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LAKE WHATCOM WATER AND SEWER DISTRICT
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES
REQUEST FOR QUALIFICATIONS

Lake Whatcom Water and Sewer District is requesting qualifications from qualified engineering firms for the GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES located in Sudden Valley and Geneva in Whatcom County, Washington. Professional services include surveying, easement acquisition, pre-design, permitting, design, bidding, inspection, and construction contract administration. The District intends to select the most qualified firm for the project. Submittal requirements and project information are available at https://lwwsd.org/2402-C

Submittals shall be delivered by 11 am, March 12, 2024 to Attn: Greg Nicoll, Lake Whatcom Water and Sewer District, 1220 Lakeway Drive, Bellingham, WA 98229. Questions should be directed to Greg Nicoll, at 360-734-9224.

Any firm failing to submit information in accordance with the procedures set forth in the Request for Qualifications may not be considered responsive and may therefore be subject to disqualification by the District.

LAKE WHATCOM WATER AND SEWER DISTRICT
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES
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I. INTRODUCTION

A. This Request for Qualifications ("RFQ") outlines the information necessary to understand the consultant selection process and the required documentation a Consultant must submit. After reviewing this RFQ, any firm that determines it has the necessary expertise and experience and could successfully perform the required services may submit its Submittal, addressing the items set forth herein. A general overview of the selection process is as follows:

1. Consultants shall deliver the Submittal to the District no later than **2:00 p.m. on March 28, 2024**, after which time they will be reviewed and evaluated. The Submittal shall be delivered to:

   Lake Whatcom Water and Sewer District
   1220 Lakeway Drive
   Bellingham, WA 98229
   Attn: Greg Nicoll, District Engineer

2. The District may, at its option, contact a Consultant and ask clarifying questions concerning the Consultant's Submittal.

3. At the District's option, the District may conduct interviews with Consultants qualifying as finalists.

B. The purpose of this RFQ is to obtain a qualified consultant team to provide professional services to design replacement and/or improvements for the Geneva Reservoir and SVWTP Pump House Seismic Upgrades project. The scope of work includes professional services for topographic surveying, pre-design, permitting, design, bidding, inspection, and construction contract administration. The District intends to select the most qualified firm for the project.

C. It is anticipated that Consultant services will be separated into three phases of work. The initial contract and first phase of work will cover topographic surveying, pre-design, and permitting. Phase two includes detailed design, specifications, cost estimates, and bidding. Phase three includes services during construction.

II. DISTRICT SUMMARY

A. The Lake Whatcom Water and Sewer District is a special purpose district operating under Title 57 Revised Code of Washington. Originally formed in 1968 as Whatcom County Water District No. 10, the District provides water service to approximately 4,100 equivalent residential units (ERUs) and sewer service to approximately 4,400 ERUs in an 18-square mile area encompassing Lake Whatcom. The District is operated by 18 full-time professionals, governed by a five-

member board of commissioners elected from within the District, and has an annual budget of approximately $8 million.

1. Water System Summary. The District owns and operates three Group A water systems and one Group B water system. In total, the District operates two water treatment plants, six pump stations, seven reservoirs, and approximately 70 miles of transmission and distribution mains. Additional information specific to the District's water system may be found in the 2018 Water System Comprehensive Plan, available on the District's website at https://lwwsd.org/resources/water-system-comprehensive-plan/.

2. Sewer System Summary. The District owns and operates 28 sewer lift stations and over 75 miles of sewage collection and conveyance lines. The District does not treat the sewage it collects, instead delivering its wastewater to the city of Bellingham's treatment plant for treatment and disposal under terms of an interlocal agreement that expires in 2034. Additional information specific to the District's sewer system may be found in the 2020 Comprehensive Sewer Plan, available on the District's website at https://lwwsd.org/resources/comprehensive-sewer-plan/.

III. PROJECT BACKGROUND

The Lake Whatcom Water and Sewer District provides potable water to its South Shore water system, which is comprised of the Sudden Valley and Geneva communities (population approximately 10,000), wholly by water treated at its Sudden Valley Water Treatment Plant. The water treatment plant is a rapid-rate, direct filtration plant with a rated capacity of 2.0 million gallons per day (mgd).

The treatment plant, whose water source is Lake Whatcom, is located at 22 Morning Beach Drive, adjacent to Lake Whatcom and the Sudden Valley Community Association's Morning Beach Park. An essential component of the Sudden Valley Water Treatment Plant system is SVWTP Pump Building. The pump building has the highest consequences of failure since it serves the entire population in the South Shore System. The pump building houses four (4) transmission pumps that convey potable water to the entire South Shore system. As a result, the pump building will not be stable under the earthquake loads assumed and could fail catastrophically.

In April 2022 Gray & Osborne Inc. consulting engineers completed the Sudden Valley Water Treatment Plant Facility Improvement master plan. One aspect of the plan was to evaluate the seismic integrity of components of the treatment plant and pump building. For the Pump Building, structural and nonstructural retrofits to address seismic deficiencies were identified.

A structural analysis was performed in 2016 on five Lake Whatcom Water and Sewer District water storage reservoirs to determine their ability to withstand seismic events based on existing earthquake code requirements. The analysis determined that the foundations and/or anchorage systems were inadequate in all five reservoirs, which included the Geneva Reservoir.

IV. PROCUREMENT PROCESS

A. General Information

1. Compliance with Legal Requirements.

    a. The procurement of these consultant services will be in accordance with applicable District, federal, state and local laws, regulations and procedures. The District reserves the right to reject any and all Submittals received. Any Consultant failing to submit information in accordance with the procedures set forth herein may not be considered responsive and may therefore be subject to disqualification by the District.

    b. In accordance with the provisions of this RFQ, the District will evaluate the Submittals. The final selection, if any, will be that Consultant which, in the opinion of the District, best meets the requirements set forth in the RFQ and is determined to be the most highly qualified for the services requested.

2. Costs borne by Consultants. All costs incurred in the preparation of a Submittal and participation in this RFQ and negotiation process shall be borne by the proposing firms.

3. Public Disclosure. Once in the District's possession, Submittals shall become property of the District and considered public documents under applicable Washington State laws. All documentation that is provided to the District may be subject to disclosure in accordance with Washington State public disclosure laws.

B. Protests

1. Time to File a Protest.

    a. Any prospective Consultant may file a protest challenging the requirements identified in the RFQ provided such protest is received no later than ten (10) calendar days prior to the date established for responding to this solicitation.

    b. A financially interested Consultant may file a protest based on evaluation of Submittals provided such protest is received no later than five (5) calendar days after the protesting party knows or should have known of the facts and circumstances upon which the protest is based.

    c. In no event shall a protest be considered if all Submittals are rejected or after execution of this contract.

2. Form of Protest. A protest shall be in writing and addressed to: Lake Whatcom Water & Sewer District, 1220 Lakeway Drive, Bellingham, WA 98229, Attention: General Manager. The protest shall include the following:

    a. The name, address and telephone number of the party protesting or their representative;

b. The RFQ number and contract title under which the protest is submitted;

c. A detailed description of the specific grounds for protest and any supporting documentation; and

d. The specific ruling or relief requested.

3. Determination of Protest. Upon receipt of a timely written protest, the District General Manager shall investigate the protest and shall prior to execution of the contract respond in writing to the protest. The District General Manager's decision shall be considered the final action by the District.

4. Compliance with Protest Process. Failure to comply with these protest procedures will render a protest untimely and inadequate and may result in rejection thereof by the District.

5. Exhaustion of Administrative Remedies: As a mandatory condition precedent to initiating a lawsuit against the District, a prospective Consultant or a Consultant shall comply with the Protest Procedures defined herein.

6. Venue: By responding to this RFQ and for the convenience of the parties, the prospective Consultant or a Consultant acknowledges and agrees that a lawsuit or action related to or arising out of this procurement shall be brought in the Superior Court of Whatcom County, Washington.

C. Schedule

1. Anticipated Schedule. The selection process is anticipated to proceed as outlined below and is subject to change:

Date	**Selection Process**
February 14, 2024	**Public Announcement of the RFQ**
March 12, 2024	**Submittals Due**
March 27, 2024	**Recommendation to Board**
Mid-April 2024	**Contract Execution**

2. Notification. The District will notify appropriate firms of changes in the RFQ and Notice of Selection.

3. Addenda. In the event it becomes necessary to revise any part of the RFQ, addenda will be provided to all firms still under consideration at the time the addendum is issued. If any firm has reason to doubt whether the District is aware of the firm's interest, it is the responsibility of the firm to notify the District to be sure that addenda are received. Mail or call such notice to Greg Nicoll, 360-734-9224, Lake Whatcom Water and Sewer District, 1220 Lakeway Drive, Bellingham, WA 98229.

D. Negotiations

1. At the completion of the selection process, the selected Consultant will enter into contract negotiations with the District. Negotiation of a contract will be in conformance with applicable federal, state and local laws, regulations and procedures. The negotiated cost and pricing data, once agreed to by the District and the Consultant, shall form the basis for a billing/payment provision.

2. At the beginning of negotiations, the selected Consultant and District shall establish a Negotiation Schedule. Negotiations shall begin with the Work Plan identified in the Qualifications Statement submitted by the selected Consultant.

3. If the District and selected Consultant cannot come to terms on level of effort (LOE) and a scope of work (SOW) after three (3) revisions to the SOW and LOE, the District may discontinue negotiations and go to next highest ranked Consultant. Failure to reach agreement after three (3) revisions demonstrates an inability to reach agreement within a reasonable timeframe.

4. If the District and selected Consultant cannot come to terms on cost and pricing data after three (3) revisions, the District may discontinue negotiations and go to the next highest ranked Consultant. Failure to reach an agreement after three (3) revisions demonstrates an inability to reach agreement within a reasonable timeframe.

E. Contract Terms and Conditions

1. A copy of the draft agreement(s) for A/E professional services is included as an Attachment.

2. By submitting qualifications, the Consultant represents that it has carefully read the terms and conditions of the Request for Qualifications and agrees to be bound by them. Agreement to be negotiated.

F. Cost and Pricing Data

1. The selected consultant shall provide the following information within five (5) business days after Notice of Selection has been received. Failure to provide such information in a timely manner may result in the District discontinuing negotiations with the selected Consultant and starting negotiations with the next highest ranked Consultant.

    a. Direct Salaries. Selected consultant and its subconsultants shall submit the following information:

        (1) List of employees, in alphabetical order (last name first), with job classification, rate of pay, and salary review date.

    b. Overhead Rates. Selected consultant and its subconsultants shall provide the following information:

        (1) Provide current audited overhead schedule, audit report, and cost detail by

general ledger account.

(2) Provide a listing of all personnel who will perform work on this Project whose salaries, in full or in part, are included in overhead for the current and previous year. For each person identify his or her title, classification, position in company and salary rate.

c. Billing Rates. Submit only for certain qualifying small firms.

(1) Small firms that do not have an accounting system in place, that identifies direct and indirect costs separately, generally use billing rates. Fully burdened billing rates, which include labor, overhead costs and profit are allowed on a case-by-case basis for those firms that typically use this method for billing purposes.

d. Other Direct Cost(s).

(1) Identify all Other Direct Cost(s) (ODC) for this project and the rationale used as a basis for this cost.

(2) For each ODC, provide the unit prices and/or rates with supporting rationale, historical data and estimating methodology used to validate these rates.

(3) Failure to identify ODC results in a presumption that there are no ODC.

e. Profit. Selected consultant and its subconsultants shall provide the following:

(1) Proposed profit;

(2) Rationale and justification for the proposed profit rate.

f. Markup on Subconsultant Costs and ODC. Selected consultant and its subconsultants shall provide the following:

(1) Proposed markup on subconsultant costs and ODC;

(2) Rationale and justification for the proposed markups.

V. INSURANCE REQUIREMENTS

A. Prior to execution of the Agreement, the Selected Consultant shall file with the District certificates of insurance and endorsements from the insurer(s) certifying to the coverage of all insurance required in accordance with the District's standard agreement. All evidences of insurance must be certified by a properly authorized officer, agent, general agent or qualified representative of the insurer(s) and shall certify the name of the insured, the type and amount of insurance, the location and operations to which the insurance applies, the expiration date, and provides that the District receives notice at least thirty (30) calendar days prior to the

effective date of any policy limit or cancellation of required coverages. The Consultant shall notify the District at least thirty (30) calendar days prior to the effective date of any cancellation or reduction in coverage in the policy. The Consultant shall maintain during the entire Contract period, insurance coverage at least as broad as the limits and coverage outlined in the District's standard agreement. The Consultant shall, upon demand of the District, make available to the District at Consultant's local office in all such policies of insurance and the receipts of payment of premiums thereon. Failure to provide such policies of insurance within a time acceptable to the District shall entitle the District to suspend or terminate the Consultant's work hereunder. Suspension or termination of the Consultant Agreement shall not relieve the Consultant from its insurance obligation hereunder.

B. The Consultant shall obtain and maintain at a minimum the limits of insurance set forth in the Consultant Agreement. By requiring such minimum insurance, the District shall not be deemed or construed to have assessed the risks that may be applicable to the Consultant under the Agreement. The Consultant shall assess its own risks and, if it deems appropriate and/or prudent, maintain greater limits and/or broader coverage.

C. Each insurance policy shall be written on an "occurrence" form; excepting that insurance for professional liability, errors and omissions when required, is acceptable on a "claims made" form.

D. If coverage is approved and purchased on a "claims made" basis, the Consultant shall continue coverage either through (1) policy renewals for not less than three years from the date of completion of the work which is the subject of this Agreement or (2) the purchase of an extended discovery period for not less than three years from the date of completion of the work which is the subject of this Agreement, if such extended coverage is available.

E. If, in order to meet the insurance requirements the Consultant must rely on the insurance to be provided by one or more subconsultant, then such subconsultant(s) shall be required to meet all of the requirements herein applicable to the insurance they are providing, and shall include District and Consultant as additional insureds on all liability policies except Professional Liability/Errors & Omissions and Workers Compensation. The District will not make any payments on work performed by subconsultants until all insurance documentation from such subconsultants have been received and accepted by the District.

F. Provided the affected insurance policies permit the following waiver, without voiding coverage, Consultant and District waive all rights against each other to subrogation for damages covered by property insurance.

VI. EVALUATION AND SELECTION CRITERIA

A. All Submittals will be evaluated by a Consultant Selection Panel ("Panel"), which will be responsible for ranking of the Submittals. The criteria outlined below will be used in evaluating the Submittals and determining the most qualified Consultant. A total of 100 points (excluding a potential interview) has been assigned to the Evaluation Criteria. The maximum points possible will follow each criterion listed. The points indicate relative weight or importance given to each criterion.

B. The District may determine that the ranking is close and an interview with the top ranked firms is necessary. Interviews will have a maximum of 50 points. The number of Consultants to participate in interviews, if any, will be determined by the District based on the recommendation of the evaluation. The District may choose to use different criteria for the interview, in which case the finalists will be so notified in writing. The interview process may or may not include a Consultant presentation and the Consultants will not be given questions to prepare for in advance of the interview.

C. Following the review of the submittals and the interviews (if conducted) the evaluators will use the points to score each Submittal. Each evaluator will put the scores in rank order, with the highest scored Consultant 1st, the second-highest scored Consultant 2nd, etc. This ranking will then be totaled. From the ranking, the District intends to recommend the most qualified Consultant to the Board of Commissioners for approval to begin negotiations.

VII. DOCUMENTATION

A. The prime Consultant shall submit two (2) bound copies and a USB with the electronic PDF file of the Submittal.

B. Consultants are discouraged from submitting lengthy Submittals. The District requests that Submittals be concise and clearly written containing only essential information. Submittals should be 25 pages or less, including any resumes and cover letter.

- Submittals should be minimum of 11 font.
- Sheets with double sided printing will be counted as 2 pages.
- Sketches, maps and charts printed on 11x17 count as 1 page.

The Submittal shall consist of the following parts:

1. Letter of Interest: The Letter of Interest shall contain the following information:
   - RFQ Title: **GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES;**
   - Consultant's name, mailing address, contact person, telephone and fax numbers;
   - UBI and federal tax ID numbers; and
   - Stipulation that Consultant accepts all terms of the RFQ, especially the terms and conditions of the attached sample contract(s).

2. Qualifications Statement. The submittal shall include Key Personnel's:
   - General statement of the understanding of the scope of services.
   - Project Team including proposed subconsultants.
   - The Project Team's experience with water conveyance and treatment infrastructure, maintenance, design, construction management and inspection services.
   - Experience with District's water infrastructure.
   - Permitting experience with Whatcom County, including experience in the County's shoreline permitting process and requirements.
   - Approach to managing and completing projects.
   - Approach to communicating with the District.
   - Approach to ensure cost efficient execution and quality control.

- Experience with FEMA Hazard Mitigation Grant projects and associated federal and state funding requirements.

The submittal shall be presented in a clear, comprehensive and concise manner and shall be submitted in a complete package by the prime Consultant.

VIII. EVALUATION CRITERIA AND SUBMITTAL INFORMATION

A. **Experience and Technical Competence - 40 Points**.

The District will evaluate the experience and technical competence of the Consultant's Key Personnel to complete the project. Emphasis will be placed on recent experience and expertise in performing the required services on projects with a scope of work similar in size and complexity to this Project.

B. **Work Plan - 30 points.**

The District will evaluate the proposed Work Plan to determine the Consultant's understanding of the scope of work, allocation of skilled personnel to specified tasks, appropriate utilization of subconsultants, and overall project approach.

1. The Work Plan is an opportunity for the Consultant to demonstrate its understanding of scope and propose ideas for the Project.

C. **Record of Past Performance & References - 30 Points**.

1. The District will evaluate the project team's record of performance and references on previous and/or ongoing projects with consideration given to quality of work, ability to meet schedules and budgets, cooperation, responsiveness, performance on other District projects and other managerial considerations.

2. The District will evaluate the project examples provided with respect to Key Personnel's experience with similar projects and the amount of involvement they had with the project examples. The project examples provided should demonstrate Key Personnel's experience in providing services similar in scope to this Project.

D. **Interviews - 50 Points (if conducted)**

1. The District may or may not conduct interviews. If the District determines that interviews are necessary, the District will conduct interviews with the short-listed Consultants (finalists).

2. Consultants will be notified in writing of the request and provided the date, place, and time of the interview. The interview process may or may not include a Consultant presentation and the Consultants will not be given questions to prepare for in advance of the interview. The District may choose to use different criteria for the interview, in which case the Finalists will be so notified in writing.

3. Failure to participate in the interview process shall result in a Consultant's disqualification from further consideration.

AGREEMENT FOR A/E PROFESSIONAL SERVICES
FOR
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

THIS AGREEMENT, made and entered into by and between Lake Whatcom Water and Sewer District, Whatcom County, Washington, hereinafter referred to as "District", and **[[[FIRM NAME]]]** ("Consultant"), a corporation with a place of business at **[[[FIRM ADDRESS]]]**, collectively referred to as "Parties", shall be effective upon the authorized signatures of both Parties to this Agreement ("Effective Date").

WHEREAS, the District, a special purpose municipal corporation, provides water and sewer service to its constituents; and

WHEREAS, the District desires to retain the Consultant to perform certain professional services, including engineering services necessary to perform **GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES** ("Project"); and

WHEREAS, the District solicited for professional services as required by RCW 39.80; and

WHEREAS, the Consultant represents it has available and offers to provide qualified personnel and facilities necessary to accomplish such services required for the Project within the required time.

The Parties enter into this Agreement. The term Agreement and Contract shall be used interchangeably and refer to this Agreement.

SECTION 1: PERIOD OF PERFORMANCE

1.1. All required work and services specified in the terms and conditions of this Agreement for **Phase 1, Design and Permitting Services per Exhibit A – SCOPE OF WORK**, shall be completed by **[[[December 31, 2023]]]** unless extended or terminated earlier by the District pursuant to the terms and conditions of this Agreement. The District reserves the right to amend this Agreement to add **Phase 2, Services During Construction per Exhibit A – SCOPE OF WORK**. The District also reserves the right to let the Agreement expire at the completion of Phase 1 and to select another consultant to perform the additional study and/or phases.

1.2. Time is a material consideration in the performance by the Consultant under this Agreement. The Consultant shall complete its work and services within the Project schedule, including any established milestones and task completion dates, and the Period of Performance, set forth in the Scope of Work. The completion dates for tasks may be modified by a written directive; however, the Period of Performance for the Agreement may only be modified through an amendment. No completion dates shall be extended because of any unwarranted delays attributable to the Consultant. Completion dates may be extended in the event of a delay caused by the District which results in a delay in the performance of an affected task, or because of unavoidable delay caused by any governmental action or other conditions beyond the control of the Consultant, which could not be reasonably anticipated and which results in a delay in the performance of an affected task.

1.3. Time Extensions. The Total Price, Period of Performance and task budgets shall not be increased because of any unwarranted delays or costs attributable to the Consultant. In the event of a delay not attributable to the Consultant which (1) delay could not be reasonably anticipated and (2) results in an increase in costs to perform the work, the District may, through the execution of an amendment, increase the Total Price, Period of Performance and/or task budget.

SECTION 2: ADMINISTRATION AND SUPERVISION

2.1. **DISTRICT**. An employee of the District, hereinafter called the "Project Manager," who shall be designated in writing by the District, shall perform day-to-day management of this Contract. Unless otherwise indicated in writing by the General Manager or its designee, the Project Manager will issue notices to proceed, approve all requests for payment, authorize termination or modification of tasks, and approve in writing changes to the task budgets outlined in the Cost Summary, Exhibit B attached hereto and incorporated by reference, provided the changes do not impact the Total Price, Period of Performance, and the Fixed Professional Fee. The Project Manager will also be responsible for determining when the Consultant has satisfactorily performed all work and for ensuring that the Consultant complies with all provisions of this Agreement.

2.2. **CONSULTANT**. The Consultant represents that it has, or will obtain, all personnel necessary to perform the services required under this Agreement and that such personnel shall be qualified, experienced and licensed as may be necessary or required by laws and regulations to perform such services. All services required under this Agreement shall be performed by the Consultant, its employees, or by subconsultants whose selection has been authorized by the District; provided, that the District's authorization shall not relieve the Consultant or its subconsultants from any duties or obligations under this Agreement or at law to perform in a satisfactory and competent manner. All contractual duties, requirements and obligations that the Consultant owes to the District shall also be owed to the District by the Consultant's subconsultants retained to perform the work pursuant to this Agreement. The term "Consultant" shall refer to **[[[FIRM NAME]]].** and all of its subconsultants.

A. Authorized Subconsultants. The Contract shall identify in the Cost Summary, Exhibit B, the subconsultants who are authorized to perform work under this Contract.

B. Process for Adding or Removing Subconsultants. If during the term of this Contract, the Consultant wishes to add or remove a subconsultant, the Consultant shall provide the Project Manager with a written request identifying the proposed change. The written request shall include the following information:
   1. Identity of the subconsultant and the work to be performed;
   2. Resumes and documentation outlining the subconsultant's experience;
   3. If the subconsultant is to perform work of the consultant or another subconsultant already identified in Exhibit B, an explanation of why the work is going to be transferred to a new subconsultant.

C. District Approval of Subconsultants. The District has sole discretion in approving or rejecting proposed subconsultants. Each subcontract shall be available for review and the cost summary subject to review by the Project Manager prior to the subconsultant proceeding with the work. Before any subconsultant not

already identified in the Contract can perform any work under this Contract, the District shall provide written authorization to the Consultant.

D. Substitution of Personnel. The Consultant recognizes and agrees that if a change is made substituting or changing assigned key personnel, the Consultant shall be responsible for any and all costs associated with "Transfer of Knowledge and Information". The Transfer of Knowledge and Information shall be defined to include the labor hours spent reviewing project documentation, participating in meetings with Project personnel, and participating in site visits to familiarize oneself with the Project and project location(s). The District shall not pay for any time spent for the "Transfer of Knowledge and Information".

1. The Consultant shall provide sufficient advance notice of any intention to remove or reassign key personnel. The Consultant shall not remove or reassign the key personnel assigned to this Project without written consent from the District. Exhibit F, Key Personnel, is a listing of key individuals for this work. Notice for the substitution of individuals and positions identified as Key Personnel shall include the following:

   a. An explanation of the reason for the reassignment or removal;
   b. The name of the person proposed to replace the individual; and
   c. Identification of the experience and qualifications of the individual proposed.

2. For individuals who are not identified as "Key Personnel" in Exhibit F, the Consultant shall provide documentation supporting the labor rate for the substituted personnel prior to submitting an invoice and the labor rate shall not exceed 110 percent of the originally assigned personnel's labor rate.

3. District Request Removal Personnel. The Consultant shall remove from the Project any personnel or subconsultant if, after the matter has been thoroughly considered by the District and the Consultant, the District considers such removal necessary and in the best interests of the Project and so advises the Consultant in writing. In this case, the District will compensate the consultant for Transfer of Knowledge costs associated with the removal of any personnel or subconsultant.

SECTION 3: SCOPE OF WORK

3.1. The District hereby retains the Consultant upon the terms and conditions contained herein to perform certain work and services on the Project. The work and services for the Project to be performed by the Consultant are set forth in Exhibit A, Scope of Work, attached hereto, and incorporated herein by this reference. The general Project Schedule is set forth in Exhibit C, attached hereto and incorporated herein by reference.

3.2. The District shall make available to the Consultant, without cost, copies of as-built plans, drawings, survey notes, studies, soil reports, maintenance and performance records, and other relevant data, and property descriptions of various District facilities related to the Project, which are readily available, and on file at the District. These documents are available solely as additional Information to the Consultant and do not relieve the Consultant of its duties and obligations under this Agreement nor constitute any

representation or warranty by the District as to conditions or other matters related to the Project.

3.3. It shall be the responsibility of the Consultant to gather and become familiar with all site information including existing improvements.

SECTION 4: CHANGES IN WORK

4.1. Any direction from the District to perform work that results in an increase or decrease in scope, changes to the Total Price or Period of Performance, or changes impacting the Scope and Budget for the project shall be made only by an amendment prior to the work being performed. A member of the Board of Commissioners for the District is the only authorized District representative who may sign amendments.

4.2. In the event the Consultant identifies something that may impact the scope of work, Project Schedule and/or cost, Consultant shall inform the Project Manager within five (5) business days of the event and possible impacts to scope, schedule and cost. If appropriate, the parties shall execute an amendment.

4.3. The District may, at any time, by written amendment direct the Consultant to make additions within the general scope of the services or work to be performed under this Agreement, delete portions of the Project, or revise portions of the work. Any changes within the general scope of work, which result in an increase or decrease in time of performance or cost, shall only be made by amendment.

SECTION 5: RESPONSIBILITY OF THE CONSULTANT

5.1. Standard of Care

A. The Consultant shall be responsible for the professional quality, technical adequacy and accuracy, timely completion and coordination of all plans, designs, drawings, specifications, reports and other services prepared or performed pursuant to this Agreement. The Consultant shall perform its work to conform to generally accepted professional standards applicable to the types of services and work provided hereunder. The Consultant shall be responsible for the professional standards, performance and actions of all persons and firms performing work pursuant to this Agreement. The Consultant shall, without additional compensation, correct or revise any errors, omissions or specific breaches of a contractual obligation in such plans, designs, drawings, specifications, reports and other services.

B. The District's approval of plans, drawings, designs, specifications, reports and other products of the professional services rendered hereunder shall not in any way relieve the Consultant of responsibility for the technical adequacy or accuracy thereof. Neither the District's review, approval or acceptance of, nor payment for, any of the services shall be construed to operate as a waiver of any rights under this Agreement or of any cause of action arising out of the performance of this Agreement.

C. The Consultant shall be knowledgeable and familiar with the District's Construction General Conditions and any District provided Division 0 (which

includes General and Supplemental conditions and Bidding Provisions) and Division 1 (General Construction Requirements). Any technical specifications drafted by the Consultant shall be consistent with these Divisions and such technical specifications should not create any ambiguity or conflict with these Divisions.

D. Consistent with generally accepted professional standards, the Consultant shall promptly bring to the District's attention any concerns that the Consultant has regarding the design, or any finding, conclusions, or final decisions made by the District. The Consultant shall, at the District's request, provide the District with a written evaluation of its concerns, along with proposed solutions to any identified problems.

5.2. Maintenance of Project Documentation

A. Upon written request by the Project Manager, the Consultant shall provide the District with access to all documents and correspondence, including e-mail communications, memoranda, and all other written materials prepared or used in performance of work on this Project.

B. The Consultant is cautioned that information and documentation submitted to the District may become a public record in accordance with the Revised Code of Washington and may not be exempt from disclosure under the Washington State Public Disclosure Act.

C. The Consultant acknowledges that unauthorized disclosure of information or documentation concerning this Project may cause substantial economic loss or harm to the District. Except as otherwise required by Court Order or subpoena, the Consultant shall not without prior written authorization by the Project Manager allow the release, dissemination, distribution, sharing, or otherwise publication or disclosure of information or documentation obtained, discovered, shared or produced pursuant to this Agreement.

SECTION 6: PRODUCTS

6.1. In the performance of this Agreement, the Consultant shall, to the extent practicable, design and draft specifications that provide for maximum use of structures, machines, products, materials, construction methods, and equipment which are readily available through competitive procurement, or through standard or proven production techniques, methods and processes.

6.2. The Consultant shall not, in the performance of the work under this Agreement, produce a design or specification which would require the use of structures, machines, products, materials, construction methods, equipment, or processes which the Consultant knows to be available only from a single source, unless the Consultant has provided a written justification for the use of a single source in writing and the District concurs.

6.3. The Consultant shall not, in the performance of the work under this Agreement, produce a design or specification which would be restrictive or written in such a manner as to contain proprietary, exclusionary, or discriminatory requirements other than those based upon performance, unless such requirements are necessary to test or demonstrate a

specific thing, or to provide for necessary interchangeability of parts and equipment. The Consultant shall report to the District any single source or restrictive design or specification giving the reason(s) why, in the Consultant's professional judgment, it is necessary to restrict the design or a particular specification. The Consultant shall substantiate in writing, and to the District's satisfaction, the basis for the single source or restrictive design or specification.

6.4. When one or more brand names or trade names of comparable quality or utility are listed, the words "or approved equal" shall follow the brand name(s) and the salient characteristics shall be identified.

SECTION 7: COMMENCEMENT AND MONTHLY REPORTS

7.1. Notice to Proceed. After execution of this Agreement by the District and the Consultant, the District will issue a written notice to proceed on the Project or specific tasks thereof. Such notices to proceed will be provided for specific tasks identified as necessary to produce specified work products and shall set forth the date of commencement of the work, a description of the work to be performed, the schedule for the work authorized, and the budgets for such tasks. Upon receipt of a notice to proceed, the Consultant shall promptly commence work.

7.2. Monthly Reports. Unless otherwise stated in the Scope of Work, not later than the 10th day of each calendar month during the performance of the Project, the Consultant shall submit to the Project Manager, a monthly report, in a format approved by the Project Manager, sufficient to show the activities completed and the Project progress as measured against the Project Schedule and Exhibit B, Cost Summary. At a minimum the monthly report shall identify work completed, costs incurred, budget status (budget vs. estimated balance to complete), amendments, project schedule, any variance between planned vs. actual project performance, all issues that may result in completion of any task beyond the established schedule or task budget, and all issues that may result in an increase in Total Price.

SECTION 8: COMPENSATION

8.1. Subject to the provisions set forth in this Agreement, the District will pay the **[[[FIRM NAME]]].** for authorized and satisfactorily completed work and services rendered under this Agreement. No more than monthly progress payments shall be full compensation for work performed and services rendered, for all supervision, labor, supplies, materials, equipment or use thereof, taxes, and for all other necessary incidentals, but in no case shall the total progress payment exceed the Total Price as defined herein. The amount to be paid to the Consultant shall be computed as hereinafter set forth; provided, that such payment shall not exceed a maximum amount of **[[[CONTRACT AMOUNT]]]** DOLLARS (**$??????**) ("Total Price"). In the event the Consultant incurs costs in excess of the Total Price, the Consultant shall pay such excess from its own funds and the District shall not be required to pay any part of such excess and the Consultant shall have no claim against the District on account thereof.

8.2. Compensation for work and services shall be on a cost plus fixed fee basis but not to exceed the Total Price. Compensation and the Total Price shall be the sum of Direct Labor Costs, Indirect Costs, a Fixed Professional Fee, and Other Direct Costs as described and defined below. Costs to be paid are identified in the Cost Summary, which

is attached hereto as Exhibit B and incorporated herein by this reference, and comprise the following:

A. **Direct Labor Costs**. Direct Labor Costs shall be the total number of allowable hours worked on the Project by each individual multiplied by the Labor Rate identified in the Costs Summary (Exhibit B) for such individual.

1. A Labor Rate shall not exceed $65.00 per hour, except in exceptional and rare circumstances when the District, in its sole discretion, agrees to pay over $65.00 per hour.

2. The District shall only pay the Labor Rate and shall not pay any premium associated with overtime.

3. The parties agree to the Labor Rates as set forth in Exhibit B, which rates shall be used during the entire term of this Agreement, including all amendments; provided however, Labor Rates may be subject to reasonable adjustments but only in accordance with paragraph 8.4 below.

B. **Indirect Costs**. Indirect Costs shall be calculated as follows:

1. Indirect Costs shall be the Overhead Rate identified in the Cost Summary (Exhibit B) multiplied by the Direct Labor Rates for every allowable hour worked on the Project and billed by the individual.

2. The Consultant agrees to the Overhead Rates as set forth in Exhibit B, which rates shall be used during the term of this Agreement, including all amendments.

C. **Fixed Professional Fee (Profit).** The District shall pay a Professional Fee which shall be calculated as set forth below.

1. The Professional Fee shall be **?.?%**, or otherwise represented as a multiplier of **0.???**, of the total of the Direct Labor Costs plus the Indirect Costs, as identified in the Cost Summary (Exhibit B).

2. The Consultant acknowledges and agrees that the Fixed Professional Fee is only due and payable for Project work for which the District has given notice to proceed and which the Consultant has satisfactorily completed. The Fixed Professional Fee will not be paid for any tasks in the Scope of Work and Cost Summary that the District does not authorize the Consultant to perform. The District is entitled to a deductive amendment for any unperformed tasks.

3. The Consultant acknowledges and agrees that the amount of the Fixed Professional Fee may be adjusted by the District to:

   a. Reduce the Fixed Professional Fee associated with Scope of Work that was not authorized, or was not performed by the Consultant;

   b. Reduce the Fixed Professional Fee associated with deletions in the Scope of Work;

c. Increase the Fixed Professional Fee for additional work included in the Scope of Work through an amendment.

4. The Fixed Professional Fee shall be paid as follows:

a. The Fixed Professional Fee will be paid monthly in proportion to the Project work satisfactorily completed. The proportion of work completed shall be determined by earned value of the Project work satisfactorily completed. The Cost Summary shall identify the Project work for payment of the Fixed Professional Fee.

b. A payment for an individual month shall include that portion of the Fixed Professional Fee allocable to the Project work satisfactorily completed during said month and not previously paid; and

c. Any portion of the Fixed Professional Fee not previously paid in the monthly payments shall be included in the final payment provided that the Consultant satisfactorily completed the entire scope of work subject to the limitations set forth above.

d. The Consultant acknowledges and agrees that the Fixed Professional Fee does not and shall not include any profit or other markup on subconsulting costs or Other Direct Costs.

D. **Other Direct Costs**. Other Direct Costs ("ODC") are those costs which can be specifically identified with the Contract objectives, are required for performance of the Contract, are approved in advance in writing by the Project Manager, and are actually incurred. Markup on ODC's shall be billed at **???% for subconsultants and at fixed rates as listed in Exhibit E – ALLOWABLE ODC'S**.

8.3. Unallowable Costs. The District shall not pay for any costs or direct charges associated with or relating to the following activities:

A. Any resubmission, changes to or adjustments in the invoices, and fixing improper invoices and the preparation and submission of monthly invoices if this cost is not included In the Consultant's overhead.

B. Preparation of, discussion and/or negotiation of a request for adjustments in any Labor Rate, Overhead Rate and/or Labor Escalation percentage; and

C. Changing or reassigning personnel or subconsultants, including but not limited to preparing requests concerning Transfer of Knowledge for Key Personnel. Exception, the District will pay for costs associated with the change or reassignment resulting from a written request from the District requesting the specific personnel or subconsultant change.

D. Preparation of any documentation related to, discussion of, or negotiation of equitable adjustment, disputes, claims or Section 16, Disputes and Remedies.

E. Meals, except when in Travel Status.

8.4. Limitations on Changes to Labor Rates.

A. Any changes Labor Rates shall have no impact on the Total Price.

B. Overhead Rates.

C. The Overhead Rates are identified in the Cost Summary, Exhibit B. The Overhead Rates shall not be subject to modification.

D. Labor Rates

1. The Consultant agrees that all Labor Rates identified in this Agreement (Exhibit B) shall be effective for the entire Contract duration, including all amendments; provided however, Labor Rates may be increased at the sole discretion of the District on an annual basis.

2. A Labor Rate shall not exceed $65.00 per hour except in exceptional and rare circumstances when the District, in its sole discretion, agrees to a Labor Rate over $65.00.

3. Labor rate increases must be based on actual and verifiable increases in labor costs.

4. Should the Consultant seek an adjustment in Labor Rate(s), Consultant must notify the District in writing of its request to modify the existing labor rate. Consultant shall submit only one request per year that must include all individual rate increase requests. This request shall include the amount of the increase in the rate for each rate increase.

E. Other Direct Costs. Other Direct Costs ("ODC") are those costs which can be specifically identified with the Contract objectives, are required for performance of the Contract, are approved in advance in writing by the Project Manager, and are actually incurred. Allowable ODC are as included in Exhibit E to this Contract.

8.5. Approval of Increases by District; Adjustments in Labor Rates, and the amount of any rate increase require the approval of the Project Manager. The Consultant shall provide additional information as requested by the District. The District shall review the Consultant's request for a rate increase and respond in writing to the request within sixty (60) calendar days of receipt of such request.

8.6. Effective Period. Any change to the Labor shall not be effective until the date the Project Manager approves, in writing, the increase. Labor rates shall not be retroactive. Only services performed after the date the Project Representative approves the rate increase shall be billed at the new labor Rate. The written approval is considered a part of the Contract documents and shall be incorporated into the Contract in the next amendment.

8.7. Invoice Process. The Consultant shall submit to the Project Manager an invoice for payment for Project work completed to the end of the previous month. Such invoices shall be for work performed subsequent to that work covered by all previously submitted

invoices and shall be computed pursuant to the rates and limitations set forth hereinabove.

A. Invoices shall detail the work by task, hours and employee name and level for which payment is being requested; include copies of all invoices from authorized subconsultants for which payment is being requested; and shall itemize, and include copies of, receipts and invoices for the Other Direct Costs.

B. At no time shall the total cumulative amounts paid for Project work exceed the total which would be due upon the completion of all Project work multiplied by the percentage of the required work satisfactorily completed, as determined by the District.

C. In the event of a disputed invoice, the District shall pay the undisputed amounts and withhold from payment the disputed portion of the invoice.

8.8. Prompt Payment of Subconsultants. Within ten (10) business calendar days of receipt of a progress payment from the District that includes dollars for work performed by subconsultants, Consultant shall pay such subconsultants out of such amounts as are paid by the District, for all work satisfactorily completed by the subconsultant.

8.9. Final Payment. Final payment of any balance earned by and payment to the Consultant for Project work will be made within sixty (60) calendar days after all of the following:

A. Satisfactory completion of all work required by this Agreement;

B. Receipt by the District of the plans, studies, surveys, photographs, maps, calculations, notes, reports and all other documents and/or deliverables which are required to be prepared and submitted by the Consultant under this Agreement;

C. Delivery of all equipment/materials purchased specifically for the Project where the District has reimbursed the Consultant for such costs;

D. Receipt by the District of a fully executed final statement of amounts Invoiced by and paid to each subconsultant under this Agreement; and,

E. Execution and delivery by the Consultant of a release of all claims against the District arising under or by virtue of this Agreement, other than such claims, if any, as may be specifically exempted by the Consultant from the operation of the release in stated amounts to be set forth therein.

F. No payment, whether monthly or final, to the Consultant for any Project work shall constitute a waiver or release by the District of any claims, right or remedy it may have against the Consultant under this Agreement or by law; nor shall such payment constitute a waiver, remission or discharge by the District of any failure or fault of the Consultant to satisfactorily perform the Project work as required under this Agreement.

SECTION 9: TERMINATION OF AGREEMENT

9.1. Termination for Default

A. The District may terminate this Agreement, in whole or in part, in writing if the Consultant substantially fails to fulfill any or all of its material obligations under this Agreement through no fault of the District.

B. If the District terminates all or part of this Contract for default, the District shall determine the amount of work satisfactorily performed to the date of termination and the amount owing to the Consultant using the criteria set forth below; provided, that (a) no amount shall be allowed for anticipated profit on unperformed services or other work and (b) any payment due to the Consultant at the time of termination may be adjusted to the extent of any additional costs the District incurs because of the Consultant's default. In such event, the District shall consider the actual costs incurred by the Consultant in performing the Project work to the date of termination, the amount of work originally required which was satisfactorily completed to the date of termination, whether that work is in a form or of a type which is usable and suitable to the District at the date of termination, the cost to the District of completing the work itself or of employing another firm to complete it and the inconvenience and time which may be required to do so, and other factors which affect the value to the District of the Project work performed to the date of termination. Under no circumstances shall payments made under this provision exceed the Total Price set forth in this Agreement. This provision shall not preclude the District from filing claims and/or commencing litigation to secure compensation for damages incurred beyond that covered by withheld payments.

C. Upon receipt of a termination notice the Consultant shall at no additional cost to the District:

1. Promptly discontinue all services affected (unless the notice directs otherwise);

2. Terminate all subcontracts to the extent they relate to the work terminated; and

3. No later than thirty (30) calendar days after receipt of termination, promptly deliver or otherwise make available to the District all data, drawings, electronic drawing files, specifications, calculations, reports, estimates, summaries, Official Project Documentation and other Project documentation, such other information and materials as the Consultant or subconsultants may have accumulated in performing this Agreement, whether completed or in progress and all equipment/materials purchased specifically for the Project where the District has paid the Consultant for such items.

D. Termination for Convenience.

1. The District may terminate this Agreement, in whole or in part, for the convenience of the District. The District shall terminate by delivery to the Consultant a Notice of Termination specifying the extent of the termination and the effective date.

2. If the District terminates this Contract for convenience, the District shall pay the Consultant only for the following items:

   a. An amount for Direct Labor Costs and Indirect Costs in accordance with the Contract and Exhibit B for services satisfactorily performed to the date of termination;

   b. Actual and reasonable Other Direct Costs incurred before the termination; and

   c. Actual and Reasonable termination settlement costs the Consultant reasonably incurs relating to commitments which had become firm before the termination, unless the District determines to assume said commitments. Reasonable termination settlement costs include settlement costs for subconsultants and actual reasonable accounting and clerical costs related to preparing Termination Settlement Proposal.

3. Upon receipt of a termination notice the Consultant shall at no additional cost to the District:

   a. Promptly discontinue all services affected (unless the notice directs otherwise);

   b. Terminate all subcontracts to the extent they relate to the work terminated;

   c. No later than thirty (30) calendar days after receipt of termination, promptly deliver or otherwise make available to the District all data, drawings, specifications, calculations, reports, estimates, summaries, Official Project Documentation, other Project documentation, and such other information and materials as the Consultant may have accumulated in performing this Agreement, whether completed or in progress and all equipment/materials purchased specifically for the Project where the District has reimbursed the Consultant for such costs;

   d. Take any action necessary, or that the District may direct, for the protection and preservation of property related to this Agreement that is in the possession of the Consultant and in which the District has or may acquire an interest.

SECTION 10: OWNERSHIP AND USE OF DOCUMENTS

10.1. Reports, studies, drawings, specifications, calculations or other information developed under the terms of this Agreement shall become the property of the District after full payment to Consultant for their preparation. Any reuse of drawings/plans, specifications and/or calculations for another project without written verification or adaptation by Consultant will be at the District's sole risk and without liability or legal exposure to Consultant. District shall defend, indemnify and hold Consultant harmless from all claims, damages, losses, and expenses, including attorney's fees, arising out of or resulting therefor. The District further acknowledges that it may receive certain materials from Consultant by way of electronic file and agrees that should it modify such materials

in connection with their subsequent use, that Consultant shall bear no responsibility for the contents thereof.

SECTION 11: THIRD-PARTY CLAIMS AND DISPUTES

11.1. At the District's request, Consultant will assist the District in review and evaluation claims and disputes, preparing information for the District's legal counsel, providing services as witness in litigation or arbitration to which the District is a party and providing other services in connection with actual or potential claims or disputes arising out of the work, regardless of whether or not consultant is named in such legal action. The parties shall cooperate to agree on the compensation for such services. If Consultant is determined to be responsible for the claim, dispute or litigation due to its negligence or breach of the contract herein, it shall remit back to the District the amounts paid under this section to the extent of such negligence or breach.

SECTION 12: AUDIT AND ACCESS TO RECORDS

12.1. The Consultant, including its subconsultants, shall maintain books, records, documents, and other evidence directly pertinent to performance of the work under this Agreement in accordance with generally accepted accounting principles and practices consistently applied. The District, or any of its duly authorized representatives, shall, for the purpose of audit and examination, have access to and be permitted to inspect such books, records, documents, and other evidence for inspection, audit and copying for a period of six years after completion of the Project. The District shall also have access to such books, overhead data, records and documents during the performance of Project work if deemed necessary by the District to verify work performed and Invoices, to assist in negotiations for amendments to the Agreement or modifications to tasks, and to resolve claims and disputes.

12.2. Audits conducted under this Section shall be in accordance with generally accepted auditing standards and established procedures and guidelines of the reviewing or audit agency(ies).

SECTION 13: LEGAL RELATIONS

13.1. The Consultant shall comply, and shall ensure its subconsultants comply, with all the terms of this Agreement and the District resolutions and federal, state and local laws, regulations and ordinances applicable to the work and services to be performed under this Agreement.

13.2. In performing work and services hereunder, the Consultant and its subconsultants, employees, agents and representatives shall be acting as independent contractors and shall not be deemed or construed to be employees or agents of the District in any manner whatsoever. The Consultant shall not hold itself out as, nor claim to be, an officer or employee of the District by reason hereof and will not make any claim, demand or application to or for any right or privilege applicable to an officer or employee of the District. The Consultant shall be solely responsible for any claims/costs and/or losses arising from the Consultant's failure to pay wages, compensation, benefits or taxes and/or pay for services, supplies and/or materials provided by Consultant employees, agents and representatives, including subconsultants, and will protect, defend, indemnify and hold the District harmless there from.

13.3. To the maximum extent permitted by law, the Consultant agrees to indemnify and save harmless the District, its officers, agents and employees, from and against any and all suits, claims, actions, losses, costs, reasonable attorney fees and expenses, penalties, judgments, settlements and damages of whatsoever kind or nature arising out of, in connection with, or incident to errors or omissions in the performance of contractual obligations, and/or the negligent performance of work or services provided by or on behalf of the Consultant, except to the extent caused by the negligence of the District. The Consultant's Indemnity obligation includes an obligation to (a) satisfy any judgment or other final decision of a court or other tribunal; (b) pay any reasonable settlement negotiated by the District with respect to claims that are within the scope of the indemnity obligation; and (c) pay all claims against the District by an employee or former employee of the Consultant or its subconsultants, and for this purpose, by mutual negotiation, the Consultant expressly waives, as respects the District only, all Immunity and limitation on liability under any industrial insurance act, including Title 51 RCW, other worker's compensation act, disability benefit act, or other employee benefit act of any jurisdiction which would otherwise be applicable in the case of such claim, The Consultant further agrees to defend all claims against the District and its officers, agents, and employees which, if proven, could result in liability of the District, its officers, agents, or employees for loss or damage caused by any such errors, omissions, or negligent work or services performed by the Consultant. The Consultant's obligation to defend shall include timely payment of all reasonable attorney fees, costs and expenses incurred in the defense of such claims. In the event of litigation between the parties to enforce the rights under this paragraph, reasonable attorney fees and expenses shall be allowed to the prevailing party.

13.4. The District's rights and remedies in this Agreement are in addition to any other rights and remedies provided by law.

13.5. The indemnification, protection, defense and save harmless obligations contained herein shall survive the expiration, abandonment or termination of this Agreement.

SECTION 14: INSURANCE

14.1. Prior to execution of the Agreement, the Consultant shall file with the District certificates of insurance and endorsements from the insurer(s) certifying to the coverage of all insurance required herein. All evidences of insurance must be certified by a properly authorized officer, agent, general agent or qualified representative of the insurer(s) and shall certify the name of the insured, the type and amount of insurance, the location and operations to which the insurance applies, the expiration date, and provides that the District receives notice at least thirty (30) calendar days prior to the effective date of any policy limit or cancellation of required coverages. The Consultant shall notify the District at least thirty (30) calendar days prior to the effective date of any cancellation or reduction in coverage in the policy. Documentation of coverage shall be provided on each insurance renewal date. The Consultant shall, upon demand of The District, make available to The District at Consultant's local office in The District all such policies of insurance and the receipts of payment of premiums thereon. Failure to provide such policies of insurance within a time acceptable to The District shall entitle The District to suspend or terminate the Consultant's work hereunder, Suspension or termination of this Agreement shall not relieve the Consultant from its insurance obligation hereunder.

14.2. The Consultant shall obtain and maintain at a minimum the limits of insurance set forth below. By requiring such minimum insurance, the District shall not be deemed or construed to have assessed the risks that may be applicable to the Consultant under this Agreement. The Consultant shall assess its own risks and, if it deems appropriate and/or prudent, maintain greater limits and/or broader coverage.

14.3. Each insurance policy shall be written on an "occurrence" form; excepting that insurance for professional liability, errors and omissions when required, is acceptable on a "claims made" form.

14.4. If coverage is approved and purchased on a "claims made" basis, the Consultant shall continue coverage either through (1) policy renewals for not less than seven years from the date of completion of the work which is the subject of this Agreement or (2) the purchase of an extended discovery period for not less than seven years from the date of completion of the work which is the subject of this Agreement, if such extended coverage is available.

14.5. If, in order to meet the requirements of this Section, the Consultant must rely on the insurance to be provided by one or more subconsultant, then such subconsultant(s) shall be required to meet all of the requirements herein applicable to the insurance they are providing, and shall include District and Consultant as additional insureds on all liability policies except Professional Liability/Errors & Omissions and Workers Compensation. The District will not make any payments on work performed by subconsultants until all insurance documentation from such subconsultants has been received and accepted by the District.

14.6. Provided the affected insurance policies permit the following waiver, without voiding coverage, Consultant and District waive all rights against each other to subrogation for damages covered by property insurance.

14.7. The Consultant shall maintain limits no less than, for:

A. General Liability. $1,000,000 combined single limit per occurrence for bodily injury, personal injury and property damage, and for those policies with aggregate limits, a $1,000,000 aggregate limit. Coverage shall be at least as broad as Insurance Services Office form number (CG 00 01) covering COMMERCIAL GENERAL LIABILITY.

B. Professional Liability Errors and Omissions. $2,000,000 per claim and in the aggregate.

C. Automobile Liability. $1,000,000 combined single limit per accident for bodily injury and property damage. Coverage shall be at least as broad as Insurance Services Office form number (CA 00 01) covering BUSINESS AUTO COVERAGE, symbol 1 "any auto"; or the combination of symbols 2, 8, and 9.

D. Workers' Compensation. Statutory requirements of the State of residency. Coverage shall be at least as broad as Workers' Compensation coverage, as required by the Industrial Insurance Act of the State of Washington, as well as any similar coverage required for this work by applicable Federal or "other States" State Law.

E. Employer's Liability or "Stop Gap". Coverage shall be at least as broad as the protection provided by the Workers Compensation policy Part 2 (Employers Liability) or, in states with monopolistic state funds, the protection provided by the "Stop Gap" endorsement to the general liability policy.

14.8. Any deductibles or self-insured retentions must be declared to, and approved by, the District. The deductible and/or self-insured retention of the policies shall not limit or apply to the Consultant's liability to the District and shall be the sole responsibility of the Consultant.

14.9. The insurance policies required in this Agreement are to contain, or be endorsed to contain the following provisions:

A. Liability Policies except Professional Liability & Errors and Omissions and Workers Compensation:

1. The District, its officers, officials, employees and agents are to be covered as additional insured as respects liability arising out of activities performed by or on behalf of the Consultant in connection with this Agreement. Such additional insured status shall include Products-Completed Operations.
2. To the extent of the Consultant's negligence, the Consultant's insurance coverage shall be primary insurance as respects the District, its officers, officials, employees and agents. Any insurance and/or self-insurance maintained by the District, its officers, officials, employees or agents shall not contribute with the Consultant's insurance or benefit the Consultant in any way.

3. The Consultant's insurance shall apply separately to each insured against whom a claim is made and/or lawsuit is brought, except with respect to the limits of the insurer's liability.

4. The Consultant's Protection and Indemnity (to include Jones Act) policy shall waive rights of subrogation against the District.

14.10. If at any time of the foregoing policies shall fail to meet the minimum standards above, the Consultant shall, upon notice to that effect from the District, promptly obtain a new policy, and shall submit the same to the District, with the appropriate certificates and endorsements, for approval.

SECTION 15: DISPUTES AND REMEDIES

15.1. Choice of Law. This Agreement and all provisions hereof shall be interpreted in accordance with the laws of the State of Washington in effect on the Effective Date.

15.2. General Manager Review. All claims, counter-claims, disputes and other matters in question between the District and the Consultant arising out of or relating to this Agreement or the breach of it shall be referred to the General Manager or a designee for determination, together with all facts, data, contentions and so forth which relate thereto. The General Manager shall make a determination within thirty (30) calendar days of such referral.

15.3. Mediation and Arbitration. The parties will first attempt to mediate any dispute arising under or in connection with this Agreement, in accordance with the provisions of the Washington Uniform Mediation Act, Ch. 7.07 RCW. In the event such mediation is unsuccessful, any such dispute will be settled by arbitration as set forth in this Section 15.3. No legal right of action may arise out of any such dispute until arbitration has been completed. Each party, however, will have full access to the courts to compel compliance with these arbitration provisions, to enforce an arbitration award or to seek injunctive relief, whether or not arbitration is available or under way. The arbitration will take place as follows:

A. Notice. The party demanding arbitration must give the other parties a written notice. The written notice must contain, in addition to the demand for arbitration, a clear statement of the issue or issues to be resolved by arbitration, an appropriate reference to the provision of the Agreement which is involved, the relief the party requests through arbitration, and the name and address of the arbitrator requested by the demanding party.

B. Response. The party receiving the notice of the demand for arbitration must provide a written response to the demand within fifteen (15) days following receipt of the notice. The response must contain a clear statement of the respondent's position concerning the issue or issues in dispute and the name and address of the arbitrator it selects as the arbitrator to hear the dispute. If the parties fail to agree upon an arbitrator within five (5) days following the time allowed for this response to the demand for arbitration, the demanding party may apply to the presiding department of the Superior Court for Whatcom County, Washington to designate the arbitrator.

C. Arbitration. The arbitrator will meet in Bellingham, Washington, within twenty (20) days after the selection of the arbitrator and will allow each party an opportunity to submit oral and written evidence and argument concerning the issue in dispute. The arbitrator may resolve only the question or questions submitted to arbitration and must include as part of his consideration a full review of the Agreement and all material incorporated in the Agreement by reference.

D. Decision. The decision of the arbitrator will be final and will bind the parties.

E. Consent to Change. By consent of all parties to any dispute under this Agreement, the method of selection of an arbitrator or arbitrators, or even the arbitrator(s) selected, may be changed at any time.

F. Payment of Costs. Subject to the provisions of Section 13.3, in any arbitration, each party will pay its own costs, witness fees and attorneys' fees. The fees charged by the arbitrator and the costs of the proceeding shall be borne equally.

G. State Law. Except to the extent inconsistent with the terms of this Agreement, the terms and provisions of Chapter 7.04A RCW are incorporated in and made a part of this Agreement.

15.4. Exhaustion of Administrative Remedies. Referral to and determination by the General Manager or a designee and mediation and arbitration shall be a condition precedent to the commencement of a civil action to adjudicate such dispute.

15.5. Jurisdiction & Venue. Subject to these provisions herein, the Superior Court of Whatcom County, Washington, shall have exclusive jurisdiction and venue over any legal action arising under this Agreement and the laws of the state of Washington shall apply.

SECTION 16: NOTICE

16.1. Any notice required to be given under the terms of this Agreement shall be in writing and directed to the party at the address set forth below. Notice shall be considered issued and effective upon receipt thereof by the addressee-party. Facsimile notice shall be considered effective with proof of confirmation that the addressee has received the facsimile. Such proof would be a confirmation sheet evidencing such receipt at the fax number listed below.

[[[NAME OF FIRM]]]	Lake Whatcom Water and Sewer District
Attn: ?????????	Attn: Justin Clary PE, General Manager
[[[ADDRESS]]]	1220 Lakeway Drive
	Bellingham, WA 98229
Fax No.: ??????????	Fax No.: 360-738-8250
Phone: ??????????	Phone: 360-734-9224

SECTION 17: ENTIRETY, AMENDMENT AND EXECUTION OF AGREEMENT

17.1. This Agreement merges and supersedes all prior negotiations, representations and agreements between the Parties relating to the subject matter hereof and constitutes the entire agreement between the Parties.

17.2. The Contract documents included in the Agreement are identified below. Any inconsistency or conflict between the Contract documents shall be resolved by giving precedence in the following descending order of importance:

A. Agreement for Professional Services for **GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES**, as modified by the latest amendment;
B. Exhibit A, Scope of Work, as modified by the latest amendment;
C. Exhibit B, Cost Summary, as modified by the latest amendment;
D. Exhibit C, Project Schedule, as modified by the latest amendment;
E. Exhibit D, Insurance;
F. Exhibit E, Allowable ODC's;
G. Exhibit F, Key Personnel List; and
H. Other

17.3. This Agreement shall be executed in two (2) counterpart copies, any of which shall be considered for all purposes as the original.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their respective authorized officers or representatives as of the day and year written below.

Lake Whatcom Water and Sewer District	Consultant
By:_____ (Justin Clary, General Manager)	By:_____ Printed Name:_____ Title:_____
Dated:_____	Dated:_____

APPROVED AS TO FORM:

By:_____
(Robert Carmichael, Attorney for Lake Whatcom Water and Sewer District)

Dated: _____

EXHIBIT A

SCOPE OF SERVICES
Lake Whatcom Water and Sewer District
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

Funding for this project is through a FEMA Hazard Mitigation Grant. The Consultant and its subconsultants agree to include clauses and conditions in the contract scope of work as required by the FEMA Hazard Mitigation Grant.

A1. Project Management

1. Organize, manage, and coordinate the disciplines required to accomplish the services required for this project. Perform quality assurance/quality control of all final documents. Maintain and enforce the project schedule and budget. Consultant will provide backup documentation of work products as appropriate to adequately record the Consultant's work, including assumptions made, regulation interpretations, methodology used, calculations, rationale supporting recommendations, and meeting or conversation records. Standards for the design deliverables will be provided to the selected consultant during negotiations.

A2. Permitting

The Consultant shall:

1. Identify all temporary and permanent permits for required construction,
2. Prepare permit applications,
3. Schedule and conduct meetings with permitting agencies, and
4. Assist District with discussions and negotiations with permitting agencies.

A3. Design and Bidding

The Consultant shall:

1. Develop the design into detailed construction contract documents consisting of plans, specifications, and engineer's cost estimate.
2. The Consultant shall maintain a Plan Holder's List,
3. Conduct a pre-bid conference,
4. Respond to bidder inquiries,
5. Prepare and distribute addenda, and
6. Attend bid opening.

A4. Services During Construction

The Consultant shall fully perform or assist with:

1. Construction support services including providing an experienced and qualified project representative to monitor the on-site progress and quality of the executed work,
2. Attend progress meetings,
3. Prepare agenda and meeting notes,
4. Review contractor submittals and shop drawings for conformance to the contract documents,
5. Review and respond to contractor's requests for information and issue design clarifications as necessary,
6. Prepare change orders,
7. Review and approve contractor's payment requests,
8. Coordinate and evaluate specialized testing,
9. Prepare record drawings, and
10. Prepare project close-out documentation.

EXHIBIT B

BILLING RATES
Lake Whatcom Water and Sewer District
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

All work shall be billed per the attached Billing Rate schedule.

EXHIBIT C

PROJECT SCHEDULE
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

Project Schedule

Permitting and Design	Completion by December 31, 2024
Bidding	Completion by March 1, 2025
Services During Construction	Completion by December 31, 2025

EXHIBIT D

INSURANCE
Lake Whatcom Water and Sewer District
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

[Attach Insurance Certificate and Endorsements]

EXHIBIT E

ALLOWABLE OTHER DIRECT COSTS (ODC's)
Lake Whatcom Water and Sewer District
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

Allowable ODC's include Subconsultants and Reimbursables as listed in Exhibit B – Billing Rates:

Subconsultants:

- List Subconsultants.

Reimbursables:

- Publication charges
- Project application fees, project permit fees
- Reproduction of drawings and construction documents
- Direct expenses for travel, meal and lodging outside of Whatcom and Skagit Counties
- Mileage at project-current IRS mileage rates
- Specialized equipment rental, at rental rate

EXHIBIT F

KEY PERSONNEL LIST
Lake Whatcom Water and Sewer District
GENEVA RESERVOIR AND SVWTP PUMP HOUSE SEISMIC UPGRADES

Key Personnel List

- Name?
- Name?
- Name?
- Name?

GENEVA RESERVOIR AND SVWTP
PUMP HOUSE SEISMIC UPGRADES
ATTACHMENT A
PROJECT INFORMATION

Lake Whatcom Water and Sewer District
Reservoir Seismic Vulnerability Assessment
Technical Report

November 2016

BHC Consultants, LLC
1601 Fifth Ave. Suite 500
Seattle, WA 98101
(206) 505-3400
www.bhcconsultants.com

5. Summary of Findings – Structural

5.1 Geneva Reservoir

5.1.1 Record Information

The Geneva Reservoir was constructed by Reliable Steel Fabricators (no longer in business) of Olympia, WA in 1979. Original design and shop drawings were provided by the District, along with a December 13, 2012 investigation report by Wilson Engineering of Bellingham, WA and a cleaning and inspection report and video by H2O Solutions dated July 9, 2012. In addition, a soils report by Anvil Corporation dated March 1979 was available. Design drawings and specifications dated May 1979 by Yoshida, Inc. of Seattle, WA were available, as well as shop drawings by Reliable Steel dated May 24, 1979 (see Figures 1 and 2). The shop drawings indicate design in accordance with AWWA D100-84, Seismic Zone 3.

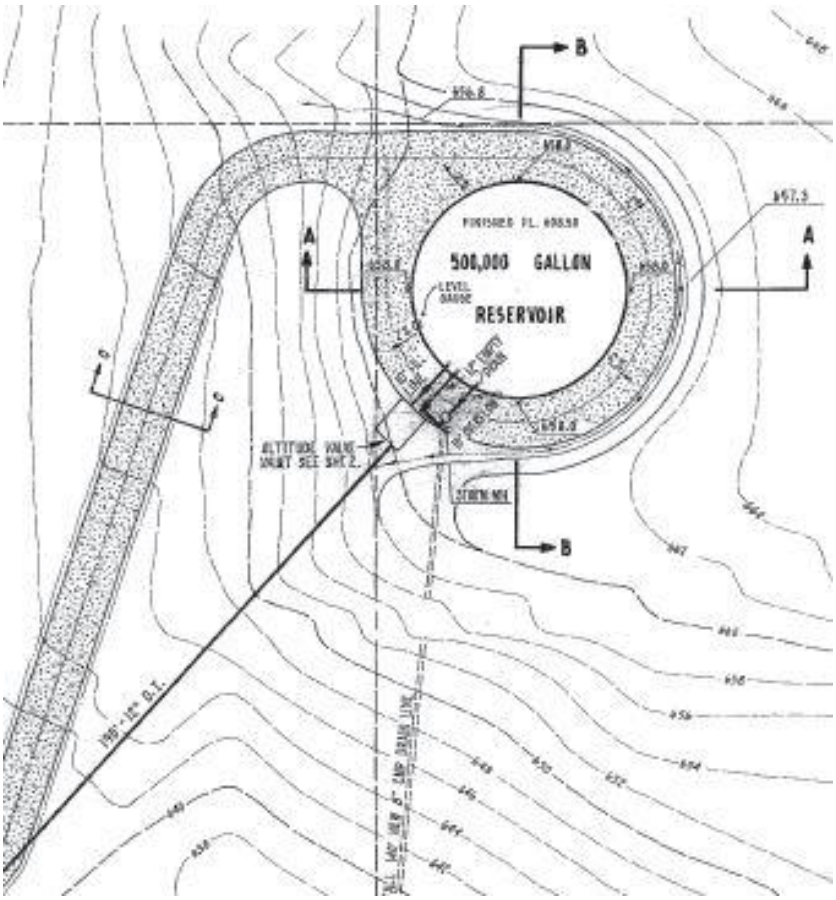


Figure 1 Site Plan from Original Design Drawings

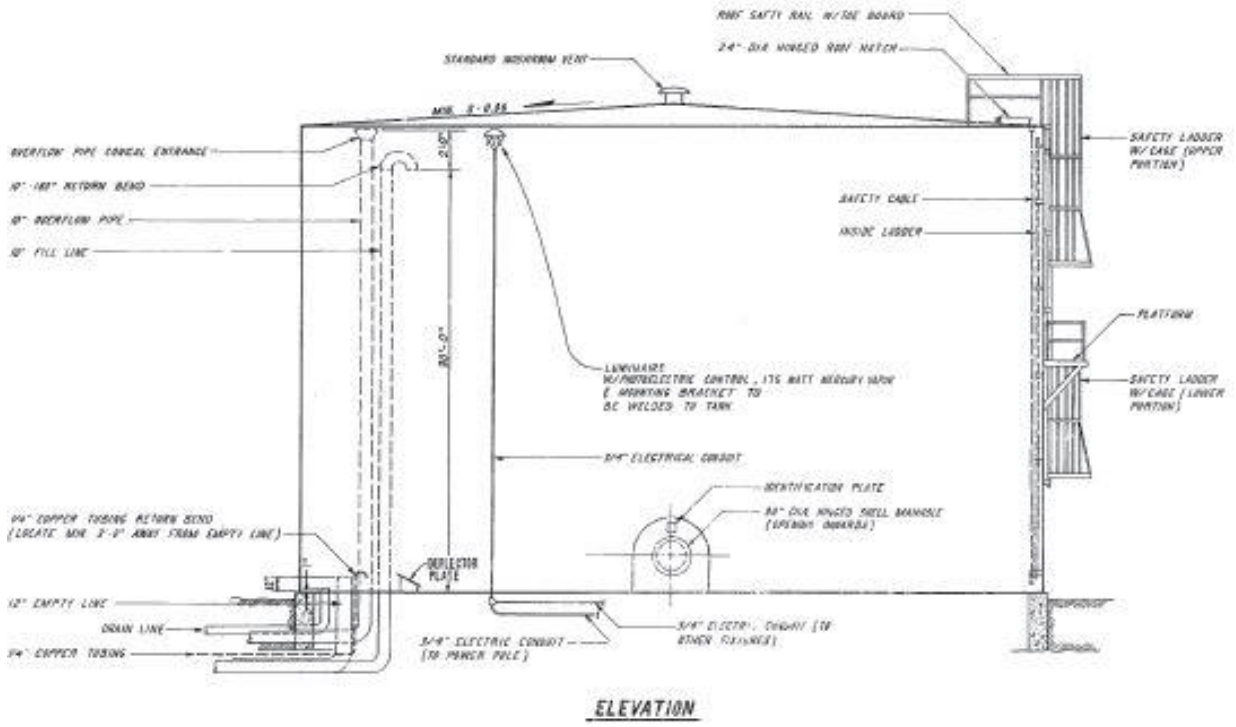
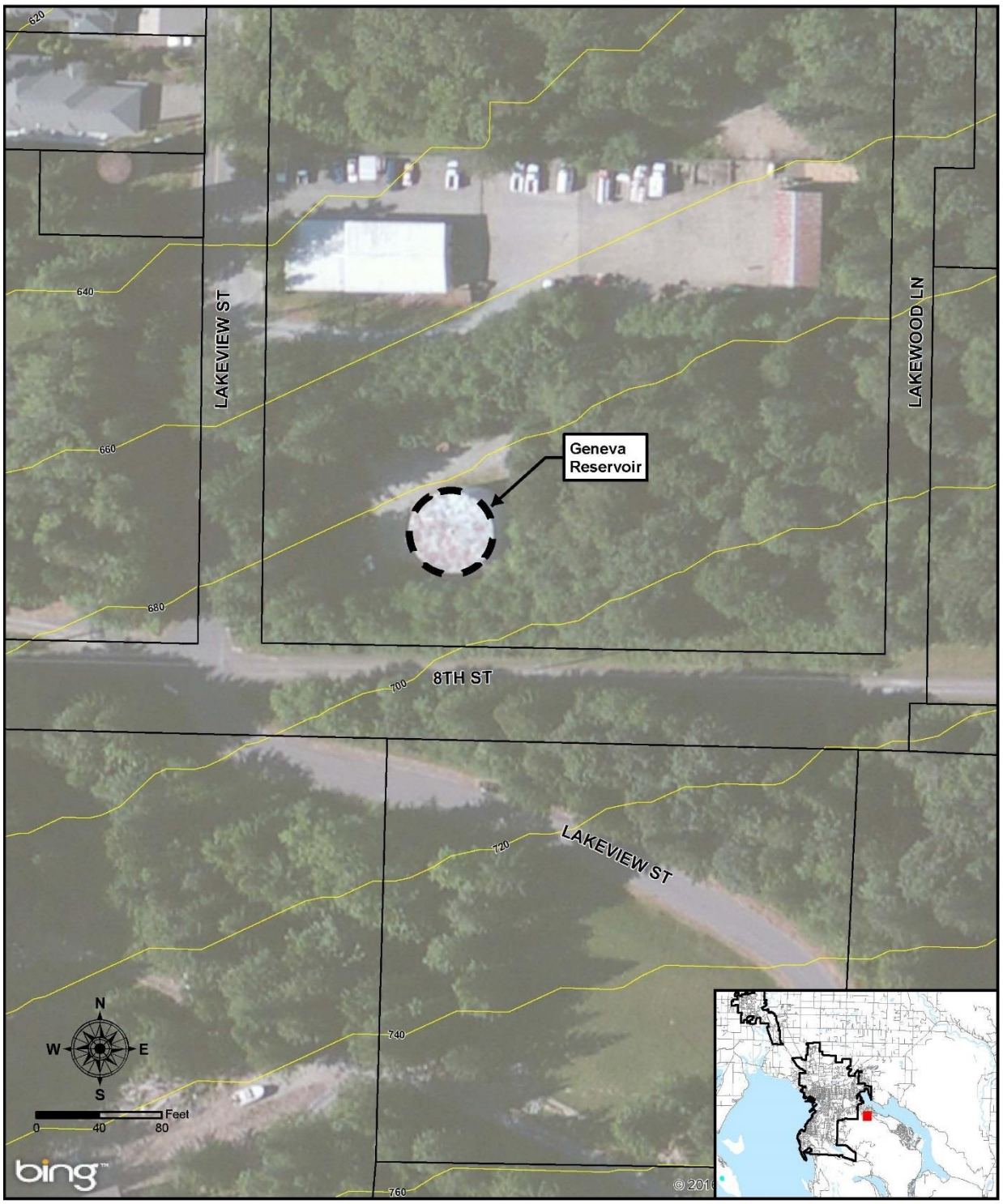


Figure 2 Elevation View from Original Design Drawings

The reservoir has a mildly sloped cone roof, supported by 27 channel-shaped rafters which span from the shell to a steel center column. The Wilson report noted a few bolts were missing at rafter connections, but the missing bolts did not appear to be critical. A site location map for the Geneva Reservoir is provided in Figure 3.



GIS Data: Whatcom County GIS.
This map is a geographic representation based on information available. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101
206.505.3400
206.505.3406 (fax)
www.bhcconsultants.com

GENEVA RESERVOIR
Lake Whatcom Reservoir Seismic Vulnerability
Lake Whatcom Water & Sewer District
November 2016

Figure **3**

Figure 3 Geneva Reservoir

5.1.2 BHC Field Observations

General condition, appurtenances, and site conditions appeared consistent with record information. The tank has a single 30 inch diameter shell manhole, and a 2 feet square roof hatch with partial roof railing. The roof is accessed by caged exterior ladder and an un-caged interior ladder (see Figure 4).

Figure 4 Geneva Reservoir, September 1, 2015

Water level at the time of examination on July 15, 2015 was 31.3 feet. BHC measured the tank diameter and height, and the height and metal thickness of shell courses, floor, and roof plates. Metal thickness for the shell and roof was measured using a Cygnus 6 Plus Ultrasonic Thickness Gauge. Other dimensions were measured using a steel tape. Record metal thicknesses and measurements are shown in Table 3 below. For analysis, thicknesses were rounded to the nearest 1/32 inch.

Table 3 – Metal Thicknesses – Geneva Reservoir							
Item	**Distance from Top of Floor Plate to Top of Shell Course (ft)**		**Metal Thickness (in)**				
	Record	**Measured By Tape**	**Record**	**Measured By Tape**	**Measured Using UT Gauge**	**Average**	**Used for Analysis**
Roof Plate	N/A		3/16	N/A	0.120, 0.120. 0.120	0.120	3/16
Shell Course 4 (highest)	32.67	32.67	1/4	N/A	0.245,0.245	0.245	1/4
Shell Course 3	24.52	24.52	1/4	N/A	0.230, 0.230	0.230	1/4
Shell Course 2	16.34	16.34	9/32	N/A	0.265,0.265	0.265	9/32
Shell Course 1 (lowest)	8.17	8.17	11/32	N/A	0.35, 0.345,0.345	0.35	11/32
Floor Plate	N/A		1/4	1/4	N/A	1/4	1/4

The measured diameter of the tank is 52 feet, and the shell height is 32 feet 8 inches. The overflow elevation (record) is 32 feet above the floor, for a top capacity of 519,206 gallons compared to a nominal capacity of 500,000 gallons. The tank is held down by 12 steel plate anchors embedded in a concrete ringwall foundation. The ringwall record dimensions are 18 inches wide by 36 inches high. The observed configuration and spacing of the anchors was consistent with the record drawings. Grade was approximately 7 inches below the top of the ringwall. Photos from the site visit are shown in Figures 5 and 6.

Anchored tanks are required by AWWA D100 to have a grout layer between the floor plate and the ringwall at the shell; however, no grout was observed.

Figure 5 Geneva Reservoir at Shell to Foundation Interface

Figure 6 Roof at Entry Hatch

The interior was observed from the roof hatch and photographed without entering. Framing conditions appeared consistent with record information.

5.1.3 Summary of Findings – Structural

Table 4 compares the results of the seismic analysis to standards in AWWA D100-11. Supporting calculations for these ratios are provided in Appendix B.1. The recommended allowable forces do not represent failure loads, but have a liberal safety factor. Anytime the ratio of actual to allowable exceeds about two, however, the demand is approaching ultimate capacity and should be a cause for concern. When comparisons are made on an ultimate strength basis, the safety limit has been reached when the ratio of factored loads to allowable strength is less than 1.0.

Because the predicted sloshing wave will contact the tank roof, the seismic load is considerably increased compared to a tank with adequate freeboard.

Table 4 – Seismic Load vs AWWA D100 Allowable – Geneva Reservoir

	Analysis	AWWA Requirement	Result
Sloshing Wave			
First Mode Amplitude	3.60 ft.	N/A	
Freeboard at Maximum Operating Level (MOL)	1.17 ft.	N/A	
Wave contacts roof	Yes	No	
Ratio of Wave Height to Wave Freeboard	3.13	≤1.00	No Good

Table 4 – Seismic Load vs AWWA D100 Allowable – Geneva Reservoir			
	Analysis	**AWWA Requirement**	**Result**
Seismic Load Increase Due to Sloshing Wave Roof Contact			
Base Shear Without Roof Contact	727 kip	N/A	
Base Shear With Roof Contact	913 kip	N/A	
Increase Due to Roof Contact	+26%	N/A	
Overturning Without Roof Contact	9,207 kip-ft.	N/A	
Overturning With Roof Contact	11,229 kip-ft.	N/A	
Increase Due to Roof Contact	+22%	N/A	
Sloshing Force on Roof-Shell Joint	1,201 plf	N/A	
Shell Static Stress			
Maximum hoop tensile stress/allowable ratio	1.05 at base. 1.02 at bottom of second course	1.0	Say OK See Item 1 in Seismic Evaluation Summary below
Shell Seismic Stress			
Maximum hoop tensile stress/allowable Ratio	1.36	≤ 1.33	Say OK See Item 1 in Seismic Evaluation Summary below
Maximum longitudinal compressive stress/allowable Ratio	0.67	≤ 1.33	OK
Maximum longitudinal tensile stress/allowable ratio	0.15	≤ 1.33	OK
Maximum shear stress/allowable at shell to floor connection	0.24	≤ 1.33	OK
Anchors			
Anchor spacing	12.5 ft.	≤ 10 ft.	No Good
Predicted/Allowable Stress Ratio (anchor top plate)	9.61	≤ 1.33	No Good
Predicted/Allowable Stress Ratio (anchor embedded plate)	6.40	≤ 1.33	No Good
Predicted/Allowable Stress Ratio (anchor weld at shell)	7.15	≤ 1.33	No Good
Predicted/Allowable Stress Ratio (anchor splice weld))	5.36	≤ 1.33	No Good
Bond Stress/Allowable Stress (embedded plate)	7.27	≤ 1.33	No Good
Foundation			
Overturning safety factor	0.92	≥ 1.67	No Good
Uplift safety factor	0.24	≥ 1.0	No Good, Uplift occurs

Table 4 – Seismic Load vs AWWA D100 Allowable – Geneva Reservoir			
	Analysis	**AWWA Requirement**	**Result**
Base shear/friction resistance at floor level	0.24	≤ 1.33	OK
Bearing pressure/allowable	2.44	≤1.33	No Good
Check Stability As Unanchored Tank			
Stability ratio, J	9.45	≤1.54	Unstable

5.1.4 Seismic Evaluation Summary

1. The static hoop stress at the base of the shell is overstated because the calculations typically ignore the restraint provided by the floor plate. The static hoop stress at the base of the second shell course is within 2 percent of allowable. Consider all shell plates adequate for static as well as seismic hoop and compression stresses.
2. Anchors are inadequate. If anchors fail, the tank would behave as if unanchored but the tank does not have the required stability without anchors and could fail catastrophically.
3. The existing ringwall does not provide enough weight to prevent uplift by a wide margin, even assuming it could be adequately anchored. This means that much of the ringwall will be subject to bending and torsional forces for which it was not designed, and the bottom of the tank could pull apart from the shell, with catastrophic failure.
4. The safety factor against overturning is insufficient.

5.2 Division 22 Reservoir

5.2.1 Record Information

The Division 22 Reservoir was constructed by Union Tank Company (no longer in business) of Seattle, WA in 1971. The nameplate indicates the use of the AWWA D100 standard. Original design drawings were prepared by Horton Dennis Engineers and were provided to BHC by the District, along with a cleaning and inspection report and video by H2O Solutions dated July 12, 2012 (see Figures 7 through 9). The Division 22 Reservoir design drawing provided basic dimensional data for the Division 7 and 30 Reservoirs on the same sheet. An original soils report by Dames and Moore was referenced but the report was unavailable.

A new reservoir near the existing one has been proposed with a capacity of 630,000 gallons. A recent soils report for this companion reservoir was prepared by PanGeo in December 2014 and recommended the use of Site Class C for design purposes. A site location map for the Division 22 Reservoir is provided in Figure 10.

LAKE WHATCOM WATER AND SEWER DISTRICT

WHATCOM COUNTY **WASHINGTON**

SUDDEN VALLEY WATER TREATMENT PLANT ASSESSMENT REPORT

G&O #20434
JULY 2020

Gray & Osborne, Inc.
CONSULTING ENGINEERS

LAKE WHATCOM WATER AND SEWER DISTRICT

WHATCOM COUNTY **WASHINGTON**

SUDDEN VALLEY WATER TREATMENT PLANT ASSESSMENT REPORT

RUSSELL L. PORTER STATE OF WASHINGTON 35688 REGISTERED PROFESSIONAL ENGINEER 7/6/2020

KEITH P. STEWART STATE OF WASHINGTON 53790 REGISTERED PROFESSIONAL ENGINEER 7/6/2020

G&O #20434
JULY 2020

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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CHAPTER 3 – TREATMENT IMPROVEMENTS

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LIST OF APPENDICES

EXECUTIVE SUMMARY

The Lake Whatcom Water and Sewer District (District) contracted with Gray & Osborne to perform a condition assessment for their existing Sudden Valley Water Treatment Plant (WTP). This assessment is part of a larger project that includes a holistic analysis of the South Shore Water System and its components, including treatment, distribution systems, and water sources. The first step in this process is to complete a condition assessment of the existing treatment plant system. The purpose of the assessment is to investigate the integrity of the existing WTP facilities from a structural, electrical, mechanical, architectural, and process perspective in order to guide the District's decisions on use and/or modifications at the WTP. Following this assessment, the District along with Gray & Osborne will complete an alternatives analysis based on the findings and recommendations within the assessment report. Using this alternatives analysis report, the District can then select the most cost-effective alternative(s) and proceed with selected modifications.

The existing WTP is a rapid rate direct filtration plant that uses chlorine gas for disinfection. The plant was originally constructed in 1972 and has a rated capacity of 2.0 million gallons per day (mgd). The WTP has been upgraded several times since its construction, most recently in 1992. The WTP treats surface water from Lake Whatcom and is located on Morning Beach Drive approximately 1 mile northeast of the intersection of Lake Whatcom Boulevard and Marigold Drive.

A site visit was completed on February 12, 2020 by Gray & Osborne process, mechanical, electrical, and structural engineers. During the visit, Gray & Osborne discussed the current operations, perceived deficiencies, and desired needs for the WTP with operations staff, and also assessed the condition of the existing facilities at both the WTP Main Building, Finished Water Pump Building, and Chlorine Contact Basin.

The condition assessment found several items for improvement, but did not find any significant structural, electrical, mechanical, or operational issues that would prevent the WTP from successful operation for the foreseeable future. In general, the facilities are in good condition and only require minor repairs and the completion of regular maintenance items in order to maintain their current function.

The report below does make some recommendations for alternatives that, if enacted, may improve the operational efficiency of the WTP. In addition to these recommendations and the listed repairs, this assessment has identified a number of high-priority improvements that should be addressed to ensure the successful operation of the facility in the future. Table ES-1 provides a summary of the high priority repairs and improvements to the facility.

TABLE ES-1

Sudden Valley WTP High Priority Modifications Summary

Modification	Location[(1)]	Discipline[(2)]
Conduct chlorine disinfection system alternatives analysis	MB	P
Chlorine gas system modifications	MB	P
Alum storage and metering pump system modifications	MB	P
Soda Ash storage and metering pump system modifications	MB	P
Conduct backwash system alternatives analysis	MB	P
Replace existing clearwell and CCB level switches	MB	P
Replace corroded steel supports	MB	S
Prepare and coat steel tanks (Floc, Soda Ash, and Filters 1/2)	MB	S
Install seismic bracing for electrical conduit, electrical equipment, and treatment equipment	MB/FPB	S
Complete detailed structural evaluation	MB/FPB	S
Relocate existing laboratory electrical equipment	MB	A
Remove soil cover, vegetation growth, and organic debris from building exterior and roof	MB	A
Provide water upgrades to safety shower and eyewash	MB	A
Add fire and smoke alarm system	MB/FPB	A
Investigate current heating schedule	MB/FPB	M
Combine all existing plant records into a single as-built planset	MB/FPB	E
Complete a comprehensive electrical system audit	MB/FPB	E
Remove chemicals and metering equipment away from MCCs	MB	E
Review historical peak demand electrical consumption	MB/FPB	E
Replace MCC1 and MCC2 with new, current technology	MB/FPB	E
Replace MCC3 to address panel and interior component corrosion	MB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.

If the recommendations listed in Table ES-1 are addressed, the WTP appears capable of successfully, effectively, and efficiently meeting the District's water treatment needs for at least the next 10 to 20 years. Although the original facility is nearly 50 years old, the structures are in good overall condition and do not appear to need significant structural, electrical, mechanical or process modifications.

Based on the findings listed in table ES-1, the District along with Gray & Osborne will complete the second phase of the project. This second phase will include a more thorough analysis of treatment alternatives that will help fully identify the desired scope of modifications to the WTP. This analysis will also help define key design parameters, system requirements, and permitting issues. Lastly, defining the full and complete scope of modifications will also allow the District to develop accurate cost estimates that can be used for budgeting and planning purposes.

CHAPTER 1

INTRODUCTION AND EXISTING FACILITIES

INTRODUCTION

The Lake Whatcom Water and Sewer District (District) contracted with Gray & Osborne to perform a condition assessment for the existing Sudden Valley Water Treatment Plant (WTP) as part of a larger effort to analyze the District's water treatment facilities in order to prioritize funds for rehabilitation, modification, and/or replacement projects. The goal of the assessment is to identify potential improvements for the existing structures and current treatment processes in an attempt to maximize treatment efficiency and extend the operational life of these facilities. The report can also be used to guide selection of feasible water treatment alternatives for longer term treatment of the Lake Whatcom source.

This report summarizes the findings of the WTP condition assessment, which was conducted on February 12, 2020. During this assessment Gray & Osborne personnel investigated the process, operations, structural, architectural, mechanical, and electrical components for the WTP.

Chapter 1 of this report provides a brief background on the District's South Shore Water System and description of water rights for the system. It also includes a description of each of the components utilized for water intake and treatment at the WTP.

Chapter 2 of this report summarizes the findings of the assessment with regards to process, structural, architectural, mechanical, and electrical disciplines.

Finally, Chapter 3 of this report provides a summary of the improvements that would be required for these facilities to meet current structural, mechanical, and electrical codes. This chapter also summarizes the modifications that may help to optimize the treatment process and provide a more efficient workspace for operations staff.

BACKGROUND AND EXISTING FACILITIES

The District operates three Group A water systems – South Shore (DOH #95910), Eagleridge (DOH #08118), and Agate Heights (DOH #52957) – all of which are in and around the shores of Lake Whatcom, which lies southeast of Bellingham in Whatcom County, Washington. The District serves approximately 3,900 residential and commercial water system connections with a residential population of approximately 10,000 people.

The South Shore system is the largest of the three systems and is supplied wholly by water treated at its Sudden Valley Water Treatment Plant. In addition to the WTP, the

District also owns and maintains surface water source, storage, and distribution system facilities. Figure 1-1 shows a map of the District's service area and highlights the location of major facilities. The distribution system includes multiple pressure zones, four booster stations, and approximately 2.8 MG of storage in five reservoirs.

The District also maintains a secondary intertie with the City of Bellingham Water System (DOH #50600) that is used only during emergency situations.

WATER RIGHTS AND PROJECTED DEMAND

The District's Sudden Valley water rights are summarized in Table 1-1. A more detailed discussion of the District's water rights is included in the current Water System Plan (*Wilson Engineering, 2018*). According to the Water System Plan, the District maintains adequate water rights for their existing demands as well as projected maximum day demands.

TABLE 1-1

Water Rights Summary

Location	Type	Number	Instantaneous Flow (gpm)	Maximum Annual Withdrawal (acre-feet)
South Shore (Sudden Valley and Geneva)	Surface Water	S1-00736C S1-00734C R1-25120C S1-25121P	1,526	1,800
Eagle Ridge	Intertie(1)	N/A	150	-
Agate Heights	Groundwater	G1-22681P CG1-22763P CG1-23449C	438	506.9
Total			**1,964(2)**	**1,800**

(1) With City of Bellingham, who maintains a large surface water source from Lake Whatcom.
(2) Does not include Eagleridge Intertie water rights.

The District's average day demand (ADD) and maximum day demand (MDD) are summarized in Table 1-2. A more detailed discussion of the District's historical, current, and projected system demands is included in the current Water System Plan (*Wilson Engineering, 2018*). According to the Water System Plan, the District's existing water rights are sufficient to meet projected ADD and MDD for the South Shore system. While the District may possess sufficient water rights to meet projected demands, the data in Table 1-2 suggest that the existing WTP cannot meet these projected demands with its current operational flow of 700 gallons per minute (gpm). The assessments below will address capacity limitations for the individual components of the treatment process. Additionally, Appendix B contains a summary of the District's monthly treatment reports for 2018 and 2019.

GENEVA ZONE 3
HGL = 572

GENEVA ZONE 2
HGL = 545

GENEVA ZONE 1
HGL = 692

LAKE WHATCOM

DISTRICT OFFICE:
1220 LAKEWAY DRIVE
BELLINGHAM, WA 98229
(NOT SHOWN)

GENEVA RESERVOIR

DIVISION 22 RESERVOIRS

ZONE 4D
HGL = 582

ZONE 4C
HGL = 561

ZONE 5B
HGL = 720

ZONE 5C
HGL = 735

ZONE 5D
HGL = 735

SUDDEN VALLEY WTP

ZONE 6
HGL = 833

ZONE 5A
HGL = 723

ZONE 8
HGL = 723

ZONE 7
HGL = 703

ZONE 4B
HGL = 603

ZONE 4A
HGL = 580

FIRWOOD ZONE
HGL = 533

ZONE 3
HGL = 770

ZONE 2
HGL = 906

ZONE 1
HGL = 1064

DIVISION 30 RESERVOIR

DIVISION 7 RESERVOIR

Legend

- ZONES
- GENEVA RESERVOIR
- DIVISION 22 RESERVOIR
- DIVISION 30 RESERVOIR
- DIVISION 7 RESERVOIR

Source:City of Bellingham, Whatcom County & LWWSD

N

0 2,250 4,500 Feet

1 " = 2,250 '

LAKE WHATCOM WATER & SEWER DISTRICT
SUDDEN VALLEY WTP ASSESSMENT
FIGURE 1-1
RESERVOIR SERVICE AREAS
AND EXISTING FACILITIES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Lake Whatcom Water and Sewer District\20434.00 Sudden Valley WTP Assessment and Facility Improvements Plan\GIS\1-1 RESERVOIR SERVICE AREAS.mxd

TABLE 1-2

Water Demand Summary

Parameter	2020	2036	Buildout
Sudden Valley ADD (gpd)(1)	405,000	415,500	490,000
Geneva ADD (gpd)	200,000	208,000	217,000
Combined ADD (gpd)	***605,000***	***623,500***	***707,000***
Sudden Valley MDD (gpd)(2)	675,000	691,000	817,000
Geneva MDD (gpd)	422,000	440,000	458,500
Combined MDD (gpd)	***1,097,000***	***1,131,000***	***1,275,500***
8-Hour Filter Capacity (gallons @ 700 gpm/1,000 gpm)	336,000/480,000		
16-Hour Filter Capacity (gallons @ 700 gpm/1,000 gpm)	672,000/960,000		
WTP Rated Capacity (gpd)(3)	2,000,000		

(1) ADD values taken from 2018 WSP and based on consumption of 150 gpd/ERU.
(2) MDD values taken from 2018 WSP and based on consumption of 250 gpd/ERU.
(3) Based on a current filter surface area of 252 sf and a maximum allowable filtration rate of 6.0 gpm/sf.

WATER TREATMENT PLANT (WTP)

The existing WTP is a rapid-rate, direct filtration plant with a rated capacity of 2.0 million gallons per day (mgd) but currently operates at approximately 1.01 mgd (700 gpm). The WTP is housed in a partially below grade concrete building located on Morning Beach Drive approximately 1 mile northeast of the intersection of Lake Whatcom Boulevard and Marigold Drive. The facility was constructed in 1972 and has undergone several minor improvements since that time, but was most recently upgraded in 1992. The WTP provides coagulation, flocculation, filtration, disinfection, and chlorine contact time before treated water is pumped to the distribution system and storage reservoirs. Each of the individual components of the treatment process is described below. Photographs of the components listed below are provided in Appendix A.

Raw Water Intake

The raw water intake draws from within Lake Whatcom, the shoreline of which is approximately 300 feet from the WTP. The intake structure is located approximately 300 feet from the shoreline at a depth of approximately 70 feet below the water surface. The intake structure consists of a 36-inch diameter tee fitting, intake screens, and transition fittings to connect to the 24-inch ductile iron pipe that proceeds from the intake structure to the shoreline. Near the shoreline, the piping transitions from 24-inch to 10-inch diameter. Approximately 100 feet inland from shore, the incoming piping

includes valves for system isolation, check valves to maintain a flooded pipe, overflow/pressure relief appurtenances, and fittings necessary to direct the pipe to the WTP. From this valve assembly, the 10-inch diameter ductile iron pipe continues an additional 200 feet to the entrance at the WTP.

Raw water quality is typically good throughout the year at this location. Annually, raw water temperature ranges between 5.0 - 10.0 degrees C, pH ranges between 6.9 - 7.5, and turbidity ranges between 0.1 - 1.4 NTU. Turbidity fluctuates seasonally and tends to increase during the spring and fall stormy season, or during periods of extended wet weather. A summary of daily water quality information for 2018 and 2019 is provided in Appendix B.

The intake piping is inspected every 5 years, was most recently inspected in 2017 by H_2O Solutions, LLC.

Raw Water Pumps

Inside the WTP, two raw water pumps move raw water from the intake piping, past the chemical injection point, and up to the flocculation tank. Both raw water pumps are located below grade level in a pit adjacent to the flocculation tank. The pumps are accessed by a single, vertical, ladder. The pump pit is covered with aluminum grating and clear plastic sheeting to prevent small objects from falling into the pit.

Both Raw Water Pump 1 and Raw Water Pump 2 are horizontal, centrifugal pumps. The pumps are driven by 20 hp, 3-phase, 1,180 rpm, totally enclosed, fan cooled (TEFC) variable speed motors. Each pump is capable of providing up to 1,400 gpm at 25 feet total dynamic head (TDH). The pumps are operated on an alternating lead/lag schedule and their operational motor speed is controlled by their variable frequency drive (VFD) motor starter which is currently set to deliver approximately 700 gpm each. Both Raw Water Pumps were installed in 1992. In 2002, the District replaced the motor on Raw Water Pump 1. Both pumps are maintained regularly according to the manufacturer's recommended schedule, and performance issues with the pumps are addressed as required.

Raw Water Flow Meter

The raw water flow meter is located at grade level downstream from the raw water pumps. The flow meter is a 10-inch diameter Toshiba LF400 Series magnetic flow meter with an integral transmitter, local display, and flanged connections. The display shows both the instantaneous flow as well as the cumulative total flow through the meter. The flow values are also displayed on the WTP Supervisory Control and Data Acquisition (SCADA) system and are recorded for trending and tracking purposes. In 2020, the District purchased a replacement raw water flow meter, which is stored onsite and can be installed quickly if the existing raw water meter should fail.

Flocculation

Once through the raw water pumps, water proceeds through approximately 30 feet of piping before entering the flocculation tank. The flocculation tank is a painted, welded steel tank with a diameter of 13.5 feet, a height of 8.6 feet, and a nominal volume of 9,000 gallons. The tank is divided into three equal sections and water flows through the tank in an over-under-over pattern. The tank contains one access ladder welded to the outer sidewall. The tank is coated on both the interior and exterior surfaces; however, the specific coating system components are not known.

The flocculation tank is equipped with a high level float. As the water level rises within the flocculation tank, the float activates and de-energizes the raw water pumps, thus stopping flow to the tank and preventing an overflow condition. This high alarm signal is also relayed to the WTP SCADA system which alerts the WTP staff that the system requires inspection.

The flocculation tank can also provide priming water for the raw water pumps should the intake check valve fail or leak. If needed, water is piped from the flocculation tank down to the intake side of the raw water pump to ensure that the intake piping remains full prior to raw water pump startup. Without this piping connection, the intake piping could empty; and the raw water pumps would lose prime, which will lead to excessive wear and in-rush electrical currents during startup. The WTP staff recently replaced the intake check valve and no longer uses this priming piping; however, the piping is maintained so that it is available for future use.

Rapid Rate Filters

Water leaves the flocculation tank via 12-inch diameter ductile iron piping and is conveyed by gravity to the equalization trough. At the trough, water is evenly distributed among the four filter units. Each filter unit consists of an inlet trough, filter media, an underdrain system, surface wash and backwashing equipment, and filtered water piping.

Filter media includes anthracite, sand, and garnet (Table 1-3). Each filter has a surface area of approximately 63 square feet, a depth of 10 feet, and a nominal media volume of 273 cubic feet. At a typical operational flow of 700 gpm (~1 mgd), the surface loading rate for all four filters is 2.8 gpm/sf, which is well within the maximum allowable rate listed by the Washington State Department of Health (DOH) for a multi-media filter (6 gpm/sf). The surface loading rate using only two filters is 5.55 gpm/sf (700 gpm/126 sf), which suggests that the WTP can operate at the typical flow rate with only two filters in service.

Filters 1 and 2 are contained within a common welded and coated steel tank that rests on a concrete equipment pad. Filters 3 and 4 are contained within a marine grade aluminum tank that rests on a concrete equipment pad.

Typically, the WTP operates for 10 to 16 hours each day, and longer during warm summer months when water demand is high.

TABLE 1-3

Sudden Valley WTP Media Filter Summary

Parameter	Value
Type	Gravity, Direct Filtration
Filter area (sf, total)	252 (4 each at 63 sf)
Rate of Filtration @ 700 gpm (gpm/sf)	2.8
Rate of Filtration @ 1,000 gpm (gpm/sf)	4.0
Rate of Filtration @ 1,390 gpm (gpm/sf)(1)	5.5
Rate of Filtration @ 1,526 gpm (gpm/sf)(2)	6.0
Rate of Backwash (gpm/sf)	20.6
Design Media Depth (inches)	
#1A Anthracite (1.0 mm - 1.1 mm)	18"
F16 Sand (0.45 mm - 0.55 mm)	9"
#50 Garnet Sand (0.28 mm - 0.38 mm)	4.5"
#12 Garnet Gravel (1.46 mm - 1.56 mm)	4.5"
#3 Gravel (0.375" - 0.1875")	3"
#2 Gravel (0.75" - 0.375")	3"
#1 Gravel (1.50" - 0.75")	10"

(1) Value is based on WTP rated capacity of 2.0 mgd.
(2) Value is based on current South Shore Water System Water Right (Table 1-1).

During normal filter operation, water is distributed evenly to all four cells and flows through the filter media and into the respective underdrain chambers. As it passes through the filter media, flocculated sediment and small particles are trapped by the media. As additional particles are trapped on the surface of the filter, both the headloss through the filter media and the turbidity of the filtered water increases. Per the District's normal operating procedures, each filter bed is backwashed each day prior to operating the filters.

Once through the filters, water flows through the filter discharge piping to the clearwell. The discharge piping at each filter consists of isolation valves, flow control valves, chemical injection fittings, and flow meters in order to ensure consistent operation.

During the backwash of a filter cell, water from the distribution system served by the District 7 Reservoir flows *upward* by gravity through the filter at approximately 1,300 gpm (20.6 gpm/sf). The backwash flowrate is measured by a magnetic flow meter on the backwash line located on the south wall of the WTP. At this flowrate, the media bed is fluidized to remove the accumulated sediment particles and the particle laden backwash water flows into the filter cell waste trough and into the backwash storage basin. Each filter also includes a surface wash system that consists of two supply arms

with up to nine nozzles on each side (18 total nozzles). The pressure and flow of backwash water through these nozzles causes the arms to rotate and disperse spray that agitates the media surface. Spray from these nozzles only occurs during backwash and helps to prevent the formation of mudballs on the media bed. The complete backwash sequence includes the following steps:

- 4.0 minutes of surface wash only;
- 2.5 minutes of surface wash and filter backwash;
- 5 minutes of filter backwash;
- up to 20 minutes settling, equalization, and drainage; and
- 15 minutes of filter to waste.

After this backwash sequence, the filters return to normal operation and water flows through the filters and into the clearwell. According to WTP staff, the entire backwash process for all four filters typically takes 120 to 160 minutes.

The backwash storage basin is located underground between the WTP building and the finished water pump building. The basin has a volume of approximately 16,000 to 17,000 gallons and provides an opportunity for settling of the removed particles. Backwash water within the basin is pumped via one of two submersible pumps several times as part of each backwash sequence. The backwash water is pumped to the residential sewer system where water proceeds to the City of Bellingham's Post Point Wastewater Treatment Plan (WWTP) for treatment. Overflow from the backwash basin is directed back to Lake Whatcom.

Clearwell

Once through the media filters, water flows through 6-, 8-, and 10-inch diameter piping to the clearwell. The clearwell is a concrete basin below the floor slab of the WTP and is accessed via a 24-inch access hatch in the clearwell's northwest corner. The access hatch is located very near the entrance to the WTP and contains a gasketed lid designed to prevent intrusion of liquids or debris.

Based on record drawings, the footprint of the clearwell is 439 square feet, which at the maximum operating depth of 6.25 feet results in a volume of 20,520 gallons.

The WTP utilizes two identical transfer pumps to move water from the clearwell to the chorine contact basin and pump operation is rotated for each pumping cycle. Each transfer pump is a 20 hp, 60 Hz, 1,760 rpm, Peerless vertical turbine pump with a listed capacity of 1,400 gpm at 43 feet TDH. The pumps operate at full speed and flow (1,400 gpm), and cycle on and off depending on the water level within the clearwell.

The clearwell contains a pressure transducer that reads and records the water level. When the water level within the clearwell rises to the upper setpoint, one transfer pump will energize. There is a 3-foot operating range within the clearwell based on the upper

water level setpoint of 6'-3" and the lower water level setpoint of 3'-3". If the high alarm water level setpoint (7'-2") in the clearwell is reached, the filter system will shut down to avoid additional filling of the clearwell. High level indication/alarm is provided by an Autocon Selectrol 3500 mercury switch. The clearwell also contains an overflow pipe with an elevation of 8'-0" above the floor. This overflow pipe will deliver water by gravity back to Lake Whatcom.

Chlorine Disinfectant Injection System

The WTP utilizes a gas chlorine injection system to provide disinfectant chemicals to the filtered water. This disinfectant provides the necessary chlorine residual to meet the concentration and contact time (CT) requirements set forth by DOH. Commercially prepared chlorine gas is delivered to the WTP in 150-pound cylinders and stored within a separate room inside the WTP. Two active cylinders and two spare cylinders are maintained onsite at all times. The active cylinders are stored on a scale, and specialized gas regulators and flow meters provide the desired gas flow. The chlorine supply to Filters 1 and 2, Filters 3 and 4, and the flocculation tank are all controlled separately using individual flow regulators and meters.

Chlorine gas is mixed with a sidestream of filtered water creating a hypochlorite solution that is then injected to the piping between the filter units and the clearwell. Additionally, a small amount of chlorine solution is injected to the first chamber of the flocculation tank, which helps prevent algal growth on the filter media. Because the WTP operates at a single flow rate, the chlorine system is adjusted manually as needed and does not include automated flow control.

The chlorine room at the WTP contains two chlorine gas sensors, which will warn operations staff of a potential leak so that appropriate ventilation and safety procedures can be followed.

Chlorine Contact Basin

Filtered water is pumped from the clearwell via the transfer pumps to the chlorine contact basin (CCB). The CCB was constructed in 1994 and is a circular, baffled, welded steel reservoir located adjacent to the Finished Water Pump Building. Design information for the CCB is summarized in Table 1-4.

TABLE 1-4

Sudden Valley WTP Chlorine Contact Basin Design Criteria Summary

Parameter	Value
Year Constructed	1994
Type	Welded steel
Shape	Circular
Height (ft)	25
Diameter (ft)	40
Base elevation (ft)	336.0
Overflow elevation (ft)	360.0
Volume (gal)	225,000
Gallons per foot	9,400
Inlet/Outlet	10-inch Perforated Riser

Water enters the CCB via a diffuser riser at one end and flows in a serpentine fashion between three steel baffles to the outlet diffuser. The inlet diffuser consists of a 10-inch diameter PVC pipe with 25, 2-inch diameter holes drilled at approximately 9.25-inches on center. The outlet diffuser riser consists of a 10-inch diameter PVC pipe with 50, 2-inch diameter holes drilled at approximately 9.25-inches on center. These risers act to promote consistent flow throughout the full depth of the water column from the inlet to the outlet. The CCB has both exterior and interior coatings. The CCB is inspected every 5 years, was most recently inspected in 2017 by H_2O Solutions, LLC.

The CCB utilizes a single, mercury level switch for high level alarm within the tank; however, the District plans to install a redundant alarm sometime in 2020. The switch communicates the alarm signal to the WTP PLC, which relays the alarm to WTP staff. Water level (depth) is measured using a pressure transmitter. Access to the CCB is provided by two 36-inch diameter manways located on opposite sides of the tank at ground level, as well as a 24-inch access hatch on the roof of the tank.

In 2016, Gray & Osborne conducted a formal tracer analysis on the District's CT system, which included the chlorine gas injection system and CCB. Surface water systems in Washington must provide a minimum level of CT to protect water quality and ensure disinfection of treated water. CT is the product of the chlorine residual (C) and the residence time within the contact basin (T). The residence time used for calculating CT is a function of the flow through the basin, minimum volume within the contact basin, and the baffling efficiency of the basin. The study conducted on the CCB at the WTP in 2016 showed a baffling efficiency of 0.3, which is less than the theoretical value of 0.7 that the WTP had previously been using. As a result of the tracer study, the WTP staff have made several operational changes in order to ensure that they consistently provide suitable disinfection of treated water leaving the WTP. One of these operational changes was to maintain a maximum allowable flow through the plant of 1,000 gpm while a

second operational change was to increase the target chlorine residual dose from 0.8 to a minimum of 1.0 mg/L.

Finished Water Pumping

Four finished water pumps pump water from the CCB to either the Division 7 or the Division 22 Reservoirs. These pumps are energized and/or de-energized based on the water levels within these reservoirs. The pumps are located in the Finished Water Pump Building adjacent to the CCB. This building also contains electrical equipment for the pumps, a small laundry facility, network and surveillance equipment, as well as the auxiliary generator for the WTP. The building also contains two adjoining public restrooms (mens and womens) available for use by beach/park patrons. At the time of our onsite assessment, the restrooms had been closed for the winter and were inaccessible.

The four pumps are served by a common 10-inch intake header with two pumps providing flow to the Division 7 Reservoir and two pumps providing flow to the Division 22 Reservoirs. The Division 7 Reservoir pumps are 100 hp, 60 Hz, 1,780 rpm, vertical centrifugal pumps with a design point of 700 gpm at 445 feet TDH. The Division 22 Reservoir pumps are 150 hp, 60 Hz, 1,780 rpm, vertical centrifugal pumps with a design point of 700 gpm at 608 TDH. Each pump is connected to a discharge flow control valve that regulates the discharge flow and pressure to the distribution system. Flow from each set of pumps is monitored by a flow meter. Instantaneous and total flow are measured by the meter and displayed and recorded on the WTP's SCADA system.

Chemical Dosing Systems

The WTP utilizes two chemicals in its treatment system in addition to chlorine disinfectant. The first is potassium aluminum sulfate (alum), which is a common coagulant used in water treatment processes. Alum is stored within a 1,900-gallon polyethylene storage tank with a diameter of 6.2 feet and a height of 8.5 feet. The storage tank supplies a diaphragm chemical metering pump, which injects the alum in to the raw water piping upstream of the flocculation tank. The alum chemical feed pump is a Pulsatron E Series with a listed capacity of 44 gpd and a maximum pressure of 100 psi.

Alum is delivered by a commercial vendor approximately every 3 months. The vendor connects a hose from the delivery vehicle to the tank inlet camlock fitting and pumps the alum solution into the tank.

The second chemical utilized at the WTP is soda ash for pH control. Soda ash is mixed and stored in a 1,200-gallon, open top, welded steel tank with a diameter of 5.6 feet and a height of 6 feet. The tank includes a shaft driven mixer as well as a polycarbonate hinged access lid. WTP staff must prepare the soda ash solution as needed by manually adding 50-pound bags of dry soda ash to the tank. Bags of dry soda ash are delivered to the WTP where staff transfer the bags to a rolling cart which is used to transport them to their

various temporary storage locations within the WTP. When ready to use, the staff haul the bags up a small platform and manually dump them into the soda ash storage tank. Filtered water is then added to the tank in the appropriate volume to create the working solution. This filtered water supply includes a totalizing flow meter used to track the flow. Approximately 16 to 20 bags of soda ash are mixed approximately every 11 to 12 days to create the dosing solution. Soda ash is injected to the filtered water between the filters and the clearwell.

Soda ash solution is delivered from the storage tank to the injection location via a Pulsatron E Series diaphragm metering pump with a listed capacity of 600 gpd and a maximum pressure of 30 psi. The chemical metering pump is located near the top level of the soda ash storage tank in order to reduce potential for crystallization within the check valve and to reduce the risk of siphoning.

Both the soda ash and alum feed pumps are manually calibrated on a daily basis using a graduated cylinder near the injection location. Based on the daily calibration, the dose rate from the pumps is modified and/or the WTP staff performs maintenance on the pumps/piping to address flow issues.

Auxiliary Power Systems

The WTP utilizes a 450-kW diesel-powered auxiliary generator to provide standby power in the event of a loss of power to the WTP. This generator also provides auxiliary power to the Afternoon Beach Sewer Pump Station, which is located approximately 300 feet northwest of the Finished Water Pump Building. The generator, installed in 2014, is located inside the Finished Water Pump Building and diesel fuel is provided to the tank via an above grade diesel storage tank located between the Finished Water Pump Building and the CCB. The generator can provide power for the complete WTP facility and sewer pump station for up to 96 hours.

Instrumentation

The WTP uses various instruments and equipment to monitor and control the overall treatment process. A description of the key components used by the WTP is provided below.

Flow Meters

Information on the flow meters utilized at the WTP are summarized in Table 1-5.

TABLE 1-5

Sudden Valley WTP Flow Meter Summary

Meter Name	Location	Type[(1)]	Make/Model
Raw Water	Grade level near WTP entrance	Magnetic, FL	Toshiba LF400
Filter Outlet	Downstream of each filter outlet	Magnetic, FL	Badger Primo
Backwash	Vertical pipe on south wall of WTP	Magnetic, FL	Badger Primo
Division 7 Finished Water	Finished water pump building	Magnetic, FL	Endress & Hauser Promag 500
Division 22 Finished Water	Finished water pump building	Magnetic, FL	Badger Primo Advanced U

(1) FL = flanged connections, MJ = mechanical joint connections, TD = threaded connections.

Turbidimeters

The WTP staff recently replaced all of their existing HACH 1720E inline turbidimeters with new HACH 5300 laser turbidimeters in 2018 and 2019. As required by DOH, turbidity is measured for the raw water, at each filter, and for the combined filter effluent. These data are displayed at the SCADA system and are also tracked and logged for reporting purposes.

Chlorine Analyzers

The WTP staff replaced their previous chlorine analyzers with HACH CL17 analytical equipment in 2018.

Temperature/pH Analyzers

pH and temperature are measured using standard probes procured from HACH. Both raw and finished water pH and temperature are measured via a flow-cell and probe assembly. The equipment is calibrated and maintained on a regular basis.

Streaming Current Monitors

The WTP maintains a streaming current monitor which is designed to assist with determining the coagulant dose prior to flocculation. WTP staff use the streaming current monitor to identify large scale changes in water chemistry that may impact coagulant dose, but they do not use the equipment to optimize their coagulant dose on a daily or weekly basis. The system collects a sample of raw water after coagulant addition and typically, the streaming current monitor is used only to identify an overfeed condition.

Pressure Transducers

The WTP utilizes a Keller Level Rat pressure transducer sensor within the clearwell.

The CCB also utilizes a pressure transducer to measure the water level (depth) within the tank.

Float Switches

The WTP utilizes float switches within the flocculation tank and mercury based level switches within the clearwell and the CCB. These switches provide a high alarm in the event that the water levels in the tanks rise above the high level setpoint. These switches were installed in 1994 with construction of the WTP.

CHAPTER 2

WTP CONDITION ASSESSMENT

INTRODUCTION

On, February 12, 2020, engineers from Gray & Osborne visited the Sudden Valley WTP to perform a condition assessment of the existing facilities. Russell Porter P.E., Aaron Pease P.E., Myron Basden P.E./S.E., Keith Stewart P.E., and Perry McKay from Gray and Osborne met District WTP operator Kevin Cook and electrician Ken Zangari onsite at the WTP.

Mr. Cook described the treatment equipment and provided operations and technical information on all facets of the treatment plant. After becoming familiar with the WTP facilities, the assessment team split up and performed assessments on all of the facilities with a specific focus on their area of expertise. The following sections include a summary of the issues identified by each discipline at our condition assessment.

TREATMENT/PROCESS CONDITION ASSESSMENT

The process condition assessment included all of the components and processes used to generate potable water at the WTP including equipment, operations, maintenance, chemicals, and monitoring and controls. Information was collected from on-site observations, discussions with operations staff regarding system performance, and previous experience at the WTP through the completion of other projects. The treatment equipment was described previously, and the assessments below correlate to the areas described in these previous sections.

WTP MAIN BUILDING

Intake Piping

- The intake piping is inspected every 5 years and was most recently inspected in 2017 by H_2O Solutions, LLC. The inspection revealed no significant damage or deterioration of intake structure and piping between the intake and the shoreline. Furthermore, the report had no recommendations for additional modifications.

- Check valves between the shoreline and the WTP have recently been modified/replaced and are in good condition.

- Inspection of the below grade raw water intake piping between the shoreline and the WTP was not included in this assessment; however, WTP staff believe that the piping is in good condition.

- Within the WTP Main Building, raw water piping is coated 10-inch diameter ductile iron materials and overall is in good condition.

  While the total installed raw water pump capacity is 2,800 gpm (1,400 gpm per pump), the typical and maximum flow rate through the filters is 700 gpm, and 1,000 gpm, respectively. The fluid velocities within the 10-inch raw water piping at 700 gpm and 1,000 gpm are 2.9 feet per second (fps) and 4.0 fps, respectively. Both of these values are within the recommended velocity range for municipal treatment systems (2 to 8 fps) and, as such, appear to maintain sufficient capacity. To maintain fluid velocities below the recommended maximum value of 8.0 fps, flow through the intake piping should not exceed 1,950 gpm. This value is above the Sudden Valley water right value of 1,526 gpm and as such, it is doubtful that the raw water intake piping would ever need to be upsized to serve the current facility.

Raw Water Pumps

- Both raw water pumps were installed in 1992 and although the pumps are in good condition, function as designed, and the motor for Raw Water Pump 1 was replaced in 2002, the pumps are approaching the end of their useful life.

- The floor in the raw water pump pit does not slope to the sump in all directions and allows for localized ponding and sediment accumulation. The presence of these sediments, especially when wet, creates slippery and dirty conditions within the pit.

- Although a supplementary raw water connection is available at grade level downstream of the existing raw water pumps, the WTP does not possess a suitable auxiliary raw water pump in the event that both raw water pumps are out of service.

- Signage indicating that the raw water pump pit is considered a confined space is not currently provided.

  Because of the potential for entrapment and the single ingress/egress ladder, the raw water pump pit should be considered a confined space and confined space entry procedures should be followed whenever entering.

- Lowering piping, fittings, or equipment into the pump pit is difficult due to restricted access in that area. No portable hoist was observed, and access for a mobile hoist is restricted by existing piping and chemical

storage. The lack of a hoist will make lowering heavy piping and fittings into the raw water pit difficult.

Raw Water Flow Meter

- The existing raw water flow meter has a listed range between 100 to 2,000 gpm and has sufficient capacity to operate under the maximum allowable flows through the WTP.

- The raw water flow meter is different from the remaining flow meters utilized in the WTP, which increases the number of spare and replacement parts required for maintenance.

- The meter is old and no longer supported by Toshiba nor is this meter commonly used in the municipal surface water treatment industry.

Flocculation

- The flocculation tank contains piping directly above the tank walls and interior space which will make removal/modifications to this piping and/or the flocculation tank difficult. Corrosion was noted on this piping and its current location may promote corrosion on the upper lip of the flocculation tank wall.

  One of these items is a tube-style high level alarm and sensor. This style of equipment is old and prone to sticking.

- Access to the full circumference of the flocculation tank is poor and restricted by the chemical dosing systems, raw water inlet pipe, and overhead water piping and electrical conduit.

- The flocculation tank appears to be undersized for the typical operational flow.

  Flocculation basins are typically designed using two criteria: hydraulic retention time and mixing energy. Assuming a sidewater depth of 7.5 feet, the operational volume of the flocculation basin is approximately 8,000 gallons. Given the typical flow through the WTP of 700 gpm, this results in a hydraulic retention time of 11.4 minutes (8,000 gallons/700 gpm), which is significantly lower than the design recommendation of 30 to 45 minutes for baffled channel contact flocculation basins (*Integrated Design and Operation of Water Treatment Facilities, S. Kawamura, 2000*). To achieve the recommended retention time of 30 minutes, flow through the flocculation tank should be reduced to 270 gpm or the flocculation tank volume should be increased to 21,000 gallons.

The mixing energy is calculated using the hydraulic retention time and the headloss through the basin. Assuming a range of headlosses between 0.5 to 2.0 feet, the mixing energy is between 37 - 74 s^{-1}, respectively. The recommendation for mixing energy in baffled channel contact flocculation basins is 55 - 10 s^{-1} (*Kawamura, 2000*). As such, it appears that the existing flocculation tank at the WTP provides more mixing energy than recommended for ideal flocculation of entrained particles. Providing extra mixing energy will reduce the effectiveness of floc creation prior to filtration.

Rapid Rate Media Filters

- Discussions with the WTP staff suggest that the backwash sequence is successful at cleaning the filters. There is no apparent long-term decrease in filter run times, and the filtration performance appears to be consistent immediately following a backwash. During our site visit, two backwash sequences were observed and our observations agree with WTP's description of the backwash system and its performance.

- Access to the filter discharge piping and fittings is limited and restricted due to the presence and the location of the equalization trough.

- Access to each filter platform is provided by only a single, vertical ladder. This represents a safety risk in the event that the existing ladder becomes obstructed or blocked.

- Media depth, consistency, and particle size breakdown were not investigated during the assessment. Discussions with WTP staff indicate that the filter media performance is good. WTP staff add additional anthracite on an annual basis to bring the total depth of anthracite (top layer) back up to the original design depth (Table 1-3).

- The underdrain system was not accessible during the WTP assessment; however, WTP staff believe that the underdrain system is in good condition.

- Discussions with WTP operations staff indicate that typical filter run times have remained stable for several years.

  Backwash flow and volume appears to be within the design range identified in the O&M manual. The backwash cycle appears to sufficiently remove trapped sediments.

Typical mixed media backwash flows are between 10 to 20 gpm/sf (*Integrated Design and Operation of Water Treatment Facilities, S. Kawamura, 2000*). At the WTP, current backwash flow is approximately 1,300 gpm, or 20.6 gpm/sf (1,300 gpm/63 sf), which is at the maximum recommended range noted above.

The backwash water is currently stored in a wastewater holding tank adjacent to the WTP. When the tank is full, the wastewater is pumped to the gravity sewer by up to two submersible pumps and then is conveyed to the City of Bellingham Post Point WWTF for treatment. This process is expensive and cumbersome for the District and their staff. The District has indicated that costs for backwash disposal to the WWTF have increased in recent years and has expressed a desire to modify this system if possible to minimize the volume of water sent to the City's municipal sewer system.

- The maximum allowable filter rate for multi-media direct filtration units is 6.0 gpm/sf. Given the total filter area for all four filters of 252 sf, and a typical flow rate of 700 gpm, the current filtration rate at the WTP is approximately 2.8 gpm/sf, which is below the maximum allowable value. Using the existing filter units, the WTP could filter up to 1,510 gpm – which is very nearly the current Sudden Valley instantaneous water right of 1,526 gpm (Table 1-1) – and still meet the maximum filtration rate requirement.

  WTP staff have indicated that they are interested in investigating the possibility of utilizing a mono-media filtration system in an attempt to improve filter run times. This may be feasible; however, it should be noted that the maximum allowable filtration rate (6.0 gpm/sf) would be reduced to 3.0 gpm/sf per Washington Administrative Code (WAC) 246-290-654. Given the current filter surface area, this would reduce the maximum filtration flow through the WTP to 755 gpm, which is above the current typical operational flow, but below the historical maximum operational flow of 1,000 gpm. This reduced flow rate also does not appear to be large enough to meet projected ADD and MDD for the South Shore System as shown in Table 1-2.

Clearwell

- The clearwell appears to be in good condition, although a thorough investigation was not possible as part of this assessment since the WTP was in operation during the site visit.

- The existing transfer pumps appear to be in good condition. However, the pumps were installed in 1992, are nearly 30 years old, and are approaching the end of their useful life.

- There is staining on the concrete walls within the clearwell. The presence of stains can hide other, more serious defects and detracts from the aesthetic appearance of the clearwell.

- The single access hatch represents a source of contamination to the filtered water. The hatch is adjacent to the path travelled by soda ash chemicals and is a potential source of contamination for spilled liquids.

- The hatch represents a trip hazard for WTP staff and is not highlighted or indicated by high visibility colors.

- The clearwell is considered a confined space; however, no signage or other information noting the access restrictions was noted in the vicinity or on the lid.

- Confined space entry equipment was not noted onsite.

Chlorine Disinfectant Injection System

- The chlorine disinfection system appears to be functioning as desired. Piping, tubing, and equipment appear to be in good condition.

- Gaseous chlorine presents some level of risk to WTP operations staff in the event of a leak, and a significant safety risk in the event of a fire or explosion.

  While the existing chlorine gas disinfection facilities likely meet building code requirements in place at the time of their construction, the current chlorine gas storage facilities do not appear to meet current building code requirements.

  The 2015 International Building Code defines the Maximum Allowable Quantities of hazardous materials that can be stored or used within a facility without triggering specific design and construction criteria. Gaseous chlorine is considered both an oxidizing gas (a physical hazard) and a toxic gas (a health hazard) and as such, the maximum allowable quantity is 150 pounds as a liquefied gas, or 810 cubic feet at NTP as a gas (both of which correspond to a single 150-pound cylinder). Several exceptions allow this maximum allowable quantity to be increased by 100 percent in buildings equipped with an approved automatic sprinkler system and by an additional 100 percent when approved storage cabinets

are used. Therefore, in a building with a sprinkler system and if all the chlorine gas is stored within approved cabinets, a total of 600 pounds of chlorine gas, or four 150-pound cylinders can be used before triggering a hazardous, H-3 occupancy. A building with an H-3 occupancy is required to have several additional safety and building protection systems including additional planning documents, ventilation system requirements, gas cabinets, smoke detection and alarm systems, emergency power supplies, and emergency alarm systems, among other requirements.

Any significant modifications to the chlorine disinfectant injection system would require that the system be modified to meet current building code requirements for the use and storage of chlorine gas.

Additional code requirements regarding chlorine use and storage are provided in Appendix E.

- Flow directions and labels for chlorine flow meters are not sufficiently labeled which may cause confusion for staff.

- Spare chlorine cylinders are not labeled sufficiently as spares, or as empty/full which may cause confusion for staff and insufficient gas redundancy.

- The coating system in the chlorine room has failed in areas and shows signs of significant fatigue in other areas.

- The spare gaseous chlorine cylinders have only one safety restraint chain near the top of the cylinder. Two chains, one near the top and another near the bottom should be provided for cylinder storage and security.

- Active gaseous chlorine cylinders are secured with a single, loose chain to the scale stanchion, which is bolted to the scale, which in turn is bolted to the floor. This arrangement will not sufficiently secure the active cylinders during a seismic event.

Chemical Dosing Systems

- Material Safety Data Sheets (MSDS) files were not inspected during this assessment. MSDS files were recently updated and are located above the existing laboratory workspace.

- The existing chemical storage facilities for alum and soda ash do not appear to violate the maximum allowable chemical quantities identified by International Building, Fire, or Mechanical Codes.

- The alum storage tank is old, beyond its useful life of 15 to 17 years, and shows signs of degradation.

- Alum is provided by a commercial vendor, and WTP staff have noted that this process is cumbersome and requires two individuals to prevent overflow since there is no direct line of sight between the parking lot and storage tank.

- Alum tank does not contain electronic level sensing equipment which can help staff identify when additional solution is needed.

- Alum dosing is manually calibrated on a daily basis, which is cumbersome and messy for WTP staff. Calibration is performed at the injection location requiring fittings to be loosened and reconnected each time a calibration is performed.

- The WTP maintains sufficient spare pumps/parts for the alum diaphragm metering pump.

- The soda ash storage tank is mislabeled as "Caustic Soda" (Sodium Hydroxide).

- The soda ash storage tank appears to be in good condition and does not show significant signs of coating damage or fatigue.

- The soda ash mixer appears to be in poor condition, is highly corroded, and is likely beyond its useful life.

- Soda ash solution must be prepared manually by WTP staff, and bags of soda ash must be moved at least three times between delivery and mixing. This process is cumbersome and exposes the staff to chemicals and heavy lifting requirements.

- The soda ash tank can only be accessed via a single, small access platform. This platform and its coating system show signs of fatigue. The platform limits access to the soda ash tank and other facilities due to its size and location.

- The location of the soda ash system likely contributes to corrosion and degradation of the electrical equipment within the WTP building.

Instrumentation

- The WTP utilizes several various flow meters for flow measurement. This makes maintaining spare parts more difficult and requires specialized knowledge for each type of meter.

- The WTP does not maintain spare flow meters for each type of unit utilized, which reduces the overall WTP reliability in the event that one of the meters fails.

- The WTP recently upgraded to HACH TC5300 turbidity meters units for measurement of raw, filtered, and finished water turbidity. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The WTP recently upgraded to HACH CL17 chlorine analyzers. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The WTP utilizes HACH equipment for temperature and pH monitors. The WTP monitors the temperature and pH of raw water, filtered water, and finished water. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The WTP maintains streaming current monitoring equipment but does not currently utilize this equipment for coagulant/flocculant optimization. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The existing clearwell level switch is out of date and utilizes mercury, which is not suitable for use with potable water.

FINISHED WATER PUMP BUILDING

Finished Water Pumping

- The finished water pumps appear to be in good condition. However, the pumps were installed in 1992, are nearly 30 years old, and are approaching the end of their useful life.

- The District does not currently maintain spare finished water pumps and/or motors, which reduces the overall level of redundancy if one or more of the pumps or motors should fail.

- The WTP cannot run more than two finished water pumps concurrently. Discussions with the WTP staff suggest that this is due to the high in-rush and amperage draw for the finished water pumps.

- The finished water pumps have not been flow tested within the last 10 years to verify their performance.

- Access to all sides of each finished water pump is somewhat restricted by the piping arrangement within the building.

- Pressure gauges have not been tested or certified within the last 5 years, which reduces the confidence in their ability to accurately read the system pressure.

CHLORINE CONTACT BASIN

- A full and complete investigation of the CCB was not conducted as part of this assessment because the WTP was in operation during the site visit.

  The tank was most recently inspected by certified divers in 2017 by H_2O Solutions, LLC. The inspection revealed no significant damage or deterioration for the suction and its components. Furthermore, the report had no recommendations for additional modifications.

- As mentioned previously, the District recently completed a tracer study investigation on its CT system – which included the CCB. The results of this investigation found that the theoretical baffling efficiency (0.7) used to estimate the CT for the system was higher than the empirically determined baffling efficiency of 0.3.

  As a result of that study, DOH set the maximum allowable flow through the WTP at 1,000 gpm. Since that directive, WTP staff have reduced the flow through the WTP to 700 gpm and increased the target chlorine residual value to a minimum of 1.0 mg/L. These changes have worked well and help ensure that the WTP provides sufficient disinfection for its treated water; however, this reduced operational flow will inhibit the WTP's ability to meet projected ADD and MDD demands for the South Shore water system

STRUCTURAL CONDITION ASSESSMENT

The structural assessment included the WTP Main Building, the Finished Water Pump Building, items within these two buildings, and the CCB. Information was collected from on-site observations as well as available original drawings for the existing structures. The structural assessment included a review of the condition of structural

members, notes of any items not complying with current building code, preliminary seismic review, and potential structural modifications that may provide benefit for operation of the plant. The building code used for this evaluation is the 2015 International Building Code (IBC). The preliminary seismic evaluation was completed using Tier 1 checklists from ASCE 41 *Seismic Evaluation and Retrofit of Existing Buildings*.

WTP MAIN BUILDING

The WTP Main Building is a one-story building consists of precast concrete tee beams overlain by 4-inch concrete topping slab at the roof. The tee beams are supported at the perimeter of the building by cast-in-place concrete walls. The building is built into a hillside so its walls are partially to fully buried below grade except at the entrance on the north side of the building. The north wall with the entrance is a glass and metal framed "storefront" façade. According to record drawings, the roof structure has 3-ply built up roofing, overlain by 2 inches of sand, overlain by up to 18 inches of soil fill. Below are specific items noted during the assessment.

- In general, the concrete structure is in good condition. No major cracks or spalling were found. In isolated locations, reinforcement on the underside of the precast concrete tee beams is exposed and shows signs of minor corrosion that does not appear to have impacted the strength of the beams.

- According to record drawings, the topping slab over the tee beams is only 2-inches thick at the perimeter. It increases to 4-inches thick at the center of the roof to provide an external slope to promote drainage. The flanges of the tee beams are also relatively thin, tapering down to 1.5-inches thick at the ends of the flange. While the flanges and topping slab could not be directly observed in the field due to the presence of plant matter and soil cover, it appears all components of the structure conform with the record drawings. According to the original record drawings, the roof was designed for 40 pounds per square foot (psf) live load and a maximum soil depth of 18 inches. Based on our investigation of the record drawings, the roof is not expected to be capable of supporting loads from added items such as equipment or tanks without installing structural retrofits.

- Miscellaneous structural steel supports such as pipe, conduit, and equipment supports are corroded. In some cases, the corrosion is severe enough that the strength of the support has been reduced.

- There are several steel tanks inside the building. The steel is coated with paint and in some areas the paint has failed leading to corrosion of the steel. Specifically, corrosion was noted on the flocculation tank, the distribution trough, and Filters 1 and 2. There is also some minor signs of

corrosion on the roof of the clearwell. The corrosion does not appear to be advanced enough to affect the structural integrity of the tanks.

- Various segments of piping and its associated fittings show minor signs of corrosion. This corrosion tends to be located at joints, fasteners, or edges which is typical for piping within a moist environment. The observed level of corrosion does not appear to have affected the integrity of the piping and/or fittings.

- A preliminary Tier 1 seismic evaluation was performed for the building. The Tier 1 evaluation is a checklist that allows quick screening of the building for significant seismic deficiencies. For the purpose of this evaluation, the building is categorized as a Type C2 with concrete shear walls and stiff diaphragm. The checklist did not find any major seismic deficiencies in the building, with only one minor item flagged by the checklist, namely the vertical rebar anchoring connection at the perimeter walls. A copy of the checklist is provided in Appendix C.

- Many of the interior tanks and miscellaneous items supported from the building structure do not appear to have adequate seismic anchorage and/or bracing. These items are at risk of experiencing excessive movement and damage during a design-level earthquake. Interior tanks appear to be unanchored to the floor. Piping connections to the tanks do not appear to have flexible connections, which puts them at risk of damage if tanks move laterally during a design-level earthquake.

FINISHED WATER PUMP BUILDING

This one story building was constructed in 1992 and consists of prefabricated wood trusses at the roof supported by CMU walls at the perimeter of the building. Below are specific items noted during the assessment.

- In general, the prefabricated wood trusses and CMU walls were found to be in good condition. No water damage was found.

- Electrical conduit in the attic had only occasional bracing that did not appear to be adequate for the design-level earthquake. Insufficient bracing increases the risk of electrical failures after a design-level earthquake.

- A preliminary Tier 1 seismic evaluation was performed for this building. For the purpose of this evaluation, the building is categorized as a Type RM1 with reinforced masonry bearing walls and flexible diaphragm. The checklist found two seismic deficiencies of concern. The first deficiency concerns the transfer of horizontal shear forces from the roof diaphragm to the CMU wall at the south side of the building. The cantilevered roof over

the exterior porch on the south side of the building does not appear to have a load path to transfer forces from the roof diaphragm to the CMU wall. There is a risk of damage or partial roof collapse in the design-level earthquake. The second deficiency is insufficient out-of-plane anchorage of the top of CMU walls to the roof diaphragm which results in some risk of damage to the wall and roof if the top of the wall moves away from the intended bearing point of the roof trusses during a design-level earthquake.

CHLORINE CONTACT BASIN

The CCB was described previously, but is a welded, coated, steel tank located just south of the Finished Water Pump Building that provides contact time for chlorinated filtered water from the clearwell.

- The exterior coating system on the CCB shows many localized areas of damage and/or failure. Corrosion of the steel wall is evident at these locations. Previous areas of corrosion have been addressed by WTP staff through surface preparation and spot coating repair.

- The interior coating system of the CCB appears to be in fair condition and shows only minor signs of corrosion at select areas (edges) within the tank.

- A seismic vulnerability assessment was completed in 2016 and had two significant recommendations for the CCB. First, the report stated that the concrete ringwall foundation should be retrofitted to increase uplift resistance during the design-level earthquake. Secondly, flexible piping connections were recommended to reduce the risk of damage that would result in emptying of the reservoir. Otherwise the report did not find deficiencies regarding the steel shell or anchorages to the foundation.

ARCHITECTURAL CONDITION ASSESSMENT

The architectural assessment included the WTP Main Building and the Finished Water Pump Building. Information was collected from on-site observations as well as original drawings for the existing structures. The assessment included a review of the condition of non-mechanical building systems and workspaces and compliance with current codes. The code used for this evaluation is the 2015 International Building Code (IMC).

GENERAL ARCHITECTURAL

The WTP has sufficient building access restrictions, but the property has minimal site security measures. Both the WTP Building and Finished Water Pump Building are secured with door locks. The CCB is secured with a padlocked ladder guard to prevent

access to the tank. The generator fuel tank is secured behind a wood slat fence and gate secured with a padlock. The WTP does not contain any site fencing.

Camera surveillance is provided at the WTP Building and the CCB; however, this system is not used for alarming due to the high volume of nuisance alarms caused by wildlife and visitors to the adjacent Afternoon Beach Park.

WTP MAIN BUILDING

- This building includes a small water quality lab area that is comprised of approximately 10 linear feet of base cabinets and countertop. Within the countertop is a 24-inch sample sink that receives flow streams of filtered water and finished water for water quality sampling and analysis. The remainder of the available countertop area is utilized for water quality analysis instruments and as the plant operator's work station for computer access and required monthly reporting. The WTP's Human Machine Interface (HMI) computer is located here and is housed within one of the base cabinets with a shelf above the countertop holding two monitors.

  The location of this work station near the sink and lab area places the computer equipment and necessary paperwork/files at greater risk for damage.

- This building includes a small bathroom along the west wall. The bathroom includes a toilet and a utility sink along with some open wall shelving for storage of janitorial supplies. Hot water is supplied to the utility sink via a mini-tank style Bosch water heater located within the closet adjacent to the bathroom. The water heater appears to be less than 5 years old.

  The bathroom is functional but shows typical signs of deterioration associated with use and age including some light moisture damage, paint deterioration, staining, and poor lighting.

- Additional filter media is currently stored south of Filters 3 and 4 between the filter tank and the building wall. While neat and organized, this location significantly restricts access to all sides of the filters for inspection and/or maintenance. This location also makes access to the filter media bags cumbersome for WTP staff.

- The facility includes an emergency eye and face wash station located on a wall adjacent to the lab area and an emergency drench shower located on the northeast corner of the Filter 3 and 4 vessel. Emergency eyewash and shower equipment is now regulated through the plumbing code by ANSI/ISEA Z358.1 - American National Standard for Emergency

Eyewash and Shower Equipment. This standard not only includes requirements for the fixtures, but also water supply to the fixtures and access to the fixtures within a facility. Eye and face wash stations should be located to be accessed in no more than 10 seconds by a user and should provide uninterrupted flow of 3.0 gpm for 15 minutes. Drench showers should also be located to be reached within 10 seconds and should provide uninterrupted flow of 20 gpm for 15 minutes. The access pathways to both types of emergency fixtures should be free and clear of obstructions and the water supply should be tempered to a temperature between 60 degrees F and 100 degrees F. In addition, emergency fixtures should also be activated weekly to ensure flow and should be tested and certified annually.

Given the location of the existing equipment within the Main Building, neither the eyewash or drench shower is in compliance with the access requirements of ANSI Z358.1. Flow and temperature for these units were not tested during the site visit, but given the date of their installation, they may not meet current flow or temperature requirements. In addition, the supply to both of these fixtures is not tempered and therefore does not meet the temperature requirements.

- There is evidence of moisture weeping through the east wall directly above the electrical gear for the raw water pumps as indicated by some rust staining down the wall at the beam-to-wall interface. It does not appear this location has leaked in the recent past and there was no apparent direct water damage to the electrical gear.

- There is evidence of moisture weeping through the east wall near the second beam to the south of the raw water pump electrical gear (MCC 3). This location had some shiny or reflective spots, indicative of a wet surface during this assessment.

- There is evidence of moisture weeping through the aluminum storefront entrance area predominantly at the easterly interface where the aluminum framing meets the concrete wall. There is staining down this wall, down the vertical framing along the wall, at the floor, and on the adjacent wall around the corner to the east. This moisture appears to be coming from outside within the entrance alcove.

- The existing aluminum storefront window entrance alcove restricts the ability to move supplies and equipment in and out. The existing aluminum-framed, glass door is 42-inches wide; however, for deliveries of chemicals on pallets and other supplies for the WTP, a double door or an overhead coiling door would be preferred.

In addition, any major work to the facility to replace or repair equipment, tanks, etc. would require that the storefront system be disassembled.

- At the concrete slab roof overhang above the alcove there was moisture staining coming in from the leading edge as well as at several locations along the joint between the concrete walls and slab extending above. In addition, it appears an attempt to seal some of these joints may have been done in the past as evidenced by some seams of white caulk.

- Some of portions of the facility's floors appear to be continually wet, particularly between the tanks and filters. The concrete floor is painted and is in good condition; however, the standing water on portions of this makes the flooring slippery and represents a potential safety hazard.

- The front and side exterior faces of the structure are covered with significant growth. This growth appears to be English Ivy and overhangs the building roof on three sides. While it is apparent this growth allows for significant camouflaging of the structure from the roadway, it does impede inspections of the structure, waterproofing systems, and roof drainage. In addition, roots from organic growth can be tenacious, can deteriorate waterproofing systems, and can work their way into structural joints potentially causing damage.

- Similar to the exterior wall faces, the roof is overgrown with plant life and also includes some large woody debris that has blown and/or fallen down on to the roof from the adjacent woods.

- Chlorine room access door and frame show signs of corrosion and the coating system is showing signs of fatigue.

- The building does not currently utilize an effective smoke or fire alarm system.

FINISHED WATER PUMP BUILDING

- The downspout on the northeast corner of the building has a leak in a joint near the soffit causing enough of a splash at grade that the cedar siding appeared to be constantly wet. The continuous presence of moisture will deteriorate the siding in this area.

- The roof and siding appear to be in good condition.

- Each end of this building includes a light well (skylight) framed through the attic with domed skylights. These areas are subject to water damage if not maintained, cleaned, and inspected on a regular basis.

- The building does not currently utilize an effective smoke or fire alarm system.

MECHANICAL CONDITION ASSESSMENT

The mechanical/HVAC assessment included the WTP Main Building and the Finished Water Pump Building. Information was collected from on-site observations as well as original drawings for the existing structures. The assessment included review of the condition of mechanical heating/cooling equipment, dehumidifiers, ventilation equipment, and compliance with current mechanical codes, namely, the 2015 International Mechanical Code (IMC).

WTP MAIN BUILDING

- This building includes a single, ceiling-hung, electric air handling unit that supplies the space with ventilation and heating and is controlled by a programmable Honeywell thermostat located within a ventilated lockbox. The internal fan has a capacity of up to 1,900 cubic feet per minute (cfm) at approximately 0.3 inches of water column (in-WC) and the heating coil has a capacity of 16 kW. This unit has a mixing box with a fixed bypass damper that allows control of the amount of outside air that is brought in and the amount of inside air that is recirculated. This unit is over 10 years old and was rebuilt in 2018 due to corrosion of the electric heating coils. In its current conditions, this unit appears to have many years of service life remaining. The unit includes a filter box with 2-inch pleated filters; however, the filters were not accessible at the time of the assessment.

  When outside air ventilation is being provided, a discharge relief louver ducted through the Chlorine Gas Room allows exhaust air to leave the space. Plant operators indicate that there are no issues or concerns with heat capacity or ventilation; however, it was noted the electric heat is expensive to operate during winter months.

  Heating and ventilating equipment is in good condition with years of service life remaining.

- This building also includes two, stand-alone industrial dehumidifiers. Each has a rated capacity of 195 pints of water removal per day at 80 degrees F and 60-percent humidity. These units include 2-inch MERV 8 pleated filters. Plant operators note that since the installation of these dehumidifiers, interior moisture control has significantly improved and has not posed an issue in recent years.

  The dehumidifiers are in good condition with years of service life remaining.

- Air flow through the Chlorine Gas Room is provided via an intake louver installed within the door and an exhaust fan with a 12" x 12" louvered gravity backdraft damper. The operable louvers of the gravity backdraft damper are partially restricted by plant growth on the building exterior.

FINISHED WATER PUMP BUILDING

- This facility includes a 40,000 btu/hr, natural gas unit heater in the southeast corner, and generator louvers which remain closed unless the generator is in operation. These components are in excellent condition with years of service life remaining.

- There appears to be a small exhaust leak in a pipe joint where the generator exhaust connects into the underside of the silencer. A portion of the insulation blanketing was stained with black soot.

ELECTRICAL CONDITION ASSESSMENT

The electrical assessment included the WTP Main Building and Finished Water Pump Building. Information was collected from on-site observations, discussions with WTP treatment staff, as well as original drawings for the existing structures. The electrical assessment included a review of the condition of existing equipment, use of the existing equipment, compliance with current electrical codes (NEC 2020), and potential modifications that may benefit the operation of the plant.

The existing utility service includes a pad mounted 300 kVA, 480/277 VAC (360 full load amps) three phase electrical transformer. This transformer is owned and managed by Puget Sound Energy and has PSE identification number 462999-164283. This service feeds a 480 VAC motor control center (MCC 1) located in the Finished Water Pump Building through a 600-amp main circuit breaker, also located in the Finished Water Pump Building. MCC 1 is generator-backed by a 600-amp rated automatic transfer switch and 450kW (~680 amp) generator. MCC 1 also provides a 150-amp 480/277 VAC feed to the treatment building, which distributes power from its own MCCs (MCC 2 and MCC 3). The generator in the Finished Water Pump Building also serves the nearby Afternoon Beach Sewer Pump Station which has its own utility feed.

GENERAL ELECTRICAL

- An overarching concern is the size of the utility transformer and its ability to provide power to the WTP. As stated above the transformer has the capacity to provide 360 amps but the facility is designed to distribute 600 amps. The load study from the 1992 WTP Upgrade Improvements Project indicates a peak requirement of 449 amps, suggesting that the

existing transformer is not sized to fully power the complete operation of the WTP for an extended period of time.

- Occupational Health and Safety Association (OSHA) mandates that electrical distribution equipment, that is likely to require service while energized, be labeled with arc flash protection labels indicating the safe working distances and the correct personal protective equipment (PPE) required. The existing electrical distribution equipment in both the WTP Main Building and Finished Water Pump Building does not currently have these labels.

- The auxiliary power generation system is new and is in excellent condition. The system is tested for approximately 30 minutes each week in accordance with the manufacturer's recommendations.

- Based on previous observations by District staff, buried conduits and/or conductors show signs of corrosion and are likely in fair/poor condition.

WTP MAIN BUILDING

At the WTP Main Building, the power enters MCC 2 which is located on the west wall and contains the clearwell transfer pumps, a panelboard, and HVAC power. MCC 2 feeds MCC 3, which is located on the east side of the WTP Main Building and contains the motor starters for the raw water pumps.

- MCC 2 is in fair/poor condition and is a GE 8000 series product which is no longer manufactured or supported with spare components.

- The original circuit breakers in MCC 2 are approaching the end of their recommended service life.

- There is a concrete pad for a previously utilized transmission pump in front of MCC 2, which violates the NEC clear space requirement for this MCC. According to the NEC, at least 42 inches of clear space are required.

- MCC 3 is a Square D Series 6 MCC which is a currently supported product line. The unit is in fair/poor condition, most likely due to its proximity to bags of soda ash. This close proximity to chemicals and water metering equipment makes the equipment more susceptible to corrosion, degradation, and places the equipment at a greater risk for failure. The panel cover shows signs of corrosion. Although the MCC interior was not inspected as part of this assessment because the WTP was in operation, WTP staff have noted that the interior components of MCC 3 exhibit signs of corrosion.

- The electrical equipment in the chorine room includes outlets and conduit and is in excellent condition primarily due to the use of PVC-RGS conduit within the space. Several existing conduits in this room are uncapped, allowing chlorine gas fumes to enter the associated panelboard, and subsequently, the WTP Main Building.

- In several locations, electrical conduit is mounted to the floor of the building. This installation location creates a tripping hazard and makes transportation of heavy items using wheeled carts or hand trucks more difficult.

- On the wall immediately south of MCC 2 there are two panels leftover from the control panel improvements project. These panels are not labeled but are a blue panel manufactured by S&B with several unused level displays, and a grey panel manufactured by QCC immediately to its right. These two panels contain field wiring that run to the main control panel for the WTP, which is designated as MCP 1. Using a control panel as a pulling point and/or junction box is not allowed by the NEC.

- There are several additional panelboards and control panels not currently used for their original design function. These panels take up valuable wall space, create confusion and difficulty in tracing wires and cables, and provide the opportunity for additional violations of current and future electrical code requirements.

- MCC 2 and the panelboards immediately following the existing 208/240V transformer do not utilize surge protection devices (SPD). SPD's help protect the electrical equipment from damage due to in-rush currents and inconsistencies in the electrical service during both normal operation and when starting up after a loss of power.

FINISHED WATER PUMP BUILDING

- MCC 1 is old and has reached the end of its recommended service life. The motor control center's product line (GE 8000 series) is no longer manufactured and in 2017 GE sold this portion of its business to Allen Bradley (ABB). ABB does offer support but the availability of new components is questionable and will continue to become more difficult with each passing year.

- The existing motor starters for the finished water pumps are auto-transformers which is an outdated technology.

- The original circuit breakers are near the end of their recommended service life.

- The generator is approximately 6 years old; however, the adjacent washing machine infringes upon the minimum required clear space around the generator. Per the NEC Article 110, a minimum of 42 inches is required in front of equipment operating at 600 V or less which is likely to require examination, adjustment, servicing, or maintenance while energized.

- The external fuel tank is less than 5 horizontal feet from the eave of the building. The 2015 International Fire Code (IFC) #5704 stipulates that diesel fuel tanks of that size must be at least 5 feet from building eaves.

- This building utilizes fluorescent light fixtures, which are outdated and inefficient.

- MCC 1 and the panelboards immediately following the existing 208/240V transformer do not utilize surge protection devices (SPD). SPD's help protect the electrical equipment from damage due to inrush currents and inconsistencies in the electrical service during both normal operation and when starting up after a loss of power.

- All of the conduits between the Main Building and the Finished Water Pump Building are routed through a common 3-foot hand hole. This hand hole contains low voltage conductors, high voltage conductors, 24VDC signal cables, and ethernet cables. Current NEC does not permit both low and high voltage cables to occupy the same space.

TELEMETRY/SCADA

The existing supervisory control and data accusation (SCADA) system consists of a computer-based HMI that communicates with a programmable logic controller (PLC) in the WTP. HMI software is the iFIX platform. In addition to monitoring and controlling activities at the WTP, the PLC also communicates with, and monitors the Division 7 and Division 22 Reservoirs directly via leased phone lines. Discussions with operations staff indicate that the Comcast broadband connection from the WTP to the internet for remote monitoring is generally reliable; however, there is already work in progress to add a local copy of the alarming software (WIN 911) across the water system in case of the loss of communication at the site. The existing SCADA system allows the operations staff to operate the WTP automatically based on the real time water system demand.

- In general, the District is pleased with both the reliability and performance of the SCADA system. Typically, WTP staff have a monthly call with their integrator (QCC Inc.) to discuss any issues and possible

improvements. This proactive approach helps to ensure that the system is maintained in good working order.

- The process control panels in the water treatment building were updated in 2012 to an Allen Bradley CompactLogix PLC based system and have had very few modifications since that time. MCP-1 (located on the west wall of the WTP Main Building) acts as the master while MCP-2 (east wall of the WTP Main Building) acts as a remote I/O base. Both these panels are in good condition. MCP-2 does not appear to have suffered from the corrosive environment despite being adjacent to the MCC 3.

CHAPTER 3

TREATMENT IMPROVEMENTS

INTRODUCTION

This chapter presents recommendations for modifications or actions based on the assessment observations noted in Chapter 2 for each discipline. The recommendations are divided into high-priority and recommended improvements. For each discipline as well as each building at the WTP, high-priority improvements are listed first, followed by recommended improvements.

In addition to the improvements recommended as a result of our assessment, the lists of recommendations below also include items noted during preparation of the most recent Water System Plan completed by Wilson Engineering in 2018 as well as the WTP Sanitary Survey completed by DOH in March 2020.

High priority improvements should be addressed within 5 years in order to help ensure the integrity of the existing facilities as well as WTP operations. Recommended improvements should be addressed within 5 to 15 years and would provide additional convenience and efficiency to the WTP operations staff and would help ensure the long-term longevity of the WTP structure and components.

TREATMENT/PROCESS RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Replace the existing clearwell level alarm switch to one that does not utilize mercury.
- Replace the existing CCB level alarm switch to one that does not utilize mercury.
- Address issues with existing chlorine disinfection system.
    - In addition to the condition assessment provided as part of this project, perform an alternatives analysis to determine whether disinfection with chorine gas continues to be the best alternative for use at the WTP. While gaseous chlorine is a viable method for disinfection of potable water – especially for small-scale water treatment facilities – many municipalities choose to disinfect using liquid sodium hypochlorite or other liquid based chemicals due to

the inherent safety risks of chlorine gas. The alternatives analysis should investigate options such as continuing gas chlorination, disinfection with bulk sodium hypochlorite, and disinfection through onsite hypochlorite generation, and should evaluate these alternatives in the context of other process improvements that may be desired.

- If an alternative technology is desired, then proceed with the design and implementation of the desired technology.
- If continued use of gas chlorination is desired, then complete the following modifications and any recommendations provided in the alternatives analysis:

    1. Assess ventilation system and air exchange.
    2. Revise labels for chlorine solution tubing.
    3. Remove existing coatings, prepare surfaces, and provide new coating system for interior walls.
    4. Add additional chain restraint system for spare cylinders approximately 18-inches from the floor.
    5. Revise scale orientation to allow for an additional chain restraint to active cylinders approximately 18 inches from the floor.
    6. Remove existing coatings, prepare surfaces, and provide new coating system for existing door (interior and exterior sides).
    7. Address existing chlorination system issues such as safety systems (fire, sprinkler, alarming, etc.), maximum storage allowances through the installation of Chlortainers and removal of spare cylinders, indicators and alarms, and storage containers in accordance with the codes listed in Appendix E.

- Address shortcomings with the existing alum system.
    - If modifications to other systems at the WTP will allow for relocation of the alum tank, we recommend that the following modifications be completed at the final tank location. Otherwise,

the following recommendations could be completed for the existing alum tank location.

1. Replace existing alum storage tank with new HDPE full draining tank. New tank should be double containment style for safety against leaks/spills.

2. Provide relocated alum fill connection to allow for easier delivery of chemical and easier observation of tank level during filling.

3. Provide level sensing equipment and/or external sight gauge for alum tank.

4. Install alum duplex chemical metering pump skid.

5. Compile and update MSDS files for all chemicals used at the WTP and store this information at the existing laboratory workspace.

6. As recommended by the DOH Sanitary Survey (Appendix D), prepare and file standard alum chemical quality specifications and standard delivery procedures for review prior to/during chemical delivery.

- Address shortcomings with the existing soda ash system.
    - For continued use of the existing soda ash mixing/storage tank, we recommend that the following modifications be completed at the final tank location.

1. Drain, clean, remove the existing coating, prepare and recoat the existing alum tank.

2. Install level markings on the interior of the tank to facilitate easier chemical addition and filling.

3. Revise tank and platform orientation to provide for easier access by staff with chemicals.

4. Replace existing soda ash mixer.

5. Provide common soda ash duplex chemical metering pump skid.

- If modifications to the other chemical systems, equipment, or layout of the WTP Main Building will allow for relocation of the soda ash tank, we recommend that a new, similarly sized, HDPE soda ash tank be provided in the desired location.

- Address shortcomings with existing backwash system.

  - In addition to the condition assessment provided as part of this project, perform an alternatives analysis for the existing backwash storage and pumping system. While the current backwash method and settling tank is sufficient for WTP operation, the process is expensive due to costs associated with pumping large volumes of water to the City of Bellingham municipal sewer system. The alternatives analysis should investigate methods to optimize the backwash process and reduce operating costs such as discharging backwash supernatant back to Lake Whatcom, installing a larger settling tank, or utilizing backwash recycle storage and pumping equipment. These alternatives should be evaluated in the context of other process improvements that may be desired.

RECOMMENDED IMPROVEMENTS

WTP Main Building

- Address shortcomings with raw water pumping area and equipment.

  - Complete raw water pump performance testing.

    Depending on the results of this performance test, repair, rehabilitate, replace, or procure spare equipment for each pump and/or pump motor as required.

  - Purchase/procure an auxiliary/portable raw water pump for connection to the auxiliary WTP inlet. Alternatively, a spare raw water pump may be purchased to replace one of the existing raw water pumps in the event that it fails.

- Procure a spare backwash flow meter.

  - In conjunction with this recommendation, it may be useful to centralize the flow meters using a common manufacturer or model number. This will provide commonality of operation and will allow a common supply of spare parts to be used for all of the meters.

- Address shortcomings with the existing flocculation tank.

    - For continued use of the existing flocculation tank, the existing coating system should be addressed as described in the structural recommendations section.

    - If a larger tank that will provide the minimum recommended residence time of 30 minutes is desired, the above modifications can be omitted and the tank can be replaced with a new, 21,000-gallon tank.

      A tank with the same footprint as the existing tank would need to be approximately 21 feet tall (including 1-foot of freboard), which is taller than the existing 13-foot ceiling in the WTP Main Building. Given the maximum tank height of 10.5 feet (to allow for access) including 1-foot of freeboard, a 21,000-gallon tank would have a diameter of approximately 19.5 feet. This size tank will not fit within the existing WTP Main Building footprint without significant other modifications. As such, it is anticipated that modifications to the flocculation tank will be done in conjunction with a larger WTP modifications project and/or remodel effort.

      It should be noted that although a new, larger tank would bring the residence time and mixing energy values closer to theoretical design values, the current flocculation tank does not inhibit the WTP from meeting the current performance requirements.

- Regrade and resurface the raw water pump pit floor to promote good drainage to the sump area and prevent the accumulation of sediments.

- Procure confined space access equipment dedicated to the WTP.

- Relocate existing small diameter piping at the flocculation tank so that piping and conduit located within the tank footprint is minimized.

- Furnish and install additional ladder access to the east side of Filter 1 and 2 and to the west side of Filter 3 and 4.

- Revise CT calculations to include the clearwell volume and an assumed baffling efficiency of 0.1.

- Provide high visibility painting or indicators for the clearwell access hatch.

- Complete transfer pump performance testing.

  Depending on the results of this performance test, repair, rehabilitate, replace, or procure spare equipment for each pump and/or pump motor as required.

- Drain and clean the clearwell.

- Provide additional "Operator in Trouble" motion sensors and alarm systems.

- Replace existing tube-style high level alarm in the flocculation tank.

Finished Water Pump Building

- Replace/test existing finished water pressure gauges.

- Complete finished water pump performance testing.

  Depending on the results of this performance test, repair, rehabilitate, replace, or procure spare equipment for each pump and/or pump motor as required.

- Procure spare finished water pump motor.

- Provide additional “Operator in Trouble” motion sensors and alarm systems.

STRUCTURAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Replace corroded steel supports for miscellaneous items such as conduit, piping, and equipment.

- If the existing floc tank is to be reused, prepare and coat both the interior and exterior of these tanks to prevent additional loss of metal. Preparation should be a minimum of SSPC-SP10 and coatings should be NSF61 approved for use with potable water. Fill the existing void space below the tank with high-strength grout.

- If the existing Filter 1 and 2 is to be reused, prepare and coat the lower 2 feet of the vessel to prevent additional loss of metal. Preparation should be a minimum of SSPC-SP3 or SSPC-SP11 and coatings should be NSF61 approved for use with potable water.

- Perform a detailed structural evaluation of seismic anchorage and bracing of interior components including, but not limited to, anchorage of interior tanks, flexible connections of piping, bracing of piping and conduit, wall-mounted electrical transformers, anchorage and bracing of miscellaneous equipment. A detailed structural evaluation was completed for the District's reservoirs in 2016, but was not completed for the WTP Main Building or Finished Water Pump Building.

- Furnish and install seismic bracing and flexible connections for tanks and other key equipment as identified by the seismic evaluation.

Finished Water Pump Building

- Add additional seismic bracing to electrical conduit in the attic to meet the demands of the design-level earthquake.

- Perform a detailed structural analysis and develop seismic retrofit design to address the deficiencies identified by the Tier 1 evaluation regarding the connection between the roof diaphragm and top of CMU wall. Implement the modifications to the Finished Water Pump Building structure as recommended from the detailed structural seismic evaluation.

RECOMMENDED IMPROVEMENTS

WTP Main Building

- Prepare existing exposed rebar on concrete ceiling to SSPC-11 Standards and coat the exposed metal with appropriate, high quality commercial primer/paint system.

Chlorine Contact Basin

- Perform a formal coating inspection on the interior and exterior of the CCB.

  This inspection should be conducted by a consultant specializing in the testing and inspection of potable water storage facility coating systems. The inspector should be NACE Certified and the coating assessment should include pull tests, metal thickness inspection, a formal visual assessment of the coating system, and any other recommended testing that

will assess the viability of the coating system and/or integrity of the steel tank.

- Develop a plan for treatment and disinfection operations during the time period that the CCB is offline for maintenance.

  Pending the results of the coating inspection recommended above, the CCB will require both interior and exterior coating system improvements. During this time period, which can last up to 3 months, the CCB will be unavailable for use and a system should be devised for how disinfection of filtered water will be provided.

ARCHITECTURAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Address the risk for corruption of the electronic equipment at the existing work counter by relocating the electrical equipment to another area of the WTP.

  One alternative to complete this recommendation is to convert the totality of the existing counter space to laboratory and wet-work (sampling, analysis, etc.) and relocate the computer work station. It is anticipated this will be done in conjunction with a larger WTP modifications project and/or remodel effort.

- Remove the soil cover and associated plant growth down to the cast concrete curb that is likely at the base of the existing chain link fence. In addition, heavy, woody debris should be removed from the roof on an annual basis.

- Remove ivy and other plant vegetative growth from building exterior.

- Replace and/or revise the existing safety shower and eyewash systems to be in compliance with ANSI Z358.1.

- Add an effective smoke and fire alarm system. The system should be in accordance with IFC requirements and should include heat/rise and smoke detection systems, and egress pull stations should be linked to the existing SCADA system to notify District staff that an alarm has been activated.

Finished Water Pump Building

- Remove any debris and clean existing roof on an annual basis.
- Add an effective smoke and fire alarm system. The system should be in accordance with IFC requirements and should include heat/rise and smoke detection systems, and egress pull stations should be linked to the existing SCADA system to notify District staff that an alarm has been activated.

RECOMMENDED IMPROVEMENTS

General Architecture

- Investigate alternatives to provide additional site security measures such as fencing, restricted access gates, and cameras. The investigation should address the District's tolerance for risk, public safety, park access, and desired level of security, all in conjunction with other measures and large-scale modifications proposed for the WTP.

WTP Main Building

- Address deteriorating conditions in the restroom. Modifications should include replacement of damaged drywall, new paint, and new fixtures.
- Remove heavy, woody debris from the roof on an annual basis.
- Address wall weeping on the east wall above MCC 3.
- Address leakage at existing storefront windows and above the windows on concrete alcove. This may be addressed by removing damaged or deficient seals and replacing with new materials.
- Address pooling of water on WTP floor to avoid potential hazards. This may be addressed by grinding or grooving the floor to promote drainage to the existing trench, and then recoating the modifications.
- Revise the existing storefront window arrangement to allow for a new, wider door that will facilitate easier delivery of pallets or other large items. It is anticipated this is done in conjunction with a larger plant modifications project and/or remodel effort.
- Relocate stored filter media to another area of the facility, or a new facility in order to provide unhindered access to all sides of Filters 3 and 4. It is anticipated this is done in conjunction with a larger plant modifications project and/or remodel effort.

- Relocate stored/extra/damaged materials in the SE corner of the building to another area of the facility, or to a new facility in order to provide unhindered access to all sides of Filters 1 and 2. It is anticipated this is done in conjunction with a larger plant modifications project and/or remodel effort.

MECHANICAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Investigate current heating schedule and equipment to optimize it for plant operation, staff comfort, protection of equipment, energy efficiency, and cost.

RECOMMENDED IMPROVEMENTS

General Mechanical

- Perform an energy audit to identify the primary source of energy consumption and heat loss.

  This audit should be conducted by Puget Sound Energy or another subconsultant familiar with the function and use of a treatment facility and experienced in providing comprehensive energy audit assessments. The audit should include all components of both the WTP Main Building and Finished Water Pump Building and should identify ways the WTP can reduce its energy footprint and operational costs.

Finished Water Pump Building

- Complete repairs to leak in the generator exhaust piping.

ELECTRICAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

General Electrical

- Combine all plant records into a new and complete electrical record set that incorporates all the changes made into a single current as-built for power distribution and controls.

- Perform a complete audit of the electrical system to focus on the electrical reliability of the circuit breakers and fuses in the MCCs as well as safety and code compliance.

  This work is typically completed by a consultant specializing in electrical analysis and various companies perform this work including Vertiv, Eaton's electrical engineering services group, and Siemen's electrical services group.

  This audit should accomplish the following tasks:

  - Identify any deficiencies with the physical condition or operation of electrical distribution equipment that could not be investigated as part of this assessment. This would include buried conduits and/or conductors. Coordinated outages to portions of the WTP facility will be required.

  - Coordinate the circuit breakers and/or list the modifications required to selectively coordinate the system,

  - Provide OSHA compliant labeling for arc and shock hazards, and

  - Identify available fault current at key points in the system and identify which devices to not have sufficient withstand ratings,

  - Recommend a schedule for the replacement of the original circuit breakers.

- Perform an electrical analysis to review the peak demand usage from historical utility bills to evaluate how well the PSE installed transformer is able to meet the facility's needs.

WTP Main Building

- Remove all chemical storage and metering pump equipment from the vicinity of MCC 2 and MCC 3. While the NEC requires at least 42-inches of clear space, 8 to 10 feet is often provided as "good practice" to help protect electrical equipment.

- Install surge protection devices (SPDs) at the first panelboards after the transformer.

- Replace MCC 2 with new equipment including motor starters, circuit breakers, surge protection devices, and VFD load filters.

- Replace MCC 3 with new equipment to address existing component corrosion.

Finished Water Pump Building

- Replace MCC 1 with new equipment including motor starters, circuit breakers, surge protection devices, and VFD load filters.

- Install surge protection devices (SPDs) at the first panelboard downstream of the wall mounted transformer.

RECOMMENDED IMPROVEMENTS

WTP Main Building

- Replace florescent lighting with LED lighting. This replacement should provide a small reduction in energy consumption but will require significantly less maintenance than current light fixtures.

- Replace AC UPS backed systems with DC UPS backed systems for increased reliability.

- Consolidate small panelboards and/or panelboards that are not currently used for their original design intent into fewer panels to provide a simpler, more streamlined distribution system. Address any open conduits to these panels through removal of capping.

- Reroute floor mounted electrical conduits to the walls and/or ceiling in order to eliminate tripping hazard.

- Reroute field wiring within the blue / grey panels manufactured by S&B and QCC through a different pathway, then remove the panel(s) if possible. Alternatively, the panels could be made into junction boxes by removing any remaining control apparatus as well as any connections associated with door mounted devices.

- Assess the likelihood of installing a third transfer pump at the WTP. If a third pump is not likely, remove the existing transfer pump pad and anchors to provide code-compliant clear space in front of MCC 2.

Finished Water Pump Building

- Replace florescent lighting with LED lighting. This replacement should provide a small reduction in energy consumption but will require significantly less maintenance than current light fixtures.

- Continue to test the auxiliary generator under load on a regular basis to ensure that it will successfully provide the necessary power to operate the entire facility. On an annual basis provide a full loading test on the generator using a load bank.

- Investigate options for relocation of existing generator fuel tank.

SUMMARY

Table 3-1 below provides a modification summary, discipline, and location for the High Priority Improvements. Table 3-2 provides this information for the Recommended Improvements. It is important to note that while the recommended improvements are not explicitly and immediately required, they are recommended in order to ensure the longevity of the existing facilities and their ability to provide the desired level of filtration and output.

TABLE 3-1

Sudden Valley WTP High Priority Modifications Summary

Modification	Location[(1)]	Discipline[(2)]
Conduct chlorine disinfection system alternatives analysis	MB	P
Chlorine gas system modifications	MB	P
Alum storage and metering pump system modifications	MB	P
Soda Ash storage and metering pump system modifications	MB	P
Conduct backwash system alternatives analysis	MB	P
Replace existing clearwell and CCB level switches	MB	P
Replace corroded steel supports	MB	S
Prepare and coat steel tanks (Floc, Soda Ash, and Filters 1/2)	MB	S
Install seismic bracing for electrical conduit, electrical equipment, and treatment equipment	MB/FPB	S
Complete detailed structural evaluation	MB/FPB	S
Relocate existing laboratory electrical equipment	MB	A
Remove soil cover, vegetation growth, and organic debris from building exterior and roof	MB	A
Provide water upgrades to safety shower and eyewash	MB	A
Add fire and smoke alarm system	MB/FPB	A
Investigate current heating schedule	MB/FPB	M
Combine all existing plant records into a single as-built planset	MB/FPB	E
Complete a comprehensive electrical system audit	MB/FPB	E
Remove chemicals and metering equipment away from MCCs	MB	E
Review historical peak demand electrical consumption	MB/FPB	E
Replace MCC1 and MCC2 with new, current technology	MB/FPB	E
Replace MCC3 to address panel and interior component corrosion	MB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.

TABLE 3-2

Sudden Valley WTP Recommended Modifications Summary

Modification	Location[(1)]	Discipline[(2)]
Modify/repair existing flocculation tank	MB	P
Provide new grout floor within raw water pump pit	MB	P
Drain and clean the clearwell	MB	P
Procure spare backwash flow meter	MB	P
Procure dedicated confined space equipment for the WTP	MB	P
Install additional access ladder to Filters 1 and 2 and Filters 3 and 4	MB	P
Revise CT calculations to include clearwell and BE of 0.1	MB	P
Revise piping and conduit above flocculation tank	MB	P
Provide additional Operator In Trouble alarming equipment	MB/FPB	P
Replacing existing tube-style level alarm at flocculation tank	MB	P
Procure a spare finished water pump motor	FPB	P
Replace existing pressure gauges	FPB	P
Improve the visibility of the existing clearwell hatch	MB	P
Complete a performance test of the raw water, transfer, and finished water pumps	MB/FPB	P
Prepare and coat exposed ceiling rebar	MB	S
Address deficiencies found in 2016 seismic report	CCB	S
Perform formal CCB coating inspection	CCB	S
Address deteriorating conditions in restroom	MB	A
Investigate additional site security measures	MB/FPB	A
Remove heavy organic debris from roof	FPB	A
Repair wall seepage above MCC3	MB	A
Repair seepage/leaks at storefront window assemblies	MB	A
Modify floor to promote drainage to existing trench drain	MB	A
Revise existing storefront window to provide larger door opening	MB	A
Relocate stored filter media and other supplies equipment	MB	A
Conduct energy and heat audit	MB/FPB	M
Repair crack in generator exhaust piping	FPB	M
Conduct annual load testing for existing generator	FPB	E
Replace existing fluorescent light fixtures with LED equipment	MB/FPB	E
Replace AC backed system with DC backed systems	MB/FPB	E
Consolidate existing electrical panelboards	MB/FPB	E
Reroute floor mounted electrical conduit	MB/FPB	E
Reroute field wiring within grey/blue wall mounted panels	MB	E
Modify transfer pump pad based on long-term operations strategy	MB	E
Fuel tank relocation investigation	FPB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.

A19: Finished Water Pump Building

Photographed:
Finished Water Pump Building north façade.

A20: Finished Water Pumps

From Left to Right:
Finished water pumps and suction piping. Finished water pumps and discharge piping.

A21: Auxiliary Generator

Clockwise from Left:
Auxiliary generator with washing machine and intake louver (background). Auxiliary generator. Auxiliary generator.

A22: External Generator Diesel Fuel Tank

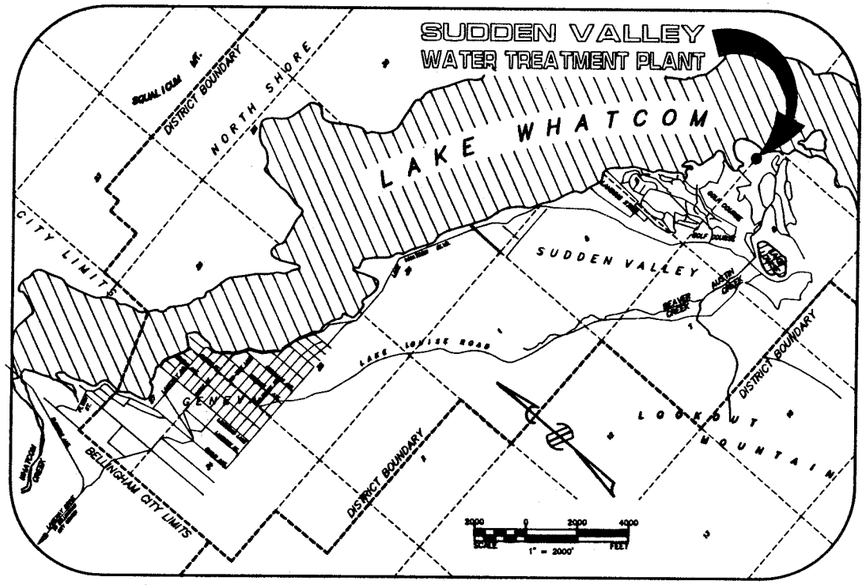
From Left to Right:
Auxiliary generator diesel fuel tank. Auxiliary genitor diesel fuel tank and Finished Water Pump Building south façade.

WHATCOM COUNTY WATER DISTRICT NO. 10

SUDDEN VALLEY

WATER TREATMENT PLANT UPGRADE

TABLE OF SHEETS



VICINITY MAP

(NOT TO SCALE)

NO.	REVISIONS	BY	DATE

Wilson Engineering
CONSULTING ENGINEERS & SURVEYORS

805 DUPONT STREET #7
BELLINGHAM, WA 98225
(206) 733-6100
FAX: (206) 647-9061

DESIGNED BY:	MAC
DRAWN BY:	RAM
CHECKED BY:	MAC

WHATCOM CO. WATER DIST. NO. 10
SUDDEN VALLEY
WATER TREATMENT PLANT UPGRADE

DATE	JUNE, 1992
SCALE	NONE
JOB NUM	92006
SHEET	

JUL 2 4 1992
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FND. BENT REBAR

REBAR MARKED H. DENNING L.S. 10957

S 71°13'53" E 253.62'

MORNING BEACH DRIVE

N 80°13'34" E 50.00'

S 0+00

E 0+00

E 0+50

E 1+00

E 1+50

E 2+00

E 2+50

PUNCH MARK IN BRASS DISC S 0.00, E 0.00

S 71°13'53" E

EXISTING DRIVE

8" DIVISION 22 TRANSMISSION LINE

8" WATER LINE

EXISTING UNDERGROUND TELEPHONE & POWER

SANITARY SEWER

WATER METER

PLUG LINE

EXIST. WATER VALVE

EXIST. WATER VALVE

BENCHMARK TOP FIRE HYDRANT ELEV. = 331.14

N 12°53'44" E 50.00'

ROW

S 0+50

T.O.C. 331.70

F.G. 331.50

I.E. 327.00

F.G. 330.00

60" CEDAR STUMP

RESTROOM

PUMP BUILDING F.F. 332.00

F.G. - 330.50

TRANSMISSION PUMPS (SEE SHEET C4)

N -80.11 E 181.39

6" DIVISION 22 TRANSMISSION LINE

6" BACKWASH

EXISTING HOLDING TANKS

I.E. 326.92

F.G. 330.00

F.G. 330.50

F.G. 331.50

10" D.I.

F.G. -332

I.E. 331.80

SHELL MANHOLE

10" D.I.

2'x 2'x 8" CONCRETE SPLASH PAD

F.F. 336.00

10" DIA OUTLET

10" OVERFLOW PIPE

I.E. 332.00

F.G. 334.00

F.G. 335.00

8" DRAIN PIPE

WATER STORAGE TANK 160,000 GAL. (SEE SHT. C3)

10" DIA. INLET

BAFFLES

EDGE OF CONCRETE

ROOF HATCH

LADDER

F.G. 334.50

F.G. 335.50

I.E. 332.00

F.G. 334.50

10" DI.

I.E. 331.00

10" DIA. OUTLET PIPE

TRANSFER PUMPS 1400 GPM EACH

RAW WATER PUMPS (1480 GPM EACH) & DISCHARGE PIPING (SEE SHEET C2)

STATIC MIXER (SEE SHT. C2)

NEW SODA ASH TANK (SEE SHT. C2)

FLOC. TANK

NEW ALUM TANK (SEE SHT. C2)

EXIST. TANKS

EXIST. WATER PLANT BUILDING F.F. EL. 328.22

FILTERS 3 & 4

FILTERS 1 & 2

FILTER PIPING MODIFICATIONS (SEE SHT. C2)

8" DIVISION 7 TRANSMISSION LINE

F.G. 335.00

F.G. - 336

F.G. - 338

F.G. - 340

F.G. - 342

F.G. - 344

N 30°21'09" E 72.08'

N 30°41'07" W 93.24'

S 1+00

S 1+50

10 0 10 20

SCALE FEET

THRUST BLOCK SCHEDULE

(NOT TO SCALE)

CROSS

90° BEND

TEE

CAP or PLUG

45° BEND

22 1/2° BEND

3" CLEAR

3/4" REINFORCING BAR

LINE GATE VALVE

GROUND LINE

TRENCH BOTTOM

2 - 1" DIA. RODS

VERTICAL BEND

11 1/4° BEND

THRUST BLOCK TABLE						
MIN. BEARING AREA AGAINST UNDISTURBED SOIL SQUARE FEET						
PIPE SIZE	A	B	C	D	E	X
4"	2	2	2	2	2	NONE
6"	4	3	2	2	2	NONE
8"	7	5	4	3	2	3
10"	11	8	6	3	2	4
12"	18	12	9	5	3	6
20"	45	34	25	13	8	17

NOTES

1 SQUARE FEET OF CONCRETE THRUST BLOCK AREA BASED ON 200 P.S.I. INTERNAL PRESSURE, A SOIL SAFE BEARING OF 3000 POUNDS PER SQUARE FOOT AND A FACTOR OF SAFETY OF 1.5.

2 BEARING AREA MUST BE ADJUSTED FOR INTERNAL PRESSURES AND LOWER SOIL BEARING VALUES.

3 CONCRETE BLOCKING SHALL BE CAST IN PLACE AND HAVE A MINIMUM OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING.

4 BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING JOINT.

5 THE CONTRACTOR SHALL INSTALL BLOCK WHICH ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY STAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

LEGEND

	PROPOSED PIPE & FITTINGS
	PROPOSED GATE VALVES
	EXISTING PIPE & EQUIPMENT
—F.G.-332—	PROPOSED FINISHED GRADE
338	EXISTING CONTOUR
F.F. 332.00	FINISHED FLOOR ELEVATION
T.O.C. 331.70	TOP OF CONCRETE
I.E. 331.80	PIPE INVERT ELEVATION
—FD—	FOOT DRAIN

JUL 24 1992

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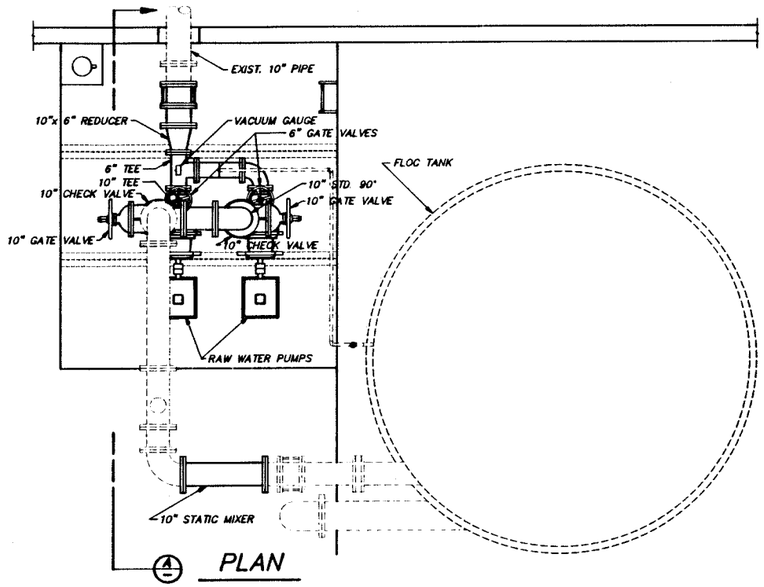
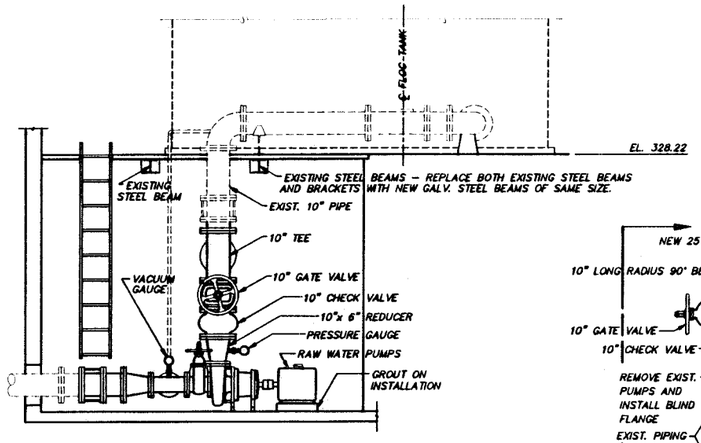
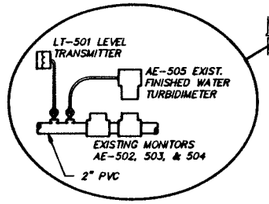
CHECKED BY: MAC

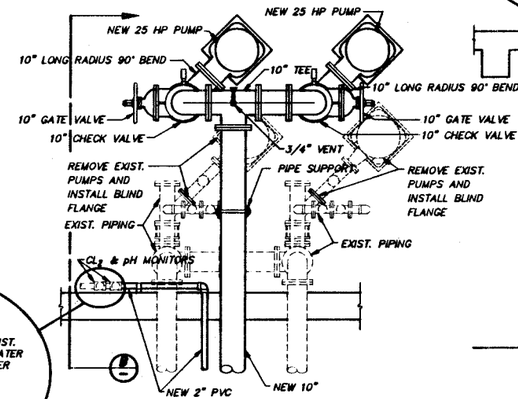
WHATCOM CO. WATER DIST NO. 10
WATER TREATMENT PLANT
SITE PLAN

DATE: MAY, 1992
SCALE: AS SHOWN
JOB NUMBER: 92006
SHEET: C1
OF: C4







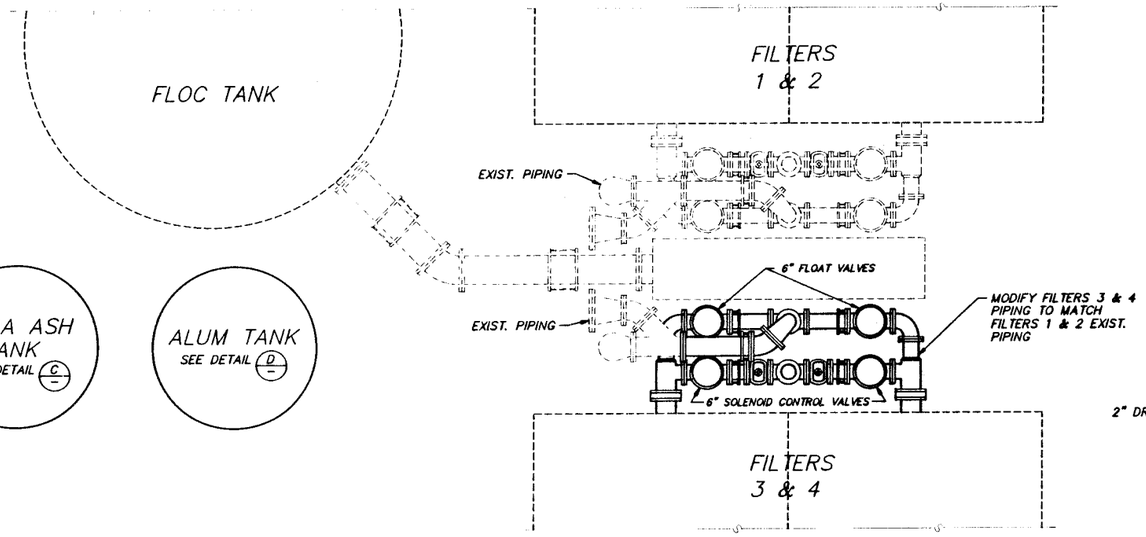


RAW WATER PUMPS & PIPING

NOT TO SCALE

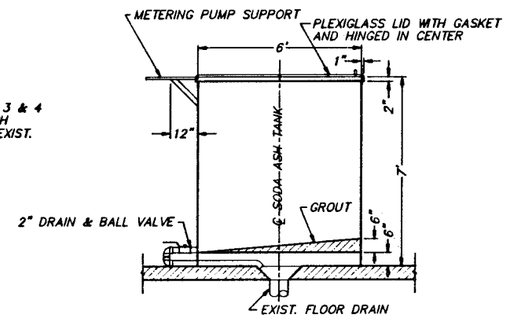
TRANSFER PUMPS & PIPING

NOT TO SCALE



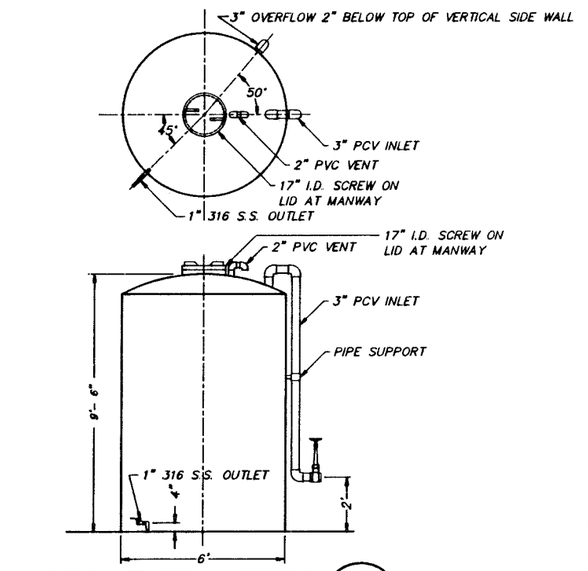
FILTER PIPING MODIFICATIONS

NOT TO SCALE



SODA ASH TANK - DETAIL C

NOT TO SCALE



ALUM TANK - DETAIL D

NOT TO SCALE

JUL 2 4 1992

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NO.	REVISIONS	BY	DATE

Wilson Engineering
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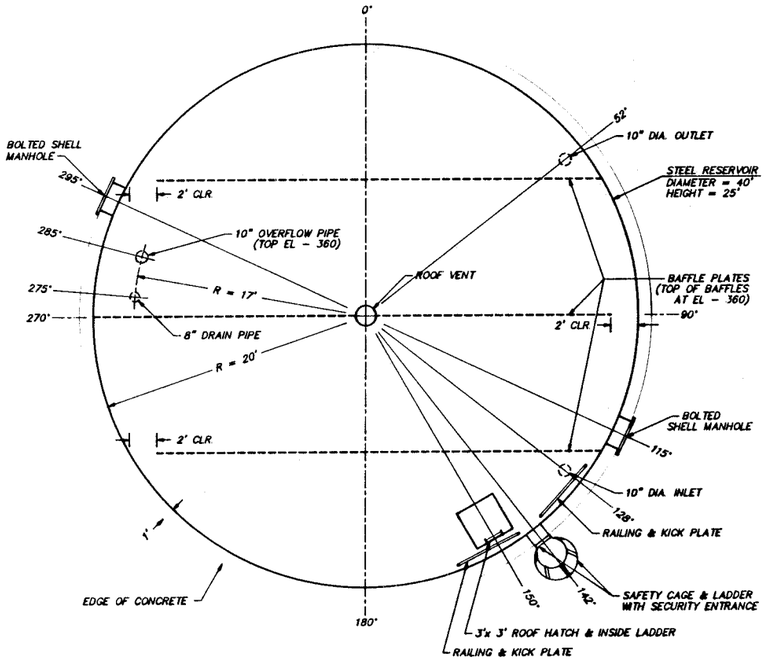
DRAWN BY:	RAM
CHECKED BY:	MAC

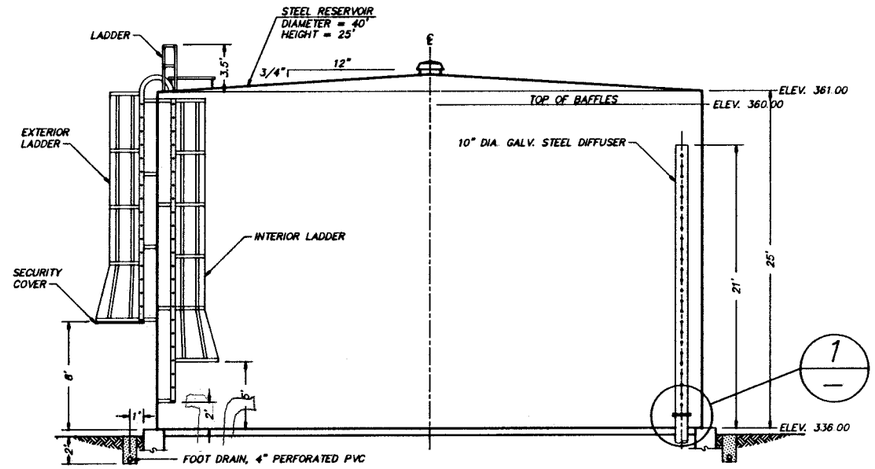
WHATCOM CO. WATER DIST. NO. 10
WATER TREATMENT PLANT
PUMP & PIPING MODIFICATIONS

DATE	MAY, 1992
SCALE	AS SHOWN
JOB NUMBER	92006
SHEET	C2
OF	C4



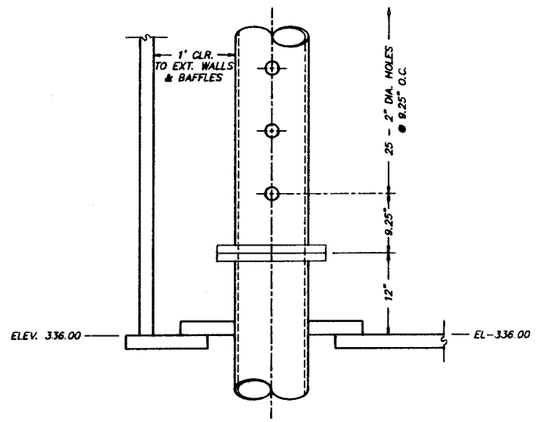
WATER STORAGE TANK – PLAN

1"= 5'- 0"



WATER STORAGE TANK – ELEVATION

1"= 5'- 0"



1/— INLET, OUTLET DIFFUSER – TYPICAL

NOT TO SCALE

JUL 24 1992
B:\DWG\92006-C3

NO.	REVISIONS	BY	DATE

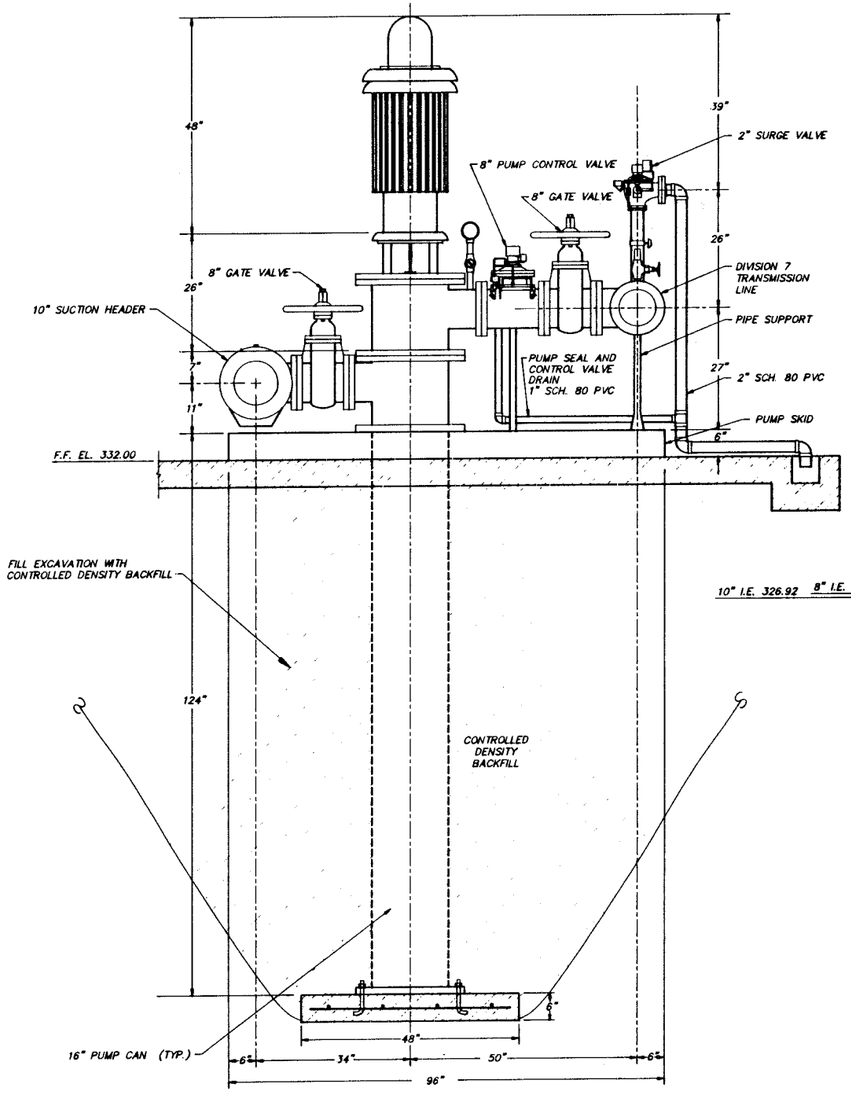
Wilson Engineering
CONSULTING ENGINEERS & SURVEYORS

805 DUPONT STREET #7
BELLINGHAM, WA 98225
(206) 733-6100
FAX: (206) 647-9061

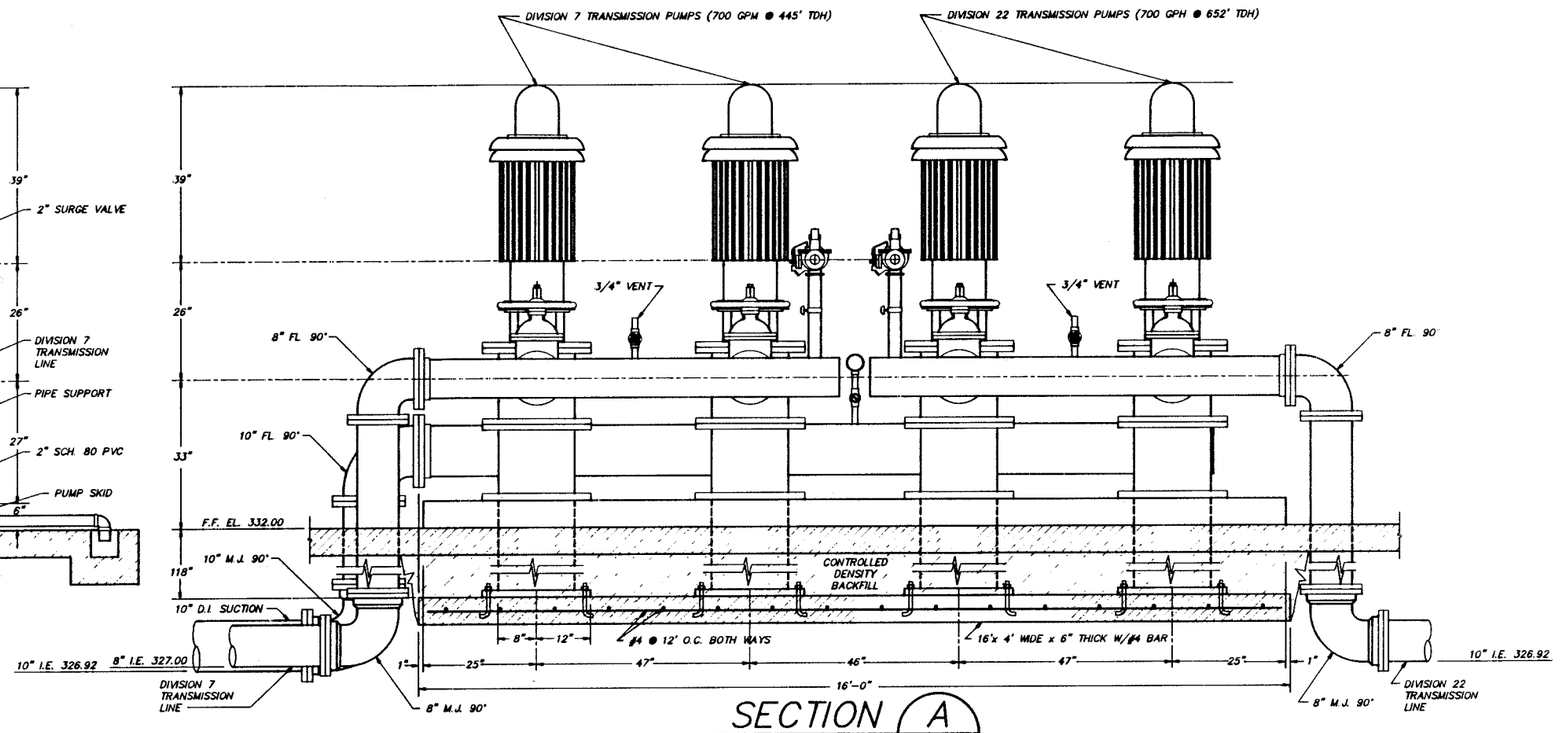
DESIGNED BY:	MAC
DRAWN BY:	RAM
CHECKED BY:	MAC

WHATCOM CO. WATER DIST. NO. 10
WATER TREATMENT PLANT
STORAGE & CHEMICAL TANKS

DATE	MAY, 1992
SCALE	AS SHOWN
JOB NUMBER	92006
SHEET	C3
OF	C4



SECTION B
NOT TO SCALE



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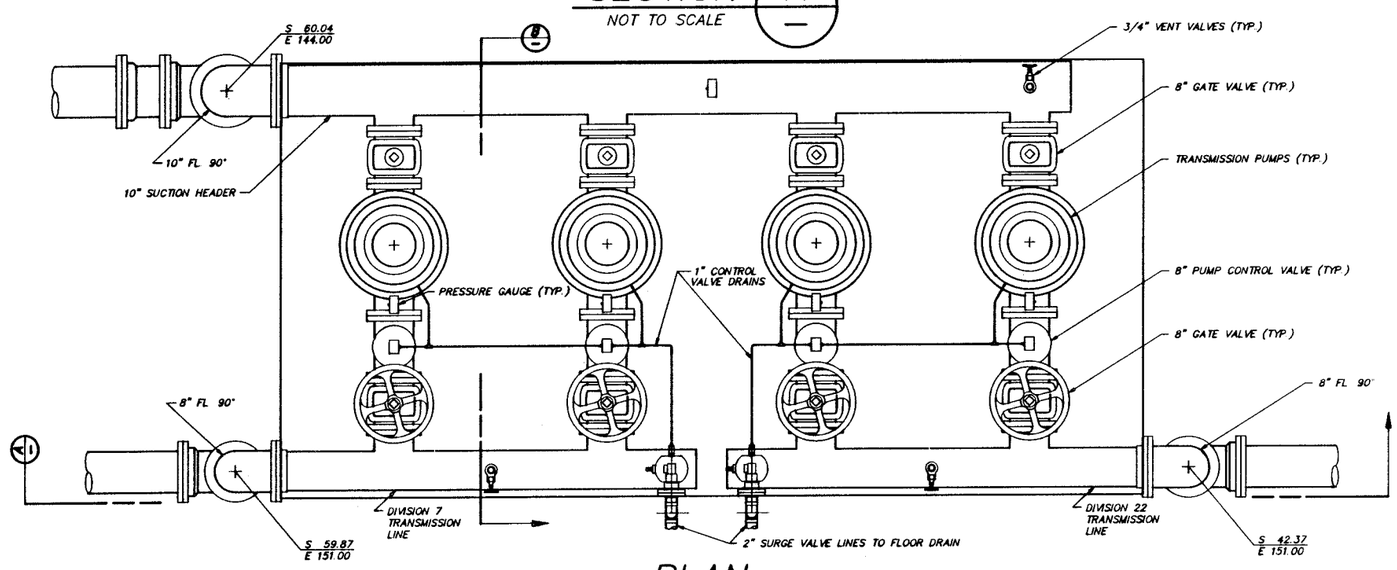

PLAN
NOT TO SCALE

JUL 2 8 1992
B:\DW9206-C4.DWG

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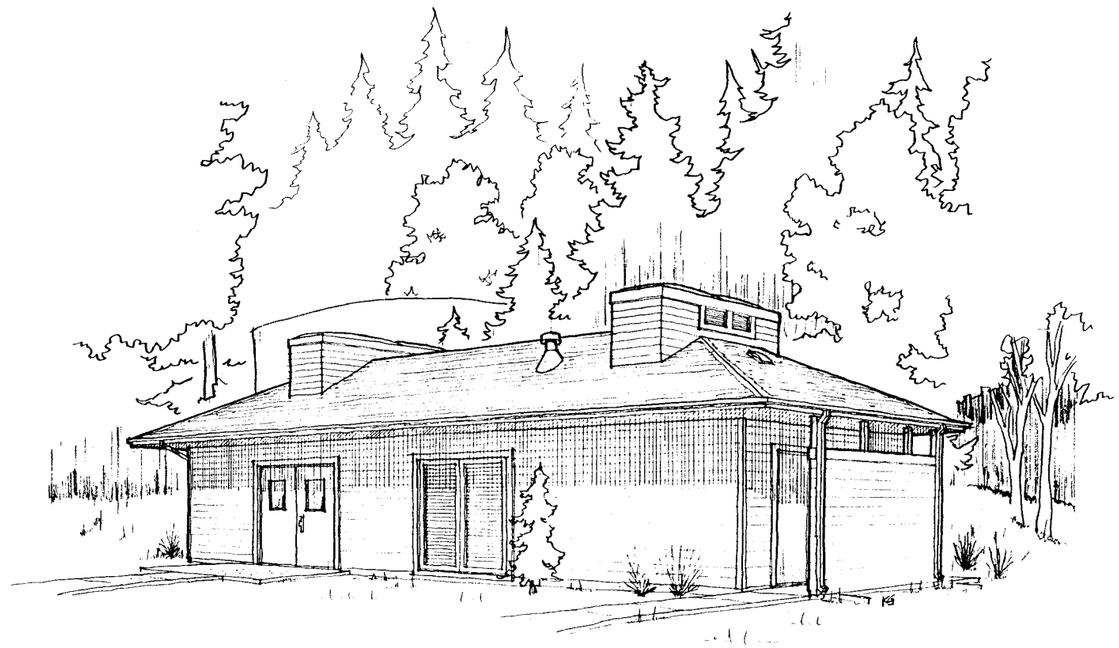
DESIGNED BY:	MAC
DRAWN BY:	RAM
CHECKED BY:	MAC

WHATCOM CO. WATER DIST. NO. 10
WATER TREATMENT PLANT
TRANSMISSION PUMPING UNIT

DATE	MAY, 1992
SCALE	AS SHOWN
JOB NUMBER	92006
SHEET	C4
OF	C4



PERSPECTIVE SKETCH

WATER TREATMENT PLANT CONTROL BUILDING

Morning Beach Drive, Sudden Valley, Washington

ARCHITECTURAL ABBREVIATIONS

SYMBOLS USED AS ABBREVIATIONS

∠	angle
℄	centerline
⌓	channel
d	penny
⊥	perpendicular
▱	plate
∅	round, diameter

ABBREVIATIONS

ABV	above
AFF	above finished floor
ACC	access
AC, ACOUS	acoustical
ACT	acoustical tile
ADD	addendum
ADJ	adjacent, adjustable
AGG	aggregate
ALT	alternate
AL ALUM	aluminum
AB	anchor bolt
ANOD	anodized
APPROVAL	written approval by the Architect
APPROX	approximate
ARCH	architect
ASB	asbestos
ASPH	asphalt
AUTO	automatic
BSMT	basement
BRG	bearing
BM	bench mark
BETW	between
BVL	beveled
BLK, BLKG	block, blocking
BD	board
BOT, BTM	bottom
BRK	brick
BLDG	building
BUR	built up roofing
CAB	cabinet
CPT	carpet
CSMT	casement
C I	cast iron
CB	catch basin
CLKG	caulk
CLG CEIL	ceiling
CEM	cement
CER	ceramic
CT	ceramic tile
CHAM	chamfer
CIR	circle
CLR	clear
COL	column
COMB	combination
COMPOS	composition, (composite)
COMP	compress (ed), (ion), (ible)
CONC	concrete
CMU	concrete masonry unit
CONST	construction
CONT	continuous or continue
CONTR	contract (or)
CJ	control joint
C G	corner guard
CORR	corrugated, corridor
CTR	counter
CTSK	countersunk
CRS	course (s)
DEMO	demolish, demolition
DTL	detail
DIAG	diagonal
DIAM	diameter
DIMEN	dimension
DR	door
DS	downspout
D	drain
DWR	drawer
DWG	drawing
DF	drinking fountain
EF	each face
EW	each way
E	east
ELEC	electric (al)
EWC	electric water cooler
EL, ELEV	elevation
ELEV	elevator
EMER	emergency
EQ	equal
EQUAL	equal in the opinion of the Architect.
EQMT	equipment
EXH	exhaust
EXIST	existing
EB	expansion bolt
EXP	exposed
EXT	exterior
FOC	face of concrete
FOF	face of finish
FOM	face of masonry
FOS	face of studs
FF	factory finish
FIN	finish (ed)
FE	fire extinguisher
FEC	fire extinguisher cabinet
FPL	fireplace
FP	fireproof
FLG, FLASH	flashing
FLR	floor (ing)
FD	floor drain
FTG, FOOT	footing
FND, FOUND	foundation
FR, FRM	frame (d), (ing)
FURNISH	supply only
GA	gauge
GALV	galvanized
G I	galvanized iron
GL	glass, glazing
GLBLK	glass block
GB	grab bar
GVL	gravel
GT	grout
GWB	gypsum wall board
HBD	hardboard
HDW	hardware
HDW	hardwood
HDR	header
HTG	heating
HVAC	heat/ventilating air conditioning
HT	height
HC	hollow core
H M	hollow metal
HOR, H, HORIZ	horizontal
HB	hose bibb
HWH, HWT	hot water heater, tank
I D	inside diameter
INSTALL	apply or install only
INS, INSUL	insulate (d), (ion)
INT	interior
INV	invert
JC	janitor's closet
JT, J	joint
J	joist
KPL	kickplate
KIT	kitchen
KO	knockout
LAB	laboratory
LAD	ladder
LB	lag bolt
LAM	laminate (d)
LAV	lavatory
LH	left hand
L	length
LT, LITE	light
LW	lightweight
LP	low point
M B	machine bolt
M H	manhole
M FR	manufacture (er)
M RB	marble
M KBD	marker board
MAS	masonry
MO	masonry opening
MTL	material (s)
MAX	maximum
MECH	mechanic (al)
MC	medicine cabinet
MED	medium
MBR	member, membrane
MET	metal
MWK	millwork
MIN	minimum
MIR	mirror
MISC	miscellaneous
MOD	modular
MLD	molding
MT	mount (ed), (ing)
MULL	mullion
NAT	natural
NR	noise reduction
NRC	noise reduction coefficient
NOM	nominal
N	north
NIC	not in contract
NTS	not to scale
OBS	obscure
OC	on center (s)
OPP	opposite
OPH	opposite hand
OD	outside diameter
OH	overhead
PNL	panel
PB	panic bar
PTD	paper towel dispenser
PTR	paper towel receptacle
PAR	parallel
PBD	particle board
PTN	partition
PVMT	pavement
PERF	perforate (d)
PLAS	plaster
PLAM	plastic laminate
PL	plate
PWD, PLYW	plywood
PT	point
PVC	polyvinyl chloride
PCF	pounds per cubic foot
PFL	pounds per lineal foot
PSF	pounds per square foot
PSI	pounds per square inch
PFN	prefinished
PL	property line
PROVIDE	furnish & install
QT	quarry tile
RBT	rabbet
RAD	radius
REF	reference
RFL	reflect (ed), (ive), (or)
REFR, RFR	refrigerator
REG	register
RE, REINF	reinforce (d), (ing)
RES	resilient
RET	return
RA	return air
RH	right hand
ROW	right of way
R	riser
RD	roof drain
RFH	roof hatch
RFG	roofing
RM	room
RO	rough opening
RB	rubber base
SCH	schedule
SNT, SEAL	sealant
SEC	section
SELECTED	as selected by the Architect
SHTH	sheathing
SHT	sheet
SH, SHLV	shelf, shelving
SHOWN	as shown or noted on the drawings
SIM	similar
SKL, SKLT	skylight
SC	solid core
SP	soundproof
S	south
SPK	speaker
SPEC	specification (s)
SQ	square
SST	stainless steel
STD	standard
STA	station
ST, STL	steel
SD	storm drain
STR	structural
SUSP	suspended
SYM	symmetry (ical)
SYS	system
TKBD	tackboard
TEL	telephone
TV	television
THK	thick (ness)
THR	threshold
TP	toilet partition
TPD	toilet paper dispenser
T & G	tongue and groove
TOS	top of slab
TB	towel bar
T	tread
TYP	typical
UNFIN	unfinished
UR	urinal
VJ	v-joint (ed)
VB	vapor barrier
VAR	varnish
VNR	veneer
VERT, V	vertical
VG	vertical grain
VIN	vinyl
VCT	vinyl composition tile
VB	vinyl base
VF	vinyl fabric
VT	vinyl tile
WSCT	wainscot
WC	water closet
WP	waterproofing
WWF	welded wire fabric
W	west
W	width, wide
W/	with
WIN, WDW	window
WM	wire mesh
WD	wood

Abbreviations and graphic symbols shown are in general compliance with building industry standards. Request clarifications, if necessary, before proceeding with the Work.

REFERENCE SYMBOLS

- North — True North (if not called North)
- 98.60 — Finish Grade Elevation
- Existing Contour
- New Contour
- Level Line
- Center Line
- Match Line, Cut Line
- Property Line
- Project Limit Line
- (B) — Grid Number/Letter
- A / A3 — Building Section Letter, Sheet Where Shown
- C / A5 — Wall Section Letter, Sheet Where Shown
- 2 / A7 — Detail Number, Sheet Where Shown
- 1 / 1/4" = 1'-0" — DETAIL — Detail Number & Title; Dash on Sheet Where Shown (and Sheet Where Called If Both on Same Sheet), Scale
- 10 A7 B — Interior Elevation Key Numbers, Sheet Where Shown
- E4 — Room Number
- 26 — Door Number
- B — Window/Rielle Letter
- 1 — Revision

MATERIALS

- Acoustic Tile or Board
- Brick
- Ceramic Tile or
- Concrete
- Concrete Masonry
- Earth
- Glass
- Gypsum Wall Board
- Batt Insulation
- Rigid Insulation
- Metal
- Plaster on Metal Lath
- Mortar, Plaster or Grout
- Plywood
- Rock Fill
- Sand
- Stone
- Finish Wood
- Framing Lumber
- Blocking Lumber

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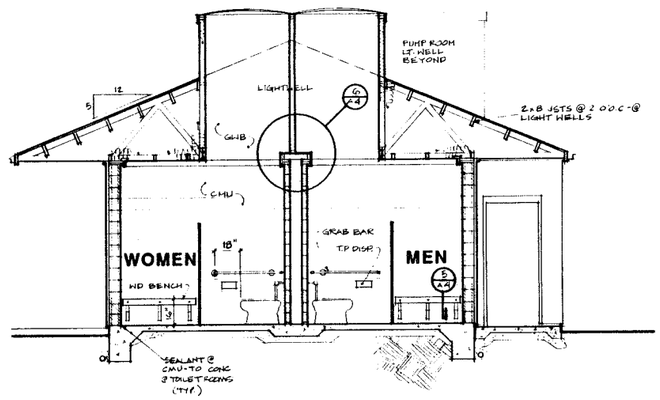
2706 REGISTERED ROBERT E. ROSS STATE OF WASHINGTON 6/15/92

Sudden Valley
Water Treatment Plant Control Bldg.
Morning Beach Drive
Sudden Valley, WA

Water District 10

Job Number	9210
Drawn By	KCG
Checked By	RER
Date	6 15 92
Revisions	

A1



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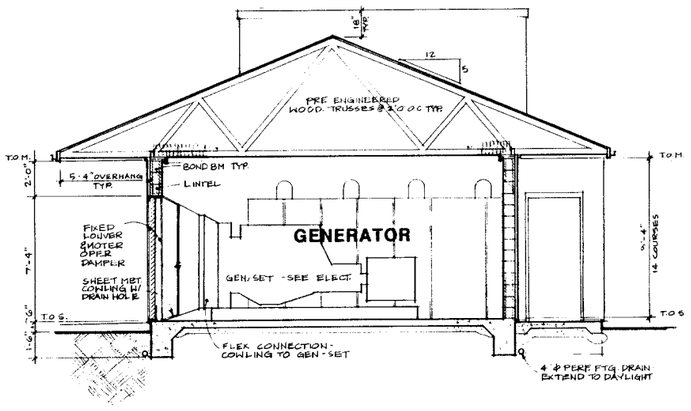

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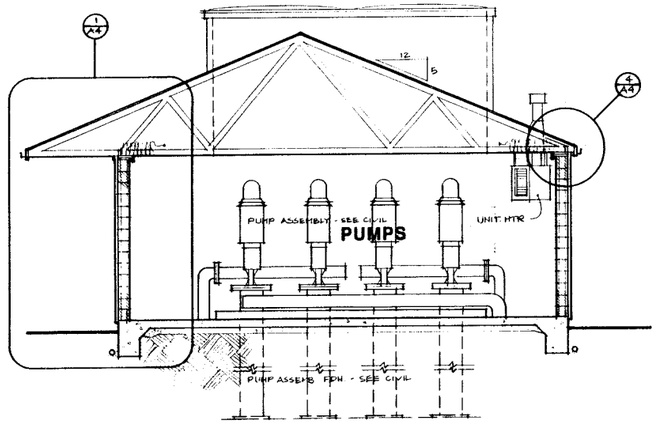

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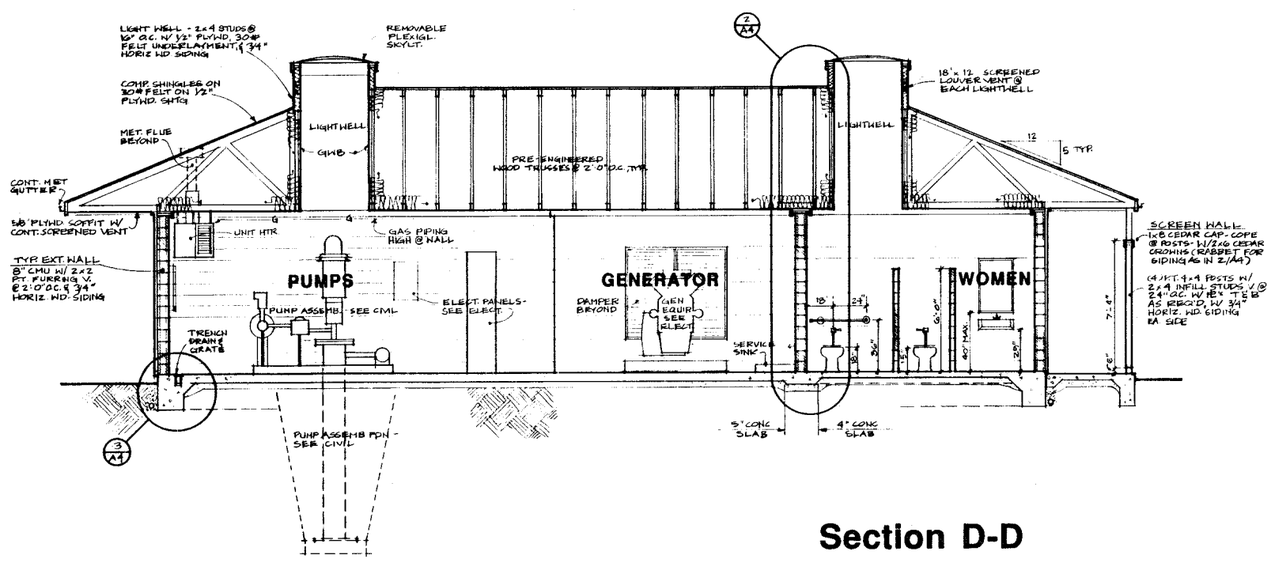

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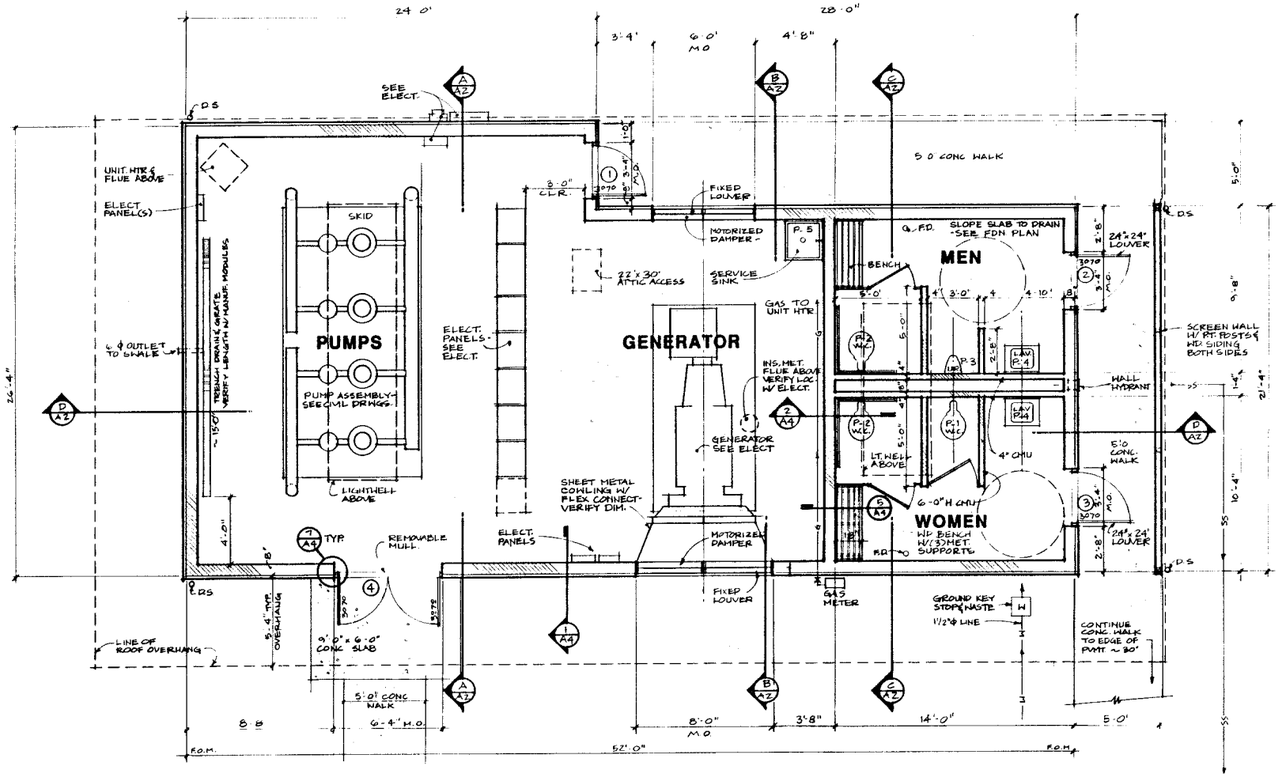

Floor Plan

SCALE: ¼"=1'-0"
ALL DRAWINGS THIS SHEET

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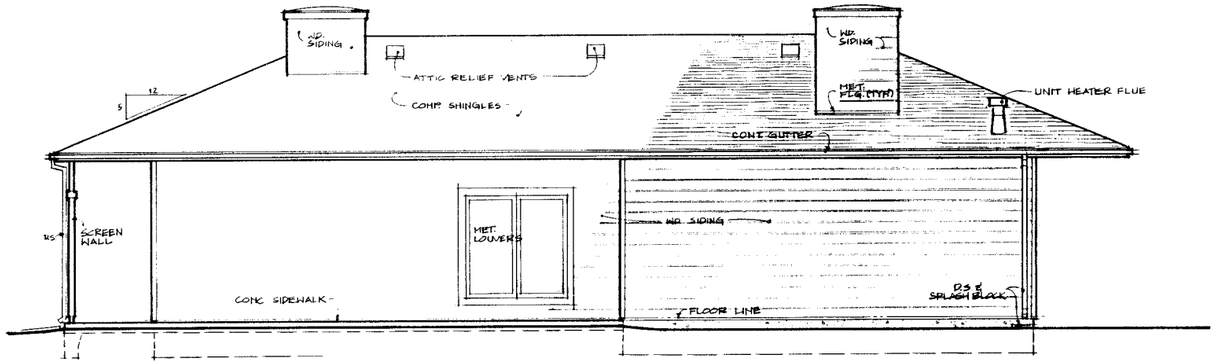
(206) 676-7733

REGISTERED ARCHITECT ROBERT C. ROSS STATE OF WASHINGTON 6/15/92

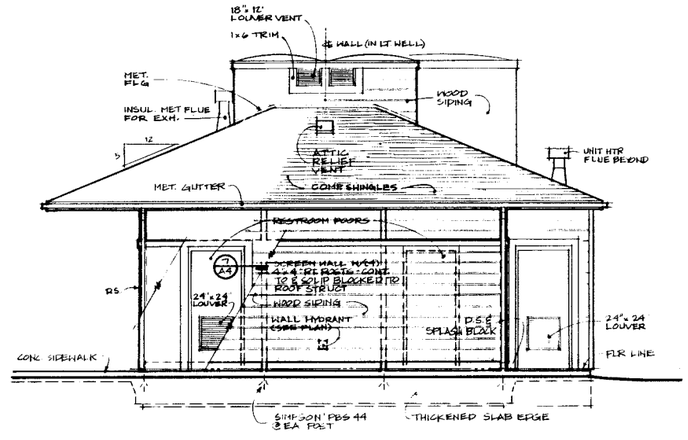
Sudden Valley
Water District 10 Water Treatment Plant Control Bldg.
Morning Beach Drive Sudden Valley, WA

Job Number	9210
Drawn By	KLG
Checked By	RCR
Date	6/15/92
Revisions	

A2



South



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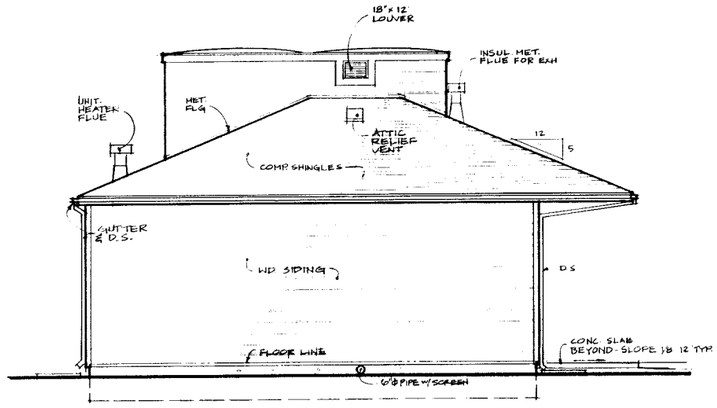
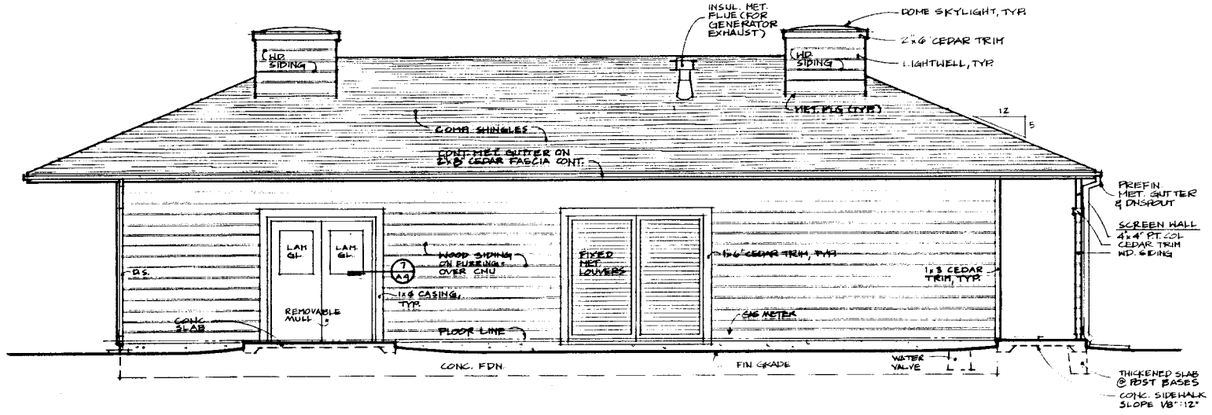


East



North

Elevations

SCALE: 1/4"=1'-0"
ALL DRAWINGS THIS SHEET

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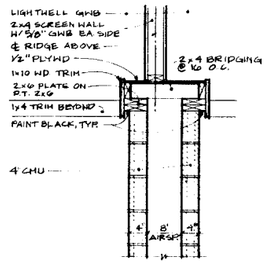
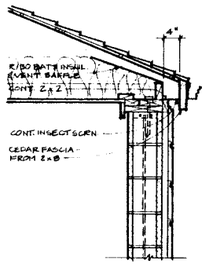
2708 REGISTERED ARCHITECT ROBERT C. ROSS STATE OF WASHINGTON 6/15/92

Water District 10
Water Treatment Plant Control Bldg.
Morning Beach Drive
Sudden Valley, WA

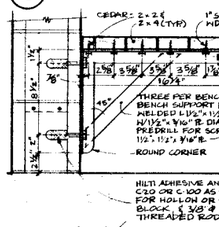
Job Number	9210
Drawn By	KCG
Checked By	RCR
Date	6/15/92
Revisions	

A3





6 LGT. WELL @ RESTRMS.



7 TYP. DOOR HEAD/JAMB

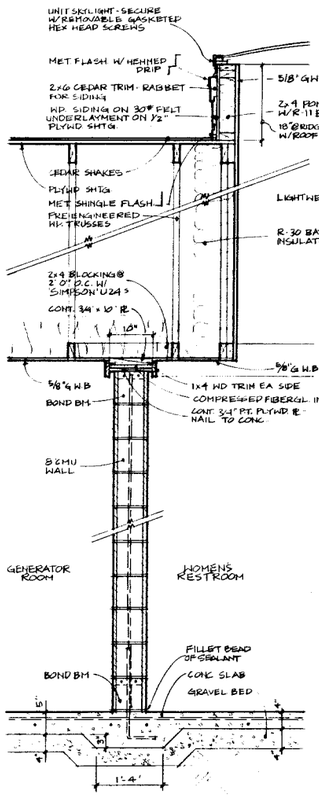
4 EAVE

5 BENCH

SCALE: 1 1/2" = 1'-0"

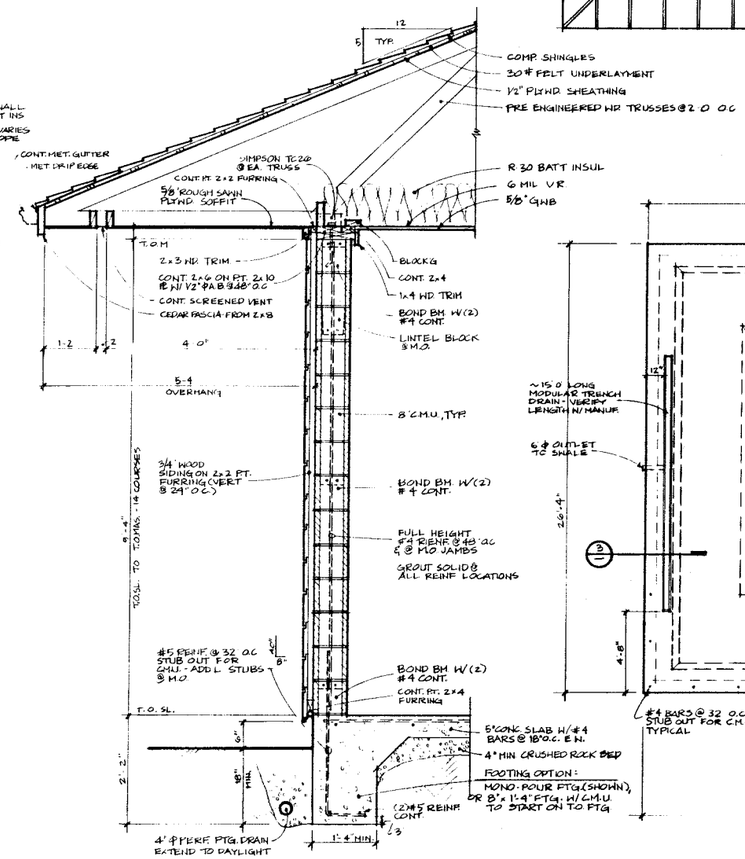
3 FDN. @ TRENCH DRAIN

SCALE: 3/4" = 1'-0"



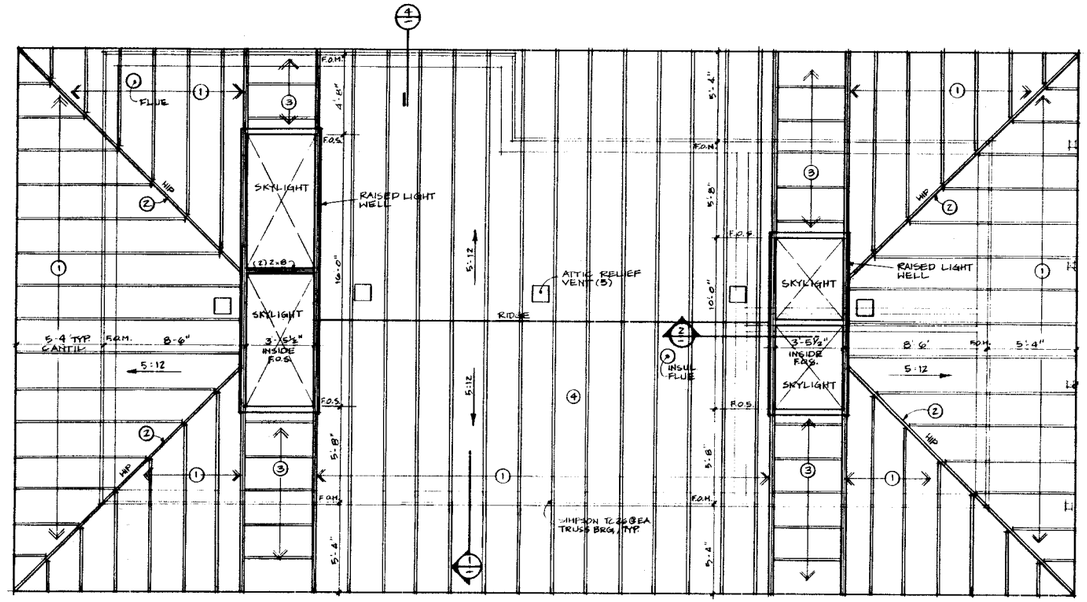
2 WALL SECTION

SCALE: 3/4" = 1'-0"



1 WALL SECTION

SCALE: 3/4" = 1'-0"

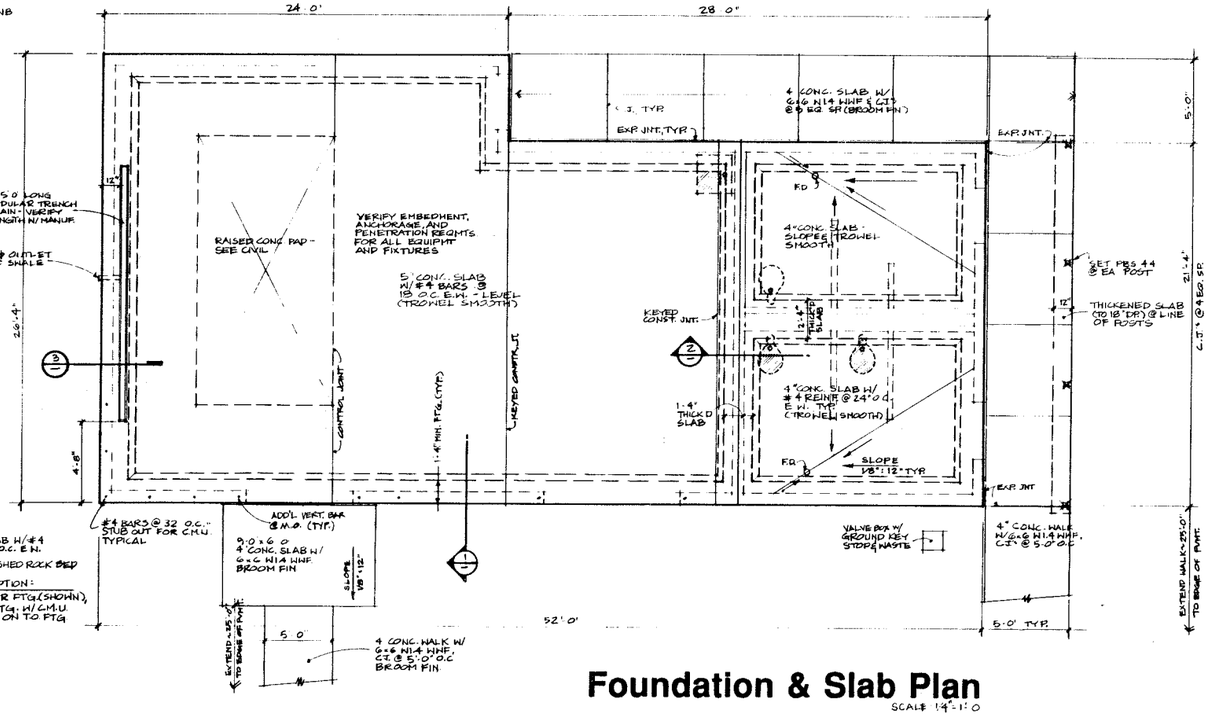


FRAMING NOTES

1. PRE ENGINEERED WD TRUSSES @ 2'-0" O.C., TYP.
2. PRE ENGINEERED WD HIP TRUSS
3. 2 x 8 JSTS. @ 2'-0" O.C. BETWEEN DOUBLED WD TRUSSES
4. 1/2 CDX PLYWD. SHEATH., TYP.

Roof Framing Plan

SCALE 1/4" = 1'-0"



Foundation & Slab Plan

SCALE 1/4" = 1'-0"

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2703 REGISTERED ARCHITECT ROBERT C. ROSS STATE OF WASHINGTON 6/19/92

Sudden Valley
Water Treatment Plant Control Bldg.
Sudden Valley, WA

Water District 10
Morning Beach Drive

Job Number	9210
Drawn By	KCG
Checked By	RCR
Date	6/15/92
Revisions	

A4

ABBREVIATION

A,AMP – AMPERE
AL – ALARM
AC – AIR COMPRESSOR
AF – AMPERE FRAME
AFF – ABOVE FINISHED FLOOR
AFS – AMPERE FUSE
AI – ANALOG INPUT POINT (PLC)
AIL – AMBER INDICATING LIGHT
ALT – ALTERNATOR
AO – ANALOG OUTPUT POINT (PLC)
AS – AMPERE SWITCH
AT – AMPERE TRIP
ATS – AUTOMATIC TRANSFER SWITCH
BC – BATTERY CHARGER
BH – BLOCK HEATER
BIL – BLUE INDICATING LIGHT
BP – BYPASS CONTACTOR
C – CONDUIT (GRS)
CB – CIRCUIT BREAKER
CP – CONTROL PANEL
CPT – CONTROL POWER XFMR
CT – CURRENT TRANSFORMER
CV – CHECK VALVE
DB – DIRECT BURIED
DEM – DEMAND
DF – DEMAND FACTOR
DIAC – AC DIGITAL INPUT POINT (PLC)
DOAC – AC DIGITAL OUTPUT POINT (PLC)
EF – EXHAUST FAN
EX, EXIST. – EXISTING
GND – GROUND
GRC – GALVANIZED RIGID STEEL (CONDUIT)
H – HOT, HIGH
HH – HIGH HIGH
HOA – HAND-OFF-AUTO
IC – ISOLATION CONTACTOR
ISR – INTRINSICALLY SAFE RELAY
KVARH – KILOVAR HOUR
KWH – KILOWATT HOUR
L – LOW
LS – LIMIT SWITCH
N – NEUTRAL
MCP – MAIN CONTROL PANEL
MOV – MOTOR OPERATED VALVE
OIT – OPERATOR IN TROUBLE
PB – PUSH BUTTON
PFR – PHASE FAILURE RELAY
PS – PRESSURE SWITCH
PT – POTENTIAL TRANSFORMER
PVC – POLY VINYL CHLORIDE (CONDUIT)
RHP – RADIANT HEAT PANEL
RIL – RED INDICATING LIGHT
RTM – RUN TIME METER
SV – SOLONOID VALVE
TC – TIME CLOCK
TDOE – TIME DELAY ON ENERGIZATION
TDOD – TIME DELAY ON DE-ENERGIZATION
TWSP – TWISTED SHIELDED PAIR
TWST – TWISTED SHIELDED THREE CONDUCTOR
UH – UNIT HEATER
VFD – VARIABLE FREQUENCY DRIVE
VGS – VOLATILE GAS SENSOR
WIL – WHITE INDICATING LIGHT
WP – WEATHER PROOF
WV – WASTE VALVE
XFMR – TRANSFORMER

REFERENCE SYMBOLS

P1 – POWER CONDUIT & WIRE TAG, SEE SCHEDULE
C1 – CONTROL CONDUIT & WIRE TAG SEE SCHEDULE
S1 – SIGNAL CONDUIT & WIRE TAG, SEE SCHEDULE
T1 – TELEPHONE CONDUIT & WIRE TAG
1 – SHEET NOTE
P-01 – MECHANICAL EQUIP. DESIGNATION
PSL-101 – INSTRUMENT DESIGNATION

A / E3 – SECTION NUMBER; SECTION CUT; SHEET ON WHICH SECTION APPEARS.

A / E1 – SECTION NUMBER; SECTION SCALE; SHEET ON WHICH SECTION CUT APPEARS.

SYMBOL (PLAN)	DESCRIPTION
F1 2	FLUORESCENT LIGHTING FIXTURE. "F1" INDICATES TYPE AS PER LIGHTING SCHEDULE, "2" INDICATES CIRCUITING.
F1 2	INCANDESCENT LIGHTING FIXTURE SURFACE
F1 2	INCANDESCENT LIGHTING FIXTURE, WALL MOUNT.
	EXIT LIGHT WITH BATTERY PACK.
F1 2	EMERGENCY WALL PACK.
J	JUNCTION BOX WITH BLANK COVER.
2 TG	DUPLEX RECEPTACLE "2" INDICATES CIRCUITING. IG. INDICATES ISOLATED GROUND.
GFI	DUPLEX RECEPTACLE WITH GROUND FAULT PROTECTION.
	208V, 3ø, RECEPTACLE
$	SINGLE POLE SWITCH.
$2	DOUBLE POLE SWITCH.
$3	THREE WAY SWITCH.
L-7	CONDUIT HOME RUN 3/4"C, 2#12 & 1#12 GND. TO PANEL L, CKT. 7 UNLESS SHOWN OTHERWISE.
C10	CONDUIT HOME RUN -- SEE SHEDULE. C10 TO MCP, (L-10) TO PANEL "L". P10 TO MCC
	CONDUIT EXPOSED,NEW
	CONDUIT EXPOSED, EXISTING
	CONDUIT UNDERGROUND OR IN FLOOR SLAB.
	CONDUIT FLEXIBLE.
	CONDUIT UP.
	CONDUIT DOWN.
	CONDUIT CAPPED
PE	PHOTO ELECTRIC CELL.
	TO BE REMOVED
	TO BE REMOVED
-E-E-	EXISTING UNDERGROUND POWER
-T-T-	EXISTING UNDERGROUND TELEPHONE
-W-W-	EXISTING UNDERGROUND WATER
-G-G-	EXISTING UNDERGROUND GAS

SYMBOL SCHEMATIC	SYMBOL PLAN	DESCRIPTION
		GROUND WELL
		GROUND ROD
	HH	HANDHOLE WITH DESIGNATION
		PANELBOARD
	T	TRANSFORMER
3	CT	CURRENT TRANSFORMER, NUMERAL INDICATES NUMBER OF C.T.'S
M	M	LOUVER (SPRING OPEN, MOTOR CLOSE)
AM AS		METER & SWITCH: A=AMP V=VOLT
		BATTERY
		FUSE
10	M	MOTOR, NUMBER INDICATES HORSEPOWER
1/4	F	EXHAUST OR SUPPLY FAN NUMBER INDICATES HOREPOWER.
		ELECTRIC HEATER WINDING
G		GENERATOR
	60 NF	DISCONNECT SWITCH NON FUSED. NO. (60) INDICATES AMPERAGE RATING.
100AFS 200AS	200/100	DISCONNECT SWITCH FUSED 200=SWITCH RATING, 100=FUSE RATING.
W		MOTOR WINDING HEATER
MS 2	MS	FULL VOLTAGE STARTER / NEMA SIZE MS=MOTOR STARTER CONTACT
WHM		WATT HOUR METER
CR		CONTROL RELAY
PFR		PHASE FAIL RELAY & FUSE
R	R	INDICATING LIGHT: G=GREEN, R=RED, A=AMBER, B=BLUE, W=WHITE
R		ANNUNCIATOR WINDOW: G=GREEN, R=RED, A=AMBER, B=BLUE, W=WHITE
		HORN
OFF HAND AUTO	HOA	SELECTOR SWITCH: HOA=HAND-OFF-AUTO AS=AMP SWITCH VS=VOLT SWITCH
		PUSHBUTTON SWITCH, MOMENTARY ON
		PUSHBUTTON SWITCH, MOMENTARY OFF
RUN STOP	RS	SELECTOR SWITCH: RUN-STOP/ON-OFF
		LOCAL EQUIPMENT CONTROL PANEL
		CONDUIT WITH SEAL FITTING
HOR		HAND-OFF-REMOTE SELECTOR SWITCH
GIL/WIL		GREEN INDICATOR LIGHT /WHITE INDICATOR LIGHT

SYMBOL SCHEMATIC	SYMBOL PLAN	DESCRIPTION
		METAL OXIDE VARISTOR
DX		DISCRETE (120V) TERMINAL STRIP POINT
DX		CIRCUIT DISCONNECTING DISCRETE TERMINAL STRIP POINT
SX		SIGNAL (ANALOG OR 24Vdc) TERMINAL STRIP POINT
SX		CIRCUIT DISCONNECTING SIGNAL TERMINAL STRIP POINT
RTM		RUNNING TIME METER
	S	SMOKE DETECTOR
		TELEPHONE OUTLET
	SV	SOLONOID VALVE
	AT	ANALYTICAL TRANSMITTER
	LT	LEVEL TRANSMITTER
	PT	PRESSURE TRANSMITTER
	FT	FLOW TRANSMITTER
	FS	FLOW SWITCH
	ZS	LIMIT SWITCH, NORMALLY OPEN
	ZS	LIMIT SWITCH, NORMALLY CLOSED.
	LS	LEVEL SWITCH, NORMALLY OPEN
	LS	LEVEL SWITCH, NORMALLY OPEN
	PS	PRESSURE SWITCH, NORMALLY OPEN
	D	DOOR SECURITY SWITCH
TD1 ON (5 SEC)		TIME DELAY RELAY, ON DELAY. (DELAY TIME)
TD1 OFF (5 SEC)		TIME DELAY RELAY, OFF DELAY. (DELAY TIME)
		CONDUCTORS NOT CONNECTED.
		CONDUCTORS CONNECTED.
		TWISTED SHIELDED PAIR (TWSP)
		PULL OUT SWITCH
G		BLOWN FUSE INDICATOR
		TERMINAL IN MCC
		TERMINAL REMOTE DEVICE OR PANEL
		NORMALLY OPEN CONTACT.
		NORMALLY CLOSED CONTACT.
		THERMAL OVERLOAD HEATER.
30/2		CIRCUIT BREAKER RATING/NO. OF POLES.
		THERMAL MAGNETIC CIRCUIT BREAKER TRIP.
		AUTOMATIC TRANSFER SWITCH.
		POWER CAPACITOR.
CP		POWER CAPACITOR.
		RECEPTACLE
MS		MOTOR STARTER CONTACTOR COIL – START
MR		MOTOR STARTER CONTACTOR COIL – RUNNING

ROBERT J. CASNE, STATE OF WASHINGTON, 12293, REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP-BLOOM, STATE OF WASHINGTON, 16288, REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E01

NO.	REVISIONS	BY	DATE

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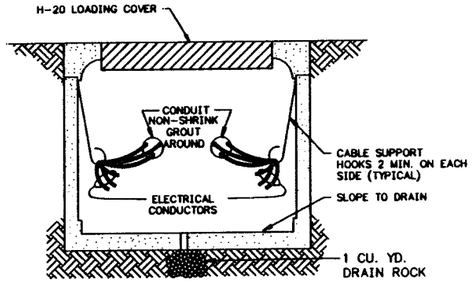
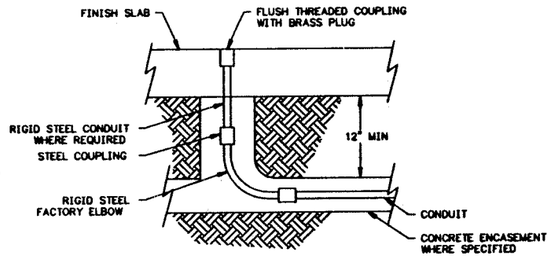
WHATCOM COUNTY
WATER TREATMENT PLANT
LEGEND AND ABBREVIATIONS

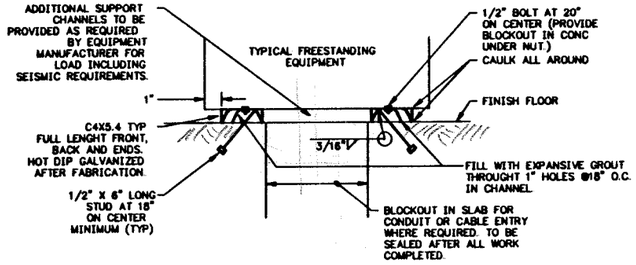
DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	E01
OF	16



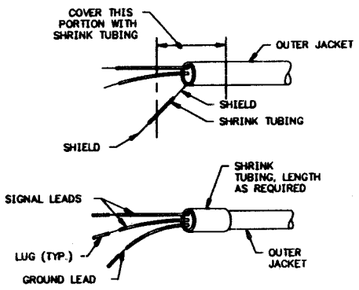
HANDHOLE/MANHOLE
N.T.S.



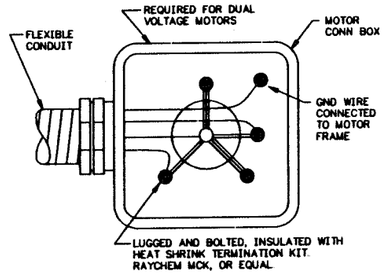
CONDUIT FLOOR TERMINATION
N.T.S.



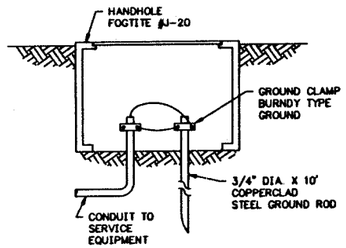
TYPICAL FREESTANDING EQUIPMENT MOUNTING
N.T.S.



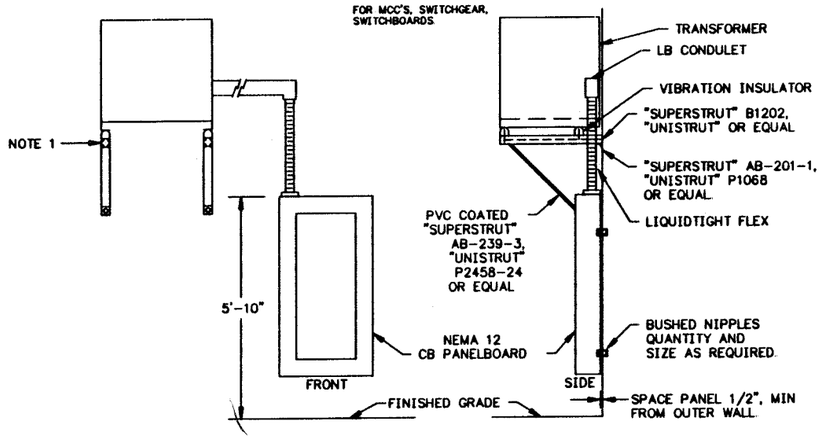
TERMINATION OF SHIELDED CONTROL CABLE SHIELD GROUNDED AT TERMINATION



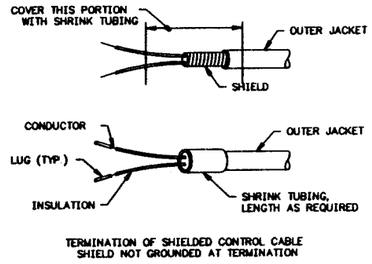
MAKEUP AT MOTOR
N.T.S.



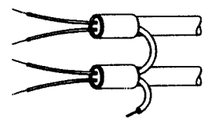
GROUND ROD DETAIL
N.T.S.



CIRCUIT BREAKER PANELBOARD AND TRANSFORMER TYPICAL SURFACE MOUNTING ASSEMBLY
ALL HARDWARE SHALL BE HOT DIP GALVANIZED

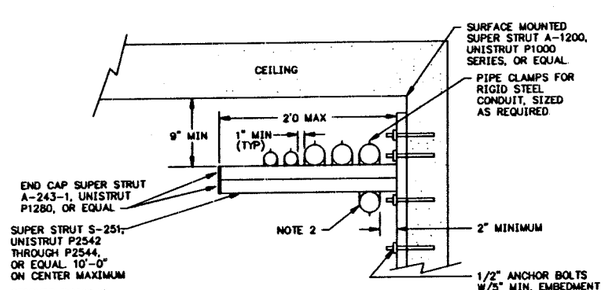


TERMINATION OF SHIELDED CONTROL CABLE SHIELD NOT GROUNDED AT TERMINATION

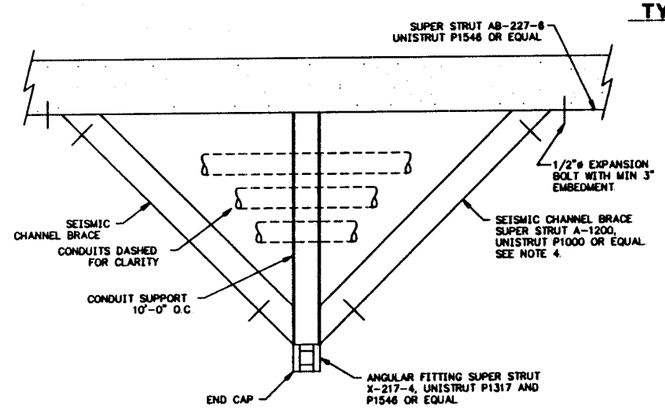


UNACCEPTABLE METHOD OF GROUNDING CONTROL CABLE SHIELD

SHIELDED WIRE TERMINATION
N.T.S.



ELEVATION

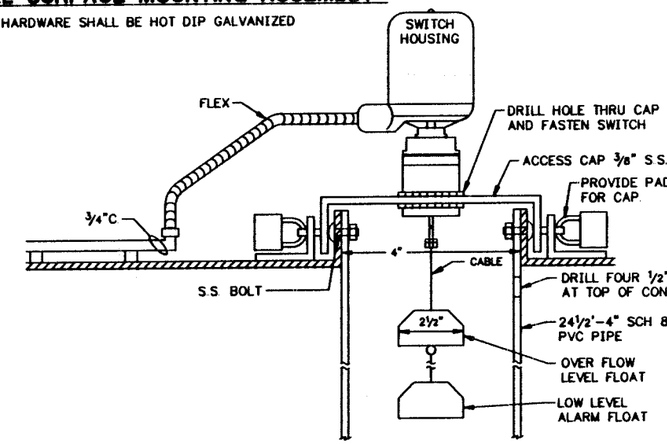


PLAN

NOTES:

1. HARDWARE SHALL BE HOT DIP OR MECHANICALLY GALVANIZED AFTER FABRICATION, EXCEPT FASTENERS MAY BE ZINC PLATED.
2. MAX. UNIFORMLY DISTRIBUTED LOAD (CONDUIT AND FILL) PER UNIT TO BE 1000 LBS. CONTRACTOR TO PROVIDE CALCULATIONS WHEN ANY CONDUIT IS OVER 2" IN SIZE OR IF CONDUIT IS INSTALLED ON TOP AND BOTTOM OF RACK.
3. HOLE SIZES ON FITTINGS SHALL BE 9/16"DIA WITH 1/2" HED HEAD CAP SCREW 15/16" LONG AND 1/2" CLAMP NUT WITH SPRING.
4. SEISMIC CHANNEL BRACING REQUIRED AT INTERVALS OF 60' MAX FOR ZONE 3 AND 40' MAX FOR ZONE 4.

CONDUIT RACK FOR SEISMIC ZONES 3 & 4
N.T.S.



RESERVOIR LEVEL SWITCH INSTALLATION DETAIL
N.T.S.

ROBERT J. CASNE — STATE OF WASHINGTON — 12888 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID B. THARP-BLOOM — STATE OF WASHINGTON — 16815 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E02

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DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
ELECTRICAL DETAILS

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E02
OF	16

DEMAND CALC WATER TREAT BLDG.

LOAD	HP	kVA	DF	kVA
RWP	20	20	1	20
*RWP	20	20	0	–
XP	25	25	1.25	32
*XP	25	25	0	–
MISC.		40	1	40
TOTAL		130		92
92kA = 111 AMPS @ 480V, 3ø				

DEMAND CALC PUMP BLDG.

LOAD	HP	kVA	DF	kVA
TRP	150	140	1.25	175
*TRP	150	140	0	–
TRP	100	96	1	96
*TRP	100	96	0	–
MISC.		10	1	10
WATER TREAT BLDG.		92	1	92
TOTAL		574		373
373kVA = 449 AMPS @ 480V, 3ø				

*PUMPS HAVE 100% BACKUP – INTERLOCKED SUCH THAT ONLY ONE OF EACH PAIR WILL RUN AT ONE TIME.

LEGEND

POWER
CONTROL
EXISTING

MCC1 – PUMP BUILDING

800A, 3ø, 4W 28,000 AIC

C.T. COMP.

800AF 600AT/3

600A ATS 3ø, 3P

480V 3ø, 4W

WATER PIPE

TEMPORARY SERVICE BY CONRTACTOR

PSL-585 NATURAL GAS PRESSURE SWITCH

230kW, 3ø, 4W, 480V NATURAL GAS

350/3

175/3 — P-51 TRANSMISSION PUMP — 100 — YV-532 / ZSC-532

175/3 — P-52 TRANSMISSION PUMP — 100 — YV-542 / ZSC-542

250/3 — P-53 TRANSMISSION PUMP — 150 — YV-512 / ZSC-512

250/3 — P-54 TRANSMISSION PUMP — 150 — YV-522 / ZSC-522

30kVAR

25/2 — 10kVA 480V–120/240 1ø — PNL L 120/240V

250AF 150AT/3

LOUVERS

INTRUSION

SMOKE DETECTOR

JB-AC

JB-DC

JB-S

WTP RES LEVEL IND. PANEL

PUMP BUILDING

WATER TREATMENT BUILDING

MCC2 – WATER TREATMENT BLDG.

250AF 150AT/3

600A, 3ø, 4W, 28,000 AIC

60/3 — P-11 RAW WATER PUMP — 20

60/3 — P-12 RAW WATER PUMP — 20

70/3 — P-41 CLEAR WELL TRANSFER PUMP — 25

70/3 — P-42 CLEAR WELL TRANSFER PUMP — 25

45/3

15/3

30/3

20/2

20/2

ALL ITEMS TO BE REMOVED

PNL A — 10 RWP — 75 P107 — 75 DIV22 — PNL B

1/3HP, ALUM MIXER

1/4HP, ALUM METER PUMP

1/4HP, SODA ASH METER PUMP

PRE-CHLORINE TANK SOLONOID

pH (EX)

Cl2 (EX)

Cl2 LEAK DETECTION (EX)

HQ TELEMETRY (EXISTING)

TELEPHONE SERVICE

TEL. TERM. BOARD (EXISTING)

WTP TELEMETRY

OIT IN CI ROOM

NOT IN CONTRACT FOR INFO ONLY

DIV 7 RES. — LT-707

DIV 22 RES. — LT-722

MAIN CONTROL PANEL (MCP)

(EXISTING) FILTER 1 & 2 CONTROLS

(EXISTING) FILTER 3 & 4 CONTROLS

(EXISTING) CLEARWELL

LSH-401 (EX)

LSL-401 (EX)

LSLL-401 (EX)

LT-401 (EX)

FQIT RW FLOW TOTAL FE-101

RW FLOW SWITCH FSL-105 (EX)

SUMP FLOOD SWITCH LSH-107

FQIT BW FLOW TOTAL FE-641

TURB AIT-301 (EX) F-1&2

TURB AIT-302 (EX) F-3&4

TURB AIT-106 (EX) RAW

TURB AIT-505 (EX) FINISH

FLOC TANK — LSH-201 / LS-201A (EX) / LS-201B (EX)

WTP RESERVOIR — LSHH-501 / LSL-501 — WTP RES. — LT RES. LEVEL

PANEL B 225A 120Y/208V 3ø

30kVA 480–120Y/208V 3ø

3/4 HEATER FAN (EXISTING)

15kW HEATER (EXISTING)

BAY 1,3,5 LIGHTS 277V (EXISTING)

BAY 2,4 LIGHTS 277V (EXISTING)

TERMINAL BOX — TO REMOVED PBD B LOADS

PNL C EXISTING

ROBERT J. CASNE — STATE OF WASHINGTON — 12206 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP-SLAXTON — STATE OF WASHINGTON — 16008 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E03

NO.	REVISIONS	BY	DATE

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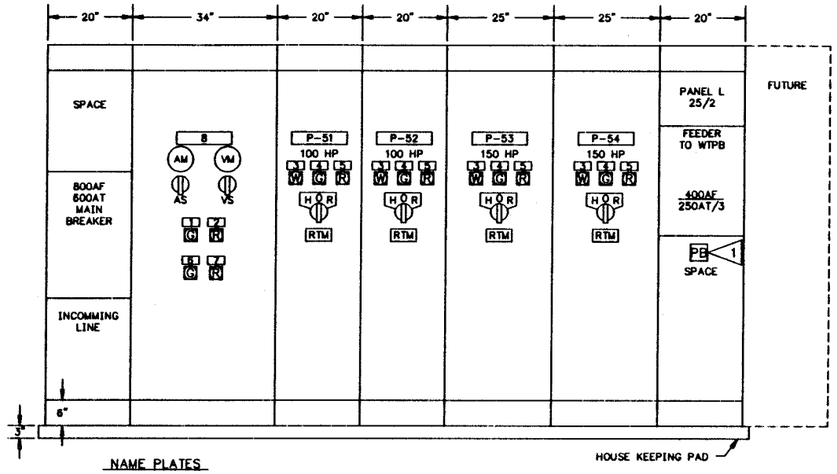
DESIGNED BY:	DMB/VMF
DRAWN BY:	TEO
CHECKED BY:	KLA

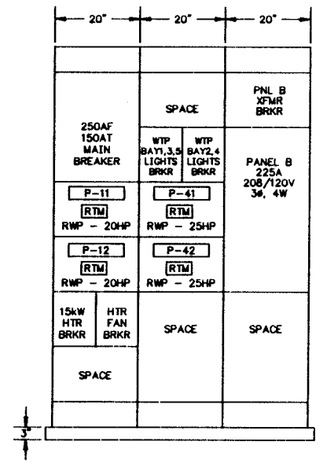
WHATCOM COUNTY
WATER TREATMENT PLANT
PLANT – ONE LINE DIAGRAM

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	E03
OF	16

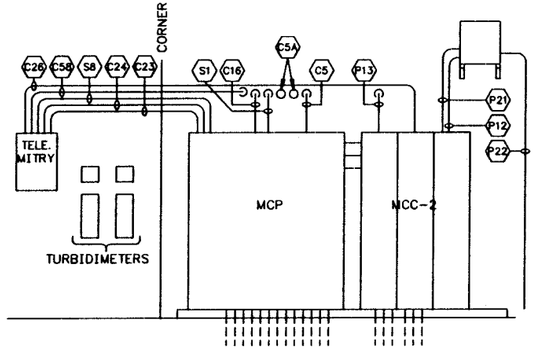


NAME PLATES
1. NORMAL SOURCE
2. EMERGENCY SOURCE
3. READY
4. RUN
5. FAIL
6. NORMAL POWER AVAILABLE
7. EMERGENCY POWER AVAILABLE
8. AUTOMATIC TRANSFER SWITCH

MCC 1 - PUMP BUILDING
3/4"=1'-0"



MCC 2 - WATER TREATMENT PLANT
3/4"=1'-0" NEMA 12



A WTP CONTROL AREA ELEVATION
E7 NTS

LIGHTING FIXTURE SCHEDULE

F1	4FT, 2-LAMP INDUSTRIAL FLUORESCENT 10% UPLIGHT ENERGY SAVING BALLAST 120V LITHONIA #AF10-240-120-ES.
F2	4FT. 2-LAMP INDUSTRIAL FLUORESCENT GASKETED ALUMINUM HOUSING WITH WET LABEL INJECTION MOLDED ACRYLIC WRAPAROUND LENS, CORROSION RESISTANT FINISH, -0 DEGREE BALLAST, 120V HOLOPHANE #7200-4-LT-P1.
F3	4 FT., 2-LAMP WALL MOUNT TASK LIGHT WITH #12 ACRYLIC LENS, UL DAMP LOCATION LABEL AND ENERGY SAVING BALLAST LITHONIA WS-240-A12-ESDL.
F4	SOFFIT LIGHT, 70W HPS, SQUARE, RECESSED, VANDAL PROOF, SUITABLE FOR DAMP LOCATIONS LITHONIA VRR-70S.
F5	POLE MOUNTED 70W HPS AREA LIGHT, SUITABLE FOR DAMP LOCATIONS, 12" ACRYLIC REFRACTOR WITH GUARD. MOUNT ON STRAIGHT STANTION 1-1/4" PIPE. GE VERSA GUARD H6 SERIES #07S. OR EQUAL.
F8	2-LAMP EMERGENCY WALL PACK RECHARGABLE BATTERY, VOLTMETER, 2 HALOGEN LAMPS 120V, EXIDE F-100-2H-V.

NOTES:

1. MAINTAINED CONTACT RED MUSHROOM HEAD PUSHBUTTON FOR OPERATOR-IN-TROUBLE TO TELEMETRY

ROBERT J. CASNE STATE OF WASHINGTON 12266 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/17/94

DAVID M. THARP STATE OF WASHINGTON 16004 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/17/93

92021E04

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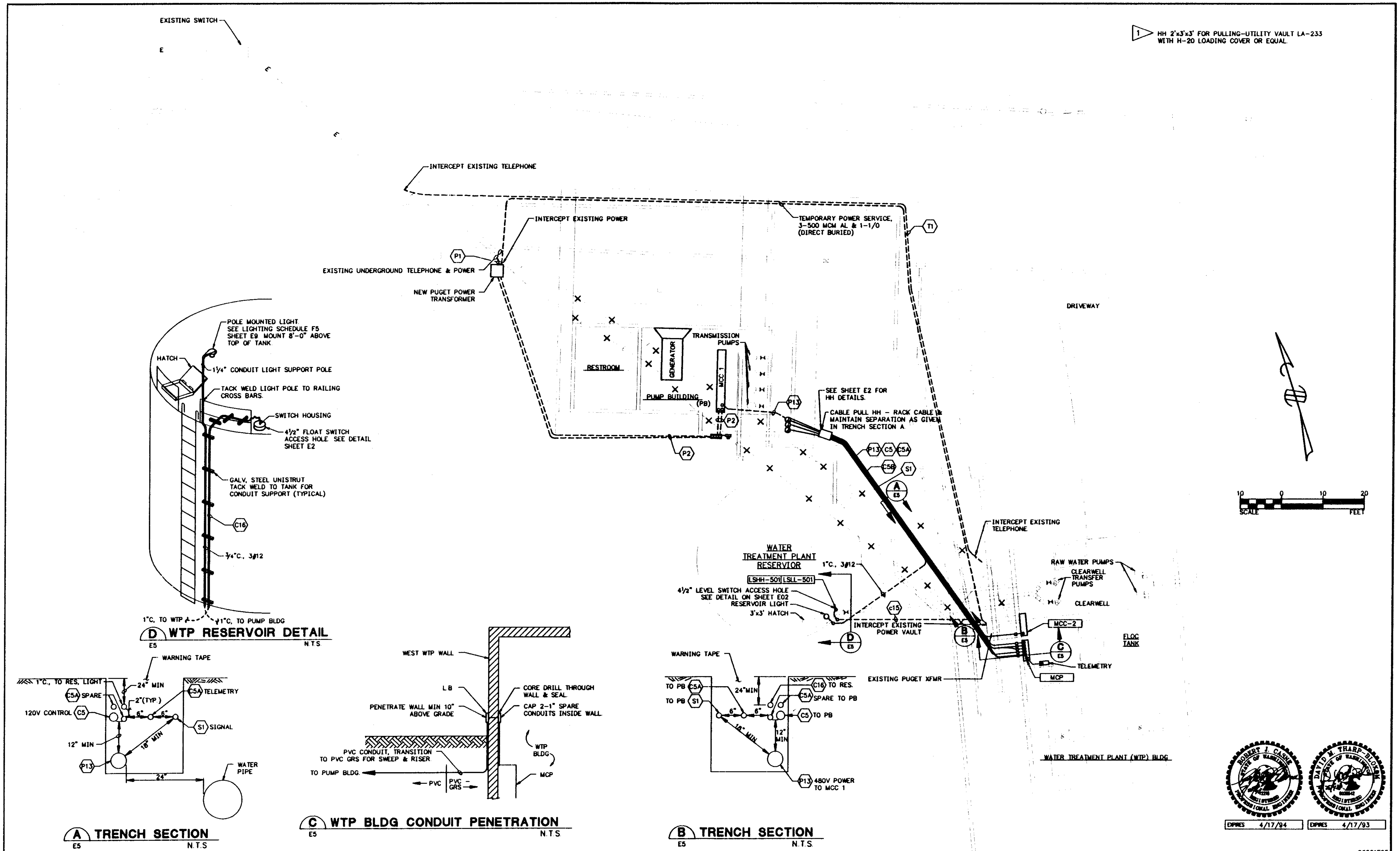
WHATCOM COUNTY
WATER TREATMENT PLANT
MCC ELEV. & LTG. FIXTURE SCHEDULE

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E04
OF	16



92021E05

NO.	REVISIONS	BY	DATE

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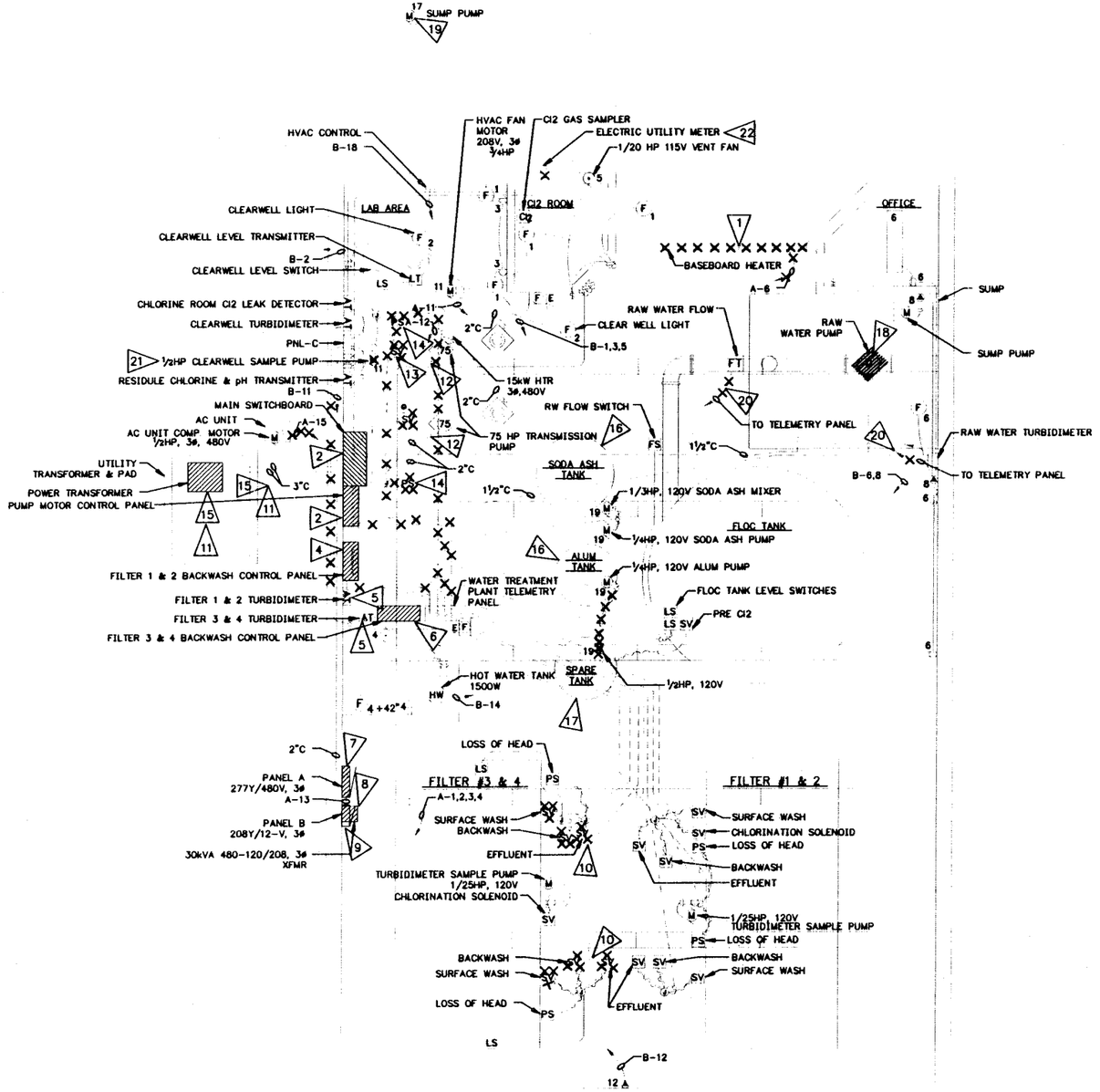
WHATCOM COUNTY
WATER TREATMENT PLANT
SITE PLAN

DATE	July 1992
SCALE	1"=10'
JOB NUMBER	92021A
SHEET	E05
OF	16



DEMOLITION PLAN
EXISTING POWER CONTROL, REC. & LIGHTING
SCALE: ¼"=1'-0"

GENERAL NOTES:

1. REMOVE BASE BOARD HEATER AND ASSOCIATED WIRE, CAP CONDUIT.
2. REMOVE SERVICE ENTRANCE SWITCHBOARD AND SERVICE CONDUCTORS.
3. REMOVE MOTOR CONTROL CENTER – DISCONNECT AND STARTER MOUNTED ABOVE MCC.
4. REMOVE FILTER 1 & 2 BACKWASH CONTROL PANEL.
5. REMOVE FILTER 1 & 2 AND 3 & 4 TURBIDI-METERS, CONDUIT, & WIRE TO BE REUSED.
6. REMOVE FILTER 3 & 4 BACKWASH CONTROL PANEL AND ALL ASSOCIATED CONDUIT AND WIRE.
7. REMOVE PANEL A.
8. REMOVE PANEL B TRANSFORMER AND SERVICE CONDUIT/WIRE TRANSFORMER TO BE REUSED MOUNT ABOVE NEW MCC.
9. REMOVE PANEL B.
10. REMOVE FILTER 3 & 4 SOLONOID VALVES – REUSE CONDUIT & WIRE.
11. SEE SWITCH-OVER SEQUENCE IN THE SPECIFICATIONS.
12. REMOVE CONDUCTORS & FLEX CONDUIT FOR 75 HP TRANSMISSION PUMPS.
13. REMOVE TRANSMISSION PUMP SOLENOID VALVES, FLEX CONDUIT AND WIRE. (2 SOLENOIDS PER PUMP)
14. REMOVE TRANSMISSION PUMP, PRESSURE SWITCHES, CONDUIT AND WIRE.
15. REMOVE SERVICE CONDUCTORS FROM POWER XFMR TO SWITCHBOARD PUGET POWER TO REMOVE XFMR.
16. EXISTING SODA ASH & ALUM TANKS TO BE REMOVED AND REPLACED. ASSOCIATED MIXER & METERING PUMPS TO BE REMOVED AND REINSTALLED ON NEW TANKS.
17. REMOVE ½2HP PUMP AND ASSOCIATED CONDUCTORS & FLEX CONDUIT.
18. DISCONNECT RAW WATER PUMP AND REMOVE CONDUCTERS.
19. EXISTING SUMP PUMP IS NOT OPERATIONAL – TO REMAIN AS IS.
20. EXISTING CONDUIT & WIRE TO TELEMETRY PANEL TO BE REMOVED.
21. SAMPLE PUMP TO BE REMOVED AND TURNED OVER TO OWNER.
22. REMOVE EXISTING METER, BASE, AND ASSOCIATED CONDUIT & WIRE TO C.T. ENCLOSURE.

ROBERT J. CASNE — STATE OF WASHINGTON — 12797 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP-BLOOM — STATE OF WASHINGTON — 16888 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E06

NO.	REVISIONS	BY	DATE

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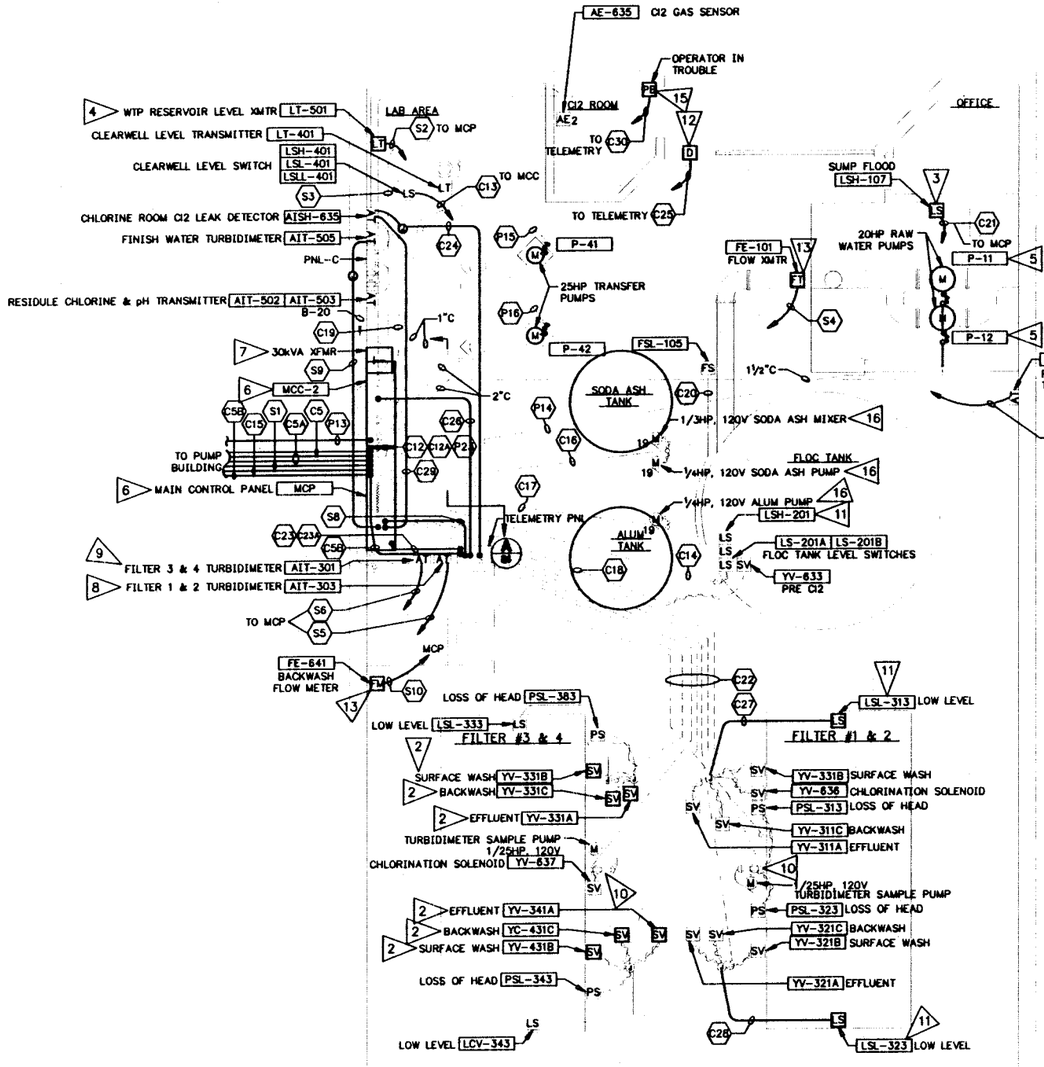
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
EXIST. POWER & CONTROL DEMO. PLAN

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E06
OF	16

FLAG NOTES:

1. RECONNECT ALL EXISTING EQUIPMENT REUSE EXISTING CONDUIT AND WIRE WHEN POSSIBLE.
2. PROVIDE SIX NEW SOLONOID VALVES AND TWO LEVEL SWITCHES FOR FILTERS.
3. PROVIDE SUMP FLOOD SWITCH.
4. PROVIDE RESERVOIR LEVEL TRASMITTER.
5. PROVIDE CONDUCTORS TO NEW RAW WATER PUMPS AND NEW TRANSFER PUMPS.
6. PROVIDE NEW MCP & MCC-2.
7. RELOCATE EXISTING 30kVA 480-120/208, 3ø, XFMR MOUNT ABOVE MCC.
8. RELOCATE FILTER 1 & 2 TURBIMETER.
9. RELOCATE FILTER 3 & 4 TURBIMETER.
10. SEE CONTROL PANEL SCHEMATICS FOR CIRCUIT DESIGNATIONS.
11. PROVIDE NEW LEVEL SWITCH.
12. PROVIDE NEW DOOR SWITCH.
13. PROVIDE NEW ROCKWELL "HSP" HEAD FOR EXISTING FLOW METER.
14. CAP ALL UNUSED RACEWAYS AT FLOOR STUB-UP.
15. NEMA 4X, NON-METALIC, MAINTAINED CONTACT RED MUSCHROOM HEAD PUSHBUTTON TO SEND CLOSED CONTACT TO TELEMETRY WHEN PUSHED.
16. EXISTING MOTORS TO BE DISCONNECTED FOR REMOVAL OF EXISTING TANKS. RECONNECT AFTER INSTALATION OF NEW TANK.



WATER TREATMENT PLANT
NEW POWER & CONTROL PLAN
SCALE: 1/4"=1'-0"

N

ROBERT J. CASNE — STATE OF WASHINGTON — 12298 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP BLOOM — STATE OF WASHINGTON — 20058-12 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E07

NO.	REVISIONS	BY	DATE

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CASNE ENGINEERING, INC.
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DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
NEW POWER & CONTROL PLAN

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E07
OF	16

GENERAL NOTES:

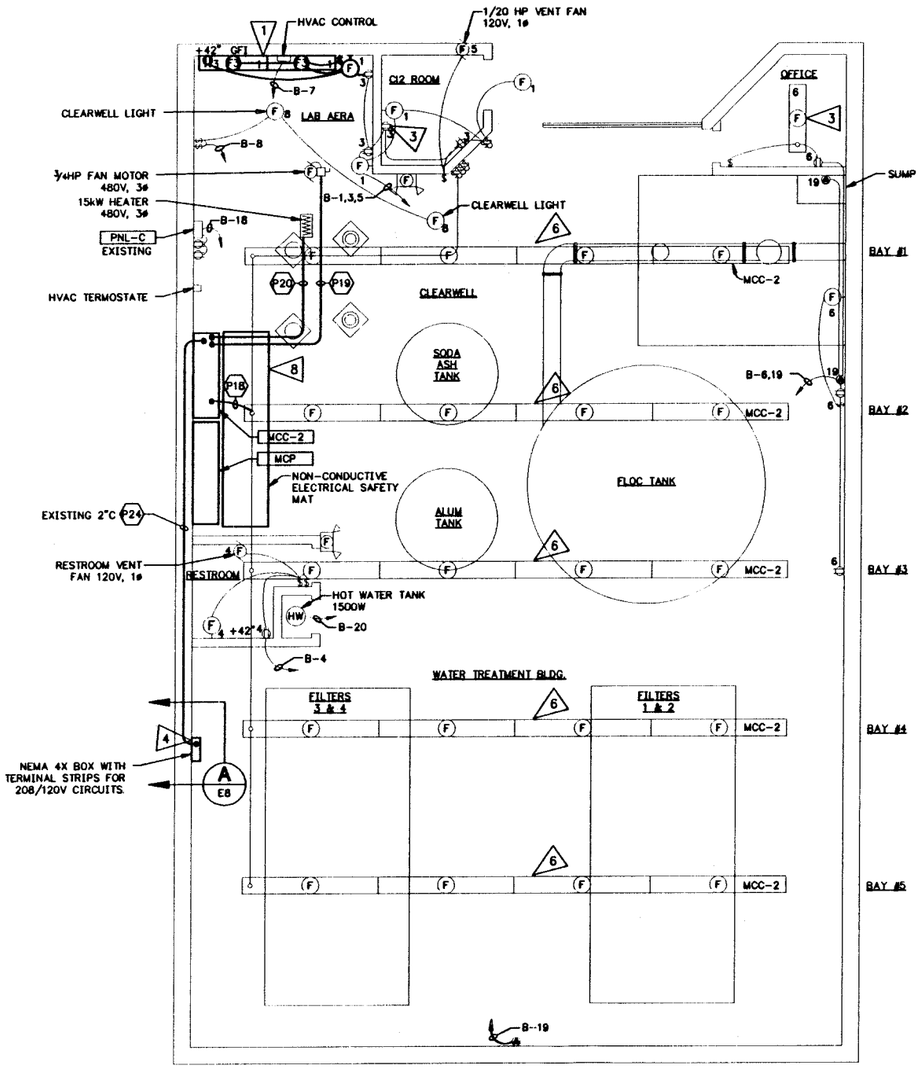
1. PROVIDE LAB AREA LIGHTS & RECEPTACLE.
2. PROVIDE Cl2 ROOM RECEPTACLES.
3. HARD WIRE EXISTING LIGHT IN OFFICE TO EXISTING SWITCH.
4. PROVIDE TERMINAL BOX FOR EXISTING CIRCUITS TO 120/208V LOADS. LAND ALL EXISTING CIRCUITS ON TERMINALS IN BOX. EXTEND EXISTING 2"C AND PULL NEW CONDUCTORS FROM MCC/PNL-B TO TERMINAL BOX. CIRCUITS AS SHOWN ON DRAWING AND PANEL SCHEDULE B.
5. EXTEND ALL OTHER HOME RUN CONDUITS (NOT INCLUDED IN NOTE #4) TO NEW MCC - REUSE EXISTING CONDUCTORS IF POSSIBLE.
6. REWIRE EXISTING 277V BAY LIGHTS - SEE MCC LAYOUT & ONE - LINE FOR DETAILS.
7. SEE FIXTURE SCHEDULE SHEET E4.
8. PROVIDE NON-CONDUCTIVE SAFETY MAT IN FRONT OF ENTIRE CONTROL PANEL AND MCC.

PANEL SCHEDULE

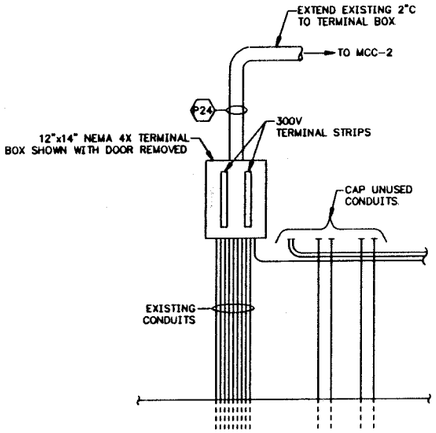
NO B | LOCATION: WTP BUILDING MCC2 | SERVING: - | 120/208 VOLTS 3 PHASE 4 WIRE | 100 AMP with MAIN CB 80/3

CKT NO.	LOAD DESCRIPTION	KVA	TRIP AMPS	TRIP AMPS	KVA	LOAD DESCRIPTION	CKT NO.	
1	WALL LIGHTS	0.6	20	20	-	SPARE	2	
3	REC. LAB AREA/Cl2 ROOM	0.6	20	20	0.4	RESTROOM	4	
5	FAN CHLORINE ROOM	0.3	20	20	0.8	OFFICE/SUMP LIGHTS & REC	6	
7	HVAC CONTROL	0.2	20	20	0.2	CLEAR WELL LIGHTS	8	
9	MCP	0.5	20	20	-	SPARE	10	
11	TELEMETRY CONTROL POWER	0.3	20	20	1.4	SODA ASH METER PUMP & MIXER	12	*
13	MCP	0.5	20	20	0.7	ALUM METER PUMP	14	*
15	MCP	0.5	20	20	1.0	MCP SPARE	16	*
17	TURBITITY ANALYSERS	0.2	20	20	0.8	PANEL C FEED	18	
19	208V RECEPTACLES	1.4	20	20	1.5	HOT WATER TANK	20	
21			2				22	
23	SPARE	-	20	3			24	
25		-	20	20	-	SPARE	26	
27		-	20	20	-		28	
29		-	20	20	-		30	
31		-	20	20	-		32	
33		-	20	20	-		34	
35	SPACE	-			-	SPACE	36	
37		-			-		38	
39		-			-		40	
41		-			-		42	

DESCRIPTION		CONNECTED LOAD	DEMAND FACTOR	DEMAND
LARGEST MOTOR		0.7	1.25	0.9
OTHER MOTORS		1.9	1.00	1.9
LIGHTS		1.3	1.25	1.7
MISC.		6.8	1.00	6.8
* VIA STARTERS IN MCP	TOTAL	10.7 KVA 29 AMPS		11.3 KVA 31 AMPS



LIGHTING, RECEPTACLE AND HVAC POWER PLAN
SCALE: 1/4"=1'-0"



A TERMINAL BOX ELEVATION
E8

ROBERT J. CASNE STATE OF WASHINGTON 9611 REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP STATE OF WASHINGTON 16046 REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E08

NO.	REVISIONS	BY	DATE

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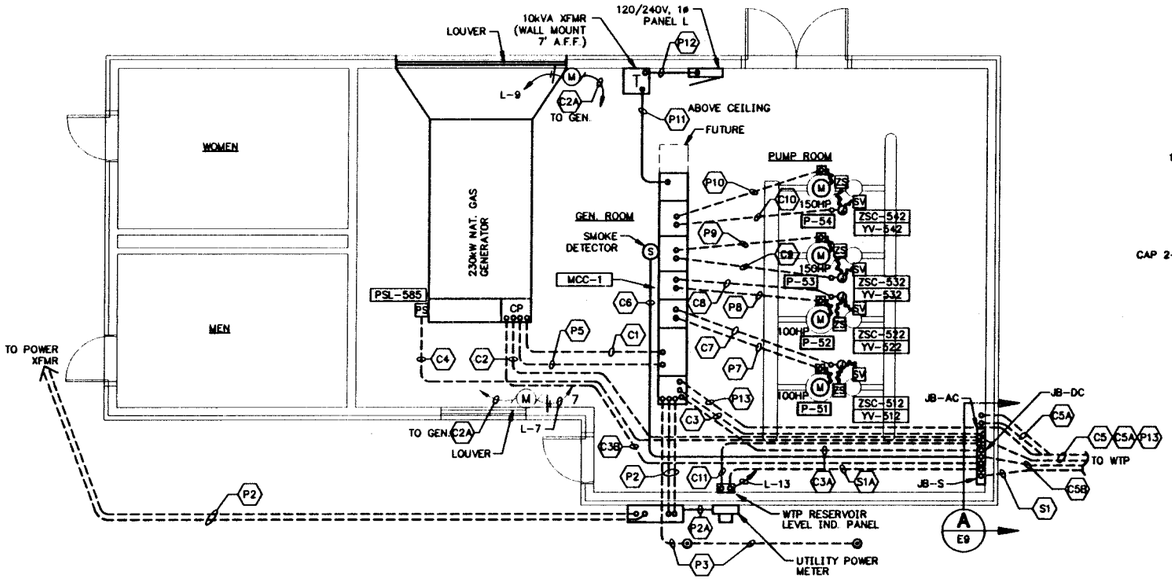
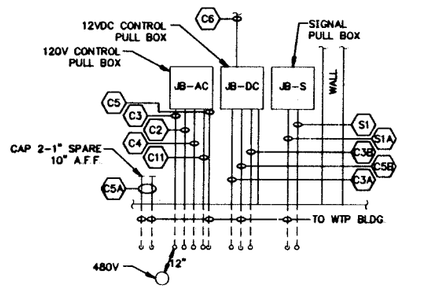
WHATCOM COUNTY
WATER TREATMENT PLAN
LIGHTING, RECPT., & HVAC POWER PLAN
PANEL B SCHEDULE

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E08
OF	16



PUMP BUILDING
CONDUIT & EQUIP. PLAN
SCALE: 1/4"1'-0"



PUMP BUILDING
A EAST WALL ELEVATION
E9

GENERAL NOTES:

1. CONDUITS SHOWN SOLID SHALL BE ROUTED ABOVE CEILING OR WITHIN WALLS WHEN EVER POSSIBLE.

FLAG NOTES:

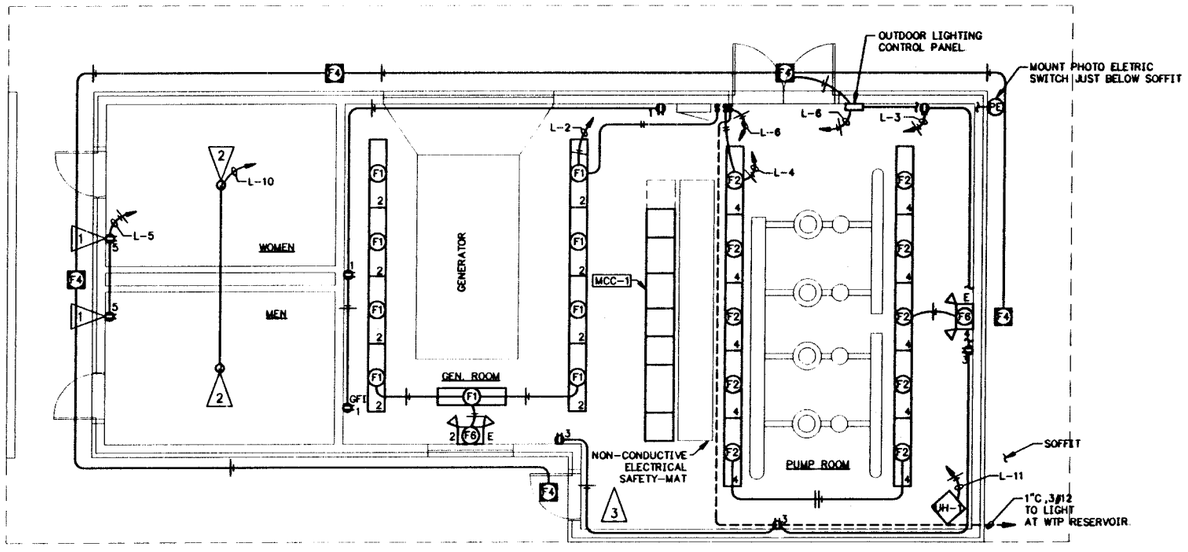
1. PROVIDE RESTROOM RECEPTACLES WITH LOCKING COVER PASS & SEYMOUR LEGRAND #WP-26L OR EQUAL.
2. PROVIDE CONDUCTORS AND JUNCTION BOX FOR FUTURE LIGHTS.
3. PROVIDE NON-CONDUCTIVE MAT ENTIRE LENGTH OF MOTOR CONTROL CENTER

PANEL SCHEDULE

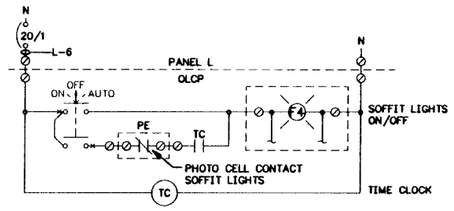
NO L | LOCATION: WTP PUMP BLDG. | 120/208 VOLTS 1 PHASE 3 WIRE | 100 AMP WITH 50/2

CKT NO.	LOAD DESCRIPTION	KVA	TRIP AMPS		TRIP AMPS	KVA	LOAD DESCRIPTION	CKT NO.
1	REC. GEN ROOM	0.6	20		20	1.0	LIGHTS GEN ROOM	2
3	REC. PUMP ROOM	0.8	20		20	0.9	LIGHTS PUMP ROOM	4
5	RESTROOM	0.4	20		20	0.5	LIGHTS EXTERIOR	6
7	LOUVER MOTORS	1.0	20		20	0.1	RESERVOIR FLOOD LIGHT	8
9	LOUVER MOTORS	1.0	20		20	1.0	(FUTURE RESTROOM LIGHTS)	10
11	UNIT HEATER CONTROL/FAN	0.2	20		20		SPARE	12
13	WTP RES LV IND PNL	0.1	20		20		SPARE	14
15	SPARE	–	20		20		SPARE	16
17	SPACE				20		SPARE	18
19	SPACE				20		SPARE	20

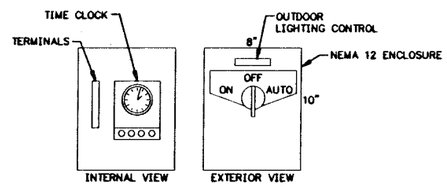
DESCRIPTION	CONNECTED LOAD	DEMAND FACTOR	DEMAND
LARGEST MOTOR – (LOUVER)	1.0	1.25	1.3
OTHER MOTORS	1.2	1.00	1.2
LIGHTS	2.5	1.25	3.2
MISC	1.9	1.00	1.9
TOTAL	6.6 KVA 55 AMPS		7.6 KVA 64 AMPS



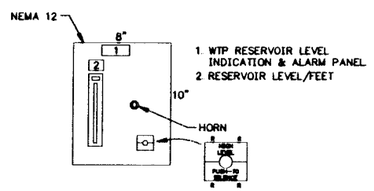
PUMP BUILDING
120V RECEPT. & LIGHTING PLAN
SCALE: 1/4"1'-0"



OUTDOOR LIGHT CONTROL DIAGRAM
N.T.S.



OUTDOOR LIGHTING CONTROL PNL
N.T.S.



WTP RESERVOIR LEVEL INDICATION PNL
N.T.S.

ROBERT J. CASNE — STATE OF WASHINGTON — 12098 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP BURTON — STATE OF WASHINGTON — 18648 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E09

NO.	REVISIONS	BY	DATE

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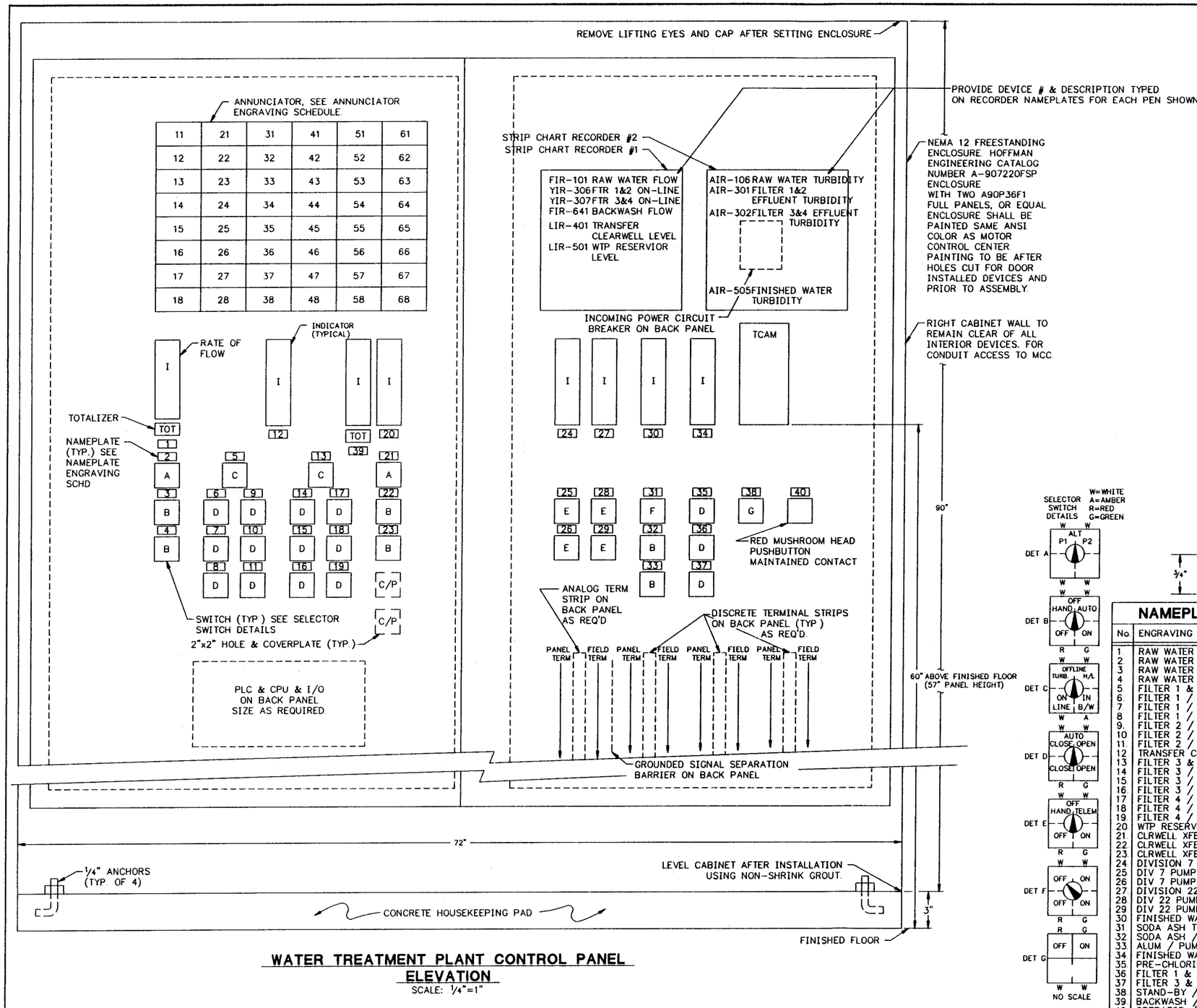
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
PUMP BUILDING POWER & LTG. PLANS

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E09
OF	16



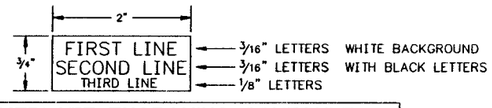
WATER TREATMENT PLANT CONTROL PANEL ELEVATION

SCALE: 1/4"=1"

ANNUNCIATOR WINDOW ENGRAVING SCHEDULE

COL	ROW	ENGRAVING (1st LINE / 2nd LINE / 3rd LINE)	INST. No.
1	1	RAW WATER / PUMP 1 / FAIL	YAL-111
1	2	RAW WATER / PUMP 2 / FAIL	YAL-121
1	3	RAW WATER / LOW FLOW / SHUTDOWN	FALL-105
1	4	RAW WATER / HIGH / TURBIDITY	AAHL-106
1	5	RAW WATER PUMP / SUMP / HIGH LEVEL	LAHL-107
1	6	FLOC. TANK / HIGH / LEVEL	LAHL-201
2	1	FILTER 1 / LOW / LEVEL	LALL-313
2	2	FILTER 2 / LOW / LEVEL	LALL-323
2	3	FILTER 3 / LOW / LEVEL	LALL-333
2	4	FILTER 4 / LOW / LEVEL	LALL-343
2	5	FILTER 1 & 2 / TOO FREQUENT / BACKWASH	UA-301
2	6	FILTER 3 & 4 / TOO FREQUENT / BACKWASH	UA-302
2	7	FILTER 1 & 2 / HIGH EFFLUENT / TURBIDITY	AAHL-301
2	8	FILTER 3 & 4 / HIGH EFFLUENT / TURBIDITY	AAHL-302
3	1	CLEARWELL TRANSFER / PUMP 1 / FAIL	YAL-411
3	2	CLEARWELL TRANSFER / PUMP 2 / FAIL	YAL-421
3	3	TRANSFER / CLEARWELL / HIGH LEVEL	LAHL-401
3	4	TRANSFER / CLEARWELL / LOW LEVEL	LALL-401
3	5	WTP RESERVOIR / OVERFLOW	LAHAL-501
3	6	WTP RESERVOIR / HIGH / LEVEL	LAHL-501
3	7	WTP RESERVOIR / LOW / LEVEL	LALL-501
3	8	WTP RES LOW / LVL PUMP / SHUTDOWN	LALLL-501
4	1	DIVISION 7 / PUMP 51 / FAIL	YAL-511
4	2	DIVISION 7 / PUMP 52 / FAIL	YAL-521
4	3	DIVISION 22 / PUMP 53 / FAIL	YAL-551
4	4	DIVISION 22 / PUMP 54 / FAIL	YAL-541
5	1	FINISHED WATER / HIGH / pH	AAHL-502
5	2	FINISHED WATER / LOW / pH	AALL-502
5	3	FINISHED WATER / HIGH / CHLORINE RESIDUAL	AAHL-503
5	4	FINISHED WATER / LOW / CHLORINE RESIDUAL	AALL-503
5	5	FINISHED WATER / HIGH / TURBIDITY	AAHL-505
6	1	CHLORINE / LEAK / DETECTION	AAL-635
6	2	UTILITY / POWER / FAIL	EAL-651
6	3	STAND-BY / GENERATOR / FAIL	YAL-652
6	4	GENERATOR / NOT IN / AUTO	YAL-653
6	5	GEN COMMON ALARM	YAL-652
6	8	ACKNOWLEDGE, RESET & TEST PUSHBUTTONS	–

NOTE: ALL REMAINING WINDOW SHALL BE PROVIDED WITH LIGHT BOXES AND BLANK WINDOWS



NAMEPLATE ENGRAVING SCHEDULE

No.	ENGRAVING (1st LINE / 2nd LINE / 3rd LINE)
1	RAW WATER / GALLONS x 1000 FOR BOTH / FI/FQI-101
2	RAW WATER LEAD / PUMP SELECT / HS-106
3	RAW WATER PUMP 1 / P11 / HS-111
4	RAW WATER PUMP 2 / P12 / HS-121
5	FILTER 1 & 2 / BACKWASH SELECT / HS-301 (PUSH TO B/W)
6	FILTER 1 / EFFLUENT VALVE / HS-311A
7	FILTER 1 / BACKWASH VALVE / HS-311B
8	FILTER 1 / SURFACE WASH VALVE / HS-311C
9.	FILTER 2 / EFFLUENT VALVE / HS-321A
10	FILTER 2 / BACKWASH VALVE / HS-321B
11.	FILTER 2 / SURFACE WASH VALVE / HS-321C
12	TRANSFER CLEARWELL / LEVEL / LI-401
13	FILTER 3 & 4 / BACKWASH SELECT / HS-302 (PUSH TO B/W)
14	FILTER 3 / EFFLUENT VALVE / HS-331A
15	FILTER 3 / BACKWASH VALVE / HS-331B
16	FILTER 3 / SURFACE WASH VALVE / HS-331C
17	FILTER 4 / EFFLUENT VALVE / HS-341A
18	FILTER 4 / BACKWASH VALVE / HS-341B
19.	FILTER 4 / SURFACE WASH VALVE / HS-341C
20	WTP RESERVOIR / LEVEL / LI-501
21.	CLRWELL XFER LEAD / PUMP SELECT / HS-402
22	CLRWELL XFER PUMP 1 / P41 / HS-411
23	CLRWELL XFER PUMP 2 / P42 / HS-421
24	DIVISION 7 RES / LEVEL / LI-707
25	DIV 7 PUMP 1 / P51 / HS-511
26	DIV 7 PUMP 2 / P52 / HS-521
27.	DIVISION 22 RES / LEVEL / LI-722
28	DIV 22 PUMP 1 / P53 / HS-531
29	DIV 22 PUMP 2 / P54 / HS-541
30	FINISHED WATER / pH / AI-502
31	SODA ASH TANK / MIXER / HS-622
32	SODA ASH / PUMP / HS-621
33	ALUM / PUMP / HS-611
34	FINISHED WATER / CHLORINE RES. / AI-503
35	PRE-CHLORINE / VALVE / HS-633
36	FILTER 1 & 2 CL / VALVE / HS-636
37	FILTER 3 & 4 CL / VALVE / HS-637
38	STAND-BY / GENERATOR / YIL-652
39	BACKWASH / FLOW / FLOWTOTAL / FI/FQI-641
40.	OPERATOR / IN / TROUBLE

92021E10

NO.	REVISIONS	BY	DATE

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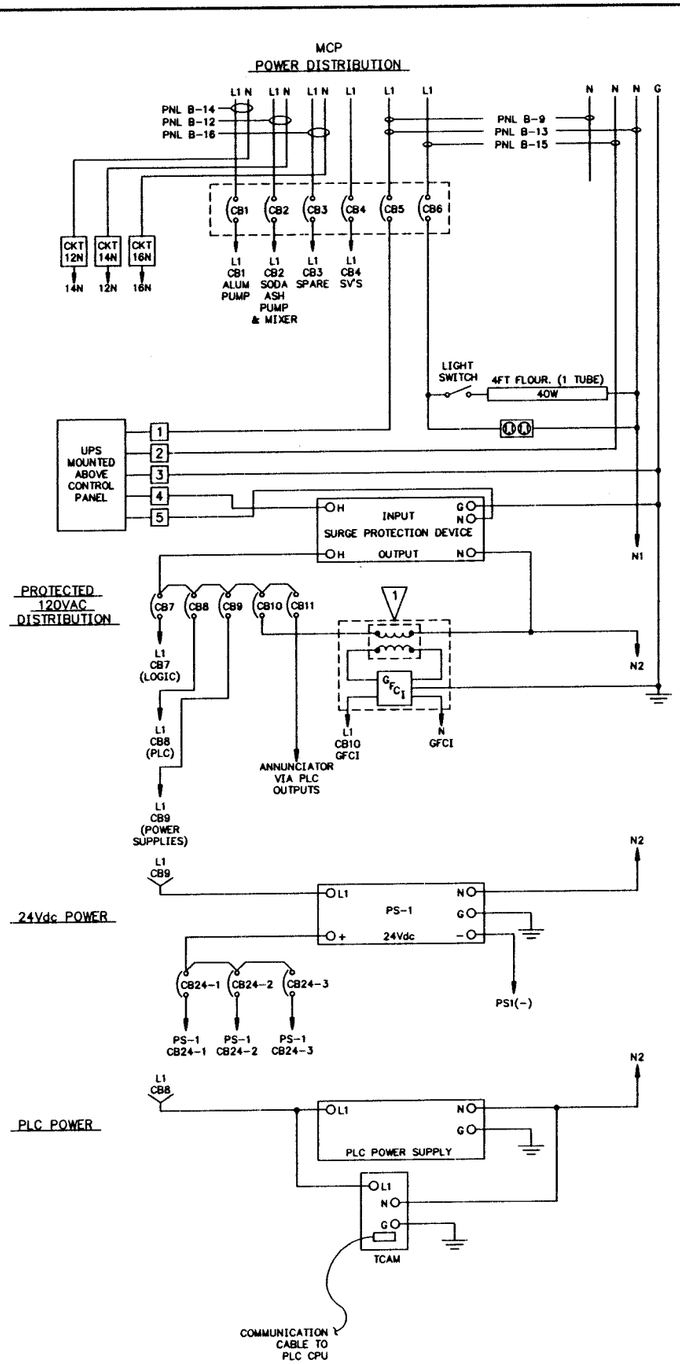
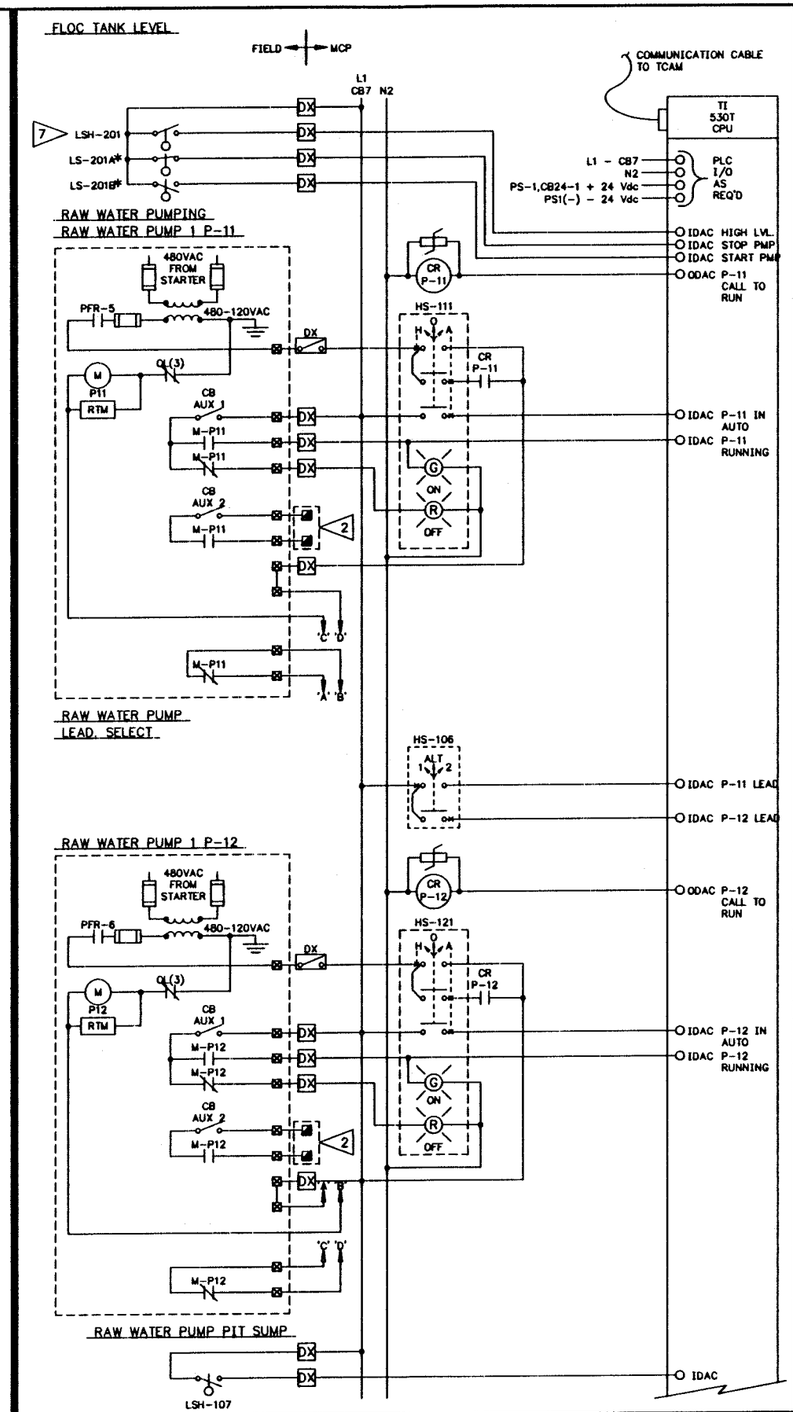
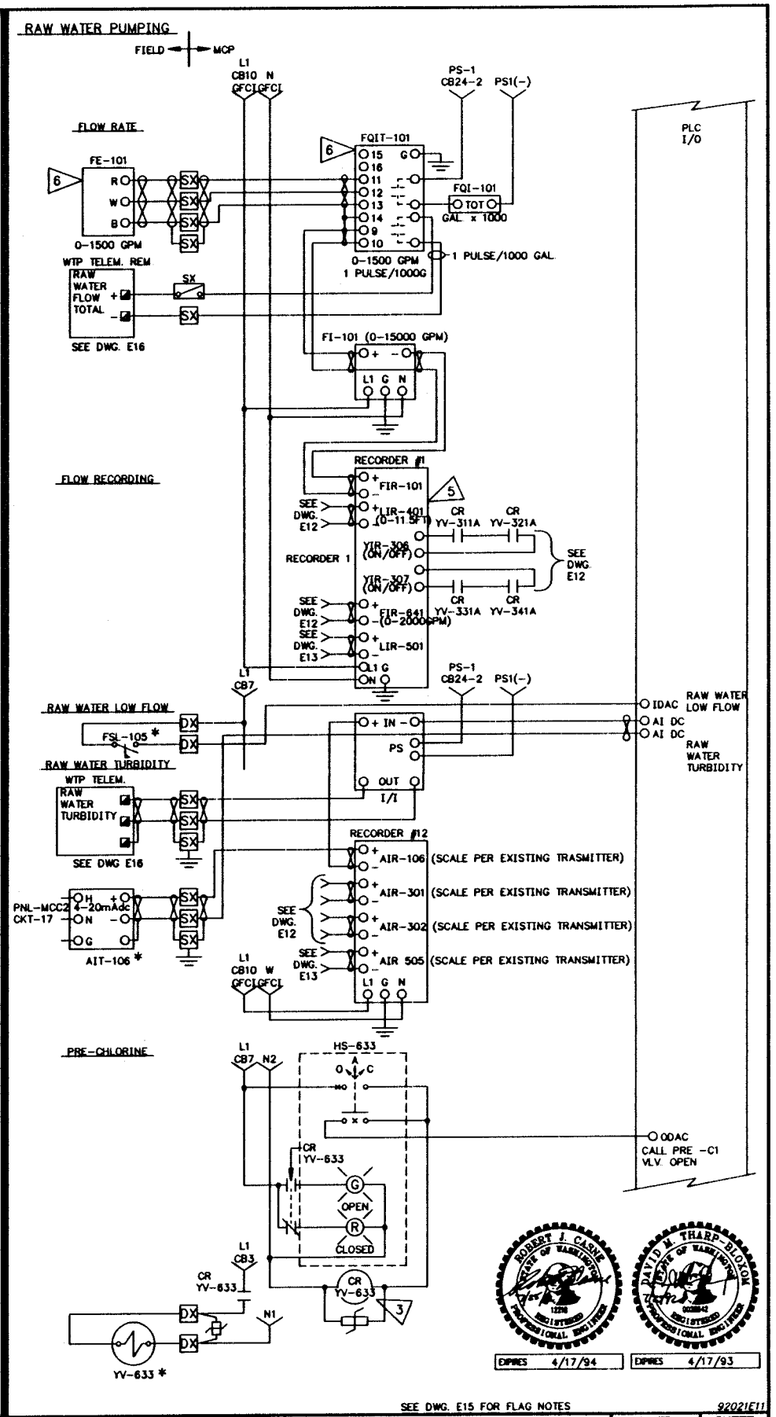
WHATCOM COUNTY
WATER TREATMENT PLANT
CONTROL PANEL ELEVATION AND DETAILS

DATE	July 1992
SCALE	AS SHOWN
JOB NUMBER	92021A
SHEET	E10
OF	16







SEE DWG. E15 FOR FLAG NOTES

92021E11

EXPIRES 4/17/94

EXPIRES 4/17/93

NO.	REVISIONS	BY	DATE

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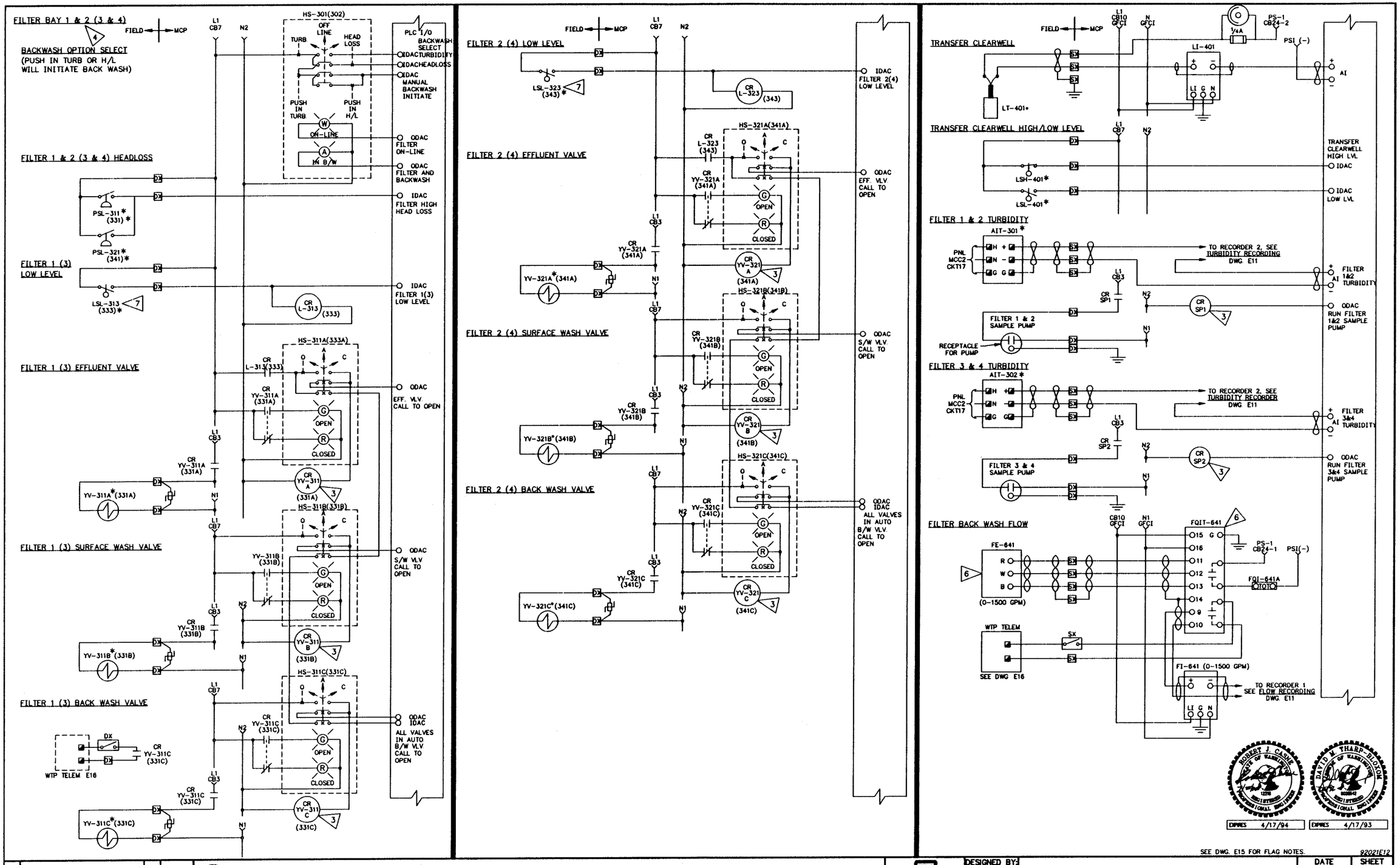
WHATCOM COUNTY WATER TREATMENT PLANT MCP SCHEMATIC DIAGRAM

DATE	July 1992
SCALE	None
JOB NUMBER	92021A
SHEET	E11
OF	16



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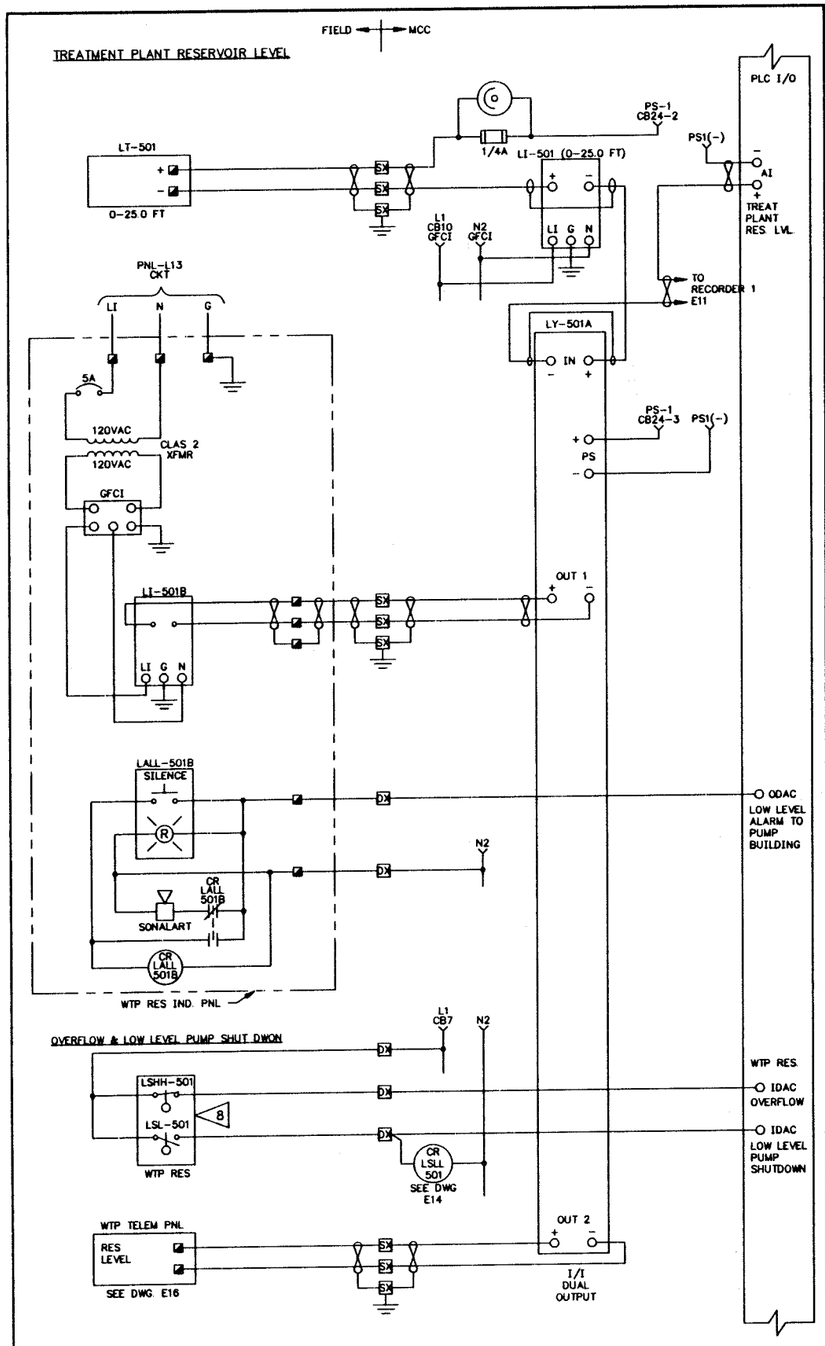
WHATCOM COUNTY
WATER TREATMENT PLANT
MCP SCHEMATIC DIAGRAM

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	E12
OF	16



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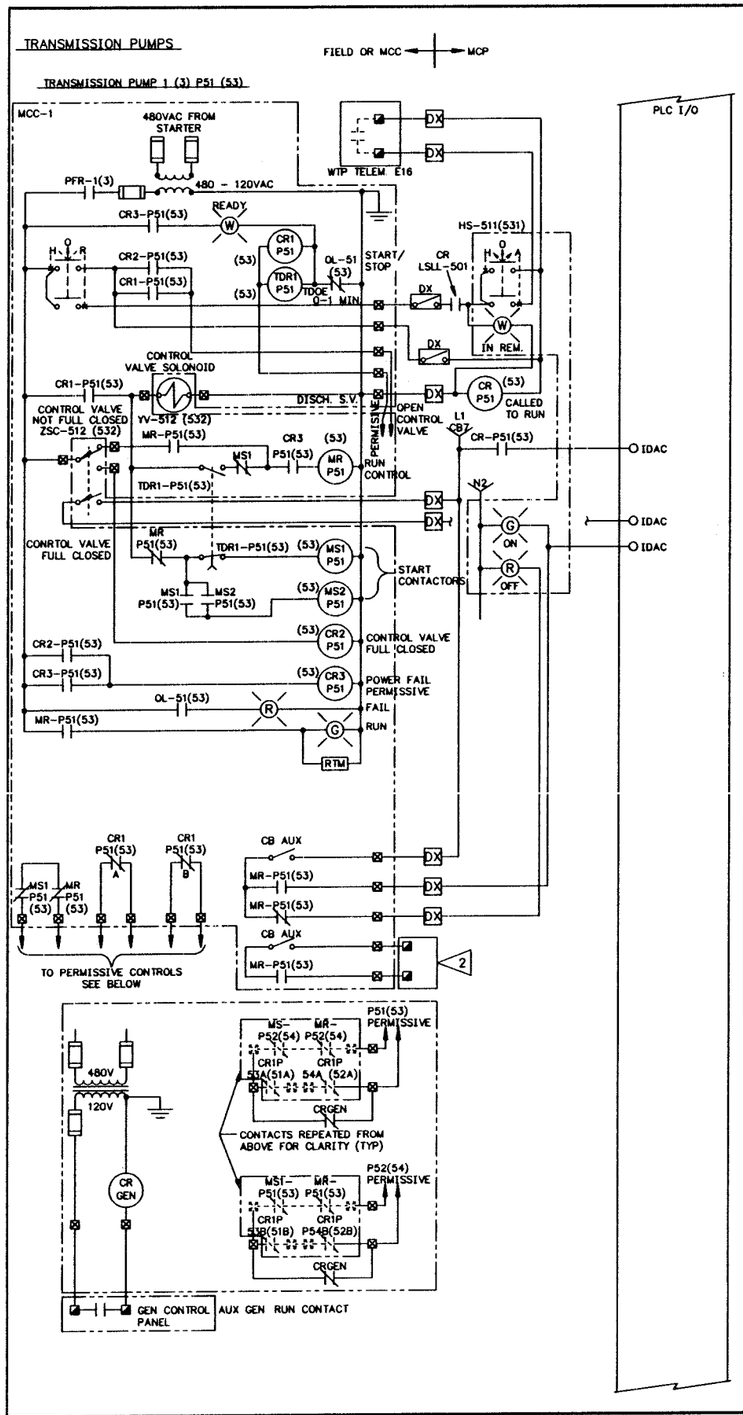
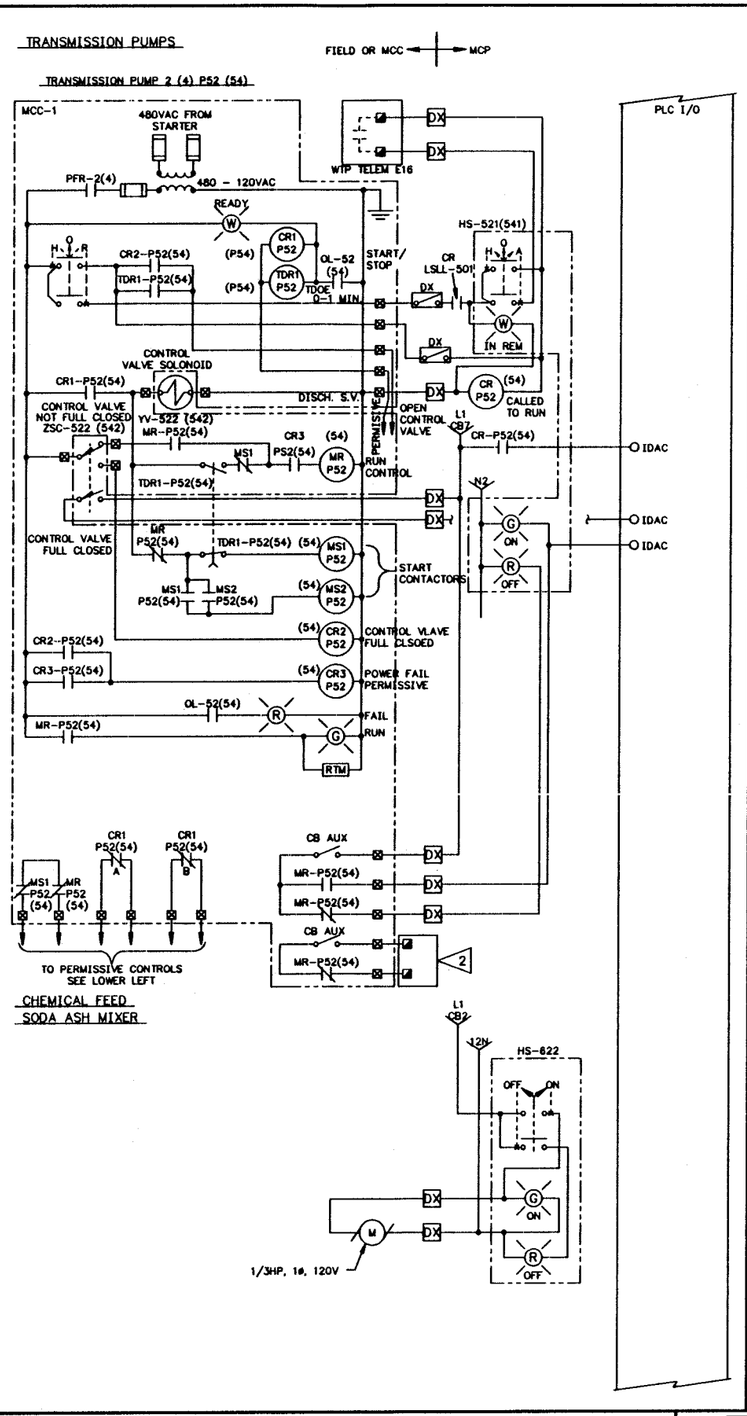
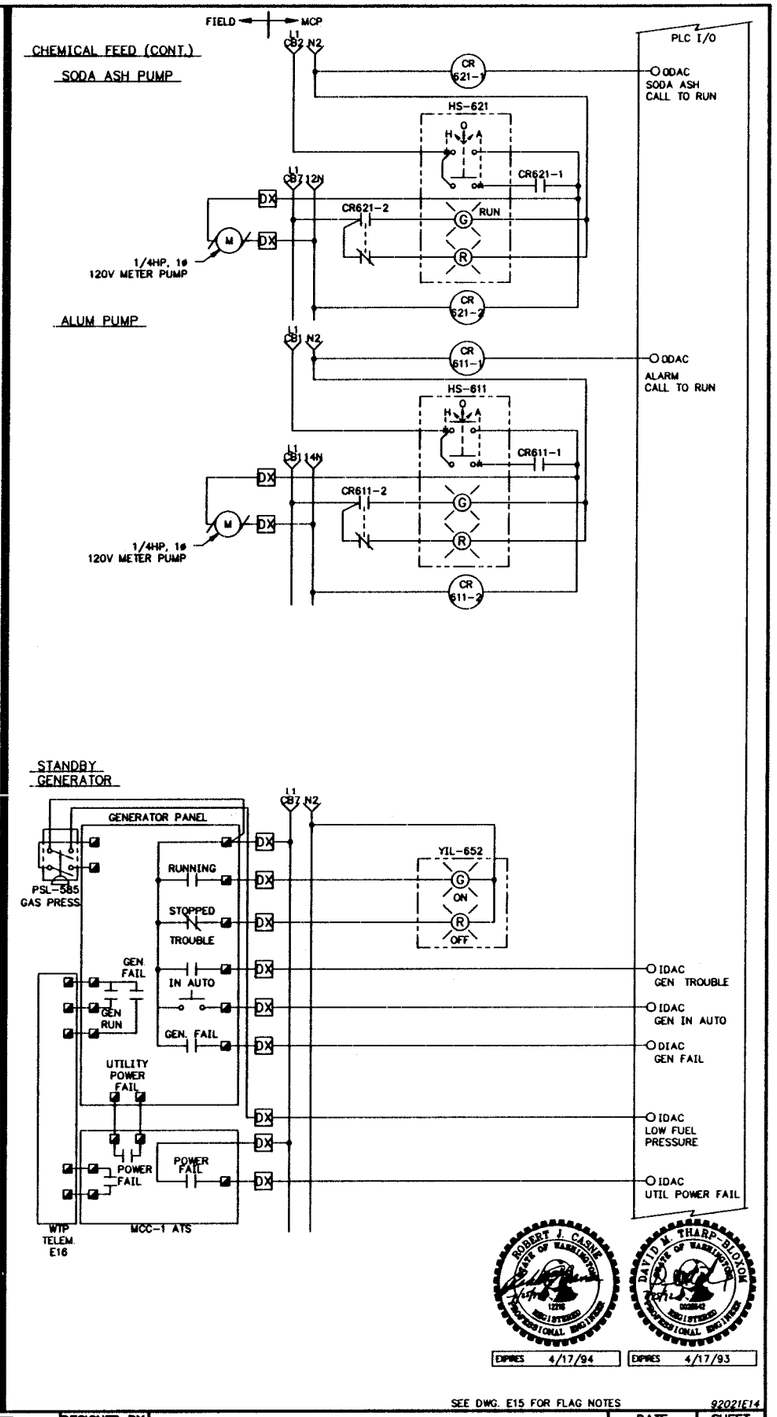
WHATCOM COUNTY
WATER TREATMENT PLANT
MCP SCHEMATIC DIAGRAM

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	E13
OF	16

EXPIRES 4/17/94 — EXPIRES 4/17/93







ROBERT J. CASNE STATE OF WASHINGTON 12298 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/17/94

DAVID M. THARP BLOOM STATE OF WASHINGTON 16888 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/17/93

SEE DWG. E15 FOR FLAG NOTES

92021E14

NO.	REVISIONS	BY	DATE

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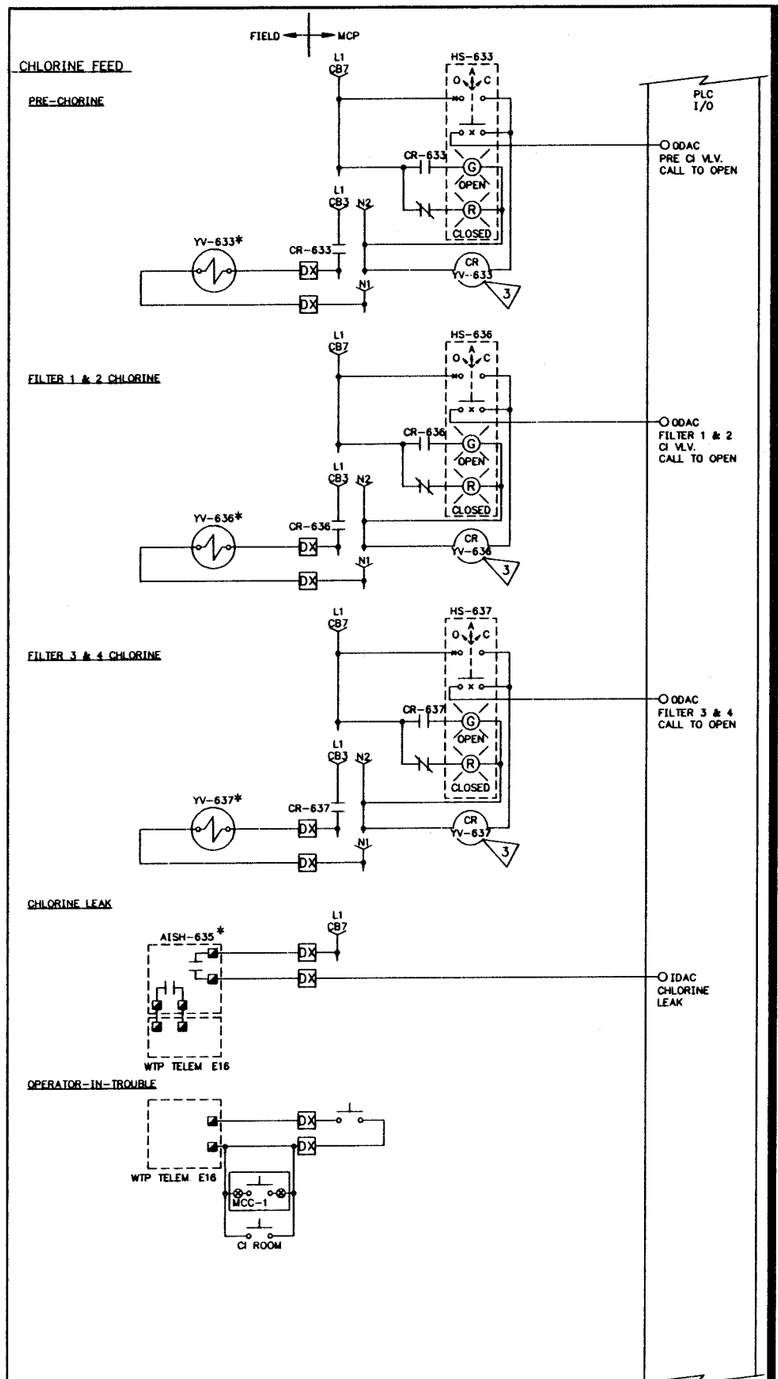
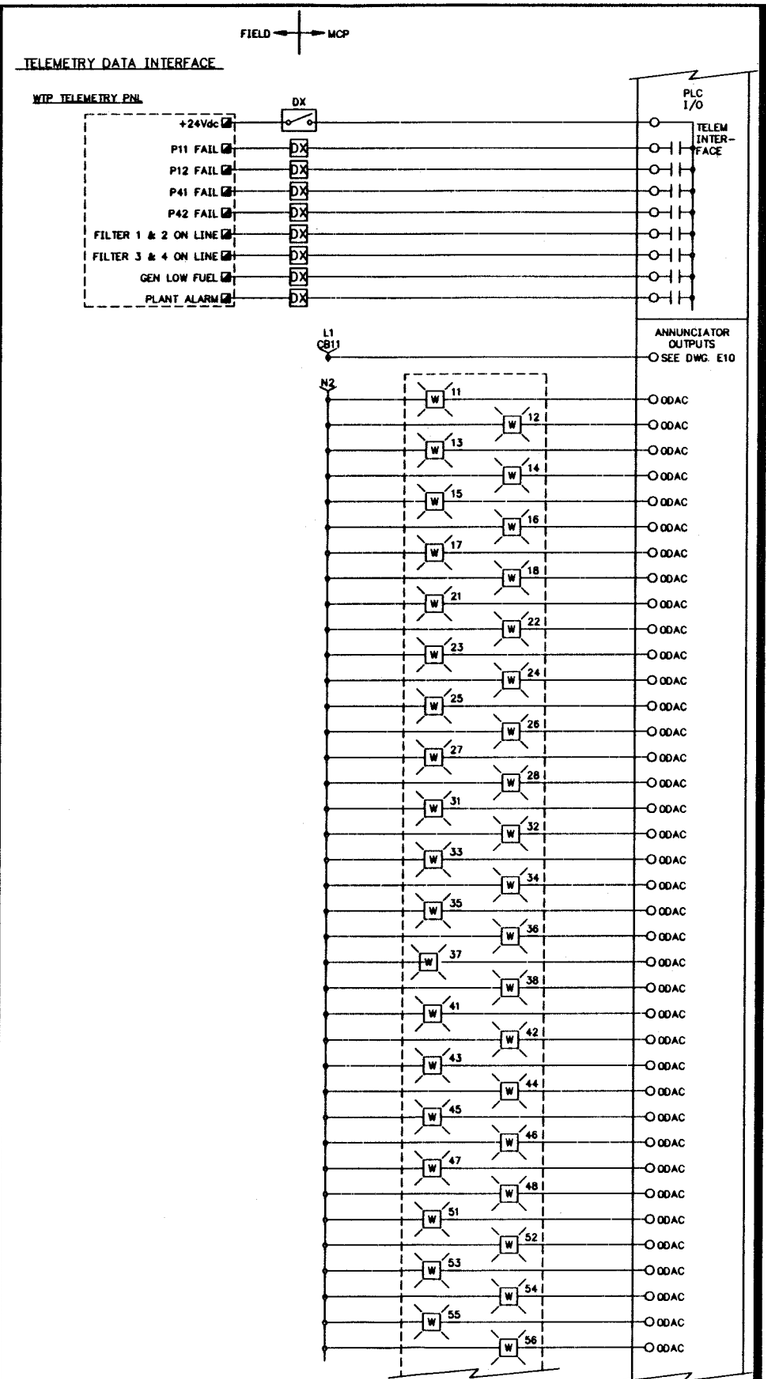
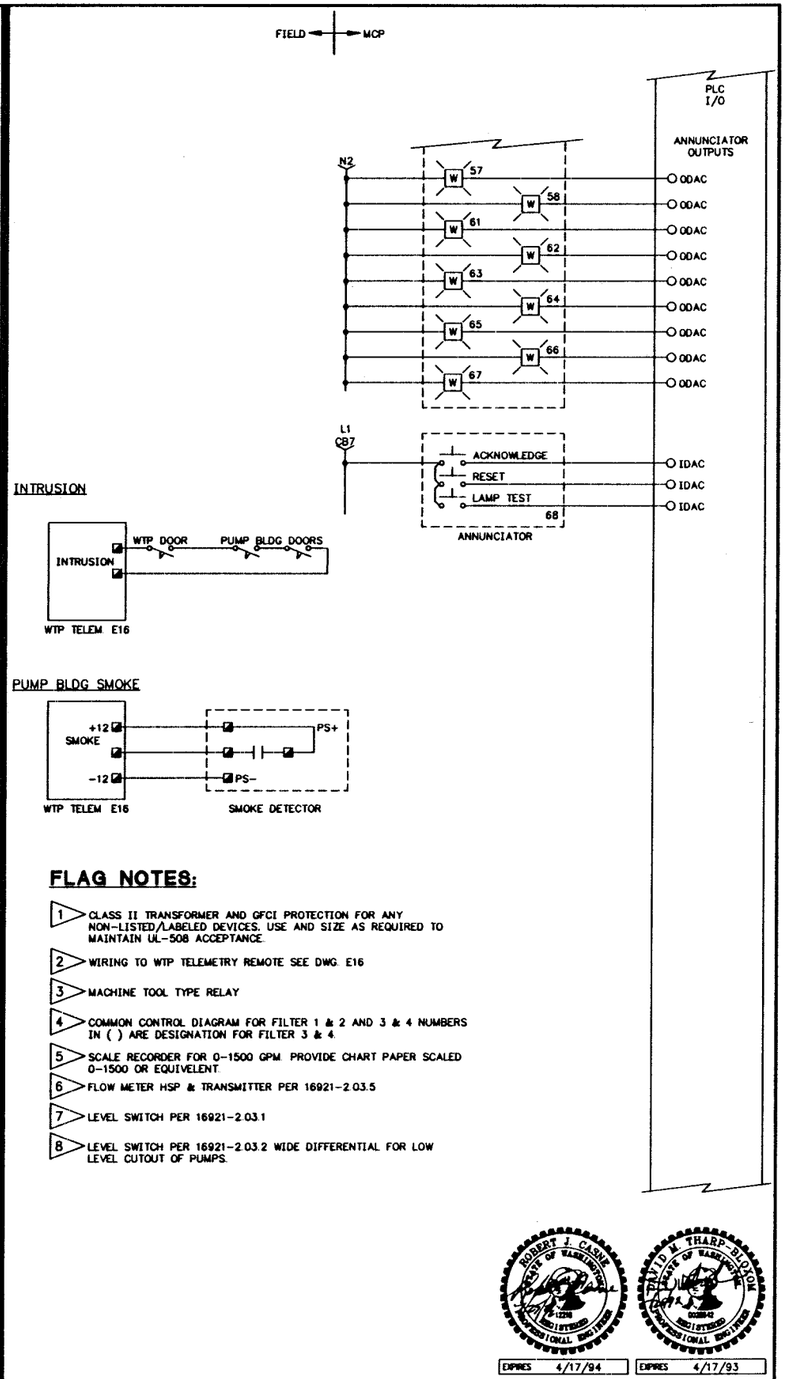
DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
MCP SCHEMATIC DIAGRAM

DATE	July 1992
SCALE	None
JOB NUMBER	92021A
SHEET	E14
OF	16







FLAG NOTES:

1. CLASS II TRANSFORMER AND GFCI PROTECTION FOR ANY NON-LISTED/LABELED DEVICES. USE AND SIZE AS REQUIRED TO MAINTAIN UL-508 ACCEPTANCE.
2. WIRING TO WTP TELEMETRY REMOTE SEE DWG. E16
3. MACHINE TOOL TYPE RELAY
4. COMMON CONTROL DIAGRAM FOR FILTER 1 & 2 AND 3 & 4 NUMBERS IN ( ) ARE DESIGNATION FOR FILTER 3 & 4.
5. SCALE RECORDER FOR 0-1500 GPM. PROVIDE CHART PAPER SCALED 0-1500 OR EQUIVELENT.
6. FLOW METER HSP & TRANSMITTER PER 16921-2.03.5
7. LEVEL SWITCH PER 16921-2.03.1
8. LEVEL SWITCH PER 16921-2.03.2 WIDE DIFFERENTIAL FOR LOW LEVEL CUTOUT OF PUMPS.

ROBERT J. CASNE — STATE OF WASHINGTON — 12288 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/17/94

DAVID M. THARP BLOOM — STATE OF WASHINGTON — 16888 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 4/17/93

92021E15

NO.	REVISIONS	BY	DATE

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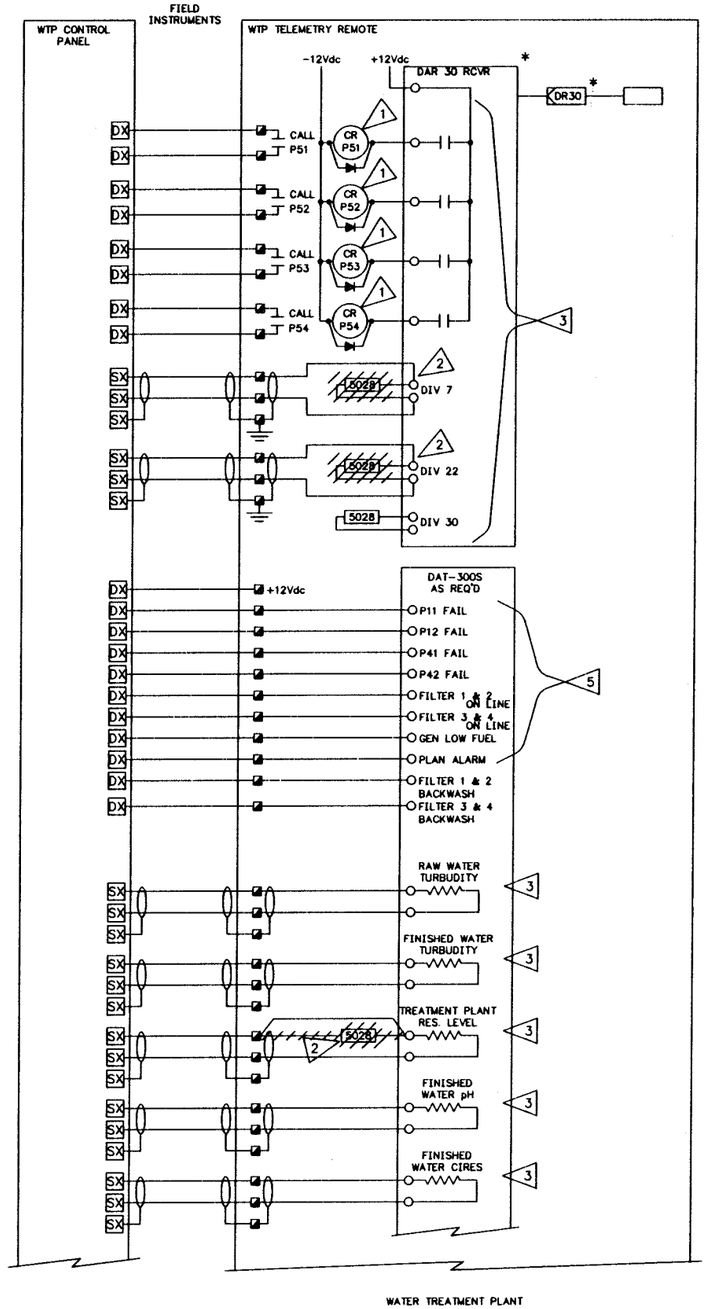
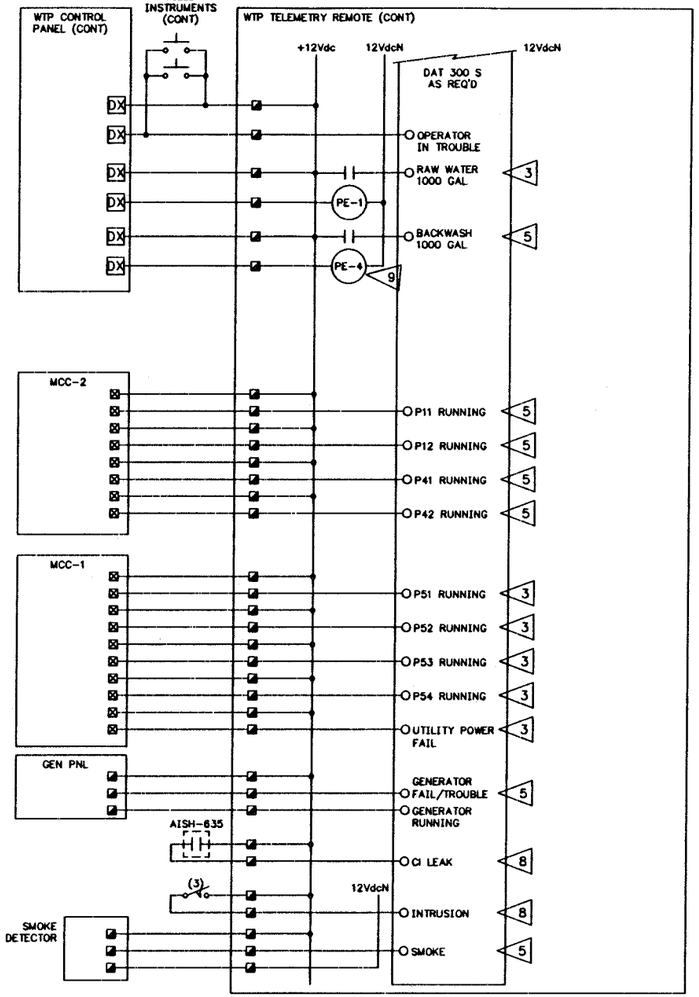
DRAWN BY:	TEO
CHECKED BY:	RJC

WHATCOM COUNTY
WATER TREATMENT PLANT
MCP SCHEMATIC DIAGRAM

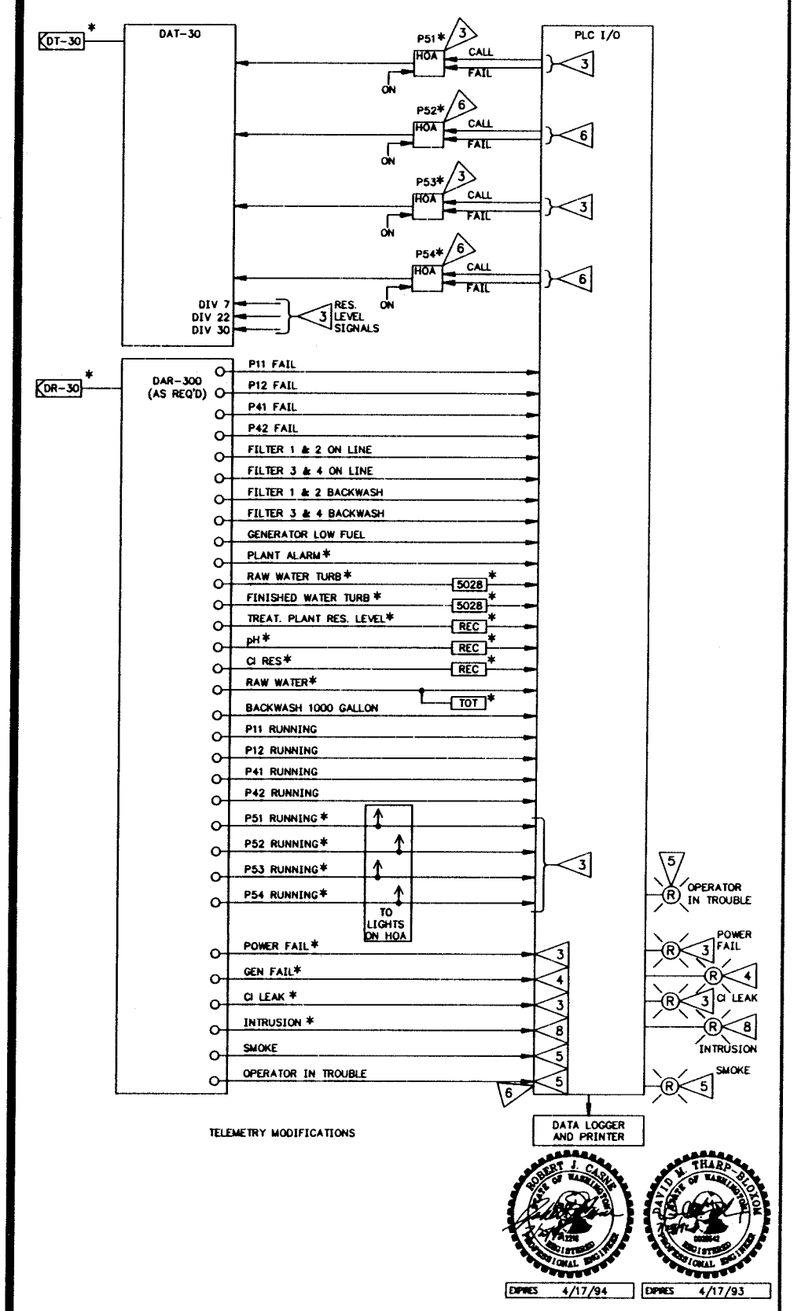
DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	E15
OF	16





CONSTRUCTION NOTES:

1. ADD INTERFACE RELAYS IN WATER TREATMENT PLANT TELEMETRY PANEL TO EXISTING OUTPUTS.
2. REMOVE EXISTING INDICATORS AND WIRING AS REQUIRED FOR REMOTE INDICATION. PROVIDE COVER PLATES FOR REMOVED INDICATOR LOCATIONS.
3. EXISTING POINTS TO BE REUSED.
4. EXISTING POINTS RENAMED TO ACCOMODATE CHANGES.
5. NEW POINT REQUIRED THIS PROJECT.
6. PRE-WIRED & PRE-PROGRAMMED PUMP CONTROL, AND NEW HAND-OFF-AUTO SWITCH IN LOCATION PROVIDED ON HEADQUARTERS PANEL.
7. NEW POINT INTO PLC FOR DATA LOGGING AND REPORTING PURPOSES ONLY.
8. EXISTING INTRUSION POINT. RE-PROGRAM TO OPERATE "FAIL SAFE".
9. ADD PULSE EXTENDERS FOR NEW TELEMETRY FLOW POINTS.



TELEMETRY MODIFICATIONS

ROBERT J. CASNE — STATE OF WASHINGTON — 12250 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP-BROOM — STATE OF WASHINGTON — 16080 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021E16

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WHATCOM COUNTY
WATER TREATMENT PLANT
TELEMETRY BLOCK DIAGRAM

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	E16
OF	16

PIPING SYMBOLS

MECHANICAL EQUIPMENT SYMBOLS

- CENTRIFUGAL PUMP
- SUBMERSIBLE SUMP PUMP
- VERTICAL PUMP
- GEAR PUMP
- ROTARY LOBE PUMP
- PROGRESSIVE CAVITY PUMP
- METERING PUMP
- FAN
- COMPRESSOR
- ROTARY LOBE BLOWER
- LIQUID RING BLOWER OR COMPRESSOR
- SILENCER
- INTAKE SCREEN
- MIXER
- VSD — VARIABLE SPEED DRIVE
- GENERATOR
- SIGHT GLASS
- TANK
- GRINDER
- FAN

PIPE LINE DEVICE SYMBOLS

- SLUICE GATE (NORMALLY OPEN)
- SLUICE GATE (NORMALLY CLOSED)
- INJECTOR
- FILTER OR SEPARATOR
- CAP OR PLUG
- BLIND FLANGE
- STRAINER
- REDUCER OR INCREASER
- BFP — BACK FLOW PREVENTER
- PIPED TO DRAIN (D)
- STATIC MIXER

VALVE & ACTUATOR SYMBOLS

- GATE VALVE (N.O. N.C.)
- GLOBE VALVE (N.O. N.C.)
- PLUG VALVE (N.O. N.C.)
- BALL VALVE (N.O. N.C.)
- BUTTERFLY VALVE (N.O. N.C.)
- CHECK VALVE
- BALL CHECK VALVE
- PINCH VALVE
- DIAPHRAGM VALVE
- NEEDLE VALVE
- RELIEF VALVE
- FLOAT VALVE

F.O. – FAIL OPEN
F.C. – FAIL CLOSED

- PRESSURE REDUCING VALVE
- BACK PRESSURE SUSTAINING VALVE
- VALVE WITH HAND OPERATOR
- S — SOLENOID OPERATED VALVE
- M — ELECTRICAL MOTOR OPERATED VALVE
- PISTON OPERATED VALVE
- DIAPHRAGM OPERATED VALVE
- BFP — BACK FLOW PREVENTER

INSTRUMENTATION SYMBOLS

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- VENTURI OR FLOW TUBE
- AVERAGING PILOT TUBE
- PROPELLER OR TURBINE METER
- M — MAGNETIC FLOW ELEMENT
- FLUME
- WEIR
- VARIABLE AREA FLOW METER (ROTAMETER)
- RUPTURE DISC
- FLOW STRAIGHTENING VANES
- ANNULAR CHEMICAL SEAL
- DIAPHRAGM CHEMICAL SEAL
- TEMPERATURE WELL
- T — MAGNETIC FLOW ELEMENT

FUNCTION IDENTIFICATION

	FIRST LETTER(S)		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER (FLAME)				
C	CONDUCTIVITY			CONTROL	CLOSED
D	DENSITY	DIFFERENTIAL			
E	POTENTIAL (ELEC)		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	FIRE, SMOKE		GLASS		
H	HAND				HIGH
I	CURRENT (ELEC)		INDICATE		
J	POWER	SCAN			
K	TIME	TIME RATE CHANGE		CONTROL STATION	
L	LEVEL		PILOT LIGHT		LOW
M	MOISTURE	MOMENTARY			MIDDLE
N	EQUIPMENT STATUS				
O	UNCLASSIFIED		ORIFICE		OPEN
P	PRESSURE		TEST CONNECTION		
Q	QUANTITY	INTEGRATE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, DAMPER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED	UNCLASSIFIED	
Y	EVENT, STATUS			RELAY, COMPUTE	
Z	POSITION			MISC. ACTUATOR	

PROCESS & SIGNAL LINE SYMBOLS

LINE	DESCRIPTION
— — — —	EQUIPMENT BOUNDARY
▬▬▶	MAIN PROCESS FLOW (WITH TYPICAL DIRECTION OF FLOW SHOWN)
———	SECONDARY PROCESS FLOW
———	INSTRUMENT SUPPLY, PROCESS TAPS, NON PROCESS FLOW
//——//	PNEUMATIC SIGNAL (ANALOG)
— — — —	ELECTRIC SIGNAL (ANALOG)
//——//	PNEUMATIC SIGNAL (DISCRETE)
— - + - + -	ELECTRIC SIGNAL (DISCRETE)
—×——×—	CAPILLARY TUBE OR FILLED SYSTEM
——~——~——	ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
~ ~	ELECTROMAGNETIC OR SONIC SIGNAL (UNGUIDED)
—o—o—	SOFTWARE OR DATA LINK
—•—•—	MECHANICAL LINK
—L—L—	HYDRAULIC
ES	ELECTRIC POWER SUPPLY 120VAC, 60HZ U.O.N.

INSTRUMENT LOOP IDENTIFICATION

X NNN
- X — MEASURED OR INITIATING VARIABLE LETTER
- NNN — LOOP NUMBER

INSTRUMENT TAG NUMBERS

XX YYY NNNZ
- XX — MEASURED OR INITIATING VARIABLE LETTER WITH OPTIONAL MODIFIER (SEE FUNCTION IDENTIFICATION TABLE)
- YYY — PASSIVE &/OR OUTPUT FUNCTION LETTERS WITH OPTIONAL MODIFIER (SEE FUNCTION IDENTIFICATION TABLE)
- NNN — LOOP NUMBER
- Z — OPTIONAL SUFFIX

INSTRUMENT & FUNCTION SYMBOLS

- DISCRETE INSTRUMENT
- MULTIFUNCTION INSTRUMENT WITH SHARED HARDWARE (USED FOR "DISTRIBUTED CONTROL SYSTEMS")
- COMPUTER FUNCTION
- INTERLOCKING OR SEQUENTIAL CONTROL FUNCTION
- PROGRAMMABLE LOGIC CONTROL

NOTE: ANY OF THE ABOVE SYMBOLS MAY BE SHOWN WITH HORIZONTAL BAR(S) TO INDICATE PANEL MOUNTING &/OR OPERATOR ACCESSIBLE

- FACE MOUNTED ON MAIN PANEL OPERATOR ACCESSIBLE
- MOUNTED ON/IN MAIN PANEL OPERATOR INACCESSIBLE
- FACE MOUNTED ON FIELD PANEL OPERATOR ACCESSIBLE
- MOUNTED ON/IN FIELD PANEL OPERATOR INACCESSIBLE
- * — ASTERISK DENOTES EXISTING INSTRUMENTS

ABBREVIATIONS

PIPING DESIGNATIONS

ALS – ALUM SOLUTION
BW – SETTLED BACK WASH WATER
BWW – BACKWASH WATER
Cl2 – CHLORINE GAS
CIS – CHLORINE SOLUTION
CW – CHLORINATED WATER
D – DRAIN
FE – FILTER EFFLUENT
FI – FILTER INFLUENT
FTW – FILTER TO WASTE
FW – FINISHED WATER
OF – OVERFLOW
NG – NATURAL GAS
PW – POTABLE WATER
RW – RAW WATER
SAS – SODA ASH SOLUTION
SW – SURFACE WASH

INSTRUMENT ABBREVIATIONS

ALT.VLV – ALTITUDE VALVE
Cl RES. – RESIDUAL CHLORINE
F.C. – FAIL CLOSED
F.O. – FAIL OPEN
HOA – HAND-OFF-AUTO
I/O – ON/OFF
HOR – HAND-OFF-REMOTE
MUX – TELEMETRY MULTIPLEXING
OAC – OPEN-AUTO-CLOSE
OOR – ON-OFF-REMOTE
PLC – PROGRAMMABLE LOGIC CONTROLLER
TURB – TURBIDITY

EQUIPMENT SPECIFICATIONS

Q – FLOW RATE
TDA – TOTAL DYNAMIC HEAD
HP – HORSE POWER

LEVEL INDICATION CLARIFICATION

NOTES:

ROBERT J. CASNE — STATE OF WASHINGTON — 12210 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP BLOOM — STATE OF WASHINGTON — 16843 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021P1

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DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
SYMBOLS & ABBREVIATION

DATE	June 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	P1
OF	5

HEADQUARTERS DATA LOGGER

TELEMETRY HEADQUARTERS PANEL

TELEMETRY HEADQUARTERS PLC

WTP TELEMETRY PANEL

WATER TREATMENT PLANT CONTROL PANEL

WATER TREATMENT PLANT PLC

UI 01

FQI B *

AI 106 *

PLC

MUX

MUX

1/0 HOA YL 611 HS 611

1/0 LAHL 107

1/0 HOA FAIL YL 121 HS 121 YAL 121

1/0 HOA FAIL YL 111 HS 111 YAL 111

1/ALT/2 HS 106

FQI 101 A

FQIT 101

FI 101

FALL 105

AAHL 106

1/0 OAC YL 633 HS 633

LAHL 201

1/0 1/0 YL 622 HS 622

FI 641

FQI 641

FQIT 641

FIR 101

YIR 306

YIR 307

FIR 641

1/0 HOA YL 621 HS 621

YC 611

LAH 107

YC 121

YC 111

YC 106

FK 105

ASH 106

YC 633

LC 201

LAH 201

YC 621

INTERLOCK/LOGIC NOTES:

1. YC 111 — IN AUTO, LC-201 RUNS PUMP P11 VIA YC-106. IF RUNNING SIGNAL NOT RECIEVED WITHIN 5 SEC., FAIL PUMP & START LAG.
2. YC 112 — P-11 CAN NOT RUN AT THE SAME TIME AS P-12.
3. YC 121 — IN AUTO, LC-201 RUNS PUMP P12 VIA YC-106. IF RUNNING SIGNAL NOT RECIEVED WITHIN 5 SEC., FAIL PUMP & START LAG.
4. YC 22 — P-21 CAN NOT RUN AS THE SAME TIME AS P-11.
5. FK 105 — IF FLOW IS NOT VERIFIED WITHIN 15 SECONDS FROM PUMP CALL, LOW FLOW ALARM IS INITIATED AND LAG PUMP IS CALLED TO START.
6. YC 106 — LEAD PUMP SELECTED VIA HS-106 OR ALTERNATOR.
7. YC 611 — IN AUTO, ALUM PUMP RUNS WHEN EITHER RAW WATER PUMP RUNS
8. YC 621 — IN AUTO, SODA ASH PUMP RUNS WHEN EITHER RAW WATER PUMP RUNS.
9. LC 201 — RAW WATER PUMP IS "CALLED" WHEN LEVEL DROP BELOW LS-201B AND STOPS WHEN LEVEL RISES ABOVE LS-201A.
10. YC 633 — IN AUTO, YV-633 OPENS WHEN EITHER RAW WATER PUMP RUNS.

TURB. SIGNAL P3 A

SAS SAS P3 B

P3 C

P3 D

P3 E

ALS

ALUM

Q: DOSAGE: 9mg/l (TYPICAL)
HP: 1/4
VOLTAGE: 115VAC

ALUM

VOLUME: 2000 GAL

LC 112 MCC-2

YK 22 MCC-2

YK1 111 1/0 MCC-2

1/0 MCC-2 YK1 121

ALS

ES

AIT 106 * TURB

AE 106 * TURB

FSL 105 *

LS 201 A *

LS 201 B *

LSH 201

HIGH LEVEL ALARM 336 93' (8 46)

RAW WATER PUMP ON 336 76' (8 29)

RAW WATER PUMP OFF 335 59' (7.12)

CLS

MIXER
HP: 1/3
VOLTAGE: 115VAC

M

SODA ASH PUMP

Q: DOSAGE: 9mg/l (TYPICAL)
HP: 1/4
VOLTAGE: 115VAC

SODA ASH

VOLUME: 1800 GAL

10"FI P3 F

LAKE WHATCOM

12" RW

6"

P11

P12

6" RW

6" RW

10"RW

FE 101 0-1500 GPM

LSH 107

RAW WATER PUMPS

Q: 1460 GPM
TDH: 42 2'
HP: 20

RAW WATER PUMP PIT SUMP

10"RW

328 47' (0.0)

FLOC TANK

DIAMETER: 13.5'
HEIGHT: 8 5'

Cl2 P3 G

S F.C YV 633 *

1"PW P3 H

12" BWW P3 I

4" BW

STORM SEWER

SANITARY SEWER

6"OF

HOLDING TANK

HOLDING TANK

ROBERT J CASNE — STATE OF WASHINGTON — 11216 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M THARP-BLOOM — STATE OF WASHINGTON — 16288-42 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021P2

NO.	REVISIONS	BY	DATE

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DRAWN BY:	TEO
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WHATCOM COUNTY
WATER TREATMENT PLANT
RAW WATER PUMPING & FLOCUATION

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	P2
OF	5

HEADQUARTERS DATA LOGGER

TELEMETRY HEADQUARTERS PANEL

TELEMETRY HEADQUARTERS PLC

WTP TELEMETRY PANEL

WATER TREATMENT PLANT CONTROL PANEL

WATER TREATMENT PLANT PLC

UI 01

PLC I/O

MUX

MUX

TO FREQ B/W

TO FREQ B/W

P5 C

P4 A

P2F

TURB SIGNAL

P2 A TURB SIGNAL

P2 B SAS

P2 C

P2 D

P2 E

SAS

FILTER BAY 1

FILTER BAY 2

BOTTOM

TOP

6" BWW

2"SW

8"

BWW

FLOW EQUALIZATION THROUGH

FILTER BAY 3

FILTER BAY 4

BOTTOM

12"FE

2"PW

BFP

6"PW

SAMPLE PUMP

CIS

Cl2

P3 B

P4 C

P4 D

P4 E

P4 F

P2 F 10"FI

P2 G Cl2

P2 H 1"PW

P2 J 12"BWW

1"PW

FTW

FILTER BACKWASH AND FILTER TO WASTE TROUGH

FILTER SYSTEM

Q:	5.0	GPM/SQ FT.
SURFACE AREA:	73.3	SQ FT.
WIDTH (EACH FILTER):	8.0'	FT.
LENGTH (EACH FILTER):	9' 2"	FT.

INTERLOCK/LOGIC NOTES:

YC 301 — HS-301 SELECTS FILTER BAY 1 & 2 OPERATION
O=OFFLINE, ALL VALVES CLOSED
T=HIGH FILTER TURBIDITY FROM AIT-301 INITIATES BACKWASH
H=FILTER HEADLOSS FROM PSL311/321 INITIATES BACKWASH.
M=MANUAL INITIATION OF BACKWASH
FILTER EFFLUENT VALVE CLOSES UPON REACHING LEVEL CONTROL AS SENSED BY LC-401 (DWG P4)

YC 302 — HS-302 SELECTS FILTER BY 3 & 4 OPERATION IN THE SAME MANNER AS YC-301

YC 303 — BOTH FILTER BAYS CANNOT BACKWASH AT THE SAME TIME. 30 MIN DELAY BETWEEN BACKWASHES REQUIRED.

YC 311 — BACKWASH SEQUENCE CONTROL FOR FILTER BAY 1 SHALL BE AS FOLLOWS (ALL VALVE SELECTOR SWITCHES IN "AUTO")

1.	CLOSE YV-311A (EFFLUENT)	TIME=0
2.	OPEN YV-311B (SURFACEWASH)	TIME+0.5 MIN
3.	OPEN YV-311C (BACKWASH)	TIME+2.5 MIN
4.	CLOSE YV-311B	TIME+4.5 MIN
5.	CLOSE YV-311C	TIME+10.0 MIN
6.	OPEN YV-311A	TIME+20 MIN

IF LEVEL DROPS BELOW LSL-313, EFFLUENT VALVE IS CLOSED & LOW FILTER LEVEL ALARM IS INITIATED. FILTER CANNOT RESTART UNTIL RESET. (TYPICAL YC-311,321,331,341)

YC 321 — BACKWASH SEQUENCE CONTROL FOR FILTER BAY 2 SHALL BE AS FOLLOWS (ALL VALVE SELECTOR SWITCHES IN "AUTO")

1.	CLOSE YV-321A (EFFLUENT)	TIME=0
2.	OPEN YV-321B (SURFACEWASH)	TIME+8.0 MIN
3.	OPEN YV-321C (BACKWASH)	TIME+11.5 MIN
4.	CLOSE YV-321B	TIME+12.0 MIN
5.	CLOSE YV-321C	TIME+19.0 MIN
6.	OPEN YV-321A	TIME+20 MIN

YC 313 — BACKWASH SEQUENCE FOR FILTER BAY 3 SAME AS YC-311

YC 341 — BACKWASH SEQUENCE FOR FILTER BAY 4 SAME AS YC-321

YO 636/7 — IN AUTO, YV 636/7 OPENS WHEN FILTER IS ON-LINE.

FLAG NOTES:

1 — SET LEVEL TO MATCH LSL-333/343

ROBERT J. CASNE — STATE OF WASHINGTON — 12218 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP-BLOXOM — STATE OF WASHINGTON — 6028642 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021P3

NO.	REVISIONS	BY	DATE

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DESIGNED BY:	DMB/MAC
DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
FILTRATION P & ID

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	P3
OF	5

HEADQUARTERS DATA LOGGER

TELEMETRY HEADQUARTERS PANEL

TELEMETRY HEADQUARTERS PLC

WTP TELEMETRY PANEL

WATER TREATMENT PLANT CONTROL PANEL

WATER TREATMENT PLANT PLC

UI 01

PLC

MUX

MUX

AAHL 635 A

AHL 635 B

AAH 635

AISH 635

Cl_2

ES

AE 635

CHLORINE CYLINDERS
CAPACITY: 150 LBS EACH
AUTOMATIC SWITCHOVER VALVES
SIZE: -
POWER:115 VAC

WE 631 · WI 631 · WI 632 · WE 632

P3 A · P3 B Cl2 · P3 C 12"FE · P3 D Cl2 · P3 E Cl2 · P3 F 6" PW

LI 401 · LAHL 401 · LALL 401 · LAH/L 401

YL 411 · HS 411 · YAL 411 · YL 421 · HS 421 · YAL 421 (I1/O, HOA, FAIL)

LIR 401 · LIR 501 · HS 402 (1/ALT/2)

YC 411 · YC 421 · YC 402

LC 401

HOR · HS 411 · 1/0 · YK1 411 · MCC-2

HOR · HS 421 · 1/0 · YK1 421 · MCC-2

MCC -2

LSH 401 · LSL 401 · LSLL 401

LT 401 0-11.5 FT

OVERFLOW 328.62(11.49')

HIGH LEVEL ALARM 325.67 (8.45')

CLOSE FILTER DISCH. VALVES 325.17 (7.95')

OPEN FILTER DISCH. VALVES 324.8 (7.38')

TRANSMISSION PUMPS RESTART 322.22 (5.0')

LOW LEVEL ALARM 320.22 (3.0')

TRANSMISSION PUMPS SHUTDOWN 319.72 (2.5')

EL. 317.22

P41 · P42

CLEARWELL
WIDTH: 17.5'
LENGTH: 25.51
VOLUME: 26,537 GAL.

CLEARWELL TRANSFER PUMPS
Q: 1400 GPM
TDH: 39.5'
HP: 25

12"FE · 12"CWOF

10" CW

12" OF

WATER TREATMENT PLANT RESERVOIR

DIAMETER: 40.0'
HEIGHT: 25.0'
CAPACITY: 220,890 GALLONS
MATERIAL: STEEL

LALL 501 A · LAHL 501 · LY 501 · LI 501 · LAHH 501 · LALL 501 · P5 A

LALL 501 B · LI 501 PUMP ROOM · TRANSMISSION PUMP BLDG. RES. LEVEL INDICATOR PNL

LSHH 501 · LSLL 501

OVERFLOW ALARM 359.00 (24.0')
HIGH LEVEL ALARM 358.75 (23.75')
TRANFER PUMP OFF 358.50 (23.5')
TRANSFER PUMP ON 354.00 (19.0')
OUTLET DIFFUSER 25@2"HOLES
LOW LEVEL ALARM 342.00 (6.0')
TRANSMISSION PUMP SHUT DOWN & ALARM 341.00 (5.0')
EL 336.00'

INLET DIFFUSER 25@2" HOLES

BAFFELS

P5 B · P5 C · P5 D · P5 E

10"FW · OF · 12" CWOF · STORM SEWER · 6"PW

INTERLOCK/LOGIC NOTES:

LC 401 — FILTERS BROUGHT ON-LINE AT 7.38' AND OFF-LINE AT 7.95' VIA YC-301 & YC-302 (DWG. P3)

YC 402 — LEAD PUMP SELECTED VIA HS-402 OR ALTERNATOR. IF PUMP IS NOT RUNNING WITHIN 5 SECONDS, FAIL PUMP & START LAG.

YC 411 — IN AUTO, LC-501 RUNS PUMP P41 VIA YC-402. IF PUMP IS NOT RUNNING WITHIN 5 SECONDS FAIL PUMP & START LAG.

AA 412 — IF CLEAR WELL DROPS BELOW 2.5' VIA LSL-401, PUMP P41 IS SHUT DOWN. LEVEL MUST RISE ABOVE 5.0' VIA LS-401B BEFORE PUMP MAY RE-START.

YC 411,421 — BOTH PUMPS CAN NOT OPERATE AT THE SAME TIME.

YC 421 — IN AUTO LC-501 RUNS PUMP P41 VIA YC-402. IF PUMP IS NOT RUNNING WITHIN 5 SECOND, FAIL PUMP & START LAG.

AA 422 — IF CLEARWELL DROPS BELOW 2.5' VIA LSL-401, PUMP P42 IS SHUT DOWN. LEVEL MUST RISE ABOVE 5.0' VIA LS-401B BEFORE PUMP MAY RESTART.

LC 501 — LEAD CLEARWELL TRANSFER PUMP STARS AT 19.0', STOPS AT 23.5'.

YC 634 — IN AUTO, YV-634 IS OPEN WHEN ANY FILTER EFFLUENT VALVE IS OPEN.

ROBERT J. CASNE — STATE OF WASHINGTON — 12216 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP-BLOXOM — STATE OF WASHINGTON — 16838 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021P4

NO.	REVISIONS	BY	DATE

Wilson Engineering
CONSULTING ENGINEERS & SURVEYORS

805 DUPONT STREET #7
BELLINGHAM, WA 98225
(206) 733-6100
FAX: (206) 647-9061

CASNE ENGINEERING, INC.
P.O. BOX 7207
BELLEVUE, WA 98008
(206) 454-3555

DESIGNED BY:	DMB/MAC
DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
CHLORINATION

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	P4
OF	5

HEADQUARTERS DATA LOGGER

TELEMETRY HQ PANEL

WTP TELEMERY PNL

WTP CONTROL PANEL

WTP PLC

TELEMETRY WTP PANEL

TELEMETRY H.Q. PANEL

TELEMETRY H.Q. PLC

P4 A

P3 C

P4 B

P4 C

P4 D

P4 E

GENERATOR CONTROL PANEL

CASCADE NATURAL GAS

STAND-BY GENERATOR
VOLTAGE: 277Y/480V
PHASE: 3 pH
WIRE: 4 W
FREQ.: 60 HZ
CURRENT: 350A C.B
POWER: 230 kW
FUEL: NATURAL GAS

OVERFLOW 33.50'

DIVISION 7 RESERVIOR

DIAMETER: 70.0'
HEIGHT: 35.0'
CAPACITY: 1,000,000 GAL
MATERIAL: STEEL

EL. 674.74'

OVERFLOW 33.50'

DIVISION 22 RESERVIOR

DIAMETER: 50.0'
HEIGHT: 35.0'
CAPACITY: 500,000 GAL
MATERIAL: STEEL

EL. 806.49'

OVERFLOW 39.00'

DIVISION 30 RESERVIOR

DIAMETER: 25.331
HEIGHT: 40'
CAPACITY: 150,000 GAL
MATERIAL: STEEL

EL. 1025.51

P51 P52 P53 P54

DIVISION 7 TRANSMISSION PUMPS

Q: 700 GPM
TDH: 445'
HP: 100

DIVISION 22 TRANSMISSION PUMPS

Q: 700 GPM
TDH: 608'
HP: 150

DIVISION 30 BOOSTER PUMP STATION

Q: 100 GPM
TDH: 525'

1992 CONNECTIONS: 435 ULTIMATE: 861

1992 CONNECTIONS: 722 ULTIMATE: 2120

1992 CONNECTIONS: 85 ULTIMATE: 825

NOT IN CONTACT - FOR INFORMATION ONLY

NOTES:

1. IN AUTO, LC-707 CONTROLS P51 VIA TELEMETRY. IF PUMP IS NOT RUNNING WITHIN 60 SECONDS AS SENSED BY ZSC-512, PUMP IS FAILED AND SHUT DOWN. LOW TREATMENT PLANT RESERVIOR LEVEL WILL SHUT DOWN PUMPS IN HAND OR AUTO.
2. DISCHARGE VALVE MUST BE CLOSED, AS SENSED VIA ZSC-512 BEFORE PUMP P51 CAN START. ONCE PUMP IS STARTED YV-521 SHALL OPEN. UPON LOSS OF RUN SIGNAL, YV-521 SHALL CLOSE. DISCHARGE VALVE MUST CLOSE, AS SENSED VIA ZSC-512, BEFORE PUMP MOTOR CAN STOP.
3. SAME AS YC-511/512 EXCEPT AS FOLLOWS:
   YC-521,531,541 YC-521 PUMP P52 SENSOR ZSC-522 VALVE YV-522
   YC-531 PUMP P53 SENSOR ZSC-532 VLAVE YV-532
   YC-532,542 YC-541 PUMP P54 SENSOR ZSC-542 VALVE YV-542
4. DURING NORMAL POWER, NO MORE THAN 2 TRANSMISSION PUMPS CAN OPERATE AT ONE TIME. DURING GENERATOR OPERATION, NO MORE THAN ONE TRANSMISSION PUMP CAN OPERATE AT ONE TIME.

ROBERT J. CASNE — STATE OF WASHINGTON — 12291 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/94

DAVID M. THARP BLOOM — STATE OF WASHINGTON — 20286 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 4/17/93

92021P5

NO.	REVISIONS	BY	DATE

Wilson Engineering
CONSULTING ENGINEERS & SURVEYORS

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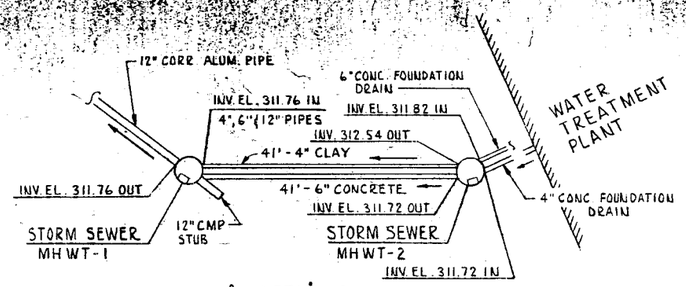
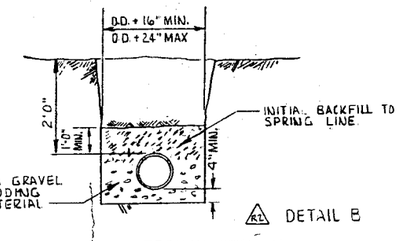
DESIGNED BY:	DMB/MAC
DRAWN BY:	TEO
CHECKED BY:	KLA

WHATCOM COUNTY
WATER TREATMENT PLANT
FINISHED WATER PUMPING & DIST. P & ID

DATE	July 1992
SCALE	NONE
JOB NUMBER	92021A
SHEET	P5
OF	5

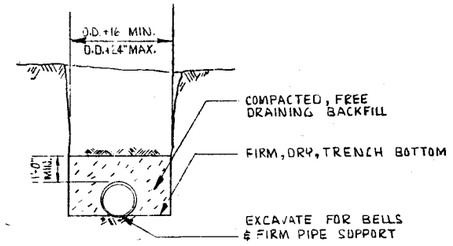


⚠ DETAIL A
EXISTING FOUNDATION DRAINS
NO SCALE



⚠ DETAIL B

TYPICAL TRENCH SECTION FOR CLAY PIPE



TYPICAL TRENCH SECTION FOR CAST IRON-DUCTILE IRON PIPE

ADDITIONAL TOPOGRAPHY DATED JAN. 8 1971

TOPOGRAPHY THIS SIDE WAS TRACED FROM WATER TREATMENT PLANT TOPOG DATED 12-70

12" CHECK VALVE SEE WATER DETAILS SHEET 2

12" GATE VALVE & BOX LOCATED AT INV. EL. 304.50

BATH HOUSE

FRENCH DRAIN 12" CORR. ALUM. PIPE ALTERNATE SECTIONS PERFORATED ENTIRE TRENCH BACKFILLED WITH GRAVEL

SAN. SEWER MH MB-2
INV. 312.20 IN
312.00 OUT

SAN. SEWER MH MB-3
INV. 314.86 IN
314.66 OUT

INTAKE

RAW WATER

50'-8"

TEE
S/B 310.68

SAN. SEWER MH MB-1
INV. 309.08 IN
308.88 OUT

45° BEND & THRUST BLOCK - ELEV. 314.0

6" GATE VALVE AND BOX

12"x12"x6" TEE EL. 314.0
THRUST BLOCK REQD

4" SEWER FLUSH LINE

22½° BEND

6" SIDE SEWER

1 FT. CLEARANCE WITH SEWER BENEATH WATER LINE

STORM SEWER MH WT-1
INV. 311.76

4" GATE VALVE & BOX
2" BLOWOFF

CLASS II DUCTILE IRON

12" INV. EL. 316.00 IN

OUTLET INV. EL. 312.00
VAULT
SEE WASH WATER HOLDING TANK SHT. 3 OF 3

DAYLITE TO MH WT-1

6" FOUNDATION DRAIN SEE OVERFLOW BOX

12" CORR STUB

CLEARWELL OVERFLOW 36"-12" CLAY SEWER

CONTRACT LIMIT INV. EL. 317.20

11¼° BEND WITH THRUST BLOCK - ELEV. 314.30

6" PERFORATED

HOLDING TANK (SEE DETAIL SHT)

STORM SEWER MH WT-2

SEE SHT 2 EXTERNAL PIPING DETAIL, WATER TRMT PLANT

45° BEND TURNED DOWN 12"-12" C.I.
45° BEND TURNED DOWN
INV EL 321.50

6" WYE (PLUG EL 318.84

11¼° BEND EL 318.90

11¼° BEND EL 315.80

6" WYE & PLUG

METAL PIPE

HOLDING TANK (SEE DETAIL SHT)

12"x6"x6" TEE EL 315.43

INV. EL. 315.76

INV. EL. 314.50

SEE DETAIL A FOR FOUNDATION DRAINS

EL. 325.33

EL. 319.18

WATER TREATMENT PLANT

EL. 330.56

6" SIDE SEWER
6"x6"x4" TEE
4" SIDE SEWER
INV. EL. 319.80

6" 45° BEND TURNED UP
EL. 327.42

8" WATER TRANSMISSION LINE

8" WATER TRANSMISSION

8" WATER DISTRIBUTION

8" WATER

SANITARY SEWER

TRANSMISSION LINE

8" WASH WATER SUPPLY LINE

22½° BEND TURNED UP

8" 90° BEND TURNED DOWN

8" 90° BEND TURNED UP

11¼° BEND TURNED DOWN
EL. 327.00

12 CLASS II DUCTILE IRON BACKWASH FILTER DRAIN LINE

8"-6"x6" TEE EL. 318.00
8" 90° BEND EL. 313.00

BM ELEV = 327.90
12" SPIKE

5' DIA MAPLE STUMP

MANHOLE
INV. 320.25 IN
320.25 OUT
& POURED

NOTE - MIN 2' COVER OVER ALL PIPES

SUDDEN VALLEY GRID SYSTEM

SUDDEN VALLEY DATUM PLANE

DATE OF PRINT
NOV 8 7 1974

DESIGNED					
DRAWN	ZLH				
CHECKED	DEE				
SYMBOL	REVISION	BY	APPROVED	DATE	
⚠	TRENCH SECTION DETAILS	RSH	MLP	3-27-72	
⚠	REVISIONS CLEARWELL OVERFLOW / EXIST. FOUNDATION DRAINS	EER	RVM	11-8-72	

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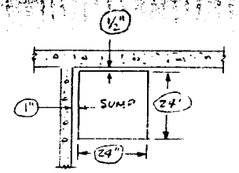
D. A. HOGAN & ASSOCIATES
DAMES & MOORE
MILES YANICA & CO.

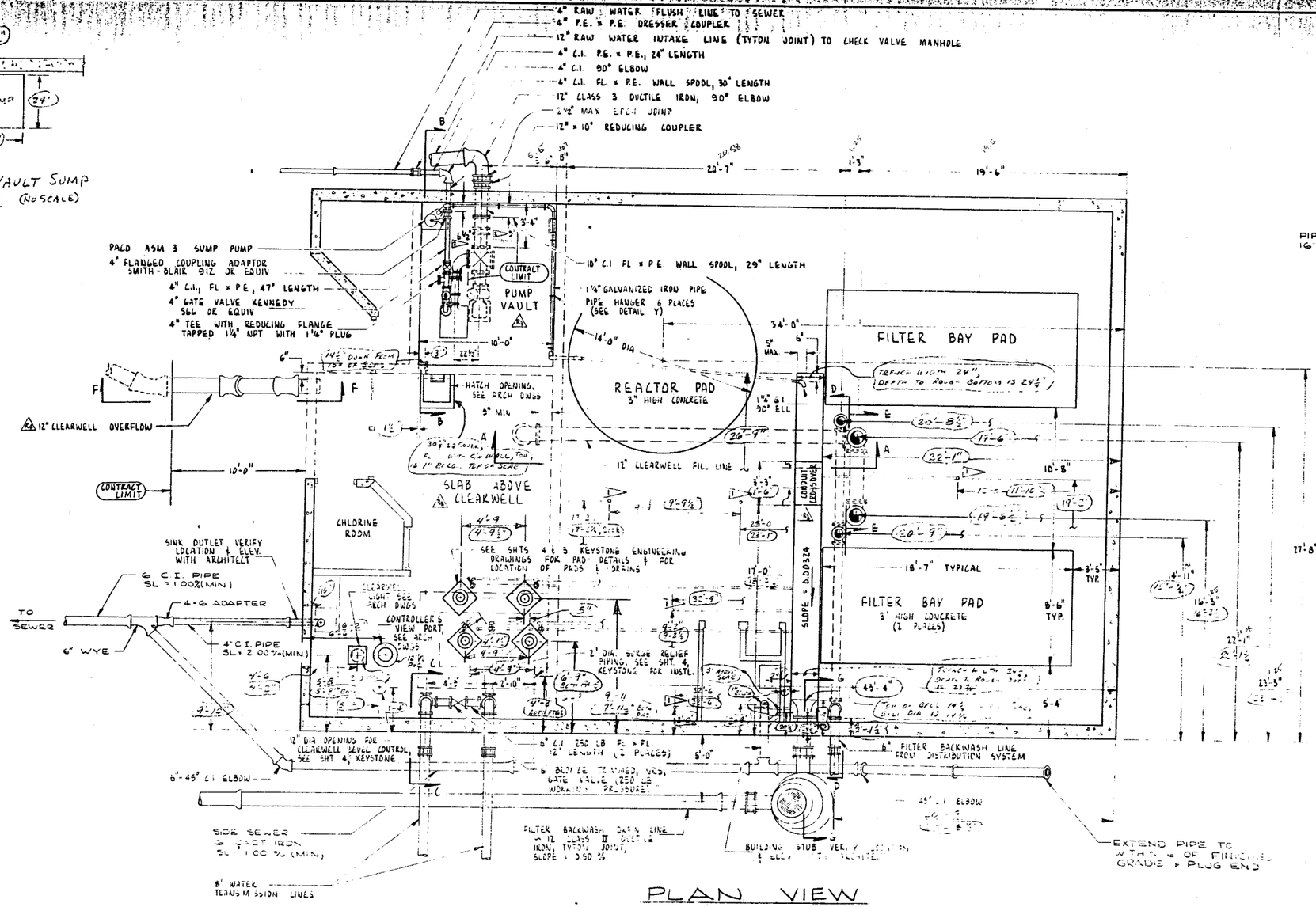
Sudden Valley

DEVELOPMENT OF THE
THE SANWICK CORPORATION

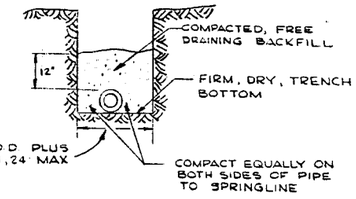
JOB NO. 2277.6
SHEET NO. 1 OF 7



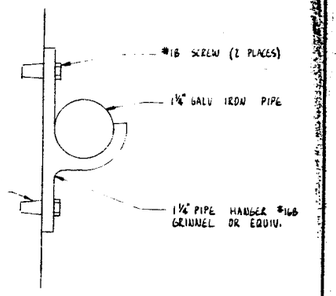
PUMP VAULT SUMP
PLAN (NO SCALE)



PLAN VIEW
SCALE: ¼" = 1'-0"



TYPICAL TRENCH SECTION
NO SCALE



⚠ DETAIL Y
NO SCALE

JAN. 6, 1972 INSPECTION NOTES:

1. 8 BLOCK CUTS FOR EFFLUENT PUMPS VARY FROM 7¾" TO 7'6" DIA'S.
2. PUMP DRAIN INTAKES LOCATED PER KEYSTONE DWGS. EXCEPT NORTHERLY ONE WHICH IS DIMENSIONED ON PLAN ABOVE. RIGHT ANGLE JOG IN IN-SLAB DRAIN PIPING WAS NOT INTENDED ALSO, PROTRUDING NIPPLES WERE PLANNED INSTEAD OF SMALL FLUSH DRAINS.
3. VIEW PORT IS 4'-½" INSTEAD OF 3'-4" AND THEREFORE EXTENDS INTO CLEARWELL 8½" INSTEAD OF BEING FLUSH.
4. VERIFIED THAT ALL CONDUIT FOR KEYSTONE EQUIP. WAS IN PLACE. ONE EXCEPTION; THE CONDUIT LOCATED NEXT TO THE VIEW PORT APPEARS TO BE AN EXTRA 2" CONDUIT WAS USED WHERE 3" IS CALLED FOR ON KEYSTONE DWGS.
5. SUMP PUMP DRAIN PIPE WAS INSTALLED "IN-SLAB" INSTEAD OF "BELOW" AS SHOWN ON THESE DWGS.
6. FORMS NOTED TO BE CUT OF LINE: (1) CLEARWELL LIGHT (2) NORTHERLY 2" SURGE RELIEF PIPE (3) SIDE CLEARANCE OF CONDUIT IN CROSS-OVER. } ITEMS 6. & 7. WERE CORRECTED 1-7-72.
7. FLOOR DRAIN NEAR TRENCH IN CENTER OF BLDG BELOW GRADE.
8. HATCH COVER WAS 1" BELOW GRADE AND EASTERLY EDGE SHOULD BE RECESSED IN WALL
9. CONDUIT CROSS-OVER IS CONSIDERABLY NARROWER THAN INTENDED BUT APPEARS TO BE SATISFACTORY.
10. ENTRANCE OF FLOOR & PUMP DRAIN PIPING INTO TRENCH WAS NOT INSPECTED. PIPE WAS BEHIND TRENCH FORMS & HAD BEEN POURED IN PLACE IN TRENCH WALL. CONSTRUCTION FOREMAN INDICATES PIPES ENTER TRENCH 8" FROM SLAB SURFACE

DATE OF PRINT
NOV 27 1974

NOTES: ⚠

FOR LOCATION OF ELECTRICAL CONDUIT IN SLAB, SEE SHT 5, KEYSTONE ENGINEERING DRAWINGS.

1 ▷ J.R. SMITH OR EQUIV. FLOOR DRAIN (5 PLACES). FOR LOCATION OF DRAINS AND UNDER SLAB PIPING, SEE SHT. 4, KEYSTONE ENGINEERING DRAWINGS

2 ▷ USE THIS DIMENSION TO SET WALL SPOOL IN PUMP VAULT WALL

(XX'-0") —MEASURED DIMENSIONS

SYMBOL	REVISION	BY	APPROVED	DATE
2⚠	CHGD. CLEARWELL OVERFLOW	ZSH	RVM	1-31-72
1⚠	CHGD. PUMP VAULT PIPING & GENERAL UPDATE	SAW	RVM	1-7-72
⚠	CHGD. CLEARWELL OVERFLOW & PUMP VAULT PIPING	SAW	RIA	12-1-71
1⚠	CHALIGED RAW WATER INTAKE LINE TO AVOID ROCK	RIA	RIA	10-22-71

DESIGNED R.I.A. DRAWN T.M.A. CHECKED R.I.A.

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DAMES & MOORE
MILES YANICK & CO

Sudden Valley
the undevelopment of the
THE SANWICK CORPORATION
SUITE 1700 DENNY BUILDING SEATTLE WASHINGTON 98121

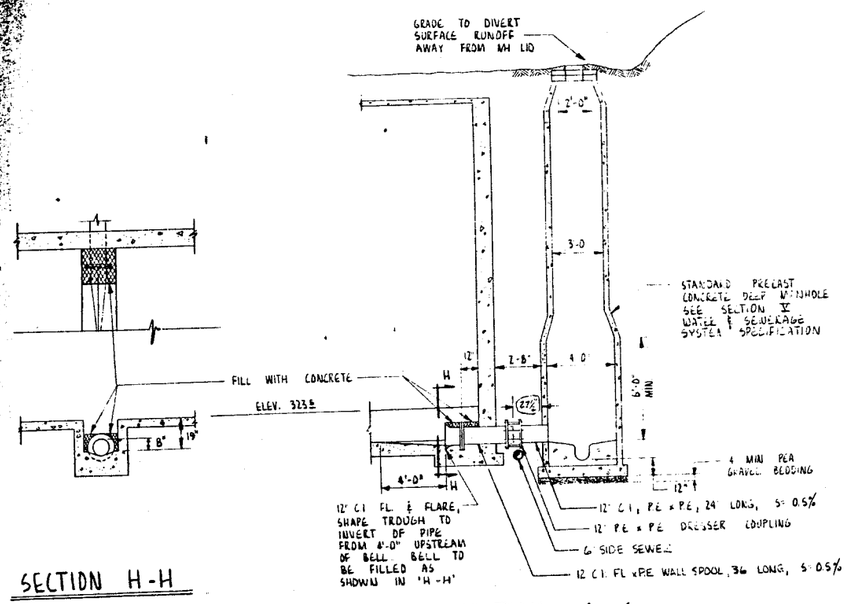
APPROVED

DATE 12-24-70
SCALE AS SHOWN
P. O. NO.

INSPECTION REPORT, IN-SLAB PIPING
(PRIOR TO CONCRETE POUR) 1-6-72 RVMcCormick

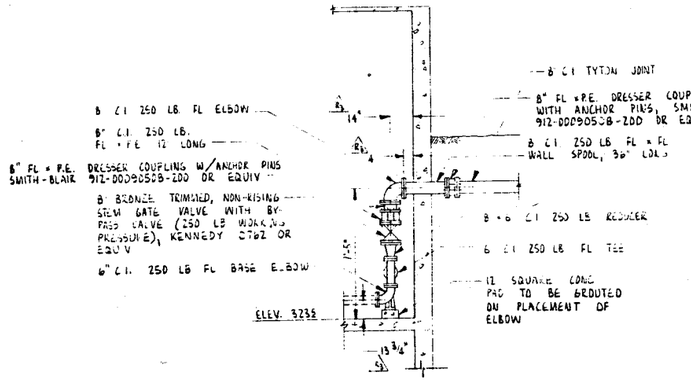
WATER TREATMENT PLANT
EXTERNAL PIPING DETAILS

JOB NO. 2277.6
SHEET NO. 3 OF 7

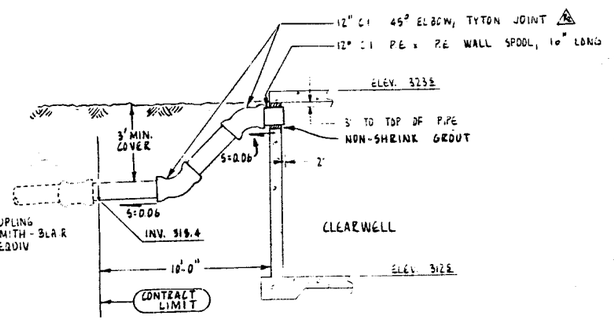


SECTION H-H

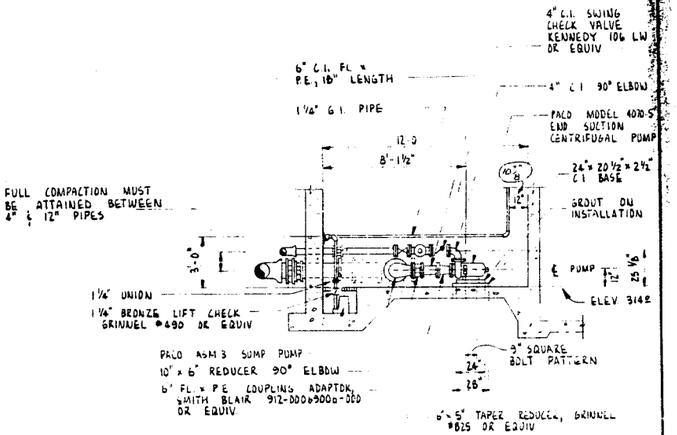
SECTION 6-6



SECTION C-C

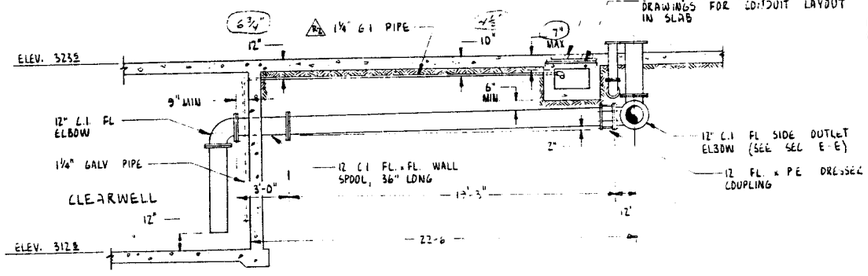


SECTION F-F

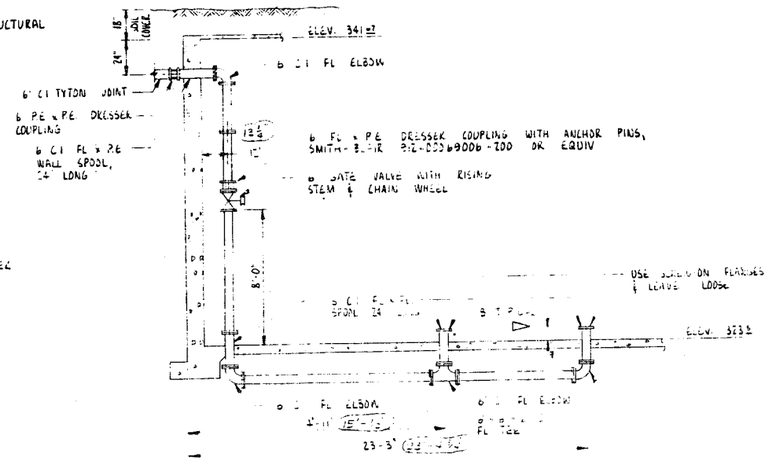


SECTION B-B

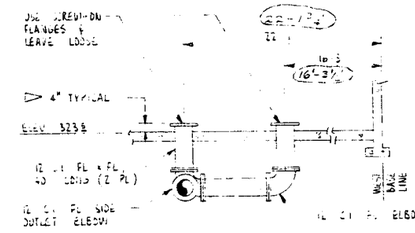
NOTE: FULL COMPACTION MUST BE ATTAINED BETWEEN 4" & 12" PIPES



SECTION A-A



SECTION D-D



SECTION E-E

(E) = COULD NOT MAKE DRILL ACCURATELY WITH MEANS AVAILABLE

○ = MEASURED DIMENSIONS
SEE INSPECTION NOTES ON SHT 1

DATE OF PRINT
NOV 27 1974

INSPECTION REPORT, IN-SLAB PIPING
(PRIOR TO CONCRETE POUR) 1-6-72 ADDENDUM

SYMBOL	REVISION	BY	APPROVED	DATE
4	CHGD. CLEARWELL OVERFLOW	ESH	RVM	1-31-72
3	CHGD. PUMP VAULT PIPING & GENERAL UPDATE	SAW	RVM	1-7-72
2	CHGD. CLEARWELL OVERFLOW & PUMP VAULT PIPING	SAW	RIA	12-1-71
1	CHANGED RAW WATER INTAKE LINE TO AVOID ROCK	RIA	RIA	10-22-71

DESIGNED RIA
DRAWN SAW
CHECKED RIA

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GOLF COURSE ENGINEERING
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DAMES & MOORE
MILES YANICK & CO

Sudden Valley

the undevelopment of the
THE SANWICK CORPORATION
SUITE 1700 DENNY BUILDING SEATTLE WASHINGTON 98121

APPROVED

DATE 12-70
SCALE ¼"=1'-0"
P. R. NO.

WATER TREATMENT PLANT
EXTERNAL PIPING DETAILS

JOB NO. 2277.6
SHEET NO. 4 OF 7

5-6"

1" PIPE

CHLORINE ROOM

LIMIT

LIMIT

ELEC. VAULT BY OTHERS

CLEARWELL OVERFLOW

TO WASTE

BACKWASH LINE FROM SYSTEM

IDENTIFICATION LIST

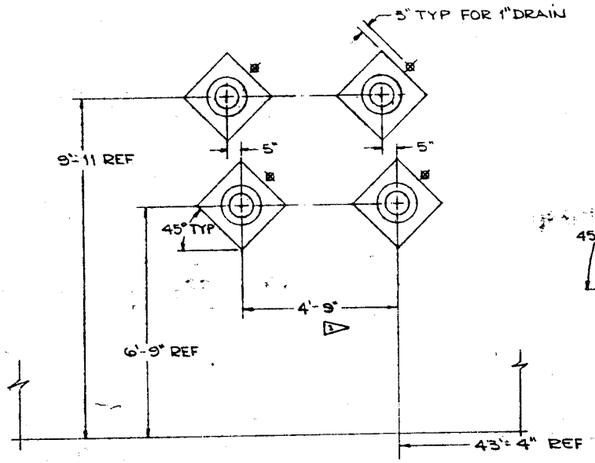
1 FILTER
4 REACTOR
5 EFF. CONTROL VALVE
4 BACKWASH CONTROL VALVE
5 MANUAL SHUT-OFF VALVE
6 SURFACE WASHER
7 SUMP PUMP
8 BACKWASH WATER PUMP
9 RATE OF FLOW CONTROL VALVE
10 FLOW METER
11 EFFLUENT PUMP
12 PUMP CONTROL VALVE
13 RELIEF VALVE
14 BY-PASS VALVE
15 ALUM TANK, FEEDER & MIXER
16 CAUSTIC
17 PE TANK & FEEDER
18 SERVICE PANEL
19 MOTOR CONTROL CENTER
20 FILTER CONTROL PANEL
21 TURBIDIMETER
22 BUBBLE TRAP
23 SAMPLE PUMP
24 CLEARWELL
25 VACUUM REGULATOR
26 CLEARWELL
27 SURGE
28 CHLORINE
29 CHLORINE

REV. No 1 - ADD CHLORINATOR

KEYSTONE AND

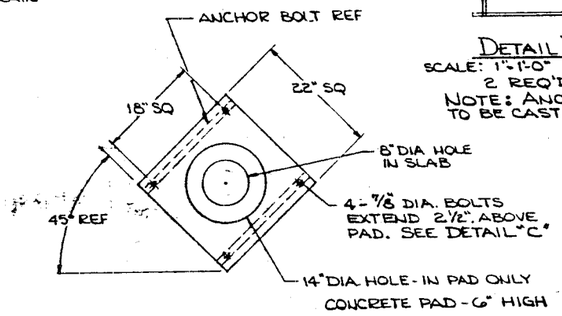
DATE 11/16/70
SCALE 1/8"-1'-0"
DES. ENG.
DRN.

GE
10 MGD



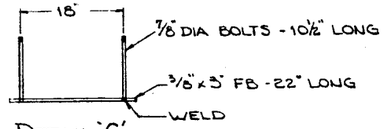
DETAIL 'B'

EFFLUENT PUMP PADS



PAD DETAIL

TYPICAL 4 PLACES

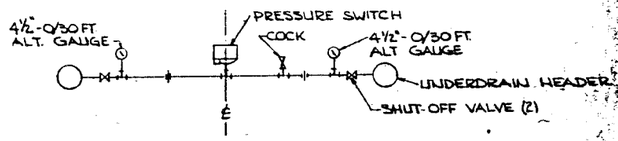


DETAIL 'C'

SCALE: 1"=1'-0"

2 REQ'D

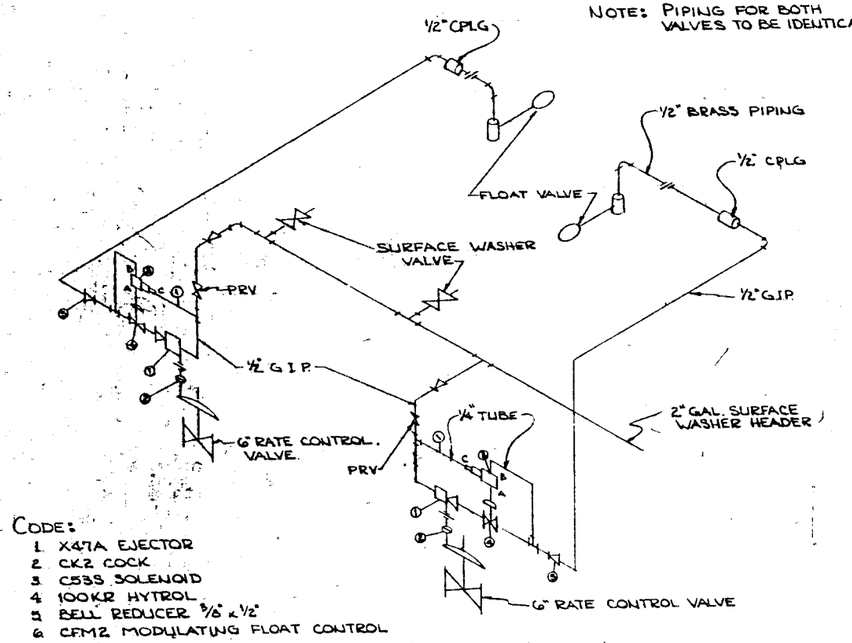
NOTE: ANCHOR BOLTS TO BE CAST IN SLAB.



LOSS OF HEAD SWITCH PIPING ASSY

NOTE: ALL PIPE & FITTINGS TO BE ½" BRASS

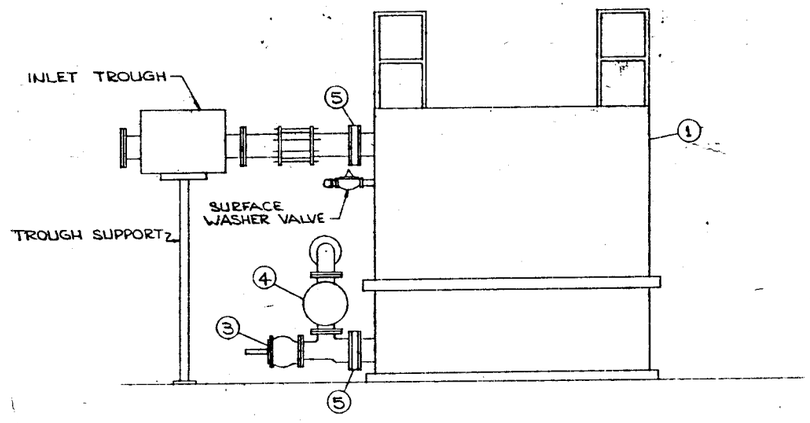
NOTE: PIPING FOR BOTH VALVES TO BE IDENTICAL



CODE:

1 X47A EJECTOR
2 CK2 COCK
3 C53S SOLENOID
4 100KR HYTROL
5 BELL REDUCER ⅜" x ½"
6 CFM2 MODULATING FLOAT CONTROL

FILTER RATE CONTROL VALVE ASSY



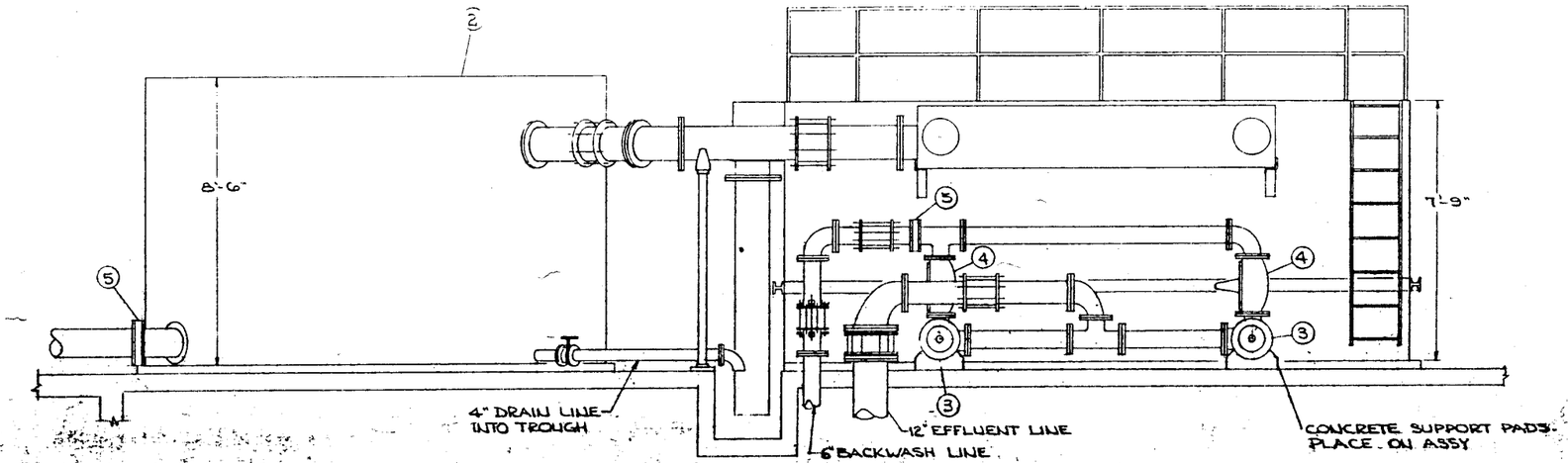
SECTION D-D SHT #1

REVISED 1-29-72

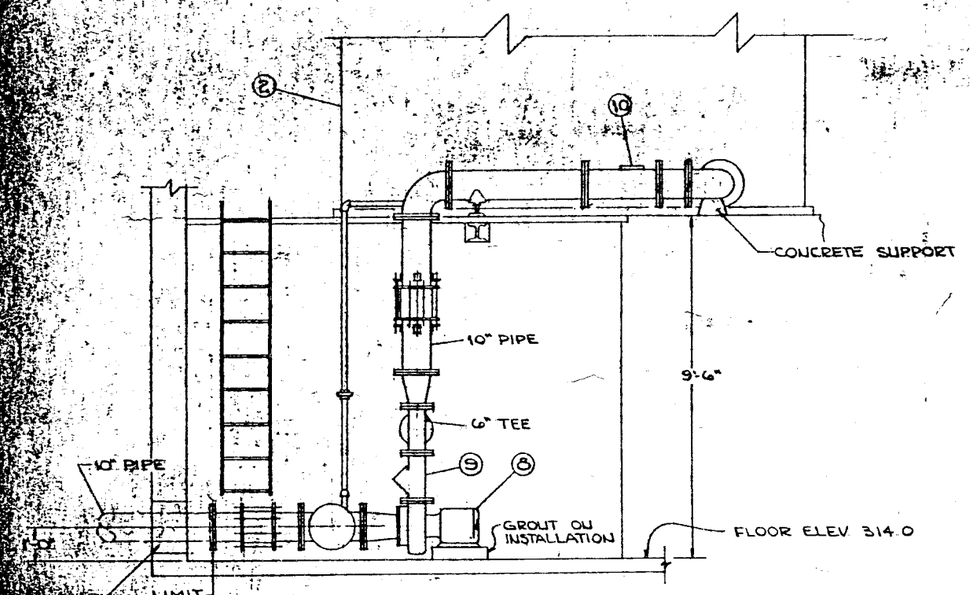
REV #1 CHG'D PAD DIM. 1-29-72

KEYSTONE ENGINEERING AND PRODUCTS CO., INC.

DATE 12/4/70	MISC. DETAILS
SCALE 1"=1'-0"	10 M.G.D. WATER TREATMENT PLANT
DES. [illegible]	SUDDEN VALLEY, INC.
DRAWN [illegible]	



SECTION 'A-A'



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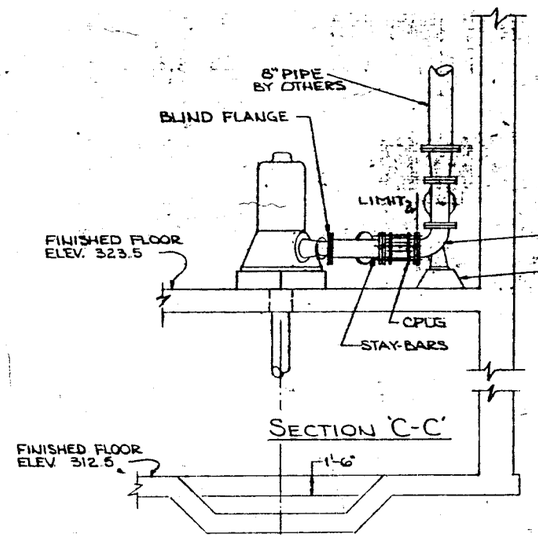

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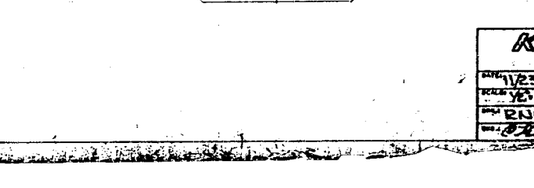


REVISED

KEYSTONE ENGINEERING AND PRODUCTS CO., INC.

DATE 11/23/70	SECTIONAL DETAILS
SCALE 1/2"=1'-0"	10 MGD - WATER TREATMENT PLANT
DRN RNG	SUDBURY
CHK [illegible]	#3

OTB15 RAW WATER PUMP STARTER IN MCC PANEL
OTB14
OTB17 CAUSTIC FEEDER
OTB16
OTB19 PE FEEDER
OTB18
OTB21 ALUM FEEDER
OTB20
SUPPLY POWER FROM SERVICE PANEL
OTB22 SAMPLE PUMP
O TB27 SUPPLY POWER FROM S/C PANEL
RAW WATER PUMP IN MCC PANEL
TO TU
MALE PLUG FOR MASTER INDICATOR
RECORDER
DRY CONTACTS OF ALARM CIRCUIT REMOTE IN MCC PANEL
115/60/1 FROM SVC PANEL
DRY CONTACTS FOR RAW WATER PUMP STARTER IN MCC PANEL
115/60/1 SUPPLY
NEUTRAL FROM SVC PANEL
CLEARWELL FLOAT SWITCH-CWFS1 OPENS ON RISING LEVEL. SEE NOTE #1
CWFS1
IFS1 UPPER LEVEL FLOAT SWITCH
IFS2 LOWER LEVEL FLOAT SWITCH
REACTOR FLOAT SWITCH ASSY
ALUM FEEDER
P.E. FEEDER
CAUSTIC FEEDER
SAMPLE PUMP SUPPLY 115/60/1 PWR FROM SVC PANEL
RED TERMINAL OF LOSS OF HEAD SWITCH WHITE TERMINAL
No 2 B/WASH VALVE
No 2 SURFACE WASHER VALVE
No 1 B/WASH VALVE
No 1 SURFACE WASHER VALVE
CHLORINATOR WATER SOLENOID VALVE
No 2 EFFLUENT VALVE
No 1 EFFLUENT VALVE

PARTS LIST & IDENT

FTD- TIME DELAY RELAY-EAGLE SIGNAL-HD32A622
FPB- PUSH BUTTON-FURNAS-BJP1/BJJ
FHR HOLDING RELAY - FURNAS-46FB11
R - RED LIGHT-FURNAS-BUL011
FS - FLOW SWITCH-MCDONNELL FS4-3F
ICR-INLET CONTROL RELAY-EAGLE SIGNAL #22APSCNDA120 W/0101749 BASE
CFR-CHEMICAL FEED RELAY-FURNAS-46FBAQ
FCR- FILTER CONTROL " "
AR- ALARM RELAY - 46FB20
IR- INTERRUPT RELAY - 46FB22
HR- HOLDING RELAY - 46FB20
MR- MONITOR RELAY - 46FB11
BFR- BACKWASH FREQ. RELAY 46FB42ZBAQ
TD1 & TD2- TIME DELAY RELAY-EAGLE-HD32A612
LHC- LOSS OF HEAD SWITCH-BARKSDALE-D1T-B
SS1 & SS2-SS6-3- SELECTOR SWITCH-FURNAS- BJ3C/BJK
SS3, SS4, SS5 " " BJ3A/BJK
PB1, 2 & 3- PUSH BUTTON- " BJP1/BJK21 & BJP1/BJK
AL1 & AL2 - RED LIGHT " BUL011
MT-MONITOR TIMER-EAGLE-HP59A6-10 HR
TM-T1-T20 B/WASH TIMER-EAGLE-MP7A620 W/MPB-40 GEAR
IFS1 & IFS2-INLET FLOAT SWITCH-GEMS 1900
CWFS- CLEARWELL FLOAT SWITCH-ALTOCON SELECTRO M5
SP- SAMPLE PUMP-
RECORDER- RUSTRAK BB/141C.

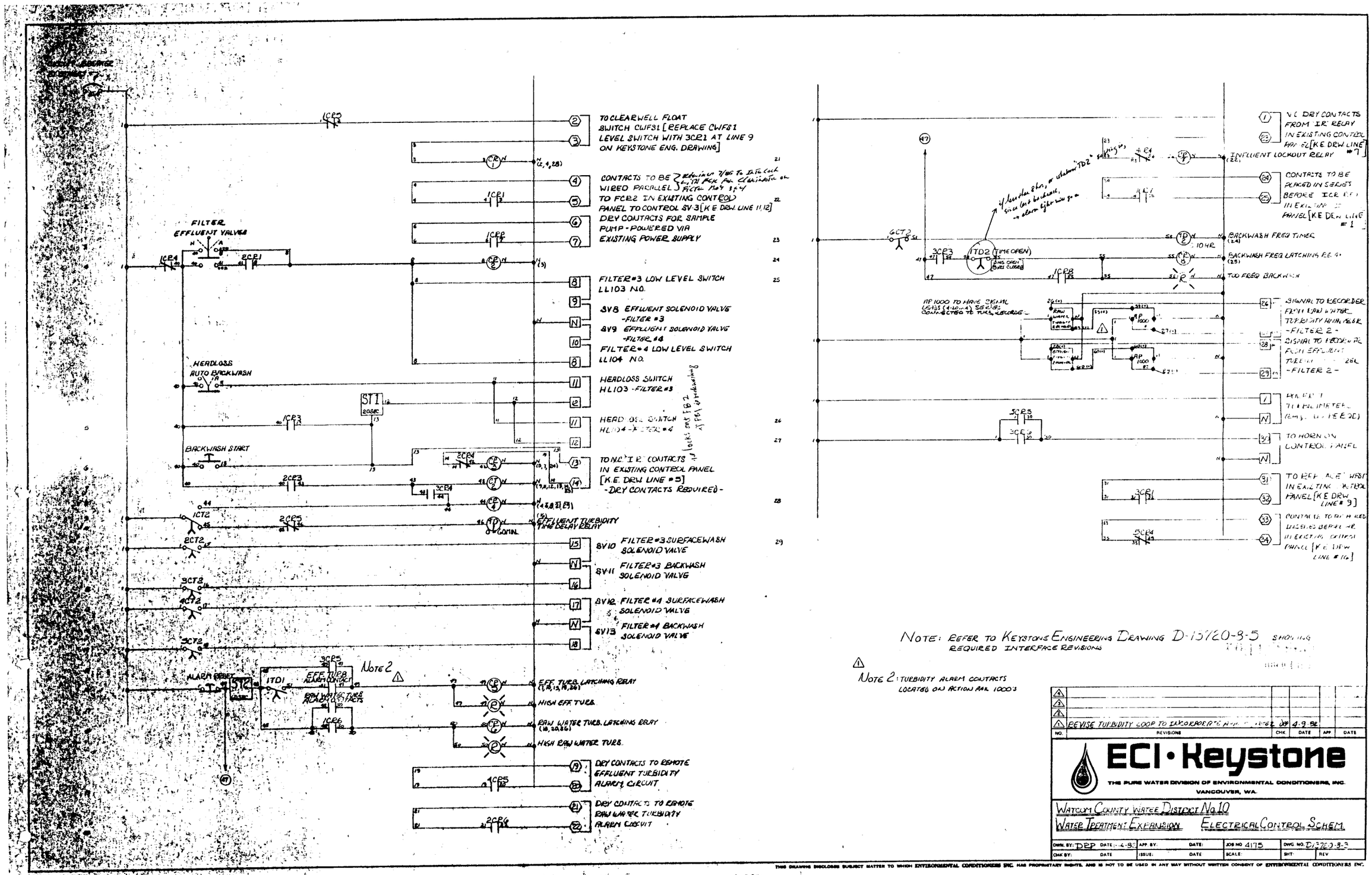
LINE DIAGRAM CONTINUED FROM LEFT

T1 MOTOR
T2 No1 SUR WASH
T3 No1 B/WASH
T4 No2 SUR WASH
T5 No2 B/WASH

BACKWASH TIMER SCHED. 100% = 20 MIN

NOTE: ✱ = 4/85 REVISED TO ORIGINAL SPEC.
✱✱ = 7/85 ADDED NC CONTACT AT FCR TO INTERLOCK CLARIFICATION AT FILTER RACK 3,4

KEYSTONE ENGINEERING AND PRODUCTS CO., INC.
CONTROL LINE & WIRING DIAGRAM
M.G.D. WATER TREATMENT PLANT
UPPER VALLEY, INC.
- 14 -



NOTE: REFER TO KEYSTONE ENGINEERING DRAWING D-15720-8-5 SHOWING REQUIRED INTERFACE REVISIONS

⚠ NOTE 2: TURBIDITY ALARM CONTACTS LOCATED ON ACTION AMP. 1000's

NO.	REVISIONS	CHK	DATE	APP	DATE
⚠					
⚠					
⚠					
⚠	REVISE TURBIDITY LOOP TO INCORPORATE HIGH TURBIDITY	DEP	4-9-92		

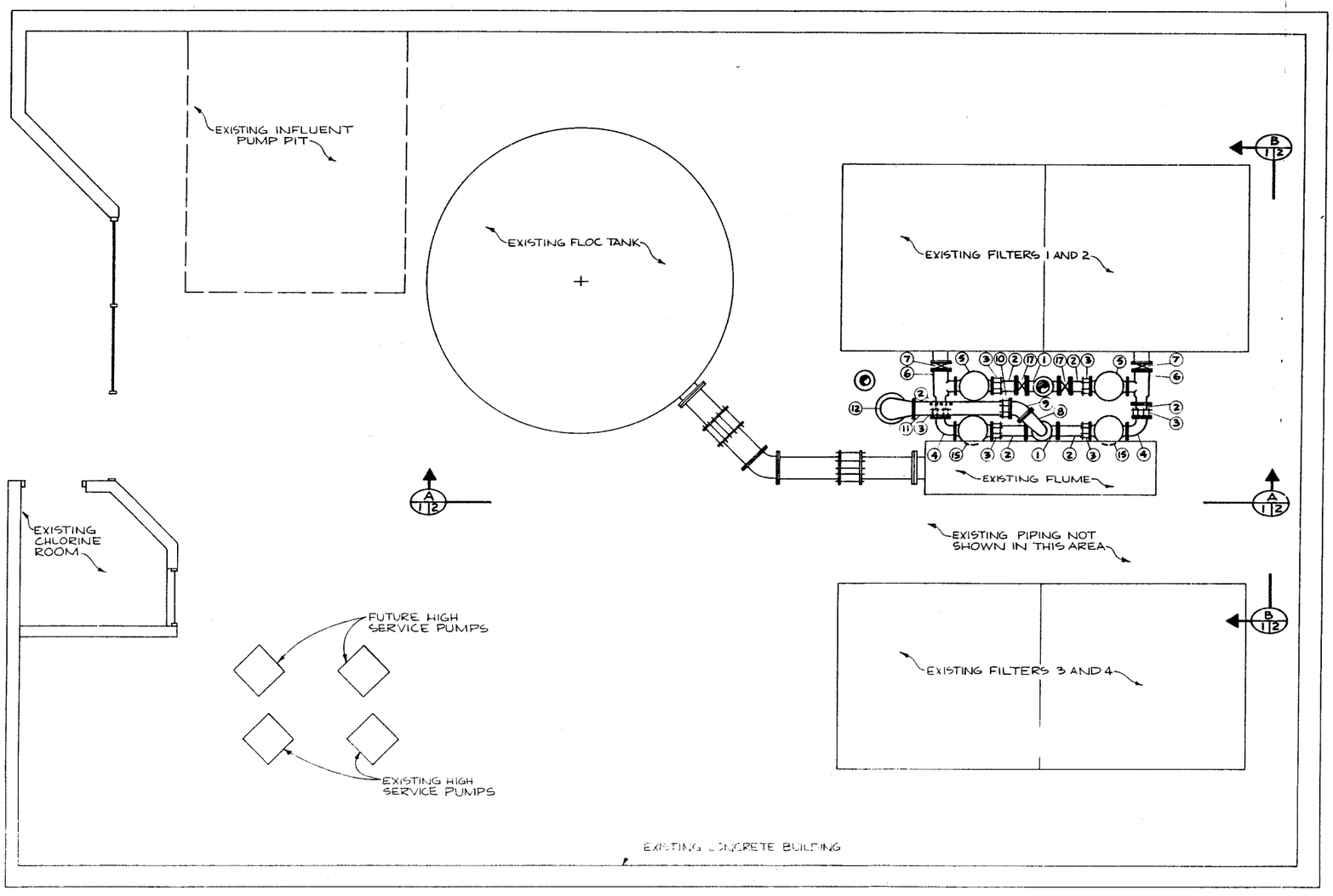
ECI • Keystone

THE PURE WATER DIVISION OF ENVIRONMENTAL CONDITIONERS, INC.
VANCOUVER, WA.

WATCOM COUNTY WATER DISTRICT NO. 10
WATER TREATMENT EXPANSION
ELECTRICAL CONTROL SCHEM.

DWN. BY: DEP	DATE: 4-9-92	APP. BY:	DATE:	JOB NO 4175		DWG NO. D-15720-8-3	
CHK BY:	DATE	ISSUE:	DATE	SCALE:		SHT:	REV

N



ITEM LIST	
KEY NO.	DESCRIPTION
1	6"x 6"x 6" TEE FLxFLxFL
2	6" SPOOL FLxPE
3	6" FLANGED COUPLING ADAPTER
4	6" 90° ELBOW FLxFL
5	6" BACKWASH CONTROL VALVE
6	8"x 6"x 8" TEE FLxFLxFL
7	8" BFV
8	8" x 6" 90° ELBOW FLxFL
9	8" 45° ELBOW FLxFL
10	8" FLANGED COUPLING ADAPTER
11	8" SPOOL FLxPE
12	8" x 12" 90° ELBOW FLxFL
13	12" FLANGED COUPLING ADAPTER
14	12" SPOOL FLxPE
15	6" FILTER CONTROL VALVE
16	8" INSULATING FLANGE
17	6" BFV

GEORGE R. MARTIN — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

Date	No	Description	By
REVISION			

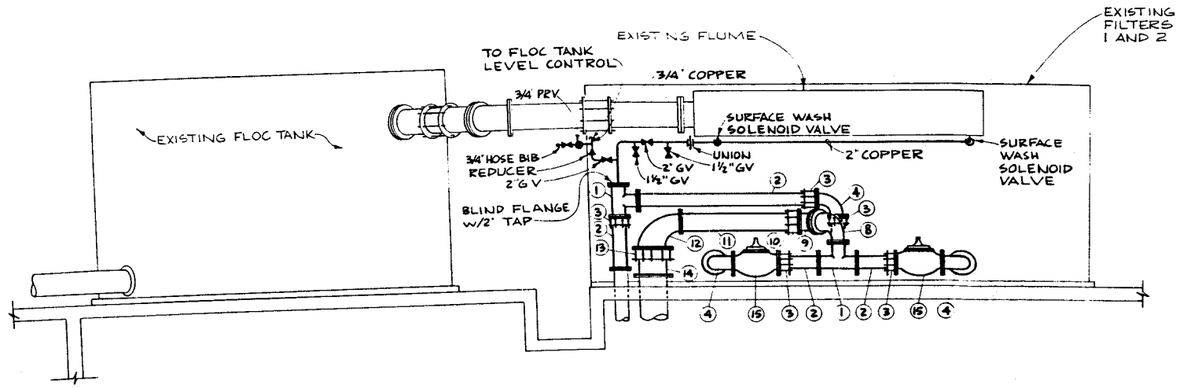
Designed RD | Approved
Drawn MN | Scale 3/8 = 1'0 | Date FEB. 1985
Checked GRN | Project No. W350102

POOL ENGINEERING, INC.
Consulting Engineers & Surveyors
2350 Southgate Way, Bellevue, Washington 98004, (206) 822-6464
6225 Tongass Avenue, Ketchikan, Alaska 99901, (907) 225-9626

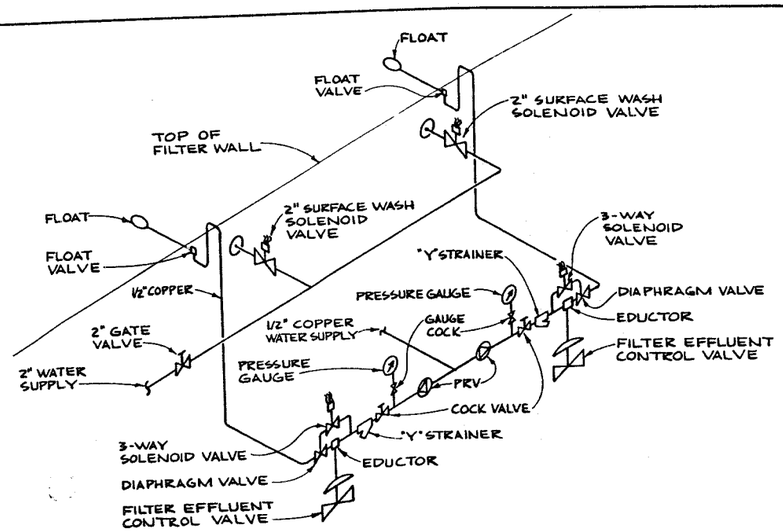
WATER DISTRICT 10
WATER TREATMENT PLANT

PLAN

1/2

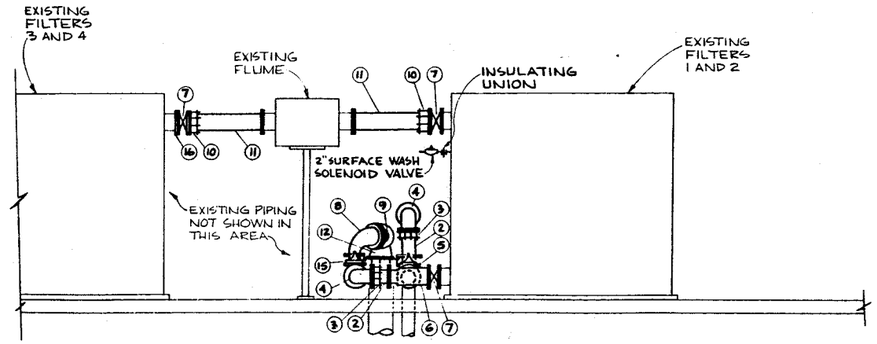


SECTION A 1|2
SCALE: 3/8"= 1'0"



FILTER RATE CONTROL VALVE ASSEMBLY

NOT TO SCALE



SECTION B 1|2
SCALE: 3/8"= 1'0"

Date	No.	Description	By
		REVISION	

Designed RD | Approved
Drawn MN | Scale AS SHOWN | Date FEB. 1986
Checked GRN | Project No. W350102

POOL ENGINEERING, INC.
Consulting Engineers & Surveyors
2950 Northup Way
Bellevue, Washington 98004
(206) 822-6464
1225 Tongass Avenue
Ketchikan, Alaska 99901
(907) 225-6626

WATER DISTRICT 10
WATER TREATMENT PLANT

SECTIONS AND

GEORGE R. NOE
STATE OF ALASKA