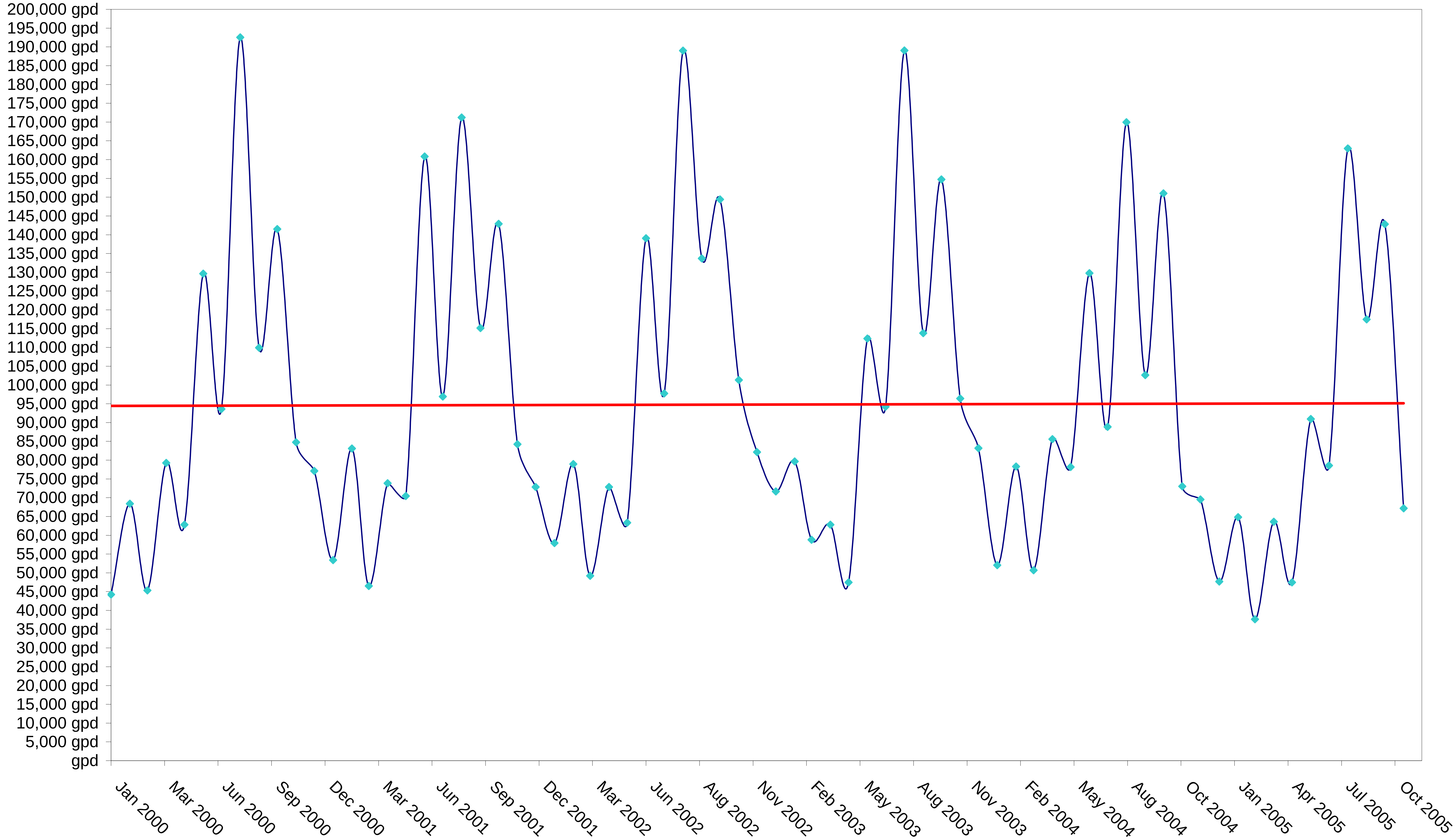
Average Water Consumption within DRA



Data Source: Paradise Irrigation District
Figure Date: March 3, 2010

Figure 2

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Phase 1 Project Boundaries

Data Source: Parcels - BCAG, Town of Paradise
Aerial: Microsoft Virtual Earth
Map Date: April 26, 2010

Phase 1

- Section 1
- DRA

Figure 3

0 0.125 0.25 Miles

0 250 500 1,000 Feet

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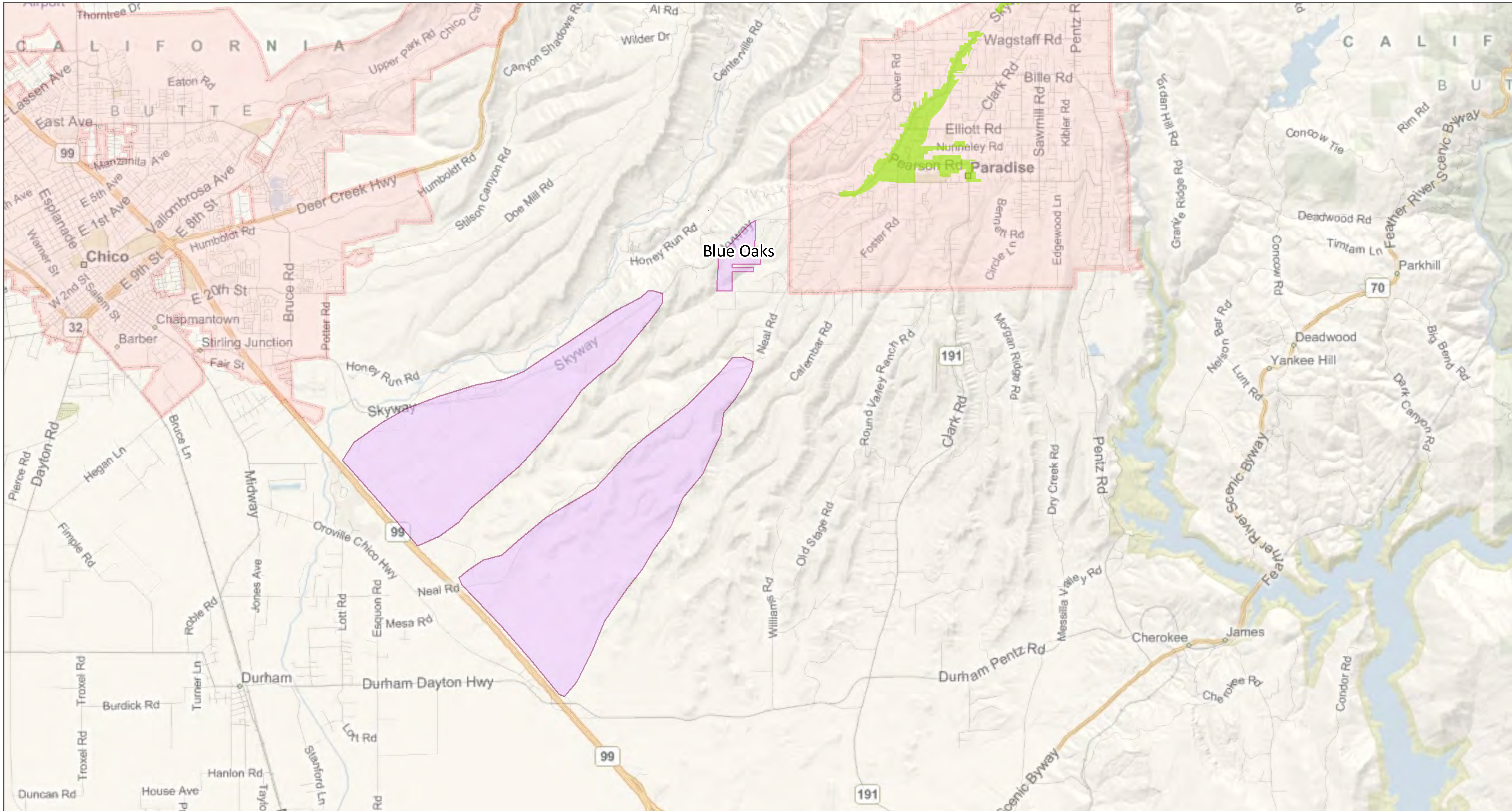
Potential Dispersal Areas Along Skyway & Neal Rd. Corridors



Data Source: Parcels - BCAG, Town of Paradise Topographic: Microsoft Virtual Earth Map Date: August 30, 2010	**Figure 4** Butte County City Limits · 50 ft. contours · Rivers and streams · Study Area (July 2009) · Potential Dispersal Areas	0 0.5 1 2 Miles 0 2,500 5,000 10,000 Feet N

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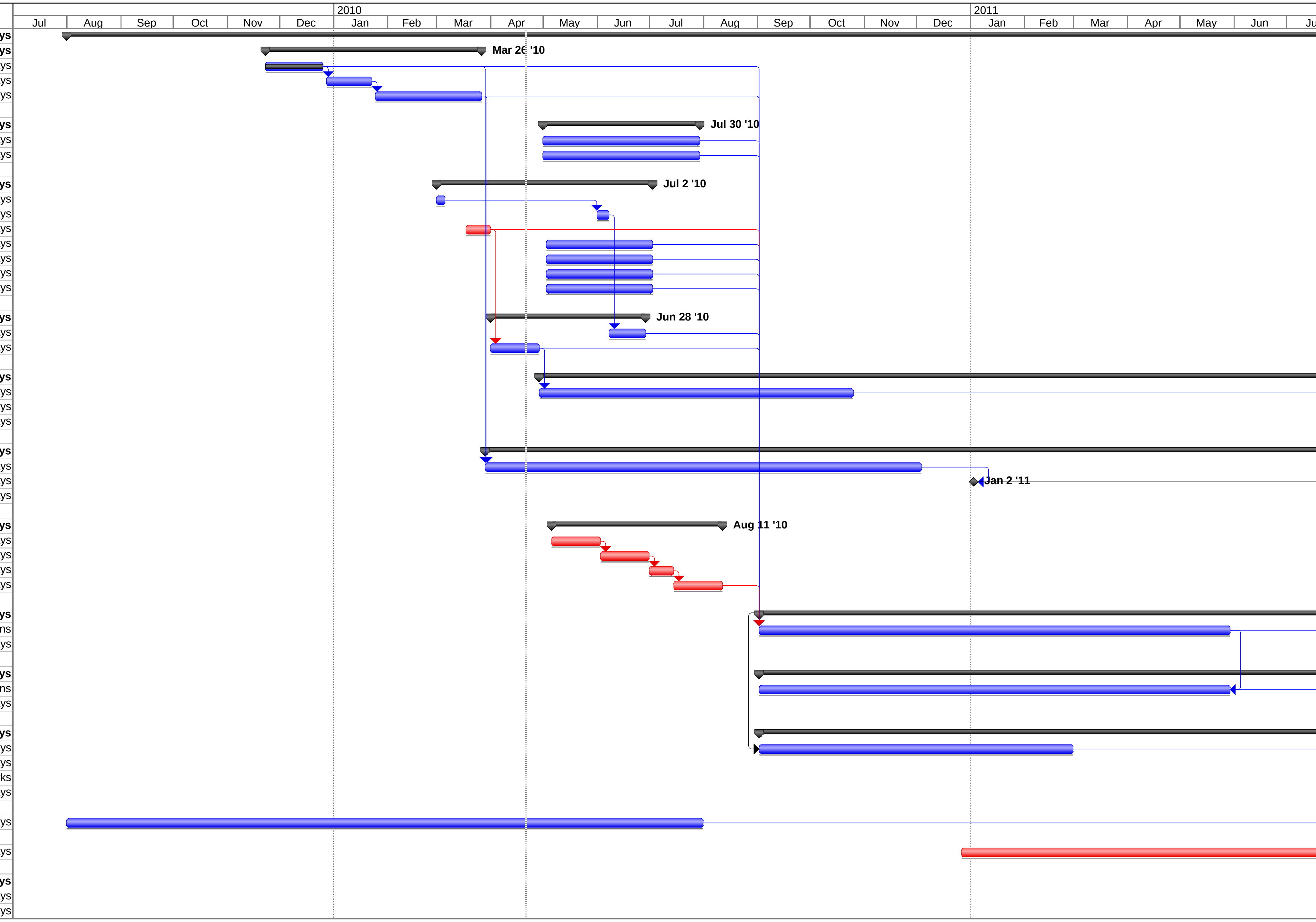
ID	Task Name	Start	Finish	Duration
1	**DCCS Project**	**Sat 8/1/09**	**Sat 6/29/13**	**1020 days**
2	**Skyway Site Wastewater Capacity Testing**	**Mon 11/23/09**	**Fri 3/26/10**	**90 days**
3	Develop Work Plan for Anti-degradation Analysis w/ RWQCB	Mon 11/23/09	Fri 12/25/09	25 days
4	RWQCB Anti-degradation Work Plan Review and Approval	Mon 12/28/09	Fri 1/22/10	20 days
5	Surface Water Sampling	Mon 1/25/10	Fri 3/26/10	45 days
6				
7	**Project Description**	**Sat 5/1/10**	**Fri 7/30/10**	**64 days**
8	Define Project Description	Sat 5/1/10	Fri 7/30/10	90 edays
9	Conceptual Plan and Layout	Sat 5/1/10	Fri 7/30/10	90 edays
10				
11	**Environmental Field Work**	**Mon 3/1/10**	**Fri 7/2/10**	**90 days**
12	Botanical Survey 1	Mon 3/1/10	Fri 3/5/10	5 days
13	Botanical Survey 2	Tue 6/1/10	Mon 6/7/10	5 days
14	Wetland Delineation	Thu 3/18/10	Wed 3/31/10	10 days
15	Cultural Resource Survey	Mon 5/3/10	Fri 7/2/10	45 days
16	Geologic Investigation	Mon 5/3/10	Fri 7/2/10	45 days
17	Hydrology Study	Mon 5/3/10	Fri 7/2/10	45 days
18	Phase 1 ESA	Mon 5/3/10	Fri 7/2/10	45 days
19				
20	**Environmental Report Preparation**	**Thu 4/1/10**	**Mon 6/28/10**	**63 days**
21	Biological Resource Assignment	Tue 6/8/10	Mon 6/28/10	15 days
22	Wetland Delineation Report	Thu 4/1/10	Wed 4/28/10	20 days
23				
24	**Environmental Permitting**	**Wed 4/28/10**	**Fri 10/21/11**	**387 days**
25	Army Corps 404 Nationwide Permit	Wed 4/28/10	Mon 10/25/10	180 edays
26	Army Corps 401 Permit	Wed 9/21/11	Fri 10/21/11	30 edays
27	Department of Fish and Game Streambed Alteration Permit	Wed 9/21/11	Fri 10/21/11	30 edays
28				
29	**Waste Discharge Requirements**	**Mon 3/29/10**	**Fri 12/23/11**	**455 days**
30	Report of Waste Discharge Preparation	Mon 3/29/10	Fri 12/3/10	180 days
31	Report of Waste Discharge Deemed Complete	Sun 1/2/11	Sun 1/2/11	0 days
32	Waste Discharge Requirements Issued	Fri 12/23/11	Fri 12/23/11	0 days
33				
34	**CEQA Consultant Selection**	**Thu 5/6/10**	**Wed 8/11/10**	**70 days**
35	CEQA Consultant RFP Preparation	Thu 5/6/10	Wed 6/2/10	20 days
36	Consultant RFP Response Preparation	Thu 6/3/10	Wed 6/30/10	20 days
37	CEQA Consultant Interview	Thu 7/1/10	Wed 7/14/10	10 days
38	CEQA Consultant Contract Negotiation and Approval	Thu 7/15/10	Wed 8/11/10	20 days
39				
40	**CEQA Process**	**Wed 9/1/10**	**Fri 8/19/11**	**252 days**
41	CEQA Document Development	Wed 9/1/10	Sun 5/29/11	9 emons
42	Notice of Determination	Fri 8/19/11	Fri 8/19/11	0 days
43				
44	**NEPA Process**	**Wed 9/1/10**	**Fri 8/19/11**	**252 days**
45	NEPA Document Development	Wed 9/1/10	Sun 5/29/11	9 emons
46	Notice of Determination	Fri 8/19/11	Fri 8/19/11	0 days
47				
48	**Permitting**	**Wed 9/1/10**	**Fri 2/17/12**	**382 days**
49	Butte County Use Permit Review	Wed 9/1/10	Mon 2/28/11	180 edays
50	Butte County Use Permit	Fri 8/19/11	Fri 8/19/11	0 edays
51	Construction Permit Review	Mon 12/26/11	Fri 2/17/12	8 wks
52	Construction Permit	Fri 2/17/12	Fri 2/17/12	0 days
53				
54	Property Acquisition	Sat 8/1/09	Sun 8/1/10	365 edays
55				
56	Plans and Specifications	Mon 12/27/10	Fri 12/23/11	260 days
57				
58	**Construction**	**Wed 2/22/12**	**Sat 6/29/13**	**353 days**
59	Construction Bid Process	Wed 2/22/12	Tue 5/15/12	60 days
60	Construction	Fri 6/29/12	Sat 6/29/13	365 days



Project: DCCS Project Schedule Fina
Date: Wed 4/21/10

Task	Progress	Summary	Rolled Up Critical Task	Rolled Up Progress	External Tasks	Group By Summary	
Critical Task	Milestone	Rolled Up Task	Rolled Up Milestone	Split	Project Summary	Deadline	

NorthStar ENGINEERING
Civil Engineers • Surveyors

ID	Task Name	Start	Finish
1	**DCCS Project**	**Sat 8/1/09**	**Sat 6/29/13**
2	**Skyway Site Wastewater Capacity Testing**	**Mon 11/23/09**	**Fri 3/26/10**
3	Develop Work Plan for Anti-degradation Analysis w/ RWQCB	Mon 11/23/09	Fri 12/25/09
4	RWQCB Anti-degradation Work Plan Review and Approval	Mon 12/28/09	Fri 1/22/10
5	Surface Water Sampling	Mon 1/25/10	Fri 3/26/10
6			
7	**Project Description**	**Sat 5/1/10**	**Fri 7/30/10**
8	Define Project Description	Sat 5/1/10	Fri 7/30/10
9	Conceptual Plan and Layout	Sat 5/1/10	Fri 7/30/10
10			
11	**Environmental Field Work**	**Mon 3/1/10**	**Fri 7/2/10**
12	Botanical Survey 1	Mon 3/1/10	Fri 3/5/10
13	Botanical Survey 2	Tue 6/1/10	Mon 6/7/10
14	Wetland Delineation	Thu 3/18/10	Wed 3/31/10
15	Cultural Resource Survey	Mon 5/3/10	Fri 7/2/10
16	Geologic Investigation	Mon 5/3/10	Fri 7/2/10
17	Hydrology Study	Mon 5/3/10	Fri 7/2/10
18	Phase 1 ESA	Mon 5/3/10	Fri 7/2/10
19			
20	**Environmental Report Preparation**	**Thu 4/1/10**	**Mon 6/28/10**
21	Biological Resource Assignment	Tue 6/8/10	Mon 6/28/10
22	Wetland Delineation Report	Thu 4/1/10	Wed 4/28/10
23			
24	**Environmental Permitting**	**Wed 4/28/10**	**Fri 10/21/11**
25	Army Corps 404 Nationwide Permit	Wed 4/28/10	Mon 10/25/10
26	Army Corps 401 Permit	Wed 9/21/11	Fri 10/21/11
27	Department of Fish and Game Streambed Alteration Permit	Wed 9/21/11	Fri 10/21/11
28			
29	**Waste Discharge Requirements**	**Mon 3/29/10**	**Fri 12/23/11**
30	Report of Waste Discharge Preparation	Mon 3/29/10	Fri 12/3/10
31	Report of Waste Discharge Deemed Complete	Sun 1/2/11	Sun 1/2/11
32	Waste Discharge Requirements Issued	Fri 12/23/11	Fri 12/23/11
33			
34	**CEQA Consultant Selection**	**Thu 5/6/10**	**Wed 8/11/10**
35	CEQA Consultant RFP Preparation	Thu 5/6/10	Wed 6/2/10
36	Consultant RFP Response Preparation	Thu 6/3/10	Wed 6/30/10
37	CEQA Consultant Interview	Thu 7/1/10	Wed 7/14/10
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52	Construction Permit	Fri 2/17/12	Fri 2/17/12
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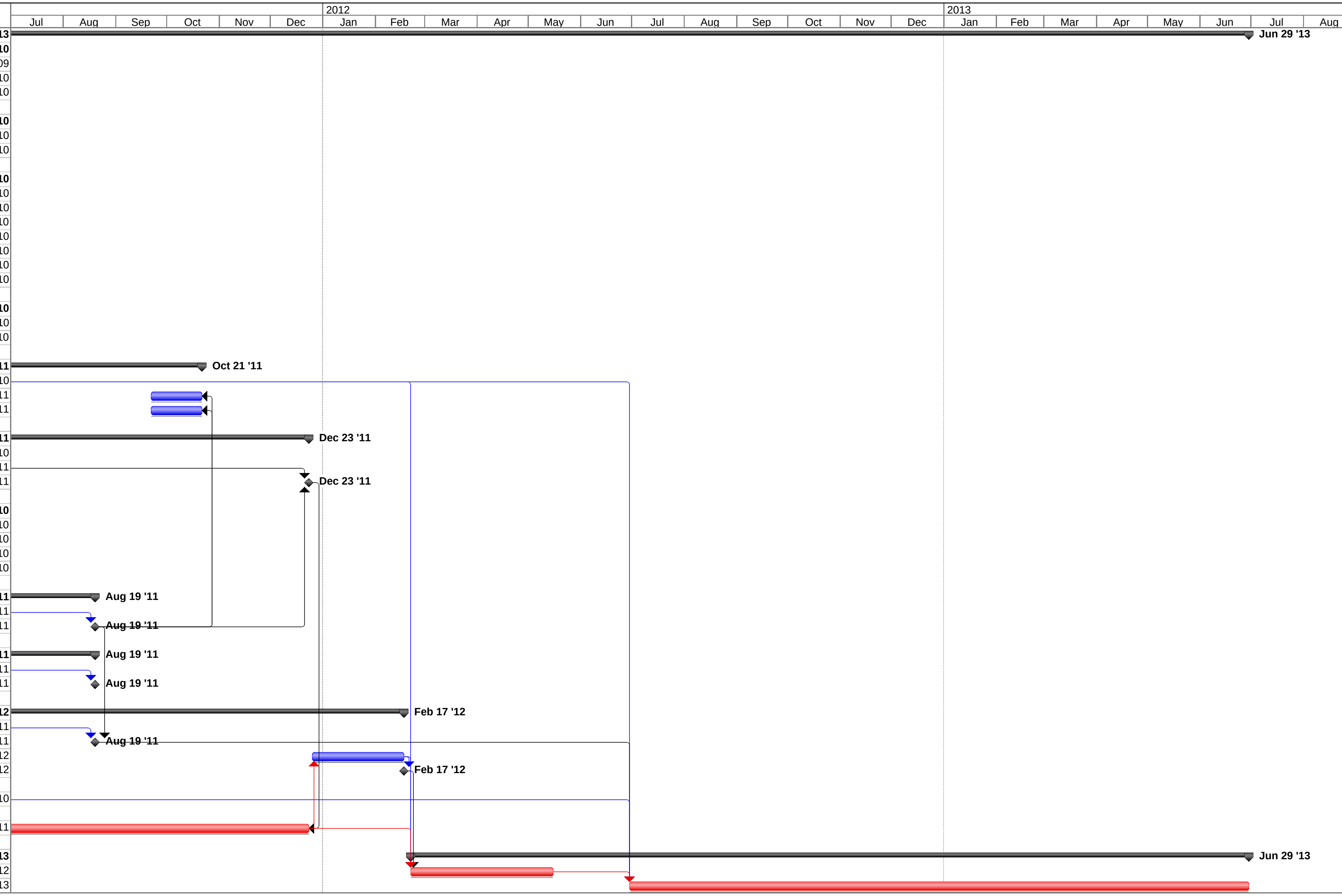
54	Property Acquisition	Sat 8/1/09	Sun 8/1/10
55			
56	Plans and Specifications	Mon 12/27/10	Fri 12/23/11
57			
58	**Construction**	**Wed 2/22/12**	**Sat 6/29/13**
59	Construction Bid Process	Wed 2/22/12	Tue 5/15/12
60	Construction	Fri 6/29/12	Sat 6/29/13



Project: DCCS Project Schedule Fina
Date: Wed 4/21/10

Task	Progress	Summary	Rolled Up Critical Task	Rolled Up Progress	External Tasks	Group By Summary	
Critical Task	Milestone	Rolled Up Task	Rolled Up Milestone	Split	Project Summary	Deadline	

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APPENDICIES

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

PROJECTED WASTEWATER FLOWS

Project: Town of Paradise DCCS

Project Data Summary

	PROJECT AREAS					PROJECTED FLOWS			
SECTION	RES	COMM	TOTAL	% RES	% COMM	RES	COMM	I&I	TOTAL
DRA	15.2 Ac	77.7 Ac	92.9 Ac	16.4%	83.6%	62,749 gpd	59,956 gpd	9,293 gpd	131,998 gpd
RDA-1	29.7 Ac	67.1 Ac	96.8 Ac	30.7%	69.3%	36,085 gpd	51,962 gpd	9,682 gpd	97,729 gpd
RDA-2	52.7 Ac	24.2 Ac	76.9 Ac	68.6%	31.4%	33,826 gpd	19,967 gpd	7,692 gpd	61,485 gpd
RDA-3	26.9 Ac	58.5 Ac	85.4 Ac	31.5%	68.5%	57,157 gpd	45,124 gpd	8,539 gpd	110,820 gpd
RDA-4	16.8 Ac	71.4 Ac	88.1 Ac	19.0%	81.0%	31,617 gpd	55,168 gpd	8,814 gpd	95,599 gpd
RDA-5	12.9 Ac	43.8 Ac	56.7 Ac	22.8%	77.2%	43,133 gpd	33,764 gpd	5,668 gpd	82,564 gpd
RDA-6	35.6 Ac	13.3 Ac	48.9 Ac	72.8%	27.2%	40,940 gpd	10,977 gpd	4,892 gpd	56,809 gpd
RDA-7	3.8 Ac	15.7 Ac	19.4 Ac	19.5%	80.5%	16,285 gpd	12,656 gpd	1,944 gpd	30,885 gpd
PHASE I	45.0 Ac	144.8 Ac	189.7 Ac	23.7%	76.3%	98,835 gpd	111,918 gpd	18,975 gpd	229,728 gpd
PHASE II	141.4 Ac	298.8 Ac	440.2 Ac	32.1%	67.9%	221,435 gpd	232,178 gpd	44,020 gpd	497,632 gpd
PHASE III	193.7 Ac	371.6 Ac	565.2 Ac	34.3%	65.7%	321,793 gpd	289,574 gpd	56,524 gpd	667,891 gpd

TOTALS	**AREA**	**PROJECTED GROSS FLOW**	**DESIGN FLOW**
PHASE I	**189.7 Ac**	**229,728 gpd**	**184,000 gpd**
PHASE II	**440.2 Ac**	**497,632 gpd**	**398,000 gpd**
PHASE III	**565.2 Ac**	**667,891 gpd**	**534,000 gpd**

Notes

1. DRA - Downtown Revitalization District
2. RDA - Town of Paradise Redevelopment Agency
3. PHASE I - Comprises DRA and RDA-1.
4. PHASE II - Comprises DRA and RDA-1 through RDA-4.
5. PHASE III - Comprises DRA and RDA-1 through DRA-7.
6. Infiltration and Inflow (I&I) from tanks and risers is assumed at 100 gpd/ac.
7. Design Flow is based on 80% of Projected Flow and Rounded to the Nearest 1000 gpd.

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

DISPERSAL (PRESSURE DOSED TRENCHES)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd

	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	*High*	*Low*	*High*
Material Cost						
Duplex pump vault, pumps, h&v, splice box, floats	23	ea	$2,200	$2,400	$50,600	$55,200
Distributing valve, enclosure, lid	45	ea	$500	$600	$22,500	$27,000
Schedule 40 drilled pipe	156400	lf	$0.8	$1.0	$125,120	$156,400
Orenco Orifice Shields	31280	ea	$1.3	$1.5	$40,664	$46,920
Gate Valve, Valve Box	270	ea	$30	$40	$8,100	$10,800
Sweep End Assembly, Valve Box	270	ea	$40	$50	$10,800	$13,500
				Material Sub Total	**$257,784**	**$309,820**
Sales Tax	8.25%				**$21,267**	**$25,560**
Land Acquisition (Primary Dispersal Field Only	78.0	ac	$40,000	$40,000	**$3,120,000**	**$3,120,000**
Installation	156,400	lf	$25	$30	**$3,910,000**	**$4,692,000**
Engineering @ 15% of Material Costs					**$38,668**	**$3,834**
Contingency @ 15% of Material Costs					**$38,668**	**$46,473**
				Pressure Distribution Estimated Cost	**$7,386,386**	**$8,197,687**
				Pressure Distribution Average Cost	**$7,792,037**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

DISPERSAL (DRIP)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd

	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	*High*	*Low*	*High*
Material Cost						
Duplex pump vault, pumps, h&v, splice box, floats	23	ea	$2,200	$2,400	$50,600	$55,200
Complete Headwords Assembly	23	ea	$2,000	$2,800	$46,000	$64,400
Assumes 24" spacing, 1/2gph Pressure Compensating	407,500	lf	$0.6	$0.8	$244,500	$326,000
Lockslip Adapters	4075	ea	$0.9	$1.1	$3,668	$4,483
Air Release Vent and valve box	41	ea	$30	$40	$1,230	$1,640
				Material Sub Total	**$345,998**	**$451,723**
Sales Tax	8.25%				**$28,545**	**$37,267**
Land Acquisition (Primary Drip Field Only)	46.0	ac	$40,000	$40,000	**$1,840,000**	**$1,840,000**
Installation @ 250% Material Costs	250%				**$864,994**	**$1,129,306**
Engineering @ 15% of Material Costs					**$51,900**	**$67,758**
Contingency @ 15% of Material Costs					**$51,900**	**$67,758**
				Drip Distribution Estimated Cost	**$3,183,335**	**$3,593,813**
				Drip Distribution Average Cost	**$3,388,574**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

DISPERSAL (SPRAY)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd

	Quantity	Units	Unit Cost Range		Total Cost Range	
Wintertime Storage and Dry Season Spray (Average Precipitation)			*Low*	*High*	*Low*	*High*
Spray Field	**65**	**ac**				
Pumping Systems	12	ea	$20,000	$25,000	$240,000	$300,000
Controls	1	ls	$25,000	$50,000	$25,000	$50,000
Header Pipe	10,750	lf	$5	$10	$53,750	$107,500
Sprinkler Line	65	ac	$1,000	$2,000	$65,000	$130,000
			Material Sub Total		$383,750	$587,500
Sales Tax	8.25%				$31,659	$48,469
Installation @20% of Material Costs					$76,750	$117,500
			Spray Sub Total		**$492,159**	**$753,469**
Pond Surface Area	**22**	**ac**				
Liner 60Mil Liner (Installed)	2,800,000	sf	$0.55	$0.75	$1,540,000	$2,100,000
Piping	1	ls	$40,000	$60,000	$40,000	$60,000
Electrical	1	ls	$30,000	$50,000	$30,000	$50,000
			Pond Material Sub Total		**$1,610,000**	**$2,210,000**
Earthwork						
Mobilization	1	ls	$5,000	$7,500	$5,000	$7,500
Excavate Pond to Subgrade	18,000	cy	$16	$20	$288,000	$360,000
Fine Grading	1	ac	$10,000	$15,000	$10,000	$15,000
Underdrain Construction	1340	lf	$10	$14	$13,400	$18,760
Liner Anchor Trench	3,800	lf	$10	$14	$38,000	$53,200
Erosion Control - Seed and Mulch	2	ac	$2,000	$2,500	$4,000	$5,000
			Earthwork Sub total		$358,400	$459,460
Land Acquisition	104.4	ac	$20,000	$40,000	$2,088,000	$4,176,000
Engineering @ 15% of Material Costs					$299,063	$419,625
Contingency @ 25% of Material Costs					$299,063	$419,625
			Total		**$5,146,684**	**$8,438,179**
			Average Cost		**$6,792,432**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

DISPERSAL (SPRAY)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd

	Quantity	Units	Unit Cost Range		Total Cost Range	
Wintertime Storage and Dry Season Spray (100-year Precipitation)			*Low*	*High*	*Low*	*High*
Spray Field	**156**	**ac**				
Pumping Systems	12	ea	$20,000	$25,000	$240,000	$300,000
Controls	1	ls	$25,000	$50,000	$25,000	$50,000
Header Pipe	25,000	lf	$5	$10	$125,000	$250,000
Sprinkler Line	156	ac	$1,000	$2,000	$156,000	$312,000
				Material Sub Total	$546,000	$912,000
Sales Tax	8.25%				$45,045	$75,240
Installation @20% of Material Costs					$109,200	$182,400
				Spray Sub Total	**$700,245**	**$1,169,640**
Pond Surface Area	**37**	**ac**				
Liner 60Mil Liner (Installed)	1,530,000	sf	$0.55	$0.75	$841,500	$1,147,500
Piping	1	ls	$40,000	$60,000	$40,000	$60,000
Electrical	1	ls	$30,000	$50,000	$30,000	$50,000
				Pond Material Sub Total	**$911,500**	**$1,257,500**
Assuming 200,000gpd Site Capacity with Conversion of Reserve Area to Active						
Earthwork						
Mobilization	1	ls	$5,000	$7,500	$5,000	$7,500
Excavate Pond to Subgrade	24,100	cy	$16	$20	$385,600	$482,000
Fine Grading	1	ac	$10,000	$15,000	$10,000	$15,000
Underdrain Construction	1,820	lf	$10	$14	$18,200	$25,480
Liner Anchor Trench	5,100	lf	$10	$14	$51,000	$71,400
Erosion Control - Seed and Mulch	2	ac	$2,000	$2,500	$4,000	$5,000
				Earthwork Sub total	$473,800	$606,380
Land Acquisition	231.6	ac	$20,000	$40,000	$4,632,000	$9,264,000
Engineering @ 15% of Material Costs					$218,625	$325,425
Contingency @ 25% of Material Costs					$364,375	$542,375
				Total	**$7,300,545**	**$13,165,320**
				Average Cost	**$10,232,933**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

DISPERSAL (SPRAY)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd

	Quantity	Units	Unit Cost Range Low	Unit Cost Range High	Total Cost Low	Total Cost High
Year-round Spray and Wet Period Storage (Average Precipitation)			*Low*	*High*	*Low*	*High*
Spray Field	**65**	**ac**				
Pumping Systems	12	ea	$20,000	$25,000	$240,000	$300,000
Controls	1	ls	$25,000	$50,000	$25,000	$50,000
Header Pipe	11,000	lf	$5	$10	$55,000	$110,000
Sprinkler Line	65	ac	$1,000	$2,000	$65,000	$130,000
				Material Sub Total	$385,000	$590,000
Sales Tax	8.25%				$31,763	$48,675
Installation @20% of Material Costs					$77,000	$118,000
				Spray Sub Total	**$493,763**	**$756,675**
Pond Surface Area	**12**	**ac**				
Liner 60Mil Liner (Installed)	468,000	sf	$0.55	$0.75	$257,400	$351,000
Piping	1	ls	$40,000	$60,000	$40,000	$60,000
Electrical	1	ls	$30,000	$50,000	$30,000	$50,000
				Pond Material Sub Total	**$327,400**	**$461,000**
Earthwork						
Mobilization	1	ls	$5,000	$7,500	$5,000	$7,500
Excavate Pond to Subgrade	12,250	cy	$16	$20	$196,000	$245,000
Fine Grading	1	ac	$10,000	$15,000	$10,000	$15,000
Underdrain Construction	920	lf	$10	$14	$9,200	$12,880
Liner Anchor Trench	2,600	lf	$10	$14	$26,000	$36,400
Erosion Control - Seed and Mulch	2	ac	$2,000	$2,500	$4,000	$5,000
				Earthwork Sub total	$250,200	$321,780
Land Acquisition	92.4	ac	$20,000	$40,000	$1,848,000	$3,696,000
Engineering @ 15% of Material Costs					$106,860	$157,650
Contingency @ 25% of Material Costs					$178,100	$262,750
				Total	**$3,204,323**	**$5,655,855**
				Average Cost	**$4,430,089**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

DISPERSAL (SPRAY)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd

	Quantity	Units	Unit Cost Range		Total Cost	
Year Around Spray and Wet Period Storage (100-year Precipitation)			*Low*	*High*	*Low*	*High*
Spray Field	**154**	**ac**				
Pumping Systems	12	ea	$20,000	$25,000	$240,000	$300,000
Controls	1	ls	$25,000	$50,000	$25,000	$50,000
Header Pipe	24,500	lf	$5	$10	$122,500	$245,000
Sprinkler Line	154	ac	$1,000	$2,000	$154,000	$308,000
				Material Sub Total	$541,500	$903,000
Sales Tax	8.25%				$44,674	$74,498
Installation @20% of Material Costs					$108,300	$180,600
				Spray Sub Total	**$694,474**	**$1,158,098**
Pond Surface Area	**16**	**ac**				
Liner 60Mil Liner (Installed)	630,000	sf	$0.55	$0.75	$346,500	$472,500
Piping	1	ls	$40,000	$60,000	$40,000	$60,000
Electrical	1	ls	$30,000	$50,000	$30,000	$50,000
				Pond Material Sub Total	**$416,500**	**$582,500**
Earthwork						
Mobilization	1	ls	$5,000	$7,500	$5,000	$7,500
Excavate Pond to Subgrade	15,000	cy	$16	$20	$240,000	$300,000
Fine Grading	1	ac	$10,000	$15,000	$10,000	$15,000
Underdrain Construction	1,100	lf	$10	$14	$11,000	$15,400
Liner Anchor Trench	3,100	lf	$10	$14	$31,000	$43,400
Erosion Control - Seed and Mulch	2	ac	$2,000	$2,500	$4,000	$5,000
				Earthwork Sub total	$301,000	$386,300
Land Acquisition	204.0	ac	$20,000	$40,000	$4,080,000	$8,160,000
Engineering @ 15% of Material Costs					$143,700	$222,825
Contingency @ 25% of Material Costs					$239,500	$371,375
				Total	**$5,875,174**	**$10,881,098**
				Average Cost	**$8,378,136**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

COLLECTION (CONVENTIONAL GRAVITY-DRA ONLY)

Project: Town of Paradise DCCS

	Quantity	Units	Unit Cost Range		Total Cost Range	
Estimated Construction Costs for Conventional Sewer Collection and Conveyance to Treatment (Update Based on Questa Report)			Low	High	Low	High
On Lot Facilities						
Pump Existing Septic Tanks[1]	241	ea	$250.00	$375.00	$60,250	$90,375
Abandon existing Septic Tanks	241	ea	$600.00	$1,000.00	$144,600	$241,000
Reroute Building Plumbing as Necessary	241	ea	$300.00	$500.00	$72,300	$120,500
4" Service Lateral (unpaved Area)	6,025	lf	$25.00	$35.00	$150,625	$210,875
4" Service Lateral (paved Area)	6,025	lf	$45.00	$55.00	$271,125	$331,375
Collection System						
12" Gravity Sewer - Zone 1	3,955	lf	$80.00	$100.00	$316,400	$395,500
8" Gravity Sewer - Zone 2	7,615	lf	$80.00	$100.00	$609,200	$761,500
8" Gravity Sewer- Deep Trenching - Zone 2	1,870	lf	$110.00	$120.00	$205,700	$224,400
8" Gravity Sewer - Zone 3	255	lf	$80.00	$100.00	$20,400	$25,500
3" Pressure Sewer Line - Zone 3	390	lf	$50.00	$60.00	$19,500	$23,400
Lift Station -Zone 3	1	ea	$40,000.00	$50,000.00	$40,000	$50,000
Manhole	29	ea	$5,000.00	$7,000.00	$145,000	$203,000
Clean Outs	7	ea	$350	$500	$2,450	$3,500
Mobilization/Demobilization	1	ls	$50,000	$60,000	$50,000	$60,000
Conventional Gravity Raw Cost per Acre					**$22,686**	**$29,504**
Conveyance						
Conveyance to Treatment Facility	15,000	lf	$110	$120	$1,650,000	$1,800,000
Pretreatment						
100,000-gal Septic Tank at Treatment Site	1	ea	$150,000	$200,000	$150,000	$200,000
				Gravity Sub Total	**$3,907,550**	**$4,740,925**
Engineering @ 15%					**$586,133**	**$711,139**
Contingency @ 25%					**$976,888**	**$1,185,231**
				Conventional Gravity Estimated Cost	**$5,470,570**	**$6,637,295**
				Conventional Gravity Average Cost	**$6,053,933**	
				Conventional Gravity Estimated Cost per Acre	**$58,887**	**$71,446**
				Conventional Gravity Estimated Cost per Connection	**$22,699**	**$27,541**

NOTES:
1. Unit cost updated to reflect 2009 pricing.

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

COLLECTION (SMALL DIAMETER GRAVITY-DRA ONLY)

Project: Town of Paradise DCCS

Collection and Conveyance to Treatment (Update Based on Questa Report)	Quantity	Units	Unit Cost Range Low	Unit Cost Range High	Total Cost Range Low	Total Cost Range High
On Lot Facilities						
Replace Existing Septic Tanks[1]	121	ea	$8,000.00	$12,000.00	$964,000	$1,446,000
Retrofit existing septic tanks[2]	60	ea	$1,700.00	$2,100.00	$102,425	$126,525
Retrofit existing septic tanks[3]	60	ea	$500.00	$700.00	$30,000	$42,000
Abandon existing leach field/treatment facilities	241	ea	$300.00	$500.00	$72,300	$120,500
4" Service Lateral (unpaved Area)	4,519	lf	$25.00	$35.00	$112,969	$158,156
4" Service Lateral (paved Area)	4,519	lf	$45.00	$55.00	$203,344	$248,531
Main Collection Line						
12" Gravity Sewer - Zone 1	3,955	lf	$80.00	$100.00	$316,400	$395,500
4" Gravity Sewer - Zone 2	7,615	lf	$80.00	$100.00	$609,200	$761,500
4" Gravity Sewer- Deep Trenching - Zone 2	1,870	lf	$110.00	$120.00	$205,700	$224,400
3" Gravity Sewer - Zone 3	255	lf	$80.00	$100.00	$20,400	$25,500
3" Pressure Sewer Line - Zone 3	390	lf	$50.00	$60.00	$19,500	$23,400
Lift Station -Zone 3	1	ea	$40,000.00	$50,000.00	$40,000	$50,000
Clean Outs	40	ea	$350	$500	$14,000	$20,000
Mobilization/Demobilization	1	ls	$50,000	$60,000	$50,000	$60,000
Small Diameter Raw Cost per Acre					**$29,712**	**$39,849**
Conveyance						
Conveyance to Treatment Facility	15,000	lf	$110	$120	$1,650,000	$1,800,000
Pretreatment						
20,000-gal Septic Tank at Treatment Site	1	ea	$60,000	$80,000	$60,000	$80,000
Small Diameter Sub Total					**$3,506,238**	**$4,136,013**
Engineering @ 15%					**$525,936**	**$620,402**
Contingency @ 25%					**$876,559**	**$1,034,003**
Small Diameter Estimated Cost					**$4,908,733**	**$5,790,418**
Gravity Average Cost					**$5,349,575**	
Small Diameter Estimated Cost per Acre					**$52,839**	**$62,330**
Small Diameter Estimated Cost per Connection					**$20,368**	**$24,027**

NOTES:

1. Assumes 50% of area connections will require tank replacement, includes new tank, pump packages, lids and risers to grade, installed.
2. Assumes 25% of area connections with existing tanks in good repair, retrofitted with STEP package, lids and risers to grade, installed.
3. Assumes 25% of area connections with existing tanks in good repair, new effluent filter, lids and risers to grade, installed.

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs
COLLECTION (CONVENTIONAL GRAVITY-PHASE I)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd
Design Flow - 184,000 gpd
Phase I
368 Total Connections (Based on 2009 Land Use Survey)

Estimated Construction Costs for Conventional Sewer Collection and Conveyance to Treatment (Based on Questa Report)	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	High	Low	High
Conventional Gravity Raw Cost, Normalized From Updated Draft Progress Report					**$22,686**	**$29,504**
Phase 1 Service Area					**189.7 Ac**	**189.7 Ac**
Conventional Gravity Cost, Extrapolated to Phase I					**$4,303,576**	**$5,596,916**
Conventional Gravity Raw Sub Total					**$4,326,452**	**$5,626,609**
Conveyance						
Conveyance to Treatment Facility	15,000	lf	$110	$120	$1,650,000	$1,800,000
Equalization						
200,000-gal Septic Tank at Treatment Site	1	ea	$300,000	$400,000	$300,000	$400,000
Conventional Gravity Sub Total					**$6,276,452**	**$7,826,609**
Engineering @ 15%					**$941,468**	**$1,173,991**
Contingency @ 25%					**$1,569,113**	**$1,956,652**
Conventional Gravity Estimated Cost					**$8,787,033**	**$10,957,253**
Conventional Gravity Estimated Average Cost					**$9,872,143**	
Conventional Gravity Estimated Cost per Connection					**$25,250**	**$31,486**

NOTES:

1. Unit cost updated to reflect 2009 pricing.

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

COLLECTION (SMALL DIAMETER GRAVITY-PHASE I)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd
Design Flow - 184,000 gpd
Phase I
368 Total Connections (Based on 2009 Land Use Survey)

Estimated Construction Costs for Small Diameter Effluent Sewer Collection and Conveyance to Treatment (Based on Questa Report)	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	High	Low	High
Small Diameter Gravity Raw Cost, Normalized From Updated Draft Progress Report					**$29,712**	**$39,849**
Phase 1 Service Area					**189.7 Ac**	**189.7 Ac**
Small Diameter Gravity Cost, Extrapolated to Phase I					**$5,636,351**	**$7,559,438**
Small Diameter Gravity Raw Sub Total					**$5,666,253**	**$7,599,477**
Conveyance						
Conveyance to Treatment Facility	15,000	lf	$110	$120	$1,650,000	$1,800,000
Equalization						
32,000-gal Septic Tank at Treatment Site	1	ea	$48,000	$64,000	$48,000	$64,000
Small Diameter Gravity Sub Total					**$7,364,253**	**$9,463,477**
Engineering @ 15%					**$1,104,638**	**$1,419,522**
Contingency @ 25%					**$1,841,063**	**$2,365,869**
Small DiameterGravity Estimated Cost					**$10,309,954**	**$13,248,868**
Small DiameterGravity Estimated Average Cost					**$11,779,411**	
Small Diameter Gravity Estimated Cost per Connection					**$29,626**	**$38,071**

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

COLLECTION (STEP-PHASE I)

Project: Town of Paradise DCCS
PHASE I - 189.7 ac, 184,000 gpd
Design Flow - 184,000 gpd
Phase I
368 Total Connections (Based on 2009 Land Use Survey)

	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	High	Low	High
Small Diameter Effluent Sewer (STEP) Collection						
Residential On Lot Facilities	**40**	**connections**				
Replace Existing Septic Tanks[1]	20	ea	$8,000.00	$12,000.00	$160,000	$240,000
Retrofit Existing Septic Tanks (STEP)[2]	20	ea	$1,700.00	$2,100.00	$34,000	$42,000
Abandon existing leach fields/treatment facilities	40	ea	$300.00	$500.00	$12,000	$20,000
1" Service Connections (unpaved areas)[3]	3,000	lf	$20.00	$30.00	$60,000	$90,000
1" Service Connections (paved areas)[3]	3,000	lf	$30.00	$50.00	$90,000	$150,000
Commercial On Lot Facilities	**308**	**connections**				
Replace Existing Septic Tanks[1]	154	ea	$8,000.00	$12,000.00	$1,232,000	$1,848,000
Retrofit Existing Septic Tanks (STEP)[2]	154	ea	$2,000.00	$3,000.00	$308,000	$462,000
Abandon existing leach fields/treatment facilities	308	ea	$20.00	$30.00	$6,160	$9,240
1" Service Connections (unpaved areas)[3]	23,100	lf	$20.00	$30.00	$462,000	$693,000
1" Service Connections (paved areas)[3]	23,100	lf	$30.00	$50.00	$693,000	$1,155,000
Main Collection Line						
2" Transport line (Internal Collectors)	13,200	lf	$20.00	$30.00	$264,000	$396,000
3" Transport line (Elliot to Treatment Facility)	13,300	ea	$30.00	$40.00	$399,000	$532,000
Clean Outs (every 400')	66	ea	$350.00	$500.00	$23,188	$33,125
Air Release Valve Assemblies	7	ea	$300.00	$800.00	$2,100	$5,600
STEP Sub Total					**$3,745,448**	**$5,675,965**
Engineering @ 15%					**561,817**	**851,395**
Contingency @ 25%					**936,362**	**1,418,991**
STEP Estimated Cost					**$5,243,627**	**$7,946,351**
STEP Estimated Average Cost					**$6,594,989**	
STEP Estimated Cost per Connection					**$19,421**	**$29,431**

NOTES:

1. Assumes 50% of area connections will require tank replacement, includes new tank, pump packages, lids and risers to grade, installed.
2. Assumes remaining area connections will receive new pump packages, lids and risers to grade, installed.
3. Assumes each service connection is 150' in length, half are in paved sections, half in unpaved sections.

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

TREATMENT (TEXTILE)

Project: Town of Paradise DCCS

Design Flow - 184,000 gpd
Phase I
368 Total Connections (Based on 2009 Land Use Survey)

	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	***High***	***Low***	***High***
Textile without Septage						
Front End Tankage						
Recirculation Tank (~ 80% of Design Flow)	150000	gal	$1.60	$1.80	$240,000	$270,000
Access Equipment	30	ea	$250	$300	$7,500	$9,000
Treatment System Components						
Pumping Equipment	22	ea	$2,200	$2,400	$48,400	$52,800
Control panel	1	ea	$20,000	$25,000	$20,000	$25,000
Distributing Valves	22	ea	$500	$600	$11,000	$13,200
Splitter Valves	6	ea	$500	$600	$3,000	$3,600
Fan Assembly	6	ea	$1,800	$2,000	$10,800	$12,000
Textile Pods	60	ea	$13,000	$13,500	$780,000	$810,000
Back End Tankage						
Holding Tank including Access Equipment	180000	gal	$1.80	$1.90	$324,000	$342,000
Dosing Tank including Access Equipment	120000	ea	$1.80	$1.90	$216,000	$228,000
Tertiary Filtration						
Holding Tank including Access Equipment	1	ea	$170,000	$200,000	$170,000	$200,000
Disinfection/Laboratory						
Disinfection	1	ls	$180,000	$200,000	$180,000	$200,000
Laboratory Equipment	1	ls	$100,000	$125,000	$100,000	$125,000
				Material Sub Total	**$2,110,700**	$2,290,600
Sales Tax	8.25%				**$174,133**	**$188,975**
Installation @ 150% Equipment Costs	150%				**$3,166,050**	**$3,435,900**
Engineering @ 15% of Material Costs					**$316,605**	**$343,590**
Contingency @ 15% of Material Costs					**$316,605**	**$343,590**
				SBR Estimated Treatment Cost	**$6,084,093**	**$6,602,655**
				SBR Treatment Average Cost	**$6,343,374**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

TREATMENT (SBR)

Project: Town of Paradise DCCS

Design Flow - 184,000 gpd
Phase I
368 Total Connections (Based on 2009 Land Use Survey)

	Quantity	Units	Unit Cost Range		Total Cost Range	
			Low	*High*	*Low*	*High*
SBR with Septage						
Treatment						
Mechanical & Electrical Equipment	1	ls	$3,284,980	$3,628,438	$3,284,980	$3,628,438
Laboratory Equipment	1	ls	$125,000	$175,000	$125,000	$175,000
				Material Sub Total	**$3,409,980**	**$3,803,438**
Sales Tax	8.25%				**$281,323**	**$313,784**
Installation, Concrete, Site Work					**$1,500,000**	**$2,000,000**
Engineering @ 15% of Material Costs					**$511,497**	**$570,516**
Contingency @ 25% of Material Costs					**$852,495**	**$950,860**
				SBR Estimated Treatment Cost	**$6,555,295**	**$7,638,597**
				SBR Treatment Average Cost	**$7,096,946**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

TREATMENT (MBR)

Project: Town of Paradise DCCS

Design Flow - 184,000 gpd
Phase I
368 Total Connections (Based on 2009 Land Use Survey)

	Quantity	Units	Unit Cost Range Low	Unit Cost Range High	Total Cost Range Low	Total Cost Range High
MBR with Septage						
Treatment						
MBR Equip; Including Membrane, Chem Cleaning, and Controls.	1	ls	$1,100,000	$1,250,000	$1,100,000	$1,250,000
Headworks, EQ, Solids Management @ 50% MBR Equ	50	%			$550,000	$625,000
Septage Receiving	1	ls	$150,000	$200,000	$150,000	$200,000
Disinfection	1	ls	$180,000	$200,000	$180,000	$200,000
Laboratory Equipment	1	ls	$100,000	$125,000	$100,000	$125,000
				Material Sub Total	**$2,080,000**	**$2,400,000**
Sales Tax	8.25%				**$171,600**	**$198,000**
Installation @ 150% Equipment Costs	150%				**$3,120,000**	**$3,600,000**
Engineering @ 15% of Material Costs					**$312,000**	**$360,000**
Contingency @ 25% of Material Costs					**$520,000**	**$600,000**
				MBR Estimated Treatment Cost	**$6,203,600**	**$7,158,000**
				MBR Treatment Average Cost	**$6,680,800**	

DOWNTOWN COMMUNITY CLUSTER SYSTEM
Preliminary Opinion of Costs

WASTEWATER BUDGET TIMELINE

Project: Town of Paradise DCCS

Assuming 100,000gpd Dispersal Site Capacity

Phase I Projected Wastewater Flows =	183,782 gpd		
Phase I Residential Projected Wastewater Flows =	77,188 gpd	42%	of Projected Wastewater Flows Residential
Phase I Commercial Projected Wastewater Flows =	88,215 gpd	48%	of Projected Wastewater Flows Commercial
Skyway Site Capacity =	100,000 gpd	54%	of Projected Build out Wastewater Flow
Flows from Initial Connections =	45,946 gpd	25%	of Projected Wastewater Flows
Yearly Additional Flows due to New Connections & Upgrades =		10%	of Remaining Projected Wastewater Flows
Total Phase I Service Area =	189.75 Acres		
Anticipated Flows from Service Area Fringe =	0 gpd		

Year	Added Flow	Total Flow	Remaining Capacity	Remaining Projected Flow	# of Years Past Installation	% of Predicted Build Out Flow
2013	45,946 gpd	45,946 gpd	54,054 gpd	137,837 gpd	0 Years	25%
2014	13,784 gpd	59,729 gpd	40,271 gpd	124,053 gpd	1 Years	33%
2015	12,405 gpd	72,134 gpd	27,866 gpd	111,648 gpd	2 Years	39%
2016	11,165 gpd	83,299 gpd	16,701 gpd	100,483 gpd	3 Years	45%
2017	10,048 gpd	93,348 gpd	6,652 gpd	90,435 gpd	4 Years	51%
2018	9,043 gpd	102,391 gpd	-2,391 gpd	81,391 gpd	5 Years	56%
2019	8,139 gpd	110,530 gpd	-10,530 gpd	73,252 gpd	6 Years	60%
2020	7,325 gpd	117,855 gpd	-17,855 gpd	65,927 gpd	7 Years	64%
2021	6,593 gpd	124,448 gpd	-24,448 gpd	59,334 gpd	8 Years	68%
2022	5,933 gpd	130,381 gpd	-30,381 gpd	53,401 gpd	9 Years	71%
2023	5,340 gpd	135,721 gpd	-35,721 gpd	48,061 gpd	10 Years	74%
2024	4,806 gpd	140,528 gpd	-40,528 gpd	43,255 gpd	11 Years	76%
2025	4,325 gpd	144,853 gpd	-44,853 gpd	38,929 gpd	12 Years	79%
2026	3,893 gpd	148,746 gpd	-48,746 gpd	35,036 gpd	13 Years	81%
2027	3,504 gpd	152,250 gpd	-52,250 gpd	31,533 gpd	14 Years	83%
2028	3,153 gpd	155,403 gpd	-55,403 gpd	28,379 gpd	15 Years	85%
2029	2,838 gpd	158,241 gpd	-58,241 gpd	25,541 gpd	16 Years	86%
2030	2,554 gpd	160,795 gpd	-60,795 gpd	22,987 gpd	17 Years	87%
2031	2,299 gpd	163,094 gpd	-63,094 gpd	20,689 gpd	18 Years	89%
2032	2,069 gpd	165,162 gpd	-65,162 gpd	18,620 gpd	19 Years	90%
2033	1,862 gpd	167,024 gpd	-67,024 gpd	16,758 gpd	20 Years	91%
2034	1,676 gpd	168,700 gpd	-68,700 gpd	15,082 gpd	21 Years	92%
2035	1,508 gpd	170,208 gpd	-70,208 gpd	13,574 gpd	22 Years	93%
2036	1,357 gpd	171,566 gpd	-71,566 gpd	12,216 gpd	23 Years	93%
2037	1,222 gpd	172,787 gpd	-72,787 gpd	10,995 gpd	24 Years	94%
2038	1,099 gpd	173,887 gpd	-73,887 gpd	9,895 gpd	25 Years	95%

Design Flow Equivalents

Initial System Connections

DRA Initial Connections		% of SA
1 bedroom units	129	
2 bedroom units	86	
3 bedroom units	65	
Commercial High Flow Use	18.38 Acres	9.7%
Commercial Low Flow Use	36.76 Acres	19.4%
Average % of SA=		14.5%

Remaining Capacity for New Connections and Upgrades

Possible New Connections		% of SA
1 bedroom units	152	
2 bedroom units	101	
3 bedroom unit	76	
Commercial High Flow Use	21.62 Acres	11.4%
Commercial Low Flow Use	43.24 Acres	22.8%
Average % of SA=		17.1%