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WATER SYSTEM FEASIBILITY STUDY

Southwood Park Water District

July 2024

Southwood Park Water District
P.O. Box 2024
Lake Oswego, Oregon 97035

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OPERATIONS AND MAINTENANCE
provided by

HILAND WATER

Prepared By:

PACE

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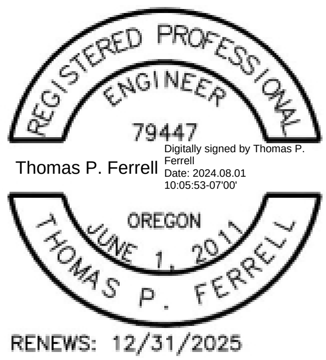
PROJECT CERTIFICATION

The technical material and data contained in this report was prepared by PACE Engineers under the supervision of the below-listed individual. Those responsible staff members who are registered professional engineers are licensed in the State of Oregon.



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SOUTHWOOD PARK WATER DISTRICT
WATER SYSTEM FEASIBILITY STUDY

1. INTRODUCTION

1.1 Location

Southwood Park Water District (District) is in the unincorporated northwest corner of Clackamas County, just east of Interstate 5 (I-5). The District is bounded by the City of Lake Oswego to the south and east, Washington County to the west, and the City of Portland to the north. Two assessor's maps showing the north and south halves of the District are included in Appendix A, along with survey plats for the District.

1.2 Population and Area Characteristics

The estimated 2022 population of Southwood Park is 724 people based on 298 customer connections, residential zoning, and 2020 US Census data for Lake Oswego, indicating an average of 2.43 persons per household.

1.3 Water Master Plan Status

Per Oregon Administrative Rules (OAR) 333-061-0060(5)(a), Water Master Plans are now only required for communities with 300 or more service connections (or a population of more than 1000 people); the District currently has 298 metered water connections and, therefore, is not required to have a Water Master Plan. As part of a funding application process, funding agencies generally require a master plan, or a feasibility study prepared by an engineer, as a basis for determining the improvement recommendations and associated opinions of probable cost. This water system Feasibility Study will serve in this capacity should the District pursue state or federal funding for the recommended improvements.

1.4 Water System Background

Southwood Park's water system dates to 1954-1955. The District's well was constructed in April 1954, but a water right was not applied for until August 1994. The system has received periodic maintenance but no large-scale replacement or upgrades of key facility components (well, reservoir, or water mains). The Oregon Health Authority (OHA) public water system identification for the District is PWS ID 00638.

A more detailed background description is included in a 2018 District memo included in Appendix B.

1.5 Current Issues

1.5.1 Overall System Assessment

The water system has exceeded typical design life expectations for many of its components but is still functional. Several studies and updates have been completed in the last 14 years:

- Southwood Park Water District Capital Improvement Plan, Tualatin Valley Water District, October 2010 (included in Appendix C).
- Hiland Water letter to Phil Kubischta, April 30, 2019 (included in Appendix D).
- Southwood Park Water District Preliminary CIP Planning – Alternatives Analysis, Special Districts Association of Oregon (SDAO), February 20, 2020 (included in Appendix E).
- PACE Engineers – Southwood Park Water District – Well Pump Assessment, Schneider Water Services, July 12, 2022 (included in Appendix F).
- Technical Memorandum: Southwood Park Storage Tank Structural Analysis, PACE Engineers, July 30, 2024 (included in Appendix G).
- 144KG Steel Standpipe Report, MIT Diving and Coating, March 3, 2023 (included in Appendix H)

These documents have recommendations for comprehensive improvements or future actions, but to date no actions have been taken aside from emergency repairs and routine maintenance.

1.5.2 2024 Emergency Well Repair

The January 2024 winter storm resulted in numerous repairs for the District. The pump station lost power for a few days, and Hiland repaired leaks that occurred. When power was restored to the pump station, the direct-on-line contactor failed, which resulted in the well motor failure. This was investigated by Cundiff Engineering, and the motor failure was due to improperly sized overload protection. Properly sized overload protection could have prevented motor failure, even with the failed contactor. It was unclear why the contactor failed, but it was possibly due to its age.

In order to remove the submersible motor, many well components were removed as well. The discharge head, drop pipe, check valves, and pump end were all found to be in deteriorated condition, and all these parts were replaced (in addition to the motor) by Schneider Water Service. Descriptions of the assessments and work performed are included in these documents.

- PACE Engineers - Southwood Park Water District – Pump Station Study, Cundiff Engineering, February 13, 2024 (included in Appendix Q).
- Well and Pump/Motor Rehabilitation, Schneider Water Services, February-March 2024 (included in Appendix F).

These recent emergency repairs could become more common for other similarly-aged elements of the water system. As noted above, many water system components are at or beyond their useful life, and replacement or repair can be costly for the District, both due to the work itself and the potential need to purchase water from the City of Portland until the water system is back online.

1.6 Feasibility Study Scope

The overall goal of the Feasibility Study (Study) is to do a comprehensive analysis of the District's water system, including a source and water rights review, production and consumption data analysis, water system assessment, and, ultimately, prioritized list of Capital Improvement Plan (CIP) projects. Prior studies and assessments evaluated system components and listed recommended improvements but did not include a planning analysis. The planning analysis is included within this Feasibility Study, and other analyses are intended to supplement those done previously. A key goal of the Feasibility Study is to develop recommendations for large-scale projects with opinions of probable cost to allow the District to apply for low interest loans/grant funding to implement (design, bid, construct) the recommendations. The exact scope and detail of the CIP projects is to be worked out in preliminary design.

1.7 Planning Period

This study uses a 20-year planning period (through the year 2044). Given that the District is essentially built-out, it is likely that the plan will be applicable past that timeframe, though unforeseen changes are always possible.

1.8 Authorization and Funding

Southwood Park Water District authorized PACE Engineers to prepare this Feasibility Study on March 16, 2022. Preparation of this document was funded entirely with District funds.

2. EXISTING SYSTEM

2.1 Existing System Description

The existing water system (primarily) consists of one well, chlorine injection chemical feed equipment, one reservoir, a flow meter vault, and a distribution system (waterlines, valves, fire hydrants, water meters, etc.). The system dates from the 1950s when the north half of the District was first built. A more detailed description of system components is provided in the following subsections. Figure 2-1 shows a plan view of the water system. Maps from prior design and study efforts are provided in Appendix C and in Appendix I.

2.1.1 Source and Supply

The District's well is located at the northwest corner of the District (see Figure 2-1) on the same property as the storage reservoir. Well and well pump data are summarized in Table 2-1. The District's water right for the well is summarized in Table 2-2.

Table 2-1: Well and Well Pump Data Summary

Item	Details
Date Well Constructed:	April 1954
Depth:	838 ft.
Casing:	12" diameter to 450 ft depth
Static Water Level:	222.3 ft
Pump (Submersible):	Goulds 7CHC, 4 stage, 4.75" impeller trim, 6" discharge, 8" motor bracket; Serial Number MG4537
Pump Motor:	Franklin Electric Sandfighter 8" motor, 50 Hp, 460 volt, 3-phase (Model 239601851)
Capacity:	400 gpm @ 367 TDH
Current Pump/Motor:	Installed in 2024

Table 2-2: Water Right Summary

Item	Detail
Certificate #:	89536
Permit #:	G-12835
Application #:	G-13768
Priority Date:	August 11, 1994
Allowed rate:	1.05 cfs
Allowed use:	Domestic use for up to 300 households
Additional information on the well and associated water right is included in Appendix J.	

Since 2004, annual well water levels have ranged from 205 to 212 feet below ground surface, with an average over the same period of 209.4 feet. Prior to 2004 data show considerable variation, which may reflect measurement errors. An airline was used for measuring prior to 2004 levels; an electric tape was used for measurements starting in 2004. Well water level data are included in Appendix K.

The District also has an emergency intertie to Portland's water system, supplied by a 2-inch meter located in a vault on SW 62nd Avenue, just north of the District. The intertie is only manually operated. The intertie was tested in November 2022 by Portland to confirm it remained operational. It was utilized to serve the District from January-April 2024 following the motor failure of the well pump.

2.1.2 Well House and Treatment

Inside the well house, there is 6-inch diameter piping connecting to the discharge head of the well. Both the inlet and outlet piping to the reservoir connect under the east wall of the well house. There is a 6-inch diameter bypass valve, that allows the well to supply the distribution system directly without flowing through the reservoir. Additionally, there is a 4-inch diameter blow-off valve that allows the well to be purged and not supply the reservoir or water system. All piping and valves in the well house are heavily corroded. It is unclear if the bypass valve is still operational.

Treatment is limited to disinfection with chlorine (sodium hypochlorite). The hypochlorite tank and metering system are located in a separate chlorine room of the well house. Due to chlorine off-gassing, significant corrosion occurred to the piping and valves in the well house. Consequently, around 2009, a wall and ventilation were installed to mitigate further corrosion. The chemical feed pump is an LMI A151 solenoid-actuated diaphragm pump that turns on when the well pump is on. There is no backup power or the ability to connect to a generator for the well or the disinfection equipment in the event of a power outage.

2.1.3 Storage

The District has a single, welded-steel ground-level treated 145,000-gallon water storage tank (reservoir) located in the northeast corner of the District on the same property as the well house. There are three 6-inch diameter floor penetrations in the reservoir: inlet, outlet, and drain. The inlet is approximately 8 feet tall, and the 2-foot outlet is adjacent to it. Both are in the northwest quarter of the reservoir. The drain is situated in the southwest quarter of the reservoir and drains to a utility easement along the northern property line. The specific routing of the drainpipe is unknown. The overflow is a 90-degree bend welded inside the top of the southern sidewall of the tank. In the event of an overflow, water would discharge 83 feet above the ground surface.

The reservoir underwent its first cleaning since 2009 in March 2023, revealing significant sediment buildup. The dive report is included in Appendix H, which includes multiple photos of the interior and exterior of the reservoir and well house. Reservoir data is summarized in Table 2-3.

Table 2-3: Reservoir Data Summary

Type:	Standpipe
Material:	Welded Steel
Height:	84 feet
Diameter:	17 feet
Height of Overflow:	83 feet
Normal Operating Level:	74 feet
Nominal Volume:	141,000 gallons (calculated based on dimensions below overflow)
	125,000 gallons (based on normal operating level)
Year Constructed:	mid-late 1950s
Additional reservoir information is available in Appendices C – H.	

2.1.4 Distribution

All 298 connections within the District are within a single pressure zone, all pressurized by the storage reservoir. With the current standard maximum operating level of 74 feet, pressure in the District typically ranges from 36 psi in the northeast corner near the storage tank to 86 psi in the southwest corner of the District. The well pump's capacity exceeds normal system demand, including peak hourly flow, which helps maintain consistent pressure levels, barring specific events such as fires, power outages, or pump failures. Water flowing from the reservoir passes through a flow meter vault on site just north of the well house. This meter measures well production for the District.

There are approximately 15,500 feet of waterlines within the District's service area that range from 4-inch to 8-inch in diameter. The larger mains include both transmission and distribution functions. The majority of the waterlines are asbestos cement (AC) pipe, which are original from the 1950s. There is a small amount of ductile iron (DI) along SW 64th Avenue. Waterline data is summarized in Table 2-4.

Table 2-4: Waterline Data Summary

Type:	Diameter (in)	Length (ft)
Asbestos Cement	8	300
Asbestos Cement	6	7,600
Asbestos Cement	4	6,500
Ductile Iron	6	1,100

The system is largely looped, with only a few short dead-end lines. The main unlooped line is a 6-inch AC waterline on Southwood Drive, which is not connected between 62nd Avenue and 63rd Avenue. There are 16 fire hydrants within the District, which are spaced between 500 to 1,000 feet on center, with the majority closer to 800 to 900 feet. There are small areas on 61st Avenue and 64th Avenue north of Southwood Drive that are over 400 feet from the nearest hydrant, as well as an area on 62nd Avenue near Pamela Street.

2.1.5 SCADA and Telemetry

The District has a limited Sensaphone Sentinel SCADA remote monitoring telemetry system. This system was installed in approximately 2015 and currently allows Hiland Water to monitor, but not control, components with the District's system. The system alerts Hiland Water in the following scenarios:

- Reservoir level (low and high alarms)
- Power outage at the well house
- Well house entry alarm
- Chlorine storage tank low level alarm

2.2 Water Production

2.2.1 Population and System Growth

The District has 298 connections (water meters), 299 households (structures), and an estimated population of 724. One of the connections serves both a primary residence and an additional dwelling unit (ADU) on its property. The District holds a water right for 300 households, so it is one household shy of being fully developed. There is a single open lot within the District service area. Based on discussions with Oregon Water Resources Department (OWRD), an ADU counts as an additional household. Given that, the District has the capacity to add one single additional household, which could be another ADU or a new connection on the available lot. There is no anticipated future growth other than that.

2.2.2 Historical and Projected Water Production Demands

The District provided bi-monthly water production, consumption, and loss values from 2015 to 2022. There were some errors in the data and meter reading windows do not perfectly align, but, generally, the water production values match that reported monthly to OWRD. (Data reported to OWRD in 2019 and 2020 both had significant conversion errors.) See Appendix L for OWRD water use reports for 2013 to 2023. Annual total production, consumption, and loss data is summarized in Table 2-5. The complete 2015 to 2022 monthly production, consumption, and water loss data table is included in Appendix L. Daily production data averages from 2015 to 2022 are shown in Table 2-6.

Table 2-5: 2015-2022 Annual Total Water Consumption, Production, and Loss Data

Year	Prod (gal)	Cons (gal)	Loss (gal)	Loss (%)
2015	26,302,670	20,925,710	5,298,190	20.14%
2016	22,804,280	19,170,020	7,185,170	31.51%
2017	25,435,740	19,189,620	6,167,520	24.25%
2018	22,446,370	18,658,160	3,620,580	16.13%
2019	20,553,920	17,557,030	2,944,397	14.33%
2020	19,587,130	19,047,120	474,510	2.42%
2021	20,152,530	19,560,680	526,440	2.61%
2022	19,352,260	18,979,510	294,150	1.52%
TOTAL	**176,634,900**	**153,087,850**	**26,510,957**	**15.01%**

Table 2-6: 2015-2022 Average Day Water Production Data

	PRODUCTION		
Year	Average Daily Prod (gpd)	Average Daily Prod (gpd/EDU*)	Average Daily Prod (gpm)
2015	72,062	242	50.0
2016	62,477	210	43.4
2017	69,687	234	48.4
2018	61,497	206	42.7
2019	56,312	189	39.1
2020	53,663	180	37.3
2021	55,212	185	38.3
2022	53,020	178	36.8
AVERAGE	**60,491**	**203**	**42.0**
*EDU – equivalent dwelling unit (single family house)			

With this data, average day production values for the District can be calculated (both annually and an average for several years). The data shows an overall drop in production from 2015 to 2022. In 2015, the average production was approximately 72,062 gallons per day (gpd) or 50 gallons per minute (gpm). In 2022, the average production was down to 53,020 gpd or 37 gpm. Overall, the 8-year average daily production for the District was 60,491 gpd (42 gpm).

Based on growth limited to a single household, it is assumed that future production needs to be approximately the same as current. Actual production will fluctuate annually, but the long-term average production is expected to remain consistent with current levels, barring significant leaks in the system. Considering the current trend of declining production levels, the 8-year average value of 60,491 gpd represents a 12 percent contingency over the 53,020 gpd produced in 2022 and will be utilized for further calculations.

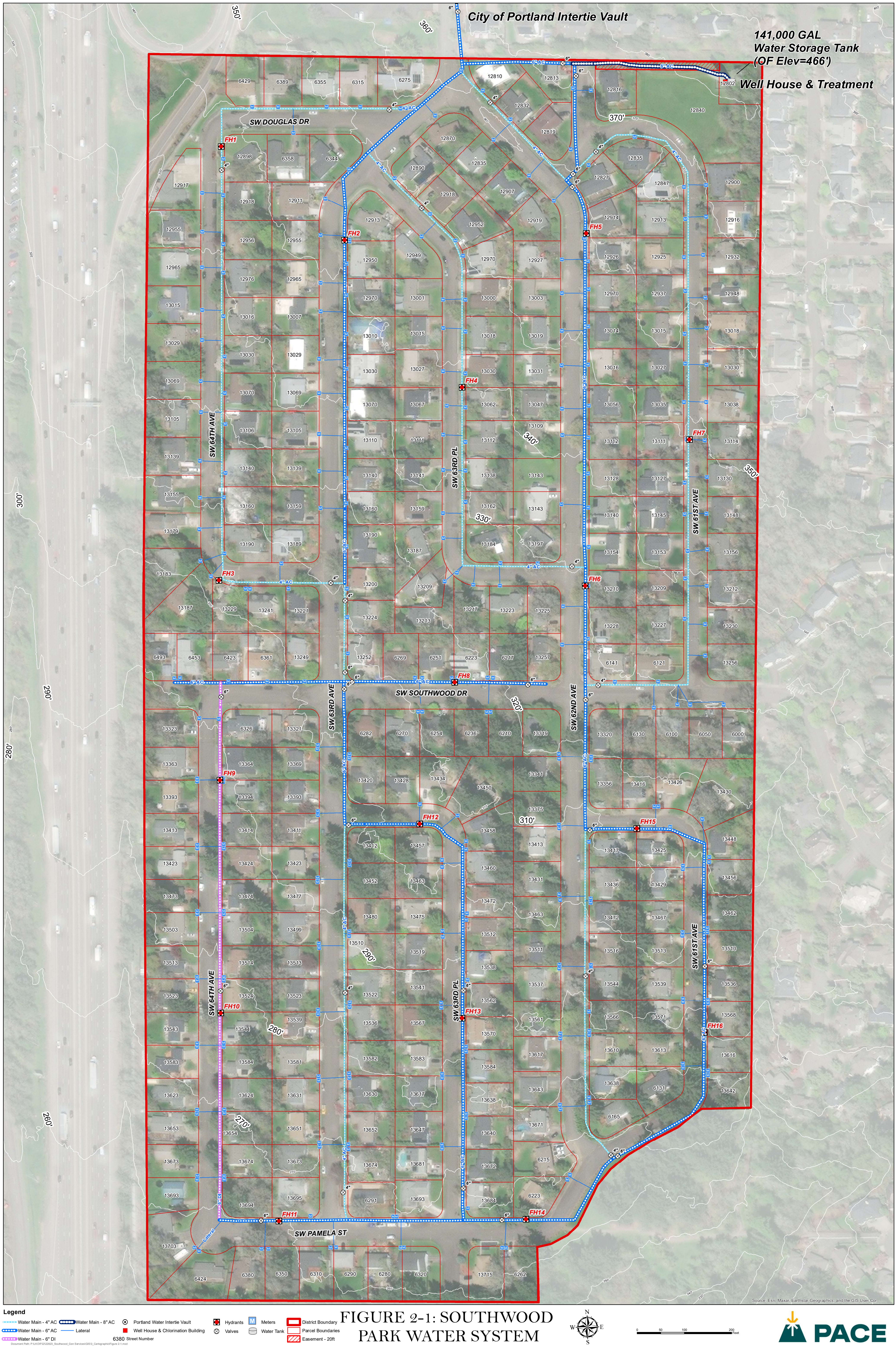

FIGURE 2-1: SOUTHWOOD PARK WATER SYSTEM

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Storage calculations will rely on average day production values, ensuring a safety factor and accounting for the water that must be in the storage tank and supplied to the system, even if a portion of this becomes unaccounted-for water.

2.3 Water Usage and Non-Revenue Water

Water usage data and water loss from 2015 to 2022 is shown in Table 2-5. Water meters are read bimonthly, so the consumption and production reported numbers have matching periods. Daily consumption data averages are shown in Table 2-7.

Table 2-7: 2015-2022 Water Consumption ADD and MDD Data

Year	ADD (gpd)	ADD (gpm/EDU)	ADD (gpm)	~MDD (gpd)	~MDD (gpd/EDU)	MDD (gpm)
2015	57,331	192.4	39.8	143,327	481.0	99.5
2016	52,521	176.2	36.5	131,302	440.6	91.2
2017	52,574	176.4	36.5	131,436	441.1	91.3
2018	51,118	171.5	35.5	127,796	428.8	88.7
2019	48,101	161.4	33.4	120,254	403.5	83.5
2020	52,184	175.1	36.2	130,460	437.8	90.6
2021	53,591	179.8	37.2	133,977	449.6	93.0
2022	51,999	174.5	36.1	129,997	436.2	90.3
AVERAGE	**52,427**	**176**	**36.4**	**131,068**	**440**	**91**

Using this data, average day demand (ADD) consumption values for the District can be calculated, both annually and as a multi-year average. The data shows an overall small decline in consumption from 2015 to 2022. In 2015, the ADD was approximately 57,331 gallons per day (gpd) or 40 gallons per minute (gpm). In 2022, the ADD declined to 51,999 gpd or 37 gpm. Overall, the 8-year ADD for the District was 52,427 gpd (36 gpm).

Since the flowmeter on the outlet of the reservoir functions as the well source meter and only measures total flow, more detailed production and flow numbers could not be calculated. Other values such as maximum day demand (MDD) and peak hourly demand (PHD) must be assumed or estimated. The highest average day consumption during the peak two-month period between 2015-2022 occurred in July or August 2015 with 91,368 gpd. Without precise calculation of MDD, a standard estimated value is 2.5 times the ADD. Based on the 8-year average ADD, the current MDD is estimated to be 131,068 gpd, which is 1.5 times higher than the average day in a maximum month (MMD).

Peak hourly demand (PHD) is estimated based on an empirical formula (source: Water System Design Manual, Washington State Department of Health, 2019):

PHD = (MDD/1440)[(C)(N)+F]+18

Where: PHD = Peak hourly demand (gpm)

C = Coefficient associated with ranges of EDUs

N = Number of EDUs

F = Factor associated with ranges of EDUs

MDD = Maximum day demand (gpd/EDU)

Current EDUs (equivalent dwelling units): 298

For a range of N (251 – 500): C = 1.8 and F = 125

PHD = (440/1440)[(1.8)(298)+125]+18 = 220 gpm = 317,000 gpd

Water loss in the system decreased notably from 2015 to 2022 following the repair of multiple leaks. Recent water losses (2020-2022) have been below 3 percent. While sustaining this low level of water loss is not likely, it indicates the District has effective policies and procedures for promptly repairing leaks, thereby aiming to keep water loss below 10 percent. A representative monthly breakdown of water production, consumption, and loss from 2021 to 2022 is shown in Table 2-8.

Table 2-8: 2021-2022 Water Loss

Month/Year	Pumped (gal)	Sold (gal)	Loss %
July 2021			
August 2021	5,193,360	5,029,340	3.16%
September 2021			
October 2021	3,573,940	3,517,420	1.58%
November 2021			
December 2021	2,425,020	2,385,760	1.62%
January 2022			
February 2022	2,324,040	2,405,950	-3.52%
March 2022			
April 2022	2,493,830	2,403,920	3.61%
May 2022			
June 2022	2,974,050	2,691,050	9.52%
July 2022			
TOTAL	**18,984,240**	**18,433,440**	**2.90%**
AVERAGE	**52,012 gpd**	**50,503 gpd**	

Considering growth is limited to a single household, the long-term average consumption is expected to remain similar to current levels, though actual consumption will vary annually. Based on the current trend of stabilizing consumption levels year over year, the 8-year average value of 52,427 gpd closely aligns with usage from 2020 to 2022.

Current and estimated future water system demands and associated peaking factors are summarized in Table 2-9.

Table 2-9: Current and Estimated Future Water System Demand

Parameter	Demand (gpd)	Demand (gpm)	Peaking Factor
ADD	52,500	36.4	1.0
MMD	91,400	63.5	1.7
MDD	131,100	91.0	2.5
PHD	317,000	220	6.0

2.3.1 Water Conservation

From 2015 to 2019, the District achieved a reduction in usage as part of its water conservation effort. Over the past five years, water usage has remained relatively stable, with a slight increase since 2019. Moreover, unaccounted-for-water within the District has significantly decreased. The installation of new water meters in 2023 is expected to further reduce unaccounted-for water.

For general planning purposes, the projections for future water demand do not include further reductions in water usage. However, ongoing reduction will lessen the District's impact on the available water supply from the well. While high water loss was previously a concern, this has not been an issue since 2020. The District should maintain their current approach to addressing leaks quickly as they arise.

2.4 Water Quality and Regulatory Status

2.4.1 Regulatory Overview

Drinking water quality is regulated at the federal level through the 1974 Safe Drinking Water Act (SDWA) and subsequent amendments. States have the flexibility to develop more stringent requirements in addition to the minimum established by the federal regulations. In Oregon, the Oregon Health Authority (OHA) Drinking Water Program is responsible for administering federal and state regulations of public water systems. Oregon Administrative Rules (OAR) Chapter 333 Division 61 includes the rules for public water systems. The complete rules and related data and materials are available directly through OHA's website: http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Pages/index.asx or through an internet search: "OHA Drinking Water Program."

2.4.2 Water Quality

Water quality discussed in this section is based on recent data from the well source or as sampled from appropriate locations in the water system. The well is classified as groundwater by OHA, and the data is from OHA and District records.

Water quality is generally excellent, with all chemical concentrations well within regulated maximum contaminant limits (MCLs). Most of the tested-for chemical concentrations result in non-detections. Detected contaminants in recent years and other common contaminants of concern include the following:

Nitrates: Nitrates are a common contaminant of concern in groundwater. Tested annually, the District has had non-detect (ND) for nitrates since 1995. The maximum contaminant level (MCL) for nitrate is 10 milligrams per liter (mg/L). Samples are taken from source water.

Radionuclides: In November 2022, tested samples indicated a Gross Alpha Particle concentration of 5.07 picocuries per liter (pCi/L) in the well, which is a measure of radioactivity. This concentration was 1.9 pCi/L in January 2008, and prior samples were non-detect. MCL for Gross Alpha is 15 pCi/L. Combined radium samples from both 2008 and 2022 were non-detect. MCL for combined radium is 5 pCi/L. A sample from November 2003 indicated a combined uranium concentration of 0.0000232 mg/L, but 2008 and 2022 samples were both non-detect. MCL for combined uranium is 0.03 mg/L. Samples are taken from source water.

Disinfection By-products (DBPs): DBPs are contaminants that occur in the finished water system when organic material interact with chlorine that is used for disinfection. DBPs include Total Trihalomethanes (TTHM) and Haloacetic Acids (HAA5). TTHM was last detected in the District in 2021 (0.0013 mg/L). The MCL for TTHM is 0.080 mg/L. HAA5 was last detected in the District in 2023 (0.0032 mg/L). The MCL for HAA5 is 0.060 mg/L. The majority of samples over the last 10 years have been non-detect (ND). Samples are taken from the distribution system.

Lead and Copper: Lead and copper sampling results are evaluated against an action level, not an MCL, and action is required if the concentration in more than 10 percent of the samples are above the action level. The action level for lead is 0.015 mg/L. The action level for copper is 1.3 mg/L. Ninetieth percentile summary results for 2021 testing show 0.003 mg/L for lead and 0.057 mg/L for copper. Results for 2018 testing show 0.004 mg/L for lead and 0.139 mg/L for copper. Samples are taken from the distribution system. A full list of lead and copper results from OHA is included in Appendix M.

Hard Water: Prior studies have discussed hard water within the District and identified potential capital projects for softening the water. Hard water is defined by having a concentration above 120 mg/L as calcium carbonate and generally indicates high mineral content (calcium, iron, and magnesium) in the water. Per OHA sampling results, there were two sample results for total hardness (as calcium carbonate): 105 mg/L in 1984 and 160 mg/L in 2000. This can be monitored further if the District chooses, but it is not of concern at this time. Hard water is also something that can be addressed at the point-of-use (POU) within the distribution system (at customer's homes).

Other Alerts: The District has had a combined seven other alerts since 2003, three for sodium, three for total coliform present, and one for xylene. Archived alerts from before 2003 show sodium, xylene, toluene, and ethylbenzene. The last three were found twice in extremely low concentrations well below the MCL but above the alert level, which is why they are indicated. These alerts are routine, and none are cause for concern. The list of alerts from OHA is included in Appendix M.

Other Minerals: Iron staining is present in the reservoir. This was noticeable based on photos taken in 2009 when the tank was cleaned and again in 2023 on the floor panels and on the walls. Iron is a secondary contaminant, meaning there is an aesthetic rather than a health concern, with a secondary maximum contaminant level (SMCL) of 0.3 mg/L. The last iron samples taken from the well water was in December 1999 and had a concentration of 0.07mg/L.

2.4.3 Regulatory Status

The District is currently in compliance with all water quality-related regulatory requirements. OHA noted the District as an “outstanding performer” after its last system sanitary survey on November 2, 2023.

Photo 1: Reservoir and Well Site

Photo 2: Well House and Reservoir

Photo 3: Well House Piping

Photo 4: Well House Chlorine Room

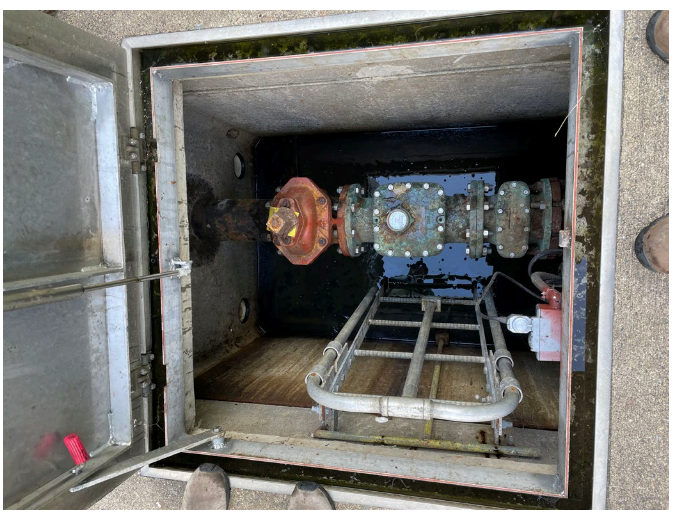

Photo 5: Flowmeter Vault

3. LEVEL OF SERVICE GOALS

3.1 Introduction

"Level of Service" pertains to the quality of the water service delivered to the customer. However, this term also encompasses the responsibilities of Hiland Water in operating, maintaining, and managing the utility, as well as the role of District officials who are responsible for the support and political will to champion the mission and needs of the utility. Supplying clean, safe drinking water is a priority service to any community. Therefore, the Southwood Park Water District should endeavor to provide a relatively high level of service.

One of the primary objectives for a water system is the protection of public health and welfare. For utilizing and maintaining a water system, it is also important to minimize adverse environmental impacts. Various agencies have promulgated rules that ultimately support these objectives, and, at a minimum, every water system must comply with these rules and requirements.

3.2 General Goals and Requirements

General level of service goals and requirements applicable to the water system include:

Conveyance and Delivery (Goal): Adequate, consistent, and reliable delivery of water under all anticipated service conditions; capacity for system to deliver maximum day demand (MDD) plus fire flow (FF).

Pressurization (Requirement): A minimum of 20 pounds per square inch (psi) system pressure must always be maintained (OAR 333-061-0025). Customer services must have individual pressure reducing valves if system pressures exceed 80 psi per 2023 Oregon Plumbing Specialty Code 608.2. Generally, a goal of a minimum of 40 psi under normal (non-fire flow) conditions is preferable if practicably achievable. The 20 psi minimum system pressure requirement extends to the customer water meter.

Water Quality (Requirements): Comply with all Oregon Health Authority (OHA) requirements. Water quality also includes aesthetic considerations that may or may not be related to specific regulatory concerns. Efforts to maintain or improve the aesthetic quality of the water provided is a goal consistent with the provision of a high level of service.

Fire Protection (Goal): Provide fire protection consistent with American Water Works Association (AWWA), Insurance Services Office (ISO), Oregon Fire Code, and local fire department requirements, recommendations, and standards.

Reliability (Goal and Requirements): Reliability as a goal is the ability of the water system and District staff and contractors to avoid or circumvent problems that adversely impact system performance. Reliability is enhanced by routine and timely maintenance and replacement, good design and construction, adequate water supply, alternate or backup facilities or equipment, and a contingency plan for efficiently handling specific problems.

3.3 Specific Goals

3.3.1 Water Supply

The water supply components (well, treatment, and transmission) should be sized to provide MDD within a 24-hour period at a minimum and, preferably, within a 20-hour period. Sizing should also incorporate consideration of the planning period, design life, economics, and plans for future utilization and demands.

3.3.2 Treatment

In addition to meeting current regulatory requirements, treatment recommendations should consider and potentially incorporate, or facilitate incorporation in the future, measures to address anticipated regulatory changes (if applicable).

3.3.3 Fire Protection

Fire protection capabilities are typically based on the ability to deliver a minimum specified flow for a minimum specified duration. Recommended fire flows and durations for the District are provided in Table 3-1.

Table 3-1: Fire Flow Goals

Land Use	Fire Flow Rate (gpm)	Fire Flow Duration (min)	Equivalent Volume (gal)
Residential Single Family/Duplex	1,000	60	60,000
Non-residential	1,000	60	60,000

Actual fire flow requirements are building-specific, and alternatives may be developed to provide some of the requisite protection (for example, an engineered building sprinkler system). Appendix N includes current fire flow requirements for buildings.

From a fire protection perspective, more fire flow capability is always advantageous; however, no specified capability can guarantee protection from all fire-related scenarios.

Fire hydrant spacing for new construction should comply with requirements of the current version of the Oregon Fire Code (Appendix N).

3.3.4 Storage Reservoirs

Oregon has no requirement for the provision of finished water storage (reservoirs), but the state does require (per OAR 333-061-0025) the maintenance of a minimum system pressure of 20 psi at all times. Reservoirs are one of the most practical and economical means of meeting the pressurization requirement. For purposes of this water study, reservoir sizing is based on the standard design provision of three times the average daily demand plus fire flow reserve (3xADD+FF). Provision of needed storage capacity is best provided with two or more reservoirs (per service area) in order to provide service when one reservoir is offline. Generally, more capacity is preferable for reliability; however, excess capacity can result in lost chlorine residuals and formation of disinfection byproducts.

3.3.5 Transmission and Distribution

Transmission and distribution mains should be sized according to anticipated hydraulic requirements that may include the provision of fire flow. Line velocities are generally 5 feet per second (fps) or less to reduce head loss. Reduction of head loss reduces pressure losses; consequently, proper sizing can reduce system operational costs and improve fire flow capabilities. Systems designed to provide fire protection typically utilize an 8-inch minimum main size except for parts of a grid with lengths of less than 600 feet where 6-inch mains may be acceptable. AWWA does not recognize lines of less than 6-inch-diameter as providing fire protection.

Hydraulics, reliability, and water quality are generally enhanced with a “looped” water main configuration that minimizes the occurrence of single-feed or dead-end lines. Nevertheless, single-feed lines are commonly used for reservoir transmission mains and supply transmission mains. Dead-end mains should be avoided but may be practicably unavoidable due to topography and existing development patterns.

3.3.6 Telemetry

Telemetry should be provided for each key facility including well pumps, treatment, and reservoirs. Telemetry provides alarm notification at a minimum. Important additional functions may include data acquisition and operational control.

3.4 Design Life

Design life (or useful life) refers to the anticipated service life of an item or system component. Typical design life values are expressed in terms of “years of service” and reflect typical design, material, and construction standards associated with municipal water system infrastructure. Actual years of service may vary greatly according to the service demands and conditions – as well as the level of maintenance provided. Typical design lives, selected from “Asset Management: A Handbook for Small Water Systems,” September 2003 (EPA 816-R-03-016), are summarized below:

Wells	25 - 35 years
Treatment and Chlorination Equipment	10 - 15 years
Storage Tanks (Reservoirs)	30 - 60 years
Pumps	10 - 15 years
Buildings	30 - 60 years
Electrical Systems	7 - 10 years
Computers	5 years
Transmission and Distribution Mains	35 - 40 years
Valves	35 - 40 years
Meters	10 - 15 years
Service Laterals	30 - 50 years
Hydrants	40 - 60 years

As a concept, “design life” is primarily used for planning and budgeting for replacement or significant rehabilitation. As such, it is an important consideration in asset management. The values are only a starting point and should be adjusted and refined to reflect local conditions and experience.

3.5 Conformance and Implementation

As a general guideline, water systems should be in conformance with the most current requirements and standards. However, as a practical matter, many do not simply because the requirements and guidelines have become more stringent over time. Many requirements, typically those associated with SDWA Amendments and OHA rules, do require immediate action to correct identified deficiencies. Other deficiencies, such as system configuration, material condition, or hydraulic deficiencies, might not trigger a regulatory mandate, but they still can reduce the level of service by compromising reliability or performance. The condition of mechanical, electrical, and telemetry components may not usually lead to a regulatory mandate, but their failure could pose significant challenges or hardship to the District.

How quickly a community addresses identified deficiencies and implements necessary improvements is a measure of the level of service it provides.

4. SYSTEM ANALYSIS

4.1 Introduction

This section of the Feasibility Study assumes the reader is familiar with the previous sections. The focus of this section is on evaluations and analyses of the water system with a goal of developing an understanding of current and future needs and developing strategies and identifying improvements to address those needs and level of service goals. Costs, insofar as discussed, generally reflect considerations discussed in Section 5.2.

4.2 Water Demands

Water usage and demands are discussed in detail in Section 2.2 and 2.3. Current and projected water demands for design purposes are summarized in Table 2-9.

The resulting water demand projections are conservative based on the average use over the prior eight years. For planning purposes, it is assumed that conservation considerations will not be used to reduce projected water demands. Metered customer demand is reasonable, and unaccounted-for water losses are currently low. The 2023 improvement to replace all meters within the District could result in an increase in usage over the next few years since old meters tend to under-report. The District should develop a meter maintenance and replacement program. Water losses tend to increase over time; therefore, some level of effort is required just to maintain the current levels.

4.3 Source and Water Rights

4.3.1 Well

The current pump has adequate capacity to continue to meet average demand (36 gpm), maximum day demand (~90 gpm), and peak hour demand (~220 gpm) for District buildout without adversely affecting water level in the well. Groundwater level, as measured annually and shown in Appendix K, has remained relatively constant (between 205-212 feet below ground surface) over the past 25 years.

The well was investigated as part of this Feasibility Study by Schneider Water Services in 2022 (report in Appendix F) and again during motor replacement in 2024. The well was videoed in 2024 when the motor was replaced and recommended improvements were limited to the pump components.

4.3.1.1 Recommendations:

A. Continue annual sampling and water level check.

B. Video well any time the pump is removed for maintenance and repair to evaluate well column and drift.

4.3.2 Water Rights

The District currently has 1.05 cubic feet per second (cfs), equal to 472 gpm, in certificated water rights for the well for use throughout the District. There is no current or future anticipated need for additional water rights.

The water right allows domestic use for up to 300 households. Currently, the District has 298 connections to homes, one of which has an ADU. This ADU counts toward the household limit of the water right. Oregon House Bill 2021 allows ADUs to be built within the area, but that does not allow the District to be in violation of its water right. Therefore, the District has a single household available to be added to remain in compliance with its water right and Oregon Water Law. The District should codify in its resolutions that, once the final household (or ADU) is connected, no further connections nor ADUs will be allowed within the District. This will make it clear for customers within the District, and the District should communicate this to Clackamas County to prevent approval of additional ADUs beyond this specified number.

Laws and rules related to water rights are constantly evolving; therefore, current regulations should always be monitored.

4.3.2.1 Recommendations:

1. Codify there is one single additional household available to be added to the District, after which no future households (including ADUs) will be allowed, consistent with the District's water right.

4.3.3 Portland Intertie

The existing intertie between the District and the Portland water system is a 2-inch meter in a vault. Portland opened this intertie and verified that it was still functional in November 2021. In 2024, the intertie was used for an extended period of time during the motor replacement and pump modifications. No intergovernmental agreement (IGA) has been developed to provide for use under emergency conditions. Based on 2024 billings from Portland, the District was charged a $7.006/CCF (100 cubic feet) retail rate for water usage (versus $2.806/CCF wholesale rate) plus administrative fees when the intertie was opened, in addition to its base charge. The District should negotiate an emergency/backup service agreement with Portland. There are different options available: higher base charge with wholesale water rate or lower base charge with retail water rate. The District will need to assess the difference in base charge versus the difference in cost of water when determining the terms of the agreement.

Portland uses a combination of surface water and groundwater (depending on the time of year) and uses chloramines to disinfect its system. The mixing of different disinfectants (chloramines versus sodium hypochlorite) was discussed with OHA and the Clackamas County Watermaster. Given the short-term and emergency nature of the District's use of Portland water, there were no immediate concerns. If the usage becomes more consistent or is planned (such as for a construction project that takes the well or storage tank offline), it is recommended that the District fully flush its system at the beginning and end of that time period.

The Portland connection feeds water directly into the District's system (as opposed into the storage tank). There is a static pressure differential of approximately 75 psi (105 psi vs 30 psi), so a backflow incident into the Portland system is not likely. Per discussion with Portland, there is currently 700 gpm available on the Portland side of the intertie, though that flow would be reduced given the 2-inch intertie size. Per hydraulic modeling, Portland determined that it could provide up to 1,000 gpm to the District in the event of a fire if the intertie is upsized to 6-inch. Having the positive pressure differential would also improve fire flow in the event of a fire.

4.3.3.1 Recommendations

1. Upsize intertie to 6-inch water meter for backup and emergency needs.
2. Negotiate an emergency agreement with Portland.
3. Monitor water quality in the event Portland water is used long-term.

4.4 Water Quality

In general, both source and distribution system water quality in the District is at a high standard. (See Section 2.4.2 for discussion). There are no specific recommendations other than diligence in meeting all applicable regulatory requirements.

Prior analyses recommended water softening to account for hard water. Recent discussions with the Board and water quality data do not show this as an urgent need at this time. Water softening could be performed at the point of use, as opposed to a system-wide upgrade.

Tank cleaning in 2009 and 2023 showed iron build-up within the reservoir. Hiland reports iron can be a problem in the distribution system, similar to the reservoir, with long term iron build-up in the waterlines staining fixtures in customer's homes. The District has not mentioned this as a problem, so it appears routine flushing in combination with low iron concentration in the source water has prevented this from becoming a recurring issue. Also, cleaning the reservoir every 3-5 years will help remove much of the iron build-up that settles out from the well water. Finally, the installation of a new drop pipe in the well in 2024 could help reduce iron in the system.

Another option for iron treatment is removal using filtration. That would be a major operational change for the District and an expensive process. Iron can also be treated with a sequestering agent, which helps keep the iron dissolved in water but can precipitate out in customer's homes. If there is an increase in complaints about iron staining or colored water, a more in-depth conversation will be necessary.

Water quality testing in the District indicates no problem with lead; therefore, no changes are recommended. The EPA is proposing Lead and Copper Rule Improvements, including lowering the lead action rule from 15 to 10 µg/L and requiring water systems to replace lead service lines under the control of the water system within 10 years. Currently, all water utilities are required to identify lead components within the distribution system including service lines by October 2024.

Reduction of Lead Drinking Water Act (RLDWA) does not require changes to the District-side of the existing system, but it could affect service laterals between customer water meters and their homes. Additionally, all new pipe and appurtenances must meet the new lead-free standard.

4.4.1 Recommendations:

1. Continue to monitor water quality.
2. Maintain regular flushing intervals to clean build-up in distribution system piping.
3. Clean reservoir more frequently to prevent iron build-up from entering distribution system.
4. Follow EPA guidance and new regulations on lead service lines.

4.5 Pump and Well House

The pump was evaluated as part of Schneider Water Services (SWS) investigation in July 2022 (Report in Appendix F). At that time, a well pump test was performed, and the pump was within 8 percent of its capacity at installation, producing 367 gpm at 367 feet (estimated) total dynamic head (TDH), versus 370 gpm at 395 feet TDH originally. Typically, a pump would be nearing the end of its usable life after 15 years. The motor was likewise found to be performing well at that time.

In 2024, the direct online contactor in the pump controls failed, resulting in a motor failure. As detailed in the Cundiff Engineering Memo in Appendix Q, the motor failure was due to improperly-sized overload protection. When the contactor failed, the overload protection did not prevent the motor from failing, as it should have. At minimum, properly sized motor overload protection needs to be installed to protect the new motor. Given that the other components in the motor control center are the same age as the contactor, replacing all of the motor control center with a new variable frequency drive (VFD) motor control would protect the motor and upgrade all the components at the same time.

When the motor failed in 2024, the pump was removed and found to be in worse condition than it was performing. The 2024 SWS bill of materials note that wear rings and impellors showed pitting and cutting, more in line with the pump's age. The District replaced the pump end, drop pipe, discharge head, and check valves at the same time as the motor.

Based on the average daily production of 60,500 gallons, the well pump and motor only need to run for three hours per day, which is a low duty cycle needed to supply the District with water. As was discovered, this allowed the pump and motor to perform close to their design points after 15 years, even though they had notable signs of wear. With the new pump and motor in 2024, having a replacement pump and motor on hand to quickly install in the event of an emergency or sudden failure is unnecessary. An upsized intertie with Portland provides an efficient back-up supply to be used when the well pump or motor fail and need to be repaired or replaced. The intertie can fully meet District water demands while new equipment is ordered, delivered, and installed.

The piping within the well house is significantly corroded, as has been documented in past studies, and needs to be replaced. This is due both to its age and the effects of chlorine off-gassing into the building prior to moving the chlorination equipment and adding additional ventilation. The piping continues in open air under the wall of the pump station and beneath the storage reservoir. The piping beyond what is visible is most likely in the same state of corrosion. Currently, there are no leaks; however, it is impossible to predict when they may occur.

Given the current condition of the reservoir and the piping attached to it, connecting a new well house to the existing reservoir does not make sense. A temporary improvement would be to replace all piping and valves within the well house when the well is offline and the reservoir is empty, but it is unclear if the piping under the wall could be replaced. Long term, a new well house would be built over the top of the existing well, with in-ground piping connecting to both a new reservoir and flow meter vault. The well house would have a separate chlorine room, be properly ventilated, and the motor control and SCADA equipment would be moved inside. Additional monitoring equipment, such as source meter, should be added.

4.5.1 Recommendations:

1. Replace or upgrade motor overload protection.
2. Given the current production of the well pump, rely on the Portland intertie to provide water for the District if a new well pump is ordered rather than having one in stock.
3. Replace well house and all piping connected to the storage tank.

4.6 Hydraulic Model

A hydraulic model of the water system was developed primarily to check general capacity and capabilities of the water system. The model was created using InfoWater® software from Autodesk®.

The model includes the storage tank as the source of supply, with 44 pipes and 36 nodes. Main lengths and node elevations were determined or estimated based on the Water System Map developed from data collected during the 2023 PACE drone survey. District records and mapping were used to supplement this data. Modelling results are discussed in Section 4.7.1 and 4.8.1.

The model was set up and run with the following parameters:

C = 110 for AC pipes

C = 140 for DI pipes

MDD = 90 gpm (approximately 2.5 gpm at most nodes)

Storage Tank: 456 feet max water surface high (416 feet min water surface elevation)

Hydrant flows were simulated at all current fire hydrant locations. The target flow was 1,000 gpm with a residual pressure greater than 20 psi. If 1,000 gpm was not achievable, the available fire flow that maintains 20 psi in the system was determined.

A future system model was also created consistent with improvement recommendations, where the dead-end line on Southwood Drive is looped and all waterlines are upsized to 8-inch mains.

4.7 Reservoir

4.7.1 Storage Capacity

The total storage capacity of the existing reservoir is 141,000 gallons when filled to the overflow at 466 feet (83 feet of storage height). Current operation maintains a maximum level of 74 feet in the tank to minimize providing more than 80 psi to homes below the 280-foot contour, which equates to approximately 125,000 gallons of storage when full. With the highest meter in the system at 372 feet, this means the tank needs a minimum of 36 feet depth to maintain 20 psi throughout the distribution system during regular flow conditions (ADD, MDD, and PHD). Water in the reservoir that is below the level that can supply the needed pressure is termed dead storage and does not count toward the total volume needed by the District. So, there is currently approximately 66,000 gallons of storage available, roughly equal to fire flow or one ADD.

For the water system, the recommended storage capacity is typically three times the average day demand (3xADD) plus fire flow (FF). Recommended FF is 1,000 gpm for one hour (60,000-gallon reserve). For Southwood, that would equal a storage volume of 240,000 gallons. This volume would need to be above the dead storage level to fully meet the criteria. The well pump exceeds maximum day demand, so, barring a power outage, the well pump could help fill the tank during a fire. Additionally, upsizing the intertie with Portland to fully provide fire flow (even in a power outage) provides the best level of redundancy available for the District and can reduce the recommended reservoir size.

4.7.2 Storage Tank Analysis

A structural analysis including seismic evaluation of the existing reservoir was performed in 2022, and the report is in Appendix G. Detailed drawings of the tank design and its foundation were not located, so the overall stability of the tank is unknown. The study found the tank to be seismically deficient, with the shell thickness in the bottom 24 feet to be insufficient and in need of reinforcing to mitigate the overstress and resist overturning.

MIT Diving and Coating dove the tank in March 2023 to clean the inside and inspect the inside and outside of the tank (report in Appendix H). Overall, the tank was found to be in fair to good condition, with mild to moderate corrosion throughout the inside of the tank, including the piping. The floor panels were in poor shape, and there were areas of liner deterioration and delamination. The exterior hatch was difficult to open and needs maintenance. The exterior of the tank has not been painted in many years, and, per prior Board notes, contains lead-based paint. The exterior paint was not re-tested as part of this study.

4.7.2.1 Recommendations

The storage tank is undersized to provide three days of ADD plus fire flow. The full volume of the tank is not being used, and the bottom half is considered dead storage. A structural upgrade of the tank is needed to increase seismic resiliency of the tank shell, but the scope related to upgrading the foundation is unknown. The interior liner has begun to degrade and is at the end of its usable life. The exterior of the tank also needs a new coating, though removal of the existing coating will entail extra precautions and permitting due to the lead-based paint.

Given all of this, it is recommended to construct a new tank that addresses all of these current deficiencies in lieu of performing the assortment of maintenance. This would provide the District with a reliable long-term storage solution.

1. Construct new 250,000-gallon ground-level reservoir, meeting current seismic code and providing additional storage capacity while maintaining 20 psi throughout the entire District.
2. Perform maintenance on the existing tank, including the exterior hatch, to keep operational until a new tank is constructed.

Constructing 250,000 gallons of storage could be accomplished in two identical 125,000-gallon tanks. This method would allow the existing tank to remain in service while the second tank is built. It also provides future redundancy if either tank needs to be taken offline. The construction of two tanks would not need to be completed at the same time, so long as the piping was designed for future expansion. New piping would be needed if a new reservoir is built before new well house piping is installed. Two separate tanks would cost more than a single tank and require more space on the property. These are design issues to be considered when the District is ready to increase storage or replace the existing tank.

4.8 Distribution System

An assessment of the District's distribution system was developed primarily through map review, review of previous analyses, modelling (see Section 4.6), and information from Hiland Water. Most of the system is still original from the 1950s. The District standardized 6-inch mains for about three-fifths of the system, with smaller 4-inch mains on looped side streets. Fire hydrants are located on both sizes of mains. The system is primarily looped with a few dead-end lines.

In general, the system is capable of providing average day demand (36 gpm), maximum day demand (90 gpm), and peak hourly demand (220 gpm) while maintaining 20 psi throughout the system (with a minimum reservoir depth of 36 feet) and keeping all flow velocities below 3 feet per second.

Fire hydrants on 4-inch mains cannot provide 1,000 gpm or cannot do so while also maintaining 20 psi of pressure throughout the system. This was indicated in the 2010 CIP by TVWD (Appendix C), which called for upsizing 4-inch waterlines to 6-inch. The fire flow model was run with maximum day demand in the system and the storage tank beginning at a height of 70 feet. With the well pump running, approximately 45 feet of water would be left in the tank at the end of a one-hour 1,000-gpm fire flow event. At the beginning of the fire event, fire hydrants 3, 4, 7, and 8 (all labeled on Figure 2-1) are unable to provide the required fire flow without adversely affecting the system. By the end of the fire event, none of the fire hydrants can provide 1,000 gpm, although five hydrants are close. This is not because fire flow is unachievable on the 6-inch lines but rather due to pressures dropping so low on the 4-inch lines.

Modelled results for all hydrants in the existing system during this fire event are indicated in Table 4-1.

Table 4-1: Fire Flow with Current Conditions

ID	Static Pressure (psi)	Residual Pressure at 1000 gpm FF Demand (psi)	Hydrant Available Flow (gpm)	Hydrant Pressure at Available Flow (psi)	Junctions with Pressure Violation	Node with the Lowest Pressure Violation	Lowest Pressure Violation (psi)	Average Pressure Violation (psi)
FH1	38.48	12.8	834.88	20	3	FH10	12.8	3.53
FH2	36.73	17.06	915.13	20	5	FH3	17.06	1.19
FH3	53.18	-3.25	748.55	20	4	FH4	-3.25	9.13
FH4	38.46	-24.5	510.39	20	4	FH5	-24.5	18.93
FH5	28.97	19.21	955.54	20	2	FH6	19.21	0.72
FH6	41.93	23.97	1,122.21	20	1	J30	17.7	2.3
FH7	33.27	-46.41	375.39	20	3	FH8	-46.41	36.42
FH8	47.94	-0.21	739.12	20	5	FH9	-0.21	5.82
FH9	60.08	18.31	979.54	20	7	FH9	11.59	2.76
FH10	65.28	21.98	1,027.91	20	5	FH9	12.3	2.87
FH11	73.07	30.56	1,134.89	20	4	FH9	12.79	3.22
FH12	55.74	15.53	938.28	20	5	FH9	12.02	4.48
FH13	60.08	17.65	970.96	20	6	FH9	13.13	3.29
FH14	68.74	32.29	1,180.19	20	4	FH9	14.53	2.31
FH15	49.7	18.46	974.42	20	2	J30	17.45	2.05
FH16	64.42	30.01	1,156.64	20	1	J30	17.71	2.29

Hydrant coverage was evaluated by measuring 250 feet along roads from hydrants shown on the system map (Figure 2-1). As indicated in Section 2.4.1, hydrant spacing does not meet the 500-foot average spacing requirement in the Oregon Fire Code (Appendix N). There are notable gaps between hydrants throughout the system. New hydrants are recommended to fill the existing gaps. However, this will not improve flow on the 4-inch lines in the northern half of the system.

Unaccounted-for water losses currently are down to around 3 percent and indicate that the water system has minimal losses. Past losses have exceeded 20 percent, but repairs from 2014-2021 appear to have corrected these problems. Repairs averaged six per year from 2014 to 2019, two in 2020, and one in 2021.

In terms of long-term reliability of the water system, it is recommended that all the watermains be replaced and increased in size. This will improve fire flow throughout the District and replace pipes that are near or at the end of their usable life. From an implementation perspective, the District could delay replacing the 6-inch diameter watermains until repair needs noticeably increase. However, this approach does not resolve the ongoing issues of aging and reduced reliability. Most mains are asbestos cement, which tends to be more brittle than other materials, meaning a greater potential for damage under earthquake conditions. It may be possible to have the existing mains evaluated to estimate the remaining life, but this likely will not address the brittleness concerns.

4.8.1 Recommendations:

1. Upsize 4-inch mains in northern half of District to 8-inch.
2. Increase fire hydrant placement to match 500-foot spacing requirement in Oregon Fire Code when installing new waterlines.
3. Upsize existing 6-inch mains to 8-inch.
4. Upsize remaining 4-inch mains to 8-inch.

4.9 Operations and Maintenance

There are multiple O&M steps the District could take to help improve the overall reliability of the water system. Many of these have been discussed as part of large replacement projects, but some could be performed independently, as part of O&M or a smaller project. With the new electronic system map, Hiland should record location of leaks and repair date (in addition to their log).

The District replaced all water meters in 2023. Consistent with the design life listed in Section 3.4, the District should begin a water meter replacement program, starting in 10-15 years, where a certain number of meters would be replaced each year on a rolling basis.

When MIT Diving was on site in 2023, they struggled to open the hatch on the reservoir. Given the age of the tank and infrequency of opening, the existing hatch is partially warped. A new shoebox-type hatch (meeting OHA's requirements) with an entry alarm would be an appropriate improvement. Upgrading the mesh on the reservoir vent and overflow could be done at the same time.

There is currently no source meter at the well and no room to add it. A meter would provide the District with additional data and accurately measure how much the well is pumping and when. Other smaller maintenance items at the well house would be an alarm if the chlorine pump stopped working and an alarm if outflow from the reservoir exceeds peak hourly demand, as this would indicate a large leak or a fire.

One way to increase pressure in the water system and lessen the impact of fire flows would be to raise the operating level at the reservoir. Filling the current reservoir would add 10-ft of pressure (approximately 4.3 psi) throughout the system. This would primarily benefit the customers near the reservoir in the northern part of the District, whose typical static pressure at their water meters is around 30 psi. This would also provide extra water for firefighting and result in additional water in the tank at the end of a fire.

Conversely, raising the operating level would cause extra pressure at the bottom of the system (roughly below the 280-ft contour line) where customers' pressures are currently around the 80 psi plumbing code maximum. Keeping these customers below this threshold while increasing the overall pressure could be accomplished in two ways: 1) having customers add home pressure regulators on the customer's side of the meter or 2) adding two pressure reducing valve (PRV) vaults on SW 62nd Avenue and SW 63rd Avenue north of Southwood Drive.

Individual regulators are a simpler way to accomplish reduced pressures. Large PRV vaults would allow the District to raise the operating level (possibly even higher in a new reservoir) but would likely result in customers south of Southwood Drive experiencing lower pressure overall. This change could benefit customers below the 280-foot contour, but result in a 15-psi decrease for those near Southwood Drive. The PRV vaults would also require some waterline re-alignment to ensure all water flowing south passed through one of the two vaults, thereby limiting the advantages of certain system looping.

4.9.1 Recommendations

1. Record all repairs and leaks on a District map.
2. Add water meter replacement to a 15-year rolling replacement cycle as part of O&M.
3. Replace reservoir hatch and add additional alarms to the reservoir and well house.
4. Add well source meter to track well performance and accurately capture production.
5. Consider raising system pressures as part of new reservoir construction and having customers install individual pressure regulators for homes with greater than 80 psi.

5. CAPITAL IMPROVEMENT PLAN

5.1 Introduction and Summary

This section focuses on recommended capital improvements from Section 4. A summary of the CIP projects is shown in Table 5-1 below and shown in Figure 5-1. The CIP is not exhaustive and does not include many smaller projects or elements that would be more properly characterized as general O&M. All projects should include a pre-design element that verifies any critical project requirements or data needs such as key elevations, pipe size/material/location, operation characteristics, etc.

Table 5-1: Capital Improvement Plan Summary

Project	Priority	Planning Level OPC
New 6-inch Intertie with Portland	High	$750,000
Replace 4,900ft 4-inch Distribution Lines (North)	High	$2,247,000
New 250,000-Gallon Reservoir	Medium	$2,012,000
New CMU Well House and Site Piping	Medium	$835,000
Replace 1,600ft 4-inch Distribution Lines (South)	Medium	$734,000
Replace 3,100ft 6-in and 8-in Distribution Lines (North)	Low	$1,421,000
Replace 5,900ft 6-inch Distribution Lines (South)	Low	$2,704,000
O&M Projects	Low	$255,000

5.2 Opinions of Probable Cost (OPC)

5.2.1 Introduction

Opinions of probable costs (OPCs) developed in the Feasibility Study are preliminary in nature and based on the level and extent of planning completed. It will be necessary to update costs as specific projects proceed and a more detailed understanding of the issues and opportunities is developed.

For general planning purposes, contingencies, engineering, and administration costs are determined on a percentage-of-construction cost basis (see Sections 5.2.3-5.2.6). This is generally most accurate for larger projects. Smaller projects, undertaken independently, may have additional costs associated with mobilization and/or economies of scale.

Additionally, the order projects are undertaken will affect the cost. Constructing a new tank prior to building a new well house will result in additional cost as a temporary piping arrangement would be needed to connect the new tank to the old well house. Similarly, phasing construction of waterlines requires connecting to the existing system as well as including valves and fittings for future work.

5.2.1 Construction Cost

Construction costs in the Study are based on preliminary layouts and design parameters developed, construction bids for similar work, published cost guides, and the author's experience within the State of Oregon. It is common practice to relate the costs to a specific index that tracks changes in the national economy. A commonly referenced index is the Engineering News Record (ENR) Construction Cost Index (CCI). All costs in this Plan are referenced to the July 2024, ENR Construction Cost Index of 13,556. Costs in the Plan can be updated in the future by multiplying the Plan cost by the current index value and dividing by 13,556. This approach is generally valid for a 2- to 3-year period, after which the costs should be updated by an engineer. Construction bids and consequent costs can vary markedly according to the actual and perceived market and economic trends, level of competition, project size, etc.; this is particularly the case during periods of economic uncertainty or volatility.

Since the Engineer has no control over the cost of labor, materials, equipment, timing of the project; services furnished by others; the future contractor's methods for determining prices or competitive bidding; or market conditions, the Engineer's opinion of probable "total project cost and construction cost" provided herein is made on the basis of the Engineer's experience and qualifications and represents the Engineer's best judgment as an experienced and qualified professional engineer familiar with the construction industry as it relates to water system improvements. By no means does the Engineer guarantee that proposals, bids, or actual total project or construction costs will not vary from the opinion of probable costs prepared herein.

5.2.2 Construction Contingencies

The Study includes a contingency factor of 20 percent of the construction cost to allow for variables associated with the bid and construction process, consistent with the level of planning included.

5.2.3 Engineering, Construction Observation, and Construction Management Costs

The Study includes a general planning allowance of 20 to 25 percent of the construction cost for engineering, construction observation, and construction management. The higher percentage is typically associated with more complex mechanical and electrical work. Similar to construction costs, engineering fees fluctuate and are dependent on project timing.

5.2.4 Legal, Administrative, and Permitting Costs

An allowance of 5-10 percent of the construction costs is included for legal, administrative, and permitting costs.

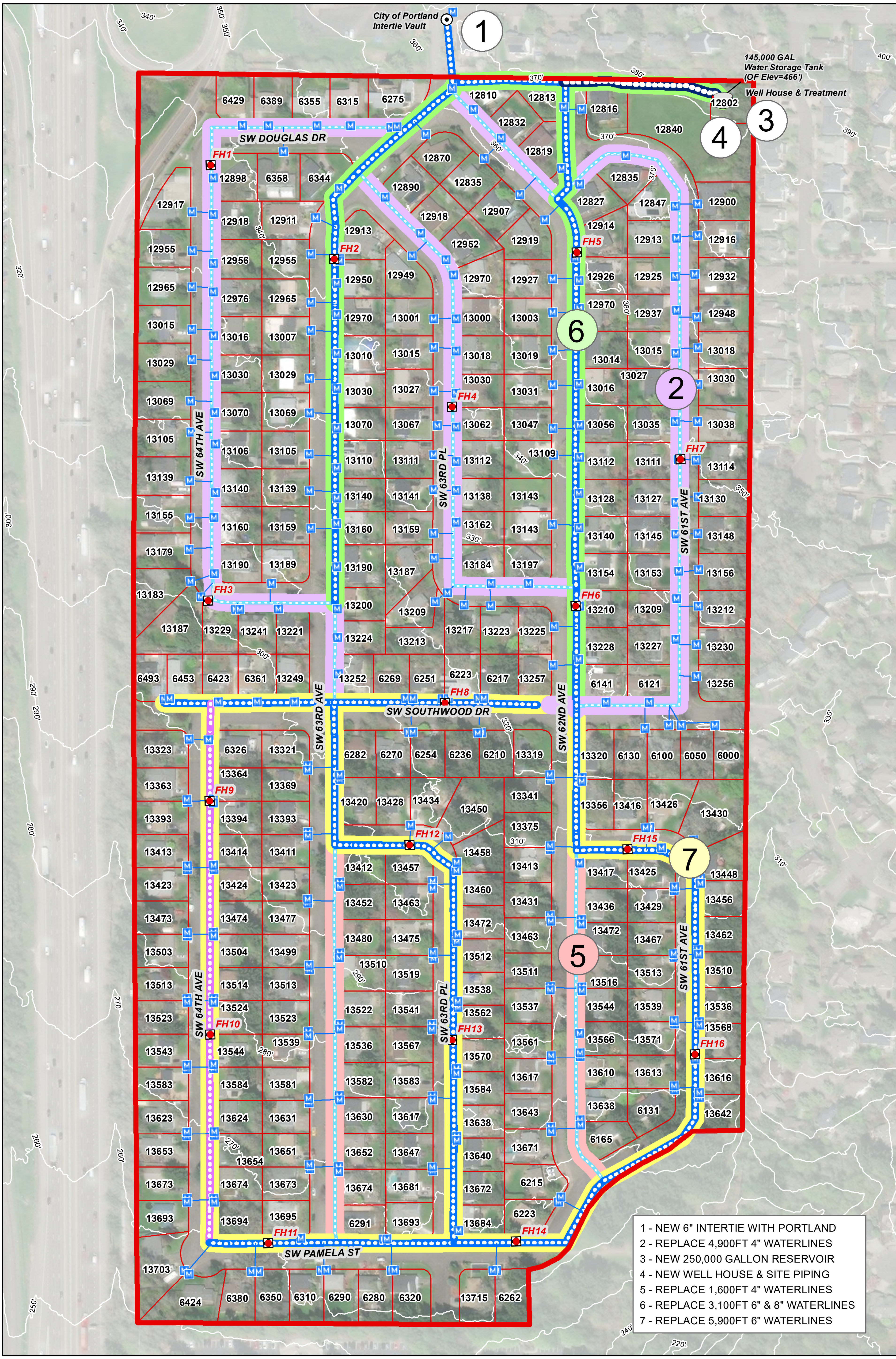

FIGURE 5-1: SPWD CIP MAP

Legend

- Water Main - 4" AC
- Water Main - 8" AC
- Water Main - 6" AC
- Lateral
- Water Main - 6" DI
- Portland Water Intertie Vault
- Well House & Chlorination Building
- Hydrants
- Valves
- Meters
- Water Tank
- District Boundary
- Parcel Boundaries
- Easement - 20ft

0 50 100 200 Feet

PACE

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5.2.5 Other Costs

Other costs may include specialized studies, property or right-of-way acquisition, specific equipment or supplies, fees, and other items that are not part of the specific categories discussed above.

Typically, these other costs are listed individually in the OPC.

5.3 Capital Improvements

5.3.1 New 6-inch Intertie with Portland

Table 5-2: 6-inch Intertie with City of Portland – Opinion of Probable Cost

Item	Quantity	Units	Total Cost
Mobilization	1	LS	$20,000
Misc Pipes, Valves, and Connections	1	LS	$125,000
Intertie Vault	1	EA	$80,000
City of Portland SDC	1	LS	$250,000
Misc. Site Restoration	1	LS	$25,000
Construction Subtotal			**$500,000**
Contingencies at 20%			$100,000
Engineering, Survey and Construction Observation @ 20%			$100,000
Legal, Administration, Permitting @ 10%			$50,000
OPC Total			**$750,000**
Includes 150 feet of 8-inch PVC to connect vault to Tee in system and second smaller vault for PRV.			

5.3.2 New 250,000-gallon Reservoir

Table 5-3: 250,000-Gallon Reservoir – Opinion of Probable Cost

Item	Quantity	Units	Total Cost
Mobilization	1	LS	$ 100,000
Site Preparation and Removals	1	LS	$ 100,000
Reservoir (Nominal 250,000 gallon)	1	EA	$ 750,000
Foundation	1	LS	$ 125,000
Misc. Pipe, Valves, Connections	1	LS	$ 100,000
Electrical, Telemetry, Cathodic Protection	1	LS	$ 25,000
Misc. Site Restoration	1	LS	$ 50,000
Construction Subtotal			**$ 1,250,000**
Contingencies at 20%			$ 250,000
Geotechnical			$ 75,000
Engineering, Survey, and Construction Observation @25%			$ 312,000
Legal, Administration, and Permitting @ 10%			$ 125,000
OPC Total			**$ 2,012,000**
No land purchase/lease is included in the above estimate. No cost for using Portland water is included.			

5.3.3 New Well House and Site Piping

Table 5-4: New Well House and Site Piping – Opinion of Probable Cost

Item	Quantity	Units	Total Cost
Mobilization	1	LS	$ 50,000
Site Preparation and Removals	1	LS	$ 50,000
CMU Well Building (Nominal 250 sq ft)	1	EA	$ 200,000
Misc. Pipe, Valves, Connections	1	LS	$ 150,000
Electrical, Telemetry, Chemical Pump	1	LS	$ 100,000
Misc. Site Restoration	1	LS	$ 25,000
Construction Subtotal			**$ 575,000**
Contingencies at 20%			$ 115,000
Engineering, Survey, and Construction Observation @20%			$ 115,000
Legal and Administration @ 5%			$ 30,000
OPC Total			**$ 835,000**
No land purchase/lease is included in the above estimate. No cost for using Portland water is included. No new well pump/motor (if constructed before 2035) No backup generator. Site piping to connect to reservoir and meter vault. New flow meter vault.			

5.3.4 Replace 4-inch Distribution Lines with 8-inch

Table 5-5: Replace 6,500 feet of 4-inch Waterline – Opinion of Probable Cost

Item	Quantity	Units	Total Cost
Mobilization	1	LS	$ 100,000
8-inch C900 Waterline, fully installed, including fittings, valves, hydrants, and services	6,500	LF	$1,787,500
Misc. Site Restoration	1	LS	$ 100,000
Construction Subtotal			**$ 1,987,500**
Contingencies at 20%			$ 397,500
Engineering, Survey, and Construction Observation @25%			$ 497,000
Legal and Administration @ 5%			$ 99,000
OPC Total			**$ 2,981,000**
C900 estimated at $275/LF installed Existing AC to be abandoned in place			

5.3.5 Replace 6-inch Distribution Lines with 8-inch

Table 5-6: Replace 9,000 feet of 6-inch and 8-in Waterline – Opinion of Probable Cost

Item	Quantity	Units	Total Cost
Mobilization	1	LS	$ 125,000
8-inch C900 Waterline, fully installed, including fittings, valves, hydrants, and services	9,000	LF	$ 2,475,000
Misc. Site Restoration	1	LS	$ 150,000
Construction Subtotal			**$ 2,750,000**
Contingencies at 20%			$ 550,000
Engineering, Survey, and Construction Observation @25%			$ 687,500
Legal and Administration @ 5%			$ 137,500
OPC Total			**$ 4,125,000**
C900 estimated at $275/LF installed Existing AC to be abandoned in place			

5.3.6 Operation and Maintenance Upgrades

Table 5-7: Operation and Maintenance Upgrades – Opinion of Probable Cost

Item	Quantity	Units	Total Cost
Reservoir Upgrades and Alarms	1	LS	$10,000
Replace Well House Piping and Add Alarms	1	LS	$60,000
Close Loop on Southwood Drive	1	LS	$50,000
Electrical – New Motor Control Center	1	LS	$50,000
Construction Subtotal			**$170,000**
Contingencies at 20%			$34,000
Engineering, Survey, and Construction Observation @25%			$43,000
Legal and Administration @ 5%			$8,000
OPC Total			**$255,000**
All items are part of larger capital projects but could be done if the larger projects are not undertaken soon.			

5.4 Project Prioritization

Some projects are noted as high priority in Table 5-1; the high priority designation is based on current condition or current insufficient capacity. Ideally, these projects will be addressed as soon as possible, possibly as one large or several smaller project(s). Deferral of these projects will result in a lower level of service and, depending on the projects, leave the District vulnerable to system failures. Project prioritization should ultimately be reflected in the CIP scheduling.

- (H) High Priority Projects (implementation year 2025-2027)
- (M) Medium Priority Projects (implementation year 2028-2030)
- (L) Low Priority Projects (implementation year 2031-2040)

5.5 Financing and Implementation

Implementation and financing are discussed in Section 6.

6. RATES AND FINANCING

6.1 Recent General Fund Budgets

The District's General Fund covers personnel and water system costs and is funded entirely through water user fees. The District's Capital Improvement Fund is a starting point, begun in 2021, to fund capital outlay for expanding and improving the water system and is funded by water user fees. The District's 2022-2024 budget was adopted on June 29, 2022. A copy of the complete budget is included in Appendix O. Recent budgets, including capital outlay for the fund, are shown in Table 6-1.

Table 6-1: General Fund Budgets

Description	Actual Fiscal Year 2019 – 2020	Actual Fiscal Year 2020-2021	Adopted Budget Fiscal Year 2021-2022	Approved Budget Fiscal Year 2022-2024
Resources				
Beginning Fund Balance	$ 113,880	$ 126,326	$ 160,000	$ 210,000*
Revenue				
User Fees	$ 101,044	$ 110,668	$ 106,100	$ 320,000
Total Resources	$ 214,924	$ 236,995	$ 266,100	$ 530,000
Expenditures				
Personnel Services	$0	$0	$0	$0
Materials & Services	$ 79,364	$ 76,248	$ 92,920	$ 256,628
Capital Outlay	$ 9,234	$0	$ 140,000	$ 270,000
Contingencies	$0	$0	$ 1,200	$ 2,400
Expenditures Total	$ 88,598	$ 76,248	$ 234,120	$ 529,028
Unappropriated Ending Balance/Reserved for Future	$ 126,326	$ 160,747	$ 31,980	$ 972
Total Requirements	$ 214,924	$ 236,995	$ 266,100	$ 530,000
Revenue – Expenditures	$ 12,446	$ 34,420	($ 128,020)	($ 209,028)
*Estimated beginning fund balance for 2022-2024				

Because the District has only one service connection available, there is no opportunity to fund future capital expenses through System Development Connection (SDC) charges. Future improvements will continue to be funded by water user fees, grants, bonds, or through debt service from loans.

6.2 Current Water Rates

Southwood Park's current (effective September 1, 2021) water rate schedule is included in Appendix P. Rates are based on a base bimonthly service charge of $50.00. To the base charge is added the water usage rate of $2.75 per CCF (100 cubic feet or 748 gallons). Southwood Park is a residential community, and the rate structure does not include consideration of other customer classes. Meter readings and billings are bi-monthly.

As shown in the recent budgets, a portion of the current rates are going to fund capital outlay projects. Future water rates could include a System Enhancement Fee per month, which could be added to the base and usage charges, to fund specific projects.

Funding agencies often evaluate a community's rates based on a monthly single-family residential billing associated with 7,500 gallons of usage; for Southwood Park, this billing would be $52.57 ($25 for base rate plus $27.57 usage).

The General Fund budgets appear healthy for annual operating and maintenance items and small, unexpected expenses. The District was able to pay for the repairs in 2024 and the Portland water bill from the General Fund. A capital outlay reserve is slowly being built for capital improvements. A portion of this fund paid for the water meter replacement program in 2023. In order to fund the large-scale CIP projects presented in Section 5, an increase in water rates will be necessary, regardless of the recent rate increase. The District should consider retaining a consultant to complete a Rate Study, which would evaluate the benefit and feasibility of the rate structure, modifications for conservation (as has been seen in the past 8 years), and surcharges if the District has to purchase water from Portland. Budget $25,000 for planning purposes.

6.3 O&M Considerations

The recommended capital improvements should not result in increased O&M costs; however, O&M costs are subject to market changes and inflationary pressures, so annual increases are typically necessary. Budgets and water rates are typically adjusted to accommodate recent or anticipated changes; however, unaddressed system deficiencies can unexpectedly increase O&M costs in ways and to an extent that are difficult to foresee. This may take the form of emergency (overtime) response and additional related expenses (such as additional Hiland time), interim measures required until the issues are adequately resolved (such as purchasing water from Portland), and unforeseen emergency projects that could incur significant costs (such as well motor replacement). Over time, such costs can add significantly to the overall utility budget.

6.4 Capital Improvement Finance

6.4.1 Introduction

Major capital improvements are often cost-prohibitive to fund exclusively with accumulated reserves. Such projects may be economically financed through programs offered by various State and Federal agencies, or a mix of public and local financing. The following discussion identifies potential sources of that funding.

6.4.2 Public Works Funding Sources

This section includes a brief description of several funding programs that are likely to best meet Southwood Park's needs.

The Safe Drinking Water Revolving Loan Fund (SDWRLF) is funded by EPA grants and from the (Oregon) Water/Wastewater Financing Program. The program is managed by Oregon Health Authority (OHA); the loans are managed by Infrastructure Finance Authority (IFA), a part of Business Oregon, a state agency. There is no maximum limit on the size of a funding award (requests over $3,000,000 require additional review), and the loan term length is up to 30 years. The interest rate was 3.15 percent (July 2024 – the rate changes quarterly and is based on 80 percent of the state/local bond interest rate). The application process includes an initial Letter of Interest, which is used by the state to rate and rank projects to determine which applicants will be invited to submit complete applications.

The Water/Wastewater Financing Program (W/WW) is capitalized primarily through Oregon Lottery funds and loan repayments. The program is managed by IFA, and the focus is on the design and construction of public works infrastructure to ensure compliance with the Safe Drinking Water Act and the Clean Water Act. The program provides up to $10,000,000 per project with a 25-year term. The interest rate was 3.93 percent (July 2024 – the rate changes quarterly). Grants of up to $750,000 are possible with equivalent matching loans; however, grant eligibility is determined on a case-by-case basis. The application process includes submittal of a Project Notification and Intake Form (PNIF). Qualified applicants are then invited to submit a complete application.

The Special Public Works Fund (SPWF) is capitalized primarily through Oregon Lottery funds and loan repayments. The program is managed by IFA, and the focus is on infrastructure projects that support economic growth and job creation. The program provides up to $10,000,000 per project with a 30-year term. The interest rate was 4.08 percent (July 2024 – the rate changes quarterly). Grants of up to $500,000 (or 85 percent of project cost, whichever is less) are possible; however, grants are typically based on up to $5,000 per family wage job created or retained; grant eligibility and extent for the project is determined on a case-by-case basis. If the project is strictly for capacity building, then no grant is awarded. The application process includes submittal of a Project Notification and Intake Form (PNIF). Qualified applicants are then invited to submit a complete application.

It is important to understand that funding programs change over time. Interest rates, fund availability, relative grant participation, and eligibility requirements are common areas of change; consequently, the figures and opportunities presented here may not be applicable at the time of funding application and award.

6.4.3 Local Financing Sources

Commonly used local financing sources include the following:

General obligation (GO) bonds are backed by the full faith and credit of the issuer who is authorized to levy ad valorem (property) taxes for payment. The issuer can use other revenue for payment if desired. A term of 20 years is typical.

Revenue bonds are backed by the District's pledge to operate the water system in a manner that will generate sufficient revenue to meet the financial obligations of the bond issue. These are generally paid with water rate revenue.

Sinking funds basically refer to a process of saving a budgeted amount over a period of time until enough funds have been accrued to undertake the project. This approach is generally viable for lower cost projects or ones with long lead times. It can be a significant tool in asset management where future projects are anticipated based on remaining design lifespans; however, it may result in significant near-term rate or fee increases that could be politically challenging to adequately implement for large capital improvement budgets.

Ad valorem tax or property tax is often used to pay all or part of a GO bond. Property taxes can provide an alternative way of distributing project costs and minimizing financial impacts on homeowners with lower property valuations.

Water rates are a typical source of monies for debt service on loans from the State and Federal funding agencies. Water rates can also be used for sinking funds.

6.5 Capital Improvement Rate Impacts

Table 6-2 includes debt service and rate impacts on a per equivalent dwelling unit (EDU) basis for projects funded through the programs identified in Section 6.4, plus a computation using a 4-, 5-, and 6-percent interest rate. Major projects may require funding through multiple sources; rate impacts for multiple funding sources are simply added together.

Note: Table 6-2 is for general planning purposes only. Actual interest rates, terms, and availability of funds through any given source may vary and are not locked in until an offer of funding is accepted by the District.

Table 6-2: Debt Service and Rate Impacts (per EDU basis) for 25 Year GO Bond Term

Loan Total	Average Homeowner Total Cost	4% Interest Annual Debt Service	4% Interest Monthly Per EDU Rate Increase	5% Interest Annual Debt Service	5% Interest Monthly Per EDU Rate Increase	6% Interest Annual Debt Service	6% Interest Monthly Per EDU Rate Increase
$1,000,000	$3,355.70	$214.81	$17.90	$238.10	$19.84	$262.51	$21.88
$2,000,000	$6,711.41	$429.61	$35.80	$476.19	$39.68	$525.01	$43.75
$3,000,000	$10,067.11	$644.42	$53.70	$714.29	$59.52	$787.52	$65.63
$4,000,000	$13,422.82	$859.22	$71.60	$952.38	$79.37	$1,050.02	$87.50
$5,000,000	$16,778.52	$1,074.03	$89.50	$1,190.48	$99.21	$1,312.53	$109.38
$6,000,000	$20,134.23	$1,288.83	$107.40	$1,428.57	$119.05	$1,575.03	$131.25
$7,000,000	$23,489.93	$1,503.64	$125.30	$1,666.67	$138.89	$1,837.54	$153.13
$8,000,000	$26,845.64	$1,718.44	$143.20	$1,904.76	$158.73	$2,100.05	$175.00
$9,000,000	$30,201.34	$1,933.25	$161.10	$2,142.86	$178.57	$2,362.55	$196.88
$10,000,000	$33,557.05	$2,148.05	$179.00	$2,380.95	$198.41	$2,625.06	$218.75

6.6 Capital Improvement Implementation

Capital improvements can be implemented over the planning period according to the nature of the projects, the relative prioritization of the project, and other financial and practical considerations that the District may have. Because of the high costs, funding agency participation may be needed or desired. If the District decides to pursue agency assistance, and has determined which projects to include, the District should contact IFA to set up a One-Stop Meeting in Salem to discuss potential project funding. Representatives of potential funding agencies attend the meeting and can assist in developing an optimal funding approach.

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Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix A
Survey Maps and Data

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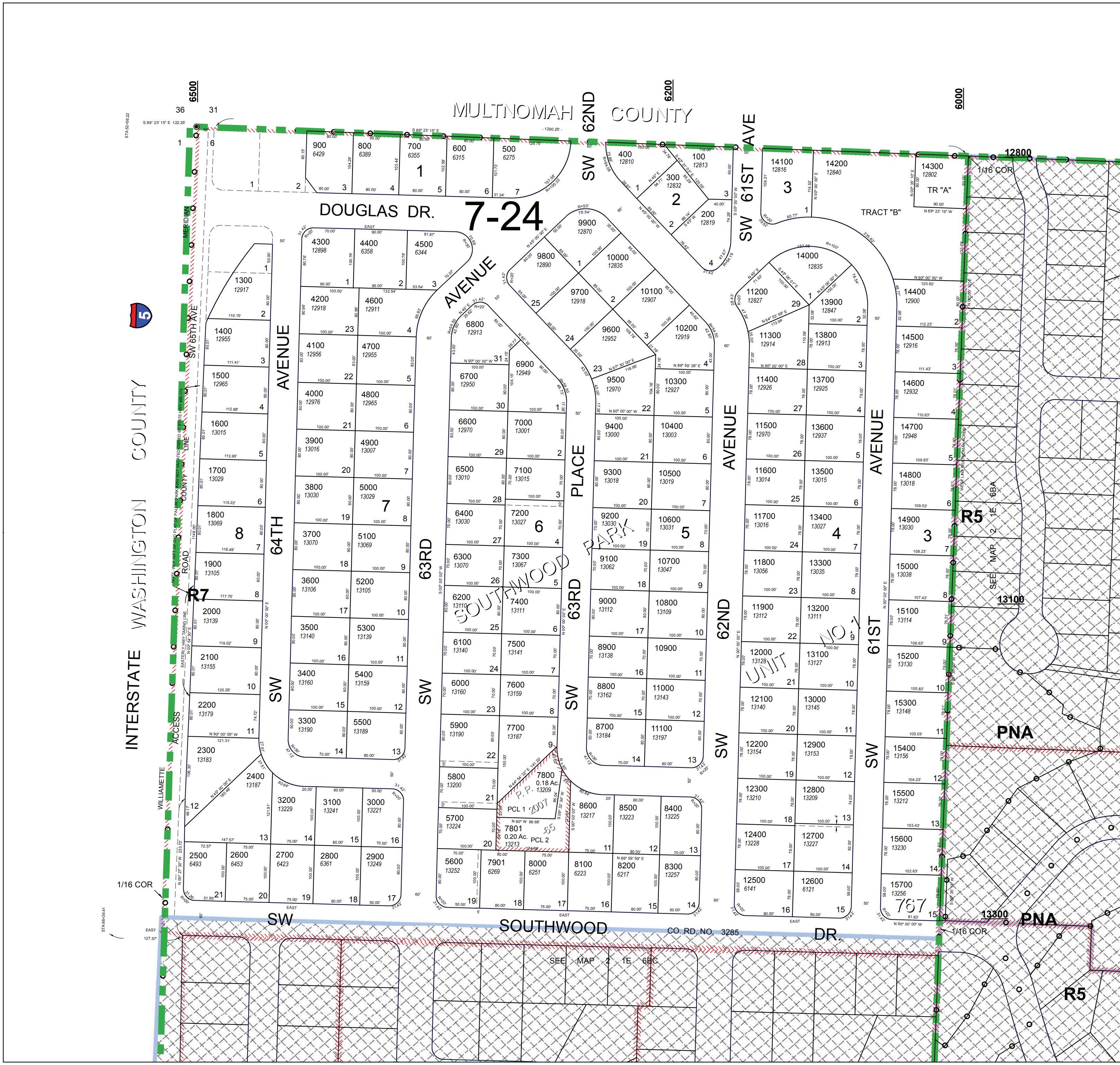
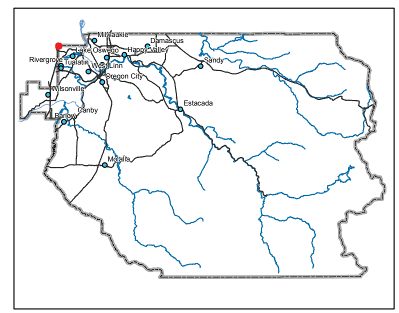
N.W.1/4 N.W.1/4 SEC.6 T.2S. R.1E. W.M.
CLACKAMAS COUNTY
1" = 100'



Cancelled Taxlots

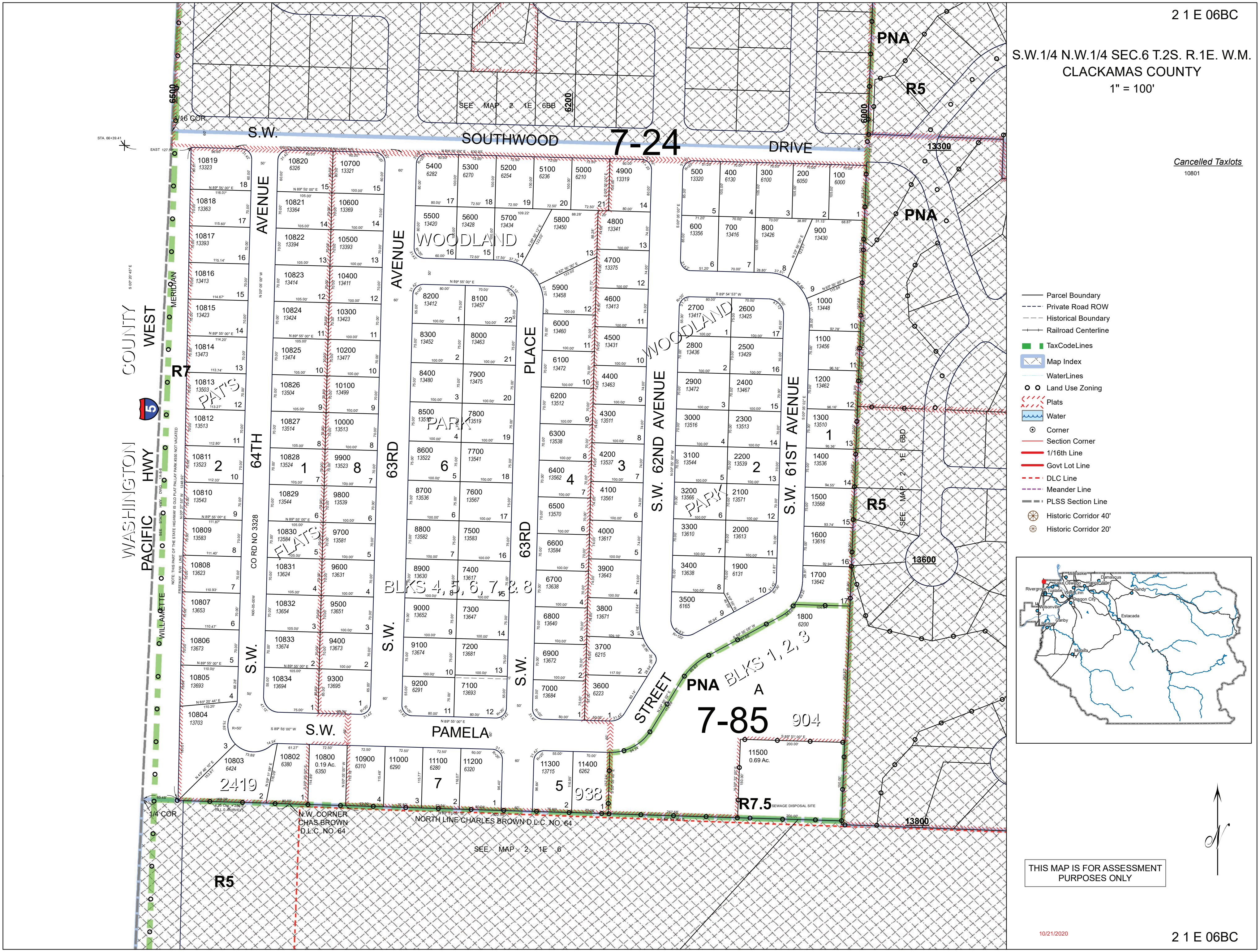
1401
501
7900
1000
1100
1200

- Parcel Boundary
- Private Road ROW
- Historical Boundary
- Railroad Centerline
- TaxCodeLines
- Map Index
- WaterLines
- Land Use Zoning
- Plats
- Water
- Corner
- Section Corner
- 1/16th Line
- Govt Lot Line
- DLC Line
- Meander Line
- PLSS Section Line
- Historic Corridor 40'
- Historic Corridor 20'



THIS MAP IS FOR ASSESSMENT PURPOSES ONLY

6/26/2018



2 1 E 06BC
S.W.1/4 N.W.1/4 SEC.6 T.2S. R.1E. W.M.
CLACKAMAS COUNTY
1" = 100'
Cancelled Taxlots
10801
S.W. SOUTHWOOD DRIVE
7-24
7-85
WOODLAND PARK
PAT'S FLATS
BLKS 4, 5, 6, 7, & 8
BLKS 1, 2, 3
S.W. 64TH AVENUE
S.W. 63RD AVENUE
S.W. 63RD PLACE
S.W. 62ND AVENUE
S.W. 61ST AVENUE
S.W. PAMELA STREET
PACIFIC HWY WEST
WASHINGTON COUNTY
WILLAMETTE MERIDIAN
CO RD NO 3328
R7
R5
R7.5
PNA
SEE MAP 2 1E 6BB
SEE MAP 2 1E 6BD
SEE MAP 2 1E 6
N.W. CORNER CHAS.BROWN D.L.C. NO. 64
NORTH LINE CHARLES BROWN D.L.C. NO. 64
1/4 COR
1/16 COR
SEWAGE DISPOSAL SITE
2419
938
904
13300
13600
13800
Parcel Boundary
Private Road ROW
Historical Boundary
Railroad Centerline
TaxCodeLines
Map Index
WaterLines
Land Use Zoning
Plats
Water
Corner
Section Corner
1/16th Line
Govt Lot Line
DLC Line
Meander Line
PLSS Section Line
Historic Corridor 40'
Historic Corridor 20'
THIS MAP IS FOR ASSESSMENT PURPOSES ONLY
10/21/2020
2 1 E 06BC

SOUTHWOOD PARK

UNIT NO. 1

SITUATED IN N.W. 1/4 SEC. 6, T. 2 S., R. 1 E., W. M.

CLACKAMAS COUNTY, OREGON

Surveyed U. Ernest Nelson & Associates
By G. Vernon Nelson

Scale: 1" = 100'

REGISTERED
OREGON
LAND SURVEYOR
G. Vernon Nelson
JANUARY 1ST, 1945
G. VERNON NELSON
No. 107

STATE OF OREGON
COUNTY OF MULTNOMAH } SS

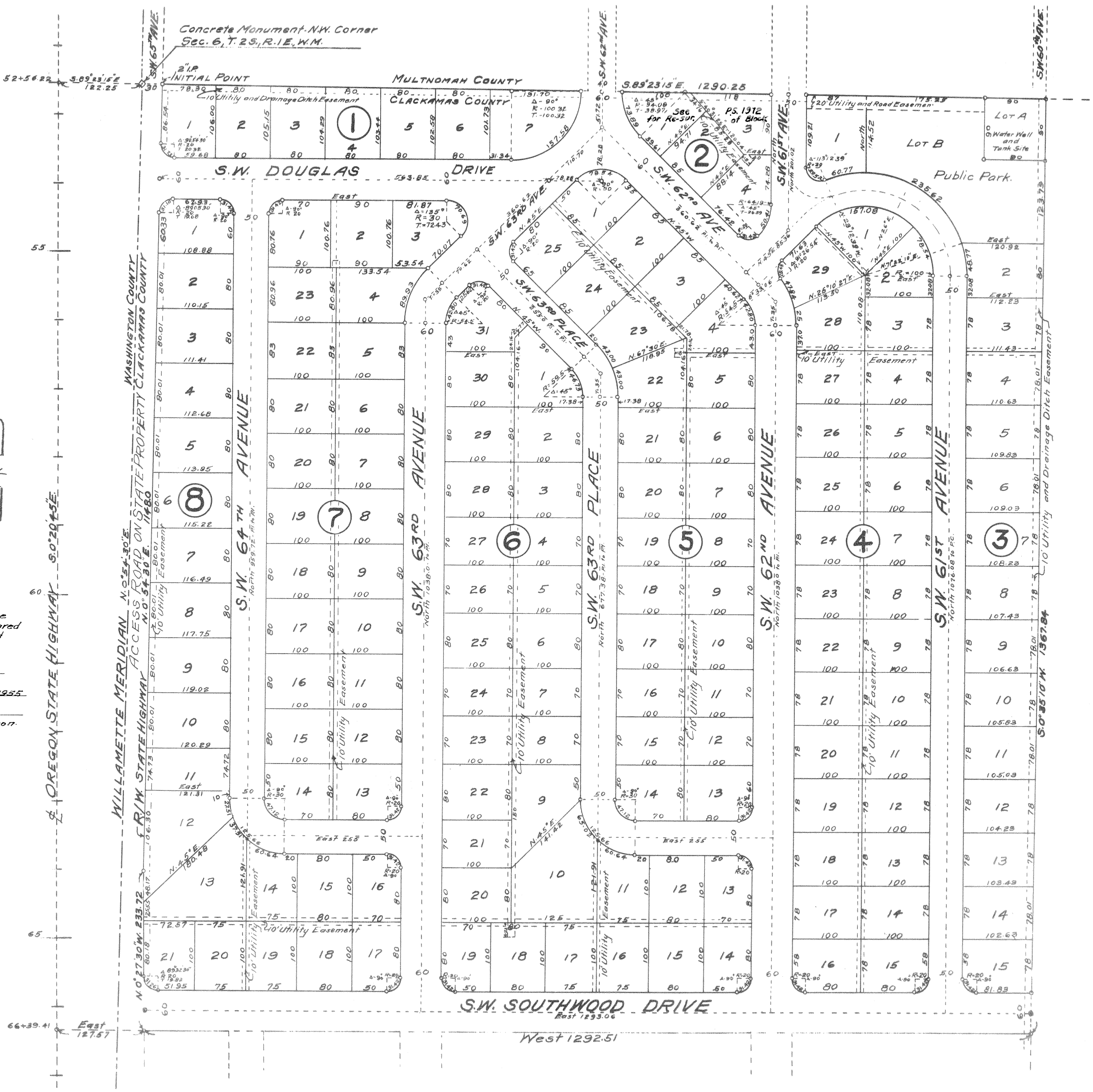
I, G. Vernon Nelson, being first duly sworn upon oath, depose and say that I am the surveyor who made the survey and prepared the final map of SOUTHWOOD PARK, UNIT No. 1 and that the annexed tracing is an exact copy of said map.

G. Vernon Nelson.

Subscribed and sworn to before me this 24th day of January 1955

Marjorie E. Hamilton
Notary public for Oregon.

My Commission expires Feb. 16, 1957



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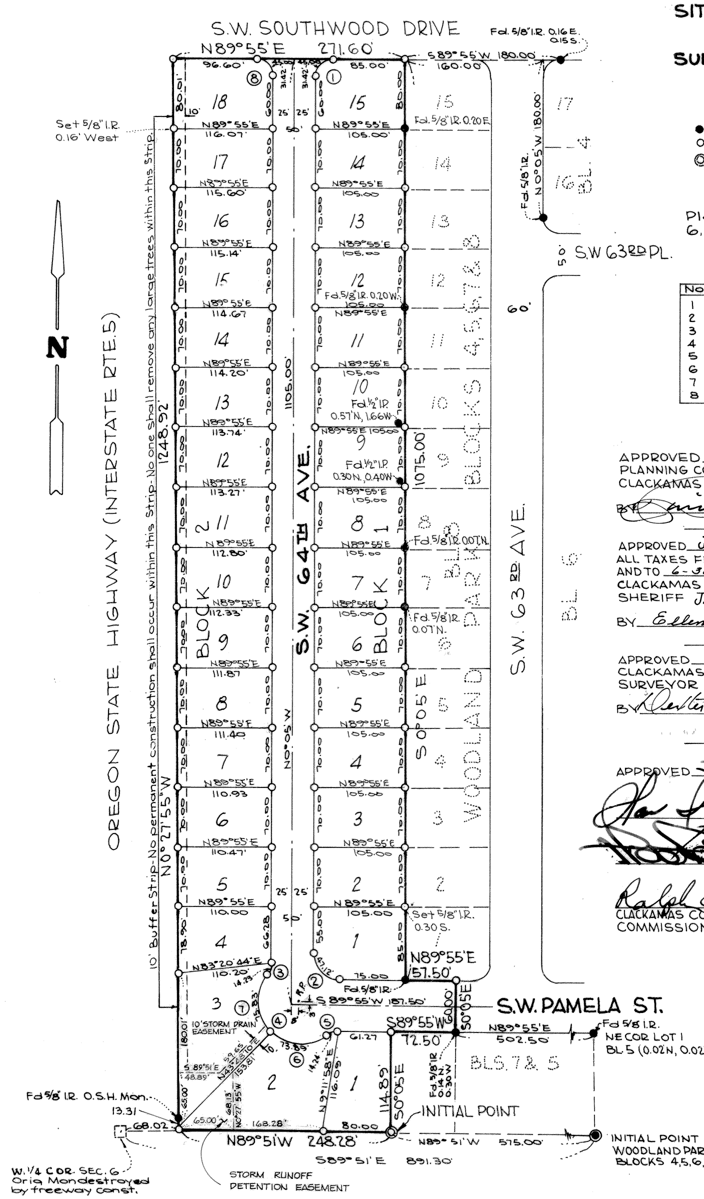


PAT'S FLATS

SITUATED IN THE NW 1/4, SECTION 6, T.2S., R.1E., W.M.
CLACKAMAS COUNTY, OREGON
SURVEYED SEPTEMBER, 1977 BY JIM WEDDLE & ASSOCIATES

SCALE: 1" = 100'   7.71 ACRES

LEGEND

- ● --- Found points as noted
- ○ --- Set 5/8 x 30" Iron rod
- ◎ --- Set 2" X 36" Galvanized Iron Pipe

BASIS OF BEARINGS

Plat Map of Woodland Park Blocks 4,5, 6,7 & 8

CURVE DATA TABLE

No.	Δ	R	L	Chord	
1	90°00'00"	20'	31.42'	N44°55'E	28.28'
2	90°00'00"	30'	47.12'	N45°05'W	42.43'
3	40°46'44"	20'	14.23'	N20°18'22"E	13.94'
4	171°33'54"	50'	149.72'	N45°05'13"W	99.73'
5	40°47'10"	20'	14.24'	S69°31'25"W	13.94'
6	84°40'20"	50'	73.89	N88°32'W	67.35'
7	86°53'34"	50'	75.83'	N2°45'03"W	68.77'
8	90°00'00"	20'	31.42'	N45°05'W	28.28'

APPROVALS

APPROVED May 31, 1978
PLANNING COMMISSION
CLACKAMAS COUNTY
BY [signature]

APPROVED June 25, 1979
CLACKAMAS COUNTY
DIRECTOR OF PUBLIC WORKS
BY [signature]

APPROVED June 26, 1978
ALL TAXES FROM 7-1-78
AND TO 6-30-79 ARE PAID
CLACKAMAS COUNTY
SHERIFF John Renfro
BY Ellen Poppen

APPROVED June 19, 1979
CLACKAMAS COUNTY
ASSESSOR JUANITA ORR
Pursuant to O.R.S. 92.095, I hereby certify that all 1979-80 taxes are paid.
BY Pat Brost

APPROVED 5-10, 1979
CLACKAMAS COUNTY
SURVEYOR
BY Dexter E Milne

ATTEST June 26, 1979
CLACKAMAS COUNTY
CLERK George D. Poppen
BY Susan Bennett

APPROVED ______, 1979
[signatures]
Ralph Groener
CLACKAMAS COUNTY
COMMISSIONERS

NOTE:
A 5.00 foot easement for Public Utilities and Drainage purposes is hereby granted along each front, side and rear lot line, unless shown otherwise hereon.

SURVEYOR'S CERTIFICATE

I, James O. Weddle, being first duly sworn, depose and say that I have correctly surveyed and marked with proper monuments the lands represented on the annexed map of "PAT'S FLATS", that for the INITIAL POINT of said survey I set a galvanized iron pipe, 2 inches in diameter, 36 inches in length, 6 inches below the ground surface at a point that is N89° 51'W 575.00 feet from the Initial Point of WOODLAND PARK, Blocks 4,5,6,7 & 8, which point is S89° 51'E 891.30 feet from the West 1/4 Corner of Section 6, T.2S., R.1E., W.M.; thence N89°51'W 248.28 feet to the East Line of the Oregon State Highway, known as "Interstate 5"; thence along said Line N0°27'55"W 1248.92 feet; thence along the South Line of the Plat of Southwood Park N89°55'E 271.60 feet; thence along the West Line of said Woodland Park S0°05'E 1075.00 feet; thence N89°55'E 57.50 feet; thence S0°05'E 60.00 feet; thence S89°55'W 72.50 feet; thence S0°05'E 114.89 feet to the INITIAL POINT and Point of Beginning and that the accompanying tracing is an exact copy of the original Plat of "PATS FLATS."

REGISTERED PROFESSIONAL LAND SURVEYOR
Jim Weddle
OREGON
JULY 12, 1968
JAMES O. WEDDLE
874

[signature]
James O. Weddle, Professional Land Surveyor No. 874

Subscribed and sworn before me this 20th day of September, 1977

Gregory D. McLeod
NOTARY PUBLIC for the State of Oregon
My Commission expires 5/14/80

DEDICATION

KNOW ALL MEN BY THESE PRESENTS that Herb Morissette Builders, Inc., an Oregon Corporation, does hereby make, establish and declare the annexed map of "PAT'S FLATS" as described in the accompanying Surveyor's Certificate to be a true map and plat thereof, all lots being of the dimensions shown and all streets and easements being of the widths thereon set forth, and said Herb Morissette Builders, Inc. does hereby dedicate to the use of the public as public ways forever all streets and easements shown on said map and the Public is hereby granted the right to maintain, replace or enlarge storm sewer facilities along these easements and will not in any way be responsible for replacing landscaping, fencing or other structures, shrubs or trees that may exist or be placed within these storm drainage easements.

Herbert E. Morissette
Herbert E. Morissette, President
HERB MORISSETTE BUILDERS, INC.

ACKNOWLEDGEMENT

STATE OF OREGON
COUNTY OF MULTNOMAH S.S.

BE IT REMEMBERED that on this 16th day of September, 1977, before me, a notary public in and for Oregon, personally appeared Herbert E. Morissette, who being duly sworn, did say that he, Herb Morissette is the President of Herb Morissett Builders, Inc. and that said instrument was signed in behalf of said Corporation by authority of its Board of Directors and said Herb Morissette does ackowledge said instrument to be a free act and deed.

IN WITNESS WHEREOF I have set my hand and seal the day and year first above written.

Bonnie La Marr
NOTARY PUBLIC for the State of Oregon
My Commission expires 3-28-80

Approved Donald C. Jolly Sept. 18, 1962
Clackamas County Planning Commission

President

All taxes from 6-30-62 and prior have been paid
Joe Shobe
Sheriff
Dave Mitchell
Deputy

Approved ____________ 1962

County Roadmaster

Deputy

Approved Sept 12th 1962
John H. Kelley Jr
County Surveyor
Lloyd Robinson
Deputy

Approved Sept 13th 1962
Donald S. Hattan
County Assessor

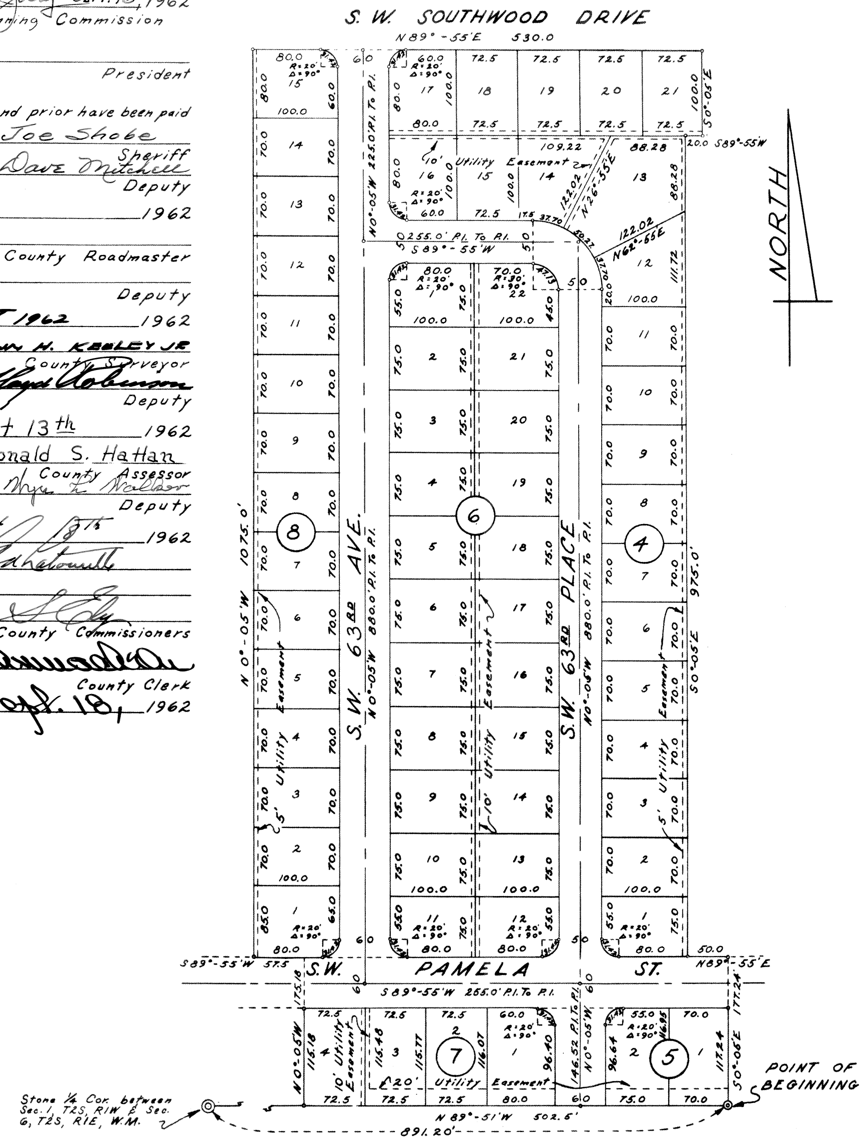
Deputy

Approved Sept 18th 1962

County Commissioners

Attest

County Clerk
Sept. 18, 1962



WOODLAND PARK

BLOCKS 4, 5, 6, 7 & 8

SITUATED IN THE NW¼ SECTION 6, T2S, R1E, W.M.

CLACKAMAS COUNTY, OREGON

SURVEYED JANUARY 1957, BY CAUFIELD & CAUFIELD CONS. ENG'RS.

SCALE: 1"=100'

KNOW ALL MEN BY THESE PRESENTS; that Edwards Industries, Inc., a corporation organized and existing under the laws of the State of Oregon, does hereby declare the annexed map to be a true and correct map of the land owned and laid out and platted by them as Blocks 4, 5, 6, 7 & 8, Woodland Park, said land being more particularly described in the surveyor's certificate hereunto annexed. And said corporation does hereby dedicate to the use of the public forever all Roads, Streets and Avenues as represented upon said map.

IN WITNESS WHEREOF Edwards Industries, Inc, pursuant to a resolution duly and legally adopted by its board of directors, has caused these presents to be executed by its President and Secretary and has caused its corporate seal to be hereunto affixed.

Edwards Industries

By Allen C. Edwards
President

By Wayne E. Coffee
Secretary

STATE OF OREGON
COUNTY OF WASHINGTON } ss

THIS CERTIFIES that on this 10th day of July 1962 before me, a notary public in and for said County and State, personally appeared Allen C. Edwards and Wayne E. Coffee, who being first duly sworn upon oath did say that he, the said Allen C. Edwards is the President, and he the said Wayne E. Coffee is the Secretary of Edwards Industries, Inc., the corporation named and described in the forgoing instrument and in this the certificate thereto, and they did individually declare that said instrument was signed and sealed on behalf of said corporation, and was executed by the free act and deed of said corporation.

Joan E. Kilblacke
Notary public for Oregon
My Commission expires Aug 14, 1965

I, James D. Caufield, Registered Professional Engineer #3002 of the State of Oregon, hereby certify that during January 1957, I accurately surveyed, subdivided and platted into blocks, lots and streets the following described tract of land in the NW ¼ of Section 6, T2S, R1E, W.M., Clackamas County, Oregon, to wit:

Beginning at a 2" iron pipe 3'-0" long which was driven 6" below the surface of the ground which point lies S89°-51'E 891.20 feet from the West ¼ Corner of Section 6, T2S, R1E, W.M., thence N89°-51'W a distance of 502.5 feet; thence N0°-05'W a distance of 175.18 feet; thence S89°-55'W a distance of 57.5 feet; thence N0°-05'W a distance of 1075.0 feet; thence N89°-55'E a distance of 530.0 feet; thence S0°-05'E a distance of 100.0 feet; thence S89°-55'W a distance of 20.0 feet; thence S0°-05'E a distance of 975.0 feet; thence N89°-55'E a distance of 50.0 feet; thence S0°-05'E a distance of 177.24 feet to the point of beginning.

James D. Caufield

REGISTERED PROFESSIONAL ENGINEER 3002 OREGON NOV. 18, 1948 JAMES D. CAUFIELD

Subscribed and sworn to before me this 22nd day of January 1962.

B. B. Klike
Notary public for Oregon

My Commission expires August 19, 1963

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix B
Water System Background Memo

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Southwood Park Water District

Background Information

December 2018

SYSTEM RELATED:

The well was drilled in 1954, and the water lines were likely installed around that time, since some homes were being completed in 1955. There have not been any significant upgrades over the years, generally only maintenance and repairs. The only additions have been the master outflow meter, three water quality test stations, chlorinator, and alarm monitoring that was installed about 20 years ago. We have a small connection to Portland for emergencies. There are 298 current service connections, with one undeveloped lot, which means no real future growth potential.

The main water lines are generally located 2-6 feet inside the curb on the house side, one per street, except where they cross a street. About 85% of the mains are made of asbestos cement (AC), roughly 2.7 miles in length, with about half being 4" dia. and half 6" dia. Currently 6" is considered the minimum size, with 8" preferred. The remaining mains are likely larger AC or ductile iron, with all of lower 64th Ave being ductile. The AC pipe life expectancy is about 60-80 years, depending on soil conditions. Our soil is somewhat acidic and known to corrode AC and stainless steel. Since the service lines are tapped into the main using a stainless steel saddle, those connections have been failing frequently due to corrosion. The service lines to the water meters are generally flexible polyethylene without a tracer wire and about half of them cross a street. As such, finding the exact location of the service lines and main lines can be difficult.

The exact age of the steel tank is unknown, but likely about 60 years, and the inside was recoated over 20 years ago. It needs interior re-inspecting, repair or recoating if necessary, and exterior painting. The pump was replaced in 2009 and has an estimated 8-12 year life expectancy.

Water loss during the past year has varied from 3.15% to over 29% and totaled over 4.3 million gallons, or an annual average loss of about 18%. That amount of water cost about $5,800 to pump. Water loss is dependent on the number of leaks, size, and the time active prior to detection. Plus the older meters could be under reporting actual customer usage, which inflates the loss. Industry standards suggest leakage rates should be less than 10% and preferably zero.

FUTURE COSTS:

We paid Tualatin Valley Water District (TVWD) to develop a capital plan for us, completed in October 2010. It consists of 26 pages with photos, drawings, and spreadsheets. The costs estimates are for planning only, which means they could vary by plus or minus 50%. But given the estimates are over eight years old, it may be advisable to consider a somewhat higher number.

In general the plan identified various projects over a number of years up to 15 years and beyond. They ranged from $1500 for alarm sensors up to $1.6 mil to replace the distribution lines. Other significant estimates were $50k for tank structural analysis (assessment only), $60k to recoat tank interior, $75k to replace well house, $125k to upgrade Portland connection, $200k to paint tank exterior, $385k for water softening equipment, and $433k to replace most plastic service lines with copper. Together all the identified projects totaled about $2.4 million. Replacing the water tank or adding earthquake reinforcement was not included in the capital plan.

Given the system's age, the basic assumption is that most of it is near, at, or beyond it's original estimated lifespan. It is theoretically possible for repairs and maintenance to keep it functioning for some time, but every year adds more risk. We know the cost to replace bad service lines (about $1-2k) or the pump (about $37k in 2009 dollars). Also two hydrants were replaced last year, an unexpected repair (about $12.5k). Currently nearly all incoming revenue is spent on operating,

maintaining, and repairing the system. All current costs are paid for through the monthly base and water usage charges. If we were to undertake a major project, like something over $50-75k, the board would likely consider a onetime fixed special charge per customer, a tax assessment (which hits higher valued homes more), and/or some combination along with a rate increase.

EARTHQUAKE & INSURANCE:

In a major earthquake, the water tower would likely fall over, possibly taking out the power lines or crushing the pump house, and about 125,000 gallons of water would flow down the park onto 61st Ave. The main water lines would likely crack or separate in multiple locations throughout the neighborhood. The District carries earthquake insurance with a deductable, and the system's age would likely be factored in, possibly reducing the amount recovered.

Our insurance coverage is with the Special Districts Insurance Services (SDIS) division of the Special Districts Association of Oregon (SDAO), of which we are a member. For 2019 the cost is $2504 after discounts. The coverage summary is 14 pages long, but in general it covers liability up to $5 mil, property damage, earthquake, and equipment breakdown up to $470k each, and crime up to $100k, all per occurrence with various limitations.

BOARD RELATED:

Total revenue last fiscal year was $90k and after expenses net income was $6k. That leaves little room for hiring a paid position or undertaking any major upgrades. Rate increases and/or tax assessments are about the only means of bringing in more revenue. Basically every $1 per month base rate increase generates about $3600 and every $0.10 usage increase generates about $3000. To bring in an additional $20k would require about a $3/month base and $0.30 usage increase or combination thereof. Sometimes rate increases do not bring in as much revenue as expected because customers may choose to reduce water usage, especially during the summer months.

With additional revenue the question becomes how to best use the funds, i.e.: hire someone, put it to maintenance, or add to a rainy day fund. Our current total funding is $110k, and while that may sound like a lot, about half could be wiped out with a pump failure. A more comfortable reserve would be 2-3 times that amount. Last fiscal year $20k was spent on repairs.

The chairperson and other board members do not need water distribution certification. That requirement is fulfilled by Hiland's certified technicians. Board members are not compensated for their time, but do receive $30 if they attend the monthly board meeting. Besides meeting monthly, the board regularly monitors Hiland's activities and reviews their monthly reports, then forwards them to our accountant. The accountant creates monthly and year-to-date budget-to-actual reports, cuts checks as required, and provides balance sheet, check register, and general ledger reports. These in turn are forwarded to all board members for review.

The board creates an agenda based on activity since the previous meeting and upcoming events. Agenda items are reviewed, discussed, and decisions are voted on as required, invoices are reviewed, and checks are signed. In addition the board is responsible for monitoring our PO Box regularly, managing our Keybank, Frontier, PGE, PDX Water, and SDAO accounts, the creation and approval of a budget, posting required newspaper notices, negotiating with Hiland and other vendors regarding work activities, keeping current on rules and regulations, and responding to

customer and outside inquiries. Also the board sends reports to the Secretary of State, Water Resources Dept. and others as required, updates and reviews the annual insurance coverage, deals with board vacancies and the biennial elections, and numerous smaller items.

HILAND RELATED:

Six years ago after 15 years with TVWD, we were notified they would no longer provide any services or renew our contract. Numerous efforts to locate another contractor were undertaken. An attempt at that time to contract services from or merge with the RiverGrove Water District was rejected, and was rejected again this past summer. Hiland was found based on a lead and they are our current locally available licensed contractor, operating and maintaining our system. They also manage and/or operate many other small water systems and have a record of trustworthiness. We are now in our sixth year with them. The contract is annual, on the fiscal year, and reviewed during budgeting each year.

Hiland charges a monthly base of $3325, plus time and materials for repairs, with a 10% markup on the materials. The base includes 24/7 on-call coverage, alarm and system monitoring, monthly bacterial test sampling, regular monitoring and maintenance of the pump house equipment, responding to customer service requests, marking locates as requested, account setup and closing, monthly payment processing and reporting, bi-monthly meter reading and billing, and the delinquent notifications and collections. Also included are annual usage reports to Clean Water Services, State well water level testing, the customer confidence report, hydrant flushing and testing, and some water chemical tests. Other inspections and testing are on 3, 5, or 7 year schedules, such as County water system surveys, insurance audits, lead and copper tests, organic and inorganic compounds tests, etc.

Repairs are based on an employee labor rate schedule, plus equipment usage charges and/or rentals, and materials are marked up 10% over cost. When and where it's practical, the lowest pay rated employee capable of doing the task is utilized to help keep costs down.

WATER QUALITY:

Using an industry standard average of 2-3 residents per customer connection, we serve about 600 to 900 population. It is not known how many are drinking the raw water, using tap or pitcher type filters, water softeners, other similar devices, and/or buying drinking water. About 70% of the U.S. gets their water from wells, including Vancouver, WA, which serves about 250,000 in population. Portland also has wells to supplement Bull Run at times during the year. All well water is hard water and ours is considered hard to very hard due to the calcium, iron and magnesium content.

The only tests we have typically done inside the home are the lead and copper tests. Monthly water samples for bacterial testing are usually taken at one of three test stations. These samples were previously taken at various home's outdoor hose bibs. Testing regulations generally indicate when and where sampling is to be done. Many of the raw water tests for contaminates such as organic and inorganic compounds must be taken directly from the well head. We are current with all required testing, many of which are now on extended schedules of 3, 5, and 7 years because no issues were previously found.

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix C
2010 TVWD Capital Improvement Plan

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Tualatin Valley Water District

Todd Heidgerken
Manager of Community
and Intergovernmental Relations

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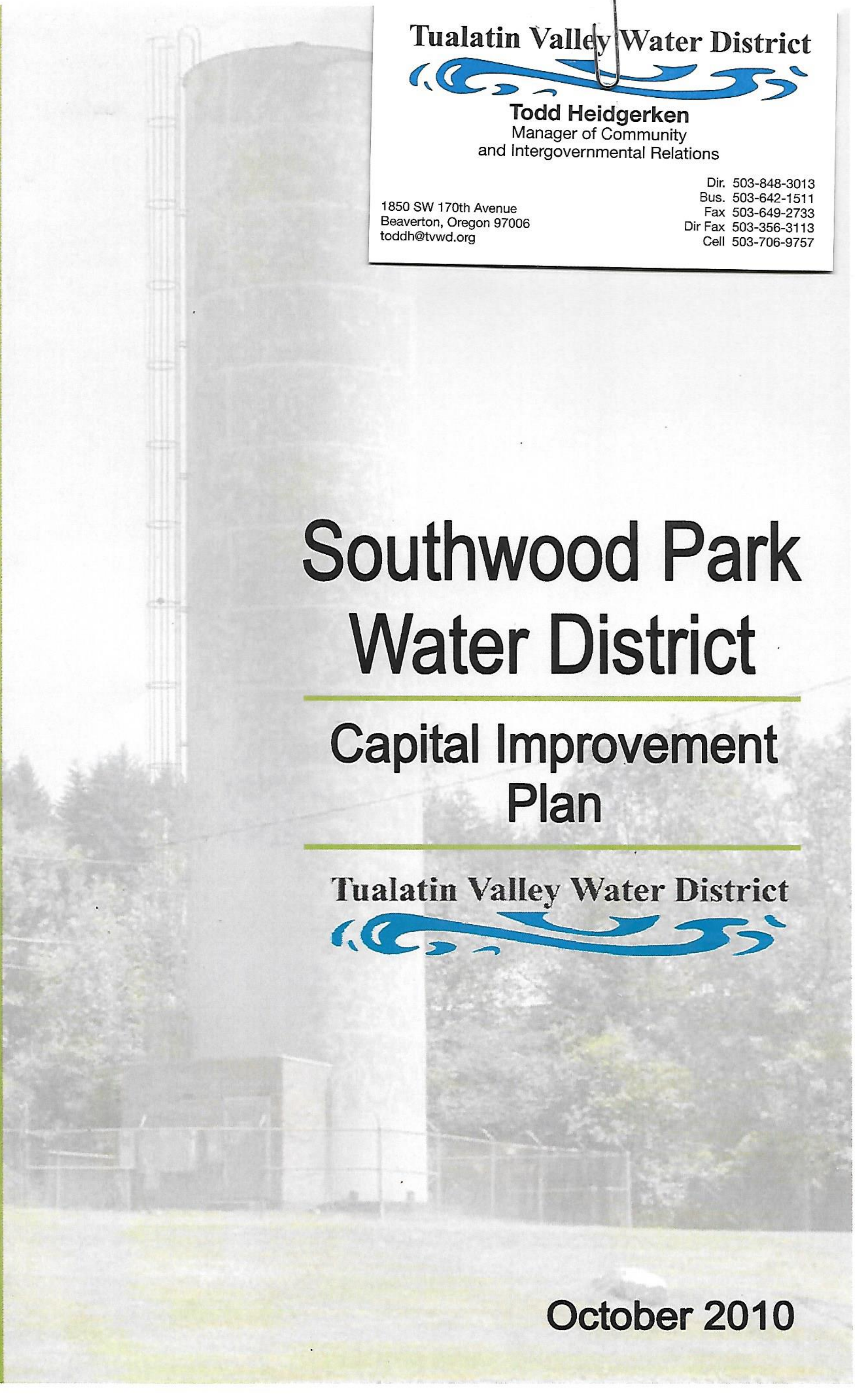


Southwood Park Water District

Capital Improvement Plan

Tualatin Valley Water District

October 2010

Planning Criteria

General

This document is intended to be a preliminary planning assessment to aid Southwood Park Water District (SPWD) in identifying and prioritizing capital improvement projects. The proposed projects included in this plan should be considered as preliminary project concepts. The project concepts are intended to allow a comparison of the relative priority and budget for each project. Additional planning and engineering design will be required to prepare documents for bid and construction purposes. Tualatin Valley Water District (TVWD) has completed this analysis based on available information provided by SPWD and based on TVWD's engineering judgment. This document does not include research, modeling, testing, detailed analysis or independent inspection of assets.

Cost Estimates

The estimated project costs herein are prepared by TVWD as "planning level estimates" based on the preliminary project concepts. Planning level estimates typically have a relative accuracy of about plus or minus 50% of the final cost. As such, the estimated project costs should not be considered "engineers estimates" or "bids" to complete the proposed projects. Cost estimates do not include the cost of purchased water that may be required during project construction.

Pump Station

The existing masonry building houses the well pump and chlorine injection equipment; the two processes are separated by a wood framed wall. The building ventilation consists of a few simple exterior vents. The lack of ventilation leads to heating and cooling issues and contributes to the corrosion of interior piping and wiring conduit. The interior lighting is minimal and should be upgraded to provide better illumination. In order to better protect the water supply, multiple security upgrades to the existing structure should be considered and are outlined below. Photos of the existing building are included in Exhibit A (2009) and Exhibit B (2010).

P1. Renovate Existing Building

This option includes three phases to upgrade the existing brick building.

a. Building modifications; upgrade and replace shelving as required to mount equipment and provide material storage in chlorine room. Upgrade and replace wiring and lighting including outlets and switches. Upgrade HVAC system and controls to include temperature controlled louver vents and fans.

   Estimated Project Cost $50,000

b. New chlorine building or enclosure; construction of a new free standing structure to house chlorine feed equipment and supplies at existing site, adjacent to existing brick building. Project to include lighting, HVAC, chlorine equipment, security and permitting for new building.

   Estimated Project Cost $50,000

c. Security upgrades; upgrade and replace both entry doors into existing building. New doors and jambs shall be commercial grade steel construction. Install security lighting on exterior of existing building.

   Estimated Project Cost $8,000

P2. Construction of New Pump Station and Chlorine Building

Given the significant costs of renovating the existing building, (project P1), a separate option was developed that consists of demolishing the existing brick pump station and chlorine room building. A new building would be constructed over the existing well head. The new building includes all of the modifications listed in project P1.

Estimated Project Cost $75,000

P3. Pump Station Piping

Determine options for corrosion protection of wellhead and pump station piping, replace piping and fittings as needed, apply new protective coating to all piping.

Estimated Project Cost $5,000

P4. SCADA Upgrades

SCADA upgrades were proposed to SPWD by S&B Inc. in 2009 and initial SCADA implementation was completed in 2010, the remaining SCADA projects are listed below.

a. Install new chlorine residual analyzer on discharge water from pump station. The chlorine residual analyzer shall be integrated in the existing SCADA system to allow remote monitoring, thus reducing required visits by TVWD staff.

   Estimated Project Cost $3,600

b. Install enhanced sensors and alarms including a flow transmitter for existing flow meter, building flood alarm and pump phase monitor.

   Estimated Project Cost $1,500

c. Install a new well level analog sensor, RTU interface and a low-level pump cut-out / alarm.

   Estimated Project Cost $3,000

P5. Backup Power Analysis

TVWD engineering would analyze and recommend options for continuation of water service during an extended power outage. Options may include utilizing the Portland connection, upgrading the pump station to be compatible with TVWD portable generators or installing a SPWD owned and maintained generator.

Estimated Project Cost $3,000 (analysis only)

Reservoir/Site Improvements

SPWD'S water reservoir is a 125,000 gallon steel standpipe. The reservoir is 84 feet tall and 17 feet in diameter. The reservoir was inspected by TVWD staff in 2009, see Exhibit A: Reservoir Inspection Report. The following reservoir assessment and improvements have been identified:

R1. Structural Assessment of Reservoir

Perform structural inspection of interior and exterior of existing reservoir including inspection of the roof and roof vents. Obtain consulting services to evaluate seismic upgrades of the existing reservoir and prepare preliminary cost estimate for seismic upgrades.

Estimated Project Cost $50,000 (analysis only)

R2. Analysis of Reservoir Options

Compare results and findings from the structural assessment of the existing reservoir to the installation of a replacement tank or a new hydro pneumatic tank.

Estimated Project Cost $10,000 (analysis only)

R3. Reservoir Interior

Recoat the interior of the reservoir; inspect interior coating, develop action plan for new coating. Drain reservoir, clean interior and remove existing coating as required for proper adhesion of new coating. Apply new coating.

Estimated Project Cost $60,000

R4. Reservoir Exterior

Recoat the exterior of the reservoir, which is thought to contain lead, inspect exterior coating, develop action plan for new coating with a painting contractor qualified for lead based paint removal. Drain reservoir and remove existing coating as required for proper adhesion of new coating. Apply new coating.

Estimated Project Cost $200,000

R5. Property Line Adjustment

To better accommodate the existing and proposed facilities, adjust the west and south property lines of the reservoir site. The proposed property lines will better center the facility within the property; adjust property lines as shown in Figure 3. TVWD to coordinate property line adjustment with adjacent property owner (Lake Oswego Parks Department). *The estimated price assumes all parties are in favor of a "land swap" and does not include the purchasing of additional property.*

Estimated Project Cost $10,000

Supply Upgrades

In addition to SPWD's ground water supply, there is also an existing connection to the City of Portland's water system near the intersection of SW 63rd Ave. and SW 62nd Ave. This connection has been used when the well pump has failed. As part of this planning effort, TVWD coordinated a meeting with Guy Graham, Public Works Director for the City of Lake Oswego, to explore the feasibility of a new supply connection between SPWD and the Lake Oswego water system.

Lake Oswego does have supply contracts with other neighboring water systems, so a request could be considered. However, Mr. Graham noted the current Lake Oswego projects are overextending staff resources so it might take a number of months to get an initial response from the city. Mr. Graham suggested that if SPWD was interested in pursuing a supply connection, a first step would be for SPWD to submit a letter requesting a cost estimate from the city.

Given the uncertain timing of receiving a cost estimate from Lake Oswego, TVWD was given direction to complete this Capital Improvements Plan based on the supplies that are currently available to SPWD. Although this report does not include information about the Lake Oswego supply intertie, SPWD was encouraged to submit a request for an estimate from Lake Oswego. In September 2010, a letter was sent to the City of Lake Oswego requesting this and other information. A copy of the letter is included as Exhibit C.

SPWD's existing Portland connection is a 2" disk style meter that is used as an emergency connection. During the well pump replacement in the summer of 2009, the Portland meter was utilized to provide water to the SPWD service area. This emergency connection has historically provided enough water for average day demands, but will not provide fire flow capacity in the event of a sustained outage.

S1. Portland Connection (Existing)

This option requires safety and security upgrades to the existing 2" Portland connection. The upgrades are to include replacing the meter vault and lid, installing a sump pump or vault drain and repairing or replacing control valves. This option also includes installing 2" backflow and 2" pressure sustaining devices to meet current Portland Water Bureau standards in a new separate vault.

Estimated Project Cost $50,000

S2. Portland Connection, New 6" Meter

This option includes a new 6" water meter with a Portland pressure sustaining valve and 6" backflow device. This project also includes required piping upgrades to connect the new meter to the existing reservoir. TVWD would fulfill all permitting requirements and assist with negotiating a new water supply contract with the City of Portland.

Estimated Project Cost $125,000

S3. Water Softening

Install water softening equipment to soften water prior to distribution. This project would include a new structure to house equipment and material storage. Preliminary design, to be completed by a consultant, will be required for further analysis.

Estimated Project Cost $30,000 (Planning & Analysis)
$350,000 (Design & Construction)

Distribution System

The existing system of distribution piping consists primarily of asbestos cement (AC) pipe with cast iron valves and fittings. The distribution system will require repairs and upgrades in the immediate future. The projects listed below are known issues identified by TVWD field staff. The distribution system repairs will improve overall system operation and reliability. The distribution system upgrades will eliminate a dead end, thus improving flow and fire protection coverage. In order to achieve minimum fire flow standards and reliability throughout the service area, the distribution system will require replacement in its entirety. The estimated costs do not include removal and disposal of AC pipe.

Distribution System Repairs

D1. Pothole to determine extents of shallow main in SW Pamela St. between SW 64th Ave and SW 63rd Ave. Estimated cost assumes replacement of 200' of existing main with 200' of 8" DIP.

Estimated Cost $24,000

D2. Excavate, repair and open the closed valve at the intersection of SW 62nd Ave. and SW 63rd Pl.

Estimated Cost $3,500

D3. Excavate buried valve at the intersection of SW 62nd & SW Southwood Dr.

Estimated Cost $3,500

D4. Excavate and repair valve with bent stem at SW 63rd Ave. & SW 63rd Pl.

Estimated Cost $3,500

D5. Locate and excavate missing valve at SW 61st Ave. & 62nd Ave.

Estimated Cost $3,500

D6. Excavate and repair valve packing at SW 61st Ave. and SW 62nd Ave.

Estimated Cost $3,500

Distribution System Upgrades

U1. Install 90' of DIP to loop pipe at SW 62nd Ave. & SW Southwood Dr., remove existing blow off, connect to 6" pipe in SW Southwood Dr. and connect to existing 6" pipe in SW 62nd Ave.

Estimated Project Cost $15,000

U2. Install 4 fire hydrants at new locations as shown in Figure 1, completing hydrant coverage of the service area.

Estimated Project Cost $16,000

Distribution System Replacement

This project involves the replacement of the distribution system piping in its entirety, including the replacement of fifteen fire hydrants. The new distribution pipes will be sized to meet current fire flow requirements. Replacing the existing pipe will minimize the inherent safety risks associated with future repairs of the AC pipe. In addition, as the AC pipe ages, there is an expected increase in frequency of main breaks as well as associated liability for damage and safety risks.

The possibility of new source water will have impacts on the decision to replace the AC piping. Currently, the hardness and mineral content of the well source is less aggressive towards AC pipe. In contrast, the Lake Oswego and Portland sources are soft waters and will be significantly more aggressive and will adversely impact the life of the existing AC pipe. Although AC distribution piping is not supported by industry best practices, if the decision is made to maintain the existing distribution system, a program for ongoing monitoring and evaluation of the distribution system should be set up.

If the existing AC pipe is to be replaced, the proposed distribution system is presented in Figure 1. It is recommended that the distribution system be replaced in four phases as represented in Figure 2. The estimated project cost stated does not include replacement of existing water services or removal of existing AC distribution piping. The project phases are summarized in Table 1.

Estimated Project Cost $1,622,000

Table 1
Piping Replacement Summary

Project Phase	Diameter	Total Length	Unit Cost ($/lf)	Estimated Project Cost
1	8"	3,600'	$120	$432,000
2	6"	1,600'	$90	$444,000
	8"	2,500'	$120	
3	6"	1,630'	$90	$332,000
	8"	1,540'	$120	
4	6"	4,600'	$90	$414,000
			Total	$1,622,000

Note: Estimated costs are rounded up to the nearest thousand dollars. Pipe material is ductile iron

Residential Water Services

TVWD crews started upgrading and replacing water services and meter boxes; The following projects are in continuation of the previous effort.

M1. Plastic Service Replacements

Replace approximately 250 existing plastic water services with new copper water services. *Estimated cost assumes all services are single service type.*

Estimated Project Cost $443,000

M2. Residential Pressure Regulators

Plumbing code requires a pressure regulator to be installed on residential water services when the distribution system pressure is over 80psi. There are currently 52 homes in the service area, 275 foot contour and below, with pressure at or above 80 psi when the reservoir is at the upper operating range (77 feet). Pressure was verified at two hydrants along SW Pamela St. by TVWD staff, pressure was found to be 83psi and 85 psi while the water level in the reservoir was at 76.3 feet. Installing 69 residential pressure regulators at or below the 280 foot contour will not only comply with the current code but will allow the reservoir to operate at full capacity (overflow of 83 feet). Operating the reservoir to full capacity will increase minimum service pressure and increase fire flow capacity throughout the distribution system. The increased operating range will add approximately 10,000 gallons of storage.

Estimated Project Cost for 52 regulators $21,000
Estimated Project Cost for 69 regulators $28,000

EXHIBIT A

RESERVOIR INSPECTION REPORT

FACILITY: **SOUTHWOOD PARK (0.125 MG Steel)**
DATE: **3/10/2009**
INSPECTOR: **BOONE**

NOTES:

Interior of tank was visually inspected after washdown by TVWD personnel. The tank is a 17' diameter, 84' tall standpipe, which makes a comprehensive inspection from the floor unfeasible.

The interior coating appears to be in good condition with no visible cracking or rust on the floor or the lowest 15 feet of the walls of the tank. The interior inlet and outlet piping is in relatively good condition. The interior of the tank is covered with a reddish brown residue that does not come off easily. A pressure washer was effective at removing the majority of the residue, but only within reach of the floor. The remainder of the interior walls could not be effectively cleaned. See Figures 1- for photos of the tank interior.

Figure 1. Reservoir Floor After Pressure Washing

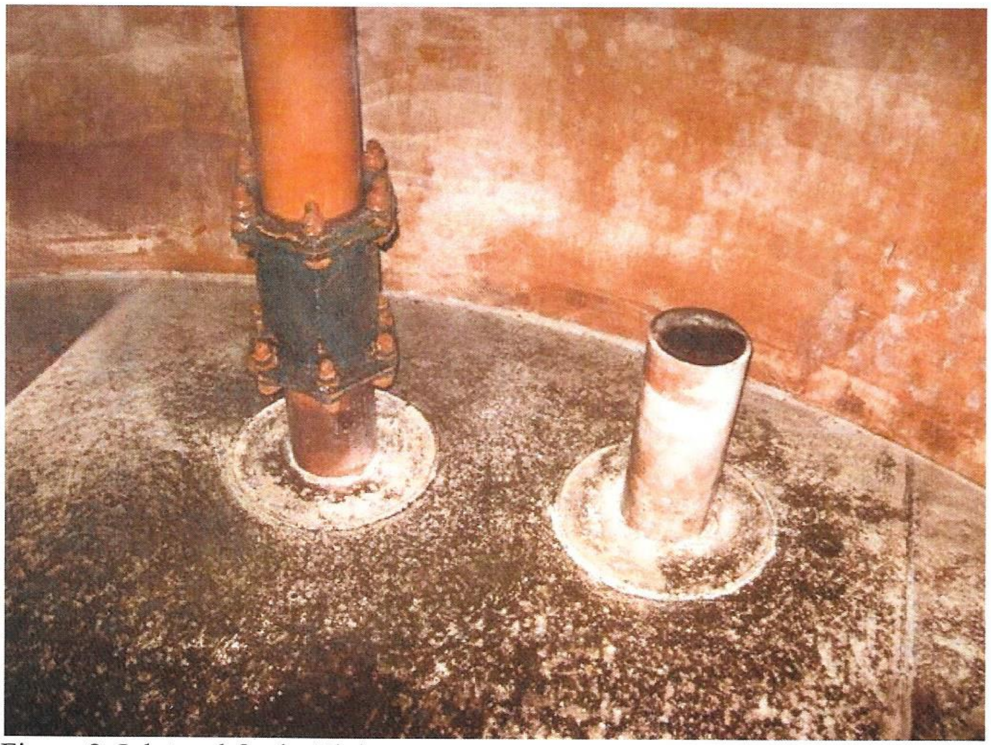


Figure 2. Inlet and Outlet Piping.

Figure 3. Interior Walls After Pressure Washing.

There is minor rust on the interior ladder near the floor. See Figures 4-5 for photos of the interior ladder.

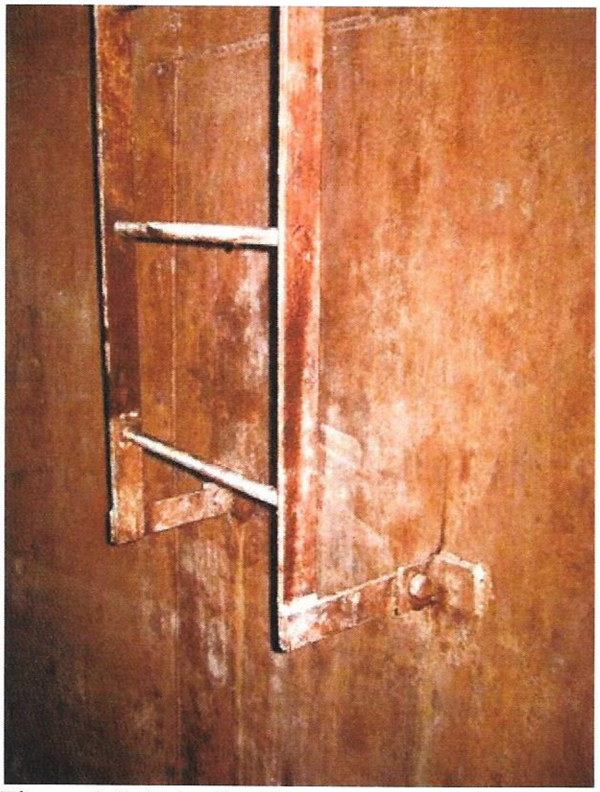


Figure 4. Interior Ladder

Figure 5. Interior Ladder Anchorage.

There is significant rust on the exterior piping and fittings in the adjacent pumphouse. See Figures 6-8 for photos of the piping, fittings, chlorination equipment, and pump inside the pumphouse.

Figure 6. Piping Inside Pumphouse.

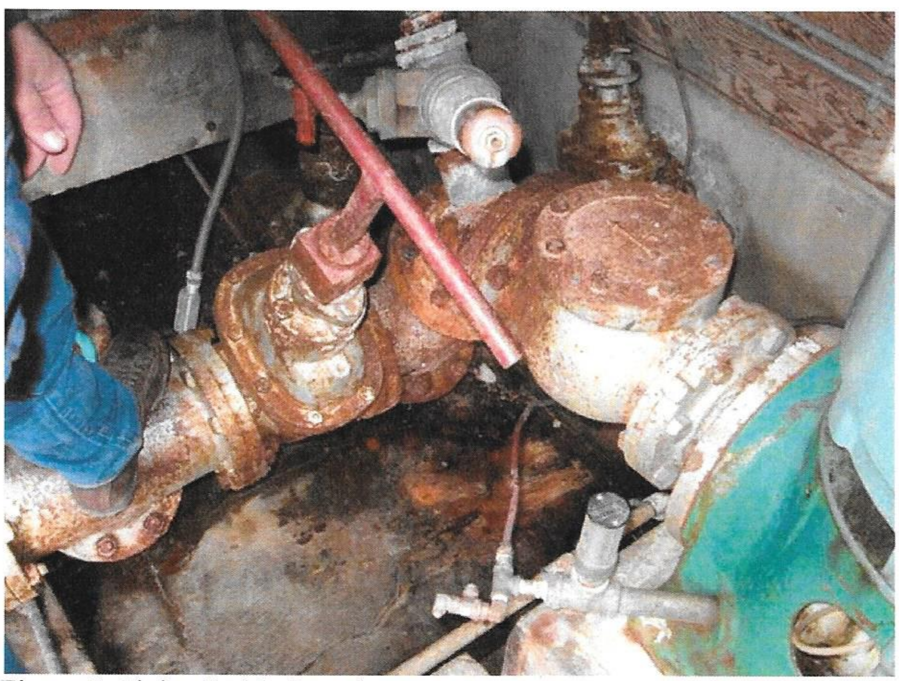


Figure 7. Piping Inside Pumphouse.

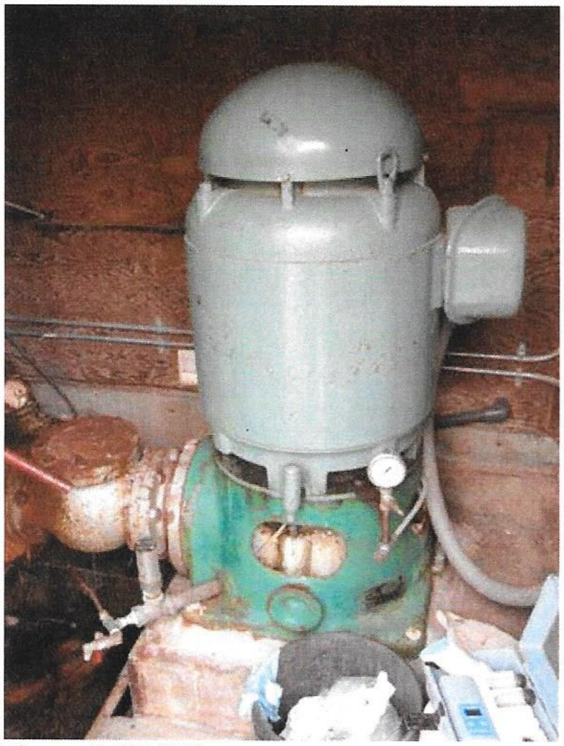


Figure 8. Well Pump.

Note: See Exhibit B for updated photos

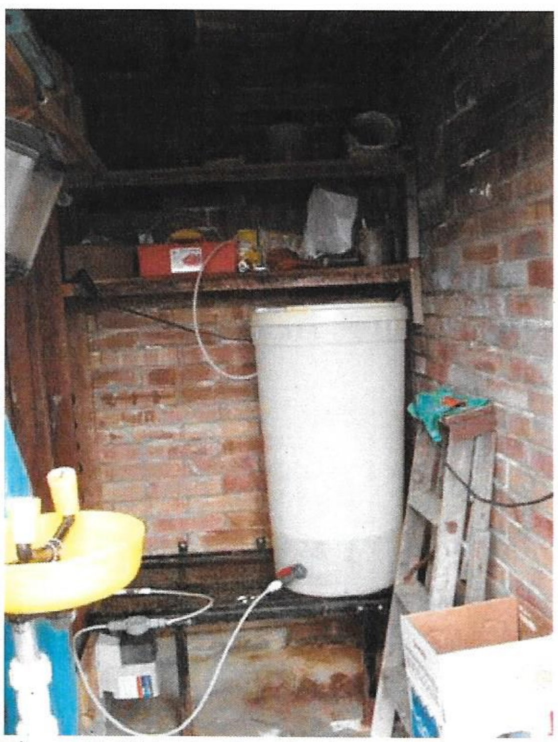


Figure 9. Chlorination Equipment.

Note: See Exhibit B for updated photos

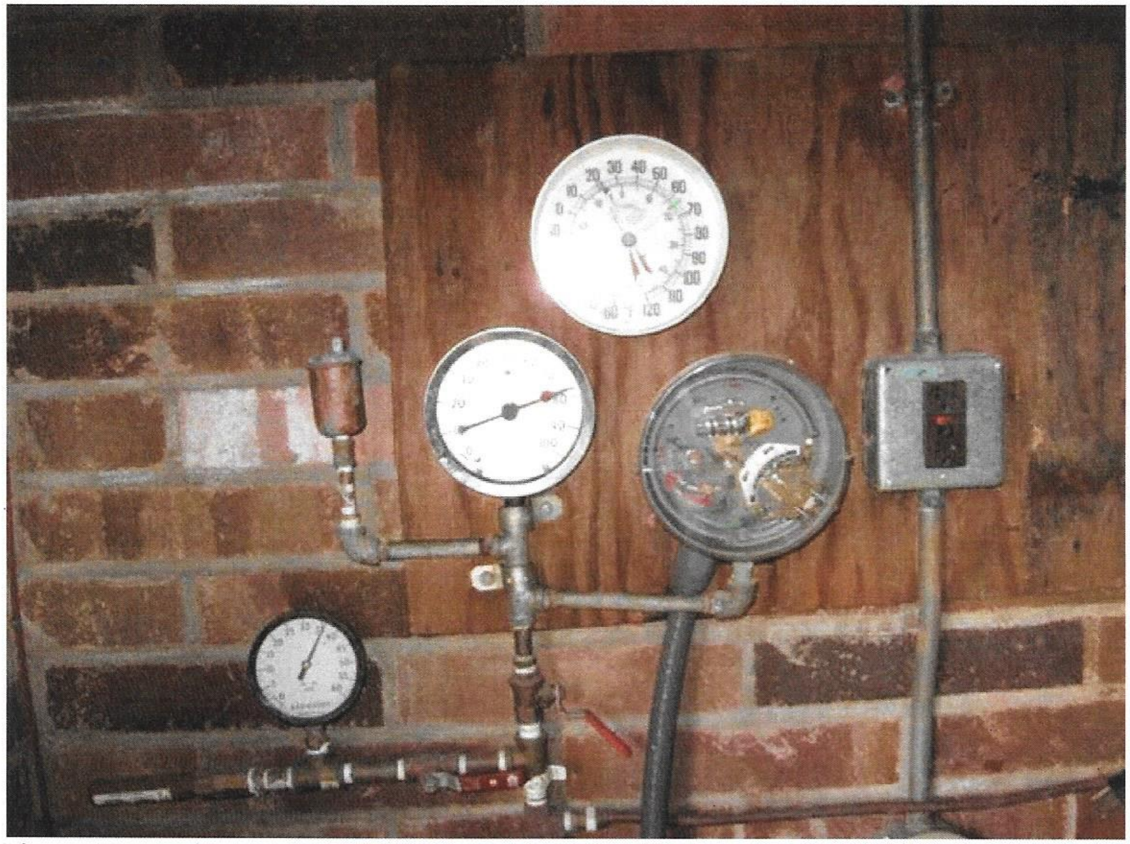


Figure 10. Interior Gauges Inside Pumphouse.

The exterior of the structure appears to be in good condition with no leakage visible. The exterior coating is in relatively good condition and the exterior coating has been touched up in many places, especially at welded seams. See Figures 10-12 for photos of the exterior of the tank.

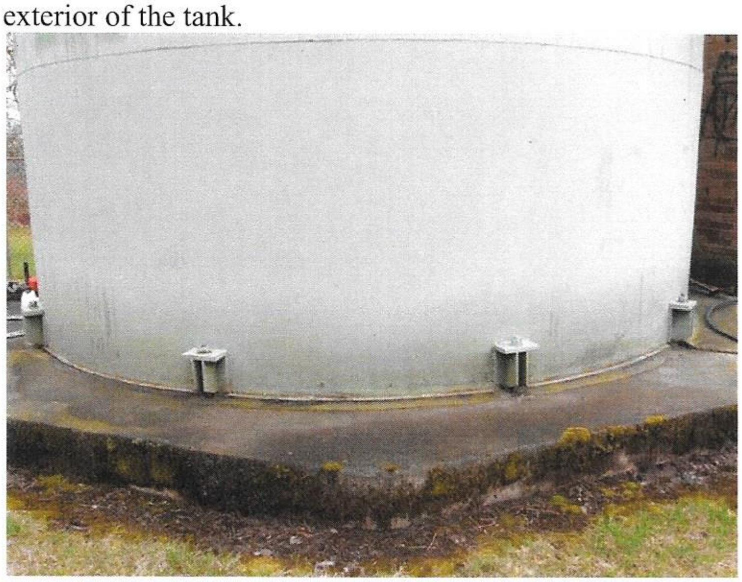


Figure 11. Tank Exterior Anchorage

Figure 12. Tank Exterior.

Figure 13. Piping Adjacent to Tank and Pumphouse

Additional digital photos of the interior and exterior were taken and are stored at:
P:\Engineering\03102009-Southwood Park.

EXHIBIT B

UPDATED FACILITY PHOTOS
September 2010

Figure 1. New Submersible Well Pump

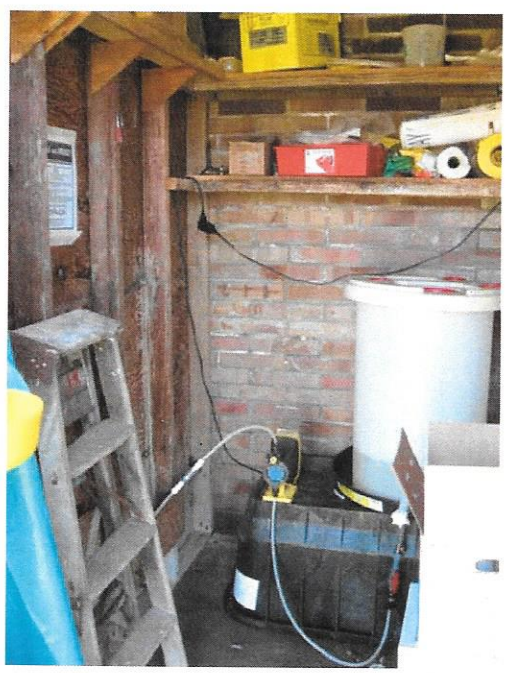


Figure 2. Chlorine Room

Figure 3. Exterior Lighting

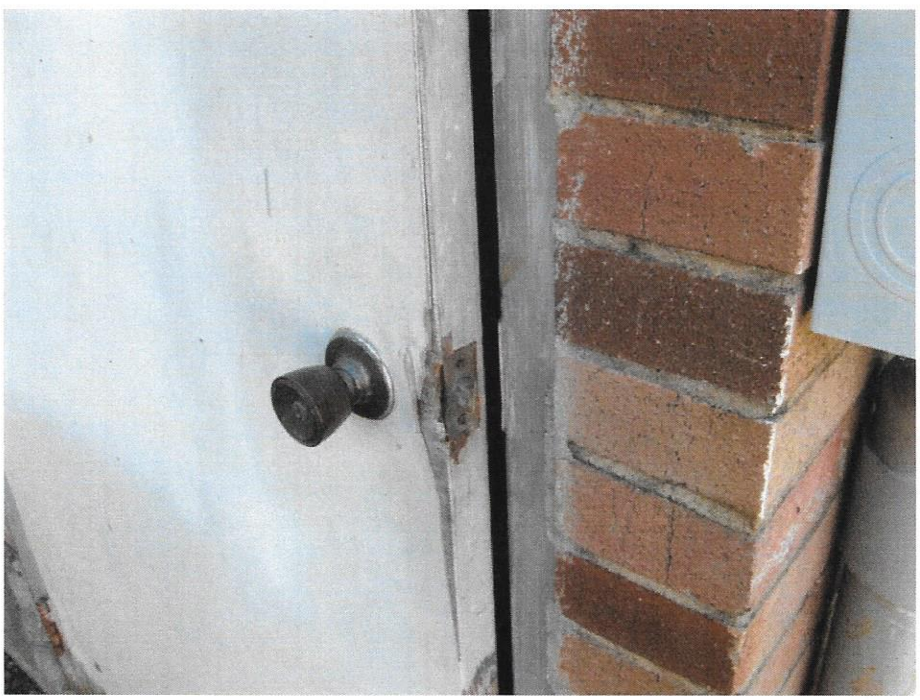


Figure 4. Pump Room Door

Figure 5. Chlorine Room Door

EXHIBIT C

LETTER TO LAKE OSWEGO

SOUTHWOOD PARK WATER DISTRICT
P.O. Box 5908
Beaverton, Oregon 97006

September 20, 2010

Alex McIntyre, City Manager
City of Lake Oswego
P.O. Box 369
Lake Oswego, Oregon 97034

Dear Mr. McIntyre,

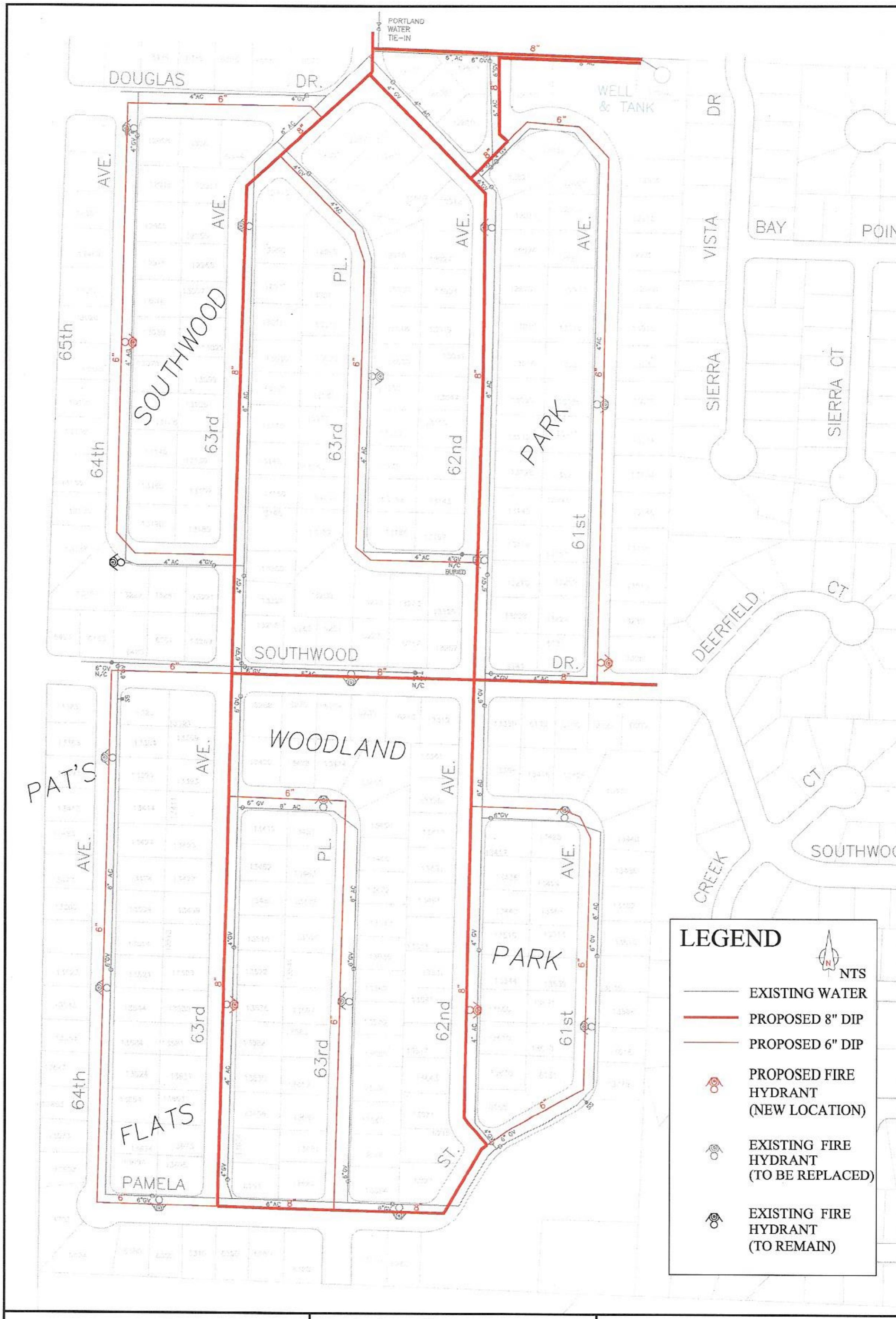
My name is Philip Kubischta and I am the Board Chairman of the Southwood Park Water District. As you may be aware, our district lies within the Lake Oswego Urban Services Boundary. We have been working on updating our Capital Improvement Plan and three questions have surfaced from that process.

Therefore we would appreciate any efforts you and your staff could make in answering the questions. We realize this may take some research time from several departments and could be somewhat difficult and time consuming. As such, due to everyone's workloads, we understand that it may take several months before we could get a response.

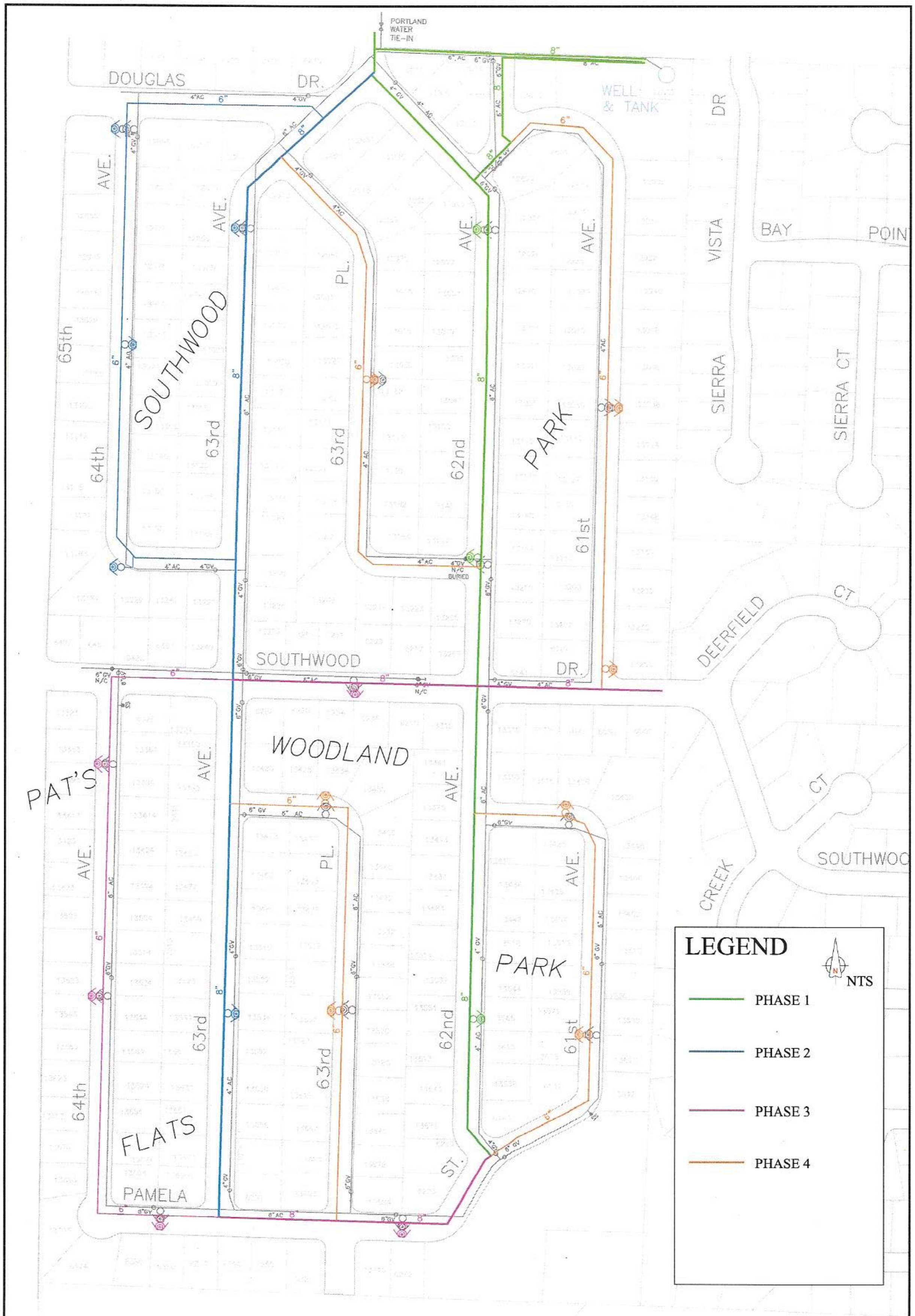
> Question 1. We have an intergovernmental agreement with the City of Lake Oswego under which Lake Oswego takes over our water district upon annexation. What, if any, plans does Lake Oswego have regarding annexation of our neighborhood within a 1-5, 5-10, or 10-20 year timeframe? What, if any, requirements might be placed upon our water district at that time?
>
> Question 2. We currently contract with the Tualatin Valley Water District for operations and maintenance services for our district. Since we are within the LO Urban Services Boundary, it behooves us to ask if the LO Public Works Department could provide similar services, and if so, at what cost? You may contact Todd Heidgerken, 503-848-3013, at TVWD for information.
>
> Question 3. We have a water tie-in to the City of Portland, primarily for an emergency backup, which we are considering improving. However we need to ask if it would be more beneficial in the long term to establish a connection to LO instead? If so, where might that connection be located, how much would it cost, and would those costs be shared?

Thank you for your consideration,
Sincerely,

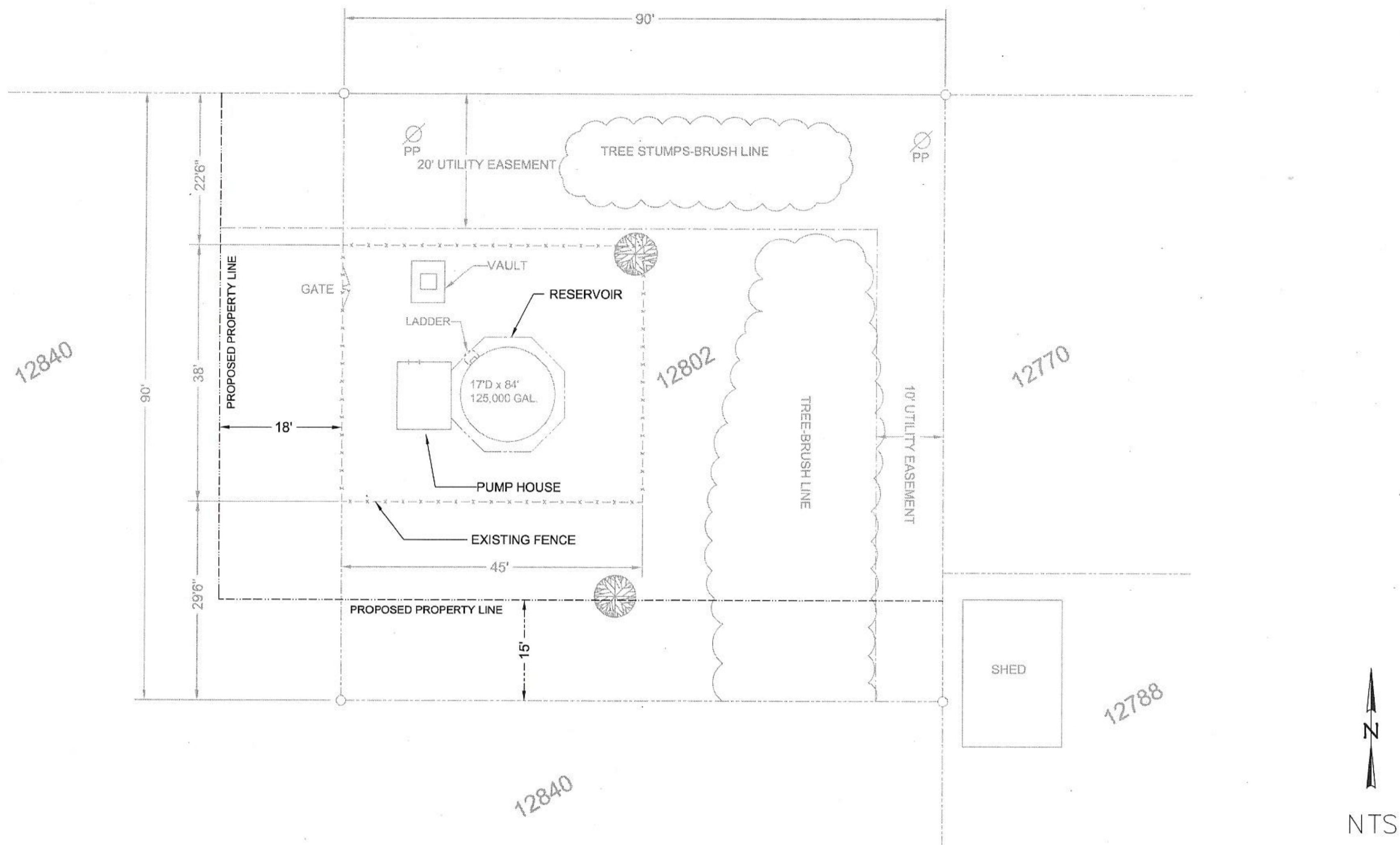
Philip Kubischta, Board Chairman
Southwood Park Water District
503-639-1231
Home address:
6050 SW Southwood Dr.
Portland, OR 97219



SOUTHWOOD PARK WATER DISTRICT CAPITAL IMPROVEMENT PLAN	Tualatin Valley Water District 1850 SW 170th Ave. Beaverton, OR 97006 (503) 642-1511 www.tvwd.org	FIGURE 1 PROPOSED DISTRIBUTION SYSTEM REPLACEMENT



SOUTHWOOD PARK WATER DISTRICT CAPITAL IMPROVEMENT PLAN	Tualatin Valley Water District 1850 SW 170th Ave. Beaverton, OR 97006 (503) 642-1511 www.tvwd.org	FIGURE 2 DISTRIBUTION SYSTEM REPLACEMENT PHASING



SOUTHWOOD PARK WATER DISTRICT
CAPITAL IMPROVEMENT PLAN

Tualatin Valley Water District
1850 SW 170th Ave. Beaverton, OR 97006 (503) 642-1511 www.tvwd.org

FIGURE 3
PROPOSED PROPERTY
LINE ADJUSTMENT

Southwood Park Water District Proposed CIP Schedule

Note: Not all projects are budgeted in this schedule. Projects budgeted represent TVWD's recommended option.

Project ID	Project Title	*Estimated Cost*	1-3 Years	3-5 Years	5-10 Years	10-15 Years	Future Years
PUMP STATION OPTIONS							
P1	**Renovate Existing Building**						
	a. Shelving, wiring, HVAC	*$ 50,000.00*					
	b. New chlorine building	*$ 50,000.00*					
	c. Security upgrades	*$ 8,000.00*					
	TOTAL RENOVATE EXISTING BUILDING	*$ 108,000.00*					
P2	**New Pump Station and Chlorine Building** Demolish existing brick pump station and chlorine room. Construct new building over existing well head	*$ 75,000.00*		$ 75,000.00			
P3	**Pump Station Piping** New coating on well head piping	*$ 5,000.00*		$ 5,000.00			
P4	**SCADA Upgrades**						
	a. Install new chlorine residual analyzer	*$ 3,600.00*	$ 3,600.00				
	b. Install enhanced sensors and alarms	*$ 1,500.00*	$ 1,500.00				
	c. Install a new well level analog sensor, RTU interface and low-level pump cut-out alarm	*$ 3,000.00*			$ 3,000.00		
	TOTAL SCADA UPGRADES	*$ 8,100.00*					
P5	**Backup Power Analysis** TVWD engineering to analyze and recommend option for continuation of water service during extended power outage	*$ 3,000.00*					
		PUMP STATION TOTALS	**$ 5,100.00**	**$ 80,000.00**	**$ 3,000.00**		
RESERVOIR/SITE IMPROVEMENTS							
R1	**Structural Assessment of Reservoir** Perform structural assessment of reservoir	*$ 50,000.00*		$ 50,000.00			
R2	**Analysis of Reservoir Options** Compare results and findings from the study of the existing reservoir to the installation of replacement tank or pneumatic tank	*$ 10,000.00*		$ 10,000.00			
R3	**Reservoir Interior** Recoat the interior of the reservoir	*$ 60,000.00*					
R4	**Reservoir Exterior** Recoat the exterior of the reservoir	*$ 200,000.00*					
R5	**Property Line Adjustment** Adjust the West and South property lines of the reservoir	*$ 10,000.00*	$ 10,000.00				
		RESERVOIR/SITE IMPROVEMENT TOTALS	***$ 10,000.00***	***$ 60,000.00***			
SUPPLY UPGRADES							
S1	**Portland Connection (Existing)** Upgrades to 2" Portland connection	*$ 50,000.00*					
S2	**Portland Connection, New 6" Meter** Install new 6" meter with Portland pressure sustaining valve and 6" backflow device with required piping upgrades, contract permitting	*$ 125,000.00*		$ 125,000.00			
S3	**Water Softening** Install water softening equipment and construct new structure to house equipment and material storage	*$ 385,000.00*					
		SUPPLY UPGRADE TOTALS		***$ 125,000.00***			

Project ID	Project Title	Estimated Cost	1-3 Years	3-5 Years	5-10 Years	10-15 Years	Future Years
DISTRIBUTION SYSTEM REPAIRS							
D1	Replace shallow main at SW Pamela St.	*$ 24,000.00*					
D2	Repair valve at SW 62nd Ave. and SW 63rd Ave.	*$ 3,500.00*	$ 3,500.00				
D3	Excavate valve at the intersection of SW 62nd Ave. and SW 63rd Pl.	*$ 3,500.00*	$ 3,500.00				
D4	Excavate and repair valve with bent stem at SW 63rd Ave. and SW 63rd Pl.	*$ 3,500.00*	$ 3,500.00				
D5	Locate and excavate missing valve at SW 61st Ave. and 62nd Ave.	*$ 3,500.00*	$ 3,500.00				
D6	Excavate and repair valve packing at SW 61st Ave. and SW 62nd Ave.	*$ 3,500.00*	$ 3,500.00				
	TOTAL DISTRIBUTION SYSTEM REPAIRS	*$ 41,500.00*					
	DISTRIBUTION SYSTEM REPAIR TOTALS		***$ 17,500.00***				
DISTRIBUTION SYSTEM UPGRADES							
U1	Install 90' of 8" DIP at SW 62nd Ave. and SW Southwood Dr.	*$ 15,000.00*					
U2	Install 4 fire hydrants at new locations Shown in FIGURE 1	*$ 16,000.00*					
	TOTAL DISTRIBUTION SYSTEM UPGRADES	*$ 31,000.00*					
	DISTRIBUTION SYSTEM UPGRADE TOTALS						
DISTRIBUTION SYSTEM REPLACEMENT							
	Piping replacement summary *Assumes utilizing existing source, see CIP*						
PR1	**3,600' of 8"**	*$ 432,000.00*				$ 432,000.00	
PR2	**1,600' of 6"** **2,500' of 8"**	*$ 444,000.00*					$ 444,000.00
PR3	**1,630' of 6"** **1,540' of 8"**	*$ 332,000.00*					$ 332,000.00
PR4	**4,600' of 6"**	*$ 414,000.00*					$ 414,000.00
	TOTAL DISTRIBUTION SYSTEM REPLACEMENT	*$ 1,622,000.00*					
	DISTRIBUTION SYSTEM REPLACEMENT TOTALS					***$ 432,000.00***	***$ 1,190,000.00***
RESIDENTIAL WATER SERVICES							
M2	**Plastic Service Replacements** Replace approx. 250 existing plastic water services with new copper water services	*$ 443,000.00*				$ 111,000.00	$ 332,000.00
M3	**Install Residential Pressure Regulators** Install 69 pressure regulators *Requires Board decision on who will be responsible for the cost of the regulators, Individual home owners or SPWD?*	*$ 28,000.00*	$ 28,000.00				
	RESIDENTIAL WATER SERVICES TOTALS		***$ 28,000.00***			***$ 111,000.00***	***$ 332,000.00***
TOTAL CIP			**$ 60,600.00**	**$ 265,000.00**	**$ 3,000.00**	**$ 543,000.00**	**$ 1,522,000.00**

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix D
2019 Hiland Water Letter

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Hiland Water

Phone: 503-554-8333
1-855-554-8333 (TF)
Mail: P.O. Box 699
Newberg, OR 97132
Email: info@hilandwater.com
Internet: www.hilandwater.com

April 30, 2019

Southwood Park Water District
Attn: Phil Kubischta, Chairman
PO Box 2024
Lake Grove, OR 97035-0629

Re: Review of SPWD: 2010 TVWD Capital Improvement Plan, 2019 OAWU report

Mr. Phil Kubischta,

Per your request, I have spent some time reviewing the Capital Improvement Plan (CIP) provided by Tualatin Valley Water District (TVWD) in 2010 and the subsequent report furnished by Oregon Association of Water Utilities (OAWU) in 2019. This should not be considered a comprehensive review, but simply a compilation of notes and responses based on Hiland Water's experience operating Southwood Park Water District (SPWD) from 2013 until now that may be used by SPWD as it conducts its budgeting and project planning processes during the ongoing operation of the water system.

GENERAL NOTES

The budget figures provided by TVWD in its CIP appear to be reasonable. None of the budget figures appear to be far from realistic amounts, in my opinion, but I would note that the cost of living has increased by approximately 16% since 2010. Consequently, it would be prudent to plan accordingly when proceeding with any projects. Additionally, round estimates for some of the larger projects were provided, indicating they were only intended to be ball park estimates at the time they were provided.

In Tim's rate review (OAWU), he mentioned that "rates can only reflect the actual operating expenses and not future capital expenditures." I don't believe that is true for all water system entities, but I am not an expert on the limitations of special districts, such as SPWD.

SCADA SYSTEM

As you are aware, SPWD currently has a Sensaphone "Sentinel" SCADA system that monitors tank levels and door alarms while utilizing a Kuntze chlorine analyzer that is made to function with high levels of iron and manganese. This was all installed after the 2010 CIP but before the 2019 OAWU report and basically fulfills the intended application discussed in both reports.

RESERVOIR

Hiland has limited experience in the areas of structural tank assessments and coating. As it has been 10 years since the last inspection and cleaning, it is advisable to conduct inspection and cleaning. While TVWD noted that the "reddish brown residue does not come off easily," OAWU recommended cleaning and inspection by a diver while the tank is full. Based on our previous conversation, I suspect using a diver would not be a good idea, although it may be more effective for inspection of the entire interior of the reservoir. If inspection reveals a need for new interior coating and SPWD decides to proceed, Hiland would be willing to consult vendors listed in OAWU's Exhibit C to evaluate options for recoating the interior.

Hiland concurs with the TWVD recommendation regarding the Reservoir Exterior (R4), but sees little utility in the recommendation to adjust the Property Line (R5). As mentioned in the general notes, all pricing seems reasonable, but an adjustment of 16% for planning is recommended to account for inflation.

DISTRIBUTION LINES
Hiland concurs that distribution lines are nearing the end of their useful life, although very few mainline breaks have occurred in the last six years. The TVWD pricing for D1 through D6 appears to be appropriate, although some or all of those repairs may have been completed already.

The estimated pricing for piping replacement also seems appropriate, with consideration given to inflation during the last 10 years. Unless SPWD chooses to proceed with distribution line upgrades for the purpose of enhanced fire protection, our recommendation would concur with OAWU's recommendation to retain a company that can evaluate the pipe through sound waves in order to estimate how many years of useful life the pipelines still have. Additionally, we concur that replacement with C900 or HDPE mainlines is more practical than using Ductile Iron pipeline and will likely result in financial savings to District.

Lastly, due to concerns about potential negative impacts on the existing asbestos cement pipe, we do not recommend water softening treatment prior to replacement of distribution lines.

RESIDENTIAL WATER SERVICES
Hiland has replaced and rebuilt several services since 2013. On one street as an example, we've replaced four or five crossings due to leaks under the street. While the services are clearly nearing the end of their useful life in several areas, our recommendation is to continue the current course of action and replace as needed rather than dedicating major capital funds to comprehensively replace service lines.

It is not common, in our experience, to provide pressure regulators to water services where the static water pressure is over 80 PSI. Consistent with OAWU, it is not our understanding that doing so would typically be the responsibility of the water purveyor.

CONCLUSION AND FINAL NOTES
Based on my brief review, I would conclude that $1,863,000.00 of the costs shown in the CIP are still valid and applicable incomplete projects. I would use the assumption that costs have gone up by 16% ($298,080), meaning the total CIP budget would now be $2,161.080.00. Since the CIP was completed nine years ago and 36% of the recommended cost at that time was recommended to be expended during the first 15 years, I have extrapolated that the goal for completion of the CIP would be the year 2050, 40 years from the time of compilation and 31 years from now. Without further consideration of future inflation or financing costs, it would be appropriate to allocate about $70,000 yearly toward the CIP.

Although the current budgets appears to allocate $50,000 for capital improvement projects, there also appears to be a deficit amounting to nearly $50,000. Assuming funds are not currently available to incur deficits of $70,000 for 31 years, water rates would need to be adjusted to increase revenues by about 78%.

While this written review isn't comprehensive, I've attempted to generally highlight any particular areas in which the TVWD CIP and OAWU report provided helpful information and areas in which Hiland's recommendation would differ from the recommendations in the reviewed reports. If there are other specific items not addressed in this report for which Hiland's opinion is needed, please do not hesitate to request it.

Regards,

Silas Olson
General Manager
Hiland Water Corp.

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix E
SPWD 2020 SDAO Preliminary CIP Planning

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Southwood Park Water District
PRELIMINARY CIP Planning - Alternatives Analysis

Overview

Southwood Park Water District (SPWD, the District) asked SDAO Consulting Services to conduct a preliminary review of alternatives for the District's Capital Improvement Program (CIP). Specific questions considered in this analysis:

1. Are the costs of the CIP projects identified in 2010 still valid?

2. Would it be possible to phase in CIP projects over time to limit near–term rate impacts?

3. What are the potential rate impacts of the proposed projects?

4. Are financing options available and how might loans be used to help limit rate impacts?

5. How would SPWD's resulting rates compare with other water providers in the region?

Summary of Analysis and Observations

The SPWD Board Chair provided SDAO Consulting Services with extensive background material including: Background Information (December 2018), Infrastructure Rate Review email (April 30, 2019), correspondence from Highland Water (April 30, 2019), Capital Improvement Plan (TVWD, October 2010), and budget documents for the 2019-20 fiscal year.

Based on this information, SDAO Consulting Services updated cost estimates for the CIP project list using published inflation rates from 2010 to 2020. In addition, five CIP implementation scenarios were developed, with project costs spread over a five-year planning horizon. Costs were compiled, and annual debt service costs were estimated for assumed loans in an amount approximately equal to the anticipated costs of each scenario (assumed term of 20 years and interest rate of 2.5%). A preliminary calculation of rate impacts was prepared for each scenario and resulting typical monthly bills were compared to other water providers in the Portland region based on available published data.

SDAO Consulting Services offers the following observations:

1. Other than replacing the well pump about 10 years ago, SPWD has made limited capital investments in renewal and replacement of water system assets since construction of the water system over 60 years ago. While SPWD's customers have realized the benefits of low rates for many years, SPWD's critical assets are at or near the end of their economic lives. Further, the SPWD distribution system may have potential deficiencies in available fire flow based on existing pipe sizes and fire hydrant spacing. In the absence of significant capital investments, the District faces a significant risk of failure of one or more critical water system assets within the next decade. Such failures may result in prolonged interruption of water service and/or unplanned costs for emergency repairs.

2. Significant rate increases – on the order of doubling current water rates – will be required to fund the needed capital improvements.

3. Low-interest loans are likely available to help fund the needed improvements; however, further planning and analysis will be required to identify a preferred capital plan, prepare a financial plan and prepare documentation needed to qualify for such funding. SPWD will also need to make significant near-term rate increases to qualify for a loan.

4. After making such rate increases, the resulting typical monthly water bills for SPWD customers would be comparable to several other water providers in the Portland region – particularly those water providers who have invested in ongoing renewal and replacement programs or have recently made significant capital investments.

5. In light of the significant capital investments the District is facing, SPWD is strongly encouraged to actively investigate possible consolidation and/or merger with another water provider. Such as consolidation will not avoid the need for capital investments – the acquiring system will likely require extensive updates to the SPWD system prior to consolidation – but consolidation will likely result in operating and maintenance cost savings that would help offset the rate impact of needed capital improvements.

Limitations of Analysis

This analysis by SDAO Consulting Services is subject to the following:

1. This analysis is based on information furnished by SPWD and has not been further researched or verified.

2. Cost estimates are based on work published by TVWD in 2010; new cost estimates and/or further research into required improvements has not been prepared.

3. Cost analysis was limited to capital costs; further analysis of rate impacts resulting from changes in future operation and maintenance costs would be needed to prepare a comprehensive economic evaluation of the alternatives. For example, no attempt was made to quantify costs and savings of the following:

   a. Reduced maintenance and repair costs to distribution piping that is replaced,
   b. Reduced water leakage and associated reductions in non-revenue water,
   c. Improved revenue recovery resulting from implementation of the proposed meter replacement program, and
   d. Changes in operating costs for well operations versus purchased water.

4. SDAO Consulting Services does not provide engineering services and, as such, all findings and recommendations presented herein are subject to further analysis and verification.

CIP Update & New Project List

10-yr Escalation Multiplier: 1.21

Project		Preliminary Cost Estimate ($)	
No.	Description	2010 Plan	2020 Update
ELA (new)	Financial Plan / Master Plan / Legal		$ 20,000
P1.a	Building Modifications	$ 50,000	$ 60,336
P3	Pump Station Piping	$ 5,000	$ 6,034
P4.a	SCADA Upgrades	$ 3,600	$ 4,344
P5	Backup Power Analysis (analysis only)	$ 3,000	$ 3,620
P6 (new)	Pump Replacement		$ 40,000
R0 (new)	Reservoir Cleaning		$ 5,000
R1	Reservoir Structural Assessment (analysis only)	$ 50,000	$ 60,336
R2	Reservoir Options Planning (analysis only)	$ 10,000	$ 12,067
R3	Reservoir Lining - new interior coating	$ 60,000	$ 72,403
R4	Reservoir Coating - new exterior painting	$ 200,000	$ 241,344
R5	Property Line Adjustment	$ 10,000	$ 12,067
R6 (new)	Reservoir Structural Upgrades		$ 350,000
S1	Portland Connection Upgrade (existing 2")	$ 50,000	$ 60,336
S2	Portland Connection (new 6")	$ 125,000	$ 150,840
S3	Water Softening	$ 380,000	$ 458,554
D1	New Pipe on SW Pamela between 63rd & 64th	$ 24,000	$ 28,961
D2	Repair Broken Valve at SW 62nd & 63rd	$ 3,500	$ 4,224
D3	Repair Broken Valve at SW 62nd & Southwood	$ 3,500	$ 4,224
D4	Repair Broken Valve at SW 63rd & 63rd Place	$ 3,500	$ 4,224
D5	Locate & Repair Valve at SW 61st & 62nd	$ 3,500	$ 4,224
D6	Repair Leaking Valve at SW 61st & 62nd	$ 3,500	$ 4,224
U1	Install New Pipe Sw 62nd & Southwood	$ 15,000	$ 18,101
U2	Install 4 Fire Hydrants	$ 16,000	$ 19,308
Replace	Replace Distribution System	$ 1,622,000	$ 1,957,300
M1	Replace Plastic Service Lines (include new meters)	$ 443,000	$ 534,577
M2	Install Residential Regulators	$ 28,000	$ 33,788

Summary of Planning Scenarios

Scenarios	Features & Improvements													Other / Notes
	Financial, Engr & Legal	Tank Struct Analysis	Maintain Tank	Maintain Well & Pump	Maintain Bldg	Dist Syst Maint	Dist Syst Replace	Tank Struct U/G	PDX Vault U/G	New PDX Connect	Meters & Services	PRVs	Water Softening	
Scenario 1 - Do Nothing														High potential for critical system failure within 10 years
Scenario 2 - Maintain existing assets; stay on well, no tank upgrades, no softening	✓	✓	✓	✓	✓	✓			✓		✓			Best case 'as is' scenario; existing operating cost
Scenario 3 - Maintain existing assets; stay on well but tank upgrades required in 5 years, no softening	✓	✓		✓	✓	✓		✓	✓		✓			Tank upgrade; existing operating cost
Scenario 4 - Maintain existing distribution assets, convert to Portland supply, maintain tank but not well	✓	✓	✓			✓				✓	✓			Changes in operating cost of wells vs purchased water; must verify compatiblity of AC pipe w/ PDX water
Scenario 5 - Replace distribution system, convert to Portland supply, maintain tank but not well	✓	✓	✓				✓			✓	✓			Replace distribution system; assume DI pipe but lower cost options may be viable.
Scenario 6 - Consolidate with other district	✓													Projects & costs will depend on consolidation agreement

<u>Helpful Comparisons</u>
1 vs any scenario: do nothing vs system investments
2 vs 3: effect of tank upgrade
2 vs 4: effect of moving to Portland supply
4 vs 5: effect of replacing distribution system

Scenario 2 - Maintain existing assets; stay on well, no tank upgrades, no softening

Project			Five Year Plan					Total 5-yr Plan
No.	Description	2020 Cost ($)	FY20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	
ELA (new)	Financial Plan / Master Plan / Legal	$ 20,000	$ 20,000					
P1.a	Building Modifications	$ 60,336		$ 60,336				
P3	Pump Station Piping	$ 6,034		$ 6,034				
P4.a	SCADA Upgrades	$ 4,344		$ 4,344				
P5	Backup Power Analysis (analysis only)	$ 3,620						
P6 (new)	Pump Replacement	$ 40,000				$ 40,000		
R0 (new)	Reservoir Cleaning	$ 5,000		$ 5,000				
R1	Reservoir Structural Assessment (analysis only)	$ 60,336			$ 60,336			
R2	Reservoir Options Planning (analysis only)	$ 12,067			$ 12,067			
R3	Reservoir Lining - new interior coating	$ 72,403				$ 72,403		
R4	Reservoir Coating - new exterior painting	$ 241,344					$ 241,344	
R5	Property Line Adjustment	$ 12,067			$ 12,067			
R6 (new)	Reservoir Structural Upgrades	$ 350,000						
S1	Portland Connection Upgrade (existing 2")	$ 60,336			$ 60,336			
S2	Portland Connection (new 6")	$ 150,840						
S3	Water Softening	$ 458,554						
D1	New Pipe on SW Pamela between 63rd & 64th	$ 28,961		$ 28,961				
D2	Repair Broken Valve at SW 62nd & 63rd	$ 4,224	$ 4,224					
D3	Repair Broken Valve at SW 62nd & Southwood	$ 4,224	$ 4,224					
D4	Repair Broken Valve at SW 63rd & 63rd Place	$ 4,224	$ 4,224					
D5	Locate & Repair Valve at SW 61st & 62nd	$ 4,224	$ 4,224					
D6	Repair Leaking Valve at SW 61st & 62nd	$ 4,224	$ 4,224					
U1	Install New Pipe Sw 62nd & Southwood	$ 18,101		$ 18,101				
U2	Install 4 Fire Hydrants	$ 19,308		$ 19,308				
Replace	Replace Distribution System	$ 1,957,300						
M1	Replace Plastic Service Lines (include new meters)	$ 534,577	$ 106,915	$ 106,915	$ 106,915	$ 106,915	$ 106,915	
M2	Install Residential Regulators	$ 33,788						
		Total by Year	$ 148,033	$ 248,999	$ 251,722	$ 219,319	$ 348,259	$ 1,216,332
		With Escalation	$ 148,033	$ 254,651	$ 263,177	$ 234,412	$ 380,565	$ 1,280,838
		Suggested Budget	**$ 163,000**	**$ 280,000**	**$ 289,000**	**$ 258,000**	**$ 419,000**	**$ 1,409,000**

Scenario 3 - Maintain existing assets; stay on well but tank upgrades required in 5 years, no softening

Project			Five Year Plan					Total 5-yr Plan
No.	Description	2020 Cost ($)	FY20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	
ELA (new)	Financial Plan / Master Plan / Legal	$ 20,000	$ 20,000					
P1.a	Building Modifications	$ 60,336		$ 60,336				
P3	Pump Station Piping	$ 6,034		$ 6,034				
P4.a	SCADA Upgrades	$ 4,344		$ 4,344				
P5	Backup Power Analysis (analysis only)	$ 3,620						
P6 (new)	Pump Replacement	$ 40,000				$ 40,000		
R0 (new)	Reservoir Cleaning	$ 5,000		$ 5,000				
R1	Reservoir Structural Assessment (analysis only)	$ 60,336			$ 60,336			
R2	Reservoir Options Planning (analysis only)	$ 12,067			$ 12,067			
R3	Reservoir Lining - new interior coating	$ 72,403					$ 72,403	
R4	Reservoir Coating - new exterior painting	$ 241,344					$ 241,344	
R5	Property Line Adjustment	$ 12,067			$ 12,067			
R6 (new)	Reservoir Structural Upgrades	$ 350,000					$ 350,000	
S1	Portland Connection Upgrade (existing 2")	$ 60,336			$ 60,336			
S2	Portland Connection (new 6")	$ 150,840						
S3	Water Softening	$ 458,554						
D1	New Pipe on SW Pamela between 63rd & 64th	$ 28,961		$ 28,961				
D2	Repair Broken Valve at SW 62nd & 63rd	$ 4,224	$ 4,224					
D3	Repair Broken Valve at SW 62nd & Southwood	$ 4,224	$ 4,224					
D4	Repair Broken Valve at SW 63rd & 63rd Place	$ 4,224	$ 4,224					
D5	Locate & Repair Valve at SW 61st & 62nd	$ 4,224	$ 4,224					
D6	Repair Leaking Valve at SW 61st & 62nd	$ 4,224	$ 4,224					
U1	Install New Pipe Sw 62nd & Southwood	$ 18,101		$ 18,101				
U2	Install 4 Fire Hydrants	$ 19,308		$ 19,308				
Replace	Replace Distribution System	$ 1,957,300						
M1	Replace Plastic Service Lines (include new meters)	$ 534,577	$ 106,915	$ 106,915	$ 106,915	$ 106,915	$ 106,915	
M2	Install Residential Regulators	$ 33,788						
		Total by Year	$ 148,033	$ 248,999	$ 251,722	$ 146,915	$ 770,663	$ 1,566,332
		With Escalation	$ 148,033	$ 254,651	$ 263,177	$ 157,026	$ 842,151	$ 1,665,039
		Suggested Budget	**$ 163,000**	**$ 280,000**	**$ 289,000**	**$ 173,000**	**$ 926,000**	**$ 1,831,000**

Scenario 4 - Maintain existing distribution assets, convert to Portland supply, maintain tank but not well

Project			Five Year Plan					Total 5-yr Plan
No.	Description	2020 Cost ($)	FY20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	
ELA (new)	Financial Plan / Master Plan / Legal	$ 20,000	$ 20,000					
P1.a	Building Modifications	$ 60,336						
P3	Pump Station Piping	$ 6,034						
P4.a	SCADA Upgrades	$ 4,344						
P5	Backup Power Analysis (analysis only)	$ 3,620						
P6 (new)	Pump Replacement	$ 40,000						
R0 (new)	Reservoir Cleaning	$ 5,000		$ 5,000				
R1	Reservoir Structural Assessment (analysis only)	$ 60,336			$ 60,336			
R2	Reservoir Options Planning (analysis only)	$ 12,067			$ 12,067			
R3	Reservoir Lining - new interior coating	$ 72,403				$ 72,403		
R4	Reservoir Coating - new exterior painting	$ 241,344					$ 241,344	
R5	Property Line Adjustment	$ 12,067			$ 12,067			
R6 (new)	Reservoir Structural Upgrades	$ 350,000						
S1	Portland Connection Upgrade (existing 2")	$ 60,336						
S2	Portland Connection (new 6")	$ 150,840			$ 150,840			
S3	Water Softening	$ 458,554						
D1	New Pipe on SW Pamela between 63rd & 64th	$ 28,961		$ 28,961				
D2	Repair Broken Valve at SW 62nd & 63rd	$ 4,224	$ 4,224					
D3	Repair Broken Valve at SW 62nd & Southwood	$ 4,224	$ 4,224					
D4	Repair Broken Valve at SW 63rd & 63rd Place	$ 4,224	$ 4,224					
D5	Locate & Repair Valve at SW 61st & 62nd	$ 4,224	$ 4,224					
D6	Repair Leaking Valve at SW 61st & 62nd	$ 4,224	$ 4,224					
U1	Install New Pipe Sw 62nd & Southwood	$ 18,101		$ 18,101				
U2	Install 4 Fire Hydrants	$ 19,308		$ 19,308				
Replace	Replace Distribution System	$ 1,957,300						
M1	Replace Plastic Service Lines (include new meters)	$ 534,577	$ 106,915	$ 106,915	$ 106,915	$ 106,915	$ 106,915	
M2	Install Residential Regulators	$ 33,788						
	Total by Year		$ 148,033	$ 178,285	$ 342,226	$ 179,319	$ 348,259	$ 1,196,122
	With Escalation		$ 148,033	$ 182,332	$ 357,799	$ 191,660	$ 380,565	$ 1,260,389
	Suggested Budget		**$ 163,000**	**$ 201,000**	**$ 394,000**	**$ 211,000**	**$ 419,000**	**$ 1,388,000**

Scenario 5 - Replace distribution system, convert to Portland supply, maintain tank but not well

Project			Five Year Plan					Total 5-yr Plan
No.	Description	2020 Cost ($)	FY20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25	
ELA (new)	Financial Plan / Master Plan / Legal	$ 20,000	$ 20,000					
P1.a	Building Modifications	$ 60,336						
P3	Pump Station Piping	$ 6,034						
P4.a	SCADA Upgrades	$ 4,344						
P5	Backup Power Analysis (analysis only)	$ 3,620						
P6 (new)	Pump Replacement	$ 40,000						
R0 (new)	Reservoir Cleaning	$ 5,000		$ 5,000				
R1	Reservoir Structural Assessment (analysis only)	$ 60,336			$ 60,336			
R2	Reservoir Options Planning (analysis only)	$ 12,067			$ 12,067			
R3	Reservoir Lining - new interior coating	$ 72,403				$ 72,403		
R4	Reservoir Coating - new exterior painting	$ 241,344					$ 241,344	
R5	Property Line Adjustment	$ 12,067			$ 12,067			
R6 (new)	Reservoir Structural Upgrades	$ 350,000						
S1	Portland Connection Upgrade (existing 2")	$ 60,336						
S2	Portland Connection (new 6")	$ 150,840			$ 150,840			
S3	Water Softening	$ 458,554						
D1	New Pipe on SW Pamela between 63rd & 64th	$ 28,961						
D2	Repair Broken Valve at SW 62nd & 63rd	$ 4,224						
D3	Repair Broken Valve at SW 62nd & Southwood	$ 4,224						
D4	Repair Broken Valve at SW 63rd & 63rd Place	$ 4,224						
D5	Locate & Repair Valve at SW 61st & 62nd	$ 4,224						
D6	Repair Leaking Valve at SW 61st & 62nd	$ 4,224						
U1	Install New Pipe Sw 62nd & Southwood	$ 18,101						
U2	Install 4 Fire Hydrants	$ 19,308						
Replace	Replace Distribution System	$ 1,957,300	$ 391,460	$ 391,460	$ 391,460	$ 391,460	$ 391,460	
M1	Replace Plastic Service Lines (include new meters)	$ 534,577	$ 106,915	$ 106,915	$ 106,915	$ 106,915	$ 106,915	
M2	Install Residential Regulators	$ 33,788						
		Total by Year	$ 518,375	$ 503,375	$ 733,686	$ 570,779	$ 739,720	$ 3,065,935
		With Escalation	$ 518,375	$ 514,802	$ 767,073	$ 610,060	$ 808,338	$ 3,218,649
		Suggested Budget	**$ 570,000**	**$ 566,000**	**$ 844,000**	**$ 671,000**	**$ 889,000**	**$ 3,540,000**

Loan Costs and New Bills

Loan Costs

Term (yrs): 20 Interest Rate (%): 2.50%

Scenario	5-yr Capital	Loan Amount	Annual Debt Service ($/yr)	Cost per Connection/yr
1	$ -	0		
2	$ 1,409,000	$ 1,400,000	$89,805.98	$301.36
3	$ 1,831,000	$ 1,800,000	$115,464.83	$387.47
4	$ 1,388,000	$ 1,350,000	$86,598.62	$290.60
5	$ 3,540,000	$ 3,500,000	$224,514.95	$753.41
6				

New Typical Bill by Scenario

Existing Typical Bill: $ 320.47 Per Year

Scenario	Existing Bill ($/yr)	New Debt ($/yr)	Total Typical Bill ($/yr)	Total Typical New Bill ($/month)	Required Rate Increase (%)
1	$ 320.47	$ -	$ 320.47	$ 26.71	0%
2	$ 320.47	$ 301.36	$ 621.83	$ 51.82	94%
3	$ 320.47	$ 387.47	$ 707.94	$ 58.99	121%
4	$ 320.47	$ 290.60	$ 611.07	$ 50.92	91%
5	$ 320.47	$ 753.41	$ 1,073.88	$ 89.49	235%
6	$ 320.47	$ -	$ 320.47	$ 26.71	0%

Comparison to Typical Monthly Bill of Other Water Providers

assumes 5/8" residential meter, based on 2018-19 rates

Juristiction	Typical Monthly Bill ($/mo)
Raleigh	$ 22.92
Rockwood	$ 23.58
Tualatin	$ 24.78
Troutdale	$ 24.84
SPWD Existing	$ 26.71
Oak Lodge	$ 27.08
Hillsboro	$ 32.12
Milwaukie	$ 32.33
Gladstone	$ 36.44
Sunrise	$ 38.00
Portland	$ 39.24
Forest Grove	$ 40.41
Sandy	$ 41.33
Beaverton	$ 41.36
CRW	$ 47.92
Gresham	$ 47.92
Cornelius	$ 49.62
SPWD Scenario 4	$ 50.92
SPWD Scenario 2	$ 51.82
TVWD	$ 52.44
Lake Oswego	$ 53.96
West Slope WD	$ 54.40
Tigard	$ 57.70
SPWD Scenario 3	$ 58.99
SPWD Scenario 5	$ 89.49

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix F
2022 Well Pump Assessment
Schneider Water Services

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WELL DRILLING
PUMP · CONTROLS
SALES & SERVICE

ST. PAUL, OR
(503) 633-2666

SCHNEIDER
WATER SERVICES
21881 River Road NE, St. Paul, Oregon 97137
schneiderwater.com

SINCE 1945
OR CCB: 39265
WA UBI: 600202757

RICHLAND, WA
(509) 943-0331

Pace Engineering – Southwood Park Water District – Well Pump Assessment
July 12, 2022

Observations:

- Well:
  - Well Log reference CLAC52290.
  - 12" casing to 450' 3" per well log.
  - Open hole to 838' per well log.
  - Last known measured well depth at 829' in 2009 when pump removed.
  - 222.3' Static Water Level from top of 1" probe tube port.
  - Pumping level 283.3' after 20 minutes.
  - Recovered to 230' in 1 minute and 223.3' in 15 minutes.

- General Site:
  - Building with hatch access for well pump removal/installation.
  - Fencing around building & reservoir with double gate access.
  - Utility Meter, Disconnect, and Pump Control Panel are mounted on exterior of building.
  - Chlorine injection setup. Chlorine room adjacent to well/mechanical room.
    - There are holes in the top of wall
    - There is exhaust fan and ducting connected to both chlorine and mechanical room.
    - Signs of corrosion on exterior of steel piping.
  - Sensaphone Sentinel with alarm notification and data logging capability.
    - Reservoir has level transducer that is connected to the Sensaphone Sentinel.
  - No flow meter on well pump discharge. Flow meter after Reservoir.
  - Soft Start Pump control panel
    - Safetronics EZ6-80
    - Run command appears to be based on mercury switch in mechanical room.
    - Idle Voltage
      - 482 L1 to L2
      - 485 L1 to L3
      - 480 L2 to L3

- Submersible Pump:
  - Goulds 7CHC, 4 stage, 4.75" trim
  - Unable to verify condition of column pipe or check valves.
  - Performed short pump test (see data sheet)
    - 283.3' Pumping level after 20 minutes
      - 61' drawdown
    - 367 GPM estimated flow
      - No flowmeter directly on well discharge.
      - Flow meter on reservoir outflow to system.
      - Measured change in flow meter and change in tank level to estimate well pump GPM.
    - 367 FT estimated TDH
      - Assume fill pipe is about 84' vertical from well.
      - Measured pumping level.
      - Friction loss not calculated, so would increase actual TDH of pump performance.
    - ~370 GPM @ ~395 FT TDH on Pump curve
      - Performance is slightly down based on estimated flow rate and TDH.
        - Margin of error as fill pipe height unconfirmed, and friction loss not calculated.
      - Wear on impellers over time can explain performance loss.

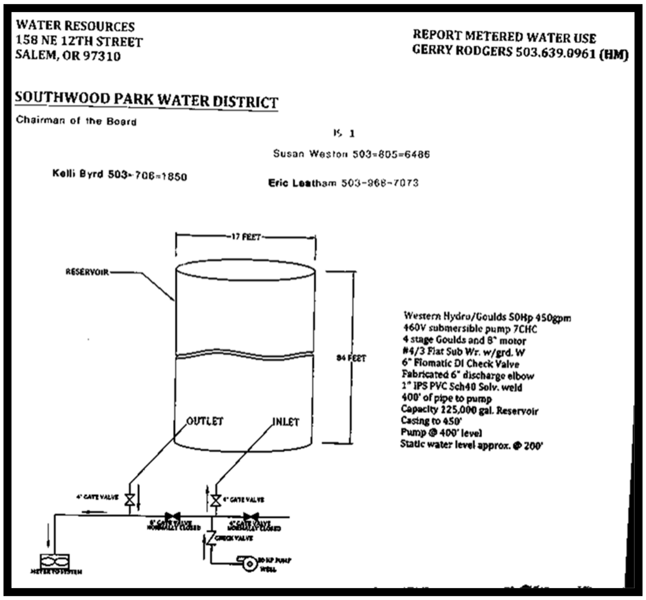
- Pump Performance Calculations:

Southwood Estimated Pump Performance	
78185555	Cubic Feet Beginning totalizer
78185736	Cubic Feet Final totalizer
181	Cubic Feet Total discharge
7.48	Conversion Cubic Feet to Gallons
1353.88	Gallons Total discharge
1696	Gal/ft Reservoir estimated
3.96	ft Reservoir level change (Sensaphone Sentinel Data Log)
6716.16	Gallons Reservoir change
8070.04	Gallons Total well pumped
22	Total time minutes
367	Well Pump GPM estimated (rounded)
84	ft reservoir head (assumed)
283.3	ft pumping level TOC
367	Well Pump TDH estimated (rounded)

- Submersible Motor:
  - Centripro Model #86M504, 8" 50HP, 460V, 3 Phase, 3490 rpm
  - Ohm winding test
    - 0.26 ohms L1 to L2
    - 0.26 ohms L1 to L3
    - 0.26 ohms L2 to L3
  - Insulation to ground test
    - 2,000+ meg ohms L1 to Ground
    - 2,000+ meg ohms L2 to Ground
    - 2,000+ meg ohms L3 to Ground
  - 70 amps during first minute of run time.
    - 73 service factor amps
    - 65 full load amps

System Assessment:

- Pump may have slight wear, but still performing within ~8% of original pump curve.
  - Recommend having spare pump stored for emergency. Downside is that warranty period most likely will expire before pump is installed. However, the quickest turnaround for a submersible pump is 1-2 weeks if components in stock.
- Motor checks good. Submersible motors typical industry average is about 9-10 years. This motor has been in service since August 2009 (about 13 years).
  - 50HP submersible motors are typically readily available locally.
  - A spare motor stored for emergency is an option but overtime the seal can dry out and prematurely fail if used. Also, warranty period most likely will expire before motor is installed.
- Column pipe, submersible wire, & check valves to be assessed next time pump is removed from well.
- Pump control still functioning. Saftronics soft start no longer in production.
  - If soft start were to fail, short term fix is to find another soft start that is locally stocked and retrofit it in existing panel. Current supply chain issues may hinder finding a solution. A more readily available solution may be to install a temporary across-the-line starter until soft start or VFD option procured.
  - Long term recommendation is to upgrade the soft start panel.
- Discharge piping significantly corroded, but no apparent leaks.
  - Recommend future replacement.
- Chlorine room source of corrosion.
  - Exhaust fan provides some remedy.
  - If building remodeled, recommend fully isolating chlorine room from mechanical room & electrical gear.
- Long term recommendation for secondary water source:
  - Metered connection to nearby water district, or drill second well & install pump.

- 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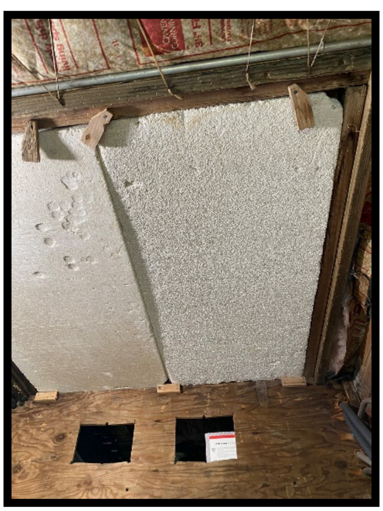
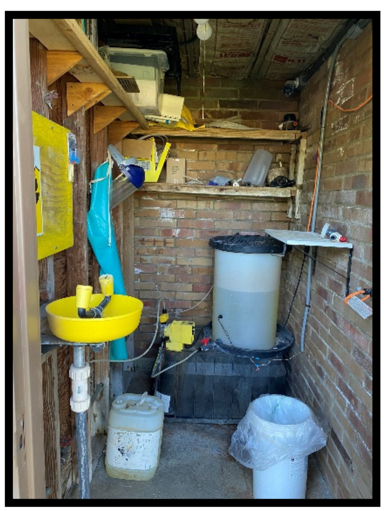
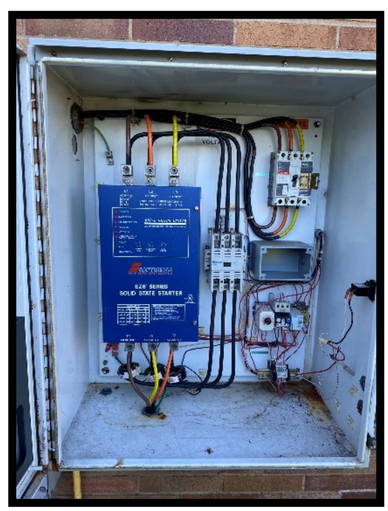
- 



Regards,
Patrick Schneider
Vice President
Schneider Water Services

SCHNEIDER WATER SERVICES--PUMP TEST DATA SHEET

WO#: 11153

Customer: Southwood Park WD

Well ID#: CLAC 52290

Date: 7/12/2022

P.L. Measuring Device: E-Tape

Datum Reference Desc: Top of Casing

Datum Ref to Grd Level:

Pump Equip. Type/Depth: Submersible / 400'

Pump Model/HP: Goulds 7CHC / 50HP

Time	Time from Pump Start	Pumping Level (FT)	Discharge Pressure	Flowmeter Totalizer (CF)	GPM	Remarks (Flow adjustments, Clarity, Sand Content, etc.)
10:33 AM	0	222.30	-	7818555	-	STATIC WATER LEVEL / START PUMP
10:34 AM	1	263.00				FLOWMETER AFTER RESERVOIR
10:35 AM	2	278.00				CALCULATED TOTAL GALLONS
10:36 AM	3	281.50				BASED ON RESERVOIR LEVEL CHANGE
10:37 AM	4	281.90				PLUS METER TOTAL CHANGE
10:38 AM	5	282.40				TO DETERMINE ESTIMATED GPM
10:39 AM	6	282.60				
10:40 AM	7	282.60				
10:41 AM	8	282.80				
10:42 AM	9	282.80				
10:43 AM	10	282.90				
10:44 AM	11	283.00				
10:45 AM	12	283.00				
10:46 AM	13	283.10				
10:47 AM	14	283.20				
10:48 AM	15	283.25				
10:49 AM	16	283.25				
10:50 AM	17	283.30				
10:51 AM	18	283.25				
10:52 AM	19	283.25				
10:53 AM	20	283.30				
10:55 AM	22	283.30		78185736	~367 AVG	STOP PUMP
10:56 AM	1	230.00				RECOVERY
10:57 AM	2	226.50				
10:58 AM	3	225.50				
10:59 AM	4	225.00				
11:00 AM	5	224.70				
11:01 AM	6	224.50				
11:02 AM	7	224.10				
11:03 AM	8	224.00				
11:04 AM	9	223.80				
11:05 AM	10	223.70				
11:10 AM	15	223.30				

Company: WESTERN HYDRO
Name:
Date: 08/21/09

Customer:

Order No:

Pump:
Size: 7CHC (4 stages)
Type: Submersible
Synch speed: 3600 rpm
Speed: 3480 rpm
Dia: 4.75 in
Curve: E6207CCPC2
Specific Speeds: Ns: 2210
Pump Notes for Standard Sizes:
Discharge Sizes-5",6". Curves are certified for water at 60°F only.
Consult factory for performance with any other fluid.
Vertical Turbine: Bowl size: 7.13 in
Max lateral: 0.5 in
Thrust K factor: 3.5 lb/ft

Pump Limits for Standard Construction:
Temperature: 120 °F
Pressure: 415 psi g
Sphere size: 0.43 in

Search Criteria:
Flow: --- US gpm
Head: --- ft

Fluid:
Water
SG: 1
Viscosity: 1.105 cP
NPSHa: --- ft
Temperature: 60 °F
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

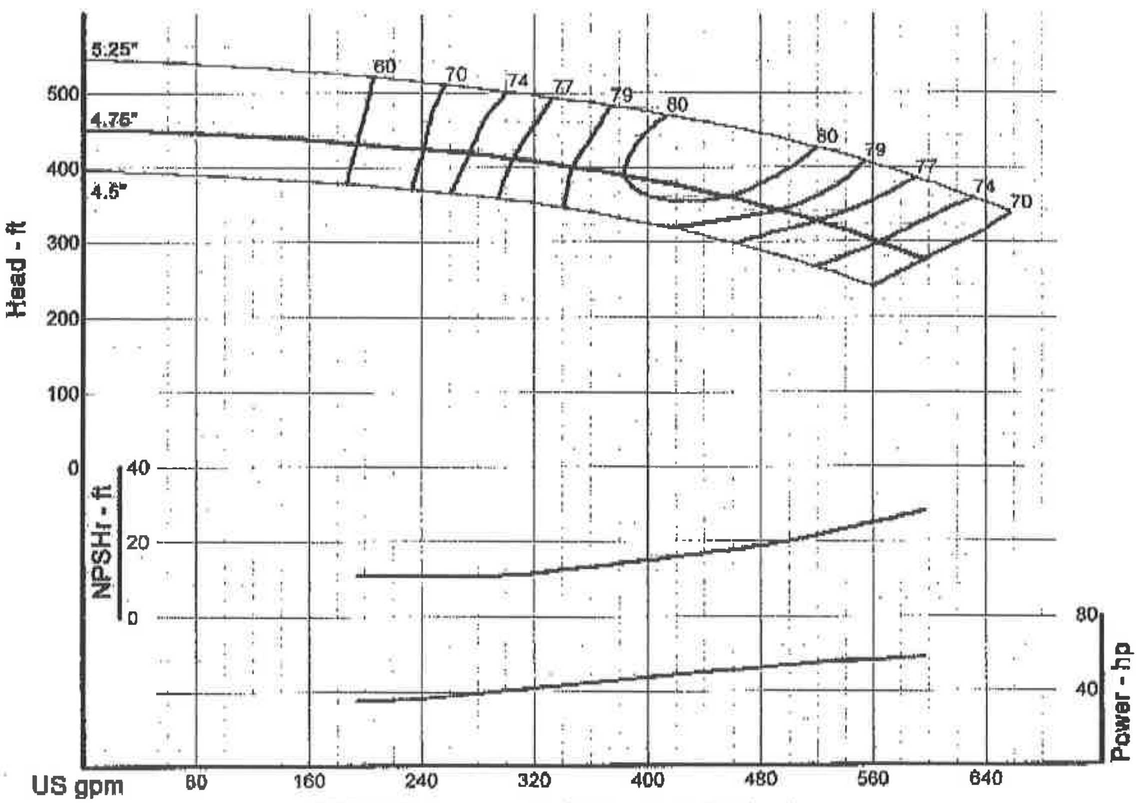
Motor:
Standard: NEMA
Size: 60 hp
Speed: 3600

Sizing criteria: Max Power on Design Curve

-- Data Point --
Flow: 472.2 US gpm
Head: 349 ft
Eff: 79.5%
Power: 52.1 hp
NPSHr: 18.2 ft

-- Design Curve --
Shutoff Head: 448 ft
Shutoff dP: 194 psi
Min Flow: --- US gpm
BEP: 80.3% eff
@ 419 US gpm
NOL Pwr: 58.5 hp
@ 595 US gpm

-- Max Curve --
Max Pwr: 79.5 hp
@ 657 US gpm



Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power hp	NPSHr ft
571	3480	290	73	57.2	25.7
476	3480	347	79.4	52.3	18.4
381	3480	386	79.9	46.4	14
286	3480	412	75.2	39.5	10.9
190	3480	429	59.2	34.7	10.8

Turbine Pump Selection 2004e

Selected from catalog: Goulds Sub 60HZ Vers: 3.30

Franklin's 8-inch submersible motors are typically used in large demanding water wells requiring high flow rates or deeper installations. These motors are tough, built to last, and come in a variety of construction options.

Item:	2396018521
Model:	8C3F(50HP,460/380,6/5,W)SF
Type	Sand Fighter

Ratings

HP	50 hp
Frequency	50/60 Hz
Phases	Three-Phase
Amps - Full Load	64 A
Amps - Service Factor	73 A
Volts	380 VAC / 460 VAC
Voltage Tolerance (%)	-10.0% / +10.0%
Wire	3-Wire
Motor Connection	DOL
Thrust Bearing Rating	10000 lb
Lead Length	13 ft
Motor	Encapsulated
Continuous Duty	Yes
Efficiency Service Factor Load [%]	87.00 %
Protection [IP]	IP68
Lead Wire Size	AWG #8
Motor Insulation Classification	F
Poles	2
S.F.	1.15
Motor Cooling	Water
Minimum Cooling Flow	.50 ft/sec

Materials of Construction

Motor Shaft End - Material	17-4SS
Thrust Bearing	Kingsbury
Seal	Mechanical Seal
Lead Insulation Material	XLPE
Diaphragm Material	Nitrile Rubber (NBR)
Motor Bottom End Bell Material	Cast Iron with E-Coat Paint
Motor Fill Solution (Water Soluble / Non Toxic)	YES
Motor Fill Solution	FES91
Motor Top End Bell Material	Cast Iron with E-Coat Paint
Shaft Slinger Material	Nitrile Rubber (NBR)
Stator Ends Material	Carbon Steel
Stator Fill	Resin
Stator/ Motor Shell Material	300 Series SS
Winding Material	Copper

Dimensions

Motor Diameter - Physical Diameter	7.70"
Motor Length	39.4 "
Product Weight	312 lb

Nominal		
Thrust Bearing Rating	10000 lb	
Motor Adapter	Double flange	
Rotation	Counter clockwise facing the shaft	
SubTrol Heat Sensor	YES	Yes

Carton Length	52.25 "
Carton Width	9 "
Carton Height	17 "
Shaft Diameter	1.5 "
Shaft End	Spline

Other

Drinking Water Agency Approvals	ANSI/NSF Standard 61
Electrical Agency Approvals	UL
Warranty Standard Time	12 Mo. from Date of Install / 24 Mo. from Date of Manufacturing

SCHNEIDER WATER SERVICES

21881 River Rd NE
St. Paul, OR 97137

(503) 633-2666
schneiderwater.com

INVOICE

Date	Inv. Number
4/26/2024	14554

INVOICE TO:

Hiland Water Corp
PO Box 699
Newberg, OR 97132

P.O. No.	Est.4023
Terms	Due on receipt
Job # - Project	12191 - 50HP Sub Motor Shorted
Counter Tkt #	

Description	Quantity	Unit	Unit Price	Amount
February 2024-March 2024 Service Labor & Materials to troubleshoot Southwood Park Water District 50HP submersible pump assembly that is reading shorted down the well. Discharge head, drop pipe, check valves are badly corroded and all need replaced. Pump end shows serious signs of pitting and cutting in the wear rings and impellers and recommend replacement.				
Pump Removal:				
Mobilization and Demobilization	1	LS	750.00	750.00
Labor & Rig Time (Crew of 2 with Tooling)	12	HR	390.00	4,680.00
8" Franklin Motor 50HP 3Ph 460V	1	EA	8,620.00	8,620.00
Submersible Wire Splice Kit #4	1	EA	35.00	35.00
#4/3 Flat Sub Wire w/Grd W	405	FT	7.63333	3,091.50
6" Galv Pipe Sch40 21'	420	FT	35.25	14,805.00
Machining & Threading Fee	1	LS	195.00	195.00
1" PVC Sch80 Flush Joint Probe Tube	800	FT	3.585	2,868.00
6" Flomatic 82DI VFD Check Vlv	2	EA	1,805.00	3,610.00
Goulds 6" 7CHC- 4 Stage Pump End	1	EA	6,650.00	6,650.00
Fabricate New Discharge Head (Existing is badly corroded)	1	LS	2,500.00	2,500.00
Well Video (If Needed)	1	LS	1,000.00	1,000.00
Pump installation:				
Labor & Rig Time (Crew of 2 with Tooling)	12	HR	390.00	4,680.00
4/10/2024 Labor - Startup & Testing	4	HR	240.00	960.00

ONLINE BILL PAY
https://schneiderwater.securepayments.cardpointe.com/pay
Pay online up to $5,000. For higher amounts please call (503) 633-2666.
3% convenience fee will be added on amounts over $5,000.

Interest on any unpaid balance of a billing that is past due is due at the rate of one and one-half percent a month, or fraction of a month. If any action, claim or arbitration is taken to collect any amount due, including interest, the prevailing party is entitled to recovery of reasonable attorney's fees, cost of suit, and all other associated costs.

Invoice Total:	$54,444.50
Payments/Credits:	$0.00
Balance Due:	$54,444.50

THANK YOU! WE APPRECIATE YOUR BUSINESS.

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix G
2022 Storage Tank Structural Analysis
PACE Engineers

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TECHNICAL MEMORANDUM

STRUCTURAL
REGISTERED PROFESSIONAL
ENGINEER
15002
OREGON
JULY 25, 1990
PATRICK K. MURPHY
EXPIRES: 12/31/2024

DATE: July 30, 2024

TO: KC Rogers, Southwood Park Water District Board Chair

Tom Ferrell, PE
PACE Project Manager

FROM: Patrick Murphy, SE

SUBJECT: Southwood Park Storage Tank Structural Analysis

Background:

The Storage Tank Structural Analysis is one part of a system-wide evaluation to characterize the existing conditions of system components relative to current applicable codes and jurisdiction requirements. The results of the analysis will be included in a Water System Feasibility Study that address system deficiencies and recommended strategic improvements. In the case of the storage tank, the PACE structural team completed a structural analysis based on the following applicable codes:

- American Water Works Association, AWWA D100, 2021 Ed., “Welded Carbon Steel Tanks for Water Storage”)
- American Society of Civil Engineers, ASCE 7, 2016 Ed., “Minimum Design Loads and Associated Criteria for Buildings and Other Structures.”

The ASCE 7 document quantifies the wind and seismic loads imposed on the storage tank. The AWWA document provides directions as to, 1) how to apply these loads to the storage tank and then, 2) how to quantify both actual and allowable material stresses in the structural elements of the tank in order to identify potential deficiencies. Elements critical to the structural integrity of the cylindrical storage tank include the tank steel shell, the tank anchor bolts, and the tank reinforced concrete foundation.

No record drawings were available for the Southwood Park storage tank. The following is a description of how PACE assembled sufficient information to perform the structural analysis.

Information Assembled:

Information to perform the structural analysis of the storage tank was assembled from the following sources:

- 5/11/22: Site observations and measurements were performed, and photos were taken.

Engineers | Planners | Surveyors

- 5/11/22: An informal interview occurred with Aaron Olson with Hiland Water Corporation, which is responsible for maintaining the Southwood Park water system.
- 7/12/22: A Carlson Testing, Inc., technician scaled the storage tank ladder and performed ultrasonic testing at each course of the tank shell assembly to verify the shell wall thickness.

Based on the information assembled, PACE confirmed or assumed the following information about the steel storage tank construction.

- The storage tank was originally built in the late 1950s. (1955 assumed for the purposes of this study.)
- The storage tank is 17 feet in diameter and 84 feet high.
- The storage tank consists of (14) 6-foot-tall steel plate courses making up the 84-foot tank height.
- The storage tank normal operating level (NOL) is 74 feet.
- The storage tank shell wall is typically 0.31-inches thick. However, the 5th, 6th, and 7th courses from the bottom measured 0.48-inches thick, based on ultrasonic testing.
- The storage tank is mechanically anchored to the concrete foundation with (10) 1¼-inch-diameter anchor bolts with unknown material strength and unknown embedment depth into the concrete foundation.
- The concrete foundation is hexagonal in shape, 21 feet wide between flat faces, with an unknown depth.
- It is inferred that the concrete foundation is supported by piling, drilled, or driven to solid strata beneath the ground surface, though this has not been verified. See below for further discussion.
- The storage tank is classified as a Risk Category IV structure (the most restrictive category), in accordance with ASCE 7, because it stores water required for fire protection.

Findings:

The storage tank shell was evaluated for three conditions:

- Static loading only
- Static plus wind loading
- Static plus seismic loading

Static Loading Findings:

- The storage tank shell, roof, and bottom weigh approximately 80,000 pounds.
- The storage tank contents, at NOL = 74 feet, weigh approximately 1,048,000 pounds.
- Maximum shell plate circumferential "hoop stress" due to hydrostatic loading is 10,555 pounds per square inch(psi), or 55% of the allowable stress.

- No deficiencies in the shell thickness or stresses were identified based on the requirements of AWWA D100.
- If the existing concrete foundation is not pile-supported, the static soil bearing pressure would be between 3,000 and 3,200 pounds per square foot (psf). This is a relatively high allowable soil bearing pressure for shallow foundations. Additionally, shallow foundations have the potential to compress the supporting soil when heavily loaded over the long term, such as with this storage tank, and to settle differentially, meaning that an edge or a corner could settle more than elsewhere. Any differential settlement of the concrete foundation would amplify the horizontal tilt at the top of the tank by a factor of 4.2. For a relatively tall and slender structure, and for critical infrastructure, it would not have been prudent to design a shallow foundation to support the storage tank. After 69 years of service, the foundation appears to be level and the storage tank appears to be plumb, leading us to believe that the foundation is pile-supported.

Static plus Wind Loading Combination:

- The wind loading criteria for a Risk Category IV structure includes a Design Wind Speed of 107 mph and an Exposure Classification of C. This exposure category determination is based on the relatively open spaces to the west and south of the site that allow wind forces to buffet the storage tank at higher levels than wooded or more developed surroundings.
- The total lateral wind load acting on the storage tank is approximately 22,000 pounds. This total wind load is approximately 8% of the total seismic load acting on the storage tank. Given the positive performance of the storage tank for 69 years under the static plus wind load combination, we therefore focused the bulk of our structural analysis on the static plus seismic load combination.

Static plus Seismic Loading Combination:

- The total lateral seismic load acting on the storage tank for this Risk Category IV tank is approximately 286,000 pounds. This force is approximately equal to 25% of the mass of the tank shell plus its contents at its NOL of 74 feet.
- This lateral seismic load quantified above, acting through the center of mass of the tank, has the potential to overturn the tank during a design earthquake. The (10) 1¼-in diameter anchor bolts installed uniformly around the tank perimeter provide a load path for transferring a hold-down tension force into the foundation. However, we do not know the material strength of the anchor bolts or the embedment depth of the anchor bolts into the concrete, and we do not know for certain the configuration of the foundation, and whether it was built with or without pile supports. Therefore, the overall stability of the tank during a design earthquake is unknown.
- Seismic loads affect the stresses in the storage tank walls in two ways. The first is that the hydrodynamic lateral load on the tank due to the inertia from the tank contents has an amplifying effect on the horizontal circumferential "hoop stress" in the tank wall. However, for this storage tank with a relatively small diameter of 17 feet, the amplifying effect is modest and the resulting hydrostatic plus hydrodynamic "hoop stress" is 10,600 psi, or 53% of the allowable stress.
- The second way in which seismic loads affect the storage tank wall stress is by imposing vertical compression in the wall as the overall tank structure flexes when subjected to the horizontal seismic force. On one side of the tank the tension force of the overturning couple is resisted by

the anchor bolts, while on the other side of the tank the compression force of the overturning couple is absorbed in the tank wall. The calculated vertical compression stress of 13,045 psi exceeds the allowable stress of 10,016 psi by approximately 31%. Given this level of overstress, it is possible that the lower course(s) of the tank could buckle in compression during a seismic event, and the overall tank could become unstable.

- The top five feet of water in the storage tank act independently of the balance of the water in the storage tank and generate a "sloshing" wave during a seismic event. The calculated height of the sloshing wave is 6.6 feet, which is less than the 10 feet of freeboard provided during normal operating conditions. Therefore, the roof system is not subject to hydrodynamic forces unless the water level is increased to 77 feet or above.
- In summary, the principal "static plus seismic loading" deficiencies of the tank are, 1.) the unknown capacity of the anchor bolts, 2.) the 31% overstress in the lower courses of the tank wall, and 3.) the unknown configuration and capacity of the foundation to resist overturning.

Recommendations:

Replacement of the storage tank to mitigate noted deficiencies would be a significant expense that would require planning, capital allocation, and financing to execute. Before exploring that option in earnest, the following steps should be considered.

- Research more exhaustively for record drawings across all relevant public agency archives in search of definitive information on the original foundation and anchor bolt design.
- Perform localized excavation at the edge of the storage tank foundation to verify the depth of the concrete footing and to try to locate and verify piling size and spacing.
- Engage a geotechnical engineer to perform the proposed study identified in the overall scope of services and to determine, based on their depth of experience, if there is any practical means by which to validate existing piling capacities, if they exist.
- Engage a special inspector to scan the concrete foundation to verify the reinforcing steel pattern and to attempt to verify the anchor bolt embedment depth.
- Expand the present structural analysis to evaluate the benefit of reinforcing the bottom four courses of the storage tank up to an elevation of 24 feet as a means to mitigate the vertical compression overstress noted above.
- Depending on feedback from the Commissioners and the findings from PACE's system-wide feasibility study, begin to develop concept-level retrofit or new tank design drawings.
- The capacity of the existing storage tank to serve the long-term needs of the system will be evaluated separately as part of the Water System Feasibility Study.

Carlson Testing, Inc.

Bend Office (541) 330-9155
Geotechnical Office (503) 601-8250
Eugene Office (541) 345-0289
Salem Office (503) 589-1252
Tigard Office (503) 684-3460

Daily Report of Structural Steel

Client: PACE ENGINEERS INC - GEOFF MAY

Project: SOUTHWOOD PARK RESERVOIR/STANDPIPE - UT THICKNESS TESTING **CTI Job #:** T2206211.

Address: 12900 SW 61ST AVE LAKE OSWEGO OR **Jurisdiction:** CLACKAMAS COUNTY

CTI representative A. IDZARDI WABO SI 01951/AWS 12041141/ICC 8210349

was on site this date Jul. 12, 2022 to perform Special Inspection for:

Permit NOT APPLICABLE

DFS #(s) ______ **PO Number:** ______

SCOPE OF INSPECTION

1. Checked in with superintendent, client or shop rep.
   Name: GEOFF
   Company: PACE ENGINEERS
2. Inspection was "IBC" [X] Continuous [ ] Periodic
3. Work performed: [X] In the field [ ] At fab shop
4. If shop inspection do they have fabrication and QC procedures? [ ] Yes [ ] No [X] N/A

Location of steel inspection [to include grid lines, elevations (floors) and drawing details]:

ULTRASONICALLY TESTED WITH 90° STRAIGHT BEAM, THICKNESS READINGS, 12" ON EITHER SIDE OF SEAMS AREAS CLOSE PROXIMITY TO ACCESS LADDER, LOCATIONS FULL HEIGHT OF WATER TANK. A TOTAL OF (14) WELDED SEAMS WERE SCANNED AND (10) LOCATIONS FULL CIRCUMFERENCE AT GROUND LEVEL. IN CONJUNCTION WITH CONTRACTOR DOCUMENTING THICKNESS READINGS, LOCATIONS FROM .31 TO .50 HAVE BEEN LOGGED AND RECORDED.

INSPECTION

	Yes	No	N/A
1. Reviewed previous inspection reports?			X
2. Verified steel materials are in compliance by reviewing random samples of the mill test reports, steel ID markings or other documentation.			X
3. Verified weld filler materials conform.			X
4. Checked steel members to see they were fabricated and erected in accordance with the workmanship and tolerances required.			X
5. Checked welded studs and structural connections were installed as required.			X
6. Verified high strength bolts and fasteners conform.			X
7. Verified the quality of welds produced by welders, welding operators, and tackers conform.			X
8. Verified steel frame joint details for bracing, stiffening, member locations, and application of joint details at each connection are in compliance by random sampling.			X

WELDER INFORMATION

Welders Name: N/A

Certification #: N/A

	Yes	No	N/A
1. Verified the contractor's Welding Procedure Specifications are in conformance with AWS requirements.			X
2. Verified the essential variables outlined in the Welding Procedure Specifications were employed during execution of the work.			X
3. Verified the weldability of reinforcing steel other than ASTM A706.			X

REPORT SUMMARY

1. Work inspected was: [X] Completed [ ] In progress
2. Completed work inspected was in compliance with
   [ ] Approved plans and specifications [ ] Shop drawings
   [ ] RFI [ ] Design change [ ] Submittal [X] N/A
   Document #(s) ______ Dated: ______
3. Noncompliance item(s) were noted this date, details on following page(s). [ ] Yes [ ] No [X] N/A
4. Noncompliance item(s) were reinspected this date, details on following page(s). [ ] Yes [ ] No [X] N/A
   [ ] Conform [ ] Remain in progress

Report(s) findings were discussed and left with
GEOFF
of PACE ENGINEERS

Based on the Code, approval is required from the Building Official before the SPECIAL INSPECTED items noted above can be covered. Carlson Testing has no authority to direct work of contractors or subcontractors.

[ ] See additional report page(s). [ ] Distribute attachments.

Daily Report of Structural Steel **For:** 07/12/2022

CTI Job #: T2206211.

Project: SOUTHWOOD PARK RESERVOIR/STANDPIPE - UT THICKNESS TESTING

Notes:

In some cases more than one box may be checked for a given item on the front page.

Our reports pertain to the material tested/inspected only. Information contained herein is not to be reproduced, except in full, without prior authorization from this office. Under all circumstances, the information contained in this report is provided subject to all terms and conditions of CTI's General Conditions in effect at the time this report is prepared. No party other than those to whom CTI has distributed this report shall be entitled to use or rely upon the information contained in this document.

If there are any further questions regarding this matter, please do not hesitate to contact this office.

Respectfully submitted,

CARLSON TESTING, INC.
Keith Gauvin

Project Manager

Reviewed By: Project Manager

Review Date: 07/22/2022

AI/MRM

CC: PACE ENGINEERS INC - GEOFF MAY GEOFFM@PACEENGRS.COM

X

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix H
2023 Steel Standpipe Assessment
MIT Diving and Coating

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Reservoir	Utility Name	Date
144KG Standpipe	Hiland Water Association	03/03/23

Dive Control/Supervisor	Diver/Inspector	Tender
Sanchez, Steven	Rendon, Chris	Placek, Sam

SSPC Rating's Key

Description - Good Condition
10 - No Rusting, or <0.01% of surface is rusted
9 - Minor rusting, or <0.03% of surface is rusted
8 - Isolated rust, <.01% of surface is rusted

Description - Fair Condition
7 - Isolated rust, <.03% of surface is rusted
6 - Extensive rusting, <1% of surface is rusted
5 - Approximately 3% of the surface is rusted

Description - Poor Condition
4 - Approximately 10% of the surface is rusted
3 - Approximately 17% of the surface is rusted
2 - Approximately 33% of the surface is rusted
1 - Approximately 50% of the surface is rusted
0 - Approximately 100% of the surface is rusted

Overall Coating Condition

Int. Roof	Good	Ext. Roof	Good
Int. Floor	Poor	Ext. Floor	Good

Overall Weld Condition

Int. Roof	Fair	Ext. Roof	Good
Int. Floor	Fair	Ext. Floor	Good

Overall Coating Deficiency's

- [x] Delamination
- [x] Blistering
- [x] Chalking
- [x] Staining
- [ ] Cracking
- [ ] Pinholes
- [ ] Cratering
- [ ] Sags/Runs

Exterior Upper Wall Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
8	8	7	7
Good	Good	Fair	Fair

Exterior Middle Wall Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
7	7	7	7
Fair	Fair	Fair	Fair

Exterior Lower Wall Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
8	8	8	8
Good	Good	Good	Good

Interior Upper Wall Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
8	8	8	8
Good	Good	Good	Good

Interior Middle Wall Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
8	8	8	8
Good	Good	Good	Good

Interior Lower Wall Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
8	8	8	8
Good	Good	Good	Good

Additional Comments

17' Diameter, 85' Height

Reservoir	Utility Name	Date
144KG Standpipe	Hiland Water Association	03/03/23

Dive Control/Supervisor	Diver/Inspector	Tender
Sanchez, Steven	Rendon, Chris	Placek, Sam

SSPC Rating's Key

Description - Good Condition
10 - No Rusting, or <0.01% of surface is rusted
9 - Minor rusting, or <0.03% of surface is rusted
8 - Isolated rust, <.01% of surface is rusted

Description - Fair Condition
7 - Isolated rust, <.03% of surface is rusted
6 - Extensive rusting, <1% of surface is rusted
5 - Approximately 3% of the surface is rusted

Description - Poor Condition
4 - Approximately 10% of the surface is rusted
3 - Approximately 17% of the surface is rusted
2 - Approximately 33% of the surface is rusted
1 - Approximately 50% of the surface is rusted
0 - Approximately 100% of the surface is rusted

Overall Coating Condition

Int. Roof ---- Ext. Roof ----

Int. Floor ---- Ext. Floor ----

Overall Weld Condition

Int. Roof ---- Ext. Roof ----

Int. Floor ---- Ext. Floor ----

Overall Coating Deficiency's

- [x] Delamination
- [ ] Blistering
- [x] Chalking
- [x] Staining
- [ ] Cracking
- [ ] Pinholes
- [ ] Cratering
- [ ] Sags/Runs

Interior Roof Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
7	7	7	7
Fair	Fair	Fair	Fair

Exterior Roof Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
8	8	8	8
Good	Good	Good	Good

Internal Roof Support

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
5	5	5	5
Fair	Fair	Fair	Fair

Interior Floor Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
4	8	4	4
Good	Good	Good	Good

Exterior Floor Panel Condition

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
9	9	9	9
Good	Good	Good	Good

Support Columns

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

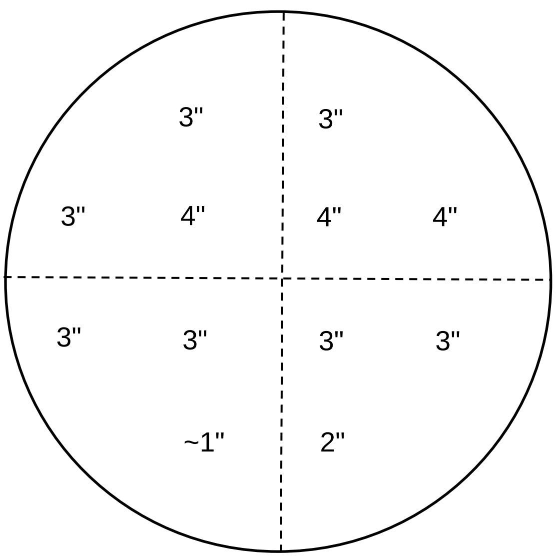
Additional Comments

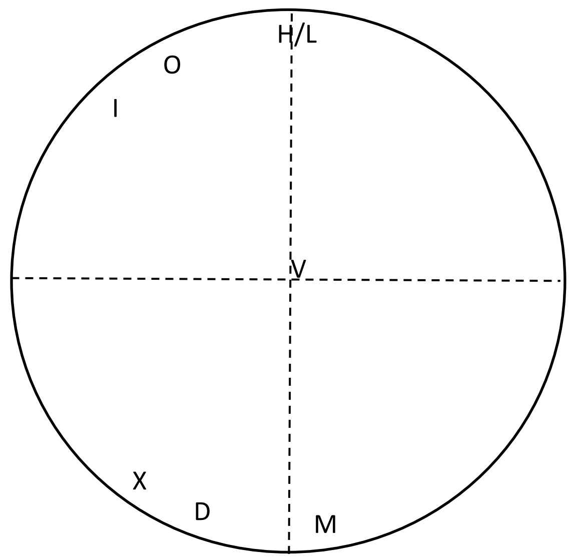
Interior Floor Panels' Coating appears to be deteriorated exposing the bare Floor Panels.

Plumbing Locations and Condition

	Quadrant One		Quadrant Two		Quadrant Three		Quadrant Four	
	SSPC Rating	Corrosion	SSPC Rating	Corrosion	SSPC Rating	Corrosion	SSPC Rating	Corrosion
Inlet Plumbing							5	Fair
Outlet Plumbing							6	Fair
Manways			9	Good				
Interior Overflow					8	Good		
Floor Drains					8	Good		

Sediment Depths & Plumbing Locations





Sediment Depths Average

Depth of sediment ~3"

Sediment Type Iron-Manganese, Sand, Clay

Plumbing Locations & Plumbing Identification Key

O = Outlet I = Inlet M = Manway V = Vent D = Drain
S = Sump L = Ladder H = Hatch X = Overflow
F = Float Level Indicator T = Telemetry C = Column

Additional Comments

Additional Reservoir Components

Primary Manway	Condition	Good	Size	3x3	Leaking	No	Location	Quadrant 2
Primary Air Vent	Type	Mushroom	Screen Installed	N/A	Screen Condition	Good		
Exterior Overflow	Location	Quadrant 3	Condition	Good				
Cathodic Protection	Installed	No	Amount of Penetrations	N/A	Properly Secured	N/A		
Water Level Indicator	Condition	N/A	Type	N/A				
Primary Access hatch	Condition	Good	Size	3x4				
Exterior Ladder	Condition	Good	Rail to Rail		Rung to Rung		Rung To Wall	
	Rail Width		Rail Length					
Railings	Present	N/A	Condition	N/A				
Roof Integrity	Holes	No	Cracks	No	Structural Condition	Good		
Wall Integrity	Holes	No	Cracks	No	Structural Condition	Good		
Antennas	Present	No	Obstructs Work Site	N/A	Antennas Offline	N/A		
Hypalon Floating Cover	Present	No	Condition	N/A				

Inspection Supplemental Report and Additional Information

Moderate Staining was observed on the Lower Wall Panels in all Quadrants with moderate staining running onto the middle wall panels in Quadrant 4. The Middle and Upper Wall Panels appear to be in good condition with mild corrosion noted on the weld seams on the upper wall panels in Quadrant 4. The Exterior Ladder appears to be in good condition with minor surface corrosion observed on the ladder rungs, side rails, and its fall protection structure. Biological Growth was noted exterior Floor Panels, though, the exterior gasket appeared to be in good condition with no discrepancies noted. The Reservoir's Seismic Protection Hardware appeared to be in good condition with minor corrosion and staining observed in Quadrants I & IV. The Exterior Man-way, located in Quadrant II, appears to be in good condition found with mild corrosion on its hardware. The Pump Room, directly west of the tank, was opened by the client for the team. The Exterior Plumbing was noted to be heavily corroded on the plumbing headed towards the interior plumbing, meanwhile moderate cell corrosion was observed on the rest of the plumbing immediately closest to to the entrance of the pump room. The Pump Room's Ventilation system appeared to be in good condition, no rips or tears were noted. The Electrical System was properly secured with its cords being in good condition.

Upon reaching the Hatch, it appeared the hatch was corroded or warped, making it hard for the dive team to open the hatch. Once it was opened, minor surface corrosion was observed on the interior corners of the hatch door. The Exterior Roof Panels appeared to be in good condition with minor peeling areas near the center vent. The Same Discrepancies was observed on the top of the vent structure. Mild corrosion was observed on the interior of the vent, with the screen appearing the be in good condition

The interior access ladder appeared to be in good condition with moderate to heavy staining throughout. Minor surface corrosion was observed at the ladder rung to rail seam. Pitting was also observed on the ladder rungs and rails throughout. Lower wall panels in this reservoir appeared to be heavily stained, but were otherwise in good condition. The floor panels in quadrant 1 appeared to be in good condition with mild to heavy staining. The floor to wall seam in quadrant 1 appeared to be in good condition with no corrosion observed. Floor seams in quadrants 1 & 2 appeared to be in good condition with mild to moderate staining. The man-way access, observed near the 5 o'clock position, appeared to be in good condition with moderate staining and minor surface corrosion. The drain was observed near the 6 o'clock position. The plumbing appeared to be in good condition with mild staining and minor nodules of corrosion on the interior and perimeter of the plumbing. Coating on the floor panels appeared to suffer from coating loss in select areas of all four quadrants, displaying areas of coated/partially coated/non-coated floor panels. Inlet roughly 8' tall, diameter 5-6". The inlet was moderately stained. The inlet appeared to be introducing turbidity to the facility at the time of inspection. The outlet, observed in quadrant 4 displayed coating loss and mild corrosion. the interior of the outlet displayed heavy staining and minor corrosion.

Minor corrosion was observed on the middle wall panel weld seams. The wall panels themselves appeared to be in good condition in all quadrants. Minor nodules of corrosion were observed on the lower and middle wall panel weld seams in quadrant 4. Middle ladder stand-offs appeared to be in good condition with mild to moderate corrosion observed on the ladder hardware. Stand-off to wall panel weld seams appeared to be in good condition with minor corrosion. Minor surface corrosion observed on middle ladder rungs. Minor cratering was observed on the middle ladder rungs and rails. Middle and upper wall panels displayed minor blistering near the 60' elevation. Minor to mild surface corrosion observed on the upper interior wall panels in quadrants 1, 3 & 4. Cracking was observed near the upper wall panel horizontal weld seams in quadrants 3 & 4. Above the surface of the water, heavy staining was observed on the upper wall panels. The roof to wall seam appeared to display mild surface corrosion as well as corrosive staining. The roof panels appeared to be in good condition with mild surface corrosion and staining. Mild surface corrosion observed at the horizontal weld seam in all quadrants. The overflow plumbing, observed near the 7 o'clock position, appeared to be in good condition with minor surface corrosion and staining. The interior of the center roof vent appeared to be in good condition with minor surface corrosion and minor coating delamination. Moderate Corrosion and minor Delamination was observed on the Upper Wall to Roof Seam in all Quadrants. Minor Surface Corrosion was observed on the Roof Panels in all Quadrants, while Moderate Isolated Corrosion Spots were also observed on the roof panels in Quadrant I, II, IV. Its Roof Supports appeared to be in fair condition with mild surface corrosion and minor delamination where the roof supports meets the roof panel.

MIT Diving & Coating appreciates the opportunity to conduct business with you and we recommend getting your reservoir serviced every 3-5 years.

GOPR7191.JPG

GOPR7142.JPG

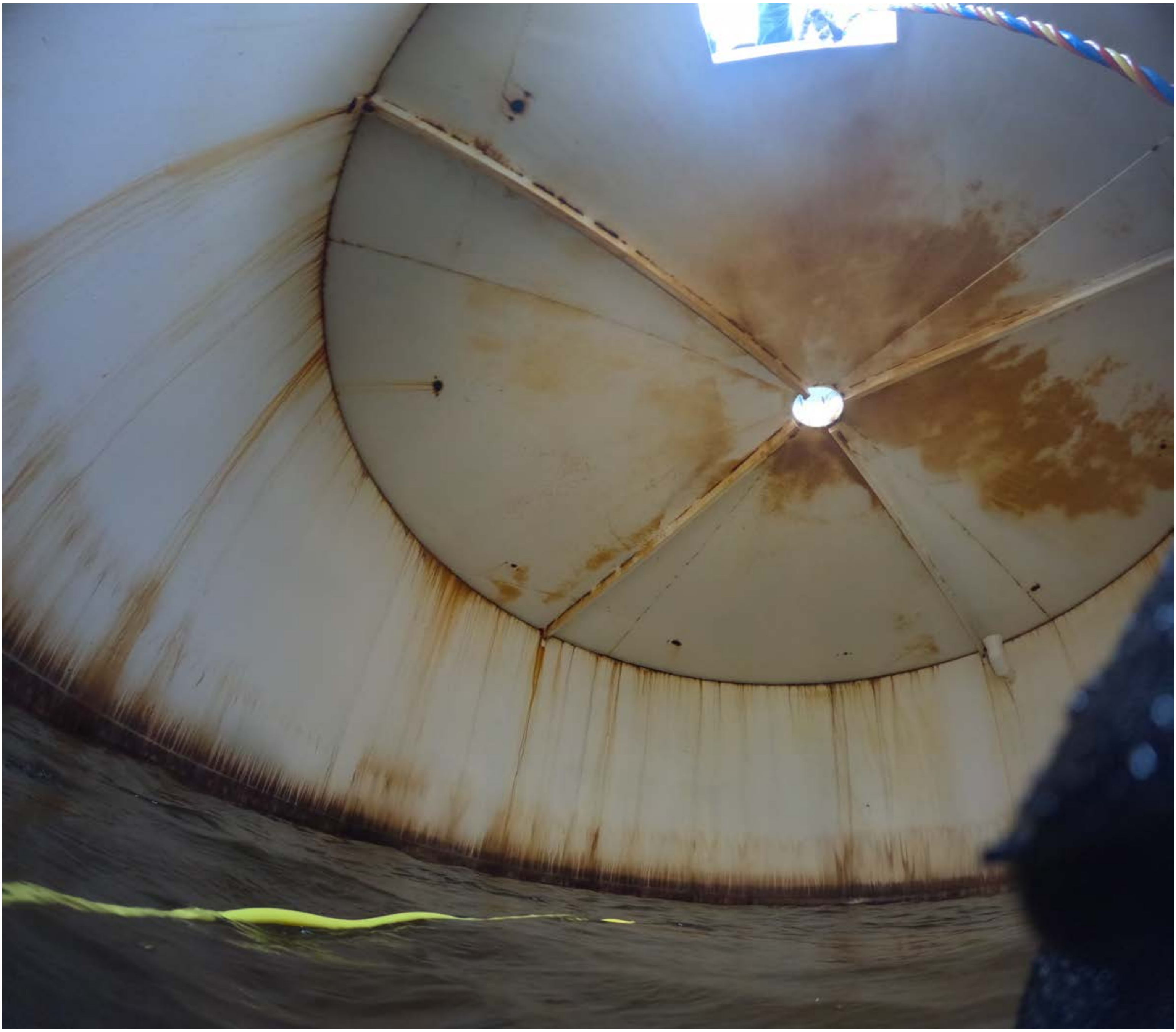
GOPR7141.JPG

GOPR7138.JPG

GOPR7135.JPG

GOPR7278.JPG

GOPR7277.JPG



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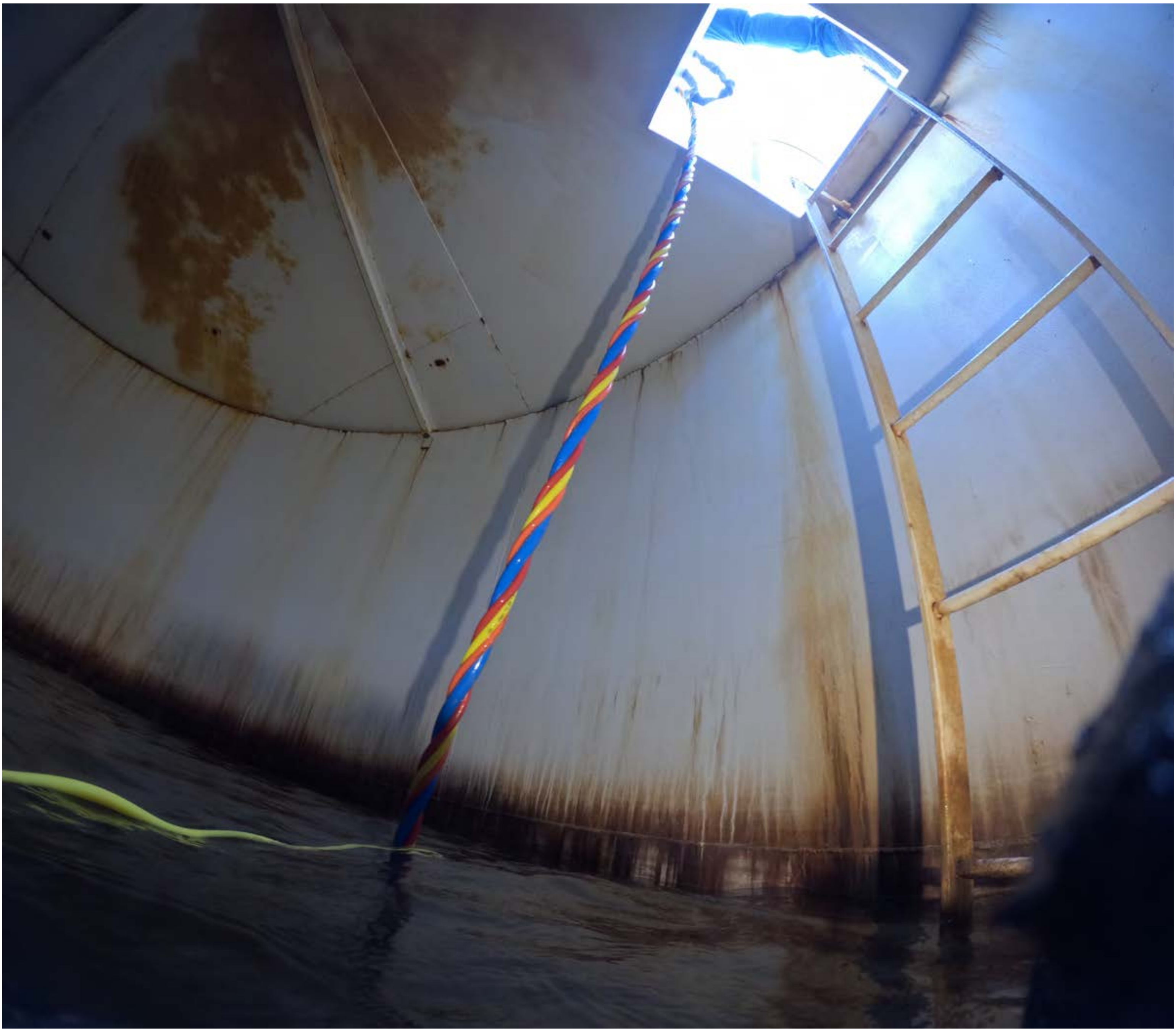
GOPR7275.JPG



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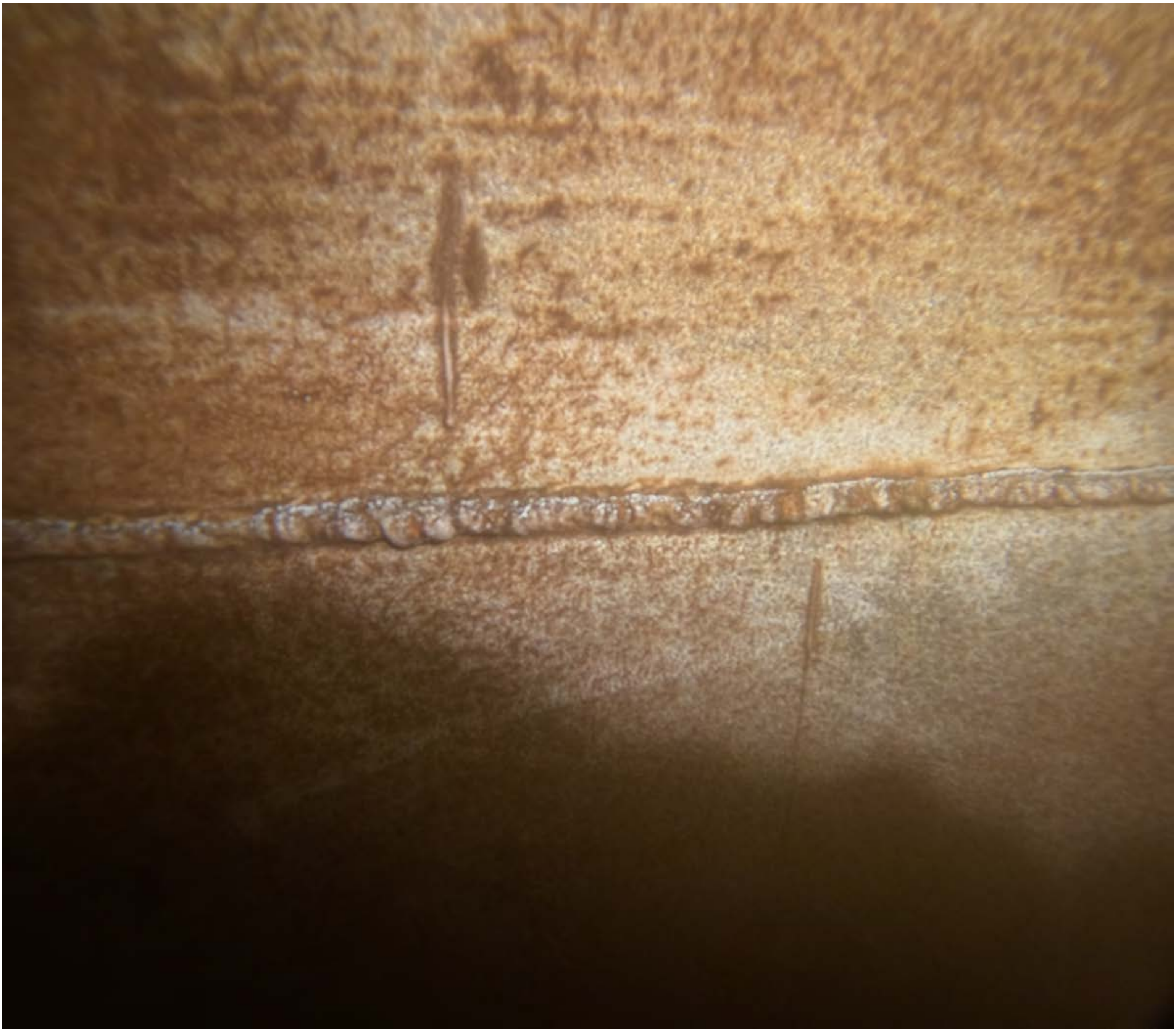

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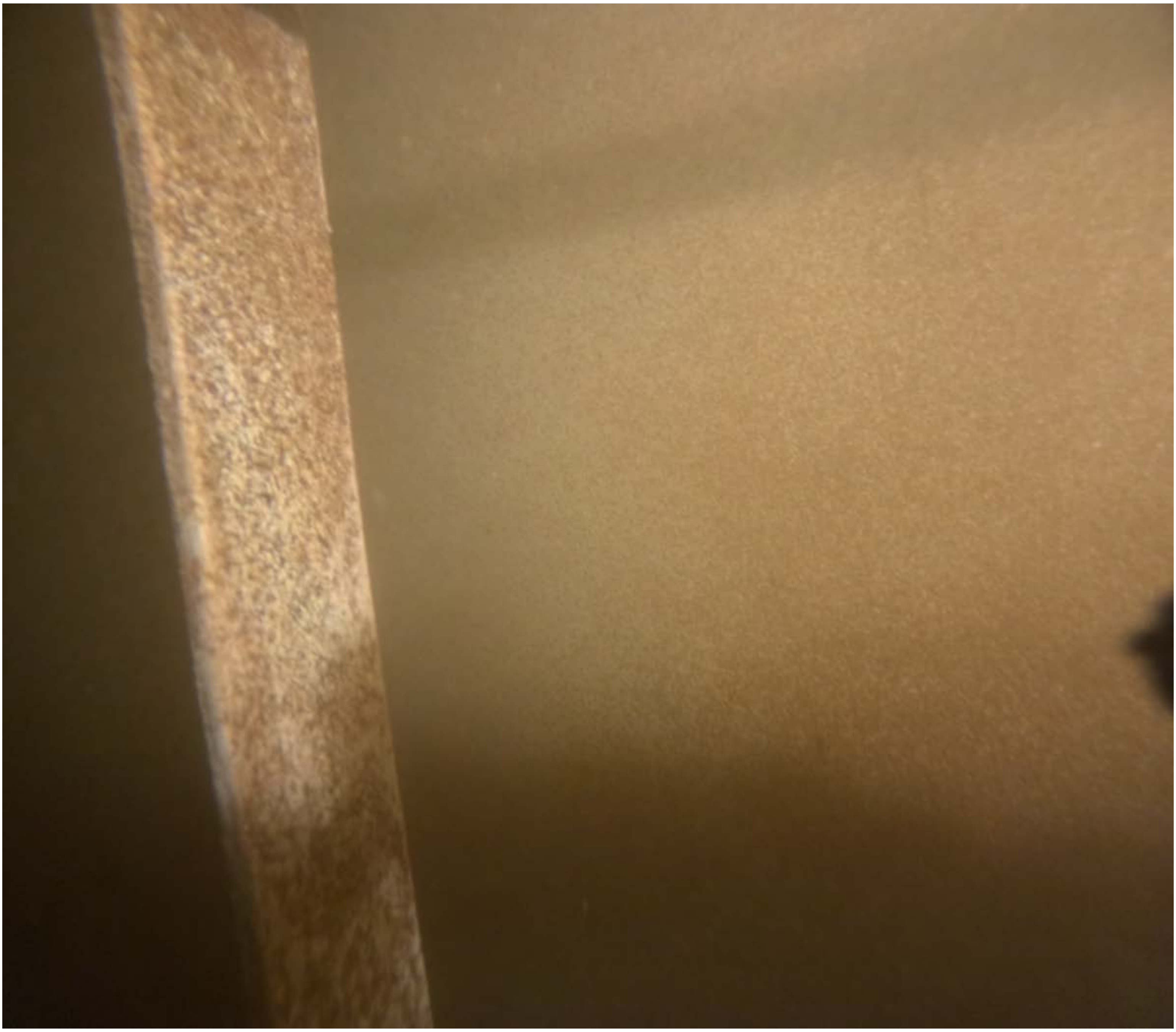

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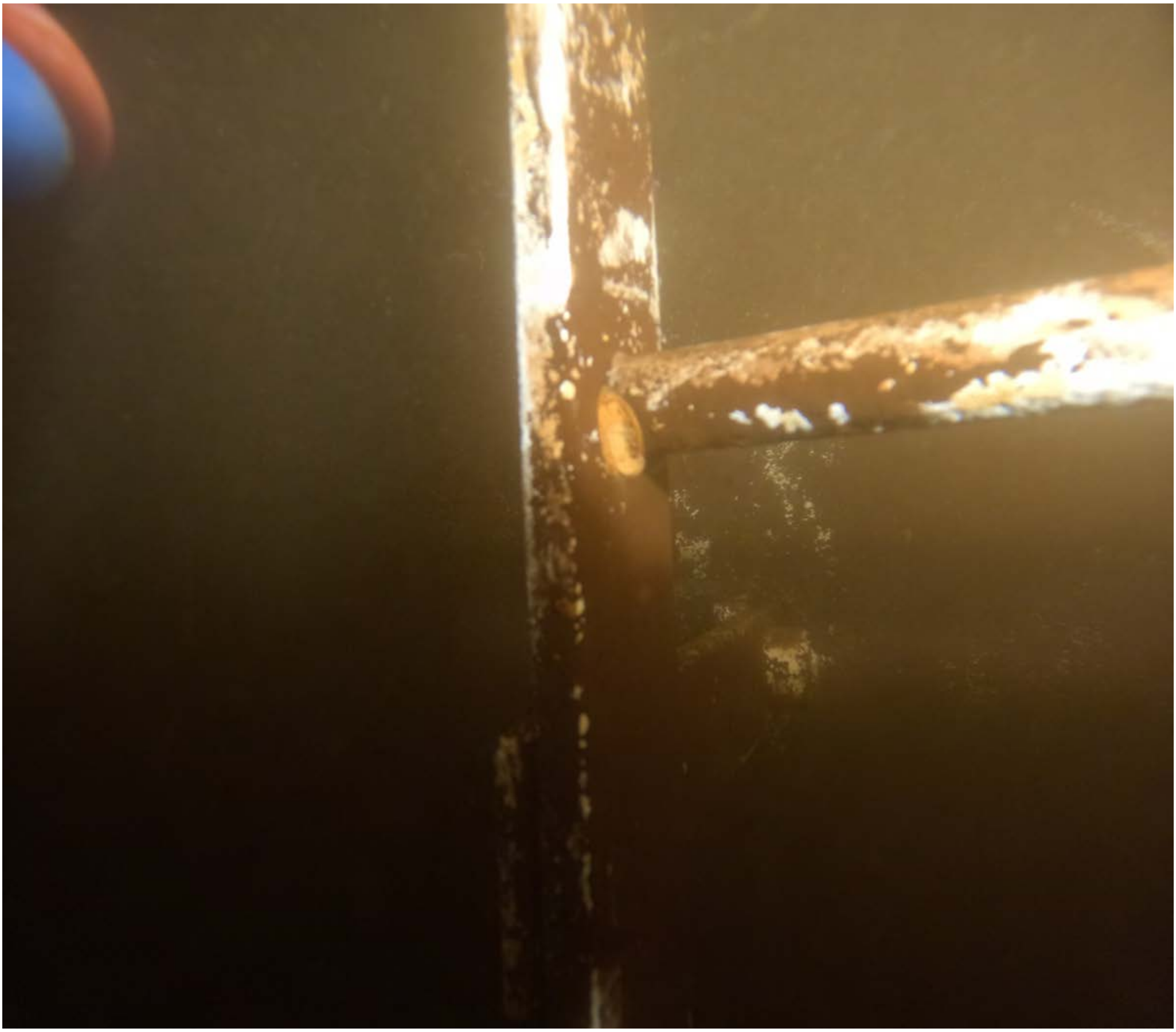

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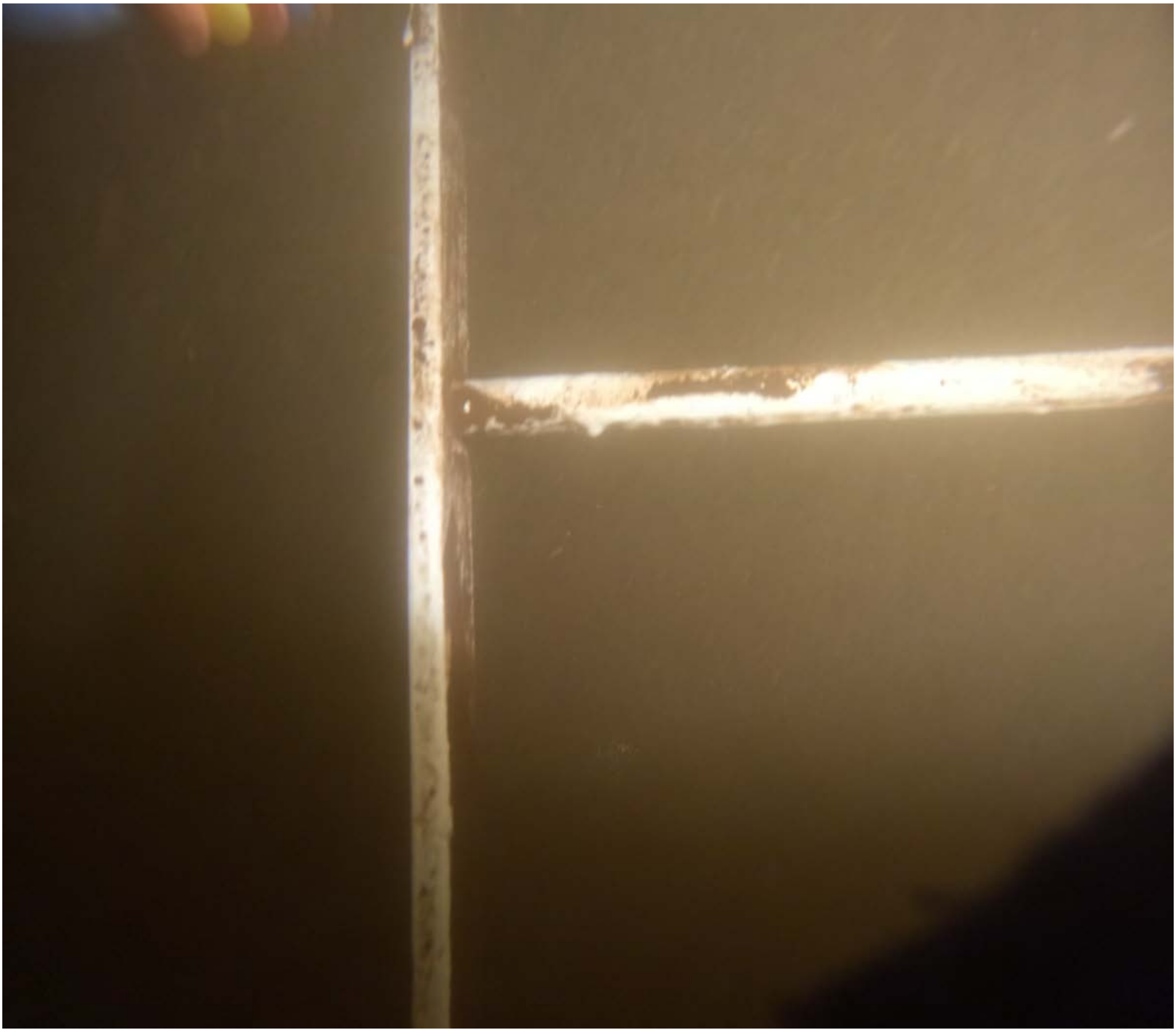

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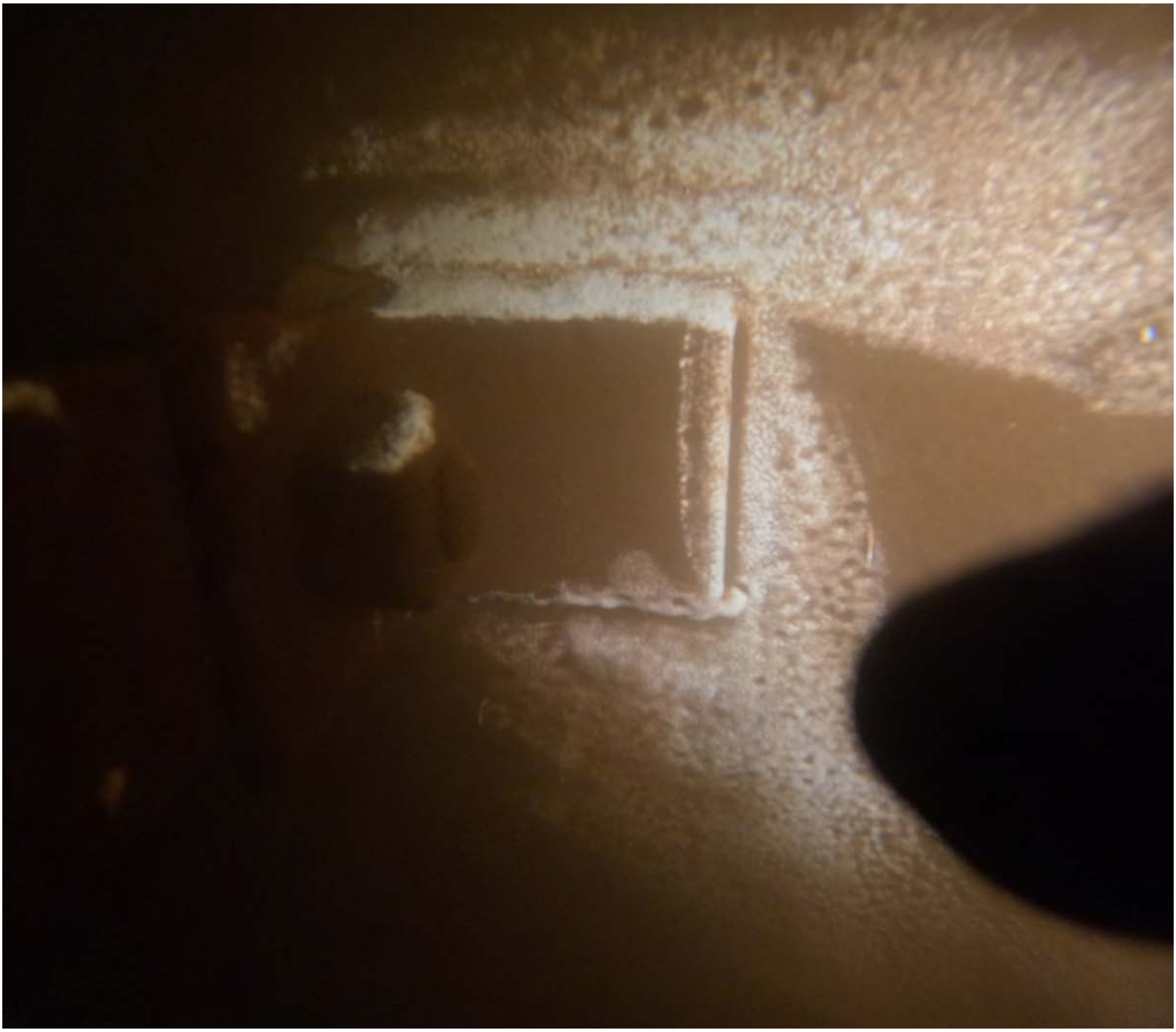

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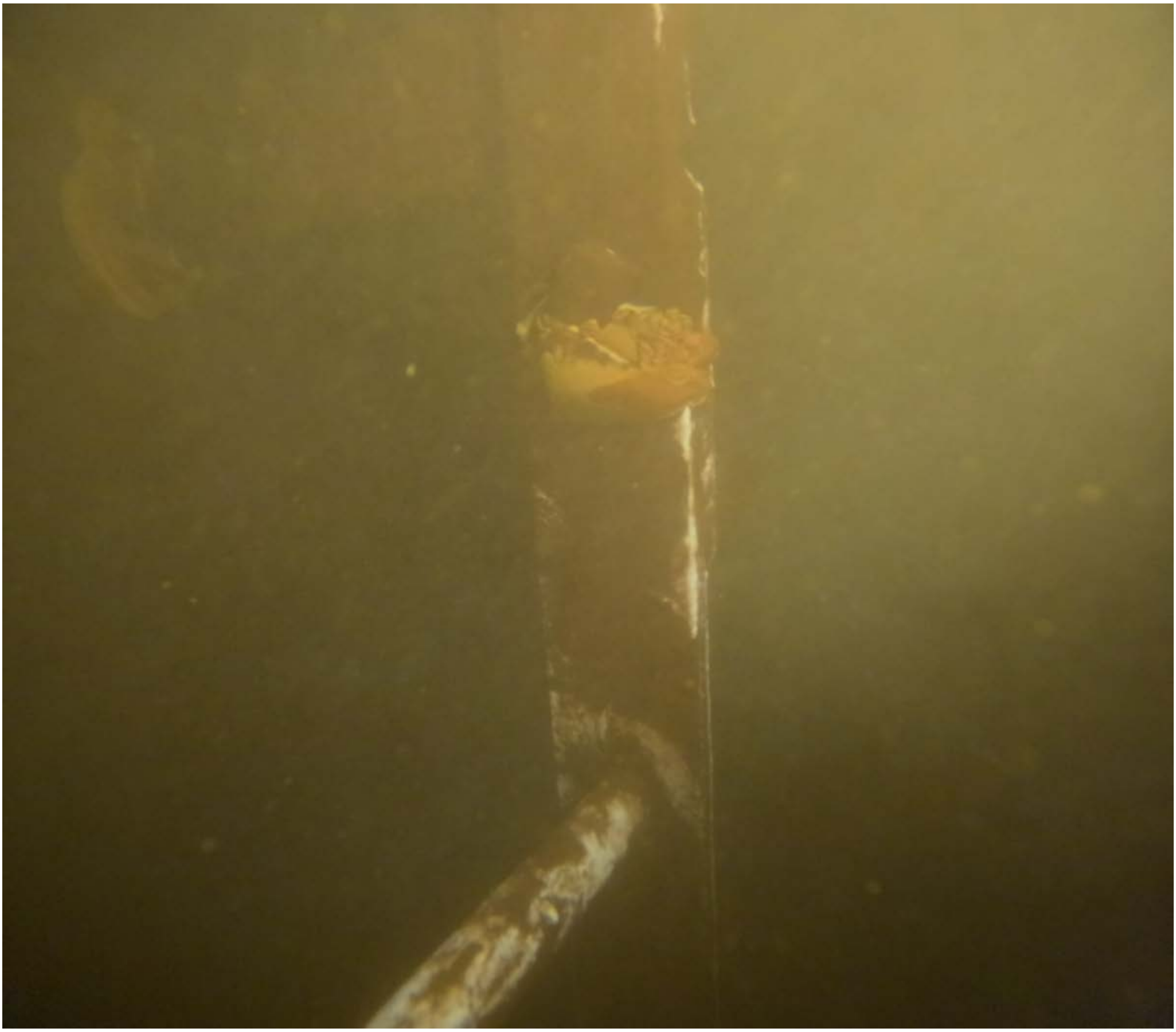

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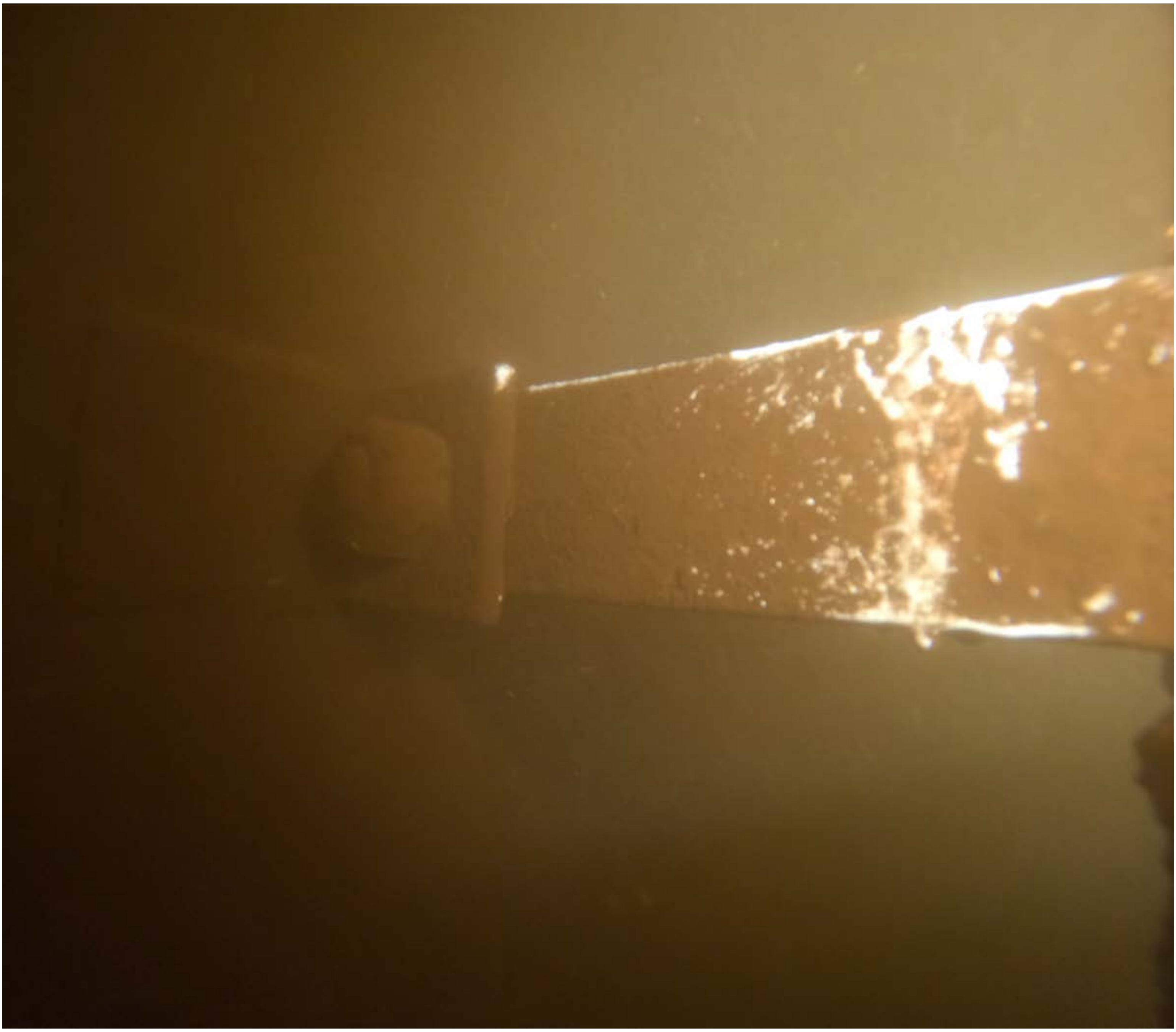

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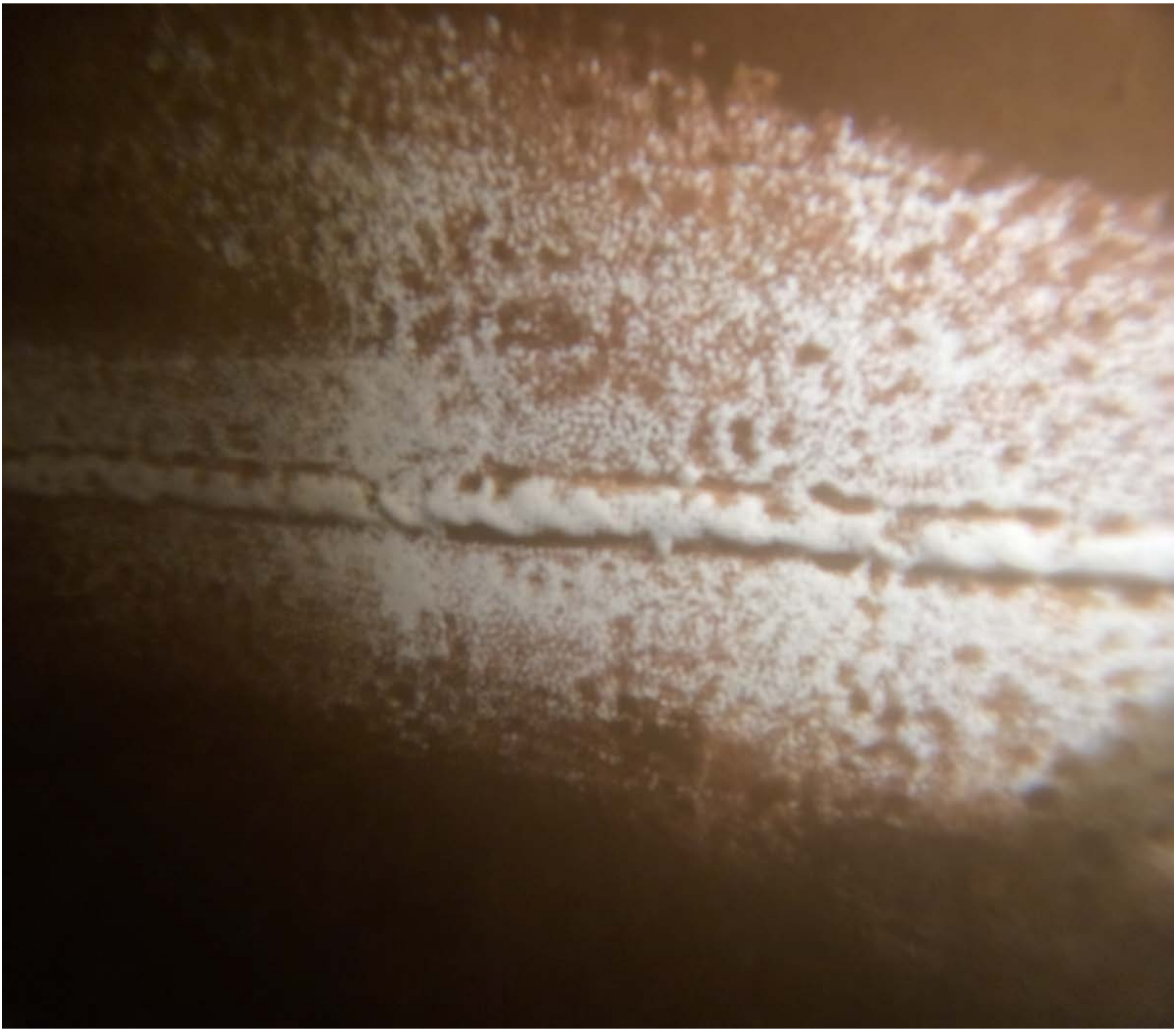

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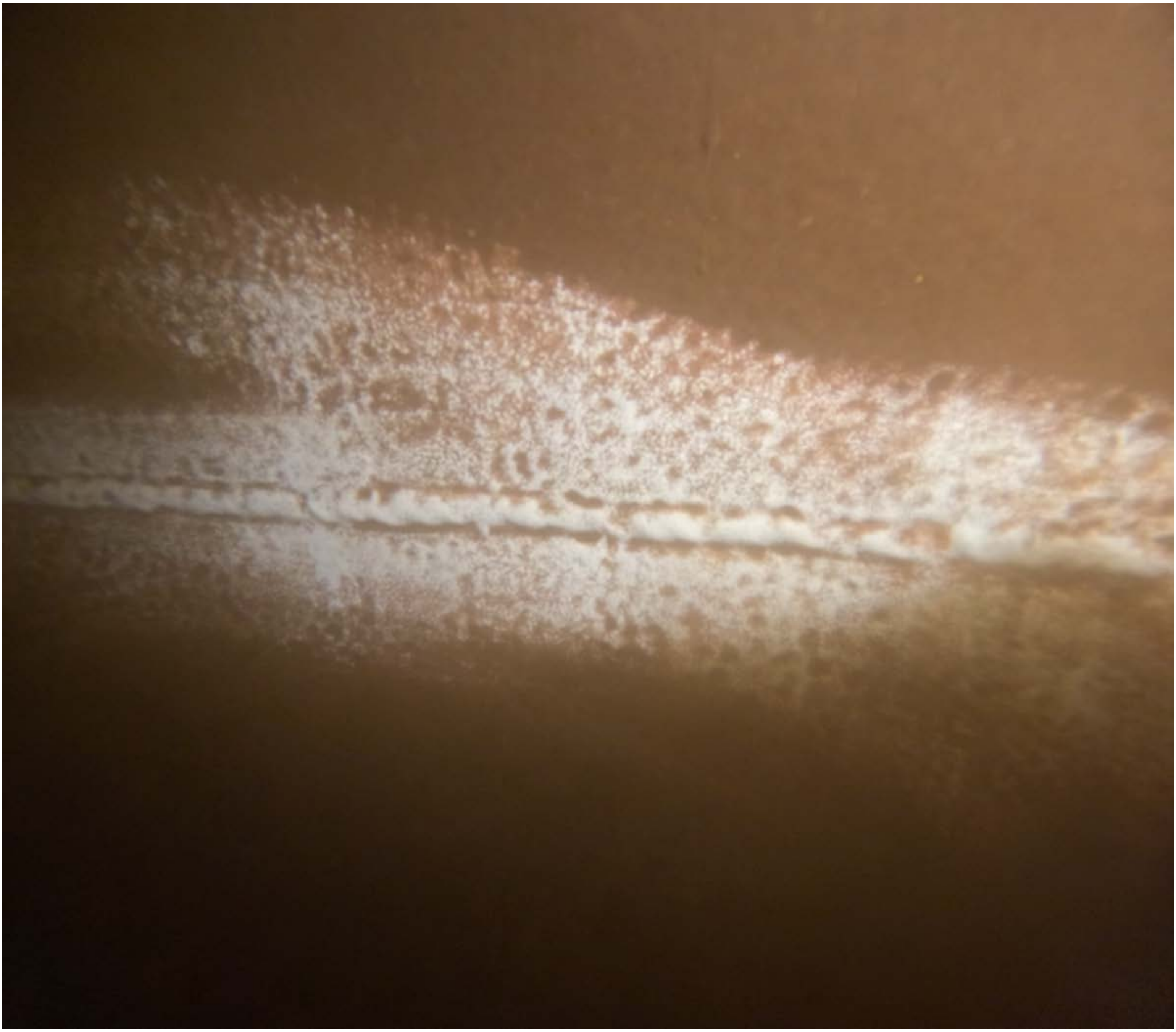

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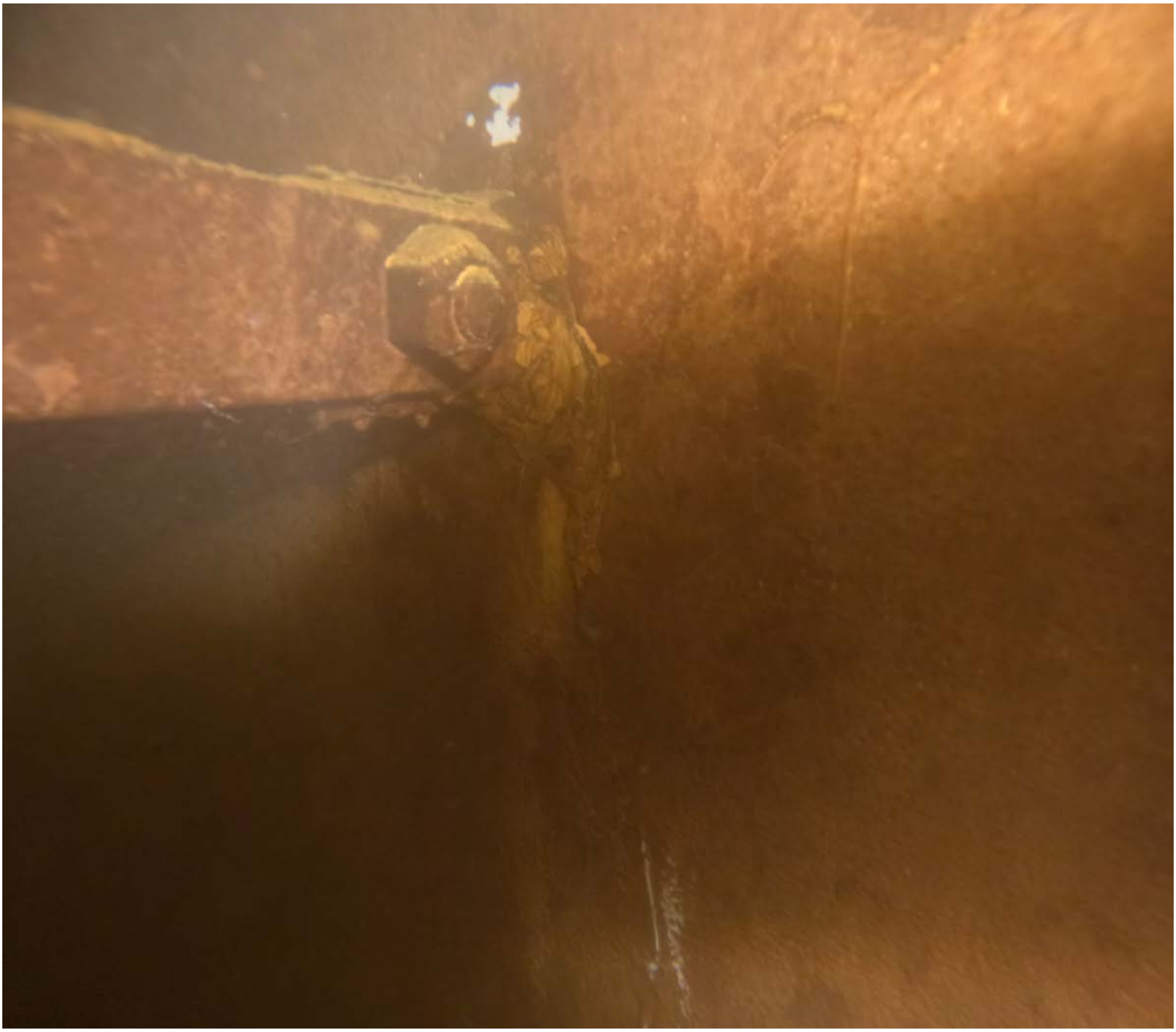

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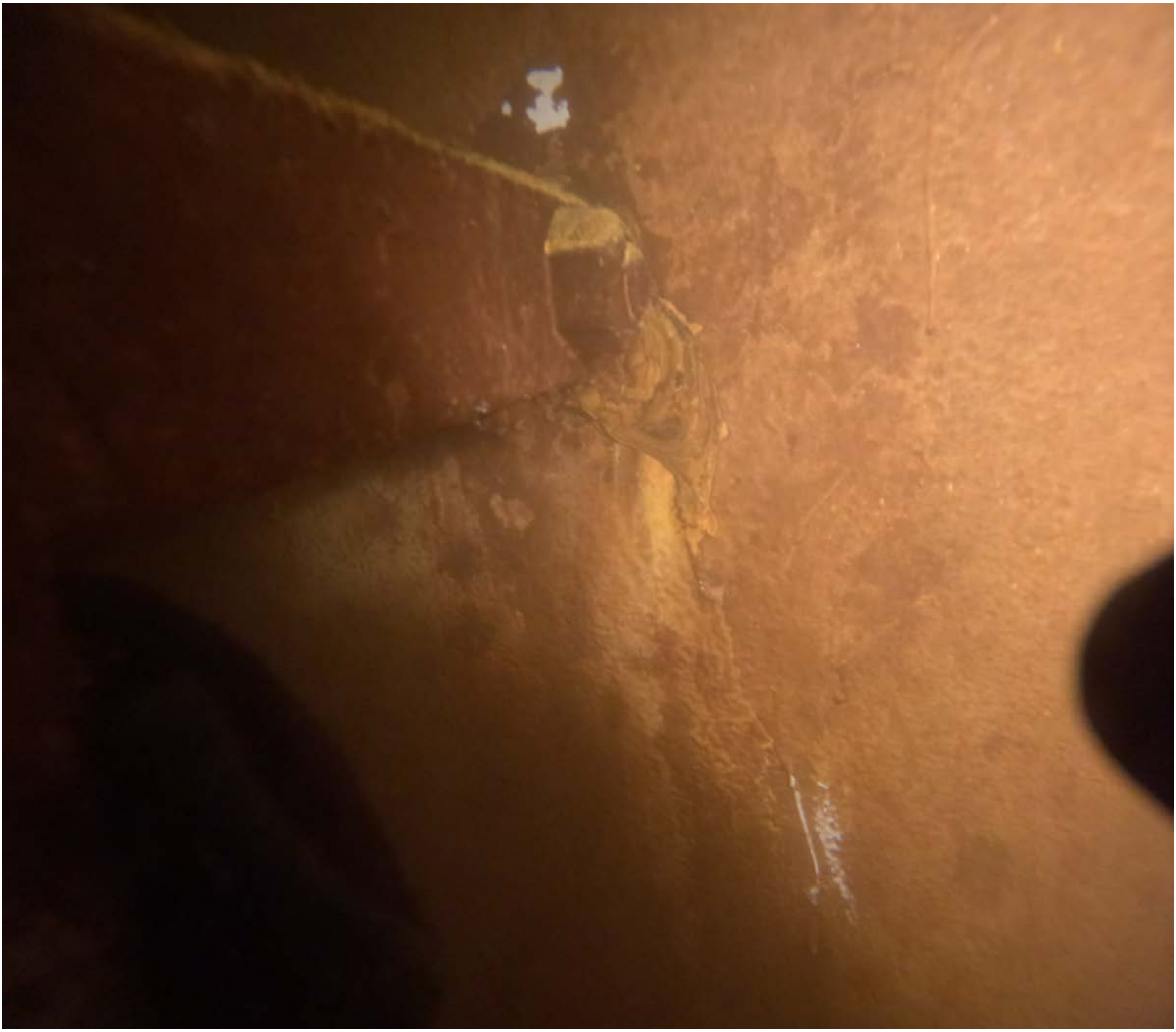

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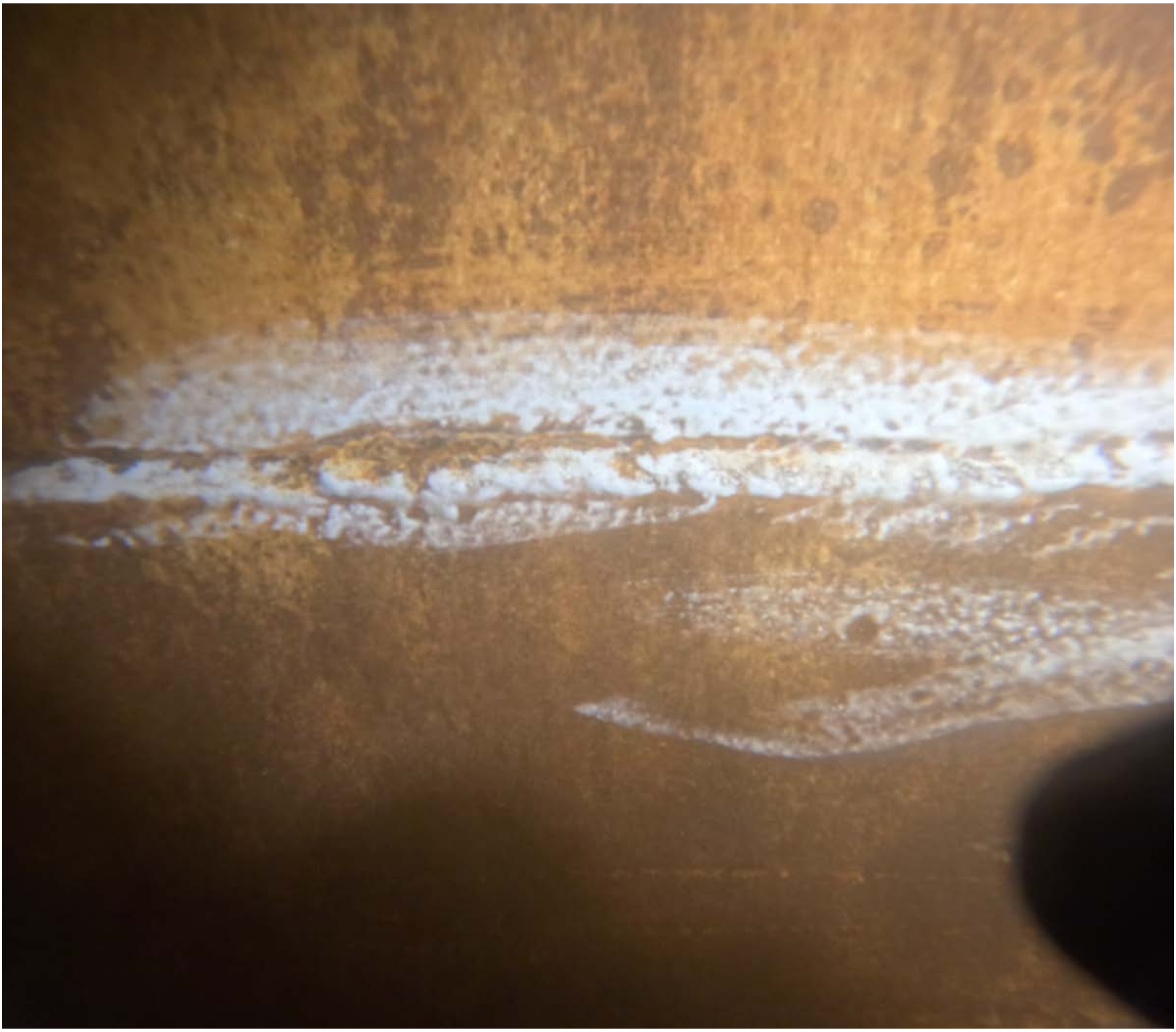

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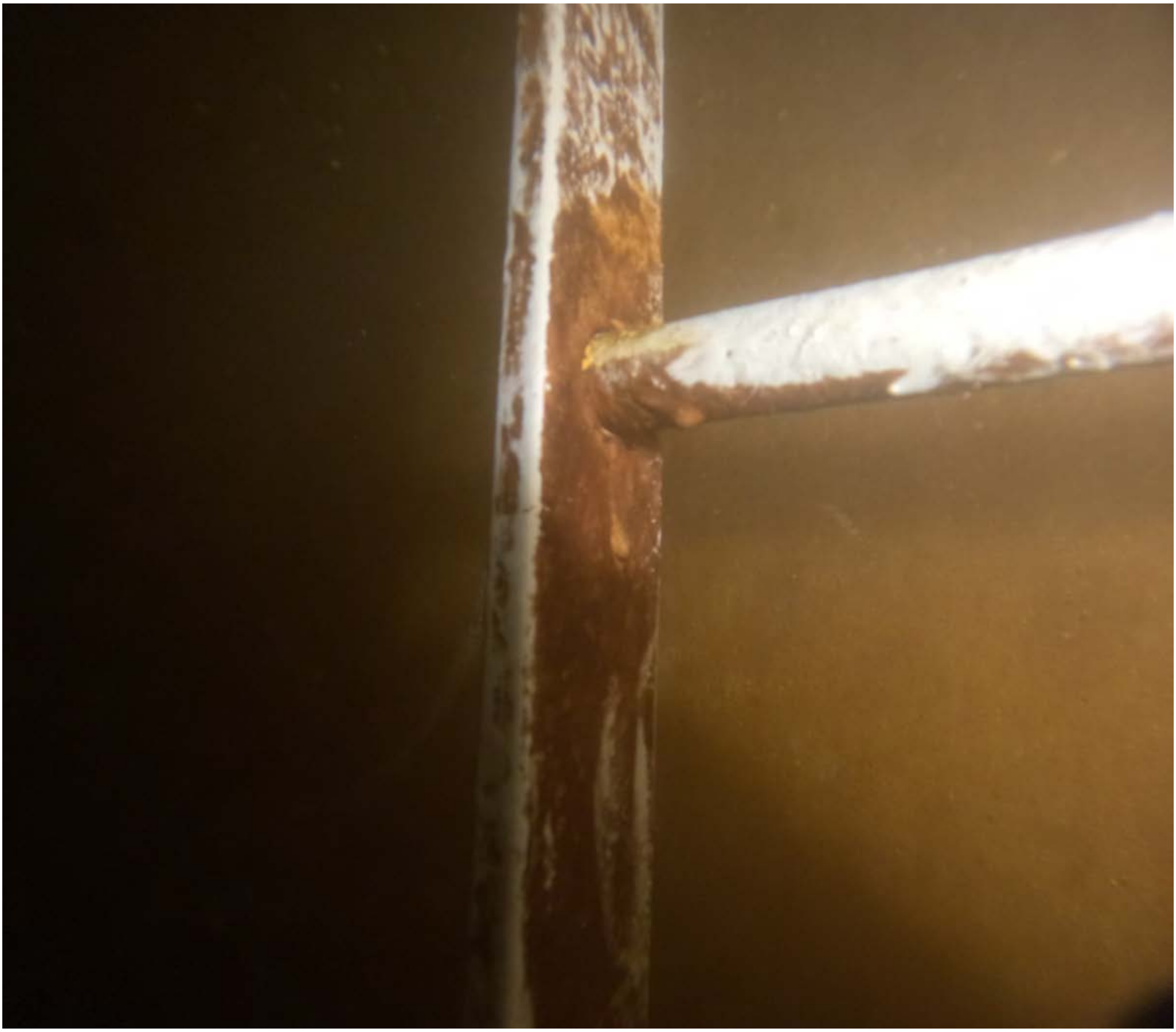

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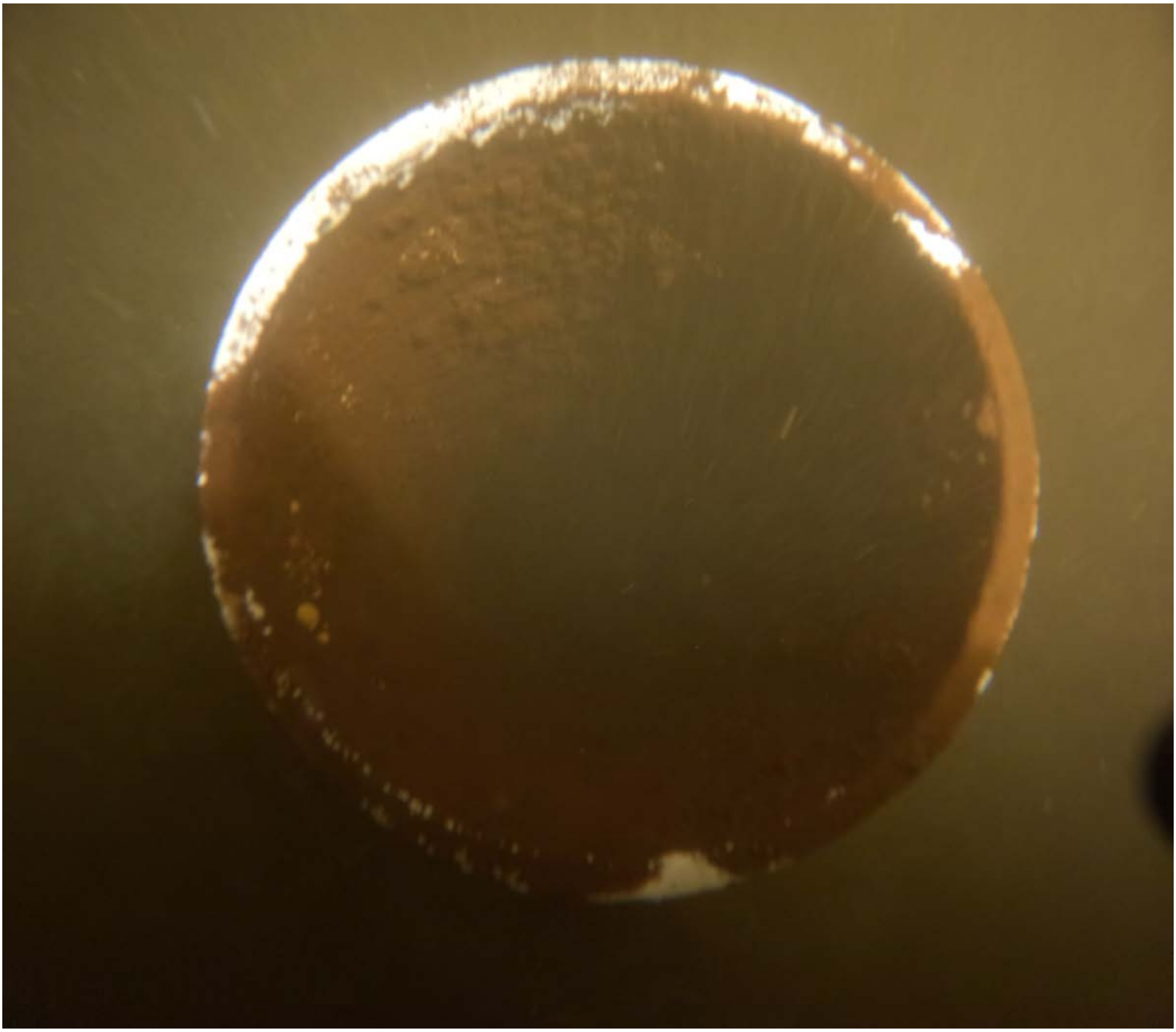

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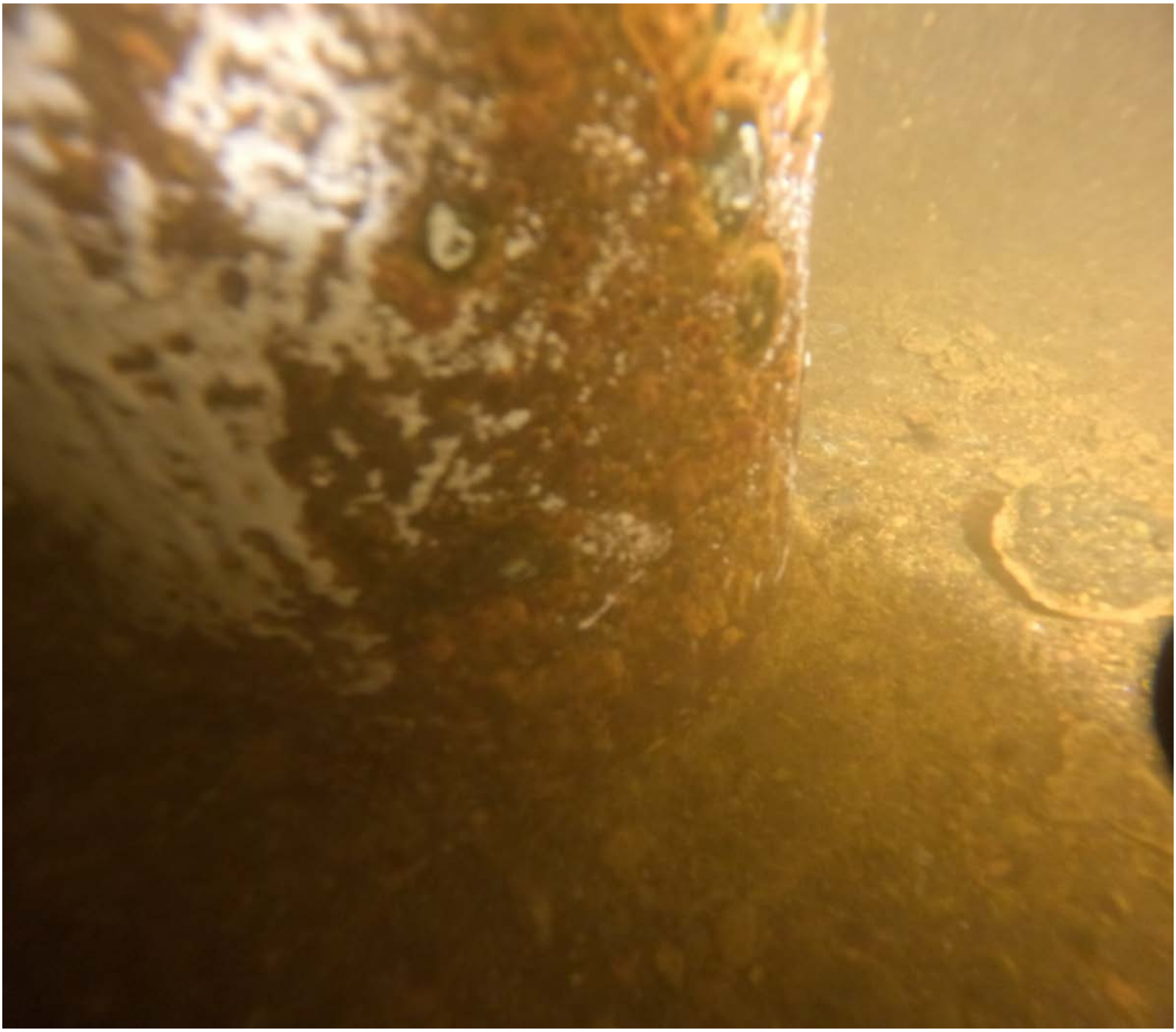

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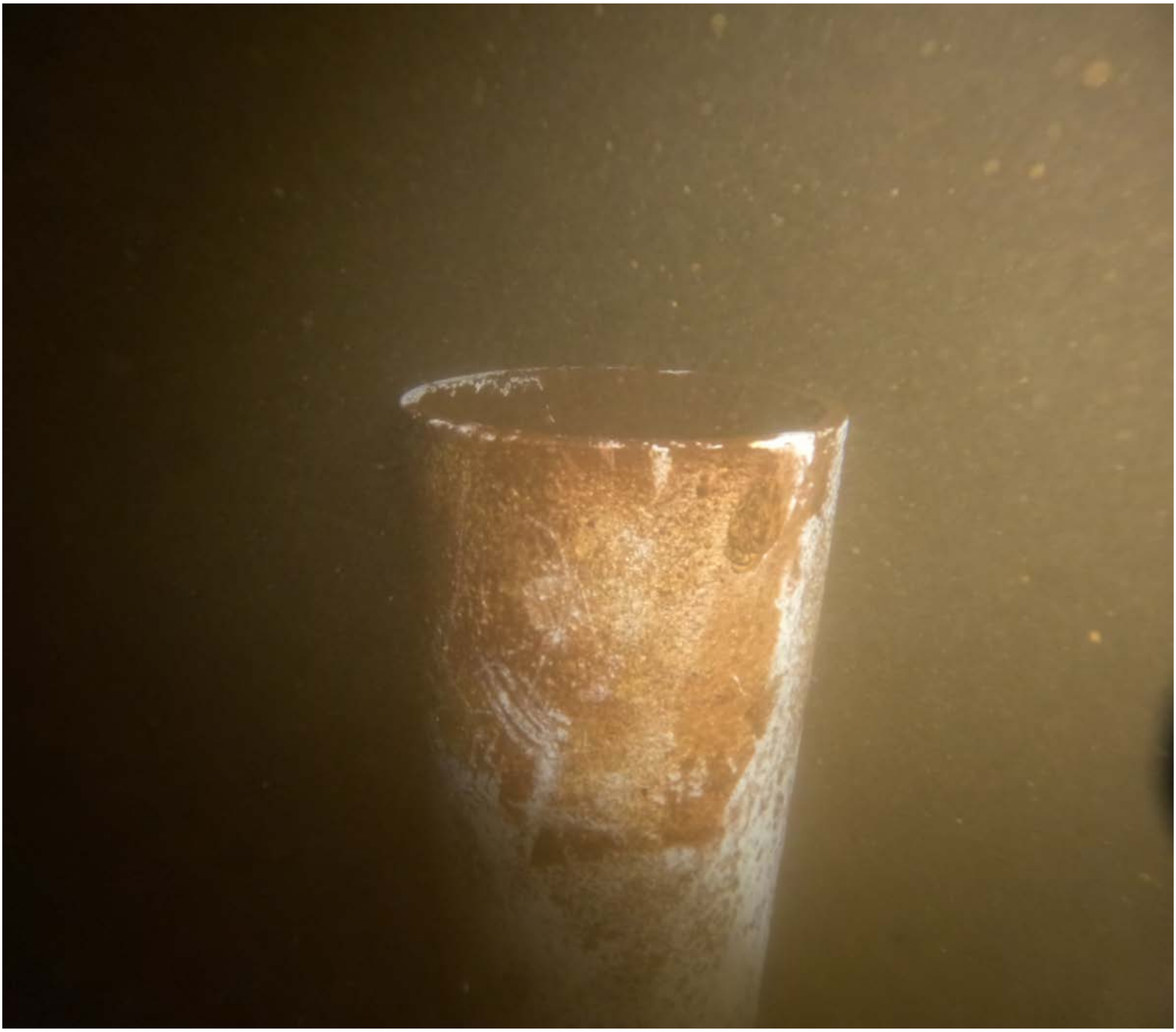

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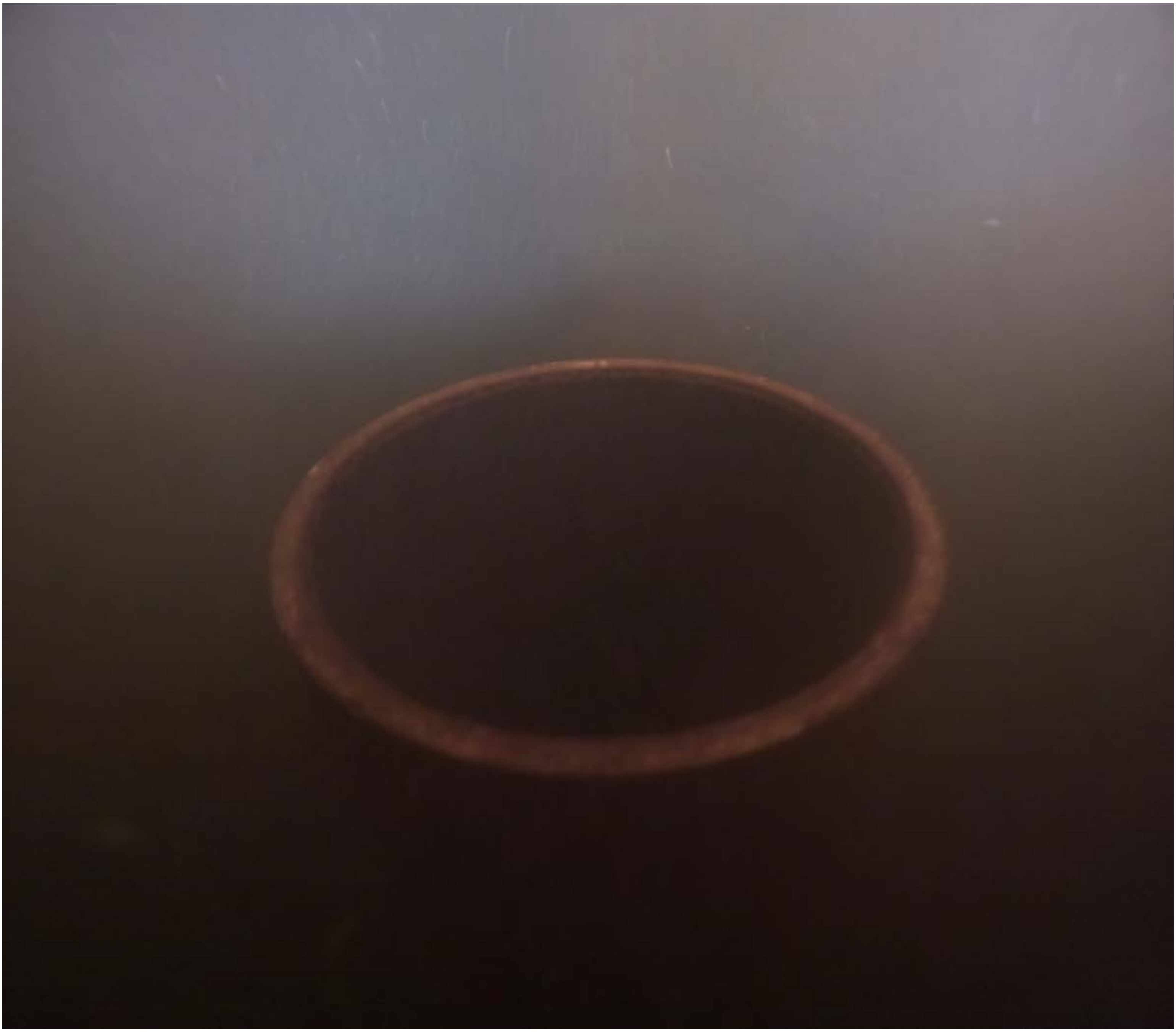

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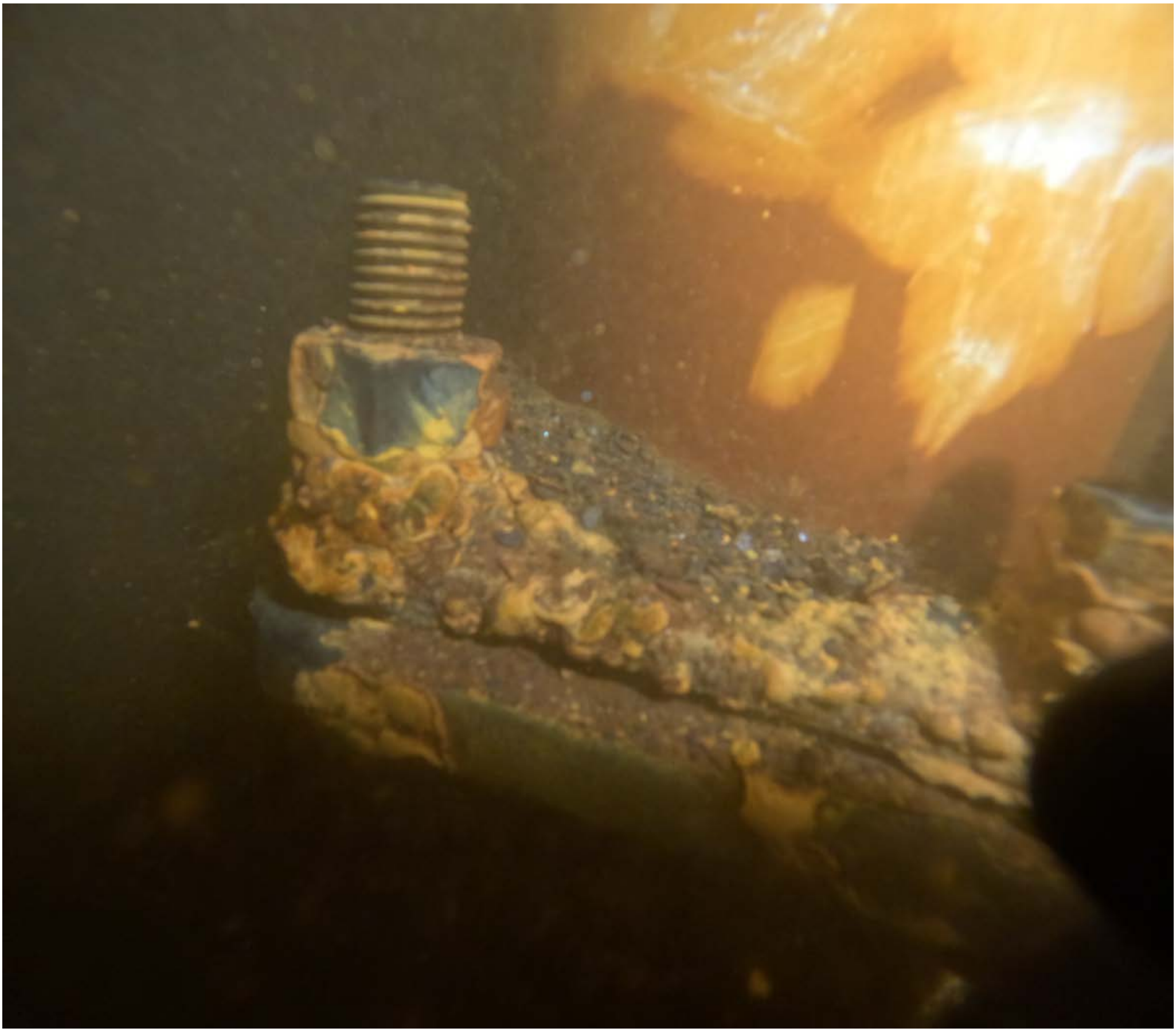

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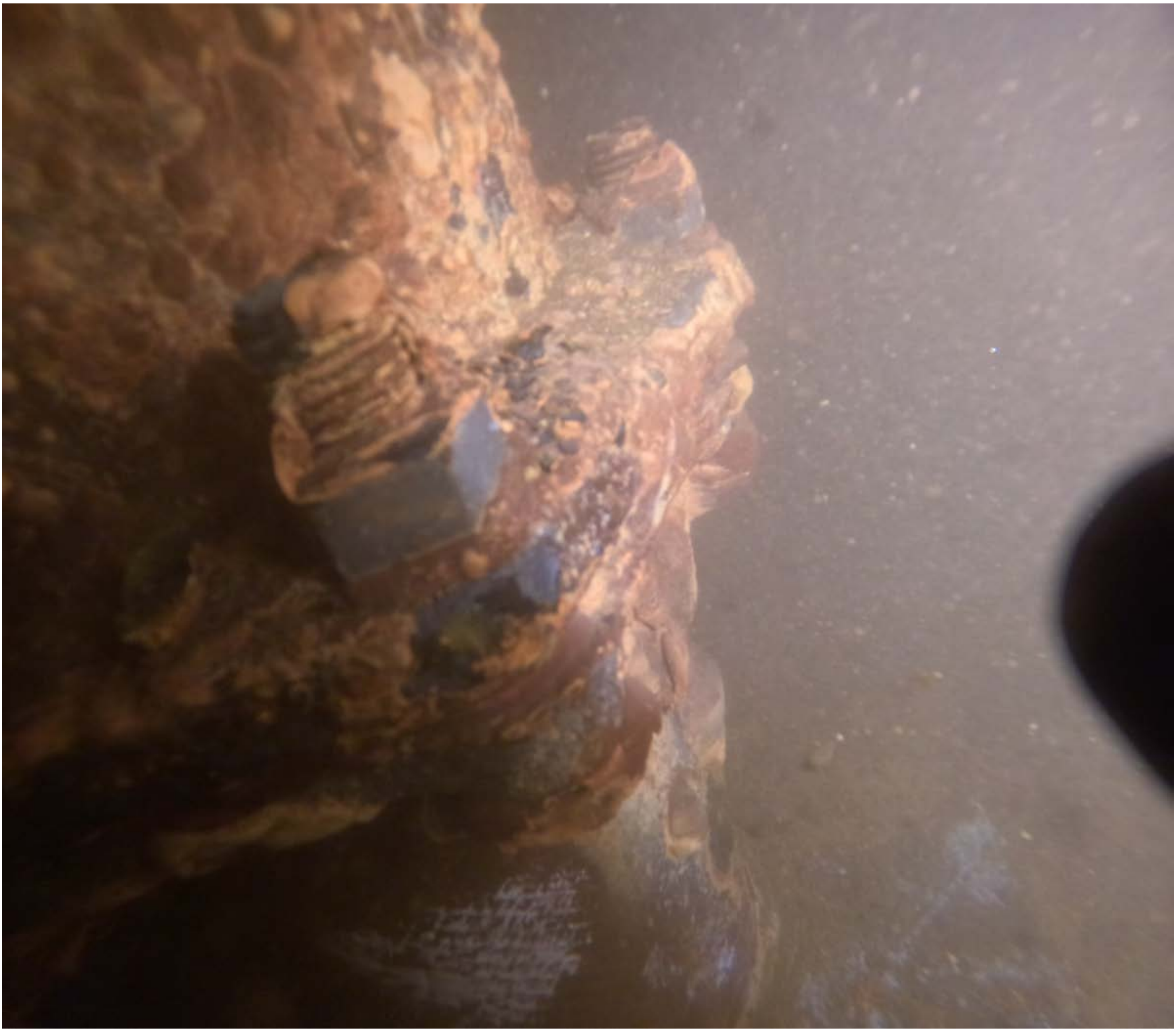

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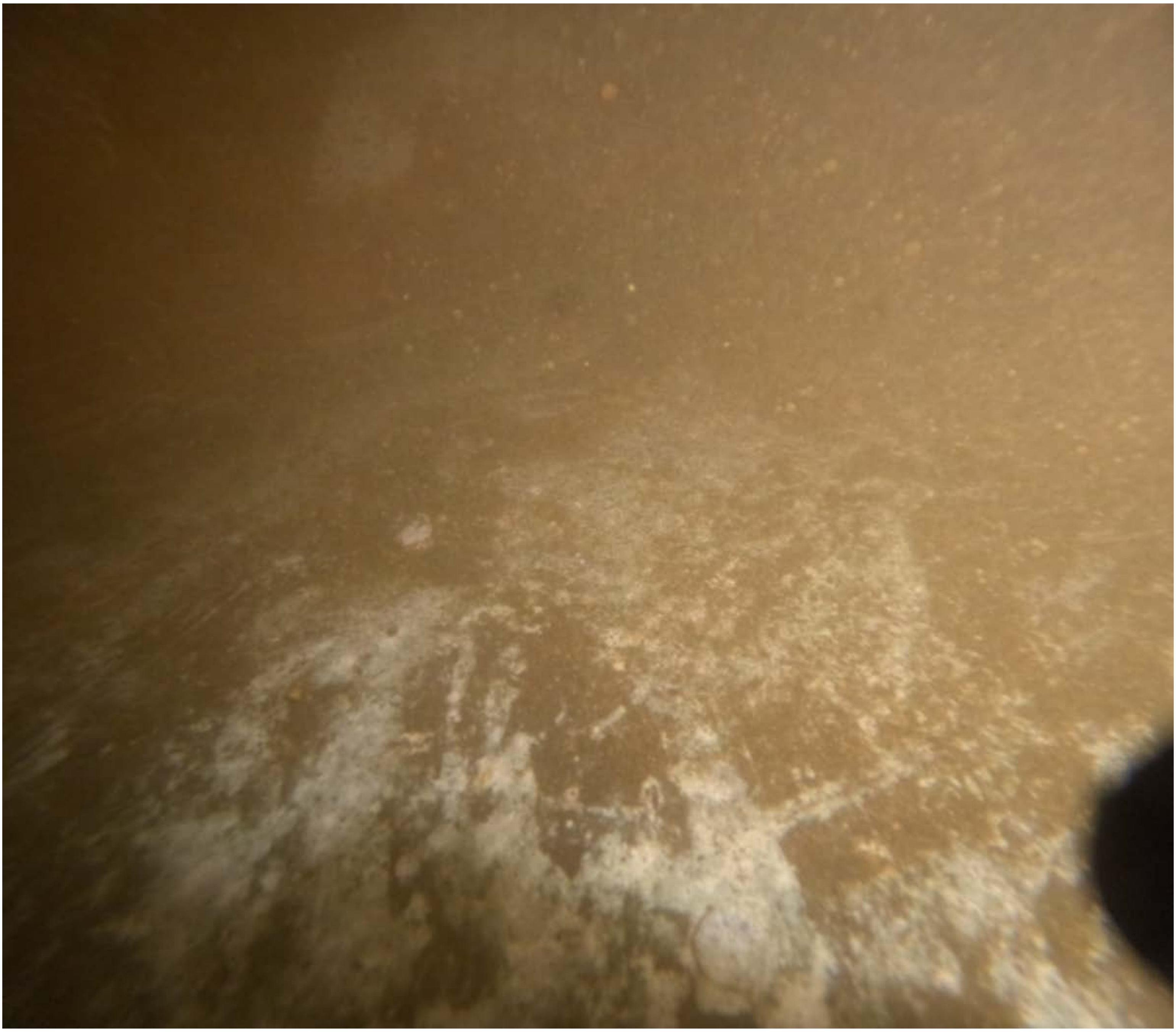

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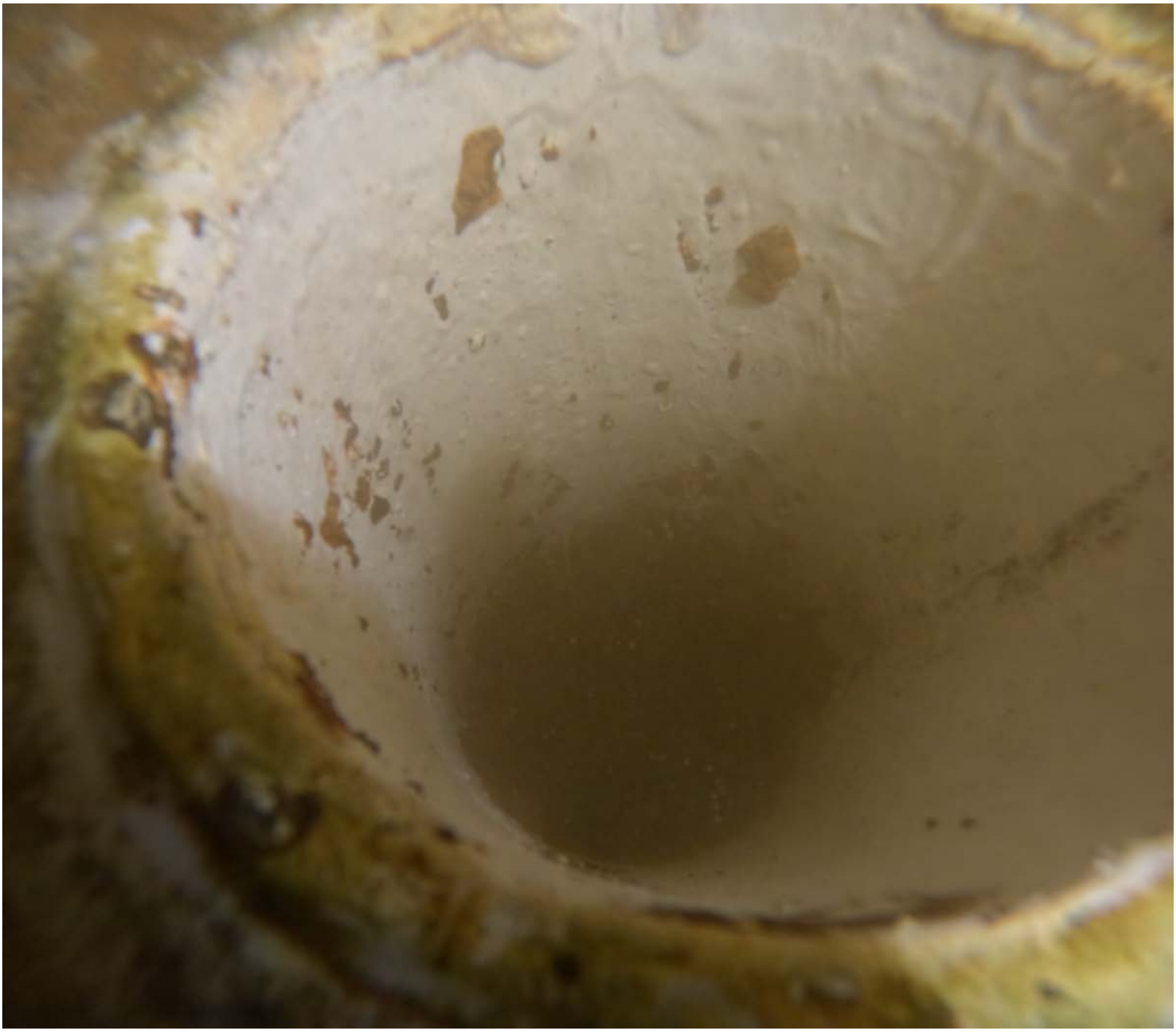

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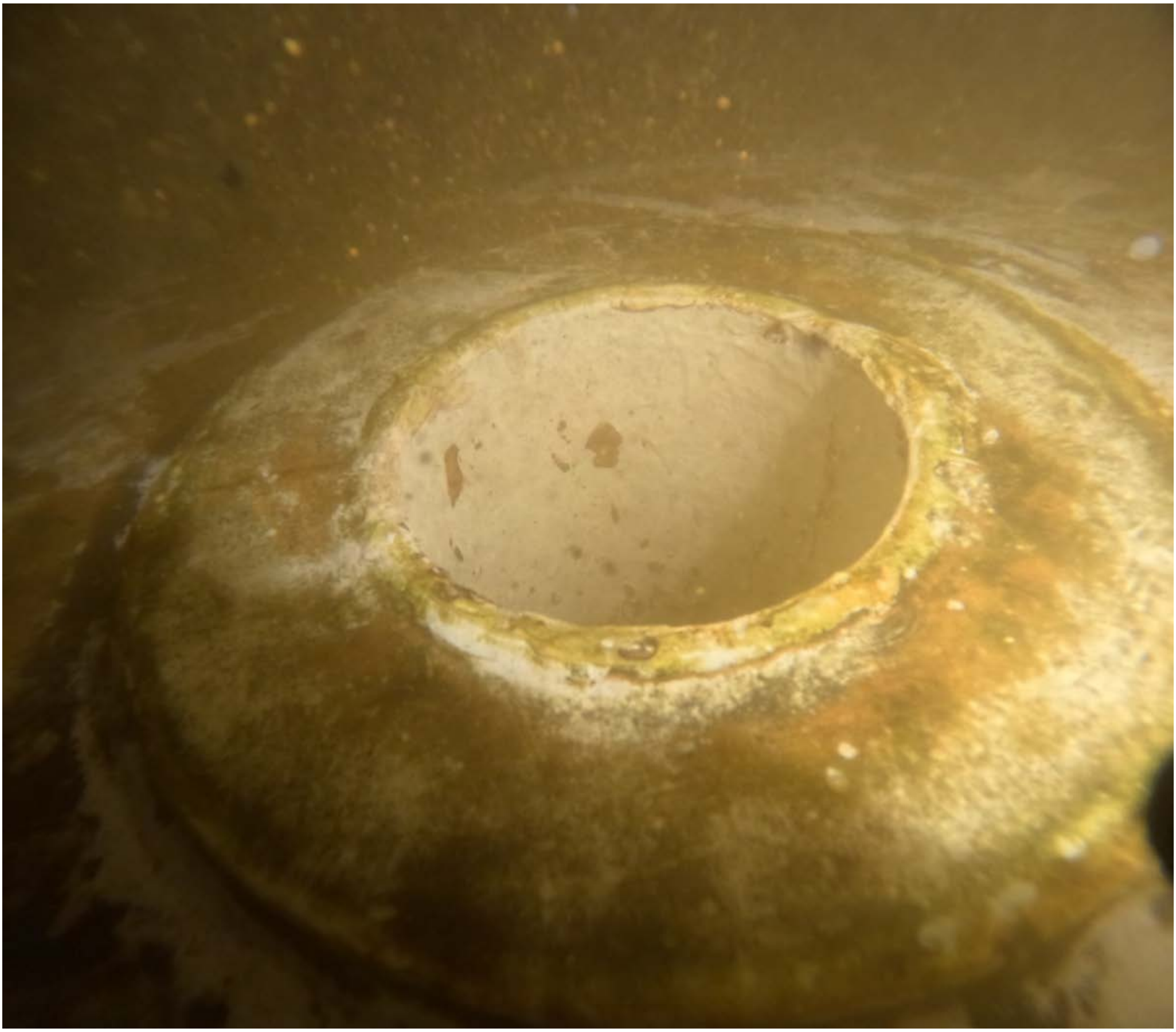

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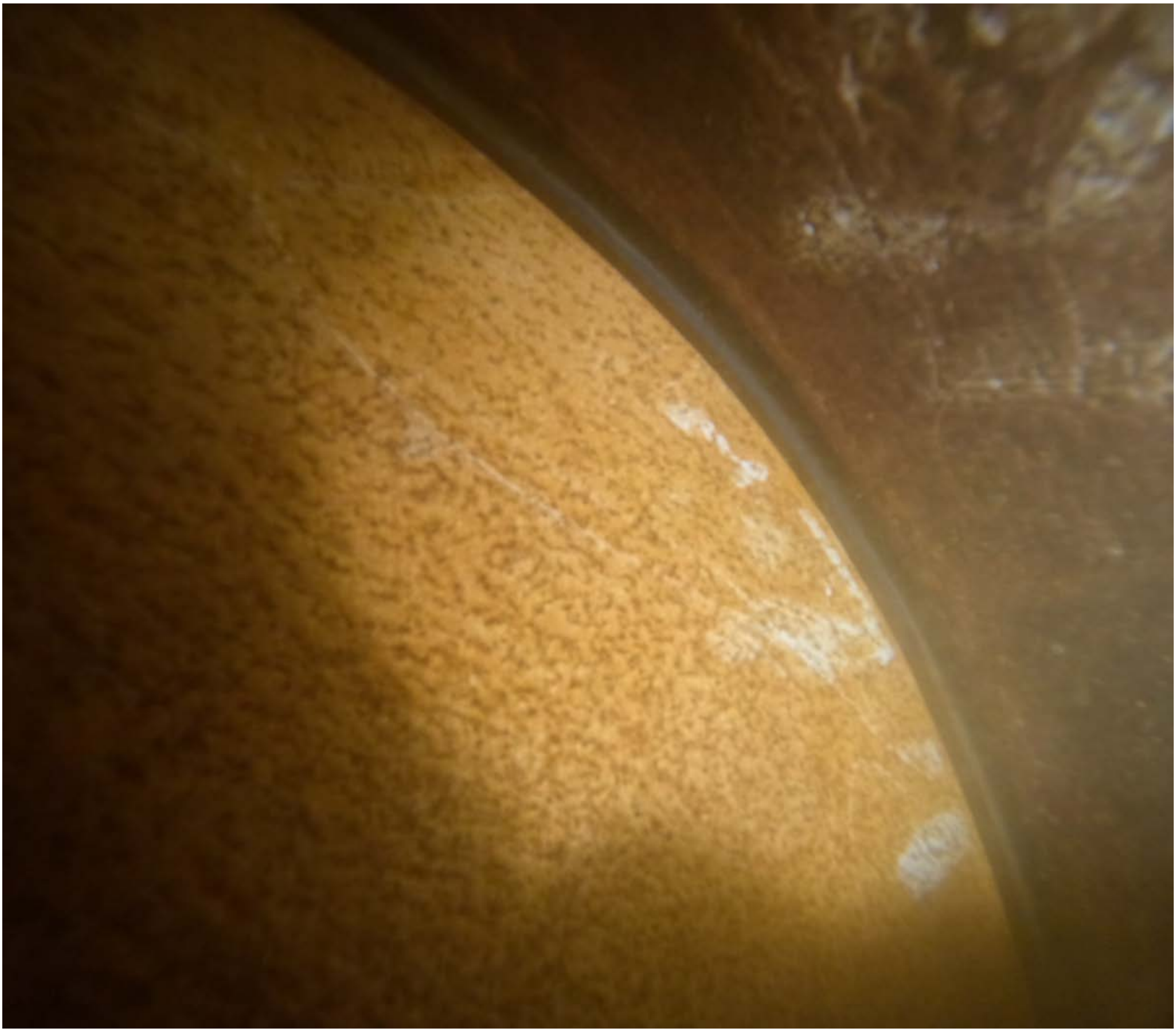

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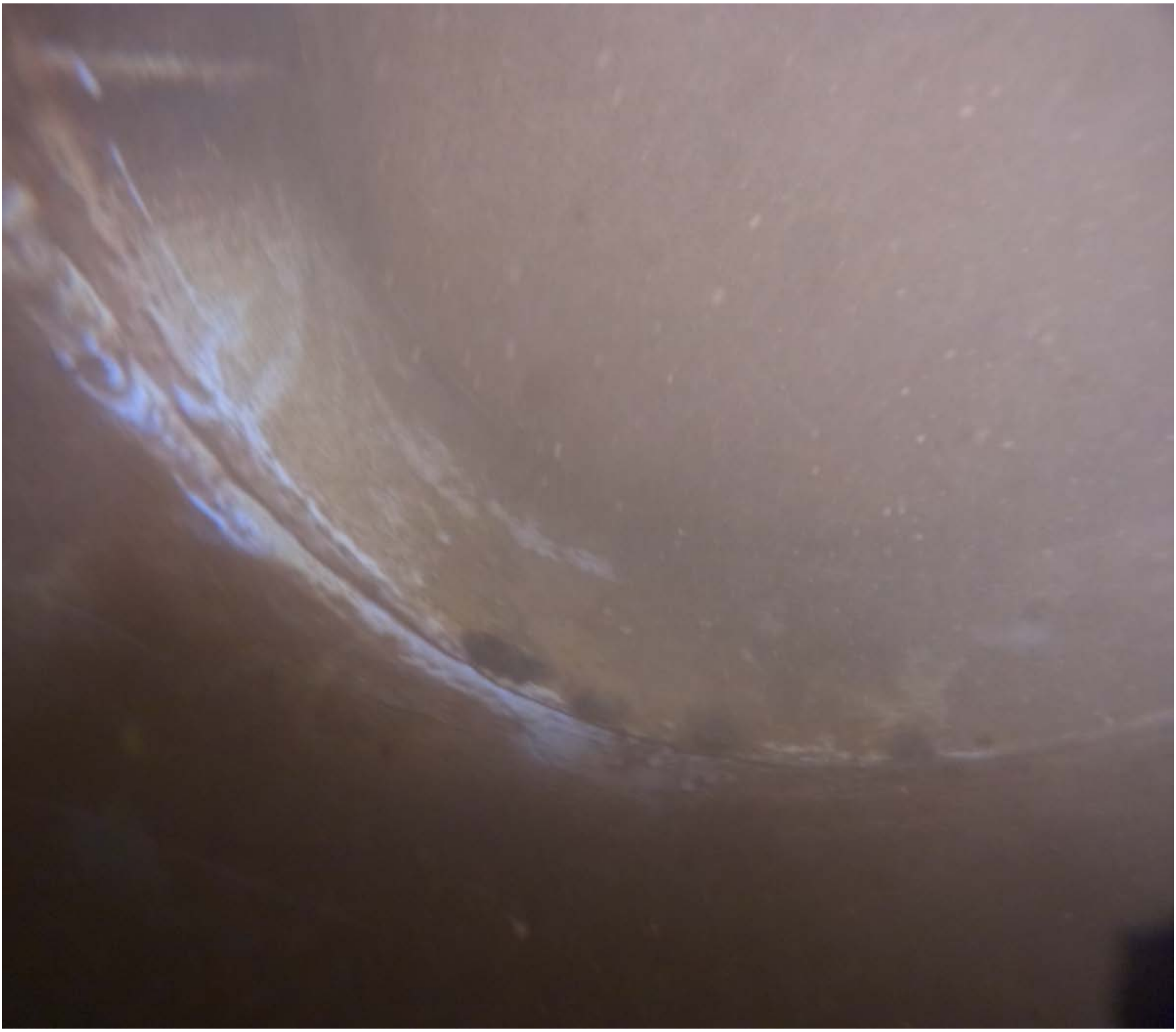

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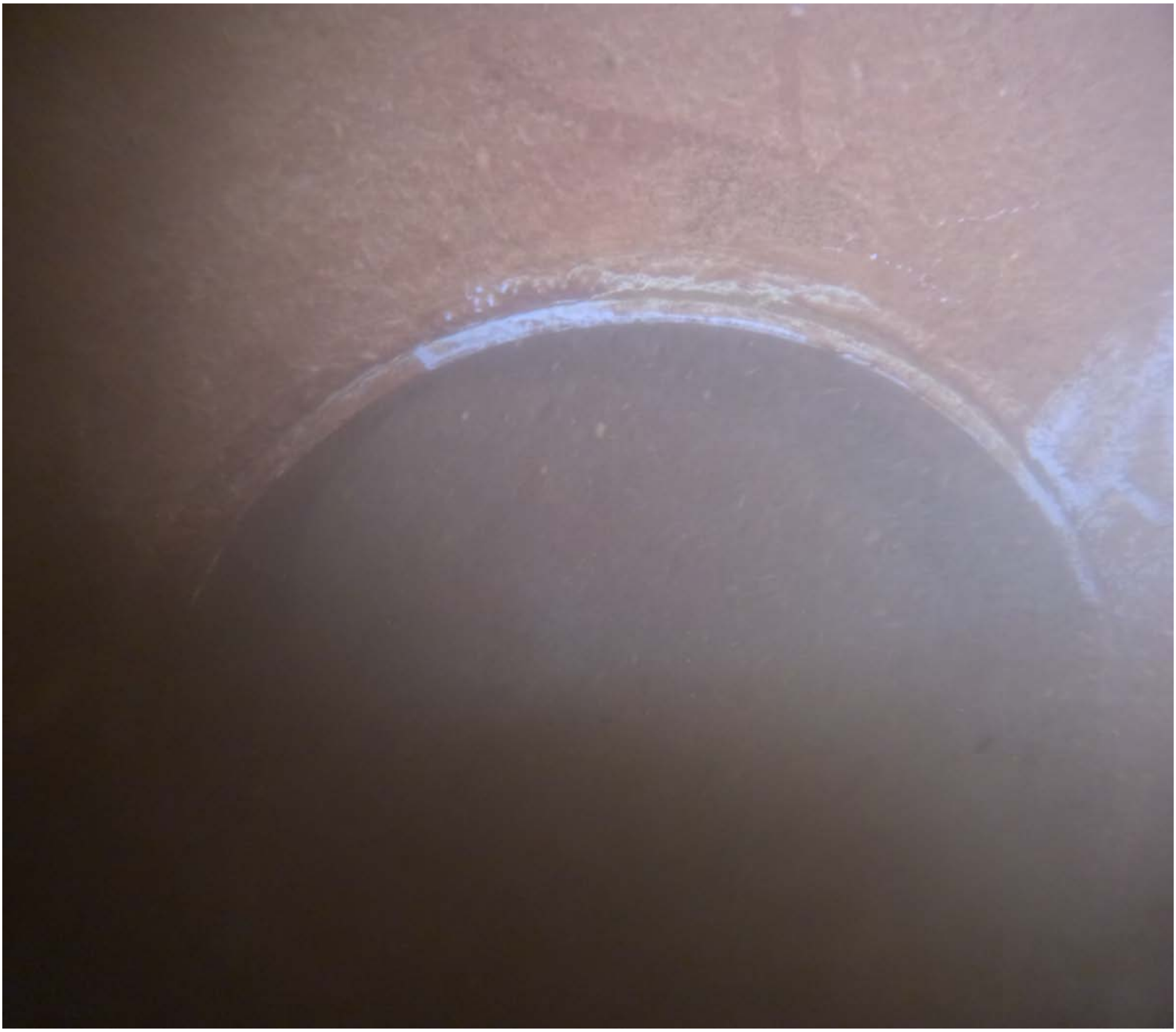

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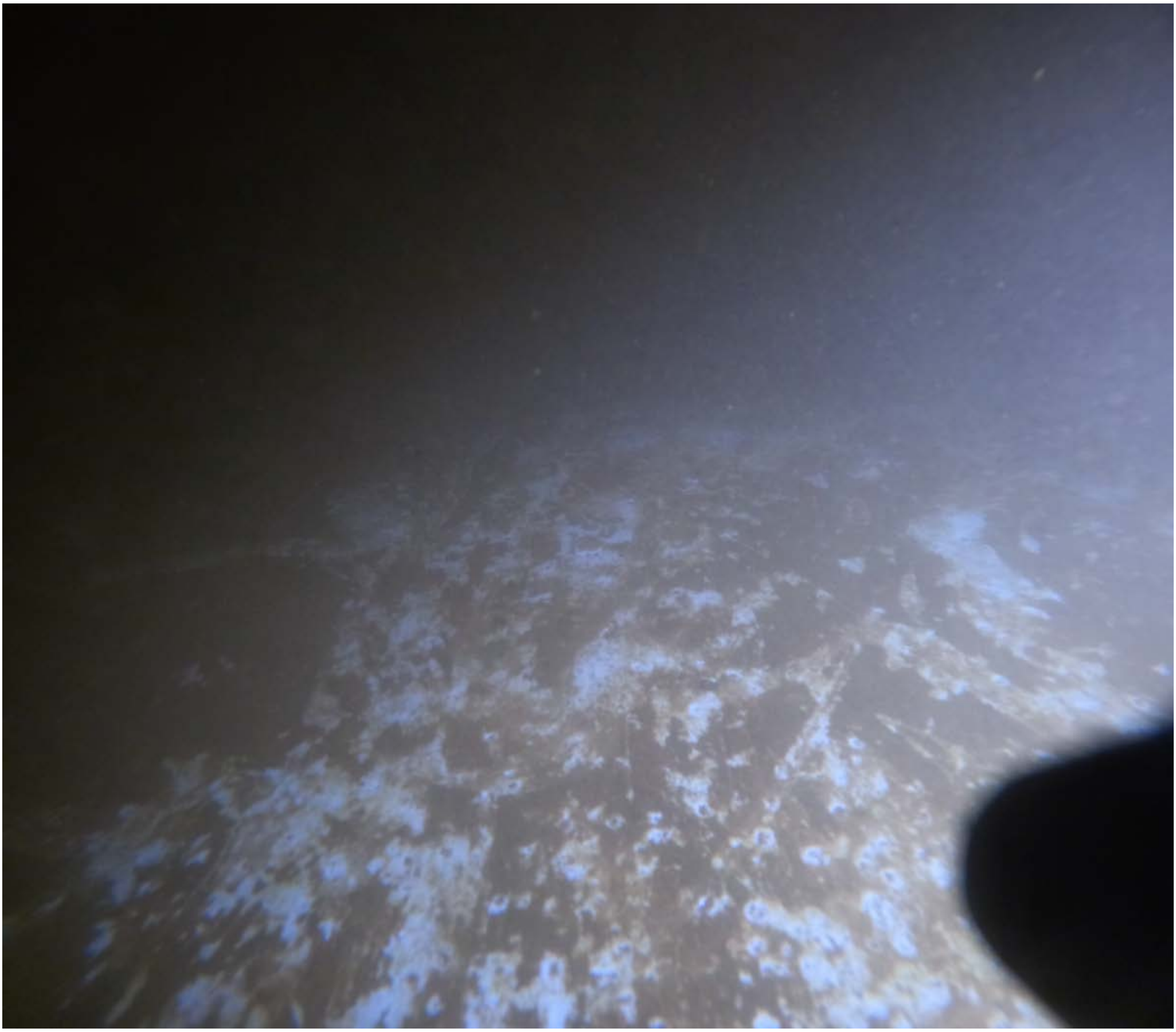

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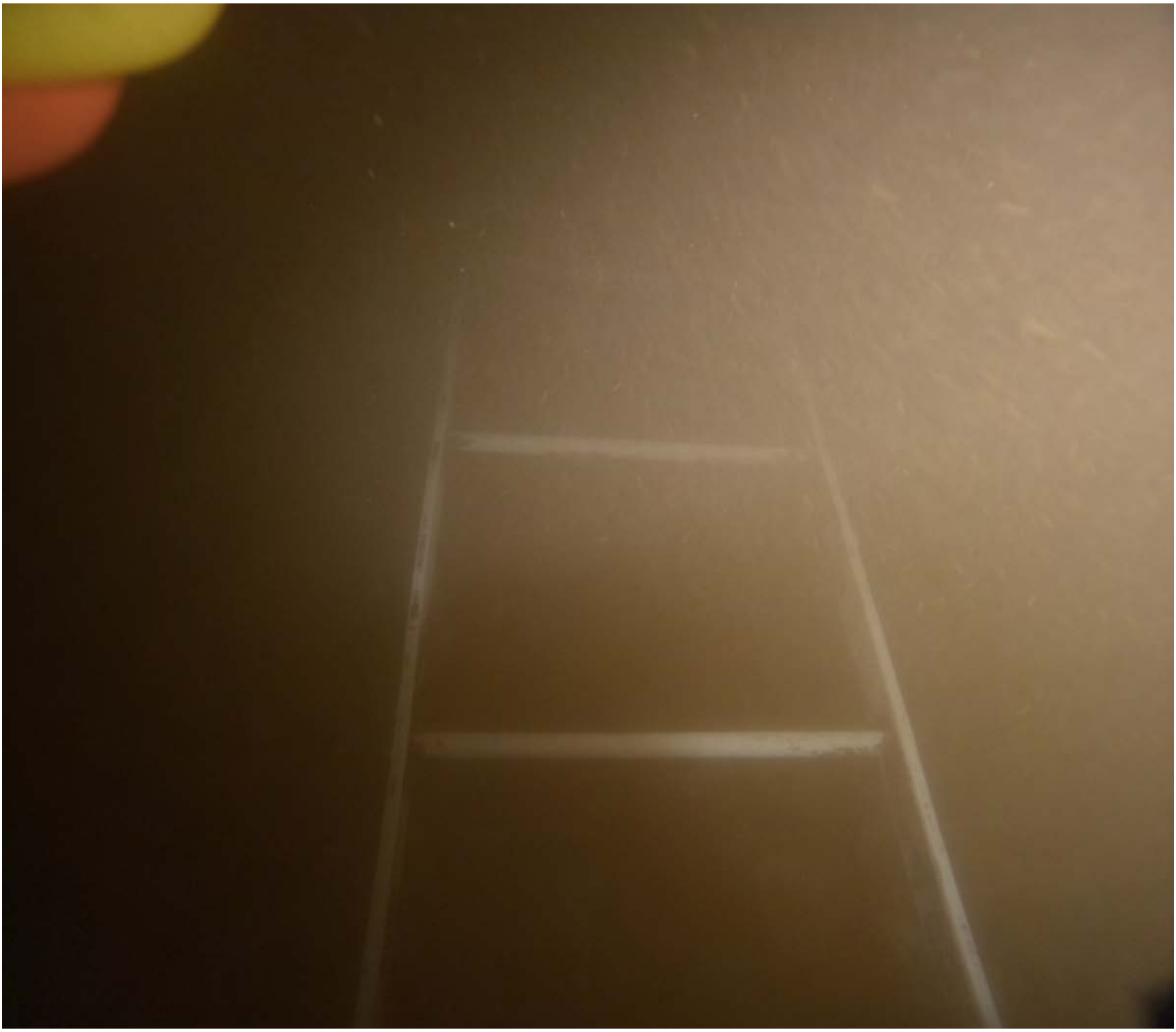

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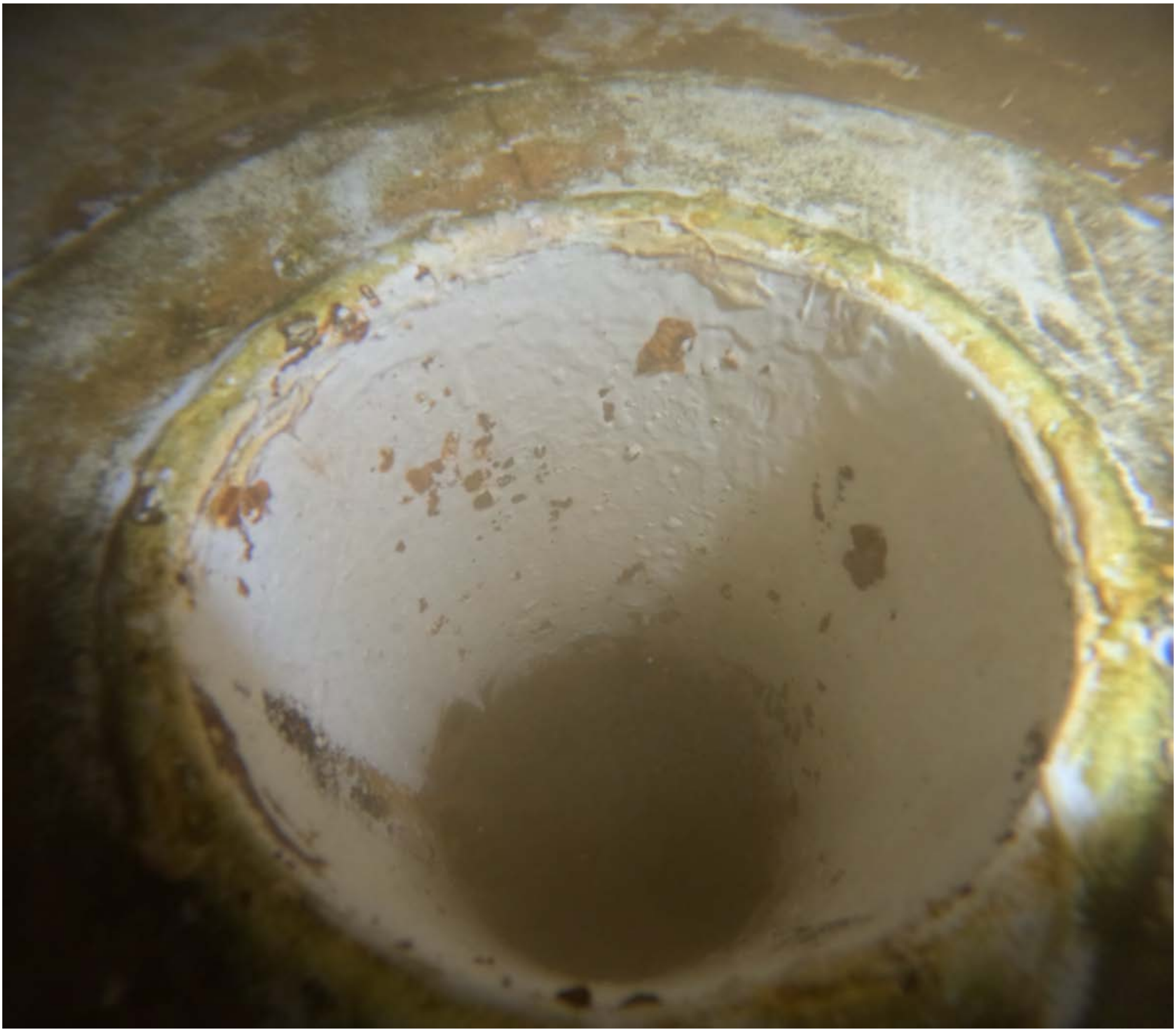

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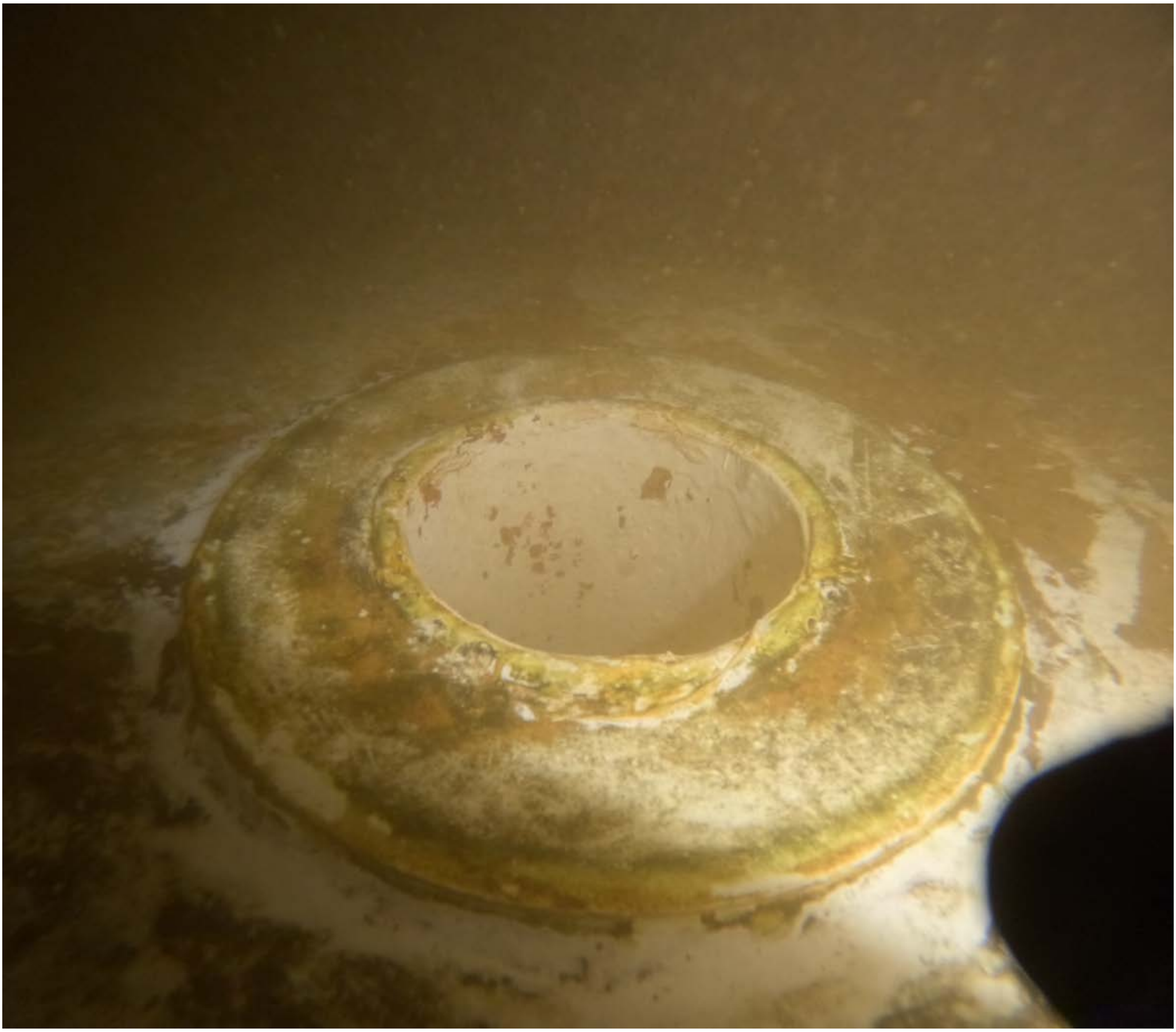

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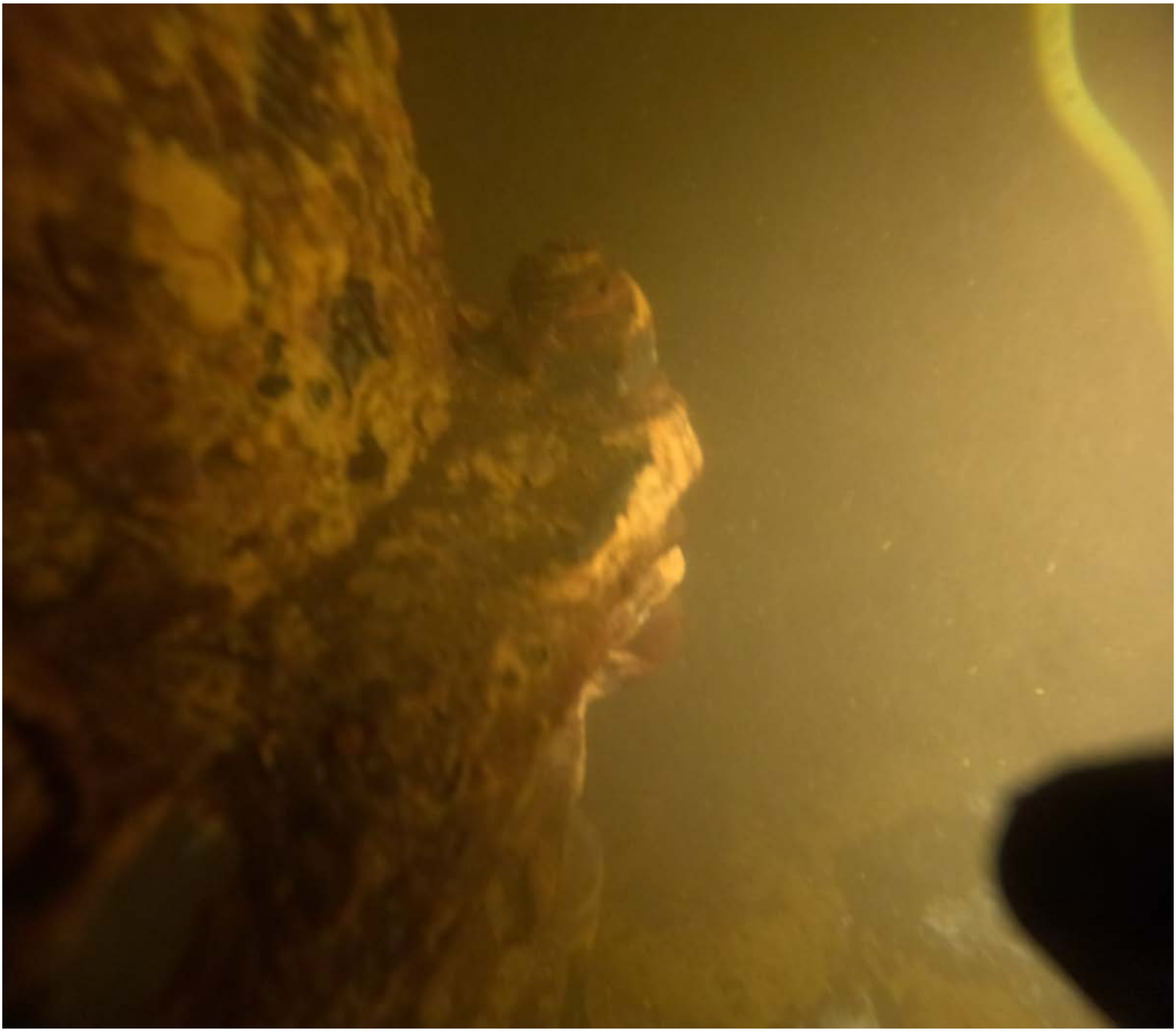

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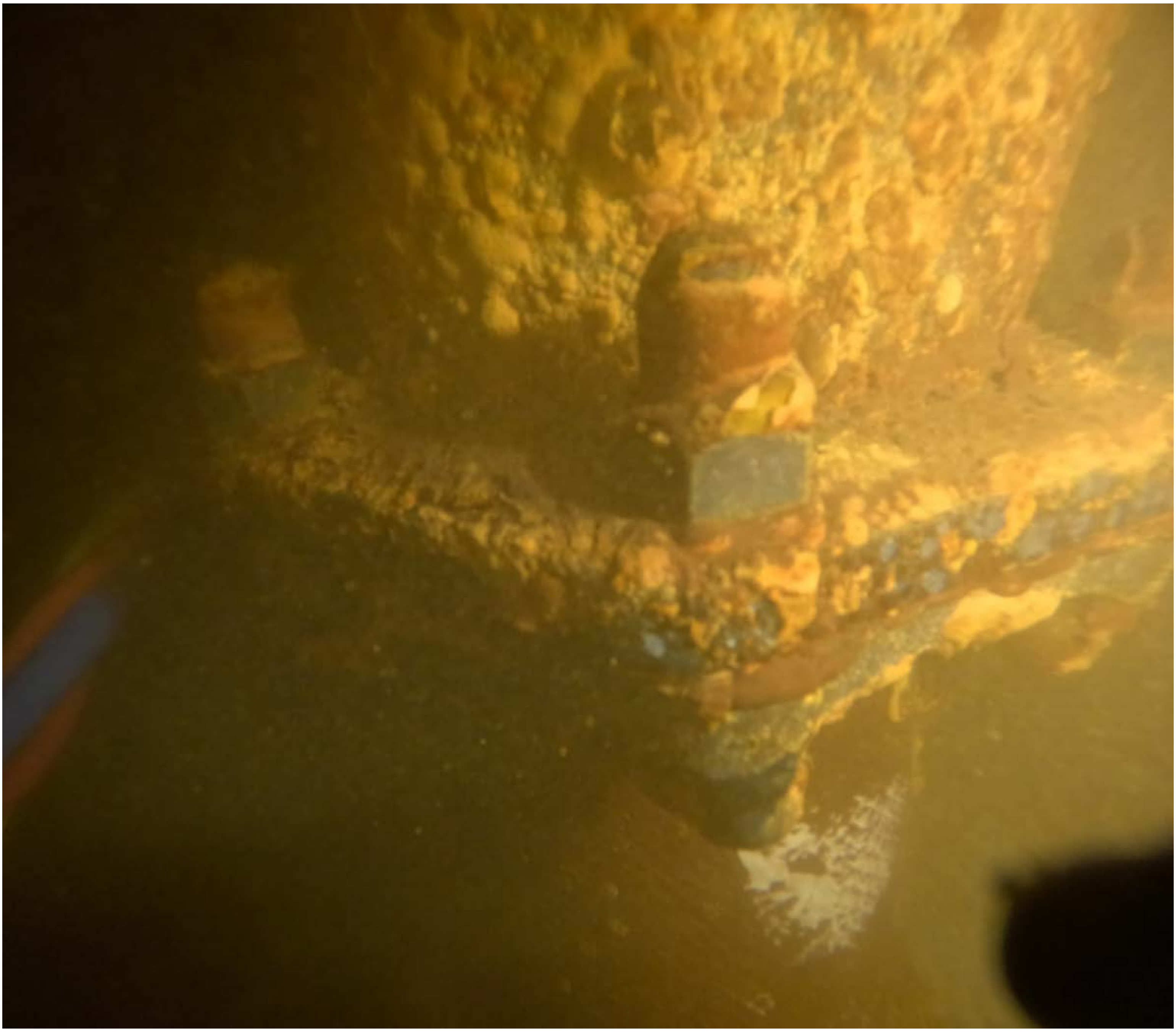

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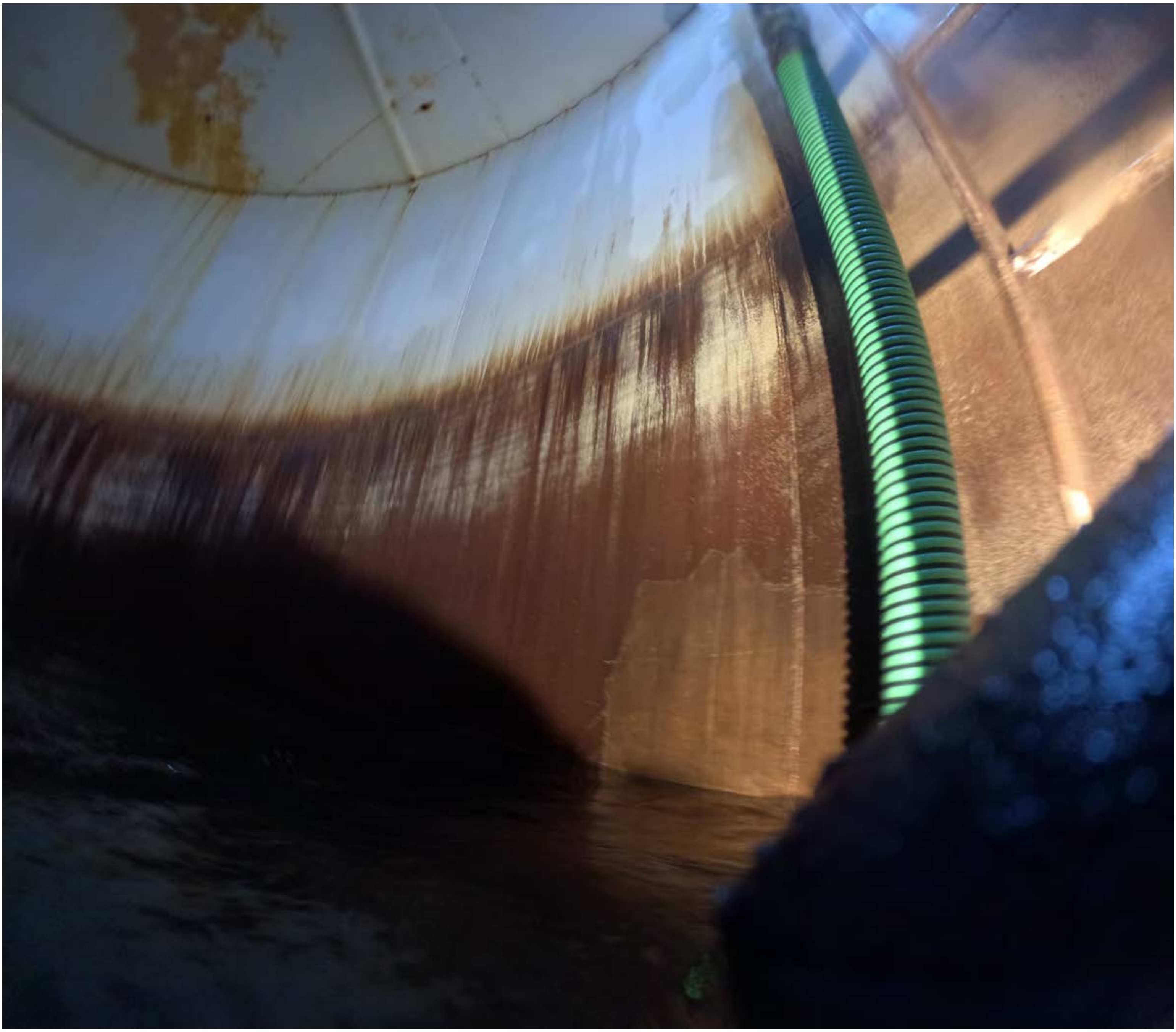

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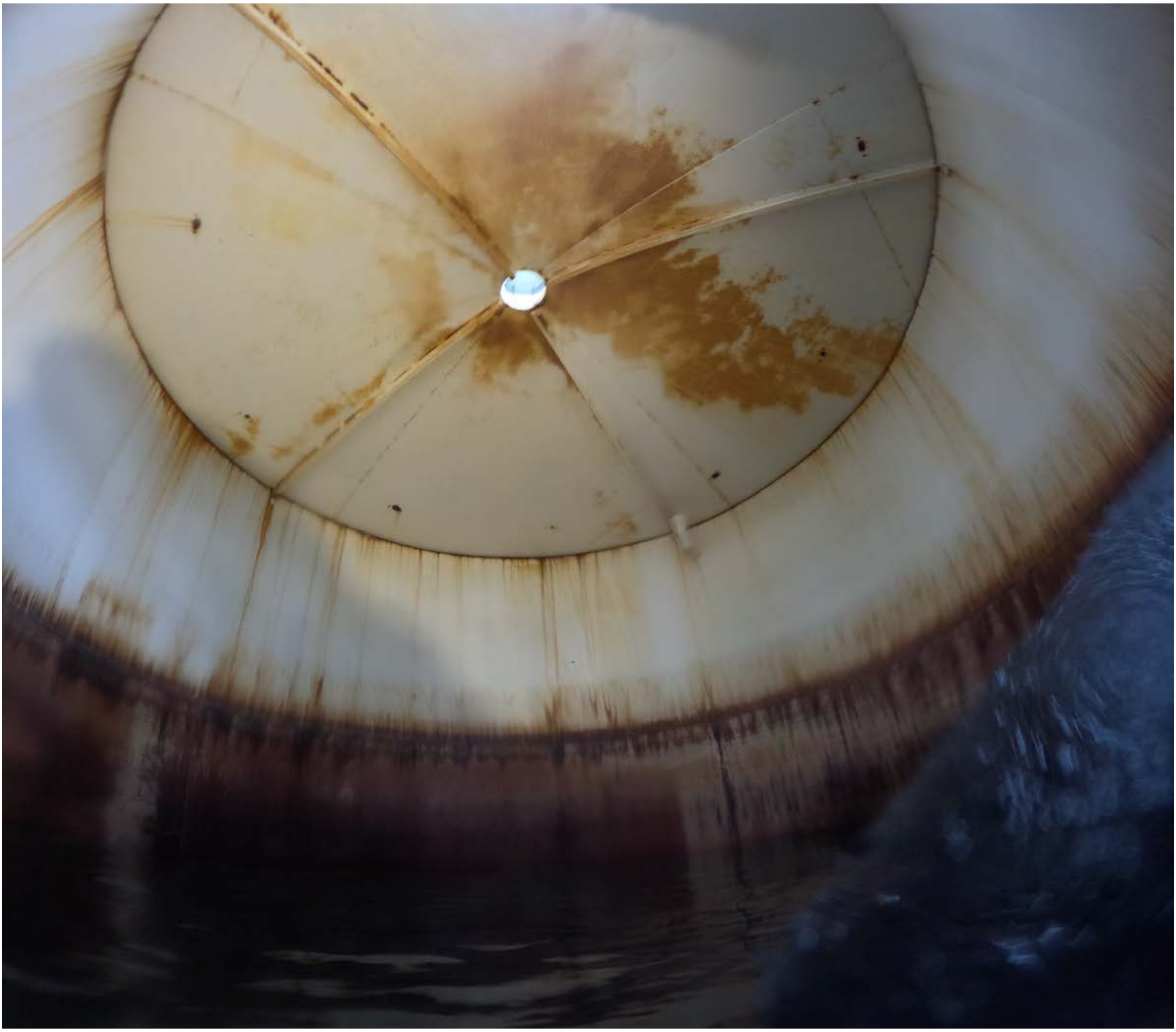

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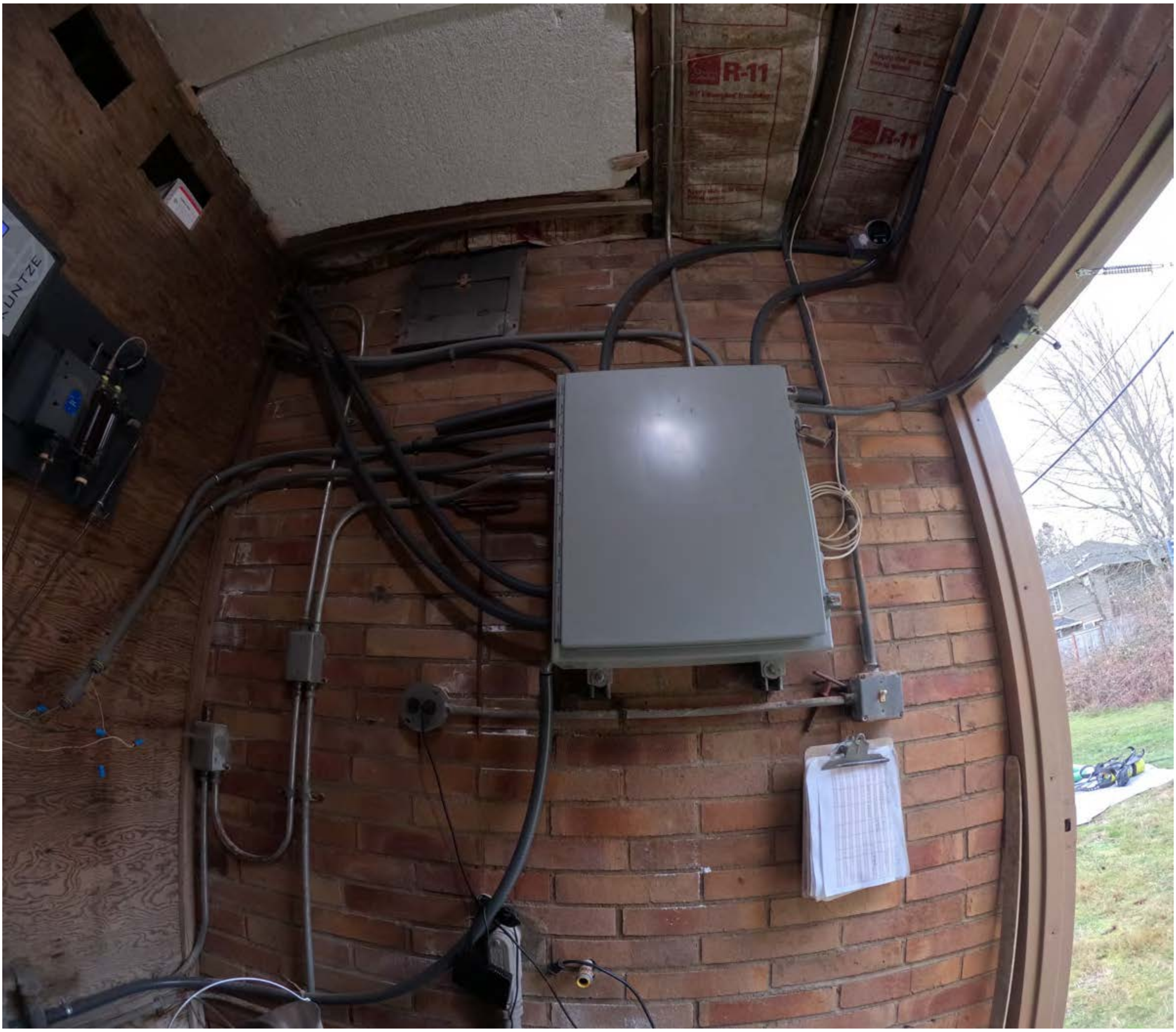

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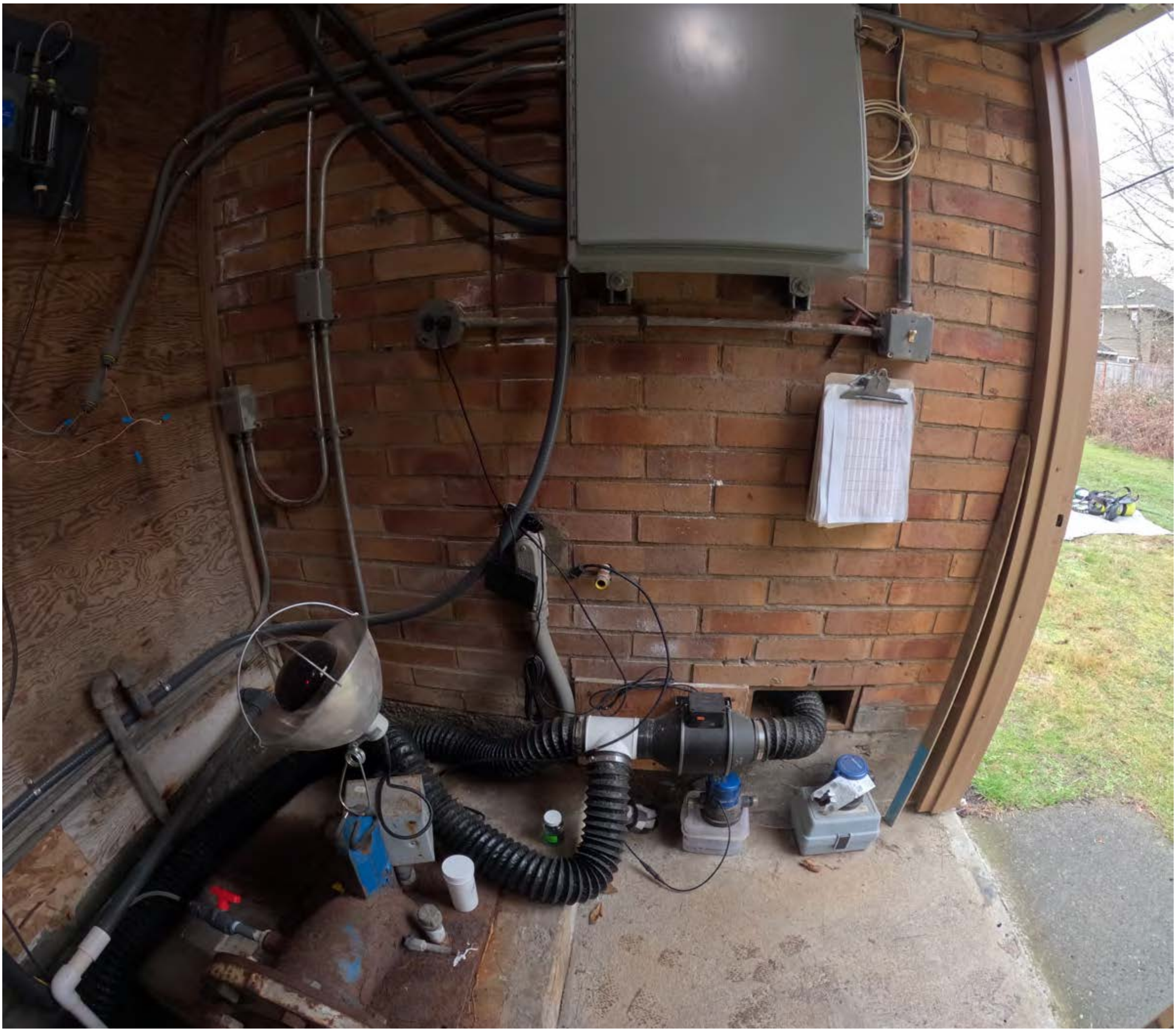

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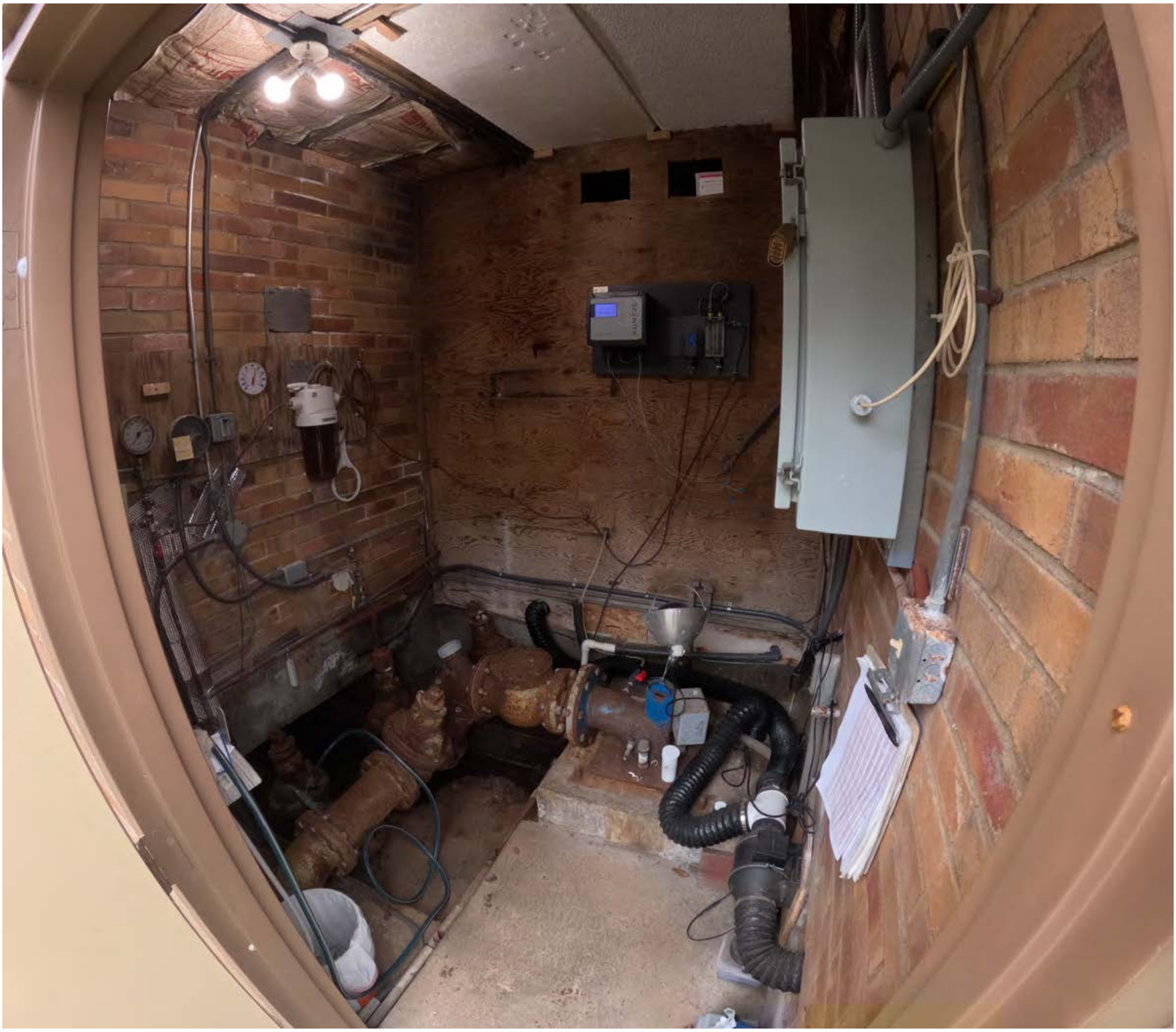

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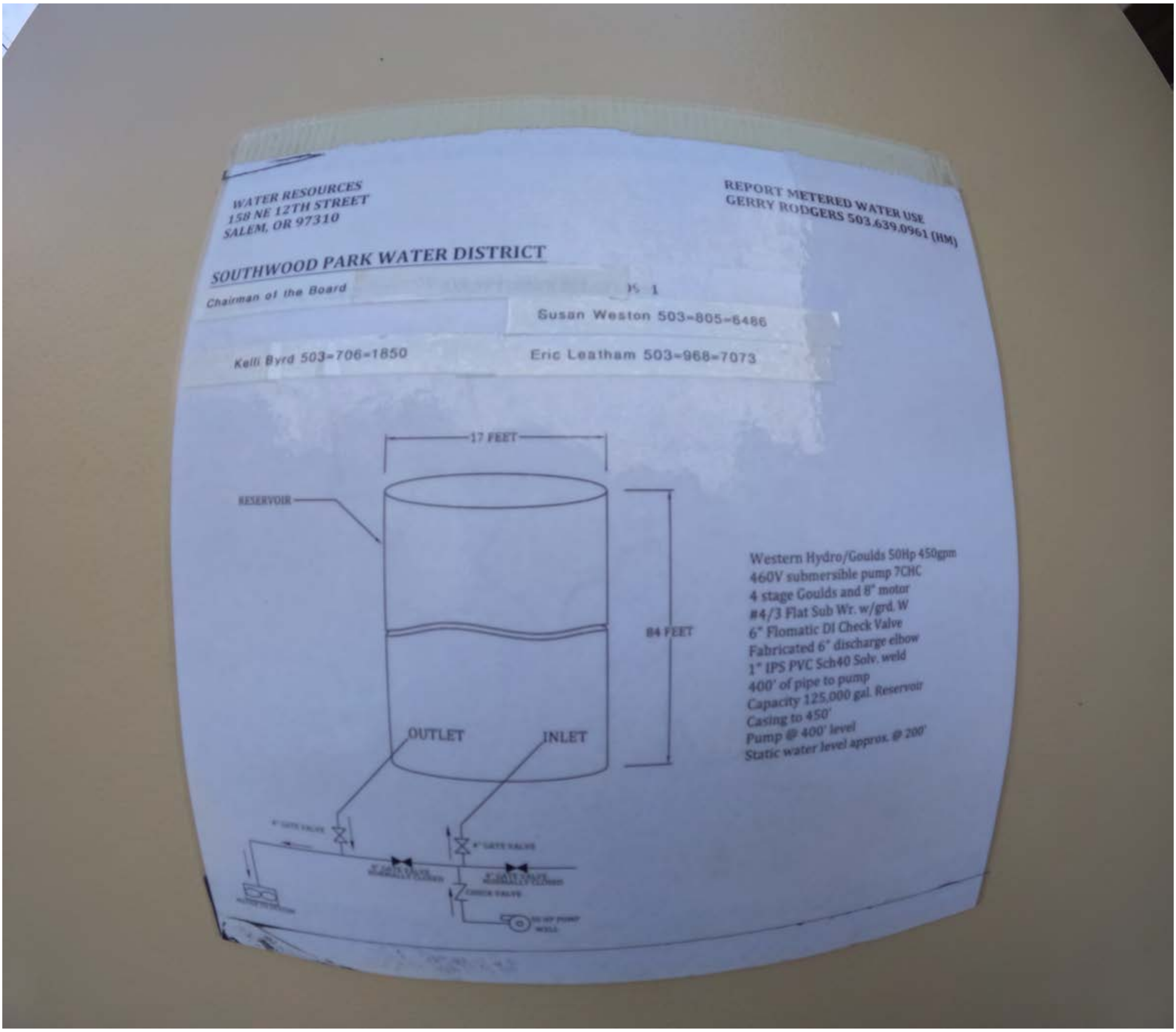

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Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix I
Previous District Mapping and As-Builts

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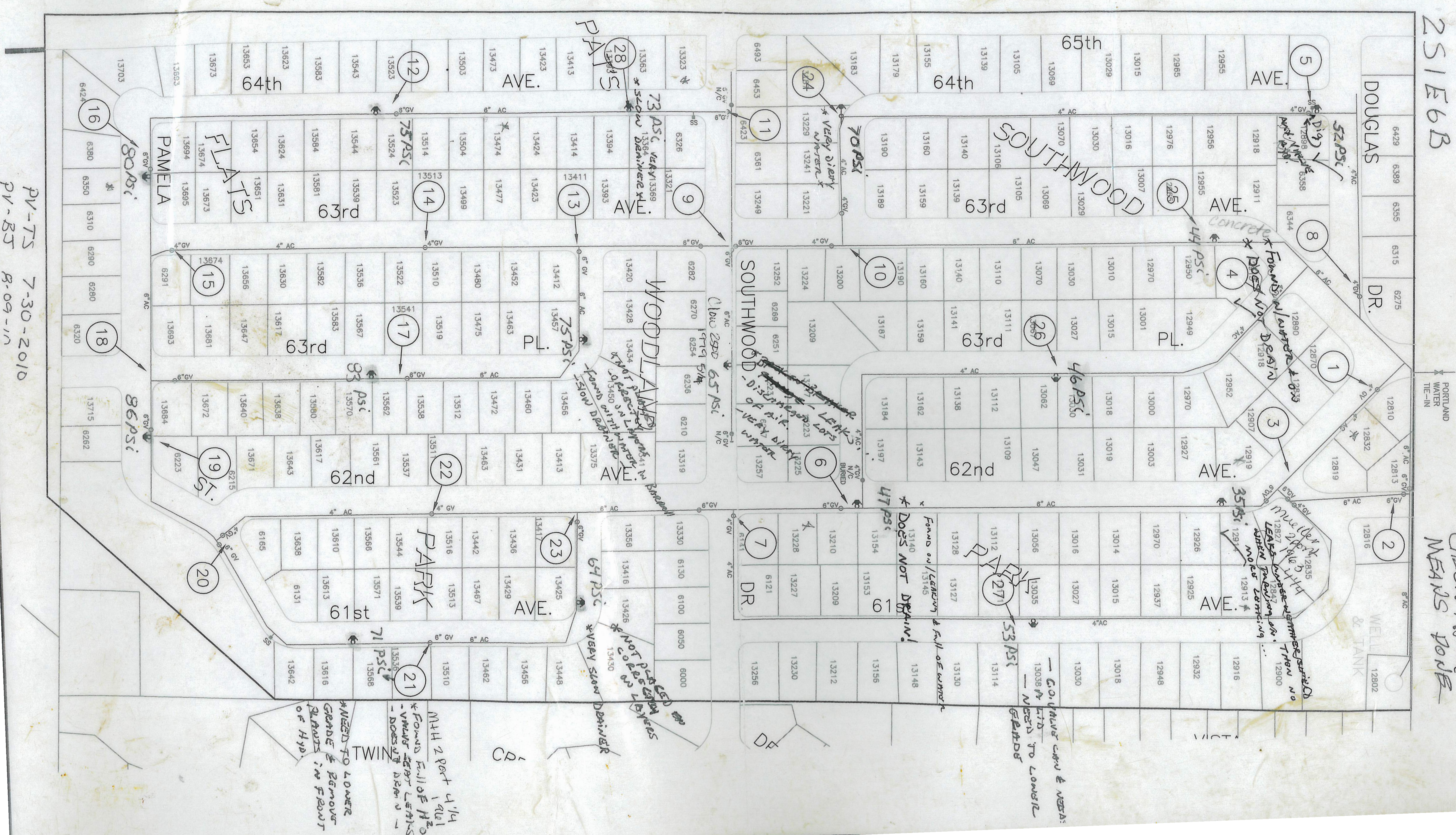
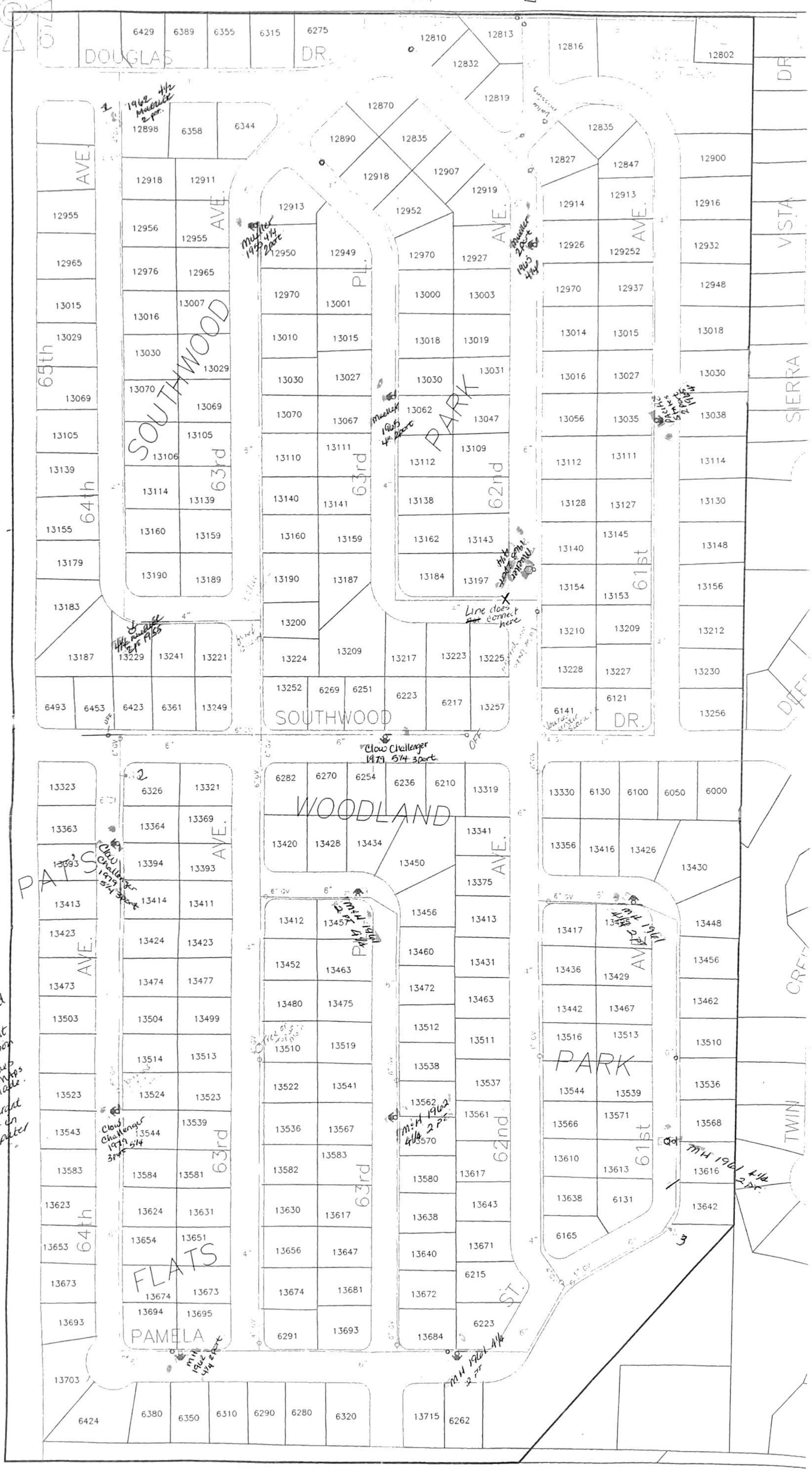
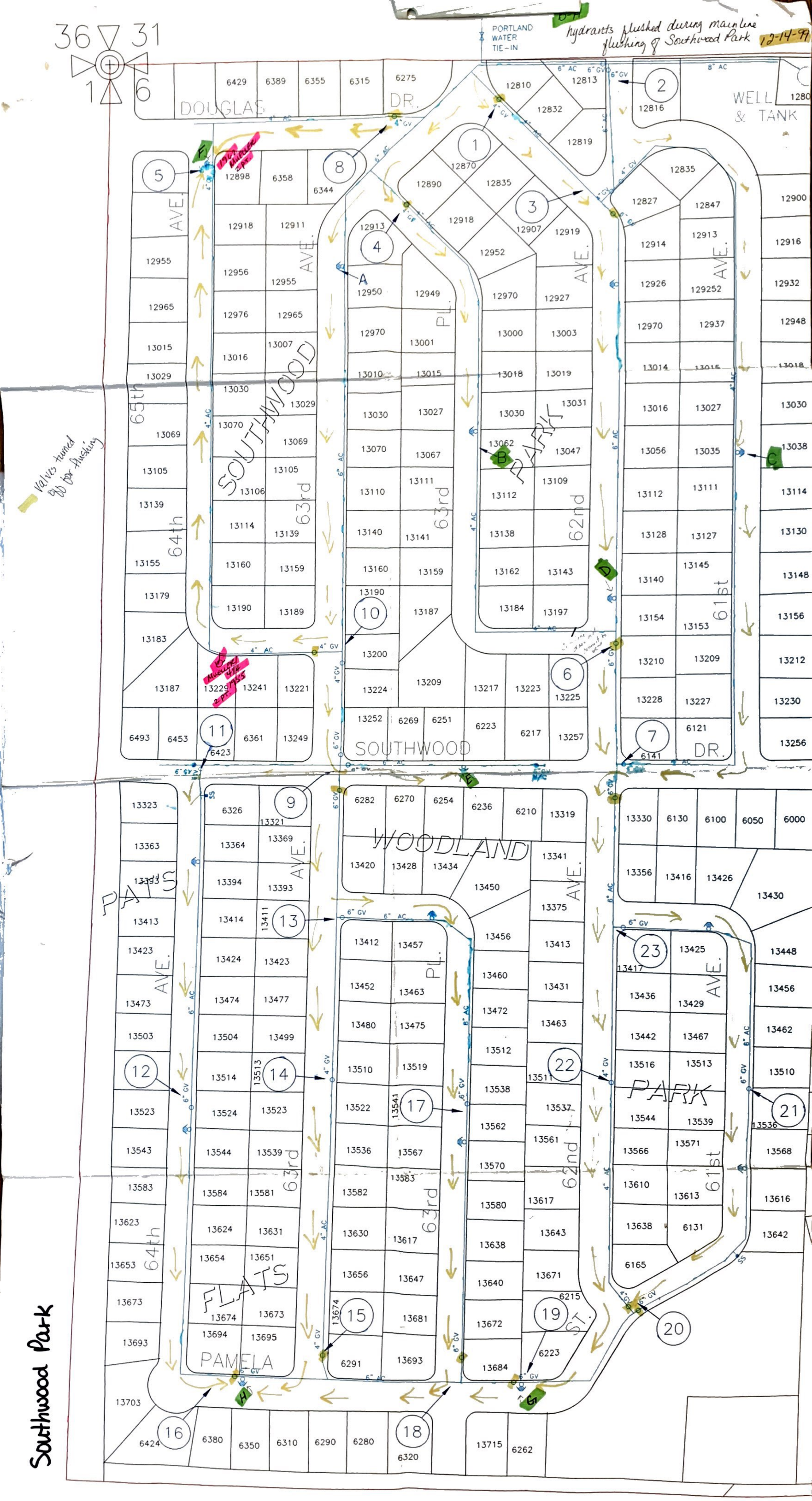


2S1E6B
PV-TS 7-30-2010
PV-BJ 8-09-10
65th
64th AVE.
64th AVE.
63rd AVE.
63rd AVE.
SOUTHWOOD
DOUGLAS DR.
PAMELA
FLATS
PATS
63rd PL.
63rd PL.
WOODLAND
SOUTHWOOD DR.
62nd AVE.
62nd AVE.
ST.
PARK
61st AVE.
61st AVE.
PARK
DR.
PORTLAND WATER TIE-IN
WELL & TANK
TWIN
Concrete
80 PSI
73 PSI
75 PSI
70 PSI
52 PSI
44 PSI
75 PSI
83 PSI
86 PSI
65 PSI
46 PSI
47 PSI
35 PSI
64 PSI
71 PSI
53 PSI
* DOES NOT DRAIN
* DOES NOT DRAIN!
* VERY SLOW DRAINER
* NEED TO LOWER GRADE & REMOVE PLANTS IN FRONT OF HYD.
- NEED TO LOWER GRADE

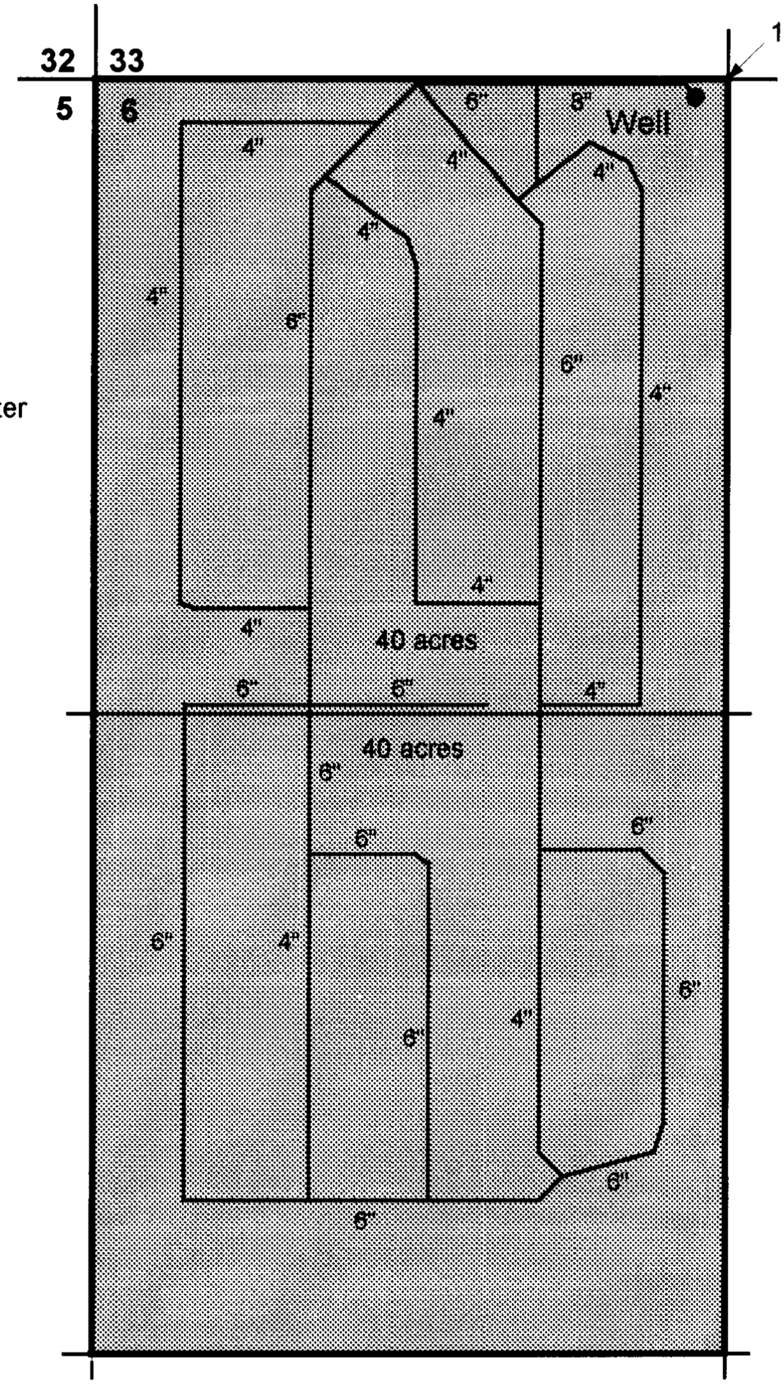


-buried
-hydrant information
-valves checked - Maps made.
-hydrant info on computer



36 31
1 6
PORTLAND WATER TIE-IN
hydrants flushed during mainline flushing of Southwood Park 12-14-99
DOUGLAS DR.
WELL & TANK
SOUTHWOOD PARK
65th AVE.
64th AVE.
63rd AVE.
63rd PL.
62nd AVE.
61st AVE.
SOUTHWOOD DR.
WOODLAND AVE.
PAYS AVE.
64th
FLATS
PAMELA
63rd
63rd PL.
PARK
62nd ST.
61st
Valves turned off for flushing
Southwood Park

T.2S. R.1E. Sec. 6, NW 1/4 NW 1/4



Well is located 44 feet south
and ~~7~~ feet west of the northeast
73 1/16 corner.

Southwood Park Water District

CERTIFIED WATER RIGHTS EXAMINER
#60772WRE
Malia R. Kupillas
MALIA R. KUPILLAS
JUNE 08, 1999
STATE OF OREGON

EXPIRATION DATE 12/31/2000

RECEIVED
[illegible] 2 [illegible]
WATER RESOURCES DEPT
SALEM, OR

Scale: 1" = 400'

0 400 800
Feet

This map was prepared for the purpose of identifying the location of a water right only and is not intended to provide legal dimensions or location of property ownership lines.

N

Pacific Hydro-Geology Inc.

Claim of Beneficial Use

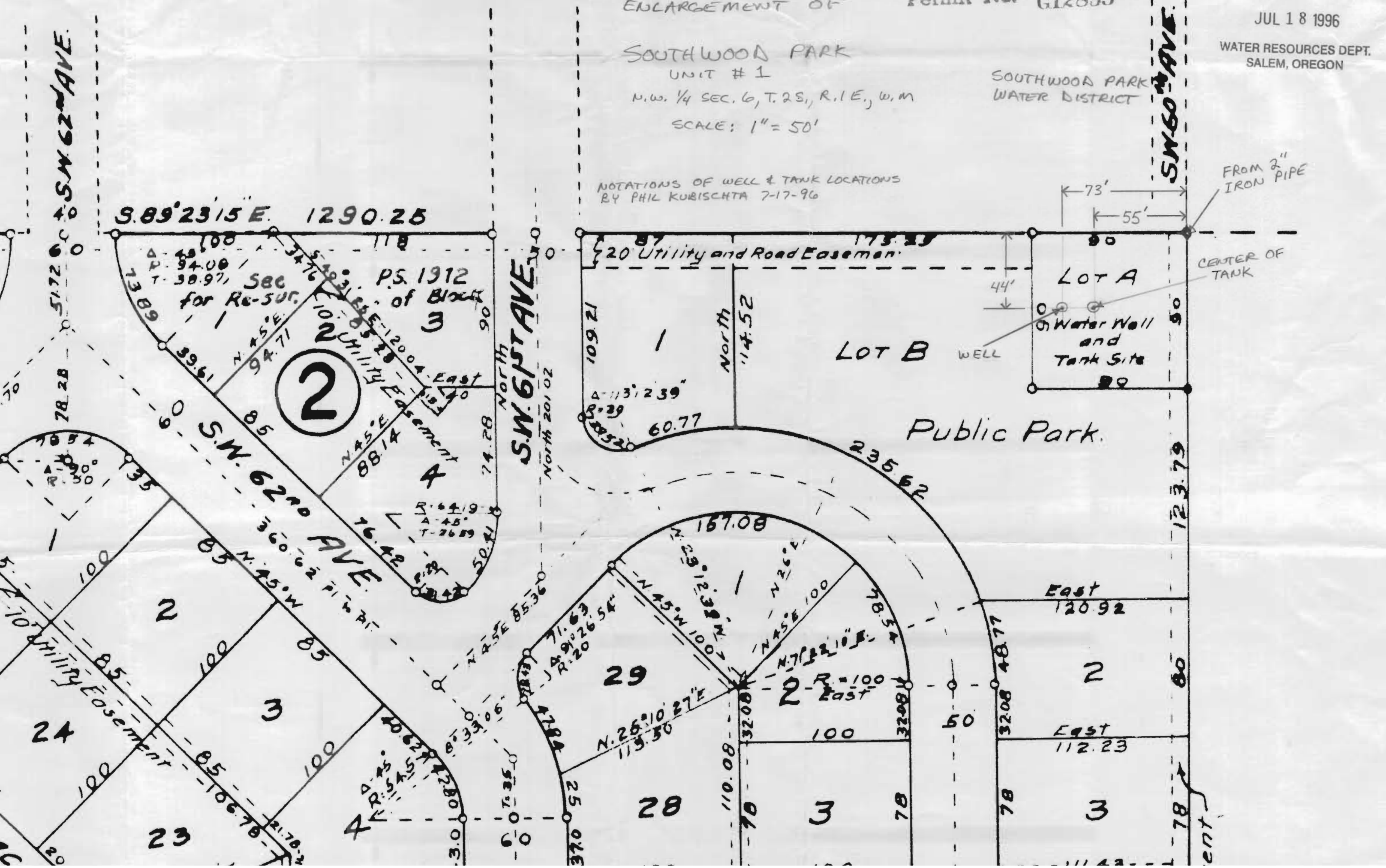
Southwood Park Water District.
T.2S. R.1E Sec. 6

Application No. G-13768 Permit No. G-12835

Updated Metes & Bounds for Well to 73 feet West. 9/24/14 MB/OWRD

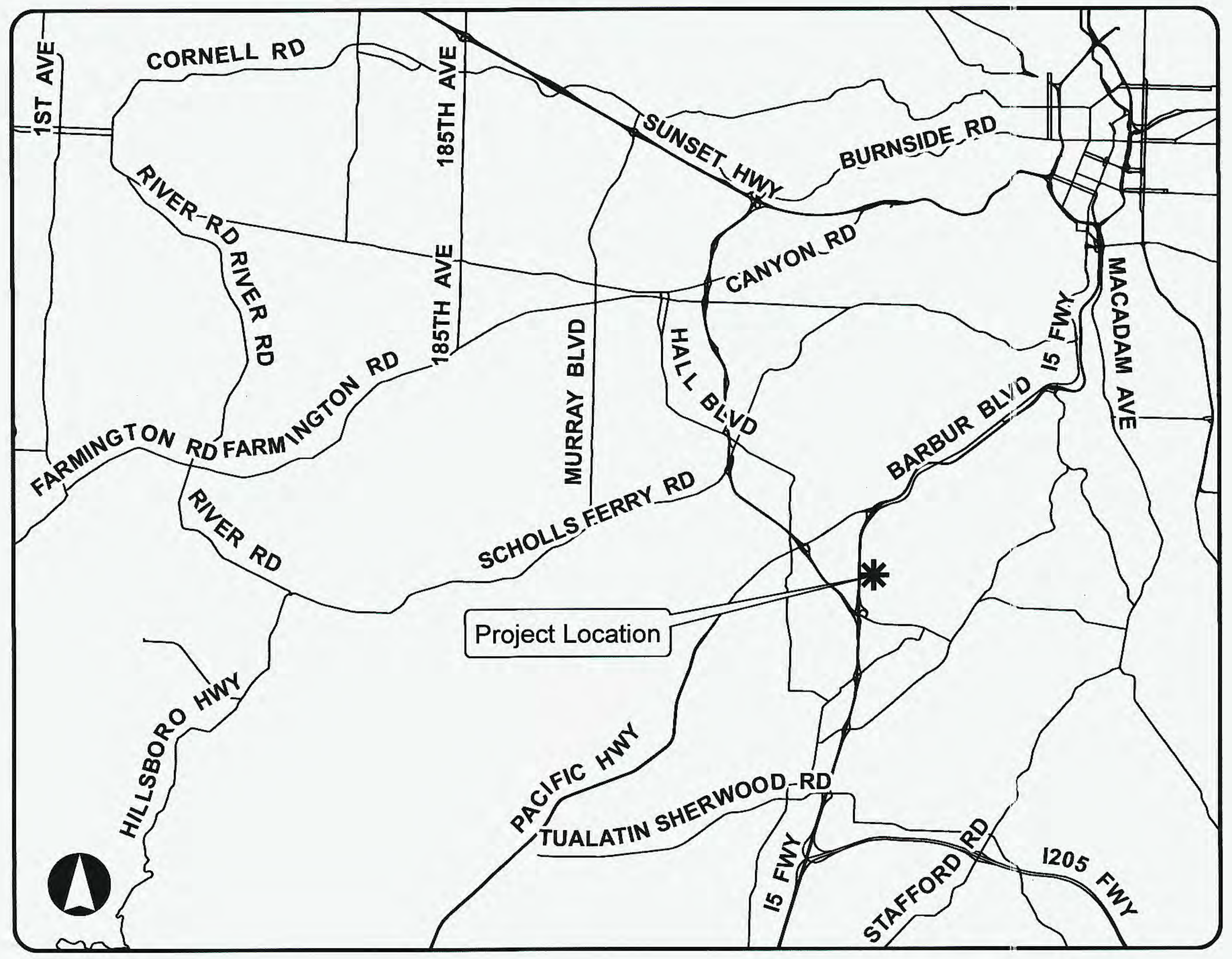
Application No. G-13768
Permit No. G12835

RECEIVED
JUL 1 8 1996
WATER RESOURCES DEPT.
SALEM, OREGON



SOUTHWOOD REHABILITATION

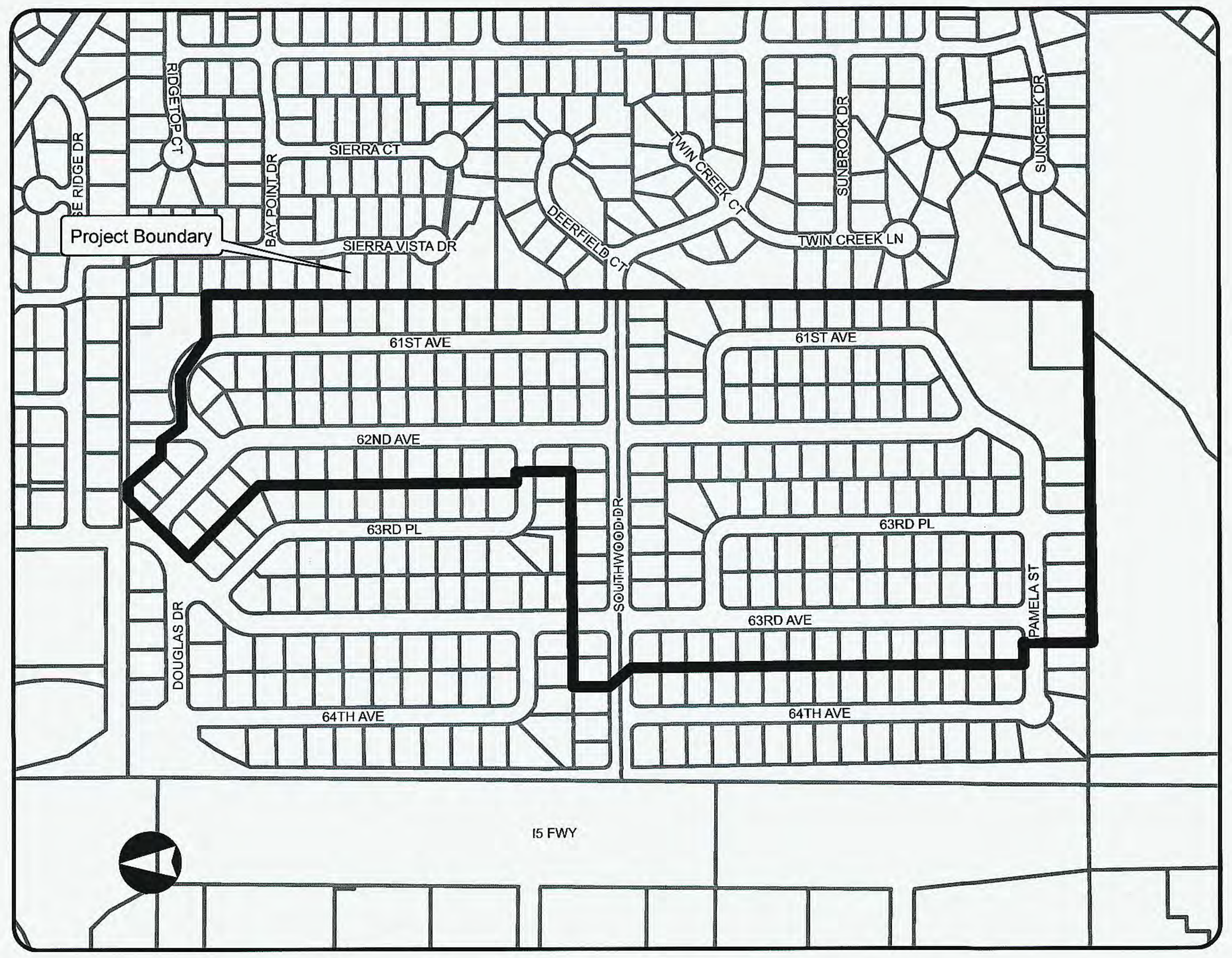
VICINITY MAP
NTS



CLEAN WATER SERVICES PROJECT NO. 6914
CLEAN WATER SERVICES PROJECT NO. 6869

SHEET INDEX

SITE MAP
NTS



UTILITY LOCATES (503) 232-1987
48 BUSINESS HOUR NOTICE PRIOR TO EXCAVATION

OREGON LAW REQUIRES CONTRACTOR TO COMPLY WITH RULES ADOPTED BY OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH 952-001-0090. COPIES OF RULES MAY BE OBTAINED BY CONTACTING THE UTILITY LOCATE CENTER AT (503) 232-1987.

ELECTRIC:	PORTLAND GENERAL ELECTRIC	(503) 228-6322
GAS:	NORTHWEST NATURAL GAS	(503) 266-4211
TELEPHONE:	FRONTIER COMMUNICATIONS	(877) 483-8118
TELEVISION:	COMCAST	(888) 824-8264
STREETS:	CLACKAMAS COUNTY	(503) 804-8271
WATER:	HIGHLAND WATER CORP.	(503) 544-8333
SANITARY SEWER:	CLEAN WATER SERVICES	(503) 547-8100
STORM SEWER:	CLEAN WATER SERVICES	(503) 547-8100

CLEAN WATER SERVICES
CONTACT INFORMATION

ENG. PROG. MGR.:	ANDREW J. BRAUN P.E.	(503) 681-3615
SENIOR ENG.:	WADE DENNY P.E.	(503) 547-8117
PROJECT MGR.:	BEN NORDLAND, P.E.	(503) 547-8113
INSPECTOR:	BILLY TERRY	(503) 369-9670
ENG. TECH.:	JACOB HENDRICKSON	(503) 547-8124

GENERAL NOTES

1. CONTRACTOR SHALL NOTIFY CLEAN WATER SERVICES PROJECT MANAGER (503-547-8113) AND INSPECTION DEPARTMENT (503-369-9670) 48 BUSINESS HOURS PRIOR TO START OF CONSTRUCTION AND COMPLY WITH ALL OTHER REQUIREMENTS OF ORS 757.541 TO 757.571.

2. CONTRACTOR SHALL PROVIDE 24 HOUR NOTICE OF WORK RESUMPTION AFTER ANY SHUTDOWN EXCEEDING ONE DAY DURATION EXCEPT FOLLOWING WEEKENDS OR HOLIDAYS.

3. ALL EROSION CONTROL INSTALLATION AND MAINTENANCE SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF CLEAN WATER SERVICES EROSION PREVENTION & SEDIMENT CONTROL TECHNICAL GUIDANCE HANDBOOK.

4. ALL RESTORATIVE PAVING WITHIN STREET RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF CLACKAMAS COUNTY.

5. ALL TRAFFIC CONTROL SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AS MODIFIED BY THE OREGON SUPPLEMENTS. COST ASSOCIATED WITH IMPLEMENTATION OF TRAFFIC CONTROL, SIGNAGE, OR DEVICES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

6. CLEAN WATER SERVICES SHALL PROVIDE CONTRACTOR WITH CLACKAMAS COUNTY RIGHT OF WAY PERMIT. CONTRACTOR SHALL HAVE A COPY OF PERMIT ONSITE AT ALL TIMES AND COMPLY WITH ALL CONDITIONS STIPULATED IN PERMIT.

7. CONTRACTOR SHALL SUBMIT AND RECEIVE APPROVAL OF TRAFFIC CONTROL PLAN FROM CLACKAMAS COUNTY PRIOR TO START OF CONSTRUCTION. FEES ASSOCIATED WITH ANY ROAD CLOSURE REQUEST SHALL BE THE RESPONSIBILITY OF CONTRACTOR.

8. CONTRACTOR SHALL CONFINE CONSTRUCTION OPERATIONS WITHIN PERMANENT EASEMENTS, TEMPORARY CONSTRUCTION EASEMENTS, OR PUBLIC RIGHT-OF-WAY ONLY. IF AREAS OR FEATURES OUTSIDE DESIGNATED CONSTRUCTION ZONES SUSTAIN IMPACT FROM CONTRACTORS ACTIVITIES, CONTRACTOR SHALL RESTORE TO PRE-CONSTRUCTION CONDITION AT NO COST TO CLEAN WATER SERVICES.

9. CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY THE LOCATION AND DEPTH (POTHOLE) OF ALL EXISTING UTILITIES WITHIN CONSTRUCTION ZONE PRIOR TO BEGINNING CONSTRUCTION. CONTRACTOR SHALL PROMPTLY NOTIFY CLEAN WATER SERVICES OF POTENTIAL CONFLICTS. UNDER THESE TERMS CLEAN WATER SERVICES SHALL BE RESPONSIBLE FOR COST OF REQUIRED RELOCATIONS. IF CONTRACTOR FAILS TO LOCATE ANY KNOWN UTILITY WITHIN CONSTRUCTION ZONE THAT CONFLICTS WITH WORK, CONTRACTOR SHALL CORRECT CONFLICT AT OWN COST. ANY COSTS TO THE CONTRACTOR ARISING FROM COORDINATION WITH UTILITY COMPANY TO RELOCATE UTILITIES SHALL BE CONSIDERED INCIDENTAL TO COST OF PROJECT AND NO ADDITIONAL COMPENSATION SHALL BE DUE CONTRACTOR

10. CONTRACTOR SHALL PROTECT ALL EXISTING SURVEY MONUMENTS AND CONSTRUCTION STAKING. CONTRACTOR SHALL NOTIFY CLEAN WATER SERVICES PRIOR TO DISTURBANCE OR REMOVAL OF ANY PERMANENT MONUMENTS TO ALLOW REFERENCING FOR FUTURE REPLACEMENT. CONTRACTOR SHALL BEAR THE COST OF RESTORATION & REPLACEMENT FOR ANY MONUMNET DISTURBED OUTSIDE OF THE DESIGNATED WORK AREA AND FOR ANY DISTURBED MONUMENT WITHIN THE DESIGNATED WORK AREA, IF NO ADVANCED NOTIFICATION WAS PROVIDED BY CONTRACTOR.

11. CONTRACTOR SHALL RESTORE ALL STREET FEATURES IMPACTED BY CONSTRUCTION. FEATURES SHALL INCLUDE , BUT NOT BE LIMITED TO, PAVEMENT, CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS, STREET STRIPING, SIGNAGE, MAILBOXES, AND UTILITIES.

12. CONTRACTOR SHALL RESTORE ALL PROJECT- RELATED EASEMENT AREAS AS STIPULATED IN EASEMENT AND CONTRACT DOCUMENTS. CLEAN WATER SERVICES SHALL PROVIDE CONTRACTOR WITH REFERENCE COPY OF ALL EASEMENT AGREEMENT CONDITIONS.

BYPASS PUMPING NOTES

1. IF SYSTEM CONDITIONS OR CONSTRUCTION METHODS REQUIRE FLOW BYPASS, CONTRACTOR SHALL SUBMIT A BYPASS PUMPING PLAN TO DISTRICT FOR APPROVAL AT THE PRE-CONSTRUCTION MEETING. NO CONSTRUCTION ACTIVITIES MAY START PRIOR TO CONTRACTOR RECEIVING DISTRICT'S WRITTEN APPROVAL OF A BYPASS PUMPING PLAN. REFER TO SPECIAL SPECIFICATION S-15 FOR INFORMATION THAT MUST BE SUBMITTED IN BYPASS PUMPING PLAN.

2. CONTRACTOR IS RESPONSIBLE FOR PROVIDING PUMPING SYSTEMS THAT ARE SIZED FOR ACTUAL FLOW CONDITIONS. CONTRACTOR SHALL MAINTAIN A BACKUP PUMP(S) OF EQUAL CAPACITY AND CONFIGURED SUCH THAT THE BACKUP PUMP(S) OPERATES AUTOMATICALLY IN THE EVENT OF A FAILURE OF THE PRIMARY SYSTEM AND INITIATES AN AUTODIALER CALL-OUT TO CONTRACTOR UPON STARTUP. PROJECTED PEAK FLOW DURING CONSTRUCTION IS 200 GPM.

3. THE PUMP SYSTEM SHALL INCLUDE NOISE ATTENUATION RATED AT 59 DB AT 7 METERS WHILE OPERATING AT FULL LOAD. CONTRACTOR SHALL SET UP PUMPS AS FAR AWAY FROM RESIDENTIAL DWELLINGS AS THE SITE CONDITIONS ALLOW TO MINIMIZE DISTURBANCE TO PROPERTY OWNERS AND TO AVOID RELOCATION DUE TO PROPERTY OWNER COMPLAINTS.

4. CONTRACTOR SHALL OPERATE BYPASS PUMPING DURING WORKING HOURS AND RETURN THE FLOW TO GRAVITY AT THE END OF EACH WORK DAY, UNLESS OTHERWISE APPROVED. CONTRACTOR SHALL PROVIDE CONTINUOUS ON-SITE MONITORING BY A DESIGNATED PUMP TENDER DURING ALL PUMPING OPERATIONS IF DISTRICT APPROVES OVERNIGHT BYPASS PUMPING. AN EMERGENCY SPILL KIT SHALL BE ON SITE AT ALL TIMES.

5. CONTRACTOR SHALL IMMEDIATELY CONTACT DISTRICT ON-CALL EMERGENCY PERSONNEL AT 503/784-6229 OR 503/681-3600 AND DISTRICT'S PROJECT INSPECTOR IF CONTRACTOR EXPERIENCES A SEWER SPILL OR BELIEVES THAT AN UNEXPECTED CIRCUMSTANCE MAY LEAD TO A PUMPING SYSTEM FAILURE AND SUBSEQUENT SPILL.

QS 4323

6914

NO.	REVISION		
A	Semi Asbuilt	5/12	ND

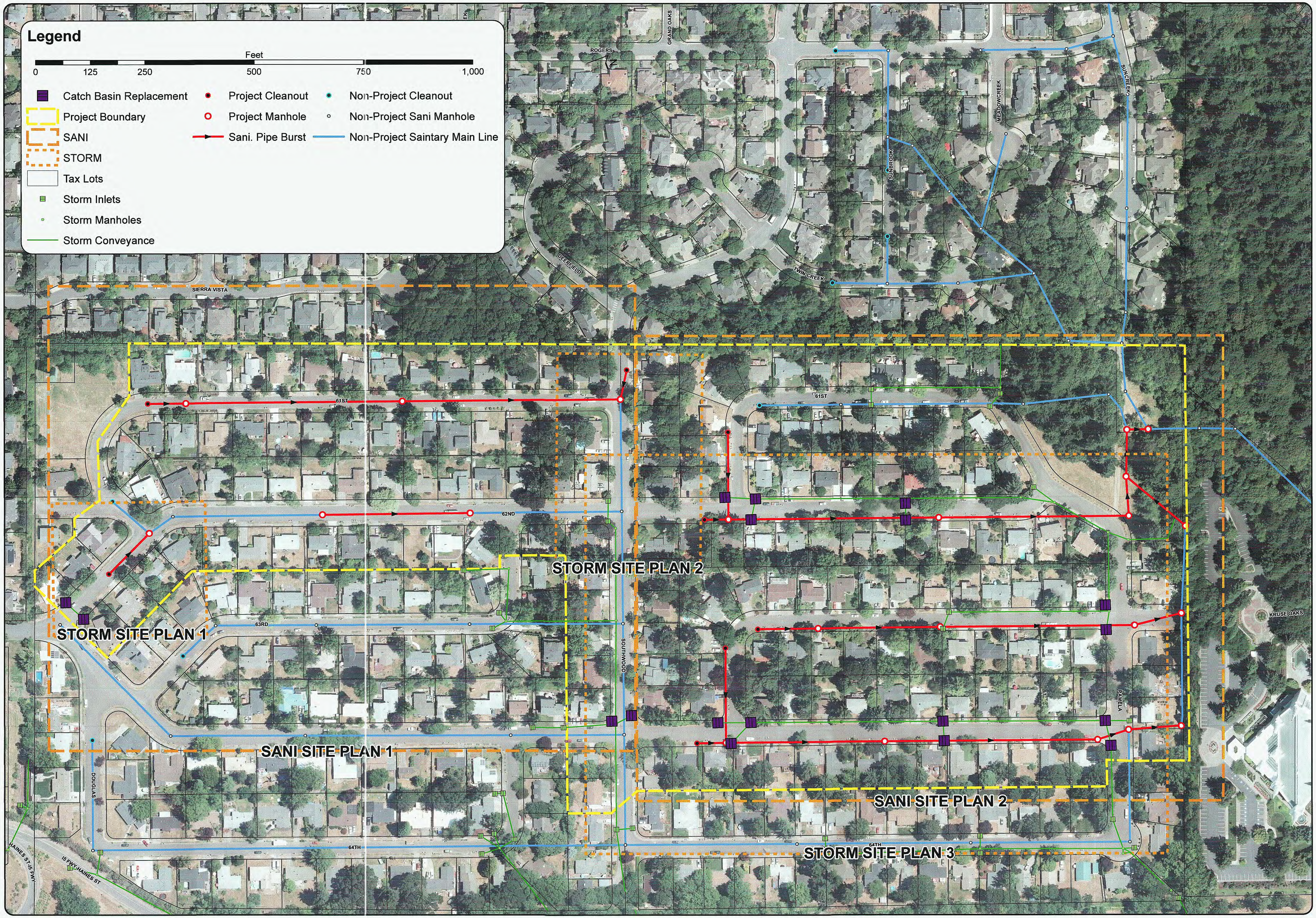
Clean Water Services
Our commitment is clear.
2550 SW Hillsboro Hwy
Hillsboro, OR 97123
(503) 681-3600
www.cleanwaterservices.org

COVER SHEET

SOUTHWOOD REHABILITATION

1/4 SECTION	4323
DRAFTER: JRH	
DESIGNER: JRH	
CHECKED: BN	
APPROVED: BN	

PROJECT 6914/6869



NO. | REVISION

Clean Water Services
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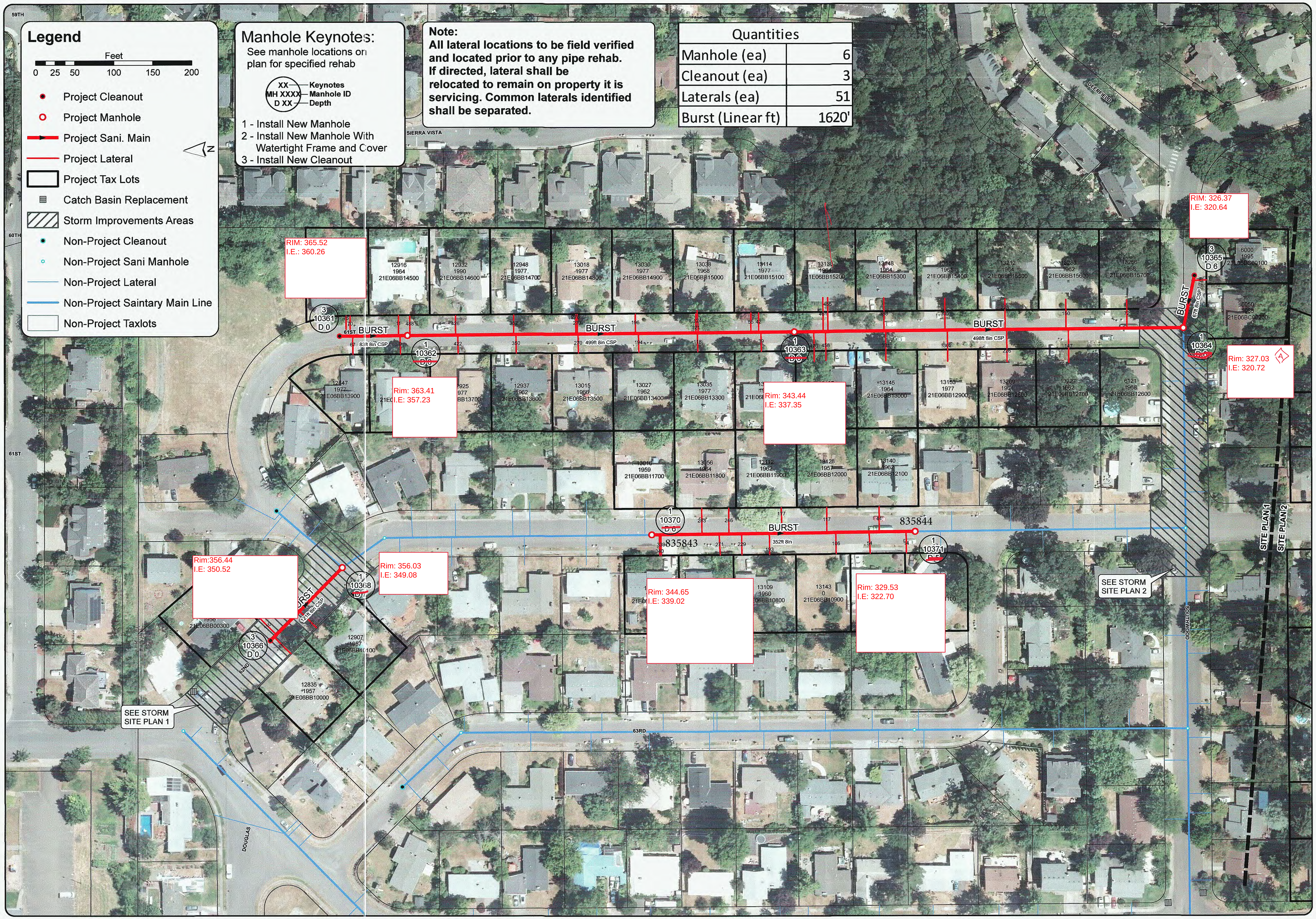
Hillsboro, OR 97123
(503) 681-3600
www.cleanwaterservices.org

COMPREHENSIVE PLAN & SHEET INDEX

SOUTHWOOD REHABILITATION

1/4 SECTION 4323
DRAFTER: JRH
DESIGNER: JRH
CHECKED: BN
APPROVED: BN

PROJECT 6914/6869
Sheet 2 of 13



Legend

Feet: 0 25 50 100 150 200

- Project Cleanout
- Project Manhole
- Project Sani. Main
- Project Lateral
- Project Tax Lots
- Catch Basin Replacement
- Storm Improvements Areas
- Non-Project Cleanout
- Non-Project Sani Manhole
- Non-Project Lateral
- Non-Project Saintary Main Line
- Non-Project Taxlots

Manhole Keynotes:

See manhole locations on plan for specified rehab

XX — Keynotes
MH XXXX — Manhole ID
D XX — Depth

1 - Install New Manhole
2 - Install New Manhole With Watertight Frame and Cover
3 - Install New Cleanout

Note:
All lateral locations to be field verified and located prior to any pipe rehab. If directed, lateral shall be relocated to remain on property it is servicing. Common laterals identified shall be separated.

Quantities	
Manhole (ea)	6
Cleanout (ea)	3
Laterals (ea)	51
Burst (Linear ft)	1620'

NO.	REVISION	
A	Sani Asbuilt	3-26-20

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Hillsboro, OR 97123
(503) 681-3600
www.cleanwaterservices.org

SANITARY SITE PLAN 1

SOUTHWOOD REHABILITATION

1/4 SECTION 4323
DRAFTER: JRH
DESIGNER: JRH
CHECKED: BN
APPROVED: BN

PROJECT 6914/6869
Sheet 3 of 13

Legend

Feet
0 25 50 100 150 200

- Project Cleanout
- Project Manhole
- Project Sani. Main
- Project Lateral
- Project Tax Lots
- Non-Project Cleanout
- Non-Project Sani Manhole
- Non-Project Lateral
- Non-Project Saintary Main Line
- Non-Project Taxlots

Manhole Keynotes:

See manhole locations on plan for specified rehab

XX — Keynotes
MH XXXX — Manhole ID
D XX — Depth

1 - Install New Manhole
2 - Install New Manhole With Watertight Frame and Cover
3 - Install New Cleanout

Note:
All lateral locations to be field verified and located prior to any pipe rehab. If directed, lateral shall be relocated to remain on property it is servicing. Common laterals identified shall be separated.

Quantities	
Manhole (ea)	16
Cleanout (ea)	5
Laterals (ea)	83
Burst (Linear ft)	3870'

NO.	REVISION		
A	Sani Asbuilt	3/20	WD

Clean Water Services
Our commitment is clear.
2550 SW Hillsboro Hwy
Hillsboro, OR 97123
(503) 681-3600
www.cleanwaterservices.org

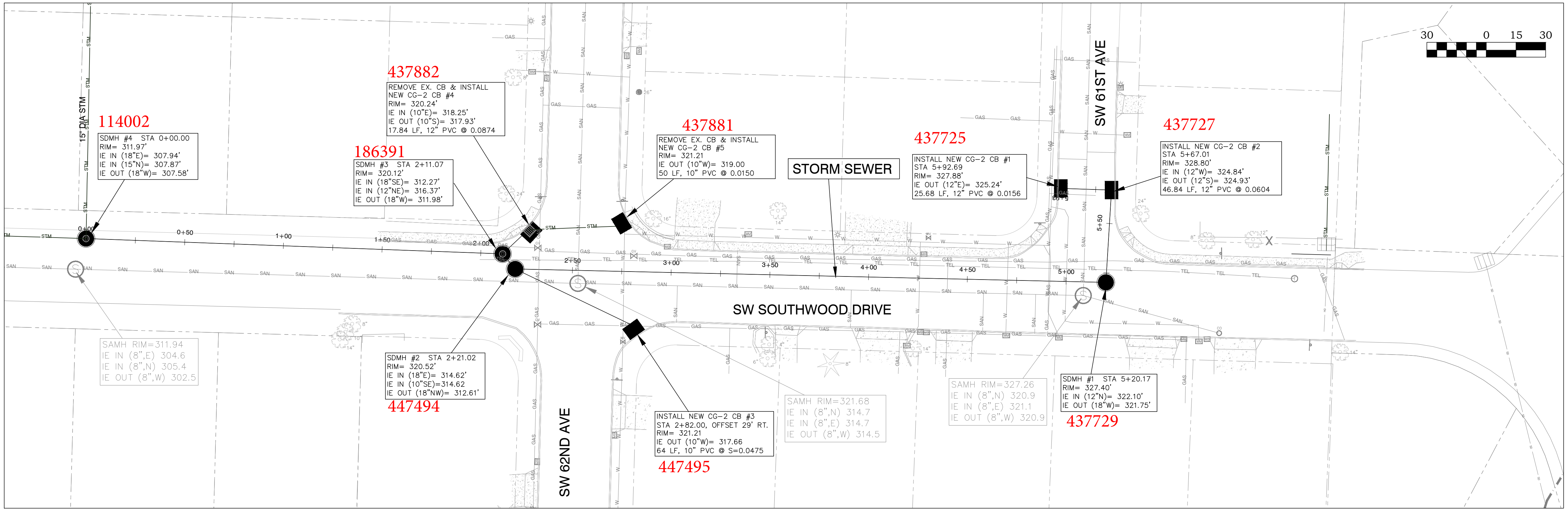
SANITARY SITE PLAN 2

SOUTHWOOD REHABILITATION

1/4 SECTION 4323
DRAFTER: JRH
DESIGNER: JRH
CHECKED: BN
APPROVED: BN

PROJECT 6914/6869
Sheet 4 of 13

6914



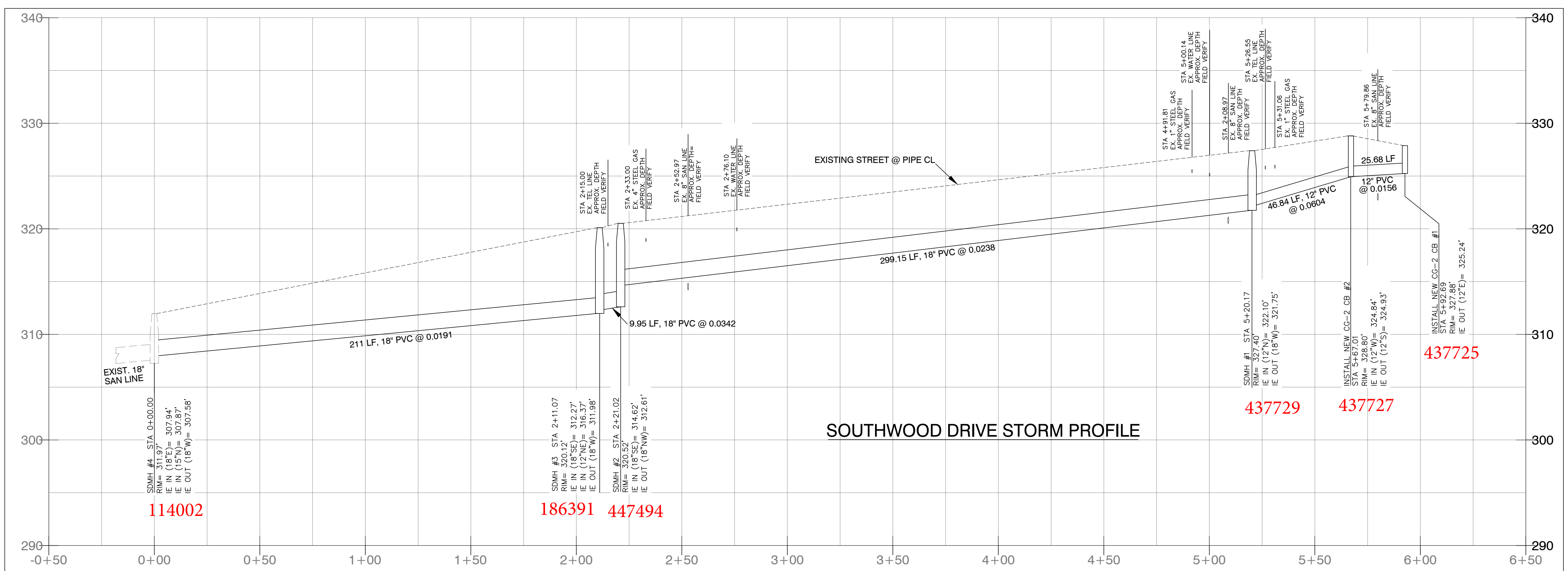
SHEET NOTES:

1. PIPE LENGTHS REPORTED FROM CENTER OF STRUCTURE.
2. INVERT ELEVATIONS REPORTED AS MEASURED AT WALL OF STRUCTURE.
3. SEVERAL MANHOLES LIE ON SLOPED SURFACES. MEASUREMENTS TO THE RIMS OF THESE MANHOLES WERE TAKEN AT THE HIGHEST POINT.
4. INSTALL EROSION AND SEDIMENT CONTROLS PRIOR TO BEGINNING EXCAVATION.
5. UTILITY DEPTH AND COVER SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO EXCAVATION.
6. EXISTING GAS IS ASSUMED TO BE 2 FT BELOW GROUND SURFACE.
7. EXISTING WATER IS ASSUMED TO BE 3 FT BELOW GROUND SURFACE.
8. CONTRACTOR SHALL POTHOLE UTILITIES CROSSING PRIOR TO CONSTRUCTION AND NOTIFY THE DISTRICT OF ALL KNOWN CONFLICTS.

VERTICAL DATUM
NGVD29 BASED ON CITY OF PORTLAND BENCHMARK #2382
NGVD29 ELEV = 354.08'

HORIZONTAL DATUM
BASIS OF BEARING & COORDINATE SYSTEM PER WASHINGTON COUNTY HORIZONTAL CONTROL NETWORK, NAD83(91) BASED ON TIES TO EXISTING CONTROL SHOWN PER DRAWING "0424-035T2Z" PROVIDED BY CWS.

* DESIGN SURVEY: WESTLAKE CONSULTANTS (NOVEMBER 2018).
* AS-BUILT SURVEY: STUNTZNER ENGINEERING & FORESTRY, LLC (JUNE 2020).



AS-BUILT SURVEY DRAWING

AS-BUILT

NO.	REVISION	BY	DATE
1	RECORD DRAWING	JH	11-24-20
0	ISSUED FOR BID	BEN	4-19-19

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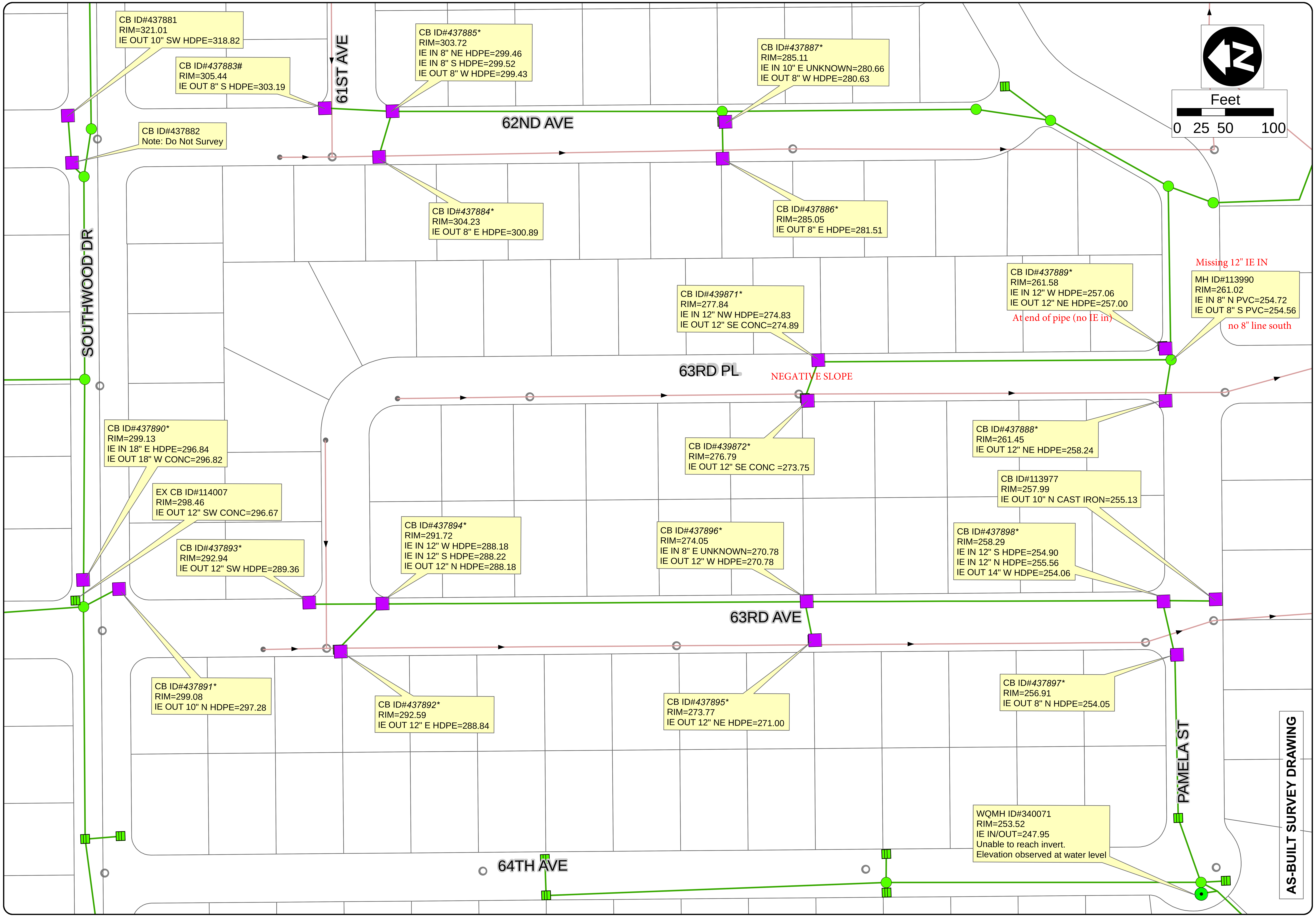
Hillsboro, OR 97123
(503) 681-3600
www.cleanwaterservices.org

STORM SEWER PLAN & PROFILE

SOUTHWOOD DRIVE STORM SEWER IMPROVEMENTS

1/4 SECTION 4323
DRAFTER: JH
DESIGNER: JH
CHECKED: JTS/AY
APPROVED: JTS

PROJECT 6914
SHEET 1 OF 2



NO.	REVISION		
1	Survey As-Built	JTS	12-4-20

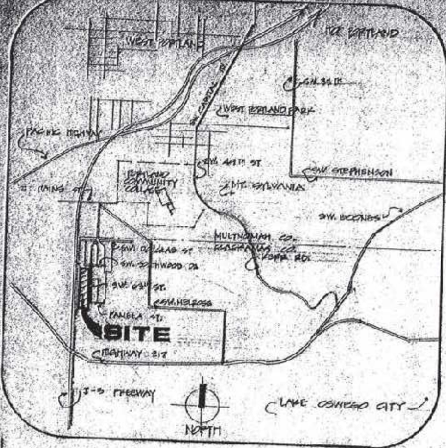
Clean Water Services
Our commitment is clear.
2550 SW Hillsboro Hwy
Hillsboro, OR 97123
(503) 681-3600
www.cleanwaterservices.org

STORM AS BUILT SITE PLAN 3

SOUTHWOOD REHABILITATION

1/4 SECTION 4323
DRAFTER: JRH
DESIGNER: JRH
CHECKED: JTS/AY
APPROVED: JTS

PROJECT 6914/6869
Sheet 2 of 2



VICINITY MAP

SITE IMPROVEMENTS FOR PAT'S FLATS

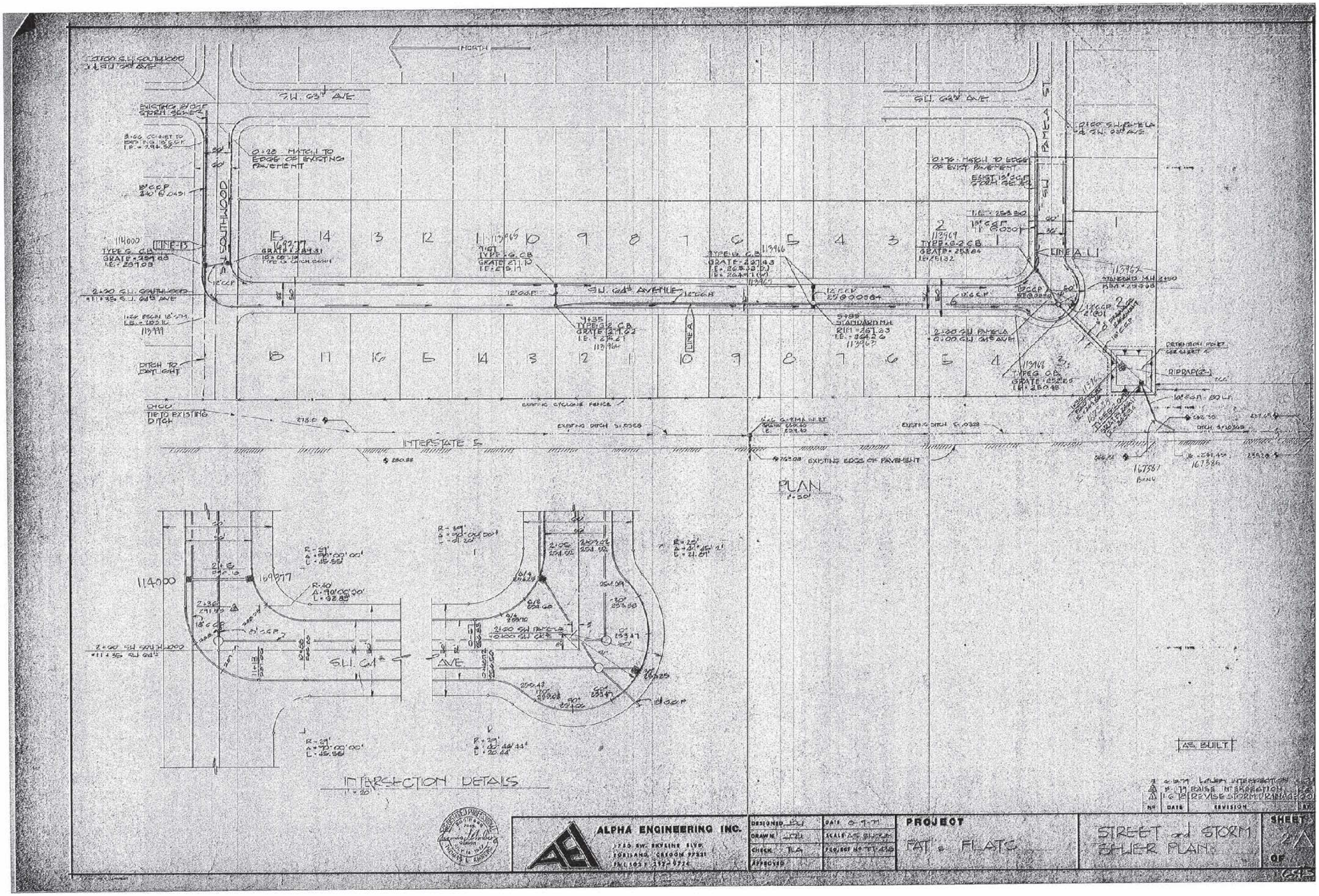
SUBDIVISION

OWNER - DEVELOPER

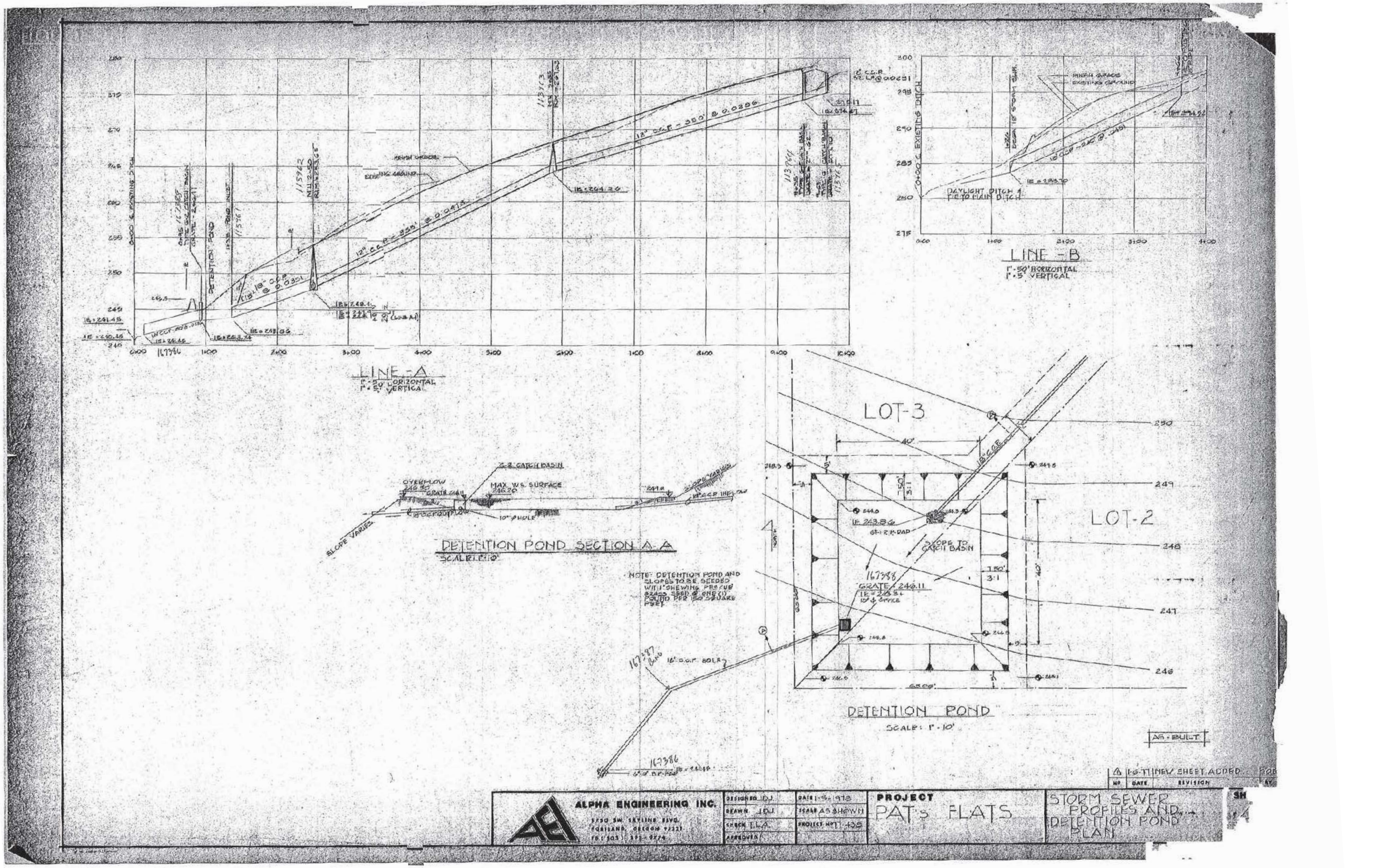
HERB MORISETTE BUILDER'S INC.
7470 S.W. 76TH
PORTLAND, OR. PHONE: 246-8803

ALPHA ENGINEERING INC.
1750 S.W SKYLINE BLVD.
PORTLAND, OR. 97221 PHONE: 292-9774

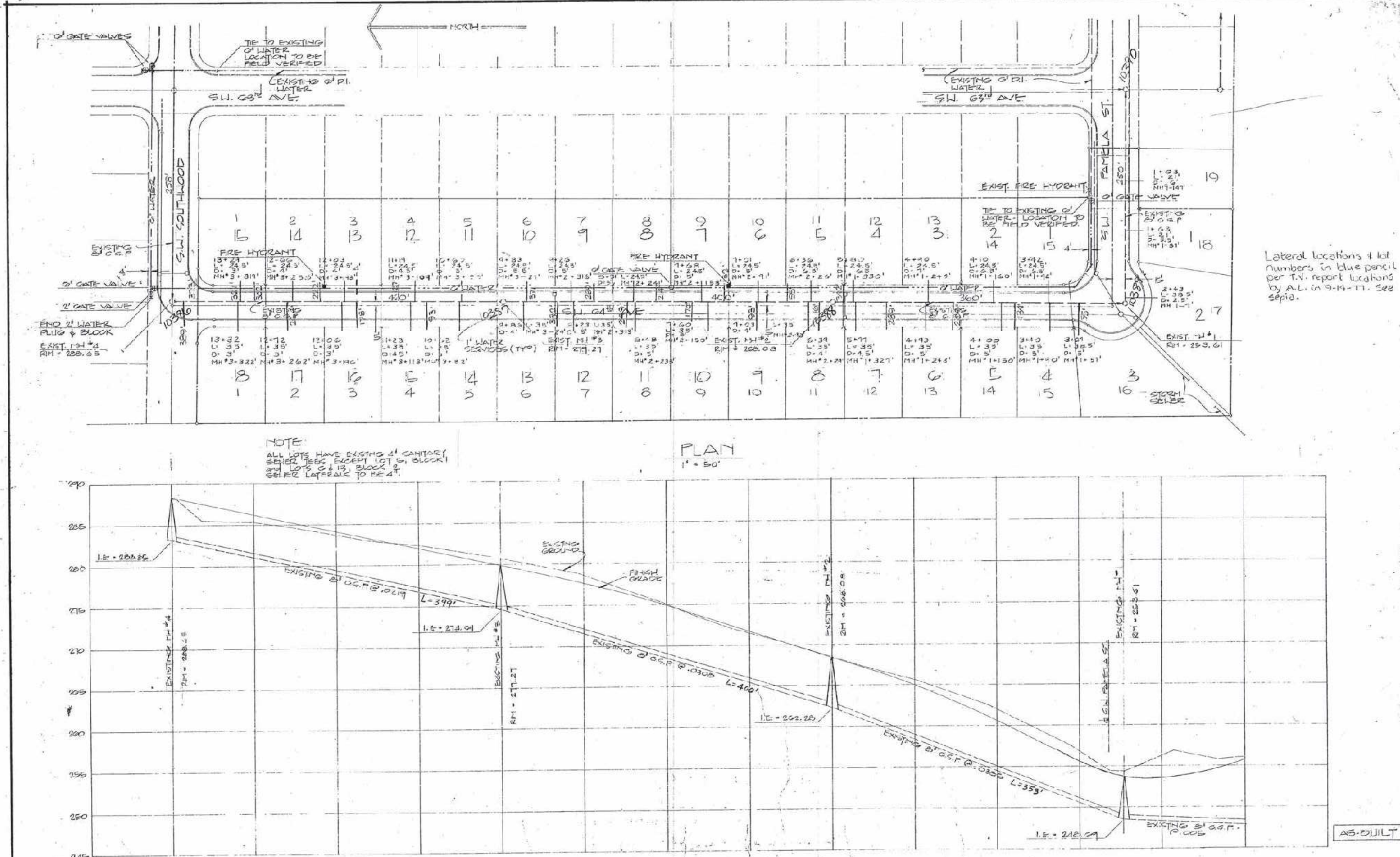
AS - BUILT



NORTH
S.W. 63rd AVE
S.W. 64th AVENUE
SOUTHWOOD
S.W. PAMELA ST
LINE A
INTERSTATE 5
EXISTING EDGE OF PAVEMENT
EXISTING CYCLONE FENCE
PLAN
1" = 30'
INTERSECTION DETAILS
1" = 20'
AS BUILT
REVISION
ALPHA ENGINEERING INC.
PROJECT
FAT & FLATS
STREET and STORM SEWER PLAN
SHEET
2A



LINE - A
1" = 50' HORIZONTAL
1" = 5' VERTICAL
LINE - B
1" = 50' HORIZONTAL
1" = 5' VERTICAL
DAYLIGHT DITCH & TIE TO MAIN DITCH
0+00 ℄ EXISTING DITCH
FINISH GRADE
EXISTING GROUND
DETENTION POND
LOT-3
LOT-2
DETENTION POND SECTION A-A
SCALE: 1" = 10'
OVERFLOW
MAX. W.S. SURFACE
10" ø HOLE
SLOPE VARIES
NOTE: DETENTION POND AND SLOPES TO BE SEEDED WITH CHEWING FESCUE GRASS SEED @ ONE (1) POUND PER 1000 SQUARE FEET.
SLOPE TO CATCH BASIN
GRATE = 246.11
DETENTION POND
SCALE: 1" = 10'
AS - BUILT
1-6-77 NEW SHEET ADDED
NO. DATE REVISION BY
ALPHA ENGINEERING INC.
DESIGNED I.D.J.
DRAWN I.D.J.
CHECK E.L.A.
APPROVED
DATE 1-5-1978
SCALE AS SHOWN
PROJECT NO. 77-435
PROJECT
PAT'S FLATS
STORM SEWER PROFILES AND DETENTION POND PLAN



PROFILE · EXISTING SANITARY SEWER

1" = 50' HORIZONTAL 1" = 5' VERTICAL

Nº	DATE	REVISION	BY
1	6-4-79	AS-BUILTS	[illegible]

ALPHA ENGINEERING INC.
1710 SW. SKYLINE BLVD.
PORTLAND, OREGON 97221
Ph (503) 292-9774

REGISTERED PROFESSIONAL ENGINEER 7335 OREGON JULY 14, 1972 THOMAS L. AMBERG

DESIGNED JDJ
DRAWN JDJ
CHECK TLA
APPROVED

DATE 8-19-77
SCALE AS SHOWN
PROJECT Nº 77-438

PROJECT
PAT's FLATS

SANITARY SEWER and WATER PLAN

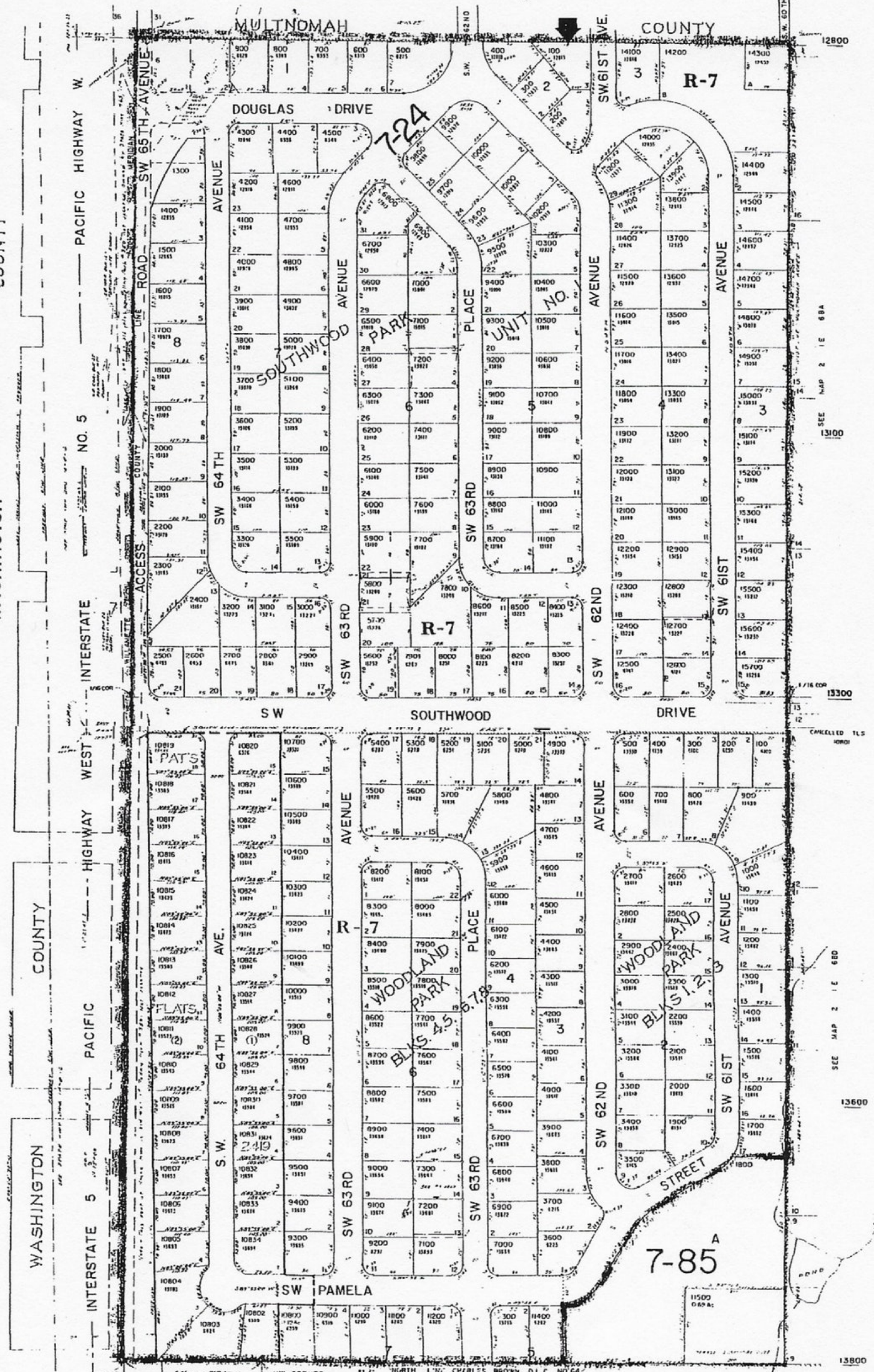
SHEET 5 OF

643

assessment purpose only.

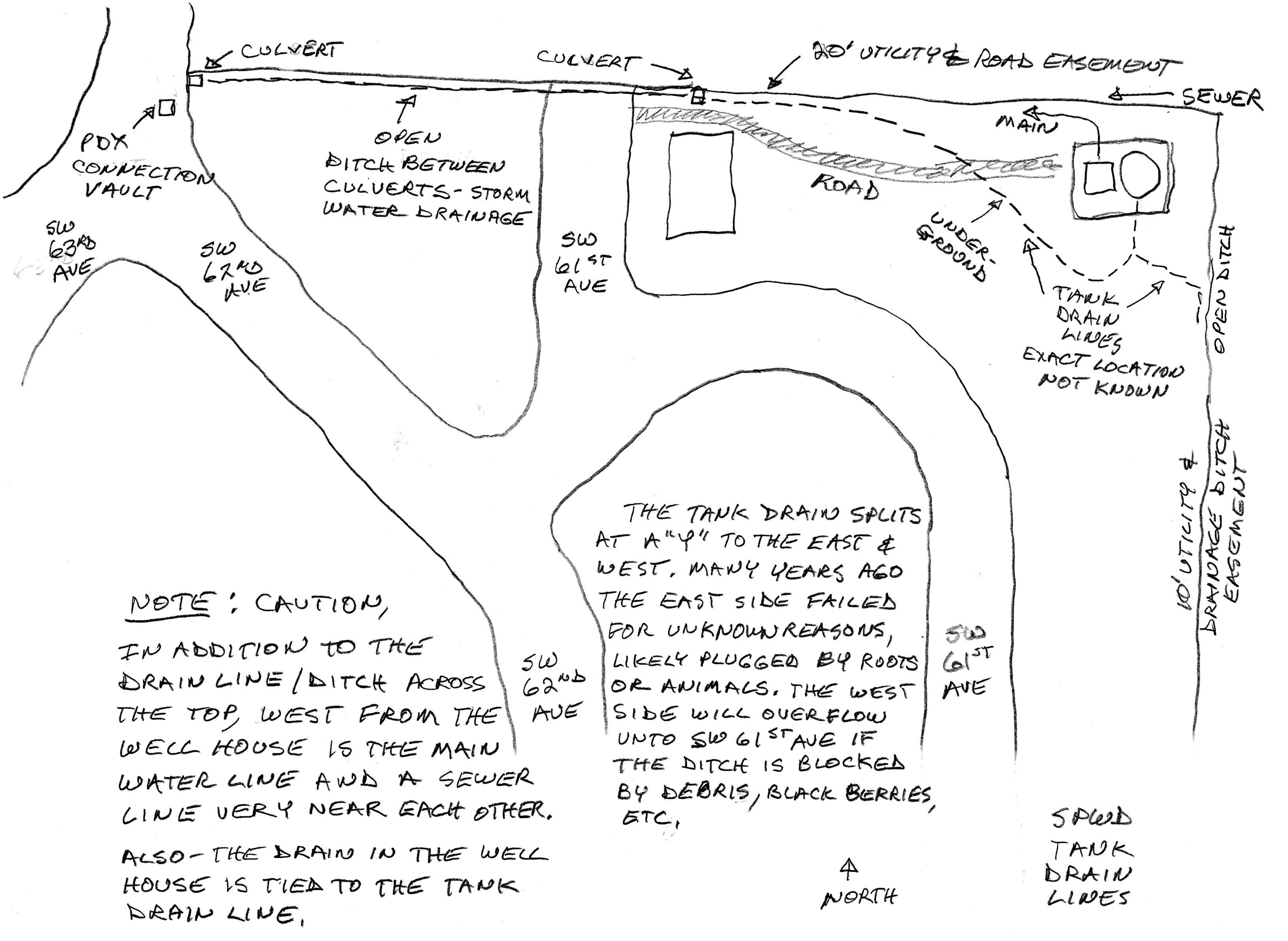
CLACKAMAS COUNTY

1"=100'



SEE MAP 2 1E 6

T.B.A.
2 1E 6BC



THE TANK DRAIN SPLITS AT A "Y" TO THE EAST & WEST. MANY YEARS AGO THE EAST SIDE FAILED FOR UNKNOWN REASONS, LIKELY PLUGGED BY ROOTS OR ANIMALS. THE WEST SIDE WILL OVERFLOW UNTO SW 61ST AVE IF THE DITCH IS BLOCKED BY DEBRIS, BLACK BERRIES, ETC,

<u>NOTE</u>: CAUTION,

IN ADDITION TO THE DRAIN LINE/DITCH ACROSS THE TOP, WEST FROM THE WELL HOUSE IS THE MAIN WATER LINE AND A SEWER LINE VERY NEAR EACH OTHER.

ALSO - THE DRAIN IN THE WELL HOUSE IS TIED TO THE TANK DRAIN LINE.

SPWD
TANK
DRAIN
LINES

1-30-23
P. KUBISCHTA

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix J
Water Right Permit and Certificate

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STATE OF OREGON

COUNTY OF CLACKAMAS

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

SOUTHWOOD PARK WATER DISTRICT
PO BOX 5908
BEAVERTON, OR 97036-0908

confirms the right to use the waters of A WELL in TUALATIN RIVER BASIN for DOMESTIC USE FOR UP TO 300 HOUSEHOLDS.

This right was perfected under Permit G-12835. The date of priority is AUGUST 11, 1994. The amount of water to which this right is entitled is limited to an amount actually used beneficially, and shall not exceed 1.05 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the well.

The period of allowed use is WATER MAY BE APPROPRIATED FOR DOMESTIC USE YEAR ROUND.

The well is located as follows:

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
2 S	1 E	WM	6	NW NW	44 FEET SOUTH & 73 FEET WEST FROM W 1/16 CORNER, SECTION 6

A description of the place of use is as follows:

Twp	Rng	Mer	Sec	Q-Q
2 S	1 E	WM	6	NW NW
2 S	1 E	WM	6	SW NW

Measurement, recording and reporting conditions:

A. The water user shall maintain the meter or measuring device in good working order, shall keep a complete record of the amount of water used each month, and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the water user to report general water-use information, including the place and nature of use of water under the right.

B. The water user shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484 and ORS 536.075. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 183.484, ORS 536.075 and OAR 137-004-0080, you may petition for judicial review and petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied. In addition, under ORS 537.260 any person with an application, permit or water right certificate subsequent in priority may jointly or severally contest the issuance of the certificate within three months after issuance of the certificate.

Use of water from the well, as allowed herein, shall be controlled or shut off if the well displays:

(A) An average water level decline of three or more feet per year for five consecutive years; or

(B) A total water level decline of fifteen or more feet; or

(C) A hydraulic interference decline of fifteen or more feet in any neighboring well providing water for senior exempt uses or wells covered by prior rights.

The water user shall install a meter or other measuring device suitable to the Director, and shall submit an annual report of water used to the Department by December 1 of each year.

The water user shall be responsible for complying with each of the following requirements for measuring water levels in the well.

(A) Use of water from a new well shall not begin until an initial static water level in the well has been measured and submitted to the Department.

(B) In addition to the measurement required in subsection (a) of this section, a water level measurement shall be made each year during the period March 1 through March 31.

(C) All water level measurements shall be made by a qualified individual. Qualified individuals are certified water rights examiners, registered geologists, registered professional engineers, licensed land surveyors, licensed water well constructor, licensed pump installer, or the water user.

(D) Any qualified individual measuring a well shall use standard methods of procedure and equipment designed for the purpose of well measurement. The equipment used shall be well suited to the conditions of construction at the well. A list of standard methods of procedure and suitable equipment shall be available from the Department.

(E) The water user shall submit a record of the measurement to the Department on a form available from the Department. The record of measurement shall include both measurements and calculations, shall include a certification as to their accuracy signed by the individual making the measurements, and shall be submitted to the Department within 90 days from the date of measurement. The Department shall determine when any of the declines cited in section (1) are evidenced by the well measurement required in section (3).

The well shall be maintained in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a useable access port, and may also include an air line and pressure gauge adequate to determine water level elevation in the well at all times.

The Director may require water level or pump test results every ten years.

Failure to comply with any of the provisions of this right may result in action including, but not limited to, restrictions on the use, civil penalties, or cancellation of the right.

This right is for the beneficial use of water without waste. The water user is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

The right to the use of the water for the above purpose is restricted to beneficial use on the place of use described.

Issued OCT 24 2014.

Dwight French
Water Right Services Division Administrator, for
Thomas M. Byler, Director
Oregon Water Resources Department

STATE OF OREGON

COUNTY OF CLACKAMAS

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

SOUTHWOCD PARK WATER DISTRICT
PO BOX 5908 (503)649-1834
BEAVERTCN, OREGON 97036 -0908

The specific limits for the use are listed below along with conditions of use:

APPLICATION FILE NUMBER: G-13768

SOURCE CF WATER: A WELL IN TUALATIN RIVER BASIN

PURPOSE OR USE: DOMESTIC USE FOR UP TO 300 HOUSEHOLDS

MAXIMUM RATE: 1.05 CUBIC FEET PER SECOND

PERIOD CF USE: WATER MAY BE APPROPRIATED FOR DOMESTIC USE YEAR ROUND.

DATE OF PRIORITY: AUGUST 11, 1994

POINT OF DIVERSION LOCATION: NW 1/4 NW 1/4, SECTION 6, T2S, R1E, W.M.; 44 FEET SOUTH AND 73 FEET WEST FROM THE W 1/16 CORNER OF SECTION 6

THE PLACE OF USE IS LOCATED AS FOLLOWS:

NW 1/4 NW 1/4
SW 1/4 NW 1/4
SECTION 6
TOWNSHIP 2 SOUTH, RANGE 1 EAST, W.M.

Measurement, recording and reporting conditions:

A. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director. The permittee shall maintain the meter or measuring device in good working order, shall keep a complete record of the amount of water used each month and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water use information, including the place and nature of use of water under the permit.

B. The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

Use of water from the well, as allowed herein, shall be controlled or shut off if the well displays:

(A) An average water level decline of three or more feet per year for five consecutive years; or

(B) A total water level decline of fifteen or more feet; or

(C) A hydraulic interference decline of fifteen or more feet in any neighboring well providing water for senior exempt uses or wells covered by prior rights.

The water user shall install a meter or other measuring device suitable to the Director, and shall submit an annual report of water used to the Department by December 1 of each year.

The permittee/appropriator shall be responsible for complying with each of the following requirements for measuring water levels in the well.

(A) Use of water from a new well shall not begin until an initial static water level in the well has been measured and submitted to the Department.

(B) In addition to the measurement required in subsection (a) of this section, a water level measurement shall be made each year during the period March 1 through March 31.

(C) All water level measurements shall be made by a qualified individual. Qualified individuals are certified water rights examiners, registered geologists, registered professional engineers, licensed land surveyors, licensed water well constructor, licensed pump installer, or the permittee/appropriator.

(D) Any qualified individual measuring a well shall use standard methods of procedure and equipment designed for the purpose of well measurement. The equipment used shall be well suited to the conditions of construction at the well. A list of standard methods of procedure and suitable equipment shall be available from the Department.

(E) The permittee/appropriator shall submit a record of the measurement to the Department on a form available from the Department. The record of measurement shall include both measurements and calculations, shall include a certification as to their accuracy signed by the individual making the measurements, and shall be submitted to the Department within 90 days from the date of measurement. The Department shall determine when any of the declines cited in section (1) are evidenced by the well measurement required in section (3).

STANDARD CONDITIONS

The wells shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge adequate to determine water level elevation in the well at all times.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

Prior to receiving a certificate of water right, the permit holder shall submit the results of a pump test meeting the department's standards, to the Water Resources Department. The Director may require water level or pump test results every ten years thereafter.

Failure to comply with any of the provisions of this permit may result in action including, but not limited to, restrictions on the use, civil penalties, or cancellation of the permit.

This permit is for the beneficial use of water without waste. The water user is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

The Director finds that the proposed use(s) of water described by this permit, as conditioned, will not impair or be detrimental to the public interest.

SEE NEXT PAGE

Actual construction of the well shall begin within one year from permit issuance and shall be completed on or before October 1, 1998. Complete application of the water to the use shall be made on or before October 1, 1999.

Issued September 30, 1996

Martha O. Pagel, Director
Water Resources Department

PHONE 649-5563 DAY OR NIGHT

A. M. JANNSEN WELL DRILLING CO. INC.

21075 S.W. Tualatin Valley Highway
ALOHA, OREGON 97006

Clac
52290

RECEIVED
AUG 11 1994
WATER RESOURCES DEPT.
SALEM, OREGON

November 9, 1993

Application No. G13768
Permit No.

James R. Miller
12918 SW 63RD Place
Portland, OR 97219

Below is a copy of our card file which we have regarding the mentioned well per our telephone conversation.

Respectfully,
Annette Buck
Annette Buck, Office Manager

KETELL CONSTRUCTION CO. MAP #248 Started April 1954
Portland, Ore. Machine # ~~20~~ 2 24
Location: Tigard, Ore. Drillers F. Gaunt
W. Jannsen

0-31 ft top soil, clay and boulders
31 to 55 hard gray rock
55-61 softer gray rock
61-93 hard gray rock
93-367 clay varying layers of red, gray, etc.
367-485 rotten rock, got solid about 450 ft.
485-600 hard rock with soft streaks
Casing 450'3" of 12" diameter ID

600-610 broken rock
610-672 hard gray rock
672-721 black rock
721-748 hard gray rock
748-761 hard and soft rock layers
761-794 hard gray rock
794-797 soft rock water bearing
797-804 hard gray rock
804-833 black porus lava rock water bearing
833-838 hard gray rock
Static water level 195 ft below surface
tested to 470 gpm at 310 ft below surface
casing 450'3" of 12"I.D.P.E. shoe

2S-1E-6

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix K
Groundwater Level Data

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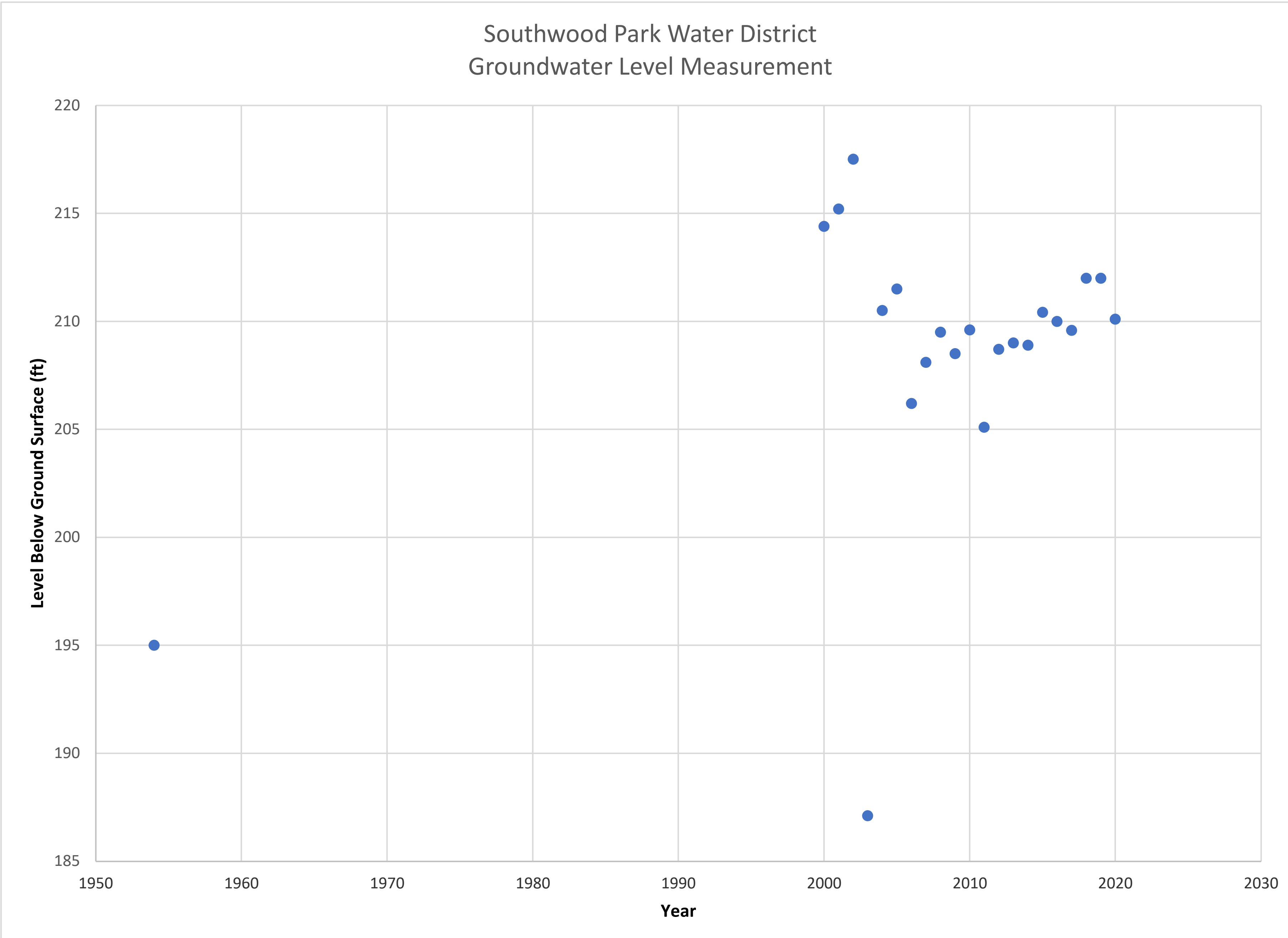
Southwood Park Water District
Groundwater Level Measurement
Level Below Ground Surface (ft)
220
215
210
205
200
195
190
185
1950
1960
1970
1980
1990
2000
2010
2020
2030
Year

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix L
Water Use Reports
Oregon Water Resource District

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Entity Water Use Report

excel
text

SOUTHWOOD PARK WATER DISTRICT

Records per page: 11

Water Year*	Report ID	Facility	Acre-feet (AF) of Water Used Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total Water Used	Irrigated Acres
2023	33051	A WELL (CLAC 52290)	5.85	5.75	4.43	4.43	3.67	3.65	4.60	5.06	7.00	8.61	9.19	7.35	69.59	
2022	33051	A WELL (CLAC 52290)	5.48	4.25	3.19	3.57	3.57	3.83	3.83	3.42	3.42	5.69	5.69	9.53	55.46	
2021	33051	A WELL (CLAC 52290)	5.75	7.56	1.08	4.19	3.03	3.96	4.25	5.45	5.18	7.57	9.68	4.89	62.59	
2020	33051	A WELL (CLAC 52290)	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.08	0.08	0.06	0.58	
2019	33051	A WELL (CLAC 52290)	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.05	0.07	0.07	0.07	0.04	0.56	
2018	33051	A WELL (CLAC 52290)	5.36	4.87	5.27	5.18	4.62	5.16	5.15	6.71	7.31	9.67	7.78	5.35	72.44	
2017	33051	A WELL (CLAC 52290)	5.42	6.61	5.67	5.98	4.87	5.52	5.78	6.21	7.92	10.51	10.08	7.08	81.67	
2016	33051	A WELL (CLAC 52290)	5.59	5.03	4.82	4.73	4.69	5.26	5.57	6.14	8.03	8.55	9.81	6.22	74.45	
2015	33051	A WELL (CLAC 52290)	5.36	4.01	5.02	5.12	4.76	5.30	5.49	6.94	10.80	10.27	8.81	6.66	78.54	
2014	33051	A WELL (CLAC 52290)	5.58	5.55	5.82	6.26	4.83	5.42	5.25	5.83	6.02	8.13	7.57	7.74	74.00	
2013	33051	A WELL (CLAC 52290)	5.60	4.85	4.98	4.93	4.55	5.36	4.97	5.94	6.10	7.61	9.25	7.09	71.24	

1 2

*The water year is named for the calendar year in which it ends. Example: the 2014 water year begins Oct. 1, 2013 and ends Sep. 30, 2014.

- Monthly amounts indicate:
    - For diverted rights, the total amount diverted during the month;
    - For storage rights, the amount generally stored in the reservoir/pond during the month, as represented by the volume of water impounded on approximately the same day each month.
- Water Use amounts have all been converted to "acre-feet" (AF), regardless of the original measurement unit reported. One AF is the volume of water that will cover an acre of ground one foot deep = 325,850 gallons.
- Zeroes indicate that a report was received, stating that no water was used during those months; if a year is not listed, no report of water use was received for that year

Southwood Park Water District
Production/Consumption Values from 2015-2022
Jul-24

			2015					2016		
	Prod (gal)	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**	**Prod (gal)**	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**
Jan										
Feb	3,165,540	2,455,020		710,520	22.45%	599,150	2,412,790		1,813,640	
Mar										
Apr	3,521,580	2,613,350	43,200	865,030	24.56%	3,570,950	2,757,400	43,200	770,350	21.57%
May										
Jun	5,040,020	3,659,910		1,380,110	27.38%	3,950,190	2,989,150		961,040	24.33%
Jul							6,130			
Aug	6,578,660	5,664,830		913,830	13.89%	5,723,700	4,499,850	13,100	1,210,750	21.15%
Sept										
Oct	4,271,080	3,686,610	43,200	541,270	12.67%	4,988,410	4,064,250	13,100	911,060	18.26%
Nov		7,630								
Dec	3,725,790	2,838,360		887,430	23.82%	3,971,880	2,440,450	13,100	1,518,330	38.23%
Total	**26,302,670**	**20,925,710**	**86,400**	**5,298,190**	**20.14%**	**22,804,280**	**19,170,020**	**82,500**	**7,185,170**	**31.51%**

			2017					2018		
	Prod (gal)	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**	**Prod (gal)**	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**
Jan							3,440			
Feb	3,469,970	2,507,040	13,100	949,830	27.37%	3,451,270	2,446,070	13,100	992,100	28.75%
Mar										
Apr	3,748,230	2,430,170	13,100	1,304,960	34.82%	3,151,320	2,127,080	108,370	915,870	29.06%
May						13,100			13,100	
Jun	3,870,150	2,847,080	13,100	1,009,970	26.10%	4,253,130	3,236,750	13,100	1,003,280	23.59%
Jul										
Aug	6,096,950	4,948,830	13,100	1,135,020	18.62%	6,048,330	5,445,700	13,100	589,530	9.75%
Sept										
Oct	5,049,750	4,011,360	13,100	1,025,290	20.30%	3,197,700	3,086,530	10,300	100,870	3.15%
Nov										
Dec	3,200,690	2,445,140	13,100	742,450	23.20%	2,331,520	2,312,590	13,100	5,830	0.25%
Total	**25,435,740**	**19,189,620**	**78,600**	**6,167,520**	**24.25%**	**22,446,370**	**18,658,160**	**171,070**	**3,620,580**	**16.13%**

			2019					2020		
	Prod (gal)	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**	**Prod (gal)**	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**
Jan										
Feb	2,571,620	2,427,910	13,100	130,610	5.08%	2,577,610	2,652,000	13,100	-87,490	-3.39%
Mar	13,100			13,100						
Apr	2,319,550	2,156,570	13,100	149,880	6.46%	2,733,940	2,587,850	13,100	132,990	4.86%
May										
Jun	5,767,080	3,358,450		2,408,630	41.77%	2,765,360	2,669,010		96,350	3.48%
Jul										
Aug	4,333,160	4,201,350	13	131,797	3.04%	4,979,440	4,837,820	13,100	128,520	2.58%
Sept										
Oct	3,233,600	3,068,620	13,100	151,800	4.69%	3,966,640	3,845,180	13,100	108,360	2.73%
Nov										
Dec	2,315,810	2,344,130	13,100	-41,420	-1.79%	2,564,140	2,455,260	13,100	95,780	3.74%
Total	**20,553,920**	**17,557,030**	**52,413**	**2,944,397**	**14.33%**	**19,587,130**	**19,047,120**	**65,500**	**474,510**	**2.42%**

			2021					2022		
	Prod (gal)	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**	**Prod (gal)**	**Cons (gal)**	**Other (gal)**	**Loss (gal)**	**Loss (%)**
Jan										
Feb	2,425,020	2,344,890	13,100	67,030	2.76%	2,324,040	2,405,950	13,100	-95,010	-4.09%
Mar										
Apr	2,718,890	2,580,680		138,300	5.09%	2,493,830	2,403,920	13,100	76,810	3.08%
May										
Jun	3,816,300	3,702,590	13,100	100,610	2.64%	2,974,050	2,691,050	13,100	269,900	9.08%
Jul										
Aug	5,193,360	5,029,340	13,100	150,920	2.91%	4,458,080	4,401,020	13,100	43,960	0.99%
Sept										
Oct	3,573,940	3,517,420	13,100	43,420	1.21%	4,476,030	4,462,230	13,100	700	0.02%
Nov										
Dec	2,425,020	2,385,760	13,100	26,160	1.08%	2,626,230	2,615,340	13,100	-2,210	-0.08%
Total	**20,152,530**	**19,560,680**	**65,500**	**526,440**	**2.61%**	**19,352,260**	**18,979,510**	**78,600**	**294,150**	**1.52%**

Indicates an error

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix M
Water Quality Data/Reports
Oregon Healthy Authority

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OHA Drinking Water Services

PWS ID: 00638 ---- SOUTHWOOD PARK WATER DISTRICT

Lead & Copper Summary Results

Lead and Copper Compliance Actions
- No lead and copper schedules found.

Lead and copper results shown are the 90th percentile summary results. See all detailed results.
Consumer notice date is the date water customers were notified of their tap results. Consumer notice records are not available prior to 2016.

Action Levels: Lead = 0.015 mg/L; Copper = 1.3 mg/L. Action level exceedances are indicated with **bold red text**.

Sample Dates	Date Received	Sample Count	Duration	Lead (mg/L)	Copper (mg/L)	Consumer Notice Date
Aug 17, 2021 - Aug 19, 2021	Sep 22, 2021	11	3Y	0.0030	0.0570	09/15/2021
Sep 10, 2018 - Sep 13, 2018	Nov 10, 2018	10	3Y	0.0040	0.1390	10/15/2018
Jul 10, 2015 - Sep 25, 2015	Nov 10, 2015	11	3Y	0.0020	0.0510	
Sep 17, 2012 - Sep 20, 2012	Oct 10, 2012	11	3Y	0.0020	0.0690	
Sep 09, 2009 - Sep 11, 2009	Oct 19, 2009	10	3Y	0.0100	0.1600	
Sep 12, 2006 - Sep 15, 2006		10	3Y	0.0000	0.0800	
Sep 06, 2003 - Sep 11, 2003	Oct 07, 2003	11	3Y	0.0050	0.1000	
Jan 01, 1999 - Sep 15, 2000	Jul 03, 2001	10	3Y	0.0030	0.0900	
Jan 01, 1997 - Sep 08, 1997	Dec 05, 1997	10	YR	0.0050	0.1000	
Jan 01, 1996 - Sep 20, 1996	Oct 22, 1996	10	YR	0.0140	0.1100	
Jan 01, 1995 - Aug 03, 1995	Nov 07, 1995	10	YR	0.0030	0.0800	
Jan 01, 1994 - Jun 28, 1994	Aug 03, 1994	20	6M	0.0050	0.1000	
Jul 01, 1993 - Dec 08, 1993	Jan 11, 1994	20	6M	0.0060	0.1200	

OHA Drinking Water Services

PWS ID: 00638 ---- SOUTHWOOD PARK WATER DISTRICT

Water Quality Alerts

Use the "Download" button to export the data to an Excel file.

- **Customization:** Use the "Columns" button to select which columns to display. Use the "Search records" box, column heading dropdowns, and date inputs to filter results. Click column headings to sort ascending or descending. Drag column headings to rearrange. Note: hidden data will not be exported.
- **MCL** = Maximum Contaminant Level. Results for MCL exceedances, *E. coli* positives, and lead and copper 90th percentile action level exceedances are shown in **bold red** text.

Alert Date Range: From 01/01/1993 to 01/25/2024

Reset ▼ Columns ▼ Download ▼

Search records

Showing 1 to 23 of 23 records (filtered from 24 total records)

Alert Type	Alert ID	Sample Date	Alert Date	Contact Report	Location	Analyte	Result	Current Alert Level	Current MCL	Units	Sample Type
Notice - Sodium	**CHEM9900**	08/22/2022	09/19/2022		EP-A	SODIUM	30.5	20		MG/L	
Notice - Sodium	**CHEM8713**	10/08/2019	11/26/2019		EP-A	SODIUM	31.2	20		MG/L	
Notice - Source	**COLI17740**	04/04/2018	04/05/2018		SRC-AA	COLIFORM, TOTAL (TCR)	Present	Present			Assessment
VOC	**CHEM4072**	03/23/2010	05/18/2010	05/25/2010	EP-A	XYLENES	0.0021	0.0005	10	MG/L	
Notice - Sodium	**CHEM4072**	04/09/2010	05/18/2010	05/25/2010	EP-A	SODIUM	46.6	20		MG/L	
TCR	**COLI465**	08/05/2003	08/12/2003		DIST-A	COLIFORM, TOTAL (TCR)	Present	Present			Routine
TCR	**COLI65**	02/04/2003	02/12/2003		DIST-A	COLIFORM, TOTAL (TCR)	Present	Present			Routine
IOC	***ARCHIVE***	*10/17/2001*	*11/23/2001*		*A*	*SODIUM*	*32.9*	*20*		*MG/L*	
VOC	***ARCHIVE***	*10/17/2001*	*11/23/2001*		*A*	*XYLENES*	*0.0016*	*0.0005*	*10*	*MG/L*	
TCR	***ARCHIVE***	*10/01/2001*	*10/09/2001*			*COLIFORM, TOTAL (TCR)*	*Present*	*Present*			*Routine*
IOC	***ARCHIVE***	*12/07/1999*	*10/25/2000*		*AA*	*SODIUM*	*31.2*	*20*		*MG/L*	
IOC	***ARCHIVE***	*10/24/1997*	*12/05/1997*		*A*	*SODIUM*	*32.1*	*20*		*MG/L*	
VOC	***ARCHIVE***	*10/24/1997*	*12/05/1997*		*A*	*XYLENES*	*0.0045*	*0.0005*	*10*	*MG/L*	
VOC	***ARCHIVE***	*10/24/1997*	*12/05/1997*		*A*	*TOLUENE*	*0.0014*	*0.0005*	*1*	*MG/L*	
VOC	***ARCHIVE***	*10/24/1997*	*12/05/1997*		*A*	*ETHYLBENZENE*	*0.0008*	*0.0005*	*0.7*	*MG/L*	
TCR	***ARCHIVE***	*02/15/1996*	*02/28/1996*			*COLIFORM, TOTAL (TCR)*	*Present*	*Present*			*Routine*
IOC	***ARCHIVE***	*03/22/1993*	*03/02/1994*		*AA*	*SODIUM*	*38.3*	*20*		*MG/L*	
TCR	***ARCHIVE***	*11/23/1993*	*01/04/1994*			*COLIFORM, TOTAL (TCR)*	*Present*	*Present*			*Routine*

Show 25 records Previous 1 Next

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix N
Fire Protection Requirements

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APPENDIX B
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are adopted by the State of Oregon.

User note:

About this appendix: *Appendix B provides a tool for the use of jurisdictions in establishing a policy for determining fire-flow requirements in accordance with Section 507.3. The determination of required fire flow is not an exact science, but having some level of information provides a consistent way of choosing the appropriate fire flow for buildings throughout a jurisdiction. The primary tool used in this appendix is a table that presents fire flow based on construction type and building area based on the correlation of the Insurance Services Office (ISO) method and the construction types used in the International Building Code®.*

The availability of water is essential for fire fighting operations. The amount of water required to fight a fire depends on many things, including the type of construction, the location of the fire, the contents of the building, response time and the capabilities of the fire department. Limiting the maximum fire flow to 3,000 gallons per minute provides local water purveyors with a predictable and cost-effective method to forecast infrastructure expenditures and can serve to lessen local fire services' apparatus capital expenditures.

SECTION B101
GENERAL

B101.1 Scope.

The procedure for determining *fire-flow* requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix and as required by the *fire code official*. This appendix does not apply to structures other than buildings.

B101.2 Protected areas.

The provisions of Section B105 are intended for use by the *fire code official* in *protected areas* in which adequate and reliable water systems exist. Refer to Section B106 for additional alternative provisions regarding limiting *fire flows*. Refer to Section B107 *fire flow* for buildings in *protected areas* without adequate and reliable water systems.

SECTION B102
DEFINITIONS

B102.1 Definitions.

For the purpose of this appendix, certain terms are defined as follows:

FIRE FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required *fire flow*.

PROTECTED AREAS. Geographic areas where a service or an agency has been established for the purpose of providing fire suppression services for buildings and other structures. Examples of agencies typically include public fire departments, rural fire protection districts and private fire protection services.

UNPROTECTED AREAS. Geographic areas where no organized service or agency exists to provide fire suppression services for buildings and other structures. Examples of *unprotected areas* typically include areas where wildland fire protection is provided by federal (USFS, BLM, BIA, etc.), state (ODF), or regional (forest protection associations) organizations and other areas that are generally in remote or rural isolated areas where no structural fire protection service is present.

SECTION B103
MODIFICATIONS

B103.1 Decreases.

The *fire code official* is authorized to reduce the *fire flow* where the development of full *fire-flow* requirements is impractical based on, but not limited to, the following: type of occupancy, type of construction, location on property, floor area, height and number of stories, yards as defined by the *International Building Code*, fire walls and the fire-fighting capabilities of the jurisdiction.

B103.2 Increases.

The *fire code official* is authorized to increase the *fire-flow* requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall be not more than twice that required for the building under consideration.

B103.3 Limiting.

The *fire code official* is authorized to limit the maximum required *fire flow* based on, but not limited to, the fire-fighting capabilities of the jurisdiction. *Fire-flow* limitations shall be in accordance with Section B106, which are in addition to the *fire-flow* requirements as specified in Section B105.

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General.

The *fire-flow calculation area* shall be the total floor area of all floor levels within the *exterior walls*, and under the horizontal projections of the roof of a building, except as modified in Sections B104.2 and B104.3.

B104.2 Area separation.

Portions of buildings that are separated by *fire walls* constructed in accordance with the *International Building Code* are allowed to be considered as separate *fire-flow calculation areas*.

B104.3 Type IA and Type IB construction.

The *fire-flow calculation area* of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: *Fire-flow calculation area* for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR
BUILDINGS IN PROTECTED AREAS WITH
ADEQUATE AND RELIABLE WATER SYSTEMS

B105.1 One- and two-family dwellings, Group R-3 and R-4 buildings and townhouses.

The minimum *fire-flow* and flow duration requirements for one- and two-family *dwellings*, Group R-3 and R-4 buildings and *townhouses* shall be as specified in Tables B105.1(1) and B105.1(2).

Exception: Where there is not more than one each of Group R, Division 3 and Group U occupancies or agricultural buildings, as defined by Oregon Revised Statute (ORS) 455.315, on a single parcel of not less than 1 acre, the requirements of this section may be modified provided that the occupancy does not require a *fire flow* in excess of 1,500 gallons per minute (5678 L/min) and in the opinion of the *fire code official*, fire-fighting or rescue operations would not be impaired.

TABLE B105.1(1)
REQUIRED *FIRE FLOW* FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required *fire-flow* rate
0–3,600	Section 903.3.1.3 of the *International Fire Code* or Appendix T of the *Oregon Residential Specialty Code*	500	$^{1}/_{2}$
3,601 and greater	Section 903.3.1.3 of the *International Fire Code* or Appendix T of the *Oregon Residential Specialty Code*	$^{1}/_{2}$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.

b. Measured at 20 psi residual pressure.

TABLE B105.2
REQUIRED FIRE FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the *International Fire Code*	25% of the value in Table B105.1(2)[a]	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the *International Fire Code*	25% of the value in Table B105.1(2)[b]	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.

a. The reduced fire flow shall be not less than 1,000 gallons per minute.

b. The reduced fire flow shall be not less than 1,500 gallons per minute.

B105.3 Water supply for buildings equipped with an automatic sprinkler system.

For buildings equipped with an *approved automatic sprinkler system*, the water supply shall be capable of providing the greater of:

1. The *automatic sprinkler system* demand, including hose stream allowance.
2. The required *fire flow*.

SECTION B106
LIMITING FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITH ADEQUATE AND RELIABLE WATER SYSTEMS

B106.1 General.

The provisions of Section B106 are intended for use by the *fire code official* in addition to the provisions specified in Section B105 as authorized by Section B103.3. This section is intended to apply in *protected areas* in which adequate and reliable water systems exist.

B106.2 Limiting required *fire flow*.

No building shall be constructed, altered, enlarged, moved or repaired in a manner that, by reason of size, type of construction, number of stories, occupancy, or any combination thereof, creates a need for a *fire flow* in excess of 3,000 gallons per minute (11 356 L/min) at 20 pounds per square inch (138 kPa) residual pressure, as specified in Table B105.2, or exceeds the available *fire flow* at the site of the structure.

> **Exception:** *Fire-flow* requirements in excess of 3,000 gallons per minute (11 356 L/min) may be allowed if, in the opinion of the *fire code official*, all reasonable methods of reducing the *fire flow* have been included within the development and no unusual hazard to life and property exists.

B106.3 Existing buildings.

Existing buildings, regardless of the time of construction, that require a *fire flow* in excess of 3,000 gallons per minute (11 356 L/min) are not required to comply with the *fire-flow* requirements of this section. Additionally, changes in use or occupancy, alterations, or repairs, shall not necessitate further increases in the required *fire flow*. Additions to the building shall not require a *fire flow* in excess of 3,000 gallons per minute (11 356 L/min).

SECTION B107
FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITHOUT ADEQUATE AND RELIABLE WATER SYSTEMS

B107.1 Areas without water supply systems.

The provisions of Section B107 are intended for use by the *fire code official* in *protected areas* in which adequate and reliable water supply systems do not exist. In determining the *fire flow* for buildings, the *fire code official* is authorized to utilize the following nationally recognized standards: NFPA 1142, the *International Wildland-Urban Interface Code* or the *ISO Guide for Determining Needed Fire Flow*.

SECTION B108
FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN UNPROTECTED AREAS
(RESERVED)

SECTION B109
REFERENCED STANDARDS

ICC	IBC—18	International Building Code	B103.1, B104.2
ICC	IFC—18	International Fire Code	B105.3
ICC	IWUIC—18	International Wildland-Urban Interface Code	B107.1
ICC	IRC—18	International Residential Code	Table B105.1(1)
ISO	06—2014	Guide for Determining Needed Fire Flow	B107.1
NFPA	13—16	Standard for the Installation of Sprinkler Systems	B105.2.1, B105.3
NFPA	13D—16	Standard for the Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes	B105.2.1.1
NFPA	13R—16	Standard for the Installation of Sprinkler Systems in Low-rise Residential Occupancies	B105.2.1.1
NFPA	72—16	National Fire Alarm and Signaling Code	B105.2.1.2
NFPA	1142—17	Standard on Water Supplies for Suburban and Rural Fire Fighting	B107.1

APPENDIX C
FIRE HYDRANT LOCATIONS AND DISTRIBUTION

The provisions contained in this appendix are adopted by the State of Oregon.

User note:

About this appendix: *Appendix C focuses on the location and spacing of fire hydrants, which is important to the success of fire-fighting operations. The difficulty with determining the spacing of fire hydrants is that every situation is unique and has unique challenges. Finding one methodology for determining hydrant spacing is difficult. This particular appendix gives one methodology based on the required fire flow that fire departments can work with to set a policy for hydrant distribution around new buildings and facilities in conjunction with Section 507.5.*

SECTION C101
GENERAL

C101.1 Scope.

In addition to the requirements of Section 507.5.1, fire hydrants shall be provided in accordance with this appendix for the protection of buildings, or portions of buildings, hereafter constructed or moved into the jurisdiction.

SECTION C102
NUMBER OF FIRE HYDRANTS

C102.1 Minimum number of fire hydrants for a building.

The number of fire hydrants available to a building shall be not less than the minimum specified in Table C102.1.

TABLE C102.1
REQUIRED NUMBER AND SPACING OF FIRE HYDRANTS[h]

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS[a, b, c, f, g] (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT[d, f, g]
1,750 or less	1	500	250
1,751–2,250	2	450	225
2,251–2,750	3	450	225
2,751–3,250	3	400	225
3,251–4,000	4	350	210
4,001–5,000	5	300	180
5,001–5,500	6	300	180
5,501–6,000	6	250	150
6,001–7,000	7	250	150
7,001 or more	8 or more[e]	200	120

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

a. Reduce by 100 feet for dead-end streets or roads.

b. Where streets are provided with median dividers that cannot be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis.

c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.

d. Reduce by 50 feet for dead-end streets or roads.

e. One hydrant for each 1,000 gallons per minute or fraction thereof.

f. A 50-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 of the *International Fire Code*.

g. A 25-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2 or 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*.

h. The fire code official is authorized to modify the location, number and distribution of fire hydrants based on site-specific constraints and hazards.

User note:

Previous editions of Table C102.1 had large gaps between *fire-flow* requirements. These gaps provided the *fire code official* with discretion based on site-specific considerations. “Note h” provides that same discretion based on the jurisdiction’s determination that conditions particular to a location justify either an increase or a decrease in the number of hydrants, or a change in their arrangement. Any decreases in the general fire protection scheme should take into account possible future development that may occur.

SECTION C103
FIRE HYDRANT SPACING

C103.1 Hydrant spacing.

Fire apparatus access roads and public streets providing required access to buildings in accordance with Section 503 shall be provided with one or more fire hydrants, as determined by Section C102.1. Where more than one fire hydrant is required, the distance between required fire hydrants shall be in accordance with Sections C103.2 and C103.3.

C103.2 Average spacing.

The average spacing between fire hydrants shall be in accordance with Table C102.1.

> **Exception:** The average spacing shall be permitted to be increased by 10 percent where existing fire hydrants provide all or a portion of the required number of fire hydrants.

C103.3 Maximum spacing.

The maximum spacing between fire hydrants shall be in accordance with Table C102.1.

SECTION C104
CONSIDERATION OF EXISTING FIRE HYDRANTS

C104.1 Existing fire hydrants.

Existing fire hydrants on public streets are allowed to be considered as available to meet the requirements of Sections C102 and C103. Existing fire hydrants on adjacent properties are allowed to be considered as available to meet the requirements of Sections C102 and C103 provided that a fire apparatus access road extends between properties and that an easement is established to prevent obstruction of such roads.

SECTION C105
REFERENCED STANDARD

ICC	IRC—18	International Residential Code	Table C102.1

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix O
SPWD 2021-2024 Budget Documents

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FORM LB-1 **NOTICE OF BUDGET HEARING**

A public meeting of the Southwood Park Water District will be held on June 23, 2021 at 7:00 __am X pm at 12647 SW 62nd Ave., Portland, Oregon. The purpose of this meeting is to discuss the budget for the fiscal year beginning July 1, 2021 as approved by the Southwood Park Water District Budget Committee. A summary of the budget is presented below. A copy of the budget may be obtained by emailing the board chair at BYRDKELLI@GMAIL.COM. This budget is for an X annual __ biennial budget period. This budget was prepared on a basis of accounting that is X the same as __ different than the preceding year. If different, the major changes and their effect on the budget are:

Contact: Kelli Byrd Telephone: 503-706-1850 Email: BYRDKELLI@GMAIL.COM

FINANCIAL SUMMARY - RESOURCES

TOTAL OF ALL FUNDS	Actual Amount 2019 - 20	Adopted Budget This Year 2020 - 21	Approved Budget Next Year 2021 - 22
Beginning Fund Balance/Net Working Capital	113,880	132,100	160,000
Fees, Licenses, Permits, Fines, Assessments & Other Service Charges	101,044	104,000	106,100
Federal, State and all Other Grants, Gifts, Allocations and Donations			
Revenue from Bonds and Other Debt			
Interfund Transfers / Internal Service Reimbursements			
All Other Resources Except Current Year Property Taxes			
Current Year Property Taxes Estimated to be Received			
Total Resources	**214,924**	**236,100**	**266,100**

FINANCIAL SUMMARY - REQUIREMENTS BY OBJECT CLASSIFICATION

Personnel Services	0	0	0
Materials and Services	79,364	89,989	92,920
Capital Outlay	9,234	100,000	140,000
Debt Service			
Interfund Transfers			
Contingencies	0	1,200	1,200
Special Payments			
Unappropriated Ending Balance and Reserved for Future Expenditure	126,326	44,911	31,980
Total Requirements	**214,924**	**236,100**	**266,100**

PROPERTY TAX LEVIES - N/A

STATEMENT OF INDEBTEDNESS - N/A

150-504-073-2 (Rev. 02-14)

FORM LB-10

SPECIAL FUND
RESOURCES AND REQUIREMENTS

Water — Southwood Park Water District

(Fund) — (Name of Municipal Corporation)

	Historical Data			DESCRIPTION	Budget for Next Year 2021-2022			
	Actual							
	Second Preceding Year 18-19	First Preceding Year 19-20	Adopted Budget This Year 2020-21	RESOURCES AND REQUIREMENTS	Proposed By Budget Officer	Approved By Budget Committee	Adopted By Governing Body	
				RESOURCES				
1	100565	113880	132100	1. Cash on hand * (cash basis), or	160000	160000	160000	1
2				2. Working Capital (accrual basis)				2
3				3. Previously levied taxes estimated to be received				3
4	0	0		4. Interest				4
5				5. Transferred IN, from other funds				5
6	95161	101044	104000	6. Water Fees	106100	106100	106100	6
7				7				7
8				8				8
9	195726	214924	236100	9. Total Resources, except taxes to be levied	266100	266100	266100	9
10				10. Taxes estimated to be received				10
11				11. Taxes collected in year levied				11
12	**195726**	**214924**	**236100**	**12. TOTAL RESOURCES**	**266100**	**266100**	**266100**	12
				REQUIREMENTS **				
13	922	1855	4469	13 Office Expense Dues Website Education	5455	5455	5455	13
14	21655	18199	24000	14 Maintenance Repair	24000	24000	24000	14
15	15774	15583	15890	14 Professional Insurance Utilities	16575	16575	16575	15
16	1676	1740	2050	15 Election Meetings	2050	2050	2050	16
17	409	126	500	16 Water Purchase	500	500	500	17
18	36400	39900	41400	17 Contract Services	42540	42540	42540	18
19	2010	1960	1680	18 Contract Service Fees	1800	1800	1800	19
20	0	0	0	19 Water Testing	0	0	0	20
21				20				21
22	0	9234	100000	21 Capital Project	140000	140000	140000	22
23				22				23
24	0	0	1200	24 Operating Contingencies	1200	1200	1200	24
25				25				25
26				26				26
27	113880	126326		27. Ending balance (prior years)				27
28			44,911	28. **UNAPPROPRIATED ENDING FUND BALANCE**	31,980	31,980	31,980	28
29	**192726**	**214924**	**236100**	**29. TOTAL REQUIREMENTS**	**266,100**	**266,100**	**266,100**	29

*The balance of cash, cash equivalents and investments in the fund at the beginning of the budget year

**List requirements by organizational unit or program, activity, object classification, then expenditure detail. If the requirement is “not allocated”, then list by object classification and expenditure detail.

150-504-010 (Rev. 01-15)

FORM
LB-20

RESOURCES

Water

(Fund)

Southwood Park Water District

(Name of Municipal Corporation)

	Historical Data				Budget for Next Year 21-22			
	Actual							
	Second Preceding Year 18-19	First Preceding Year 19-20	Adopted Budget This Year 20-21	**RESOURCE DESCRIPTION**	Proposed By Budget Officer	Approved By Budget Committee	Adopted By Governing Body	
1	100565	113880	132100	1. Available cash on hand* (cash basis) or	160000	160000	160000	1
2				2. Net working capital (accrual basis)				2
3				3. Previously levied taxes estimated to be received				3
4	0	0	0	4. Interest	0	0	0	4
5				5. Transferred IN, from other funds				5
6				6 **OTHER RESOURCES**				6
7	95161	101044	104000	7. **Water Fees**	106100	106100	106100	7
8				8				8
9				9				9
10				10				10
11				11				11
12				12				12
13				13				13
14				14				14
15				15				15
16				16				16
17				17				17
18				18				18
19				19				19
20				20				20
21				21				21
22				22				22
23				23				23
24				24				24
25				25				25
26				26				26
27				27				27
28				28				28
29	195726	214924	236100	29. Total resources, except taxes to be levied	266100	266100	266100	29
30				30. Taxes estimated to be received				30
31				31. Taxes collected in year levied				31
32	**195726**	**214924**	**236100**	**32. TOTAL RESOURCES**	**266100**	**266100**	**266100**	**32**

*The balance of cash, cash equivalents and investments in the fund at the beginning of the budget year

REQUIREMENTS SUMMARY

FORM LB-30

NOT ALLOCATED TO AN ORGANIZATIONAL UNIT OR PROGRAM

Water

(name of fund)

	Historical Data			REQUIREMENTS DESCRIPTION	Budget For Next Year 2021-22			
	Actual		Adopted Budget					
	Second Preceding Year 2018-19	First Preceding Year 2019-20	This Year 2020-21		Proposed By Budget Officer	Approved By Budget Committee	Adopted By Governing Body	
				PERSONNEL SERVICES NOT ALLOCATED				
1				1				1
2				2				2
3	**0**	**0**	**0**	**3 TOTAL PERSONNEL SERVICES**	**0**	**0**	**0**	**3**
4	**0**	**0**	**0**	**Total Full-Time Equivalent (FTE)**	**0**	**0**	**0**	**4**
				MATERIALS AND SERVICES NOT ALLOCATED				
5	64,024	60,185	67,580	5 Repairs Contract Services Fees Water Purchase	68,840	68,840	68,840	5
6	17,822	19,178	22,409	6 Office Professional Insurance Utilities Meetings	24,080	24,080	24,080	6
7	**81,846**	**79,363**	**89,989**	**7 TOTAL MATERIALS AND SERVICES**	**92,920**	**92,920**	**92,920**	**7**
				CAPITAL OUTLAY NOT ALLOCATED				
8	0	9,234	100,000	8 Capital Project	140,000	140,000	140,000	8
9				9				9
10	**0**	**9,234**	**100,000**	**10 TOTAL CAPITAL OUTLAY**	**140,000**	**140,000**	**140,000**	**10**
				DEBT SERVICE				
11				11				11
12				12				12
13	**0**	**0**	**0**	**13 TOTAL DEBT SERVICE**	**0**	**0**	**0**	**13**
				SPECIAL PAYMENTS				
14				14				14
15				15				15
16	**0**	**0**	**0**	**16 TOTAL SPECIAL PAYMENTS**	**0**	**0**	**0**	**16**
				INTERFUND TRANSFERS				
17				17				17
18				18				18
19				19				19
20				20				20
21				21				21
22	**0**	**0**	**0**	**22 TOTAL INTERFUND TRANSFERS**	**0**	**0**	**0**	22
				OPERATING CONTINGENCY				
23	0	0	1,200	**23 TOTAL OPERATING CONTINGENCY**	1,200	1,200	1,200	23
24	81,846	88,598	191,189	**24 Total Requirements Not Allocated**	234,120	234,120	234,120	24
25				**25 Total Org./Prog. Requirements**				25
26				**26 Reserved for future expenditure**				26
27	113,880	126,326		27 Ending balance (prior years)				27
28			44,911	**28 UNAPPROPRIATED ENDING FUND BALANCE**	31,980	31,980	31,980	28
29	**195,726**	**214,924**	**236,100**	**29 TOTAL REQUIREMENTS**	**266,100**	**266,100**	**266,100**	**29**

150-504-030 (Rev 10/14)

DETAILED REQUIREMENTS

FORM
LB-31

Southwood Park Water District
Water

	Historical Data			REQUIREMENTS FOR: Water Fund	Budget for Next Year 2021-2022			
	Actual		Adopted Budget					
	Second Preceding Year 18-19	First Preceding Year 19-20	This Year 2020-21		Proposed by Budget Officer	Approved by Budget Committee	Adopted by Governing Body	
1	0	0	1200	1 Contingencies	1200	1200	1200	1
2	39400	39900	41400	2 Contract Services	42540	42540	42540	2
3	2010	1960	1680	3 Contract Service Fees	1800	1800	1800	3
4			425	4 Association Dues	355	355	355	4
5	2504	2962	3000	5 Insurance	3500	3500	3500	5
6	1530	1740	2050	6 Meeting Expense	2050	2050	2050	6
7			3000	7 Education - Conferences	3000	3000	3000	7
8	373	0	0	8 Miscellaneous	0	0	0	8
9	550	1855	444	9 Office Expense	1500	1500	1500	9
10	5100	5100	5340	10 Professional Fees	5340	5340	5340	10
11	21655	18199	24000	11 Repairs	24000	24000	24000	11
12	8170	7521	7550	12 Utilities	7735	7735	7735	12
13	409	126	500	13 Water Purchase	500	500	500	13
14	0	0	0	14 Water Testing	0	0	0	14
15	145	0	0	15 Election	0	0	0	15
16			600	16 Website	600	600	600	16
17	0	9234	100000	17 Capital Projects	140000	140000	140000	17
18				18				18
19				19				19
20				20				20
21				21				21
22				22				22
23				23				23
24				24				24
25				25				25
26				26				26
27				27				27
28				28				28
29				29				29
30				30 Total Full Time Equivalent (FTE)*				30
31	113880	126326		31 Ending balance (prior years)				31
32			44,911	**32 UNAPPROPRIATED ENDING FUND BALANCE**	31,980	31,980	31,980	32
33	**195726**	**214924**	**236100**	**33 TOTAL REQUIREMENTS**	**266,100**	**266,100**	**266,100**	**33**

150-504-031 (Rev 03-15)

* When budgeting for Personnel Services Expenditures, include number of related full time equivalent positions

FORM LB-1 — NOTICE OF BUDGET HEARING

A public meeting of the Southwood Park Water District will be held on June 29, 2022 at 7:00 __am X pm at 12647 SW 62nd Ave., Portland, Oregon. The purpose of this meeting is to discuss the budget for the fiscal year beginning July 1, 2022 as approved by the Southwood Park Water District Budget Committee. A summary of the budget is presented below. A copy of the budget may be obtained by emailing the board chair at SPWD.CHAIR@GMAIL.COM. This budget is for an __ annual X biennial budget period. This budget was prepared on a basis of accounting that is __ the same as X different than the preceding year. If different, the major changes and their effect on the budget are: The board has elected to move the budget from an annual budget to a biennial budget. No other changes were made.

Contact: Kelli Byrd — Telephone: 503-706-1850 Email: SPWD.CHAIR@GMAIL.COM

FINANCIAL SUMMARY - RESOURCES

TOTAL OF ALL FUNDS	Actual Amount	Adopted Budget	Approved Budget
	2020 - 21	This Year 2021 - 22	Next Year 2022 - 24
Beginning Fund Balance/Net Working Capital	126,326	160,000	210,000
Fees, Licenses, Permits, Fines, Assessments & Other Service Charges	110,668	106,100	320,000
Federal, State and all Other Grants, Gifts, Allocations and Donations			
Revenue from Bonds and Other Debt			
Interfund Transfers / Internal Service Reimbursements			
All Other Resources Except Current Year Property Taxes			
Current Year Property Taxes Estimated to be Received			
Total Resources	**236,995**	**266,100**	**530,000**

FINANCIAL SUMMARY - REQUIREMENTS BY OBJECT CLASSIFICATION

Personnel Services	0	0	0
Materials and Services	76,248	92,920	256,628
Capital Outlay	0	140,000	270,000
Debt Service			
Interfund Transfers			
Contingencies	0	1,200	2,400
Special Payments			
Unappropriated Ending Balance and Reserved for Future Expenditure	160,747	31,980	972
Total Requirements	**236,995**	**266,100**	**530,000**

PROPERTY TAX LEVIES - N/A

STATEMENT OF INDEBTEDNESS - N/A

150-504-073-2 (Rev. 02-14)

FORM LB-10

SPECIAL FUND
RESOURCES AND REQUIREMENTS

Water (Fund)

Southwood Park Water District (Name of Municipal Corporation)

	Historical Data: Actual: Second Preceding Year 19-20	Historical Data: Actual: First Preceding Year 20-21	Adopted Budget This Year 2021-22	DESCRIPTION RESOURCES AND REQUIREMENTS	Budget for Next Year 2022-2024: Proposed By Budget Officer	Approved By Budget Committee	Adopted By Governing Body	
				RESOURCES				
1	113880	126326	160000	1. Cash on hand * (cash basis), or	210000	210000	210000	1
2				2. Working Capital (accrual basis)				2
3				3. Previously levied taxes estimated to be received				3
4	0	0		4. Interest				4
5				5. Transferred IN, from other funds				5
6	101044	110668	106100	6. Water Fees	320000	320000	320000	6
7				7				7
8				8				8
9	214924	236994	266100	9. Total Resources, except taxes to be levied	530000	530000	530000	9
10				10. Taxes estimated to be received				10
11				11. Taxes collected in year levied				11
12	**214,924**	**236,994**	**266,100**	**12. TOTAL RESOURCES**	**530,000**	**530,000**	**530,000**	12
				REQUIREMENTS **				
13	1855	2567	5455	13 Office Expense Dues Website Education	11998	11998	11998	13
14	18199	12476	24000	14 Maintenance Repair	48000	48000	48000	14
15	15583	16273	16575	14 Professional Insurance Utilities Administrative	86710	86710	86710	15
16	1740	2010	2050	15 Election Meetings	3600	3600	3600	16
17	126	0	500	16 Water Purchase	1000	1000	1000	17
18	39900	41400	42540	17 Contract Services	101520	101520	101520	18
19	1960	1522	1800	18 Contract Service Fees	1800	1800	1800	19
20	0	0	0	19 Water Testing	2000	2000	2000	20
21				20				21
22	9234	0	140000	21 Capital Project	270000	270000	270000	22
23				22				23
24	0	0	1200	24 Operating Contingencies	2400	2400	2400	24
25				25				25
26				26				26
27	126326	160747		27. Ending balance (prior years)				27
28			31,980	28. UNAPPROPRIATED ENDING FUND BALANCE	972	972	972	28
29	**214,924**	**236,995**	**266,100**	**29. TOTAL REQUIREMENTS**	**530,000**	**530,000**	**530,000**	29

*The balance of cash, cash equivalents and investments in the fund at the beginning of the budget year

**List requirements by organizational unit or program, activity, object classification, then expenditure detail. If the requirement is "not allocated", then list by object classification and expenditure detail.

150-504-010 (Rev. 01-15)

FORM
LB-20

RESOURCES

Water
(Fund)

Southwood Park Water District
(Name of Municipal Corporation)

	Historical Data				Budget for Next Year 22-24			
	Actual							
	Second Preceding Year 19-20	First Preceding Year 20-21	Adopted Budget This Year 21-22	RESOURCE DESCRIPTION	Proposed By Budget Officer	Approved By Budget Committee	Adopted By Governing Body	
1	113880	126326	160000	1. Available cash on hand* (cash basis) or	210000	210000	210000	1
2				2. Net working capital (accrual basis)				2
3				3. Previously levied taxes estimated to be received				3
4	0	0	0	4. Interest	0	0	0	4
5				5. Transferred IN, from other funds				5
6				6 **OTHER RESOURCES**				6
7	101044	110668	106100	7. **Water Fees**	320000	320000	320000	7
8				8				8
9				9				9
10				10				10
11				11				11
12				12				12
13				13				13
14				14				14
15				15				15
16				16				16
17				17				17
18				18				18
19				19				19
20				20				20
21				21				21
22				22				22
23				23				23
24				24				24
25				25				25
26				26				26
27				27				27
28				28				28
29	214924	236994	266100	29. Total resources, except taxes to be levied	530000	530000	530000	29
30				30. Taxes estimated to be received				30
31				31. Taxes collected in year levied				31
32	**214,924**	**236,994**	**266,100**	**32. TOTAL RESOURCES**	**530,000**	**530,000**	**530,000**	**32**

*The balance of cash, cash equivalents and investments in the fund at the beginning of the budget year

FORM LB-30

REQUIREMENTS SUMMARY

NOT ALLOCATED TO AN ORGANIZATIONAL UNIT OR PROGRAM

Water
(name of fund)

	Historical Data: Actual: Second Preceding Year 2019-20	Actual: First Preceding Year 2020-21	Adopted Budget This Year 2021-22	REQUIREMENTS DESCRIPTION	Budget For Next Year 2022-24: Proposed By Budget Officer	Approved By Budget Committee	Adopted By Governing Body	
				PERSONNEL SERVICES NOT ALLOCATED				
1				1				1
2				2				2
3	0	0	0	3 TOTAL PERSONNEL SERVICES	0	0	0	3
4	0	0	0	Total Full-Time Equivalent (FTE)	0	0	0	4
				MATERIALS AND SERVICES NOT ALLOCATED				
5	60,185	55,398	68,840	5 Repairs Contract Services Fees Water Purchase	154,320	154,320	154,320	5
6	19,178	20,850	24,080	6 Office Prof Insurance Utilities Meetings Admin Website	102,308	102,308	102,308	6
7	79,363	76,248	92,920	7 TOTAL MATERIALS AND SERVICES	256,628	256,628	256,628	7
				CAPITAL OUTLAY NOT ALLOCATED				
8	9,234	0	140,000	8 Capital Project	270,000	270,000	270,000	8
9				9				9
10	9,234	0	140,000	10 TOTAL CAPITAL OUTLAY	270,000	270,000	270,000	10
				DEBT SERVICE				
11				11				11
12				12				12
13	0	0	0	13 TOTAL DEBT SERVICE	0	0	0	13
				SPECIAL PAYMENTS				
14				14				14
15				15				15
16	0	0	0	16 TOTAL SPECIAL PAYMENTS	0	0	0	16
				INTERFUND TRANSFERS				
17				17				17
18				18				18
19				19				19
20				20				20
21				21				21
22	0	0	0	22 TOTAL INTERFUND TRANSFERS	0	0	0	22
				OPERATING CONTINGENCY				
23	0	0	1,200	23 TOTAL OPERATING CONTINGENCY	2,400	2,400	2,400	23
24	88,598	76,248	234,120	24 Total Requirements Not Allocated	529,028	529,028	529,028	24
25				25 Total Org./Prog. Requirements				25
26				26 Reserved for future expenditure				26
27	126,326	160,747		27 Ending balance (prior years)				27
28			31,980	28 UNAPPROPRIATED ENDING FUND BALANCE	972	972	972	28
29	214,924	236,995	266,100	29 TOTAL REQUIREMENTS	530,000	530,000	530,000	29

DETAILED REQUIREMENTS

FORM
LB-31

Southwood Park Water District
Water

	Historical Data: Actual — Second Preceding Year 19-20	Historical Data: Actual — First Preceding Year 20-21	Adopted Budget This Year 2021-22	REQUIREMENTS FOR: Water Fund	Budget for Next Year 2022-2024: Proposed by Budget Officer	Approved by Budget Committee	Adopted by Governing Body	
1	0	0	1200	1 Contingencies	2400	2400	2400	1
2	39900	41400	42540	2 Contract Services	101520	101520	101520	2
3	1960	1522	1800	3 Contract Service Fees	1800	1800	1800	3
4		354	355	4 Association Dues	910	910	910	4
5	2962	3046	3500	5 Insurance	7800	7800	7800	5
6	1740	2010	2050	6 Meeting Expense	3600	3600	3600	6
7		335	3000	7 Education - Conferences	6000	6000	6000	7
8	0	510	0	8 Miscellaneous	0	0	0	8
9	1855	768	1500	9 Office Expense	3888	3888	3888	9
10	5100	5340	5340	10 Professional Fees	55160	55160	55160	10
11	18199	12476	24000	11 Repairs	48000	48000	48000	11
12	7521	7887	7735	12 Utilities	16550	16550	16550	12
13	126	0	500	13 Water Purchase	1000	1000	1000	13
14	0	0	0	14 Water Testing	2000	2000	2000	14
15	0	0	0	15 Election	0	0	0	15
16		600	600	16 Website	1200	1200	1200	16
17				17 Administrative Services	7200	7200	7200	17
18	9234	0	140000	18 Capital Projects	270000	270000	270000	18
19				19				19
20				20				20
21				21				21
22				22				22
23				23				23
24				24				24
25				25				25
26				26				26
27				27				27
28				28				28
29				29				29
30				30 Total Full Time Equivalent (FTE)*				30
31	126326	160747		31 Ending balance (prior years)				31
32			31,980	**32 UNAPPROPRIATED ENDING FUND BALANCE**	972	972	972	32
33	**214924**	**236995**	**266100**	**33 TOTAL REQUIREMENTS**	**530,000**	**530,000**	**530,000**	**33**

150-504-031 (Rev 03-15)

*When budgeting for Personnel Services Expenditures, include number of related full time equivalent positions

RESOLUTION No. 2022-01

ADOPTING THE BUDGET

BE IT RESOLVED that the Board of Commissioners of the Southwood Park Water District hereby adopts the budget for fiscal year 2022-2024 in the total of $530,000.

MAKING APPROPRIATIONS

BE IT RESOLVED that the amounts for the fiscal year beginning July 1, **2022**, and for the purposes shown below are hereby appropriated:

General Fund	
Personal Services.............	0
Materials & Services............	256,628
Capital Outlay..................	270,000
Transfers......................	0
Contingency..................	2,400
Total...........	**529,028**

Total APPROPRIATIONS, All Funds	**529,028**
Total Unappropriated and Reserve Amounts, All Funds	972
TOTAL ADOPTED BUDGET	**530,000**

IMPOSING THE TAX

BE IT RESOLVED that the Board of Commissioners of the Southwood Park Water District hereby imposes the taxes provided for in the adopted budget:

(1) At the rate per $1,000 of assessed value of $ 0.00 for permanent rate tax; and

(2) At the rate per $1,000 of assessed value of $ 0.00 for local option tax.

and that these taxes are hereby imposed and categorized for tax year 2022-2024 upon the assesed value of all taxable property within the district as follows:

CATEGORIZING THE TAX

General Government Limitation	**Excluded from Limitation**
Permanent Rate Tax.........$ 0.00 /$1,000	
Local Option Tax.............$ 0.00 /$1,000	
General Obligation Bond Debt Service	$ 0.00

The above resolution statements were approved and declared adopted on this 29th day of June, 2022.

x Kelli Byrd
Signature, Kelli Byrd, Board President

x Jonathan Howell
Signature, Jonathan Howell, Budget Officer

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix P
Water Rates

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SOUTHWOOD PARK WATER DISTRICT
NOTICE OF PUBLIC HEARING ON WATER RATE CHANGES

After 65 years of providing our neighborhood with an ongoing supply of clean, safe water, our Southwood Park Water District is long overdue for renewal. To continue providing this service, the District's infrastructure needs long-overdue maintenance, upgrades, and capital improvements. Accordingly, your Board of Commissioners is proposing a resolution to adopt a one-year interim rate increase. The new rates for purchase of water and water services provided by the District would become effective September 1, 2021. The hearing will take place at the regular monthly board meeting for July and is called under provisions of ORS 264.312.

Date: July 28, 2021
Time 7:00 pm
Location: Meadow Springs Community Church
12647 SW 62nd Ave, Portland OR 97219

For more information, email spwd.chair@gmail.com or drop a line to P.O. Box 2024, Lake Grove, OR 97035-0629.

These are the current and proposed new water rate structures:

Current bi-monthly rates:	Proposed bi-monthly rates:
Fixed charge $36.00	Fixed charge $50.00
Water usage $1.75 per CCF*	Water usage $2.75 per CCF*

*1 CCF = 100 Cubic feet =748 gallons

Although water usage varies considerably from month to month and customer to customer, average usage is about 7 CCF per month, or 14 CCF per bimonthly bill. Based on that usage, the "average" bimonthly bill for base rate + water is currently about $60.50. With this rate increase, that average bill would increase to $88.50, an increase of about 46%.

The new rate is designed to encourage conservation, as well as to raise needed revenue.

As the word "interim" implies, this temporary rate structure will be in place for approximately one year. A further rate increase will be proposed after one year as we get firmer estimates of costs associated with needed repairs and improvements.

Although this rate increase is substantial, Southwood Park's rates are still well below those of most neighboring water districts.

Kelli Byrd
Interim Board Chair

Eric Leatham
K.C. Rogers
Randy Turner
Sue Weston
Water Board Commissioners

sw

Southwood Park Water District
P.O. Box 2024
Lake Grove, OR 97035-0629

NOTICE OF PUBLIC HEARING
ON WATER RATE CHANGES

Southwood Park Water District
Water System Feasibility Study
Lake Oswego, Oregon

Appendix Q
Pump Station Study
Cundiff Engineering, February 13, 2024

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Cundiff Engineering, Inc.
10700 SW Bvtn Hldl Hwy
Ste 654
Beaverton OR 97005-3019
Phone: (503) 521-7260
Fax: (503) 521-7257

PROJECT MEMORANDUM

Attention: **Tom Ferrell, P.E.**
PACE Engineers, Inc.
4500 Kruse Way #250
Lake Oswego, Oregon 97035

From: **Pedro Alzaga, P.E.**

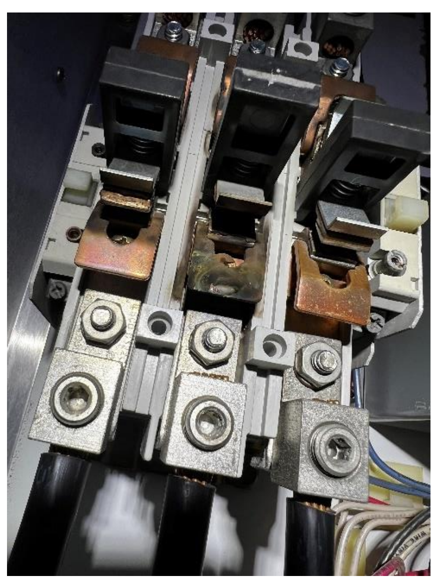
Date: **February 13, 2024**

Project: **Southwood Park Water District - Pump Station Study**
Job No.: **24-004**

Subject: **02/05/2024 Electrical Site Visit**

The following are observations from our site visit on the above subject to the existing well pump station located at 12802 SW 61st Avenue in Portland, Oregon 97219.

1) Upon our arrival, we observed pump cables serving the submergible pump were disconnected at the junction box next to the well entry.
2) Maintenance personnel proceeded to open the pump control panel. In the panel is the soft starter within direct-on-line starter contactor, along with a motor circuit protection (MCP) main disconnect. Also noted was the pump nameplate with the pump rating information was loose within the panel.
3) Submergible pump is CentriPro Model 86M504 50-Hp with rated full load amperes (FLA) of 65-amperes.
4) It is our understanding the direct-on-line starter contactor was damaged and replaced with a new contactor. The following photographs were taken by the Electrical Contractor:

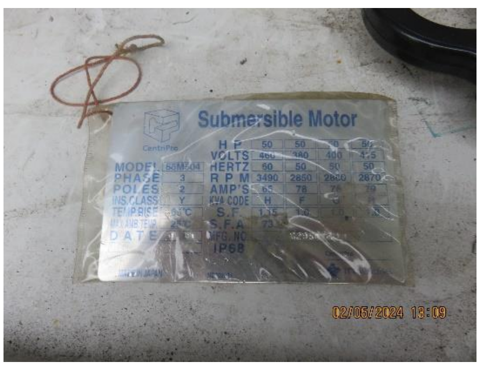
Per the photographs we can see the center contactor silver plate detached from the contactor arm and landed at the arc suppression fins.

5) In our opinion, failure of the pump was due to the direct-on-line starter contactor failure. The pump is supposedly protected by current overloads which are located to the right of the soft starter.

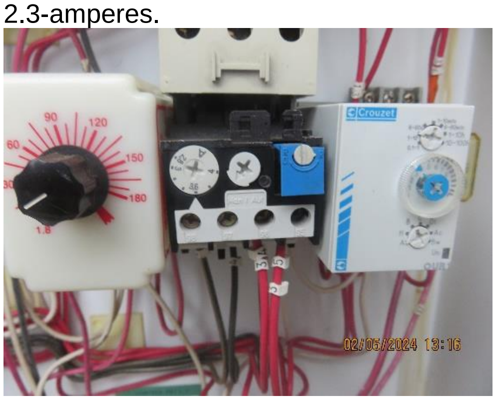
6) A Soft Start system is equipped with the Soft Starter drive and direct-on-line starter contactor. When the system receives a signal to start the motor, soft starter gives power to the motor, gradually applying voltage to slowly increase the speed. Once full motor speed is reached, the soft starter will signal the direct-on-line starter contactor to close. At this time, the motor will be at full speed and torque, and the soft starter will not be in operation. The Soft Starter is used only to start the motor, limiting the large inrush of initial current associated with motor startup.

7) When the pump is running, all the current will go through the direct-on-line starter contactor; therefore, new overloads are required to protect the pump when running. In this system, current transformers (CTs) are installed at each phase to reduce the current and use smaller overloads. The existing CT has a ratio of 150:5, which means if a current of 150-amperes is circulating over any of the phase conductors, 5-amperes are circulating from the CT. Photograph below is of the CTs.

Existing pump motor is 50-HP with a rated FLA of 65-amperes and a service factor of 1.15, making the pump able to run for a small period of time at 73-amperes. With 65-amperes of full load on the pump motor, using the 150:5 ratio, the CT current will be 2.16-amperes.

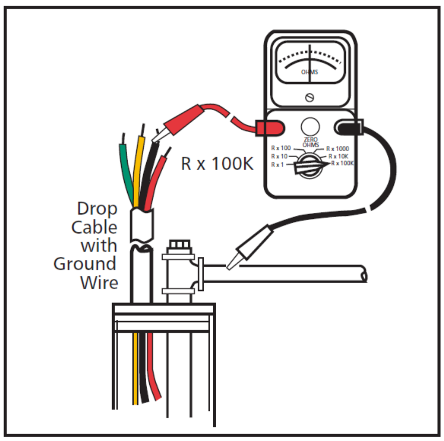


Photograph below is of the overload protection, showing the setting is at 3.6-amperes. Using the same ratio of 150:5 for the CT, the current on the phase conductor will be 108-amperes, which exceeds the limits of the pump motor rating. The minimum setting of this overload is 2.8-amperes which represents a phase current of 84-amperes, this is over of the motor rating of 65 amperes. A correct setting for the overload will be between the 65-FLA of the motor and the 73-amperes with the service factor. A good setting would be 69-amperes, which, with the CTs ratio, gives us a setting of 2.3-amperes.



8) When we were onsite, I proceeded to check for continuity from the phase conductors of the pump-to-ground with an Amprobe Meter set to continuity/ohms. The meter will produce a beeping sound if the resistance is from 0- to 100-ohms. In this case, each of the phase conductors caused the meter to beep. This represents that the resistance between the phase conductors and ground is 100-ohms or less. The following is the Pump Manufacturer instruction to test the pump motor:

2. Connect an ohmmeter lead to any one of the motor leads and the other to the metal drop pipe. If the drop pipe is plastic, connect the ohmmeter lead to the metal well casing or ground wire.



MOTOR INSULATION RESISTANCE

Normal Ohm and Megohm Values (Insulation Resistance) Between All Leads and Ground

Insulation resistance does not vary with rating. All motors of all HP, voltage and phase rating have similar values of insulation resistance.

Condition of Motor and Leads	Ohms Value	Megohm Value
A new motor (without drop cable).	20,000,000 (or more)	20.0
A used motor which can be reinstalled in the well.	10,000,000 (or more)	10.0
New motor in the well	2,000,000 (or more)	2.0 (or more)
Motor in the well in good condition	500,000 - 2,000,000	0.5 - 2.0
Insulation damage, locate and repair	Less than 500,000	Less than .50

What it Means

1. If the ohm value is normal, the motor windings are not grounded and the cable insulation is not damaged.

2. If the ohm value is below normal, either the windings are grounded or the cable insulation is damaged. Check the cable at the well seal as the insulation is sometimes damaged by being pinched.

As mentioned above, our maximum reading from the Amprobe meter was significantly lower than 500,000-ohms recommended by the manufacturer.

9) Conclusion:

a) With the failure of the direct-on-line starter contactor center phase, the running pump went to a single-phase; only phase A and C were present at the pump motor. This made motor amperes increase very rapidly, and if it is not protected by the overloads, the pump motor can be damaged. The overload protection setting of 3.6-amperes (108-amperes at the motor) does not protect the motor, and the motor was damaged.

b) We recommend performing a resistive test to verify the resistance between phases is 0.331-ohms as recommended by the manufacturer.

c) Once the motor damage is confirmed, a new motor will be required. In addition, we recommend new Variable Frequency Drive (VFD) starters and controls be provided with the new motor. If a VFD is selected, the installation and settings of the VFD have to be per the Manufacturer's specific requirements. All new equipment can be easily reinstalled if modifications are made to the pump house in the future.