K/J 037012.00

Preliminary Design Report Cold Springs Water Reclamation Facility Expansion



Washoe County Department of Water Resources

October 2003

Kennedy/Jenks Consultants

Engineers & Scientists

Table of Contents

Executive Summary

- Design Criteria
- Site Layout
- Flow Schematic
- Hydraulic Profile

Cost Estimate

Technical Memorandums

- Technical Memorandum No. 001 Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge
- Technical Memorandum No. 002 Elevated vs. At-Grade Headworks
- Technical Memorandum No. 003 Effluent Reuse Filtration, Disinfection, and Plumbing
- Technical Memorandum No. 004 Facility Expansion Design Criteria Gallons per ERU
- Technical Memorandum No. 005 Equivalent Residential Units
- Technical Memorandum No. 006 Secondary Treatment Process Alternative Comparison
- Technical Memorandum No. 007 Odor Control Alternatives
- Technical Memorandum No. 008 Rapid Infiltration Basin Preliminary Design
- Technical Memorandum No. 009 Diamond Peak Lift Station
- Technical Memorandum No. 010 Early Start Improvements / Re-rating Evaluation
- Technical Memorandum No. 011 Aerobic Digestion
- Technical Memorandum No. 012 Standby Power / Electrical Services

– P&IDs

Cut Sheets

- Flow Meter
- Fine Screen
- Grit Removal
- Oxidation Ditch
- Secondary Clarifier
- Centrifuge
- Pumps

Meeting Minutes

PROJECT DESCRIPTION

Kennedy/Jenks Consultants is performing preliminary design, design and construction administration services for the expansion of Washoe County's Cold Springs Water Reclamation Facility (CSWRF). The project includes a headworks facility, an oxidation ditch, provisions for a future oxidation ditch, two secondary clarifiers, a recycled activated sludge/waste activated sludge (RAS/WAS) pump station, a solids dewatering facility, a plant water system, a new Operations Building, and additional rapid infiltration basins (RIBs). The project also includes conversion of the existing sequencing batch reactors (SBRs) to aerobic digesters and upgrades to the Diamond Peak Lift Station (DPLS).

Expansion of the WRF will occur over two phases. Phase 1 will provide sufficient capacity to treat approximately 3,100 equivalent residential units (ERUs) and Phase 2 will provide additional capacity for a total of 5,200 ERUs. While this preliminary design effort focuses on the Phase 1 expansion, some components constructed in Phase 1 will provide the necessary capacity for the Phase 2 expansion. Components that will be incorporated into the Phase 1 expansion but will have adequate capacity for Phase 2 are the Operations Building, the headworks facility, the secondary clarifiers, the RAS/WAS pump station, the dewatering facility, the in-plant pump station and the plant water system. The remaining components will be sized only for the Phase 1 design flows and loads.

The proposed headworks facility will include fine screening, grit removal with odor control, and a bypass channel with a manual bar screen. An oxidation ditch using horizontally-mounted brush aerators and submerged mixers will be constructed to meet the Phase 1 capacity requirements and will include provisions to construct a common-wall, Phase 2 oxidation ditch. Two, 50-foot secondary clarifiers will be constructed during the Phase 1 expansion to provide the required regulatory redundancy. A solids processing facility with odor control will be constructed in Phase 1 to house a decanting centrifuge and a RAS/WAS pump station. An in-plant pump station will be constructed to convey recycle streams back to the oxidation ditch and a plant water system will be constructed to facilitate the use of treated effluent for process purposes. The DPLS will be modified and additional RIBs will be constructed to facilitate the Phase 1 flows. The basins of the existing SBR facility will be converted to provide aerobic digestion capacity.

PRELIMINARY DESIGN COMPONENTS

The components of this preliminary design report includes the Design Criteria, a Flow Schematic, the proposed Site Layout, a Hydraulic Profile, a Preliminary Cost Estimate, Process and Instrumentation Diagrams (P&IDs), Technical Memorandums (TMs) covering several aspects of the design and equipment cut sheets.

Design Criteria

Design criteria for the Phase 1 expansion are shown on Table 1. The criteria with respect to flows and loads were based on existing plant operating data and expectations for future growth. Determination of future flows and loads are examined in detail in TMs 4 and 5.

Cold Springs Water Reclamation Facility 6 October 2003 Page 2

Site Layout

The site layout, as shown on Figure 1, is based on construction of an oxidation ditch with secondary clarifiers for liquid treatment and conversion of the existing SBRs to aerobic digesters along with construction of a Solids Processing Facility for solids handling. The proposed location of the headworks facility, the Operations Building, and the liquid and solids treatment processes are shown. An in-plant pump station will be constructed to divert plant recycle streams back to the oxidation ditch. The existing motor control center (MCC) in the SBR structure will be modified to include the additional controls and panels required for the expanded plant. Architectural improvements will include a new Operations Building housing a laboratory, lavatory, break room, and a vehicle storage/workshop space.

The layout is intended to efficiently incorporate the existing facilities, minimize yard piping, provide efficient access to the basins for daily operations and equipment maintenance, permit easy truck access and maneuvering, provide for efficient future expansions, and to provide an aesthetically pleasing appearance to residential neighbors.

Flow Schematic

The Phase 1 flow schematic is presented on Figure 2. The schematic is intended to show the unit processes in their correct sequence, all major pipe connections and flow directions, pump stations, chemical application points, flow metering locations and disposal points for the liquid and solids streams.

Hydraulic Profile

The preliminary hydraulic profile for the Phase 1 expansion is shown on Figure 3. As with the existing plant, the new plant will require influent and effluent pumping to accommodate the nearly flat site. The proposed headworks will be elevated sufficiently above the existing grade to allow for gravity flow between the headworks and the effluent pump station. New basins, such as the oxidation ditch and the secondary clarifiers will primarily be constructed below grade. The site is essentially flat with a slight increase in elevation (about 0.5%) from south to north.

Preliminary Cost Estimate

The estimate of probable cost is preliminary and has been prepared prior to the development of the construction drawings. This preliminary estimate is likely accurate from -15% to 30% and is intended for the purpose of developing a project budget. A 15% construction contingency was applied to the subtotal. As the design is refined and plans are developed, a more accurate cost estimate will be prepared. Construction Administration cost is calculated at 12% of the total for the Phase 1 expansion. The estimate indicates the Phase 1 expansion cost to be

Cold Springs Water Reclamation Facility 6 October 2003 Page 3

approximately \$5.9M. When construction administration costs are included, the estimated costs are approximately \$6.6M.

Process and Instrumentation Diagrams

Preliminary P&IDs were developed for the following areas:

- Influent Pump Station and Headworks
- Oxidation Ditch
- Secondary Clarifiers
- RAS/WAS Pumping and Aerobic Digestion
- Dewatering.

At the pre-design level, the P&IDs do not include any information regarding PLC or SCADA interfaces.

Technical Memorandums

The twelve TMs included in this document are intended to address the specific areas of the predesign focus. TMs regarding equipment and process options that were previously submitted to Washoe County for review and comment are indicated in the list below. Decisions based on those memorandums are presented in the Summary of Technical Memorandums section of this document. The technical memorandums address the following areas:

TM 001 - Comparison of a Belt Filter Press and Centrifuge Decanter for Dewatering Digested Sludge (Previously submitted to Washoe County)

TM 002 - Elevated and At Grade Headworks Comparison (Previously submitted to Washoe County)

TM 003 - Disinfection, Filtration, and Effluent Reuse Applications Requirements (Previously submitted to Washoe County)

TM 004 - Gallons per Equivalent Residential Unit (ERU)

TM 005 - Number of ERUs for Phase 1 and Phase 2 Expansion

TM 006 - Liquid Stream Treatment Alternatives (Previously submitted to Washoe County)

TM 007 - Odor Control for Unit Processes

TM 008 - Rapid Infiltration Basins (RIBs) for Effluent Disposal

Cold Springs Water Reclamation Facility 6 October 2003 Page 4

TM 009 - Diamond Peak Lift Station, Modifications

TM 010 - Early Start Improvements / Re-rating of the Existing CSWRF Facility

TM 011 - Aerobic Solids Digestion

TM 012 - Standby Power / Electrical Services

Summary of Technical Memorandums

TM 001 - Comparison of a Belt Filter Press and Centrifuge Decanter for Dewatering Digested Sludge: The pros and cons of both options were presented along with capital and operating costs. A decision was made by Washoe County to install a decanting centrifuge for dewatering. The decision was based on Washoe County's familiarity with centrifuges at other county facilities, the reduced footprint and building space required by the centrifuge and the reduced potential for generating objectionable odor during processing.

TM 002 - Elevated and At Grade Headworks Comparison: This memorandum was written with the understanding that an SBR plant would be selected for the capacity expansion. Subsequently, Washoe County has rejected the SBR option and decided to construct an oxidation ditch. It was determined that the proposed headworks for the oxidation ditch option should be elevated sufficiently to provide for gravity flow through the oxidation ditch and the secondary clarifiers. The oxidation ditch option only requires a slight elevation (about 9 feet above grade to the HWL) of the headworks structure compared to the elevated headworks for the SBR option (about 17 feet above grade to the HWL). The proposed headworks will be elevated above the surrounding driveway and use a staircase for personnel access.

TM 003 - Disinfection, Filtration and Effluent Reuse Applications Requirements: This memorandum examined the requirements for disinfection and filtration as they relate to effluent reuse applications and for the possible use of treated effluent for offsite landscape irrigation purposes. Future plans may also include the use of ultraviolet light for disinfection of effluent prior to discharge to the RIBs. Conceptual flow schematics and a preliminary cost estimate were presented for these future options. The requirements for a plant water system, planned as a part of the Phase 1 expansion, were also identified in this memorandum. The plant water system will use treated effluent to provide pressurized process water. A flow schematic and preliminary cost is included for this unit process.

TM 004 - Gallons per Equivalent Residential Unit (ERU): The influent characteristics related to flow rates were evaluated in this memorandum by studying operating data from the existing treatment facility and comparing these values with other communities. The study concludes that for the Cold Springs Valley, 225 gpd should be assigned per Equivalent Residential Unit (ERU) to newer residential developments and 250 gpd should be assigned to older residential developments.

Cold Springs Water Reclamation Facility 6 October 2003 Page 5

TM 005 - Number of ERUs for Phase 1 and Phase 2 Expansion: This memorandum documents the number of ERUs for the Phase 1 and Phase 2 capacity expansions by analyzing existing and potential growth areas. The memorandum proposes the use of 3,100 ERUs for Phase 1 and 5,200 ERUs for Phase 2.

TM 006 - Liquid Stream Treatment Alternatives: Construction of a new SBR plant was compared with 3 versions of the oxidation ditch process. The memorandum presents pros and cons for each option and includes an estimate of cost for each alternative. Based on the information presented, Washoe County selected an oxidation ditch with brush aerators (OX Rotor) and submerged mixers. The selection of the brush rotor oxidation ditch option was based on familiarity with the process, ease of operation, treatment reliability, and the flexibility to readily accommodate biological nutrient removal (BNR). The competing oxidation ditch processes were rejected due to the requirement (and expense) of providing removable diffusers in the diffused air (OX Diffused) option and the proprietary considerations of the Orbal™ System. Two clarifiers, required for regulatory redundancy and a RAS/WAS pump station will be built in Phase 1. The secondary clarifiers and the RAS/WAS pump station will have adequate capacity for both Phase 1 and Phase 2.

TM 007 - Odor Control for Unit Processes: Odors may be generated at certain systems at the treatment facility. To minimize their impact, odor control systems will be provided. Two different types of system were evaluated; a mixed media systems containing primarily granulated carbon and a forced-air biofilter (soil bed). These systems absorb the odorous airborne material as it moves through the media. The memorandum proposes to use packaged, mixed media systems when air flow requirements are below 200 scfm due to their minimal space and cost requirements. When the demand is above that range the use soil beds is proposed. It is proposed to include mixed media canisters at the influent pump station and the headworks. A soil bed will be provided to scrub the air from the Solids Processing Facility.

TM 008 - Rapid Infiltration Basins (RIBs) for Effluent Disposal: The existing RIBs were evaluated for capacity as part of the pre-design effort. This memorandum summarized the anticipated capacity of the existing rapid infiltration basins (RIBs), identified capacity requirements and possible locations for additional RIBS. The memorandum concludes that meeting the flow capacity of the Phase 1 expansion will require the removal of 2 to 3 feet of topsoil from the existing RIBs 1 and 2 and construction of three new RIBs located to the north of the existing effluent disposal area.

TM 009 - Diamond Peak Lift Station, Modifications: Technical Memorandum 009 evaluates the Diamond Peak Lift Station. This pump station consists of a 6-foot diameter wetwell and two solids handling centrifugal pumps in a metal drywell adjacent to the wetwell. The firm capacity of the pump station is approximately 300 gpm based on recent pump tests. The existing peak flow to the pump station is approximately 250 gpm. The memorandum recommends that the pump station not be reconstructed at this time. Once flows to the station reach capacity the station as well as the force main need to be replaced. When constructed, the new force main will discharge directly into the headworks at the water reclamation facility.

Cold Springs Water Reclamation Facility 6 October 2003 Page 6

TM 010 - Early Start Improvements/Re-rating of the Existing CSWRF Facility: This memorandum will be submitted separately so that observations/recommendations from the August 22 field trip by Kennedy/Jenks Consultants can be incorporated.

TM 011 - Aerobic Solids Digestion: Conversion of the existing SBR basins to provide additional aerobic digestion capacity will be undertaken during the Phase 1 expansion. The two 0.175 MG SBR basins plus 0.12 MG of existing digestion volume will be combined to provide a total of 0.46 MG of digestion volume. The existing aeration and mixing equipment will be reused. Minor piping modifications will enable operation the basins in a series or parallel configuration and allow for decanting from all three basins. Based on the analysis presented, the existing basins will provide sufficient retention time to meet the Part 503 regulations for class B sludge for the Phase 1 planning period but will be insufficient to meet the requirements for Phase 2. The existing mixing and aeration equipment are sufficient to meet the requirements for both Phase 1 and Phase 2.

TM 012 - Standby Power and Power Service: This memorandum examines Standby Power and Electrical Service requirements. The existing service is rated at 277/480 volts, 3 phase served from a utility-owned pad mounted transformer. The existing meter, located outside the building, serves a motor control center with a main circuit breaker rated for 400 amps. The motor control center is also served from a 225 kW (275 kVA) diesel driven engine-generator through a 400 amp automatic transfer switch. The service equipment including the metering cabinet, main circuit breaker and automatic transfer switch will be replaced with systems that will serve 800 amps. The existing 600 amp motor control center will be reused. Only essential services to assure the plant will function in a power outage will be connected to the 225 kW stand-by power engine generator. This will include the influent and effluent pump stations, one pump in the inplant pump station, two oxidation ditch rotors, two RAS pumps, two clarifier drives and all single phase loads.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR CONSTRUCTION ACTIVITIES

Name and Location of Project:

Cold Springs Water Reclaimation Facility Expansion 5350 Sandpiper Dr., Washoe County, NV 89506

Land Owner:

Washoe County. Project Manager - Mr. Joe Howard, Washoe County Department of Water Resources, 4930 Energy Way, Reno, NV 89502, 775-954-4623 (office)

Site Operator:

Contract Plant Operations - SPB Utilities - Mr. Ken Mallory, 430 Stoker #207, Reno, NV 89503, 775-329-7757 (office), 775-772-5560 (cell)

Person Responsible for Implementing SWPPP:

RIB Construction: Mr. Bob Rapper, Atlas Contractors, Inc., 1475 Hulda Way, Sparks, NV 89431, 775-359-1000 (office), 775-771-6199 (cell)

Treatment Plant Construction: To be determined

Notice of Intent Filing Date:

May 19, 2004 - NDEP Permit # NVR100000-36620

NOTE: A WORKING COPY OF THIS SWPPP MUST BE KEPT AT THE CONSTRUCTION SITE OR BE LOCALLY AVAILABLE FOR REVIEW BY NDEP and LOCAL REGULATORY AGENCIES

A COPY OF STORMWATER GENERAL PERMIT NVR100000 AND THE NOTICE OF INTENT FOR THIS PROJECT MUST BE ATTACHED TO THIS SWPPP

GUIDANCE FOR SELECTING AND IMPLEMENTING BMPs IS AVAILABLE IN THE TRUCKEE MEADOWS CONSTRUCTION SITE BMP HANDBOOK. ATTACH ADDITIONAL PAGES WHEN NECESSARY TO PROVIDE THE REQUIRED INFORMATION

Table of Contents

Page #
I. Notice of Intent
II. Project Description
III. Existing Soil and Water Quality Data
IV. Site Maps7
A. General Location Map7A
B. Detailed Site Map – Rapid Infiltration Basins
C. Detailed Site Map - Treatment Plant Expansion7C
V. Receiving Waters8
VI. Erosion and Sediment Controls
A. Sequence of BMPs and Contractors8
B. Temporary Stabilization Practices
C. Permanent Stabilization Practices9
D. Structural Practices
VII. Stormwater Management
VIII. Other Controls
A. Material Storage, Spill Prevention and Response
B. Offsite Vehicle Tracking Controls
C. Construction Waste Storage and Disposal
D. Hazardous and Sanitary Waste Storage and Disposal 12
E. Offsite Discharges
F. Non-stormwater Discharges
IX. Inspection/Maintenance Procedures
A. Inspection and Maintenance of Stabilization and Structural Practices 13
B. Inspection and Maintenance of Other Controls
X. Certification of Compliance
A. Owner/Operator Certification Statement
B. Contractor's Certification Statement
XI. Record of Construction Activities
Appendix A – Site Photographs
Appendix B – BMP Fact Sheets
Appendix C – Stormwater General Permit NVR100000

II. PROJECT DESCRIPTION

Description of the Proposed Construction Activity [§ I.B.1a.(6)]

Figure 1 shows the general location of Washoe County's Cold Springs Water Reclamation Facility (CSWRF). The CSWRF expansion project includes modification of two existing rapid infiltration basins (RIBs), installation of six additional RIBs, a number of treatment plant modifications, upgrades to the Diamond Peak Lift Station and a force main extension along future Briar Dr. The CSWRF expansion project is in response to on-going residential growth in the northern portion of Cold Springs Valley. Phases 1 and 2 of the project will provide sufficient capacity to treat approximately 5,200 equivalent residential units (ERUs).

Expansion of the CSWRF will begin with the removal of 2 to 3 feet of topsoil from existing RIB Nos. 1 and 2 and the construction of six new RIBs located to the north of the existing effluent disposal area. Soils removed from RIB Nos. 1 and 2 will be used to construct the perimeter berm around new RIB Nos. 7 through 12 (Figure 2). Approximately 19.5 acres of land north of existing RIB Nos. 5 and 6 will be disturbed during the construction of new RIB Nos. 7 through 12. Excavation and construction equipment will access the site from the existing equipment and materials storage area of Woodland Village Phase 13 project located directly to the east of the CSWRF. A temporary unimproved dirt road between RIBs Nos. 6 and 9 will be utilized and all excess soils excavated during the construction of RIB Nos. 7 through 12 will be utilized on the Woodland Village Phase 13 project area.

Treatment plant upgrades will include the addition of a headworks facility, an oxidation ditch, provisions for a future oxidation ditch, two secondary clarifiers, a recycled activated sludge/waste activated sludge (RAS/WAS) pump station, a solids dewatering facility, a plant water system and a new operations building (Figure 3). The project will also include conversion of the existing sequencing batch reactors (SBRs) to aerobic digesters. Treatment plant upgrades will increase the impervious area of the existing plant from approximately 0.6 acres to 2.0 acres.

Upgrades to the Diamond Peak Lift Station will not involve any earthwork. Construction of the force main will be done as part of the Woodland Village Phase 12 and 13 projects (NDEP permit numbers NVR100000-35980 and NVR100000-35982, respectively).

Intended Sequence of Major Soil Disturbing Activities [§ I.B.1a.(7)]

- 1. Stripping of existing vegetation and general site grading in the area of future RIB Nos. 7 through 12 (approx 19.5 acres).
- 2. Excavation of RIB Nos. 1 and 2 and construction of the perimeter berm around future RIB Nos. 7 through 12.
- 3. Excavation and construction of RIB Nos. 7 through 12.
- General treatment plant site grading.
- 5. Construction of new treatment plant facilities (i.e oxidation ditch and clarifiers).

Total Area of Site (acres) [§ I.B.1a.(8)]	Total Area to be Disturbed (acres) 😸 🐉
40 acres	25.3 acres

Runoff Coefficients [§ I.B.1a.(9)]: Use the following worksheet for sites with only 1 or 2 land uses, such as an undeveloped site with a proposed parking lot. For sites with 3 or more land uses (pre and/or post-project) attach a separate worksheet.

Pre-Project Land Use 187

24.7 acres X 0.20 = 4.94 (C1) undisturbed land and existing RIBs 1 and 2

Pre-Project Land Use 2:

0.6 acres X 0.85 = 0.51 (C2) existing treatment plant

Average Pre-Project Runoff Coefficient

(C1 + C2) / Total area = 5.45/25.3 = 0.22

Post-Project Land Use 1

23.3 acres X 0.25 = 5.83 (C3) disturbed land and RIBs 1 and 2 and 7 through 12

Post-Project Land Use 2

2.0 acres \times 0.85 = 1.70 (C4) new treatment plant

Average Post-Project Runoff Coefficient

(C3 + C4) / Total area = 7.53/25.3 = 0.30

III. EXISTING SOIL AND WATER QUALITY DATA

Provide a description of the existing soil and/or water quality data of any discharges from the site [§ I.B.1a.(9)] Existing water for adjacent waterways that may receive a discharges from the site is also recommended, if available.

Existing soils data is documented in the report prepared by Broabent & Associates "Rapid Infiltration Basin Evaluation Report, Cold Spring Valley Wastewater Treatment Facility, Washoe County, Nevada, July, 2003." The lithology of the surface soils encountered by Broadbent & Associates in the vicinity of the project site was generally described as brown silty sands of medium density to a silt-clay mix. Double ring infiltrometer testing of the near surface soils indicated infiltration rates of approximately 0.07 to 0.90 in/hr for surface soils up to approximately 7.0 in/hr at a depth of 4.5 ft below ground surface. Subsurface soils were generally described as fine to coarse-grained beach and delta sands with some silts and gravels underlain by clay units of variable thickness and depths.

No known water quality data of the stormwater discharges from the site or the water quality of the recieving water body (Whites Lake Playa) is reportedly available. Photographs of the site prior to the commencement of construction activities are presented in Appendix A.

IV. SITE MAPS

The Detailed Site Map must indicate the following:

- 1. Existing and proposed topography and drainage patterns drawn to scale with north arrow.
- 2. Areas of soils that will be disturbed and areas that will not be disturbed.
- 3. Locations of structural and non-structural controls identified in SWPPP.
- 4. Locations where stabilization practices will be applied.
- 5. Locations where vehicles and equipment will be stored and maintained.
- 6. Locations where materials and wastes will be stored (including concrete washout areas).
- 7. Location(s) and aerial extent of nearby receiving waters (including wetlands).
- 8. Location(s) where stormwater discharges will enter receiving waters and/or the municipal stormdrain system.
- 9. Legend identifying all symbols, BMP numbers or abbreviations used.
- C. Location and description of any discharge(s) associated with Industrial Activity other than construction, including any stormwater discharges from dedicated asphalt or concrete plants covered under General Permit NVR100000 [§ I.B.1a.(11)].

There will be no dedicated asphalt or concrete plants for this project.

V. RECEIVING WATERS

Receiving Water(s): Identify the name and location of the streams, rivers, ditches, and drainages, lakes or wetlands (both perennial and intermittent) that will receive runoff, from the construction site. If the site will drain to the municipal storm drain system, identify the receiving water to which the system discharges [§ I.B.1a.(12)]

Runoff from the site (that will not be captured and infiltrated by the RIBs or the stormwater infiltration pond shown on Figure 3) will drain to a newly constructed detention basin located south of the existing treatment plant. This detention basin drains to a flood control channel that conveys flows south to Whites Lake Playa, the final recieving water body.

VI. EROSION AND SEDIMENT CONTROLS

A. Best Management Practices (BMPs) [§ I.B.1b]

Describe each control measure and the general sequence of implementation during the construction process. Clearly identify below the BMPs that will be used for each of the major activities identified in 3) above. Also indicate each Contractor that will be responsible for installing and maintaining each control measure.

Control measures must be properly selected, installed, and maintained in accordance with the manufactures specifications and good engineering practices. Controls must be inspected at least weekly and sediments must be removed from when the design capacity has been reduced to 50%. Construction materials, chemicals, wastes, litter and debris must be prevented from becoming a stormwater pollutant source. Offsite material storage areas used solely by the permitted project must also be addressed.

Control Measures	Contractors
Rapid Infiltration Basins (Figure 2)	
RIBs - Temporary Diversion Ditch (BMP fact sheet RC-2 with Check Dams (RC-3)) 1. Atlas Contractors, Inc.
2. Wind Erosion and Dust Control (EC-5)	2. Atlas Contractors, Inc.
3. Stockpile Management (GM-2)	3. Atlas Contractors, Inc.
4. Spill Prevention and Control (GM-6) Vehicle and Equipment Cleaning (GM-7) and Maintenance and Fueling (GM-8) to be conducted at offsite storage area	4. Atlas Contractors, Inc.
5. Slope Tracking (EC-2) Mulching (EC-3) and Revegetation (EC-8) for exterior slopes and disturbed area around perimeter of RIBs	5. Atlas Contractors, Inc.
Treatment Plant (Figure 3)	
6. Fiber Rolls (SC-1) or Silt Fencing (SC-5)	6. To be determined
7. Construction Site Entrance/Exit (SC-8)	7.
8. Wind Erosion and Dust Control (EC-5)	8.
9. Sediment Retention Basin (SC-7)	9.
10. Stormdrain Outlet Protection (DP-2)	10.
11. Stockpile Management (GM-2)	11.

 Vehicle and Equipment Cleaning (GM-7) Maintenance and Fueling (GM-8) 	12.
13. Handling and Disposal of Concrete and Cement (GM-9)	13.
14. Material Delivery, Handling, Storage and Use (GM-10)	14.
15. Spill Prevention and Control (GM-6)	15.
16. Paints and Liquid Materials (GM-11)	16.
17. Sanitary/Septic Waste Management (GM-14)	17.
18. Rip-rap (EC-7) on 2H:1V slopes – refer to Figure 3	18.
19. Landscaping Management (GM-15)	19
20. Slope Tracking (EC-2), Mulching (EC-3) and Revegetation (EC-8)	20.

B. Temporary Stabilization Practices [§ I.B.1b.(2)].

Describe the temporary stabilization BMPs (e.g. soil binders, revegetation and/or mulching) that will be provided on stockpiles and disturbed portions of the site where construction activity is expected to cease for 14 days or more and will not be resumed within 21 days.

All stockpiles created onsite or offsite by this project, that have the potential to transport sediment to the storm drain system, shall have perimeter controls installed (fiber rolls or sandbags). Wind erosion and dust control measures (BMP fact sheet EC-5) will be applied to all disturbed soils, including stockpiles. During periods of high winds, additional control measures may be necessary. All stockpiles that will not be reworked within 21 days will have mulch applied to reduce erosion potential.

All disturbed portions of the site that will not be reworked within 21 days or will not be utilized for vehicular access shall be track walked (EC-2) and stabilized with mulch and vegetation following the seeding specifications noted on project sheet L1.

C. Permanent Stabilization Practices [§ I.B.1b.(2)]

Describe the permanent stabilization BMPs (e.g. permanent revegetation and/or rolled erosion control products) that will be provided on disturbed portions of the site where construction activities have permanently ceased. Permanent stabilization measures must be applied no later than 14 days from the last construction activity in that area. Final stabilization with vegetation must achieve a uniform cover with a minimum density of 70% of what was on the site prior to commencement of construction activities. Permanent stabilization must be achieved prior to NDEP issuing a Notice of Termination.

All disturbed portions of the site that will not be reworked within 21 days or will not be utilized for vehicular access shall be track walked (EC-2) and stabilized with mulch and revegetated following the seeding specifications noted on project sheet L1. These areas will include the exterior slopes of the berm surrounding RIB Nos. 7 through 12 and all other areas outside of the RIBs that have been disturbed by construction practices. A rolled erosion control product or rock rip-rap (3"-4" angular rock) will be used to stabilize and protect all new 2H:1V slopes shown W of the Operations Bldg., S, W, and N of the Oxidation Ditch and W and N of Clarifier #2 (Figure 3).

D. Structural Practices [§ I.B.1b.(3)]

Provide a description of the temporary and permanent structural BMPs (e.g. temporary diversion dikes, silt fences, fiber rolls, check dams, sediment traps, storm drain inlet protection, etc.) that will be used during construction to divert or filter flows from exposed soils, reduce flow velocities or temporarily store flows and limit runoff from the exposed areas of the site. All sediment basins must be designed to the criteria outlined in the Truckee Meadows Construction Site BMP Handbook. From May to October, water must not be allowed to pond in any structural practice in excess of 7 days.

During the construction of RIBs 7 through 12, a temporary diversion ditch with rock or sand bag check dams will installed to convey runoff from the construction area and runon from the watershed area to the west to a detention basin. The approximately 3,200 ft long temporary diversion ditch will convey runoff from the northeast corner of future RIB No. 11 to the existing culvert pipe located southwest of the existing treament plant (Figure 2). This culvert drains to a detention basin recently constructed for Woodland Village Phase 13 (capacity = approximately 4 acre-feet). The temporary diversion ditch will be a minimum of 2 feet deep with 3H:1V side slopes or flatter. Rock or sand bag check dams (BMP fact sheet RC-3) will be placed across the ditch to a depth of approximately 1 ft and will be spaced at approximately every 200 ft. The check dams will reduce runoff velocities and trap sediment during runoff events. Upon completion of the perimeter berm around RIBs 7 through 12, the chech dams will be removed and the temporary ditch backfilled.

During the construction of the treatment plant, a permanent stormwater infiltration basin will be constructed with a capacity of approximately 4,700 cubic ft. The basin has been designed to retain and infiltrate the runoff created by the majority of the treatment plants new impervious surfaces.

VII. STORMWATER MANAGEMENT

Stormwater Management Controls [§ I.B.1c.]

Provide a description of the measures installed during construction that will be used to control pollutants in stormwater discharges between the time construction has ceased and final site stabilization has been achieved. These stormwater management controls include but are not limited to sediment retention basins, infiltration trenches, vegetated swales and velocity dissipation measures, such as riprap aprons on culvert outfalls. Permittees are responsible for the installation and maintenance of these stormwater BMPs until an approved Notice of Termination is received by NDEP.

As shown on Figure 3, a permanent stormwater infiltration basin will be constructed with a capacity of approximately 4,700 cubic ft. The basin has been designed to retain and infiltrate the runoff created by the majority of the treatment plants new impervious surfaces. In addition, as shown on project sheet L1, a 20 to 25 ft buffer strip consisting of rock muclh, trees and shrubs will be installed along the south and southwest edges of the site in the vicitiy of the treatment plant.

VIII. OTHER CONTROLS

A. Material Storage, Spill Prevention and Response [§ I.B.1d.(1)]

Provide a description of the construction materials and chemicals that are expected to be stored onsite, with updates as appropriate. Describe the BMPs that will be provided to ensure proper storage of these construction materials that will minimize their exposure to stormwater. Describe the response measures that will be provided if a spill occurs.

No construction materials or chemicals will be stored on the project site during the construction of the RIBs. Construction vehciles, materials and supplies associated with the construction of the RIBs (stored offsite) and the expansion of the treatment plant (stored on the southwest corner of the site - Figure 3) will use the appropriate BMPs indicated for Vehicle and Equipment Cleaning (GM-7), Maintenance and Fueling (GM-8), Handling and Disposal of Concrete and Cement (GM-9), Material Delivery, Handling, Storage and Use (GM-10), Paints and Liquid Materials (GM-11), Sanitary/Septic Waste Management (GM-14) and Spill Prevention and Control (GM-6).

B. Offsite Vehicle Tracking Controls [§ I.B.1d.(2)]

Provide a description of the control measures that will be provided to prevent tracking or deposition of sediments offsite and the measures that will be used to remove any sediment that have been deposited on the paved roadways bordering the site.

During the construction of the RIBs no offsite tracking of sediment is anticipated from the site since all excavation equipment will use a temporary access road located between RIB Nos. 6 and 9 and the storage area located directly to the east on the Woodland Village Phase 13 project site. Any construction vehicles that access the RIB construction site and exit the area through the Woodland Village Phase 13 project site shall do so via a stabilized Construction Site Entrance/Exit (BMP fact sheet SC-8) installed by the contractor responsible for that project.

During the expansion of the treatment plant, a stabilized Construction Site Entrance/Exit (SC-8) will be installed at the new entrance to the treatment plant site (Figure 3). As noted on BMP fact sheet SC-8, the stabilized entrance/exit will be constructed of 1-3 inch washed, well-graded gravel or crushed rock to a minimum depth of 12 inches. The stabilized entrance/exit will have a minimum length of 50 ft and a minimum width of 10 ft. Additional gravel or crushed rock will be applied whenever necessary to prevent tracking of sediments onto paved roadways. Any sediment deposited from the site onto paved roadways will be removed daily and diposed of onsite.

C. Construction Waste Storage and Disposal [§ I.B.1d.(3)-(4)]

Describe the construction wastes that are expected to be generated onsite. Construction waste include concrete washout, excess building materials, chemicals, litter and debris. Describe the BMPs that will be used to temporarily store these wastes, how they will be collected and disposed, and the response measures that will be provided if a spill occurs

All construction wastes generated onsite will be properly disposed of in covered roll off dumpters located either at the offsite storage area noted on Figure 2 or the Contractor Work Area noted on Figure 3. All roll off dumpsters will be serviced at regular intervals and will remain covered whenever windy conditions occur, rain is predicted or construction activities are not occuring at the site (i.e. at night and on weekends).

A dedicated concrete washout pit (GM-9) will be constructed onsite for concrete and cement waste management. A sign will be posted to identify its location and all contractors and subcontractors will be educated on the proper use of the washout area. A berm will be placed around the concrete washout pit to prevent runoff from entering. Concrete washout facilities should be used only to temporarily contain washwater from the cleaning of concrete-coated equipment and washout from concrete trucks. They should not be for disposal of excess concrete and cement and trucks should not be allowed to back turn and dispose of residual loads.

D. Hazardous and Sanitary Waste Storage and Disposal [§ I.B.1d.(3)-(4)]

Provide a description of hazardous and sanitary or septic wastes that are expected to be generated onsite. Describe how these wastes will be temporarily stored, collected and the response measures that will be provided in the event of a spill. Describe the measures that will be used to ensure no contact with stormwater.

No hazardous wastes will be generated during the construction of this project.

The contractor will be responsible for the appropriate practices of managing and maintaining all temporary mobile sanitary waste stations used during the construction of this project consistent with specifications noted on BMP fact sheet GM-14.

E. Offsite Discharges [§ I.B.1d.(5)]

Provide a description of potential offsite pollutant sources from dedicated sites such as asphalt or concrete plants and describe the BMPs that will be provided to minimize stormwater pollution.

No dedicated asphalt or concrete plants are anticipated for the construction of this project.

F. Non-Stormwater Discharges [§ I.B.1h]

Provide a description of the activities that may produce non-stormwater discharges, such as water line flushings and dewatering from excavation. Describe the BMPs that will be used to minimize stormwater pollution.

No non-stormwater discharges are anticipated during the construction of this project.

IX. Inspection/Maintenance Procedures

The contractor or his qualified agent is required to inspect all disturbed areas, areas used for storage of materials and equipment that are exposed to precipitation, including vehicle entrance and exit locations and all erosion and sediment control BMPs. Inspections shall occur weekly, prior to forecasted rain events, and within 24 hours after any actual rain event. The following sources may be used to obtain weather forecasts:

- The National Weather Service: Telephone: (775) 673-8100
 Website: http://www.wrh.noaa.gov/Reno/
- The Western Regional Climate Center Website: http://www.wrcc.dri.edu/CURRENTOBS.html
- The Weather Channel Website: http://www.weather.com/weather/detail/USNV0076

Once storms are imminent, a portable NOAA weather radio can also provide useful information. NOAA weather radio broadcasts are made on one of seven high-band FM frequencies. These frequencies are typically only on radios that provide a "weather band" as an added feature or portable weather radios that exclusively provide weather broadcasts. The local FM frequency for the Reno/Sparks area is 162.500 MHz. Taped weather messages are repeated every four to six minutes and are routinely revised at least once every one to three hours, 24 hours daily.

A. Inspection and Maintenance of Stabilization and Structural Practices [§ I.B.1d.(f)-(g)]

Provide a description of the practices that will be used to inspect and maintain all Temporary and Permanent Stabilization Practices described in boxes VI.B and VI.C and all Structural Practices described in box VI.D.

Temporary and permanent stabilization practices (e.g. slope tracking EC-2, mulching EC-3, riprap EC-7 and revegetation EC-8) shall be inspected for loss of mulch and riprap and formation of gullies and rills after storm events. Lost mulch and riprap should be replaced immediately and gullies and rills filled to prevent further erosion.

The permanent structural practice that will be installed during the construction of the treatment plant (the stormwater infiltration basin) should be inspected after every significant rainfall event to ensure that water does not pond in excess of 7 days. Any damage caused by construction or erosion should be repaired immediately. Silt should be removed from the basin whenever extended ponding begins to occur or when the silt depth reaches one-third of the basin volume.

B. Inspection and Maintenance of Other Controls [§ I.B.1d.(f)-(g)]

Provide a description of the practices that will be used to inspect and maintain all Other Controls described in Sections VIII. A. through F.

The following BMPs will be inspected weekly to ensure all contractors and subcontractors are implementing the proper procedures:

<u>Spill Prevention and Control (GM-6)</u> – adequate supplies of spill cleanup materials will be maintained onsite and located close to storage, fueling, and unloading areas. On-site vehicles and equipment will be inspected and leaks repaired.

<u>Vehicle and Equipment Cleaning (GM-7)</u> – if a containment sump is installed, it will be inspected weekly and sediments and liquids removed as needed.

<u>Maintenance and Fueling (GM-8)</u> – all containment structures and sumps will be inspected weekly and waste removed as necessary. All waste fluid containers will be maintained in a leak proof condition.

<u>Handling and Disposal of Concrete and Cement (GM-9)</u> – Accumulated wastes will be disposed of at least once per week. When the washout is 75 percent full, it must be cleaned or a new washout must be constructed.

Material Delivery, Handling, Storage and Use (GM-10) – Storage areas will be inspected weekly to ensure neatness. Proper storage instructions and Material Safety Data Sheets (MSDS) will be posted for all currently stored materials where appropriate. Any damaged secondary containment structures shall be repaired or replaced immediately. All empty containers and packaging will be removed from the site. Materials will be stored with adequate clearances for access and emergency response.

Paints and Liquid Materials (GM-11) – these materials will be stored in the appropriate containers and properly disposed of offsite.

<u>Sanitary/Septic Waste Management (GM-14)</u> – All temporary sanitary facilities should be inspected at least once per week. Units should be properly maintained, repaired, or replaced by liscensed professional company.

Additional inspection and maintenance procedures are presented in Appendix B.

X. CERTIFICATIONS OF COMPLIANCE

A. This SWPPP must be certified that it is consistent with all applicable Federal, State and Local regulations, or other approved site plans or permits. It is to be prepared in accordance with the Truckee Meadows Construction Site Best Management Practices (and Handbook. This SWPPP must be updated as necessary to remain consistent with the changes in other site plans that effect soil disturbing activities, site drainage patterns or any other activity that may impact stormwater runoff quality. It must also be re-certified annually by July 1 until the construction project is complete and a Notice of Termination has been submitted to NDEP.

OWNER/OPERATOR CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations [§ II.B.1d.].

Initial Certification:		
		٠
Print Name	Title	•
Signature	Date	
Annual Re-Certification:		
Print Name	Title	
Signature	Date	

B. All contractors and subcontractors responsible for implementing pollution control measures must be identified in this SWPPP with the measures for which they are responsible. They must also sign the following certification statement that indicates they understand the requirements of the States General Permit for Construction Activities (Attach Copy of Permit).

CONTRACTOR'S CERTIFICATION STATEMENT

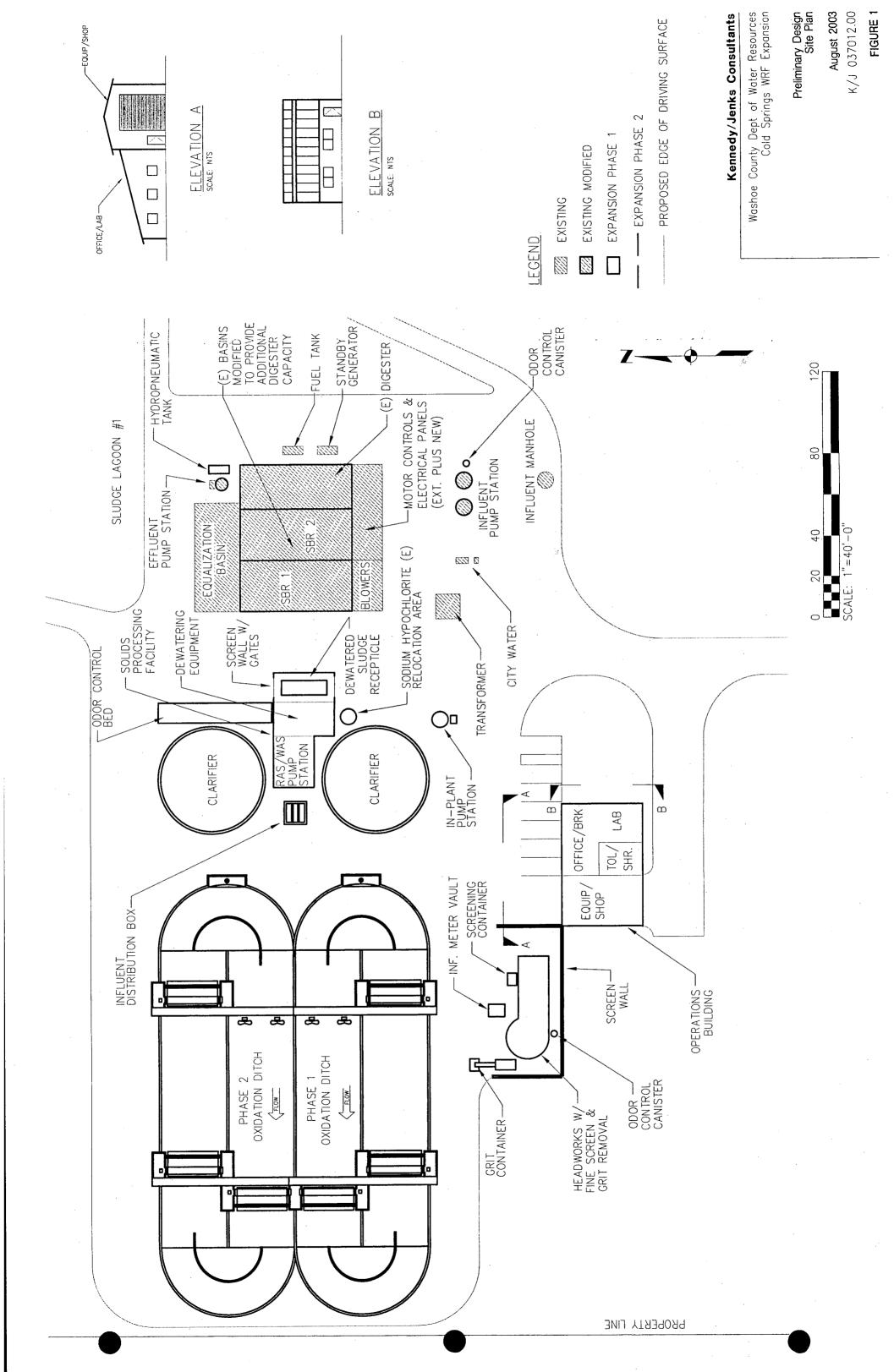
I certify under penalty of law that I understand the terms and conditions of the State's General Permit (NVR100000) that authorizes stormwater discharges associated with industrial activity from the construction site identified as part of this certification.

·.	
Company 1	Address
City	State Phone No.
Print Name	Title
Signature	Date
Responsibilities	
Company 2	Address
City	State Phone No.
Print Name	Title
Signature	Date
Responsibilities	
Company 3	Address
City	State Phone No.
Print Name	Title
Signature	Date
Responsibilities	

XI. RECORD OF CONSTRUCTION ACTIVITIES

Dates of Major Construction	on Activities and BMPs
on a portion of a site tempor permanent stabilization prac	najor grading activities occur, the dates when construction activities arily or permanently cease, and list the dates when temporary and tices are implemented. Photo documentation of major construction of BMPs is strongly recommended.

	DESIGN DATA EXI	EXISTING (2003)	DESIGN (2004)	DESIGN (2014)	DESIGN DATA	EXISTING (2003)	DESIGN (2004)	DESIGN (2014)
Note 1971	FFLUENT FLOW AND LOADING OPULATION DATA				SECONDARY CLARIFIER TYPE	NA	CIRCULAR CENTER-FEED	CIRCULAR CENTER-FEED
	EQUIVALENT RESIDENT UNITS, ERU		3,100	5,200	NUMBER DIAMETER EEFT	AN A	2	2 2
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	POPULATION FACTOR, CAPITAL/ERU		2.83	2.83 250	DIAMETER, FEET SIDE WATER DEPTH, FEET	AN AN	50	50 12
1.00 1.00	BOD CONCENTRATION FACTOR, LB/CAPITA		0.2	0.2	SURFACE AREA EACH, SF	Y Y	1,963	1,963
1 1 1 1 1 1 1 1 1 1	TSS CONCENTRATION FACTOR, LB/CAPITA		0.2	0.2	بر 9		3,927	2,92/
1.00 1.00	AVERAGE DAILY		0.7	1.2			178	306
1.00 1.00	PEAK HOUR		1.75	ħ.,	SOLIDS LOADING RATE PPD/SE	NA	J. 24	69/
1.00 1.00	008		1,763	3,022	AVERAGE DAY	AN	5.4	7.6
17.2 2.5	TSS	584	1,763	3,022			10.8	19.8
1,	TOTAL NITROGEN	175	350	009			CONSTANT FLOW	CONSTANT FLOW
100 100	LUENT LOADING, MG/L	000		303	RAS PUMPS TYPF	• • • • • • • • • • • • • • • • • • •	DRY-BIT CENTRIE ICA	DRY-PIT CENTRIFICAL
MANIE CONTINUE C	SST SST	200	302	302	NUMBER		3	3
Comparison Com	AMMONIA	33	48	48	CAPACITY (EACH), GPM @ T		700 @ 25	700 @ 25
Control Cont	IOIAL NIROGEN DES PERMIT RECLIREMENTS MG/I	09	00	60	WASIE ACTIVATED SCUDGE SYSTEN			
Control Cont	BOD	30	30	30	TYPE	NA	DRY-PIT CENTRIFUGAL	DRY-PIT CENTRIFUGAL
Column C	TSS MATORIAL MATORIAL	30	30	30			2 2 2 2 5 2 5	2 00 0 00 15
	IOTAL NITROGEN MOND PEAK PIMP STATION	2	. 07		CHLORINE FEED SYSTEM		100 @ 23	CZ ∌ 001
	POINT OF DISCHARGE INFLUENT F		ADWORKS(when upgraded, 1400 gpm)	HEADWORKS		LIQUID SOBIUM HYPOCHLORITE	NA	AN
	DODLAND VILLAGE PUMP STATION POINT OF DISCHARGE		HFADWORKS	HFADWORKS	VOLUME, GAL	375	A Z	₹ Z
	LUENT PUMP STATION				CONCENITATION, % DF PUMPS	2.3	4 4 Z Z	ď ď
1	TYPE NIMBER	:YWELL/WETWELL	DRYWELL/WETWELL	DRYWELL/WETWELL		6.1	AN	N A
1	YING	-	-	F	EFFLUENT FLOW METERING	GEN NI NOTA		CITANDAM
1	STANDBY	(← ((EFFLUENT PUMP STATION	CLEVALION IN SON	O DE DESCRIPTION DE LA CONTRACTION DEL CONTRACTION DE LA CONTRACTI	
No.	CAPACITY, (EACH), GPM	800	800	800	TYPE	SUBMERSIBLE	SUBMERSIBLE	SUBMERSIBLE
No.	DESIGN HEAD, FEET	35	35	35	NUMBER	•	•	•
No.	FIRM CAPACITY, GPM	800	800	800	STANDBY			
Manufactor Man	ADWORNS OW METERING				TOTAL	2	2	2
Mail	TYPE	NA	MAGNETIC	MAGNETIC	CAPACITY, (EACH), GPM DESIGN HEAD, FEFT	1,100	1,100	1,100
Mail	KEENING	ΝΑ	PERFORATED BASKET	PERFORATED BASKET	FIRM CAPACITY, GPM	1,100	1,100	1,100
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	CAPACITY (PEAK HOUR), MGD	AN .	3.1	3.1	HAPID INFILITATION BASINS NUMBER	ίο	თ	12
Mail	NUMBER CHANNEL WIDTH, FEET	K Z	- 2	2 -	TOTAL AREA, ACRES	8.18	14.18	20.18
Number of The	HOLE DIAMETER, INCH	A A	0.25	0.25	DESIGN INFILTRATION RATE, IN/HR AFRORIC DIGESTER	0.1	0.1	0.1
Mail		NA	-	•-	NUMBER OF TANKS	-	רא	ES.
Mail	TYPE	. V N	VORTEX, CLASSIFIER	VORTEX, CLASSIFIER	TOTAL VOLUME, GAL	120,000	470,000 (1-120,000 & 2-175,000)	470,000 (1-120,000 & 2-
Mode	NUMBER	₹ V	-	-	DEPTH, FEET AFRATION SYSTEM	8-	89	80
1	CAPACITY (PEAK HOUR) MGD	NA	3.1	3.1	TYPE	JET TECH	. JET TECH	JET TECH
1	TYPE	SBR	OXIDATION DITCH	OXIDATION DITCH	BLOWER TYPE	POSITIVE DISPLACEMENT	POSITIVE DISPLACEMENT	POSITIVE DISPLACEMEN
15.1 1.5	NUMBER	2	-		TOTAL NAMEPLATE, HP		75 (1–15 & 2–30)	75 (1–15 & 2–30)
1.5 1.5	LENGTH, FEET	53 24	210 عن	210	DAILY DIGESTED SOLIDS PRODUCTION		1,058	1,813
1,15 1,15	SIDE WATER DEPTH, FEET	18	11	11	PERCENT SOLIDS (DIGESTED SLUDG		1.5	1.5
1.0 1.0	VOLUME, (EACH) MGAL	0.175	0.948	0.948	DAILY DIGESTED SOLIDS PRODUCTION GRAVITY THICKENING		8,460	14,490
12 12 12 12 12 12 12 12	TOTAL VOLUME, MGAL	0.35	0.948	1.896	THICKENING TYPE	JET TECH DECANTER	JET TECH DECANTER	JET TECH DECANTER
1.5 1.5	AVERAGE DAY	24	32.5	38.0	DEWATERING	;		
125 125 129	PEAK HOUR	9.6	13.0	15.2	TYPE	√	CENTRIFUGAL 1	CENTRIFUGAL
POSTIVE DISPLACEMENT BRUSH ROTOR STANDA STATION NA SUBMERSIBLE	BOD LOADING RAIE; PPD/1,000 CF AVERAGE DAY	12.5	13.9	13.9	CAPACITY, CPM, LB/HR	N.A.	65, 475	65, 475
POSITIVE DISPLACEMENT BRUSH ROTOR BRUS	DESIGN MLVSS, MG/L	3	3 1	; 1	IN-PLANT PUMP STATION	:		
POSITIVE DISPLACEMENT BRUSH ROTOR BRUS	DESIGN MLSS, MG/L	1	3,000	3,000	TYPE NIMBER	NA.	SUBMERSIBLE	SUBMERSIBLE
STANDBY NA		TIVE DISPLACEMENT	acica Holiga	actoa HSIIAB	DUTY	ĀV		-
1.260 1.210 1.260 1.210 1.260 1.210 1.260 1.210 1.260 1.210 1.26		2	3 50 50	9	STANDBY	Y N		- 1
1.260 FIRM CAPACITY, CPM NA 1.26	LENGTH	٧Z	30	30	(₹ ž	2	2 200 @ 25
1.260	NAMEPLATE HP, EA	30	09	09	5	ų ∢ Ž	700	2.007
1.260 1.26	MAXIMUM SOTR, PER BASIN	00	081	280				
5,120 15	LB/HR	06	630	1,260				
SCALES S	044	2,160	15,120	30,240				
SCALES RIB				DESICNED				
COLD SPRINGS VALLEY, NEVADA	PINE DE DOUBLETE		SCALES	89	WASHOE COUNTY DEPARTMENT OF W	ATER RESOURCES		
OLD SPRINGS WRF EXPANSION DESIGN CRITERIA DATE DAT	MENT, INCLUDING THE INCORPORATED		ı		COLD SPRINGS VALLEY, NEV	ADA	TABLE 1	
Ouest society and	S AN INSTRUMENT OF SERVICE FOR ECT AND SHALL NOT BE USED FOR ANY ACET WITHOUT THE WRITTEN		0 25nm		COLD SPHINGS WHF EXI	ANSION		ì
Kennedy/Jenks Consultants	DECT WITHOUT THE WAITTEN TON OF KENNEDY/JENKS CONSULTANTS.		DINENSION SHOWN, ADJUST SCALES	CHECKED	4 7		DESIGN CHITEHIA	LEGIS.
			ACCORDINGLY.	1	Kennedy/Jenks Consult	ants		1100



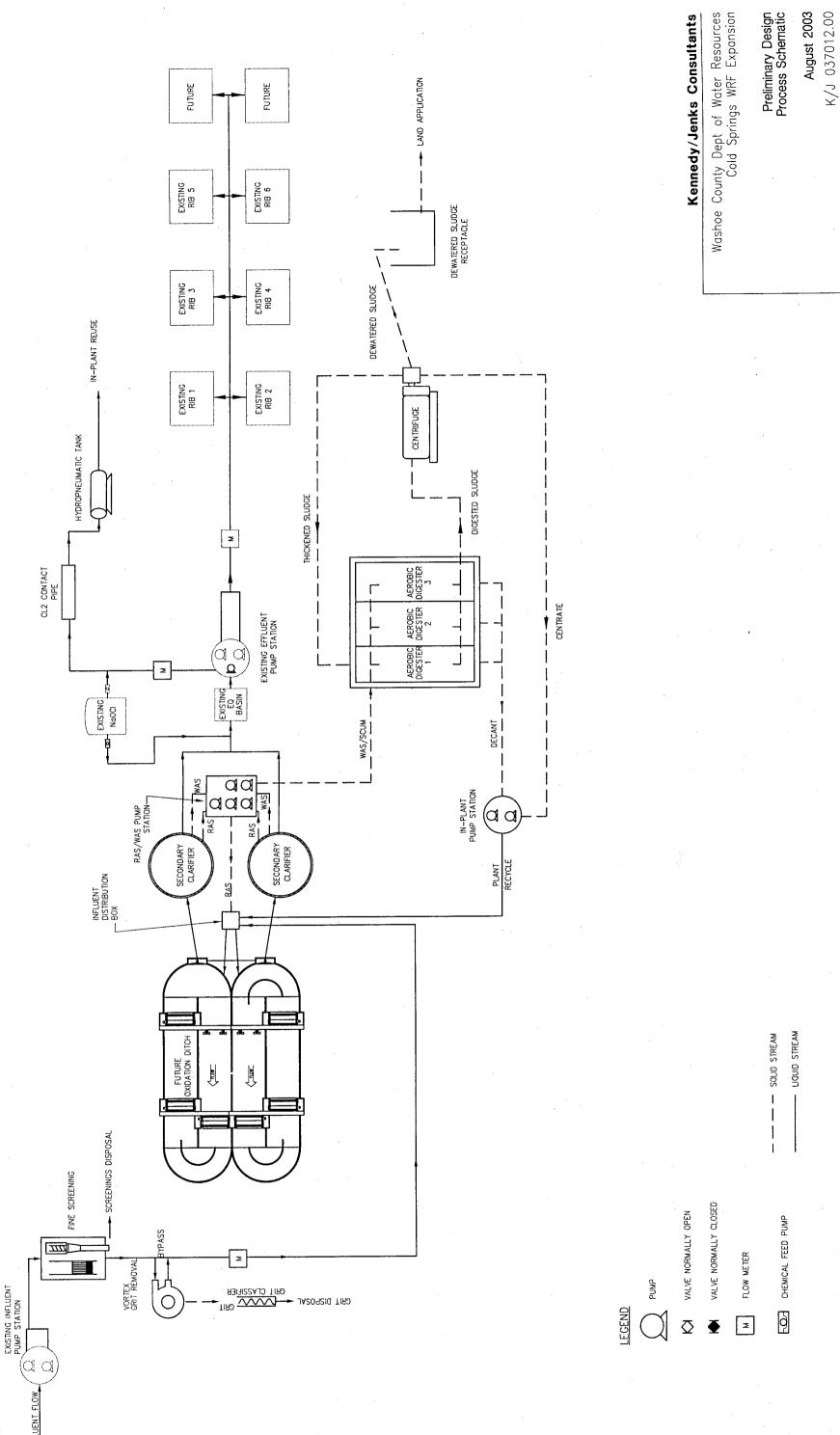
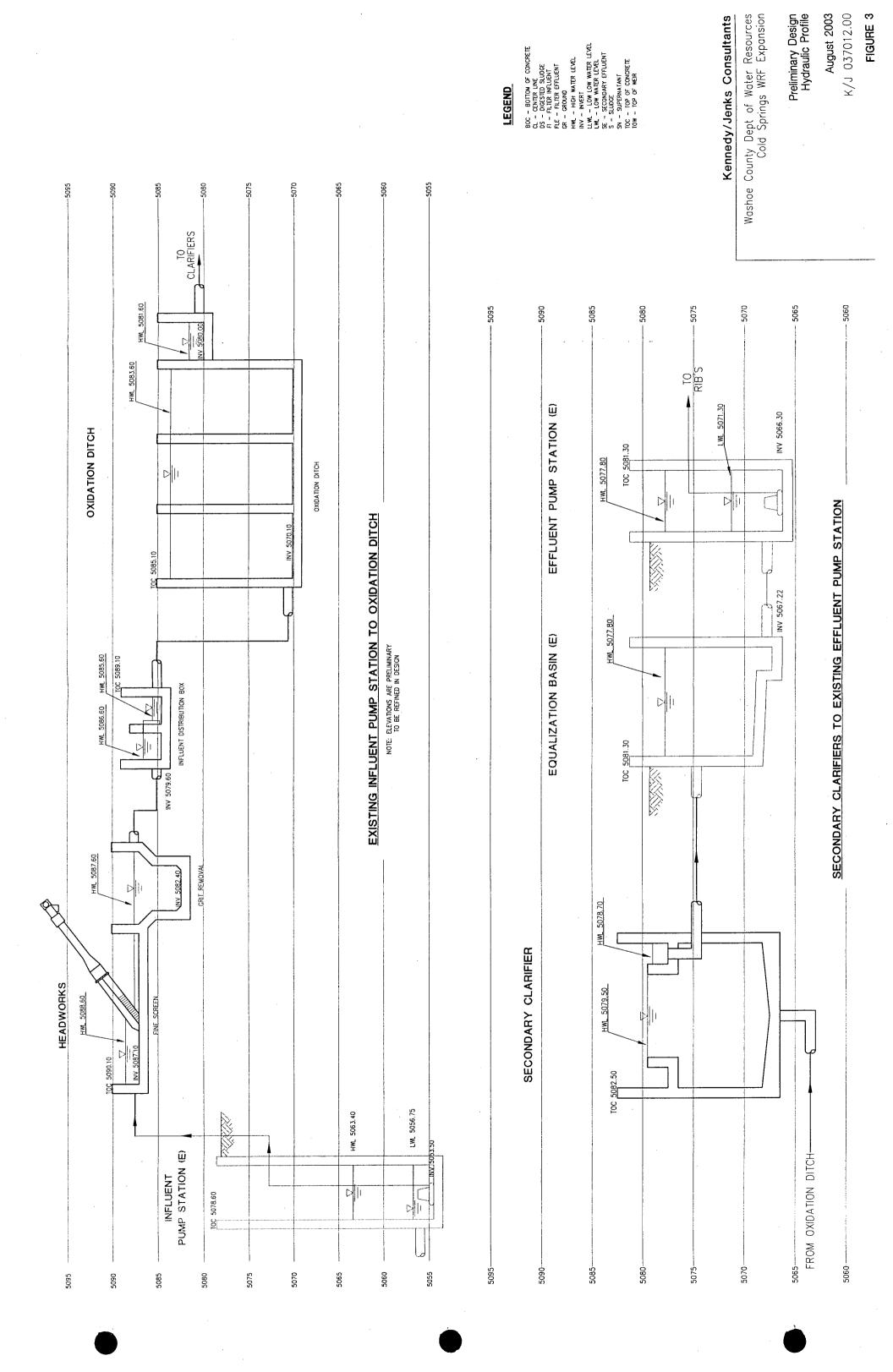


FIGURE 2



ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

 Project:
 Cold Springs Water Reclamation Facility Expansion
 Prepared By:
 JKC

 Date Prepared:
 20-Aug-03

 K/J Proj. No.:
 37012

IMARY BY AREA Months to Midpoint of Constr.: 15

	SUMMARY E	BY AREA	Months to Mi	dpoint of Constr.:	15
ITEM	ITEM RECORDING	MATERIALS	INCTALLATION	SUB-	TOTAL
NO.	ITEM DESCRIPTION	MATERIALS	INSTALLATION	CONTRACTOR	TOTAL
	Influent Pump Station	5,000			5,000
	Headworks	279,000		27,000	377,000
	In-Plant Pump Station	58,000			64,000
3.00	Oxidation Ditch	775,000	L		1,210,000
4.00	Secondary Clarifiers	435,000	101,000	74,000	610,000
5.00	RAS/WAS Pumping Facility	157,000	65,000	16,000	238,000
6.00	Aerobic Digester	34,000	5,000	10,000	49,000
7.00	Dewatering Facility	573,000	73,000	14,000	660,000
8.00	Effluent Pump Station	70,000	, ,		70,000
9.00	Rapid Infiltration Basins	40,000	152,000	16,000	208,000
10.00	Operators Building	209,000	166,000	24,000	399,000
	Yard Piping	117,000	25,000		142,000
12.00	SCADA Software/Programming	11,000	5,000	60,000	76,000
		· · · · · · · · · · · · · · · · · · ·		·····	
		- · · · · · · · · · · · · · · · · · · ·			
		······································			· · · · · · · · · · · · · · · · · · ·
		· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	
	Subtotals	2,760,000	950,000	400,000	4,110,000
	Contractor OH&P @ 15%	414,000	143,000	60,000	617,000
	Subtotals	3,170,000	1,090,000	460,000	4,730,000
	Construction Contingency 15%	476,000	164,000	69,000	709,000
	Subtotal	3,650,000	1,250,000	530,000	5,440,000
	Escalate to Midpt of Const. @ 2%				136,000
	Subtotal				5,576,000
	Construction/Administration @ 12%				669,000
	Total Estimate of Project Cost				6,250,000
			f		

Date Printed: 10/6/2003

ENGINEER'S	SESTIMA	ENGINEER'S ESTIMATE OF PROBABLE COST						KENNEDY/JENKS CONSULTANTS	ISULTANTS
Project:	Cold Spri	Cold Springs Water Reclamation Facility Expansion	Expansion					Prepared By:	JKC
, Area	::	Influent Pump Station						Date Prepared:	Aug-03 37012
i								Current at ENR_	6732.81
Estimate Type:	□×	Conceptual Preliminary (w/o plans)		Construction Change Order	tion Order			Escalated to ENR	
		Design Development @		% Complete	ete				
Spec. Section	Item No.	Description	ģ	Units	Materials \$/Unit	rials Total	Installation \$/Unit Total	Sub-contractor \$/Unit Total	Total
11		Odor Control	_	ST	5,000.00	5,000			5,000
16 & 17		Electrical	-	ΓS					
			,						
		·							
		-							
					T				
									-
Subtotals						5,000			5.000
2.2.2.2.2									

Page 3 of 15

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Prepared By: JKC
Date Prepared: Aug-03
K/J Proj. No. 37012.00

Current at ENR 6732.81 Escalated to ENR

Cold Springs Water Reclamation Facility Expansion Project:

Conceptual Preliminary (w/o plans) Design Development @ Headworks Estimate Type: Building, Area:

Construction
Change Order

]	Design Development (U		200000000000000000000000000000000000000							
Spec. Section	Item No.	Description	Αď	Units	Mat \$/Unit	Materials t Total	Insta \$/Unit	Installation it Total	Sub- \$/Unit	Sub-contractor Jnit Total	Total
02301		Excavation	20	کر			9.00	450	-	50	200
		Import Structural Fill	15	ჯ	7.95	119	7.53	113	7	30	262
		Backfill	20	ζ			15.00	300	٥	5	305
		Compaction	40	<u>ک</u>			1.18	47	2	69	116
		Hauling Dirt	31	ζ			4.85	150	-	30	181
1											
03300		Concrete Walls	20	ò	340.00	17 000	160 00	8 000	100	5,000	30.00
		Concrete Stairs	5	5	6.75	34	18.44	92	=	57	183
		Concrete Landings	009	r.	2.60	1.560	7.66	4 596	5	2724	A ABO
		Concrete Slab	75	ζ	190.00	14,250	70.00	5,250	8	6,750	26,250
05310		Metal Decking	300	P.					25	7,500	7,500
T		Stop Gates	5	EA	2,725,00	13.625	325.00	1 625			15.250
11330		Screening Equipment									
		Screening Basket	-	Ę	00.000,09	60,000	18,000.00	18,000			78,000
		Grit Removal	1	EA	00 000 59	65,000	19,500.00	19,500			84,500
		Bar Screen	-	EA	2,500.00	2,500	1,000.00	1,000			3,500
15550		Fiftings									
		8" Flexible Compling Adaptor	,	ΔĦ	150.00	300	50.00	100			700
		oden Buden San San San San San San San San San Sa		i			20.25	3			3
		Odor Scrubber	-	รา	2,000.00	2,000					5,000
		Influent Flow Meter/Vault		ų.	30,000,00						000
			1.00	SI	7,500.00	7,500					7,500
						L					
	Ī										
+											
T											
								3			
			,								
16 & 17		Electrical/Instrumentation (20%)				43,378		11,845		4,443	59,665
Subtotals						220 020		74 069		233 30	100 400

10/6/2003	
-	
ate	
2	

Project:	Cold Spr	Cold Springs Water Reclamation Facility Expansion	nolsus							Prepared By:	SK SK
Bullding, Area:	يا	In-Plant Pump Station							ã	Date Prepared: K/J Proj. No.	1 8
Estimate Type:				Construction Change Order	ction Order	•			ES C	Current at ENR Escalated to ENR	6732.81
Spec.	Item No.	Description	ě	Units	S/Un	Materials t Total	Instal	Installation Init Total	Sub-co	Sub-contractor	Total
02301		Excavation	225	ζ			00.6	2,025	-	225	2,250
00000		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		-	0000	000					
03300		Wetwell	25	2 4	1,000.00	25,000					25,000
11000		Pumps	2	EA	5,000.00	10,000	2,000.00	4,000			14,000
15050		Piping	-	ST	10,000.00	10,000					10,000
16&17		Electrical/Instrumentation (20%)	1	ST .	4,200.00	4,200	401.80	402			4,602
Subtotals						54,200		6,427		225	60,852

KENNEDY/JENKS CONSULTANTS

ENGINEER'S ESTIMATE OF PROBABLE COST





OST
BLEC
ROBA
OF P
Σ
S EST
NEER
ENG

Cold Springs Water Reclamation Facility Expansion Project:

Conceptual Preliminary (w/o plans) Design Development @ Oxidation Ditch Building, Area: Estimate Type:

Construction Change Order % Complete

Prepared By: JKC
Date Prepared: Aug-03
K/J Proj. No. 37012 Current at ENR 6732.81
Escalated to ENR

KENNEDY/JENKS CONSULTANTS

									ţ	,		:		į	i	1											
	Total		76.500	6,642	5,791	15,370	25,302	358,400	167,200	50,000			259,500												192,941		1 157 647
Sub-contractor	Total		7,650	760	1,094	9,116	4,253	61,600	44,000																25,695		154 168
Sub-co	\$/Unit		-	2	0	2	-	110	100															-			
ation	Total		68,850	2,861	4,697	6,254	21,049	95,200	35,200																46,822		280.933
Installation	\$/Unit		9.00	7.53	1.03	1.18	4.85	170.00	80.00																		
ials	Total			3,021				201,600	88,000	50,000			259,500												120,424		722,545
Materials	\$/Unit			7.95				360.00	200.00	50,000.00			259,500.00														
	Units		ζ	CY	CY	CY	ζ	≽	Շ	r.s	1		EA					1							rs		
	aty		7,650	380	4,560	5,300	4,340	260.00	440.00	-															-		
	Description	Earthwork	Excavation	Import Structural Fill	Backfill	Compaction	Hauling Dirt	Concrete Walls	Concrete Slab	Misc Metals		Equipment	CLR Equipment Package												Electrical/Instrumentation (20%)		
Item	ė.	w						7		-		J)													Ш		
Spec.	Section	02301						3300			000,	2001													6 & 17		ubtotals

KENNEDY/JENKS CONSULTANTS

Cold Springs Water Reclamation Facility Expansion Project:

ENGINEER'S ESTIMATE OF PROBABLE COST

6732.81 Aug-03 37012 Current at ENR Escalated to ENR K/J Proj. No. Construction Change Order % Complete Design Development @ Conceptual Preliminary (w/o plans) Clarifiers Building, Area: Estimate Type:

Spec.	Item				Mate	Materials	Insta	lation	Sub-	Sub-contractor	
Section	No.	Description	Qty	Units	\$/Unit	Total	\$/Unit Tot	Total	\$/Unit	Total	Total
02301		Excavation	800.00	СУ			9.00	7,200	+	800	8,000
		Import Structural Fill	262.00	CY	7.95	2,083	7.53	1,973	2	524	4.580
		Backfill	350.00	CΥ			1.03	361	0	84	445
		Compaction	612.00	СУ			1.18	722	2	1,053	1.775
		Hauling Dirt	450.00	CΥ			4.85	2,183	1	441	2.624
		Scum Pump Vault	1.00	EA	2,000.00	2,000					2,000
		Scum Pump Valve Vault	1.00	EA	2,000.00	2,000					2,000
03300		Concrete Walls	315.00	չ	340.00	107,100	160.00	50,400	100	31.500	189,000
		Concrete Slab on Grade	305.00	≿	290.00	88,450	70.00	21,350	06	27.450	137,250
		Misc Metals	1.00	rs.	5,000.00	5,000					5.000
11000		Scum Pumps	1.00	EA	5,000.00	5,000					5,000
11336		Equipment	100.00	DIA-FT	1,100.00	110,000					110,000
15050		Piping Scum Pump	1.00	rs	2,000.00	2,000					2,000
		RAS/WAS Piping	120.00	LF	120.00	14,400					14,400
16 & 17		Electrical/Instrumentation (20%)				67,607		16,838		12,370	96.815
Subtotals						405,639		101,026		74,222	580.887





- -
S
0
Ō
ш
ᆵ
oy.
*
₩.
×
PROB/
-
EOF
STIMATE
7
€
=
S
ш
·^
٧,
Œ
щ
₩
=
U
Z

KENNEDY/JENKS CONSULTANTS

Expansion	
on Facility	
Reclamativ	
3	ļ
Cold Springs	
ect:	

Project: Col	old Sprin	Cold Springs Water Reclamation Facility Expansion	nsion							Prepared Bv:	,KC	
Building, Area:		RAS/WAS Pumping Facility								Date Prepared: K/J Proj. No.	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
Estimate Type:		Conceptual Preliminary (w/o plans)		Construction Change Order	ction			ı	ESC	Current at ENR Escalated to ENR		
Spec. It	E S.	Description	ě	% Complete	Z lbi	Materials	Insta	Installation	o-qns	Sub-contractor		
╁	1	Earthwork		2		100		lolai	JIIIO/*	lotai	lotai	
		atio	100	Շ			9.00	006		100	1 000	
		Import Structural Fill	40	ζ	7.95	318	7.53	301	2	80	669	
		Backfill	20	ζ	·		1.03	52	0	12	2	
		Compaction	9	င်			1.18	7.1	2	103	174	
	\dagger	Hauling Dirt	8	≿			4.85	340	1	69	408	
03300		Concrete Slab	35	λ	290.00	10,150	70.00	2,450	96	3,150	15,750	
		Concete Walls	9	Շ :	340.00	3,400	160.00	1,600	100	1,000	6,000	
	+	Oriciere otalis	70	<u>-</u>	00.7	140	18.00	360	=	220	720	
04220	8	8"x16" Smooth Face CMU	1080	SF	5.75	6.210	5.50	5.940			12 150	
00000	4 (Roof Systems	200	SF	25.00	5,000					6,000	
00500	0	Structural Steel Framing	,	,								
	2	Columns and Beams Misc Metals	- 13	5 4	1,525	19,825	409	5,317	341.00	4,433	29,575	
11310		Vertical Non-Cloa Centrifugal Pumps	- 4:	3 4	00000	25,000	1 500 00	7 500			5,000	
			,	5	0000	000,02	on one'l	nnc',			32,500	
15050	-	Piping										
	+	6* DAG	9 5	<u>.</u>	25.00	2,500	5.00	200			3,000	
	+		3		72.00	2,500	2.00	200			3,000	
	ŭ.	Filtings										
		4* 90 deg El	10	EA	150.00	1,500	18.00	180			1.680	
	+	4" Tee	5	EA	140.00	700	27.00	135			835	
	+	4" Flexible Coupling	- ;	A i	206.00	506	65.00	65			271	
	+	6" Tee	2	2 5	200.00	3,000	30.00	450			3,450	
	-	6" Flexible Coupling	0 6	EA L	260.00	280	00.04	007			1,100	
				i	2007	3	00.00	0,40			1,020	
	- 12											
	}	Valves										
	+	4 Check Valve	- ,	S C	365.00	365	25.00	25			390	
	+	4 Flug valve	7	ă i	335.00	670	180.00	360			1 030	
	+	6" Dira Valve	2	1	545.00	1,635	40.00	120			1,755	
15400	ā	Plumbina	7	5 0	15,000,00	3,2/3	10,000,00	1,400			4,675	
15800	Ĭ	Heating, Ventilating, and Air Cond.	-	S	14,000.00	14 000	15,000.00	15,000			25,000	
15990	Í	VAC Testing and Balancing	+	SJ					4 000	4 000	4 000	
16 & 17	ū	Electrical/Instrumentation (20%)				24,415		10,801		2,633	37,849	
Cultotale	-											
						146,489		64,806		15,800	227,095	

KENNEDY/JENKS CONSULTANTS

Aug-03

JKC

37012 6732.81

Current at ENR Escalated to ENR Construction Change Order Cold Springs Water Reclamation Facility Expansion Conceptual Preliminary (w/o plans) Aerobic Digester Building, Area: Estimate Type: Project:

ENGINEER'S ESTIMATE OF PROBABLE COST

		Design Development @		% Complete							
Spec. Section	Item No.	Description	Qty	Units	Materials \$/Unit	erials Total	Instal \$/Unit	Installation nit Total	Sub-c \$/Unit	Sub-contractor nit Total	Total
		Concrete Wall Drilling	-	FS					10.000	10 000	10 000
									200'51	000	000'01
		Header Replacement	2	EA							
		Decanter Piping Modifications	1	rs	12,000.00	12,000					12.000
		Piping									
		4" WAS	200	<u>.</u>	25.00	5,000	5.00	1,000			6.000
		6" DS	160	LF.	28.00	4.480	11.00	1.760			6.240
		Fittings									212
		4" Tee	2.00	EA	140.00	280	27.00	54			334
		4" 90 deg EI	10	EA	150.00	1,500	18.00	180			1 680
		Valves									
		4" Plug	4	EA	340.00	1,360	180.00	720			2.080
		6" Plug	4	EA	500.00	2,000	200.00	800			2,800
	,										
	1										
		Electrical	-	rs		5,324		903		200	6,427
Subtotals						31,944		5,417		10.200	47 561





Date Printed: 10/6/2003

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

6732.81

Current at ENR Escalated to ENR

Aug-03

Prepared By:
Date Prepared:
K/J Proj. No.

Cold Springs Water Reclamation Facility Expansion Project:

Dewatering Facility

Building, Area:

Conceptual Preliminary (w/o plans) Design Development @

Estimate Type:

Construction

Order	plete
Change Order	% Comp

			l Total
		Sub-contractor	Total
		gns	\$/Unit
		Installation	Total
		Instal	\$/Unit
		Aaterials	Total
מ מנו	<u>lete</u>	Mate	\$/Unit
Joinanige Older	% Comp		Units
ı	- 1		

Spor	1400				- Mark	oloi.	1	11-45	1		
Section	2	Description	à	Inite	Male (4/11/2)	Malerials	Insta	Installation	tions -	Sub-contractor	T.
		TORKI DESC	ا ا	SIII O	THO (*	i ora		lotal	1110/6	Lotal	lotal
12301		Earthwork									
		Excavation	40	չ			9.00	360	-	40	400
		Import Structural Fill	40	Շ	7.95	318	7.53	301	2	80	669
		Backfill	15	СУ			1.03	15	0	4	19
		Compaction	25	ζ		ļ.	1.18	30	2	43	73
		Hauling Dirt	30	ζ			4.85	146	-	29	175
12820		Fencing and Gates	50	<u>u</u>	35.00	1 750	5.00	250			2,000
											2007
3300		Concrete Slab	20	ζ	130.00	6,500	120.00	6,000	100	5,000	17,500
0007		1 1 0 not no		į							
74220		8"X16" Smooth Face CMU	1,000	Z,	5.75	5,750	5.50	5,500			11,250
		Metal Roofing	009	SF	10.00	6,000	2.00	3,000			000'6
5300		Structural Steel Framing						,			
		Columns and Beams	13	Ton	1,525.00	19,825	409.00	5,317	341	4,433	29,575
		Misc Metals	1	rs	5,000.00	5,000					5,000
		Metal Decking									
		1-1⁄2 " deep wide rib, 18ga, G90 &	150	SF	1.82	273	0.56	84	1	84	441
1000		Centrifuge	1	LS	250,000.00	250,000					250,000
		Polymer Equipment		rs	40,000.00	40,000					40,000
		Sludge Conveyor	1	ST	00'000'52	75,000					75,000
		Sludge Feed Pump	_	EA	5,000.00	5,000	1,000.00	1,000			000'9
		Thickening	1	LS							
		Odor Scrubber	1	ST	70,000.00	70,000					70,000
5800		Heating, Ventilating, and Air Cond.	1	LS	28,000.00	28,000	40,000.00	40,000			68,000
5990		HVAC Testing and Balancing		ΓS					4,000	4,000	4,000
5400		Plumbing	1	LS	10,000.00	10,000	10,000.00	10,000			20,000

Pre-Design Cost Estimate.XLS Dewatering

12,183 621,314

274

1,440 73,443

10,468 533,884

Electrical/Instrumentation (20%)

Subtotals 16 & 17

15400 15990

13,987

Prepared By: JKC	Date Brongered: And OS
rings Water Reclamation Facility Expansion	
	Id Springs Water Reclamation Facility Expansion

Project: Cold Springs Water F					KENNEDY/JENKS CONSULTANTS	ULTANT
	Cold Springs Water Reclamation Facility Expansion	ansion		!	Prepared By: JKC	JKC
Building, Area: Effluent Pur	Effluent Pump Station				Date Prepared: Aug-03 KJ Proj. No. 37012	Aug-03 37012
Estimate Type: Conceptual X Preliminary (w/o plans)	II y (w/o plans)	Construction Change Order	·		Current at ENR 6732.81 Escalated to ENR	6732.81

ltem		Č		Materials	rials	Installation	lation	Sub-contractor	intractor	
vo. Description		Ctry	Units	\$/Unit	Total	\$/Unit	Total	\$/Unit	Total	Total
	- 1									
Electrical		1	SJ	30,000.00	30,000					30 000
Effluent Flow Meter		-	ST	30,000.00	30,000					30,000
Sampler		1	ST	5,000.00	5,000					5,000
	•									
,										
,	- 1									
	$\overline{}$									
	Н									
	\neg									
	Ţ									
	,									
	. 1									
	- 1									
	- 1				65,000					65,000





. Date Printed: 10/6/2003

205,260

16,000

151,985

37,275

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

JKC Aug-03

Prepared By:
Date Prepared:
K/J Proj. No.

6732.81 37012

Current at ENR_Escalated to ENR_

Cold Springs Water Reclamation Facility Expansion Project:

Rapid Infiltration Basins
uilding. Area:

۱ ا															Ì	ŀ					
Escalated to ENR		Sub-contractor	lotai	16,000			·	1		1	2		9444								
is is		Sub-c	a/Onit	1																	
		ation	rotai	144,000		5,600			195	290			1,900	i							
		Installation	#NODIIC	9.00		7.00			39.00	58.00			380.00								
		rials	i ora			24,000			2,250	2,275			8,750								
tion	Order ete	Materials	1100/			30.00			450.00	455.00			1,750.00								-
Construction	Change Order % Complete	1	OIIIIS	ζ		F.			EA	EA			EA								-
		į	ξίζ.	16,000		800			5	2			. 2								-
Conceptual	Preliminary (w/o plans) Design Development @	Occupation		Excavation	Civio	10" RIB		Fittings	10" 90 deg El	10" Tee		Valves	10" Plug								
		ltem No		Ш				<u>"</u>				<u>></u>									-
Estimate Type:		Spec.		02301	15050																_

29,600

2,445

2,565

10,650

160,000

Total

Subtotals

Date 10/6/2003

ENGINEER'S ESTIMATE OF PROBABLE COST

Project: Cold Springs Water Reclamation Facility Expansion

Building, Area: Operators Building

Conceptual
Preliminary (w/o plans) Change Order
Design Development @ %Complete

Estimate Type:

Escalated in

Prepared By: JKC
Date Prepared: Aug-03
K/J Proj. No. 37012
Current at ENR 6732.81
Escalated to ENR

KENNEDY/JENKS CONSULTANTS

Section	Š	Description	å	Units	Mate \$/Unit	Materials It Total	Inst \$/Unit	Installation Init Total	Sub \$/linit	Sub-contractor	150
				L							2
02301		Earthwork									
		Excavation	150	5			8	0,0,0			
		Import Structural Fill	Ş	2	7.05	000	9 5	1,330		150	1,500
		Backfill	3 3	3	Si	887	1	526	2	09	524
	L	Compaction	3 8	5			1.03	62	0	14	9/
			8	5			1.18	71	2	103	174
03200		Reinforcing Steel Slab on Grade	20	\perp	00 303						
33300		Concrete State	3 3	4	00.626	CZ9'Z		2,275	370	1,850	6,750
03350		Slab Eleichen	00.02	٦	130.00	15,600		14,400	100	12,000	42,000
2350		Sido riffishes	1,600.00	Z.			0.37	592	0.18	288	880
2555		Floor Hardener and Sealer	1,600.00	SF	0.13	208	0.17	272	0.10	160	640
04220		8"v16" Smooth East Ottl		į							
		OWN STATE OF	4,410	አ	5/2	25,358	5.50	24,255			49,613
06200		Break Room Cabinets and Counter	12	<u>"</u>	250.00	3,000	90	1 200			
06250		Finish Carpentry and Cabinet Work	-	S	4 000 00	4 000	3	1,200			4,200
						200					4,000
0/200		Roof Insulation: Batts	1,600	SF	0.20	320	0.30	480			008
		Roof Insulation: Rigid Over Shop	1,000	SF	0.36	360	0.26	260			000
		Wall Insulation: Batts	2,000	SF	0.36	720	0.26	520			070
0/400		Metal Roofing and Siding	1,700	SF	3.00	5,100	2.00	3.400			047
0/600		Flashing/Downspouts	100	ĿF	10.00	1,000	2.00	200			4 500
,											3
00100		Door/Frames	9	EA	450.00	2,700	120.00	720			3 120
		Pair Door/Frame	-	EA	00:009	900	200.00	200			2,420
		Overhead Doors	2	EA	1,000.00	2,000	500.00	1,000			2000
02520		Windows 4'x4"	9	EA	320.00	1,920	200.00	1.200			3 130
											2, 2
09100		Metal Stud Walls	300	SF	3.50	1,050	1.30	390			4 440
06260		Acoustic Tile Ceiling	600	SF	1.00	900	1.00	009			2007
00000				•							2021
200		rainting	-	S T	6,000.00	000'9					9,000
0800		Toilet Accessories	-	0	00	000	0000				
				3	00.000	000	200.00	200			1,000
2000		Lab Cabinets & Epoxy Counter	25	Ľ,	300.00	7,500	151.00	3,775			11 275
		Piping Valves and Accessories	-	o	25 000 00	00000	70000				
5400		Plimbino		3 5	00.000,62	000,52	15,000.00	15,000			40,000
5800		Heating Ventilating and Air Cood	-	3 9	00.000.60	15,000	15,000.00	15,000			30,000
5990		HVAC Testing and Ralancian	- -	3 9	28,000.00	28,000	40,000.00	40,000			68,000
				3	1				4,000	4,000	4,000
16 & 17		Electrical and Controls				44,910		38.384		5 588	68 88
										2000	700,000
Subtotals						194,609		166.332		24 243	395 454
										21412	לייייייייייייייייייייייייייייייייייייי





H
က
0
ပ
ш
SABLE COS
Ä
ò
PROB
œ
Ω.
Ĭ.
О
AATE OF I
7
È
_
EST
ш
ľ
EER'
щ
뿌
€
<u></u>
z
ш

Cold Springs Water Reclamation Facility Expansion Project:

Conceptual Preliminary (w/o plans) Yard Piping Building, Area: Estimate Type:

Design Development @

Construction Change Order % Complete

JKC Aug-03 37012 6732.81 Prepared By:
Date Prepared:
K/J Proj. No. Current at ENR _____

KENNEDY/JENKS CONSULTANTS

					Materials	2	316121	Hallon	7 235	Sub-collitaciól	
Section	No.	Description	Qty	Units	\$/Unit	Total	\$/Unit	Unit Total	\$/Unit	Total	Total
15050		Piping									
		2" PW	625	F)	15.00	9,375	2:00	3,125			12,500
		4" WAS	200	F.	20.00	4,000	2.00	1,000			2,000
		6" RAS	100	LF	25.00	2,500	5.00	200			3,000
		Q.,9	250	F	25.00	6,250	5.00	1,250			7,500
		8" RAS	200	37	28.00	2,600	00'9	1,200			6,800
		6" FM	100	F.	25.00	2,500	00'9	200			3,000
		16" SE	275	F.	45.00	12,375	17.00	4,675			17,050
		16" RW	325	3	45.00	14,625	17.00	5,525			20,150
		16" WW	275	77	45.00	12,375	17.00	4,675			17,050
		Fittings									
		4" 90 deg El	10	EA	150.00	1,500	18.00	180			1,680
		6" 90 deg El	10	EA	200.00	2,000	27.00	270			2,270
		6"Tee	2	EA	180.00	006	40.00	200			1,100
		8" 90 deg El	2	ĘĄ	290.00	1,450	30.00	150			1,600
		10" 90 deg El	2	EA	450.00	2,250	39.00	195			2,445
		10" Tee	2	EA	455.00	2,275	00'89	290			2,565
		16" 90 deg El	2	EA	00'069	3,450	28.00	290			3,740
		16" Tee	2	EA	1,200.00	000'9	100.00	200			6,500
		1-1/4" Yard Hydrant	9	EA	1,000.00	000'9					
		RPBP	-	ST	10,000.00	10,000					10,000
		Valves									
		16" Plug Valve	-	EA	4,000.00	4,000	400.00	400			4,400

75,000

000,09

5,000

10,000

Subtotals

KENNEDY/JENKS CONSULTANTS	Prepared By: JKC
ENGINEER'S ESTIMATE OF PROBABLE COST	roject: Cold Springs Water Reclamation Facility Expansion

Project:	Cold Spr	Cold Springs Water Reclamation Facility Expansion	ansion						. 1	Prepared By:	KC
Building, Area:	·	SCADA							ة "	Date Prepared: K/J Proj. No.	Aug-03 37012
Estimate Type:		Conceptual		Construction	ction				CL Esca	Current at ENR Escalated to ENR	6732.81
	\square	Preliminary (w/o plans) Design Development @		Change Order % Complete	Order <u>lete</u>					ı	-
Spec. Section	Item No.	Description	ģ	Units	5	Materials it Total	Instal \$/Unit	Installation iit Total	Sub-co \$/Unit	Sub-contractor nit Total	Total
		SCADA Software/Programming	-	<u> </u>	10 000 00	10.000	5,000,00	5,000	90009	60.000	75,000
		Barrier Colon	-	3	00.000,00	200	00.000,0	200	200,00	80.00	200,5
_	_					_				-	





Date Printed: 10/6/2003

ENGINEER'S ESTIMATE OF PROBABLE COST

Cold Springs Water Reclamation Facility Expansion Project:

Diamond Peak Lift Station Conceptual

| Reliminary (w/o plans) | Design Development @ Building, Area: Estimate Type:

Construction Change Order

% Complete

Current at ENR 6732.81 Escalated to ENR

KENNEDY/JENKS CONSULTANTS

JKC Aug-03

Prepared By:
Date Prepared:
K/J Proj. No.

37012

Spec.	Item				Materials	rials	Installation	-qns	Sub-contractor	
Section	No.	Description	Qty	Units	\$/Unit	Total	\$/Unit Total	\$/Unit	Total	Total
		Cathodic Protection	. 1	S7	35,000.00	35,000	L			35,000
		Upgrade Pumps	1	ST	45,000.00	45,000				45,000
		Temporary Pumping and Valving	-	rs	30,000.00	30,000				30,000
		Misc	1	rs	20,000.00	20,000				20,000
		Contingency (25%)	-	ΓS	32,500.00	32,500				32,500
									,	
									Town the second	
									3	
									12.00	
									i.	
,										
totals			-			162,500				162,500

Prepared For: Joe Ho

Joe Howard and Rick Warner, Washoe County Department of Water

Resources

Submitted by:

Travis Tormanen, Ron Bush and Lynn Orphan

Kennedy/Jenks Consultants

Cc:

Ken Mallory, SPB Utilities Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Subject:

Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

Washoe County is considering installation of either a belt filter press (BFP) or a centrifuge decanter (centrifuge) for dewatering aerobically digested secondary sludge at the Cold Springs Water Reclamation Facility (CSWRF). This technical memorandum is intended to serve as a basis for comparing the two alternatives by presenting a life-cycle cost analysis and the advantages/disadvantages for both types of dewatering systems.

DESIGN CRITERIA

Table 1 lists the design criteria for the dewatering equipment.

Table 1: Digested Sludge Design Criteria

Criteria	Phase 1 ^(a)	Phase 2 ^(b)
Influent ADF ^(c)	0.7 mgd	1.2 mgd
Influent BOD Concentration	302 mg/l	302 mg/l
Assumed Overall Yield Coefficient ^(d)	0.60 ^(d)	0.60 ^(e)
Daily Digested Solids Production	1,058 lbs dry solids	1,813 lbs dry solids
Weekly Digested Sludge Production	7,405 lbs dry solids	12,692 lbs dry solids
Percent Solids (Digested Sludge)	1.5%	1.5%

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 2

Criteria	Phase 1 ^(a)	Phase 2 ^(b)
Daily Digested Solids Production	8,460 gallons	14,490 gallons
Weekly Digested Sludge Production	59,200 gallons	101,450 gallons

Notes:

- (a) Phase 1 corresponds to the first capacity expansion of the CSWRF.
- (b) Phase 2 corresponds to the second capacity expansion of the CSWRF.
- (c) Average flow was used rather than maximum flow since the average flows are a better indicator of sludge production, operating costs, etc. than maximum flows. However, each of the dewatering equipment scenarios is assumed to be sized such that maximum month flows could be handled successfully.
- (d) Conversion of influent biochemical oxygen demand (BOD) to digested total suspended solids (TSS) (lbs digested TSS/lbs influent BOD).
- (e) Overall yield coefficient is based on the assumptions made for sizing of the secondary process.

ADF = Average daily flow.

mgd = Million gallons per day.

mg/l = Milligrams per liter.

lbs = Pounds.

COMPARISON

The BFP and the centrifuge are the most commonly used mechanical devices for dewatering digested municipal sludge. Historically, centrifuges have been used at larger plants while smaller plants have relied on the BFP for dewatering needs; however, recent developments in centrifuge technology have made them appropriate for smaller plants as well.

Important performance criteria for both types of dewatering devices are solids concentration (cake solids) and percent of solids captured (solids capture). "Cake solids" refer to the solids concentration of the finished cake on a percent of weight basis whereas "solids capture" refers to the percent of throughput solids that the device retains. Both the cake solids and solids capture are influenced by the type and concentration of the conditioning agent (typically a polymer) and both are required to quantify the performance of a dewatering device. Generally, the centrifuge produces higher cake solids than the BFP, but both devices achieve a similar solids capture. The operation and the advantages/disadvantages of both types of equipment are discussed below.

Belt Filter Press

The BFP is a continuous-feed dewatering device that uses chemical conditioning, gravity drainage, and mechanically applied pressure to dewater sludge. The technology was introduced into the United States in the early 1970s and is effective for dewatering many types of municipal sludge.

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 3

Sludge must first be conditioned prior to its introduction to the BFP. Typically, a suitable polymer is introduced to the sludge feed prior to its introduction to the gravity drainage section of the machine. Following the gravity drainage section, pressure is applied in the low-pressure and then in the high-pressure sections of the machine where the sludge is squeezed between two continuous filter belts. The pressure exerted on the sludge induces the release of additional quantities of water producing a dewatered cake and filtrate. The sludge cake is normally dropped into a hopper for conveyance to the storage area and the filtrate is conveyed back to the treatment process.

Advantages of the BFP

Advantages of the BFP are listed below.

- The BFP is well suited for small plants with limited staff because maintenance and repair of the machine can be undertaken without special tools or equipment.
- An operator can visually check the operation and performance of the BFP by making small adjustments to the polymer dose and feed rate to optimize performance.
- The BFP operates at slow speed and has relatively low power consumption.
- Compared to the centrifuge, the BFP requires about one-half of the polymer dose; reducing the overall operating costs.
- The BFP is quiet; the main source of noise being the wash water sprayer.
- The BFP can handle dilute sludge without increasing the power consumption; although overall processing time will be increased.
- The BFP requires a lower capital investment compared to the centrifuge.

Disadvantages of the BFP

The disadvantages of the BFP are listed below.

- The BFP requires a steady stream of high-pressure wash water (approximately 70 gallons per minute). The water must be low in suspended solids so filtered effluent or potable water is required for this application.
- The BFP is not well suited to high concentrations of grease and fat as these substances tend to "blind" the belts and degrade the performance of the machine.

Kennedy/Jenks Consultants

Technical Memorandum No. 001

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 4

- The BFP can be a source of odors. For this reason, an adequate air exchange system is required for indoor operation. However, a well digested aerobic sludge is not likely to produce extreme odors.
- The BFP will tend to splash sludge and filtrate as it operates, requiring more time and labor for cleanup. Cleanup is normally accomplished by the operator using a highpressure hose stream.
- When compared to the centrifuge, the BFP produces a less concentrated cake, making transport and disposal of dewatered sludge more expensive.
- The BFP would require a building with more floor space and more vertical clearance than the centrifuge.

Centrifuge Decanter

The centrifuge is a continuous-feed dewatering device that imparts rotational acceleration to the sludge separating it into a solid "cake" and a liquid stream called the "centrate". The technology has been widely used for many years in industrial applications in both Europe and the United States. Increasingly, centrifuges have been used to dewater municipal wastewater sludge. Recent developments in programmable electronic controls have automated these machines, enabling them to be started, stopped, and cleaned automatically. As with the BFP, polymer conditioning is required to optimize the solids concentration of the cake, especially when dewatering aerobically digested sludge. Conditioned sludge is accelerated in the spinning bowl using centrifugal force to perform the separation. Upon separation, the sludge cake is normally dropped into a hopper for conveyance to the storage area and the centrate is conveyed back to the treatment process.

Advantages of the Centrifuge

- The centrifuge decanter is compact and occupies a smaller area in terms of both footprint and height.
- The centrifuge can require less operator attention.
- The centrifuge can produce a dryer cake when compared to the BFP.
- The centrifuge does not require wash water except for final washdown.

Kennedy/Jenks Consultants

Technical Memorandum No. 001

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 5

- The centrifuge can operate effectively on sludge containing high concentrations of fat and grease.
- The centrifuge is almost totally enclosed; reducing the degree of odor production.
- The centrifuge is available with automated startup and shutdown controls that can allow for unsupervised operation of the device. Alarms can be incorporated to shut down the machine in case of malfunction.
- The operator can adjust feed rate, polymer feed rate, main drive and backdrive speeds at the centrifuge control panel. Automatic torque sensing capabilities commonly found on newer machines can be used to optimize performance.
- The centrifuge is self-contained, making cleanup faster and easier.

Disadvantages of the Centrifuge

- The centrifuge produces very high rotational speeds and requires careful maintenance by a skilled mechanic equipped with special tools. Typically, extensive service requires bringing a maintenance expert to the operations site or shipping the device to the service facility.
- The centrifuge is power intensive
- The centrifuge requires a high polymer dose compared with the BFP.
- Many models of centrifuges are noisy and require that ear protection be worn.
- The operator cannot observe the solids separation process in the centrifuge. However the cake can be observed where the conveyor discharges to cake storage and the centrate can be observed at a centrifuge discharge sample port.
- Centrifuges have a higher capital cost compared with a BFP.
- While generally very reliable, major catastrophic failures can occur resulting in extremely costly repairs and long down times.

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 6

Installation Space Requirements

Table 2 shows the installation space required for both pieces of equipment.

Table 2: Installation Space Requirement

Machine	Machine Dimensions	Required Space ^(a)
BFP	24' x 10' x 8' (L x W x H)	34' x 20' x 14' (L X W X H)
Centrifuge	11' x 3' x 5' (L x W x H)	21' X 13' X 11' (L X W X H)

Note:

(a) Required Space assumes 5 feet clear space on all sides of the equipment and 6 feet of overhead clearance.

Based on the dimensions shown on Table 3, and assuming \$100 per square foot for the BFP building and \$80 per square foot for the centrifuge building, installation of a BFP would increase the overall cost of this option by roughly \$46,000. As stated earlier, the possible need to scrub odors from air evacuated from the solids handling room is more likely with a BFP, which would also add costs.

Lifecycle Cost Comparison

While the lists compiled above highlight the major advantages/disadvantages of both types of devices, quantifying the differential costs associated with particular criteria is important for completing the comparison. The following criteria drive the overall lifecycle cost of both devices:

- Initial capital cost
- Power consumption
- Polymer consumption
- Cake solids percent as related to the disposal costs of dewatered sludge
- Labor cost associated with operation and housekeeping
- Process water cost (for continuous BFP belt cleaning).

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 7

To help facilitate a valid comparison, Kennedy/Jenks Consultants asked one of the major suppliers of both types of equipment (Andritz) for lifecycle costs. Two comparisons were provided. The first comparison was based on a 1-meter BFP and a centrifuge, both with the capacity to dewater the Phase 2 weekly solids production in 24 hours (three, 8-hour processing sessions). The second comparison was based on the same size centrifuge but used a 2-meter BFP with the capacity to dewater the weekly solids production in 12 hours (three, 4-hour processing sessions). This second comparison may be more realistic because it allows time in a normal workday for the startup/cleanup requirements of the BFP, which can require up to 2.5 hours of startup/cleanup time for every operational session. The centrifuge requires about 45 minutes of startup/shutdown time but can be equipped with a programmable logic controller (PLC) and appurtenances that will initiate the startup and cleanup cycles so that the entire 8-hour day can be utilized for processing sludge. Due to economies of scale, the 2-meter BFP only increases the 20-year lifecycle cost by about 10% when compared to the 1-meter machine. Therefore, the 2-meter BFP was used as the basis of comparison.

The analysis uses the following values for the comparison:

- Power cost @ \$0.10/kW*hr
- Polymer cost @ \$2.00/active pound of polymer
- Wash water cost @ \$0.75/kgal
- Sludge disposal cost @ \$15/wet ton of sludge
- BFP solids production @ 17% solids
- Centrifuge solids production @ 23% solids
- Labor cost @ \$45/hour
- Annual repair and replacement costs (centrifuge = \$3,700, BFP = \$3,100).

The lifecycle cost comparison is based on a 20-year design period and does not include appurtenances common to both dewatering systems such as the sludge feed pump, the conveyor system, and the polymer feed system. Engineering and contracting fees were also omitted. Therefore, the estimate illustrates the differential cost for either option. The 20-year cost for both devices is shown on Table 3.

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 8

Table 3: 20-Year Lifecycle Cost(a)

Item	Capital Cost Equipment/Building ^(b)	Present Worth O&M ^(c)	Present Worth Sludge Disposal ^(d)
2-meter BFP	\$246,000	\$538,000	400,000
		Total	\$1,184,000
Centrifuge	\$224,000	\$562,000	\$295,000
		Total	\$1,081,000

Notes:

(a) O&M and Sludge Disposal values are based on treating the Phase 2 flows and loads. Actual O&M and disposal costs will be lower during the initial years of operation.

(b) The only portion of building costs included in this evaluation is the \$46,000 differential associated with the larger footprint/headspace requirements associated with the belt filter press. These values do not include appurtenances common to both systems such as polymer feed and conveyor system. Does not include engineering services for design and construction administration or the contractor's markup or installation cost.

(c) O&M costs include the cost of power, polymer, labor, replacement parts, and wash water. Overall interest rate is assumed to be 2%, accounting for a 5% interest rate and 3% inflation rate.

(d) Disposal fees are based on a cost per wet ton. Overall interest rate is assumed to be 2%, accounting for a 5% interest rate and 3% inflation rate.

DISCUSSION

Both the BFP and the centrifuge are viable options for dewatering service at the Cold Springs WWTF. Based on the lifecycle cost comparison, the centrifuge would be slightly less expensive over the 20-year design life, especially if the higher cost of odor control for the BFP is considered.

The BFP is a mechanically simple, robust machine suitable for treatment plants with limited maintenance resources. The BFP consumes less power and polymer than a centrifuge but requires more operator attention, especially for cleanup activities. Operators can more easily observe the effects of increasing the polymer dose and feed rate, which allows for fine-tuning the separation process. The BFP has a greater likelihood of producing odors during operation. The BFP also requires a larger installation area and higher-height building space which is not desired for this project due to aesthetic concerns. However, the height would be partially masked by the lower-height building spaces surrounding it. The labor portion of the lifecycle costs can be reduced if the BFP can be operated for longer continuous periods, minimizing the number of cleanup cycles.

Kennedy/Jenks Consultants

Technical Memorandum No. 001

Washoe County Department of Water Resources Centrifuge Decanter vs. Belt Filter Press for Dewatering Digested Sludge 6 October 2003 Page 9

The centrifuge is a mechanically complex but normally reliable piece of equipment. Service other than routine maintenance requires factory-trained personnel equipped with special tools. The machines are totally enclosed, reducing the potential for odor, but also making direct observation of the process more difficult. Power and polymer consumption is high but labor requirements are lower, making the centrifuge competitive with the BFP on a lifecycle cost basis. The centrifuge can be equipped with automatic startup and shutdown/cleanup appurtenances that allow the equipment to utilize a full 8-hour day or longer, if desired, as it can be operated without direct operator supervision. Centrifuges can produce higher cake solids than the BFP reducing sludge hauling and disposal costs.

CONCLUSION

Due to its lower life cycle costs, greater cake solids, and low odor production, the centrifuge is the recommended equipment for dewatering 6 October 2003

Technical Memorandum No. 002

Prepared For: Joe Howard and Rick Warner

Washoe County Department of Water Resources

Submitted by: Travis Tormanen, Lynn Orphan, and Ron Bush, Kennedy/Jenks

Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Subject: Elevated vs. At-Grade Headworks

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

Washoe County is planning to construct a new headworks structure at the Cold Springs Water Reclamation Facility (CSWRF) as part of the upcoming expansion project. The headworks will include fine screening, grit removal, a bypass channel, magnetic flow meter, and an influent sampler. This technical memorandum compares the option of constructing the new headworks at grade level to elevating the headworks atop a basin wall. Preliminary cost estimates and the pros and cons of both options are presented.

Influent pumping is a related topic that will also be addressed in this memorandum. Part of the current design effort involves an analysis of the Diamond Peak Lift Station (DPLS) (see Technical Memorandum 009). The analysis will determine if the station is adequate to serve existing and Phase 1 flows, or if it needs modification or replacement. If major modification or replacement is required, consideration will be given to designing the DPLS to pump directly to the headworks channel rather than pumping to the existing influent pump station.

DESIGN CRITERIA

Table 1 lists the current design criteria for the CSWRF expansion. It is expected that the headworks can be constructed at this time to meet the needs of Phase 2 without significantly impacting the project costs.

Cold Springs Wastewater System Expansion - Elevated vs. At-Grade Headworks Washoe County Department of Water Resources 6 October 2003
Page 2

Table 1: CSWRF Expansion Design Criteria

Criteria	Phase 1 ^(a)	Phase 2 ^(b)
Average Daily Flow	0.7 mgd	1.20 mgd
Peak Hourly Flow	1.75 mgd	3.00 mgd

Notes:

- (a) Phase 1 corresponds to the first planned capacity expansion of the CSWRF, as defined in the Facility Plan.
- (b) Phase 2 corresponds to the second planned capacity expansion of the CSWRF, as defined in the Facility Plan.

mgd = Million gallons per day.

Diamond Peak Lift Station and Influent Pumping

The existing capacity of the DPLS is about 300 gallons per minute (gpm). It is discharging to a gravity sewer manhole south of the treatment plant that discharges into the existing influent pump station wet well. Due to the limited existing capacity of the DPLS, it will be redesigned and a new lift station and force main may be constructed to replace the existing facility. The timing of the modifications to the DPLS will depend on the rate of development and when the pre-existing unsewered area connects to the community sanitary sewer collection system. The DPLS will eventually convey nearly half of all flow to the CSWRF. Currently, the DPLS forcemain terminates at the CSWRF influent pump station wetwell.

When modification of the DPLS occurs, the proposed force main should be extended to the new headworks location so that the influent sewage can be pumped directly to the headworks channel, bypassing the influent pump station. This would be desirable for the following reasons:

- The existing influent pump station pumps, with a rating of 800 gpm at 35-feet TDH, may be undersized for conveyance of the future peak flows.
- The volume of the existing influent pump station wetwell is insufficient to provide attenuation of the DPLS lift station flows. Attenuation of flows from the collection system could better be accomplished by designing the DPLS with ample wetwell volume and fitting the pumps with variable frequency drives.
- Pumping directly from the DPLS to the headworks will also ensure that redesign of the influent pump station is not required to accommodate future flows from the DPLS.

Cold Springs Wastewater System Expansion - Elevated vs. At-Grade Headworks Washoe County Department of Water Resources 6 October 2003 Page 3

It is also recommended that the Woodland Village Lift Station pump directly to an elevated headworks. This should be able to be accomplished with negligible impact on performance of the Woodland Village Lift Station.

The existing influent pump station would remain in service to receive and lift the flow that enters the CSWRF by gravity from about 836 homes plus any pumped flow that is not connected to directly to the headworks.

Alternative Headworks Configuration

The proposed headworks facility for the treatment plant expansion consists of a "basket-type" fine screening device, a vortex grit removal system, a bypass channel equipped with a manual bar screen, and a Parshall Flume for flow metering. An influent sampler will be installed to sample the raw influent. Two alternate configurations are under consideration.

The "at-grade" configuration would be constructed at ground level. This configuration would require an intermediate pump station downstream of the headworks to lift the screened influent into the treatment basins. A flow schematic for this configuration is shown on Figure 1. A possible layout for this alternate is shown on Figure 2.

The proposed "elevated" configuration would be constructed on top of the exterior wall of the digester. The elevated configuration is essentially the same as the at-grade configuration in terms of equipment and function. The advantage of elevating the headworks is that the intermediate pump station could be eliminated. A flow schematic for this configuration is shown on Figure 3. A possible layout for this alternate is shown on Figure 4.

Comparison

Both options for the headworks configuration provide the same level of screening and grit removal performance. The primary differences of the alternate approaches are aesthetics, capital costs, ease of operation and maintenance, and elimination of the intermediate pump station. Annual power cost for the at-grade option would be nearly identical to the power cost for the elevated option, as the total pumping head is essentially the same. The pumping requirements for both options are illustrated on Figure 5. A spreadsheet showing the estimated annual power costs for both options is included as Attachment A. The differences between the two options are examined in greater detail below.

Kennedy/Jenks Consultants

Technical Memorandum No. 002

Cold Springs Wastewater System Expansion - Elevated vs. At-Grade Headworks Washoe County Department of Water Resources 6 October 2003 Page 4

At-Grade Headworks

Description

The at-grade headworks configuration would be constructed such that access to the channels and equipment could be made from the surrounding walkway at ground level. This configuration is shown in plan and profile view on Figure 6.

Advantages/Disadvantages

The major advantage to constructing the headworks at grade is unencumbered access for maintenance and housekeeping and the ability to visually inspect the process without climbing stairs. From an aesthetic standpoint, the at-grade configuration is less noticeable and integrates well with the existing structures.

The major disadvantage of constructing the headworks at grade is that an additional pump station (intermediate pump station) is required to lift the influent into the treatment basins. This lift station would require periodic operator attention for daily checks and maintenance requirements.

Cost of Construction

The cost presented below includes the cost of the concrete structures, walkways, the fine screening and grit removal equipment, electrical/controls, and installation. For the at-grade option, the cost of a new intermediate pump station is included. The cost to modify the existing influent pump station (if required) and the cost for the yard piping necessary to connect the structure to the process equipment would be comparable for both options, and was not included in the estimates. The estimate is considered a "conceptual stage estimate" (i.e., accuracy is likely within +50% to -30%). Table 2 shows the cost for the at-grade headworks.

Cold Springs Wastewater System Expansion - Elevated vs. At-Grade Headworks Washoe County Department of Water Resources 6 October 2003 Page 5

Table 2: Cost of "At-Grade" Headworks

Item	Cost
Headworks ^(a)	\$286,400
Headworks (Intermediate) Pump Station ^(b)	\$78,500
Electrical (25%)	\$91,000
Contingency (15%)	\$68,000
Sub Total A	\$524,000
Tax (7.25%)	\$39,000
Grand Total(°)	\$563,000

Notes:

- (a) Includes earthwork, concrete structures, equipment, and installation.
- (b) Includes earthwork, concrete structures, equipment, and installation
- (c) Does not include contractor O&P, engineering, or construction administration. Estimate rounded to nearest \$1,000.

Elevated Headworks

Description

The elevated headworks configuration would be constructed atop the digester basin wall requiring a staircase for access. The channels and equipment would be accessible from the surrounding walkway constructed from either concrete or fiberglass reinforced plastic (FRP) grating. This configuration is shown in plan and profile view on Figure 7.

Advantages/Disadvantages

The major advantage to constructing the elevated headworks is the elimination of the intermediate pump station as the extra elevation would provide the energy necessary to convey screened influent to the treatment basins.

The major disadvantages of constructing elevated headworks are higher construction costs, more difficult access for maintenance and housekeeping, and the loss of the ability to visually inspect the process without climbing stairs. From an aesthetic standpoint, the elevated configuration is more noticeable and could detract from the clean modular lines currently presented by the treatment facility.

Cold Springs Wastewater System Expansion - Elevated vs. At-Grade Headworks Washoe County Department of Water Resources 6 October 2003 Page 6

Cost of Construction

The cost presented below includes the cost of the concrete structures, walkways, staircase, the fine screening and grit removal equipment, electrical/controls, and installation. For the elevated option, the cost of an intermediate pump station is omitted as it would not be required. The cost to modify the existing influent pump station and the cost for the yard piping necessary to connect the structure to the process equipment would be comparable for both options and was not included in the estimates. The estimate is considered a "conceptual stage estimate" (i.e., accuracy is likely within +50% to –30%). Table 3 shows the cost for the elevated headworks.

Table 3: Cost of "Elevated" Headworks

Item	Cost
Headworks ^(a)	\$356,600
Electrical (25%)	\$89,000
Contingency (15%)	\$67,000
Sub Total A	\$512,600
Tax (7.25%)	\$38,000
Grand Total b)	\$551,000

Notes:

(a) Includes earthwork, concrete structures, equipment, and installation.

(b) Does not include contractor O&P, engineering, or construction administration. Estimate rounded to nearest \$1,000.

CONCLUSION

Both headworks configurations provide the same level of screening and grit removal. The capital costs are similar for both options as the cost of elevating the headworks structure is balanced against the requirement of the additional pump station for the at-grade option.

Operation and maintenance costs are similar for either option; although, the additional pump station required for the at-grade option would result in a small additional maintenance burden for staff and would introduce a small risk of a pump station malfunction. However, modern submersible pumps are very reliable and require minimal maintenance, especially following screening and grit removal. The slight increase in maintenance required by the additional pump station would be offset by the burden of performing operation and maintenance duties from an elevated platform. Therefore, it is concluded that either option is a viable alternative.

Kennedy/Jenks Consultants

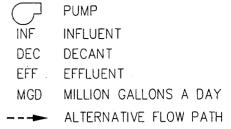
Technical Memorandum No. 002

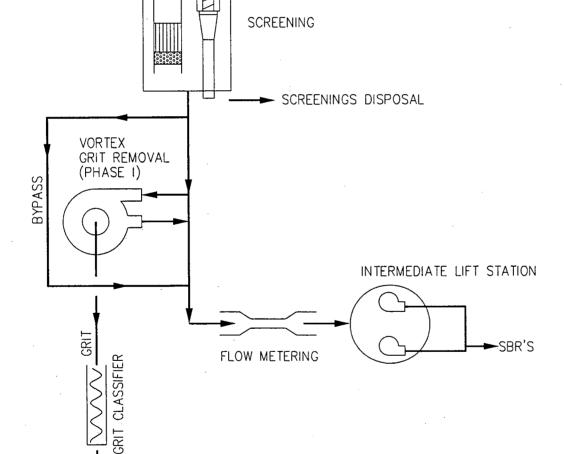
Cold Springs Wastewater System Expansion - Elevated vs. At-Grade Headworks Washoe County Department of Water Resources 6 October 2003 Page 7

The at-grade alternative offers the advantage of having minimal visual impact. Since the CSWRF is located in a residential area, it is desired to maintain the low profile and clean lines of the existing facility. A headworks structure mounted atop the basin wall would alter the appearance of the plant, making it less attractive in a residential setting.

Based on these considerations, it is concluded that the aesthetic advantage of the at-grade option outweighs the small reliability advantage offered by the elevated structure. It is therefore recommended that an at-grade headworks facility be constructed with an associated screening wall as part of the Phase 1 expansion.

LEGEND





EXT. INFLUENT PUMP STATION

EXISTING

COLLECTION SYSTEM

INF

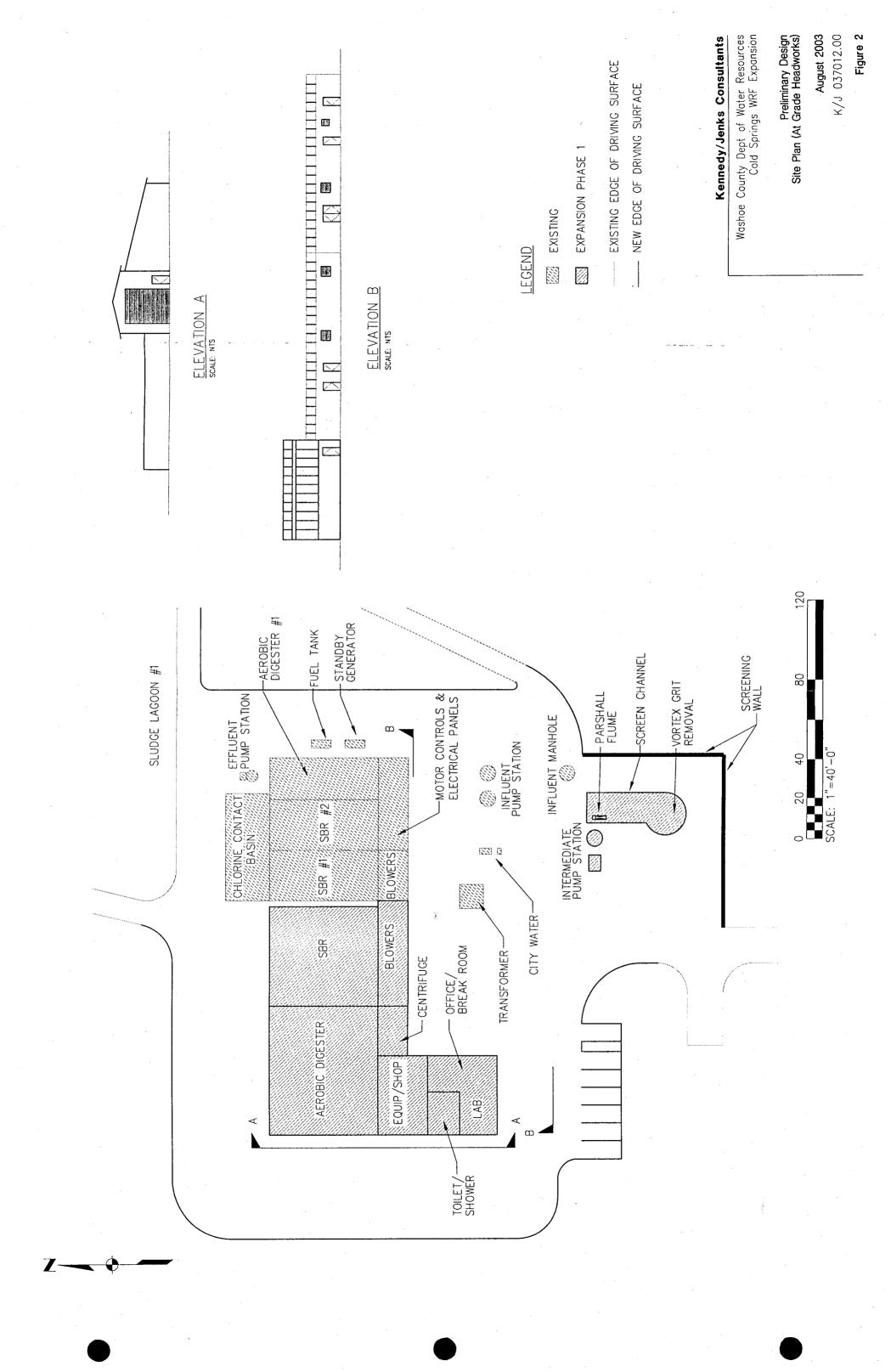
DIAMOND PEAK FORCE MAIN DEC

Kennedy/Jenks Consultants

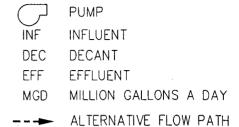
Washoe County Dept. of Water Resources Cold Springs WRF Expansion

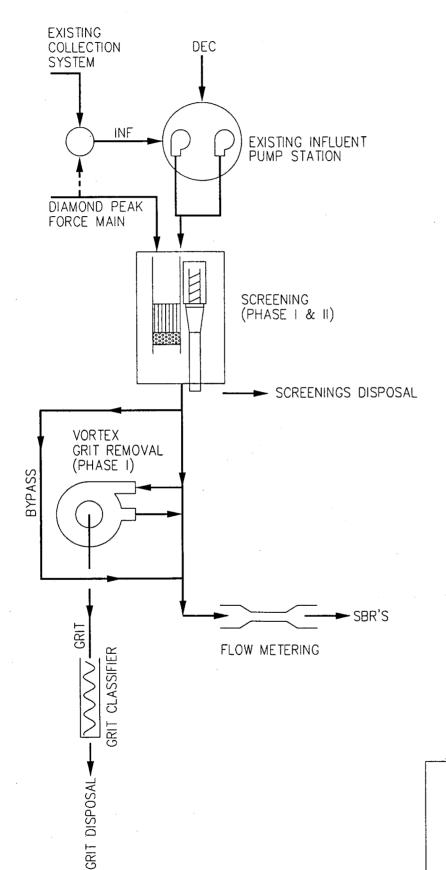
> Preliminary Design At Grade Headworks

> > August 2003 K/J 037012.00







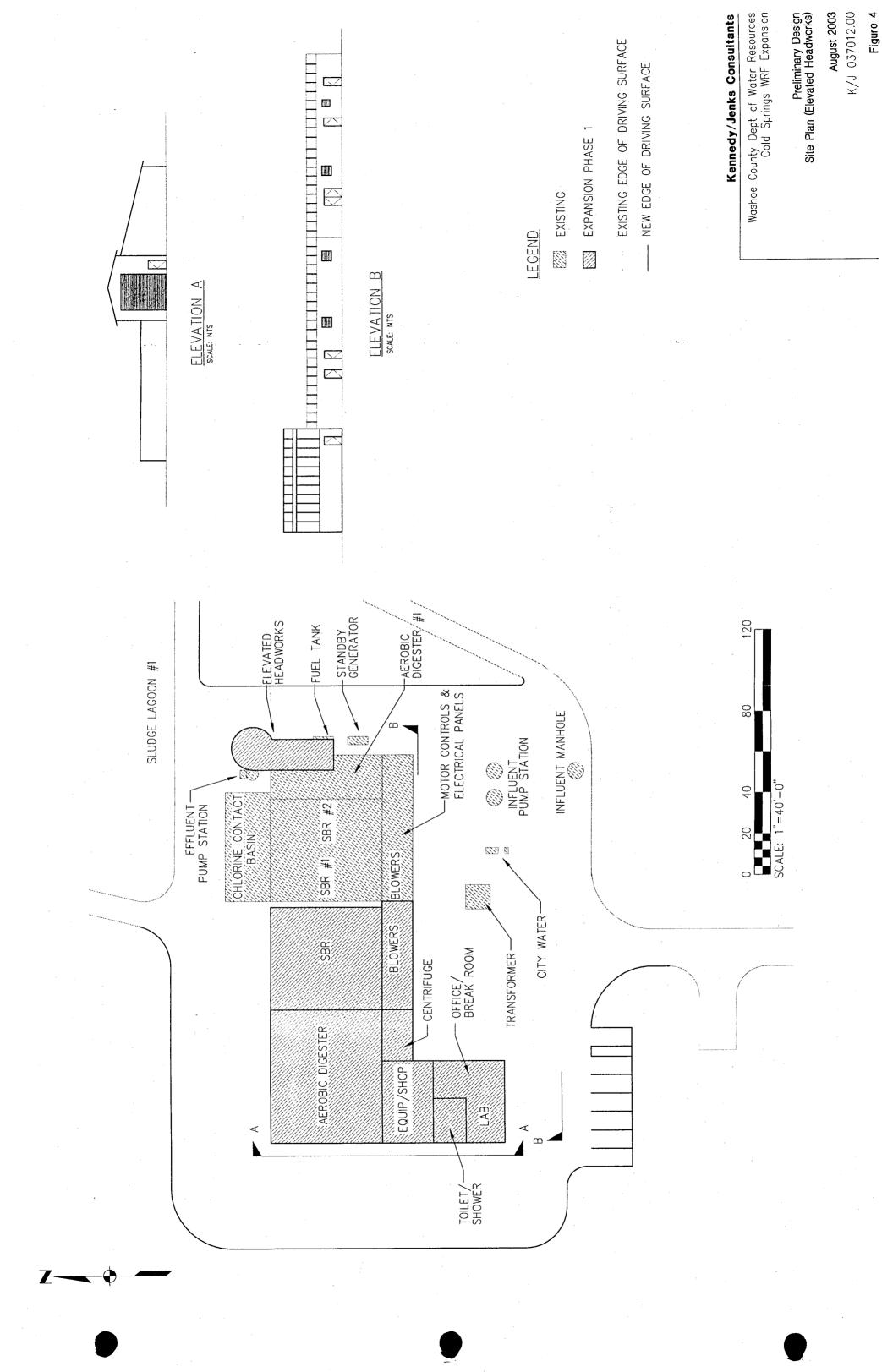


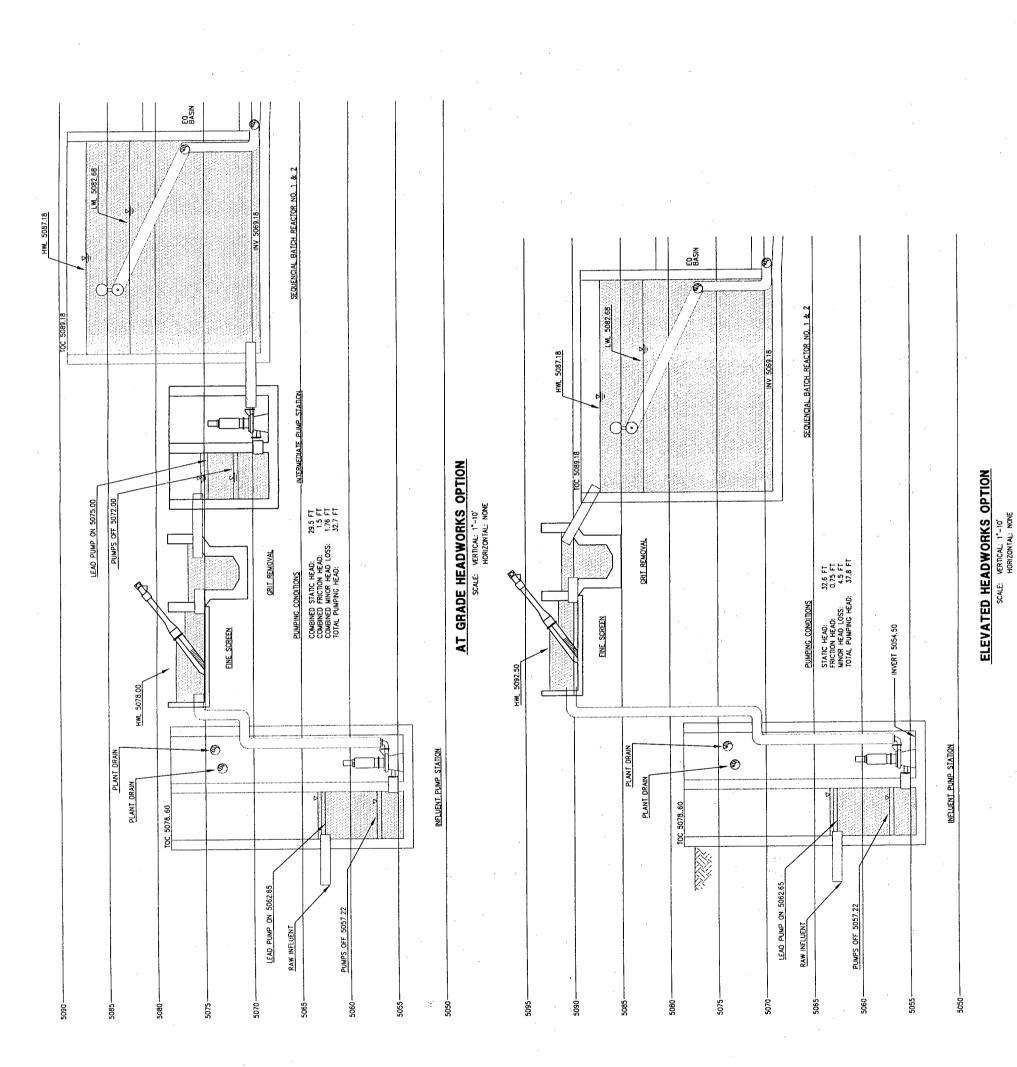
Kennedy/Jenks Consultants

Washoe County Dept of Water Resources Cold Springs WRF Expansion

> Preliminary Design Elevated Headworks

> > **August 2003** K/J 037012.00





LEGEND

BOC – BOTTOM OF CONCRETE CL – CENTRE LINE DS – DIGESTED SLUDGE FI – FILTER INFLUENT FILE – FILTER FETLUENT GR – GROUND HWL – HIGH WATER LEVEL INV – INVERT

INVEXT

LLM. - LOW LOW WATER LEVEL

LLM. - LOW WATER LEVEL

SE - SECONDARY EFFLUENT

S - SLUGG

SN - SUPERNATM

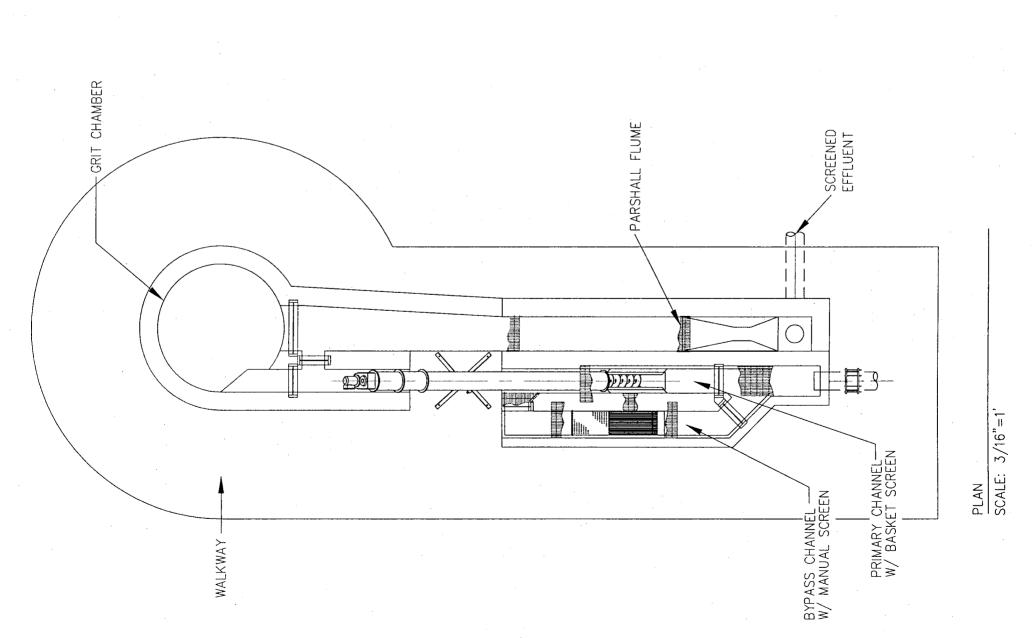
TOC - TOP OF COWCRETE

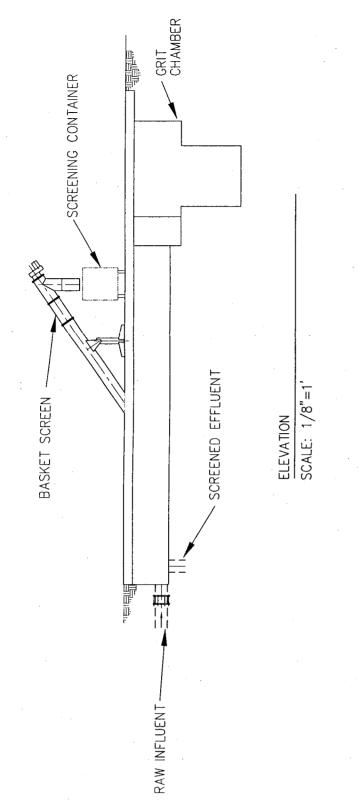
TOW - TOP OF WERE

Washoe County Dept of Water Resources Cold Springs WRF Expansion Kennedy/Jenks Consultants

Preliminary Design Hydraulic Profile

August 2003 K/J_037012.00

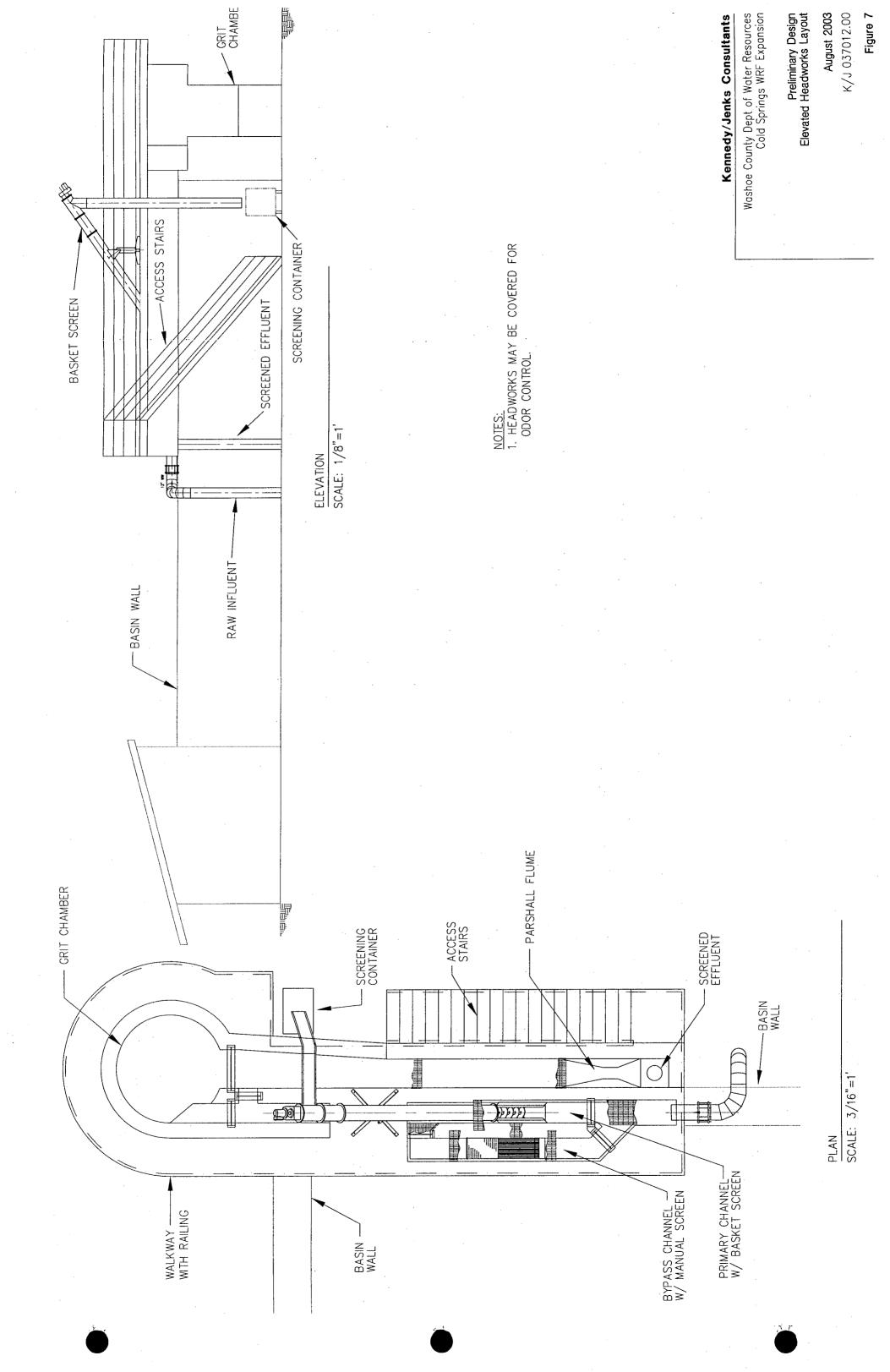




NOTES: 1. HEADWORKS MAY BE COVERED FOR ODOR CONTROL.

Kennedy/Jenks Consultants

Washoe County Dept of Water Resources Cold Springs WRF Expansion Preliminary Design At Grade Headworks Layout August 2003 K/J 037012.00



Attachment A

Estimated Annual Power Costs

Attachment A: Estimated Annual Power Costs

Annual Pumping Costs for Headworks Alternatives

ADF (mgd) = 0.8	
ADF (gpm) = 556	

At-Grade Headworks

The at-grade headworks would require an influent pump station (PS) to pump influent into the headworks plus a headworks PS to pump from the grit chamber to the treatment basin.

Influent PS	Headworks PS
Pump On EI (ft) = 5062.7	Pump On EI (ft) = 5075
Pump Off EI (ft) = 5057.2	Pump Off EI (ft) = 5072
Average Wetwell EI (ft) = 5060.0	Average Wetwell EI (ft) = 5073.5
Headworks Water Surface EI (ft) = 5078	Average Aeration Basin Water Surface EI (ft) = 5084.94
Static Lift (ft) = 18.1	Static Lift (ft) = 11.4
Assumed Pump Efficiency (%) = 60	Assumed Pump Efficiency (%) = 60
Discharge Pipe Dia (in) = 8	Discharge Pipe Dia (in) = 8
Flow Velocity (fps) = 3.5	Flow Velocity (fps) = 3.5
Length of Pipe (ft) = 150	Length of Pipe (ft) = 150
Friction Loss (ft) = 0.75	Friction Loss (ft) = 0.75
Minor Loss K = 4.5	Minor Loss K = 4.5
Minor Loss (ft) = 0.88	Minor Loss (ft) = 0.88
Total Pumping Head Required (ft) = 19.68	Total Pumping Head Required (ft) = 13.07
Required bhp = 4.6	Required bhp = 3.1
Assumed Motor Efficiency (%) = 85.0	Assumed Motor Efficiency (%) = 85.0
Required kW input = 4.0	Required kW input = 2.7
Cost of Power ($\frac{kW^*hr}{0.075}$	Cost of Power ($\frac{kW*hr}{0.075}$
Daily Pumping Cost = \$7.27	Daily Pumping Cost = \$4.83
Annual Pumping Cost = \$2,652	Annual Pumping Cost = \$1,761
	Total Annual Pumping Cost = \$4,413

Elevated Headworks

The elevated headworks would require an influent PS to pump to the elevated headworks structure. Flow from the headworks to the treatment basin would be by gravity.

Influent PS

SHE L

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Harry Ritter, Travis Tormanen, and Lynn Orphan, Kennedy/Jenks

Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Subject: Effluent Reuse - Filtration, Disinfection, and Pumping

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

As a part of the preliminary design (pre-design) effort for the Cold Springs Water Reclamation Facility (CSWRF) Expansion, Kennedy/Jenks Consultants has addressed the anticipated requirements for future reclaimed water uses and the unit processes associated with their implementation.

The purpose of this technical memorandum is to examine the requirements for filtration, disinfection, and effluent pumping as it relates to land application of treated effluent for irrigation purposes and to examine the requirements for ultra violet (UV) disinfection of effluent for application to the rapid infiltration basins (RIBs). Additionally, this technical memorandum will examine the requirements for an in-plant effluent reuse system proposed for irrigation, process, and housekeeping purposes.

Functional descriptions, flow schematics, and preliminary cost estimates for the reclaimed water improvements are presented. With the possible exception of the in-plant reuse system, these improvements will not be constructed as part of the Phase 1 expansion. However, provisions will be included in the design so that future implementation of these items is possible.

BACKGROUND

The CSWRF currently relies on six existing RIBs for discharge of treated effluent. The RIBs are located to the north of the treatment plant and will be evaluated for capacity and performance as part of the current pre-design effort. New RIB sites required for the proposed plant expansion are also being evaluated as part of the pre-design effort. Currently, undisinfected secondary effluent is pumped to the RIBs and allowed to percolate providing recharge to the underlying aquifer. Groundwater application of treated effluent is considered beneficial as it contributes to the long-term sustainability of the local aquifer, which is a priority to Washoe County.

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003 Page 2

Effluent disinfection is not currently required but could be required for future application to the RIBs. If eventually required, Washoe County (County) proposes to use UV disinfection for this purpose to avoid the production of disinfection byproducts.

As a response to community needs, the possibility of using a portion of the treated effluent for future spray or drip irrigation is under consideration as part of the current pre-design effort. The use of treated effluent to irrigate common space vegetation such as parks and greenbelts is increasingly common and is considered beneficial reuse as water used in this manner results in an equivalent reduction in potable water use. If implemented at the CSWRF, irrigation reuse would be seasonal with the RIBs used as the primary means of effluent discharge.

The CSWRF currently uses potable water for housekeeping activities. It is desired to use treated effluent for housekeeping, irrigation of the CSWRF grounds, and as process water for the dewatering operation. An in-plant effluent reuse system is proposed as part of the current expansion to provide water for these activities.

ASSUMPTIONS

The following assumptions were used by Kennedy/Jenks Consultants:

- If necessary, effluent flow equalization (EQ) will be used to provide a steady state
 effluent discharge equal to the average daily flow (ADF). The ability to attenuate peak
 flows allows for the use of a smaller filter and UV disinfection unit. Flows exceeding
 ADF would go to the RIBs.
- RIBs will be the primary means of effluent discharge. Irrigation reuse applications are not intended to be a discharge alternative to the use of RIBs; only a means to provide irrigation water.
- Redundancy will not be required for irrigation reuse equipment as effluent could be automatically diverted to the RIBs in the case of irrigation equipment malfunction or if there is a failure to meet treatment/disinfection goals.
- Disinfection of irrigation reuse water will be accomplished using commercially available liquid sodium hypochlorite and the existing storage and feeding installation.
- A plastic-lined storage pond with the capacity to store approximately one day's ADF will
 be assumed for the irrigation system. Actual storage requirements may differ depending
 on the number and requirements of irrigation users. An automated means will be

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003 Page 3

incorporated to automatically divert effluent to the RIBs in the case of a full storage pond.

- An effluent pump station will be required between the EQ basin and the filter or UV
 disinfection. Depending on the final configuration of the treatment basins, it may be
 possible to eliminate this pump station if adequate head is available.
- Gravity filtration and an open channel UV system will be used for this evaluation. Rapid advances in these technologies will make it prudent to re-evaluate the choice of equipment prior to the actual design of the reuse systems.
- The in-plant reuse system will use sodium hypochlorite for disinfection. Filtration will not be provided.

DESIGN CRITERIA

Table 1 lists the design criteria.

Table 1: Effluent Filtration, Disinfection and Pumping Criteria

Criteria	Phase 1 ^(a)	Phase 2 ^(b)
Average Daily Flow	0.7 MGD	1.2 MGD
Effluent Total Suspended Solids	20 mg/l	20 mg/l
Reuse Classification ^(c)	Category C	Category C
Disinfection Requirement ^(c)	2.2 mpn/100 ml	2.2 mpn/100 ml
Irrigation Reuse Storage ^(c)	1.0 MG	NA
In-Plant Peak Demand ^(d)	125 gpm	125 gpm

Notes:

(a) Phase 1 corresponds to the first planned capacity expansion of the CSWRF.

(b) Phase 2 corresponds to the second planned capacity expansion of the CSWRF.

(c) Pertains to reuse to irrigation applications per NAC 445A.275.

(d) Refers to in-plant effluent reuse. Provides for housekeeping uses, irrigation of plant grounds, and process water for dewatering equipment.

MGD = Million gallons per day.

mg/l = Milligrams per liter.

mpn = Most probable number.

ml = Milliliter.

MG = Million gallon.

NA = Not applicable.

gpm = Gallons per minute.

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003 Page 4

Flow Schematic

A flow schematic showing the reuse system components intended as part of the current expansion is shown on Figure 1. Figure 2 shows the additional reuse components associated with reuse to irrigation and disinfection of reuse to the RIBs, which will be considered for future implementation. The alternate means of effluent reuse are discussed in greater detail below.

Effluent Reuse to Groundwater

System Description

Land application to rapid infiltration basins is the current effluent discharge strategy for the CSWRF. There are approximately 8 acres of RIBs for the existing 0.35 MGD plant. To accommodate the increased flow from new development, additional RIBs will be required. Additional land is available close to the CSWRF that is suitable for constructing RIBs.

Currently, the CSWRF is configured to use sodium hypochlorite for disinfection. However, the local regulatory authority does not require disinfection of effluent applied to the RIBs; so the existing hypochlorite system is used only for in-plant purposes. In the future, the County may wish to use a UV light system for disinfection of effluent discharged to the RIBs. While disinfection of this reuse stream is not likely to be a regulatory requirement, it is an important consideration for the future if continued groundwater monitoring indicates that pathogens are surviving passage through the soil. In addition to providing pathogen destruction, UV disinfection prevents the formation of chlorinated by-products.

This section of the technical memorandum presents the likely disinfection system that would be added to the CSWRF in the future. The Phase 1 expansion of the plant will be laid out to provide space and possible connections for that future installation. The system shown on Figure 1 proposes the use of an open channel UV system and a pump station (RIB pump station) to convey effluent from the UV system to the RIBs. It may be possible to gravity flow between the UV system and the RIBs depending on their final configuration and location. It would also be possible to use an in-line pressurized UV system which would also eliminate the need for the RIB pump station; however, pressurized UV systems use a less efficient type of lamp and consume additional energy. The decision as to which type of system to use would need to be re-evaluated following location of the new RIBs.

If implemented as proposed, the effluent "reuse to groundwater" system would require a UV disinfection system consisting of a single or dual concrete channel housing the UV light system, the RIB pump station, yard piping, and valving.

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003
Page 5

Estimated Cost of Construction

A preliminary estimate for the cost of the system is presented in Table 2. The costs presented are considered conceptual as there are unknown variables that would require additional consideration upon final design. The accuracy of the conceptual estimate is considered +50% to -30%.

Table 2: Preliminary Estimate of Probable Cost (Reuse to Groundwater)

Item	Cost ^(a)
UV Disinfection System	\$345,000
RIB Pump Station	\$85,000
Yard Piping	\$20,000
Electrical (15%)	\$68,000
Sub Total	\$518,000
Contingency (25%)	\$130,000
Grand Total ^(b)	\$648,000

Notes:

- (a) Includes earthwork, concrete structures, equipment, and installation.
- (b) Cost rounded to nearest \$1,000.

Effluent Reuse to Irrigation

System Description

Effluent Reuse for irrigation is considered a future addition to CSWRF. This section of the technical memorandum describes the likely facilities for planning purposes. The plant layout will have areas identified for future installation of effluent polishing processes for irrigation reuse.

Major components of the effluent "reuse to irrigation" system would consist of an effluent filter to reduce suspended solids, a plastic-lined pond storage facility with capacity equal to approximately one times the average daily flow, and a high-pressure pump station to convey the reuse flow to the irrigation users. There are several types of filter technologies that could be considered. The estimated cost of this system was based on a fabric-covered disk filter, but continuing advances in filter systems may warrant selection of a different technology by the time of implementation. A chemical coagulation storage/feed system and a sodium hypochlorite storage/feed system would be required for coagulation and disinfection. It was assumed that the existing hypochlorite storage/feed system would be adequate with only minor modifications.

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003
Page 6

The system, as proposed, would include pipe between the filter and the storage plant to meet the chlorine contact time requirement. A bypass line between the high pressure pump station and the RIB discharge system would be incorporated to reject irrigation water not meeting regulatory compliance requirements.

The size of the effluent storage pond and the operating pressure for the irrigation pumps would need to be determined following design of the irrigation conveyance and application system.

Estimated Cost of Construction

A preliminary estimate for the cost of the system is presented in Table 3. The costs presented are considered conceptual as there are many unknown variables that would require additional consideration upon design. The accuracy of the conceptual estimate is considered +50% to -30%.

Table 3: Preliminary Estimate of Probable Cost (Reuse to Irrigation)

Item	Cost ^(a)
Filter System	\$450,000
Coagulant Feed/Storage System	\$70,000
CL ₂ Contact Pipe ^(b)	\$125,000
Effluent Storage Pond ^(c)	\$80,000
Irrigation Pump Station ^(d)	\$110,000
Flow Meter	\$5,000
Yard Piping	\$30,000
Instrumentation	\$30,000
Electrical (15%)	135,000\$
Sub Total	\$1,035,000
Contingency (25%)	259,000
Grand Total ^(e)	1,294,000

Notes:

- (a) Includes earthwork, concrete structures, equipment, and installation.
- (b) Assumes 65,000 gallons of contact pipe volume (1,200 feet of 36-inch pipe) for approximately 90 minutes of contact time at 1 MGD flow rate.
- (c) Assumes a plastic-lined open pond with volume = 1 MG (10' x 115' x 115').
- (d) Assumes a duplex submersible pump station with an 8-foot wetwell and discharge piping/valve vault.
- (e) Cost rounded to nearest \$1,000.

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003 Page 7

Effluent Reuse for Plant Water

System Description

Major components of the "effluent reuse for plant water" system would consist of a submersible pump located in the effluent pump station wetwell, a disinfection chemical feed pump, a chlorine contact pipe, an in-line strainer and a hydropneumatic tank. The pump would draw treated effluent from the chlorine contact tank; sodium hypochlorite would be injected at the discharge of the pump and the contact pipe would provide the required contact time for disinfection. Following disinfection, the reuse water would be conveyed through the hydropneumatic tank which provides constant delivery pressure and keeps the reuse pump from cycling too frequently. Under normal operating conditions, the chlorine contact tank retains several thousand gallons of treated effluent following drawdown and discharge of effluent to the RIBs. This residual volume would be sufficient to allow constant use of the reuse system throughout the day. Protection from freezing would be provided by locating vulnerable components in a separate enclosure or by integrating them into one of the other planned structures. The system would be designed to allow simultaneous operation of washdown, irrigation, and dewatering activities.

Estimated plant water demands are shown in Table 4 below. Total daily demand is approximately 42 gpm. The instantaneous demand is assumed to be about 3 times the daily demand, or about 125 gpm

Table 4: Effluent Reuse for Plant Water Demands

Plant Water Point of Use	Daily Demand (gallons)	Annual Demand (gallons)
Screen and Grit Washer	15,000	5,500,000
Washdown Water	1,000	365,000
Onsite Irrigation	1,500	270,000 ^(a)
Centrifuge Wash Down	6,500	2,400,000
Foam Control Spray	36,000	13,140,000
Total	60,000	21,675,000

Notes

(a) Assumes irrigation for 180 days per year.

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003 Page 8

Estimated Cost of Construction

A preliminary estimate for the cost of the system is presented in Table 5. The costs presented are considered conceptual as there are many unknown variables that would require additional consideration upon design. The accuracy of the conceptual estimate is considered +50% to -30%. If the system were solely to be used for irrigation, fewer costs would be incurred.

Table 5: Preliminary Estimate of Probable Cost (Effluent Reuse for Plant Water)

ltem	Cost ^(a)
125 gpm Submersible Reuse Pump ^(b)	\$20,000
Hypochlorite Feed Pump and Feed Lines ^(c)	\$5,000
CL ₂ Contact Pipe ^(d)	\$10,000
Hydropneumatic Tank and Controls ^(e)	\$25,000
Flow Meter	\$5,000
Basket Stainer	\$7,500
Freeze Protection ^(f)	\$20,000
Yard Piping	\$5,000
Electrical (15%)	\$15,000
Sub Total	\$113,000
Contingency (25%)	\$28,000
Grand Total ^(g)	\$141,500

Notes:

- (a) Includes earthwork, concrete structures, equipment, and installation.
- (b) Includes pump, guide rails, pump controls, hatch cover, and installation.
- (c) Assumes flow paced chemical feeding.
- (d) Assumes 80 feet of 24-inch contact pipe providing 15 minutes of contact time.
- (e) Assumes a 1,000-gallon tank, slab, and controls package with installation.
- (f) Freeze protection required for hydropneumatic tank, strainer, and exposed piping.
- (g) Price rounded off to the nearest \$1,000.

DISCUSSION

The UV disinfection system and the reuse to irrigation system presented in this discussion represent one way in which these two systems could be configured. Other configurations are possible. For example, an in-line UV (pressurized) system could be considered that might eliminate the need for the RIB pump station. However, the location of the proposed RIBs (location currently undetermined) may require the additional head supplied by the RIB pump station depending on their distance from the CSWRF. It would be necessary to weigh the

Kennedy/Jenks Consultants

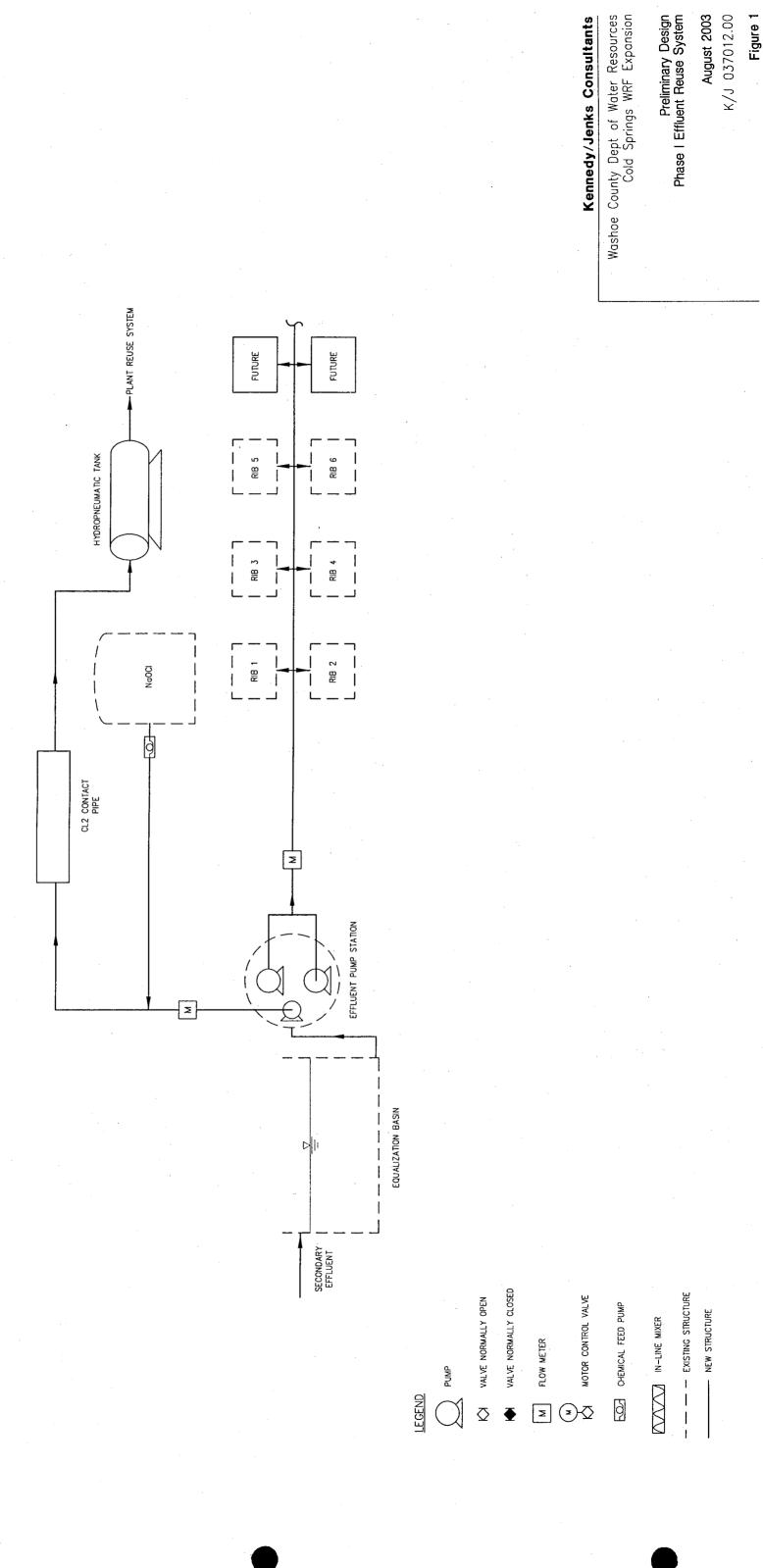
Technical Memorandum 003

Cold Springs Water Reclamation Facility - Effluent Reuse Washoe County Department of Water Resources 6 October 2003
Page 9

lifecycle costs of an in-line UV system against the lifecycle cost of an additional pump station as in-line UV systems require more power than an open channel system due to the type of UV bulbs required. It would also be possible to configure the irrigation to reuse system differently than shown on the flow schematic presented. However, the system configurations and the costs presented in this discussion should provide reasonable expectations for planning purposes.

In the future, if these improvements are implemented, the technology available at that time will be considered in greater detail.

Figures



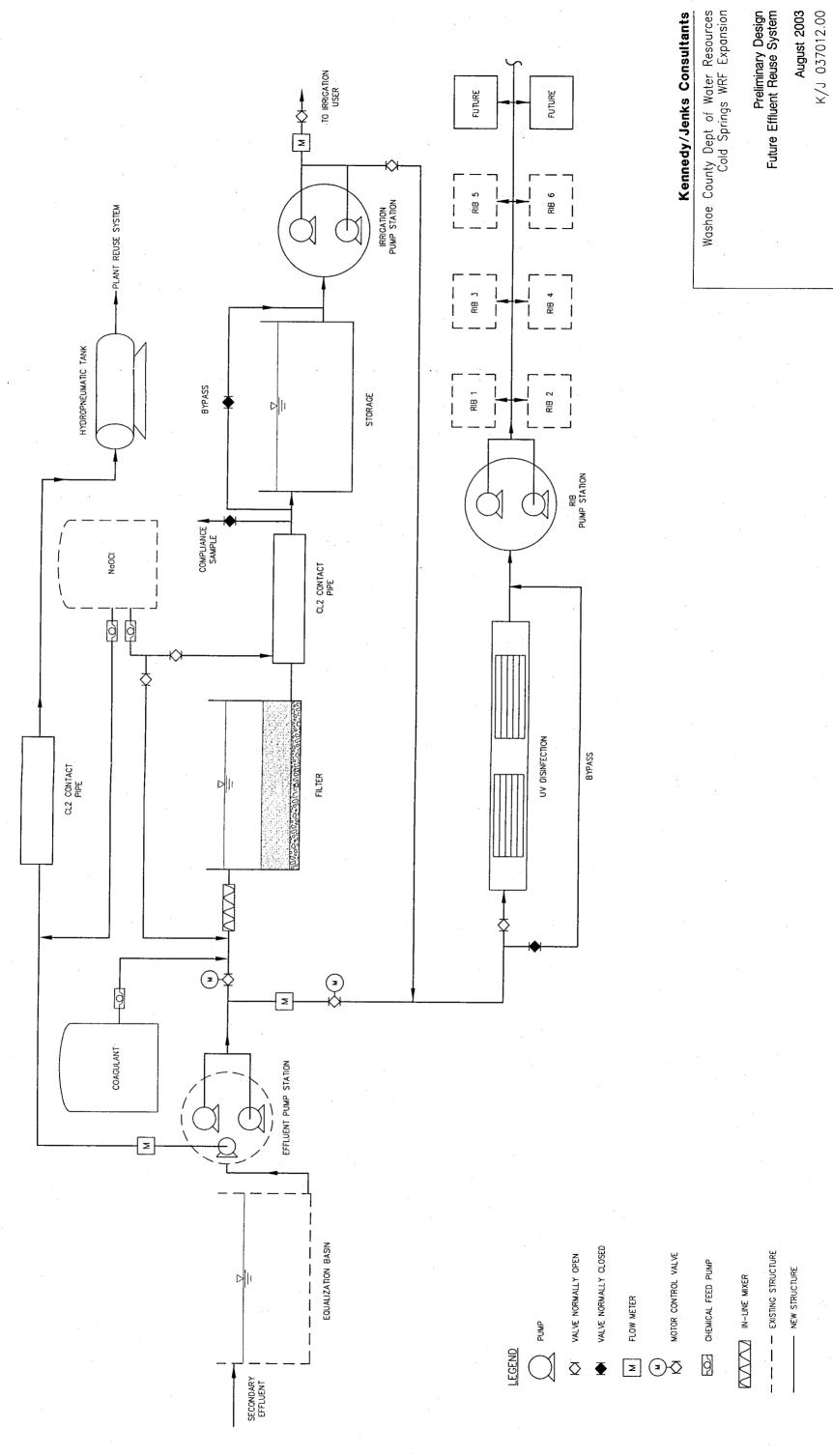


Figure 2

6 October 2003

Technical Memorandum No. 004

Prepared For: Joe Howard and Rick Warner

Washoe County Department of Water Resources

Submitted by: Lynn Orphan

Kennedy/Jenks Consultants

Analysis by: Jill Christiano and Travis Tormanen

Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC

Subject: Facility Expansion Design Criteria – Gallons per ERU

Cold Springs Wastewater Treatment Facility Expansion

K/J 037012.00

PURPOSE

This technical memorandum has been developed to serve as a part of the Cold Springs Water Reclamation Facility CSWRF) and Diamond Peak Lift Station and Force Main Preliminary Design. The purpose of this memo is to evaluate the influent characteristics related to flow rates and determine the influent flow design criteria for upgrading the CSWRF. An additional technical memorandum will be issued that relates to influent water quality and other design criteria related issues.

BACKGROUND

The CSWRF serves a new community composed of residential homes that use water conservation techniques commonly found in arid regions. In the future, some existing homes may be added to the system. The Washoe County standard is an annual average flow of 350 gallons per day (gpd) per Equivalent Residential Unit (ERU) (gpd/ERU). The Washoe County Utility Division approved a deviation from 350 gpd/ERU for the Cold Springs Wastewater Facility Plan (Facility Plan) to 325 gpd/ERU for the maximum month average daily flow.

Historic data for the CSWRF suggests an average flow of 130 gpd/ERU. This is an unusually low number and there is not enough data to rely on this number – particularly if pre-existing homes are added to the sewer system in the future. Even the newer areas of the community are likely to eventually see an increase in gpd/ERU as the system becomes older through replacement of low-flow fixtures by some of the residents and increased inflow and infiltration as the system becomes older.

Kennedy/Jenks Consultants

Technical Memorandum No. 004

Washoe County Department of Water Resources Facility Expansion Design - Gallon per ERUs 6 October 2003 Page 2

This technical memorandum looks at different sources of flow data to develop a recommendation for an appropriate gpd/ERU for design of the CSWRF and lift station upgrades for current and future flows. In addition to historic CSWRF data, other sources of data have been included from similar communities. Influent water quality parameters required for the design include biochemical oxygen demand (BOD), total suspended solids (TSS), total Kjeldahl nitrogen (TKN), ammonia nitrogen (ammonia), nitrate nitrogen (nitrate), and fecal or total coliform (coliform). These water quality parameters are not addressed in this memorandum, but will be included in the preliminary design report.

INFLUENT FLOW

Factors affecting wastewater generation include the following:

- Type of community and habits of inhabitants.
- Water conservation measures.
- Condition and age of the sewer system.
- Presence/absence of industrial and/or commercial wastewater sources.

Flow per Capita

The flow per capita in gpd is the typical design criteria for estimating influent flow quantities to a wastewater treatment plant. Table 1 summarizes the influent dry weather flows from various wastewater plants.

Washoe County Department of Water Resources Facility Expansion Design - Gallon per ERUs 6 October 2003 Page 3

Table 1: Summary of Per Capita Flows

	Source	Gallons per day per Capita (gpd/capita)	
1.	Cold Springs, NV (Historical)	48	
2.	Sun Valley, NV	84 to 93	
<u>2.</u> 3.	South Bayside System Authority, CA	86	
4.	San Leandro, CA	65	
5.	Burbank, CA	97	
6.	Anaheim, CA	90	
7.	Los Angeles Area, CA	90	
8.	Las Vegas, NV	106	
9.	Vallecitos Water District, CA	85	
10.	Metcalf & Eddy Typical Flow Values	68	
	MEAN	82	
	MEDIAN	87	

The average flow per person from these sources, rounded to the nearest gallon, are 82 gpd/capita (mean) and 87 gpd/capita (median). However, since each wastewater system is unique, using the mean or median values without considering the differences amongst systems is difficult to do. Each of the 10 situations is described briefly herein. Recommendations for consideration by Washoe County are then presented.

Example Community No. 1 – Cold Springs, NV (Historical)

The historical flow at the CSWRF has been 130 gpd/ERU. The exact number of people per residence isn't known. The average number per residence in unincorporated Washoe County was 2.73 according to census data adopted 23 November 1999 (Washoe County Comprehensive Plan, Housing Element). The 130 gpd/ERU equates to historical flows of 48 gpd/capita.

Example Community No. 2 - Sun Valley, NV

The community of Sun Valley, Nevada is located in Washoe County. It is a residential development of approximately 21,000 people similar to Cold Springs, but with a significant number of mobile homes and multi-family dwelling units. According to Washoe County, the average wastewater flow to the WWTF for this community is 225 to 250 gpd/ERU. Using data from the same November 1999 Comprehensive Plan, 2.68 persons per residence reside in the Sun Valley area; this converts to an equivalent 84 to 93 gpd/capita.

Kennedy/Jenks Consultants

Technical Memorandum No. 004

Washoe County Department of Water Resources Facility Expansion Design - Gallon per ERUs 6 October 2003 Page 4

Example Community No. 3 - South Bayside System Authority, CA

The California South Bayside System Authority operates a wastewater treatment facility that treats wastewater from 210,000 residents largely comprised of upper scale residences. The current influent flow for that treatment plant is 86 gpd/capita. This excludes industrial / commercial flows which are calculated separately. This community was built between 1920 and 1960. Conservation practices became more popular starting in the droughts of the late 1970s and late 1980s. Programs to subsidize homeowners for replacing water-using appliances were introduced and many homes were retrofitted with low flow, water saving fixtures.

Example Community No. 4 - San Leandro, CA

San Leandro, California is located between San Francisco and Oakland, California. The town is about 15 square miles with a population just over 100,000. The current influent flow for that treatment plant is 65 gpd/capita. This excludes industrial / commercial flows which are calculated separately. The average number of people per household in this community is 2.57. This community was built between 1920 and 1960. Conservation practices became more popular starting in the droughts of the late 1970s and late 1980s. Programs to subsidize homeowners for replacing water-using appliances were introduced and many homes were retrofitted with low flow, water saving fixtures.

Example Community No. 5 -Burbank, CA

The city of Burbank is located in the San Fernando Valley of Southern California. The climate includes moderate seasonal variance in climate with warm, dry summers. While Burbank is typically dry, the annual precipitation rate in the city of Burbank does vary from year to year. The 100-year average annual rainfall is approximately 12 inches. The city of Burbank is over 95% built-out, and the majority of the sewer lines in the central city were installed in the 1950s.

Kennedy/Jenks is currently assisting the City with a sewer master planning project. Per capita wastewater generation factors have not yet been provided to the City for this project. However, there is data available from water billing as well as winter 2003 flow monitoring that shows per capita residential wastewater generation of 97 gpd/capita.

Example Community No. 6 - Anaheim, CA

The city of Anaheim is located in the Los Angeles metropolitan area. Like the city of Burbank, Anaheim is located in a relatively dry climate with much of the sewer system being installed some years ago. The City's Draft Master Plan report includes a value of 90 gpd/capita.

Washoe County Department of Water Resources Facility Expansion Design - Gallon per ERUs 6 October 2003 Page 5

Example No. 7 - Los Angeles Area, CA

Los Angeles, California is an urban city. The City of Los Angeles Sewer Design Manual, Part F (June 1992) contains standards used for sewer design in the Los Angeles area. In this document, the average per capita wastewater flow in the Los Angeles area is estimated at 90 gpd/capita.

Example No. 8 - Las Vegas, NV

Las Vegas, NV also has high standards specified in the City of Las Vegas 1996 Master Plan. Their current numbers are 250 gpd/ERU and 2.35 persons per ERU equating to 106 gpd/capita. These values were determined before most water conservation programs were in place. These values are standards rather than actual observed values. At the time of issuing this draft technical memorandum, Kennedy/Jenks Consultants did not have observed flow data from Las Vegas to include as part of this analysis.

Example No. 9 - Vallecitos Water District, CA

The Vallecitos Water District (District) covers approximately 45 square miles in the northwestern part of San Diego County. It is situated about ten miles from the Pacific Ocean; about 30 miles north of San Diego; and 100 miles south of Los Angeles. The District's customers produce approximately 5.95 million gallons per day of wastewater. The District continues to experience new growth and development.

Kennedy/Jenks Consultants has provided wastewater analysis (Ongoing Master Planning Project, Technical Memorandum No. 9) to the District which describes the wastewater generation factors. The factors have been accepted by the District for use in the Master Plan. The per capita value within the District actually varies depending on the density of residences and type of housing units. However, a typical value used is 85 gpd/capita.

Example No. 10 – Metcalf & Eddy Typical Flow Values

This example comes from Metcalf and Eddy, Inc.'s *Wastewater Engineering Treatment, Disposal, and Reuse* (fourth edition). It states that typical flow values are 76 gpd/capita for households with 2 persons and 66 gpd/capita for households with 3 people. Since Kennedy/Jenks Consultants is recommending that 2.83 persons/residence be used for the purposes of load planning at Cold Springs, the Metcalf & Eddy values have been interpolated to 68 gpd/capita.

Washoe County Department of Water Resources Facility Expansion Design - Gallon per ERUs 6 October 2003 Page 6

ANALYSIS OF EXAMPLES / RECOMMENDATIONS

Analysis of 10 Examples

While each of the examples provided in this memorandum provide useful data for this evaluation, it is important to consider which data points are most applicable to this particular application. As can be seen from comparing the data, the actual Cold Springs data appears to be somewhat of an anomaly as compared to other available data. It is therefore recommended that a more conservative value be used than the 48 to 52 gpd/capita that has been observed at this facility during its limited operating history.

It may be most appropriate to use two separate values for: a) new development areas that include low-flow fixtures as part of the residential construction, and b) existing residential areas that are added to the sewers in the future.

The new development areas with a strong emphasis on conservation may be most similar to the San Leandro and South Bayside System Authority systems. These communities were each able to implement successful conservation programs. The demographics of the San Leandro system may be more similar to Cold Springs than South Bayside System Authority in terms of income. It is also less susceptible to inflow and infiltration than South Bayside System Authority.

A reasonable value for new development would appear to be 80 gpd/capita. This is reasonably conservative as compared to the historical Cold Springs flows (48 to 52), while still being within the range seen at San Leandro (65) and South Bayside System Authority (86).

A reasonable value for sewer service to residences constructed prior to implementation of water conservation measures would appear to be 90 gpd/capita. This would be consistent with recent data from Sun Valley (84 to 93), Anaheim (90), Burbank (97), and Vallecitos (85).

The Las Vegas, Los Angeles, and Metcalf & Eddy data provide information of interest to this study, but the data from these examples are not as specific or as recent as the other data. It is therefore recommended that this data not be used as a basis for establishing the flow design criteria for Cold Springs.

Population - People per Residence

The Washoe County Public Works Department Utility Division Design Standards & Review Guidelines for Water & Wastewater, Section 3.1.2 states that an occupancy factor of 3.50 persons per residence shall be used. This standard appears to be too high for this particular

Washoe County Department of Water Resources Facility Expansion Design - Gallon per ERUs 6 October 2003 Page 7

application since census data for unincorporated Washoe County indicates significantly less than 3.50 people live in each residence.

According to population information from the November 1999 Washoe County Comprehensive Plan, the unincorporated Washoe County population density is 2.73 persons per residence. For the purposes of being conservative, Kennedy/Jenks Consultants has included a safety value of 0.10 persons per residence, for a total of 2.83 persons per residence.

Peak Hourly Flow

A peaking factor of 2.5 was recommended in the Facility Plan. This is a common number used for systems that do not have high inflow and infiltration problems. It is therefore recommended that the Facility Plan value of 2.50 continue to be used for this project.

SUMMARY OF RECOMMENDATIONS

Based on the analysis presented in this memorandum, Kennedy/Jenks Consultants has developed specific recommendations for Washoe County and other stakeholders to review and comment. A summary of the recommendations is as follows:

- 80 gallons per capita for new development
- 90 gallons per capita for older residential areas
- 2.83 people per residence
- 225 gallons per ERU (80 x 2.83; rounded to nearest 25) for new development areas
- 250 gallons per ERU (90 x 2.83; rounded to nearest 25) for older residential areas
- 2.5 peaking factor for peak hourly flows.

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Christian Heinbaugh, Kennedy/Jenks Consultants

Reviewed by: Lynn Orphan and Ron Bush, Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Subject: Equivalent Residential Units

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

The purpose of this technical memorandum is to identify current and projected residential development in the Cold Springs area for use in sizing improvements to the Cold Springs Water Reclamation Facility (CSWRF).

BACKGROUND

The CSWRF was originally designed to treat and average daily flow of 0.35 million gallons per day (MGD). This capacity is quickly being reached and, therefore, an expansion to the CSWRF is necessary. A projection of future growth will be developed in this technical memorandum in order to determine the future flows that the CSWRF can expect to receive. This projection will include newly developed homes as well as properties that are currently on septic systems but will be connected to the collection system within the design life of the proposed improvements.

In order to estimate the expected flows to the CSWRF, the number of Equivalent Residential Units (ERUs) must be estimated. The population projections for this area assume an average of 2.83 people per ERU, which was developed based on previous data from the Cold Springs area. The average flow per ERU is multiplied by the number of ERUs to establish the estimated flow.

Currently, the CSWRF is experiencing lower volumes of wastewater than would be expected from the number of ERUs utilizing the facility. This low volume of wastewater can be attributed to the relatively new sewer system, as well as to the type of residences that are served. Many of the residences that currently contribute to the CSWRF are part of newer developments that were constructed with low flow appliances, reducing the amount of wastewater that is sent to CSWRF.

Washoe County Department of Water Resources - ERUs 6 October 2003 Page 2

DESIGN CRITERIA

Estimating the future flow to the CSWRF requires estimating the expected number of ERUs and the expected flow per ERU. Washoe County has previously used a standard of 350 gallons per ERU per day (gal/ERU/day) when estimating wastewater flow in an area. This standard is high in comparison to the flows the CSWRF is currently experiencing; so a lower rate of 225 gal/ERU/day for newer development and 250 gal/ERU/day for older residential areas is recommended for this project. See Technical Memorandum No. 004 for further discussion of flow per ERU.

Table 1 presents the existing and projected development for the CSWRF service area.

Table 1: ERU Projection

Source	Phase I ERUs (Existing and Current Expansion)	Phase II ERUs (Buildout)
Existing and Future Lifestyle/Woodland Homes Developments ^(a)	2,209	3,209
Existing and Future Residential Development from White Lake Homes ^(b)	364	364
Dry Sewered Area #1 ^(c)	57	57
Dry Sewered Area #2 ^(c)	109	109
Lots within the Facility Planning Limits Using Septing Tank and Leach Field Systems for Sewage Treatment and Disposal ^(d)		883
Existing and Proposed Bordertown Improvements ^(e)	304	304
Existing Lots with Gravity Access to the Whipporwill/Puffin Sewer Line ^(c)		102
Nancy Gomes Elementary School (c)	28	28
Potential Development along the North Side of White Lake ^(e)		80
Subtotal (Rounded Up):	3,100	5,200
Existing Plant:	(1,000)	(3,100)
Expansion:	2,100	2,100

Notes:

- (a) Includes gravity flow and Woodland Village List Station.
- (b) Present Diamond Peak Lift Station.
- (c) Future flow to Woodland Village Lift Station.
- (d) New lift station or route to Diamond Peak Lift Station.
- (e) Future flow to Diamond Peak Lift Station.

Washoe County Department of Water Resources - ERUs 6 October 2003 Page 3

Based on current and projected growth, the Phase 1 expansion will need to increase the capacity of the CSWRF to provide treatment for approximately 3,100 ERUs, while the Phase 2 expansion will need to provide treatment for an additional 2,100 ERUs for a total Phase 2 capacity of 5,200 ERUs.

The purpose of rounding the estimated number of ERUs to 3,100 at Phase 1 and 5,200 at Phase 2 is to create a design standard. These numbers will be used throughout this project as the design standard unless a change is agreed upon at a later date.

Our analysis is based on 225 gal/ERU/day for newer development and 250 gal/ERU/day for older residential areas, allowing for a projection of wastewater flows at the different phases. Table 2 presents this projection. These estimates will be used to determine the sizing required for the two phases of expansion at the CSWRF.

Table 2: Wastewater Flow Projections

Phase #	Number of ERUs	Flow/ERU (gal/ERU/day)	Estimated Average Daily Flow to CSWRF (gpd)	
Current Condition	1,000	225	225,000	
Phase I	3,071	225	700,000	
Phase II	5,136	225/250	1,200,000	

Note:

and = Gallons per day.

SUMMARY

Expanding the existing CSWRF has become necessary due to development in the Cold Springs area. In order to determine the expansion necessary, the projected development in the area was estimated. This estimate includes new homes that will be built as well as residential units that are currently on septic systems that may switch to the CSWRF sewer system. The estimated number of ERUs was then multiplied by the estimated flow per ERU which gave the estimated flow to the CSWRF at the various phases. This information will be used as the design standard throughout this project unless changes are agreed upon later.

The CSWRF design is based on 3,100 ERUs for Phase 1 and 5,200 ERUs for Phase 2, with the resultant flows of 700,000 gpd and 1,200,000 gpd, respectively. The resulting design flows are 700,000 gpd for Phase 1 and 1,200,000 gpd for Phase 2.

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Ron Bush and Harry Ritter, Kennedy/Jenks Consultants

Reviewed by: Travis Tormanen and Lynn Orphan, Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes Jason Phinney, TEC Civil Engineering Consultants

oujour vinite, i a com angulo concentente

Subject: Secondary Treatment Process Alternative Comparison

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

The purpose of this technical memorandum is to compare four secondary treatment technologies for the Cold Springs Water Reclamation Facility (CSWRF). The technologies under consideration are Sequencing Batch Reactors (SBRs); the Envirex Orbal™ System (Orbal™ System); an oxidation ditch using diffused aeration, blowers, and submersible mixers (OX Diffused); and an oxidation ditch using brush aerators and submerged mixers (OX Rotor). Capital costs, power costs, and the advantages/disadvantages of each alternative are presented. Items common to all three alternates such as screening, grit removal, digestion, and dewatering are not included in the cost estimates.

BACKGROUND

Due to potential residential development and septic tank conversions, a two-phase capacity expansion is planned for the CSWRF. The Phase 1 expansion will increase the capacity to provide treatment for approximately 3,100 Equivalent Residential Units (ERUs) while the Phase 2 expansion will provide treatment for an additional 2,100 additional ERUs.

The CSWRF currently uses SBRs to provide wastewater treatment. The expansion planning effort provides an opportunity to compare the use of new SBR basins with the operation of oxidation ditch technology and the Orbal™ System to meet future loading, treatment, and regulatory requirements. Regardless of the technology chosen, the existing SBR basins will be converted to aerobic digesters as the layout and volume of the existing basins are consistent with future needs.

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 2

DESIGN CRITERIA

For this comparison, the following phasing was assumed:

- The phasing of the SBR option would include initial construction of two SBR basins with a capacity of 0.4 MGD each and constructing a third basin in Phase 2 for a total capacity of 1.2 MGD.
- The Orbal™ System would be constructed at 0.7 MGD capacity in Phase 1 with an additional 0.5 MGD capacity in Phase 2 for a total capacity of 1.2 MGD.
- The other oxidation ditch options would be constructed as two equal capacity expansions of 0.7 million gallons per day (MGD) each (1.4 MGD total for Phase 2).

All of the phasing schemes provide a minimum capacity equivalent to 3,100 ERUs for Phase 1 and a minimum capacity equivalent to 5,200 ERUs for Phase 2. Design criteria for the three alternative processes are shown on Table 1. A diagram showing the phasing and treatment capacity of the three options is shown on Figure 1.

Table 1: General Design Criteria

Criteria	Unit	Phase 1	Phase 2
Population Data		visitati karangan	
ERUs		3,100	5,200
Persons per ERU		2.83	2.83
Daily Flow per ERU	gpd	225	225/250 ^(a)
BOD per Capita	lb/cd	0.2	0.2
TSS per Capita	lb/cd	0.2	0.2
Influent Loading			
Average Daily Flow (ADF)(b)	MGD	0.7	1.2
Peak Hour Flow (ADF)	MGD	1.75	3.0
Biological Oxygen Demand (BOD)	ppd	1,755	2943
Total Suspended Solids (TSS)	ppd	1,755	2943
Ammonia (NH ₃)	ppd	280	480
Total Nitrogen (TN)	ppd	350	600

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 3

Criteria	Unit	Phase 1	Phase 2
Effluent Limits	in Para tion and the		Control of the Contro
Biochemical Oxygen Demand (BOD)	mg/l	30	30
Total Suspended Solids (TSS)	mg/l	30	30
Total Nitrogen (TN)	mg/l	10	10

Note:

- (a) For Phase 2, it is assumed that 50% of the new ERUs would contribute 250 gpd and that the remaining 50% would contribute 225 gpd.
- (b) Phase 1 capacities will be higher for the SBR option (0.8 mgd) and lower (0.7 MGD) for the OX Diffused and Orbal™ System due to the phasing requirements. Two of the three options would have a Phase 2 capacity of 1.2 MGD. The OX Diffused option would have a Phase II capacity of 1.4 MGD.

Volume requirements for the SBR process are based on the following criteria:

- Basin volume for 8-days "oxic" solids retention time (SRT)
- Solids production yield coefficient of 0.8 pounds (lbs) total suspended solids (TSS) per lb of biochemical oxygen demand (BOD)
- Maximum allowable mixed liquor suspended solids (MLSS) is 3,000 milligrams per liter (mg/l).

Volume requirements for the Orbal™ System and the oxidation ditch processes are based on the following criteria:

• Provide a minimum of 1,000 cubic feet of basin volume per 15 lb of BOD per day. Kennedy/Jenks evaluated the appropriateness of using this volume assumption under each of the oxidation ditch scenarios. We found that even if there were differences in aeration efficiencies, the ditch sizing assumptions would not change. The aeration horsepower could change depending on oxygen transfer/aerator efficiency, but 1,000 cubic feet per 15 lbs. BOD would still be appropriate design criteria for any of the three oxidation ditch technologies evaluated in this memo.

COMPARISON

The comparison of the four treatment alternatives was based on capital and power costs and the potential benefits or disadvantages offered by each. All options would provide adequate treatment and are configured to provide biological nutrient removal (BNR).

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 4

Sequencing Batch Reactors

The SBR option would involve Phase 1 construction of two new SBR basins with one additional basin installed in Phase 2. All three basins would be of equal volume. An effluent equalization (EQ) basin with the capacity of 50% of one full decant cycle would be built to augment the existing EQ/chlorine contact basin. If reuse applications are included in the future, additional EQ volume would be required. The SBR option includes integral sedimentation and clarification so standalone clarifiers are not required.

Advantages of the SBR

- Aeration and clarification accomplished in one basin; no secondary clarifier is required.
- Less total tankage is required so the process has a smaller footprint compared to an oxidation ditch process.
- A return sludge pumping system is not required.
- A mixed liquor recycle (MLR) pumping system is not required for BNR.
- Process is the same as the existing CSWRF, which is familiar to Washoe County and SPB Utilities.

Disadvantages of the SBR

- The process requires a programmable logic controller and automated valves. The electronic controls are vulnerable to lightning damage.
- The SBR requires substantial headloss between the inlet and outlet.
- The SBR requires EQ volume for attenuating the effluent flow rate.
- The SBR requires an elevated headworks configuration or an intermediate pump station between the headworks and the SBR.

Estimate of Probable Cost for the SBR System

A preliminary estimate for the cost of the system is presented on Table 2. The costs presented are considered conceptual as there are unknown variables that would require additional consideration upon final design.

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 5

Table 2: Estimate of Probable Cost (SBR System)

Item	Phase 1 Cost	Phase 2 Cost
SBR Basins and Equipment	\$1,136,000	\$540,000
EQ Basin	\$88,000	\$0
Intermediate Pump Station	\$84,000	\$0
Process Equipment Building	\$315,000	\$158,000
Electrical & Controls	\$215,000	\$107,000
Contingency (15%)	\$276,000	\$121,000
Total	2,114,000	\$926,000

Power Cost for the SBR Option

The annual estimated power cost for the SBR process is shown on Table 3. These power costs assume that the process is treating the design loadings from startup of the expansion plant throughout the planning period. In reality, power consumption will be less as peak loadings for either phase are not expected initially.

Table 3: Annual Power Cost for the SBR Option

Component	Required Power (kW)	Operation (Hrs/day)	Annual Cost ^(a)
Phase 1	106	18	\$70,000
Phase 2	178	18	\$117,000

Note:

(a) Based on \$0.10 per kW*hr.

Orbal™ System

The Orbal™ System is an extended aeration, continuous flow, activated sludge system that uses a series of concentric donut shaped basins with surface-mounted rotating discs for mixing and aeration. The process can be expanded by adding additional common wall basins to the outside of the configuration. Partially submerged plastic rotors suspended on horizontal shafts provide the energy required to keep the mixed liquor moving around the basin and to provide aeration. Therefore, no blowers or diffuser network is required. BNR is accomplished by providing anoxic (low oxygen) conditions in at least one of the basins. A MLR pump is required to circulate mixed liquor between the oxic/anoxic basins. The Orbal™ System process requires standalone clarifiers and a Return Activated Sludge (RAS) and Waste Activated Sludge (WAS) pumping system.

Kennedy/Jenks Consultants

Technical Memorandum No. 006

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 6

Advantages of the Orbal™ System

- Common wall construction reduces the overall construction cost and allows for economical expansion increase.
- The basin configuration allows for individual basins to be taken offline.
- The Orbal™ System requires no diffuser grid network, blowers, or mixers as aeration and mixing are provided by the partially submerged rotating disks.
- The Orbal™ System requires only a small head differential between the inlet and outlet and would not require an intermediate pump station following screening and grit removal.
- The long hydraulic retention time and resulting basin volume make the system easy to operate, particularly in a BNR mode, and less prone to periodic upset.

Disadvantages of the Orbal™ System:

- Requires a MLR pumping system for BNR.
- Requires standalone clarifiers and a RAS/WAS pumping system.
- Redundancy requirements mandate that both clarifiers be built in Phase 1.
- The Orbal™ System is proprietary, making it difficult to get competitive bids.

Estimate of Probable Cost for the Orbal™ System

A preliminary estimate for the cost of the system is presented on Table 4. The costs presented are considered conceptual as there are unknown variables that would require additional consideration upon final design.

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 7

Table 4: Estimate of Probable Cost (Orbal™ System)

Phase 1 Cost	Phase 2 Cost
1,082,000	813,000
545,000	0
134,000	0
161,000	107,000
288,000	138,000
2,210,000	1,058,000
	1,082,000 545,000 134,000 161,000 288,000

Note:

Power Cost for the Orbal™ System Process

The estimated annual power cost for the Orbal process is shown on Table 5. These power costs assume that the process is treating the design loadings from startup of the expansion plant throughout the planning period. In reality, power consumption will be less as peak loadings for either phase are not expected initially.

Table 5: Annual Power Cost for Orbal Option

Component	Required Power (kW)	Operation (Hrs/day)	Annual Cost ^(a)
Phase I	70	24	\$65,000
Phase II	120	24	\$111,000

Note:

Oxidation Ditch with Diffused Aeration (OX Diffused)

The OX Diffused option uses a conventional oxidation ditch configuration consisting of an oval "racetrack" basin fitted with fine bubble air diffusers, blowers, and submerged mixers. The diffusers and blowers provide dissolved oxygen and the mixers are used to circulate the basin contents. The OX Diffused process is a continuous flow system and provides BNR capability without MLR pumping. Installation of the diffused aeration system with instrumentation allows for fine tuning of the air supply and potential power savings when oxygen demand is low. Submersible mixers are required in the four corners of the basins as the fine bubble aeration system does not provide energy for circulating the basin contents. Since only one basin would be installed during the Phase 1 expansion, it would be necessary to install aeration diffusers

⁽a) Includes RAS/WAS pump building.

⁽a) Based on \$0.10 per kW*hr.

Kennedy/Jenks Consultants

Technical Memorandum No. 006

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 8

that could be removed without draining the basin. Removable diffusers are more expensive than fixed diffusers and were included in the Phase 1 cost for this option. The Phase 2 basin is assumed to use fixed fine bubble diffusers which are substantially less expensive. Common wall construction of the Phase 1 and Phase 2 basins was assumed for the cost estimate.

Advantages of the OX Diffused:

- No intermediate pump station is required following screening and grit removal.
- Aeration supply can be fine-tuned resulting in potential energy savings.
- The long hydraulic retention time and resulting basin volume make the system easy to operate, particularly in a BNR mode, and less prone to periodic upset.
- Phase 2 capacity would be higher than the SBR and Orbal[™] options (6,200 ERUs vs. 5,200 ERUs)
- An MLR pumping system is not required to alternate between anoxic and oxic conditions
- Process is similar to the South Trukee Meadows WRF, which is owned by the County and operated by SPB.

Disadvantages of the OX Diffused:

- Requires standalone clarifiers and a RAS/WAS pumping system.
- Redundancy requirements mandate that two clarifiers be built in Phase 1.
- Lack of aeration basin redundancy requires that the Phase 1 ditch have removable diffusers.

Estimate of Probable Cost for the OX Diffused System

A preliminary estimate for the cost of the system is presented on Table 6. The costs presented are considered conceptual as there are unknown variables that would require additional consideration upon final design.

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 9

Table 6: Estimate of Probable Cost (OX Diffused Option)

Item	Phase 1 Cost	Phase 2 Cost	
Basin and Equipment	\$1,285,000	1,050,000	
Clarifiers and Equipment	\$545,000	0	
Buildings and Equipment	\$217,000	0	
Electrical and Controls	\$215,000	107,00	
Contingency (15%)	\$339,000	174,000	
Total	2,601,000	1,331,000	

Power Cost for the OX Diffused Process

The estimated annual power cost for the OX Diffused process is shown on Table 7. These power costs assume that the process is treating the design loadings from startup of the expansion plant throughout the planning period. In reality, power consumption will be less as peak loadings for either phase are not expected initially. At this early stage of comparison, Kennedy/Jenks was not able to find any substantial evidence of aeration efficiency differences between the various oxidation ditch technologies. Thus, the power costs for each of the oxidation ditch alternatives are presented as being the same.

Table 7: Annual Power Cost for OX Diffused Option

	Required Power	Operation	
Component	(kW)	(Hrs/day)	Annual Cost ^(a)
Phase I	70	24	\$65,000
Phase II	120	24	\$111,000

Note:

(a) Based on \$0.10 per kW*hr.

Oxidation Ditch with Aeration Rotors (OX Rotor)

The OX Rotor option uses a conventional oxidation ditch configuration consisting of an oval "racetrack" basin fitted with horizontally-mounted, rotating "brush" aerators and submerged mixers. Under aerobic conditions, the rotors provide dissolved oxygen and circulate the basin contents while the mixers are used to circulate the basin contents under anoxic conditions (i.e., rotors OFF or run at reduced speed). The OX Rotor process is a continuous flow system and provides BNR capability without MLR pumping. The mixers allow the aeration rotors to be

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 10

turned down to meet the actual air demand providing potential power savings when oxygen demand is low. Only one basin would be installed during the Phase 1 expansion. Common wall construction of the Phase 1 and Phase 2 basins was assumed for the cost estimate.

Advantages of the OX Rotor:

- No intermediate pump station is required following screening and grit removal.
- Aeration supply can be fine-tuned resulting in potential energy savings.
- The long hydraulic retention time and resulting basin volume make the system easy to operate, particularly in a BNR mode, and less prone to periodic upset.
- Phase 2 capacity would be larger than the SBR or Orbal alternatives (6,200 ERUs vs. 5,200 ERUs).

Disadvantages of the OX Rotor:

- Requires standalone clarifiers and a RAS/WAS pumping system.
- Redundancy requirements mandate that two clarifiers be built in Phase 1.

Estimate of Probable Cost for the OX Rotor System

A preliminary estimate for the cost of the system is presented on Table 8. The costs presented are considered conceptual as there are unknown variables that would require additional consideration upon final design. The accuracy of the conceptual estimate is considered +50% to -30%.

Table 8: Estimate of Probable Cost (OX Rotor Option)

Item	Phase 1 Cost	Phase 2 Cost	
Basin and Equipment	\$1,000,000	\$1,024,000	
Clarifiers and Equipment	\$506,000	\$0	
Buildings and Equipment	\$198,000	\$0	
Electrical and Controls	\$446,000	\$107,000	
Contingency (15%)	\$322,000	\$170,000	
Total	\$2,471,000	\$1,301,000	

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 11

Power Cost for the OX Rotor Process

The estimated annual power cost for the OX Diffused process is shown on Table 9. These power costs assume that the process is treating the design loadings from startup of the expansion plant throughout the planning period. In reality, power consumption will be less as peak loadings for either phase are not expected initially. At this early stage of comparison, Kennedy/Jenks was not able to find any substantial evidence of aeration efficiency differences between the various oxidation ditch technologies. Thus, the power costs for each of the oxidation ditch alternatives are presented as being the same.

Table 9: Annual Power Cost for OX Rotor Option

	Required Power	Operation	•
Component	(kW)	(Hrs/day)	Annual Cost ^(a)
Phase I	70	24	\$65,000
Phase II	120	24	\$111,000

Note:

COST SUMMARY

The Phase 1 and Phase 2 cost estimates for the three options are presented on Table 10.

Table 10: Summary of Estimated Comparative Capital Costs

Option	Phase 1	Phase 2	Combined
SBR	\$2,114,000	\$926,000	\$3,040,000
Orbal™	\$2,210,000	\$1,058,000	\$3,268,000
OX Diffused	\$2,601,000	\$1,331,000	\$3,932,000
OX Rotor	\$2,471,000	\$1,301,000	\$3,772,000

PRESENT WORTH ANALYSIS

A present worth analysis for the three options is presented on Table 11 and Table 12 using the following assumptions:

Phase 1 construction is estimated to be completed in 2005.

⁽a) Based on \$0.10 per kW*hr.

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 12

- Phase 2 construction is estimated to be completed in 2015.
- Present worth power costs have been developed for the 20-year period of 2005 to 2025.
- Other operations and maintenance costs (labor, equipment replacement, etc.) are considered relatively equal and have not been included.
- An overall interest rate of 2% was used for the analysis, assuming an interest rate of 5% and an annual inflation rate of 3%.

Table 11: Estimated Comparative Life Cycle Costs (Phase 1)

	Capital PW	Power PW	Combined PW	\$/gpd
SBR	\$2,114,000	\$629,000	\$2,743,000	\$3.43
Orbal™	\$2,210,000	\$584,000	\$2,794,000	\$3.99
OX Diffused	\$2,601,000	\$584,000	\$3,185,000	\$4.55
OX Rotor	\$2,471,000	\$584,000	\$3,055,000	\$4.36

Note:

Phase 1 and annual costs listed on Table 9 are all based on 2003 dollars.

Table 12: Estimated Comparative Life Cycle Costs (Phase 1 plus Phase 2)

	Capital PW	Power PW	Combined PW	\$/gpd
SBR	\$2,874,000	\$1,491,000	\$4,365,000	\$3.64
Orbal™	\$3,078,000	\$1,402,000	\$4,480,000	\$3.73
OX Diffused	\$3,693,000	\$1,402,000	\$5,095,000	\$3.64
OX Rotor	\$3,538,000	\$1,402,000	\$4,940,000	\$3.53

Note:

The combined Phase 1 and Phase 2 costs and the annual costs listed on Table 9 are all based on 2003 dollars.

CONCLUSION

The present worth analysis shows that all four alternatives fall within +/- 8% of the average cost of all options. The SBR option has the lowest overall cost and the OX Diffused option has the highest cost. The OX Rotor alternative provides the lowest ultimate cost/gallon when the additional capacity associated with the dual basin phasing is considered.

Kennedy/Jenks Consultants

Technical Memorandum No. 006

Washoe County Department of Water Resources - Alternative Comparison 6 October 2003
Page 13

Based on this comparative analysis, all four options are close enough in cost that any one of them could be justified for this application. Kennedy/Jenks Consultants would recommend that one of the oxidation ditch alternatives be selected as the oxidation ditch systems tend to be easier to operate and more reliable for BNR applications due to the long hydraulic and solids retention time afforded by the relatively large basin volume.

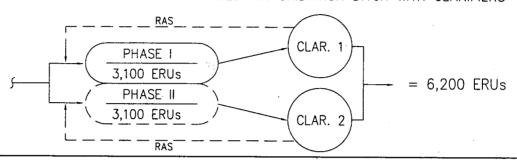
Figure

COLD SPRINGS LIQUID PROCESS ALTERNATIVES: USING CRITERIA OF 3,100 ERUs (PHASE I) AND 5,200 ERUs (BUILD OUT)

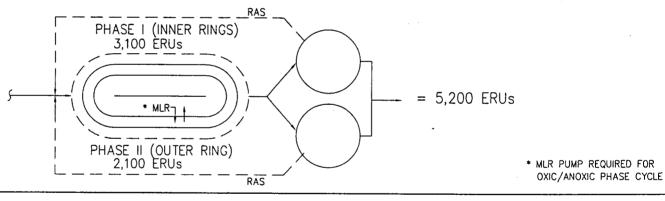




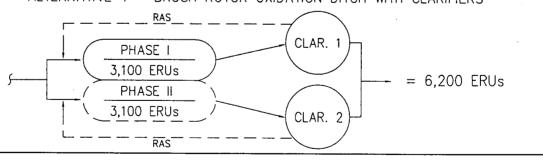
ALTERNATIVE TWO - DIFFUSED AIR OXIDATION DITCH WITH CLARIFIERS



ALTERNATIVE THREE - ORBAL SYSTEM WITH CLARIFIERS



ALTERNATIVE 4 - BRUSH ROTOR OXIDATION DITCH WITH CLARIFIERS



Kennedy/Jenks Consultants

NOTES: ALTERNATIVES TWO AND THREE WOULD BOTH INCLUDE ENOUGH CLARIFICATION CAPACITY IN PHASE 1 TO MEET THE REQUIREMENTS OF 5,200 ERUS.

ALTERNATIVE TWO COULD BE MORE COST EFFECTIVE IF EQUAL INCREMENTS OF 2,600 (PHASE 1) + 2,600 (PHASE II) WERE CONSTRUCTED.

Washoe County Dept. of Water Resources Cold Springs WRF Expansion

Preliminary Design

LIQUIDSOLIDS

— LIQUID — SOLIDS

August 2003 K/J 037012.00

Figure 1

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Abdul Toubat, Kennedy/Jenks Consultants

Reviewed by: Lynn Orphan and Travis Tormanen, Kennedy/Jenks

Cc: Ken Mallory, SPB Utilities

> Bob Lissner, Lifestyle Homes Jason Phinney, TEC Civil Engineering Consultants

Odor Control Alternatives

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

Subject:

The purpose of this technical memorandum is to compare alternative treatment technologies for odor control for the Cold Springs Water Reclamation Facility (CSWRF). The technologies under consideration are biofilters and activated carbon packaged systems. Capital costs and the advantages/disadvantages of each alternative are presented. Items common to both alternates such as blowers/fans and ducts are not included in the costs estimates in this technical memorandum, but will be included in the overall construction cost estimate that is being developed separately.

BACKGROUND

Due to nearby existing and planned residential developments, the CSWRF will need to treat the odors generated in the treatment process to an acceptable level for residential areas. In Phase 1 of the project, areas that generate most of the odors in the plant will be connected including the influent pump station wetwell, headworks influent channel and grit dumpster, and the centrifuge building. Other areas, such as the dewatered sludge storage, could be connected in later phases if odor becomes an issue.

ALTERNATIVE 1 – ACTIVATED CARBON CANISTERS

The activated carbon system is an adsorption process that directs the airflow through a vessel where odorous compounds are adsorbed onto the activated carbon media. The system would typically be designed to provide 3 seconds of contact time. Activated carbon equipment systems, such as High-Flow HF Series or Phoenix Odor Control System manufactured by Calgon Carbon Corporation, are pre-designed, pre-packaged, and ready to be assembled

Washoe County Department of Water Resources - Odor Control Alternatives 6 October 2003
Page 2

onsite. Calgon and other manufacturers of this type of equipment also make small package units that will efficiently treat up to 200 scfm of foul air with a media life of over one year with the types of loadings that will be present in this application. Airflow in the canister or vessel is directed to the bottom of the absorber and up through the media to a center exhaust exit. Activated carbon media should be regenerated after being used for a period of time, based on equipment and manufacturer recommendation, to continue working to remove odorous air efficiently.

Advantages

- Small footprint, suitable for point source application or tight space within the treatment plant.
- Very effective in removing high concentration of odor generating compounds.
- Media could be replaced with another type to meet specific odor compounds needs (i.e., organic compounds vs. H2S).
- Pre-packaged and pre-assembled, easy to connect to source.
- Less susceptible to weather changes than soil bed filters.
- Blowers can be located on the clean air side of the scrubber, reducing potential corrosion problems.

Disadvantages

- Higher capital and operational costs compared to soil bed filters in larger applications (over 200 scfm).
- Requires special arrangement for spent media disposal.
- Media in canister could be effective for one type of odor compound, but not as effective for another compound or type (less versatile); thus, may require a mixture of media types.
- Requires more attention from the plant's operation and maintenance personnel.

Washoe County Department of Water Resources - Odor Control Alternatives 6 October 2003
Page 3

Special Design Issues

If this alternative is selected, separate packages could be designed and installed for each specific flow from each location near the source of foul air. The systems come as a package and can be placed outdoors with little or no problem.

ALTERNATIVE 2 - BIOFILTER (SOIL BED) SCRUBBER

Biofilters or biological odor control use microorganisms to oxidize and remove contaminants from the air. Airflows pass through a biologically active media where bacteria digest contaminants, producing carbon dioxide and water vapor. Media in biofilter could be organic (peat, soil, compost, or heather) or synthetic (granular activated carbon or plastic). A soil media was assumed for this comparison.

Advantages

- Simple to construct and operate.
- Lower capital and O&M costs compared to other odor control technologies.
- Treats a wide variety of contaminants including H2S, CS, ammonia, and small organic sulfides.

Disadvantages

- May not remove all odors.
- Removal efficiency 85% to 95%.
- Moisture control system required, creating some water demand during summer months.
- Can be susceptible to weather changes.

Special Design Issues

A moisture control system would need to be included to keep the bed from drying out during warm weather months.

While operation of soil beds in cold temperatures is common, it is necessary to take measures to keep the moisture control piping and other soil bed elements from freezing during winter months.

Washoe County Department of Water Resources - Odor Control Alternatives 6 October 2003
Page 4

Soil Bed Design Criteria

The odor compound concentration and type (mostly H2S) generated in the influent pump station wetwell are different from other odor compounds generated through the treatment process; thus, treating the influent wetwell odor separately is common. Therefore, one soil bed filter would be dedicated for the influent wetwell. Another one could be combined for the Headworks and Centrifuge building because of their close proximity.

The detailed design criteria for the soil bed scrubbers will be developed as part of the actual bed design upon the final selection. Of particular concern is the media or mix of media to be used in the bed. The following is a discussion of the preliminary design parameters that would typically be used.

1. <u>Design Loading Rate.</u> The loading rate selected is important for the effectiveness of the treatment and the land required by the bed design. The higher loading rate will require much less land but could adversely affect the efficiency of the treatment. The lower loading rate will result in high efficiency of odor removal but requires more land. Based on previous experience and successful design in other wastewater treatment plants (Las Vegas, San Francisco Bay area, and Phoenix areas), the following loading rates as shown in Table 1 are recommended.

Table 1: Soil Bed Scrubber Loading Rates and Area Requirements

Odor Source	Exhaust Rate (cfm)	Loading Rate (cfm/sf)	Bed Area (sf)
Influent PS Wetwell	60	2.5	24
Headworks	50	2.5	20
Centrifuge Building	1,500	3.0	500

2. <u>Biofilter Media.</u> The media would consist of a mixture of materials designed to provide nutrients for bacteria while minimizing headloss through the filter. The media would be lightly composed to provide uniform compaction and minimize future settlement. The air distribution system in the soil filter would be installed in a ¾-inch screened gravel layer. A layer of filter fabric would be placed over the air distribution media to separate it from fine filter media above and a cover to protect the soil filter from weed growth would be installed on top. Commercial materials that will restrict the sunlight but permit air and water to flow through are available.

Washoe County Department of Water Resources - Odor Control Alternatives 6 October 2003
Page 5

3. <u>Sprinkler System.</u> Moisture is important for the soil filter to remove odor efficiently. A sprinkler system controlled automatically would be installed to ensure the soil stays moist.

COST COMPARISON

The costs shown in Table 2 include the installation of equipment or excavation of beds and media. Table 2 assumes the use of Calgon HF Equipment although other brands are available at similar prices. Also, costs shown in Table 2 do not include operational costs of the prepackaged unit for the lack of data at this point. However, operational costs for the prepackaged equipment, in general, are slightly higher than that for soil filter beds. The media replacement costs for the two alternatives are not significantly different

Table 2: Estimate of Probable Costs for Alternatives

Location	Calgon Equipment	Soil Bed Filters
Influent PS Wetwell	\$5,000	\$13,000
Headworks	\$5,000	\$12,000
Centrifuge Building	\$69,000	\$55,000

RECOMMENDATION

Based on the analysis performed for this technical memorandum, either technology could be used for this project. Based on this analysis and on Kennedy/Jenks Consultants' past experience, however, it is recommended that soil bed technology be used for the large bed for the following reasons:

- 1. Easy to construct and operate.
- 2. Costs less to construct than carbon canister type of technology.
- 3. Technology is more versatile to changing and/or unexpected odor compounds.

It is also recommended that the small package mixed media canisters be used in the locations such as the influent pump station and the headworks where the airflow requirements are low enough to allow use of this type of system.

Kennedy/Jenks Consultants

Technical Memorandum No. 007

Washoe County Department of Water Resources - Odor Control Alternatives 6 October 2003 Page 6

Table 3: Estimate of Probable Costs for Recommended Alternatives

Location	Equipment	Cost
Influent PS Wetwell	Package Media Scrubber	\$5,000
Headworks	Package Media Scrubber	\$5,000
Centrifuge Building	Soil Bed Filter	\$55,000
Total	·	\$65,000

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Christian Heinbaugh and Lynn Orphan, Kennedy/Jenks Consultants

Reviewed by: Travis Tormanen and Stuart Childs, Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Subject: Rapid Infiltration Basin Preliminary Design

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

The purpose of this technical memorandum is to present and compare the design options and possible locations of the new Rapid Infiltration Basins (RIBs) for the Cold Springs Water Reclamation Facility (CSWRF). The new RIBs will need to work in conjunction with the six existing RIBs in order to accommodate future flows from the CSWRF. This memorandum will present several concepts and evaluate them to recommend a preferred option.

Background

As mentioned in Technical Memorandum Nos. 005 and 006, the CSWRF will require a two-phase capacity expansion due to planned residential development. The Phase 1 expansion will increase the capacity to provide treatment for approximately 3,100 Equivalent Residential Units (ERUs). The Phase 2 expansion will provide treatment for an additional 2,100 ERUs, for a total of 5,200 ERUs. An average of 2.83 persons per ERU will be used in determining the design flows represented by these 5,200 ERUs.

This memorandum uses current and projected infiltration data obtained from the *Rapid Infiltration Basin Evaluation Report* [July 2003 Broadbent & Associates, Inc. (BAI)](see Attachment A). Currently, six RIBs are being used at the CSWRF; generally, only one is receiving effluent at a given time. The BAI report indicates that of the six existing RIBs, #1 and #2 are performing poorly, #3 and #4 are performing slightly above their design rate, and #5 and #6 are performing very well. Table 1 of the attached BAI report presents loading and infiltrations rates from both CSWRF staff and from field infiltration tests conducted by BAI.

Kennedy/Jenks Consultants

Technical Memorandum No. 008

Washoe County Department of Water Resources 6 October 2003 Page 2

DESIGN CRITERIA

Expected Conditions and Improvements to Existing RIBs

The design of the new RIBs is based on current and projected effluent flows, projected infiltration rates, and current regulations guiding RIB sizing. The RIBs will need to be able to handle effluent loading of approximately 700,000 gallons per day (gpd) at the conclusion of Phase 1 of this project. This number was obtained by assuming 3,100 ERUs producing 225 gallons per day per ERU (gal/ERU/day). Flows of approximately 1.2 million gallons per day (MGD) are expected at buildout; therefore, Phase 2 will require additional infiltration capacity. This flow volume was obtained by assuming an addition of 2,100 homes for Phase 2 of which 50% will produce 225 gpd and the other 50% will produce 250 gpd.

In order to maintain design infiltration rates, the RIBs are loaded one at a time, allowing each basin to drain completely with a resting period before it is loaded again. Due to this requirement, the new RIBs will be designed to give the RIB system enough capacity to not only infiltrate the projected effluent loads but also allow the system to have several basins empty at any given time.

Improvements to existing RIBs #1 and #2 should minimize the size and number of new RIBs to be constructed. According to BAI, 2 to 3 feet should be removed from the bottom of these RIBs. The removal of this material should increase the efficiency of RIBs #1 and #2 significantly (an estimated 5 times greater infiltration rate) as well as provide berm material for the new RIBs, thus reducing the amount of excavation necessary for construction of the new RIBs.

Design Guidelines

An average design infiltration rate of 0.1 inches per hour (in/hr) was used to determine the size and number of RIBs required for the two expansion phases. This rate is based on the July 2003 data presented by BAI.

The data shows that the field tests by BAI, using a double ring infiltrometer at ground surface and at 4 feet below ground surface, showed a higher infiltration rate than the anecdotal data from CSWRF staff. Applying the Environmental Protection Agency (EPA) recommended factor of 4.5% of a 30-minute infiltrometer rate, the design rates ranged from 0.097 in/hr to 0.315 in/hr in RIBs #6 and #2, respectively, and from 0.20 to 0.29 in the future RIBs areas. The anecdotal evidence of actual loading dissipation in the existing RIBs indicates a rate of 0.072 in/hr to 0.101 in/hr in basins #3 through #6. This experience leads to a recommended rate of 0.1 in/hr which is typical for fine textured sandy clays and silty clays.

Washoe County Department of Water Resources 6 October 2003 Page 3

Phase 1 Expansion

Phase 1 expansion of the CSWRF RIB system will be the construction of three new two-acre RIBs [RIB # 7(N), 8(N), and 9(N)]. These new RIBs will be located north of the existing RIBs (see Figure 1 for a general site map). They will give the system a design infiltration capacity of approximately 0.9 MGD with an expected effluent load of 0.7 MGD. The excess capacity will allow for each RIB to completely dry with a resting period before being loaded again as the effluent is cycled amongst them. The proposed location of the new RIBs allows them to share existing berms; thus, limiting the cost of construction.

Phase 2 Expansion

Three more two-acre RIBs [RIB #10(N), #11(N), and #12(N)] will be constructed east of the Phase 1 expansion RIBs. This addition will increase the RIB system's infiltration capacity to approximately 1.3 MGD at buildout. The excess capacity will allow for each RIB to completely dry with a resting period before being loaded again as the effluent is cycled amongst them. The proposed location for these new RIBs allows for the use of existing berms from other RIBs to reduce the required earthwork and cost.

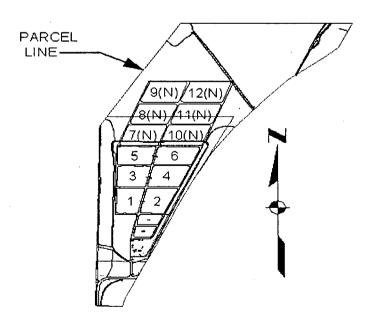


Figure 1: CSWRF Site Map

Washoe County Department of Water Resources 6 October 2003 Page 4

Projected Flows and Capacity

Table 1 of this report displays the estimated flow rates and infiltration capacities for current, Phase 1, and Phase 2 conditions. These projections are based on current and expected growth for the Cold Springs area.

Table 1: Current and Projected Flow and Infiltration Data

Rapid Infiltration Basin #	Design Rate (in/hr)	Design Rate (gpd/ac)	Estimated Acreage (ac)	Estimated Daily Load Capacity (gpd)	Estimated Effluent from CSWRF (gpd)
1	0.1	65,171	1.22	79,508	
2	0.1	65,171	1.40	91,239	
3	0.1	65,171	1.25	81,464	
4	0.1	65,171	1.58	102,969	
5	0.1	65,171	1.28	83,419	·
6	0.1	65,171	1.45	94,497	-
Sub Total Cւ	ırrent Condi	ion:		533,096	300,000
7(N)	0.1	65,171	2.00	130,341	
8(N)	0.1	65,171	2.00	130,341	
9(N)	0.1	65,171	2.00	130,341	
Sub Total Ph	nase 1:			924,119	700,000
10(N)	0.1	65,171	2.00	130,341	
11(N)	0.1	65,171	2.00	130,341	
12(N)	0.1	65,171	2.00	130,341	
Sub Total Ph	nase 2:			1,315,142	1,200,000

Note:

Design rate for basins 1 and 2 is based on removal of 2-3 feet from existing bottom.

A cycling plan was established to determine the amount of time to load and empty and the amount of dry time associated with each RIB at each expansion phase. Table 2 is this cycling plan which determines the estimated loading/unloading frequencies of the RIBs at the various phases of development.

EPA Land Treatment of Municipal Wastewater Effluents (1976, p. 57) recommends resting periods of 50% of the total time for year-round operation which is used as a guide for the Cold

Kennedy/Jenks Consultants

Technical Memorandum No. 008

Washoe County Department of Water Resources 6 October 2003 Page 5

Springs RIBs. The cycling plan allows adequate resting time for maintenance, including scrapping fine materials and moving vegetation. The dry times shown in Table 2 range from 214 to 242 days per year. This is more conservative than the EPA resting recommendations, and it provides more flexibility in spreading out the application points in order to mitigate the rising trend in shallow monitoring wells around the existing RIBS.

Washoe County Department of Water Resources 6 October 2003 Page 6

Table 2: RIB Cycling

Current Conditions:

	Approx. Dry Time per Year (Days)	292	280	288	270	286	278		
	Dry Time Between Cycles (Days)	146	140	144	135	143	139		
	Completely Dry (Day #)	219	252	279	316	343	376		
Cycle 2	Begin Dissipation w/o loading (Day #)	210	241	269	304	333	365		
S	End Loading (Day #)	209	240	268	303	332	364		
	Begin Loading (Day #)	183	210	241	269	304	333		
	Completely Dry (Day #)	37	70	26	134	161	194		
le 1	Begin Dissipation w/o loading (Day #)	28	59	87	122	151	183		
Cycle 1	End Loading (Day #)	27	58	98	121	150	182		
	Begin Loading (Day #)	-	28	59	87	122	151		
	Estimated Effluent from CSWRF (gpd)								300,000
	Time to Dissipate (days)	6	17	10	12	10	1		
	Time to Load (days)	26	30	27	34	28	31		
	Area (Acres)	1.22	1.40	1.25	1.58	1.28	1.45		8.18
	RIB#	*	2*	ო	4	22	9	Total	Current:

Notes:

* Assumes RIB #1 and #2 have been excavated to increase capacity

Assumptions:

Current Conditions:

Average days to load = 29.38 days (RIB #3-6 on Table 1 of BAI report). Average size of RIB = 1.36 AC (RIB #1-6 on Table 1 of BAI report). Average days/acre = 21.60. Average days to unload = 10.5 (RIB #3-6 on Table 1 of BAI report). Average days/acre to unload = 7.72.

Washoe County Department of Water Resource 6 October 2003
Page 7

RIB Cycling (Continued) Table 2:

Phase 1:

	Approx. Dry Time per Year (Days)	315	304	309	296	309	304	278	278	278	0.75	
	Dry Time A Between Cycles Tii (Days)	121	117	119	114	119	117	107	107	107		
	Completely Dry (Day #)	164	180	192	210	22.1	236	260	280	300		
Cycle 2	Begin Dissipation w/o Ioading (Day #)	155	169	182	198	211	225	245	265	285		
	End Loading (Day #)	154	168	181	197	210	224	244	264	284		
	Begin Loading (Day #)	143	155	169	182	198	211	225	245	265		
	Completely Dry (Day #)	22	38	20	68	79	94	118	138	158		
Cycle 1	Begin Dissipation w/o Ioading (Day #)	13	27	40	56	69	83	103	123	143		
	End Loading (Day #)	12	26	39	55	89	82	102	122	142		
	Begin Loading (Day #)		13	27	40	56	69	83	103	123		
Estimated	Effluent from CSWRF (gpd)									•	000	/00,000
	Time to Dissipate (days)	6	11	10	12	10	11	15	15	15		
i	Time to Load (days)	11	13	12	15	12	13	19	19	19		
	Area (Ac)	1.22	1.40	1.25	1.58	1.28	1.45	2.00	2.00	2.00	27.7	14.18
	RIB #	*	2*	က	4	5	9	7(N)	8(N)	(N)6	Total Phase	-

Notes:

* Assumes RIB #1 and #2 have been excavated to increase capacity

Assumptions:

Phase 1:
Ratio of Design Flow to Current Flow = 697,500/300,000 = 2.33.
Average days to load = 21.60/2.33 = 9.27 days/acre.
Average days/acre to unload = 7.72 days/acre.

Washoe County Department of Water Resources 6 October 2003 Page 8 Table 2: RIB Cycling (Continued)

Phase 2:

	Approx. Dry Time per Year (Days)	310.3	301.6	307.4	295.8	307.4	301.6	281.3	281.3	281.3	281.3	281.3	281.3		
	Dry Time Between Cycles (Days)	107	104	106	102	106	104	26	26	26	26	97	26		
	Completely Dry (Day #)	142	153	160	172	178	188	204	216	228	240	252	264		
Cycle 2	Begin Dissipation w/o Loading (Day #)	133	142	150	160	168	177	189	201	213	225	237	249		
S	End Loading (Day #)	132	141	149	159	167	176	188	200	212	224	236	248		
	Begin Loading (Day #)	125	133	142	150	160	168	177	189	201	213	225	237		
	Completely Dry (Day #)	18	29	36	48	54	64	80	92	104	116	128	140	:	
Cycle 1	Begin Dissipation w/o Loading (Day #)	6	18	26	36	44	53	65	77	68	101	113	125		
S	End Loading (Day #)	8	17	25	35	43	52	64	92	88	100	112	124		
	Begin Loading (Day #)	1	6	18	26	36	44	53	65	27	89	101	113		
: :	Estimated Effluent from CSWRF (gpd)													1,200,000	
	Time to Dissipate (days)	6	11	10	12	10	11	15	15	15	15	15	15		
	Time to Load (days)	7	8	. 2	6	7	8	11	1.1	11	11	11	11		
	Area (Ac)	1.22	1.40	1.25	1.58	1.28	1.45	2.00	2.00	2.00	2.00	2.00	2.00	20.18	
	RIB#	*	2*	3	4	5	9	7(N)	8(N)	9(N)	10(N)	11(N)	12(N)	Total Phase 2:	

Notes:

* Assumes RIB #1 and #2 have been excavated to increase capacity

Assumptions:

Phase 2:

Ratio of Design Flow to Current Flow = 1,196,250/300,000 = 3.99. Average Days to Load = 21.60/3.99 = 5.41 days/acre. Average days/acre to unload = 7.72 days/acre.

Kennedy/Jenks Consultants

Technical Memorandum No. 008

Washoe County Department of Water Resources 6 October 2003 Page 9

SUMMARY

After review of the concepts described above, Kennedy/Jenks Consultants has determined that the existing RIB system needs to be improved to allow for anticipated growth in the Cold Springs area. Phase 1 construction will include the removal of 2 to 3 feet off of the bottom of RIBs #1 and #2 along with the construction of three new two-acre RIBs located to the north of the existing RIBs. Phase 2 construction should be the development of three more two-acre RIBs which will give the plant an infiltration capacity of 1.3 MGD. This capacity is enough to satisfy the anticipated flows from the Cold Springs area.

Attachment A

Rapid Infiltration Basin Evaluation Report - Broadbent & Associates, Inc.

RAPID INFILTRATION BASIN EVALUATION REPORT COLD SPRING VALLEY WASTE WATER TREATMENT FACILITY WASHOE COUNTY, NEVADA

Prepared for:

Kennedy/Jenks Consultants 5190 Neil Road, Suite 210 Reno, NV 89502



Prepared by:

BROADBENT & ASSOCIATES, INC. 2000 Kirman Avenue Reno, Nevada 89502 (775) 322-7969

July, 2003

Project No. 03-02-116



July 25, 2003

Project No. 03-02-116

Kennedy/Jenks Consultants 5190 Neil Road, Suite 210 Reno, NV 89502

Attn: Mrs. Lynn Orphan, P.E.

RE: Rapid Infiltration Basin (RIB) Evaluation Report, Cold Spring Valley Waste Water

Treatment Facility, Washoe County, NV.

Dear Mrs. Orphan:

Broadbent & Associates, Inc. (BAI) is pleased to present this *Rapid Infiltration Basin (RIB) Evaluation Report* for the Cold Spring Valley Waste Water Treatment Facility located in northern Cold Spring Valley, Washoe County, NV. BAI conducted activities documented herein as a sub-consultant to Kennedy/Jenks Consultants (K/J), while K/J is contracting directly with the Washoe County Department of Water Resources (DWR). Conducted activities included three basic tasks: 1) Evaluation of the existing RIBs; 2) Evaluation and siting of potential new RIB locations; and 3) preparation of the enclosed report. Details of conducted activities, results, and conclusions are provided within the report.

Should you have questions or require additional information, please do not hesitate to contact us.

Sincerely, BROADBENT & ASSOCIATES, INC.

Lee W. Williams, Senior Staff Geologist



Douglas G. Guerrant, R.G., C.HG., C.E.M. Principal Hydrogeologist

Enclosure:

Rapid Infiltration Basin Evaluation Report, Cold Spring Valley Waste

Water Treatment Facility, Washoe County, Nevada

TABLE OF CONTENTS

			<u>Page</u>
1.	Introduc	ction/Purpose	1
2.	2.1. (2.2. I	RIB Evaluation Activities Current Treatment Facility Operations Double Ring Infiltrometer Testing Activities Discussion	1 1 2 3
3.	3.1. I 3.2. 3 3.3. I	B Locations Purpose Subsurface Lithology Double Ring Infiltrometer Testing Activities Discussion	4 4 4 5 6
4.	Ground	-Water Flow & Solute Transport Model Up-Date	6
5.	Summa	ry/Discussion	.7
6.	Conclus	sions	8
7.	Referen	ices	8
		TABLES	
Tal	ole 1:	RIB Operation and Testing Data for the Cold Spring Valley Wa Treatment Facility, Cold Spring Valley, Washoe County, Nevad	aste Water da.
Tal	ole 2:	Double Ring Infiltrometer Test Results, Cold Spring Valley, Wa County, Nevada.	ashoe
		DRAWINGS	
Dra	wing 1:	North Cold Spring Valley Geologic Map, Cold Spring Valley, N	evada.
		FIGURES	
Fig	ure 1:	SW - NE Cross Section A - A'.	
Fig	ure 2:	S – N Cross Section B – B'.	
Fig	ure 3:	Depth to Water versus Time for MW-1S, 2S, 3S, and 4S, Cold Valley, Washoe County, Nevada.	Spring

Figure 4:

Depth to Water versus Time for MW-2D, 3D, and 4D, Cold Spring Valley,

Washoe County, Nevada.

Figure 5:

Depth to Water & Sweger Well Pumping Data versus Time for MW-2D &

4D, Cold Spring Valley, Washoe County, Nevada.

APPENDICES

Appendix A:

RIB Test Data Sheets

Appendix B:

Boring Logs

1.0 INTRODUCTION/PURPOSE

Based upon on-going residential growth in the north Cold Spring Valley area, the existing Cold Spring Valley Waste Water Treatment Facility (CSWWTF) will need to be expanded to accommodate the increased loading associated with continued growth. The current facility has six rapid infiltration basins (RIBs) that are utilized to infiltrate treated waster water effluent. Furthermore, it has been reported that the existing RIBs are not performing as originally anticipated, in that they are not capable of transmitting/infiltrating at the design capacity. Given this information, it is likely that additional RIBs will be needed and that additional locations may be required to better accommodate future anticipated flows.

The purpose of this investigation was to evaluate the existing RIBs and then rerate their infiltration capacities, to evaluate and test additional areas as potential new RIB locations for Treatment Facility expansion, and to incorporate the new infiltration and flow information into the existing ground-water flow and solute transport model for this area to determine if there will be any significant impacts to the long term water resources of northern Cold Spring Valley.

2.0 EXISTING RIB EVALUATION ACTIVITIES

2.1 CURRENT TREATMENT FACILITY OPERATIONS

As indicated above, the CSWWTF, in its current state, consists of six RIBs. In general, only one RIB receives discharge at any given time. Since the facility was opened in late-1997, discharge flows have increased from approximately 10,000 gallons per day (gpd) to approximately 120,000 gpd.

Drawing 1 (a geologic map of the area discussed below) depicts the current plant configuration. The RIBs are numbered 1 – 6. The rotation pattern for use of the RIBs is as follows: #1, #4, #5, #2, #3, and then #6. Personnel from SPB utilities (the CSWWTF operation and maintenance contractor) have indicated that RIBs #1 and #2 perform poorly, while RIBs #5 and #6 perform the best. Furthermore, they have indicated that RIBs #1 and #2 take about one week to load and about one month to dry up, while RIBs #5 and #6 take about one month to load and about one week to dry up. RIBs #3 and #4 perform somewhere in between.

Unfortunately, specific flow data is readily not available on a per RIB basis. However, SPB Utilities was able to provide a schedule of time periods when each RIB was being loaded for the period of July, 1999 – June, 2003. Table 1 provides a tabulation of estimated flows and resulting estimated infiltration rates per RIB for the last two loading events for each RIB (covering the period of September, 2002 through June, 2003). Review of Table 2 indicates that average infiltration rates range from 0.022 inches/hour (~17,700 gpd) to 0.031 inches/hour (~28,000 gpd) for RIBs #1 and #2, respectively. Average infiltration rates for RIBs #3 and #4 are 0.082 inches/hour (~71,300 gpd) and 0.072 inches/hour (~75,000 gpd), respectively. Average infiltration

rates for RIBs #5 and #6 were 0.101 inches/hour (~87,000 gpd) and 0.107 inches/hour (~91,600 gpd), respectively.

Review of the Dewante and Stowell 1991 report entitled *Proposed Wastewater Facilities*, *Cold Spring Valley* (Dewante and Stowell, 1991) indicates that the design loading rate for the existing RIBs was approximately 40,000 gpd/acre, or 0.06 inches/hr. This design rate was derived from double ring infiltrometer test results for tests conducted by Pezonella Associates, Inc. in 1991 in the area of the CSWWTP (Pezonella, 1991). The design rate was derived by taking 4.5% of the actual double ring test results, as suggested in the US EPA process design manual entitled *Land Treatment of Municipal Wastewater* (October, 1981).

As a means of evaluating actual performance rates versus the design rate, Table 1 was complied. Review of Table 1 indicates that there is a range in the level of actual RIB performance of 36% to 157% relative to the design rate, with RIB #1 being the worst performer and RIB #6 being the best.

2.2 DOUBLE RING INFILTROMETER TESTING ACTIVITIES

BAI personnel conducted an investigation of the existing RIBs to evaluate their current performance on June 25 and 26, 2003. Two double ring infiltrometer tests were conducted in both RIB #2 and RIB #6: one at the current RIB surface and one at a depth of approximately 4.0 – 5.0 below the current surface. Each test area was set up with a four-foot diameter outer ring and a two-foot diameter inner ring. The outer rings for the at-depth tests were constructed by excavating an approximate four-foot diameter pit to the test depth. Excavated materials were used to construct berms to act as outer rings for the surface tests. A two-foot diameter steel inner ring was driven approximately two inches into the test surface. Yardsticks were driven into the surface within the inner rings in order to facilitate water level measurements within the inner rings.

Lithology encountered during construction of the rings in RIBs #2 and #6 generally consisted of a brown silty sand of medium density. However, in RIB #2 the upper 1.5 feet consisted of a dark brown dense silt-clay mix with a trace of sand. A one-inch thick lens of red clayey silt with a trace of sand was also observed at a depth of 2.75 feet in RIB #2. The silt-clay mix observed in RIB #2 exhibited desiccation cracks that were expressed at the surface. The surface of RIBs #1, #2 and #3 exhibited similar desiccation cracks and silt-clay mix. RIBs #4 and #5 were covered with water as well as aquatic plants, and therefore, could not be observed. The surface of RIB #6 consisted of the brown silty sand encountered during ring construction, however, the desiccation cracking but was not as pronounced as the cracks in the silt-clay mix found in RIB #2.

Once each ring was constructed, it was pre-soaked and then a six-hour infiltration test was conducted for each area. Water used for the test was effluent pumped from the CSWWTF. Water levels between the inner and outer ring were kept similar by adding water to the outer ring when necessary. Water was maintained in both rings for the duration of each test. Collected infiltration data for these tests is provided in Table 1. Additionally, the field data sheets for these tests are provided in Appendix A.

Results from the double ring infiltrometer tests discussed above were compared with actual operation flow data provided by SPB Utilities, as presented in Table 1. Review of Table 1 indicates that the estimated operational infiltration rate for the current surface of RIB #2 is 42% of the rate estimated by the double ring infiltrometer test $(0.03"/hr \div 0.07"/hr)$. The estimated operational infiltration rate for RIB #2 at a depth of 4.5 feet below the current surface is only 0.4% of the rate estimated by the double ring infiltrometer test $(.03"/hr \div 7.15"/hr)$, meaning the at depth double ring test rate is much greater than the current operational rate at the surface. Therefore, it seems clear that the infiltration rate for RIB #2 (and likely RIB #1) could be significantly enhanced by excavating the top 2.0 - 3.0 feet of this RIB to remove the fine textured materials (to a depth below the thin red clay lens, where present) and to expose the underlying more course textured sands.

Review of Table 1 relative to RIB #6 indicates that the estimated operational infiltration rate for the current surface of RIB #6 is 11% of the rate estimated by the double ring infiltrometer test, while the estimated operational infiltration rate for RIB #6 at a depth of 4.0 feet below the current surface is 19.0% of the rate estimated by the double ring infiltrometer test. Accordingly, there does not appear to be a significant difference between the two tests conducted on RIB #6.

2.3 DISCUSSION

Based upon the above information, it appears that, in general, the existing RIBs are performing at rates similar to the design rates of 40,000 gpd (0.06"/hr), but that RIBs #1 and #2 rates could be significantly increased by removing the top 2.0-3.0 of overburden to expose some underlying coarser materials. Re-rated information for each RIB, based upon actual operation data, is provided in Table 1, both in gallons per day (gpd) and gpd/acre, and as listed below:

Basin	Gpd/acre	acres	gpd
	Ĺ		
RIB #1	14,500	1.22	17,690
RIB #2	20,138	1.40	28,193
RIB #3	53,665	1.33	71,374
RIB #4	47,090	1.58	74,402
RIB #5	66,097	1.33	87,909
RIB #6	62,935	1.45	91,256

As indicated above, if the top 2.0 - 3.0 feet of overburden were removed from RIB #1 and #2, infiltration rates would likely significantly increase. Infiltration test results suggest that an infiltration rate of approximately 7.0 inches/hr might be possible. However, the long term rate would likely be significantly less, as suggested in the previously mentioned US EPA document that indicates that 4.5% of test results should be utilized as a design rate. However, that suggested rate is based upon a short term (30 minute test) utilizing clean water for the test. In this case, a six-hour test was conducted utilizing actual effluent water. Accordingly, a higher percentage would be reasonable to assume (i.e., 10%). If 10% of the infiltration test rate were assumed to be reasonable in this case, then one might expect an infiltration rate of approximately

0.7"/hr (10% of 7.0 inches/hr) to be experienced in RIB #1 and #2, if the overburden were removed. To be even more conservative, a 4.5% rate could be utilized, which would result in an estimated rate of 0.315 inches/hr.

3.0 NEW RIB LOCATIONS

3.1 PURPOSE

Based upon current information and planned growth for the area, it appears that the existing RIBs will not be capable of accommodating future anticipated flows. Given this information, it is likely that additional RIBs will be needed and that a different location will be required to better accommodate future anticipated flows. The purpose of this portion of the investigation documented herein is to locate potential new sites for additional RIBs. To do so, existing lithologic information for the area was reviewed and additional drilling and lithologic logging was conducted, the details of which are discussed below.

3.2 SUBSURFACE LITHOLOGY

There have been several investigations conducted in this area of Cold Spring Valley over the years, with some drilling and some test pit excavations. These investigations include Van Denburgh, 1981 and Pezonella, 1991. Both of these reports were reviewed prior to BAI selecting possible drilling locations for additional drilling and lithologic logging.

Drawing 1 is a geologic map of northern Cold Spring Valley (adapted from Van Denburgh, 1981), specifically depicting the area around and north of the CSWWTF. Review of Drawing 1 indicates that there exists a surface expression of a rather large beach and delta deposit (as described by Van Denburgh, 1981) located in the middle of the extreme northern portion of the valley in an arched shaped pattern to the north and east of the CSWWTF. The presence of this coarse grained (sand) deposit was confirmed by review of lithologic logs provided in the Pezonella, 1991 report and upon field inspection. Furthermore, this sand deposit is believed to exist throughout the northern portion of the valley at varying depths, depending upon your location. To further investigate this sand body as well as lithology in general in this area, three new borings were drilled by Broadbent & Associates, Inc. (BAI), as documented below.

Drawing 1 depicts several boring locations identified as PB- and BB-. The PB-locations were drilled and logged by Pezonella in 1991 and the BB- locations were drilled and logged by Broadbent & Associates, Inc. in 2003. The PMW-1 location is a monitor well location drilled, logged, and constructed by Pezonella in 1991.

The above mentioned Pezonella borings were drilled with a truck mounted hollow stem auger drill rig with split spoon sampling equipment. Samples were collected on a five-foot interval. The BAI borings were also drilled with a hollow stem auger rig but sampling was conducted via the continuous core Moss sampling system which facilitated more accurate description of subsurface lithologic conditions, relative to the split spoon sampling technique.

Lithologic boring logs for both the Pezonella, 1991 work and the BAI 2003 work were utilized to build two geologic cross-sections (A-A' and B-B') provided herein as Figures 1 and 2 (see Drawing 1 or cross-section transects). Copies of the utilized boring logs utilized are provided in Appendix B. In both cases, the lithology was logged utilizing the universal soil classification system.

Review of these two cross-sections indicates that for the area investigated, in general, the sand deposit is present from land surface to a depth ranging from approximately 20 feet below land surface (bls) to the total depth investigated (55 feet bls). This sand is underlain by a clay unit with variable thickness. Depths and thicknesses of each unit vary depending upon your location, and the clay layer is not found to be laterally continuous. Additionally, there was clay material present at the surface in the area of BB3, which is located out in the flood plain area in the extreme northern portion of the valley. Ground water was only encountered in BB3 at a depth of approximately 39 feet bls.

The presence of the sand deposit appears to offer a good opportunity for placement of additional RIBs. This sand appears to be relatively clean with some silts and some gravels. While there is underlying clay present, it does not appear to be laterally continuous such that infiltrated water should be able to work its way vertically downward, over time, and not remain perched above the clay.

3.3 DOUBLE RING INFILTROMETER TESTING

To further investigate the potential for new RIB locations discussed above, BAI personnel conducted three double ring infiltrometer tests (BR-1, BR-2, and BR-3), one each at the three BAI drilling locations (BB1, BB2, and BB3, respectively) discussed above. Testing activities were conducted on July 16 and 17, 2003. Each test was conducted at a depth of approximately 5.0-6.0 feet bls. Each test area was set up with a four-foot diameter outer ring and a two-foot diameter inner ring. The outer ring for the at-depth tests were constructed by excavating an approximate four-foot diameter pit to the test depth. Lithology encountered during the excavation of the outer ring was consistent with the soil boring lithology discussed above. A two-foot diameter steel inner ring was driven approximately two inches into the test surface. Yardsticks were driven into the surface within the inner rings in order to facilitate water level measurements within the inner rings.

Subsequent to construction, each ring was pre-soaked and then a six-hour test was conducted for each area. Clean water was used for these tests which was provided by the Lifestyle Homes construction crew (via the Utilities, Inc. water supply well known as the Sweger Well). Water levels between the inner and outer ring were kept similar by adding water to the outer ring when necessary. Water was maintained in both rings for the duration of each test. Collected infiltration data for these tests (as well as the early tests) is provided in Table 2. Additionally, the field data sheets for these tests are provided in Appendix A.

Review of Table 2 indicates that the average infiltration rate for BR-1, measured at a depth of 5.5 feet below the existing land surface, is 4.44 inches/hour. The average infiltration rate for BR-2, measured at a depth of 5.5 feet below the existing land surface, is 6.55 inches/hour. The average infiltration rate for BR-3, measured at a depth of 5.0 feet below the existing land surface, is 1.15 inches/hour.

3.4 DISCUSSION

Based upon the above information, it appears that the area to the northeast of the existing RIBs has potential for successful installation and operation of future RIBs. Lithologic logging and infiltration testing activities suggest that two of the three areas tested (BR-1 and BR-2) offer good potential for infiltration (test rates of 4.44 "/hr and 6.55 "/hr, respectively), while the BR-3 test area was found to be of less potential (1.15 "/hr).

As discussed above, design rates for land application of treated effluent are generally a percentage of test rates. In the case of the original design for the CSWWTF, a 4.5% rate of infiltration test rates was utilized, where testing activities were short duration (30 minutes) and clean water was utilized for the test. In the case of the BR-1 and BR-2 tests, clean water was used for the test, but a much longer test was conducted (6 hours). However, to be consistent with previous design criteria for the CSWWTF, a design rate equal to 4.5% of the infiltration test result is recommended. Therefore, the design rate for infiltration for the BR-1 test area would be approximately 0.2"/hr (130,349 gpd/acre), while the design rate for infiltration for the BR-2 test area would be approximately 0.3"/hr (195,523 gpd/acre).

4.0 GROUND-WATER FLOW & SOLUTE TRANSPORT MODEL UP-DATE

BAI previously prepared (Broadbent & Associates, 2002) a ground-water flow and solute transport model as part of waste water facility planning activities for the CSWWTP conducted by the Washoe County Department of Water Resources. As part of the investigation documented herein, any new information developed in terms of infiltration rates was to be incorporated into the flow model to see if there were to be any resulting impacts to the local water resources. Review of the model input parameter data reveals that the input flows to the RIBs for 2003 were estimated at approximately 129,000 gpd. Current actual discharge is approximately 120,000 gpd, therefore, there is a minor discrepancy and little influence within the model.

Additional review of model parameter data reveals that the vertical hydraulic conductivities utilized in the model for the area under and around the current RIB locations ranged from 0.05 – 0.5 inches/hr. These rates are similar to those developed from the operation and test data for the RIBs. Therefore, there does not appear to be any new information that would significantly affect the ground-water flow model at this time.

5.0 SUMMARY/DISCUSSION

The existing CSWWTF will require expansion in order to accommodate the planned residential growth for north Cold Spring Valley. Existing RIBs are capable of handling current loads and they are operating at or above the original design rating of 0.06"/hr, with the exception of RIBs #1 and #2. However, infiltration rates for both RIB #1 and #2 can likely be significantly increased by removing the top 2.0-3.0 feet of overburden to expose underlying sands. If this overburden were to be removed, the infiltration rate for these basins might be expected to increase from ~ 0.03 "/hr to 0.315"/hr or greater. Infiltration rates for RIB #3, 4, 5, and 6 range from 0.072-0.101"/hr, based upon estimated operation data.

Several potential new RIB locations were investigated to the northeast of the existing CSWWTF. Available literature was reviewed and three new soil borings were drilled to assess the subsurface lithology in this area. A large sand body is found to be present, both exposed at the surface as well as at depth. This sand is underlain by noncontinuous clay layer of variable thickness. Double ring infiltrometer tests were conducted at all three drill locations. Two of the three test areas (BR-1 and BR-2) were found to possess good infiltration rates (4.44 and 6.55"/hr, respectively). Applying the EPA recommended standard of 4.5% of the test rate for a design rate, the estimated design rates are 0.2"/hr and 0.3"/hr for BR-1 and BR-2, respectively.

BAI previously prepared a ground-water flow and solute transport model as part of waste water facility planning activities for the CSWWTP conducted by the Washoe County Department of Water Resources. Review of the model input parameter data reveals that the input flows to the RIBs for 2003 were estimated at approximately 129,000 gpd. Current actual discharge is approximately 120,000 gpd, therefore, there is a minor discrepancy and little influence within the model. Additionally, the vertical hydraulic conductivities utilized in the model are similar to those developed from the operation and test data for the RIBs. Therefore, there does not appear to be any new information that would significantly affect the ground-water flow model at this time.

It should be noted that during review of CSWWTF operation data, it was observed that water levels are rising in existing shallow monitor wells (MW-1S, 2S, 3S, and 4S). These wells were installed by the Washoe County Department of Water Resources (WCDWR) and they are monitored on a quarterly basis by the WCDWR. Monitoring data for 1997 – 2003 are provided on Figure 3 for these four wells. Review of Figure 3 demonstrates this rising trend. It was further noted that water levels in the deeper monitor wells (MW-2D, 3D, and 4D) are slowly declining and that there appears to be a direct influence on water levels in these deeper wells as a result of pumping from the nearby Sweger Well. Figure 4 depicts the declining water level trend, while Figure 5 depicts the influence of the Sweger Well on water levels in these monitor wells. While these results are not unexpected, it noted here as something that should be monitored over time, especially as the residential growth of the valley continues to increase and as water supply demand and CSWWTF discharges continue to increase.

6.0 CONCLUSIONS

General conclusions are as follows:

- The current RIBs are operating at or above the original design rating of 0.06"/hr, with the exception of RIBs #1 and #2. Infiltration rates for RIB #3, 4, 5, and 6 range from 0.072 0.101"/hr, based upon estimated operation data.
- Infiltration rates for both RIB #1 and #2 can likely be significantly increased by removing the top 2.0 – 3.0 feet of overburden to expose underlying sands. Expected infiltration rates would be approximately 0.315"/hr or greater.
- There is a sand deposit present at the surface or just below the surface throughout a large portion of the area to the northeast of the CSWWTF that offers good potential for future RIB locations.
- Estimated design infiltration rates for two tested areas (BR-1 and BR-2) are approximately 0.2"/hr and 0.3"/hr, respectively.
- Review of the ground-water flow and solute transport model reveals that the model was constructed with information that still appears to be representative of known conditions, and therefore, no modifications were necessary.
- Water levels in existing shallow monitor wells located in direct proximity to the CSWWTF are increasing while water levels in deeper monitor wells are slowly declining (apparently due to Sweger Well pumping). These water level changes were anticipated but should be closely monitoired as growth in the valley continues.

7.0 REFERENCES

- Broadbent & Associates, Inc., 2002, Ground-Water Flow and Salute Transport Model, North Cold Spring Valley, Washoe County, Nevada.
- Dewante & Stowell, 1991, Proposed Wastewater Facilities, Cold Spring Valley, Crystal Canyon Corporation, Washoe County, Nevada.
- Pezonella Associates, Inc., 1997, Geotechnical Investigation, Proposed Woodland Park, Washoe County, Nevada.
- SEA Engineers/Planners, Inc., 1985, Soils Investigation, Sweger Estate, Cold Springs Valley, Washoe County, Nevada.
- Van Denburgh, A.S., 1981, Water Resources of Cold Spring Valley, A Growing Urban Area Northwest of Reno, Nevada, USG Open File Report 80-1287.

TABLES

Table 1: RIB Operation and Testing Data for the Cold Spring Valley Waste Water Treatment Facility, Cold Spring Valley, Washoe County, Nevada.

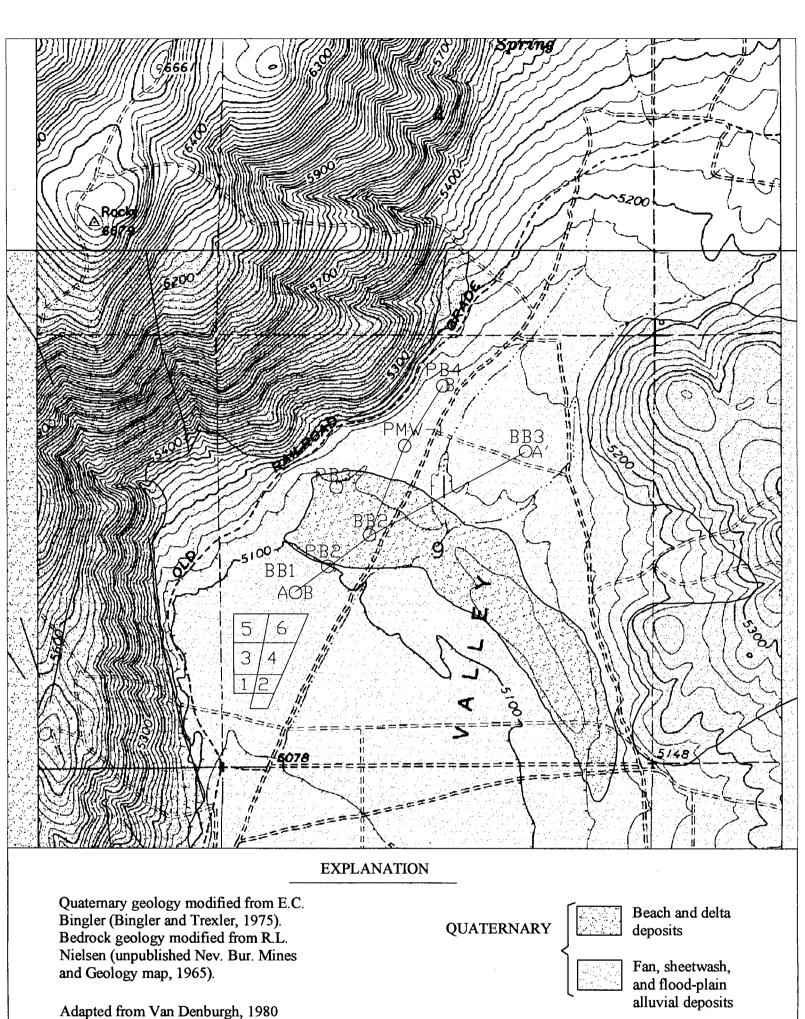
RIB Performance ant of Percent of sst Rate Design Rate [⋆]	36%	20%	134%	118%	165%	157%
Ring Test Rate	Not Tested	42% 0.4%	Not Tested	Not Tested	Not Tested	11% 19%
Ring Test Depth From Surface (ft)	Not Tested	Surface 4.5	Not Tested	Not Tested	Not Tested	Surface 4.0
Double Ring Test Results (in/hr)	Not Tested	7.15	Not Tested	Not Tested	Not Tested	0.88
Loading Time Period	1/16/03 - 1/21/03 5/15/03 - 5/21/03	9/17/02 - 9/30/02 3/10/03 - 3/20/03	9/30/02 - 11/5/02 3/20/03 - 4/9/03	1/21/03 - 2/12/03 5/21/03 - 6/18/03	12/11/02 - 1/16/03 2/12/03 - 3/10/03	11/5/02 - 12/6/02 4/9/03 - 5/15/03
Infiltration Rate (in/hr)	0.019 0.025 0.022	0.029 0.033 0.031	0.083 0.081 0.082	0.067 0.078 0.072	0.095 0.108 0.101	0.087 0.107 0.097
Infiltration Rate (gpd/acre)	12,563 16,438 <i>14,500</i>	19,014 21,262 20,138	54,309 53,022 53,665	43,528 50,651 47,090	61,833 70,362 66,097	56,406 69,464 62,935
Infiltration Rate (ft/day)	0.039 0.050 0.044	0.058 0.065 0.062	0.167 0.163 0.165	0.134 0.155 0.145	0.190 0.216 0.203	0.173 0.213 0.193
Basin Area (Acres)	1.22 1.22 Average:	1.40 1.40 Average:	1.33 1.33 Average:	1.58 1.58 Average:	1.33 1.33 Average:	1.45 1.45 Average:
Basin Area (ft2)	53,000	60,950	57,750 57,750	68,800	57,800	63,000 63,000
Time to Dissipate (days)	30	30	4 ₁	14 14	7	7
Volume Loaded (ft3)	71,515 96,244	152,921	481,219 319,476	330,838 449,138	471,595	414,383
Volume Loaded (gal)	535,000 720,000	1,144,000	3,600,000	2,475,000	3,528,000	3,100,000
Loading Rate (gal/day)	107,000	88,000	100,000	112,500	98,000	100,000
Days Loaded (days)	6 5	13	36 20	22 28	36 26	31 36
CSWWTP RIB No.		2 2	တတ	4 4	သ	9 9

* The design rate for the RIBs was 40,000 gpd (0.06"/hr), as derived by Dewante and Stowell (1991) and Pezonella (1991).

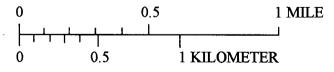
Table 2: Double Ring Infiltrometer Test Results, Cold Spring Valley, Washoe County, Nevada.

Ring Test Number	Date	Infiltration Rate (in/hr)	Depth Below Surface (ft)
RIB2-S	6/26/2003	0.074	0.0
RIB2-D	6/26/2003	7.15	4.5
RIB6-S	6/26/2003	0.88	0.0
RIB6-D	6/26/2003	0.50	4.0
BR-1	7/17/2003	4.44	5.5
BR-2	7/17/2003	6.55	5.5
BR-3	7/17/2003	1.15	5.0

DRAWINGS



Base from U.S. Geological Survey 1:24,000 Reno NW, 1967 (photorevised 1974)



CONTOUR INTERVAL 20 FEET

DATUM IS SEA LEVEL



Metavolcanic

and metasedimentary rocks

Fault. Dashed where

approximately located; dotted where buried

 $\mathbf{A}^{\mathbf{I}}$

Cross Section Lines



Existing Waste Water Treatment Facility

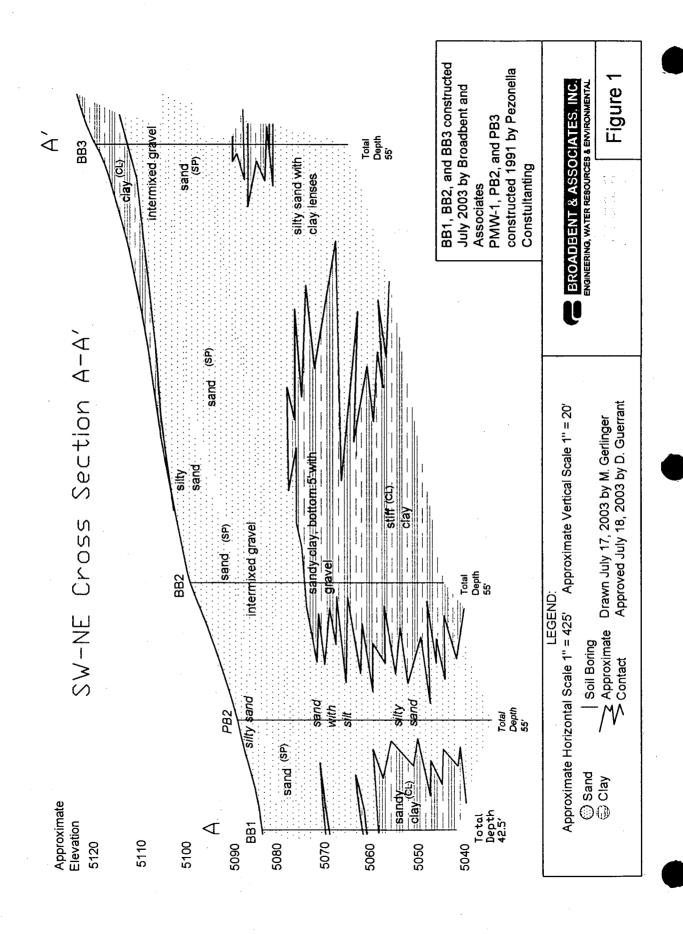
BB1 O Borehole and/or test pit location



North Cold Spring Valley Geologic Map, Cold Spring Valley, Nevada

Drawn July 21, 2003 by M. Gerlinger Approved July 22, 2003 by D. Guerrant Drawing 1

FIGURES



BB1, BB2, and BB3 constructed constructed 1991 by Pezonella Figure 2 BROADBENT & ASSOCIATES, INC. ENGINEERING, WATER RESOURCES & ENVIRONMENTAL July 2003 by Broadbent and PMW-1, PB2, and PB3 Total Depth 36' $\stackrel{\mathcal{B}}{\mathbb{R}}$ Constultanting Town votings exiditing to the colors. sand(SP Associates silty sand with clay lenses. Sand (SP) PMW-1 Total Depth 75' Section B-B' Drawn July 17, 2003 by M. Gerlinger Approved July 18, 2003 by D. Guerrant Approximate Horizontal Scale 1" = 425' Approximate Vertical Scale 1" = 20' silty interm|xed gravel sandy clay. with gravel S-N Cross bottom 5 sand (sp) Total Depth 55' LEGEND: Approximate Sontact Soil Boring silty sand Sand PB2 Total Depth 55' sand (sP) clay (CL) sandy Sand Clay Approximate Elevation Depth 42.5 5090 BB1 Total ф 5120 5110 5100 5080 5070 5040 5060 5050

Figure 3: Depth to Water versus Time for MW-1S, 2S, 3S, and 4S, Cold SpringValley, Washoe County, Nevada.

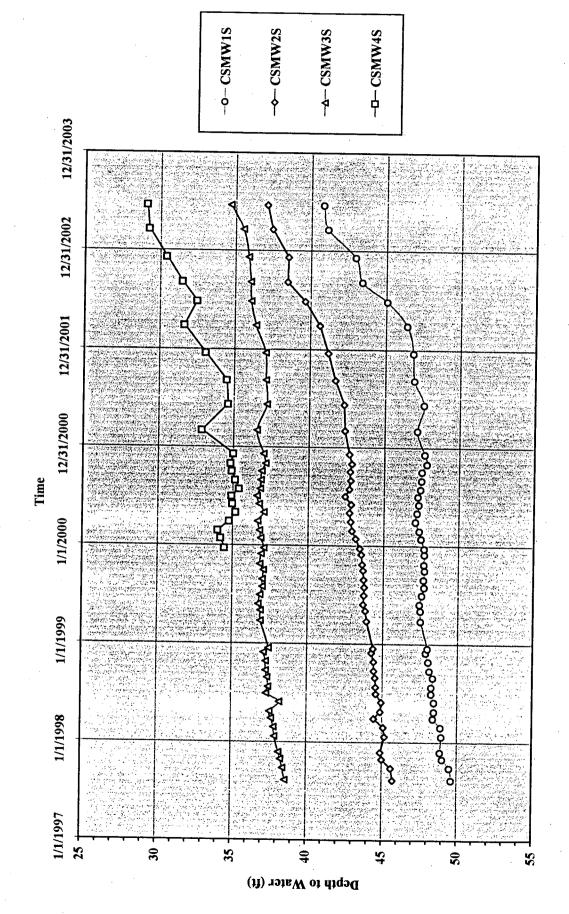


Figure 4: Depth to Water versus Time for Monitor Wells MW-2D, 3D, and 4D, Cold Spring Valley, Washoe County, Nevada.

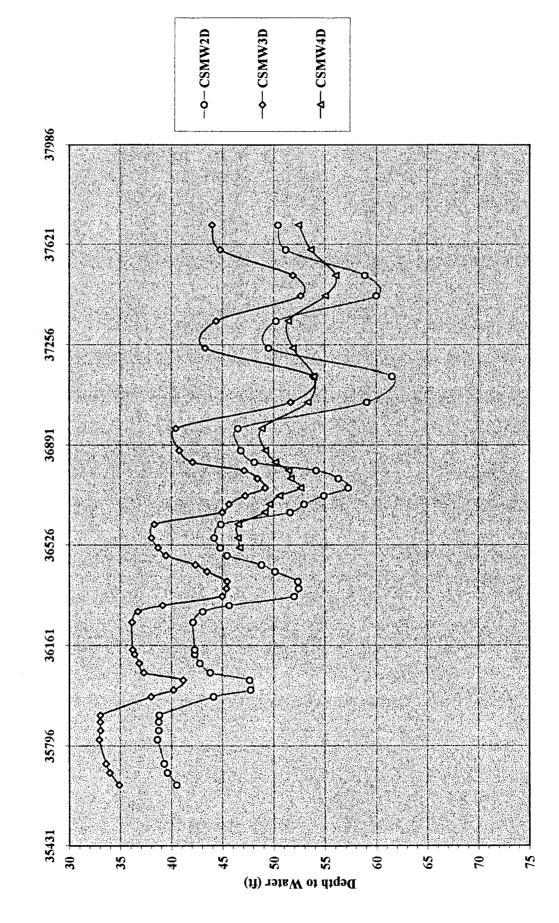


Figure 5: Depth to Water & Sweger Well Pumping Data versus Time for MW-2D & 4D, Cold Spring Valley, Nevada.

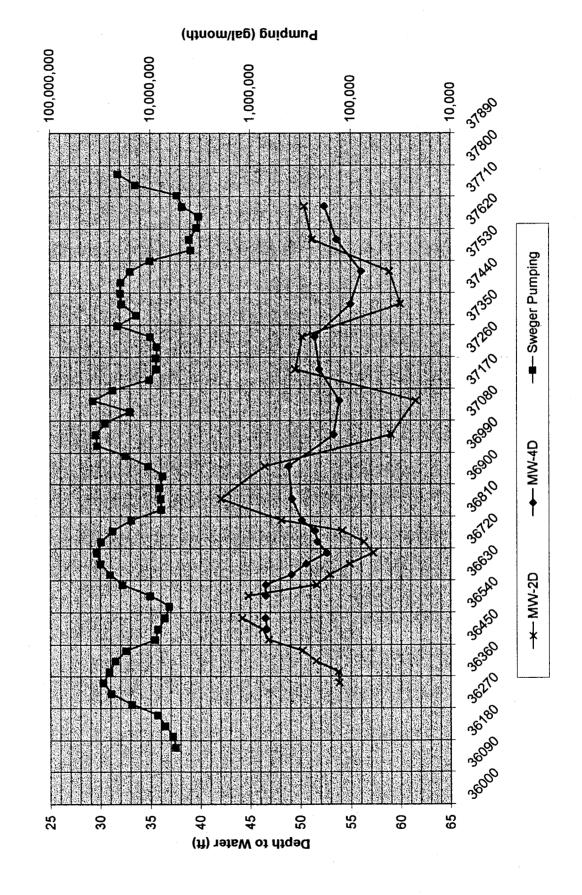


Figure 4: Depth to Water versus Time for Monitor Wells MW-2D, 3D, and 4D, Cold Spring Valley, Washoe County, Nevada.

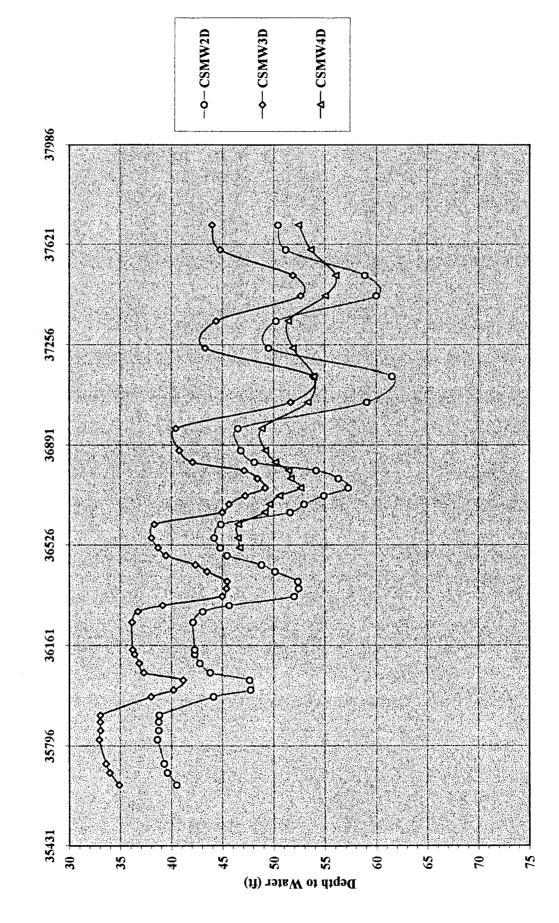


Figure 5: Depth to Water & Sweger Well Pumping Data versus Time for MW-2D & 4D, Cold Spring Valley, Nevada.

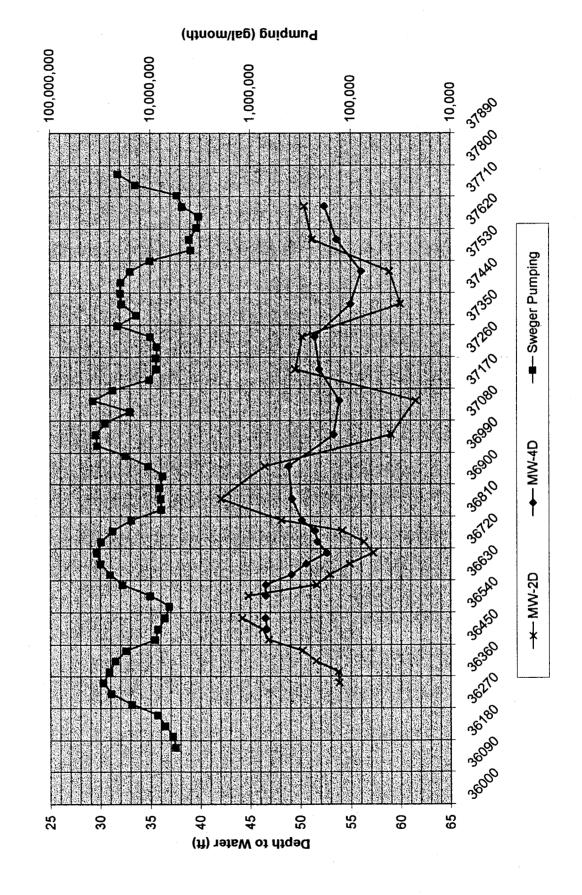


Figure 4: Depth to Water versus Time for Monitor Wells MW-2D, 3D, and 4D, Cold Spring Valley, Washoe County, Nevada.

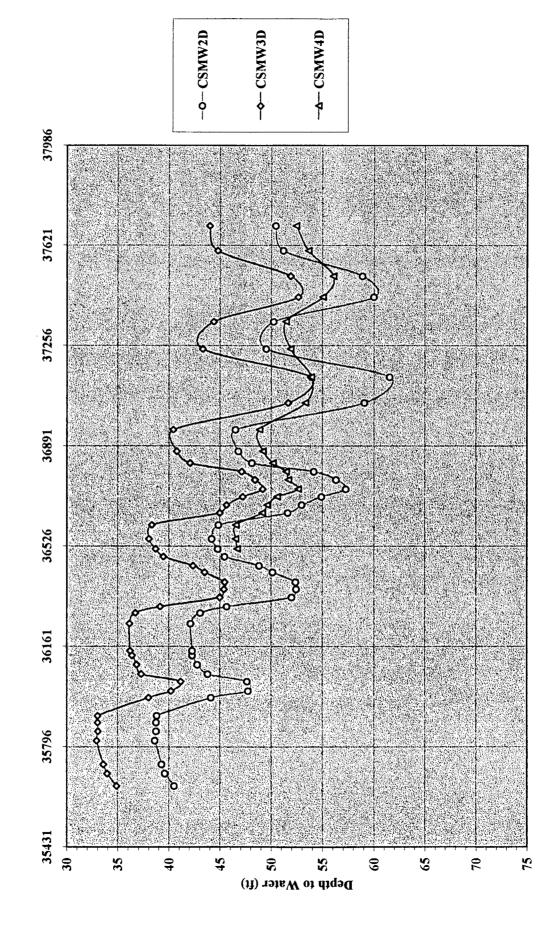
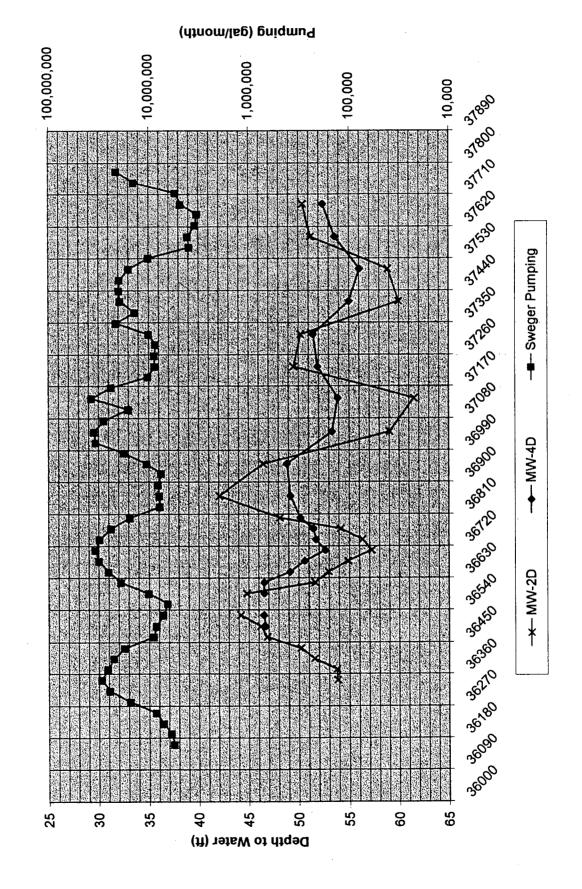


Figure 5: Depth to Water & Sweger Well Pumping Data versus Time for MW-2D & 4D, Cold Spring Valley, Nevada.



APPENDIX A RIB TEST DATA SHEETS

Date:	6/26/2003	
Test Location:	RIB2-S	
Test Depth:	Surface	_

Time	Water Level Re	ading (Inches)	Elapsed Time	Infiltration	Infiltration Rate	
11110	Before Filling	After Filling	(Minutes)	(Inches)	(Inches/Hour)	
11:00	2.75	2.75				Still full from 6/25/03, outer ring dry
12:01	2.88	2.88	61	0.13	0.12	Not Filled (NF)
13:57	2.88	2.88	116	0.00	0.00	NF
15:51	3.00	3.00	114	0.13	0.07	NF
17:00	3.13	End	69	0.13	0.11	End of test
				<u></u>		Lita of lest
			·	Average	0.074	
				* · · · · · · · · · · · · · · · · · · ·		
				<u> </u>		
					<u>.</u>	
· · · · · · · · · · · · · · · · · · ·						
				-		
<u> </u>						

Date:_	6/26/2003
Test Location:	RIB2-D
Test Depth:_	4.5 Feet

Time	Water Level Ne	ading (Inches)	Elapsed Time	Infil t ration	Infiltration Rate	N.A.
	Before Filling	After Filling	(Minutes)	(Inches)	(Inches/Hour)	Notes
11:27	Dry	3.50				Infiltration is very fast
11:44	6.88	6.88	23	3.38	8.80	Not Filled (NF)
11:54	8.00	0.50	10	1.13	6.75	·
12:51	7.75	7.75	57	7.25	7.63	NF
13:07	9.50	0.50	16	1.75	6.56	
14:14	8.38	0.50	67	7.88	7.05	
15:26	7.75	0.50	72	7.25	6.04	
16:41	8.63	0.50	75	8.13	6.50	·
17:27	6.50	End	46	6.00	7.83	
17.27	0.50	End				End of Test
				Average	7.15	-
						
<u> </u>						
<u> </u>						

Date:	6/26/2003	
Test Location:	RIB6-S	
Test Depth:	Surface	

Time	Water Level Re	eading (Inches)	Elapsed Time	Infiltration	Infiltration Rate	
	Beforè Filling	After Filling	(Minutes)	(Inches)	(Inches/Hour)	Notes
10:26	Dry	4.00				
11:34	4.88	4.88	68	88.0	0.77	Not Filled (NF)
12:29	5.63	5.63	55	0.75	0.82	
13:49	6.75	6.75	80	1.13	0.84	NF
14:41	7.50	2.50	52	0.75	0.87	NF
16:26	4.13	End	105	1.63	. 0.93	
	4.10	CIIQ				End of test
				Average	0.88	
						
·						
<u>.</u>						
·		_				
<u>.</u>						
		,				

Date:	6/26/2003
Test Location:	RIB6-D
Test Depth:	4.0 Feet

	Water Level Re	ading (Inches)	Elapsed Time	Infiltration	Indianation D.A.	
Time	Before Filling	After Filling	(Minutes)	(Inches)	Infiltration Rate (Inches/Hour)	Notes
10:20						
10:29	Dry	4.00	68	0.50	0.44	
11:37	4.50	4.50	53	0.38	0.42	Not Filled (NF)
12:30	4.88	4.88	80	0.63	0.47	NF
13:50	5,50	5.50	62	0.75	0.73	NF
14:52	6.25	3.00	97	0.75	0.73	
16:29	3.75	End	31	0.75	0.46	End of test
				Average	0.50	
					7	
		·				
	1					
	, , , , , , , , , , , , , , , , , , ,					
		· · · · · · · · · · · · · · · · · · ·				

Date:	7/17/2003	
Test Location:	BR-1	
Test Depth:	5.5 Feet	

	Time	Water Level Re	ading (Inches)	Elapsed Time	Infiltration	Infiltration Rate	
	rine	Before Filling	After Filling	(Minutes)	(inches)	(Inches/Hour)	` Notes
	10:15	NA	1.00				Infiltration is fast
	10:52	3.88	1.00	37	2.88	4.66	irinia audir is rast
				95	7.38	4.66	
	12:27	8.38	1.00	61	4.38	4.30	
	13:28	5.38	1.00	94	6.88	4.39	
ļ	15:02	7.88	1.00	73	5.13	4.21	
	16:15	6.13	End		<u> </u>	1.221	End of Test
				-	Average	4.44	
					Average	4.44	
					· · · · · · · · · · · · · · · · · · ·		
							·
							
	-	·			· .		7
			 				· · · · · · · · · · · · · · · · · · ·
					·		
			<u> </u>				

Date:	7/17/2003
Test Location:	BR-2
Test Depth:	5.5 Feet

Time	Water Level Re	ading (Inches)	Elapsed Time	Infiltration	Infiltration Rate	
	Before Filling	After Filling	(Minutes)	(Inches)	(Inches/Hour)	Notes
10:05	NA	0.50				Infiltration is very fast
10:26	3.13	0.50	21	2.63	7.50	
11:08	5.00	0.50	42	4.50	6.43	
11:35	3.38	0.50	27	2.88	6.39	
12:03	3.63	0.50	28	3.13	6.70	
12:37	4.25	0.50	34	3.75	6.62	
12:58			21	2.38	6.79	
	2.88	0.50	40	4.25	6.38	~
13:38	4.75	0.50	37	3.75	6.08	
14:15	4.25	0.50	27	3.00	6.67	
14:42	3.50	0.50	42	4.38	6.25	
15:24	4.88	0.50	41	4.25	6.22	
16:05	4.75	End		7.25	0.22	End of Test
				A	C 55	
				Average	6.55	
	·					
				3.		
		;				
	·					
· · · · · · · · · · · · · · · · · · ·						
~ ~~						
· · · · · · · · · · · · · · · · · · ·						
						

Date:	7/17/2003
Test Location:	BR-3
Test Depth:	5.0 Feet

Time	Water Level Re	ading (Inches)	Elapsed Time (Minutes)	Infiltration (Inches)	Infiltration Rate (Inches/Hour)	Notes
	Before Filling	After Filling		(Inches)		
10:32	Dry	0.63	402	2.42	4.24	Infiltration is very slow
12:15	2.75	2.75	103	2.13	1.24	Not Filled
13:49	4.63	0.50	94	1.88	1.20	
16:02	2.75	End	133	2.25	1.02	End of Test
				A	1 15	
				Average	1.15	
				447		
						10.50
					-	-
						-
					-	1
			<u> </u>			
					-	
1	<u>. L</u>	1	<i></i>			

APPENDIX B

BORING LOGS

LITHOLOGIC LOG OF BORING BB1 CLIENT: Kennedy Jenks Consultants PROJECT NUMBER: 03-02-116 ADDRESS: 5053 Mud Springs Rd, Cold Springs NV DATE: 7/14/03 DRILLING CO/METH: WESTEX/Hollow Stem Auger with MOSS sampler START: 14:20 LOGGED BY:M. E. GERLINGER DESCRIPTION: STOP: 18:35 EASTING: 119 58 19.86020 COODINATES: NORTHING: 39 42 49.33432 **BORING ELEVATION:** 5088.3' LITHOLOGIC DESCRIPTION LITHOLOGIC DESCRIPTION GL Light brown sand, SP Light grey sand, SP 2 -20 -Greenish grey sandy clay, CL Moist Light brown sand, locally 24 fining upwords, SP 8 Red brown and grey sandy clay with interbeds up to 4" of stiff clay, CL Color change to red brown 10 Interbeded grey and red brown sands, oxidized lenses, lense of gravel 12-14 32 · Stiff grey clay, CL 16 Light grey sand, SP BROADBENT & ASSOCIATES, INC.

Page No.:

Approved by:

D. Guerrant

M. Gerlinger

Prepared by:

ENGINEERING, WATER RESOURCES & ENVIRONMENTAL

LITHOLOGIC LO	G OF BORING BB1
CLIENT: Kennedy Jenks Consultants	PROJECT NUMBER: <u>03-02-116</u>
ADDRESS: 5053 Mud Springs Rd, Cold Springs NV	DATE: _7/14/03
DRILLING CO/METH: WESTEX/Hollow Stem Auger with MOS	Sampler START: 14:20
LOGGED BY:M. E. GERLINGER DESCRIPTION:	STOP: <u>18:35</u>
COODINATES: NORTHING: 39 42 49.33432 EASTING:	119 58 19.86020 BORING ELEVATION: 5088.3'
LITHOLOGIC DESCRIPTION	LITHOLOGIC DESCRIPTION
36	54
	_
Red brown and grey clay interbeds of sandy clay with interbeds up to	56 —
4" of stiff clay, CL Water level	_
40	58—
Power in the control of the control	
	-
End of borehole, total depth 42.5'	60
_	_
44	62
_	
46—	64
48—	66—
	_
50 —	68
	_
52 —	70 —
	_
54	72
Total Depth: 42.5' Prepared by: M. Gerlinger Approved by: D. Guerrant P	BROADBENT & ASSOCIATES, INC. ENGINEERING WATER RESOURCES & ENVIRONMENTAL

	LITHOLOGIC	LOG OF BORING	BB2					
CLIENT: Kennedy Jenl	cs Consultants		PROJECT NUMBER: <u>03-02-116</u>					
ADDRESS:5053 Mud Springs Rd, Cold Springs NV DATE: _7/15/03								
DRILLING CO/METH:	DRILLING CO/METH: WESTEX/Hollow Stem Auger with MOSS sampler START: 09:30							
LOGGED BY:M. E. GERL	INGER DESCRIPTION:		STOP: 13:30					
COODINATES: NORT	HING: 39 42 53.02909 EASTI	NG: 119 58 09.45844	BORING ELEVATION: 5097.1'					
	LITHOLOGIC DESCRIPTION LITHOLOGIC DESCRIPTION							
GL			Light grey sand, SP					
4—	Light brown sand and silt, SP	22 —	Sandy light brown clay, CL					
6 ————————————————————————————————————		26—	Sand lenses and stiff clay lenses					
8 —	Moist Color change to light grey,	28—						
12 —	decreased silt and clay	30—————————————————————————————————————						
14—	Color change to darker grey, granitic pebbles	32-	Color change to lighter brown, stiff sandy clay with sandy lenses of decomposed granite					
6-		34—	up to 1" thick					
18—	Color change to lighter grey, gravely lenses	36	Color change to darker brown, stiff clay					
20		38	AND MAN CONTROL OF THE CONTROL OF TH					
Prepared by: M. Gerlinger Approved by: D. Guerrant Page No.: 1 of 2 ENGINEERING, WATER RESOURCES & ENVIRONMENTAL								

LITHOLOGIC LOG OF BORING BB2							
CLIENT: Kennedy Jenks Cons	ultants		PROJECT NUMBER: 03-02-116				
ADDRESS: 5053 Mud Spring	s Rd, Cold Springs NV	· · ·	DATE: 7/15/03				
DRILLING CO/METH: WEST	TEX/Hollow Stem Auger with N	MOSS sampler	START: 09:30				
LOGGED BY:M. E. GERLINGE	R DESCRIPTION:		STOP: <u>13:30</u>				
COODINATES: NORTHING:	39 42 53.02909 EASTI	NG: 119 58 09.45844	BORING ELEVATION: 5097.1'				
	LITHOLOGIC DESCRIPTION	N	LITHOLOGIC DESCRIPTION				
36		54	End of borehole, total depth 55'				
And the second content of the second of the			Water not encountered				
38	Sandy light brown clay, CL	56					
		-					
40		58—					
		_					
42—		60-					
44		62—					
The second secon							
The second section is a second							
46		64—					
		-					
48-		66—					
The second secon		-					
50 —		68					
		_					
52		70 —					
54		72					
Total Depth: 55'							

LITHOLOGIC LOG OF BORING BB3								
CLIENT: Kennedy Jenks Con	nsultants	PROJECT NUMBER: <u>03-02-116</u>						
ADDRESS: 5053 Mud Sprin	ngs Rd, Cold Springs NV	1	DATE: _ 7/15/03					
			•					
DRILLING CO/METH: WES	STEX/Hollow Stem Auger with MOSS	sampler		START: 15:10				
LOGGED BY:M. E. GERLINGE	ER DESCRIPTION:		·	STOP: <u>18:45</u>				
COODINATES: NORTHING	COODINATES: NORTHING: <u>39 43 05.42701</u> EASTING: <u>119 58 55.01557</u> BORING ELEVATION: <u>5115.0'</u>							
LITHOLOGIC DESCRIPTION LITHOLOGIC DESCRIPTION								
GL		18						
The control of the co	Links become along CV	-						
2	Light brown clay, CL	20						
And the second of the case of the second of								
Transport Market San Charles S		- -						
4		22		Color change to light brown				
				silty sand, with 1"-2" lenses with more or less sand and silt				
- Andready		-						
6 —		24—						
	Dark grey silt layer, MH ight brown sand, little gravel, SP			·				
	Light brown clay, CL							
8 —		26						
,	Red brown and light grey sands, SP							
-	g,,	-						
10		28						
	Light grey silty sand, >1/2" clay lenses, SW	-						
12		30—						
-	Light grey clean sand, SW	-		Light brown clay, CL				
14	Y :-14	32-		·				
	Light grey silty sand, SM	ļ ļ.						
	Red brown sand, SP	-		Light grey silty sand, thin red brown interbeds, SP				
16		34						
	Color change to light grey sand, >1" clay lenses			Light brown clay, with 1/16"-1/8" clean sand lenses, CL				
		-		Cican Sanu iciises, CL				
18		36						
A. Carlotte and the second sec	BROADBENT & ASSOCIATES, INC.							
Prepared by: M. Gerlinger	Approved by: D. Guerrant Pa	nge No.: _1		RING, WATER RESOURCES & ENVIRONMENTAL				

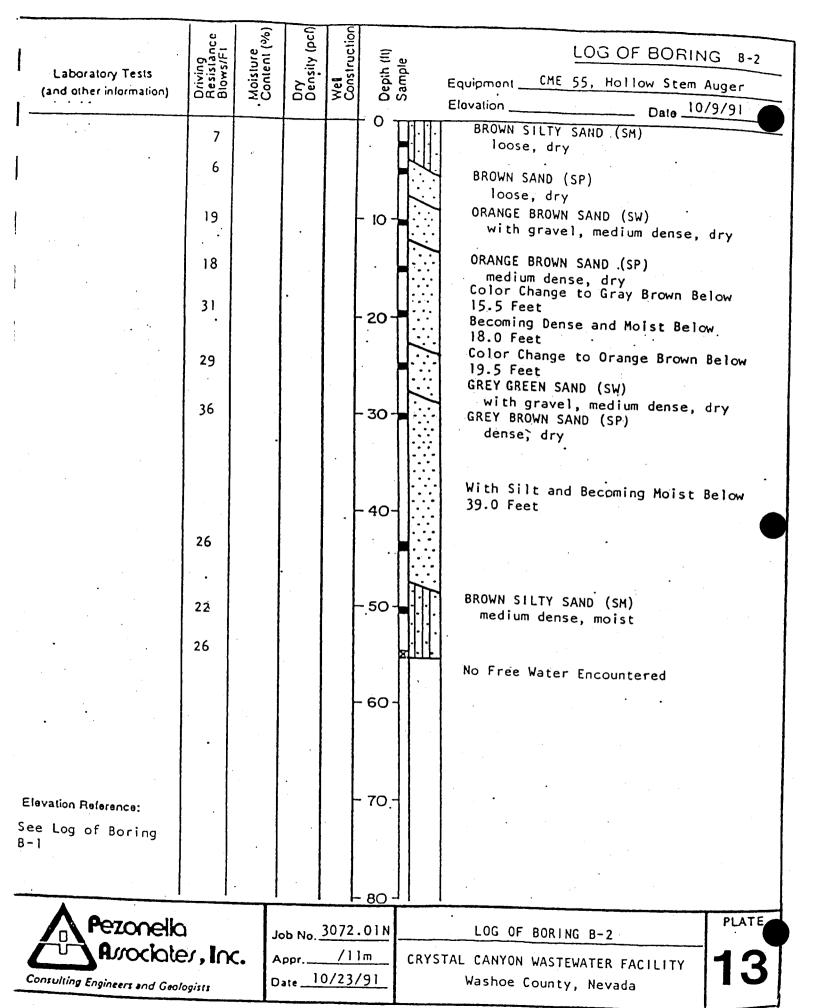
LITHOLOGIC LOG OF BORING BB3 CLIENT: Kennedy Jenks Consultants PROJECT NUMBER: 03-02-116 ADDRESS: 5053 Mud Springs Rd, Cold Springs NV DATE: 7/15/03 DRILLING CO/METH: WESTEX/Hollow Stem Auger with MOSS sampler START: 15:10 LOGGED BY:M. E. GERLINGER DESCRIPTION: STOP: 18:45 COODINATES: NORTHING: 39 43 05.42701 EASTING: 119 58 55.01557 BORING ELEVATION: 5115.0' LITHOLOGIC DESCRIPTION LITHOLOGIC DESCRIPTION 36 Light brown clay, with 1/16"-1/8" clean sand lenses, CL End of borehole, total depth 55' Water not encountered . 56 -Red brown silty sand, SP Red brown sandy clay, CL 58-Red brown silty sand, locally fining down to a 2" clay lense, SP 60-62-Repeated fining down sequences every 2'-4' 46 -64-48-66-50 -68-52 -70 -Total Depth: 55' **BROADBENT & ASSOCIATES, INC.** Prepared by: Approved by: Page No.:

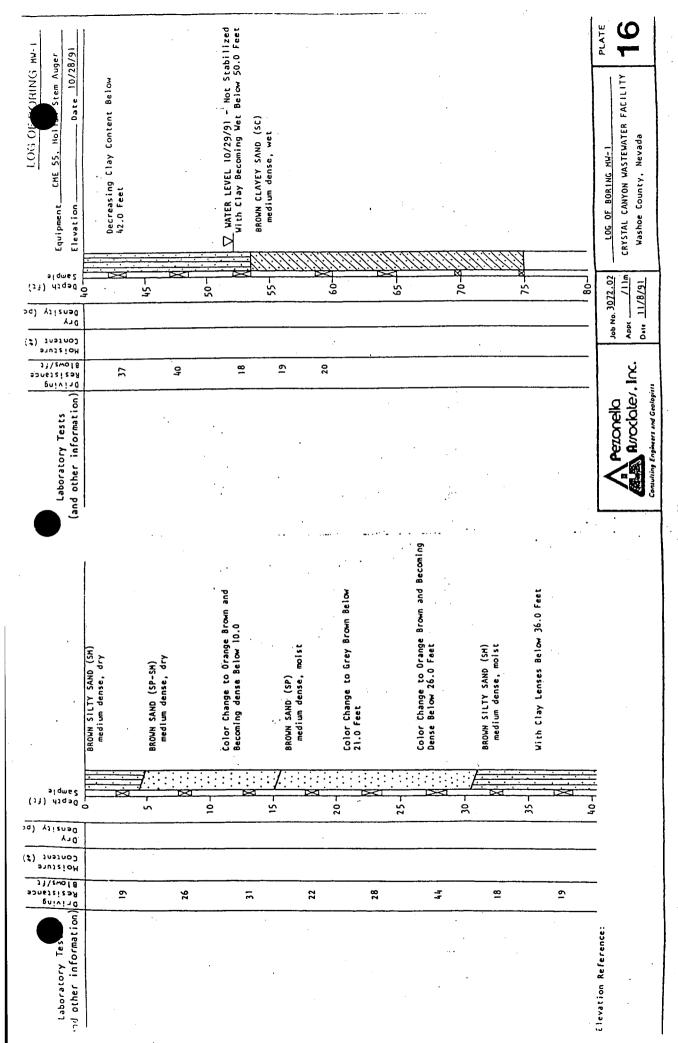
2 of 2

ENGINEERING, WATER RESOURCES & ENVIRONMENTAL

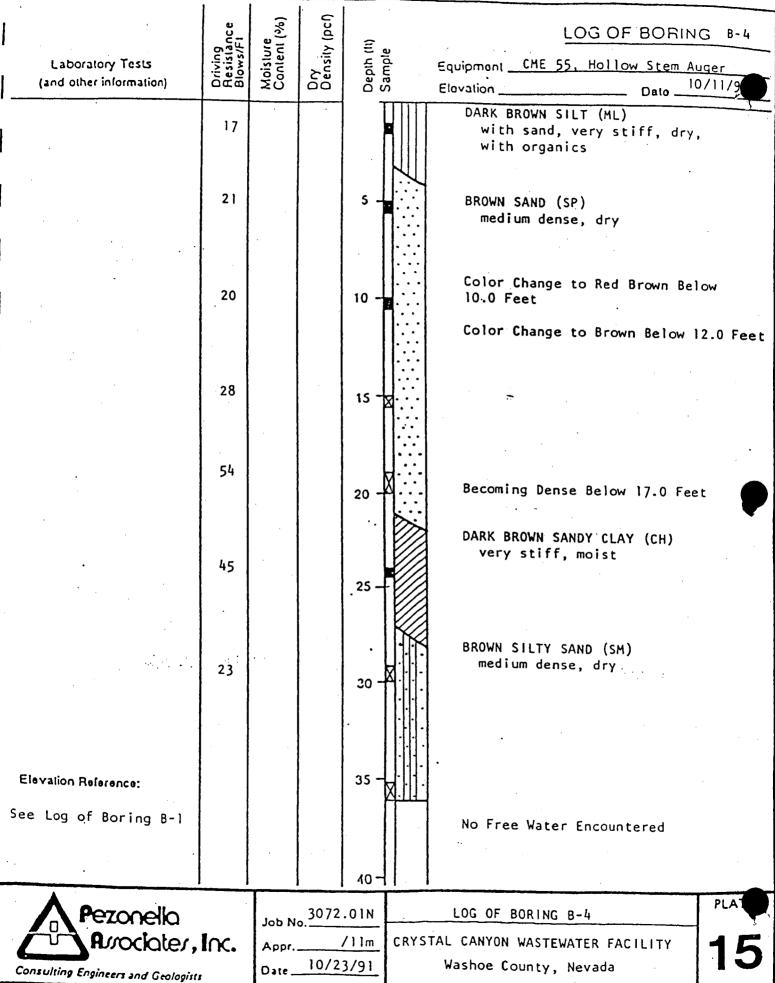
M. Gerlinger

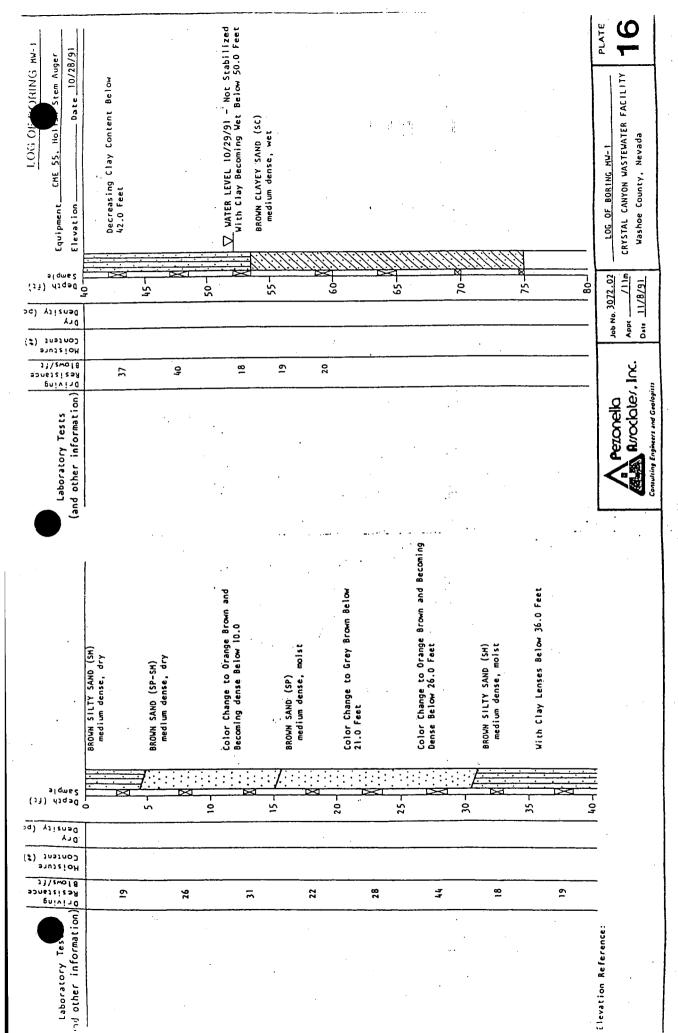
D. Guerrant





Laboratory Tests (and other information)	Driving Resistance Blows/Ft	Moisture Content (%)	Dry Density (pcf)	Depih (II) Sample	Equipment	LOG OF BORING CME 55, Hollow Stem Au Dato 10/	ger
	12			5 -	BROWN SA with s	ND (SP-SM) ilt, medium dense, dry	
	46			10 -	Increasia	ange to Light Brown, ng Silt Content and Be low 10.5 Feet	coming
•	36			15	GREY BROW	WN SAND (SP) dry with red staining	
	28			20			•
	14			25 -	with sa	EN SILT (ML) and, very stiff, moist ed staining	
	36	•		30	dense,	WN SILTY SAND (SM) moist with red staining Water Encountered	og
Elevation Reference: See Log of Boring B-1				35 -			
Pezonella Avociates	.Ioc	Job I		2.01N CRY		DRING B-3 WASTEWATER FACILITY	PLATE
Consulting Engineers and Geologis				23/91		unty, Nevada	





6 October 2003

Technical Memorandum No. 009

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Robert Hoppe, Kennedy/Jenks Consultants

Reviewed by: Ron Bush, Travis Tormanen, and Lynn Orphan, Kennedy/Jenks

Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Subject: Diamond Peak Lift Station

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

The purpose of this technical memorandum is to evaluate Phase 1 and Phase 2 flows to the Diamond Peak Lift Station (DPLS) and evaluate alternatives to increase the capacity of the DPLS.

BACKGROUND

The existing DPLS pumps sewage from the area around White Lake to the Cold Springs Water Reclamation Facility (CSWRF) through a 7,500 foot, 6-inch force main. It was designed for 364 Equivalent Residential Units (ERUs) at buildout, which is not complete. It is currently proposed that expansion in the Bordertown be added to this lift station. The ERUs related to this expansion are 304.

The current lift station is a wet pit/dry pit configuration with two pumps housed in a steel shell, a 6-foot diameter wet well with an emergency generator. The station has no emergency storage, which current Washoe County (County) Standards require. Groundwater is present at the site sometimes at the surface depending on precipitation. The soils surrounding the lift station are corrosive and have caused problems with the steel enclosure. This problem can be controlled by adding impressed current protection.

Washoe County Department of Water Resources - Diamond Peak Lift Station 6 October 2003
Page 2

DESIGN CRITERIA

Phase 1

The ERUs in the Phase 1 service area for the DPLS are all new construction. Projected flows to this station are 668 ERUs at 225 gallons per ERU. Average daily flow is 104 gallons per minute (gpm). Applying a peaking factor of 3 (typical for small basins) for peak hour flow results in a peak design flow of 313 gpm. The current Diamond Peak Lift Station was designed for 364 lots at 325 gallons per day and a peaking factor of 3. This results in a design flow of 246 gpm. Field flow tests indicate this station can pump 290 to 300 gpm which are close to the peak design flows. The existing pumps are a poor choice for the installation as they are operating near shut-off head. Operating at this point can cause excessive wear due to vibration. Any additional elevation at the discharge end will result in the pumps decreasing dramatically in flow. The above scenario assumes that there is not an elevated headworks.

Velocity in the 6-inch force main is estimated at 3.55 fps at 313 gpm. The force main is at capacity due to the friction head associated with the flows. The anticipated flows increase head requirements of the pump to above what most sewage pumps can handle in this flow range.

A sump should be sized to have an operating volume to limit starts of a pump to 6 per hour or a 10 minute cycle. The required sump volume is 2.5 times the maximum flow rate or (2.5)(313)=783 gallons. Maximum cycling would happen at one-half the design flow rate or 157 gpm. The present sump has 700 gallons of operational storage which is of sufficient size to maintain an acceptable cycle time. The level in the wet well could be adjusted to obtain 783 gallons.

County Standards require emergency storage of 4 hours of average flow at the lift station. The required emergency storage is 24,960 gallons for the anticipated service. Diamond Peak does not have emergency storage, but there is some available storage in the collection system draining to the Diamond Peak Lift Station. The sewers and manholes would begin to fill when the wet well exceeds its high level alarm at an elevation of 5023.30, and would overflow at the manhole in Diamond Peak Drive in front of the lift station at elevation 5036.4. Using the overflow elevation of 5036.4, the existing system provides approximately 19,000 gallons of storage. Additional storage can be provided by installing an overflow pipe. Sixty-three feet of 4-foot diameter pipe is needed to store 5,960 gallons.

If backing up sewage into the collection system is not acceptable, a structure could be built close to the pump station and connected with a pipe. The sewage would overflow to the structure and be pumped back to the wet well when the level in it dropped.

Phase 2

An area to the south and east of the Diamond Peak lift Station contains 883 lots that are on septic tanks. This area is proposed to have a new collection system and the sewage pumped to

Washoe County Department of Water Resources - Diamond Peak Lift Station 6 October 2003
Page 3

the CSWRF in Phase 2. It is possible to configure the system so the sewage is either pumped or flows by gravity to the Diamond Peak Station. The Diamond Peak Station would be designed to handle this flow and the flow from its existing service area.

The area to be connected contains older homes and would be expected to generate more flow per capita than new construction. The design flow is as follows:

150,300 apd 668 units at 225 gpd 220,750 gpd 883 units at 250 gpd 371,050 gpd Total 258 gpm Average Daily Flow Peak Hourly Flow 773 gpm Wet Well Operational Volume* 1,993 gallons A pit 10 by 10 in size would have 2.7 feet of operating volume 61,920 gallons **Emergency Storage** A 6 ft pipe 293 ft long would be required for emergency storage

Table 1: DPLS Design Flows

Note:

A new 10-inch force main would be constructed to the plant. To achieve 3.0 ft/sec in the force main, the flow rate would be 735 gpm. Initially, the pump operating levels in the wet well would be reduced to minimize the time sewage is held in the wet well.

COMPARISON

There are two options for the Diamond Peak Station. Option 1 is to upgrade the pumps to increase flow and to operate at a better point, and add impressed current for corrosion protection of the steel shell. The force main to the plant would remain in service. No electrical upgrades are anticipated. Some piping modifications would have to be done to accommodate the modifications. The new pump is dimensionally different than the existing pumps and in order to install the new pumps, the existing isolation valve has to be replaced. From the existing plans, there is no way to isolate the station so temporary pumping, and isolation of the station will have to be done during construction.

^{* = 6} starts per hour.

Washoe County Department of Water Resources - Diamond Peak Lift Station 6 October 2003 Page 4

The system provides about three hours of emergency storage before a sewage spill. Installing additional storage would involve dewatering, tearing up the new street, and resurfacing to gain another hour's worth of storage for Phase 1. This does not appear to be cost effective.

Option 2 is to build a new lift station and force main. It would handle the present and future Diamond Peak Station flows and existing 883 lots. A new site would be required because there is no readily available space to construct a new pump station and emergency storage on the present site that could be used. There is a "common area" to the south of the pump station. Some land is also vacant across the street to the east and could be used for this purpose. The new lift station would be wet pit/dry pit configuration with an emergency generator. Emergency storage would be with a buried concrete pipe and no sewage would back up into the system. The existing force main and lift station would be abandoned in place.

Table 2: Cost Estimates

Option 1	
Add Cathodic Protection	\$35,000
Upgrade Pumps	\$45,000
Temporary Pumping and Valving	\$30,000
Miscellaneous	\$20,000
Subtotal:	\$130,000
Contingencies @ 25%	\$32,500
TOTAL:	\$163,000
Option 2	
New Wet Well 35 feet deep	\$350,000
Dewatering	\$30,000
New Pump Station	\$165,000
New Emergency Generator	\$50,000
New Emergency Storage 293 ft. of 6-foot pipe \$650/ft.	\$190,000
New 10" Force Main: Pavement – 5,750 ft. @ \$60/ft.	\$345,000
New 10" Force Main: Graveled Road – 2,450 ft. @ \$45/ft.	\$110,000
Subtotal:	\$1,240,000
Contingencies @ 25%	\$310,000
TOTAL:	\$1,550,000

If sewage collection from the lots to the east will not happen for five years or more, Option 1 is recommended. With new pumps and corrosion improvements this option can serve the Phase 1 development.

Option 2 can be postponed until the homes on septic tanks are sewered. The new lift station and force main would be constructed as part of that project.

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: John Harrison and Lynn Orphan, Kennedy/Jenks Consultants

Reviewed by: John Wyckoff and John Jenks, Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes
Jason Phinney, TEC Civil Engineering Consultants

Subject: Early Start Improvements / Re-rating Evaluation

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

This technical memorandum has been developed to serve as a part of the Cold Springs Water Reclamation Facility (CSWRF) evaluation of the facility expansion. Support calculations and other key information used as a basis for this technical memorandum are attached as follows:

- A. Kennedy/Jenks Consultants support calculations for evaluating/maximizing sequencing batch reactor (SBR) units.
- B. Design criteria and actual composite laboratory tests.
- C. US Filter SBR calculations.

The gathering of data, field testing, and suggestions for early-start operational/interim design changes was a collaborative effort between Kennedy/Jenks Consultants and SPB Utilities.

BACKGROUND

The CSWRF was originally sized for serving 1,000 Equivalent Residential Units (ERUs) based on 350 gallons per day (gpd) per ERU and the 3.5 persons occupying a single ERU. Presently there are 900 ERUs being served. Actual flows per ERU currently average approximately 140 gpd/ERU. To allow for peak month flows, this analysis (for interim conditions) is based on 180 gpd per ERU. The interim flow value is approximately 33% higher than the actual 2003 flows but less than the Phase I average daily flow (ADF) design criteria of 225 gpd/ERU.

Records indicate that sludge settleability in the SBRs is poorer than originally assumed for design. Poor settling results in the need to operate with less biomass (lower concentration) than assumed in the SBR design. Currently, the operation of one blower does not meet the oxygen demand and it has been necessary to operate all aeration equipment (including the standby blower) to maintain a dissolved oxygen concentration above 0.5 milligrams per liter

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 2

(mg/l). Finally, the strength of sewage as measured by the biochemical oxygen demand (BOD) is generally 1.6 times greater than typical domestic sewage assumed in the original SBR design (320 mg/l measured vs. 200 mg/l original design). The high BOD concentration is a consequence of lower than anticipated flows per person but typical BOD per person loading (0.2 lb BOD/day per person) on a weight basis for domestic sewage.

The purpose of this re-rating evaluation is to determine if the SBRs can serve above 1,000 ERUs as originally designed. The purpose is to also propose facility/operational improvements that could stretch existing plant capacity.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Findings

Kennedy/Jenks Consultants find the following regarding plant capacity rating:

- As presently equipped and operated, the SBR unit is capable of serving 900 ERUs.
 This is based on 140 gpd/ERU which is the current hydraulic loading.
- With recommended facility/operational changes, the existing SBR process should be capable of serving 1,200 to 1,400 ERUs. This is based on influent flow rates of 180 gpd/ERU, which is the flow criteria selected for the WRF expansion project.

Recommendations

It is recommended that the following initial short-list of improvements be implemented to stretch plant capacity. It may well be that this initial short list of actions will be adequate to achieve the desired 1,200 ERU capacity. However, if further action is necessary, additional steps as described in this memorandum (or discovered in subsequent operation/analysis) can be reevaluated and implemented. Based on the information presented in this technical memorandum, Kennedy/Jenks Consultants has developed the following specific initial recommendations for consideration at the CSWRF.

- 1) Lower the operating MLSS concentration to between 1,500 to 1,800 mg/l to improve settlability while still maintaining nitrification
- 2) Shorten the settling time and increase the oxic react time for the SBRs.
- 3) Purchase a standby blower.
- 4) Convert the digester to an equalization basin, to receive overflows from each SBR at the end of each fill cycle when hydraulic peaks occur

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 3

- 5) Raise (increase) the SBR decanter low water level (LWL) by 2.0 feet, and the top water level by one foot to increase the biomass and treatment volume.
- 6) Modify the existing alternating anoxic/aerobic fill to anoxic fill only.
- 7) Increase onsite operational presence.
- 8) Re-evaluate the use of 4 cycles per day for the SBRs.
- 9) Install automatic in-basin SBR solids wasting capability.

FACILITY DESIGN vs. ACTUAL PLANT PERFORMANCE

The 1997 SBR design was based on providing a reactor whose contents would settle to a low water level (LWL) of 13.5 feet and produce a settled MLSS of 4,000 mg/L. When filled to the top water level (TWL) of 18.0 feet the MLSS concentration would be 3,000 mg/L. Under these conditions, the BOD load to biology mass ratio would result in a mean cell residence time (MCRT) of 19 days (commonly referred to as sludge age). Four cycles of SBR operation would result in the SBR reactors being aerobic (oxic) for 38% of the time. The remaining 62% of operating time would be associated with the phases described on Table 1, such as effluent decant, idle time, reactor fill and settling time.

Table 1: Comparison of SBR Design versus Present Operation

Event	Individual Read Time (hou	•	Individual Reactor Cycle Time (%)	
	1997 Design	Present	1997 Design	Present
Decant	0.50	0.26	8.3	3.3
ldle	0.25	0.84	4.2	10.5
Static Fill	1.10	0.74	18.3	9.3
Mixed Fill	1.15	0.76	19.2	9.5
Alternating-Anoxic Fill	0.00	1.00	0.0	12.5
Aerated Fill	0.75	1.50	12.5	18.8
React	1.50	0.52	25.0	6.5
Settling	0.75	2.38	12.5	29.8
Total Time per Cycle	6	8	100.0	100.0
Total Oxic Time/Cycle	2.25	2.02	37.5	25.3

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 4

Actual SBR operation has resulted in reactors whose contents settle to a low water level (LWL) of 13.0 feet and produce a settled MLSS averaging 2,300 mg/L. When filled to the top water level (TWL) of approximately 15 feet, the MLSS concentration averages about 2,000 mg/L. The present BOD load to biology mass ratio in the SBR results in a mean cell residence time (MCRT) of 15 to 18 days. The SBR is presently operated with three cycles per day resulting in aerobic (oxic) conditions for 25% of the time. The remaining 75% of operating time is associated effluent decant, idle time, reactor fill and settling time as indicated on Table 1.

Perhaps the most notable difference between design vs. actual plant performance is the production of poor quality sludge that results in both a high sludge volume index (poor settling sludge) and in the formation of thick foam on the SBR water surface. The presence of foam has caused SPB Utilities to operate the SBRs at a water surface level that generally varies from 13.0 to 16.0 feet. Operating the aeration equipment at a low water level for foam control, results in poor oxygen transfer efficiency, thereby requiring greater blower capacity. Further complicating operations is that the original design did not include provisions for automatic sludge wasting. Difficulty in fine-tuning the system and maintaining a balanced system with fluctuating/increasing loads has resulted in the need for increased operator attention.

Since start up, SPB Utilities has implemented a number of changes in plant operation. The more notable changes that have resulted in increased reliability, capacity or reduced operation requirements include:

- The ability to chlorinate mixed liquor recycle (MLR) for filamentous bacteria control.
- The ability to operate two aeration blowers, providing additional oxygen.
- Foam control on the SBR tanks in the form of water sprays.
- A backup seal water system for pump lubrication.
- The addition of an overflow line to the facultative sludge lagoons
- A connection between the sludge lagoons and ability to decant water off the sludge lagoons and return it to the plant.

ANALYSIS OF THE EXISTING FACILITY

Influent Load

The existing plant capacity is based on the calculations presented in Attachment A. Laboratory testing of the plant influent on 17 July 2003 (see Attachment B) confirms that waste strength assumed for re-rating purposes appears to correlate well with of actual measurements.

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 5

Opportunity to Stretch Plant Capacity

Kennedy/Jenks Consultants met with SPB Utilities several times to discuss plant operation and potential action that might stretch existing plant capacity. The following is an overview of collective thinking of Kennedy/Jenks Consultants and SPB Utilities.

Initial Actions to Implement

1) Lower the SBR mixed liquor suspended solids concentration to provide faster settling

The SBR currently operates an average TWL MLSS of approximately 2,300 mg/l rather than the design value of 3,000 mg/L. To achieve the current 2,300 mg/L MLSS the time associated for settling has been increased to 2.39 hours versus the design value of 0.75 hours. The added time required for settling consumes valuable periods of SBR cycle that could otherwise be redistributed to aeration of nitrifying bacteria.

Bench scale tests indicated that a reduction in MLSS concentration can dramatically increase the rate of settling. Stated differently, the SBR MLSS concentration is at or near the point where hindered settling occurs. It may be that by operating at a lower MLSS a significant decrease in settling time can be achieved. If this is the case, then time presently allocated to settling can be redistributed within the SBR cycle to phases more critical to plant performance. The decrease in MLSS concentration will result in a decrease in oxic MCRT so the adjustments must be tested to assure that nitrification is not lost. Operating with MLSS concentration in the range of 1,800 mg/l or lower may result in reduced settling time and this saved time that can be re-allocated to aerobic react (to help nitrification).

2) Redistribute the time within existing cycles to increase the oxic (aeration) time

Critical to SBR operation is maintaining a minimum aerobic (oxic) mean cell residence time (MCRT) necessary to assure nitrification. The minimum oxic MCRT becomes critical during winter months when cold water temperature results in slow bacterial growth. Under current operating conditions 25 percent of the SBR cycle is dedicated to aeration necessary for the growth of nitrifying bacteria. As waste load to the CSWRF increases it will be necessary to increase the percent of time allocated for oxic conditions for nitrification. This necessary increase may be accomplished by redistributing cycle time to increase the react and/or aerated fill phases. Shortening the settling time will allow more flexibility to accomplish this action.

3) Purchase a standby blower

All of the installed blowers are in use to provide aeration to the SBRs and digester, leaving no redundancy if one blower is out of service. One additional blower could be

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 6

kept onsite for quick response and installation should it be needed. This blower would continue to serve as a spare in the long term expansion of the WRF.

4) Convert the existing aerobic digester to a flow equalization basin

The existing aerobic digester could be converted to a flow equalization tank. When peak flows (such as between 8 a.m. to 10 a.m. and 5 p.m. to 9 p.m.) exceed the basin capacity during a fill cycle, the mixed liquor would be overflow a new weir to the flow equalization tank. During the next fill cycle, the contents of the flow equalization tank would be transferred to the SBRs for treatment. This conversion will require an overflow weir and outlet pipe in each SBR and pumps and controls for returning flow to the SBRs. The modifications will be kept as part of the aerobic digesters in the long term expansion.

Thickening of waste solids will no longer be possible in aerobic digester. However, the recently installed piping and decant system allow the two facultative sludge lagoons to be used for thickening and digestion.

5) Raise the SBR low water level (LWL) and/or top water level (TWL) to increase biomass

The LWL and TWL used in the 1997 SBR design was established in part by the volume required to contain the average daily flow of 350,000 gallons per day using 4 cycles of operation. Since the actual average daily flow is less than 40 percent of the design flow, there is unused volume or space in the SBR reactor. This unused volume could be put to use by increasing the LWL and operating closer to the planned TWL of 18 feet. Raising the LWL allows an increase of biomass without increasing the MLSS concentration.

To utilize the untapped SBR volume it will be necessary to address foam issues and may require additional operator attention. With the SBR operating at 4 cycles per day the LWL could be raised from the current 13 feet to approximately 15 feet. If the SBR continue operating at 3 cycles per day the LWL could be raised to approximately 14 feet.

6) Return to a non-aerated mixed fill cycle to discourage the growth of filamentous bacteria

The theory of SBR operation includes the use of anoxic (no dissolved oxygen but some combined-N0₂/N0₃ oxygen present) conditions to control the presence of filamentous organisms. Most filamentous organisms, cause poor settling sludge and are strict aerobic (oxic) organisms. The growth of filaments is discouraged in the SBR process when the majority of the fill phase is maintained in an anoxic to anaerobic condition.

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 7

Maintaining an anoxic/anaerobic fill allows facultative bacteria, which settle well, to absorb BOD, while the filamentous bacteria remain inactive.

Current SBR operation includes a combined cyclic -- anoxic and aerated fill totaling approximately 2.5 hours. The combination of short periods of anoxic/oxic conditions during the fill may encourage the growth of filamentous organisms. Returning to a longer oxic - react phase with a short aerated fill may result in better settling sludge.

7) Increase operator presence at the plant

As loading to the CSWRF increases it will be necessary to increase operator attention to assure that process control and equipment changes are occurring in a timely fashion. Maintaining operational presence that averages 4 to 6 hour per day may be necessary as expectations from the existing system increase. It may also be necessary to automate some functions which are now manually operated.

8) Return to a 4-cycle per day SBR to increase flow capacity and allow a higher LWL

The use of 3-cycles per day for SBR operation may be easiest-to-operate under current low-flow conditions. However, as waste loads to the CSWRF increase, maximum capacity may be achieved only through the use of more cycles per day. A balance between number of cycles per day and increasing the LWL should be sought to maximize plant capacity. It may be that added operator attention to wasting and balancing the load to the two SBRs will be necessary if 4-cycle operation is to be achieved.

9) Install in-basin automatic sludge wasting to optimize process control

Sludge is currently wasted from the SBRs through manual adjustment of valves and pumps. Wasting must take place during the end of the decant phase to obtain thick sludge for transfer to the aerobic digester.

An alternative to the existing manual/time-critical wasting would be to install small submersible pumps in each SBR basin that could be used to accomplish the majority of necessary wasting on a daily basis (probably 2 to 5 minutes per cycle). The existing use of manual adjustment of valves and pumps could continue to be used for making final adjustments to sludge wasting.

Actions of lower priority

10) Add chemicals to enhance settling

Chemical addition has sometimes proven useful in improving the settling properties of mixed liquor from SBRs. Both polymer and polyaluminum chloride (PAX) have been

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 8

successful in improving sludge settleability. SPB Utilities has also periodically applied chlorine to the mixed liquor recycle to control filamentous growth.

Chemical addition would normally be considered a back up measure, as chemicals attack the symptom rather then the cause of poor settling. However, for interim operation, chemical addition is a viable short-term alternative.

11) Perform oxygen uptake rate and other tests for process optimization

Oxygen uptake rate and other qualitative tests may be useful in determining the necessary duration of individual phases within the SBR cycle. Kennedy/Jenks Consultants operational staff may work with SPB Utilities to optimize phases based on both quantitative and qualitative analysis.

12) Allow a reduction in effluent quality by operating at higher loading

As plant operation professionals, SPB Utilities has operated the CSWRF to produce the best quality effluent possible within the constraints of the existing system. However, as loading increases it may be necessary to allow some increase in effluent TSS to occur in order to maximize the number of cycles or to shorten settling time. Another example of how operating at a higher rate might be necessary, is the possibility of allowing some increase in nitrate to be discharged with the effluent to maximize the react phase (for nitrification) while maintaining strict anoxic/anaerobic conditions during the fill phase.

13) Add a blower and/or diffusers to assure oxic conditions during periods of aeration

Air requirements in the 1997 design are based on aerobic conditions being maintained for 38 percent of the cycle and at a TWL of 18 feet. Current operations result in aerobic conditions being maintained 25 percent of the time with a TWL ranging from 15 to 16 feet. The shortened oxic phase and low diffuser discharged pressure (from operating at a low water surface) result in greater air requirements then originally planned. Also, the aerator supplier assumed 13.5% field transfer efficiency, which may be optimistic for the equipment and field conditions present.

Assuming oxygen transfer at 0.667 % field efficiency per foot of submergence, the system would currently require approximately 550 scfm at a water depth of 14 feet and 450 scfm at 17 foot water depth. Although increasing the number of cycles or adding water depth to the SBR will increase oxygen transfer, increased waste loading will require that both of the existing 396 scfm blowers be utilized in the future. Consideration can also be given to supplemental aeration with additional blowers/diffusers, an aspirating aerator, or a floating aerator.

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 9

14) Convert the existing aerobic digester to an SBR reactor

The existing aerobic digester contains approximate 35 percent of the volume in the SBR reactors. One approach to add capacity would be to convert the aerobic digester to an SBR reactor. A small gravity thickener or temporary sludge storage tank could be added as an interim measure for thickening prior to transfer of waste sludge to the facultative sludge lagoons. It may also be that changes SPB Utilities is in the process of implementation to operate the facultative sludge in series may allow direct wasting to lagoons.

15) Lease or prepurchase a centrifuge to enhance solids thickening

As loading increases it may be necessary to improve or replace existing solids handling/thickening facilities. Should this be necessary, it may be possible to either lease or pre-purchase a centrifuge that could be used for thickening during interim operation. Should this be done, the thickening centrifuge would be converted to a dewatering centrifuge at a later time.

16) Install fixed film media in the SBR to increase the biomass

Should it be necessary to add biomass within the SBR reactors to maintain nitrification, it may be possible to add fixed film (plastic media) to the existing SBR tanks. It has been found that the combined SBR/fixed film volume contains approximately 50 percent more biomass then a conventional SBR system. With this alternative, plastic media would be suspended on a grid, with the top of the media located below the LWL of the SBR. Approximately 8 feet of media could be supported in the SBR reactors.

IMPLEMENTATION AND COST

Implantation of changes to stretch capacity of the CSWRF must be done on a progressive basis. This means that a series of changes listed above as "Initial Actions to Implement" should be implemented followed by a period (usually 2 to 4 months) of monitoring when benefits of the change are measured. It is only logical to first implement the easiest changes or those that fit into the long term expansion plan. Regarding capital cost, most of the easy to implement changes require only programming time, minor control system changes, and piping modifications. In these cases there will be some capital cost and engineering costs. However, the modifications that will be made will support the future plant expansion. Thus the modifications appear to be a good investment to make both for the short-term and the long term. In contrast, the harder to implement changes will require significant effort or equipment. Cost for each of these more difficult improvements may be several \$100,000.

Kennedy/Jenks Consultants and SPB Utilities will each be performing defined tasks so that the recommended Early Start Improvements can be made in a timely manner. A separate

Technical Memorandum No. 010

Washoe County Department of Water Resources Early Start Improvements / Re-rating Evaluation 8 October 2003 Page 10

memorandum will be provided to the Washoe County Department of Water Resources for review that delineates the specific tasks to be performed by Kennedy/Jenks and SPB Utilities. Estimated costs associated with the proposed Early Start Improvements will be identified in this separate memorandum so that the County has an opportunity to review and approve the proposed modifications prior to implementation.

Attachment A

Kennedy/Jenks Consultants Support Calculations for Evaluating/Maximizing SBR Units

Chec	ار ked b	y				Dat	e											/			hoo!	Z	, 			7
		<i>-</i>		.,		Dat					-									Si	neet	_		_ or		<u> </u>
	_		_		_	<u> </u>	ļ		\perp																	
	_ _		_		-	ļ		_	_	_		\perp	_				1	L	_							
	e	 	+	-	 	 	 	ļ	_	igg	-		_	1	_		ļ <u>.</u>			_				_		ļ
<u> - </u>	Rev	100	4	7	1/2	 	6	ری لم	15	-	9	صلح	(<u> 2</u> 2	g	100	;/	<u> S</u>	18	R	1	200	1/5	7		
	4	-72	4/	011	7	-	<u> </u>	_	-		<u>'</u>	-	_	-	-	_	10	Fr	br-	U	5	Fil	1/2	<u> </u>	19	77
		-	-	<u>u</u>	=	-	1. 3	\ <u>\</u>	^	75	0	┼	1	_	13.		 	1	Ļ	,	_	<u> </u>	<u> </u>	_	_	_
		-	-	30)		20	0	m	7			1	12	6	7	16	K	70,		<u>)</u>	igg	<u> </u>		-	
		-	-	13			0	5	n	15	10	1	1	12	4	7	15	كا	01	1	2	<u> </u>	-	_	 	-
		+	-	12/	14	=	3	5	1	24	1	,	-		7	-	11	_		ļ.,	,	_	-	ļ	-	
				12	5	-	2	10	7	19	1/1		-		5	0	12	-	K	7/	-	1	-		 	-
			-	-	<u> </u>	<u>.</u>			9	۲			0	77	_	-	╁		-			-	-	-	 	_
	E	F	6	رمد	+		R	-	1		10	17	Fc	-		-	 -	_	\vdash			_	-			<u> </u>
					·		, ,	-7		-	<u> </u>		7	\vdash	_	_		-				-	-	<u> </u>		
					人	11	/3		W		=	1.	0		ارر	-	/		/ ^	lυ		100	ء سرزا			1
					,	_	19		N		= '-	İ	1	5	n	,	0					7.		-	767	
							to		P		د		1,	6	1	14	10	,	1	No	8	را ويحد	2:4	درج	20	17
		L			7.	·		,						,		1						7	-			
	\downarrow																									
	10,	20	e	<u> </u>		9	2	2	7	·.o	7 5															
	-					_	4	4	<u>_</u>	S	5	=	3	, (00	O	м)~	4	1-8		LY	Z	M	. د -	=	40
						0		_{	4	2	<i>r</i>	=	-	_	74	10	1	\$								
	+-				_ {	<u> </u>	رکد				e /c	4	=	0	-	۲_	/	5	75	<u>ر ک</u>	//	Ь	B	01		
					_	-	E	10	V4	Ti	7		-	5.	, 0	<u></u>	2		7		/	5	4			
	+-	5			\dashv		2	_					ļ													
		20	c e	اک	\dashv	-	47	91	19	.7		7							_							\dashv
	+		_	-				Λ	0	_	3 เ	0	-(Se.	_				_	-	1		7			
				٠	ᅥ	\dashv	7		9	_ {			,	_		V 0	9	-	2 t	{	1	p	<u>/</u>	54	3-	_
					$\neg \dagger$				d		Χ,		U	J _	~ {	7.3			- 4	1	7	g	<u>/</u> c	19	7	
			_	\dashv	+	\dashv	+		-		\dashv						\dashv					_			_	\dashv
							\dashv		7								\dashv		_	\dashv					\dashv	
							1										\dashv	\dashv	-+	\dashv	\dashv	\dashv	\dashv	\dashv	\dashv	\dashv
						_									-+					<u> </u>						

Ву	7#		Date	8/	<u>25</u>	<u>{6</u>	_ Sı	ubje	ct		0	10		\leq_{ℓ}	2	1/2	<u>25</u>	· 	Jol	o No)				
Checked														•					Sh	eet _	<u>3</u>	-	of _	9	
			,													 r		—т	 1						
																	_								_
	50	3 R		4	2:	3¢	-4	<u>a</u>	١,٢	ne	15	10	7.				_		_	_				-	\dashv
					-,-		_					2 4					_								\dashv
				N	14	-	=		1 8		+	- 1	-	7/				7	_,		_		1.3	1	[]
	_	N	Um	۲.۲	<u>-, </u>	_4	<u>- 4</u>	싀	=	-	<u> </u>	<u>: .\$</u>		-1		(2	19	TJ	9		/ 3	-	15	- 0	<u> </u>
							_											-							
								_		7						1			1			5			
	7/2	10	e-				_{		70	0	-		. 4	, 4		ם	02	-/	1		<u> </u>		re	774	بيد
]						7		2	=		7.	6	1	a	<u>[2</u>]	; ()	18	<u>s [</u>	1	/	<u> </u>	—	
		_	_					7 (70	PK	=	-	7	5 6	2	0 (<i>و</i>	2/	1/6	$\stackrel{\wedge}{\sim}$	$O_{\mathbf{X}}$		2 5	VE	_ لح	\vdash
			ļ					Inc		<u> </u>	. 0		9		ر و		7	27	+,	27	6-10	<u> </u>			-
			-			-9	, 7		-	(2	10	U	ם ו	\circ	7	79	2								\vdash
100	,		╀	1		4		Λ	0	<i>b</i> .		1	7 (77	1		,	7	7		-	7.	-h		
5	6	SPY	m	\ P	04	7		トレ				1		0		9 (2	/	2		-		31		
- - -	PS	1 2	30	ha.	~~	P		<u>၁</u>	אַ	-	-	1	<u> </u>) <u> </u>	<u> </u>	160			 	0,	30		7
1, 9	Po			+				1	\	_	. 1		7			_		1 1		-	-				\vdash
			<u> </u>	71	n	<i>,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		-	~ (70	1 0		1.6	n	7.0	_			_		-	 	_	\vdash	
		1	 			٩٦	:4	. ,	5	(-		4				フ	R	0 1		سرا	ζ,		-
	م	191	<u> </u>	e c				5,			 	-		7	-	U					-		f-	 	\Box
			-	2	_			0,	2	-		 		<u></u>	,										
1211	_			_	_			5.	2	5	7	 		FI	- -	 					 	\vdash			
2,25	0 01/2	<u>.</u>	FO	X	F.	11	-	2,	7	\$	۲		3-	7	7-0-	V-5					†	T			
4143	704	4	1	eo						5				-											
2.25		\ \		e-	Ĭ	•	3	C	+	1		 			-				-			<u> </u>			
d.0 hv4	5-5	8/0					Ξ		-			+													
3.0 10	3				 			4	10	0	- 	יסו	1	_											
			1	†					 	1	<u> </u>						Г								
										1	1													T	
		+	1		T								1			\top									
			I					E	L		,,,	4	n	4	40,	vis i	1	1	2.	1					
							1) (7	-	1	6		10	a-		7	1		1					
								1	1		1				//		70	64	1.7	7	1				
			1																					<u></u>	

Y JRH	_ Date <u></u>	Cold Springs	Job No
hecked by	Date	Cold Springs	Sheet
3 75	Carlevistin	s - for Original	Basis & Design
Ac7	144 / Basin 24 ft x 53	ff x 1 ff x 7, 48 goly	14,3
at		9-11-55 MILSS	9,029 gal/ff+3.
	1= (3000mg/1)	1.34(18)(19,029)	= 85691573
M		1×10 = 1	19 0945
	494	16TS5/2	
	IL MCRT = C	2,38 (192445)	= 7.2 days
Oxq.	en Supply	+	1602/0 /bas, 21
	50R NOR	= 89.9 or 90 /2 = 55.7 1602/	602/h-/basin
4,	+ Supply = 3 =	16 5 cfm =	4.4 scfm
	GT 39	6 Scf	= 0.71 scfm
ield Ef	freezely = 501		
	= 53.6		96 sfm

By	7	R	4		Date	<u>.</u> 8	hi	1/2	3 _s	ubje	ct	(<u> C</u>	1/2] ,	<u>5</u> 2	0~	Ing	<u> </u>		Jol	b No)					
Chec	ked	by_				1	Date									•		U	,		Sh	eet .	<u>S</u>	<u>.</u>	of _	9	}	
				אעו	pu	,			/	13	Ŧ,				_	د، ۲	, J	Цc		12	01	/4-	7.0	7		70	10 F	RUS
		•							, ,									-8 										, 3
				. •						3 .							1)			ン 5	e	-		10		
-	\dashv			•		I	ne t	1		<u>±</u> 31.	<u></u>					e l							17	2.3	70	/E	20/	ERU
							Ŀ															a	200	R	1n + 0	5c		-
				3	_	(74	<u>)</u> =	20		r		_	d_4	7	_						ţ	101	7	7 O 2b	10	215	in .
						1	ie	C G	7-			0), ;	2	6													
-							天	1	2	11		_).).	8.4	7	7	-					-						
	-						9- 23 :				7)		0,	76	<u></u>	7	4.	0	>	\neg	3	-	1-	2 1	10	7~		
							2	40	1:0	A				. 0	0	+1	_											
							0	či c		R	/1_		0	5,5	_	J	1			2								.
							De						2	3				9	Т	īm	e 4) <u>X</u> ;	: ب	2	0	2	= 2	s%
			人		-	n r	1	l	l .	10	-0	a -	8	.0	ho	ws				\ .	<u> </u>	7 (20	0	0		
			30 30	<u>=</u>	=	70	10	0	X	2	5	٥.,	ers	34	3	ge E	e/	E#	7) -) , 1	- 2.#	<u>ر لا</u>	2) ' =	4	D	D D	15	BOD
			λ -	0	00	2												+2>	7	px	sø	7			7			
			5	00	20	1.	=	9	00	K 2	15	7(1, 0	7		3 8	6	0m	d)			(4	28	7 W	g H	
			P	×	:	-	2	15	50	7	۲ (١,	8	= ;	3	6°C		ر ط	J	44	_(3	06	#/6	100	0.	77	#/2/2
	M	<u> </u>	_	1.								\	,] 34		1	2 2	7		1	9.	07	9	Ba	011	7	\	
	"	1	=	(00	n	18	1/1	-	1 0	-	<u> </u>	\	+	5 1	×	1	5 4	'/	-		0_	1	<u> </u>		
		M	5		5	3	6	4		6	TS	2																-
	7	<u> </u>	1.6	<u>₹</u> Т	<u> </u>	<u> </u>	-	-	-	5	۶ د	4		ļ	_		4		 } }	4	a .	<u>-</u> (e	<u>C</u>		2 #4	10/2
									3.	60		6	J		E		7	5	-	4	75		Ø	C	1,17		+,	
				-	~) ,	<u> </u>		A		_	R	-	=	-	4.	A	1.0		\		3	7		99		0	0.20
			h	~	19/		1	en		اعا	212	1			ری	1-			,	0	=	4	4	9			5,0	.17
		,	٧	M :	376	۲ ٧	4.4	Me	\$5	17	o:	4, C	1117	K		7-10	W	30	H	he	.Ip)			4	Rev	G-3	

By JRH	_ Date_ 8/25/03 _{Subject}	Cold Spring	Job No
Checked by	Date		Sheet <u>6</u> of <u>9</u>
who	at ste av	verage fill	neight
(140gpd/e	edu) - 126,000	gal/day	= 42,000 gal/cycle
heid		gul x ++3	24ft x 53ft x 264
	= 2,2 fee-		
For	Eron BNR MO	op < R + up	15 2 10 2
Aern		SRT W/F	
4+	97 /87	+ Lepth =	0.667 % proff
	ilculate Setn		3%
Ai~	readured = 450	21b 02 x 1.2 +	2014 6) 8.34 (0.126ng)
		my 11) (0.5) 2.	8 (8.34) (0.126 MG)
	= 540	+97-15 =	622 1602/2
Ox	2	المالحماليا	cycles x 2 basins
		DI 3 15 02/a	48

By UK 11	_ Date <u> හි/</u>	25 /0 Subject	1 Co/d	Springs	_ Job No	
Checked by				\mathcal{L}	Sheet	_ of
AVE	Eaguire 1	= 51.	31602	1.		1 SCF- APP
		0.0	73 1602	- 1scfm 60mi	20.0	9315 Gmdis
		55	32	Scfm		
la l		11 100	h pen		Star	
100 715	770	12 hs	2 7 3	2 0+4 91	5167	742
						+
	% e	1/4 =	17 (0.	667) = 11.	3 %	
		1				
Aw	regui		51.3			427
		1 0	.0173	(60) (0,11	3)	Safin
		1 1 1 - 1 - 1 - 1				
		140		LWL ,11)8,34 (P		1-1-1
Calculat	4 + h	of the	7 600	11/8/24/10	205.116	77/2/26
		ft (The Ma	14 16,51 (17)	,030,011,1	
I, M	CRTON	rsent =	G190		= 6190	= 20 443
	@017#,	16/11		5 x 17 x .8	306	
		 		_ _ _ _		0/
	cMC	<u> </u>	70 1	25 =	54935	@ 25% ox @ 38% ox
		-	1 es x	138 = 7	6 days	C 38 70 07
	+	+				
Can	lusion	- try	/ to 1	nevense o	xic M	CRT
		and	vaise			
} 	int 5	taff in	dicate Jet	Minumum +	tempn	- 150
n b	<u>サーサ</u>	4 100	7 1764	Tech origi	nally a	somed

4	¥	4	Gi	hir	Sh	ee	t
_	^	-	\sim		~		

Ву	<u>)</u>	2	\Box		Date	ج_	/2.	5/0	<u>3</u> s	ubje	ct_		<u>C</u>	/<	<u>/</u> _	Se	1/6	hq	<u> </u>		_ Jo	b No	o					
Chec	cked	i by_				(Date	·					•								Sh	eet		<u>3</u>	of_		}	
							Ī	ı —	Τ	1	1	Γ	Γ	1			Γ					Γ	I	· · ·	Ι	<u> </u>	·	ł
	_		_	J.		_		1		<u> </u>	<u> </u>	1	-	_	1			<u> </u>	12	<i>(</i> 2)	_		2.	•				
-4	ر	-		DL	2	<u> </u>	V	1	B	20	7	0	44 C	2	<u> </u>	Or	<u></u>		1 2		,	27	0	7	2 mi	/E	=,0	U
						<u></u>	• 6		0	7	P-/ -		10	7/1	/ ed	4	2	9	No		200	3	1	73	-"	7 * 3		: :
				-					e s	1	سا			n	14	S	2	_	\overline{z}	0	0	5	27	/	P			I. •
				6	9						-40	1		[-		
				1	11	/	19	0	30	bg	4	1/	7	12	S	7	=	3	42	2	7	00	1	/=	(9.	34	ZMG
							سا					ļ	1	1	١. ا		1				-	-						
			_/	1.	=	1	9.	34	2,	11	()	8	- 3	41	2	20	00	n		1/1)	<u> </u>	L	ļ			
						-	_	7			ļ.,		<u> </u>	رسور	_							_						
							12	/	þ <u>s</u>	<u> </u>	#	Ē.	<i></i>	75	5													
			-	2	0	-		_	<u></u>	,			7	1	B	175	<u></u>				~		~	- 0	-	4.6	21	0
					۷	2_		S.	Dn.	2	1		_	$\overline{}$	ري د ک		-	_=				• •			•	R		
-							72	1		_			<u> </u>	-	20	-	/-	-							12	7		
				X	P	<u>-</u>	7	2.	8	1	0	5	6	6) :	-	0	,	4	5	3	#	- 7	3	5 1	2/	ם הי	vçq
				_	<u>.</u>									<u> </u>												R		
						,															,							
				世	E	?	U	5	=		5	7	0	5					_		7	0	0	E	24	PL	2	
										_	10	, 4	Σ.	5		18	1					0	$\perp \iota$	Sd	44	. 1	10	RT
					,			_																<u> </u>				<u> </u> -
				9	1			50	DC	U	n	4	1-1		1	<u> </u>	5	5	_ر					_				ŀ
						· -	-		_	,	-	<u> </u>	2	 —	/_			1			,		_	-/			0	10
						生		<u> </u>	R	<u> </u>	=	-	3/	2_	1	20	0	1	=		/_		7		-1		20	/7
							<u> </u>	_		_			<u> </u>	_	· .		-						-	-				
			7.6	e	را		1	=	17	-	/	7		_	<u> </u>	1							_					
			<u> </u>	2	-	10	1.	-	//	8	1	3		70	, /	X	_	+	1	1	19	, 0	3	00) >	12	- 4	cles
							<u> </u>	-	1	0	-	7	-	_		-	7 6	50	, '	70	-		4	1		-	U	
													<u> </u>			-		1.4	1		Ö							
				1,	7	1	U	C	0	نے	人		E		2	50	2,	9	0		e	P	_		_	17	7	ERU
														_			XO X	Şe	01		2.11							
		ļ		_		<u> </u>		<u></u>	<u> </u>							•		0										
		C	N	ch	15	0	h ~	<u> </u>	C	11	ħ_		19	iS	e	L	h	17						<u></u>			G-3	

ByJRH	Date	3/25/13	Subject	Cold	Spring	<u>ی</u>	Job No	
Checked by							Sheet 9	or <u>9</u>
	MZ	55,	VL: 5	18	3=(2	200)	=267	ronge
S	55	ne	vaise	H	e 1	LW4 .	to m	ax/eve/
		80 gp		1200	-	2/6	,000 rog!	GAP LWL
Tet 3200	les =	216,	var	/19	,030	/3	= 3.8)	C1 14,25,
For 4 cy	==	216	000	/ 19	,039 4		7.8	ft 15,24
Coul	dn	e 1	ماد		LSS		due se	1
779	-		150	20 1		941	1209	YMCRT
EA	V = -		705	2,00		278	7.8	
		10	455)	128	(0)	453)12		500 my/(2 day SRT
	=	(04)	278	- 7	940		Populs	100 La SRT
E	१८५ (Dmy/e	ا اسر	22 @	120=	1049	ERVS
14: 400		. 0 2			MLSS (102=	125	1 EQUS -038%
or stude	je qu	of C	184	=	875	ERUS	0x15 W	CRT = 6 8 da
			0 128	0 11 10	1311			4.649

Attachment B

Design Criteria and Actual Composite Laboratory Tests

Cold Springs WRF Interium Capacity

	Interim Criteria*	Phase 1 Criteria
Capacity (ERUs) =	1,200	3,100
Flow per ERU (gpd) =	180	225
Person per ERU =	2.83	2.83
BOD per Person (ppd) =	0.2	0.2
TSS per person (ppd) =	0.2	0.2
Maximum Month Capacity (MGD) =	0.22	0.70
BOD Loading (ppd) =	679	1,755
TSS Loading (ppd) =	679	1,755

*The goal for Brad Musick and John Harrison is to find relatively low cost means of eliminating any bottlenecks that prevent the CSWRF from achieving the Interim Criteria goals.

We DO NOT want to confuse things by trying to achieve anything different than the Interim Criteria described above.

We need to keep in mind that the SBR's will be converted to digesters in in 1 ½ - 2 years, thus major investment to get additional short-term capacity is not desired.

It is important, however, that we achieve the interim criteria so that a building moratorium does not need to be placed on the community.





INFLUENT & EFFLUENT SAMPLING 7/17/2003

Influent C	omposite
------------	----------

Analyses	Concent	ration
Nitrate, as N	ND	mg/L
Nitrite, as N	ND	mg/L
Sulfate	42	mg/L
Alkalinity, Bicarbonate (as-CaCO3)	290	mg/L
Alkalinity, Carbonate (as CaCO3)	ND	mg/L
Hydroxide (as CaCO3)	ND	mg/L
Alkalinity, Total (as CaCO3)	290	mg/L
BOD, 5 Day	320	mg/L
CBOD, 5 Day	280	mg/L
Chemical Oxygen Demand	670	mg/L
Ammonia, as N	39	mg/L
Orthophosphate, as P	7.9	mg/L
Total Phosphorous, as P	1.2	mg/L
рН	7.27	
Total Kjeldahl Nitrogen	53	mg/L
Total Suspended Solids	328	mg/L
pH-	7.66	
Temperature	21.9	°C
Volatile Solids	210	mg/L

Influent Composite (Filtered)

Analyses	Concentra	Concentration			
Nitrate, as N	ND	mg/L			
Nitrite, as N	ND	mg/L			
Sulfate	36	mg/L			
Alkalinity, Bicarbonate (as CaCO3)	280	mg/L			
Alkalinity, Carbonate (as CaCO3)	ND	mg/L			
Hydroxide (as CaCO3)	ND	mg/L			
Alkalinity, Total (as CaCO3)	280	mg/L			
BOD, 5 Day	180	mg/L			
CBOD, 5 Day	160	mg/L			
Chemical Oxygen Demand	370	mg/L			
Ammonia, as N	41	mg/L			
Orthophosphate, as P	7.2	mg/L			
Total Phosphorous, as P	7.5	mg/L			
рН	7.42				
Total Kjeldahl Nitrogen	48	mg/L			
рН	7.69				
Temperature	21.7	°C			

Effluent Composite

Analyses	Concentration				
Nitrate, as N	0.52	mg/L			
Nitrite, as N	0.9	mg/L			
Sulfate	38	mg/L			
Alkalinity, Bicarbonate (as CaCO3)	150	mg/L			
Alkalinity, Carbonate (as CaCO3)	ND	mg/L			
Hydroxide (as CaCO3)	ND	mg/L			
Alkalinity, Total (as CaCO3)	150	mg/L			
BOD, 5 Day .	6.9	mg/L			
CBOD, 5 Day	5.1	mg/L			
Chemical Oxygen Demand	44	mg/L			
_ Ammonia, as N	0.37	mg/L			
Orthophosphale, as P	0.8	mg/L			
Total Phosphorous, as P	1.4	mg/L			
pH	7.64	_			
Total Kjeldahl Nitrogen	2.7	mg/L			
Total Suspended Solids	16	mg/L			
pH:	7.69	_			
Temperature	21.7	°C			
Volatile Solids		mg/L			

Effluent Composite (Filtered)

Analyses	Concentration			
Nitrate, as N	0.51	mg/L		
Nitrite, as N	0.68	mg/L		
Sulfate	31	mg/L		
Alkalinity, Bicarbonate (as CaCO3)	160	mg/L		
Alkalinity, Carbonate (as CaCO3)	ND	mg/L		
Hydroxide (as CaCO3)	ND	mg/L		
Alkalinity, Total (as CaCO3)	160	mg/L		
BOD, 5 Day	ND	mg/L		
CBOD, 5 Day	ND	mg/L		
Chemical Oxygen Demand	18	mg/L		
Ammonia, as N	0.29	mg/L		
Orthophosphate, as P	0.8	mg/L		
Total Phosphorous, as P	0.82	mg/L		
pH 🔪 .	7.81	- J		
Total Kjeldahl Nitrogen	1.3	mg/L		
pH	7.69			
Temperature	21.7	°C		

Attachment C

USFilter SBR Calculations



7/3/2003

Cold Springs WWTP

JET TECH PRODUCTS OMNIFLO® SEQUENCING BATCH REACTOR

DESIGN CALCULATIONS				
DDF1 IMINARY				

Rev. No.

Prep. By:

BSL

JET TECH PRODUCTS FILE NO. JTP-97018

1500 edus @ 1.80 golledu - 1200 edus @ 225 golledu .27 MGD Interim Design -

I. **DESIGN PARAMETERS:**

Influent &	Effluent Characteristics			English Units	Metric Units	
Flow Pea	k Instantaneous	=	0.27 0.68	MGD average MGD	1,022 m ³ /d 2,555 m ³ /d	
COD	to SBR	=	799 654	mg/l total * mg/l soluble		
Efflu	ent COD	< =		mg/l not required		
COD	removed	=	1,687	lbs./day	765 kgs/d	
Peak	sustained COD load	=	1,199 2	mg/l, for not more than consecutive days		
BOD	to SBR	=	400 900	mg/l lbs./day -	408 kg/d	-1500 edus@ 0.6#/edu/
Efflu	ent BOD	< =	. 20 30	mg/l mg/l required		-1500 edus@ 0.6#/edu/ -1590 edus e 0.566#/01
BOD	removed	=	877	lbs./day	398 kg/d	
TSS	to SBR	=	260 585	mg/l lbs./day	265 kg/d	
Inert	TSS fraction	=	40	% *		•
Efflu	ent TSS	< = =	20 30 23	mg/l <i>mg/l required</i> lbs./day	10 kg/d	

II.

				•
Influent dissolved solids, TDS	=	500	mg/l*	
Y //		52	/! *	
Influent NH4-N	=	53	mg/l *	EA leada
	=	120	lbs./day	54 kg/d
Influent TKN	=	79.9	mg/l	201 /1
	=	180	lbs./day	82 kg/d
Effluent NH3-N	<		mg/l	
•	=		not required	
				ninhibited nitrification rates
Effluent Total Nitrogen	<	10	mg/l	
•	=	10	mg/l required	t 1 12 to 4 - to 25 and an ended
7 G . D. 1				ninhibited nitrification rate*
Influent Phosphorus	=	11	mg/l *	12 log/d
	=	26	lbs./day	12 kg/d
Effluent Phosphorus	<		mg/l	
	=		not required	
Winter Temperature (min.)	=	12 °C	•	
Summer Temperature (max)	= .	23 °C	÷	
Reactor & Process Characteristics				
Design MLSS	=	3,000	mg/1 @ TWL	
Hydr. Retention Time provide	(= [']	1.28	days	30.8 hours
Aerobic Sludge Age (SRTox)	=	6.2	days min. SRTox	·
System SRT	322	12.4	days	
Biosolids yield factor	=	0.25	gVSS/gCODr/d	
Diocona field lation	=	0.54	gVSS/gBODr/d	
			••	
Aerobic or Oxic F:M	= -	0.42	gCOD/gMLSS/d	
	=	0.21	gBOD/gMLSS/d	
System F:M	-=	0.10	gBOD/gMLSS/d	
Elevation	=	5,000	ft. MSL*	1,524 m
Average barometric pressure	=	12.22	psia*	84 kPa
PROCESS PARAMETERS:				
Average COD removed	=	1,687	lbs./day	765 kg/d
Maximum COD removed	=	2,587	lbs./day	1,173 kg/d
Minimum SRTa - peak loadir	1£ =	5.0	days	• • • •

	•				r
	Avg biosolids yield, dXv	=	422	lbs./day*	191 kg/d
	Avg net sludge yield (bio+iner	t: =	647 699	lbs/d based on CODr¹ lbs/d based on BODr¹	293 kg/d 317 kg/d
	Maximum sludge yield	=	872	lbs/d based on CODr	395 kg/d
	Required aerobic mass	==	4,333	lbs MLSS	1,965 kgs
	Required aerobic volume	=	0.17	MG	655 m ³
	Aerated portion of cycle	=	50.0	%	
	Required total SBR volume	=	0.35	MG	1,311 m^3
m.	SBR BASIN DESIGN:				
	Number of SBR basins	=	2		
	If Rectangular Basins are used:				
	Length/Width Ratio	=	2.2	:1	
	Length	=	53	ft.	16.21 m
	Width	==	24	ft.	7.37 m
	If Round Tanks are used:				
	Diameter	=	40	ft.	12.34 m
	Maximum Water Level	=	18.0	ft.	5.49 m
	Nominal Bottom Water Lev **(The minimum h)	el '= ydraul	14.5 lic water	ft. level is typically well be	4.42 m low nominal BWL)
	TWL at Design Average Flo		18.0	ft.	5.49 m
	Total Volume in SBR's	=	0.35	MG	1,311 m^3
	Total Retention Time in SB	R's=	30.8 1.28		

IV. OXYGEN REQUIREMENT:

First Estimate:

lbs. O2/lb. BOD removed 1.26 kg O2/kg BOD removed

lbs. O2/lb. TKNoxidized 4.6 kg O2/kg TKNoxidized

lbs. O2/lb. NO₃x denitrified -2.86 Denite efficiency = 60 %

Actual Oxygen Req'd, AOR 1,522 lbs. O2/day 690 kg/d

Second Estimate:

$$\frac{15^{22}}{900} = 1.69 \frac{\pm 02}{4800}$$

Check AOR estimate against mass balance: (TKNox may be included in COD, assume not)

AOR = CODi - CODw - CODes + 4.6*TKNox - 2.86*NO3Ndn

CODi = influent = 816 kg/d 1,800 lbs./day CODw = wasted = 506 lbs./day 230 kg/d CODes = eff solubl = 113 lbs./day 51 kg/d $TKNox^{**} = oxidized =$ 144 lbs./day 65 kg/d NO₃Ndn = denitrifie = 73 lbs./day 33 kg/d

The oxygen requirement determined by mass balance is: AOR =1,637 lbs./day 743 kg/d

Differences in AOR values calculated is due to assumptions for sludge yield, for effluent COD & BOD, and for oxidation of NH3-N in the COD analysis. Precise determination of AOR requires a detailed plant or pilot study. Use highest

> **DESIGN AOR =** 1,637 lbs. O2/day 743 kg/d

Convert Process, or Actual Oxygen Requirement (AOR), to Standard Oxygen (SOR):

Conversion Formula from ASCE Manual of Practice:

value in lieu of better data. Therefore:

$$SOR = \frac{AOR * Cs}{a * (\beta Csd - DO) * \emptyset^{T-20}}$$

Where:

Cs = DO saturation at Stnd Conditions Csd = DO saturation at design conditions = 9.07*(1+0.4*D/34)

= Cst*(Fe+0.4*D/34)

10.99 mg/l where: Cst = DO saturation at liquid Temp & 1 sea level

= 8.56 mg/lElev. Factor, Fe = 0.83Therefore, Csd = 8.91 mg/l

C-5/9

Cold	Springs	WWTP
------	---------	------

.27 MGD Interim Design

SWD, D = 18.0 ft

D.O., mg/1 = 2.0 mg/1

Alpha, $\alpha = 0.85 *$

Beta, $\beta = 0.95 *$

Liquid Temp, T = 23 °C

Theta, $\emptyset = 1.024$

Therefore:

Standard Oxygen Required, SOR =

3,049 lbs. O2/day

1,384 kg/d

1.91 m^3/min/jet

V. PROCESS DESIGN:

CYCLE TIMES

No. of batches/day/SBR = 4.0 per SBR

Maximum Fill time = 3.0 hrs. per basin

Complete Cycle time = 6.0 hrs. per basin

Fill time at Design Flow = 3.0 hrs.

Anoxic Fill time = 1.5 hrs. 50 % of FILL is anoxic.

Aerated Fill = 1.50 hrs.

React time = 1.50 hrs. 50.0 % of cycle is aerated. (Existing plant design used 38% aer

Settle Time = 0.80 hrs.

Decant time = 0.39 hrs.

Idle time = 0.31 hrs.

VI. AERATION SYSTEM DESIGN:

 $\{-1\}$

Aerator elevation = 2.5 ft. 0.76 m

Avg aerator submergence = 15.1 ft. 4.59 m

Total aeration time = 3.00 hrs./cycle

= 12.0 hrs./basin/day

SOR for aeration design = 127 lbs./hr/basin 58 kg/hr

Design gassing rate = 67.4 SCFM / jet

Gassing rate (current) = 40 SCFM / jet Site gassing rate = 75.2 ICFM / jet 2.13 m³/min/jet

Absorption efficiency Efficiency (existing jets) Design air flow	= = =	21.9	% % SCFM	$\frac{673 \text{ Cfm}}{900 \pm 800/1} = 0.75 \text{ Cf}$ $\frac{4810}{6}$ 19 m^3/m
Jets required per basin	=	10.0	Model 40 Jets	
Jet headers per basin	=	1	Type: C Orientation: L	B = BDM, $C = CML = Length$, $W = Width$
Jets per header	=	10	Model 40 Jets	

VII. BLOWER DESIGN CALCULATIONS:

Operating blowers	=	. 2	per aerating basin				
Type of Blowers:	=	1	 1 = Rotary, positive displacement 2 = Multistage Centrifugal 3 = Variable-vane centrifugal 				
Total Number of Blowers	=	2	not including a spare				
Air flow per blower Existing blower output	=	337 396	SCFM SCFM	1,144 m^3/h	ur		
Inlet losses	=	0.3	psig *	2.07 kPa	0.02 bar		
Net inlet pressure	=	11.92	psia (absolute)	82.18 kPa	0.82 bar		
Discharge piping losses	=	0.7	psig *	4.83 kPa	0.05 bar		
Static head + Aerator loss	=======================================	6.62 6.81 5.29	psig average psig at Max. W.L. psig at Min. W.L.	45.65 kPa 46.95 kPa 36.48 kPa	0.46 bar 0.47 bar 0.36 bar		
Total discharge pressure		7.62 7.81 6.29	psig average psig maximum psig minimum	52.54 kPa 53.85 kPa 43.38 kPa	0.52 bar 0.54 bar 0.43 bar		
Design ambient temp.	=	100 0	°F maximum °F minimum	38 °C -18 °C			
Site air flow required	=	880	ICFM average	24.94 m^3/s	min		
Equiv. sea level pressure	=	9.82	psig average	67.68 kPa	0.68 bar		
Nominal blower efficiency	=	64	% *				
BHp per blower	=	37.2	BHp/Blower	27.8 BkW 30.8 kW (90% ME		
Blower BHp/aerating basin	=	37.2	BHp/Basin	27.8 BkW 30.8 kW (a, 90% ME		

VIII. PUMP DESIGN CALCULATIONS:

Number of pumps	=	1	per basin $I = Dry Pit C$	Pentrifugal
Type of Pumps:	= ·	1	2 = Submersi	ble Centrifugal ble Propeller
Total number of pumps	=	2		
Flow per pump	=	1,831	GPM	115.5 l /s
Required jet head	=	17	ft.	5.2 m
System headloss	=	4	ft.*	1.2 m
Total pump head	=	21	ft.	6.4 m
Assumed pump efficiency	=	76	% *	• .
BHp per pump	. =	12.8	BHp/Pump	9.5 BkW 10.6 kW @ 90% ME
Total pump BHp/basin	=	12.8	BHp/Basin	9.5 BkW 10.6 kW @ 90% ME
m . mrobi criompa (CID (D.C.	4 D37.			

IX. AERATION SYSTEM SUMMARY:

				anat to the state of
Assume Cost of Power	=	0.05	\$/kW	
Avg. BHp for 24 hrs.	=	50	BHp**	41 kW
Standard Oxygen Required	=	3,049	lbs./day	1,386 kg/d

Max. Annual Cost of Power** = 18,144 \$/yr, (assuming 90% motor efficiencies)

* *Actual power draw is typically less due to Demand-Proportional aeration process control

7/3/2003

X. DECANTER SIZING:

Cycles per day =

Volume per decant = 33,750 Gallons at Design Flo 128 m³ m³ Gallons Decantable 128 m³

Decant time = 0.39 hrs.

Average decant flow = 1,458 GPM 92.0 1/s

XI. PHOSPHORUS REMOVAL

BOD vs Phosphorus:

Assume TSSi inert fraction is as shown under 'DESIGN PARAMETERS'.

Check BOD to P ratios:

Based on total influent values: Based on soluble influent values:

BODi:P = 35:1 SBODi:P = 23:1

Approximate mg BODi/mg P reqr'd = 27:1 at oxic SRT selected

Assuming only bio-P removal:

Effluent P conc. achievable biologically = < 1 mg/l

Chemical phosphorus removal required = 0.0 mg/l

or

Approximate ferric chloride dosage reqr = 0 mg/l (as FeCl3) = 0 gpd @ 30% FeCl3

7/3/2003

XII. NUTRIENT REQUIREMENT CALCULATIONS:

Nitrogen: assume a minimum waste biosolids content of 10% Nitrogen, and that a 5 mg/l soluble total N in effluent ensures adequate N for process.

N addition required =	0	mg/l	@ (0.10*dXv+5) - TKNi	
or =	0	mg/l	@ (0.05*BODi) - TKNi	
use the greater value =	0	mg/l	of Nitrogen	
or =	0	lb/d	OI I IIII OM TI) kg/d
Chemical required =	0	lb/d	O. G.M., C. W.	0 kg/d
or =	0	lb/d	of Urea	0 kg/d

Phosphorus: assume waste biosolids contain 2% P, and 2 mg/l soluble P in effluent ensures adequate P for process.

P addition required =	0	mg/l	@ (0.02*dXv+2)-Pi	
or	0	mg/l	@ 1% of BODi-Pi	
use the greater value =	0	mg/l	of Phosphorus	01 /1
or	0	lb/d	of Phosphorus	0 kg/d
Chemical required =	0	lb/d	of calc. dihyd phos.	0 kg/d
or	0	lb/d	of ammonium phos.	0 kg/d
OI	0	lb/d	of phos acid (75%)	0 kg/d

XIII. ALKALINITY REQUIREMENT CALCULATIONS:

Assume waste biosolids contain 10% N. Also, 7.14 mg/l alkalinity per 1 mg/l nitrate generated and 3.57 mg/l alkalinity recovered per 1 mg/l nitrate denitrified.

Total TKN oxidized to nitrate	= or =	61 138	mg/l lb/d	@ TKNi - (0.10*dXv)	63 kg/d
Alkalinity req'd for nitrification Alkalinity recovered from denite	=	437 131	mg/l mg/l	60 % Denitrification	Eff.
Alkalinity lost in process	= ,	306	mg/l	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Influent alkalinity concentration Alkalinity as buffer	=	200 75	mg/l* mg/l		
Additional alkalinity required	= or =	181 407	mg/l* lb/d	as CaCO3	185 kg/d
Chemical required	===	326	lb/d	of NaOH of NaHCO3	148 kg/d 311 kg/d
	or =	684	lb/d	Of Maricos	5 Kg -

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Ron Bush and Harry Ritter, Kennedy/Jenks Consultants

Reviewed by: Travis Tormanen and Lynn Orphan, Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes Jason Phinney, TEC Civil Engineering Consultants

Subject: Aerobic Digestion

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

The purpose of this technical memorandum is to estimate the future requirements for aerobic digestion at the Cold Springs Water Reclamation Facility (CSWRF) and to evaluate conversion of the existing sequencing batch reactor (SBR) basins and aeration system to provide future digester capacity. Design criteria, a description of the existing basins, the proposed modifications, and a cost estimate for the conversion will be presented.

BACKGROUND

In response to proposed residential development, the CSWRF will undergo a two-phase capacity expansion. The existing Jet Tech™ SBR treatment facility consists of two, 0.175 million gallon (MG) aeration basins and one, 0.12 MG aerobic digester. All three basins are equipped with blowers for aeration, a motive pump for mixing, and floating decanters for removal of clarified supernatant. As part of the upcoming capacity expansion, it is intended to convert the existing SBR aeration basins into aerobic digesters. The three basins combined will provide approximately 0.47 MG of digestion capacity. The existing basin configuration is shown on Figure 1.

DESIGN CRITERIA

General design criteria for the Phase 1 and Phase 2 expansions are shown on Table 1. Table 2 lists design criteria specific to the aerobic digestion process.

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003 Page 2

Table 1: General Design Criteria

Criteria	Unit	Phase 1	Phase 2
Population Data			
Equivalent Residential Units (ERUs)	None	3,100	5,200
Persons per ERU	None	2.83	2.83
Daily Flow per ERU	gpd	225	225/250 ^(a)
Biochemical Oxygen Demand (BOD) per Capita	ppd	0.2	0.2
Total Suspended Solids (TSS) per Capita	ppd	0.2	0.2
Influent Loading		Datis September 1987 (1987)	
Average Daily Flow (ADF)	MGD	0.7	1.2
Peak Hour Flow (PHF)	MGD	1.75	3.0
BOD	mg/l	300	300
TSS	mg/l	300	300
Ammonia (NH ₃)	mg/l	48	48
Total Nitrogen (TN)	mg/l	60	60
CSWRF Elevation	feet	5,100	5,100
Effluent Limits	Salakin ista		
BOD	mg/l	30	30
TSS	mg/l	30	30
TN	mg/l	10	10

Note:

⁽a) For Phase 2, it is assumed that 50% of the new ERUs would contribute 225 gallons per day (gpd) and that the remaining 50% (older collection system subject to infiltration) would contribute 250 gpd.

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003
Page 3

Table 2: Aerobic Digestion Design Criteria

Criteria	Unit	Phase 1	Phase 2
Influent BOD	ppd	1,755	2,943
Influent TSS	ppd	1,755	2,943
Inert Portion of TSS	%	30	30
Inert TSS to Digester	ppd	527	883
Net Sludge Yield ^(a)	lb VSS/lb BOD	0.45	0.45
Volatile Suspended Solids (VSS) to Digester	ppd	793	1,324
Total Solids to Digester	ppd	1,320	2,207
VSS Destruction	%	40	40
Digester Solids	%	2.0 ^(b)	2.0 ^(b)

Notes:

- (a) Describes conversion of BOD to VSS in the aeration basin.
- (b) Assumes thickening/decanting of solids during digestion.

REGULATORY CONSIDERATIONS

Currently, the CSWRF probably produces Class B biosolids using aerobic digestion followed by onsite storage in one of two sludge lagoons located north of the treatment plant, but the solids do not meet the reporting requirements for Class B. The stabilized sludge is disposed of at the Lockwood Regional Landfill. The planned expansions will incorporate provisions for producing Class B biosolids as it is not anticipated that Class A biosolids will be required to accommodate future disposal options. Regulatory options for meeting biosolids disposal requirements are discussed in greater detail below.

Biosolids Disposal

Biosolids disposal is regulated by the Environmental Protection Agency (EPA) under Title 40 Code of the Federal Regulations Part 503 (Part 503) which establishes minimum national standards for the land application of biosolids. These regulations include limitations on metals and other compounds, pathogen reduction, vector attraction, and best management practices.

Part 503 sets criteria for Class A and Class B biosolids. Treatment to Class A standards is required for application of biosolids to public use sites and for certain food crops. It is not anticipated that the CSWRF will require treatment to Class A standards. Class B biosolids are intended for application to grain and forage crops, pastures, grasslands, fallowland, and

Technical Memorandum No. 011

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003
Page 4

timberland. Although not required for biosolids disposal to a landfill, it is anticipated that Class B biosolids may be required for future disposal options.

Class B Sludge Requirements

Class B biosolids must meet the treatment requirements for pathogen reduction and vector attraction. Pathogen reduction is related to the biological component of the sludge. Vector attraction is a function of the level of volatile solids present in the sludge.

Pathogen Reduction

Sufficient pathogen reduction must either be demonstrated by performing a fecal coliform test (performance testing) or by implementing one of the approved processes to significantly reduce pathogens (PSRPs). Use of one of the PSRPs ensures that the required treatment criteria are always met.

There are several approved PSRPs that will meet the Class B requirements, including aerobic or anaerobic digestion for prescribed periods, air drying, composting, and lime stabilization. To minimize the manpower and land requirements and to maximize reliability, it is intended to meet the Class B requirements at the CSWRF by providing 40 to 60 days aerobic digestion. The number of days required to meet the treatment objective is a function of the process temperature (40 days @ 20° C to 60 days @ 15° C).

Vector Attraction

Vector attraction refers to the propensity of the sludge to attract disease carriers (vectors) such as flies and rodents. There are several ways to meet the vector attraction requirements of Part 503, including reducing the volatile solids content of the digested sludge by 38%, drying sludge to over 75% solids, or digesting the sludge at elevated temperatures. Other possible options include testing the specific oxygen uptake rate (SOUR) of the digested sludge or incorporating the biosolids into the soil within 6 hours after spreading. A 38% volatile solids reduction in the digester is difficult to achieve in an extended aeration process (i.e., oxidation ditch process) as the volatile solids are significantly reduced in the aeration basin. For extended aeration plants, vector attraction reduction is normally achieved by incorporation of the biosolids into the soil within 6 hours.

DIGESTION VOLUME REQUIREMENTS

Traditionally, 12 to 18 days of solids retention time is required for conventional aerobic digestion of activated sludge. The Part 503 regulations for pathogen reduction require additional detention time to provide for an increased level of sludge stabilization. Table 3 shows the

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003
Page 5

volume and detention time provided by the existing basins at the CSWRF for the anticipated Phase 1 and Phase 2 sludge production rates.

Table 3: Solids Retention Time for Existing Basins(a)

Basin	Volume (MG)	Phase 1 ^(b) (days)_	Phase 2 ^(c) (days)
SBR1	0.175	22	9.9
SBR 2	0.175	22	9.9
Digester 1	0.12	15	6.8
Total	0.47	59	26.6

Notes:

- (a) Assumes average digester solids concentration of 2.0%.
- (b) Retention time based on estimated sludge production at the end of Phase 1 planning period.
- (c) Retention time based on estimated sludge production at the end of Phase 2 planning period.

The values provided on Table 3 are based on a solids concentration of 2.0% which should be achievable by decanting the digester basins and/or by using the centrifuge for thickening the digesting sludge. The totals indicate that the existing basins should be able to meet the Part 503 retention time requirements (60 days at 15° C) for the Phase 1 expansion but that additional capacity will be required as part of the Phase 2 expansion. The layout and location of the existing basins would allow for expansion by constructing an additional basin to the east.

AERATION AND MIXING

To ensure proper operation, the contents of the aerobic digester must be adequately aerated and mixed. Normally, both aeration and mixing energy are provided by the aeration system. Diffused or surface aeration will achieve mixing as the air introduced to the basin creates mixing currents. The Jet Tech™ system, currently installed in the basins under consideration, use a "motive" pump to augment the mixing provided by the aeration system. Aeration is provided by positive displacement blowers. The air is diffused into the basin through the use of "jets" operating in concert with the motive pump.

Aeration Requirements

The theoretical oxygen requirement for aerobically digested sludge, referred to as the actual oxygen requirement (AOR), is 2.3 lbs of oxygen per lb of volatile solids destroyed. The standardized oxygen transfer rate (SOTR) accounts for tank geometry, system efficiency, and environmental conditions and is the actual oxygen that must be delivered to the basin to meet the AOR. The translation of these values into required blower power is a function of the overall

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003
Page 6

efficiency of the blowers and aeration system. The aeration requirements for Phase 1 and Phase 2 are listed on Table 4. These values are based on AOR/SOTR values and aeration system efficiencies provided by Jet Tech™.

Table 4: Aeration Requirements for Aerobic Digestion

Criteria	Phase 1	Phase 2
AOR (ppd)	727 ^(a)	1,218 ^(a)
SOR (ppd)	1,652 ^(b)	2,768 ^(b)
Required BHP	15 ^(c)	25 ^(c)

Notes:

- (a) Based on 2.3 lb O₂ /lb VSS destroyed.
- (b) Based on AOR/SOR = 0.44 (per Jet Tech™ for existing digester).
- (c) Based on 2.0 lbs O₂/hr/hp (per Jet Tech™).

Existing Aeration Capacity

The existing aeration capacity is shown on Table 5. The values presented for existing basins 1 and 2 reflect the capacity of one of two installed blowers. The second blower is installed as a standby blower. From the information presented on this table it can be determined that adequate aeration capacity is available to treat the anticipated volatile solids without taking credit for the aeration capacity of Basin 3 (existing digester basin). This is important as the majority of volatile solids destruction will take place in Basins 1 and 2. Basin 3 will receive digested sludge from Basins 1 and 2, providing additional solids retention time. Basin 3 will require less than the currently installed aeration capacity for this purpose.

Table 5: Existing Aeration Capacity

Criteria	Existing (Basins 1 and 2)	Existing (Basin 1, 2, and 3)
AOR (ppd)	950 ^(a)	1,372
SOR (ppd)	2,160 ^(a)	3,120
Available bhp ^(b)	22 ^(a)	31

Note:

- (a) Values are for the capacity of one of two (equal capacity) installed blowers.
- (b) bhp = Brake horsepower (installed horsepower x system efficiency)

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003
Page 7

Mixing Requirements

Mixing requirements for aerobically digested sludge are typically based on a value of approximately 1 bhp/1,000 cubic feet of digester capacity. The Jet Tech™ system uses a motive pump that continuously circulates the basin contents providing a portion of the required mixing energy. Air bubbles discharged from the Jet Tech™ aeration system provide the additional energy required to meet the remainder of the mixing requirement.

Existing Mixing Capacity

Information on the mixing energy provided by both the motive pumps and the aeration system for both basins is included on Table 6. It can be determined that mixing is sufficient in all three basins.

Basin	Motive Pump (bhp)	Aeration System (bhp)	Total Mixing Energy (bhp/1,000 cf)
1	13	11 (22/2)	1.0
2	13	11 (22/2)	1.0
3	10.2	9.1	1.2

Table 6: Existing Mixing Energy

REQUIRED MODIFICATIONS TO EXISTING BASINS AND EQUIPMENT

The modifications required to convert the existing SBR basins to aerobic digesters are described below.

Descriptions of Modifications

The modifications would involve adding piping and valves to allow for feeding and transferring the sludge between basins and modifications to the decanter piping.

A waste activated sludge (WAS) distribution header and a sludge transfer line would be required for feeding WAS/scum and transferring sludge between basins. The WAS/scum distribution line would be installed along the north wall of the basin with the transfer line lying along the south wall (see Figure 1). This would allow the basins to be operated in series or in parallel, or in a configuration with Basins 1 and 2 in series and Basin 3 in parallel. The piping would also allow any one of the three basins to be taken offline while maintaining operation.

Washoe County Department of Water Resources - Aerobic Digestion 6 October 2003
Page 8

The decanters in all three basins would need to be re-plumbed so that they drain to the proposed in-plant pump station. This would be a relatively simple modification.

Estimated Cost of Modifications

The estimated cost of the modifications required to convert the existing SBR basins to aerobic digesters is shown on Table 7.

Table 7: Estimate of Probable Cost (Existing Basin Conversion)

Item	Cost	
4-inch WAS Influent Line and Valves	\$18,000	
6-inch Sludge Transfer Line and Valves	\$20,000	
Decanter Re-Piping	\$15,000	
Contingency (25%)	\$13,000	
Total	\$66,000	

Note:

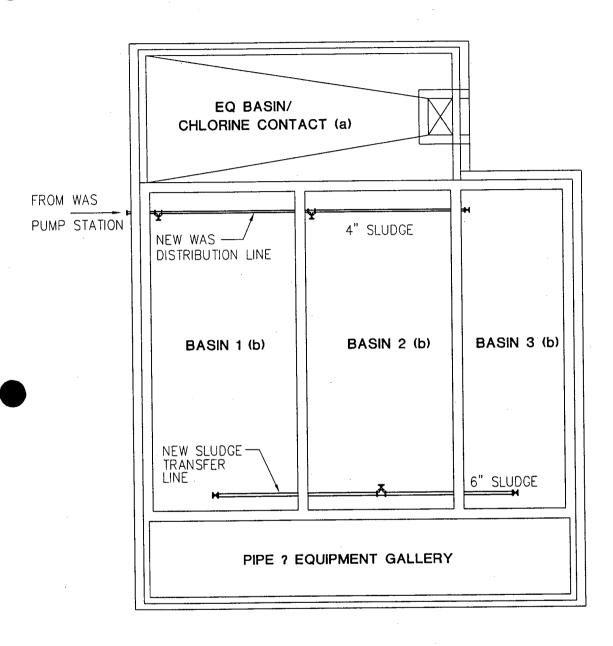
Costs do not include yard piping.

CONCLUSION

The existing aeration and mixing equipment is adequate for meeting the anticipated oxygen and mixing requirements for both Phase 1 and Phase 2. According to the analysis, the existing basins provide 59 days of retention at the end of Phase 1 which should be sufficient to meet Part 503 requirements for pathogen reduction. Depending on the method chosen for sludge disposal, the volume of the existing basins may be inadequate for Phase 2. An additional digester basin could be incorporated in Phase 2 that would provide the required additional capacity.

Figure





NOTES

- (a) EQ BASIN/CHLORINE CONTACT BASIN TO REMAIN IN SERVICE.
- (b) AERATION, PUMPING, MIXING AND DECANTING EQUIPMENT OMITTED FOR CLARITY.

10 0 10 20 30 40 SCALE: 1/16"=1' FEET

Kennedy/Jenks Consultants

Washoe County Dept. of Water Resources Cold Springs WRF Expansion

Preliminary Design Ext. SBR Converted To Aerobic Digester

August 2003 K/J 037012.00

Figure 1

Technical Memorandum No. 012

Prepared For: Joe Howard, Washoe County Department of Water Resources

Submitted by: Tony Wakim and Lynn Orphan, Kennedy/Jenks Consultants

Reviewed by: Catherine Dummer and Travis Tormanen, Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities

Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

out on the second of the secon

Standby Power / Electrical Services

Cold Springs Water Reclamation Facility Expansion

Washoe County K/J 037012.00

PURPOSE

Subject:

This technical memorandum has been developed as part of the evaluation of the capacities and requirements for electrical service and standby power for Phase 1 of the Cold Springs Water Reclamation Facility (CSWRF) Expansion project.

ELECTRICAL SERVICE

Existing Condition

The existing electrical service is rated at 277/480 volts, 3 phase and is served from a utility-owned pad mounted transformer. The existing service meter, located outside the existing SBR equipment building, feeds a motor control center with a main circuit breaker rated for 400 amperes (amps). The motor control center can also be served from a 225 kilowatt (kW) [275 kilovolt-amperes (kVA)] diesel-driven engine generator through a 400 amp automatic transfer switch.

Expansion Loads

Based on the electrical load calculations (see Attachment A), it was determined that the peak-demand electrical loads, including existing and proposed equipment, is over 450 amps. The calculated connected load will be 681 amps, which is above the rating of the existing 400 amp main circuit breaker, the metering cabinet, and the automatic transfer switch. The existing circuit breakers are molded case type circuit breakers. They are typically rated to carry 80% of their rated capacity on a continuous use basis. Therefore, the existing service breakers and

Kennedy/Jenks Consultants

Technical Memorandum No. 012

Washoe County Department of Water Resources - Standby Power 6 October 2003
Page 2

utility metering are not rated to carry the net peak of the proposed wastewater treatment plant load.

Recommendations

Our recommendation is to provide new service equipment including an 800 amp metering cabinet, an 800 amp main circuit breaker, and an 800 amp automatic transfer switch to replace the existing components. The existing motor control center rated at 600 A would be reused and fed from the new service.

The local utility will need to be notified of the proposed expansion of the CSWRF and the associated increased loads and will evaluate whether a new transformer is needed.

It is anticipated that a 1,200 amp service will eventually be necessary for Phase 2. If desired, the new equipment could be sized now for 1,200 amps.

STANDBY POWER

Existing Condition

The existing standby generator is rated at 225 kW (275 kVA) and can currently serve the entire plant's loads. The generator is connected to an automatic transfer switch which serves the motor control center.

Plant Expansion

The calculated load for the plant's expansion indicates an increased peak-demand load of 362 kVA which exceeds the rating of the existing standby generator. To serve the entire projected future peak demand loads in the plant, a new standby generator unit would be required. However, the existing unit could be used if certain plant loads are not permitted to start after loss of "normal" power.

Recommendations

Our recommendation is to reuse the existing 225 kW generator, but with interlocks to prevent certain identified connected loads from starting when the generator is providing power. Based on our calculations, the following loads could be served from standby power:

Kennedy/Jenks Consultants

Technical Memorandum No. 012

Washoe County Department of Water Resources - Standby Power 6 October 2003
Page 3

- Influent Pumps
- Effluent pumps
- One In-Plant Pump Station Pump
- Two Oxidation Ditch Rotors
- Two RAS Pumps
- Two Clarifier Drives
- All single phase loads.

Electrical loads would be interlocked using PLC controls. Certain loads such as blowers would be provided with solid-state starters to reduce inrush to generator.

It is recommended that the Phase 2 expansion include increased standby power capabilities.

Attachment A

Standby Power Calculations

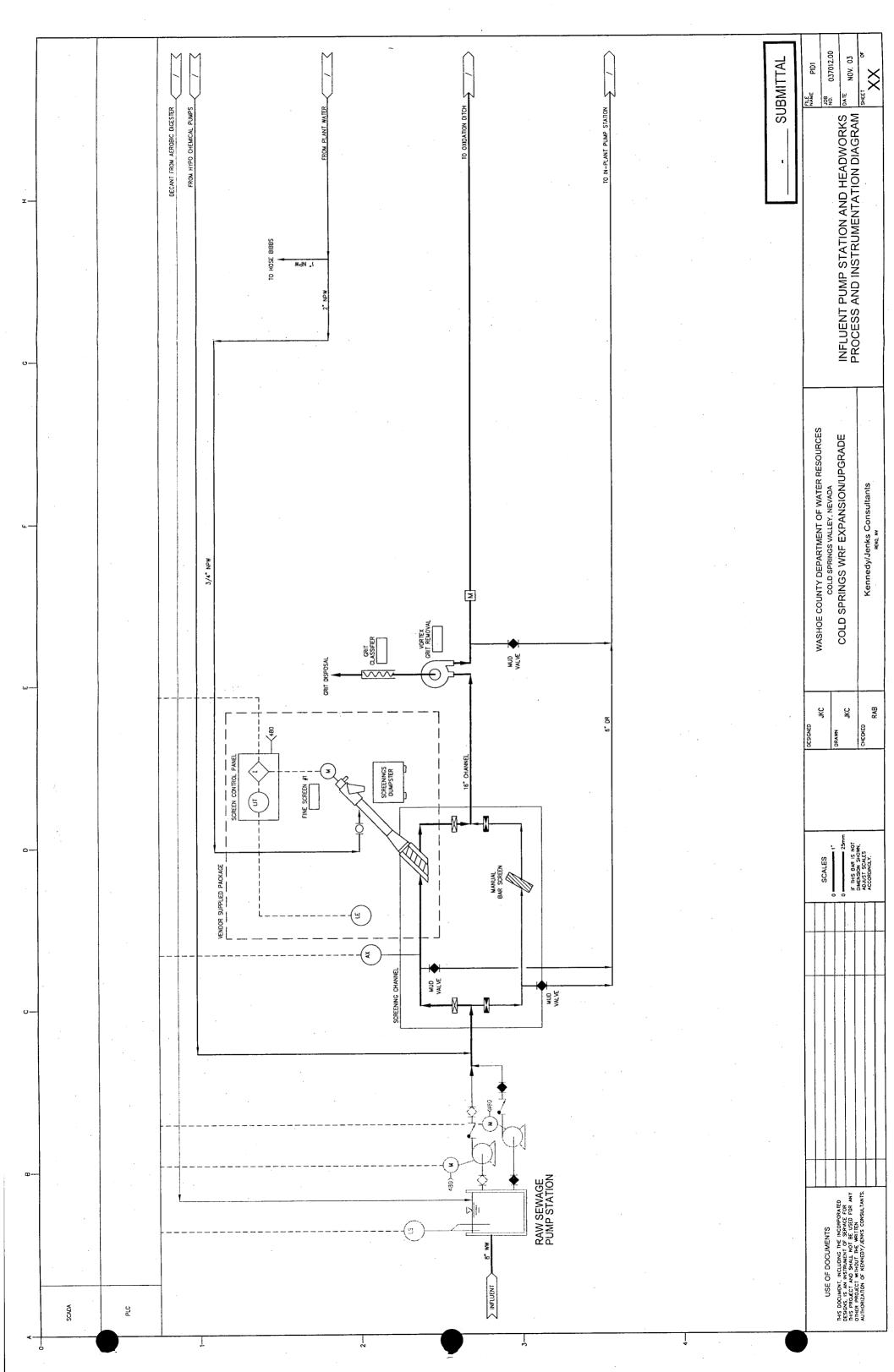
Attachment A Cold Springs Water Reclamation Facility

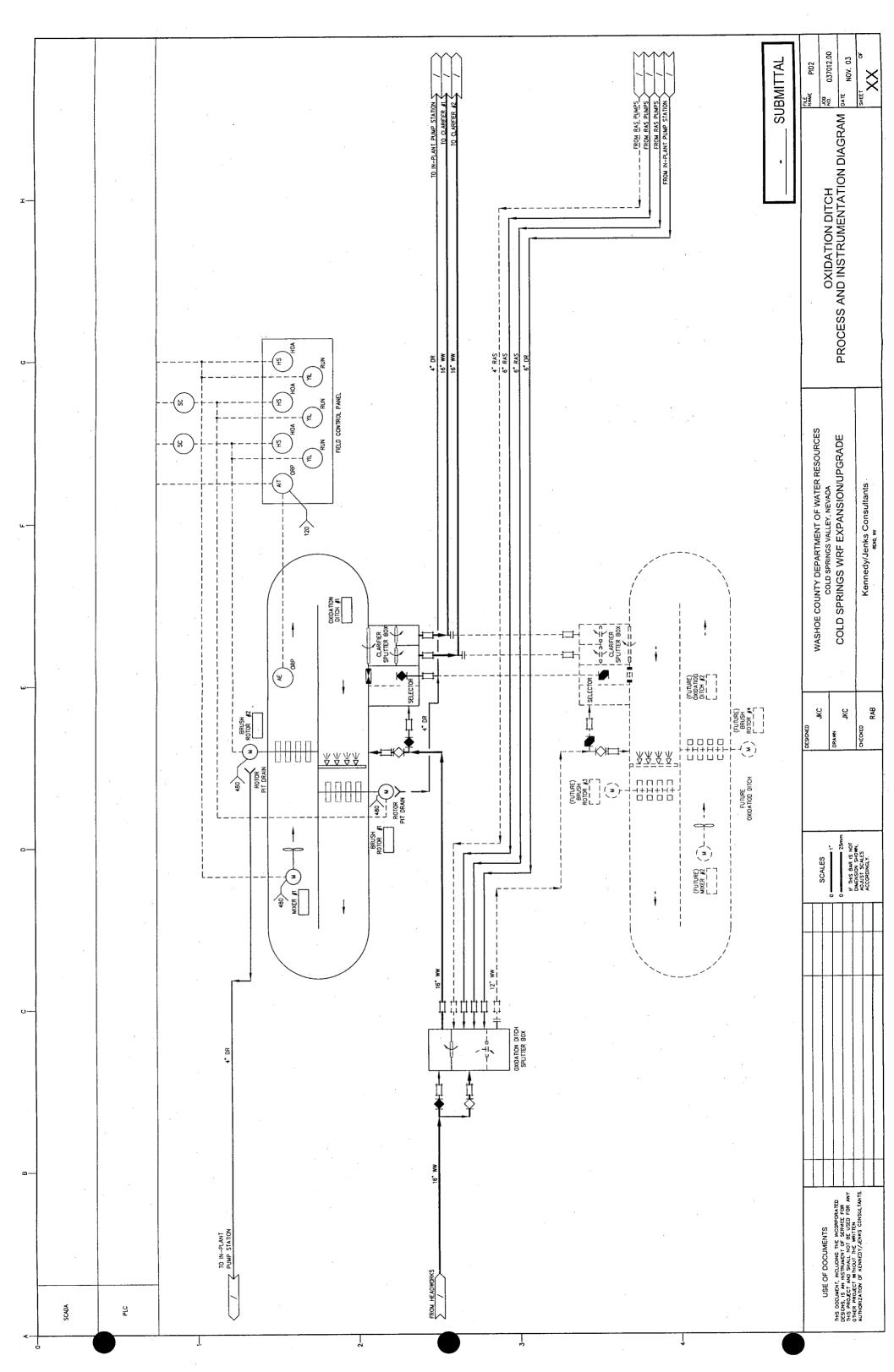
Standby Power Calculations

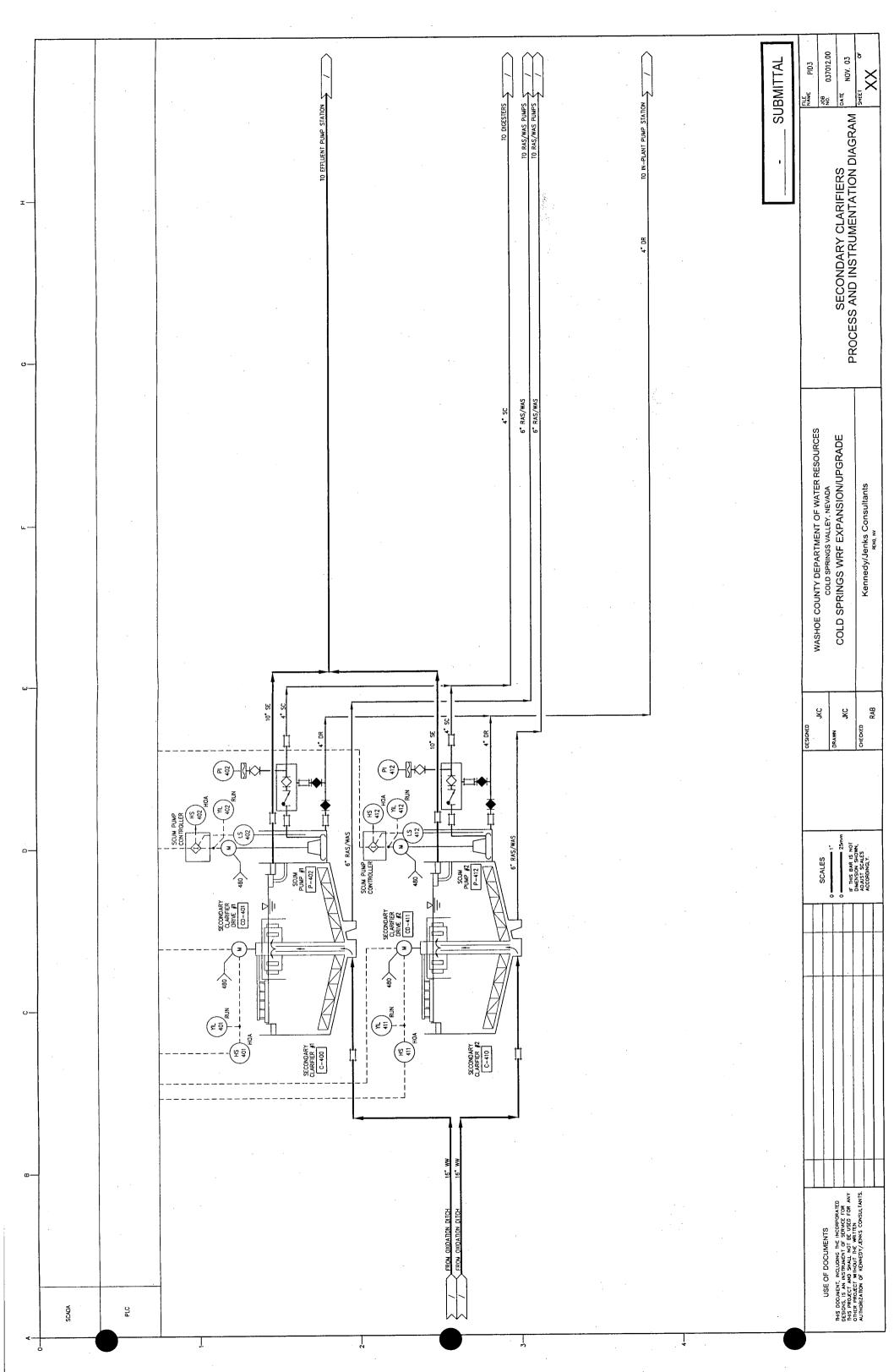
Item		HP	FLA	KVA
1	Oxidation Rotor 1	60	77	61.3
2	Oxidation Rotor 2	60	77	61.3
3	Oxidation Rotor 3	60	77	61.3
4	Oxidation Mixer 1	7.5	11	8.8
- 5	Oxidation Mixer 2	7.5	11	8.8
6	RAS Pump 1	7.5	11	8.8
7	RAS Pump 2	7.5	11	8.8
8	RAS Pump 3	7.5	11	8.8
9	WAS Pump 1	2	3.4	2.7
10	WAS Pump 2	2	3.4	2.7
11	Clarifier 1	1	1.8	1.4
4	Clarifier 2	1	1.8	1.4
5	Digester Blower #1	30	40	31.9
6	Digester Blower #2	30	40	31.9
7	Blower #3	15	21	16.7
7	Centrifuge Unit	50	65	51.8
	Sludge pump # 1	5	7.4	5.9
9	Sludge pump # 2	5	7.4	5.9
10	Lift Pump #1	5	7.4	5.9
11	Lift Pump #2	5	7.4	5.9
12	Effluent Pump #1	15	21	16.7
13	Effluent Pump #2	15	21	16.7
	SBR Pump #1	20	27	21.5
	SBR Pump #2	20	27	21.5
	Digester Pump	15	21	16.7
17	In Plant Pump Station Pump 1	7.5	11	8.8
18	In Plant Pump Station Pump 2	7.5	11	8.8
19	(E)Panelboard loads (50%)		36	15.0
20	Panelboard s- New (50%)		36	15.0
	Total Standby Power Loads		330	236
	Generator Capacity			275
				- 1

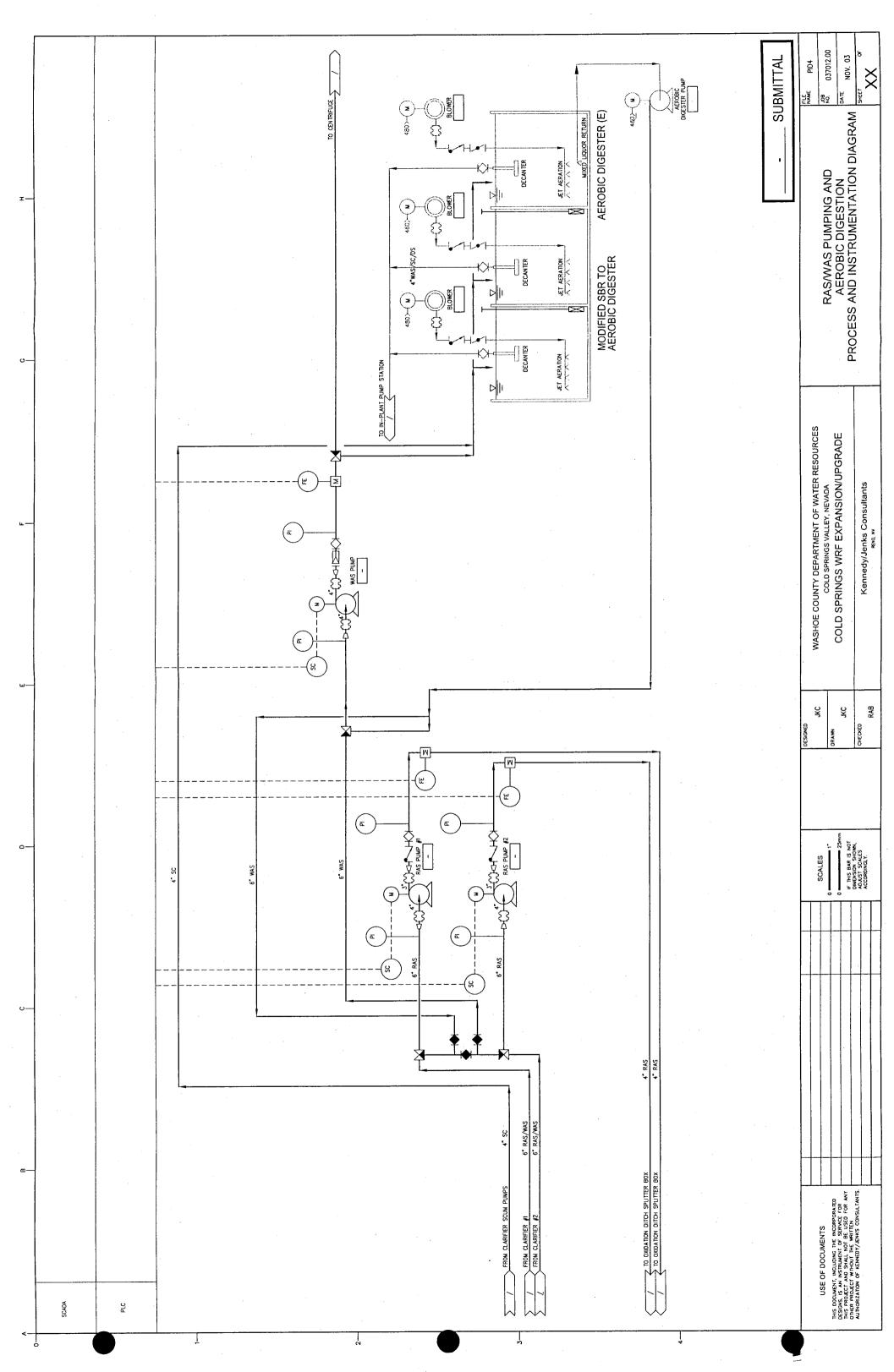
Standby Loads are shaded

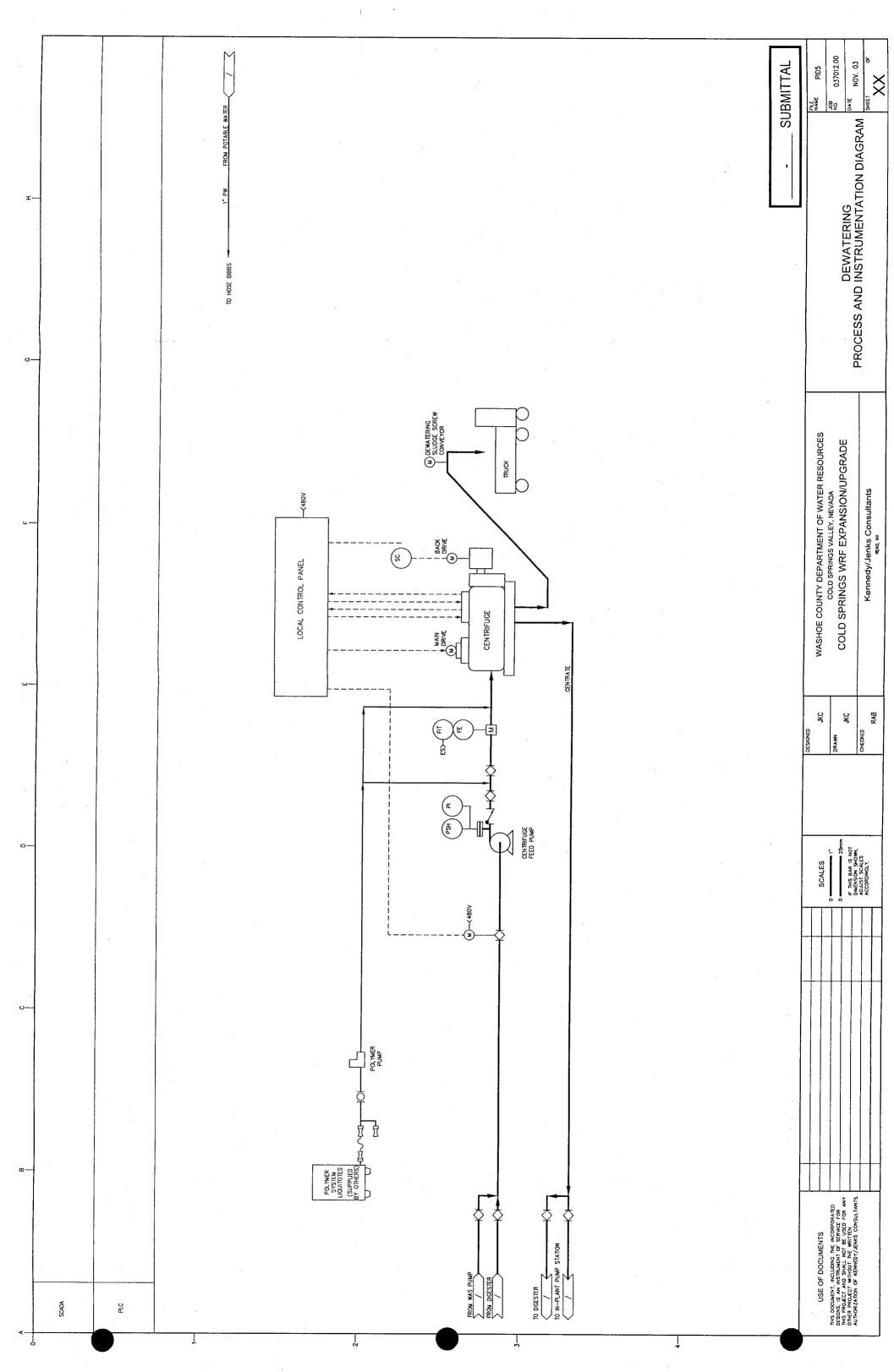
Other Loads will be prevented from running on Standby Generator









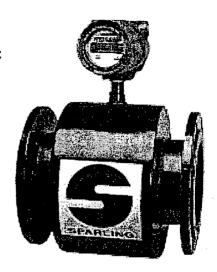


Product Data Sheet PDS-656

TigermagEP

Technical Specifications

FM656 Obstructionless Electromagnetic Flowmeter



DESCRIPTION

The Model 656 is a microprocessor-based electromagnetic flowmeter designed to measure the flow of conductive liquids in full pipes. The sensor and the transmitter are integral and enclosed in a NEMA-7 explosion-proof housing. The sensor housing is made of steel.

A wide variety of liners and electrodes are available to allow you to tailor the meter to your process.

The Model 656's nonvolatile E²PROM memory and circuitry eliminates the need for a microprocessor backup battery. It is not necessary to reprogram if the electronic module is replaced or exchanged with electronics from another size flowmeter.

APPLICATIONS

The Model 656's high signal frequency makes it ideally suited to applications with high levels of inherent noise including: Process Chemicals, Heavy Sludges, Pulp & Paper Stock, Mining Slurries, Polymers, Acids, Alkalies, Sewage, Cooling Water. Nearly any conductive liquid can be measured.

CERTIFIED ACCURACY

Each TigermagEP™ is wet-flow calibrated in Sparling's Primary Flow Lab traceable to the National Institute of Standards and Technology. A certificate of accuracy is furnished with each meter.

PRINCIPLE OF OPERATION

The Model 656 magnetic flowmeter is based on Faraday's Law which states that the voltage induced in a conductor moving through a magnetic field is proportional to the velocity of that conductor. The magnetic flowmeter will measure liquids with conductivities greater than 5 micromhos.

STANDARD FEATURES

- Sampling frequency up to 100 Hz for accurate measurement of fluids with high levels of inherent noise
- Forward, reverse and net totalization
- Programmable high and low flow alarms
- Nonvolatile E²PROM memory
- Universal electronics module compatibility
- 2-line, 16 character backlit display
- Programming made easy with Mag-Command
- User-selectable damping & low flow cutoff
- NEMA-4X & NEMA-7 explosion proof enclosure
- Approvals include: FM, CSA (std.)
- Pending approvals include: CE
- Rotatable modular display
- Empty pipe detection
- PZR Positive Zero Return
- Standard 0.5% accuracy
- Sizes available from 0.5" 72"









FLOW RATES & DIMENSIONS

Table 1 - Flow & Dimensions

	Meter Size	Mating Flange	1	Dimensio	ns		Flow rate	es - GPM - F	Full Scale
ı	nches	Size	Α	В	С	D	1 fps	3 fps	33 fps
Ī	0.5	0.5	4.00	3.50	9.50	9.25	0.6	1.7	18
1	1	1	4.00	4.25	10.19	9.94	2	6	66
١	1.5	1.5	4.00	5.00	10.88	10.63	5	15	174
۱	2	2	4.00	6.00	11.69	11.44	9	27	303
ı	3	3	6.00	7.50	13.00	12.75	20	60	664
١	4	4	6.00	9.00	14.38	14.13	35	107	1182
	6	6	13.38	11.00	17.00	16.75	85	254	2800
ı	8	8	13.38	13.50	19.40	19.15	145	436	4800
ı	10	10	18.15	16.00	22.56	22.31	236	709	7800
	12	12	19.40	19.00	25.00	24.75	333	1000	11000
_	14	14	21.38	21.00	26.67	26.42	409	1227	13500
7	1 6	16	23.38	23.50	28.97	28.72	545	1636	18000
٦	18	18	27.25	25.00	31.14	30.89	667	2000	22000
- [20	20	27.63	27.50	33.39	33.14	879	2636	29000
-	24	24	32.75	32.00	37.44	37.19	1273	3818	42000
-1	30	30	43.50	38.75	43.72	43.47	1909	5727	63000
-	36	36	47.75	46.00	. 50.20	49.95	2925	8775	96525
-	42	42	51.75	53.00	56.90	56.65	4040	12120	133320
	48	48	51.75	59.50	63.05	62.80	5322	15966	175626
ı	54	54	53.50	66.25	69.88	69.63	7144	21433	235800
١	60	60	65.50	73.00	76.75	76.50	8500	25500	280500
١	66	66	65.50	80.00	83.75	83.50	10300	31000	341000
	72	72	72.75	86.50	90.00	89.75	12700	38100	419100

Dimensions for 150 lb flanges. Allow 1/8" to 1/4" for lining thickness / Dimensions C & D \pm .0125"

HOW TO ORDER A TIGERMAG EP MODEL 656

Base Model Number

FM-656 - TigermagEP

FM656

OD = 0.50", OF = 1", OG = 1.5", O2 = 2", O3 = 3", O4 = 4", O6 = 6", O8 = 8", etc.

Table 3 - Liner Material

Hard Rubber (6"-72") Tefzel® (0.5" - 48")6 Ceramic liner (0.5"-2") Soft Rubber (6" - 72") 5 Polyurethane (6"-48") Neoprene (6" - 72")

Table 4 - Electrode Material

1 316SS Hastelloy C

Titanium Platinum Tantalum

316SS Bullet Nosed

Fused Platinum

R Zirconium Monel

Table 5 - Flange Rating

150 lb. flanges

4 PN 10 DIN 5 PN 16 DIN 6 JIS 10K

3 300 lb. flanges

JIS 20K

Table 6 - Transmitter and Mounting

- Integral NEMA-4X/NEMA-7 enclosure
 - Remote NEMA-4X/NEMA-7 enclosure, 15' cable,

accidential submergence proof sensor

- Remote NEMA-4X encl., 15' cable, acc. submergence proof sensor Remote NEMA-4X encl., 15' cable, permanent submergence proof sensor
- Remote NEMA-4X encl. w/Batcher, 15' cable, acc. submergence proof sensor
- Remote NEMA-4X enclosure w/Batcher, permanent submergence proof sensor

Table 7 - Power Supply*

0 77-265 VAC Power

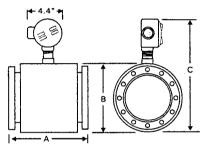
12-60 VDC Power

Special Notes for Construction

- Hart® protocol (KP602 programmer available)
- RS-485 Communications port
- High temperature coils required for temperatures over 266 °F Requires remote mount option from Table 6
- Ceramic max temp 420 °F / Tefzel* max temp 300 °F @ 100 psi X Hot Tap removable electrode design (6" & above only)
- Removable electrode design (6" 72")
- Special cable length (over 15 feet Max. 100 ft.)
- Alarm with relay contacts (remote only)

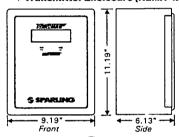
Integral Mount Transmitter_

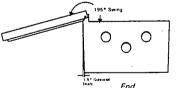
Remote Mount Transmitter —

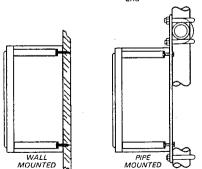


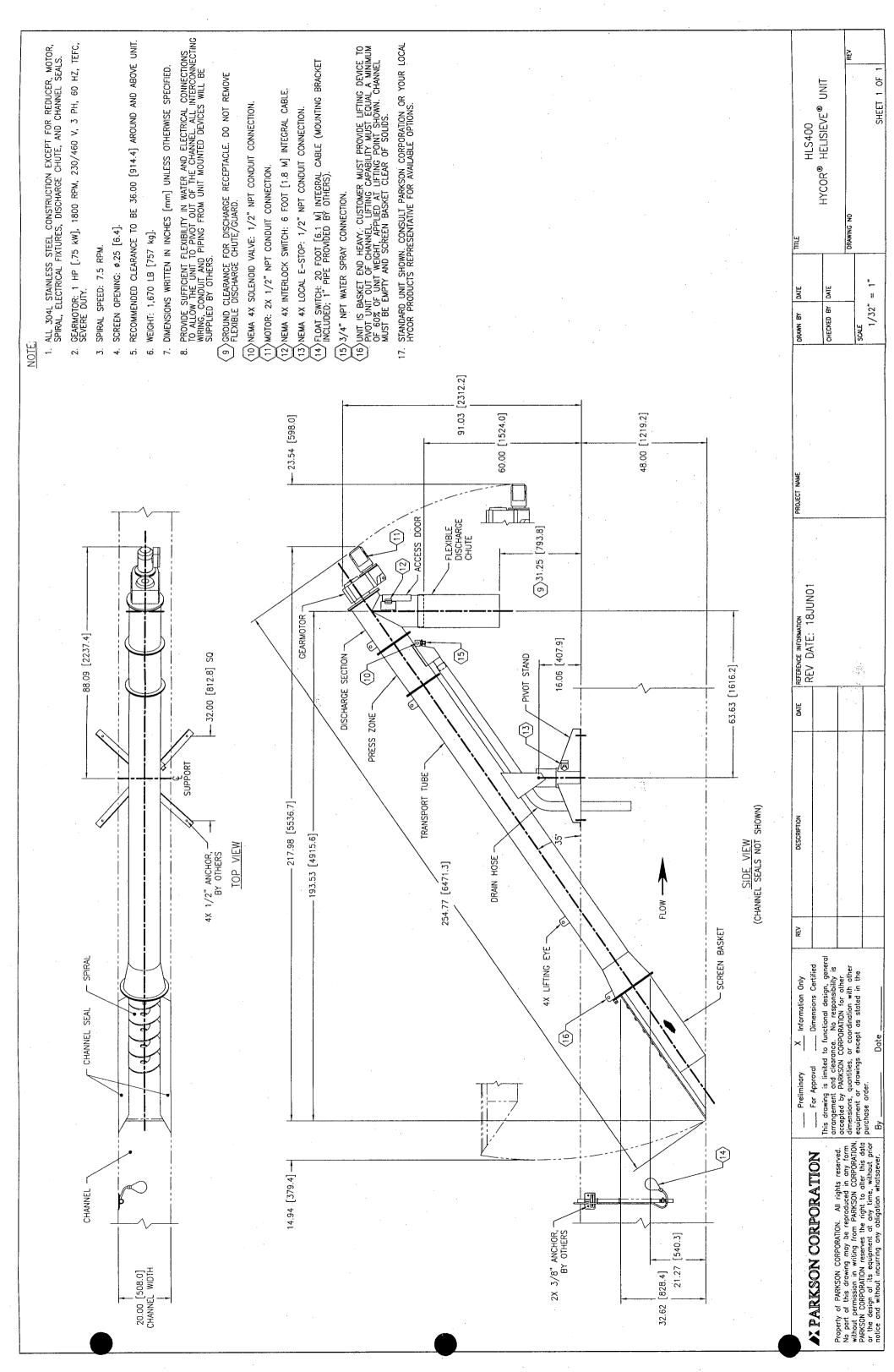
A Sensor

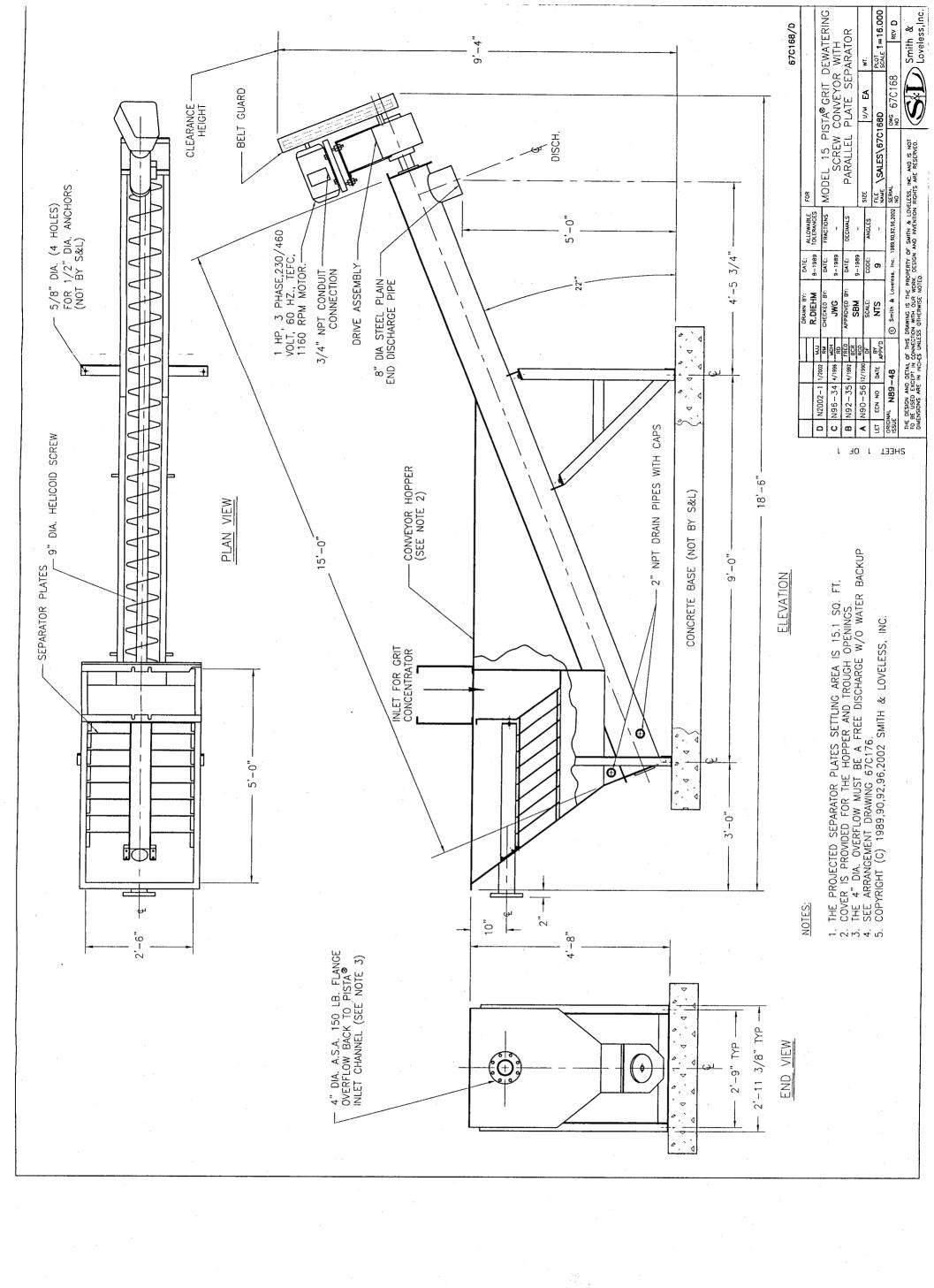
▼ Transmitter Enclosure (NEMA-4X)

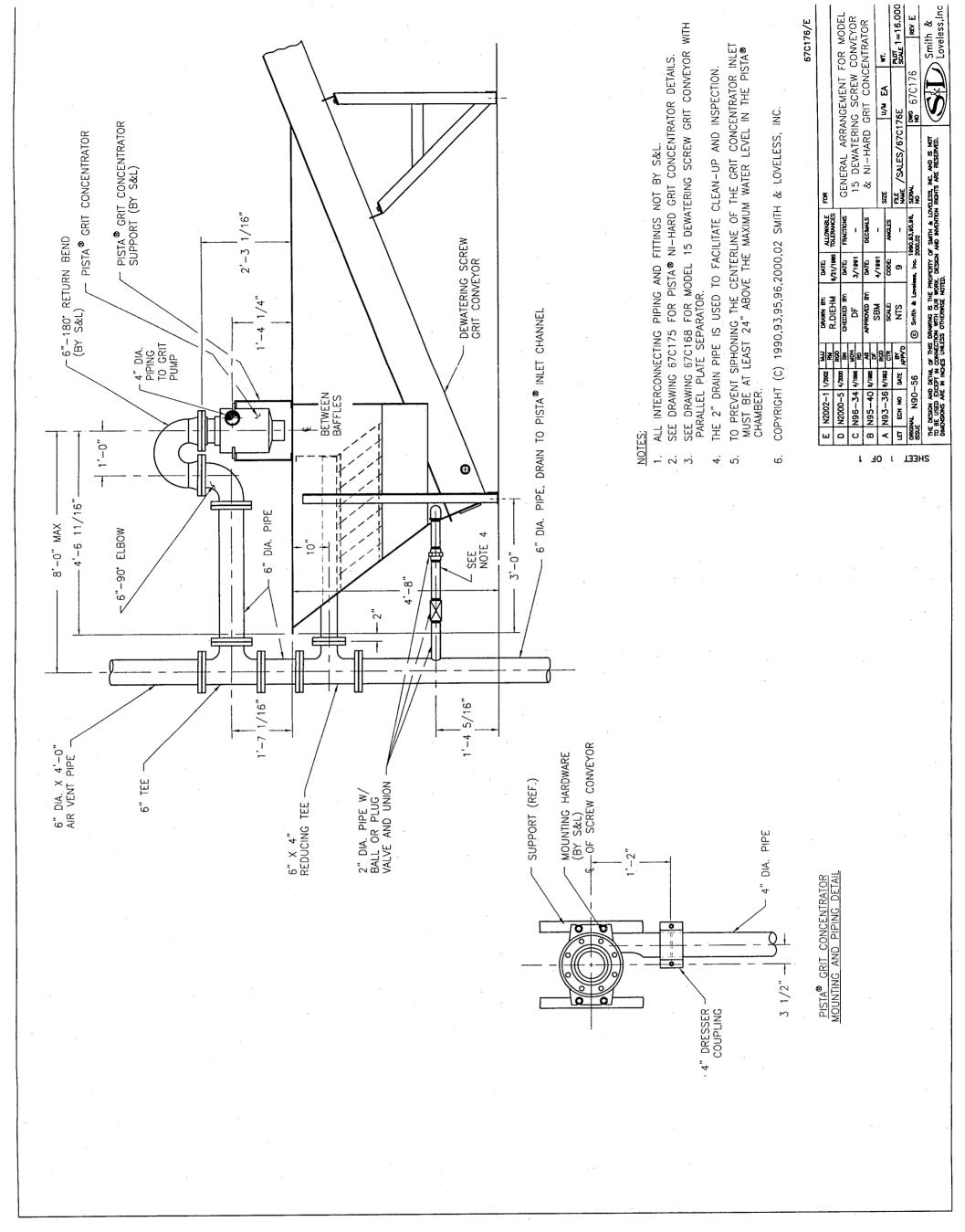


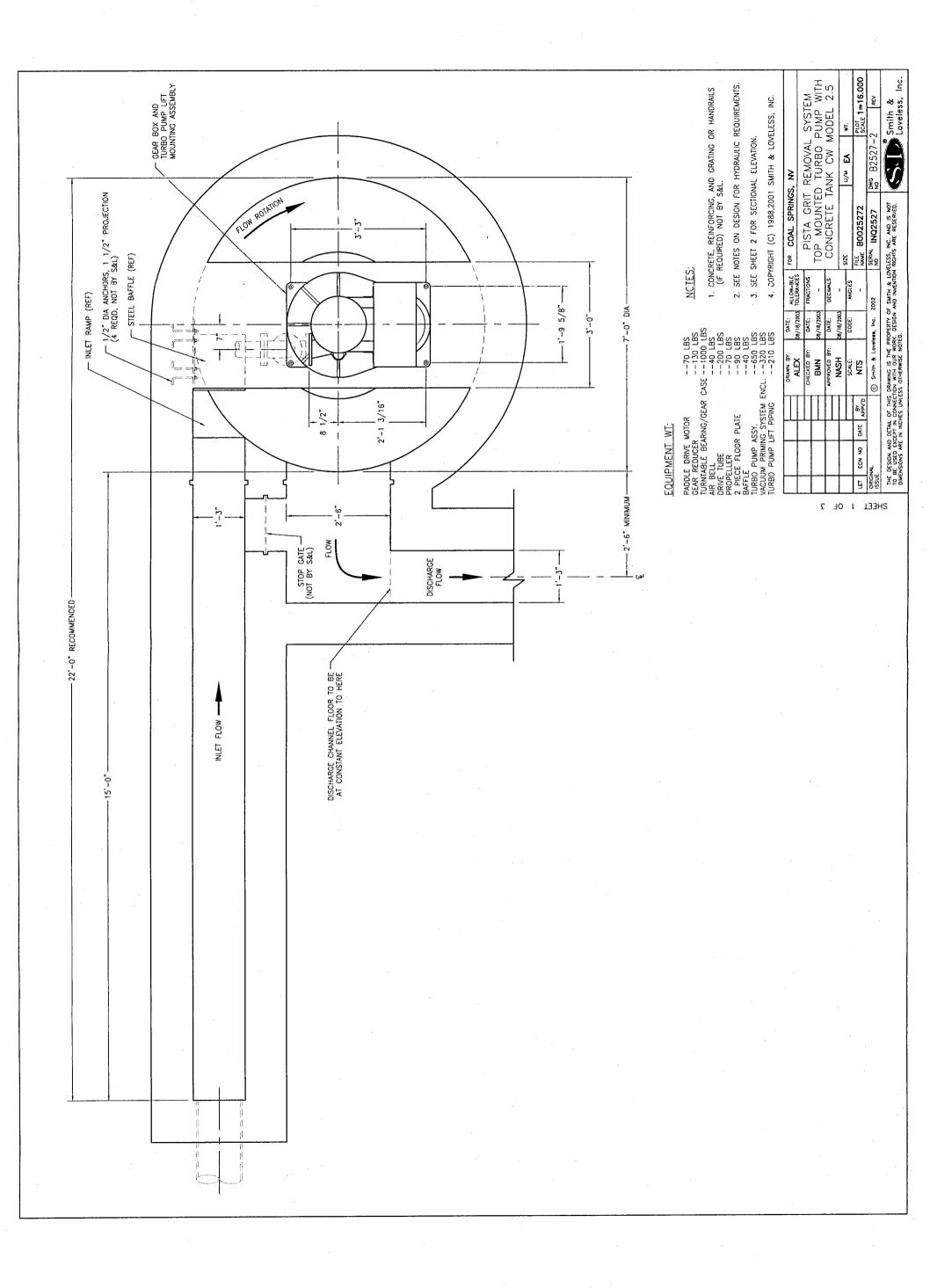


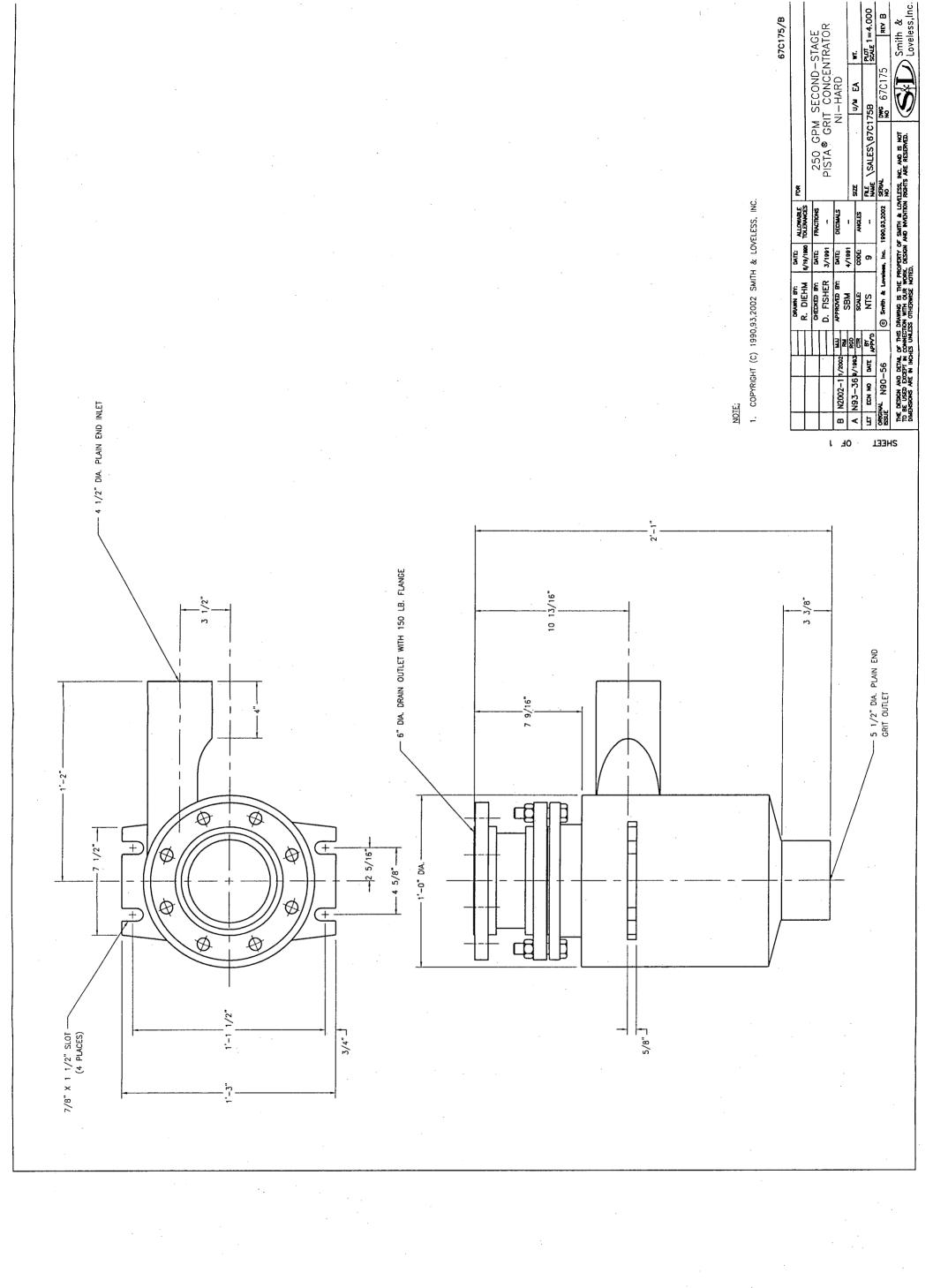




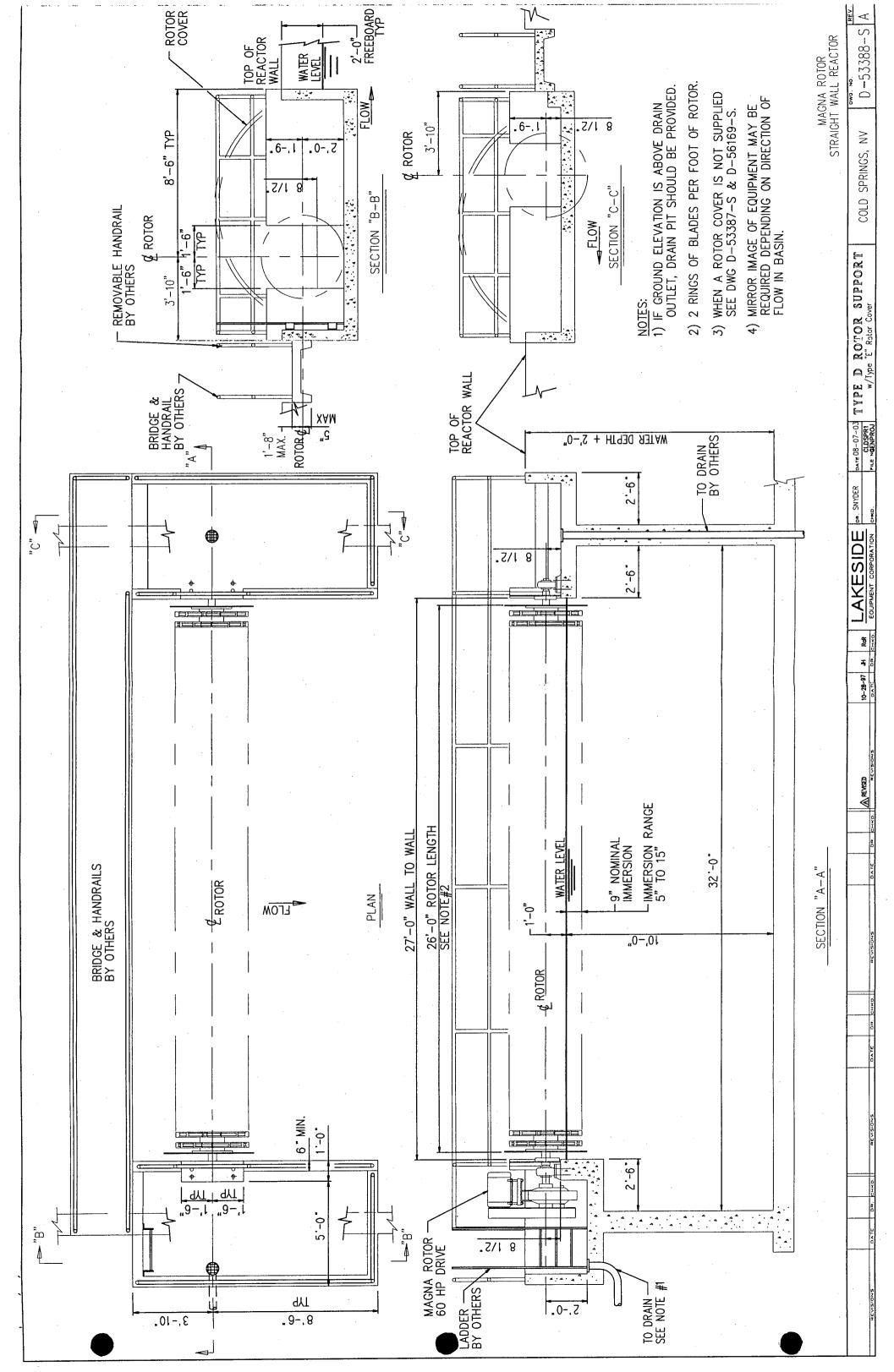


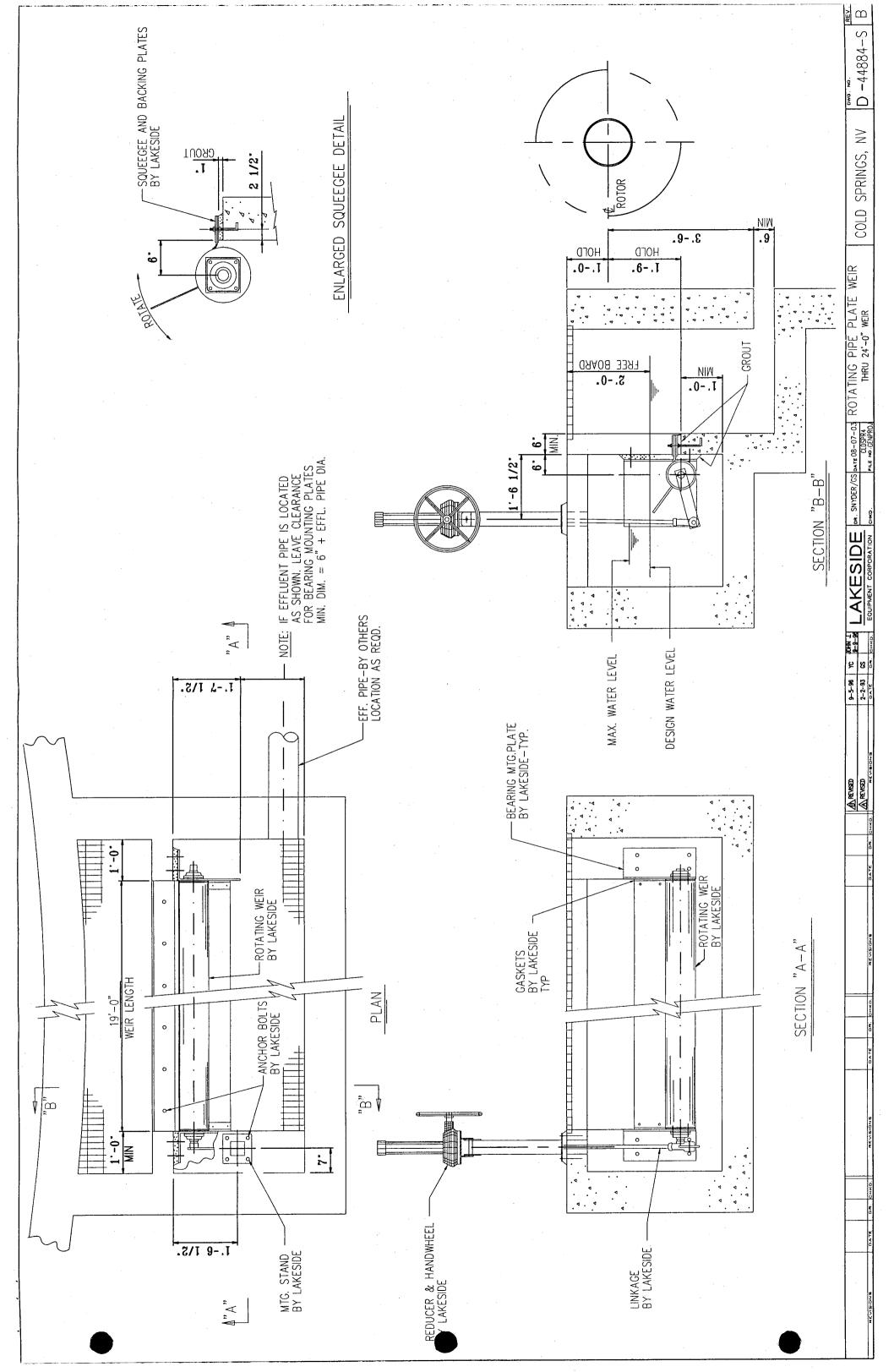


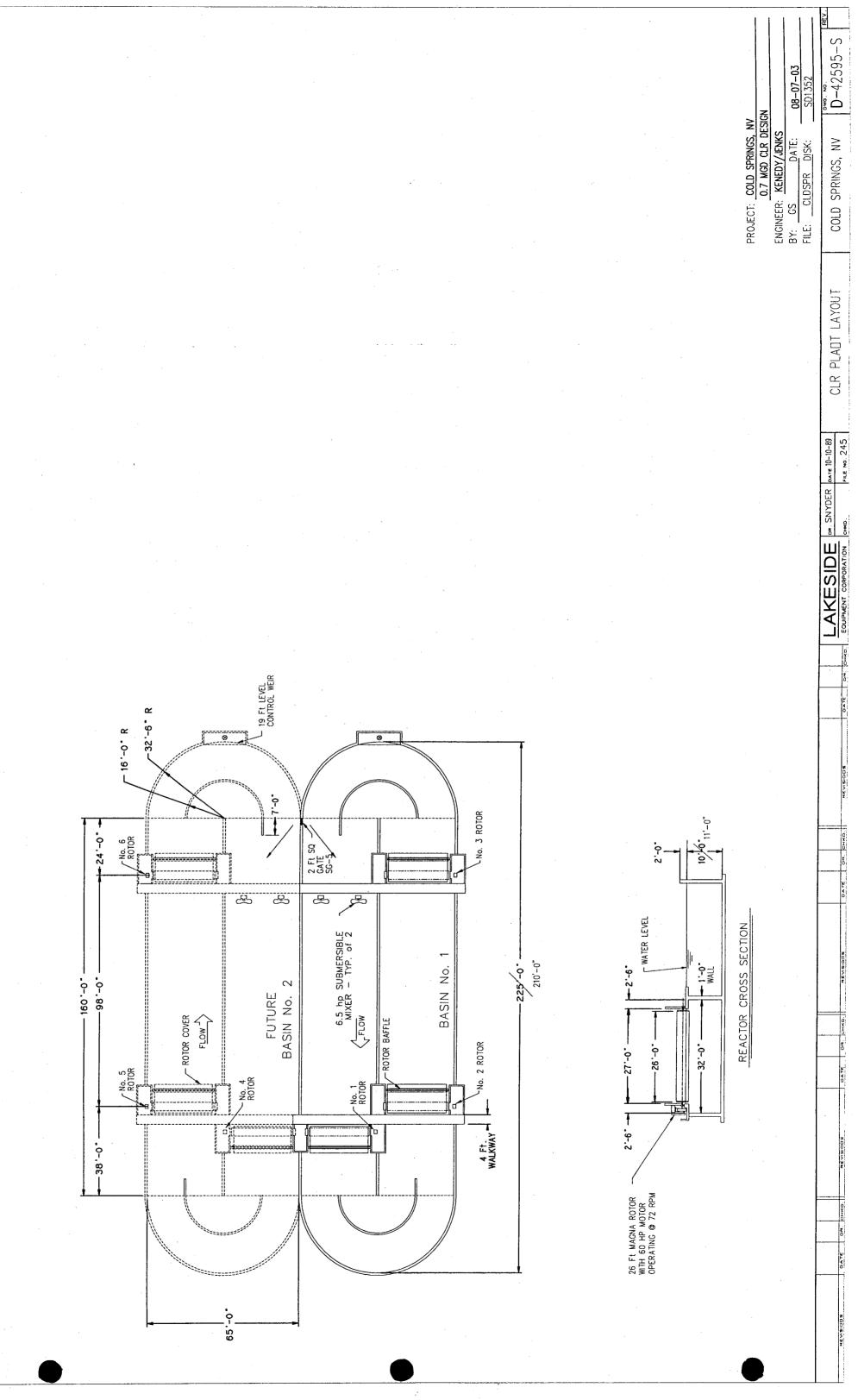




REV B







Site Search



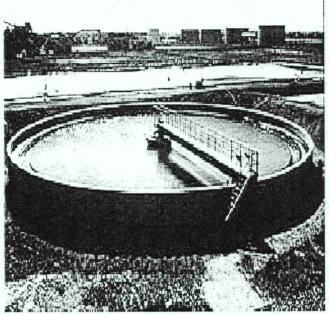
VEOLIA Environment

Home | Help | Contact | Parts and Service

End Uses • Technologies • Tow-Bro® Hydraulic Removal Clarifier

Tow-Bro® Hydraulic Removal Clarifier

The Rex Tow-Bro® Unitube hydraulic sludge removal system provides the ultimate in rapid and uniform removal of secondary wastewater activated sludges. Since USFilter's Envirex Products introduced it in 1929, more than 2,500 Tow-Bro clarifiers have been installed in basins up to 67m (220ft). Sludge is hydraulically removed via the Tow-Bro Unitube header. Tow-Bro clarifiers feature increased return solids concentration, reduced sludge pumping and increased tank capacity. Their use leads to a 35% reduction in aeration requirements as compared to circular scraper clarifiers.



Summary

The Rex Tow-Bro® Unitube hydraulic sludge removal system for circular clarifiers, provides the ultimate in rapid and uniform removal of secondary wastewater activated sludges.

Model(s) (* click to see more details)
Standard

Product Center

Envirex Products

Brand (* click to see more details)

Rex® *

Product Manager

Bill Boyle (262)-521-8342

BoyleB@USFilter.com

Available Documents to download:

Brochure(s)

Circular Clarification Equipment and Processes

Tow-Bro Unitube Sludge Removers

Data Sheet

Tow-Bro Clarifier

Related Products!

This product belongs in several product families.

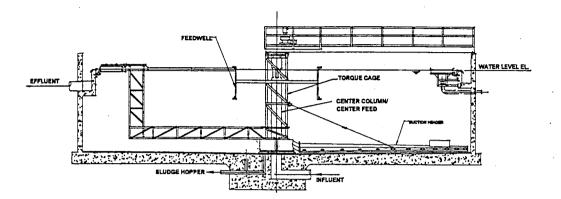
Choose your specific interest to see related products.

Select a Product Family...

Go

APPLICATION SUMMARY CLARIFIERS

Suction Header Clarifiers



Models: CLC18, CLC19, CLS28, CLC38, CLS38, CLC48

Description: Settled solids are removed through a rotating suction arm or header located at the bottom of the clarifier. The suction header is a sealed tube with orifices sized and spaced to ensure even solids removal over the entire clarifier bottom.

Advantages:

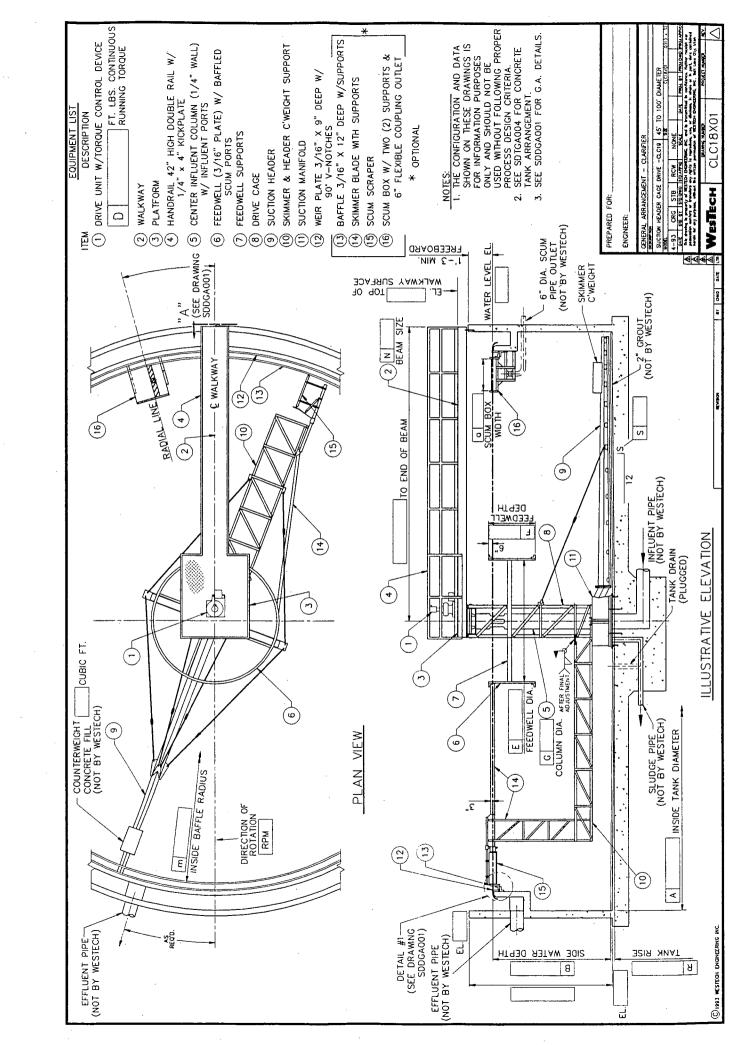
- Low capital costs
- Rapid removal of settled solids
- Reduces denitrification flotation
- Removes uniformly across tank floor
- Lowest disruption to clarification zone

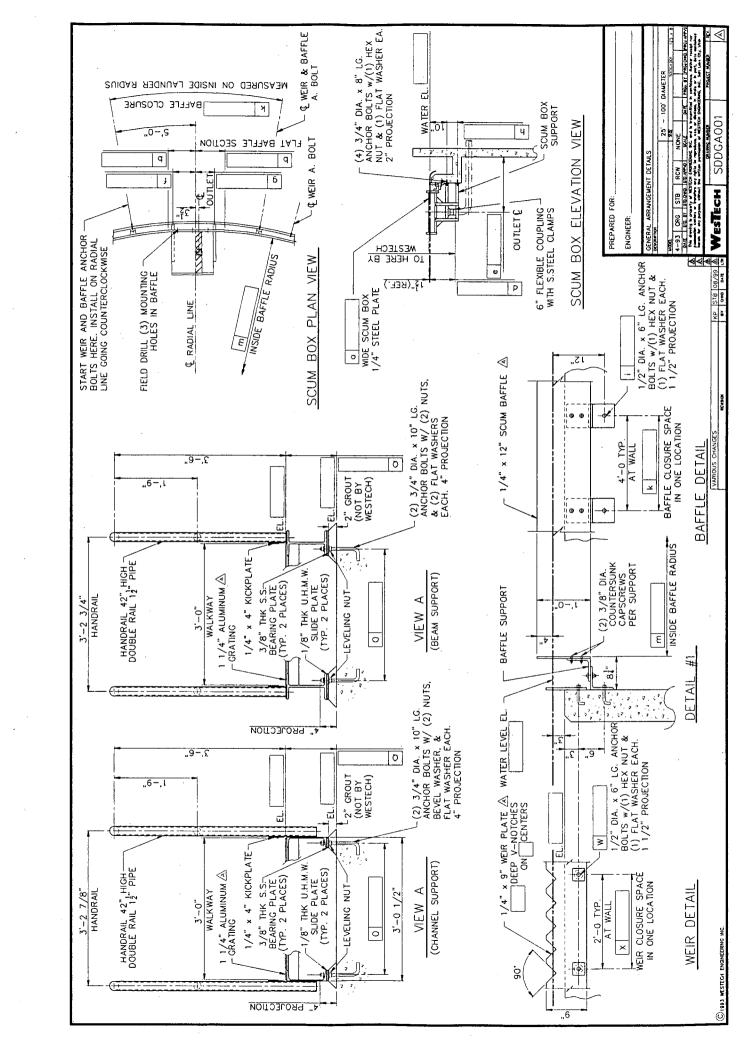
Disadvantages:

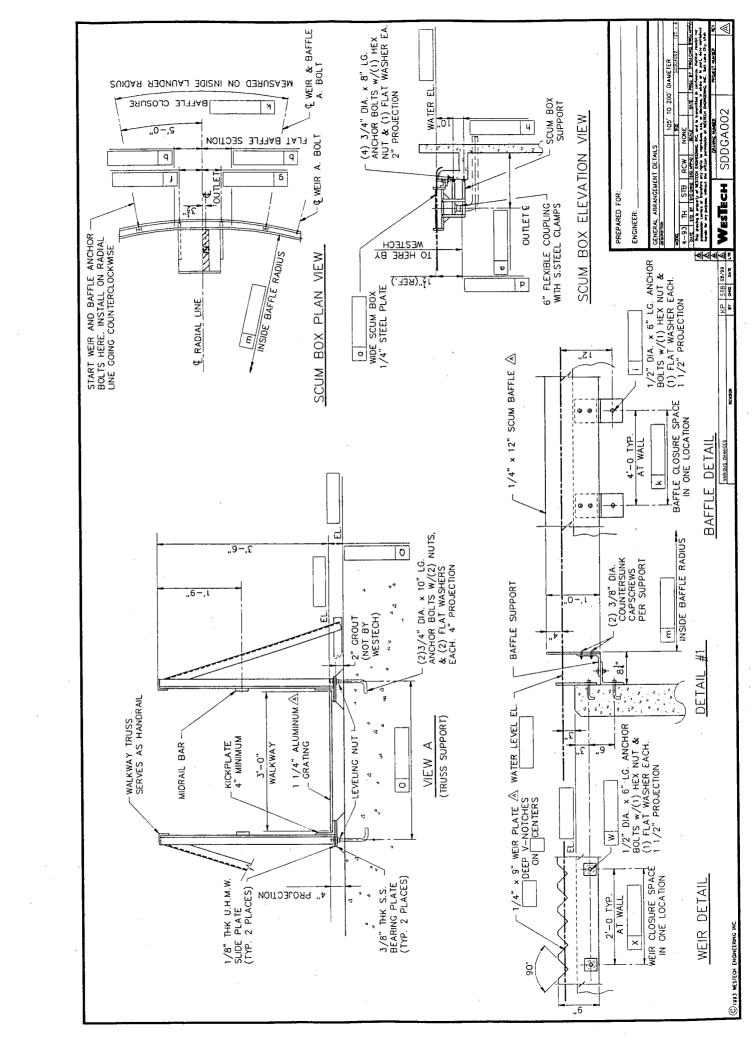
- There is no practical method during operation to verify that solids are removed evenly across the tank diameter or to verify that no orifices are plugged
- Nature of removal results in diluted solids concentrations
- Center manifold seals wear and will eventually fail, causing short-circuiting to the underflow
- Will not adequately remove heavier solids
- Diluted sludge requires increased RAS flows, therefore requiring increased pumping costs, lower SRT's and higher hydraulic loading on the clarifiers
- Usually not suited for field adjustment due to changing flows and/or solids loading rates
- Inability to make operational observations
- Narrow range of applications

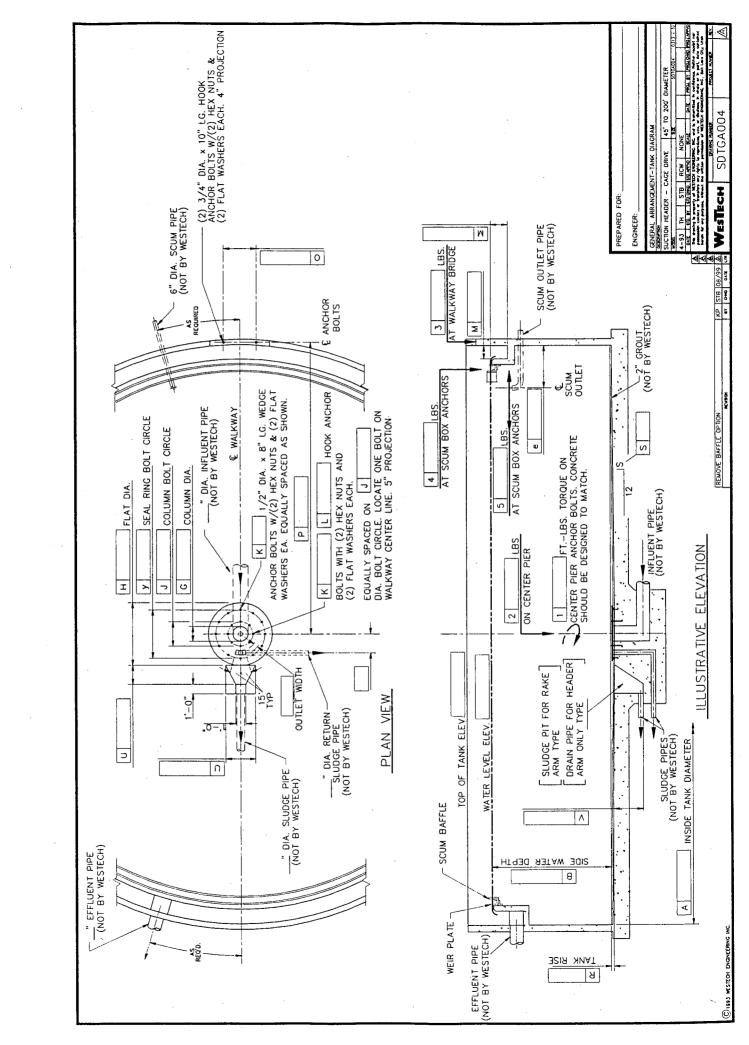
Applications:

- Activated sludge clarifiers









MODEL CLC18 SUCTION HEADER CAGE DRIVE CLARIFIER

(Work with Drawings CLC18X01, SDDGA001, and SDTGA004)

TANK	MIN.	HYDRA	AULIC CAF	PACITY	TORQUE	FEE	DWELL		CEN	TER PIER			SEAL RING	TANK
DIA.	SWD	@ RISE F	RATE (GPI	D/SQ.FT.)	(FT-LBS)	DIA.	SIDE	COLUMN	FLAT	ANCH	OR BO	LTS	ANCHORS	DIA.
		400	800	1200			DEPTH	DEPTH	DIA.	CIRCLE	NO.	SIZE	SIZE	
Α	В	FLO\	W RATE (N	ИGD)	D	E	F	G	Н	j	К	L_	у	Α
45'	14'	0.64	1.27	1.91	6000	12'	6'					7/8"		45'
50'		0.79	1.57	2.36				18"		2'-4 1/2"				50'
55'		0.95	1.90	2.85	9000	15'			6'-0"]		5'-8"	55'
60'	15'	1.13	2.26	3.39						2'-8"	8	1"		60'
65'		1.33	2.65	3.98	13,500	18']	65'
70'	i .	1.54	3.08	4.62			7'	20"	<u> </u>	2'-11"		1 1/8"		70'
75'		1.77	3.53	5.30		20']				l	75'
80'	16'	2.01	4.02	6.03	18,500]						İ	80'
85']	2.27	4.54	6.81		22'		24"	7'-6"	3'-10"		1"	7'-2"	85'
90'		2.54	5.09	7.63	21,600	<u> </u>]				12			90'
95'	18'	2.84	5.67	8.51	26,500	25'		30"	<u> </u>]			95'
100']	3.14	6.28	9.42	<u> </u>	ļ	8'		9'-6"	4'-4"		1 1/8"	9'-2"	100'
										<u>-</u>				CLC18X11

07-95

TANK	LAUNDER		WALKWA	Y BRIDGE		TAN	١K	SLUD	GE PIT_	WEIR	ANCHORS	TANK
DIA.	WIDTH	BEAM	ANCHO	R BOLTS	DEPTH	RISE	SLOPE	SIZE	DEPTH	@:	2'-0" O.C.	DIA.
1		SIZE	WIDTH	CENT. DIST.			(IN./FT.)			NO.	CLOSURE	
Α	М	N	0	Р	Q	R	S	J	V	W	Х	Α
45'	1'-3"			22'-11 1/2"		0'-4 7/8"		2'-6"	3'-0"	65	9 5/8"	45'
50'	1'-6"	C 10x15.3	2'-9 1/2"	25'-5 1/2"	12 3/4"	0'-5 1/2"			ļ	72	11 1/4"	50'
55'	ŀ			27'-11 5/8"		0'-6 1/8"		3'-6"		80_	7 3/4"	55'
60'		C 12x20.7	2'-9"	30'-5 5/8"	14 3/4"	0'-6 3/4"	1/4			87	1'-3 3/4"	60'
65'	1'-8"			32'-11 5/8"		0'-7 3/8"				95	1'-0 1/4"	65'
70']			35'-5 5/8"	•	0'-8"			4'-0"	103	8 3/4"	70'
75']		37'-11 3/4"		0'-8 1/2"				110	1'-4 5/8"	75'
80'	1'-10"	W 16x26	2'-9 1/4"	40'-5 3/4"	18 1/2"	0'-4 1/2"		4'-6"		118	1'-1 1/8"	80'
85'	1			42'-11 3/4"		0'-4 7/8"				126	9 5/8"	85'
90,				45'-5 3/4"		0'-5 1/8"	1/8			133	1'-5 5/8"	90'
95'	2'-0"		1	47'-11 3/4"		0'-5 1/2"				141	1'-2 1/8"	95'
100'	1	W 16x36	2'-8 1/2"	50'-5 3/4"	18 5/8"	0'-5 5/8"]	5'-6"	5'-0"	149	10 5/8"	100'
		<u> </u>		*************************************								CLC18X12

07-95

MODEL CLC18 SUCTION HEADER CAGE DRIVE CLARIFIER

(Work with Drawings CLC18X01, SDDGA001, and SDTGA004)

TANK				SCUM BOX	<			SCUN	A BAFFLE A	NCHORS	TANK
DIA.	WIDTH	FLAT	HEIGHT	CENTER	ANO	CHOR BOL	TS		@ 4'-0" O.0	D .	DIA.
L				LINE		.		NO.	CLOSURE	RADIUS	
Α	а	b	d	е	f	g	h	j	k	m	Α
45'	2'-6"	2'-0"	1'-9"	4'-0 7/16"	2'-1 3/4"		10"	31	8'-9 5/8"	19'-9 3/4"	45'
50'				4'-6 5/8"			1'-1"	34	10'-11 1/4"	22'-0 3/4"	50'
55'	3'-0"	2'-3"	1'-11 1/2"	4'-6 9/16"	2'-4 3/4"	1'-4 1/2"		38	10'-7 3/4"	24'-6 3/4"	55'
60'	·			4'-8 3/8"				42	9'-3 3/4"	26'-10 3/4"	60'
65'				4'-8 5/16"			1'-3"	46	9'-0 1/4"	29'-4 3/4"	65'
70'			,	5'-2 7/8"				50	8'-8 3/4"	31'-10 3/4"	70'
75'				5'-4 3/4"				53	11'-4 5/8"	34'-2 3/4"	75'
80'		•		5'-4 5/8"			1'-5"	57	11'-1 1/8"	36'-8 3/4"	80'
85'	4'-0"	2'-11"	2'-6 1/2"	5'-4 9/16"	2'-5 3/4"	1'-6 1/2"		61	10'-9 5/8"	39'-2 3/4"	85'
90'			•	5'-6 1/2"				65	9'-5 5/8"	41'-6 3/4"	90'
95'				5'-6 7/16"	,		1'-7"	69	9'-2 1/8"	44'-0 3/4"	95'
100'				5'-6 3/8"				73	8'-10 5/8"	46'-6 3/4"	100'

CLC18X13

04-93

TANK	CENTER COL	LUMN LOADS	BRIDGE	SCUM BC	X LOADS	TANK
DIA.	TORQUE	VERTICAL	LOAD	VERTICAL	HORIZ.	DIA.
	(FTLBS.)	(LBS.)	_(LBS.)	(LBS.)	(LBS.)	
_A	1	2	3	4	5	Α
45'		14,000	4000	800	800	45'
50'	27,000	17,000	5000			50'
55'				1000	1000	55'
60'	40,300	20,000	6000			60'
65'						65'
70'	57,000	23,000	7000			70'
75'						75'
80'		27,000	8000			80'
85'	89,200			1400	1400	85'
90'		31,000	9000			90'
95'						95'
100'	127,400	33,000	10,000			100'
						CLC18X14

CLC18X

04-93



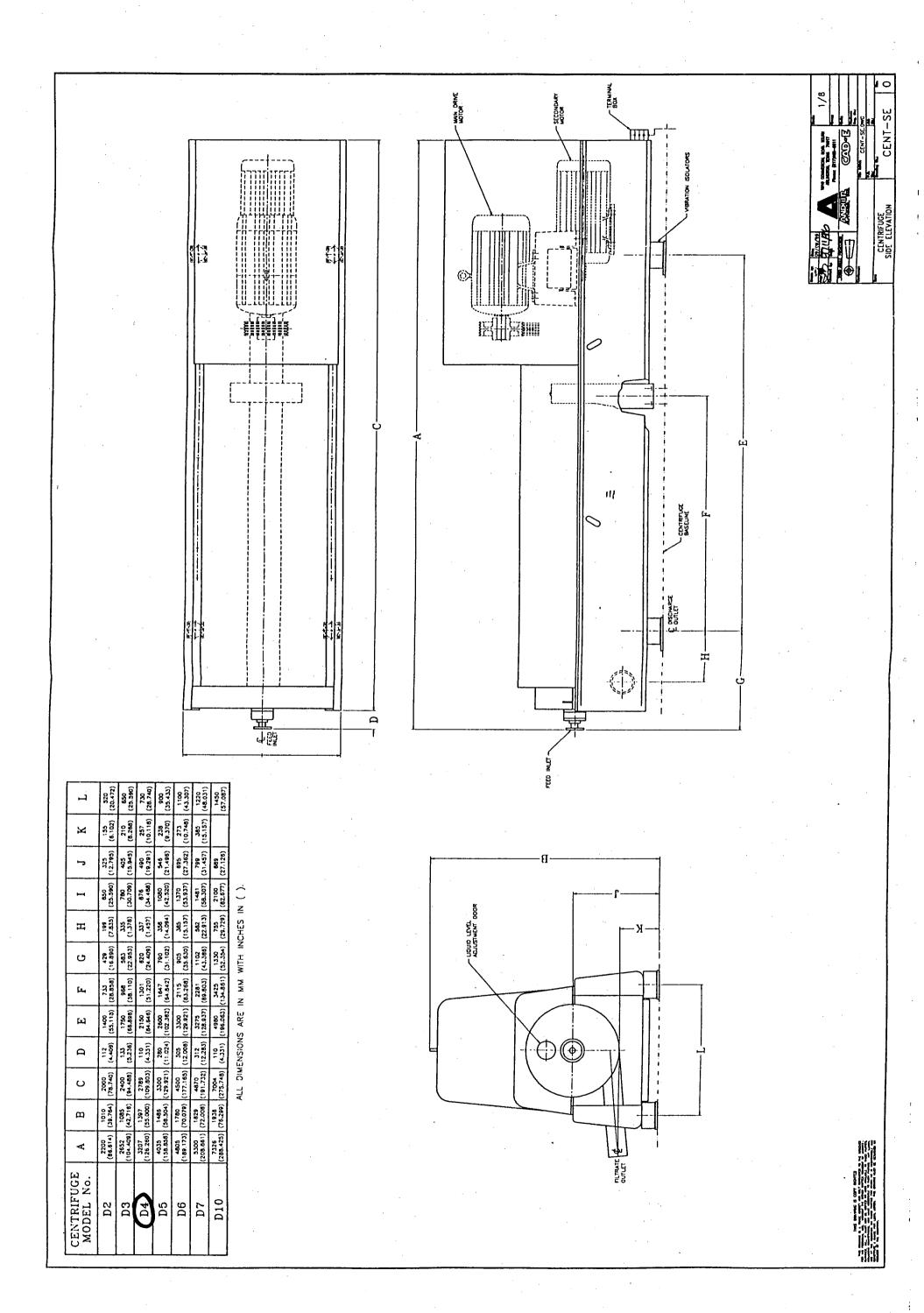
ANDRITZ SOLID BOWL DECANTER CENTRIFUGE MACHINE SPECIFICATIONS

General Machine Technical Data

Model Number	D2L	D3L	D4L	D5L	D5LL	D6L	D7L	D10L
Internal Diameter	10.23"	13.38"	16.92"	20.47"	20.47"	25.59"	29.52"	39.37"
Bowl Length	37.5"	49.5"	63.0"	76.0"	102.0"	95.0"	115.0"	164.0"
Bowl Thickness	0.35"	0.47"	0.5"	0.78"	0.79"	0.9"	0.9"	0.9"
Front Hub Thickness	0.83"	0.98"	0.9"	1.25"	3.26"	1.88"	2.28"	3.9"
Rear Hub Thickness	3.07"	4.21"	3.7"	3.9"	1.57"	3.9"	3.9"	3.9"
Maximum Speed (RPM)	5000	4000	3600	3200	3400	2400	2500	2000
Force (G)	3704	3039	3113	2948	3360	2085	2619	2243
Overall Length	87"	105"	134"	161"	178"	184"	201"	307"
Overall Width	29"	37"	41"	47"	44"	60"	65"	88"
Overall Height	40"	43"	59"	67"	56"	75"	78"	90"
Dry Weight (lbs)	2072	3750	6615	9260	10360	17420	24250	50706
Main Drive (HP)	25	30	50	75	100	150	200	400
Secondary Drive (HP)	10	10	20	20	30	40	40	100

MAJOR COMPONENTS

Bowl	Constructed of 316L stainless steel.
External Bowl Cover	Constructed of fiberglass.
Internal Discharge Guard	Constructed of 316L stainless steel.
Scroll Conveyor	Constructed of 316L stainless steel. Flight edges protected against abrasion with field replaceable tungsten carbide tiles.
Base	Reinforced carbon steel mounted on vibration isolators.
Bearings	All bearings L-10 rated for over 100,000 hours.
Fasteners	Fasteners 316L stainless steel.
Gearbox	In-line one-stage cyclo speed inducer.
Control Panels	NEMA 4X stainless steel enclosure with touch screen operator interface

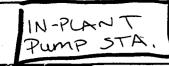


UTNAMIC LOADING IN LB WITH KG IN 1. KOTATING FORCE EQUIVALENT TO THE UNBALANCED LOAD PERPENDICULAR TO THE	DURING MACHINE SLOW DOWN	RESONANCE SPEED 400 RPM	87.4 tb [30.6 kg]	.47 lb [21.4. Kq]	a 35 [5]	4 وة 1 [2 يم كـ17]	87.5 lb [31-Kg]	112 B [51 Kg]						-€1						•		miniminimini.	<u></u>	F-	
BALANCED LOAD PE	SPEED ON THE	AFTER VIBRATION ISOLATORS	3.2 lb [1.4 kg] 2.9 lb [1.3 kg] 2.5 lb [1.1 kg]	9 to [4.1 Kg] 11 tb [5 Kg] 13.5 tb [6 Kg]	14 th [6.4 Kg] 15 th [7.1 Kg] 18 th [8.2 Kg]		27 tb [12.2 Kg] 29 tb [13.2 Kg] 34 tb [15.4 Kg]	34 tb [15.3 Kg] 40 tb [18.4 Kg] 45 tb [20.4 Kg]											XV.	C)	mhimin			
JIVALENT TO THE UN	AT NORMAL WORKING	BEFORE VIBRATION ISOLATORS	305.7 to [138.7 Kg] 225 to [102 Kq] 161.8 to [73.4 Kg]	517 lb [234.5 Kg] 623 lb [282 Kg] 663 lb [301 Kq]	665 lb (302 Kq) 795 lb (361 Kg) 992 lb (418 Kq)	888 ib [403 Kg] 1111 ib [504 Kg] 1223 ib [555 Kg]	1326 lb [502 Kg] 1484 lb [673 Kg] 1708 lb [775 Kg]	1664 lb [755 Kq] 2068 lb [938 Kg] 2248 lb [1020 Kq]	,									111							
	A P	MACHINE SPEED	5000 RPM 4500 RPM 4000 RPM	2500 RPM 3000 RPM 3200 RPM	2500 RPM 3000 RPM 3500 RPM	2000 RPM 2500 RPM 2750 RPM	1800 RPM 2000 RPM 2300 RPM	1600 RPM 2000 RPM 2200 RPM								2 -		E		-		min			
SIATIC LOAD	WEIGHT OF MACHINE	× 1.2 =	2536 lb [1150 Kg]	2050 lb [4585 Kg]	8095 lb [3672 Kq]	10,791 lb [4895 Kg]	20.900 lb [9460 Kg]	29,674 lb [13,460 Kg]		ě				- @				•		·	-	intim			
SCROLL REMOVAL	(5	1450 (57.086)	2000 (78.740)	2000 (78.740)	2200 (86.614)		3500 (137.785)	ITEMS D THRU G ARE IN MM WITH INCHES IN (-	(- ∂	<u>+</u>										
OLATORS	ŗ	4	(20.472)	(25.590)	730	900	1100	1220	TEMS D THE							_]	B)	111111			
VIBRATION ISOLATORS		ម	260	125	365 (14.370)	450 (17.715)	550 (21.654)	610	DIMENSIONS AR								0					11111		:	
S)	. F		0 IB) 1400 5 CONN (55.118)	1750 JOINT (88.898)	2150 JOINT (84.646)	2500 JOINT (102.362)	3300 JOINT (129.921)	3275 JOINT (128.937)	DIMEN													111111			
CONNECTIONS		SOUDS PILTRATE	8-21/32 x 14-9/16 3 (150 lb) FLG CONN	6-3/8 x 15-15/16 RECTANGULAR SUP JOINT	6-3/6 x 19-3/8 S RECTANGULAR SUP JOINT	B-1/2 x 24-7/16 6 RECTANGULAR SUP JOINT	11-13/16 x 28-3/8 SUP JOINT	11-13/16 x 32-1/4 RECTANGULAR SUP JOINT												<i>i</i> •		TITI TITIL			
o Syllaid.		RED INCE	NNS: FLG CONN 1-1/2 (150 16) 8-21/3	1-1/2 (150 16) 6-3/8 ANSI PLG CONN	2 (150 lb) 6-3/6 ANSI PLG CONN REC	2 (150 lb) 6-1/2 ANSI FLG CONIN PEEC	3 (150 Ib) 11-13/ ANSI FLG CONN REC	4 (150 lb) 11-13/				,						(+) -(+)							
	MODEL No.		D2 1-1,	D3 (1-1)	D40	D5 ws	D6 ws	D7 ANS			Ċ				, C					A)				

No description of the property

1/8

CENT-FP



C-3085

Py 1 OFZ

Section 3

Impeller/Motor/Nominal Sizes

Issued: 8/00

Supersedes: 5/96

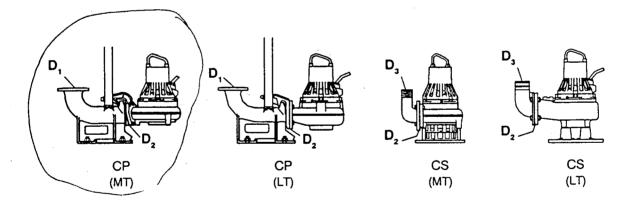
PUMP	IMPELLER	HF	RATIN	G	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	7	Do	D3	D4
MODEL	CODE	СР	cs	CZ	VAC	וטן	D2	נט	D4

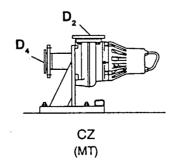
	414 LT	3.0	3.0			4"	4"	4"	
N.	434 MT				200	0"			
3085 3Ø	436 MT	2.2, 3.0			230/460	3" or	3"	3"	4"
32	₩ 438 MT	2.2, 3.0	2.2, 3.0	1.6, 2.3	575	4"			
	440 MT	2.2, 3.0	2.2, 3.0						

0005	436 MT	2.4	2.4	·		3"			
3085 1Ø	438 MT 440 MT	1.6, 2.4	1.6, 2.4		230	or 4"	3"	3"	

LT= High Volume MT= Standard

Note: CT version is available on special request, contact Flygt Engineering.

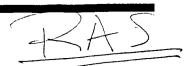




IN-PLANT Pump STA C-3085 (MT Impeliers) Section 3 **Family of Performance Curves** Issued: 2/00 Supersedes: 2/96 INPUT KW 6,7 NOTE: Family of performance curves are for pre-selection only. Impeller Phase Code Curve зØ зØ 1Ø зØ 1Ø зØ 1Ø TOTAL HEAD (FT)

FLOW (US GPM)

0 L

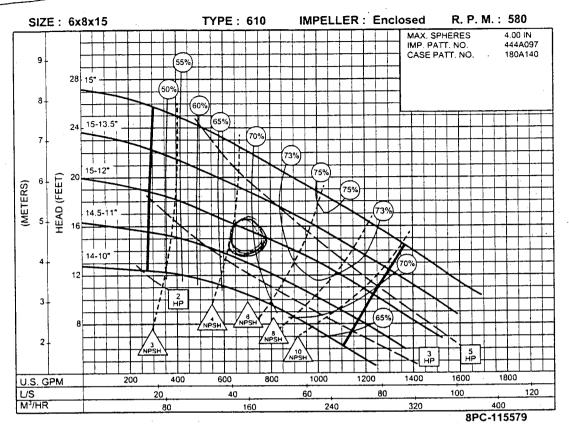


6 x 8 x 15 SERIES 610

ENCLOSED IMPELLER

Section **610** Page **407**Date **April 2001**

Supersedes Section 610 Page 412 Dated March 1983







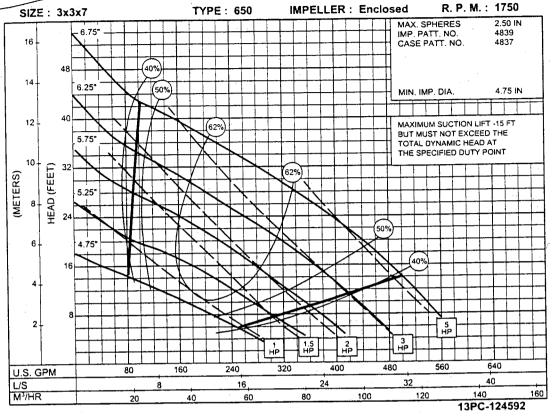
3 x 3 x 7 SERIES 650A

ENCLOSED IMPELLER

Section **650** Page **401**Date **April 2001**

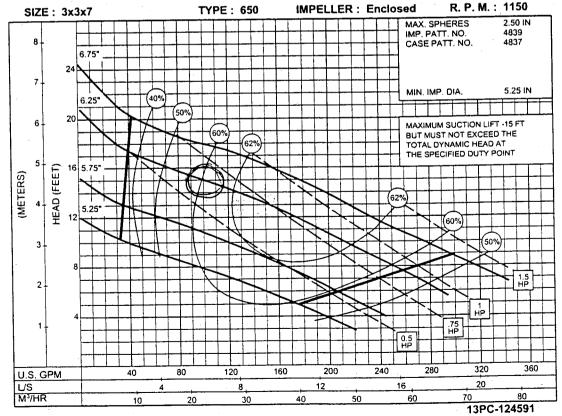
Supersedes Section 650 Page 401 Dated July 1988







RPM





14 August 2003

Meeting Memorandum

Prepared For:

Joe Howard, Washoe County Department of Water Resources

Submitted by:

Travis Tormanen and Lynn Orphan, Kennedy/Jenks Consultants

Cc:

Ken Mallory, SPB Utilities Bob Lissner, Lifestyle Homes

Jason Phinney, TEC Civil Engineering Consultants

Scheduled Meeting:

Cold Springs Water Reclamation Facility

28 July 2003

Concept and Criteria Review (CC&R)

K/J 037012.00

MEETING LOCATION

A meeting was held on 28 July 2003 in the Portland Office of Kennedy/Jenks Consultants for the purpose of holding a project CC&R.

ATTENDEES

Washoe County DWR:

Joe Howard; Paul Orphan; Rick Warner

Kennedy/Jenks Consultants: Travis Tormanen; Ron Bush; Bill Ramroth; Lynn Orphan

Lifestyle Homes:

Bob Lissner

TEC Civil Engineering Consultants: Jason Phinney

PURPOSE - MAJOR DISCUSSION ITEMS

Design Criteria - Gallons per Equivalent Residential Unit

Kennedy/Jenks presented the findings of Technical Memorandum No. 4. These findings were discussed and agreed to by all parties. The flow criteria used for designing the Cold Springs Water Reclamation Facility (CSWRF) and the Diamond Peak Lift Station are as follows:

- 80 gallons per capita for new development.
- 90 gallons per capita for older residential areas.
- 2.83 people per residence.

Meeting Memorandum

Washoe County Department of Water Resources 14 August 2003 Page 2

- 225 gallons per ERU for new development areas.
- 250 gallons per ERU for older residential areas.

Design Criteria – Number of ERU's by Phase

One of the Technical Memoranda currently being developed by Kennedy/Jenks was discussed. This memo related to Equivalent ERU's for Phase 1 and Phase 2. It was decided that the Phase 1 project would be designed to include:

- 2,208.5 ERU's for the Lifestyle/Woodland Development.
- 364 homes from the existing and future White Lake Homes.
- 57 homes from Dry Sewered Area #1.
- 109 homes from Dry Sewered Area #2.
- 304 ERU's from existing and proposed Bordertown Improvements.
- 28 ERU's from the Nancy Gomes Elementary School.

The total for Phase 1 is 3,062 ERU's. This has been rounded, resulting in a design criteria of 3,100 ERU's for Phase 1 design.

It was decided that eventual Phase 2 expansion may include:

- 883 homes within the facility planning limits using septic tank and leach field systems.
- 102 lots with access to the Whipporwill/Puffin Sewer Line.
- 80 potential homes along the north side of White Lake.
- 1000 +/- homes potentially to be constructed by Lifestyle Homes pending zoning modifications.

These additional connections result in a target plant build-out capacity of 5,200 ERU's. Facilities will be laid out in the design documents such that expansion to 5,200 ERU's can be readily accomplished if and when it is necessary.

Kennedy/Jenks is going to talk to Dave Kitchen of Summit Engineering for the design criteria at the Woodland Village Lift Station.

Washoe County Department of Water Resources 14 August 2003 Page 3

Oxidation Ditch vs. Sequencing Batch Reactors

There was some discussion about the relative merits of an expansion using oxidation ditch technology as compared to sequencing batch reactor technology. It was decided that Kennedy/Jenks would provide a technical memorandum describing the following alternatives. Included with the memorandum will be comparative costs as well as pros and cons.

- Sequencing Batch Reactors
- Oxidation Ditch with diffused air panels
- Multi-Ring Oxidation Ditch

Other notes related to this discussion included:

Each of the alternatives will be designed with a minimum of 3,100 ERU's in Phase 1 and be expandable to 5,200 ERU's in Phase 2.

There was some discussion about types of aeration systems. The County and SPB Utilities mentioned that they would prefer not to use brush rotor technology.

If there is a single ditch, it will be necessary to use removable diffused air panels.

The County currently has a diffused air oxidation ditch with removable panels and banana style propeller mixers.

Bob Lissner reported that the soils are very easy to dig in at the site.

Centrifuge vs. Belt Filter Press

Technical Memorandum No. 1 was discussed. It was decided that the centrifuge would be preferred because it is less costly.

Kennedy/Jenks is going to revise the memo for the preliminary design report. The revisions will include higher costs for solids disposal and a much clearer statement of assumptions.

The solids building will be designed for disposal to a dumpster instead of a truck. A preference was voiced for not having the solids dumpster in the front of the building.

Meeting Memorandum

Washoe County Department of Water Resources 14 August 2003 Page 4

Headworks

There was discussion about Technical Memorandum No. 2 regarding whether or not to elevate the headworks.

It was decided that a slightly elevated headworks would be used if oxidation ditch technology were used. This would eliminate the need for an intermediate pump station.

If an SBR expansion is used, then either approach could be used. It is preferred to eliminate the need for an intermediate pump station. If the headworks can be masked behind the building, then elevated headworks will be used.

There will not be a building placed around the headworks. An effort will be made to control odor by placing a plate cover on the headworks.

The headworks will include grit removal as previously at the Kickoff Meeting.

SPB Utilities would like to have misters above the dumpsters.

The screenings will need to be double bagged.

The County is interested in possibly using magnetic flow meter technology instead of a parshall flume.

The headworks will be placed as close to the secondary treatment basins as practical.

The headworks will be screened from the neighborhood by berms, buildings, or screen walls.

Rapid Infiltration Basins

Doug Geurrant presented the field test and results from the Rapid Infiltration Basin (RIB) analysis. He is recommending that RIB's 1 and 2 be skimmed of 2-3 feet of soil to make them operate more effectively.

Broadbent has issued a draft report to Kennedy/Jenks for review.

Washoe County Department of Water Resources 14 August 2003 Page 5

Building Layout

Potential building layouts and site layouts were presented for SBR and Oxidation Ditch expansions.

It is necessary to verify the height of the Vactor truck. The 18-ft. overhead door may not need to be that tall.

The idea of clear story windows on the building was agreeable if they can be worked into the design.

There was some concern about the location of the centrifuge and the associated solids dumpster. It is desired to keep the dumpster out of site.

The RAS and WAS pump station integral with the clarifiers. The County seemed potentially interested in combing RAS and WAS pump room with the blowers and centrifuge and keeping these items separate from the lab/office/break building.

The oxidation ditch layout didn't seem to be laid out as efficiently as it could with regards to yard piping.

Disinfection

Kennedy/Jenks presented the Draft Technical Memorandum No. 3, which hasn't yet been disseminated. The County is going to think about the possibility of reclaiming effluent for non-potable uses at the plant.

Follow-Up

Kennedy/Jenks will get Technical Memorandum No. 3 to the County on Thursday, July 31. A conference call will be held on Monday morning at 9:00 a.m. to discuss the memorandum.

Kennedy/Jenks will be providing additional memos to the County during the coming two weeks.

Kennedy/Jenks target date for submittal of a draft preliminary design report is August 15, 2003. There is quite a bit of work to do in the interim to get the report completed by that date.

Treatment Facility Title

The treatment plant will hereafter be referred to as the Cold Springs Water Reclamation Facility (CSWRF).

8 July 2003

Meeting Memorandum

Prepared For: Joe Howard and Paul Orphan

Washoe County Department of Water Resources

Prepared by: Bill Ramroth, Lynn Orphan and Travis Tormanen

Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities; Bob Lissner, Lifestyle Homes; Jason Phinney, TEC

Meeting: Cold Springs Wastewater System Expansion Facilities Programming Meeting

8 July 2003, 10:00 a.m. - 11:45 a.m.

Washoe County Department of Water Resources

K/J 037012.00

Meeting Time and Location

The meeting was held from 10:00 a.m. to 11:45 a.m. on 8 July 2003 at the offices of the Washoe County Department of Water Resources.

Attendees

Washoe County: Joe Howard, Rick Warner, Scott Smiley, John Collins and Paul Orphan

Kennedy/Jenks Consultants: Lynn Orphan and Bill Ramroth. Travis Tormanen and Tony Wakim arrived after 11:00 am.

SPB Utilities: George Shaw

Woodland Village Homes: Bob Lissner

Theil Engineering Company: Jason Phinney

Purpose

The meeting was intended to determine the Architectural Facilities Space and Program Requirements for the Cold Springs Wastewater Treatment Expansion Project.

Meeting Notes

Introductions: The various parties were introduced and roles were discussed.

Space Requirements: Following the agenda and architectural questions contained in the 30 June 2003, the architectural space requirements were discussed. George Shaw handed out a

Cold Springs Wastewater System Expansion Facilities Meeting - 8 July 2003 Washoe County Department of Water Resources 8 July 2003 Page 2

written response to some of the questions contained in the 30 June 2003 Memo. The notes below summarize the architectural space requirements for the Project.

Equipment Storage Building

A building should be provided to house a Facility Workshop, vehicle storage and miscellaneous storage. The Equipment Storage Building should be sized to accommodate the following:

- 1. County's vactor truck, measuring approximately 25 feet long x 8 feet wide x 16 feet high. The vactor truck will be parked in the building only occasionally. Other smaller vehicles can be parked in the building at other times. A large chain-operated roll-up door will be necessary to accommodate the vactor truck. Door size: 10 feet wide x 18 feet high. Provide insulated slats on door to cut down on rattling sound in the wind.
- 2. Facility Workshop. During the day when a vehicle is not parked within the building, the floor can be used as a workshop for the repair of various pieces of equipment.
- 3. Plan the Building to house a work bench and tool storage cabinets/lockers. These items will be purchased directly by the County. The building should be laid out to accommodate these items but the items themselves are not in the plant expansion contract.
- 4. The Building will be used to store various items and equipment. Storage space is needed for a back-up blower, at least three large extra valves, basket screen parts and other miscellaneous parts/equipment.
- 5. A portable hoist will be used within the facility to lift heavy parts/equipment into the bed of a pickup truck. The portable hoist is not in the building contract.
- 6. A utility sink with cold water is required. No hot water is required.
- 7. Provide ample 120 volt, 20 amp outlets. No 240 power is required.
- 8. No welding or use of open flames will take place in the facility. No dust generating (woodworking) equipment will be used in the building.
- The quantity of chemicals, lubricants and solvents stored in the building will be minimal
 and will be stored in approved storage cabinets and in quantities small enough so as not to
 trigger an H (hazardous) occupancy classification. The Chemical storage cabinets are not
 in the building contract.
- 10. Building heating is minimal. Heating to 50 degrees F. is sufficient. No cooling is required.
- 11. Storage space for safety equipment is not necessary.

Cold Springs Wastewater System Expansion Facilities Meeting - 8 July 2003 Washoe County Department of Water Resources 8 July 2003 Page 3

12. Based on the above requirements, a building of approximately 1000 SF should be adequate.

Laboratory

The following summarizes the laboratory requirements as discussed in the meeting and as contained in George Shaw's memo received 8 July 2003.

- 1. The Laboratory should be in close proximity to the motor control centers for the WWTF but does not have to be in the same room.
- 2. The Laboratory will be used for process control, not compliance testing.
- 3. The lab has two employees. These two employees cover all seven days of the week.
- 4. The existing lab counter space is minimal and will not meet the requirements for an expanded facility.
- 5. The current lab has about 13 linear feet of counter space. Provide approximately 12 additional feet bringing the total to 25 linear feet of counter space.
- 6. Space is required for a scale on its own stand. The scale and stand are not included in this building contract.
- 7. Approximately 4 linear feet of desk-height counter space is required for a microscope. The microscope is not a part of this building contract.
- 8. Ample 120 volt, 20 amp circuits are required. One 240 volt connection is required for the muffle furnace.
- 9. Provide floor space for a portable lab equipment dishwasher. The dishwasher is not a part of this contract.
- 10. Provide an eyewash/shower in the lab or directly and easily accessible from the lab.
- 11. Lab glassware and equipment will be purchased by the County and is not included in this building contract.
- 12. The existing Lab can be shut down during construction. SPB Utilities can use one of its other nearby labs for processing testing during construction.

Cold Springs Wastewater System Expansion Facilities Meeting - 8 July 2003 Washoe County Department of Water Resources 8 July 2003 Page 4

Office Space

An office area is required. This space can be shared with the laboratory. Space is needed for a desk, chair and file cabinets (all items are not-in-contract).

Breakroom

A room is required to house a break/lunch table large enough for two people. Provide a small countertop area with sink, undercabinet refrigerator and locker space for four full-height lockers.

Unisex Toilet Room

Provide a handicapped accessible unisex toilet room. The facility has two employees during a shift. A unisex toilet room will meet the needs and code requirements for this number of employees.

Unisex Shower Room

Provide a handicapped accessible unisex shower room. Provide shower and drying area. The facility has two employees during a shift. A unisex shower room will meet the needs and code requirements for this number of employees.

Janitor's Closet

Provide a small closet for cleaning equipment and miscellaneous cleaning and toilet room supplies.

Building Materials & Building Height

The current facility is one story in height. It has tan-colored combed block walls with a standing seam metal roof. The facility blends well into the landscape. One meeting participant commented that it is almost invisible. The additions to the plant should, likewise, blend into the surrounding brown-colored hillside. In addition the new facility should require low maintenance and have longevity. Metal buildings vs Block buildings were discussed and it was decided that block buildings are preferable with the possible exception of metal for the Equipment Storage Building, if it was placed behind the other block buildings.

In order to house the vactor truck the Equipment Storage Building will need to be 20 feet high or so. K/J will consider siting this facility so that it does not present a blank flat 20 foot high wall to the community.

Cold Springs Wastewater System Expansion Facilities Meeting - 8 July 2003 Washoe County Department of Water Resources 8 July 2003 Page 5

Miscellaneous Items

- 1. Door Hardware shall be Schlage Hardware. The County will give K/J the name of its locksmith for further information.
- 2. Paint shall be by Fuller O'Brien.
- 3. The County Fire Marshall will require a fire hydrant flow rate of 2,000 gpm with a residual pressure of 20 psi. If this cannot be achieved then fire sprinklers may be required. Bob Lissner said that the development is providing a 4,000 gpm flow rate and that the water flow and pressure can be met. If any buildings are over 5,000 SF then fire sprinklers will be required. It is not anticipated that any of the facilities will be larger than 5,000 SF. The access road to the facility must be at least 20 feet wide in order to meet fire fighting requirements. Turning the fire truck requires A 40 foot radius.
- 4. A Vulnerability (Security) Assessment Study has not been made for the facility. The County plans on contracting out such a study. Bob Lissner, the developer, commented that he would be glad to provide security during construction of the facility. The question was asked if razor-wire could be substituted for the current 3-strand barbed-wire. Currently razor-wire is not legal except for correctional institutions. In light of recent security concerns, the ban on razor wire may change. The existing security camera is inadequate in its focus; license plates cannot be read. As a minimum this camera should be replaced.
- 5. Large overhangs on the facility are desirable in order to cut down on cold weather water penetration.
- 6. Community Development will require a review of the facility to confirm that the facility meets its requirements. A detailed list of its requirements will be obtained. Community Development will require landscape upgraded compared to the plants current landscaping and will require a better irrigation system. More trees to screen the facility will be required. In considering whether to use recycled water or potable water for irrigation, KJ will look at treatment and health protection requirements of a recycled water system. Issued identified were screening, filtration, chlorination, underground irrigation and protection of landscape workers.
- 7. George Shaw asked if cool air from the pipe gallery could be used to cool the blower room during the summer and if blower room warm air could be used to warm the pipe gallery in the winter. K/J will consider this suggestion.
- 8. K/J will take design steps to reduce sound transmission from the process spaces, thereby minimizing sound levels at the plant property line.

Meeting Memorandum

Cold Springs Wastewater System Expansion Facilities Meeting - 8 July 2003 Washoe County Department of Water Resources 8 July 2003 Page 6

9. Access to the existing pumps is difficult. Considering the configuration of the existing piping and existing height of the pipe gallery, it may not be possible to solve this problem. George Shaw suggested that the existing pumps be left as is, but more consideration be given to the pipe and ceiling elevations in the expansion project.

30 June 2003

Meeting Preparation - Architectural Questions

Prepared For: Ken Mallory, SPB Utilities

Joe Howard, Washoe County Department of Water Resources

Submitted by: Travis Tormanen, Kennedy/Jenks Consultants

Cc: Bob Lissner, Lifestyle Homes; Jason Phinney, TEC

Scheduled Meeting: Cold Springs Wastewater System Architectural Meeting

8 July 2003 - 10:00 a.m. to 2:00 p.m.

Washoe County Department of Water Resources

K/J 037012.00

MEETING TIME AND LOCATION

A meeting is scheduled for Tuesday, 8 July 2003 at 10:00 a.m. at the Washoe County Department of Water Resources (DWR). The purpose of the meeting is to discuss equipment storage, laboratory, and other building space needs for the proposed Cold Springs Wastewater Treatment Plant expansion. There will also be a second meeting on 8 July 2003 to discuss building department requirements.

ATTENDEES

The tentative list of attendees for the above meetings includes:

Washoe County DWR: Joe Howard, Rick Warner, Paul Orphan, and Jess Coffman

Kennedy/Jenks Consultants: Lynn Orphan, Bill Ramroth, Travis Tormanen, and Bob Hoppe

SPB Utilities: Ken Mallory, Kirk Peterson, and George Shaw

Lifestyle Homes: Bob Lissner

TEC Civil Engineering Consultants: Jason Phinney

Others: Washoe County Building Department / County Architect Representatives

PURPOSE

The purpose of the meeting is to discuss space requirements for the upcoming expansion and attempt to reach decisions on a) what spaces are high enough priorities to include in the currently proposed expansion, b) what functions are required within these spaces, c) how much

Washoe County Department of Water Resources 30 June 2003 Page 2

square footage is needed for each of these functions, and/or d) what follow-up actions are needed to bring closure to this issue?

QUESTIONS

It is desirable that SPB Utilities (SPB) prepare preliminary answers to the questions below prior to the 8 July meeting, where practical, and that the other parties that will be present at the meeting spend some time thinking about these questions and reviewing answers provided by SPB Utilities. The response and input provided by SPB Utilities will enable Kennedy/Jenks Consultants (Kennedy/Jenks) to prepare for the Architectural Meeting.

What Spaces Need to Be Considered

Kennedy/Jenks understands that the following spaces may need to be considered when the treatment plant is expanded:

- 1. Additional Laboratory Space
- 2. Equipment Storage Space
- 3. Additional Electrical Motor Control Center Space
- 4. Solids Dewatering Space
- 5. Additional Pipe Gallery / Valve Space [to serve any new digester and/or sequencing batch reactor(s)]
- 6. Blower Space (depending on re-rating evaluation results).

Questions Related to Laboratory Space

- 1. How many people will be working in the lab at one time? What is their technical background (e.g., chemist, lab technician, plant operator)? Will the lab staff have any other duty besides lab work?
- 2. Is a lab office required? If so, is there a need for any new desk/file space?
- 3. Does SPB have a list of tests that are currently being performed?
- 4. Does SPB have a list of tests that they would like to perform in the lab?
- 5. Are any tests outsourced and/or performed at other SPB facilities? Will this continue?

Washoe County Department of Water Resources 30 June 2003 Page 3

- 6. Does SPB desire to purchase any new equipment? If so, what?
- 7. Does the SPB have an idea of the quantity of lab gasses and deionized water that will be used?
- 8. Does the lab require a glassware dishwasher (lab quality dishwasher)?
- 9. Are the current lab finishes (cabinets, counters, sinks, and floors) adequate?
- 10. What are the storage requirements for samples, glassware, manuals, etc.?
- 11. How long can the lab be shut down for construction or relocation of equipment (if the existing lab were to be expanded)?
- 12. How much additional counter space is desired, if any?
- 13. Are there any other laboratory needs that have not been addressed by these questions?

Questions Related to Equipment Storage

- 1. What types of storage are needed?
 - a. Vehicle
 - b. Spare Equipment
 - c. Tools
 - d. Parts
 - e. Files
 - f. Chemicals: Is a list of potential chemical storage requirements available?
 - g. Clothing/Lockers: Any requirement for lockers and shower?
 - h. Safety Equipment
 - i. Other
- 2. Would the storage best be:
 - a. Fence enclosure only
 - b. Fence enclosure with roof
 - c. Building
 - d. Accessed from indoors (i.e., closet)
 - e. Accessed from outdoors

Meeting Memorandum

Washoe County Department of Water Resources 30 June 2003 Page 4

- i. roll-up door
- ii. overhead door
- iii. double-person doors
- iv. single-person door?
- 3. How much space is desired for each type of storage described?

Other Questions

It is premature to evaluate the amount of space needed for electrical equipment, valving, piping, solids dewatering, etc. It is assumed that the spacing requirements for these items will be determined by Kennedy/Jenks with input from the stakeholders as the preliminary design and final design process continues.

However, if there are any special requests (from anyone) related to these items, it is desired that Kennedy/Jenks be made aware of them.

- 1. Washoe County Storage Does the County wish to have any dedicated storage space at the facility for any reason?
- 2. Restroom Are there any inadequacies with the existing restroom facility?
- 3. Are there any specific Office / Control Room requirements?
- 4. Are the current building materials adequate for use in new building spaces? Does SPB have any preferences/desired improvements for architectural items, such as hardware, paint, doors, and guardrails?
 - a. Doors
 - b. Floor Drains
 - c. Floor Materials
 - d. Wall Construction
 - e. Paint Systems
 - f. Ventilation
 - g. Lighting
 - h. Countertops
 - i. Heating
 - j. Air-Conditioning
 - k. Windows.

Washoe County Department of Water Resources 30 June 2003 Page 5

- 5. Are there any building/room components that could be improved with regards to safety?
- 6. Are there any building/room components that could be improved with regards to convenience?
- 7. Are there any building/room components that could be improved with regards to access?
- 8. Does SPB anticipate any noise concerns with surrounding property owners or occupants?
- 9. Any other special desires that should be considered at this meeting?
 - a. Functions
 - b. Location of Specific Functions / Buildings / Rooms

WHAT'S NEXT

At this point in the preliminary design, brief and/or partial responses are acceptable. It is not intended that SPB undergo major efforts prior to the meeting.

Input from the County and other stakeholders prior to the meeting is also encouraged.

Please contact Travis Tormanen at (503) 423-4009 with any questions, ideas, or concerns.

27 June 2003

Meeting Memorandum

Prepared For: Joe Howard and Paul Orphan

Washoe County Department of Water Resources

Prepared by: Lynn Orphan and Travis Tormanen

Kennedy/Jenks Consultants

Cc: Ken Mallory, SPB Utilities; and Bob Lissner, Lifestyle Homes

Meeting: Nevada Division of Environmental Protection Meeting

18 June 2003, 1:30 p.m.

Cold Springs Wastewater Treatment System Expansion

Washoe County Department of Water Resources

K/J 037012.00

Meeting Time and Location

The meeting was held at 1:30 p.m. on 18 June 2003 at the offices of Kennedy/Jenks Consultants (Kennedy/Jenks).

Attendees

Washoe County: Joe Howard

Kennedy/Jenks Consultants: Lynn Orphan, Ron Bush, and Travis Tormanen

Nevada Division of Environmental Protection: Joseph Maez

Purpose

The meeting was held in conjunction with the kick-off of the preliminary design phase of the Cold Springs Wastewater Expansion project. The meeting was intended to inform the Nevada Division of Environmental Protection (NDEP) that the project is beginning, to ask NDEP some questions, and to offer NDEP an opportunity to provide input on the project.

Meeting Notes

Various project elements were discussed. These included:

<u>SRF Project Requirements:</u> Joe Maez, NDEP, stated that the requirements are the same as previous and recommended going to the website for a checklist of requirements.

Meeting Memorandum

Nevada Division of Environmental Protection Meeting - 18 June 2003 Cold Springs Wastewater System Expansion Project Washoe County Department of Water Resources 27 June 2003 Page 2

Facility Plan: Joe Maez stated that there are still two outstanding issues to be resolved related to the facility plan. These include the connection of dry sewers and the groundwater monitoring plan. He would like to see all dry sewers connected and is particularly concerned about the school being connected. Joe Maez intends to issue a Notice of Intent to waiver the environmental for the treatment plant only so the expansion can be constructed while the dry sewer issue is addressed. A groundwater monitoring plan will need to be established. Lynn Orphan and Joe Howard are both going to look into these issues.

Rapid Infiltration Basins: Joe Maez reported that monitoring will need to continue with nitrates being the focus. He also stated that it is important that the new rapid infiltration basins (RIB) don't go any closer to the water supply well. It may be necessary for additional monitoring wells to be added when the new RIBs are installed.

<u>Disinfection:</u> Joe Maez says that disinfection of RIB discharges is not common and isn't seen as a likelihood in the near future at the Cold Springs facility. He doesn't have any concerns about bacteriological contamination.

<u>Jet-Tech Sequencing Batch Reactors (SBRs):</u> Joe Maez isn't sure about sole-sourcing. He will check into it. Other procurement methods were discussed as well.

<u>Design Review:</u> Joe Maez would like to review the preliminary design report (with calculations) and the 90% plans and specifications. The review times currently built into the project schedule are fine.

<u>Effluent Quality and Permit Requirements:</u> The biggest concern now remains to be nitrogen. Future concerns could include pharmaceuticals. The next permit would likely contain the same requirements as the current permit, including monitoring and maximum monthly limits for TDS, metals, and other inorganics. Joe Maez recommended negotiating with the permit writer with regards to monitoring and sampling requirements (i.e., frequency of metals testing)

27 June 2003

Meeting Memorandum

Prepared For: Joe Howard and Paul Orphan

Washoe County Department of Water Resources

Prepared by: Lynn Orphan and Travis Tormanen

Kennedy/Jenks Consultants

Ken Mallory, SPB Utilities; Bob Lissner, Lifestyle Homes; Jason Phinney, TEC Cc:

Cold Springs Wastewater System Expansion Kick-off Meeting Meeting:

> 18 June 2003, 9:30 a.m. - 11:45 a.m. Washoe County Department of Water Resources

K/J 037012.00

Meeting Time and Location

The meeting was held from 9:30 a.m. to 11:45 a.m. on 18 June 2003 at the offices of the Washoe County Department of Water Resources.

Attendees

Washoe County: Joe Howard, Rick Warner, and Paul Orphan

Kennedy/Jenks Consultants: Lynn Orphan, Ron Bush, Travis Tormanen, and Bob Hoppe

SPB Utilities: Ken Mallory, Kirk Peterson, and George Shaw

Broadbent Associates, Inc. Doug Guerrant

Lifestyle Homes: Bob Lissner

Thiel Engineering Company: Jason Phinney

Purpose

The meeting was intended as a Cold Springs Wastewater Expansion project kickoff meeting to establish expectations, discuss schedule, select preferred equipment technologies, and coordinate upcoming meetings.

Meeting Notes

Introductions: The various parties were introduced and roles were discussed.

Cold Springs Wastewater System Expansion Kickoff Meeting - 18 June 2003 Washoe County Department of Water Resources 27 June 2003 Page 2

Expectations: Joe Howard, Rick Warner, and Paul Orphan discussed the Washoe County's (County) expectations for the project. The County would like the project to come in under budget and ahead of schedule. The County also considers the capacity evaluation, potential early start improvements, and establishment of clear design criteria to be important. The County would like the project to be properly documented and well managed, with both Joe Howard, County, and SPB Utilities (SPB) fully aware of all developments. The County would like Kennedy/Jenks Consultants (Kennedy/Jenks) to discuss financing issues with Joe Howard.

The expectations for both SPB and Lifestyle Homes were similar – to be kept in communications and for their input to be considered during the project. Lifestyle Homes would also like the project to finish ahead of schedule and under budget.

Communications

Formal communications to and from the County will go through Joe Howard. Joe Howard will be copied on communications between Kennedy/Jenks and SPB and other stakeholders.

Email communications will include Joe Howard, Paul Orphan, Lynn Orphan, Travis Tormanen, SPB, Bob Lissner, and Jason Phinney.

Schedule

Various upcoming meetings were discussed. Some of the meetings that will occur during the project include:

- <u>Citizens Advisory Board Meetings:</u> There will be approximately three of these meetings. Lynn Orphan will represent Kennedy/Jenks at these meetings.
- Nevada Department of Environmental Protection (NDEP): A meeting is scheduled for 18 June 2003 after lunch with Joe Maez of NDEP.
- <u>Architectural Programming:</u> A meeting will be held the week of 7 July 2003 to discuss laboratory, equipment storage, and solids handling building issues. Jess Coffman, the head of the County's Operations and Maintenance, is interested in the equipment storage issue and will be invited to this meeting. Also, the County's building official and the County's architect will be invited to the meeting.
- Concepts and Criteria Review. This meeting will be held on 28 July 2003. It will be an
 opportunity for project concepts to be presented to the stakeholders. The intended
 outcome of the meeting will be for the parties to reach an agreement as to how
 Kennedy/Jenks should proceed with the project as it goes into design.

Cold Springs Wastewater System Expansion Kickoff Meeting - 18 June 2003 Washoe County Department of Water Resources 27 June 2003 Page 3

Other schedule items that were discussed included value engineering, NDEP review, special use permitting, and building permits. Value engineering may potentially be waived if it is found that the preliminary design report is complete. The importance of keeping the building department and NDEP on board with routine meetings was discussed. This may speed up the review time later on in the process. Joe Howard is going to check on the possible need for a special use permit and identify any constraints that may need to be considered if a special use permit is to be avoided. If one is necessary, the process should be started in September.

The design schedule was discussed. Kennedy/Jenks explained that the design schedule is very aggressive and that it may be necessary to complete the 50% design early to allow the 95% design to be completed on schedule.

The practicality of turning around the building permit review on short notice was also discussed. It may be necessary to either allow more time or possibly have the review done simultaneously with bid advertisement.

The County would like to review technical memoranda on an on-going basis to make the draft preliminary design report review easier.

Coordination

There were several coordination items discussed including survey, site access, and rapid infiltration basin analysis.

- <u>Survey:</u> Bob Lissner, Lifestyle Homes, asked that Kennedy/Jenks check with Summit regarding available survey information in the Cold Springs area. Summit has done quite a bit of work and there may be some control information that could help Tri State's effort.
- <u>Site Access:</u> SPB can disalarm the Cold Springs wastewater facility during the day time when visits are planned by consultant personnel. Kennedy/Jenks can pick up keys from the County when needed. Advance notification to SPB is desired since the site is not staffed full-time.
- Rapid Infiltration Basin Analysis: Broadbent Associates, Inc. (Broadbent) will be beginning work soon on the rapid infiltration basins (RIBs). There was some discussion about possible sites and the performance of the existing RIBs. The RIBs nearest the plant have generally performed the worst. Doug Gerraunt of Broadbent described the process they will use for performing their work.

Cold Springs Wastewater System Expansion Kickoff Meeting - 18 June 2003 Washoe County Department of Water Resources 27 June 2003 Page 4

Design Criteria

Several design criteria were discussed. One of these is the high-strength / low-flow nature of flows that have been experienced. Kennedy/Jenks will develop recommendations for the flow per ERU for the project after comparing similar wastewater systems elsewhere.

The County would like to serve the build-out capacity wherever possible with this expansion.

Process / Equipment Information

<u>Elevated Headworks:</u> Kennedy/Jenks will consider whether designing an elevated headworks makes sense for the project to eliminate one or more pump stations on the project. This would require the extension of force mains from the Woodland Village and Diamond Peak lift stations. No decision was made at the meeting.

Influent Screening: The current plant includes a chopper pump, but does not have screening. It was decided that a basket style (i.e., Hycor Helisieve) would be used as part of the expansion. There is concern about over-compaction. It was pointed out that the Health District requires double bagging of screenings.

<u>Grit Removal:</u> Grit has not yet been a problem, but is anticipated to be a greater problem in the future; especially as older homes are connected to the sewer. It was decided that the vortex type of grit removal would be fine for this project (i.e., PistaGrit).

Sequencing Batch Reactors: There will be one or two additional sequencing batch reactors (SBRs) needed for this project. There is some concern about the procedures associated with sole-sourcing Jet-tech for the project. SPB would like to have spray nozzles on the new SBRs and would like to have them added to the existing SBRs. Also, there seems to be some problems with blower capacity/redundancy. SPB recently had the controls modified to allow more flexibility in the operation of the SBRs and the blowers. SPB is also not particularly happy with the electric actuators that Jet-tech provided.

<u>Filter and Disinfection</u>: The County would like filtration and disinfection to be reviewed on a cursory basis only at this time. Ultraviolet disinfection could be required at some point in the future. Filtration would only be done as part of an irrigation reuse system, which is not likely in the short-term. Dynasand or disk filtration was discussed.

Sodium hypochlorite is currently used for filamentous control. There is no "3 water" at the plant at this time. The current contact basin is about 50,000 gallons, and is only used for equalization since effluent dewatering is not being done.

<u>Metering and Sampling:</u> The existing number of meters and samplers may be adequate for the project expansion.

Cold Springs Wastewater System Expansion Kickoff Meeting - 18 June 2003 Washoe County Department of Water Resources 27 June 2003 Page 5

<u>Aerobic Digestion:</u> The existing digester is not big enough. Dewatering could help with the problem. Sizing apparently is a common problem to many of the Jet-tech SBR treatment plant designs.

<u>Solids Dewatering:</u> Belt filter presses will be considered alongside centrifuges. Cost, operability, supernatant strength, and percent solids will be considered. No decision was made regarding which technology to use; although, percent solids was identified as a critical criterion. Adding dewatering will allow the solids lagoons to no longer be used. One of the considerations during design will be to consider "what happens if the landfill were to go away?" One significant problem at the existing plant is the inability to return overflows from the lagoons back into the plant.

<u>Diamond Peak Lift Station:</u> The lift station was discussed. The existing lift station may need to be abandoned due to capacity and corrosion concerns. Bob Lissner requested deferring the force main until the future be considered.

<u>Influent and Effluent Pumping:</u> Phasing of the lift station will be considered. SPB is happy with the submersible effluent pump lift station.

<u>Controls:</u> SPB has remote operating capabilities with PC Anywhere software. There will need to be an upgrade to the plant controls included with this expansion.

<u>Standby Power:</u> The existing generator may be reasonably sized to handle the expanded treatment plant. This will be evaluated.

<u>Process Water:</u> The existing water system is not adequate. Lifestyle Homes is willing to bring an 8-inch line and fire hydrant to the plant to rectify this problem.

Meeting Memorandum

Cold Springs Wastewater System Expansion Kickoff Meeting - 18 June 2003 Washoe County Department of Water Resources 27 June 2003 Page 6

Contact Information

Name	Company	Phone
Lynn Orphan	Kennedy/Jenks Consultants	(775) 827-7900
Robert Hoppe	Kennedy/Jenks Consultants	(775) 827-7900
Travis Tormanen	Kennedy/Jenks Consultants	(503) 295-4911
Ron Bush	Kennedy/Jenks Consultants	(503) 295-4911
Joe Howard	Washoe County DWR	(775) 954-4623
Rick Warner	Washoe County DWR	(775) 954-4621
Paul Orphan	Washoe County DWR	(775) 954-4614
Doug Guerrant	Broadbent Associates, Inc.	(775) 322-7969
Ken Mallory	SPB Utilities	(775) 772-5560
Kirk Peterson	SPB Utilities	(775) 240-6776 (cell)
		(775) 329-7757
George Shaw	SPB Utilities	(775) 771-5557 (cell)
	•	(775) 329-7757
Jason Phinney	Thiel Engineering Company	(775) 352-7800
Bob Lissner	Lifestyle Homes	(775) 750-5537