January 2013 Reports

Tuluksak Water & Sewer Feasibility Study, Site Visit, CRW Engineers, Jan 2013

Tuluksak Water Treatment Plant Structural Condition Survey, Reid Middletoon, Jan 2013

Tuluksak Water Treatment Plant Mechanical Condition Survey, EDC Engineers, Jan 2013

Tuluksak Water Treatment Plant Electrical Condition Survey, CRW Engineering Group, Jan 2013

TRIP REPORT

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Project:	Tuluksak Water & Sewer Feasibility Study, 82301.00	
Purpose:	Tuluksak Native Community (TNC) Council Meeting, Site Visit & Data Collection	
Date of trip:	Thursday, January 31, 2013	
People Traveling:	Beverly Short, VSW Jon Hermon, CRW Bill McDonald, CRW Andrea Meeks, CRW	Kevin Hansen, EDC Ken Andersen, Reid Middleton Bob White, YKHC
Location:	Tuluksak, Alaska	
Contacts:	Wascca Fly, TNC Council President Darlene Peter, TNC Tribal Administrator Angela Alexie, TNC Bookkeeper Willy Phillip, TNC Utility Manager Carl Napoka, Sr., Water Operator Brandon Andrew, TNC Admin Joe Demantle, Sr., Tulkisarmute Inc.	
Reporter:	Andrea Meeks	

Activities:

We departed Anchorage for Bethel at 6:30 a.m. We waited at Grant's charter office for the weather to clear. After a few hours, we were given the okay to fly and loaded up in a Piper. Wascca Fly met us at the runway and transported us to the TNC Office to meet with the council. Kevin, Bill, and Ken walked to the water treatment plant to begin their facility condition assessments. Bob walked there too to check in with Carl Napoka and review any operational issues.

I met with Angela, Willy and Brandon to discuss TNC's water and sewer budgets, fee collections and usage. Angela contacted Kate Nichaolai with Rural Alaska Empowered and had her talk with me about the financial information I needed. Kate said that her group was finalizing the 2013 budgets for TNC and thought they would be completed in late February. Angela and I discussed average median household incomes. She provided ranges of monthly expenses for a typical resident of Tuluksak (typical cell phone, cable and internet fees are in the hundreds of dollars per month).

The council meeting started. Jon introduced CRW and gave a brief overview of the purpose of trip. The community is very interested in getting a piped water and sewer system. We explained that the funding agencies wanted another evaluation of feasible water and sewer systems for the community and that pipes would be included in this analysis. We explained that community input was going to be crucial to generating a good feasibility study and asked for suggestions on how to increase public involvement. In other communities, a door prize or two given out during a community meeting has been a good way to boost attendance. Angela suggested we raffle off cash.

I asked the council members if any of them could recall a time when septic systems were used in the community (this is suggested in an early water and sewer study). No one could recall that any septic systems were installed.

During the meeting (around 3:00 pm), Grant Aviation called to let me know the weather was closing in and they wanted to pick us up in the next 30 minutes. I asked them to give us as much time as they could. They agreed to pick us up at 4:30 pm.

While Bev and Jon completed the council meeting, I walked to the WTP to take photos and document conditions (see trip photos). The gravity wastewater line from the building show signs of leaking at the pipe/bldg. interface. The red water is presumably backwash water from the treatment system (the raw water is very high in iron). The gravity line shows signs of bellies between pipe supports. According to Bob White, the gravity line freezes often. The WTP/Washeteria facility shows its age (30 plus years), there appear to be many sections of rotten flooring. Most of the water treatment piping appears to have been either modified, repaired or added to over the last 30 years and the resulting plant is a mishmash of pipes, valves and pumps (some clearly not operable). While we were there, Bob worked with Carl troubleshooting a problem with their well pump. Neither had information about the size and type of well pump being used. Ken pointed out the holes in the flooring where water apparently ponded and rotted the floor. These holes were apparent in the mechanical and treatment rooms.

The washeteria side of the building also shows its age. None of the toilets or showers were functioning. Only a few washers and dryers were available for use. No one was actively using the washeteria while we were there.

Bill and Kevin walked to the new TNC Powerhouse to determine how easy it could be to tap into waste heat for use in any new water and/or sewer mains. Drawings of the piped sewer system (designed by CE2) calls out for a connection to waste heat on the sewer force main. Bill and Kevin said that there appeared to be pumps and controls currently installed in the powerhouse suitable for waste heat recovery but that no electrical had been provided for these systems to be operational.

Grant called and said they were on their way. Wascca gathered us and drove us to the runway (we grabbed Bill and Kevin as they walked to the runway). The weather in Bethel was not very good (low fog still) and the pilot had to circle for about 30 minutes before we were able to land in Bethel.

We checked into our evening flight then grabbed a cab for dinner in downtown Bethel. The 9:00 pm jet took us home to Anchorage.

Attachments: Site Visit Photos (1 page)

Tuluksak Water & Sewer Feasibility Study - Jan 31, 2013 Site Visit Photos

WTP/W Bldg (SE corner, notice insulated well head & piping)

Insulated well head & piping

Leaky (glaciated) wastewater line from WTP/Washeteria (notice iron content in filter backwash water).

WTP/W Bldg (western end)

WTP Watering Point

Rotten floor in mechanical room

Mechanical Room Piping (HWH behind)
Treatment System Pump Manifold

Treatment Room (cw from left, treated water tank, greensand filter, pressure tank, backwash water surge tank)

Potassium Permanganate Tank

Treatment System Pump Manifold

Pressure Tanks (backwash surge tank on left foreground)

Washeteria

Tuluksak Water Treatment Plant Structural Condition Survey Report

Tuluksak, Alaska

RM Project No. 402013.007

February 2013

Prepared for:
CRW Engineering Group, LLC

Prepared by:

ReidMiddleton

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<u>**TABLE OF CONTENTS**</u>

1.0 Executive Summary

The Tulusak Water Treatment Plant has been in operation since 1982 or 1983. Reid Middleton, Inc. was retained to perform a condition survey of the water treatment facility to access the general condition of the building's structural framing systems and provide recommendations for repair or upgrade.

In general, the water treatment plant is in reasonably good condition. The most significant issue is the presence of significant rot in the floor sheathing and joists in the northwest corner of the boiler room. The rot is caused by water penetration from the washing machines in the washeteria or by leaks from the boilers.

Recommended repairs or upgrades include the following:

Routine Maintenance

1. Repair/upgrade the railing systems at the east and west stairs.
2. Replace the stair treads at the east stairs.
3. Replace the missing corner trim at the northwest corner of the building.
4. Tighten existing cable bracing or replace the bracing with new rod bracing and turnbuckles.
5. Replace broken window on south wall of building.

Significant Repairs or Upgrades

1. Replace the flooring in the boiler room.

From an operational perspective, the Owner should prevent water accumulation on the floor. This would include ensuring that washers are not leaking and are properly draining, boiler leaks are fixed promptly, and water is not allowed to pond on the floor. Water from washeteria and treatment plant operations are the cause of rot in the floor framing of the platform.

2.0 Existing Construction

2.1 Background

The Tuluksak Treatment Plant, constructed in 1982, was funded and constructed by the U.S. Department of Health, Educational & Welfare, Public Health Service, Indian Health Services, project number AN-81-220. "As Built" drawings for the facility, dated December 1982, were provided for our review. The building is therefore approximately 30 years old.

The existing building is a panelized wood framed structure supported on a heavy timber post and pad foundation. The building is 32 ft wide by 64 ft long, with a 6'–0" wide by 8'–0" entry vestibule with stairs on each end of the building. On the south side of the building, identified as the "front" of the building on the record drawings, a ramp with a landing provided access to the room containing the water storage tanks. The ramp, landing and access door to the building are no longer in use.

The roof is a simple gable roof with a 4:12 slope.

See Photos No. 1, No. 2 and No. 3 for general views of the water treatment facility. See also Figure No. 1 - Floor Plan.

2.2 Building Design

The building consists of a wood framed superstructure and a substructure consisting of a heavy timber post and pad foundation system. The as-built drawing set, provided for our review, included 30 sheets of drawings. Copies of sheet numbers 1-13, depicting the architectural and structural layout of the building, are included in Section 7 of this report.

2.2.1 Superstructure Framing

2.2.1.1 Roof Framing

Roof construction is shown on sheet 11 of the original design drawings for the building.

Roof framing consists of insulated timber panels that span from the eave of the building to the ridge. The panels are 4'-0" wide and are framed with 2x6's on all edges and ½-inch CDX plywood sheathing on both sides. There are no intermediate 2x6 members between the edge members of the panels. This results in an equivalent framing of a 2x6 every 24-inches on center.

The building has three intermediate beam lines, at the quarter points of the building width, which run the full length of the building. The panels therefore have a span length of 8'-0", spanning from the eave to the first intermediate beam line and then from this intermediate beam to the ridge.

The ridge line post and beam framing is divided into four spans of 12 ft, 14 ft, 18 ft and 20 ft. The ridge beams are 5.125x12 glued-laminated beams (GLB) supported on 5.125x7.5 glued-laminated columns.

The intermediate beams, between the eave and ridge, consist of a 4x12 at the 12 ft span, a 4x14 at the 14 ft span, a 3.125x13.5 GLB at the 18 ft span, and a 3.125x15 GLB at the 20 ft span. These beams are not supported on posts. They frame into glued-laminated beams that span 16 feet from the eave to the ridge beam. Therefore, there are only three intermediate posts within the footprint of the building – the three posts on the ridge post and beam framing. See sheet no. 7 of the original drawings.

2.2.1.2 Wall Framing

Wall framing consists of insulated timber panels with a height, at the eaves, of 10'-0". The panels are constructed with 2x6 studs spaced at 24-inches on center. The panels are sheathed with 5/8-inch T1-11 siding on the exterior face and ½-inch CDX-Interior plywood on the interior face. The panels, all 4 ft wide, are insulated with polyurethane insulation. Wall panel construction is shown on sheet 10 of the original drawings.

2.2.2 Substructure Framing

2.2.2.1 Platform Framing

Platform framing is depicted on sheets 5 and 6 of the original drawings.

The water treatment plant is supported on a wood framed platform. The platform consists of four lines or bents of heavy timber post and beam framing with wood joists spanning between the bents. Spacing between bents consists of one 12 foot span followed by two 10-foot spans.

Flooring consists of 1-1/8-inch plywood sheathing supported by timber joists spaced 12-inches on center. Three sizes of joists are used: 4x12s under the water storage tanks, 3x12s in the treatment room area that does not support the tanks, and 2x12s in the washeteria and boiler room. 3/8-inch plywood is attached to the undersize of the joists creating an insulated floor assembly.

The floor joists are supported at the bearing lines by 10x10 treated beams. The 10x10 beams are supported on 10x12 treated posts spaced four feet on center.

2.2.2.2 Foundation System

The foundation system is depicted on sheets 4 and 6 of the original drawings.

The foundation system consists of 10x12 treated posts spaced four feet on center along each of the four bents. The posts extend approximately 3 feet below grade and are supported on a treated timber strip footing. Each 10x12 post bears on a 10x12 cross-beam that distributes the loads across the strip footing that consists of treated 4x12s that run the length of the building. The width of the strip footing varies. Under the interior bent supporting the water tanks, the footing is (4) 4x12 planks wide. The other strip footings are two or three 4x12s wide. See sheet 6 for a 3-D perspective of the foundation system.

2.2.2.3 Lateral Systems

Lateral loads for the water treatment plant are resisted by plywood diaphragms at the roof and floor levels and plywood shear walls on the perimeter of the building.

In the long direction of the building, lateral loads are transferred from the platform to the foundation by 3x8 diagonal braces nailed to the sides of the 10x12 posts. See sheets 12 and 13 of the original design drawings. In the narrow or transverse direction, lateral loads are transferred from the platform to the foundation with steel cable braces at the end walls. The original drawings show three sets of X-bracing at each end of the building, extending from the platform level to just above finish grade. The drawings also show intermediate 3x8 cross bracing at the 1/3 points of the building. These braces were not installed.

The cable bracing are fastened to the posts just above finish grade. At this point, lateral loads are transferred from the posts to the ground through bearing pressure of the posts against the soil.

3.0 Structural Design Load Comparison and Analysis

3.1 Design Loads – Original versus Current Code Requirements

The as-built drawings for the water treatment plant did not contain detailed general structural notes. However, some design information was provided on the drawings. The drawings also did not specify the design code under which the facility was designed. As the building was designed in 1981 and constructed in 1982, we assumed, for our building evaluation, that the water treatment plant was designed in accordance with the 1979 edition of the Uniform Building Code (UBC) - the code in affect at the time of design and construction. Live loads for new buildings are currently specified in the 2009 International

Building Code (IBC) and the American Society of Civil Engineers ASCE 7-05, *Minimum Design Loads for Buildings and Other Structures*. As part of our evaluation, we compared the design loads from the 1979 UBC to current design code requirements for a facility of this type in this location. Design loads specified on the as-built drawings included:

- Roof Loads 40 psf
- Wall Loading (wind) 25 psf
- Seismic Zone 1

3.1.1 Floor Live Loads

Neither the 1979 UBC, the 2009 IBC, nor ASCE 7-05 provide recommended design loads for water treatment plants or washeterias. The 1979 states that industrial or commercial buildings should be designed for the live load "caused by the use to which the building or part of the building is to be put" with special provision for the weight of equipment if the equipment or machine weight exceeds the live load. The 1979 UBC also has a category called "Mechanical and Electrical Equipment" and states that the area should be designed for "total loads". ASCE 7-05 does not have a category for mechanical rooms. However, mechanical rooms are typically designed for 125 psf or 150 psf or the weight of the equipment – whichever controls. The fully loaded water storage tank or water treatment tank will have pressures in excess of 500 psf.

3.1.2 Roof Snow Loads

Current codes (IBC and ASCE 7-05) specify a ground snow load for communities throughout Alaska and provide a methodology for converting that ground snow load to a roof snow load. The 1979 UBC did not specify a ground snow load, or a recommended roof snow load, for Bethel or any other community in Alaska. Prior to 1979, the Corps of Engineers recommended a roof snow load of 30 psf for Bethel.

Under current codes, ASCE 7-05 recommends a ground snow load for Bethel of 40 psf. This translates into a roof snow load, when adjusted for the 4:12 roof slope, of 25 psf. For gable roofs, the code assumes that wind will "unload" the windward roof and "load" or blow the snow onto the leeward roof. Therefore, under ASCE 7-05, the roof must support either a uniform load of 25 psf over the entire roof or an "unbalanced" snow load consisting of no snow on one side of the ridge and a uniform snow load of 40 psf on the leeward side of the roof.

Original Design Roof Snow Load	40 psf
Current Recommended Roof Snow Load	40 psf

3.1.3 Wind Loads

ASCE 7-05 specifies a design wind speed of 117 mph for Tuluksak. This results in lateral wind pressures of 20.5 psf for the main exterior walls and corner pressures of 30.7 psf (typically the end 6 feet of the building). The design wind pressures for the building, under current codes, are less than the pressures for which the building was designed.

3.1.4 Seismic Loads

For simple buildings seismic forces are typically computed as a percentage of the weight, called the seismic mass, of the building. The force levels, expressed as a percentage of "W" or the dead load of the building, are:

- 1979 UBC: V(eq) = 0.035 x W
- ASCE 7-05: V(eq) = 0.043 x W

Code prescribed seismic forces for a building of this type, under current codes, are slightly higher than for which the building was designed. However, Tuluksak is located in an area of low seismic activity, such that wind pressures will control the design of lateral systems for the building.

3.2 Structural Analysis

3.2.1 Material Properties

The as-built drawings for the Tuluksak Water Treatment Plant did not specify the type or grade of timber components used in construction. To determine how the building's design and construction compares to current code requirements, we had to make assumptions as to the type of materials used for construction. Our assumptions were based on our knowledge of the materials typically used for the construction of wood frame buildings in Alaska in the early 1980s. Our analysis is based on the following assumptions:

- Timber Joists and Wall Framing: Hem-Fir No. 2 or Better (Doug-Fir No. 2 or Better was also typically used, but we based our evaluation on the lower quality Hem-Fir No. 2 wood.)
- Glued-Laminated Beams: Doug-Fir with Fb = 2,400 psi
- Heavy Timber: Douglas Fir No. 1 or Better

Our analysis showed the following:

3.2.2 Roof Panels

Our analysis shows that the 2x6 framing, acting as individual joists, have adequate capacity to support a snow load of 40 psf. The framing, acting as a structural insulated panel with plywood sheathing, has even greater capacity.

3.2.3 Wall Panels

The wall panels can safely support the combined required roof snow loads and wind pressures.

3.2.4 Floor Joists

The floor capacity was evaluated assuming that Hem-Fir No. 2 lumber was used for all floor joists. The framing can support the following live loads:

- Washeteria/Boiler Room (2x12 floor joists) 150 psf
- Treatment Plant Room (3x12 floor joists) 250 psf
- Treatment Plant Room – Tanks (4x12 floor joists) 600 psf

If the floor framing consists of Douglas-Fir wood, live load capacities can be increased by approximately 15 percent.

The recommended floor live load for mechanical type facilities is typically 125 psf or 150 psf.

The drawings for the water treatment plant indicate that the water tanks have a minimum height of 8 feet which translates to floor load, from the water alone, of 500 psf.

In summary, the platform framing, as designed, as adequate capacity to support the floor loads for water treatment plant operations.

3.2.5 Support Beams

The 10x10 support beams, if Hem-Fir material, can support an average uniform load of approximately 400 psf. If the wood is Douglas-Fir, the beams can support an average uniform load over 600 psf.

3.2.6 Foundation System

The original drawings did not provide an allowable soil bearing pressure for the building foundation. Assuming a conservative allowable bearing pressure of 2,000 psf, the foundation system can support uniform live loads of 550 to 600 psf.

4.0 Field Observations

On January 31, 2013 Ken Andersen, P.E., principal with Reid Middleton, performed a structural condition survey of the Tuluksak water treatment plant. The following observations are based on visual observations of the existing facility. As the interior of the building was covered with either gypsum wallboard or other finish materials and the underside of the floor joists sheathed with plywood, we had limited access to the structural framing members.

4.1 General Observations

The Tuluksak water treatment plant, constructed in 1982, is 30 years of age and is showing its age. Exterior siding appears weathered and entries to the building, although functional, are worn, uneven, and in need of repair.

Structurally, with the exception of rot in the plywood flooring and floor joists in the northwest corner of the boiler room, the building appears to be in reasonable condition

4.2 Building Exterior

The exterior of the buiding appeared in good condition. Observations included:

1. The exterior T1-11 siding could use new paint.
2. A 3-foot section of corner trim is missing from the northwest corner of the building (Photo No. 4).
3. West Stairs: The railing system is not code compliant - too large of opening between vertical members (Photo No. 3).
4. East Stairs:

a. The railing system is not code compliant – too large of opening between vertical members (Photo No. 5).
b. The top rail is rotten in places and should be replaced (Photo No. 6).
c. The stair treads are damaged and should be replaced (Photo No. 5).

5. The ramp and landing on the south side of the building, although not used, does not have a code compliant railing system and the sheathing/decking at the landing has been removed. The ramp and landing poses a potential hazard and should be repaired, removed, or chained off so that people cannot access the ramp.
6. Window on the south wall is broken.

4.3 Foundation System

The foundation system appears in good condition. We did not observe any signs of settlement, rot, or overstressed or failed members. Observations included:

1. West Elevation: The design drawings showed three sets of cross bracing, one in each of the three bays of the building in the transverse direction. Cross bracing is missing from the middle bay. The braces in the end bays are loose.
2. Mid-building braces: The original drawings showed two more rows of braces at the third points of the building. These braces were not installed.
3. East Elevation: The design drawings showed three sets of cross bracing, one in each of the three bays of the building in the transverse direction. Cross bracing is missing from the middle bay. The braces in the end bays are loose.

The original design drawings showed three sets of cross bracing at each end of the building. However, it appears that only two sets were installed. The original drawings also show the bracing as rod bracing with turnbuckles for tightening. Cable bracing without turnbuckles were installed. The bracing is not providing any lateral support for the building. However, the building appears to be performing adequately without the bracing. Lateral resistance is probably being provided by the numerous 10x12 posts resisting wind pressures through bending and lateral bearing pressure against the soil. My recommendation, however, would be to restore the bracing to a functional condition by either tightening the existing cable bracing or replacing the existing cable bracing with rod bracing and turnbuckles. This restores the bracing to the original design intent for the building.

4.4 Roof Framing

We observed no structural issues with the roof framing. Water stains were noticed on several of the roof beams (Photos 10 and 12), but no rot was observed in the roof framing members. Where glued-laminated beams framed into columns, it appears that the steel hanger connections were too short and the beams were notched to allow for installation (Photo No. 11). This is not a recommended detail as it can lead to splitting of the bottom of the beam at the notch. However, the beams are performing adequately with no splitting. No action is required.

4.5 Wall Construction

We observed no issues with the exterior wall construction.

4.6 Platform Floor

The platform appears to be performing adequately under the equipment loads and operation of the water treatment plant. Floors appear level and there are no signs of excessive deflection or member failure.

Rot was observed at several locations in the floor of the water treatment building, as noted below:

1. Base of the wall separating the washeteria from the boiler room. The keyhole saw could be pushed several inches into the sill plate of the wall (Photo 13 and 14).
2. Northwest corner of the boiler room, behind boiler no. 2 (Photo 17). The floor in this area has a soft spot that "gave" under the weight of a foot. The plywood could be easily removed by hand. The top of the 3x12 joists in this area could also easily be removed by hand – indicating extensive rot. The insulation between joists was wet, not just damp.
3. Northeast corner of the boiler room, equipment pad for hot water generator (Photo 15 and 16): The hot water tank is supported on a raised equipment pad that is wood framed, not concrete. The front edge of the pad is rotten (see Photo 16 showing knife penetration into wood platform).
4. Doorway between the boiler room and treatment room: The wood framing under the door is rotten (Photo 18).
5. Floor in front of the water treatment tank (Photo 19): An area of the floor in front of the water tank is soft. The plywood is soft and can be scraped easily with a knife. The extent of rot is not as severe as in the boiler room.

The plywood sheathing and joists in the boiler room, at least in the area adjacent to boiler no. 2, should be replaced. As the equipment pad under the water heater is also severely rotten, there is a chance that the floor under the water heater is rotten or damaged as well. Replacing the flooring and joists would not be an easy task. The best approach would be to remove existing equipment, remove all damaged flooring, and replace with new framing and sheathing, including the wall separating the washeteria from the boiler room. This approach would work well if the existing boilers and water heaters were scheduled for replacement. The flooring could be removed from below, but even this approach would probably require the temporary removal and replacement of equipment. For budgeting purposes, I would recommend that the entire boiler room floor be considered for replacement.

5.0 Recommendations

Based on our observations and evaluation of the Tulusak water treatment plant, we'd recommend the following repairs or upgrades.

a. Routine Maintenance

1. Repair/Upgrade the railing systems at the east and west Stairs.
2. Replace the stair treads at the east stairs.
3. Replace the missing corner trim at the northwest corner of the building.
4. Tighten existing cable bracing or replace the bracing with new rod bracing and turnbuckles.
5. Replace broken window on the south wall of the building.

b. Significant Repairs or Upgrades

1. Replace the flooring in the boiler room.

c. Operational Procedures

1. Prevent water accumulation on the floor. This would include ensuring that washers are not leaking and are properly draining, boiler leaks are fixed promptly, and water is not allowed to pond on the floor. Water from washeteria and treatment plant operations are the cause of rot in the floor framing of the platform.

6.0 Limitations

The professional services described in this report were performed based on limited visual observation of the structures. No destructive testing, except as noted in the report, was performed to qualify as-built conditions or to verify the quality of materials and workmanship. No other warranty is made as to the professional advice included in this report. This report has been prepared for the exclusive use of The City of Tuluksak / Village Safe Water and is not intended for use by other parties, nor may it contain sufficient information for purposes of other parties or their uses.

7.0 Photos

Photo No. 1: North Elevation

Photo No. 2: South Elevation

Photo No. 3: West Elevation
Note: Non-compliant railing at stairs

Photo No. 4: West Wall
Note: 1. Missing trim from corner of building
2. Cable bracing not tight

Photo No. 5: East Entry Stairs
Note: 1. Non-compliant railing
2. Damaged stair treads

Photo No. 6: West Entry Stairs
Note: Rotten stairrail

Photo No. 7: Ramp on South Wall
Note: Non-compliant Railing

Photo No. 8: Landing on South Wall
Note: No decking creates potential safety hazard

Photo No. 9: Post and Beam Foundation

Photo No. 10: Typical Roof Framing

Photo No. 11: Roof Framing
Note: Dapped GLB at connection

Photo No. 12: Roof Beam
Note: Water stains on beam

Photo No. 13: Washeteria – Rot at base of wall separating Washeteria and Boiler Room

Photo No. 14: Washeteria - Rot at base of wall separating Washeteria and Boiler Room

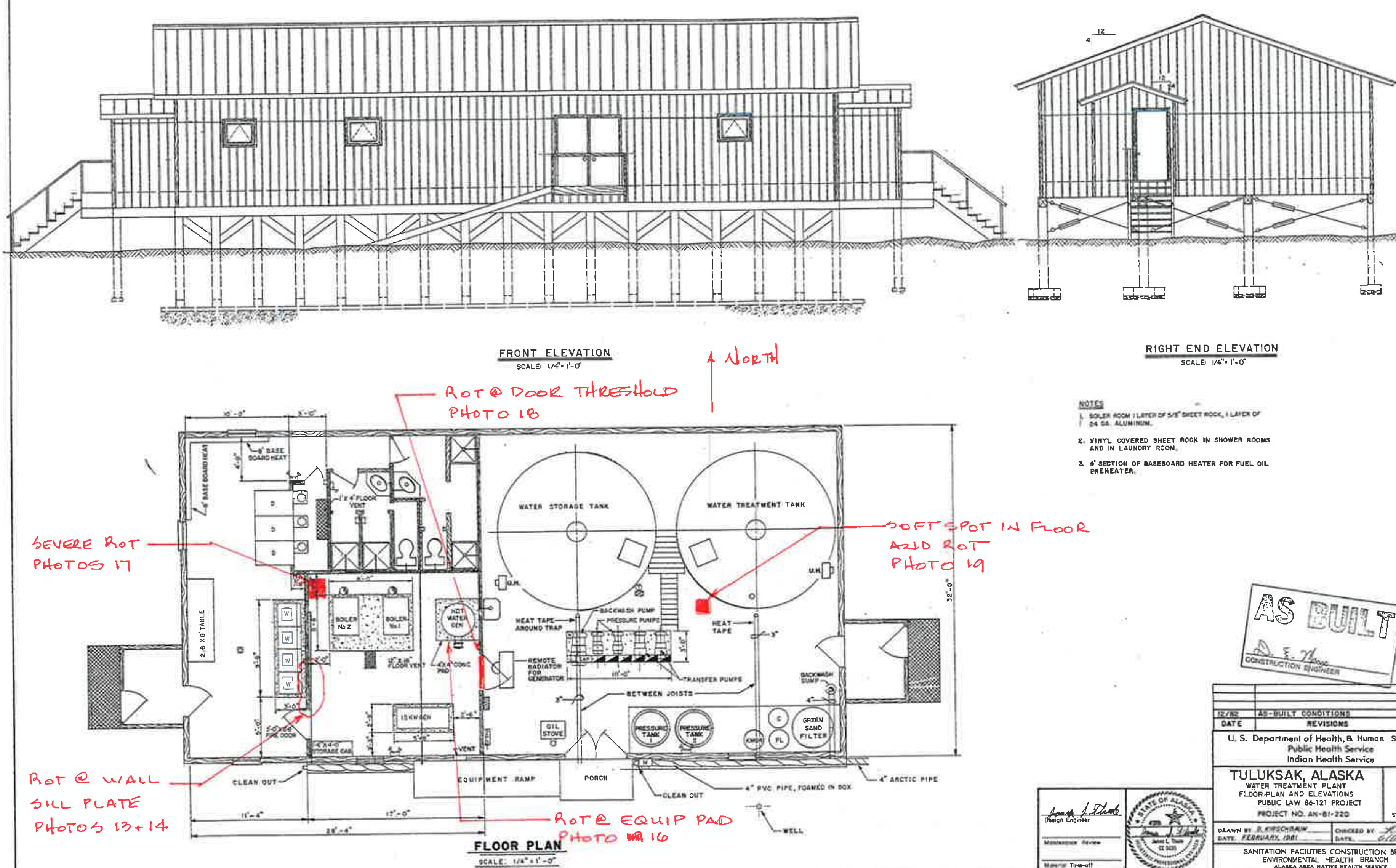
Photo No. 15: Boiler Room – Hot Water Generator

Photo No. 16: Boiler Room – Wood platform supporting hot water tank

Photo No. 17: Boiler Room – Rotten plywood and joists behind Boiler No. 2

Photo No. 18: Boiler Room – Rotten sill at door between Boiler Room and Treatment Room

Photo No. 19: Water treatment tank – rotten plywood adjacent to tank



NOTES

1. BOILER ROOM 1 LAYER OF 5/8" SHEET ROCK, 1 LAYER OF 24 GA. ALUMINUM.
2. VINYL COVERED SHEET ROCK IN SHOWER ROOMS AND IN LAUNDRY ROOM.
3. 6' SECTION OF BASEBOARD HEATER FOR FUEL OIL PREHEATER.

DATE	REVISIONS	INITIALS
12/82	AS-BUILT CONDITIONS	WKT

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

TULUKSAK, ALASKA
WATER TREATMENT PLANT
FLOOR-PLAN AND ELEVATIONS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

SHEET NO. 12 OF 30 TOTAL SHEETS

DRAWN BY: R. KIRSCHBAUM
DATE: FEBRUARY, 1981
CHECKED BY:
DATE: 6/81

Design Engineer
Maintenance Review
Material Take-off

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

FIGURE 1

CONSTRUCTION PLANS

SANITATION FACILITIES
TULUKSAK, ALASKA

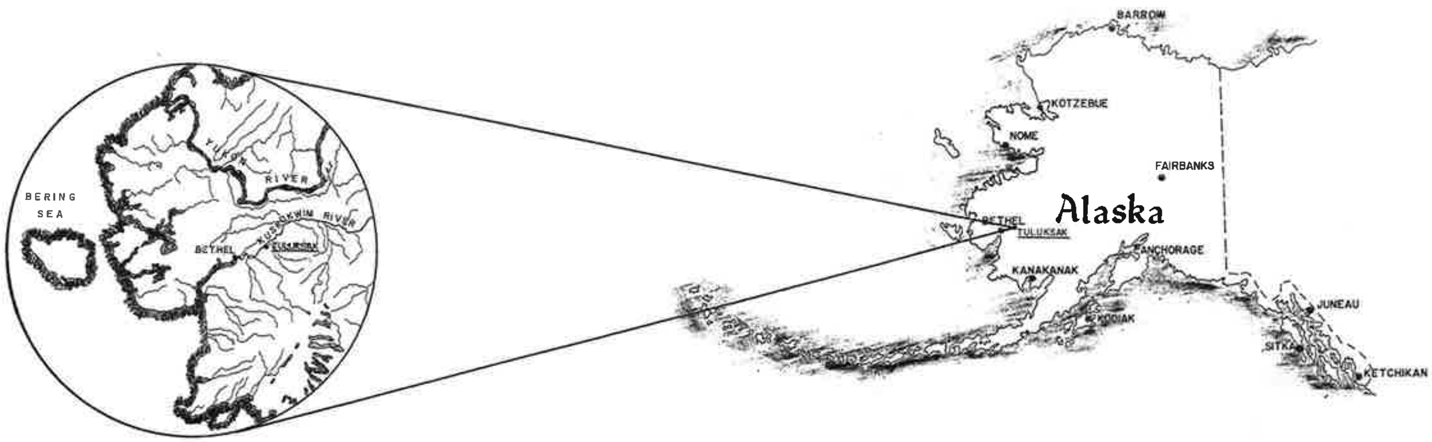


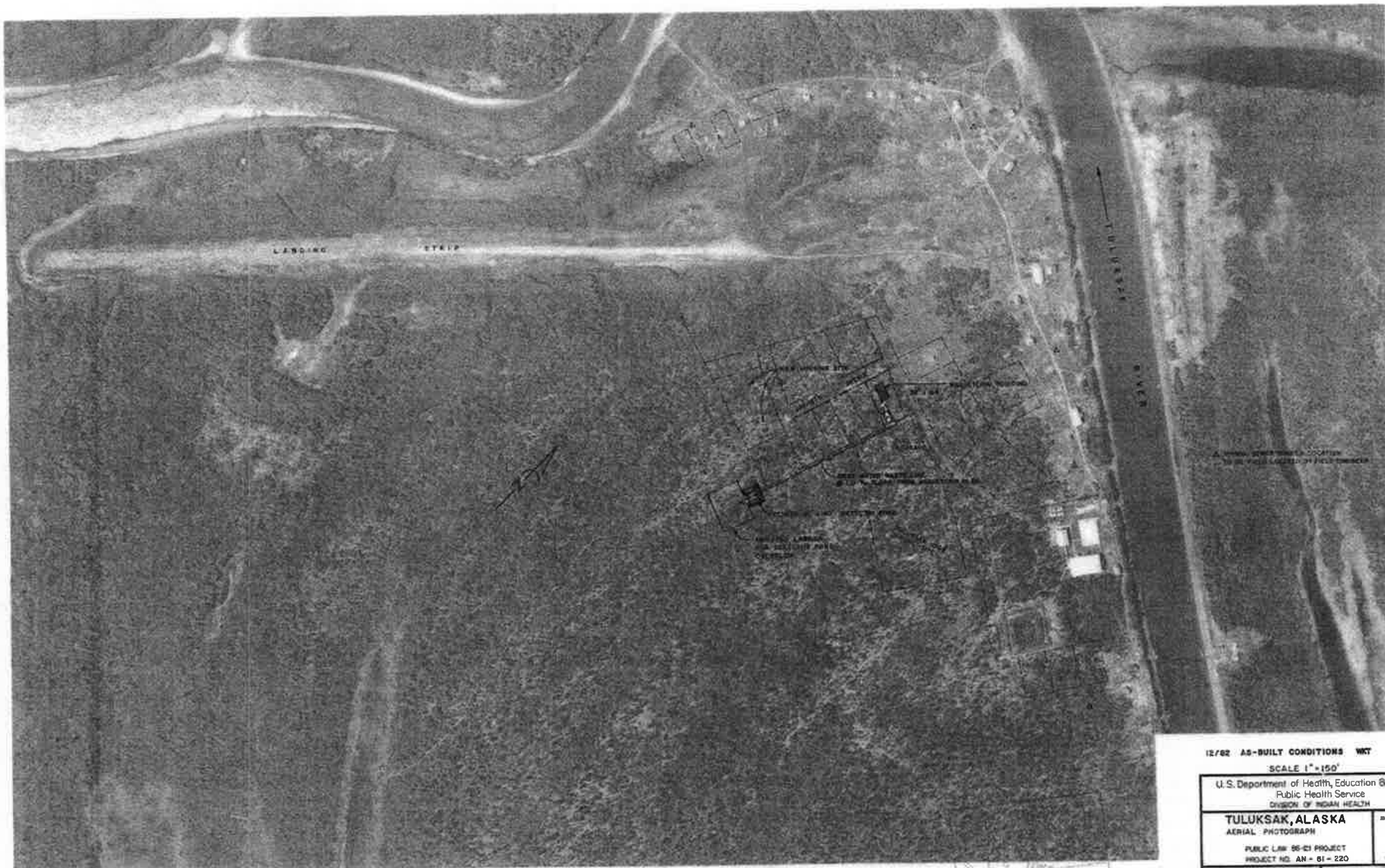
TABLE OF CONTENTS

SHEET NO.	ITEM
1	TITLE PAGE
2	AERIAL PHOTOGRAPH
3	SITE PLAN
4	FOUNDATION FOOTING & BRACING DETAILS
5	FOUNDATION PLAN
6	FOUNDATION ISOMETRIC
7	WTP FLOOR PLAN & ELEVATIONS
8	WTP ELEVATIONS & DETAILS
9	WTP DOOR DETAILS
10	NW BUILDING SYSTEMS
11	NW BUILDING SYSTEMS
12	WTP FLOOR PLAN & ELEVATIONS
13	WTP ELEVATIONS
14	PLUMBING SCHEMATIC
15	HYDRAULIC SYSTEM
16	WTP WATER POINT DETAILS
17	SEWAGE DISPOSAL BUNKER
18	HEATING & VENTILATION DUCT ISOMETRIC
19	WTP WATER TANK DETAILS
20	MECHANICAL DETAILS
21	HOT WATER GENERATOR
22	GREEN SAND FILTER
23	ELECTRICAL PLAN
24	PANELBOARDS - POWER ONE LINE DIAGRAM
25	WTP FUEL STORAGE
26	WASTE WATER DISPOSAL PLAN
27	WASTE WATER PLUMBING
28	CHAIN LINK FENCE GATE DETAILS
29	CHAIN LINK FENCE CORNER & LINE POST DETAILS
30	SPECIFICATION SHEET

ALASKA AREA NATIVE HEALTH SERVICE
OFFICE OF ENVIRONMENTAL HEALTH
P.O. BOX 7-741
ANCHORAGE, ALASKA 99510

PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

U. S. DEPT. OF HEALTH EDUCATION & WELFARE
PUBLIC HEALTH SERVICE
INDIAN HEALTH SERVICE



12/82 AS-BUILT CONDITIONS WKT

SCALE 1" = 150'

U.S. Department of Health, Education & Welfare
Public Health Service
DIVISION OF INDIAN HEALTH

TULUKSAK, ALASKA
AERIAL PHOTOGRAPH

PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN - 81 - 220

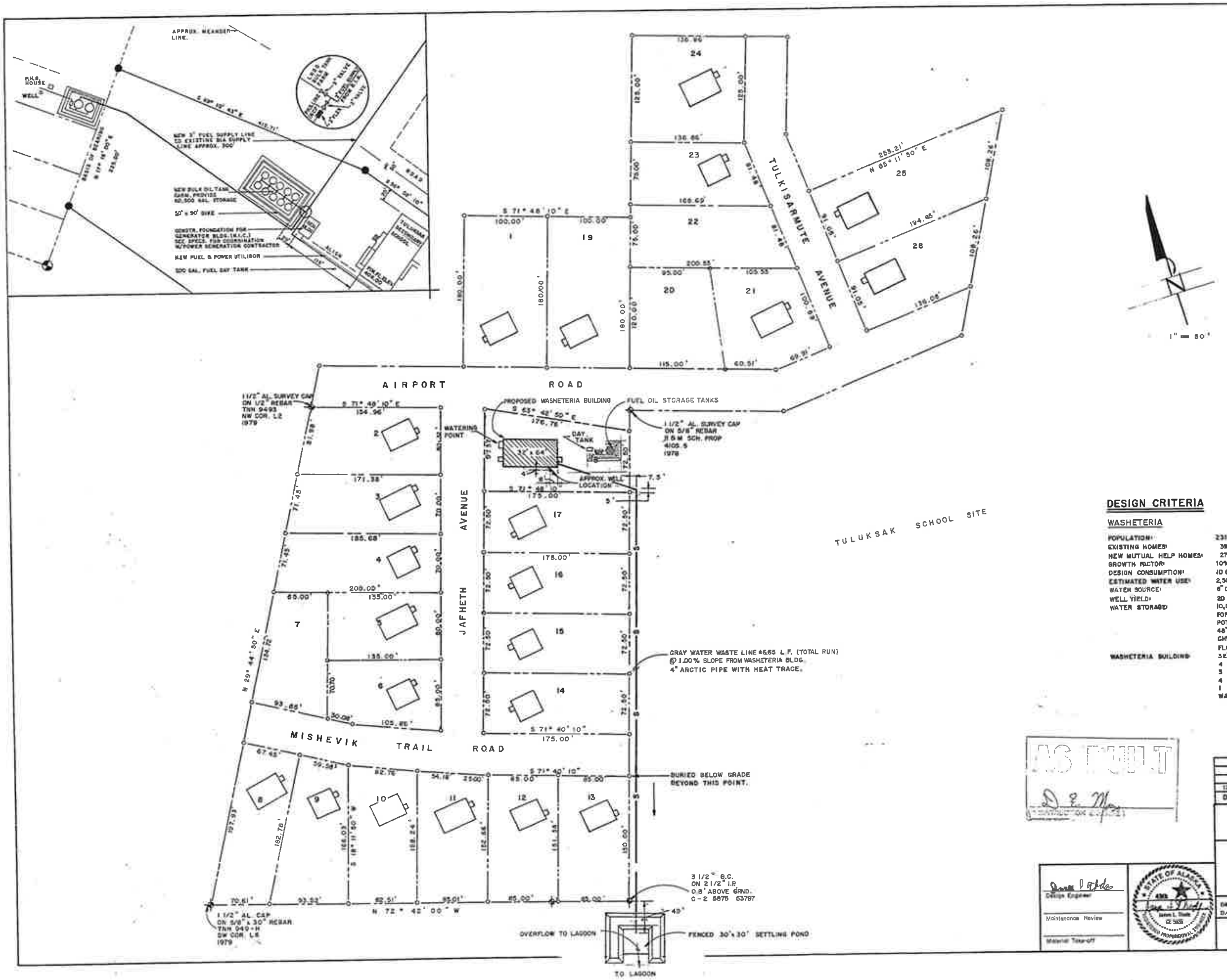
SHEET NO. 2 OF 30 TOTAL SHEETS

DRAWN BY D.R.F.
DATE 4/15/81

CHECKED BY
DATE

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Prepared by: NORTH PACIFIC AERIAL SURVEYS, INC.
Anchorage
Alaska



DESIGN CRITERIA

WASHETERIA

POPULATION:	231
EXISTING HOMES:	39
NEW MUTUAL HELP HOMES:	27
GROWTH FACTOR:	10%
DESIGN CONSUMPTION:	10 GPCD
ESTIMATED WATER USE:	2,500 GPD
WATER SOURCE:	6" DIA. X 30' DRILLED WELL
WELL YIELD:	20 GPM
WATER STORAGE:	10,000 GALLON BATCH TREATMENT FOR IRON REMOVAL BY ADDING POTASSIUM PERMAGANATE; 48" MANGANESE GREEN SAND FILTER; CHLORINATION; FLUORIDATION
WASHETERIA BUILDING:	32'-0" X 64'-0" WITH 4 CLOTHES WASHING MACHINES; 3 CLOTHES DRYERS; 4 SHOWERS; 1 WATERING POINT; WATER TREATMENT AND STORAGE

AS BUILT

DATE	REVISIONS	INITIALS
12/82	AS-BUILT CONDITIONS	

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

TULUKSAK, ALASKA
SITE PLAN

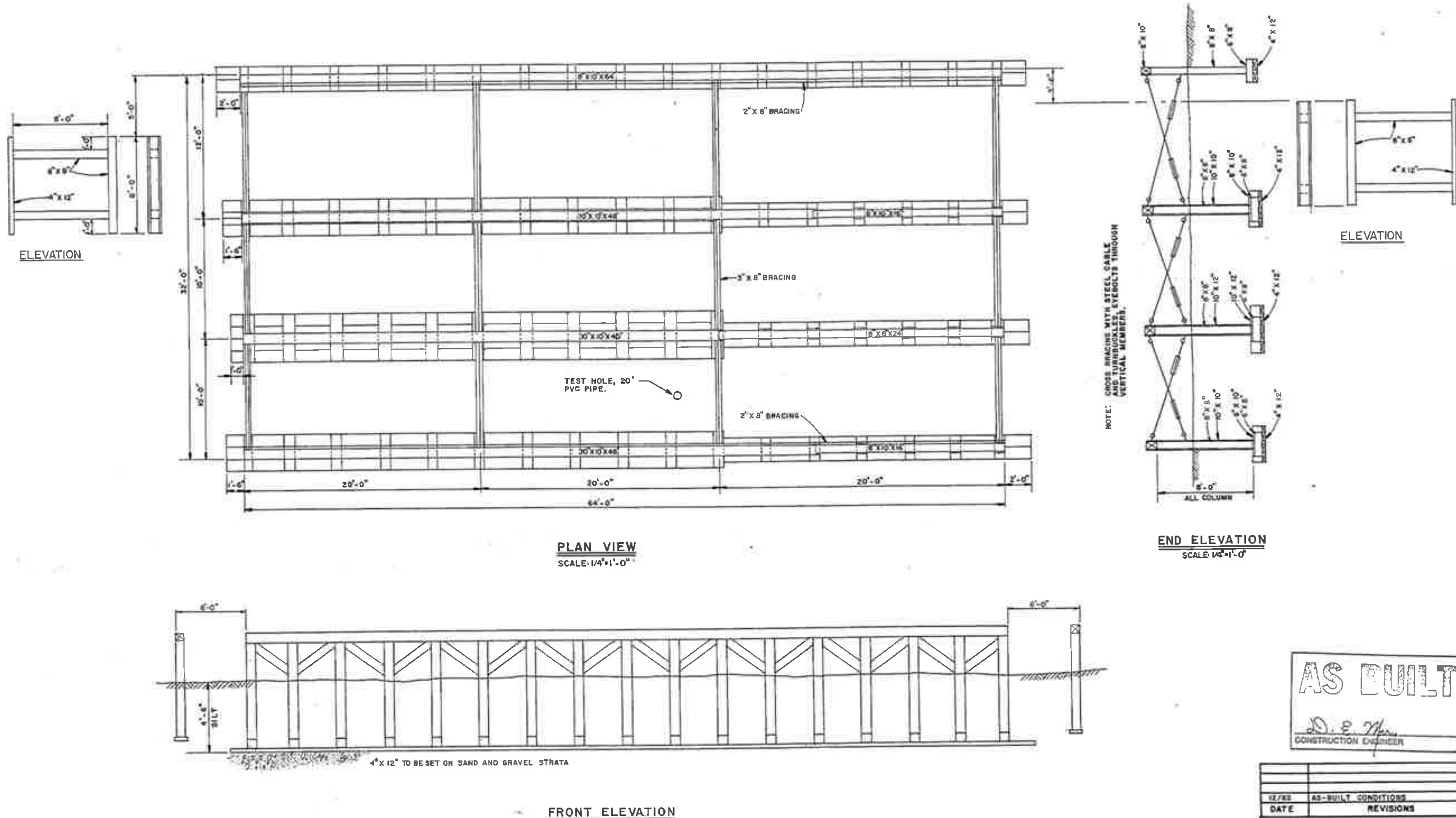
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

SHEET NO. 3 OF 30 TOTAL SHEETS

DRAWN BY: DRF DATE 4-15-81
CHECKED BY: DATE

Design Engineer
Maintenance Review
Material Take-off

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA



AS BUILT
D. E. [signature]
CONSTRUCTION ENGINEER

DATE	REVISIONS	INITIALS
12/82	AS-BUILT CONDITIONS	VKT

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

TULUKSAK, ALASKA
FOUNDATION FOOTING AND BRACING DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

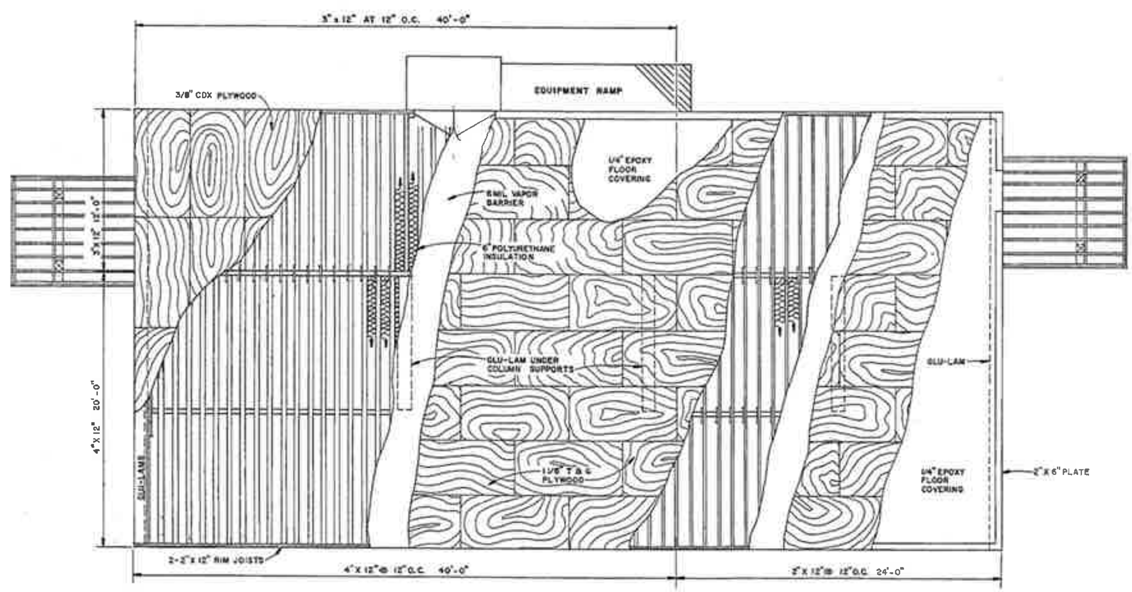
SHEET NO. 4 OF 30 TOTAL SHEETS

DRAWN BY: R. KIRSCHBAUM
DATE: FEBRUARY 1981
CHECKED BY: [signature]
DATE: 2/81

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

[signature] Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA 49th James L. Tlede CE 3325 REGISTERED PROFESSIONAL ENGINEER



FOUNDATION PLAN

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

AS BUILT

D. E. Moore
CONSTRUCTION ENGINEER

DATE	REVISIONS	INITIALS
12/82	AS-BUILT CONDITIONS	WKT

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

TULUKSAK, ALASKA

FOUNDATION PLAN
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

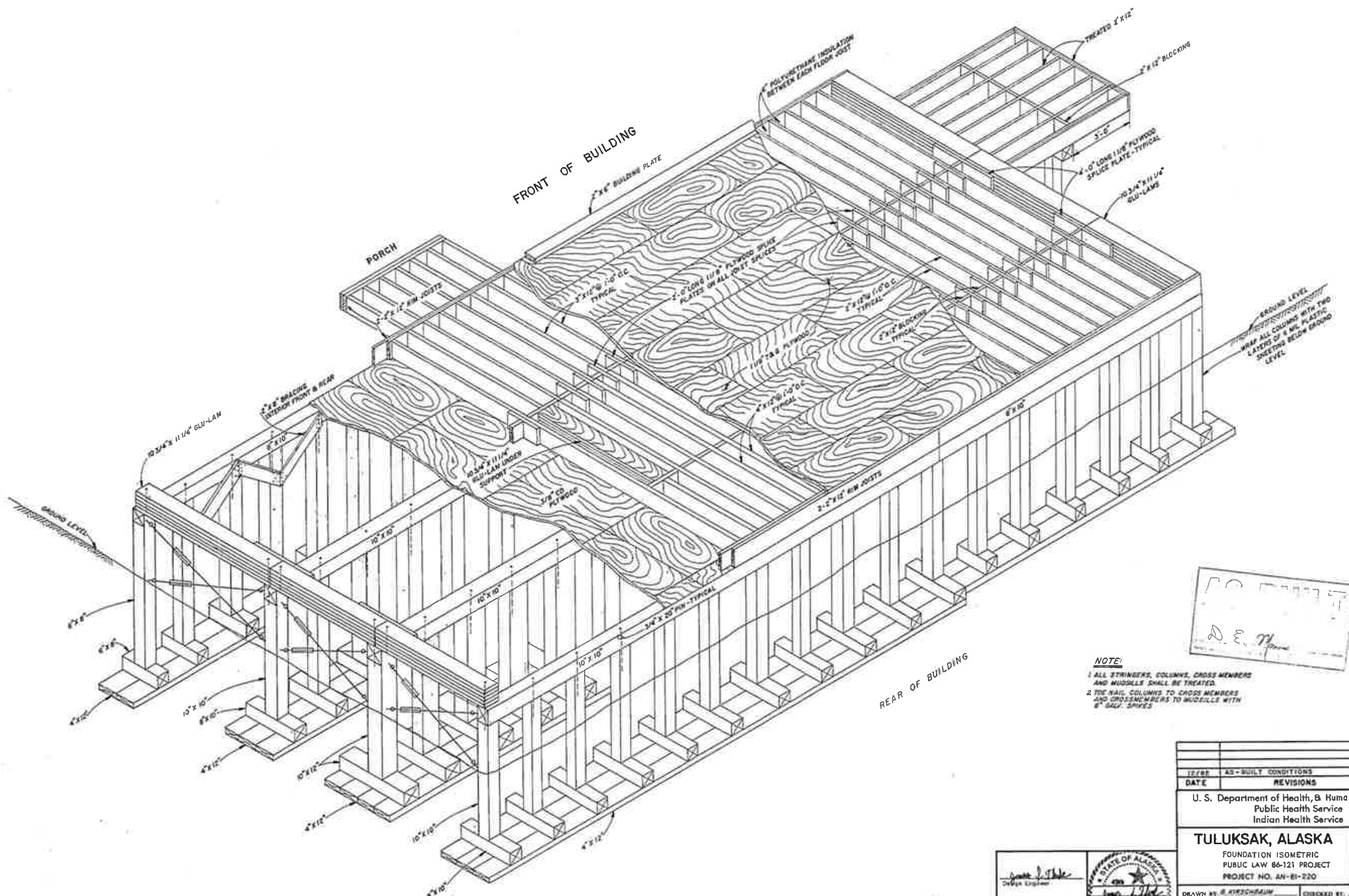
SHEET NO. 5 OF 30 TOTAL SHEETS

DRAWN BY: B. KIRSCHBAUM
DATE: FEBRUARY, 1981
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Design Engineer
Maintenance Review
Material Takeoff

STATE OF ALASKA
49th
James L. Thiele
CE 5025
REGISTERED PROFESSIONAL ENGINEER



NOTE:

1. ALL STRINGERS, COLUMNS, CROSS MEMBERS AND MUDSILLS SHALL BE TREATED.
2. TOE NAIL COLUMNS TO CROSS MEMBERS AND CROSSMEMBERS TO MUDSILLS WITH 6" GALV. SPIKES

12/82	AS-BUILT CONDITIONS	WKT
DATE	REVISIONS	INITIALS

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

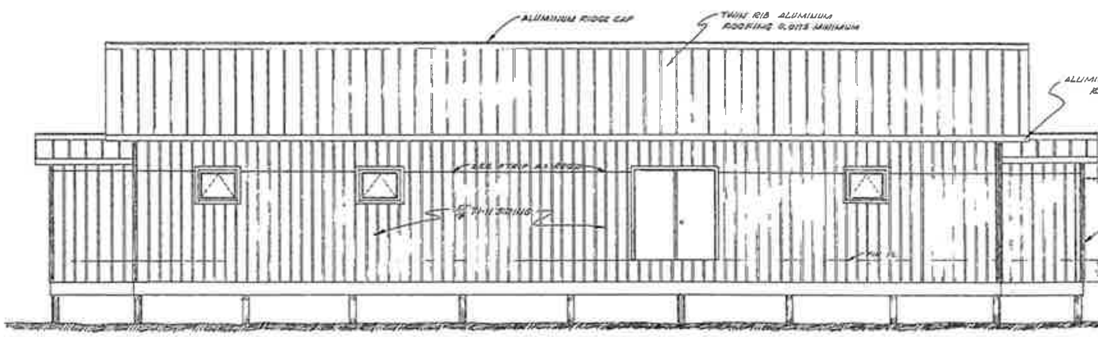
TULUKSAK, ALASKA
FOUNDATION ISOMETRIC
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

SHEET NO. 5 OF 30 TOTAL SHEETS

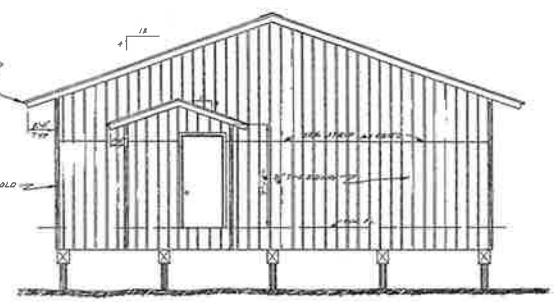
DRAWN BY: G. KIRSCHBAUM
DATE: FEBRUARY, 1981
CHECKED BY:
DATE:

Design Engineer
Maintenance Review
Material Take-off

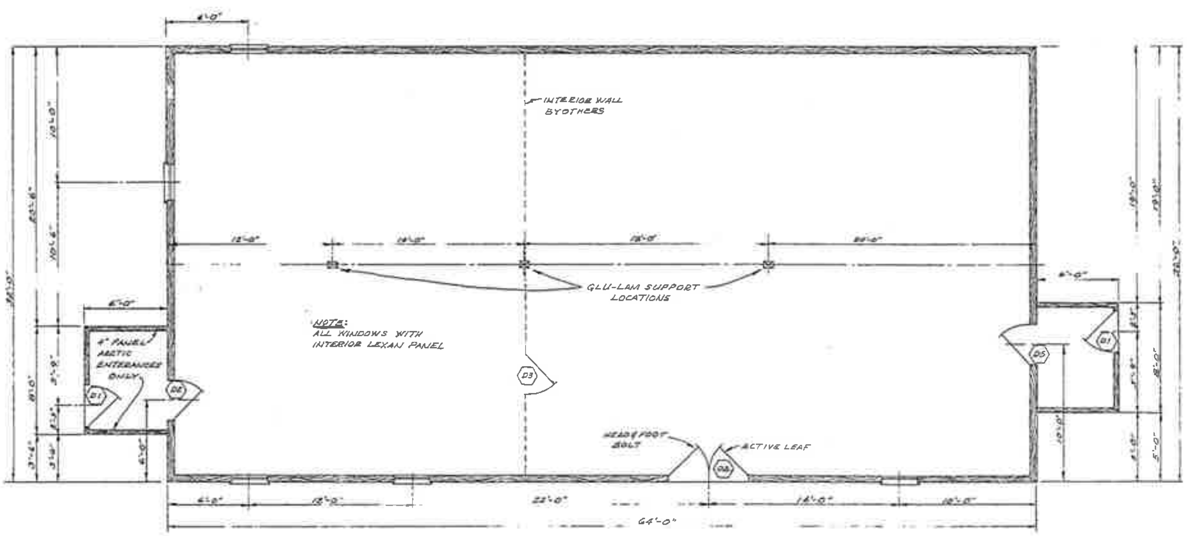
SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA



·FRONT ELEVATION·
SCALE 1/4"=1'-0"



·RIGHT END ELEVATION·
SCALE 1/4"=1'-0"



·FLOOR PLAN·
SCALE 1/4"=1'-0"

·DOOR SCHEDULE·

REQ'D	DOOR	TYPE OF DOOR	TYPE OF FRAME	TYPE OF HINGE	TYPE OF LOCKSET	DOOR CLOSER	TYPE OF THRESHOLD	TYPE OF DOOR BOTTOM	SWING	SEE DETAIL SHEET
2	D1	EXTERIOR	WOOD	EXTERIOR	ENTRANCE	YES	EXTERIOR IN-SWING	EXTERIOR	R.H.	A/3
1	D2	EXTERIOR	WOOD	INTERIOR	PASSAGE	YES	INTERIOR PANEL	EXTERIOR	R.H	C/3
1	D3	FIRE	METAL	INTERIOR	ENTRANCE	YES	INTERIOR	FIRE	L.H	D/3
1 SET	D4	EXTERIOR	WOOD	EXTERIOR	ENTRANCE	NO	EXTERIOR IN-SWING	EXTERIOR	DOUBLE	B/3
1	D5	EXTERIOR	WOOD	INTERIOR	PASSAGE	YES	INTERIOR PANEL	EXTERIOR	L.H	C/3

AS BUILT
CONSTRUCTION ENGINEER

NOTE:
LOADING CONDITIONS TO BE USE IN DESIGN OF BUILDING SHALL BE AS INDICATED IN SPECIFICATION AND AS FOLLOWS:
WALL LOADING: HORIZONTAL WIND LOADING OF 25 POUNDS/SQ FT, SEISMIC ZONE I
ROOF LOADING: VERTICAL LIVE LOAD (INCLUDING SNOW LOAD) OF 40 POUNDS/SQ FT SEISMIC ZONE I

DATE	REVISIONS	INITIALS
12/82	AS-BUILT CONDITIONS	WKT

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TULUKSAK, ALASKA
WATER TREATMENT PLANT
FLOOR PLAN AND ELEVATIONS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-80-320

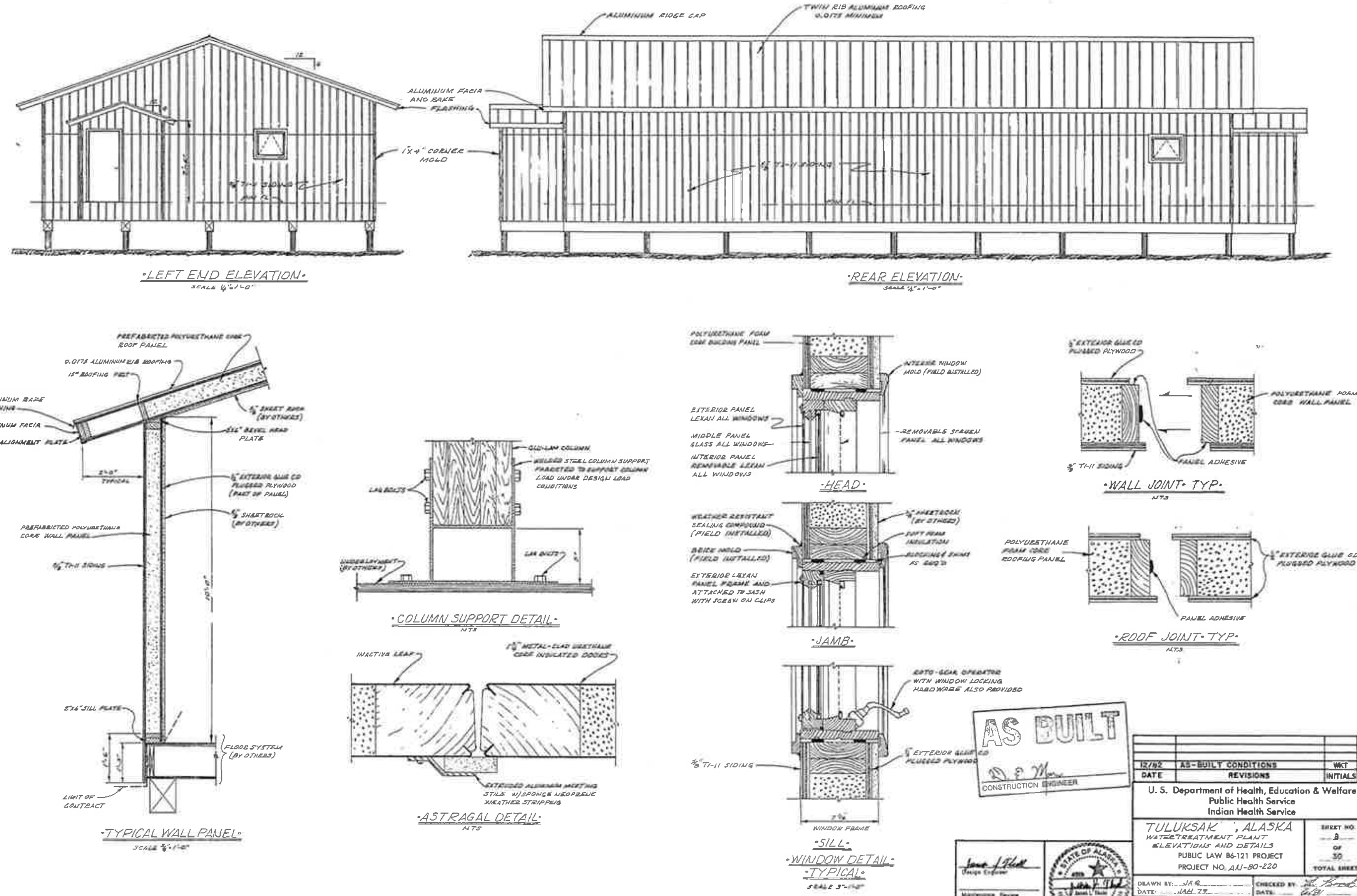
SHEET NO. 7 OF 30 TOTAL SHEETS

Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA

DRAWN BY: JRB
DATE: JAN 79
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA



12/82	AS-BUILT CONDITIONS	WKT
DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

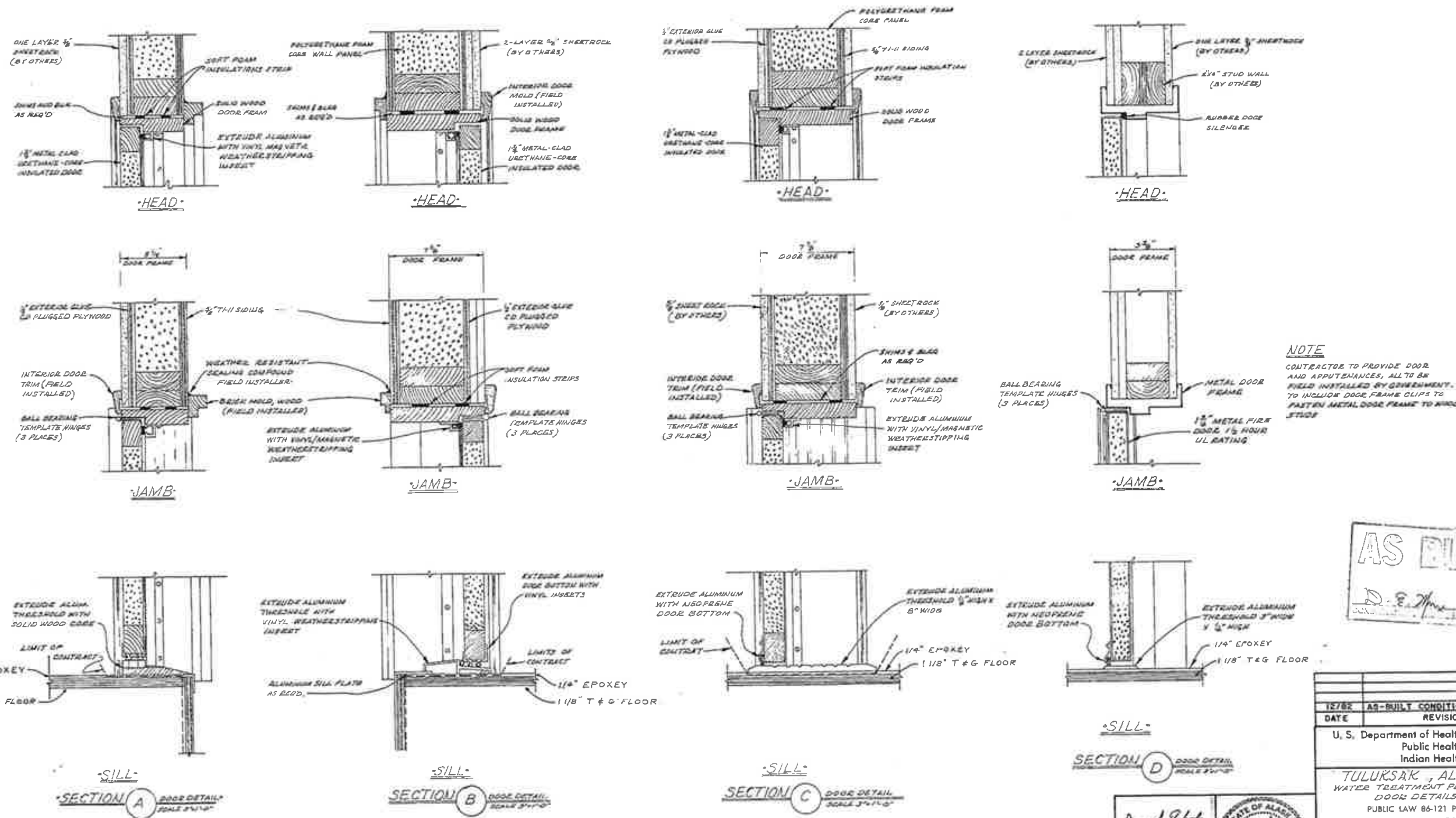
TULUKSAK, ALASKA
WATER TREATMENT PLANT
ELEVATIONS AND DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-80-220

SHEET NO. 8 OF 30 TOTAL SHEETS

Design Engineer
Maintenance Review
Material Take-off

DRAWN BY: JAR
DATE: JAN 79
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA



AS BUILT

12/82	AS-BUILT CONDITIONS	WKT
DATE	REVISIONS	INITIALS

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

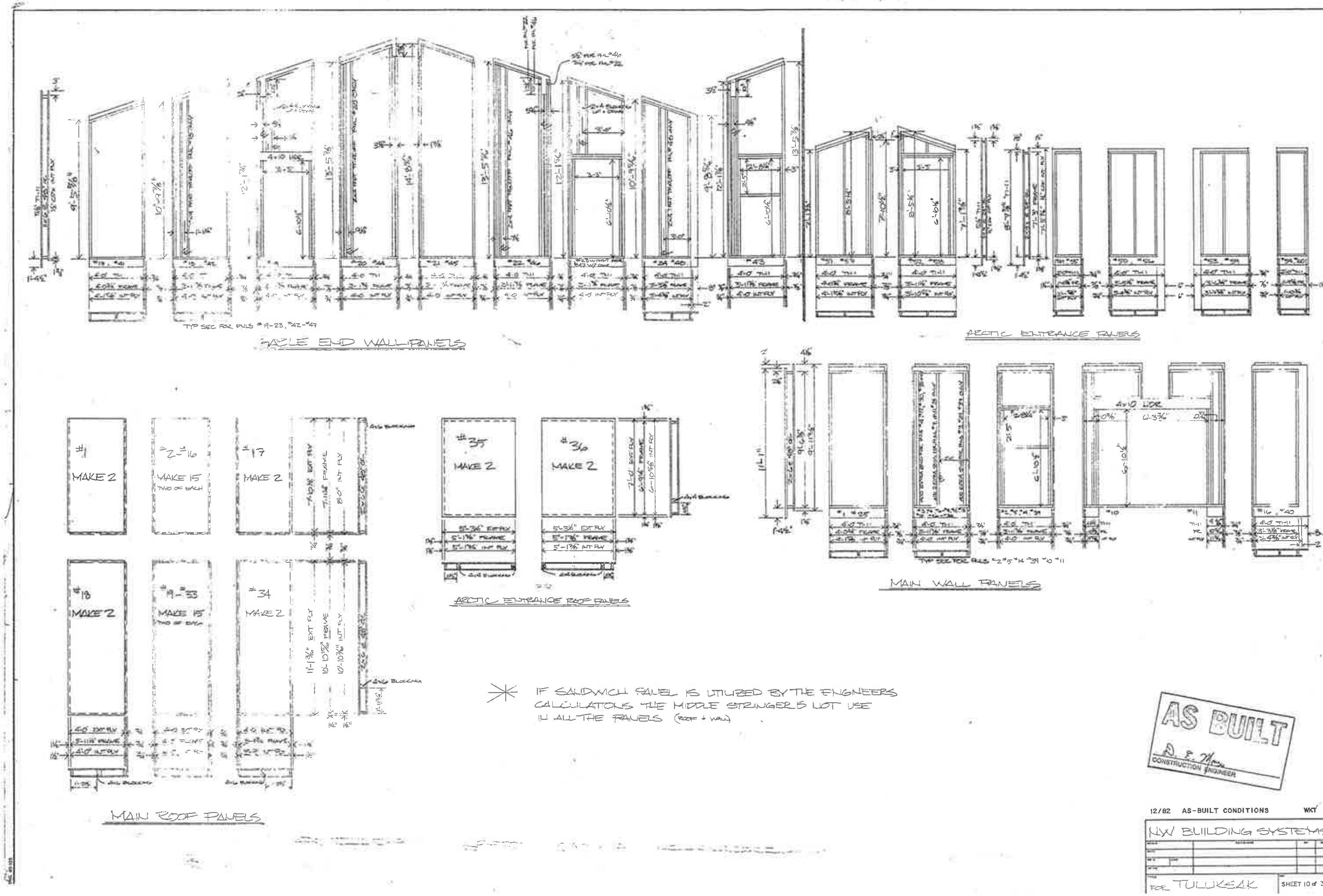
TULUKSAK, ALASKA
WATER TREATMENT PLANT
DOOR DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-80-220

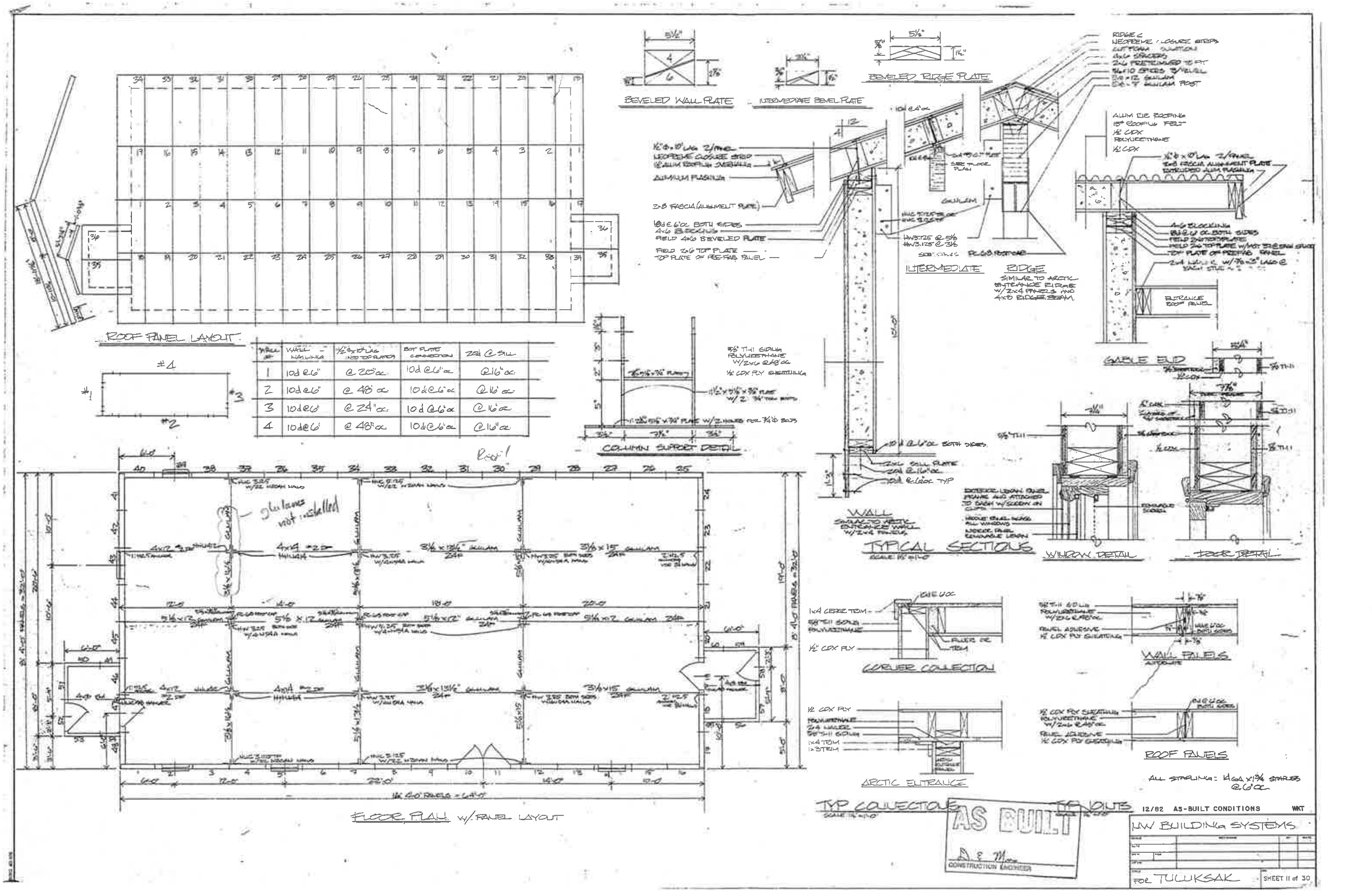
SHEET NO. 9 OF 30 TOTAL SHEETS

DRAWN BY: JAG DATE: JAN 79
CHECKED BY: DATE:

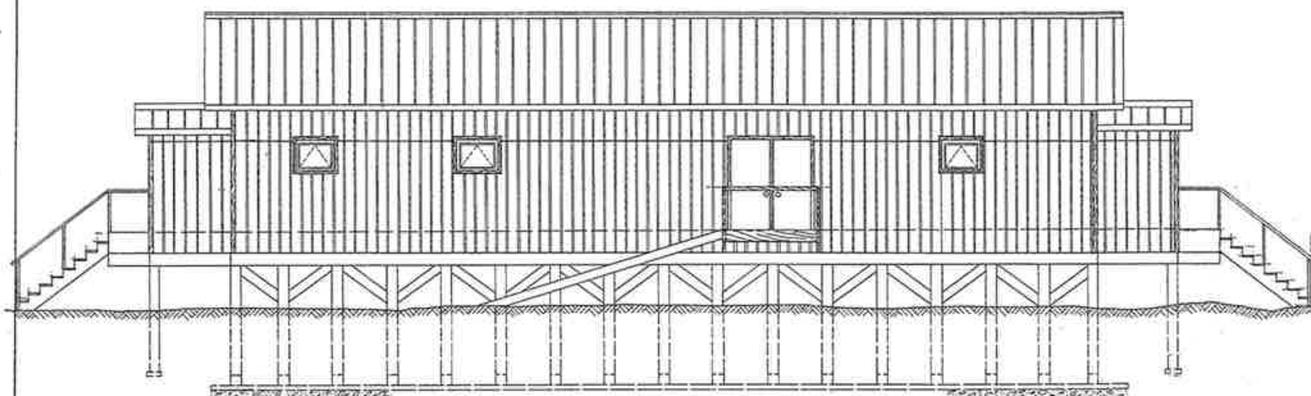
Design Engineer
Maintenance Review
Material Takeoff

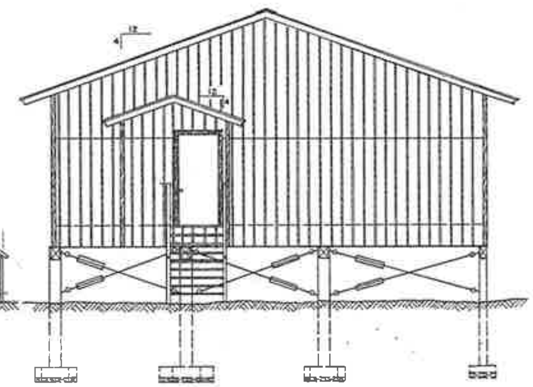
SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA


GABLE END WALL PANELS
TYP SEC FOR PNLS #19-23, #42-47
ARCTIC ENTRANCE PANELS
MAIN WALL PANELS
ARCTIC ENTRANCE ROOF PANELS
MAIN ROOF PANELS
#1 MAKE 2
#2-#16 MAKE 15 TWO OF EACH
#17 MAKE 2
#18 MAKE 2
#19-#33 MAKE 15 TWO OF EACH
#34 MAKE 2
#35 MAKE 2
#36 MAKE 2
IF SANDWICH PANEL IS UTILIZED BY THE ENGINEERS CALCULATIONS THE MIDDLE STRINGER IS NOT USE IN ALL THE PANELS (ROOF + WALL)
AS BUILT
CONSTRUCTION ENGINEER
12/82 AS-BUILT CONDITIONS WKT
NW BUILDING SYSTEMS
FOR TULUKSAK
SHEET 10 of 30

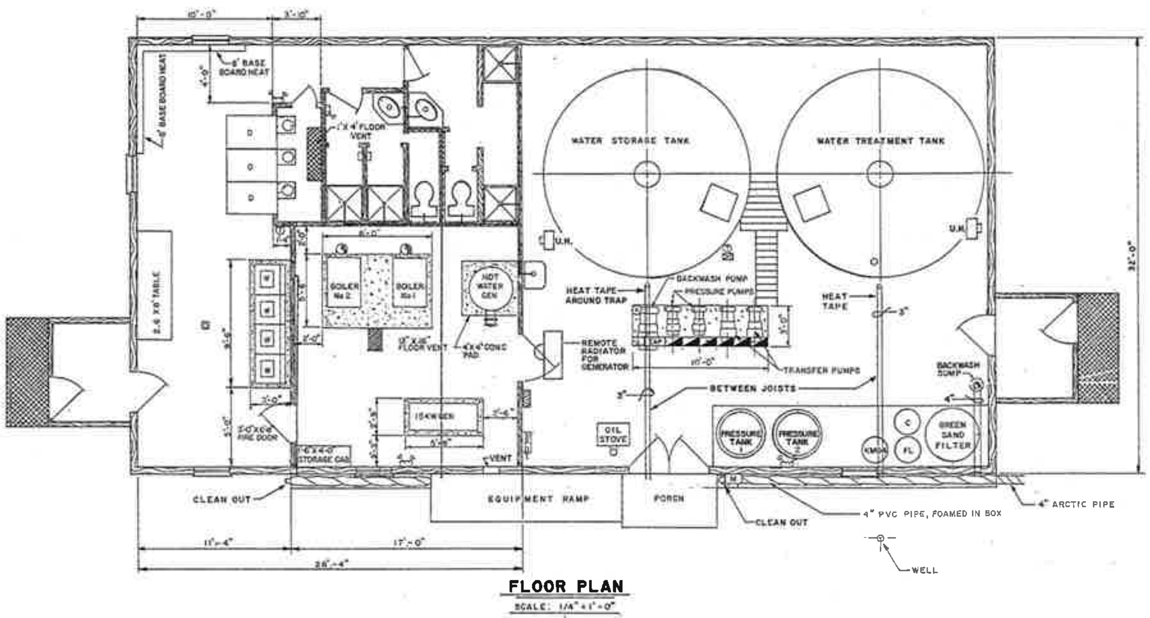


Wall #	Wall nailing	1/2"x10" lag into top plates	Bot plate connection	2x4 @ sill
1	10d@6"	@ 20" oc	10d @ 6" oc	@ 16" oc
2	10d@6"	@ 48" oc	10d @ 6" oc	@ 16" oc
3	10d@6"	@ 24" oc	10d @ 6" oc	@ 16" oc
4	10d@6"	@ 48" oc	10d @ 6" oc	@ 16" oc





NOTES
1. BOILER ROOM 1 LAYER OF 5/8" SHEET ROCK, 1 LAYER OF 24 GA. ALUMINUM.
2. VINYL COVERED SHEET ROCK IN SHOWER ROOMS AND IN LAUNDRY ROOM.
3. 6' SECTION OF BASEBOARD HEATER FOR FUEL OIL PREHEATER.



AS BUILT
CONSTRUCTION ENGINEER

12/82	AS-BUILT CONDITIONS	WKT
DATE	REVISIONS	INITIALS

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

TULUKSAK, ALASKA
WATER TREATMENT PLANT
FLOOR-PLAN AND ELEVATIONS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

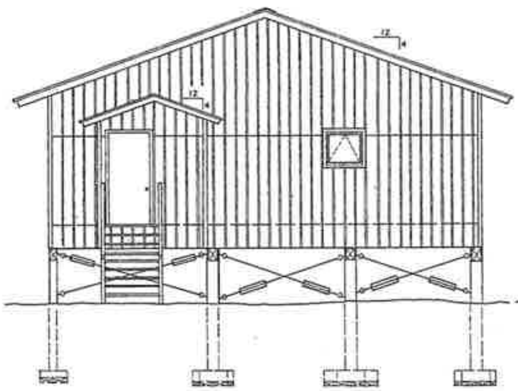
SHEET NO. 12 OF 30 TOTAL SHEETS

DRAWN BY: D. KIRSCHBAUM
DATE: FEBRUARY, 1981
CHECKED BY:
DATE:

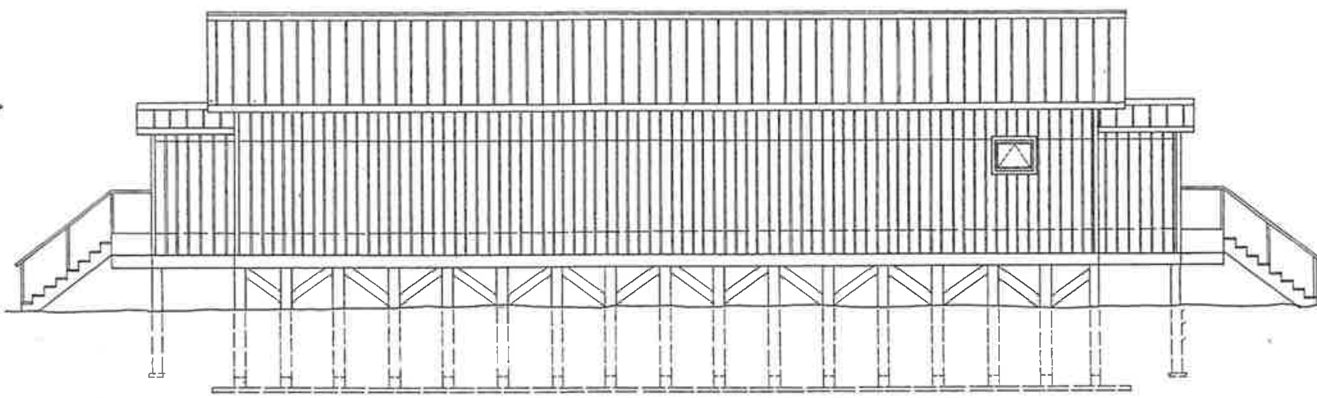
Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA



LEFT END ELEVATION
SCALE: 1/4"=1'-0"



REAR ELEVATION
SCALE: 1/4"=1'-0"

AS BUILT
CONSTRUCTION ENGINEER

DATE	REVISIONS	INITIALS
12/82	AS-BUILT CONDITIONS	WKT

U. S. Department of Health, & Human Services
Public Health Service
Indian Health Service

TULUKSAK, ALASKA
WATER TREATMENT PLANT
ELEVATIONS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-81-220

SHEET NO. 13 OF 30 TOTAL SHEETS

DRAWN BY: B. KIRSCHBAUM
DATE: FEBRUARY, 1981
CHECKED BY:
DATE: 6/81

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Design Engineer
Maintenance Review
Material Take-off

STATE OF ALASKA
49th
James L. Thede
CE 3635
REGISTERED PROFESSIONAL ENGINEER

EDC, INC **MEMORANDUM**

PREPARED FOR: Andrea Meeks, P.E. CRW Engineering Group

PREPARED BY: Kevin L. Hansen, P.E.

COPIES: File

DATE: February 15, 2013

SUBJECT: Tuluksak Site Visit Report - Jan 31, 2013

PROJECT: CRWTLT

A site visit was made to evaluate the condition of the Tuluksak WTP/Washeteria on Jan 31, 2013.

Attendees were:

Beverly Short – Project Manager, VSW
Jon Hermon – Project Manager, CRW
Andrea Meeks – Project Engineer, CRW
Bill McDonald – CRW Electrical Engineer, CRW
Kevin Hansen – Mechanical Engineer, EDC, Inc.
Ken Anderson – Structural Engineer, Reid Middleton
Bob White – Remote Maintenance Worker, YKHC

The group arrived in Tuluksak at approximately 1 PM, and met with city personnel at the City offices. Kevin, Bill, Ken and Bob went to the WTP/Washeteria while the others met with City personnel.

WTP Washeteria Evaluation

The facility was constructed in 1981-82 and is typical of other PHS designs in the same time period. Most of the mechanical equipment is original to the construction date, with a few exceptions. Carl, the water plant operator was very helpful in pointing out areas where he had problems or had repaired things to keep the operation going.

Laundry Equipment

The facility was designed with four washers, and three hydronic dryers, but has been modified from the original design either during the original construction or sometime afterward. The toilet/shower rooms now consist of two rooms with toilet, shower and lavatory in each, although the toilets are not currently installed or operational. The original second shower room shown on the plans has been converted to three clothes washer stations, although they are not currently operational. Of the four washer locations shown on the original drawings, three washers are still installed and assumed to be operational. The three original hydronic dryers have been replaced with two (stacked) hydronic dryers and three household style electric dryers. Neither of the hydronic dryers are operational having been abandoned in place, but the three household style dryers appear to be operational. With the substitution of electric dryers for hydronic dryers, the load has shifted from fuel consumption in the boilers to electrical consumption. Numerous clothes washers that are apparently no longer working are setting in various spots around the building.

Heating System

The heating system consists of two hydronic boilers, with two circulating pumps. The hydronic system serves baseboard heaters in the laundry and toilet areas, unit heaters in the treatment area, a domestic hot water generator. and the hydronic dryers that are still in place. At some point, a heating piping loop with circulation pump was installed to serve a heat exchanger to preheat raw water for treatment. There is also a small heat exchanger to provide freeze protection for the school and work camp service lines. None of the heat exchangers, including the domestic hot water generator tube bundle appear to be double-wall type to provide isolation between boiler water and potable water.

The two boilers are original to the facility. They are Weil McLain boilers, but the data plates have been removed. The assumption is that they are model BL-676, based on the drawings. That boiler series was discontinued in 1993, although some parts (such as intermediate sections) are still available. The boilers are significantly deteriorated, with corrosion on the supply nipples from leakage and potentially on the front cast iron sections (which cannot be replaced). They appear to be gas-tight between sections and both boilers and burners are operational. Carl reports that Boiler 1 doesn't sound right when firing, so probably needs a tune-up at a minimum. The barometric damper on Boiler 2 is incorrectly installed so cannot operate properly.

Piping near the boilers is deteriorating badly, with multiple joints starting to leak. The supply flange connections at both boilers have been replaced due to leakage, but copper sweat joints will either need to be re-soldered after disassembling and cleaning or the piping replaced. The hydronic system fill is water, and has no corrosion inhibitors as a glycol system would. The fill valve is maintaining steady pressure in the system, but the relief valve at the fill valve started leaking and was plugged by Carl to stop the leak. The relief valve is a redundant one, as the relief valves on the boilers are in place and so not appear to be leaking. However, relief valves should be tested or replaced on a regular basis (10 years maximum interval), and the service record of these is unknown.

Circulating pumps appear to be the originally installed pumps, as they match the equipment specified on the drawings. They appear to be operating properly, but are oversized since the hydronic dryers are no longer being used.

Baseboard heaters in the public area of the building have missing covers and the fins are badly damaged. The bent fins and lack of covers significantly reduces the capacity of the heaters. The unit heaters in the treatment area appear to be in reasonably good shape and are operating. They may need to be cleaned to remove dust and obstructions from the coils, but are otherwise serviceable.

The fuel supply pipeline has a leak where the piping first crossed under the building which should be fixed to reduce fire hazard and contamination of the nearby well.

Water Treatment

The water treatment system is a batch type treatment, with a well pump delivering water through the preheat exchanger to a pre-treatment tank (approximately 10,000 gallons capacity) after preheating and injection of treatment chemicals. The water is then pumped through a 4 foot diameter greensand filter, chlorinated, and stored in a treated water tank (also approximately 10,000 gallon capacity). Pressure pumps draw water from the treated water tank and deliver it to the fixtures in the building, a public watering point, and to the school and work camp. Two hydro-pneumatic pressure tanks are used for pump protection. A backwash pump also draws water from the treated water tank to backwash the filter. The backwash waste is directed to a 1000 gallon polyethylene tank, which then drains by gravity through an arctic pipe to discharge. The tank was added after original construction to regulate flow through the discharge line and prevent surges. The tank also receives water from a 1/4 HP B&G pump draining the pre-treatment tank. The pump has an estimated capacity of 60 to 80 gallons per minute, and is manually controlled to flush treatment residue from the pre-treatment tank.

The well pump was specified as a Sta-Rite VIP III 20, 5-stage, 1/2 HP submersible pump. It is unknown whether the original pump is still in place, but it is doubtful. The capacity, make and model of the existing well pump is unknown. The raw water heat exchanger that preheats the water for treatment is a plate and frame type. It may be double wall construction for isolation of the heating fluid from the water, but not likely. This is a potential source of contamination if a leak occurs in the heat exchanger. The treatment system transfer pumps are 3/4 HP PACO end suction centrifugal pumps, rated at approximately 35-40 gpm at 1750 rpm, however only one was operable. The pumps were either original to the facility or had been replaced with the same models as originally specified. The pressure pumps were originally specified as 1-1/2 HP PACO end suction centrifugal pumps, rated at approximately 50 gpm at about 25 psi boost at 3500 rpm. They had been changed to Goulds Model 3SVBK3 multi-stage vertical centrifugal pumps. Per catalog information, the currently installed pressure pumps are 3 HP, rated at approximately 55 gpm at 60 psi boost, operating at 3500 rpm, so they may be are oversized for the current application. Only one of the pressure pumps is operational. Carl indicated that seals had failed on the two non-working pumps. The motor data plates on the pumps have been removed, so motor sizes could not be physically confirmed. The backwash pump appeared to be the original 3 HP PACO end suction centrifugal pump delivering approximately 180 gpm at 45 ft head at 1750 rpm (based on catalog information).

The public watering point is not working, most likely due to a failed solenoid valve located in the attic space above the washeteria. The control box at the watering point also appeared to be damaged, as the pushbutton was missing.

Equipment Condition Recap

Boilers: Near the end of their useful life, with corrosion damage. Also oversized for the current load with hydronic dryers not operational. At a minimum burner tune-up is required.

Circulation Pumps: Operational but oversized for the current load with hydronic dryers not operational.

Baseboard Heaters: Operating at less than designed output due to damaged fins. Should be replaced.

Unit Heaters: Operational. Could probably operate for another 10 years with minimal maintenance, such as cleaning of coils and fan motor lubrication.

Domestic Water Heater: Operational, but uses a single wall heat exchanger bundle. Is original to the building, but may have another 8-10 years life remaining.

Well Pump: Operational, Condition and capacity unknown. A fuel piping leak nearby may eventually contaminate the ground water if not fixed.

Treatment Transfer pumps: Only one of the pair operating. Obsolete models and repair parts are difficult to obtain. Recommend replacement.

Pressure pumps: Only one of the pair operating. With repair of the inoperable pump, may have 10 years additional life. The piping configuration makes maintenance very difficult.

Pressure tanks: Operational. Probably have 10 years of life remaining.

Water Storage Tanks: Operational, however the treated water storage tank may have leakage. Should be tracked down and repaired if the facility is to remain in use.

Raw Water Heat Exchanger: Operational, although the controls are not operating correctly, wasting energy by running the glycol circulation pump continuously rather than only when needed to heat incoming water. Heat exchanger is single wall. Probably has at least a 10 year remaining life.

School and Camp Supply Line Heat Exchanger: Operational, although piping arrangement of the camp circulation pumps causes school water meter to turn backward. Heat exchanger is single wall.

Washeteria equipment and facilities: Limited operation capability. Equipment is used hard and maintenance is difficult. Hydronic dryers in place but non-operational. Toilet and shower facilities are not operational and significant expense would be required to restore the facility to full operation to serve the villages laundry needs.

AVEC Waste Heat

Bill McDonald and I visited the AVEC power plant to check for potential for waste heat utilization.

We discovered that Waste Heat equipment had been partially installed. The system consisted of an Ameridex plate-and-frame type heat exchanger using a pumped branch from the engine cooling lines on the hot side, and two branches with pumps on the cold (output) side of the heat exchanger. The hot side supply to the heat exchanger uses a Grundfos UP 50-75F pump, with a nominal capacity of 20-25 GPM. One output side branch (3/4-inch size) serves the power plant itself with a Grundfos Model 15-42SF pump delivering glycol to unit heaters in the plant and is in operation. The other branch is 2-inch size with duplex Goulds 2SVB, 2-stage, 3/4 HP, 480/240V 3-phase pumps. The pumps have a capacity somewhere between 10 and 40 GPM. The branch piping is valved off and stubbed out to the building exterior. The Goulds pumps are not connected, nor are controls for the 2-inch branch. Duplex PEX piping is routed under the road adjacent to the power plant, but not connected at either end. Assuming a 20 degree temperature drop on the hot side of the heat exchanger, approximately 180,000-200,000 BTUH of waste heat could be utilized.

We departed Tuluksak at approximately 4 PM.

Tuluksak Site Visit - 1/31/13 Photos

View of Boilers with leaking piping and deteriorated piping insulation

Tuluksak Site Visit - 1/31/13 Photos

Close-ups of copper boiler piping with corroding, leaking joints

Close up of corroded boiler supply nipple.

Boiler and Circulation Pump

Baseboard heaters with missing covers and damaged fins.

Tuluksak Site Visit - 1/31/13 Photos

Domestic Water heater with original single wall heat exchanger bundle.

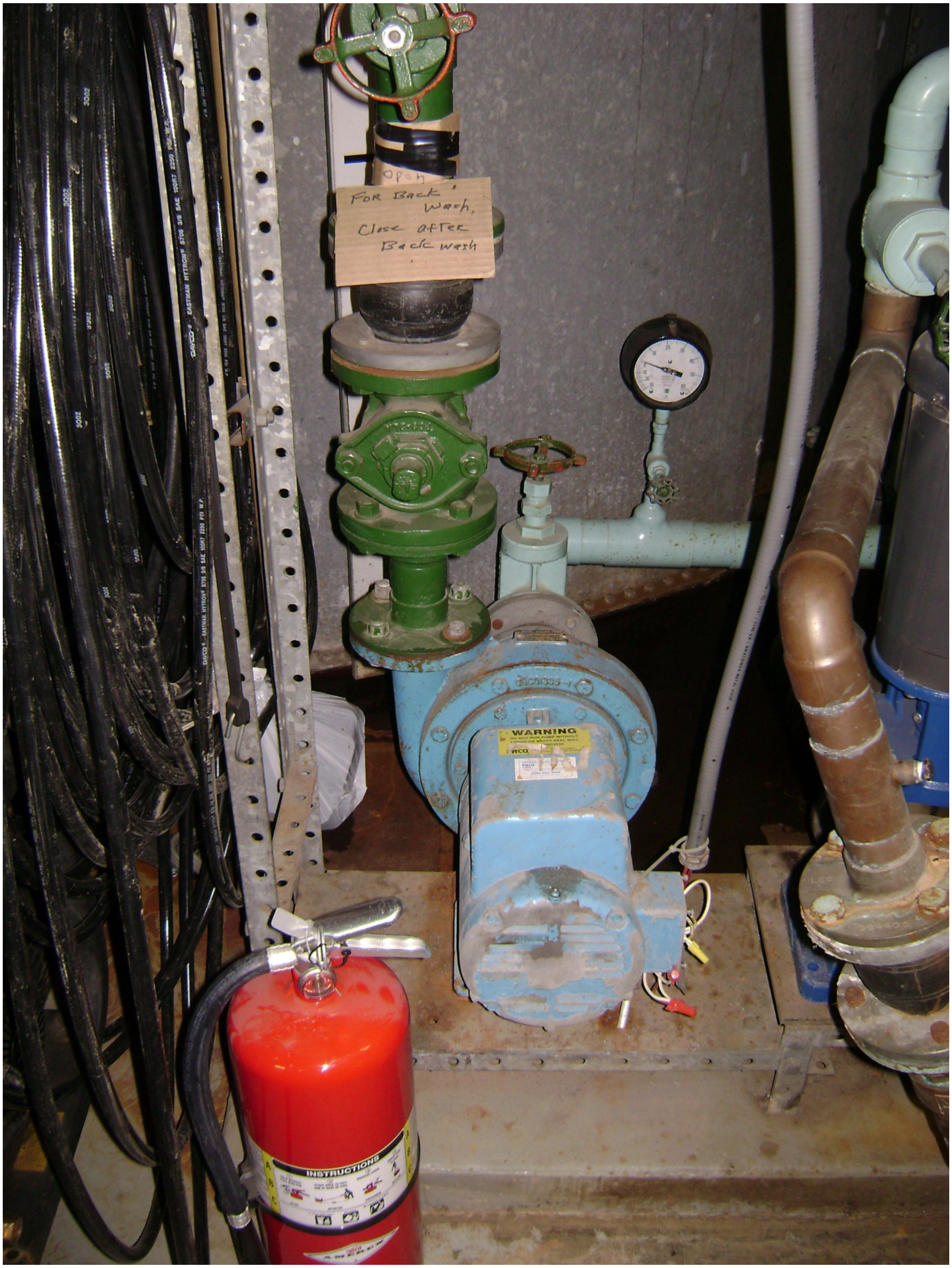
Tuluksak Site Visit - 1/31/13 Photos

Photo of leaking fuel supply piping – Well pump is in the background to the left. Leak is at union about 4 ft from elbow.

Washeteria area. Two unoccupied washer connections at right. Two stacked dryers are inoperable

Tuluksak Site Visit - 1/31/13 Photos

Typical Toilet/Shower room. Toilets not connected.



Backwash pump

Tuluksak Site Visit - 1/31/13 Photos

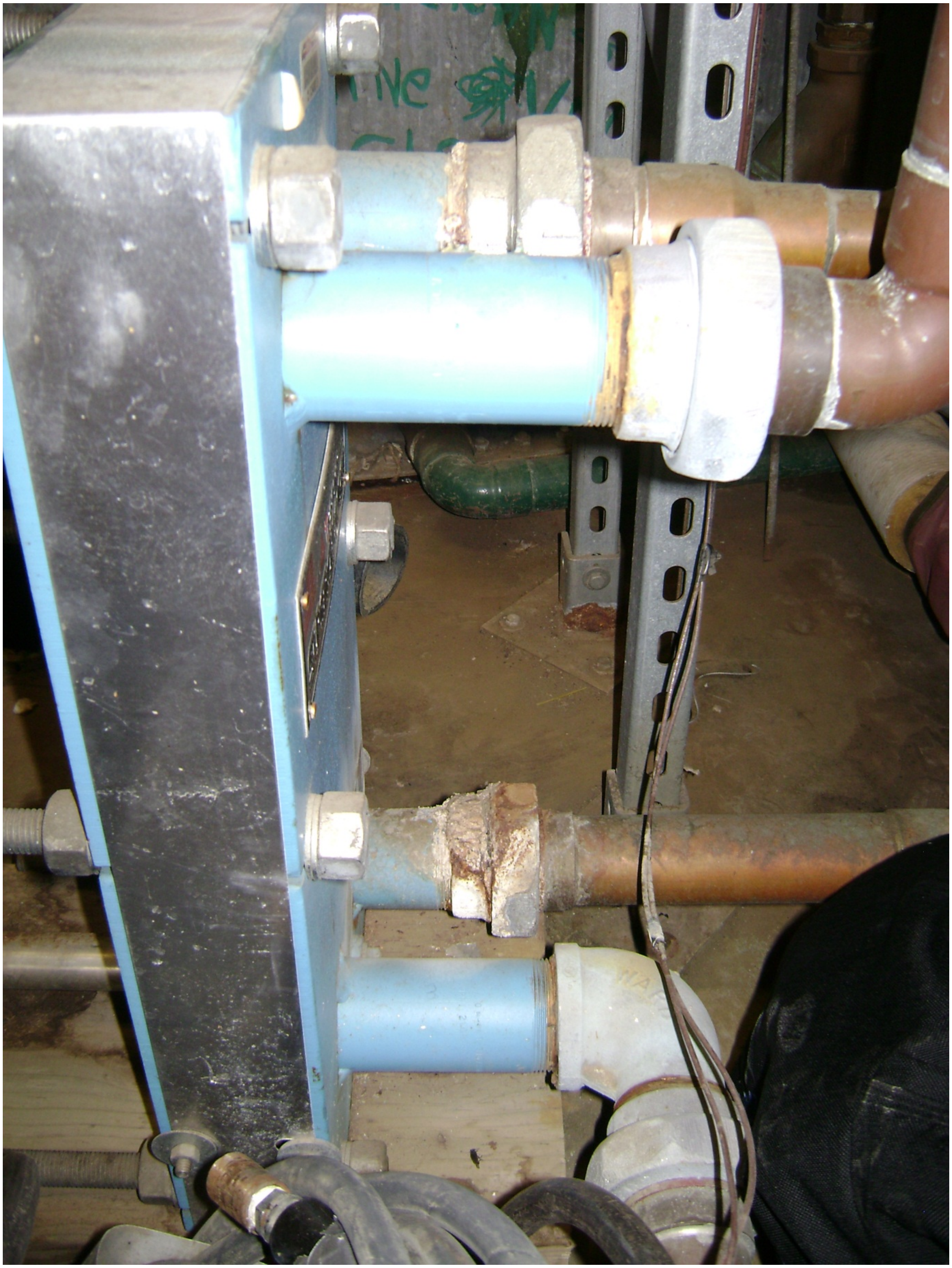
Pressure pumps (right two). One is not working. Note piping obstructing pump maintenance.

Treatment Transfer Pumps (right two). One is not working

Treated water tank corrosion. Tank has been lined, but water still appears on floor underneath

Tuluksak Site Visit - 1/31/13 Photos

School and Work Camp (smaller) water lines thru floor. Raw water tank drain line pump at left.



Raw Water Heat Exchanger.

Tuluksak Site Visit - 1/31/13 Photos

Open connections at Backwash drain line. Line is broken at exterior of building wall

Tuluksak Site Visit - 1/31/13 Photos

Leak at backwash drain piping from outside.

Tuluksak Site Visit - 1/31/13 Photos

AVEC Waste Heat equipment

Tuluksak Site Visit - 1/31/13 Photos

Circulation pumps for Waste Heat supply. Note pumps and control valve at upper right not connected to power. Pump in background is hot side circulator for heat exchanger.

Tuluksak Site Visit - 1/31/13 Photos

Waste Heat Piping conduit at exterior of power plant.

Waste Heat Piping conduit on opposite side of road from power plant.

TRIP REPORT

CRW Engineering Group
3900 Arctic Blvd. Suite 203
Anchorage, AK 99503
(907) 562-3252 FAX 561-2273

DATE: Jan 31,2013

PROJECT: Tuluksak Feasibility Study (CRW 20093.00)

LOCATION: Tuluksak, Alaska

REPORTER: William McDonald P.E, Electrical Engineer, CRW

PURPOSE: Site Visit – Condition Survey

CONTACTS:

Beverly Short	VSW Program Manager
Jon Hermon	CRW Project Manager
Andrea Meeks	Tribal Council Chief
Bob White	Remote Miracle Worker
Ken Anderson	Reid Middleton
Kevin Hanson	EDC

ACCOMPLISHMENTS:

The following objectives were accomplished during this trip:

- Investigate and document the electrical systems in the WTP/Washeteria
- Investigate and document the partial installation in the Power Plant.

BACKGROUND:

This trip was my first trip to Tuluksak. The information obtained during condition survey and installation documentation are intended to be used for the feasibility study and in the event the existing facility is to be upgraded (as opposed to replaced) it will be used as a basis for the design effort.

ACTIVITIES:

On Thursday Jan 31, 2013 I traveled with the above mentioned personnel from Anchorage to Tuluksak via Bethel. Weather delays in Bethel postponed the scheduled departure of the 1-day trip reduced time on site, however the site survey mission was able to be completed.

OBSERVATIONS:

WATER TEATMENT (WTP) / WASHETERIA

Electrical Service:

The facility is served via an overhead service drop. A pole mounted transformer which is shared with two other structures.

The incoming supply is 120/240V single phase. The building main consists of a 200A meter / main combination and is rated at 200A. The building main disconnect is inaccessible due to a collapsed landing.

Standby Generator:

A diesel-fired 20kW/20kVA, 120/240V generator, located in the boiler room provides standby power to the facility. It appears to be in good shape but we did not have time to operate it.

Electrical Distribution:

The generator output serves a 60A breaker located adjacent to the generator and then is routed through a 70A fused switch located in the office.

The 200A service and the 70A generator supply are terminated in a 100A rated transfer switch. Which in turn serves a 225A rated, 42 space panelboard that powers the water treatment plant..

Another 100A rated 16 space panel is connected directly to the transfer switch on the same lugs as the 200A service. This panel serves the washeteria.

Controls and Alarms

There is no central control panel. Each system is individually controlled using discreet components.

Pressure pumps – There are two pressure pumps. They are operated as MAIN /STANDBY and only one runs at a time. A single differential pressure switch is manually switched between the pump motor starters to allow automatic operation.

Chemical Injection – A flow switch controlled receptacle is provided for the operation of the chemical injection system. Other chemical injection in use at the time of the inspection (pre-treatment) was manually operated.

Pre-Treatment – VFD controlled mixers are utilized for chemical dispersion and aeration and are manually operated.

An alarm panel in the mechanical room, intended to monitor building temperature and pressure is installed but is not operable. Based on a design no longer in use, the panel is powered from a 12VDC emergency light power supply. The panel does not meet code as it is not Listed.

General Electrical

Lighting consisted of Fluorescent fixtures. Where diffusers were damaged or missing it was noted that the newer more efficient T-8 lamps were in use, however, as was mentioned – there were several fixtures with broken or missing parts. The lighting appeared marginal in corners and at the pretreatment areas but adequate in the vicinity of the controls and major electrical components.

Wiring is installed in general in a combination of 4"x 4" wireways that run along most of the walls in WTP with EMT risers and Liquidtight Flexible Metal Conduit (LFMC) to devices and equipment.

The major motor controls are installed on a plywood rack centrally located above the pumps they control, the (2) exceptions being the VFDs that operate mixers in one of the Pre-Treatment tanks.

CONDITION SURVEY

Although not an electrical item per se, it was noted that almost all of the motor placards have been removed (and discarded ?) and a blue sticker with undecipherable letter and number designations have been provided in their place. An effort to restore the original pump information will go a long way in allowing proper replacement.

Service and Distribution

The Main disconnect is inaccessible due to a collapsed landing. This condition appears to have existed for some time as the main doors leading to the landing have been blocked off and the vestibule area used for permanent storage. This is a violation of NEC 110.16 access NEC

The 200A rated Main feeder exceeds the rating for the 100A transfer switch. This is a violation of NEC 110.3 and due to its height NEC 240.24.

Both the Fused Disconnect for the generator supply and the Manual transfer switch are located over a desk – they are not accessible per NEC 110.16. (NOTE: the 225A distribution panel located adjacent to the transfer switch does have clearspace.)

The feeders from the service and the standby generator are incorrectly color coded with White insulated conductors used for HOT legs with marking tape only to identify that they are not grounded conductors.

The Washeteria feeder is tapped at the manual transformer on the same lugs as the incoming utility service conductors. The lugs are not rated for multiple conductors. NEC 110-3 violation.

The standby generator is not UL Listed – it is listed for use in Canada only.

Controls and Alarms

The alarm panel is not listed and is in poor condition.

The pressure pump controls are only MAIN / STANDBY – originally Lead Lag was employed but the second pressure switch was inoperative.

As the rated pump motor currents could not be ascertained (see first paragraph under CONDITION) These values should be verified. NOTE : No overload trip problems were brought to our attention.

Wiring Methods

Most of the conduits in the WTP show varying degrees of corrosion – some completely corroded over 100% of the surface. The integrity of the conduit as a grounding system MAY be compromised at couplings and connectors..

The wiring methods in the washeteria utilize flush devices and surface mounted lighting is in poor condition. Receptacles accessible to the public should be GFCI type.

RECOMMENDATIONS

The following items should be addressed in order to bring the facility up to code and return it to the original operating conditions. If all of the recommended mitigation measures are employed approximately 60% of the electrical will need to be replaced/rewired. The major work will be in the replacement of the service and distribution and electrical wiring.

1. Provide new landing and access to the building Main.

2. Replace the 100A transfer switch with a 200A rated unit and re-install the conductors with proper color coding.

3. Provide overcurrent protection for the Washeteria panel feeder and tap the incoming service properly.

4. Provide a Feeder One Line diagram to permit proper operation.

5. Replace heavily corroded conduits. Provide additional protection (paint) or use PVC to

mitigate corrosion.

6. If after any system upgrades, the generator is still adequately sized, confirm with State Inspector that the generator can be used if provided with Ground Fault protection in lieu of UL listing.

7. Provide new (listed) alarm panel with outside dialer for notification.

8. Replace Lead Lag pressure pump controls.

9. Somehow figure out what the pump motor ratings are and provide pseudo placards to replace the ones removed – verify overloads are properly sized.

POWER PLANT

CURRENT INSTALLATION

There is no electrical provided for the installation of the pumps and controls currently installed (but obviously never run).

RECOMMENDATIONS

A new 480/3 panel and distribution to serve the motors should be installed with a 5 or 7.5 kVA unit substation for the 120V control and instrument supply. The existing 480 Station service could be tapped for this or if separate metering is called for a new METER/MAIN/DISTRIBUTION panel installed.

END OF REPORT