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FIRE SAFETY REVIEW
PWSRCAC FIRE CONSULTANTS
OCTOBER 28-31, 2002

On October 28 - 31, 2002, the PWS RCAC Fire Consultants, A.J. Semenza and O.M. Slye, Jr, PE, visited the Valdez Marine Terminal (VMT) to conduct an annual review of the status of fire protection systems, equipment and fire fighting/emergency response capability. During the visit, emphasis was also given to the review of plans and procedures for control of paraffin wax accumulations in Ballast Water Treatment Tanks 92-94. During the review, discussions were held with Chief D. Blackburn, Valdez City Fire Department; Aleyska Fire Chief A.W. Postishek; VMT Fire Chief B. Majors; and Aleyska Pipeline Services Co. (APSC) staff including Richard Ranger, T. Stokes, and S. Newcomber and other staff personnel involved in specific subjects under discussion. Also contacted were Joe Hughes, JPO; T. Kuckertz of RCAC Staff; Stan Stephens, RCAC Board Member; and D. Lawn of DEC. Chet Weger, the JPO State Fire Marshals Office Representative, was contacted by telephone.

Meetings were held to discuss fire related issues. On October 29, 2002, a meeting was held at VMT to review a wide range of fire issues. On October 30, 2002, a tour of VMT was held to view field conditions related to fire systems and the Ballast Water Tanks. On October 31, 2002, a briefing by VMT for RCAC on wax removal and measures to reduce crude oil levels in Tanks 92-94 in BWT included a discussion on fire prevention and safety issues. Topics reviewed during these meetings are summarized in this report.

1.0 FIRE SYSTEM ISSUES

East and West Metering Foam Systems were discussed using the summary report provided by Aleyska to RCAC on the status of the foam system design, Key discussion points were as follows:

1) The report does not address the primary concerns related to high pressure in the foam eductor inlets;
2) Code issues related to system design are not properly addressed;
3) Design parameters for duration of system operation;
4) Fire Department response time to supplement foam concentrate supply;
5) Proportioning Methods; and

6) Alaska State Fire Marshal requirements.

After discussion the following conclusions and agreements were reached:

1) System design will be arranged to control inlet pressure to the proportioners to provide required design water flow.
2) NFPA 11, Low Expansion Foam Systems, will be the minimum code requirements for system design.
3) The system will be designed for a foam concentrate supply of 20 minutes of operation.
4) The VMT Fire Department response time has been tested to demonstrate a response time of 13 minutes. The 20 minute concentrate supply will allow adequate time for fire department response and connection to the foam concentrate tank to supply foam concentrate should it be required for fire control.
5) The method of proportioning can be either eduction devices or an Inline Balanced Pressure Proportioner (IBPD) since either method meets NFPA 11 requirements.
6) The results of Items 1 to 5 are consistent with requirements of the AK State Fire Marshal.

RCAC Fire consultants requested that the completed design for the foam proportioning system be forwarded for review before implementation.

2.0 FIRE SYSTEMS MAINTENANCE

VMT will be replacing liner rings with new rings after the proper metalurgical requirements are determined. The current failed rings will be replaced with spare items in stock. Once the new design is determined these rings will be replaced with the new design. (See **Attachment 1** for slides on the Corrosion of the Fire Mains).

During the field review of the fire protection systems in the fire pump building the 2000 gpm electric pump was being replaced because of a shaft problem and one 8000 gpm diesel operated pump was also out of service and being replaced. Repairs such as this should be expedited or scheduled so that a large percentage of the fire water pumps are not impaired at the same time.

3.0 MAINTENANCE OF FIRE SYSTEMS

RCAC Fire consultants reviewed the current maintenance practices for fire protection equipment. The water-based systems are being maintained to scheduled frequencies which meet NFPA 25, *Inspection, Testing and Maintenance of Water Based Fire Protection Systems*, and/or AK state requirements. The Fire Team is being notified of impairments and also perform inspection and maintenance of fire protection equipment.

Critical valves are being sealed and/or locked and tagged. Sealing of the valves with a car seal requires special procedures at VMT due to the high degree of controls

established for car seals. RCAC Fire Consultants verified that key valves in the fire water system have been sealed and tagged as previously recommended for a "fire system red tag system" for management and control of the manipulation of key fire system control valves.

Weekly coordination meetings are held to determine priorities for maintenance and repair of systems. The meetings are attended by involved parties, including maintenance, fire, and operating teams.

4.0 FIRE TRAINING AND EQUIPMENT

In past reports, focus has been placed on the need to increase training and coordination of fire fighting operations with the Valdez Fire Department. RCAC Fire Consultants met with VFD Chief D. Blackburn to review status of current coordination activities. Coordination continues between operational chiefs at VMT and the VFD Chief through periodic meetings. Training of VFD personnel continues through rotation of the municipal fire department personnel to flammable liquid fire fighting training at Texas A&M and other out of state training opportunities

The location of a proposed VMT training area was discussed with VFD Chief Blackburn. He is interested in having the training area in Valdez. However, locating the training area in the City is likely to require extensive funding to Valdez in order to complete the facility. Further financial support will be required to operate the facility. Also, location in the city will result in added costs for VMT to support extra hours for personnel training, coverage of extra personnel, and may result in additional legal and operating restrictions when located in the city versus a VMT location. RCAC Fire Consultants emphasized a preference for locating the training area in VMT to minimize impediments to effective training. The lack of a training area for VMT fire brigade seriously limits the ability to train the volunteer fire brigade in flammable liquid firefighting operations.

VMT has reorganized the Fire Team with Chief Postishek having responsibility for VMT fire issues with emphasis on coordination of fire team activities and management of fire issues at VMT.

5.0 FIRE TEAM PERSONNEL

Recruitment of Fire Team Contractor personnel has improved and retention is reported to be higher than previously experienced. However, the retention of firefighters continues to be a concern. RCAC Fire Consultants requested VMT verification of the longer firefighter retention period. RCAC Fire Consultants also emphasized the need to locate the training area at VMT to aid in improving staff training efforts. VMT advised that training records will be to forwarded to the RCAC Fire Consultants.

6.0 BWT TANKS

VMT has decided to modify Ballast Water Tanks No. 92 – 94 in order to remove wax laden crude and to remove excessive amounts of accumulated paraffin wax and crude oil from the tanks. Levels of crude and wax in the tanks now exceeds 4 feet, in excess of the acceptable level of a maximum of one foot. In an October 31, 2002, meeting Aleyska briefed RCAC personnel on the modifications and tank cleaning (See **Attachment 2** for Briefing Slides). Fire safety concerns included potential for discharge of static charges should gauging tapes or other isolated potential objects be inserted into the tank vapor space. To avoid static discharges, it was recommended that operating procedures preclude manual gauging for a minimum of 30 minutes to allow for static charge dissipation. Aleyska intends to keep RCAC engaged in the process of design to assure early review of potential fire safety issues.

7.0 CRUDE TANK MIXERS AND FOAM SPIDER JUMP-OVERS

The belt driver mixer motors and the jump-over piping to flush out the foam spider legs were examined during a plant tour. The PM schedule and the procedure for the jump-over piping for spider flushing was reviewed. Once crude oil inventories are higher, the process will take place semiannually as planned.

Prepared by:
Orville M. Slye, Jr., P.E.
President

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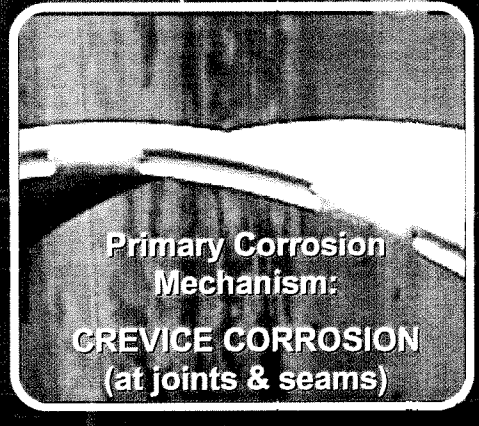
RCAC 10-02 Notes.doc

ATTACHMENT 1

SLIDES ON CORRIOSION OF THE FIRE MAINS

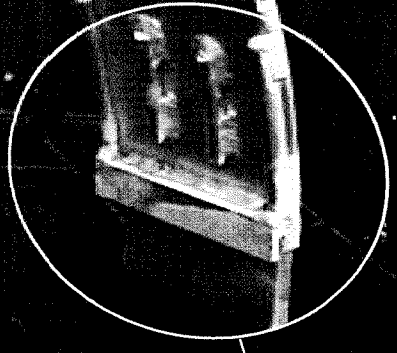
Corrosion Mechanisims vs. End-Seal Design

- **Aluminum Components:** ***Anodic to all other metals present in the firewater system and extremely susceptible to corrosion in saltwater environments.***
- **Tack Weld Construction:** ***Creates numerous crevices, voids, and seams.***
- **Flow Characteristics of End-Seal Design:** ***Protuberances (i.e. stiffener segments) creates "riffle" effect to concentrate aeration in crevice areas as well as debris and possible dissimilar metal particles.***



Primary Corrosion Mechanism:

CREVICE CORROSION (at joints & seams)



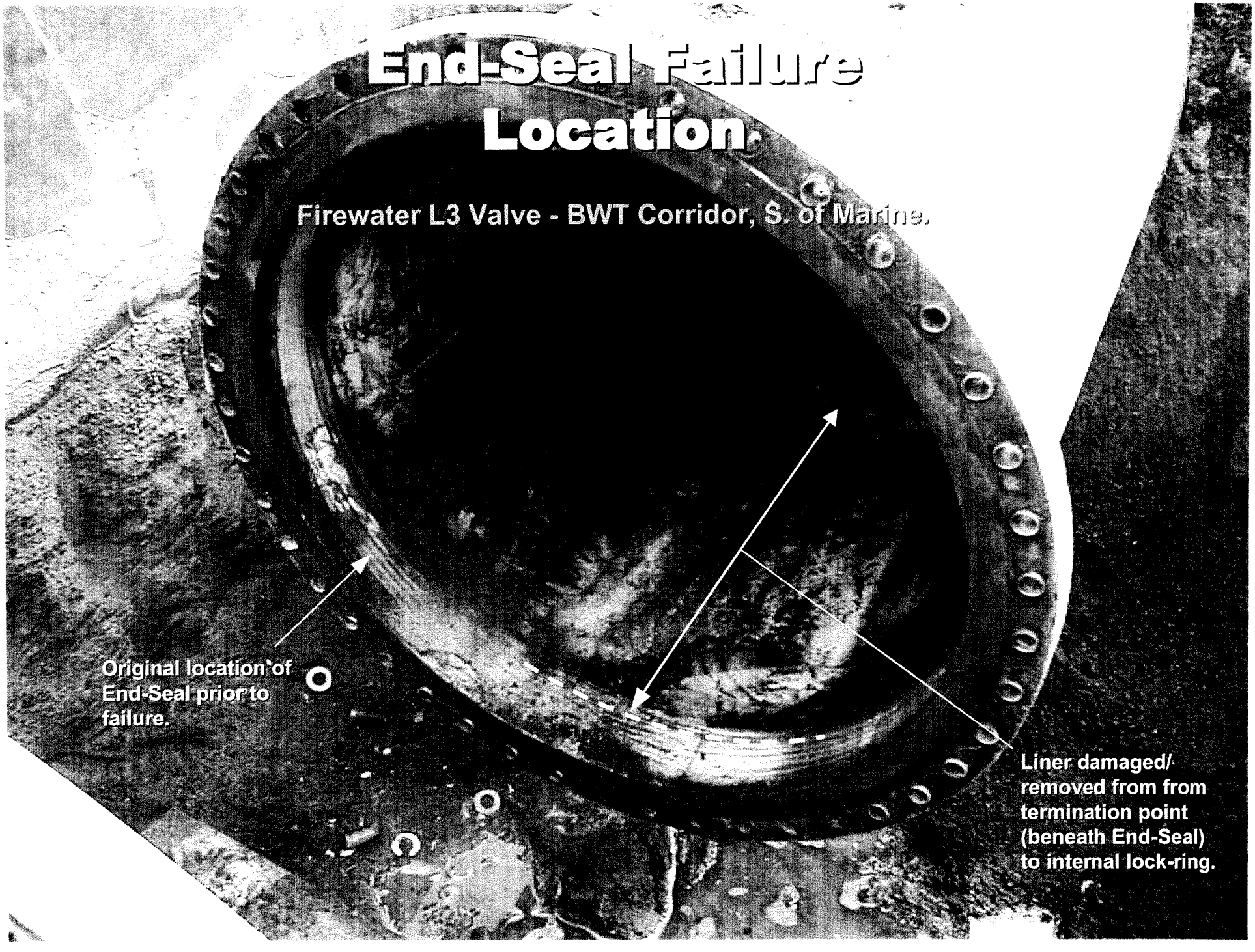
- CREVICE CORROSION: "Forms in cracks or crevices between mating surfaces of metal assemblies. Metals that depend on oxide films for corrosion resistance [e.g. aluminum] are particularly susceptible to crevice corrosion"
- DEPOSITION CORROSION: "A form of galvanic corrosion that can occur in an aqueous environment when a more 'noble' metal [I.e. copper, bronze, or carbon steel] is plated out of solution onto a more anodic metal surface [aluminum] ."

Secondary Corrosion Mechanism:

DEPOSITION CORROSION

End-Seal Failure Location.

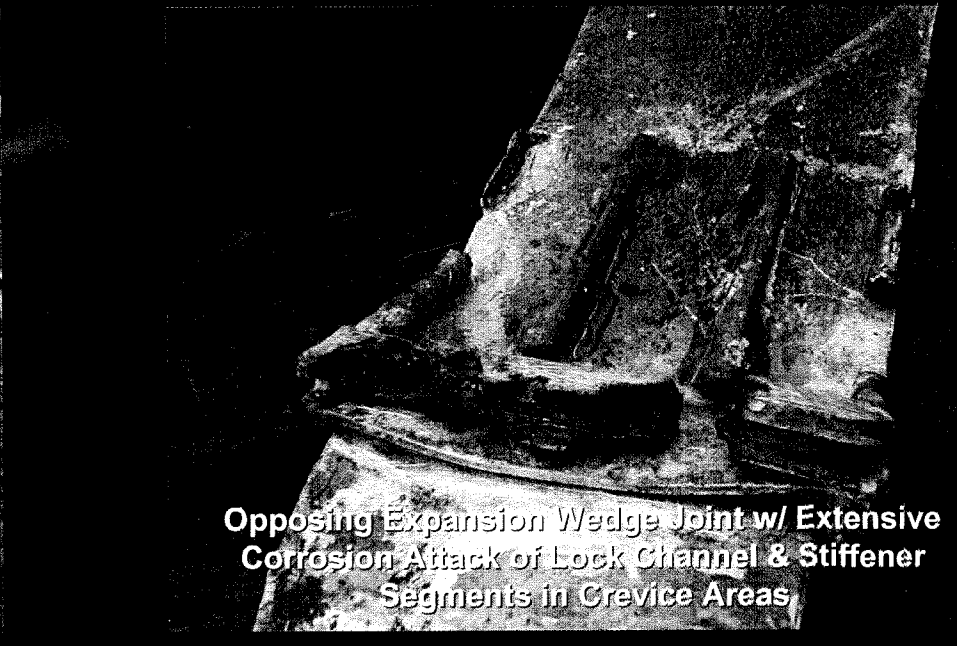
Firewater L3 Valve - BWT Corridor, S. of Marine.



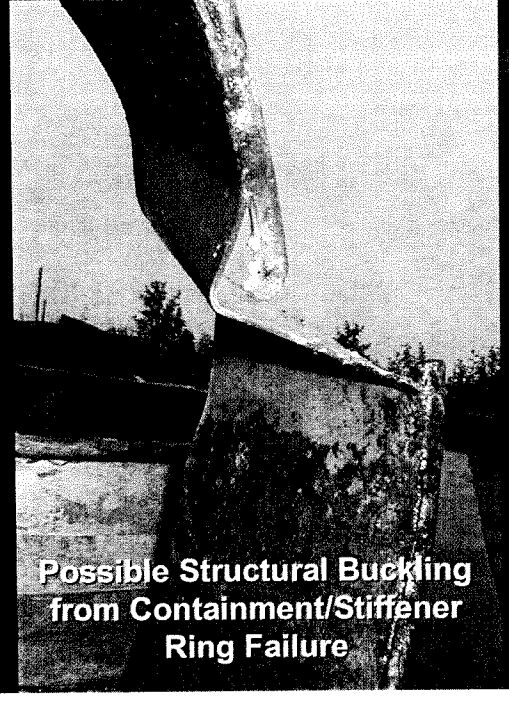
Recovered End-Seal & Sealing Gasket

Failed End-Seal Details

Expansion Wedge Joint w/ Moderate Corrosion Attack of Lock Channel & Stiffener Segments in Crevice Areas

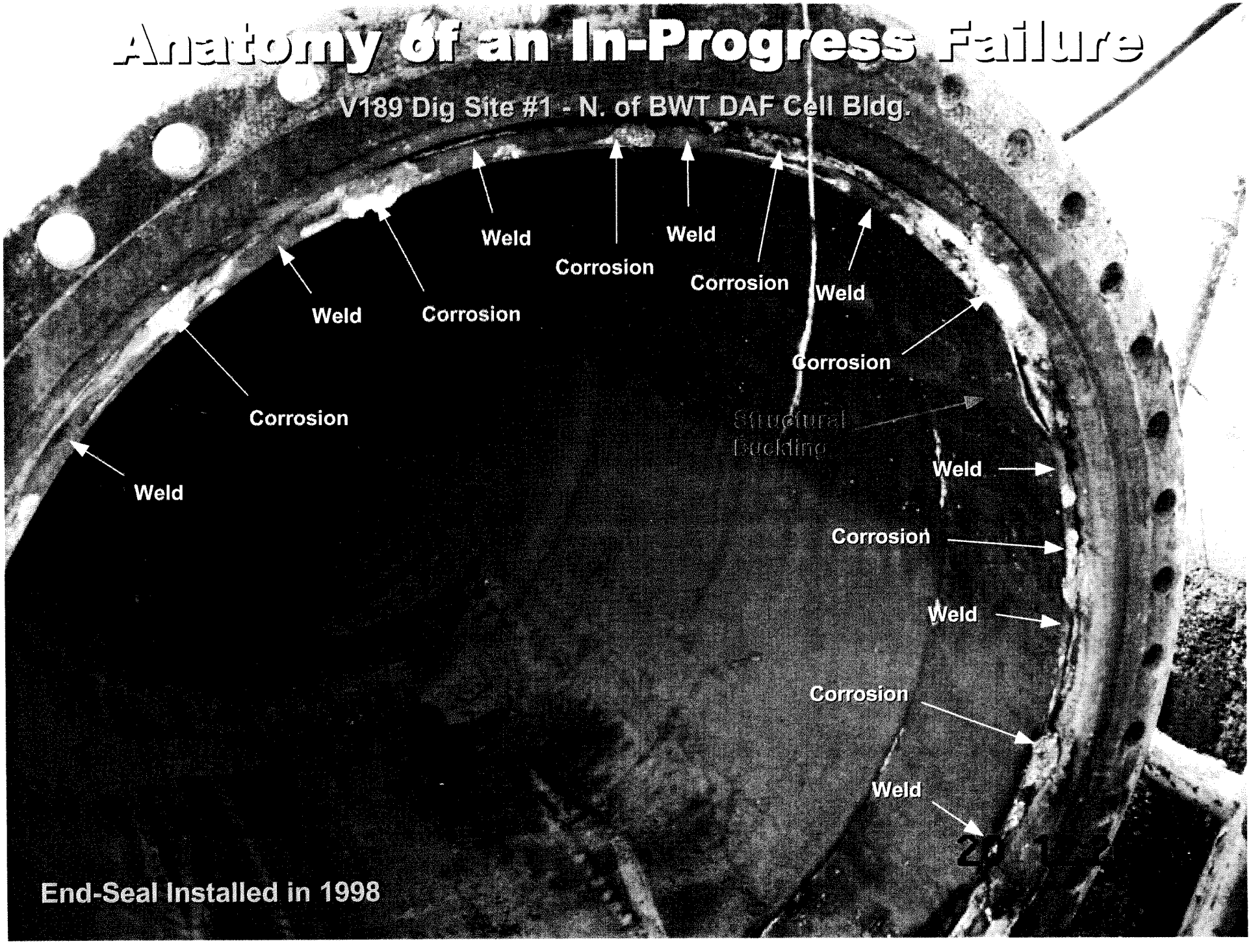


Opposing Expansion Wedge Joint w/ Extensive Corrosion Attack of Lock Channel & Stiffener Segments in Crevice Areas



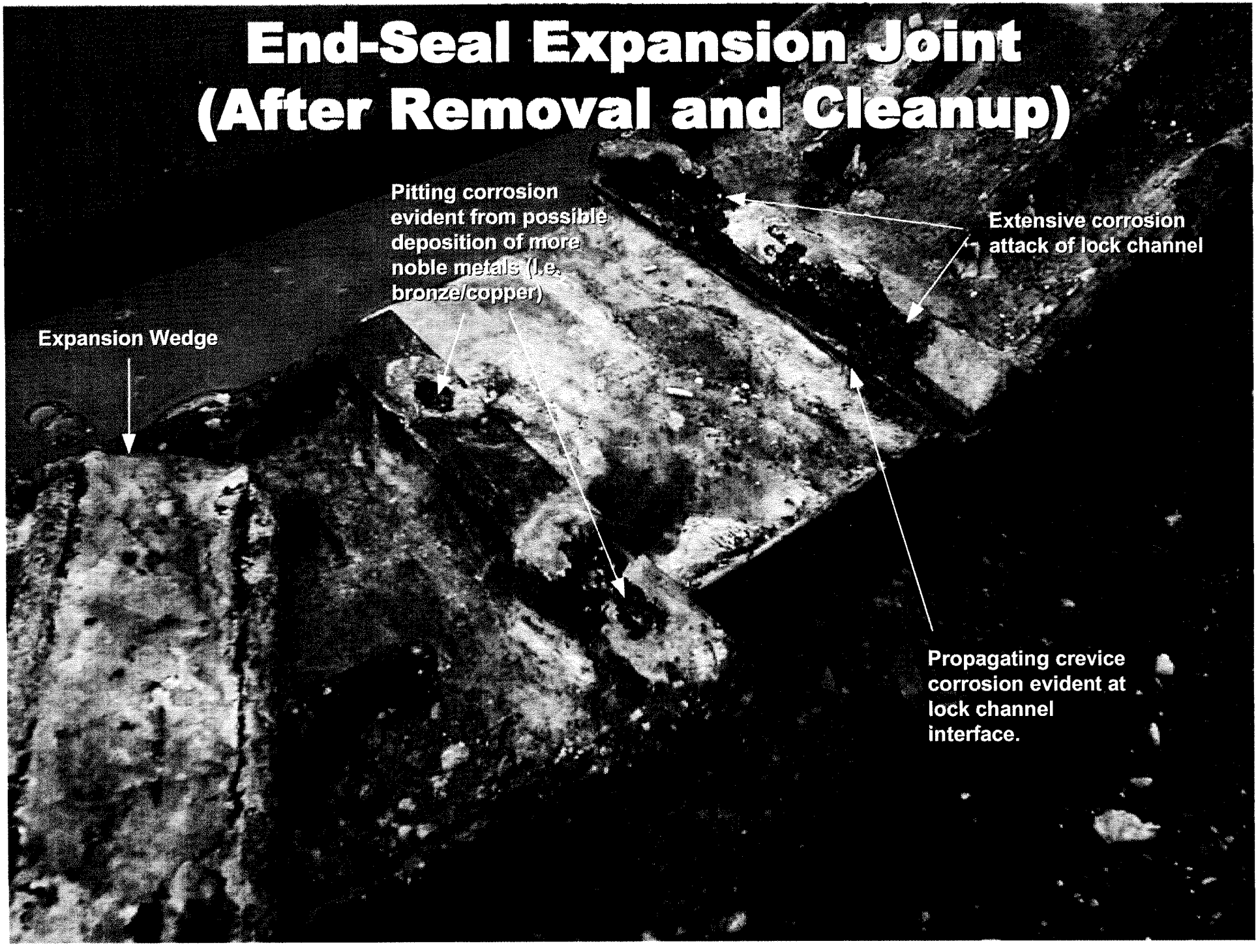
Possible Structural Buckling from Containment/Stiffener Ring Failure

Extensive Corrosion Attack and Consumption of Containment/Stiffener Rings at Non-Welded (Crevice) Areas.

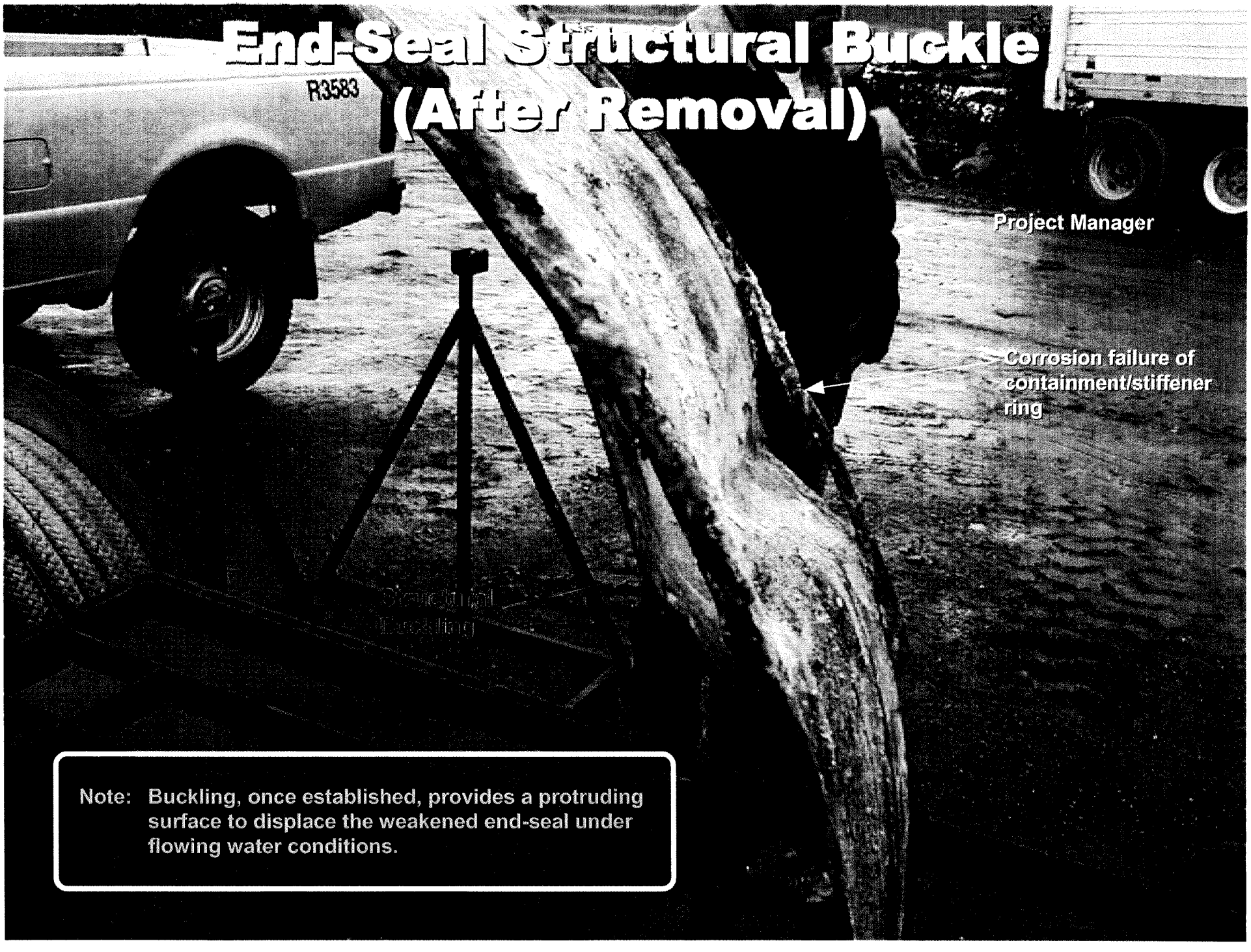

Anatomy of an In-Progress Failure
V189 Dig Site #1 - N. of BWT DAF Cell Bldg.
Weld
Corrosion
Weld
Corrosion
Weld
Corrosion
Weld
Corrosion
Weld
Corrosion
Structural Buckling
Weld
Corrosion
Weld
Corrosion
Weld
End-Seal Installed in 1998

In-Progress Failure (Continued): End-Seal Expansion Joint

End-Seal Expansion Joint (After Removal and Cleanup)



End-Seal Structural Buckle (After Removal)



Note: Buckling, once established, provides a protruding surface to displace the weakened end-seal under flowing water conditions.

ATTACHMENT 2

BRIEFING SLIDES

BWT WAX REMOVAL

BWT 90s Tanks Oil Removal & Skimmer System Upgrade

Project Z454

Rod Crew, Project Manager

10/28/02

Issue Being Resolved

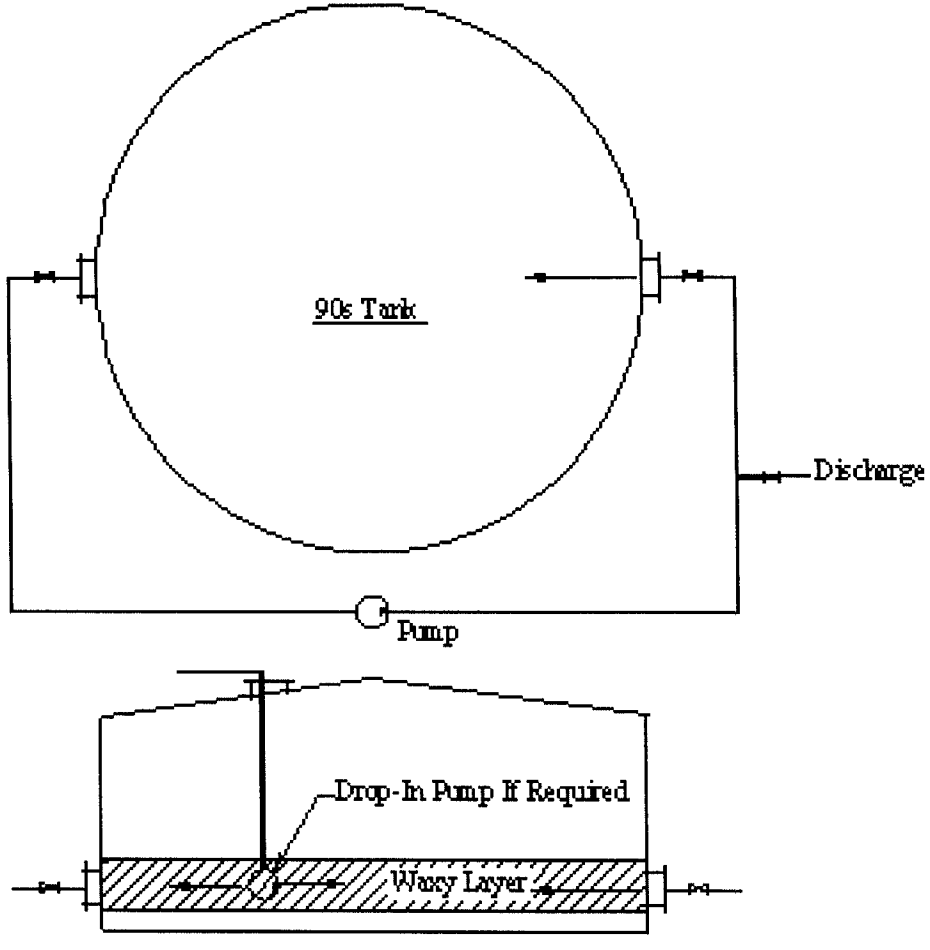
- TK92 has 4.6'
- TK94 has 4.2'
- 80K BBLS + Residual recovered crude
- 90s TKs RC level a fire issue
- Safety of previously proposed fix (using Butterworth) in question

Background

- Initially issue being worked by Terminal
- Effort became too big for local resources
- Rod Hanson requested Projects get involved
- A Projects/VMT Team will:
  - Reduce buildup below 1' (Short Term Issue)
  - Develop acceptable interim operational plan (Mid Term Plan)
  - Optimize process (Long Term Plan)

The Short Term Plan

- Fluidize & remove waxy layer via manway hot taps
- If needed: Add additional drop-in pump thru roof man ways
- If needed: Add diesel or oil to dilute
- If needed: Warm layer by heating diesel or seawater
- Worst Case: Take tank down & clean it



BWT 90s Tanks Waxy Crude Removal

N.T.S. 10/18/02

Project Team

- Rod Crew, Project Manager 762-1764
- Betsy Engle, Assistant Project Manager
- Bob Elliott, Project Engineer
- Tom Bishop & Jerry Johnson, Ops SPOCs
- Joe Howell, VMT Engineering Liaison
- Andy Postishek, Fire/Safety
- Brad Thomas, Air Quality
- Harold Gray, Measurement/Oil Movements
- Richard Ranger, RCAC Liaison
- Melanie Rhodes, Veco Project Engineer
- Process Engineer- TBD

Tentative Plan

- Provide temp tie-in down stream of the recovered crude pumps
- Screen & possibly macerate materials before pumping to Tank 2
- Fluidize material
- Pump to TK2 through RC line

Unresolved Items

- Identifying shipper to take this material from Tank 2
- Identifying receiving refinery

Schedule

- Initial funding approved for project October 24
- AFE for near term funding in preparation
- Start fluidizing TK 94 in early December
- (Estimated 25-30 days per tank)
- Start fluidizing TK92 in early January
- AFE for long term engineered solution planned for early '03

Critical Path

- Tank 93 back in service by December 1, 2002
- All long lead materials procured and ready by Dec. 1
- All procedures developed and ready
- Funding for oil removal in place to continue
- Permits obtained for contingency plans
- Agency agreement to proceed with plan

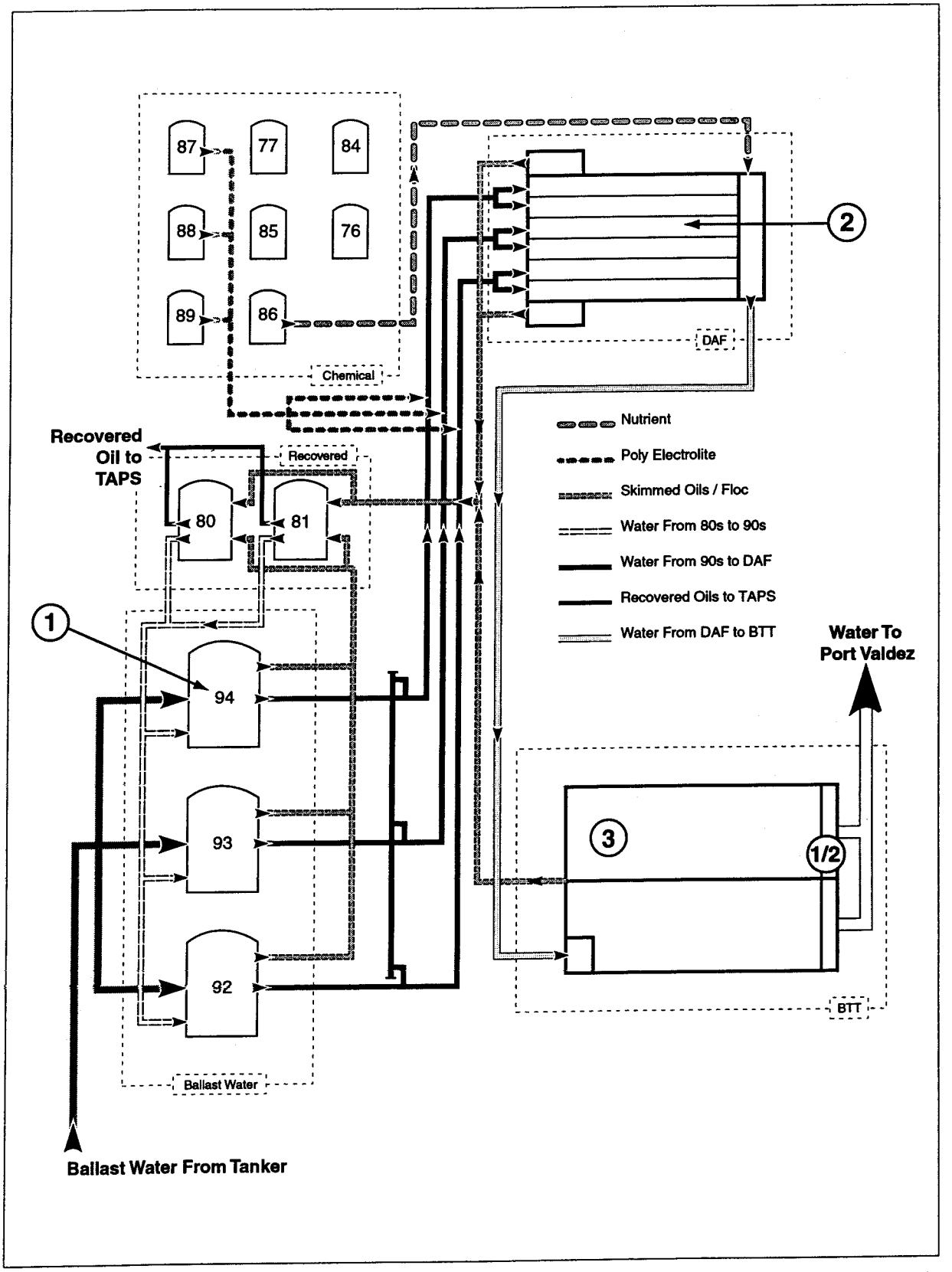


Figure 3-2. BWT Flow Diagram. Treatment occurs in 3½ stages: gravity separation (90s tanks), enhanced separation (DAF), and biological oxidation with intermittent air stripping.

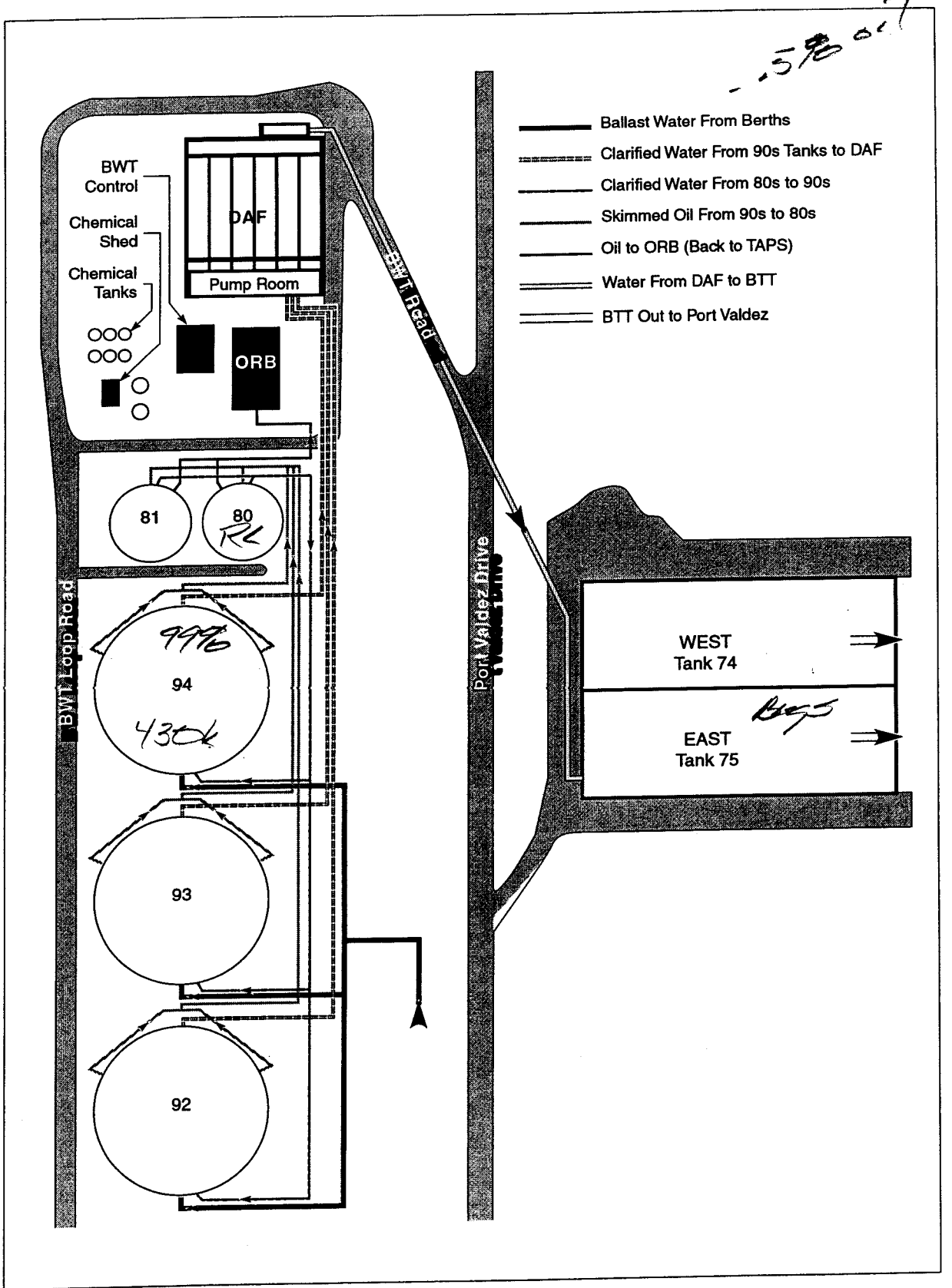


Figure 3-1. BWT Facility Diagram. This diagram shows the basic layout and flow pattern of the BWT facility at the Valdez Marine Terminal.