APR - 8 1994

Docket No. 50-272
License No. DPR-70
CAL No. 1-94-005

Mr. Steven E. Miltenberger
Vice President and Chief Nuclear Officer
Public Service Electric and Gas Company
P.O. Box 236
Hancock's Bridge, New Jersey 08038

Dear Mr. Miltenberger:

SUBJECT: CONFIRMATORY ACTION LETTER 1-94-005

On April 7 and 8, 1994, in telephone discussions, William Kane, Deputy Regional Administrator, informed Mr. Joseph Hagan, Acting General Manager, Salem Nuclear Generating Station, of our decision to dispatch an Augmented Inspection Team (AIT) to review and evaluate the circumstances and safety significance of the Unit 1 reactor trip and safety injection that occurred on April 7, 1994. The event was complex and may have involved personnel error, equipment failure, or a combination of both. The AIT was initiated because of the complexity of the event, the uncertainty of the root causes of some of the conditions and equipment problems encountered during the event, concerns relative to the proper functioning of engineered safety features, and possible generic implications. The AIT, led by Mr. Robert Summers of our office, is expected to commence their activities at the Salem Nuclear Generating Station on April 8, 1994.

In response to our request, Mr. Hagan agreed to place Salem Unit 1 in a cold shutdown condition and maintain that condition until the AIT acquired all the information needed for their assessment and was satisfied that any necessary corrective measures have or would be taken; and that your staff would take actions to:

1. Assure that the AIT Leader is cognizant of, and agrees to, any resumption of activities that involve the operation, testing, maintenance, repair, and surveillance of any equipment, including protection logic or associated components, which failed to properly actuate in response to the reactor trip and safety injection(s) of April 7, 1994.

2. Assemble or otherwise make available for review by the AIT, all documentation (including analyses, assessments, reports, procedures, drawings, personnel training and qualification records, and correspondence) that have pertinence to the equipment problems leading up to the reactor trip and safety injection(s), and subsequent operator response and recovery actions.

3. Assemble or otherwise make available for review by the AIT, all equipment, assemblies, and components that were associated with the problems encountered during the events leading up to, and subsequent to the reactor trip and safety injection(s).

4. Make available for interview by the AIT, all personnel that were associated with, or have information or knowledge that pertains to the problems encountered during the events leading up to, and subsequent to the reactor trip and safety injection(s).

5. Gain my agreement prior to commencing any plant startup.

Pursuant to Section 182 of the Atomic Energy Act, 42 U.S.C. 2232, and 10 CFR 2.204, you are hereby required to:

1. Notify me immediately if your understanding differs from that set forth above.

2. Notify me, if for any reason, you require modification of any of these agreements.

Issuance of this Confirmatory Action Letter does not preclude issuance of an Order formalizing the above commitments or requiring other actions on the part of the licensee, nor does it preclude the NRC from taking enforcement action if violations of NRC regulatory requirements are identified through the actions of the AIT. In addition, failure to take the actions addressed in the Confirmatory Action Letter may result in enforcement action.

The responses directed by this letter are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Pub. L. 96-511. In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter will be placed in the NRC Public Document Room. We appreciate your cooperation in this matter.

Sincerely,
Original Signed By:
William F. Kane

for Thomas T. Martin
Regional Administrator

cc:
J.J.Hagan, Acting General Manager - Salem Operations
C. Schaefer, External Operations - Nuclear, Delmarva Power & Light Co.
S. LaBruna, Vice President - Engineering
R. Hovey, General Manager - Hope Creek Operations
F. Thomson, Manager, Licensing and Regulation
R. Swanson, General Manager - QA and Nuclear Safety Review
J. Robb, Director, Joint Owner Affairs
A. Tapert, Program Administrator
R. Fryling, Jr., Esquire
M. Wetterhahn, Esquire
P. J. Curham, Manager, Joint Generation Department,
Atlantic Electric Company
Consumer Advocate, Office of Consumer Advocate
William Conklin, Public Safety Consultant, Lower Alloways Creek Township
K. Abraham, PAO (2)
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
State of New Jersey

bcc:
J. Taylor, EDO
J. Milhoan, OEDO
W. Russell, NRR
L. Reyes, NRR
A. Thadani, NRR
J. Calvo, NRR
C. Rossi, NRR
C. Miller, PD I-2, NRR
F. Miraglia, NRR
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W. Parler, OGC — B. SHERON
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J. Lieberman, OE
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W. R. Lanning, DRP, RI
J. Durr, DRP, RI
W. Hodges, DRS, RI
J. Wiggins, DRS, RI
R. Blough, DRS, RI
C. Hehl, DRSS, RI
S. Shankman, DRSS, RI
J. Stone, NRR
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E. Wenzinger, DRP, RI
J. White, DRP, RI
R. Summers, DRP, RI
D. Chawaga, SLO, RI
D. Holody, EO, RI

M. VIRGILIO, NRR

~~RI:DRP~~	RI:DRP	RI:DRP	RI:DRP	RI:EO	NRR Telephonic
JWhite	EWenzinger	JDurr	WLanning	DHolody	CMiller
4/ /94	4/ /94	4/8/94	4/8/94	4/8/94	4/ /94

RI:DRS	RI:RC RER	RI:DRA	RI:RA
WHodges	KSmith	WKane	TMartin
4/8/94	4/ /94 TTM	4/8/94	4/8/94

OFFICIAL RECORD COPY A:SALEM.CAL

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RI:DRP*	RI:DRP*	RI:DRP*	RI:DRP*	RI:EO*	NRR*
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*See Previous Concurrence

I

ATTACHMENT 3
CONFIRMATORY ACTION LETTER

April 8, 1994

Docket No. 50-272
License No. DPR-70
CAL No. 1-94-005

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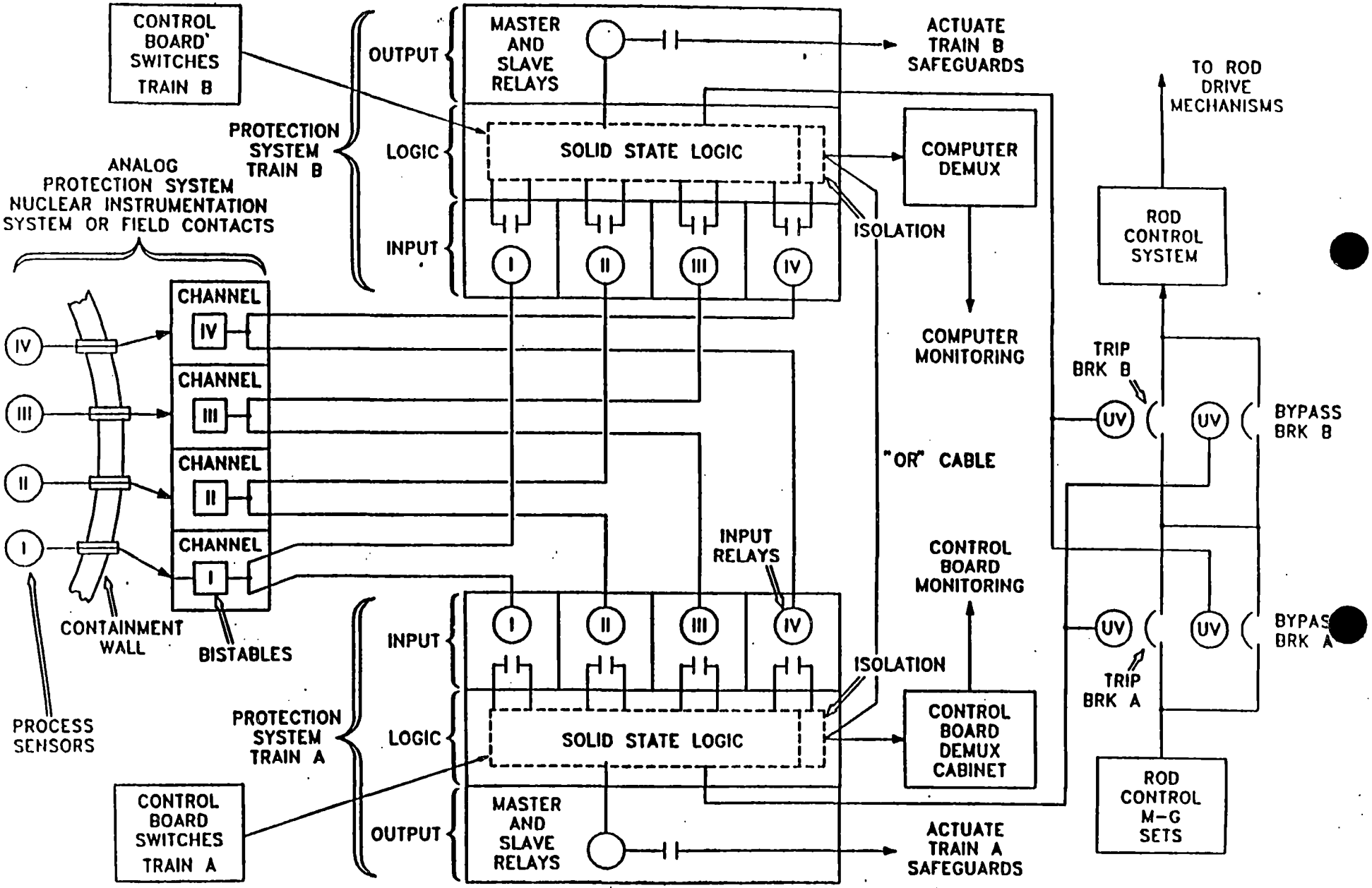
2. Assemble or otherwise make available for review by the AIT, all documentation

ATTACHMENT 2
SAFETY INJECTION SYSTEM LOGIC DIAGRAM



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Sincerely,
ORIGINAL SIGNED BY:
William F. Kane for:

Thomas T. Martin
Regional Administrator

ATTACHMENT 3
CONFIRMATORY ACTION LETTER

cc:
J.J.Hagan, Acting General Manager - Salem Operations
C. Schaefer, External Operations - Nuclear, Delmarva Power & Light Co.
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P. J. Curham, Manager, Joint Generation Department,
Atlantic Electric Company
Consumer Advocate, Office of Consumer Advocate
William Conklin, Public Safety Consultant, Lower Alloways Creek Township
K. Abraham, PAO (2)
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
State of New Jersey

DETAILED SEQUENCE OF EVENTS

April 7, 1994

Pre-transient initial conditions: Unit 1 power at 73%, rod control in manual.

0730 12A circulator out of service for waterbox cleaning.

1016 13B circulating water pump emergency trip on travelling screen differential pressure; 13A, 13B and 12B travelling screens all clog and eventually go out of service.

1027 13A circulating water pump trips on high screen differential pressure.

1032 Unit 1 operating crew initiated a plant power reduction from approximately 650 MWe at 1% power per minute initially (up to this point, plant power had decreased from 800 MWe due to an increase in condenser back pressure). Subsequently, operators increased the reduction rate to as high as 8% per minute.

1034 Operators attempt to restart 12A circulating water pump; pump immediately trips due to pump circuit breaker not being fully racked in.

1039 P-8 permissive (reactor trip on low coolant flow in a single loop) reset (blocked) at 36% reactor power.

By this time, all circulating water pumps except 12B have tripped; 13A and 13B are restarted, but by 10:46 they have tripped again, leaving 12B as the only circulator in service.

1043 P-10 permissive (power range low setpoint reactor trip and intermediate range reactor trip and rod stop) reset (reinstalled) at 10% reactor power.

At about this time, the Nuclear Shift Supervisor (NSS) directs the Reactor Operator (RO) at the rod control panel to go to the electrical distribution panel to perform group bus transfers.

1044 Turbine load at 80 MWe, RCS temperature at 531 degrees F. Low-low T_{avg} bistable setpoint Tech Spec allowable value $\geq$ 541 degrees F, therefore low-low T_{avg} bistables trip.

1045 The NSS begins to withdraw rods, and then the RO is directed by the NSS to return to the rod control panel and withdraws rods to restore RCS temperature - rods pulled 35 steps, from step 55 to step 90 on control rod bank D.

1047 Reactor power increases from 7% to 25% due to the outward rod motion - reactor trips at 25% power range low setpoint. This is a "reactor startup" nuclear instrument (NI) trip. The NI "intermediate range" 20% power rod stop and 25% power reactor trip did not actuate.

1047 Automatic safety injection (SI) on high steam flow coincident with low-low T_{avg}. All ECCS pumps start, ECCS flow paths functional, main feedwater regulating valves close.

No "first-out" alarm was received for the SI. SI signal received on SSPS logic channel "A" only.

1049 Operators enter EOP-Trip 1 procedure.

1053 Operators manually initiate main feedwater isolation.

1058 Operators manually initiate main steam isolation (only 2 of 4 main steam isolation valves closed at the time of the auto-initiation of SI).

Operators manually trip main feed pumps.

1100 Licensee declared an Unusual Event, based on: "Manual or Auto ECCS actuation with discharge to vessel"

1105 EOP exit-step 36 directs operators to reset SI; operator notices SI logic channel "B" was already reset (indicated that "B" channel had not auto-initiated) and a flashing light on the RP4 panel (indicated SI logic channel disagreement).

1118 Pressurizer PORVs (PR-1 and PR-2) subsequently periodically auto open on high pressurizer pressure (indicated pressurizer was filling to solid condition).

During recovery, steam generator atmospheric relief valves open several times to control secondary temperature and pressure.

Number 11 and/or Number 13 steam generator safety valves open, causing RCS cooldown (by this time T_{ave} had increased to about 552 degrees F). This indicated that the steam generator atmospheric relief valves were not properly controlling pressure.

1126 Second actual automatic safety injection - initiated by low pressurizer pressure (low pressurizer pressure trip setpoint=>1765 psig, allowable>=1755 psig). Low pressurizer pressure due to RCS cooldown (due to steam generator code safety valve going open).

Second auto SI received on SSPS logic channel "B" only. Operators initiate a manual SI just after auto SI, in response to the rapidly decreasing RCS pressure.

1141 While resetting the second SI, operator notices that RP4 panel lights indicate SI logic channels in agreement (i.e., light no longer flashing).

Technical Specification Action Statement (TSAS) 3.0.3 entered due to two blocked auto SI trains.

1149 Pressurizer relief tank (PRT) rupture disk ruptures (pressurizer was either solid or nearly solid after the first auto-initiated SI at 1047, and the second auto-initiated SI resulted in sufficient relief of RCS to the PRT to raise level and pressure until rupture disk blew).

1316 Alert declared. This was done to ensure proper technical staff was available. Licensee staff recognized that TSAS 3.0.3 could not be met for inoperable SI logic channels. The operators were also concerned about how to properly restore the pressurizer to normal pressure and level control from solid RCS conditions and wanted sufficient engineering support.

1336 The NRC entered the monitoring phase of the Normal Response Mode of the NRC Incident Response Plan. NRC Region I activated and staffed their Incident Response Center, with support provided by NRC headquarters personnel.

1410 The Technical Support Center was staffed to assist control room operators with recovery of normal RCS pressure and level control.

1511 Operators restore pressurizer bubble.

1630 Pressurizer level restored to 50%, level control returned to auto. EOPs exited, IOP-6

(Hot Standby to Cold Shutdown) procedure entered

1715 Plant cooldown initiated.

2020 Alert terminated.

April 8, 1994

0106 Mode 4 (Hot shutdown) entered.

1124 Mode 5 (Cold shutdown) entered.

ATTACHMENT 5
LIST OF ACRONYMS

AIT	Augmented Inspection Team
CDF	core damage frequency
CETPS	core exit thermocouple processing system
CW	circulating water
DNBR	departure from nucleate boiling ratio
EPRI	Electric Power Research Institute
ESF	engineered safety features actuation
FSAR	Final Safety Analysis Report
GL	generic letter
IPE	Individual Plant Evaluation
LOCA	loss of coolant accident
MPA	multi-plant action
NRC	Nuclear Regulatory Commission
NRR	NRC's Office of Nuclear Reactor Regulation
PRA	probabilistic risk assessment
PRT	pressurizer relief tank
PORV	pressure operated relief valve
PR...	PR1, PR2 are pressurizer PORVs; PR3 - PR5 are pressurizer safety valves
RCP	reactor coolant pump
RCS	reactor coolant system
RHR	residual heat removal
RVLIS	Reactor Vessel Level Indication System
RV	reactor vessel
SCM	subcooling margin
SER	safety evaluation report
SG	steam generator
SI	safety injection actuation
SIS	safety injection system
SSPS	solid state protection system
SW	service water
VCT	volume control tank

ATTACHMENT 6
EXIT MEETING ATTENDEES

NAME	TITLE
<u>Nuclear Regulatory Commission (NRC)</u>	
Iqbal Ahmed	Senior Electrical Engineer, NRR
Stephen Barr	AIT Assistant Team Leader, Division of Reactor Projects (DRP)
M. Wayne Hodges	Director, Division of Reactor Safety (DRS)
John Kauffman	Senior Reactor Systems Engineer, AEOD
Warren Lyon	Senior Reactor Systems Engineer, NRR
Larry Scholl	Reactor Engineer, DRS
Richard Skokowski	Reactor Engineer, DRS
J. Scott Stewart	Reactor Engineer - Examiner, DRS
Robert Summers	AIT Team Leader, DRP
Edward Wenzinger	Chief, Projects Branch No. 2, DRP
<u>Public Service Electric and Gas Company (PSE&G)</u>	
R. Dougherty	Senior Vice President - Electrical
J. Hagan	Vice President, Nuclear Operations & General Manager, Salem Operations
S. LaBruna	Vice President, Nuclear Engineering
S. Miltenberger	Vice President and Chief Nuclear Officer
F. Thomas	Manager, Nuclear Licensing

ATTACHMENT 7
FIGURES

FIGURE 1 - PORV Design Drawing

FIGURE 2 - RCS Pressure Response

FIGURE 3 - Salem and Hope Creek CW and SW Layout

FIGURE 4 - Salem CW Drawing

FIGURE 5 - Salem SW Drawing

FIGURE 6 - Hope Creek SW Drawing

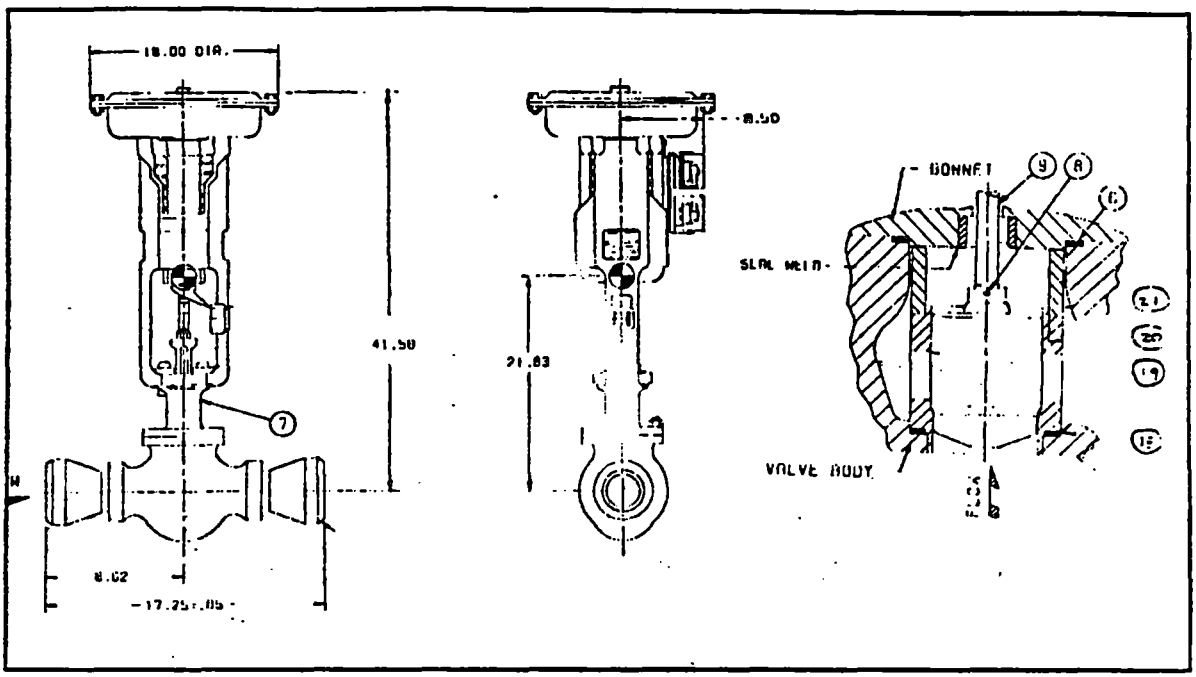

Figure 1. Pressure Operated Relief Valve

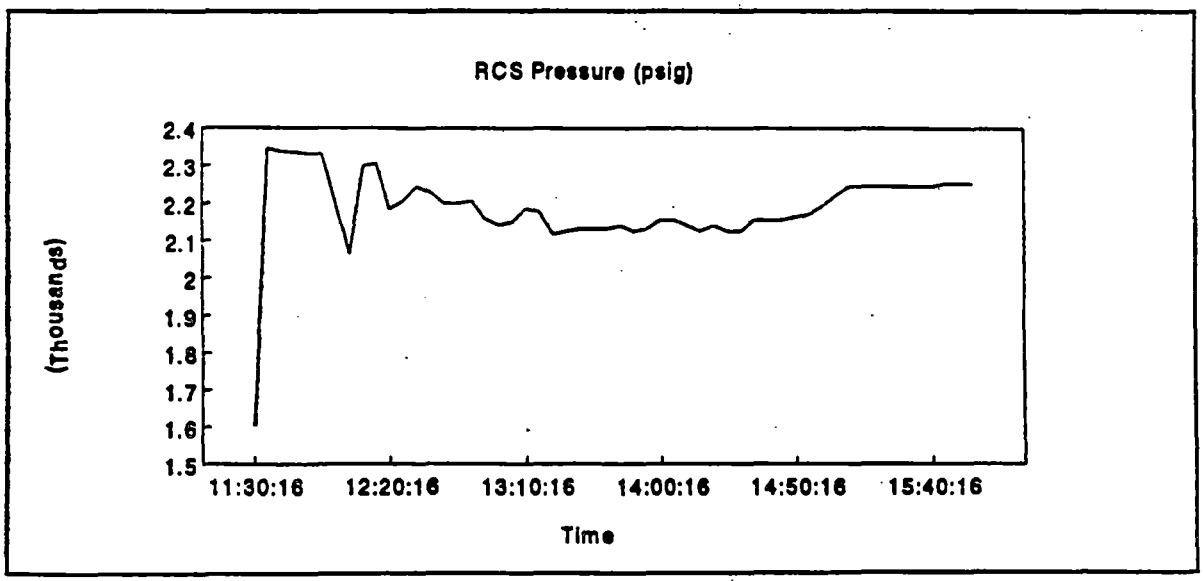

Figure 2. Reactor Coolant System Pressure

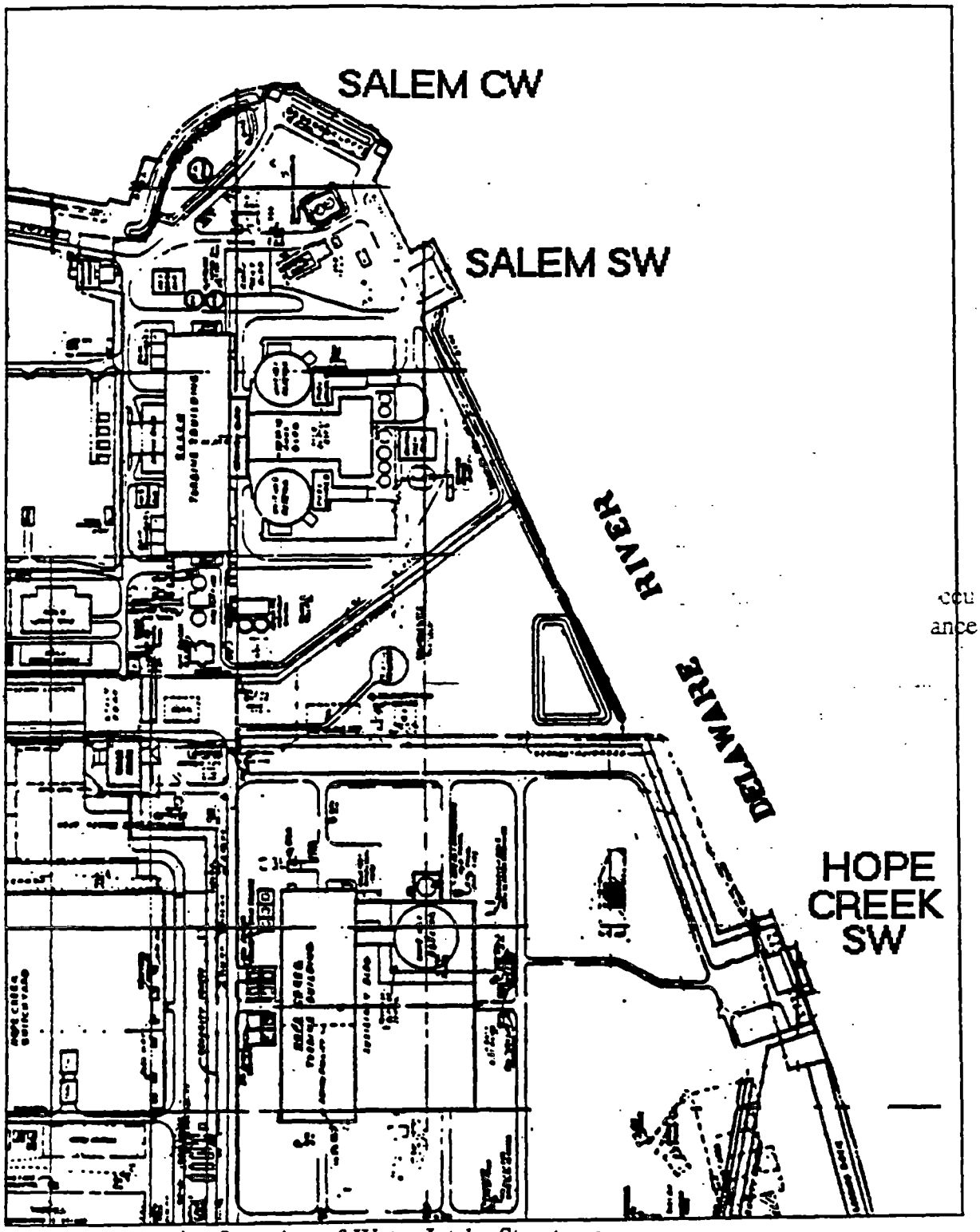

Figure 3. Relative Location of Water Intake Structures

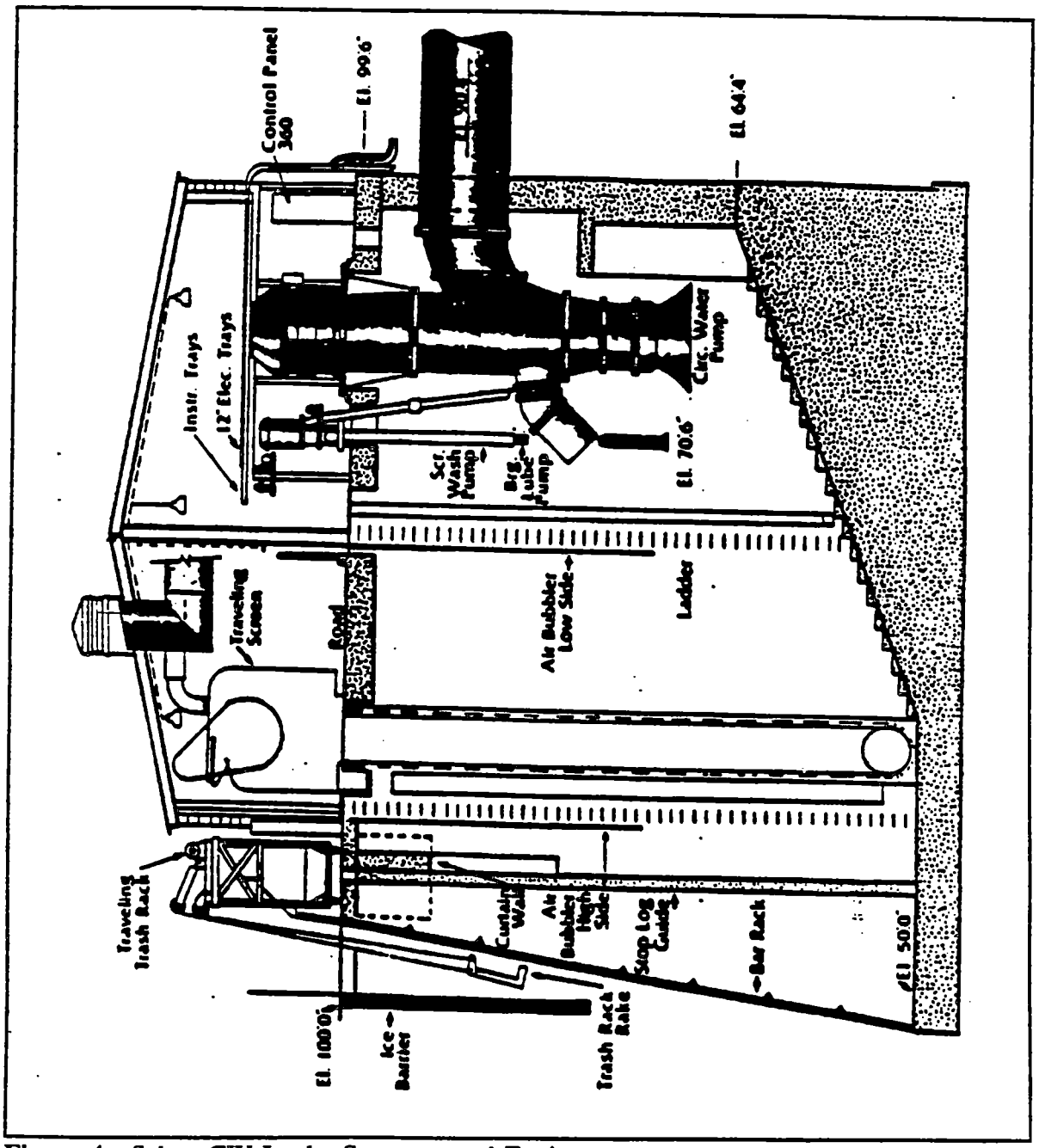

Figure 4. Salem CW Intake Structure and Equipment

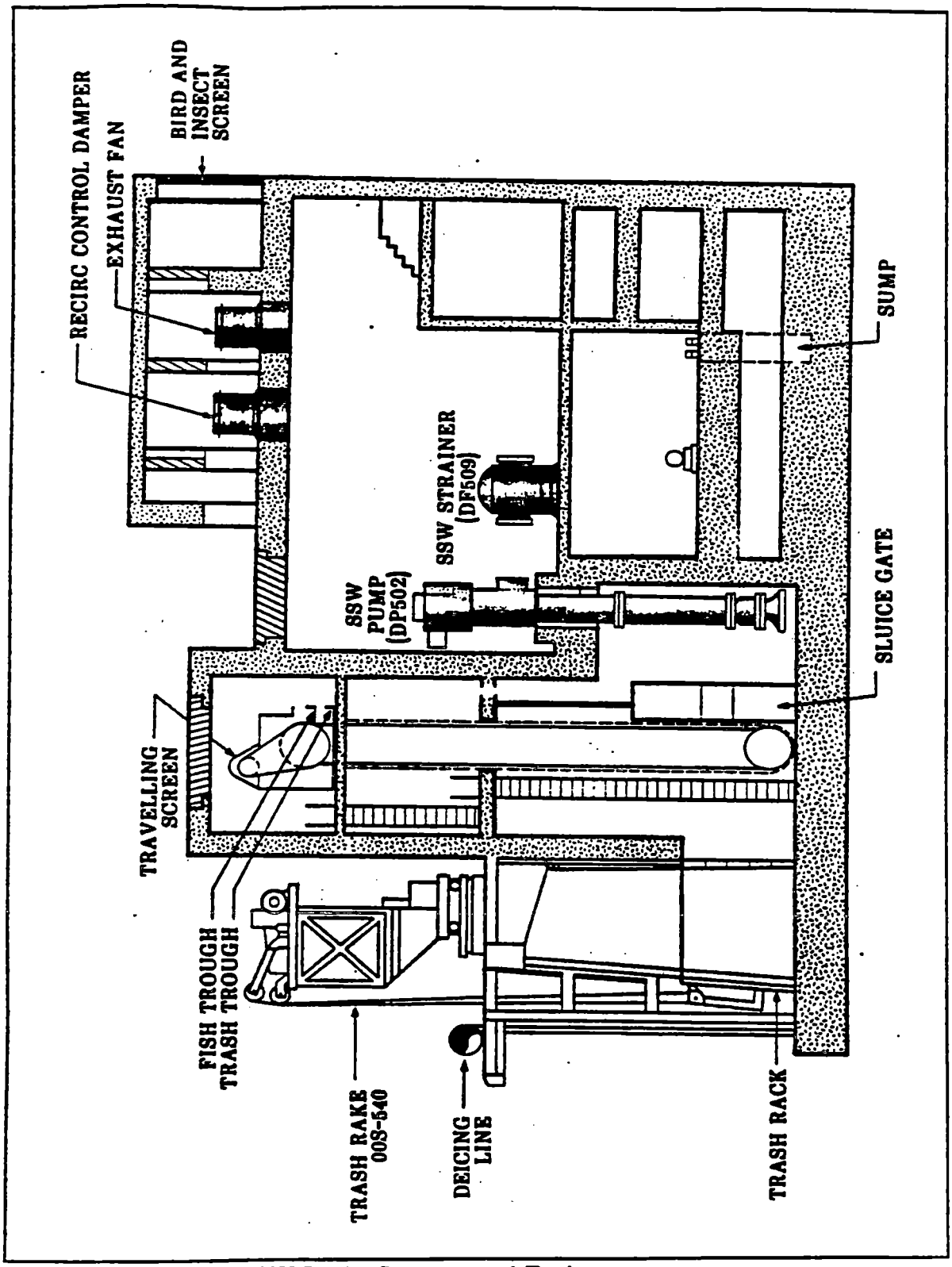

Figure 6. Hope Creek SW Intake Structure and Equipment

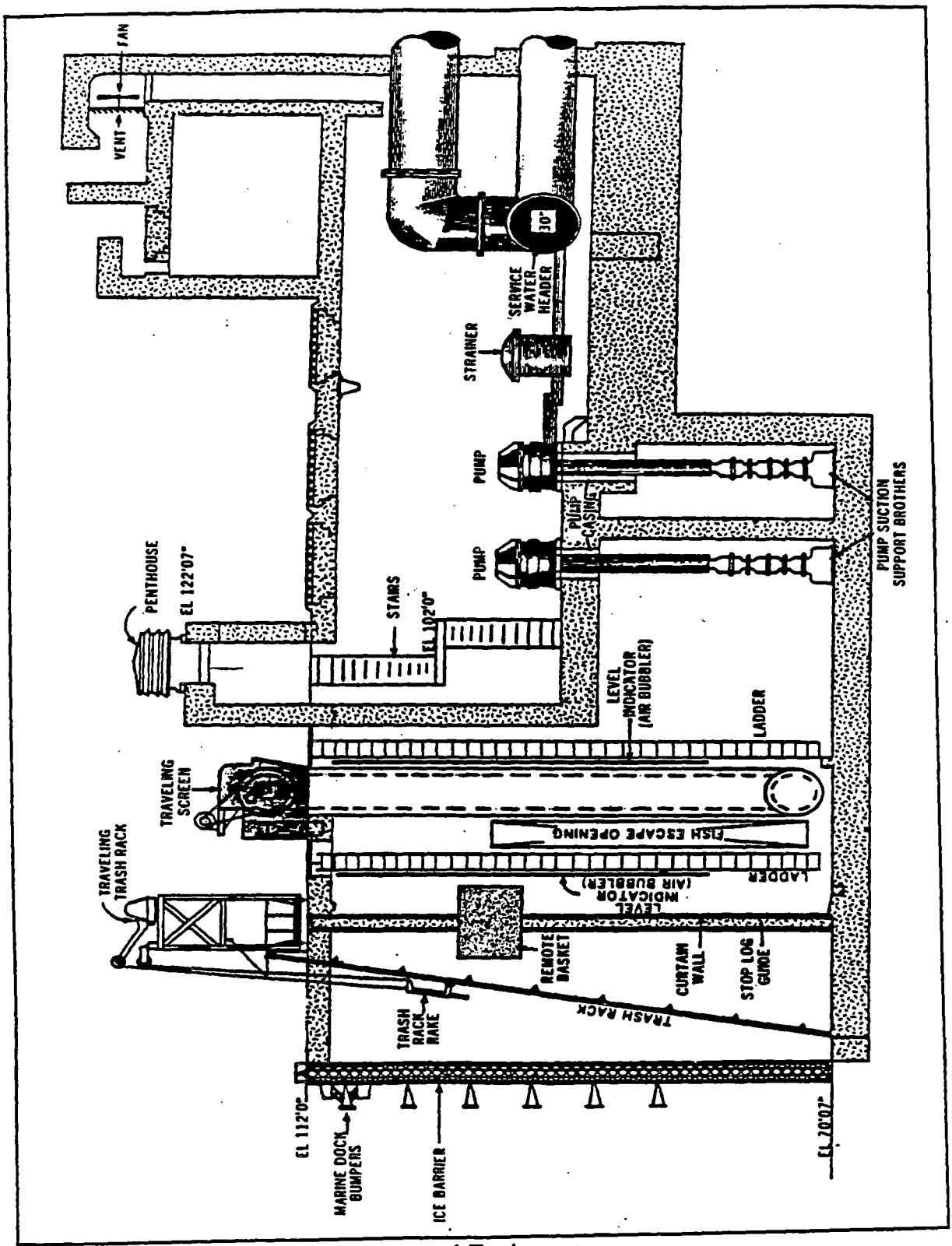

Figure 5. Salem SW Intake Structure and Equipment