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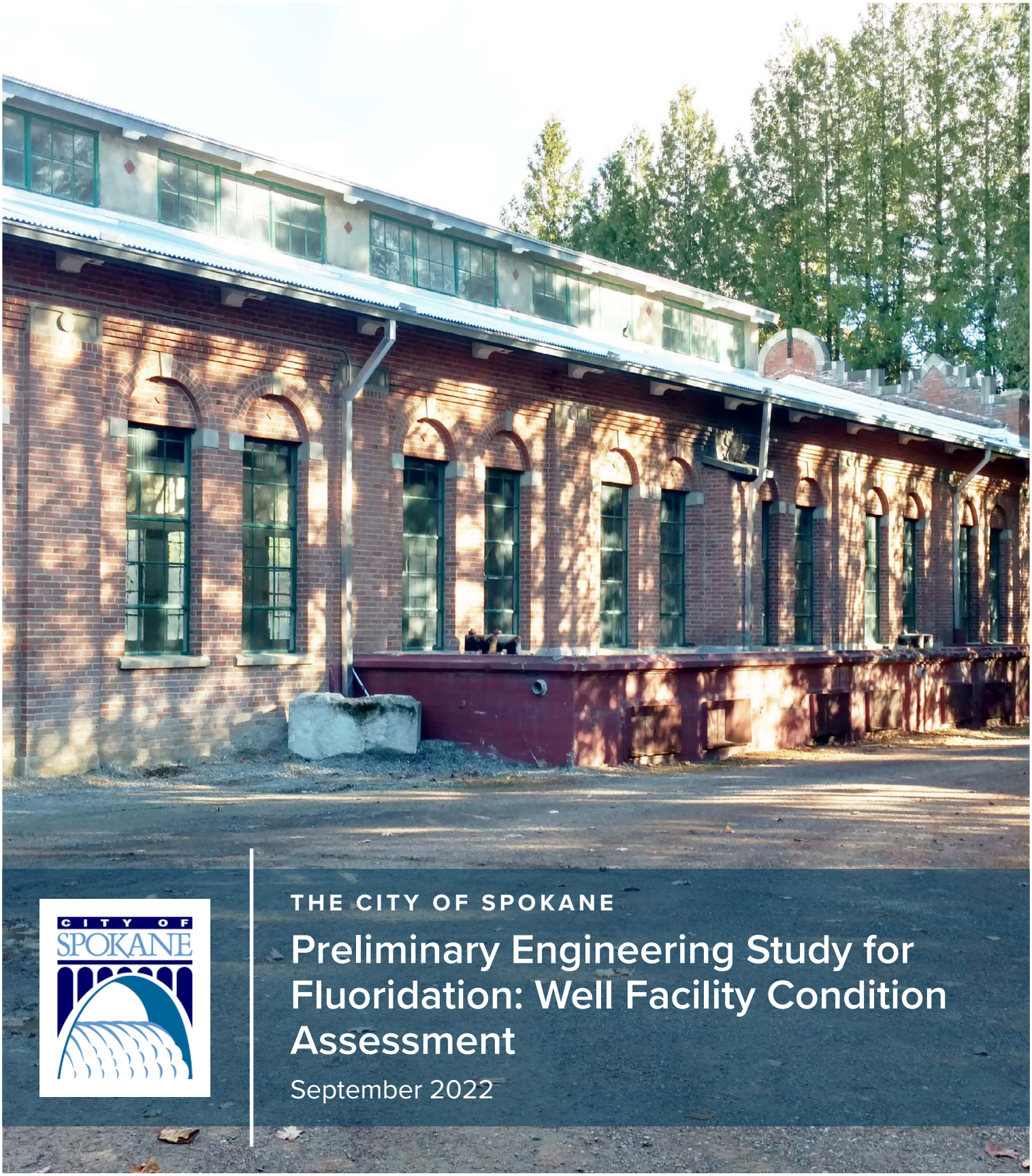

CITY OF SPOKANE

THE CITY OF SPOKANE

Preliminary Engineering Study for Fluoridation: Well Facility Condition Assessment

September 2022

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Preliminary Engineering Study for Fluoridation Well Facility Condition Assessment

City of Spokane

September 2022

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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

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Introduction

The City of Spokane's (City's) priority is continuing to deliver safe, high-quality drinking water to its residents with efficient operations, while keeping rates affordable for the community. To inform future decisions, the City is completing a feasibility study to better understand the costs and implementation steps associated with providing fluoridated water to the community. The study is fully paid for by grant funds and builds off previous feasibility studies conducted in 2004 and an update in 2016 which were high-level reviews of the permitting requirements, long-term operational/maintenance requirements, and capital improvements needed to fluoridate the water system. This report is a condition assessment of the City's well stations which is intended to establish a foundation for the upcoming fluoridation alternatives analysis and preliminary design.

The City owns eight well station facilities that provide water supply for the entire water system. This condition assessment includes information on each facility's site, facilities, equipment, and electrical and controls infrastructure as they are related to supporting a fluoridation system. The purpose of the assessment is to document the existing infrastructure at each facility in preparation for defining required retrofits for implementing fluoridation.

A summary of the condition assessment report by site is shown in Table I-1.

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Table I-1 | Condition Assessment Summary Matrix

Assessment Category	Well Electric	Parkwater	Ray	Central Ave	Grace	Nevada	Hoffman	Havana
Access: Adequate for Chemical Delivery?	Yes, via Waterworks St. No through access for large vehicles. Turnarounds needed for large vehicles.	Yes, via E Rutter Ave. There is adequate turnaround at the nearby end of Rutter Ave.	Passes through Residential Zones.	Passes through Residential Zones for one block. Pull through driveway provides turnaround for smaller delivery vehicles.	Yes, via North Foothills Drive. Delivery vehicle turnaround is needed since only one driveway off North Foothills Drive.	Yes, via the Water Department yard. Vehicle turnaround is provided within the Water Department yard.	Passes through Residential Zones. No through access for large vehicles. A turnaround is needed for delivery vehicles.	Passes through Residential Zones. Two site entrances provide turnarounds for large delivery vehicles.
Security	Site perimeter fencing exists up to Spokane Riverbank. Consider security cameras.	Site perimeter fencing exists except along Rutter Avenue. North fence line is Felts Field perimeter security fencing. Consider security cameras.	Consider fence upgrades. The electrical switch gear yard is fenced. Site perimeter fencing is only 3 ft. tall.	No site perimeter fencing. Electrical switchgear yard is fenced. Consider fence upgrades and security cameras.	Only the back (southside) of the well station and electrical switch gear yard contain fencing. Consider fence upgrades and security cameras.	Water Department yard fencing provides security. Unknown if Water Department yard contains security cameras.	Only the back (northside) of the well station and electrical switch gear yard contain fencing. Consider fence upgrades and security cameras.	Site perimeter fencing contains privacy slats. Electrical switchgear yard has separate fencing within site perimeter fencing. Consider security cameras.
Space in Existing Facility for Fluoridation System?	Potentially: Loading area adjacent to Cl room, tool room adjacent to well building, or existing Sodium Hypochlorite storage area.	No	No, unless future pump site can be used.	No	No	No	No	With some changes to design
Space onsite for new building?	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Building Code Notes	Investigate soil conditions. Large penetrations may trigger lateral retrofit of building. Ensure proposed work does not affect load capacity of building.	N/A; no space inside building.	Investigate concrete beams under slab.	N/A; no space inside building.	N/A; no space inside building.	N/A; no space inside building.	N/A; no space inside building.	N/A; building not constructed
Adequate Power for Proposed System?	Potentially; further evaluation required later in design. Onsite power available at this site.	Potentially; further evaluation required later in design.	Lighting panel is full. Main panelboard has capacity.	Potentially; further evaluation required later in design.	Most likely no; additional capacity required.	Potentially; further evaluation required later in design.	Potentially; further evaluation required later in design.	Not evaluated
Emergency Backup Power?	Yes, but cannot be used for new electrical loads.	No	No	No	No	No	No	Yes
PLC Capacity and Expansion	Existing spare I/O cannot accommodate, but spare slots may.	Existing spare I/O cannot accommodate, but spare slots may.	No capacity available. Additional PLC likely required.	No capacity available. Additional PLC likely required.	Existing spare I/O cannot accommodate, but spare slots may.	Existing spare I/O cannot accommodate, but spare slots may.	No capacity available. Additional PLC likely required.	Not evaluated
Station Service Voltage	120/240	120/208	120/208	120/240	120/208	120/208	120/208	120/240

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Site Overview

Each of the City's well facilities have unique sites with varying building size and layout due to them being constructed over at different eras with different water production requirements. Zoning, security, and access vary between well stations. Details are provided in the Existing Facilities section

Mechanical Overview

Most of the City's wells are caisson-style with one or more vertical turbine pumps in each well (see Existing Facilities section for details and exceptions). The City currently utilizes gaseous chlorine for treatment, which is stored in 150-pound bottles (though the Parkwater Well Station uses a 1-ton cylinder) and injected as a chlorine solution at the bottom of each pump. Flow metering typically occurs via magnetic flow meter in an underground vault downstream of each well.

The City's pressure zones are divided into three major groups named by the lowest parent zone connected to the City's wells: the "Low System," the "Intermediate System," and the "North Hill System". The Existing Facilities section documents which system is served by each well.

Structural Overview

Most of the City's well stations were constructed between 1895 and 1960, though the Central Avenue facilities were upgraded between 2016 and 2019 and the future Havana station was under construction during the time of this assessment. The primary construction types for the well station buildings include unreinforced brick masonry (URM), concrete masonry unit (CMU), and concrete. Most of the sites did not appear to have enough space for a fluoridation system inside the buildings, so it is likely that new enclosures will be constructed on each site for the retrofit. The Well Electric and Ray Well Stations appeared to have potential to fit a new fluoridation system within the existing buildings on site; however, further investigation is still required at those sites to verify the existing infrastructure can accommodate the proposed fluoridation systems.

Electrical, Instrumentation & Controls, and Telemetry Overview

A new fluoride system would require additional Input/Output (I/O) channels to monitor the system and communicate with the control center, similar to the existing equipment. The I/O quantity will be dependent on the number of well pumps at a site. It is anticipated that fluoride I/O requirements will be similar to the requirements for the chlorination system at each site, and will include pump run status, chemical weight and/or volume, chemical concentration in the header to each pressure zone, and alarms related to equipment failure or chemical spills or leakage. Ability to control the system remotely (in addition to monitoring) would result in additional requirements.

Preliminary estimated I/O requirements are listed in Table I-2.

Table I-2 | I/O Quantity Estimate

Fluoridation System I/O	Digital Inputs	Digital Outputs	Analog Inputs
Dosing pump run		1 per pump	
Dosing pump running	1 per pump		
Dosing pump fail/trouble	1 per pump		
Fluoride Tank A level/weight	2 per site		1 per site
Fluoride Tank B level/weight	2 per site		1 per site
Fluoride concentration at header			1 per pressure zone
Fluoride system leak		2 per site	1 per site
Other controls		2 per site	

Based on the projected additional I/O requirements of a fluoridation system, most of the existing Programmable Logic Controllers (PLCs) do not have enough additional I/O spares and would require modification to support additional equipment.

A site summary spreadsheet comparing the amount of spare I/O at each site with the anticipated amount of I/O for a fluoridation system at each site is attached in Appendix A.

With the exception of Nevada Well's PLC which is hardwired to Grace Well Station's PLC, and the Remote Terminal Units (RTUs) at Well Electric Well Station, All RTU sites communicate to the Master Terminal Unit (MTU) at Well Electric Well Station through 900 megahertz (MHz) ethernet radios manufactured by Microwave Data Systems Inc. (a GE company).

Section **1**

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Section 1

Well Electric Well Station

The Well Electric Well Station, located at the City's Upriver Dam facility, which is north of the Felts Field Airport, serves three different pressure zones from four operating pumps and two wells (Wells 4 and 5). For parts of the year, the wells experience the influence of the Spokane River, which is extremely close to the site, so the wells are operated seasonally. The Well 4 and 5 building was constructed in 1925 and the pumps are partially powered by the facility's hydroelectric generators. The City's system MTU and central control room are located at the same site.

1.1 Existing Site – Summary

1.1.1 Parcel Information and Access

The Well Electric Well Station is located southwest of the City's hydroelectric Upriver Dam (south of the Spokane River), and on the same site as the City's central control room for all water facilities and the Upriver hydroelectric facility. The facility address is 2701 N Waterworks Street, Spokane, WA 99212.

The figure in Appendix B highlights the building and well location, as well as existing yard piping. The parcel (number 35111) is zoned for Light Industrial use (LI zoning). The site is also used for City vehicle storage and equipment maintenance.

The parcel is 56.3 acres (which includes the dam and associated river area) and slopes up away from the riverbank to the south edge of the parcel. Access is intended to accommodate trucks for chemical and equipment delivery. The well station site can only be accessed from N Waterworks Street, since this street dead ends at the adjacent Spokane Police Academy training facility, which is northeast of the Well Electric Well Station site.

The main access into the Well Electric Well Station site is at the southeast side of the parcel at a gated driveway that leads to the Upriver Hydroelectric and Waterworks Project Interpretive Center office with adjacent visitor parking. The other access into the Well Electric Well Station site is at the southwest side of the parcel at a gated driveway that leads to and is adjacent to the southwest side of the "L" shaped well station building. which houses Well 4 and 5. This site access road connects to the main entrance driveway near the small parking lot at the interpretive center's office. There is an upper (i.e., in elevation) gravel roadway running through the City's planned future wellfield that connects these two site entrance roadways and provides access to the site's electrical transformers. These roads provide adequate vehicular access to the Well Electric Well Station site.

The southwest access road wraps around the east side of the Well 4 and Well 5 building addition with a tight turning radius that likely limits vehicular through access to Class 4 (14, 001 to 16,000 pound) vehicles which have two axels. Larger classes of vehicles would likely not be able to use this through access. Areas for larger classes of product delivery types of trucks is limited since there are no designated turnaround areas along this southwest access route. However, turnarounds could be completed by smaller classes of delivery trucks if City staff vehicles are moved from two parking areas adjacent to this through route. See Well Electric Well Station Site Plan in **Appendix B.**

1.1.2 Site Security

The Well Electric Well Station site is surrounded by a 6-foot-tall chain link perimeter fence that is in good condition. There is no barb wire along the top of the perimeter fence, nor are there any privacy slats within the chain link fence fabric. The perimeter fence south of the L-shaped building has a gap that is spanned by a hedge row. The perimeter fencing is parallel to and is on the northwest side of N Waterworks Street and then angles towards the Spokane River at the northeast and southwest corners of the site. There is no perimeter fencing along the Spokane River.

The main entrance at the northeast corner of the Well Electric Well Station site has an electric slide gate with an entrance card reader for gate operation. This gate typically remains open during business hours. The secondary entrance at the southwest corner of the Well Electric Well Station site has a 16-foot-wide swing gate that remains locked during all hours for site security. The Well Electric Well Station site fencing and gates provide fair security for the facility.

1.1.3 Pressure Zones Served

The City's 21 pressure zones are divided into three major groups named by the lowest parent zone connected to the City's wells: the "Low System," the "Intermediate System," and the "North Hill System". The Well Electric Well Station facility serves all three major parent zones. Detailed information on how each well pump serves the distribution system is shown in **Table 1-1.** The North Hill transmission main and one of the Low transmission branches run northwest across the Spokane River.

Table 1-1 | Well Electric Well Station Pump Transmission Summary

Pump No.	Well No.	Zone Served	Transmission Main Size
1	5	Intermediate	30-inch (see **Appendix B**)
2	5	North Hill	36-inch (same outgoing main as pump 4)
3	5	Low	36-inch, 30-inch, and 42-inch (see **Appendix B**)
4	4	North Hill	36-inch (same outgoing main as pump 2)
5	Out of service indefinitely		
6	Out of service indefinitely		

1.2 Existing Facility Summary – Structural

1.2.1 Description of Structures

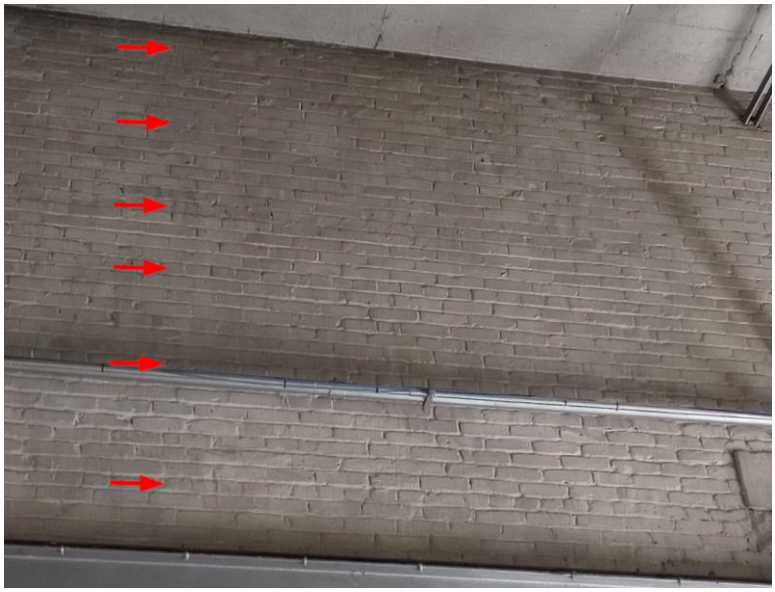
The original building constructed at the Well Electric Well Station site was constructed in 1895 using unreinforced brick masonry. The addition to the original building that encompasses Wells 4 and 5 was constructed in 1925 using unreinforced brick masonry for the walls, but also used concrete columns to support the steel roof framing (see **Figure 1-1**).

Figure 1-1 | Well Electric Well Station – Wells 4 and 5 Building Addition

All the construction at the site appears to use unreinforced masonry. Unreinforced masonry is the use of masonry without any steel reinforcing needed to provide tension capacity in a structure. For URM, typically two courses of brick are laid side by side with a 'header' course every six to eight layers of brick, which is oriented perpendicular to the layers in-between. This 'header' course

is the simplest way to visually determine if brick masonry is unreinforced (see **Figure 1-2** below). This type of construction has very low capacity for lateral loads caused by wind or earthquakes.

Figure 1-2 | Well Electric Well Station – Unreinforced Masonry 'Header' Course



The structures on-site appeared to be in fair condition. Due to the age of the building, settlement over time, and concrete shrinkage, several minor cracks have propagated throughout the facility.

Structural steel in the buildings appeared to be in fair condition, but closer inspection was difficult as it was typically high and far away for visual observation.

1.2.2 Building Code Requirements

Well Electric Well Station was one of the few sites that appears to have enough available square footage to add a fluoridation system inside the existing buildings. Multiple locations in the building were deemed as feasible, but further investigation is required structurally in those locations, mainly to determine soil conditions underneath where the system would be placed. When performing work on existing structures, a general guideline is a "do no harm" policy to make sure that work performed on an existing structure does not affect the load capacity of the building. Several of the proposed locations could impact the structure if penetrations are required in the walls. Per the International Existing Building Code (IEBC) Section 807 (assuming a Level 2 alteration), it is likely that creating large penetrations in the walls to get equipment in place could trigger a full building lateral retrofit.

1.3 Existing Mechanical Plan

Two caisson-style wells (Wells 4 and 5) are housed in the southeastern building at the Well Electric/Upriver Dam site. A summary of the 6 pumps is shown in **Table 1-2.** Magnetic Flow Meters installed on discharge mains for Pumps 1 and 3 are located inside the building. Because Pumps 2

and 4 both serve the North Hill System, flow metering is combined for these two pumps and is located in an underground vault northeast of the building after the two discharge mains meet. Flow metering is shown in the figures in **Appendix B.** The appendix also includes photos of the facility.

Table 1-2 | Well Electric Well Station Pump Summary

Pump No.	Well No.	Pump Type	Horsepower	Design Flow (gpm)	Design Head (ft)	Notes
1	5	Byron Jackson Vertical Turbine	900	7,550	415	
2	5	De Laval Split Case	900	8,330	320	
3	5	Goulds Vertical Turbine	1,000	13,500	240	
4	4	Flowserve Split Case	900	8,000	319	New pump to be installed 2022
5	4	Out of service indefinitely				
6	4					

The Well Electric Well Station Chlorine room is located northwest of the well building as shown in **Appendix B**. The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson, except for Well Pump 2, where chlorine injection occurs in the pump suction line aboveground as shown in **Appendix B**.

Free chlorine residual is continuously monitored by one Hach CL17 analyzer for each pressure zone. Samples are taken from the pump discharge pipes inside the building prior to the pipes entering the pipe tunnel. The locations of the chlorine analyzers are on the upper level as shown in the building layout plan in **Appendix B.** One of the four CL17 analyzers does not appear to be operational, and the three operational analyzers monitor the Low, Intermediate, and North Hill pressure zones. Each Hach CL17 chlorine analyzer requires 1-3 gallons per minute (gpm) of continuous sample flow. The CL17 is a colorimetric analyzer which adds a small amount of reagent to the sample; thus, the sample is drained to sanitary sewer.

1.4 Existing Facility Summary – Electrical

1.4.1 Power Feed and Supply Capacity

Well Electric Well Station can generate its own power from its onsite hydroelectric generators, but power is supplemented by the local utility, Avista. A one-line diagram of the medium voltage distribution system is shown below.

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DIVERSION DAM

SG3 STANDBY GENERATOR NO. 3 81.25kVA 0.8pf

480V PORTABLE GENERATOR PLUG

3PDT MANUAL SWITCH

PP1

TO DAM GATE HOISTS

120/240V STATION SERVICE

ATS NO. 4

480V

POWERHOUSE NO. 2

STA. SERV.

PP2

PP1

ATS NO. 3

TRANSF 480V, 3ø 225kVA–4.16kV

SG2 STANDBY GENERATOR NO. 2 310kVA 0.8pf

EXCITATION 1500KVA 4160V–250V 3ø 60HZ

41

EXCITER

G4

0.9PF, 4160V 6500KVA, 3ø, 60HZ 150RPM

52G4

125VDC BATTERIES

EXCITER

G5

41

0.9PF, 4160V 6500KVA, 3ø, 60HZ 150RPM

52G5

EXCITATION 1500KVA 4160V–250V 3ø 60HZ

SWITCH YARD NO. 2

4160V

4000A

1–3ø 18/24 MVA OA/FA 4.2–13.8kV ±5%

52MB 2000A

AIR SW. NO. 163 1200A

13.8KV

SWITCH YARD NO. 1
UNIT SUBSTATION

1–3ø 7.5 MVA OA 2300V–13.8kV, Z=7%

52L 2000A

13.8KV CUTOUT x 3

AIR SWITCH

52PW 2000A

2300V

PARKWATER FEEDER

52T

2300V

52WE 2000A

2300V

13.8KV TO BEACON SUBSTATION 13T09 LINE

POWERHOUSE NO. 1

PORTABLE GENERATOR PLUG IN

EXCITER TRANSF 2300V–480V 150kVA, 3ø

TO G1 G2 AND G3 EXCITER

2300V

2000KA, 0.8PF, 2300V 3ø, 60HZ 200RPM G1

52G1

2000KA, 0.8PF, 2300V 3ø, 60HZ 200RPM G2

52G2

2000KA, 0.8PF, 2300V 3ø, 60HZ 200RPM G3

52G3

120/240V STATION SERVICE (PH1)

ATS NO. 2

TRANSF 75kVA, 3ø 2400–240/120V

120/240V

WELL ELECTRIC

2300V

WELL ELECTRIC WATER PUMPS

TRANSF 3x37.5kVA

STANDBY GENERATOR NO. 1 137.5kVA 0.8pf

SG1

ATS NO. 1

120/240V STATION SERVICE SHOP

120/240V STATION SERVICE WELL ELECTRIC

120/240V STATION SERVICE

120/240V STATION SERVICE

120/240V STATION SERVICE

120/240V STATION SERVICE GARAGE

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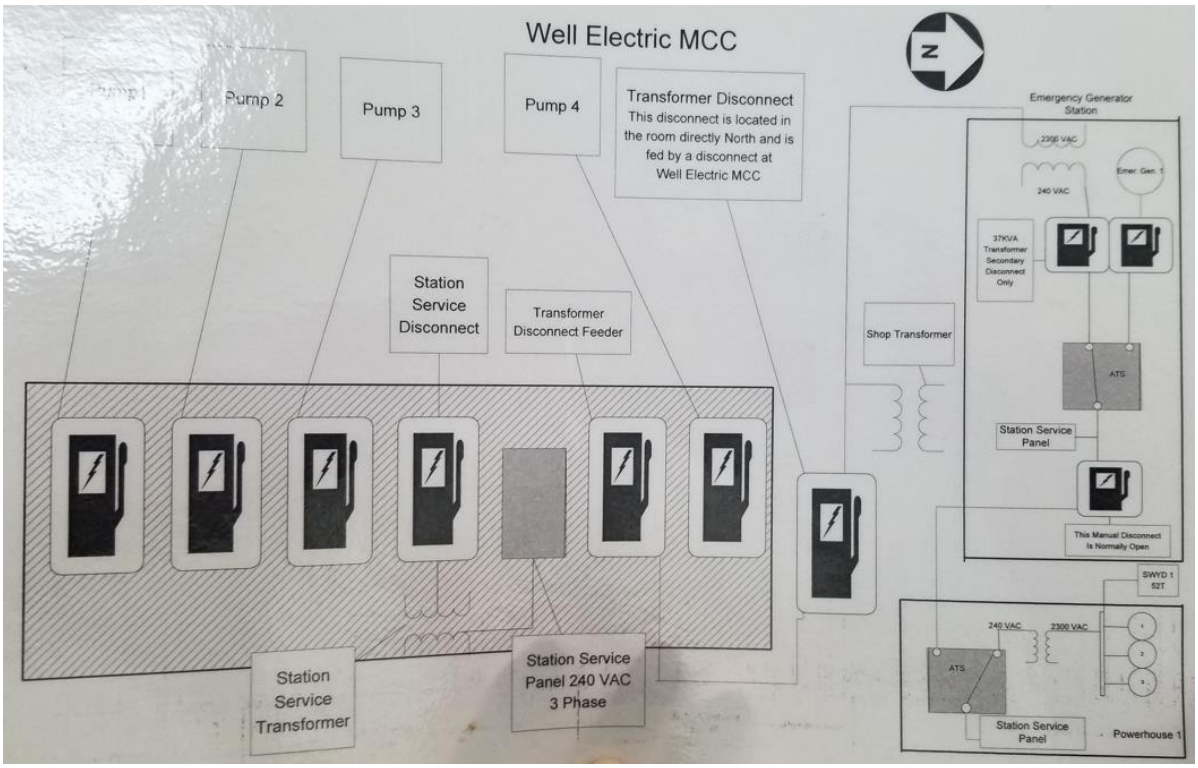
1.4.2 Motor Control Centers and Panelboards

The 2400-volt (V) Motor Control Centers (MCC) currently serves four well pumps on a 1200-amp bus. Each pump operates on a soft starter. There is an MCC section containing a station service transformer and a 225 amp, 120/240V panelboard, labeled Panel A.

A one-line diagram of the motor control center and its surrounding distribution equipment is shown in **Figure 1-4**.

Figure 1-4 | Well Electric Well Station MCC One-Line Diagram



Well Electric Well Station has eight low voltage (120/240V) panelboards:

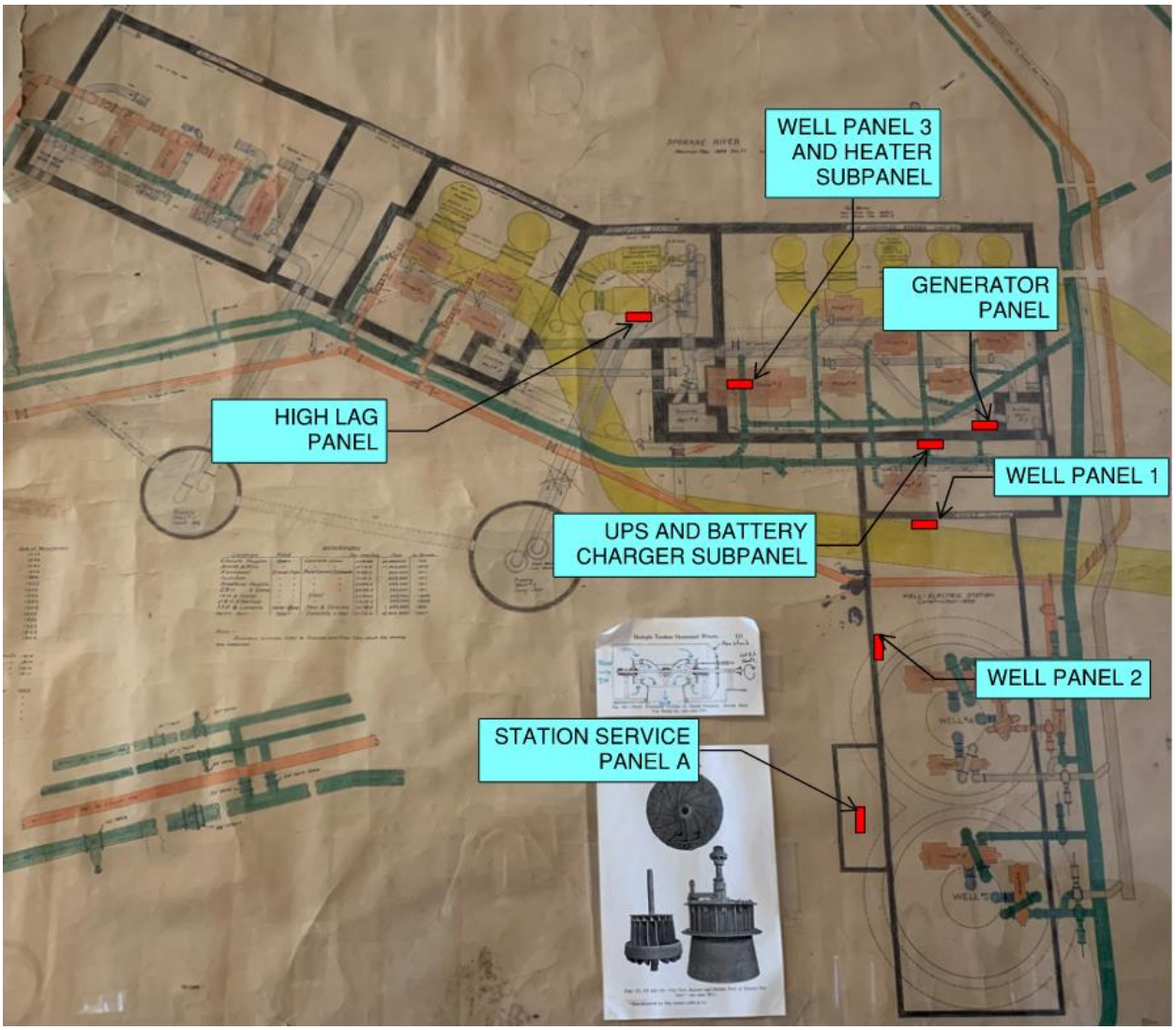
1. Panel 1 – Located in the Well 4/5 room by the door closest to the main entrance.
2. Panel 2 – Located in the Well 4/5 room at the base of the mezzanine stairs.
3. Panel 3 – Located in the garage bay adjacent to the chlorine room.
4. Heater subpanel – Located next to Panel 3.
5. UPS and Battery Charger subpanel – Located in the storage room between the Well 4/5 room and offices.
6. Generator Panel – Located near the 100-kilowatt (kW) emergency generator.

7. High Lag Panel – Located outside the offices, under the stairs leading up to the second-floor storage room.

8. Station Service Panel A – Located in the Pump MCC.

A site plan showing the locations of the eight panels is shown in **Figure 1-5**.

Figure 1-5 | Well Electric Well Station Electrical Panel Locations



Electrical capacity information for each panelboard is shown in **Table 1-3**.

Table 1-3 | Well Electric Well Station Panelboard Information

Well Electric	Main breaker?	Spare breakers available?	Space available for new breakers?	Notes
Panel 1	Unknown size, looks like 100 amp	Yes (3)	No	Spares are in subpanel.
Panel 2	100 amp	Maybe circuits 13 and 14	No	
Panel 3	Unknown size, looks like 100 amp	Maybe circuit 14	No	
Heater Subpanel	No	No	Yes (3 spaces)	
UPS and Batt. Charger Subpanel	No	No	Yes (6 spaces)	
Generator Panel	60 amp	No	No (see notes)	Panel is at capacity.
High Lag Panel	No	Yes (2)	Yes (25 spaces)	
Station Service Panel A	No	Yes	No	240V only. 120V not available.

Based on the availability of spare breakers and spaces for additional breakers, Panel 1 and the High Lag Panel are the best candidates for accommodating the fluoridation system should the new equipment require 120V or 240V loads.

Once enough information on the fluoridation equipment's location and electrical load are determined, prospective sources of power from existing panelboards may be finalized. A 30-day load measurement should be performed at any prospective panelboards to verify the panelboards can support the anticipated electrical load of the fluoridation system.

1.4.3 Emergency Backup Generators Capacity

Well Electric Well Station is the only operational well site with an emergency backup generator. The backup generator is rated at 100 kW and supplies power to a 60 amp, 120/140V panelboard which primarily powers the server room equipment and the generator's battery charger. The generator and its panel do not have the capacity to support additional loads.

1.5 Existing Facility Summary – I&C

1.5.1 Existing Hardware and Software Platforms

The City water supervisory control and data acquisition (SCADA) system's MTU resides at Well Electric Well Station. It comprises an Allen Bradley ControlLogix L72 processor and two Ethernet/IP modules on a 4-slot rack. Located physically next to the MTU are a redundant pair of servers running Wonderware/AVEVA Human Machine Interface (HMI) software in a server cabinet.

There are two RTU PLCs at Well Electric Well Station:

1. The Well Pump PLC, located at the Well 4/5 room's mezzanine, is an Allen-Bradley MicroLogix 1100 with 10 discrete inputs and 6 discrete outputs on board, and two 8-channel analog input modules leaving room for two additional modules. This PLC monitors the four well pumps around Wells 4 and 5, discharge pressures at certain areas of the system, a flood detection system, and an intrusion system. Flow meter signals (instantaneous and totalized) at each of the four pumps are transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART). No controls are performed at this PLC. This PLC control panel has a Schneider Electric Magelis local HMI.

2. The Chlorination System PLC, located outside of the Chlorine Room, manages monitoring, alarming, and control for the chlorination system. The PLC is an Allen-Bradley MicroLogix 1100 with 10 discrete inputs and 6 discrete outputs on board, and one 4-channel analog input modules leaving room for three additional modules. No controls are performed at this PLC. This PLC control panel does not have a local HMI.

1.5.2 Telemetry

The MTU and central control room is located at Well Electric Well Station, so wireless telemetry is likely not required for expansion at this site. Any fluoridation equipment installed at this site with a PLC can be connected directly to the MTU over copper-based Ethernet cable.

1.5.3 Expansion Options for Additional Monitoring and Controls

At the time this report was written, the existing PLCs have the following quantities of spare I/O (see Table 1-4):

Table 1-4 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Well Pump	4	6	2	0
Chlorination	5	6	3	0

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Section **2**

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Section 2

Parkwater Well Station

2.1 Existing Site – Summary

The Parkwater Well Station was constructed in 1947 out of concrete and serves two pressure zones via eight pumps and four wells. It is located southwest of the Felts Field Airport and its transmission mains connect directly to several of the Well Electric Well Station transmission mains to the north.

2.1.1 Parcel Information and Access

The Parkwater Well Station is located at 5317 E Rutter Avenue, Spokane, WA, 99212. The well station site can be accessed from westbound E Rutter Avenue, or from eastbound E Rutter Avenue which is the arterial that provides access to Felts Field airport.

The site plan in Appendix C highlights the building and well location, as well as existing yard piping. The parcel (number 35114.2501) is zoned for Light Industrial use (LI zoning). The parcel is 0.68 acres.

The Parkwater Well Station building structure sits approximately 10 feet from E Rutter Avenue's westbound lanes concrete curb and gutter. Unmarked streetside parking is available along the westbound lane of the E Rutter Avenue curb. There is an adjacent sidewalk along E Rutter Avenue with concrete walkways that lead to two sets of large double doors that provide access into the well station for large equipment to pass through. A single door with hazardous materials warning signs provides City staff adequate access into the well station building. There are concrete driveways (i.e., curb drops) at each of these access doorways. Bollards in front of the double doors prevent vehicles from blocking the double doors and unlawful entrance into the Parkwater Well Station.

Vehicle access around to the backside, or north side of the Parkwater Well Station is through double swing gates that are 8 feet in width each. This singular vehicle access is at the northeast corner of the parcel and provides paved access from the back of sidewalk to the gate which remains locked, until access is required to the backside of the building where chlorine gas canisters are delivered. Therefore, vehicle access to the front and back sides of the Parkwater Well Station site is good. See Parkwater Well Station site plan in Appendix C.

A likely delivery route to the Parkwater Well Station is shown in Appendix C. The route is along Rutter Avenue from Fancher Road via Trent Avenue (SR 920). This delivery route passes only three residential parcels. The haul route is mostly along industrial zoned and commercial zoned parcels.

2.1.2 Site Security

The Parkwater Well Station's east and south sides of the parcel are surrounded by a 6-foot-tall chain link perimeter fence that does not contain a top rail. There is no barb wire along the top of these sections of perimeter fencing, nor are there any privacy slats within the chain link fence fabric. At the southwest corner of the parcel, the perimeter fencing terminates at the Felts Field airport perimeter security fence and extends to the southwest corner of the Parkwater Well Station building. The well station sites perimeter fencing on the east side of the parcel terminates at the northeast corner of the Parkwater Well Station building and extends to the east parcel line at a corner fence post. This perimeter fencing then extends northward along the parcel's east boundary line.

There is airfield security fencing on the west side and north sides of the Parkwater Well Station parcel. This airfield fencing consists of a 6-foot-tall chain link fencing with a top rail, but no barb wire nor privacy slats. There are no access gates in the airfield security fencing that is adjacent to the Parkwater Well Station parcel's north and west boundary lines. The Parkwater Well Station site fencing along with the airfield fencing provide good security for the facility.

2.1.3 Pressure Zones Served

The Parkwater Well Station serves the Intermediate Pressure Zone and the Low-Pressure Zone. Detailed information on how each well pump serves the distribution system is shown in **Table 2-1.** The transmission mains running north cross the Felts Field Airfield to connect to the Well Electric Well Station transmission mains.

Table 2-1 | Parkwater Pump Transmission Summary

Well No.	Pumps	Zone Served	Transmission Main Size (in)
1	1&2	Intermediate	20" upsizes to 24"
2	3&4	Low	20" which splits to 42", 30" and 18"
3	5&6	Low	20" which splits to 42", 30" and 18"
4	7&8	Low	20" which splits to 42", 30" and 18"

2.2 Existing Facility Summary – Structural

2.2.1 Description of Structures

The original building constructed at the Parkwater site was constructed in 1947 per available existing drawings. The building was constructed with concrete from floor to ceiling (see **Figure 2-1**).

Figure 2-1 | Parkwater – Concrete Walls, Columns, and Ceiling

The structure on-site appeared to be in satisfactory condition. Due to the age of the building, settlement over time, and concrete shrinkage, a few minor cracks have propagated throughout the facility.

2.2.2 Building Code Requirements

While on-site, it was determined that there was not enough space inside the existing facility to incorporate a new fluoridation system. This site would require a new fluoridation system to be placed nearby outside the building with a new enclosure around it. This new enclosure would need to meet all requirements under the current International Building Code (IBC).

2.3 Existing Mechanical Plan

The Parkwater Well Station houses four caisson-style wells and eight vertical turbine pumps (see Table 2-2). Each pump has its own flow meter installed in underground vaults northwest of the building, as shown in Appendix C.

Table 2-2 | Parkwater Pump Summary

Pump No.	Well No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1	1	Fairbanks-Morse	900	7,000	415
2	1	Flowserve	1,000	7,500	450
3	2	Fairbanks-Morse	900	8,000	247
4	2	Goulds	900	8,000	249
5	3	Fairbanks-Morse	600	8,000	247
6	3	Trillium/Floway	600	8,000	243
7	4	Fairbanks-Morse	600	8,000	247
8	4	Trillium	600	8,000	243

The Parkwater chlorine room is located on the northwest side of the building as shown in the figures in Appendix C. The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson.

Free chlorine residual is continuously monitored by one Hach CL17 analyzer for each pressure zone, for a total of two analyzers. Representative samples are taken from the low and intermediate pressure zones. Samples are taken from below grade vaults in the yard and run back to chlorine residual monitors in the building. The location of the sample taps is shown in the building layout plan in Appendix C and the locations of the Chlorine monitors are shown in the site plan in Appendix C. Each Hach CL17 chlorine analyzer requires 1-3 gpm of continuous sample flow. The CL17 is a colorimetric analyzer which adds a small amount of reagent to the sample; thus, the sample is drained to sanitary sewer.

2.4 Existing Facility Summary – Electrical

2.4.1 Power Feed and Supply Capacity

Parkwater's electrical supply comes from a 2.3 kilovolt (kV) 2000 A feeder within the Switch Yard No. 1 Unit Substation. A one-line diagram of the medium voltage distribution system is shown in Section 1.4.1.

2.4.2 Motor Control Centers (MCC) and Panelboards

Parkwater has two MCCs that both operate on a 1200-amp bus at 2400V. Each MCC has a station service disconnect switch. One MCC powers Pumps 1 through 4 and the other powers Pumps 5 through 8. There is a tie breaker between the MCCs that is normally open.

Parkwater has three station service panelboards:

1. Panel A – Located on the exterior east wall of the chlorination room to the right of the MCC powering Pumps 5-8.

2. Panel B – Located adjacent to Panel A.

3. Lighting Panel – Located next to the main entrance.

Electrical capacity information for each panelboard is shown in **Table 2-3**.

Table 2-3 | Parkwater Panelboard Information

Parkwater	Main breaker?	Spare breakers available?	Space available for new breakers?	Notes
Panel A	No (200A bus)	Yes (2)	No	120/208V
Panel B	200A	No	No	
Lighting Panel	No (100A bus)	Yes (1)	No	

Between Panel A and the Lighting Panel there may be enough circuits to provide power to a new fluoridation system, but further information on the fluoridation system's electrical load requirements, as well as measured load data at these panels, are needed to make a determination.

2.5 Existing Facility Summary – I&C

2.5.1 Existing Hardware and Software Platforms

The Parkwater PLC is an Allen-Bradley 1747-L552C SLC 5/05 in a 10-slot rack with two slots available. This PLC control panel has a Schneider Electric Magelis local HMI. Flow meter signals (instantaneous and totalized) at each of the eight pumps are transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART).

2.5.2 Telemetry

Parkwater communicates to the MTU at Well Electric Well Station with a 900 MHz radio.

2.5.3 Expansion Options for Additional Monitoring and Controls

The Parkwater PLC has the following quantities of spare I/O and has space for two more I/O modules (see **Table 2-4**):

Table 2-4 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Parkwater	2	0	18	0

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Section **3**

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Section 3

Ray Street Well Station

The Ray Street Well Station, located in the City's East Central residential neighborhood, was constructed in 1937. It serves one pressure zone via two wells and three pumps.

3.1 Existing Site – Summary

3.1.1 Parcel Information and Access

The Ray Street Well Station is located at 607 S Ray Street, Spokane, WA. The well station site is located northeast of the intersection of W Hartson Avenue and S Ray Street are local residential access streets. This street intersection where the Ray Street Well Station is located is within the City's East Central residential neighborhood.

Vehicle access into the Ray Street Well Station site is rated fair since there is only one 10-foot-wide concrete driveway from S Ray Street. The concrete driveway (i.e., curb drop) through the adjacent concrete sidewalk provides access to a one-way concrete pathway 10-foot in width to the front coil roll-up door with man door that leads into the Ray Street Well Station building. There is no vehicular turn around at the end of the concrete pathway. Also, there are no other driveways or roads providing access through the Ray Street Well Station site. The site plan in Appendix D highlights the building and well location, as well as existing yard piping. The parcel (number 35222.0001) is zoned for Residential Two-Family use (RTF zoning). The parcel is 1.90 acres.

A likely delivery route to the Ray Street Well Station is shown in Appendix D. The route is along Thor Street from 3rd Avenue via Interstate 90. This delivery route passes many residential zoned parcels along 3rd Avenue and Thor Street with commercial zoned at the intersection of 3rd Avenue and Thor Street. The portion of the haul route on Hartson Avenue and Ray Street is along residential zoned parcels.

3.1.2 Site Security

The Ray Street Well Station site security is fair since there is a site perimeter fence around the site. However, the perimeter fence is only 40 inches tall and does not cross the concrete pathway to the building structure's main access door. A taller site perimeter fence would likely prevent unauthorized access and vandalism. However, since the Ray Street Well Station site is in the City's East Central neighborhood, site security perimeter fencing would likely exclude the property from the rest of the neighborhood. Also, a site perimeter security fence would result in an undesired visual presence for the East Central neighborhood who use the southeast corner of the Ray Street Well Station parcel as a community garden space.

There are two removable steel pipe bollards in front of the roll-up coiling garage style of door at the front of the Ray Street Well Station. These bollards provide a protective barrier that limits vehicle access through the door protecting the Ray Street Well Station and City staff inside the building structure.

The high voltage switchyard that contains electrical service assets and transformers for the Ray Street Well Station has an 8-foot-tall perimeter fence with no barb wire along its top rail. There are no privacy slats in the chain link fence fabric. There are double swing gates on the north side of the high voltage switchyard's perimeter fence which is in fair condition. There are high voltage warning signs posted on the north, east and south sides of the switchyard's perimeter fence. The Ray Street Well Station site's building structure frames the west side of the switchyard's boundary.

3.1.3 Pressure Zones Served

The Ray Street Well Station serves the Intermediate Pressure Zone via 20-inch discharge mains that tee into the 36-inch transmission main on Ray Street.

3.2 Existing Facility Summary – Structural

3.2.1 Description of Structures

The original building constructed at the Ray site was constructed in 1937 per available existing drawings. The building was constructed with unreinforced brick masonry walls above grade and a concrete foundation below grade. (see Figure 3-1).

Figure 3-1 | Ray – Unreinforced Masonry Walls and Concrete Foundation (Painted Yellow)

The structure on-site appeared to be in fair condition. Due to the age of the building, settlement over time, and concrete shrinkage, several minor cracks have propagated throughout the facility.

3.2.2 Building Code Requirements

Ray was one of the few sites that appeared to have enough available square footage to add a fluoridation system inside the existing buildings. A portion of this available space would no longer be available if a future pump was installed next to pump No. 1. Some existing piping is in place that suggests a future pump has been planned for at this location. The currently available space was located in the southwest corner of the building. Large concrete beams are underneath the slab that appear to be capable of supporting the new system, but further investigation is required structurally to fully verify the capacity of the beams and what load they currently support. This location appears to require no major work to be performed at the site and would seemingly not trigger any IEBC full building retrofit criteria. The capacity of the beams would need to be verified per the IEBC. Additionally, the site has plenty of space to construct a nearby enclosure for the new fluoridation system.

3.3 Existing Mechanical Plan

The Ray Well Station houses two caisson-style wells and three vertical turbine pumps (see **Table 3-1**). Each pump has its own flow meter installed in underground vaults west of the building, as shown in **Appendix D**.

Table 3-1 | Ray Street Pump Summary

Pump No.	Well No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1	1	Fairbanks-Morse	900	7,000	406
2	2	Fairbanks-Morse	900	7,200	400
3	2	Goulds	500	4,350	372

The Ray Street chlorine room is located inside the well building on the upper level as shown in the figures in **Appendix D.** The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson.

Free chlorine residual is continuously monitored by one Hach CL17 analyzer because Ray Street feeds one pressure zone (Intermediate). The sample is taken from an unknown location in the yard and run back to chlorine residual monitor in the building via a 1-inch service line entering the northwest corner of the building. The location of the Chlorine monitor is shown in the building layout plan in **Appendix D**. Each Hach CL17 chlorine analyzer requires 1-3 gpm of continuous sample flow. The CL17 is a colorimetric analyzer which adds a small amount of reagent to the sample thus, the sample is drained to sanitary sewer.

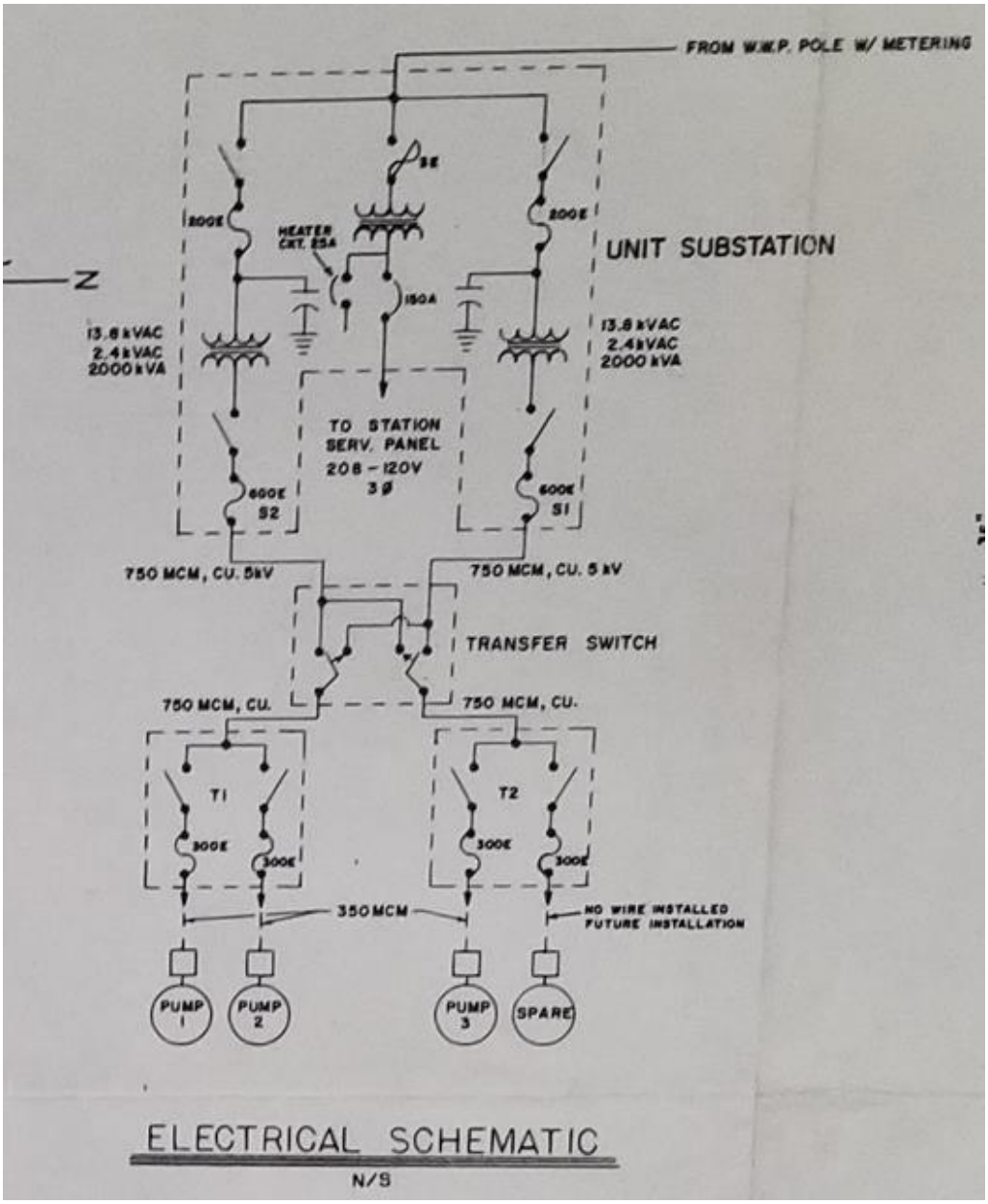
3.4 Existing Facility Summary – Electrical

3.4.1 Power Feed and Supply Capacity

The Ray Street Well Station is fed by a single utility feeder supplying power to a unit substation outside the rear side of the well building. The unit substation contains three feeders: two feeders each supply a 2000 kilovolt-Ampere (kVA) transformer and the third feeder supplies 120/208V station service power through a 30 kVA transformer.

A one-line diagram of Ray Street Facility is shown in **Figure 3-2**.

Figure 3-2 | Ray Street One-Line Diagram



3.4.2 Motor Control Centers (MCC) and Panelboards

Dedicated MCCs for each pump are fed by disconnect switches in the switchyard. There is a spare 2400V feeder if voltages larger than 208V are needed for the fluoridation system.

Ray Well has two panelboards under station service:

1. Main panelboard – Located at the lower level between Pumps 2 and 3.
2. Lighting panel – Located above the stairs leading down to Pumps 1 and 2.

Electrical capacity information for each panelboard is shown in Table 3-2.

Table 3-2 | Ray Street Panelboard Information

Ray	Main breaker?	Spare breakers available?	Space available for new breakers?	Notes
Main Panelboard	175A	Yes (1)	Yes (11)	120/208V 3-ph
Lighting Panel	100A	No	No	

There may be enough circuits at the Main Panelboard to provide power to a new fluoridation system, but further information on the fluoridation system's electrical load requirements, as well as measured load data at the Main Panelboard, are needed to make a determination.

3.5 Existing Facility Summary – I&C

3.5.1 Existing Hardware and Software Platforms

The Ray PLC is an Allen-Bradley MicroLogix 1100 with three 4-channel analog input modules and one 16-channel discrete direct current (DC) input module. Module expansion is at capacity for this PLC. This PLC control panel has a Schneider Electric Magelis local HMI. Flow meter signals (instantaneous and totalized) at each of the three pumps are transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART).

3.5.2 Telemetry

The Ray Street Well Station communicates to the MTU at Well Electric Well Station with a 900 MHz radio.

3.5.3 Expansion Options for Additional Monitoring and Controls

The Ray PLC has the following quantities of spare I/O and has no space for more I/O modules, but the 4-channel analog input modules can be replaced with 8-channel analog input modules if needed (see Table 3-3).

Table 3-3 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Ray	14	0	1	0

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Section **4**

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Section 4

Central Avenue Well Station

The original Central Avenue Well Station was constructed in 1960 and consisted of three buildings: one for each well, and one control and chlorine building. New buildings for each well were constructed between 2016 and 2019. The well station serves one pressure zone via two wells and two pumps and is located in the City's North Hill residential neighborhood.

4.1 Existing Site – Summary

4.1.1 Parcel Information and Access

The Central Avenue Well Station is located at 5903 N Normandie Street, Spokane, WA. The well station site is located northwest of the intersection of W Central Avenue and N Normandie Street, which are urban minor collector and local access streets, respectively. This street intersection where the Central Avenue Well Station is located is within the City's North Hill residential neighborhood. The site plan in Appendix E highlights the buildings and well locations, as well as existing yard piping. The parcel (number 36311.1406) is zoned for Residential Single-Family use (RSF zoning). The parcel is 0.35 acres.

Vehicle access into the Central Avenue site is good since there is a 16-foot-wide circular drive from W Central Avenue to N Normandie Street. This quarter circle drive-through provides front door access to the older control building with chlorine room. There are also concrete driveways (i.e., curb drops) at each of the two well pump stations; one at the southwest corner of the site that provides vehicle access to well station #1 from W Central Avenue and the other at the northeast corner of the site that provides vehicle access to well station #2 from N Normandie Street. These 16-foot-wide driveways provide access to the double doors on the east side of well station #1 and to the double doors on the south side of well station #2.

Also, there is an alley that is accessible from W Central Avenue that provides access to the fenced high voltage yard that is in the northwest corner of the Central Avenue Well Station site. The alley way provides good access to the electrical service assets and transformers for the well station site. The utility pole with transformer is also located within the fenced high voltage yard. Vehicle access the yard by driving on the lawn to the gates in the high voltage yard's perimeter fence.

A likely delivery route to the Central Avenue Well Station is shown in Appendix E. The route is along Central Avenue from Division Street (Hwy 395) Drive. This delivery route passes one block of residential parcels. The haul route is along commercial zoned parcels that line Division Street.

4.1.2 Site Security

The Central Avenue Well Station site security is poor since there is not a site perimeter fence to enclose the sites three building structures which are well station #1, well station #2, and the controls building with chlorine room. The site perimeter fence would prevent unauthorized access and vandalism. However, since the Central Avenue Well Station site is in the City's North Hill neighborhood, site security perimeter fencing would likely exclude the property from the rest of the neighborhood. Also, a site perimeter security fence would result in an undesired visual presence for the North Hill neighborhood.

The high voltage switchyard that contains electrical service disconnects and transformers for the Central Avenue Well Station has a 6-foot-tall perimeter fence with three strands of barb wire along its top rail. There are no privacy slats in the chain link fence fabric. There are double swing gates on the south side of the high voltage switchyard's perimeter fence which is in fair condition. There are high voltage warning signs posted on the south and east sides of the switchyard's perimeter fence. Arborvitae hedges line the west and north sides of the high voltage switchyard's perimeter fence. The hedges provide privacy and visual appeal for the adjacent residences to the west and north of the Central Avenue Well Station site.

4.1.3 Pressure Zones Served

The Central Avenue Well Station serves the North Hill Pressure Zone via 24-inch discharge mains which both tee into two different 24-inch and 30-inch transmission mains.

4.2 Existing Facility Summary – Structural

4.2.1 Description of Structures

The well buildings at the Central Ave site were constructed between 2016 and 2019 to replace the existing vaults over the wells and pumps. The original chlorine and control building was still in operation, which was constructed in 1960. The two new well buildings were constructed using CMU walls and a timber framed roof. CMUs, sometimes called cinder blocks, are much more standard for modern masonry construction. The CMUs are staggered, similar to typical brick construction, so the holes overlap with CMU layers above and below. Reinforcing can be ran through all the layers of CMU to tie the wall together and provide tension capacity in the wall. However, not all CMU construction uses reinforcing. There is no visual way to tell with this type of construction, but noninvasive tools are available if further investigation is required. Due to the age of these buildings as well as available information in the plans, the well buildings on site are reinforced and designed to meet today's code requirements. The figure below shows the CMU walls.

Figure 4-1 | Central Ave – CMU construction

The structures on-site appeared to be in good condition. Minimal damage was observed at these relatively newer facilities.

4.2.2 Building Code Requirements

While on-site, it was determined that there was not enough space inside the existing facility to incorporate a new fluoridation system. This site would require a new fluoridation system to be placed nearby outside the buildings with a new enclosure around it. This new enclosure would need to meet all requirements under the current IBC.

4.3 Existing Mechanical Plan

Two caisson wells, each with one vertical turbine pump (see **Table 4-1**), are housed in two different buildings on the Central Avenue site. Each pump has its own flow meter installed in underground vaults as shown in the site plan in **Appendix E**.

Table 4-1 | Central Avenue Pump Summary

Pump No.	Well No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1	1	Goulds	900	8,000	355
2	2	National Pump Company	900	8,000	355

A separate building on the Central site, has a chemical room for the chlorine system as shown in the figures in **Appendix E.** The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson.

Free chlorine residual is continuously monitored by one Hach CL17 analyzer for each pump, for a total of two analyzers. Both pumps serve the same zone but have separate headers. Samples are taken from unknown locations from pump discharge header pipes in the road and run back to chlorine residual monitors in their respective buildings. The locations of the chlorine monitors are shown in the building layout plan in **Appendix E**. Each Hach CL17 chlorine analyzer requires 1-3 gpm of continuous sample flow. The CL17 is a colorimetric analyzer which adds a small amount of reagent to the sample; thus, the sample is drained to sanitary sewer.

4.4 Existing Facility Summary – Electrical

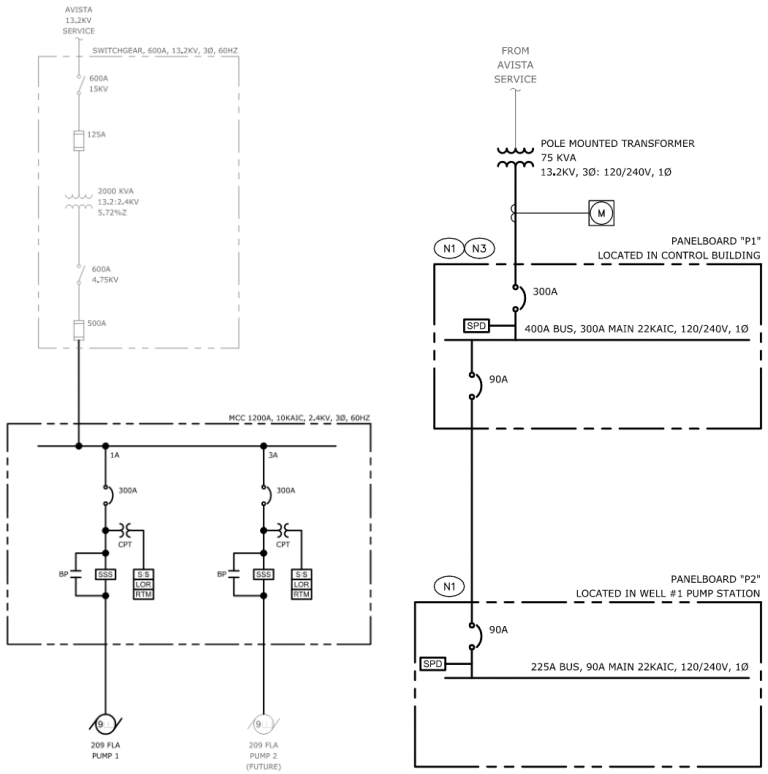
4.4.1 Power Feed and Supply Capacity

Well pump power is supplied by a 2000 kVA pad mount dry transformer and disconnect switch in the switchyard. The disconnect feeds a 1200-amp MCC operating at 2400V.

Station service power is supplied by a 75 kVA pole mounted transformer feeding a panelboard with a 300-amp bus and 400-amp main breaker.

One-line diagrams of the well pumps and station service power are shown in **Figure 4-2**.

Figure 4-2 | Central Avenue One-Line Diagram



4.4.2 Motor Control Centers (MCC) and Panelboards

The MCC is a three section MCC located in the building between the two well pump buildings. The two well pump soft starters reside in this MCC. The MCC can potentially be expanded to the left if voltages larger than 240V are required for the fluoridation system.

Central has three station service panelboards:

1. Panel P1– Located in the main building between the two well pump buildings.
2. Panel P2 – Located in the west pump building where Pump 1 resides.
3. Panel P3 – Located in the east pump building where Pump 2 resides.
4. Panels P2 and P3 are fed by Panel P1 with 90 amp 2-pole breakers.

Electrical capacity information for each panelboard is shown in Table 4-2.

Table 4-2 | Central Avenue Panelboard Information

Central	Main breaker?	Spare breakers available?	Space available for new breakers?
Panel P1	400A adjustable (300A bus)	Yes (1)	Yes (10)
Panel P2	90A	Yes (2)	Yes (9)
Panel P3	90A (125A bus)	Yes (5)	Yes (28)

Based on the number of spare breakers and space for new breakers, Central Avenue Well Station has relatively abundant capacity to support a fluoridation system, but further information on the fluoridation system's electrical load requirements, as well as measured load data at these panelboards, are needed to make a determination.

4.5 Existing Facility Summary – I&C

4.5.1 Existing Hardware and Software Platforms

Central's RTU PLC is an Allen-Bradley MicroLogix 1100 with two 4-channel analog input modules, one 16-channel discrete DC input module, and a 4-channel RTD module. Module expansion is at capacity for this PLC. This PLC control panel has a Schneider Electric Magelis local HMI. Flow meter signals (instantaneous and totalized) at each of the two pumps are transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART).

4.5.2 Telemetry

The Central Avenue Well Station communicates to the MTU at Well Electric Well Station with a 900 MHz radio.

4.5.3 Expansion Options for Additional Monitoring and Controls

The Central Avenue Well Station PLC has the following quantities of spare I/O and has no space for more I/O modules, but the 4-channel analog input modules can be replaced with 8-channel analog input modules if needed (see Table 4-3):

Table 4-3 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Central	12	2	0	0

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Section **5**

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Section 5

Grace Well Station

The Grace Well Station serves one pressure zone via two wells and two pumps and is located east of the City's Water Department building. The Nevada Well Station is also located at this site. The Grace Well Station was constructed in 1949.

5.1 Existing Site – Summary

5.1.1 Parcel Information and Access

The Grace Well Station is located at 1024 E North Foothills Drive, Spokane, WA. The Grace Well Station is located within the City's water department yard that is southeast of the intersection of E North Foothills Drive and N Hamilton Street. The Grace Well Station site can be accessed only from E North Foothills Drive because water department yard perimeter fencing terminates at the northwest and southeast corners of the Grace Well Station building structure. This fencing blocks access into the Grace Well Station from the water department yard since there are doors only on the north side of the well station building. The man door and roll-up garage door face E North Foothills Drive. Site access is only fair since the water department yard perimeter fencing limits vehicle access to each the Grace Well Station. The site plan in Appendix F highlights the building and well location, as well as existing yard piping. The Grace Well Station is on the same parcel as the Nevada Well Station and the City Water Department (parcel number 35081.2802). The parcel is zoned as a Center and Corridor Type 1 Zone- Employment Center (CC1-EC). The parcel is 6.68 acres.

A likely delivery route to the Grace Well Station is shown in Appendix F. The route is along North Foothills Drive from the Ruby Street/Division Street couplet (Hwy 395). This delivery route passes only three residential parcels. The haul route is along industrial zoned and commercial zoned parcels.

5.1.2 Site Security

The Grace Well Station building does not have perimeter security fencing and its assessment rating is poor. Only the west and south sides of the well station building are within City water department yard fencing. Existing fencing on the west side of the Grace Well Station is 6 feet tall with three strands of wire with no barbs strung above the top fence rail. There are red vinyl privacy slats in the chain link fencing along E North Foothill Drive and in the chain link fencing that surrounds the transformer yard that is located northwest and adjacent to the Grace Well Station site. The water department fence on the south side of the Grace Well Station building is new fencing that is in excellent condition. This fencing is 6 feet tall with three strands of barb wire along its top rail.

There is also a locked man gate in the fencing where it terminates at the southeast corner of the well station building. This new fencing was installed as part of the Spokane Public Schools' (SPS) new Yasuhara Middle School located east of the Grace Well Station.

There is one fisheye security camera mounted on the southeast corner of the Grace Well Station building. The security camera is mounted approximately 12 feet above the ground surface. This (SPS) security camera provides a southeast view of the middle school parking lot that is along E North Foothills Drive. The security camera likely provides a limited view along the east boarder of the City's water department yard south of the Grace Well Station building.

5.1.3 Pressure Zones Served

The Grace Well Station serves the North Hill Pressure Zone via 24-inch discharge mains that turn east into the 36-inch transmission main on Foothills Avenue.

5.2 Existing Facility Summary – Structural

5.2.1 Description of Structures

The building at the Grace Well Station site was constructed in 1949 per available drawings. The building was constructed using CMU walls. It is unknown whether the walls contain reinforcing. The ceilings were very tall in this building and the framing appeared to be covered by plywood. It was difficult to confirm what was used for the roof framing, but the plywood may suggest that it was formwork for concrete that was never removed (see Figure 5-1). The building has a brick veneer on the outside, which only serves aesthetic purposes.

Figure 5-1 | Grace – CMU Walls and Unknown Ceiling

The structure on-site appeared to be in fair condition. Due to the age of the building, settlement over time, and concrete shrinkage, several minor cracks have propagated throughout the facility. Under the main floor of the building, several beams span transversely across the floor. There was some spalling observed on one of the beams which has exposed bars and has allowed for corrosion of the reinforcing bars to take place (see Figure 5-2).

Figure 5-2 | Grace – CMU Walls and Unknown Ceiling

5.2.2 Building Code Requirements

This site has enough floor space to include a new fluoridation system, however there are concerns about the logistics of operating the overhead crane inside the building. Picks made by the crane would need to go up and over the new fluoridation equipment or over the existing pump equipment. The floor would also need to be evaluated for the required structural capacity to support the new fluoridation equipment. The floor spans over the wells below and is not supported by soil underneath. There may be potential to shore up the existing floor to support the new equipment. Without needing any penetrations in the walls, this site would not trigger any IEBC upgrades for the building. Additionally, the fluoridation equipment could be located in a new structure outside the building that is current with the IBC requirements.

5.3 Existing Mechanical Plan

The Grace Well Station houses one caisson-style well and two vertical turbine pumps (see **Table 5-1**). Each pump has its own flow meter installed in an underground vault north of the building, as shown in **Appendix F**.

Table 5-1 | Grace Pump Summary

Pump No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1	Goulds	900	8,000	340
2	Goulds	900	8,000	340

The Grace chlorine room is located inside the well building on the upper level as shown in the figures in Appendix F. The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson.

Free chlorine residual is continuously monitored by one Hach CL17 analyzer. The sample is taken from an unknown location in the pump discharge header pipe in the road and run back to chlorine residual monitor in the pump building via a 2-inch water service line. The location of the chlorine monitor is shown in the building layout plan in Appendix F. Each Hach CL17 chlorine analyzer requires 1-3 gpm of continuous sample flow. The CL17 is a colorimetric analyzer which adds a small amount of reagent to the sample; thus, the sample is drained to sanitary sewer.

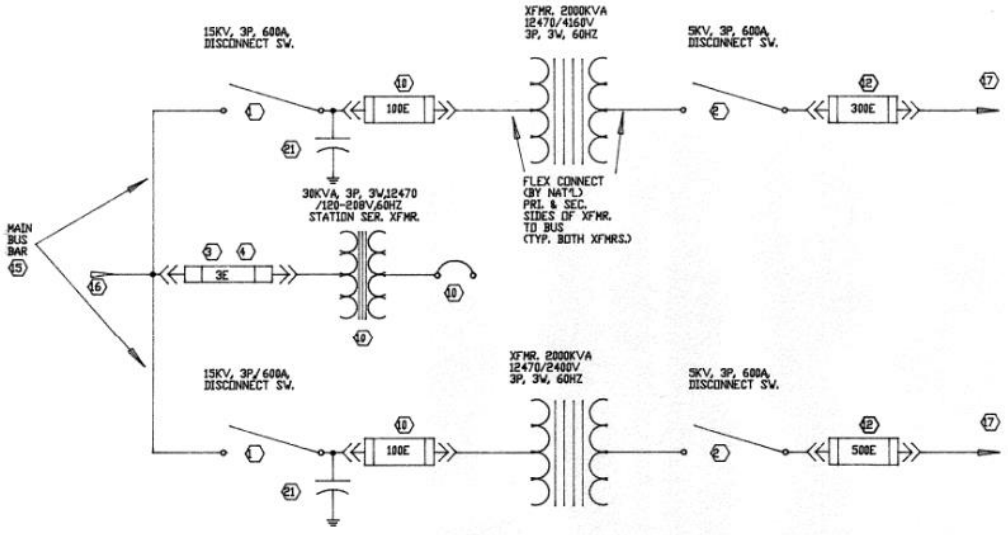
5.4 Existing Facility Summary – Electrical

5.4.1 Power Feed and Supply Capacity

The Grace Well Station MCC is powered through a 2000 kVA transformer and operates at 4160V. A 600 amp disconnect switch is installed at the transformer secondary.

Station service power is supplied by a 30 kVA transformer and operates at 120-208V 3-phase. This transformer also feeds one of two station power feeders to the Nevada Well facility. A one-line diagram of the Grace facility is shown in Figure 5-3.

Figure 5-3 | Grace One-Line Diagram



5.4.2 Motor Control Centers (MCC) and Panelboards

Grace Well Station has two well pumps installed and use soft starters in an MCC with a bus rating of 1200 amps.

Grace Well Station has one panelboard for station service power, located on the south wall adjacent to the pump MCC (see Table 5-2).

Table 5-2 | Grace Panelboard Information

Grace	Main breaker?	Spare breakers available?	Space available for new breakers?
Station Service Panel	100A (200A bus)	Yes (1 20A)	No

With one spare breaker and no space for additional breakers, the existing panel likely does not have the capacity to support a fluoridation system, so a subpanel or further evaluation on an additional power source may be required.

5.5 Existing Facility Summary – I&C

5.5.1 Existing Hardware and Software Platforms

Grace Well Station's PLC is an Allen-Bradley MicroLogix 1100 with three 4-channel analog input modules leaving room for one additional module. This PLC control panel has a Schneider Electric Magelis local HMI. Flow meter signals (instantaneous and totalized) at each of the two pumps are transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART).

5.5.2 Telemetry

Grace Well Station communicates to the MTU at Well Electric Well Station with a 900 MHz radio. This radio also transmits data from Nevada Well Station.

5.5.3 Expansion Options for Additional Monitoring and Controls

The Grace Well Station PLC has the following quantities of spare I/O and has space for one more I/O module. The 4-channel analog input modules can be replaced with 8-channel analog input modules if needed (see Table 5-3):

Table 5-3 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Grace	1	2	7	0

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Section 6

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Section 6

Nevada Well Station

The Nevada Well station serves one pressure zone via four pumps in one well. It was constructed in 1956 and is located at the City Water Department site, west of the Grace Well Station.

6.1 Existing Site – Summary

6.1.1 Parcel Information and Access

The Nevada Well Station is located at 914 E North Foothills Drive, Spokane, WA. The Nevada Well Station is located within the City's water department yard that is southeast of the intersection of E North Foothills Drive and N Hamilton Street. The Nevada Well Station site can only be accessed from within the City's water department yard that has a driveway entrance from E North Foothills Drive. Vehicular and City staff access to the Nevada Well Station site good since there is more than 44 feet of asphalt pavement on the west and south sides of the Nevada pump house and chlorine building that comprise the Nevada Well Station. The site plan in Appendix G highlights the building and well location, as well as existing yard piping. The Nevada Well Station is on the same parcel as the Grace Well Station and the City Water Department (parcel number 35081.2802). The parcel is zoned as a Center and Corridor Type 1 Zone- Employment Center (CC1-EC). The parcel is 6.68 acres.

A likely delivery route to the Nevada Well Station is shown in Appendix G. The route is along North Foothills Drive from the Ruby Street/Division Street couplet (Hwy 395). This delivery route passes only three residential parcels. The haul route is along industrial zoned and commercial zoned parcels.

6.1.2 Site Security

The Nevada Well Station lies within the water department's yard. The water department yard has 6 feet tall perimeter fencing with three strands of barb wire above the top rail and red vinyl privacy slats in the chain link fence fabric which provides good site security. The north side of the chlorine building is not within City water department yard site fencing. This north side of the chlorine building structure is adjacent to E North Foothill Drive.

The Nevada Well Station is adjacent to and east of the main driveway entrance into the City's water department yard off E North Foothills Drive. The gate at the main entrance is 30 feet wide minimum, with two slide gates that are manually operated.

6.1.3 Pressure Zones Served

The Nevada Well Station serves the Low-Pressure Zone via 16-inch discharge mains that turn north into a 36-inch, and south into a 30-inch transmission main.

6.2 Existing Facility Summary – Structural

6.2.1 Description of Structures

The building was constructed at the Nevada Ave site was constructed in 1956 per available drawings. The building was constructed using concrete for the walls and timber framing for the ceiling (see figure below). Several alterations have taken place over the years, including a pump house roof and hoist frame replacement in 2002.

Figure 6-1 | Nevada – Concrete Walls and Timber Ceiling

The structure on-site appeared to be in fair condition. Due to the age of the building, settlement over time, and concrete shrinkage, several minor cracks have propagated throughout the facility.

6.2.2 Building Code Requirements

While on-site, it was determined that there was not enough space inside the existing facility to incorporate a new fluoridation system. This site would require a new fluoridation system to be

placed nearby outside the buildings with a new enclosure around it. This new enclosure would need to meet all requirements under the current IBC.

6.3 Existing Mechanical Plan

The Nevada Well Station houses one caisson-style well and four pumps (see Table 6-1). Each pump has its own flow meter installed in an underground tunnel connected to the west side of the building, as shown in Appendix G.

Table 6-1 | Nevada Pump Summary

Pump No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1	Byron-Jackson-Submersibles	400	5,700	234
2	Flowserve Vertical Turbine	800	9,800	250
3	Flowserve Vertical Turbine	800	9,800	250
4	Byron-Jackson-Submersibles	400	5,700	234

The Nevada chlorine room is the northern, main level portion of the well building as shown in the figures in Appendix G. The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson.

Free chlorine residual is continuously monitored by one Hach CL17sc analyzer (a newer model than the CL17). The sample is taken from an unknown location from the pump discharge header pipe in the road and run back to the chlorine residual monitor in the control room, whose location is shown in the building layout plan in Appendix G. Each Hach CL17sc chlorine analyzer requires 1-3 gpm of continuous sample flow. The CL17sc is a colorimetric analyzer which adds a small amount of reagent to the sample; thus, the sample is drained to sanitary sewer.

6.4 Existing Facility Summary – Electrical

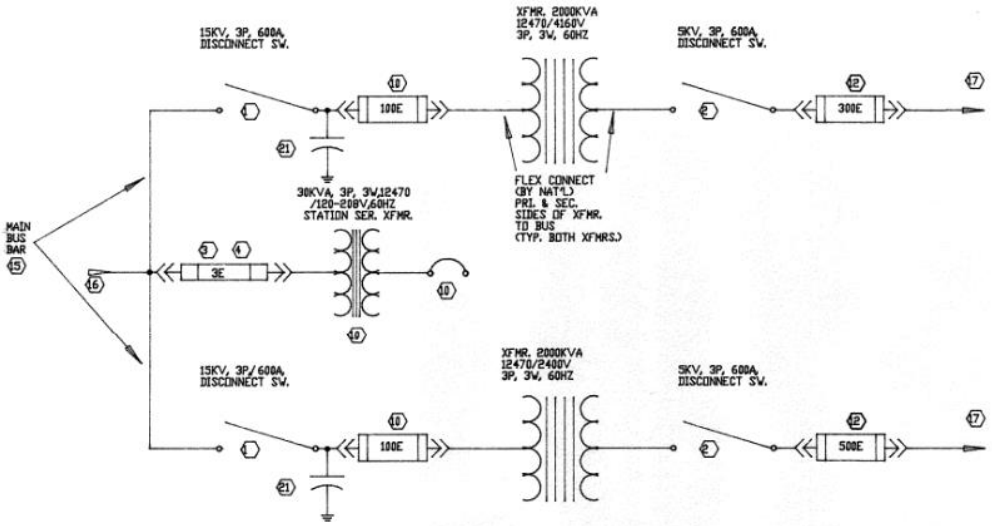
6.4.1 Power Feed and Supply Capacity

The Nevada Well Station has four pumps. Pumps 1 and 2 are fed by a 2000 kVA transformer and operate at 2400 volts. The 2000 kVA transformer also services one of two station service panels that is located outside the Nevada Well building on the east exterior wall, which primarily serves the two HVAC units for the pump room. The exterior station service panel is fed by a 75 kVA transformer and operates at 120-208V 3-phase. A 200-amp fused disconnect switch protects the primary side of the 75 kVA transformer.

Pumps 3 and 4 are fed by a 1500 kVA transformer and operate at 2400V.

The second station service panel, located inside the Nevada Well Station next to the main entrance, shares the same 30 kVA transformer that feeds the Grace Well Station service as mentioned in Section 5.4.1. A one-line diagram of the facility is shown in Figure 6-2.

Figure 6-2 | Nevada One-Line Diagram



6.4.2 Motor Control Centers (MCC) and Panelboards

The MCC lineup is located at the northeast corner of the pump building and is dual sourced as discussed in Section 6.4.1. Nameplate information such as bus rating was not clearly visible on the face of the MCC lineup.

The Nevada Well Station has two station service panelboards:

1. Interior Station Service Panel – Located inside the building next to the main entrance. Fed by the 50 kVA, 120/208V transformer.

2. Exterior Station Service Panel – Located outside the building on the east exterior wall. Fed by the 2000 kVA, 2400V transformer and the 75 kVA, 120/208V transformer.

Electrical capacity information for each panelboard is shown below. (see Table 6-2).

Table 6-2 | Nevada Street Panelboard Information

Nevada	Main breaker?	Spare breakers available?	Space available for new breakers?
Interior Panel	100A	Yes (2)	Yes (4)
Exterior Panel	200A	Yes (2)	Yes (27)

There appears to be adequate space and capacity to provide breakers for a fluoridation system at this site, but a load study should be performed to ensure the additional load will not exceed the bus rating of the panelboard(s) being used.

6.5 Existing Facility Summary – I&C

6.5.1 Existing Hardware and Software Platforms

The Nevada Well Station PLC is an Allen-Bradley MicroLogix 1100 with one 16-channel discrete DC input module and two 8-channel analog input modules leaving room for one additional module. This PLC control panel has a Schneider Electric Magelis local HMI. Flow meter signals (instantaneous and totalized) at each of the four pumps are transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART).

6.5.2 Telemetry

Nevada Well Station does not have a radio. Its data is sent to the Grace PLC through a MODBUS serial connection, then is relayed to the MTU at Well Electric Well Station to the 900 MHz radio at Grace Well Station.

6.5.3 Expansion Options for Additional Monitoring and Controls

The Nevada Well Station PLC has the following quantities of spare I/O and has space for one more I/O module (see Table 6-3):

Table 6-3 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Nevada	13	0	3	0

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Section **7**

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Section 7

Hoffman Well Station

The Hoffman Well Station is located in the City's Bemiss residential neighborhood and was constructed in 1936. It serves one pressure zone via one pump and well but is currently undergoing retrofits so that a second pump can be installed in the facility's second well (which is currently out of commission).

7.1 Existing Site – Summary

7.1.1 Parcel Information and Access

The Hoffman Well Station is located at 2109 E Hoffman Avenue, Spokane, WA. The well station site is located northeast of the intersection of N Crestline Street and E Hoffman Avenue which are urban minor arterial and local access streets, respectively. This street intersection where the Hoffman Well Station is located is within the City's Bemiss residential neighborhood.

Vehicle access into the Hoffman Well Station site is rated fair since there is only one 12-foot-wide concrete driveway from E Hoffman Avenue. The concrete driveway (i.e., curb drop) through the adjacent concrete sidewalk provides access to a one-way concrete pathway 12 feet in width to the tall front double doors that lead into the Hoffman Well Station building. There is no vehicular turn around at the end of the concrete pathway. Also, there are no other driveways or roads providing access through the Hoffman Well Station site. The site plan in Appendix H highlights the building and well location, as well as existing yard piping. The Hoffman Well Station parcel (parcel number 35041.0419 is zoned for Residential Single Family (RSF) use. The parcel is 0.64 acres.

A likely delivery route to the Hoffman Well Station is shown in Appendix H. The route is along Wellesley Avenue from Division Street (Hwy 395). This delivery route passes many residential zoned parcels along Wellesley Avenue with commercial zoned parcels at the intersection of Wellesley Avenue and Crestline Street. The portion of the haul route on Division Street is along commercial zoned parcels.

7.1.2 Site Security

The Hoffman Well Station site security is poor since there is not a site perimeter fence to enclose the well station building structure. A site perimeter fence would likely prevent unauthorized access and vandalism. However, since the Hoffman Well Station site is in the City's Bemiss neighborhood, site security perimeter fencing would likely exclude the property from the rest of the neighborhood. Also, a site perimeter security fence would result in an undesired visual presence for the Bemiss neighborhood.

There are two removable steel pipe bollards in front of the double swing doors that provide the only access into the Hoffman Well Station. These bollards provide a barrier that limits vehicle access through the doors protecting the Hoffman Well Station and City staff inside the building structure.

The high voltage switchyard that contains electrical service assets and transformers for the Hoffman Well Station has a 6-foot-tall perimeter fence with three strands of barb wire along its top rail. There are no privacy slats in the chain link fence fabric. There are double swing gates on the north side of the high voltage switchyard's perimeter fence which is in fair condition. There are high voltage warning signs posted on the north, west, and east sides of the switchyard's perimeter fence. The Hoffman Well Station site's building structure frames the south side of the switchyard's boundary.

7.1.3 Pressure Zones Served

The Hoffman Well Station serves the North Hill Pressure Zone. The facility retrofit will replace the existing 18-inch discharge mains with 24-inch mains that will feed into an existing 30-inch transmission main running north.

7.2 Existing Facility Summary – Structural

7.2.1 Description of Structures

The building at the Hoffman site was constructed in 1936 per available drawings. The building was constructed using URM brick walls on top of concrete foundation walls (see figure below). The roof framing was covered and not able to be observed from the main floor. The Well 2 caisson is currently undergoing structural retrofits to accommodate a new pump in 2022.

Figure 7-1 | Hoffman – URM Walls on Concrete Foundation and Unknown Ceiling

The structure on-site appeared to be in fair condition. Due to the age of the building, settlement over time, and concrete shrinkage, several minor cracks have propagated throughout the facility.

7.2.2 Building Code Requirements

While on-site, it was determined that there was not enough space inside the existing facility to incorporate a new fluoridation system. This site would require a new fluoridation system to be placed nearby outside the buildings with a new enclosure around it. This new enclosure would need to meet all requirements under the current IBC Building Code Requirements.

7.3 Existing Mechanical Plan

Once retrofits are complete (scheduled for 2022 or 2023), the Hoffman Well Station will house two caisson-style wells and two pumps, one in each well (see Table 7-1). The combined flow will be metered in the underground vault on the north side of the site, as shown in Appendix H.

Table 7-1 | Future Hoffman Pump Summary

Pump No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1	Flowserve	600	5,500	340
2	Flowserve	600	5,500	340

The Hoffman chlorine room is located on the ground level of the well building as shown in the figures in Appendix H. The gaseous chlorine is mixed with water from the distribution system and injected at each pump suction bell in the well caisson.

Free chlorine residual is continuously monitored by one Hach CL17 analyzer. The sample is taken from an unknown location in the yard and run back to chlorine residual monitor in the pump building. The location of the chlorine monitor is shown in the building layout in Appendix H. Each Hach CL17 chlorine analyzer requires 1-3 gpm of continuous sample flow. The CL17 is a colorimetric analyzer which adds a small amount of reagent to the sample; thus, the sample is drained to sanitary sewer. Future planned changes to the yard piping may modify the sampling at monitoring protocol at this station.

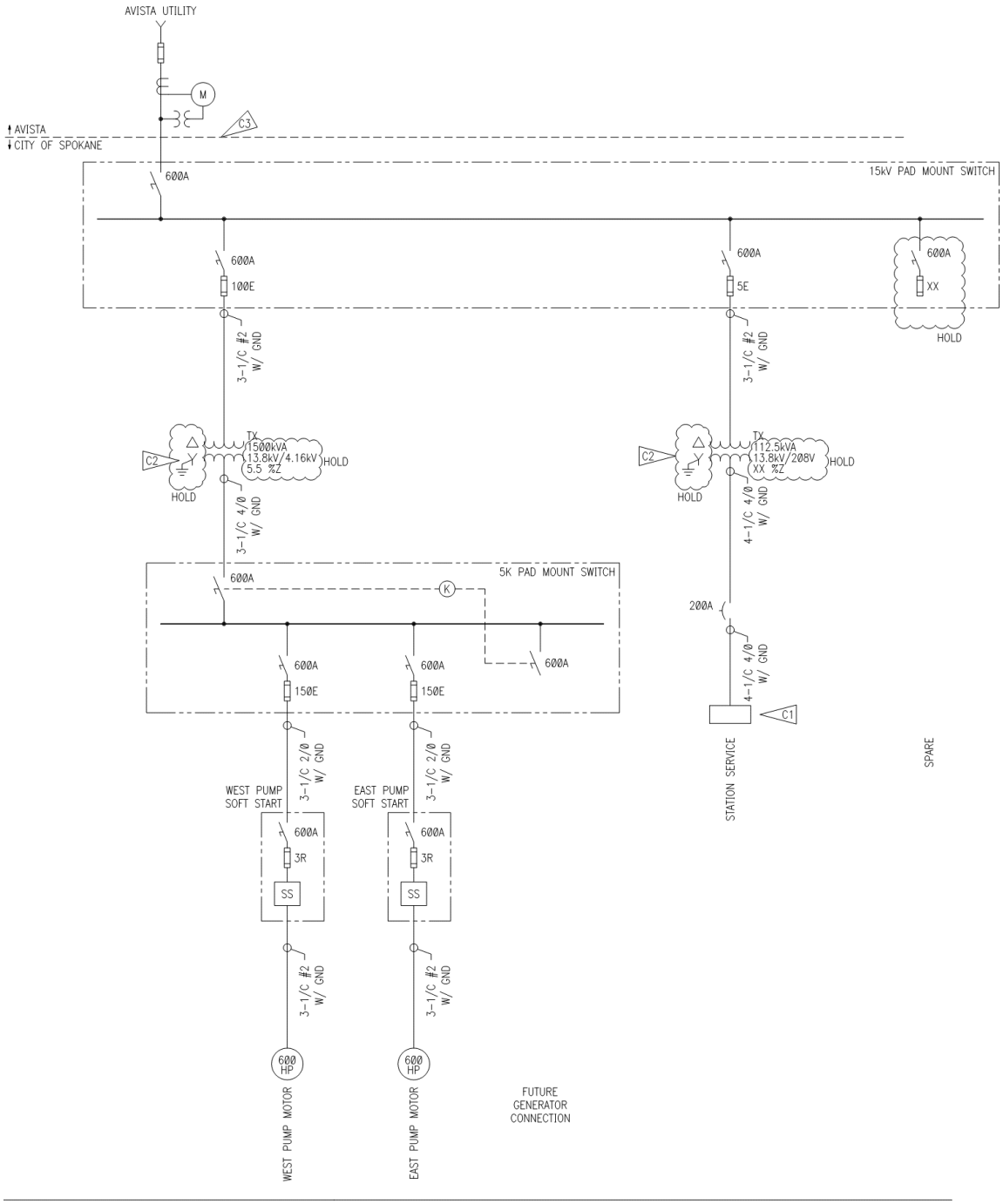
7.4 Existing Facility Summary – Electrical

7.4.1 Power Feed and Supply Capacity

The Hoffman Well Station facility is in the process of having its electrical switchyard equipment upgraded. After the upgrade, a 1500 kVA transformer will be installed to power two well pumps that operate at 2400V. A second, 112.5 kVA transformer will be installed for station service power that operates on 120/208 volts three-phase.

A one-line diagram of Hoffman Well Station's power distribution (after retrofits) is shown in Figure 7-2.

Figure 7-2 | Hoffman One-Line Diagram



7.4.2 Motor Control Centers (MCC) and Panelboards

At the time this report was written, only one of the two pumps was in service, but retrofits were underway to install a second pump in the facility. Pump 1's motor control enclosure is located on the west side of the building near the chlorine room entrance and is comprised of a soft starter and a control relay panel. Pump 2 was in the process of getting rehabilitated with a new motor

and starter. The starter is planned to be installed at the east side of the mezzanine near the small storage room.

Hoffman Well Station has two station service panelboards that operate under 120/208 3-phase:

1. Main Panelboard – Located on the north wall in front of the main entrance.
2. Lighting Panel – Located next to the main entrance to the west.

Electrical capacity information for each panelboard is shown below (see Table 7-2).

Table 7-2 | Hoffman Panelboard Information

	Main breaker?	Spare breakers available?	Space available for new breakers?
Main Panelboard	200A	Yes (6)	Yes (4)
Lighting Panel	No	Yes (3)	No

There may be enough circuits at the Main Panelboard to provide power to a new fluoridation system, but further information on the fluoridation system's electrical load requirements, as well as measured load data at the Main Panelboard, are needed to make a determination.

7.5 Existing Facility Summary – I&C

7.5.1 Existing Hardware and Software Platforms

Hoffman Well Station's PLC is an Allen-Bradley MicroLogix 1100 with two 4-channel analog input modules leaving room for two additional modules. This PLC control panel has a Schneider Electric Magelis local HMI. Flow meter signals (instantaneous and totalized) at Pump 1 is transmitted through a HART-to-Ethernet/IP gateway (Prosoft part number 5228-DFNT-HART).

7.5.2 Telemetry

The Hoffman Well Station communicates to the MTU at Well Electric Well Station with a 900 MHz radio.

7.5.3 Expansion Options for Additional Monitoring and Controls

The Hoffman Well Station PLC has the following quantities of spare I/O* and has space for two more I/O modules, but the 4-channel analog input modules can be replaced with 8-channel analog input modules if needed (see Table 7-3):

Table 7-3 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Hoffman	0	2	0	0

*These quantities are based on the assumption that Pump 2's I/O will be identical to Pump 1's I/O when it is installed.

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Section 8

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Section 8

Havana Well Station

8.1 Existing Site – Summary

The Havana Well Station was under construction at the time of this assessment but will serve two different pressure zones via six wells and six pumps. A limited assessment was conducted for this site due to its status.

8.1.1 Parcel Information and Access

The future Havana Well Station site is located at 4302 E 6th Avenue, Spokane Valley, WA, southeast of the intersection of S Havana Street and E 6th Avenue, which are urban minor arterial and local access streets, respectively. At the Havana Well Station site, Havana Street is the east City of Spokane boundary limit and Havana is also the west City of Spokane Valley boundary limit. At this S Havana Street intersection, E 6th Avenue in the City of Spokane Valley changes to E 5th Avenue on the west side of Havana Street, within the city limits of Spokane. The parcel (number 35232.4114) and does not have a zoning designation. The parcel is 1.24 acres.

A likely delivery route to the Havana Well Station is shown in Appendix I. The route is along Havana Street from 3rd Avenue via Interstate 90. This delivery route passes many residential zoned parcels along 3rd Avenue and Havana Street. The portion of the haul route on 6th Avenue is also along residential zoned parcels.

8.1.2 Site Security

The Havana Well Station security infrastructure is under construction.

8.1.3 Pressure Zones Served

The Havana Well Station “A” will serve the Intermediate Pressure Zone, and Station “B” will serve the Low-Pressure Zone.

8.2 Facility Summary – Structural

8.2.1 Description of Structures

Havana was under construction during the time of observation. The building was being constructed with reinforced CMUs. Steel joists were planned to be used for the roof framing.

8.2.2 Building Code Requirements

The building was designed per current codes at the time of observation. The building did not appear to have enough extra space per the plans to include a fluoridation system. This site would require a new fluoridation system to be placed nearby outside the buildings with a new enclosure around it. This new enclosure would need to meet all requirements under the current IBC.

8.3 Future Mechanical Plan

The Havana Well Station is under construction; however, the six borehole-style wells had already been drilled at the time of the assessment visit. Each well will house a vertical turbine pump. Chlorine injection will occur at each pump suction bell similar to the other well stations. The three well pumps that have already been selected as part of the facility construction and will be installed in 2022 or 2023 are shown in **Table 8-1.**

Table 8-1 | Future Havana Pump Summary

Pump No.	Pump Manufacturer	Horsepower	Design Flow (gpm)	Design Head (ft)
1, 2, and 3	TBD			
4, 5, and 6	Floway/Trillium	600	3,750	426

8.4 Future Facility Summary – Electrical

8.4.1 Power Feed and Supply Capacity

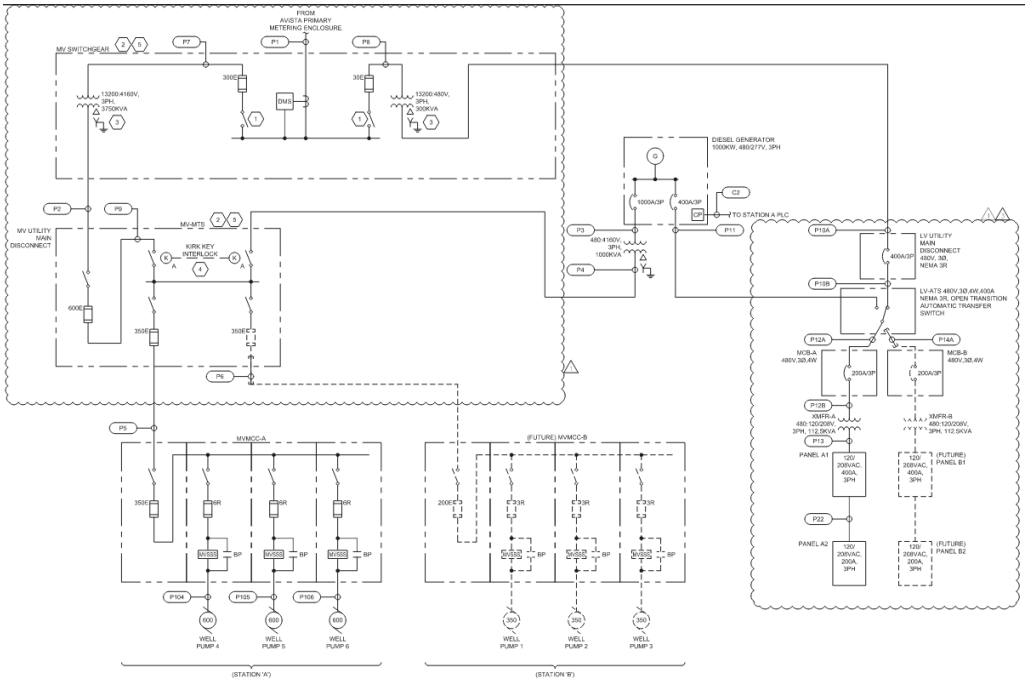
The Havana Well Station is a new facility that was under construction at the time this report was written. It will be comprised of two well buildings named Station A and Station B.

A utility feeder will enter medium voltage switchgear with two feeders. One feeder will be dedicated to pump power and the second feeder will be dedicated to station service. A 3750 kVA transformer will supply power to the pump power feeder at 4160V, and a 300 kVA transformer will supply power to station service at 120/208V 3-phase.

A 1000 kW diesel generator will back up station service as well as up to 1000 kVA to the pump feeder in the event of a power outage.

A one-line diagram of Havana's power distribution is below.

Figure 8-1 | Havana One-Line Diagram



8.4.2 Motor Control Centers (MCC) and Panelboards

Two motor control centers are planned to power six well pumps at Havana. One motor control center will reside in Station A building and will power three 600 horsepower (HP) pumps, and the other motor control station will reside in Station B building and power three 350 HP pumps. All pumps will operate on 4160V.

Five station service panelboards are planned for the Havana Well Station facility. All panels will operate on 120/208V:

1. Panel A1 – Located next to the south entrance of Station A
2. Panel A2 – Located in Station A's Communications Room
3. Panel B1 – Located next to the north entrance of Station B
4. Panel B2 – Location to be determined

Electrical capacity information for each panelboard is shown in **Table 8-2**.

Table 8-2 | Havana Panelboard Information

Havana Panel	Main breaker?	Spare breakers available?	Space available for new breakers?
Panel A1	400A	Yes (10)	No
Panel A2	200A	Yes (7)	No
Panel B1	400A	Yes (11)	No
Panel B2	TBD	TBD	TBD

Based on the design load calcs, Station A has about 200 amps of capacity remaining between Panels A1 and A2, and 150 amps of capacity remaining at Station B.

There appears to be adequate space and capacity to provide breakers for a fluoridation system at this site, but a load study should be performed to ensure the additional load will not exceed the bus rating of the panelboard(s) being used.

8.5 Future Facility Summary – I&C

8.5.1 Existing Hardware and Software Platforms

The design drawings to not specify the hardware platform for Havana's RTU, but if it is going to match most of the other well sites it will have an Allen-Bradley MicroLogix 1100 PLC with a Schneider Electric Magelis HMI, model HMIS5T. Two PLCs are planned for the Havana site: one in Station A and one in Station B.

8.5.2 Telemetry

The design drawings do not specify the method of telemetry Havana Well Station will be using, but if it is going to match the other well sites it will communicate to the MTU at Well Electric Well Station with a 900 MHz radio.

8.5.3 Expansion Options for Additional Monitoring and Controls

The Havana Well Station PLC has the following quantities of spare I/O in its design (see Table 8-3):

Table 8-3 | Existing PLC Spare I/O

	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
Havana	15	5	7	0

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APPENDIX A

Electrical Assessment Matrix

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Spokane Fluoridation Study Electrical Site Assessment Matrix

	Voltage	Main Breaker	Spare Breakers?	Breaker Spaces?	Arc Flash Sticker?	Notes
Well Electric						
Pump Voltage	2400					
Station Service Transformer						2400/4160Y:120/208
On-Site Generator	240					
Heater (sub)Panel	120/240	no	no	space available for three breakers	no	
W.E. Panel 3	120/240	size unknown, looks like 100 amp	maybe circuit 14	no space available	no	
UPS and Batt. Charger Subpanel	120/240	none	no	6	no	
Well Elect. Panel 2	120/240	100 amp	maybe circuits 13, 14	no space available	no	
Pump MCC Panel A	240 only	no	yes	no (but lots of spares)	no	
Well Elect. Panel 1	120/240	size unknown, looks like 100 amp	yes	yes, in subpanel above	no	
Generator Panel	120/240	60 amp	no	yes, but can't be used	no	Feeds server room equipment, do not use
"208V High Lag"	120/240, but panel says 208 V	no	yes	plenty	no	Feeds 220V heaters, offices
Parkwater						
Pump Voltage	2400					
Fed from Well Electric Substation						Transformers mounted on roof of chlorine room
3 Phase 208 Volt Panel A	120/208	no, bus is 200a rated	yes	no	no	3-ph 4-wire
Panel B	240	yes, 200a, bus is 200a rated	no	no	no	feeds unit heaters
Lighting Panel	120/208	no, bus is 100a rated	yes	no	no	
Grace						
Pump Voltage	4160					
Station Panel	120/208	yes, 100a, bus is 200a rated	one spare 20a	no	yes	Two gray 2000 kva for grace and nevada each, green 1500 kva for nevada
Nevada						
Pump Voltage	2400					
Station Panel	120/208	yes, bus is 100a rated	yes, 15a and 20a	yes, 4	yes	
Station AC Panel Nevada	120/208	yes, 200a, bus rating not shown	maybe (two turned off)	plenty	yes	Feeds ac units and outlet
Central						
Pump Voltage	2400					
Main Building Panelboard P1	120/240	yes, 400a, bus is 300a rated (?)	20a 208	10	no	Station service appears to be fed from overhead transformer
East Building Panel "P3"	120/240	yes, 90a, 125a bus rating	plenty	28	no	
West Building Panel "P2"	120/240	yes, 90a, 90a bus rating	two spares	9	no	
Hoffman						
Pump Voltage	2400					
Station Service Panel	120/208	yes, 200a	plenty	4	yes	Transformer in fenced yard, to be replaced with new transformer
Station Lighting Panel	120/208		(1) 15A, (2) 20A	no	yes	
Ray						
Pump Voltage	2400					Transformer in fenced backyard, plenty of yard
Lighting Panel	120/208	yes, 100a	no	no	yes	RTU fed from here
Main Panelboard	120/208	yes, 175a	yes	plenty	yes	RTU circuits here too

Spokane Fluoridation Study Electrical Site Assessment Matrix

	PLC Type	Empty I/O slots available	Spare DI Available	Spare DO Available	Spare AI available	Notes
Well Electric						
Well Pump PLC	MicroLogix 1100	2	4	6	2	
Chlorination PLC	MicroLogix 1100	3	5	6	3	
Anticipated quantity of fluoridation I/O			**12**	**8**	**4**	
Parkwater						
Parkwater PLC	SLC 5/05	2	2	0	18	
Anticipated quantity of fluoridation I/O			**20**	**12**	**4**	
Grace						
Grace PLC	Micrologix 1100	1	1	2	7	
Anticipated quantity of fluoridation I/O			**8**	**12**	**4**	
Nevada						
Nevada PLC	Micrologix 1100	1	13	0	3	
Anticipated quantity of fluoridation I/O			**12**	**8**	**4**	
Central						
Central PLC	Micrologix 1100	0	12	2	0	
Anticipated quantity of fluoridation I/O			**8**	**6**	**4**	
Hoffman						
Hoffman PLC	Micrologix 1100	2	0	2	0	
Anticipated quantity of fluoridation I/O			**8**	**6**	**4**	
Ray						
Ray PLC	Micrologix 1100	0	14	0	1	
Anticipated quantity of fluoridation I/O			**10**	**7**	**4**	

LEGEND:

2400/4160	Existing spare I/O cannot accommodate, but spare slots may.
	No capacity available. Second PLC likely required.
	Capacity available.

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APPENDIX B

Well Electric Well Station Figures

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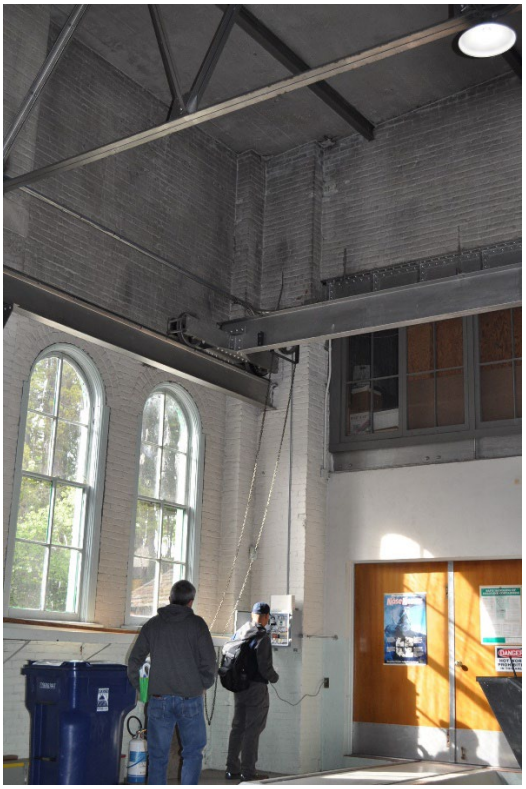
Well Electric Well Station Photos

Chlorine Room Entrance



East Exterior of Well Building

Gaseous Chlorine Tanks

Monitoring Sample Point, Pump 1

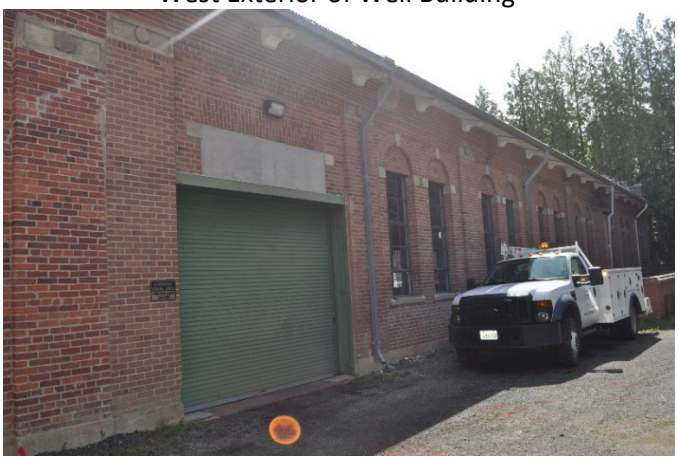
Well Electric Well Station Photos

North Hill Pressure Zone Flow Meter Vault

Well 4

Pumps 3-6 Discharge Piping

West Exterior of Well Building



PLAN
SCALE: 1"=20'

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EJJ/DKH DRAWN
KLW CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

WELL ELECTRIC WELL WELL STATION SITE PLAN

PROJECT NO.:	22-3386	SCALE:	AS SHOWN	DATE:	JULY 2022

SHEET
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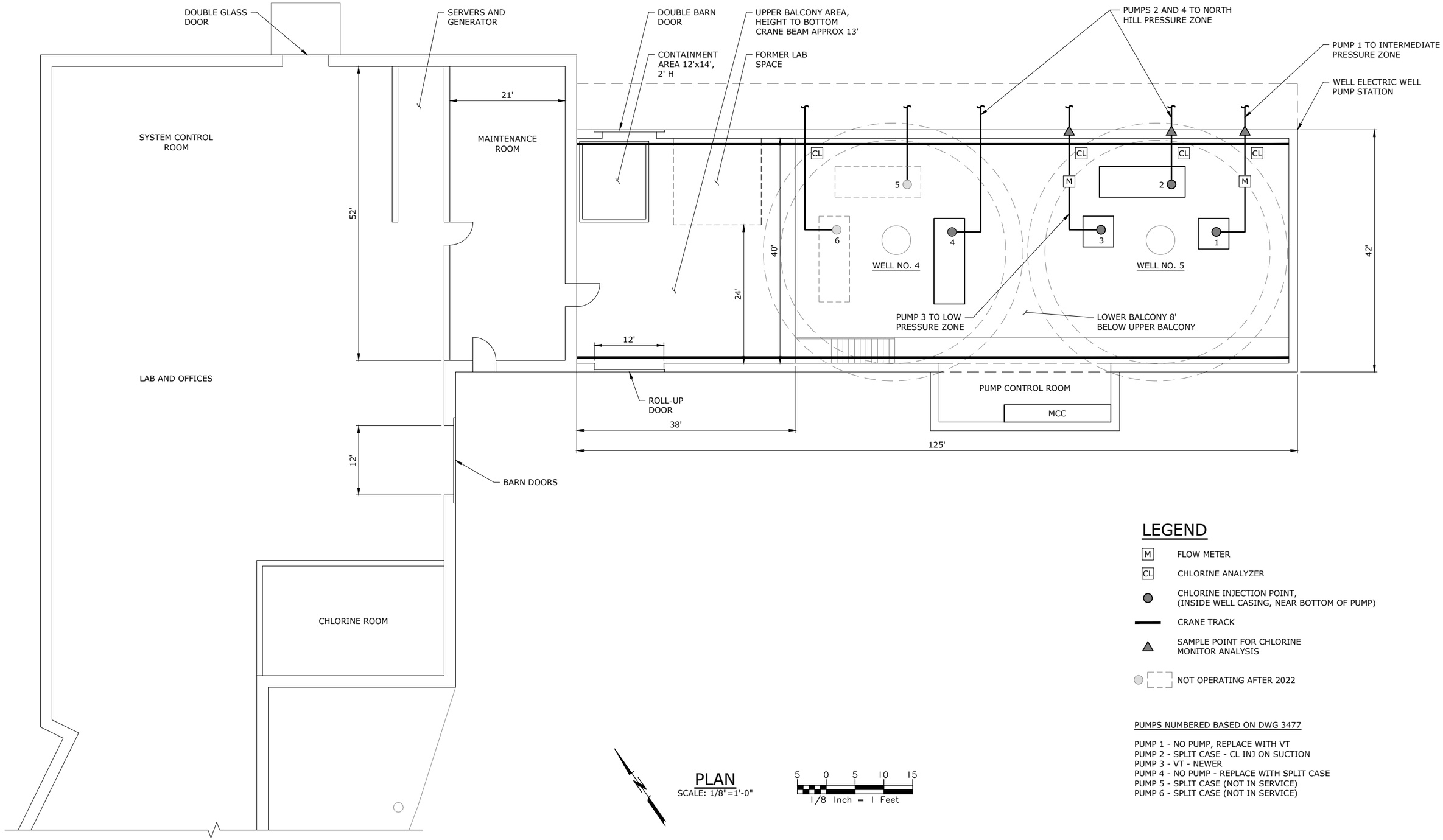

LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER
- CHLORINE INJECTION POINT, (INSIDE WELL CASING, NEAR BOTTOM OF PUMP)
- CRANE TRACK
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- NOT OPERATING AFTER 2022

PUMPS NUMBERED BASED ON DWG 3477

PUMP 1 - NO PUMP, REPLACE WITH VT
PUMP 2 - SPLIT CASE - CL INJ ON SUCTION
PUMP 3 - VT - NEWER
PUMP 4 - NO PUMP - REPLACE WITH SPLIT CASE
PUMP 5 - SPLIT CASE (NOT IN SERVICE)
PUMP 6 - SPLIT CASE (NOT IN SERVICE)

PLAN
SCALE: 1/8"=1'-0"

5 0 5 10 15
1/8 Inch = 1 Feet

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
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KLW CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

WELL ELECTRIC WELL
WELL STATION BUILDING PLAN LAYOUT

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

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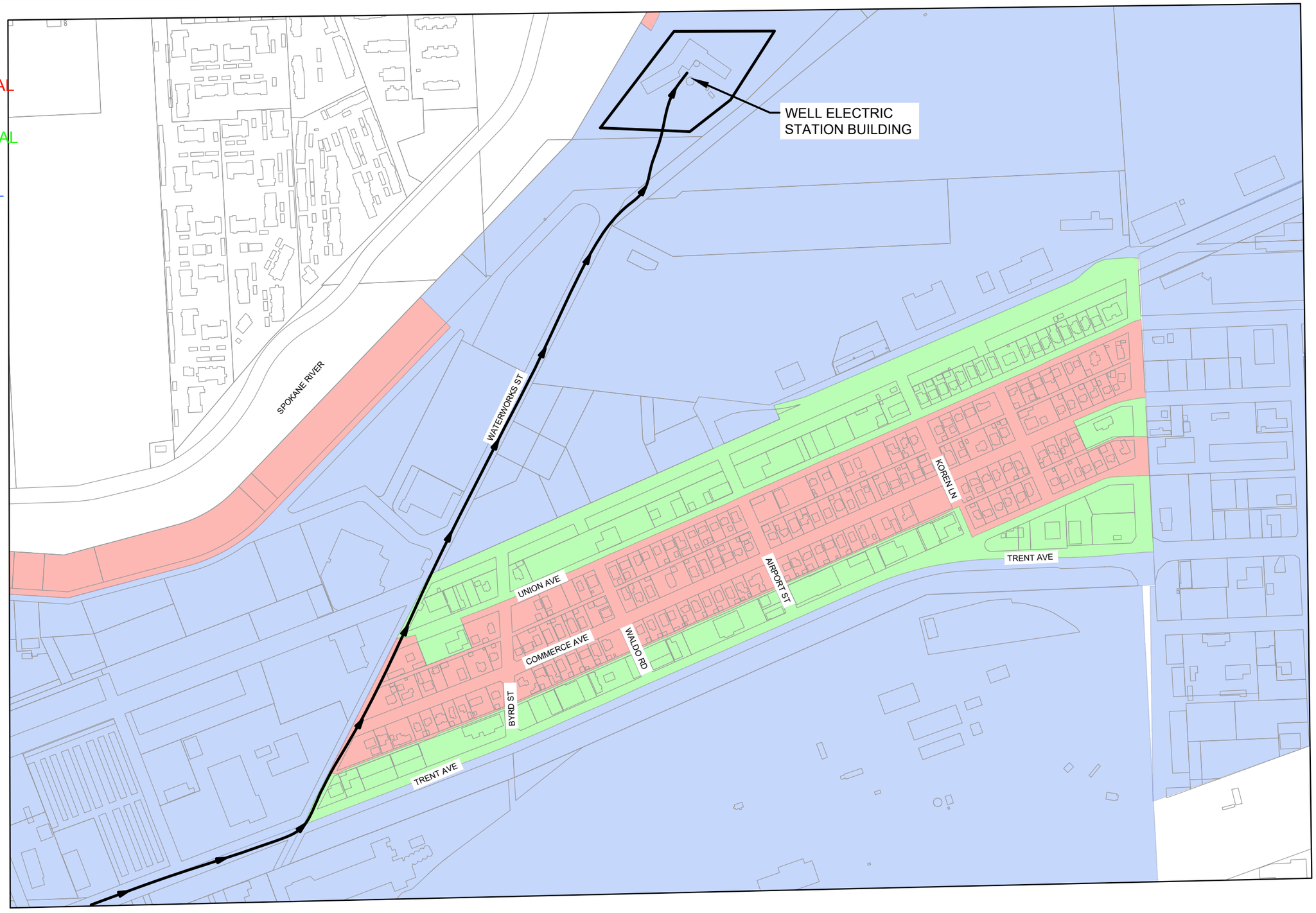
LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE



NORTH

400 200 0 400 800

SCALE FEET

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

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\- DESIGNED

\- DRAWN

\- CHECKED

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SPOKANE FLUORIDATION STUDY

WELL ELECTRIC SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

ATTACHMENT

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APPENDIX C

Parkwater Well Station Figures

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Parkwater Well Station Photos

1 Ton Chlorine Cylinder

Corner of Building Facing East

Differential Flow Meter

Exterior West

Parkwater Well Station Photos

Front Gate

Parkwater Chlorine Monitor

Pump and Discharge Piping

Corner of Building

LEGEND

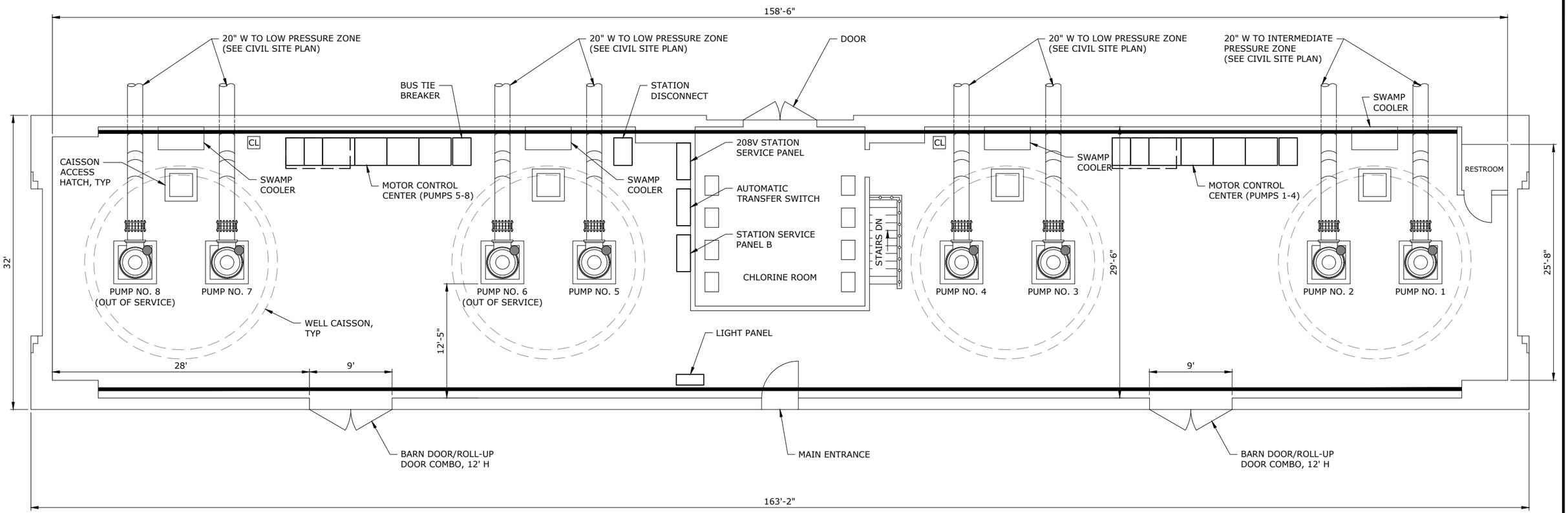
CL — CHLORINE ANALYZER

CHLORINE INJECTION POINT, (INSIDE WELL CASING, NEAR BOTTOM OF PUMP)

CRANE TRACK

NOTE:

1. DISTANCE BETWEEN FINISHED FLOOR OF PUMP LEVEL AND BOTTOM OF CRANE BEAM APPROXIMATELY 24'.



N

PLAN
SCALE: 3/16"=1'-0"

0 5 10 15
3/16 Inch = 1 Feet

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

PARKWATER WELL
WELL STATION BUILDING LAYOUT PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
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LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER, (SEE BUILDING PLAN)
- CHLORINE INJECTION POINT, (SEE BUILDING PLAN)
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- APPROX LOCATION OF WELL PUMP

20 10 0 20 40
SCALE IN FEET

PLAN
SCALE: 1"=20'

N

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EJJ/DKH DRAWN
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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

PARKWATER WELL
WELL STATION SITE PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

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LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE

NORTH

200 100 0 200 400

SCALE FEET

PARKWATER WELL STATION BUILDING

RUTTER AVE

RUTTER AVE

FANCHER RD

HOWIE RD

KOREN LN

UNION AVE

COMMERCE AVE

AIRPORT ST

TRENT AVE

TRENT AVE

BYRD ST

WALDO RD

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

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DESIGNED -

DRAWN -

CHECKED -

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SPOKANE FLUORIDATION STUDY

PARKWATER WELL SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

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APPENDIX D

Ray Street Well Station Figures

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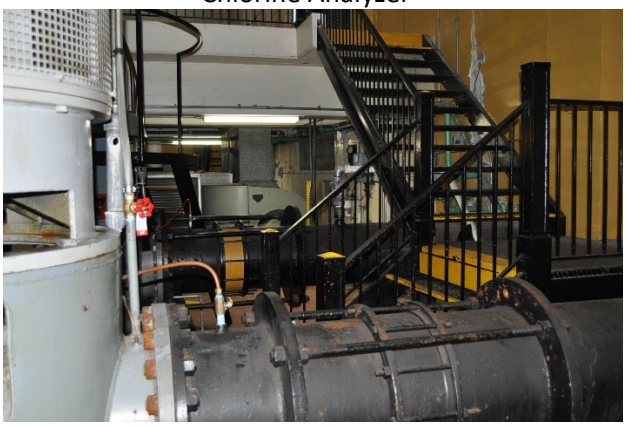
Ray Street Well Station Photos

Chlorine Analyzer



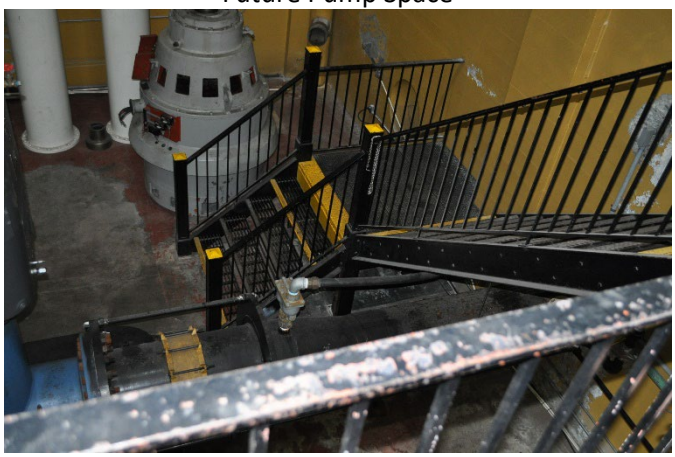
Chlorine Room

Flow Meter

Roll Up Door

Ray Street Well Station Photos

Future Pump Space



Pump 1

Pump Discharge

LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER, (SEE BUILDING PLAN)
- CHLORINE INJECTION POINT, (SEE BUILDING PLAN)
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- APPROX LOCATION OF WELL PUMP

20 10 0 20 40
SCALE IN FEET

PLAN
SCALE: 1"=20'

N

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

RAY STREET WELL
WELL STATION SITE PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
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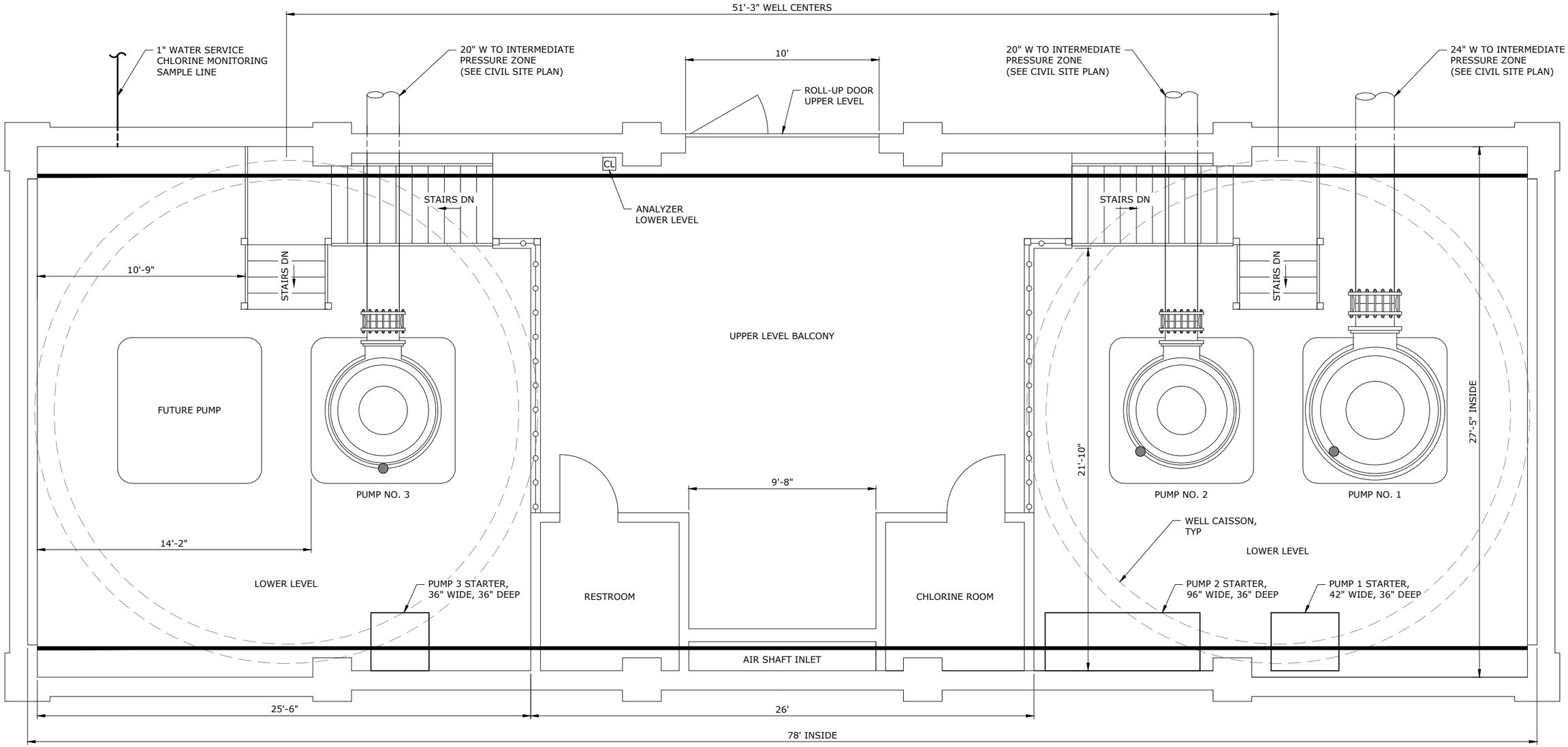

LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER
- CHLORINE INJECTION POINT, (INSIDE WELL CASING, NEAR BOTTOM OF PUMP)
- CRANE TRACK

NOTE:

DISTANCE BETWEEN FINISHED FLOOR OF PUMP LEVEL AND BOTTOM OF CRANE BEAM IS 30'. DISTANCE FROM FINISHED FLOW OF GROUND LEVEL TO BOTTOM OF CRANE BEAM IS 20'.

N

PLAN
SCALE: 3/8"=1'-0"

0 5
3/8 Inch = 1 Feet

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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DKH DRAWN
KLW CHECKED

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SPOKANE FLUORIDATION STUDY

RAY STREET WELL
WELL STATION BUILDING LAYOUT PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
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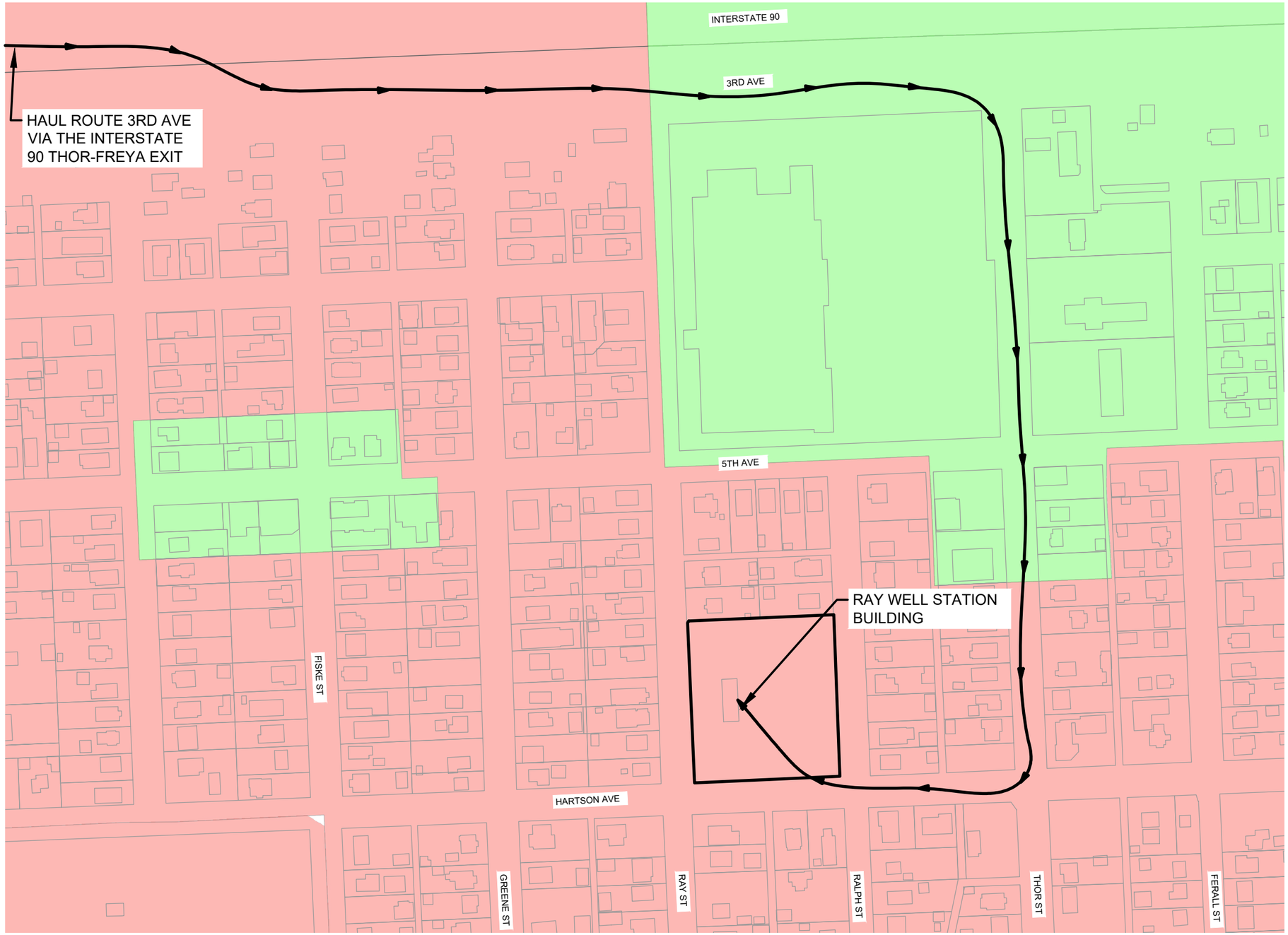
LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE



NORTH

200 100 0 200 400

SCALE FEET

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NOTICE

0 ½ 1

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DESIGNED -

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

RAY WELL SITE DELIVERY ROUTE

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APPENDIX E

Central Avenue Well Station Figures

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Central Avenue Well Station Photos

Control Building and Well 2 Building Exterior

Fenced Power Area

Well 1 Exterior

Well 1 Piping in Building

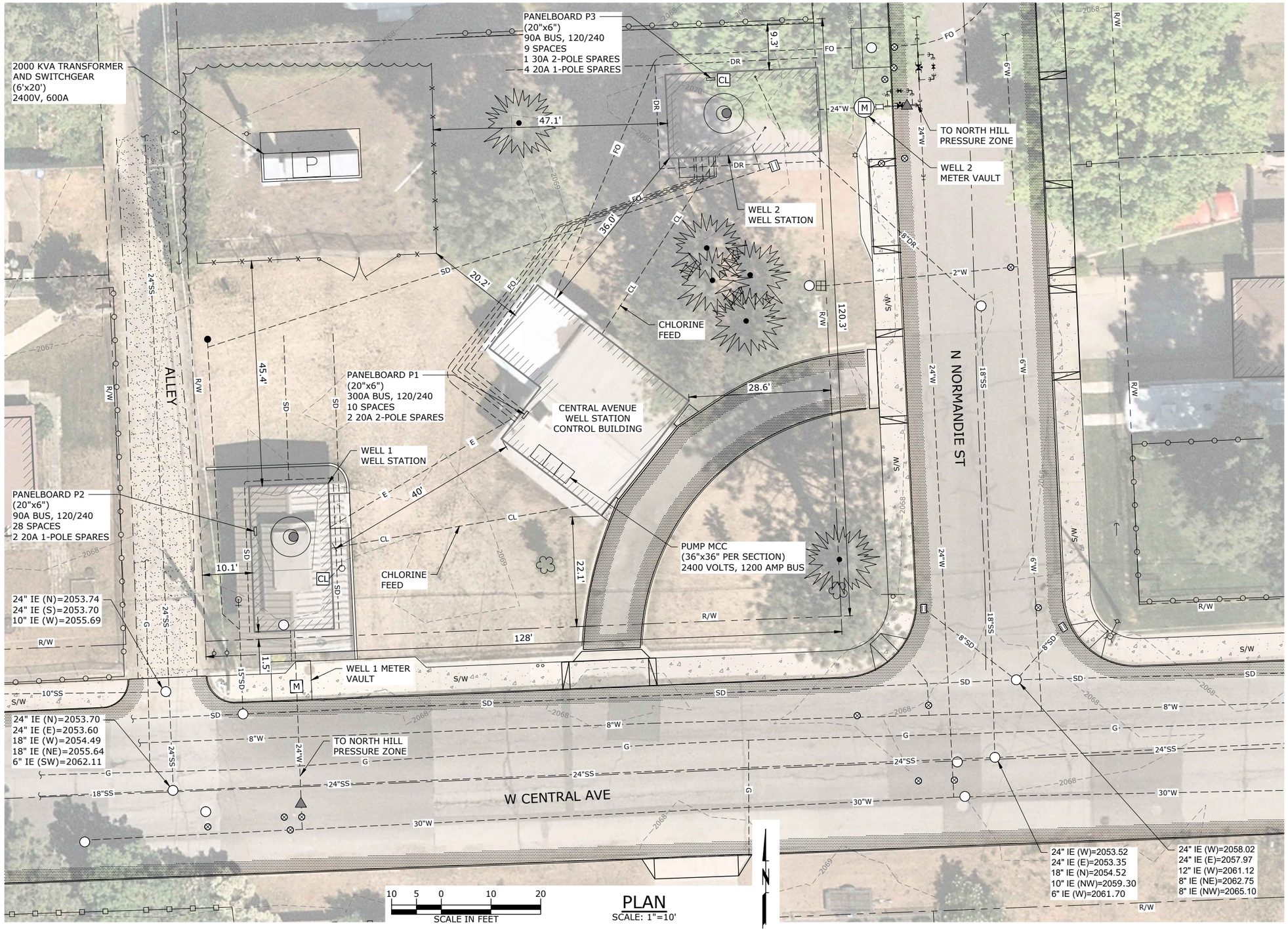
Central Avenue Well Station Photos

Well 1 Meter Vault

Well 1 Chlorine Analyzer

Well 1 Sample Tap

Well 1 Pump Motor



PLAN
SCALE: 1"=10'

LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER, (SEE BUILDING PLAN)
- CHLORINE INJECTION POINT, (SEE BUILDING PLAN)
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- APPROX LOCATION OF WELL PUMP

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
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EJJ/DKH — DRAWN
KLW — CHECKED

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SPOKANE FLUORIDATION STUDY

CENTRAL AVE WELL WELL STATION SITE PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

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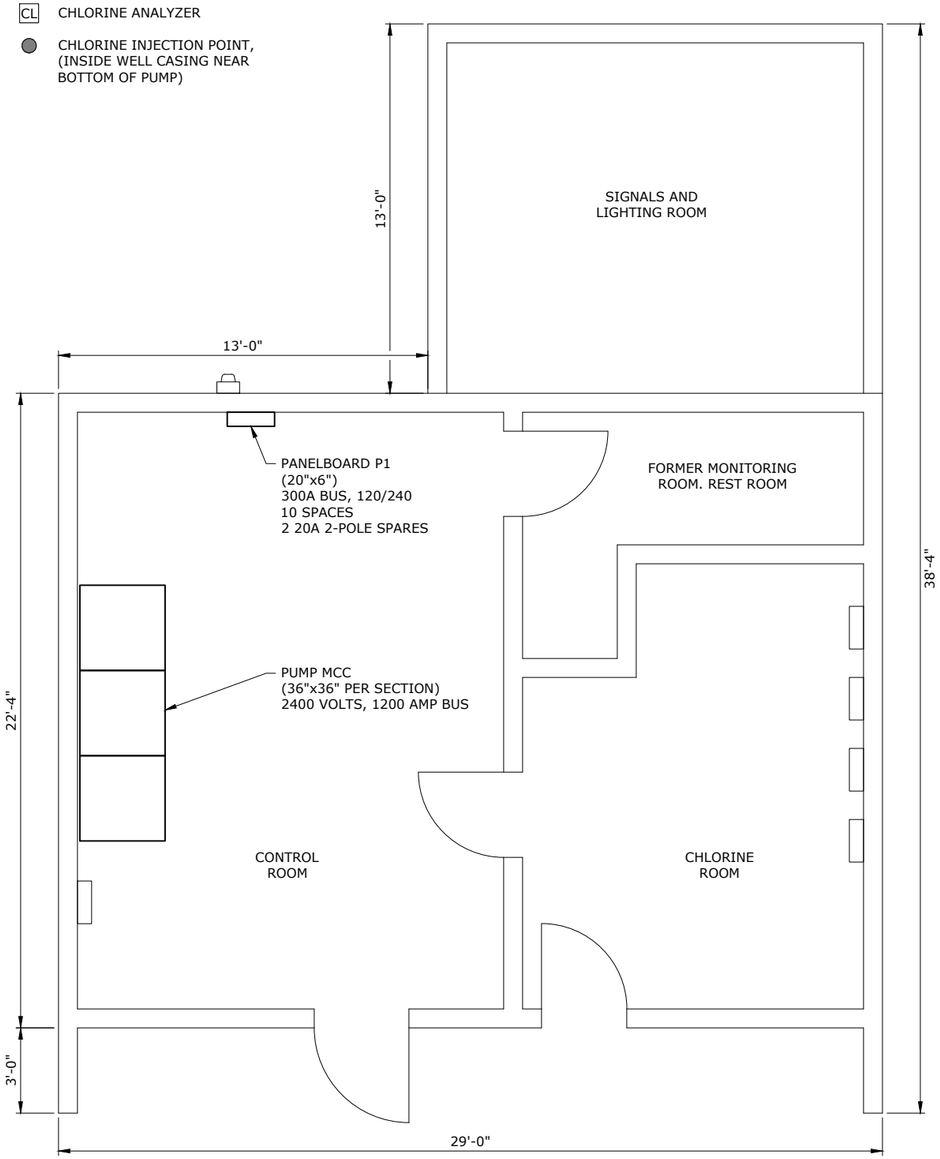
LEGEND

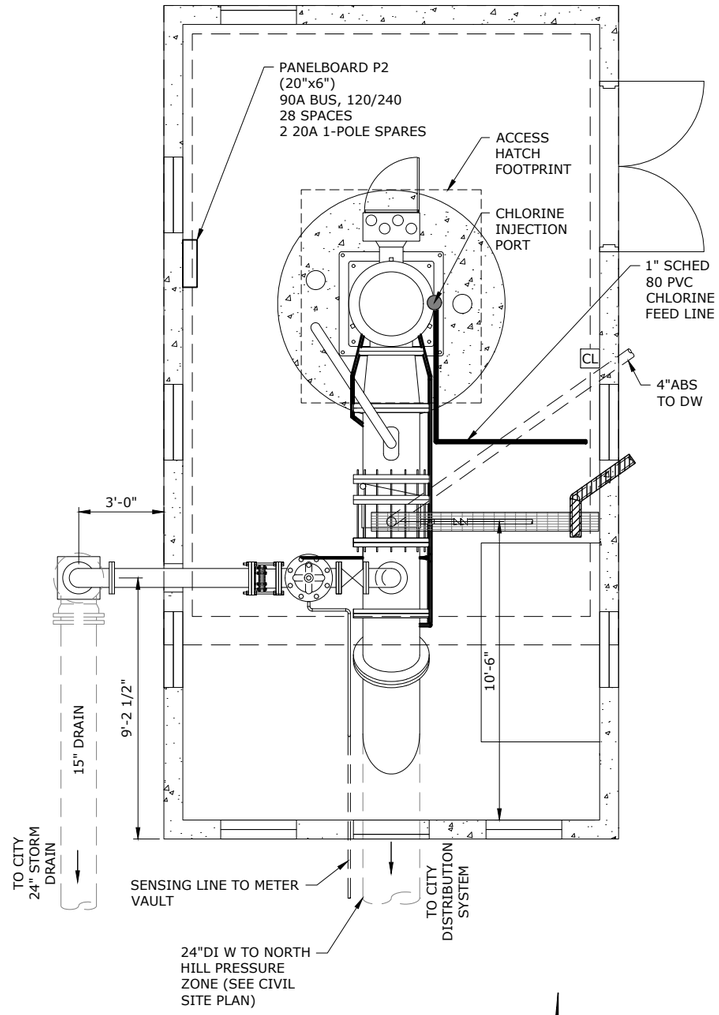
CL CHLORINE ANALYZER

CHLORINE INJECTION POINT, (INSIDE WELL CASING NEAR BOTTOM OF PUMP)



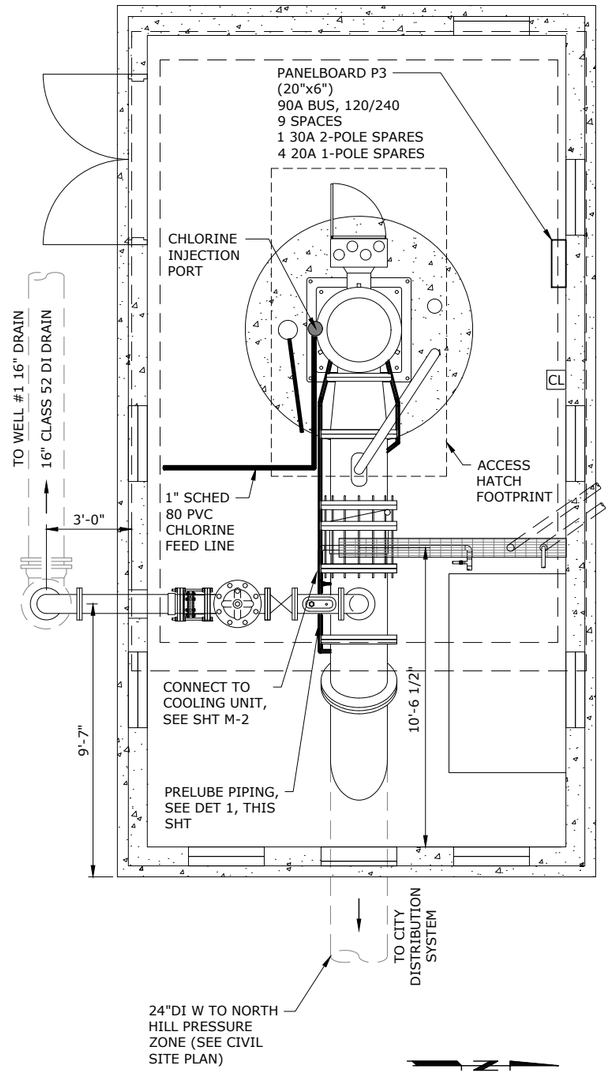
CENTRAL AVENUE WELL CONTROL BUILDING

SCALE: 3/8"=1'



CENTRAL AVENUE WELL 1 - WELL HOUSE PLAN

SCALE: 3/8"=1'



CENTRAL AVENUE WELL 2 - WELL HOUSE PLAN

SCALE: 3/8"=1'

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
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EJJ DRAWN
KLW CHECKED

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SPOKANE FLUORIDATION STUDY

CENTRAL AVE WELL
WELL STATION AND CONTROL BUILDING LAYOUT PLANS

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

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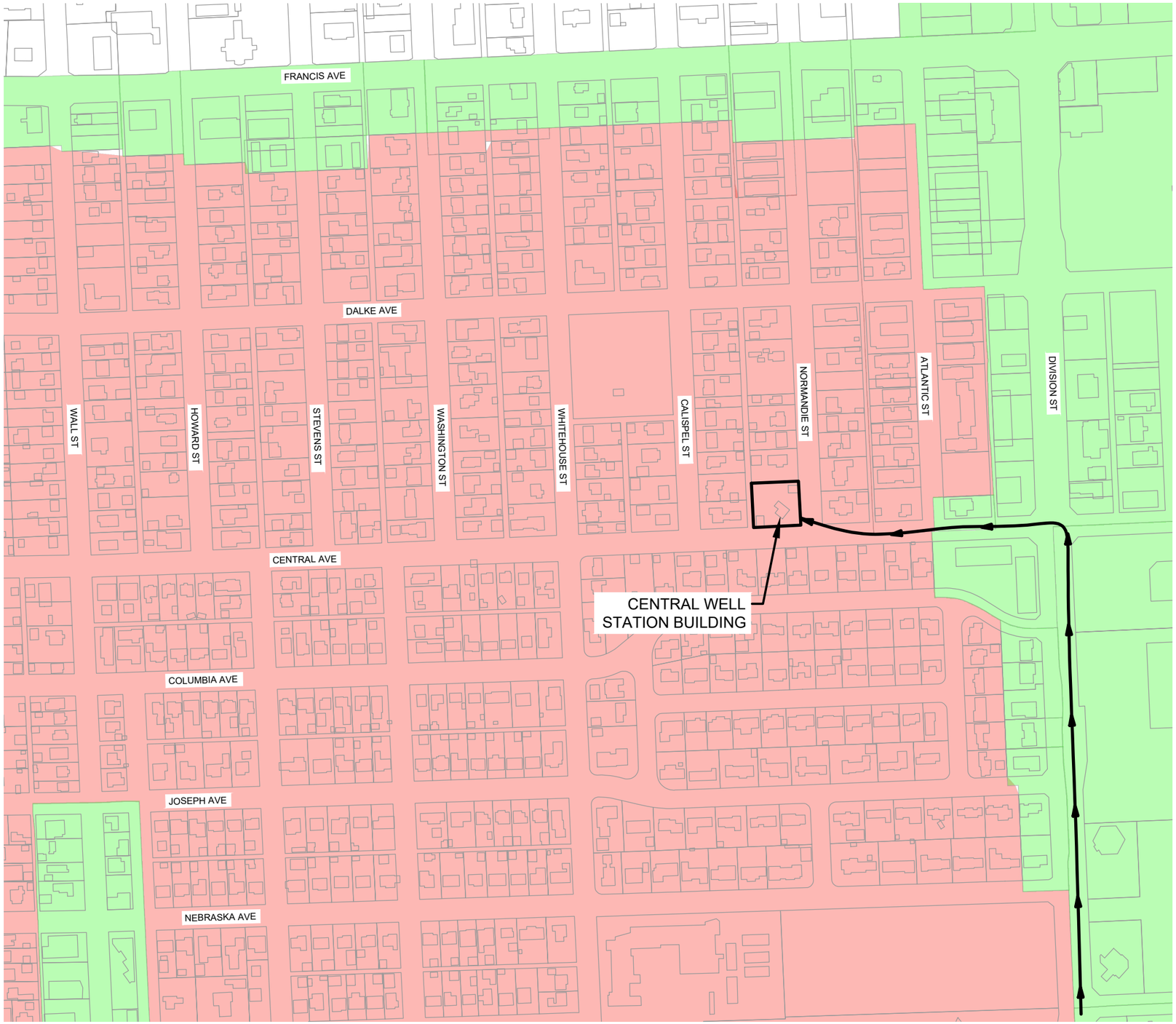
LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE



NORTH

300 150 0 300 600

SCALE FEET

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

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- DESIGNED
- DRAWN
- CHECKED

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SPOKANE FLUORIDATION STUDY

CENTRAL WELL SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

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APPENDIX F

Grace Well Station Figures

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Grace Well Station Photos

Grace Exterior

Grace Chlorine Analyzer

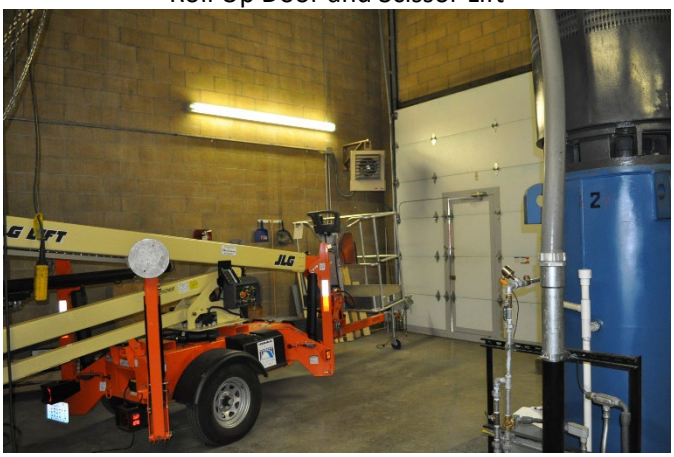
Grace Flowmeter Vaults

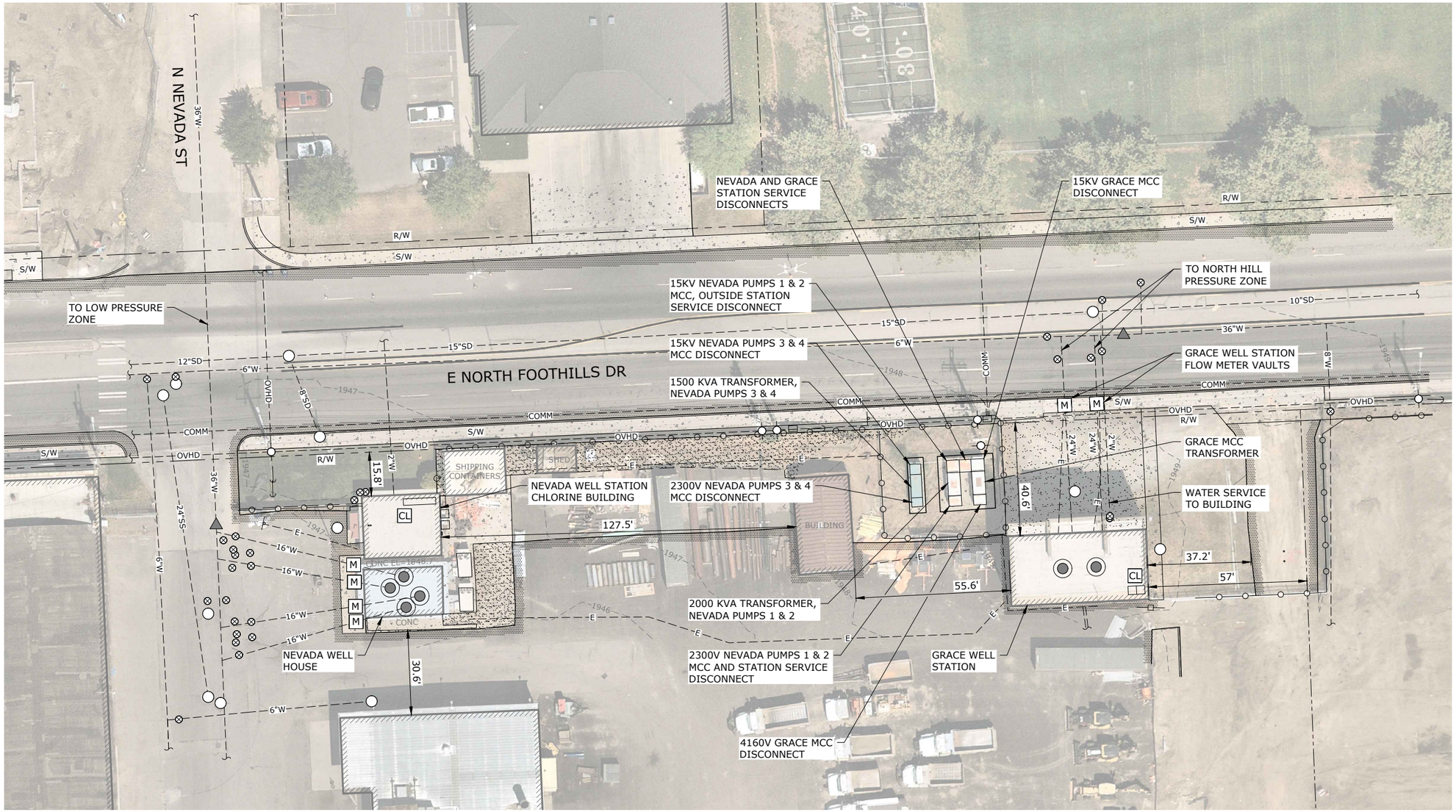
Grace Flowmeter

Grace Well Station Photos

Pump and Pipe Discharge

Roll Up Door and Scissor Lift





LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER, (SEE BUILDING PLAN)
- CHLORINE INJECTION POINT, (SEE BUILDING PLAN)
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- APPROX LOCATION OF WELL PUMP

20 10 0 20 40
SCALE IN FEET

PLAN
SCALE: 1"=20'

N

NO.	DATE	BY	REVISION

NOTICE
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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

GRACE AND NEVADA WELLS WELL STATION SITE PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

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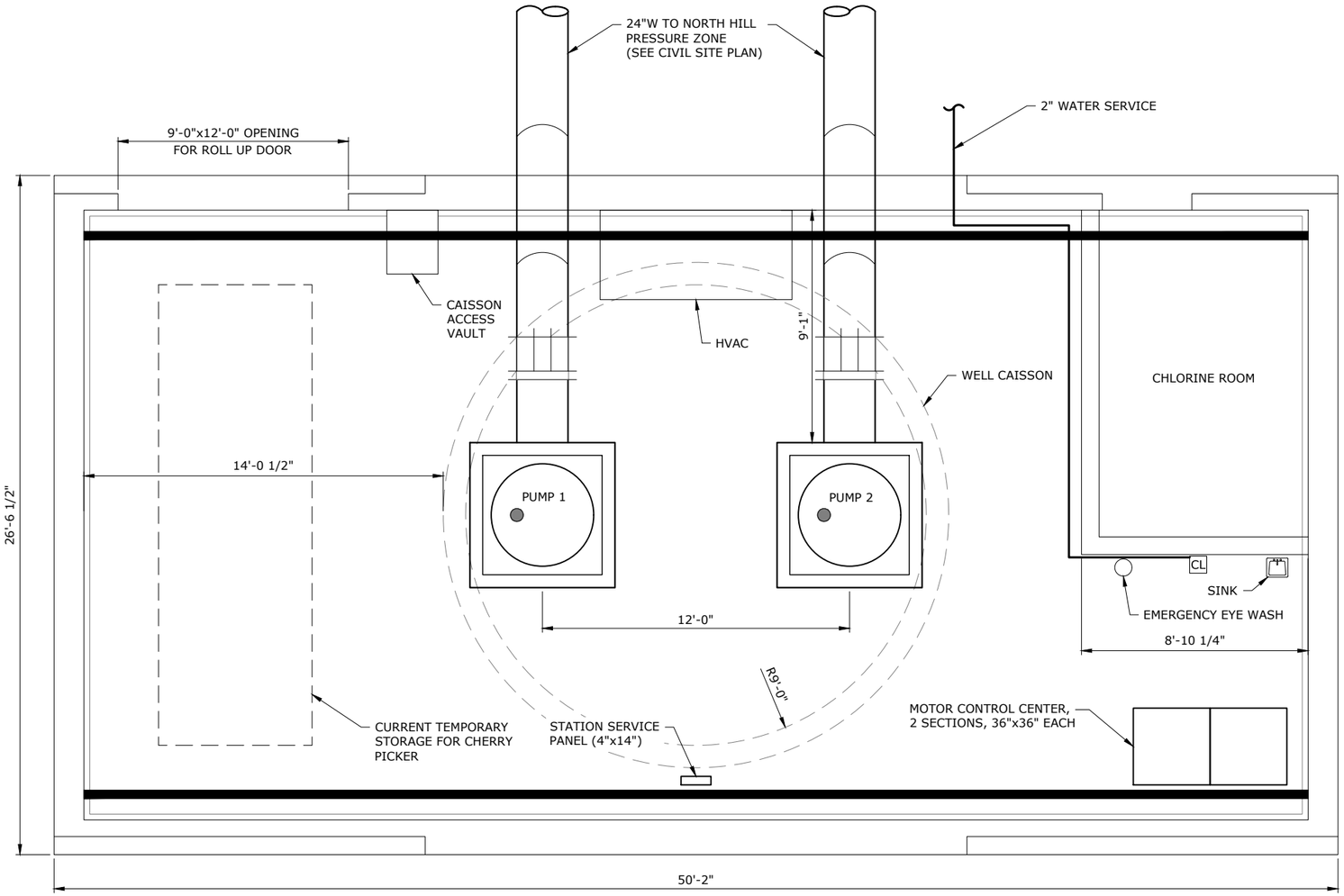

LEGEND

- CL — CHLORINE ANALYZER
- ● — CHLORINE INJECTION POINT, (INSIDE WELL CASING, NEAR BOTTOM OF PUMP)
- ▬ — CRANE TRACK

NOTE:

DISTANCE BETWEEN FINISHED FLOOR AND BOTTOM OF CRANE BEAM IS 25'-6"

N

PLAN
SCALE: 3/8"=1'-0"

0 5
3/8 Inch = 1 Feet

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EJJ/DKH DRAWN
KLW CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

GRACE WELL
WELL STATION BUILDING LAYOUT PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

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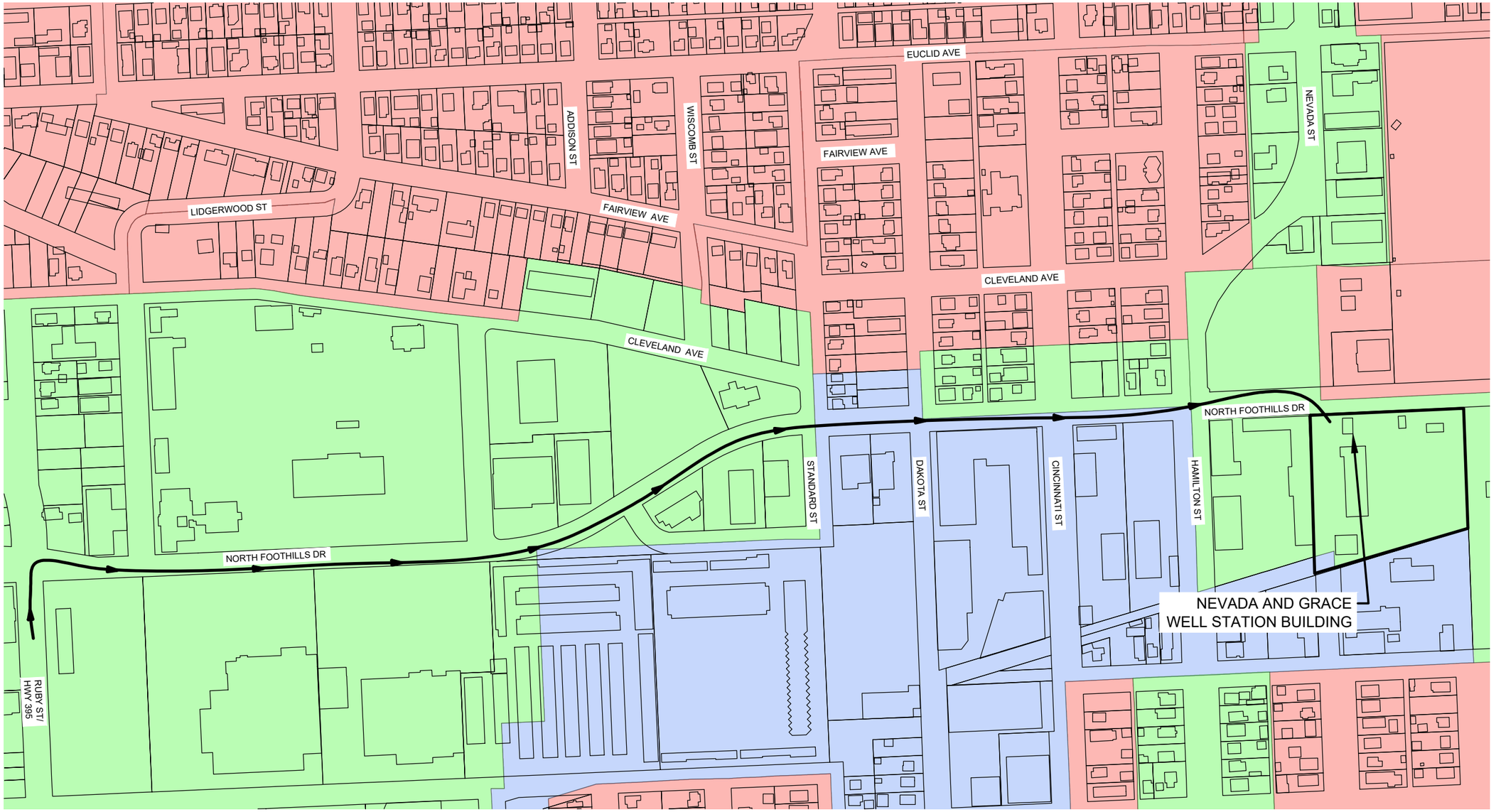

NORTH

300 150 0 300 600

SCALE FEET

LEGEND

RESIDENTIAL ZONING

INDUSTRIAL ZONING

COMMERCIAL ZONING

DELIVERY ROUTE

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED -

DRAWN -

CHECKED -

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

NEVADA AND GRACE WELL SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

ATTACHMENT X

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APPENDIX G

Nevada Well Station Figures

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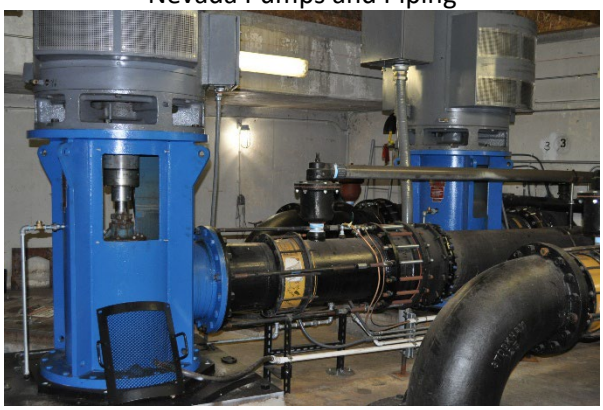
Nevada Well Station Photos

Between Sites Facing East

Nevada Flow Meter Tunnel

Nevada Pump Station and Chlorine Building Exterior

Nevada Pumps and Piping

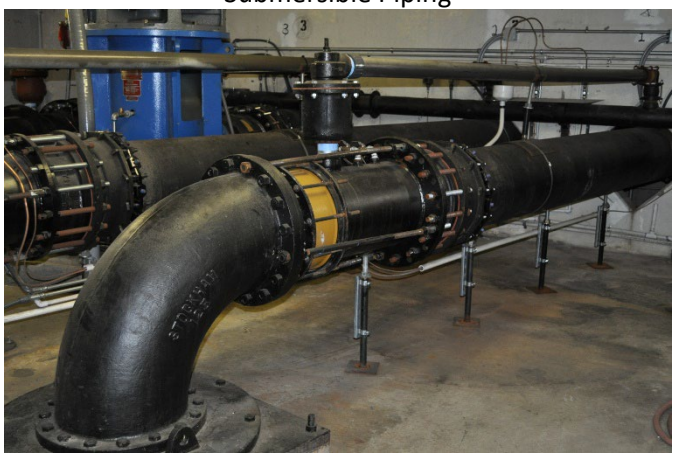


Nevada Well Station Photos

Nevada Turbidity and Chlorine Analyzer

Piping Storage Area

Submersible Piping



LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER, (SEE BUILDING PLAN)
- CHLORINE INJECTION POINT, (SEE BUILDING PLAN)
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- APPROX LOCATION OF WELL PUMP

20 10 0 20 40
SCALE IN FEET

PLAN
SCALE: 1"=20'

N

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKW DESIGNED
EJJ/DKH DRAWN
KLW CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

PARKWATER WELL
WELL STATION SITE PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
C-1
X of X

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LEGEND

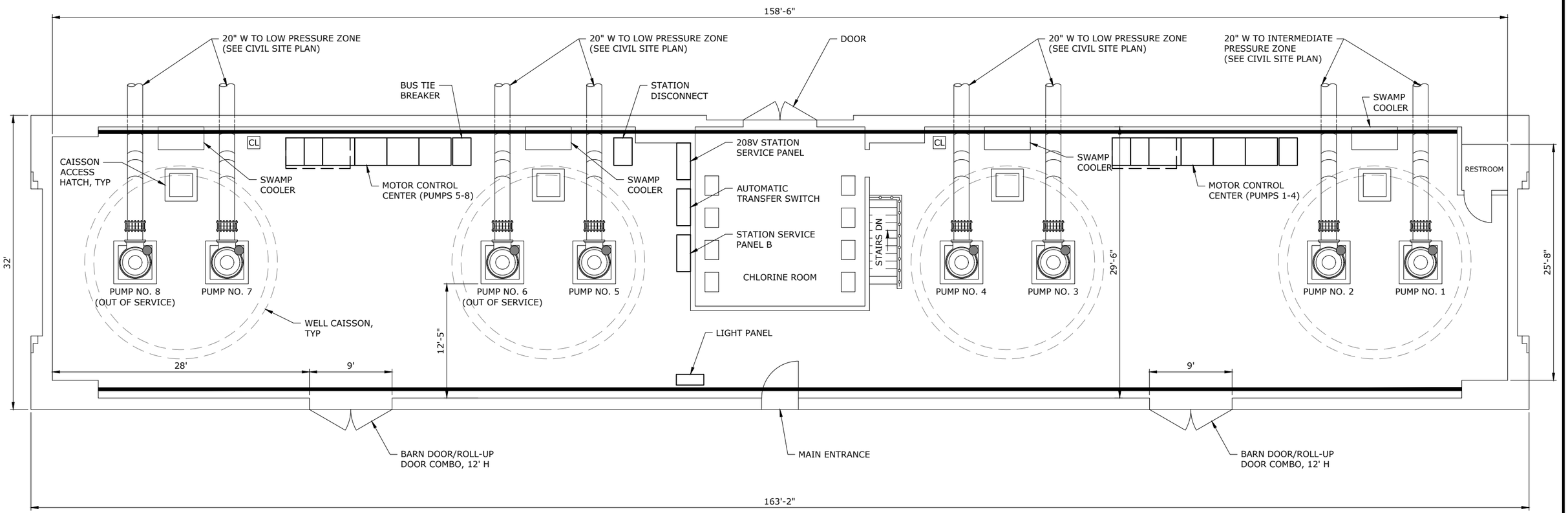
CL — CHLORINE ANALYZER

CHLORINE INJECTION POINT, (INSIDE WELL CASING, NEAR BOTTOM OF PUMP)

CRANE TRACK

NOTE:

1. DISTANCE BETWEEN FINISHED FLOOR OF PUMP LEVEL AND BOTTOM OF CRANE BEAM APPROXIMATELY 24'.



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PLAN
SCALE: 3/16"=1'-0"

0 5 10 15
3/16 Inch = 1 Feet

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
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DKH DRAWN
KLW CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

PARKWATER WELL
WELL STATION BUILDING LAYOUT PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
M-1
X of X

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LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE

NORTH

200 100 0 200 400

SCALE FEET

PARKWATER WELL STATION BUILDING

RUTTER AVE

RUTTER AVE

FANCHER RD

HOWIE RD

KOREN LN

TRENT AVE

UNION AVE

COMMERCE AVE

AIRPORT ST

BYRD ST

WALDO RD

TRENT AVE

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

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DESIGNED -

DRAWN -

CHECKED -

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

PARKWATER WELL SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

ATTACHMENT X

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APPENDIX H

Hoffman Well Station Figures

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Hoffman Well Station Photos

Chlorine Analyzer Area

Chlorine Room and HVAC

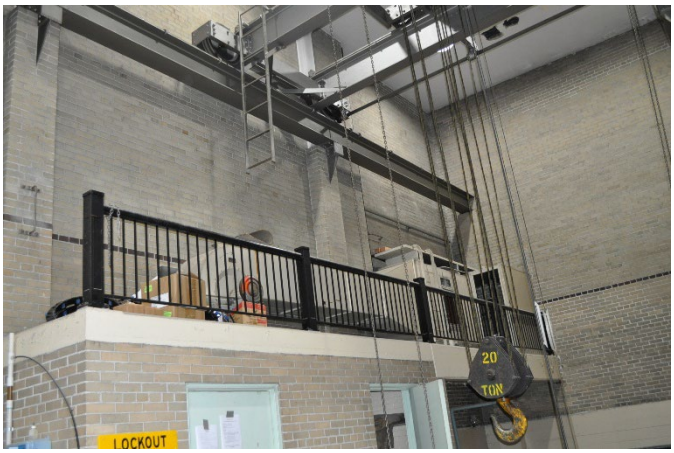
Hoffman Chlorine Analyzer

Hoffman Front Exterior

Hoffman Well Station Photos

Hoffman Site View Facing Southeast

HVAC Area



Pump 1 and Piping

Pump 2 Casing

Hoffman Well Station Photos

Storage Area and Crane

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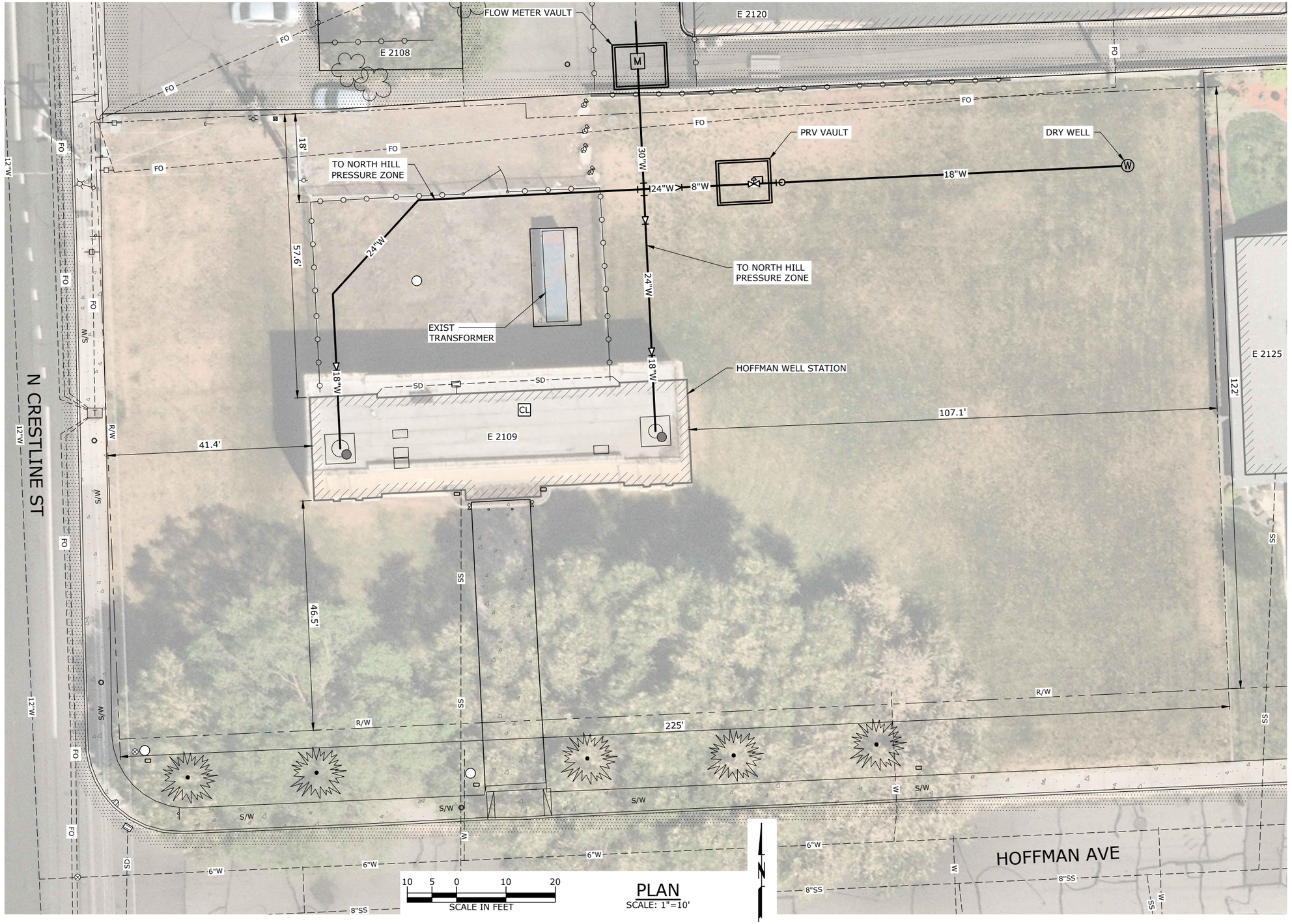

PLAN
SCALE: 1"=10'

LEGEND

- M — FLOW METER
- CL — CHLORINE ANALYZER, (SEE BUILDING PLAN)
- CHLORINE INJECTION POINT, (SEE BUILDING PLAN)
- SAMPLE POINT FOR CHLORINE MONITOR ANALYSIS
- APPROX LOCATION OF WELL PUMP

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EJJ/DKH — DRAWN
KLW — CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

HOFFMAN WELL
WELL STATION SITE PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
C-1
X of X

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LEGEND

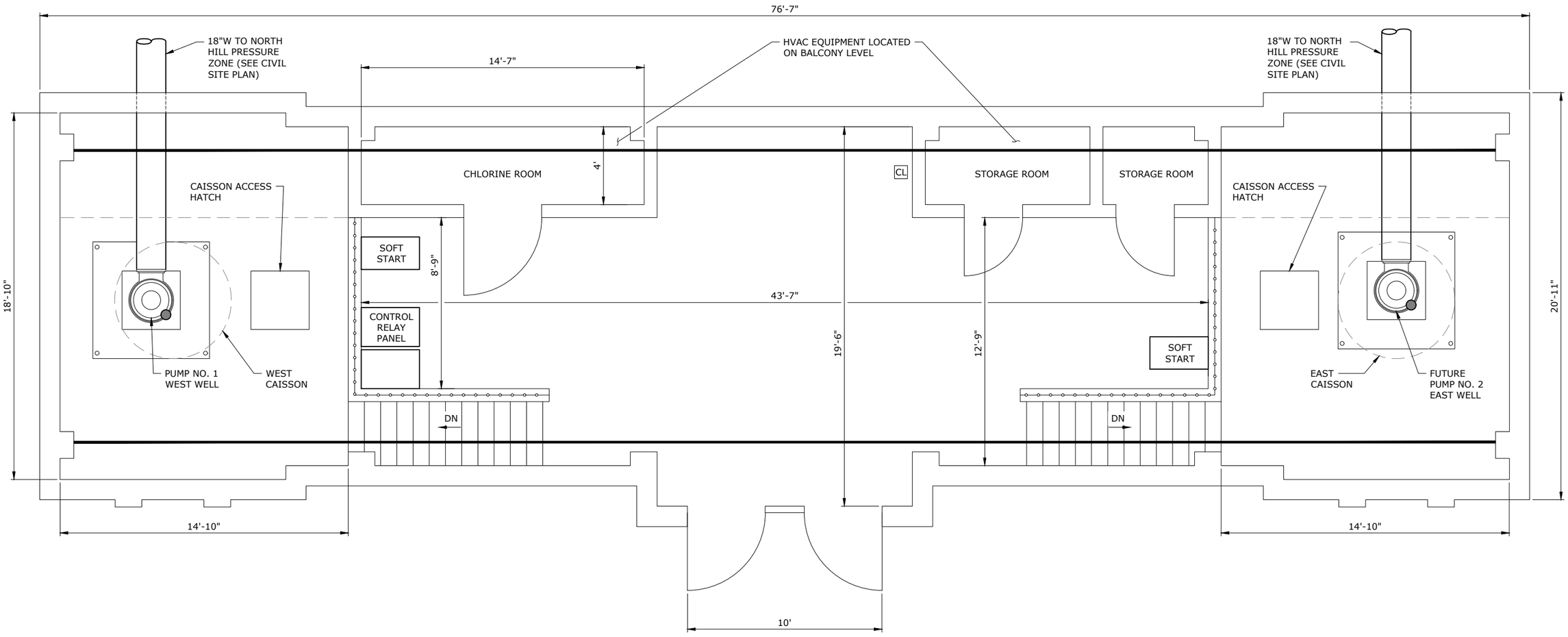
CL — CHLORINE ANALYZER

CHLORINE INJECTION POINT, (INSIDE WELL CASING, NEAR BOTTOM OF PUMP)

CRANE TRACK

NOTE:

DISTANCE BETWEEN FINISHED FLOOR OF GROUND LEVEL AND BOTTOM OF CRANE BEAM APPROXIMATELY 18'. PUMP LEVEL IS APPROXIMATELY 12' LOWER THAN GROUND LEVEL.



PLAN
SCALE: 3/8"=1'-0"

0 5
3/8 Inch = 1 Feet

NO.	DATE	BY	REVISION

NOTICE
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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DKH DRAWN
KLW CHECKED

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SPOKANE FLUORIDATION STUDY

HOFFMAN WELL
WELL STATION BUILDING LAYOUT PLAN

PROJECT NO.: 22-3386 | SCALE: AS SHOWN | DATE: JULY 2022

SHEET
M-1
X of X

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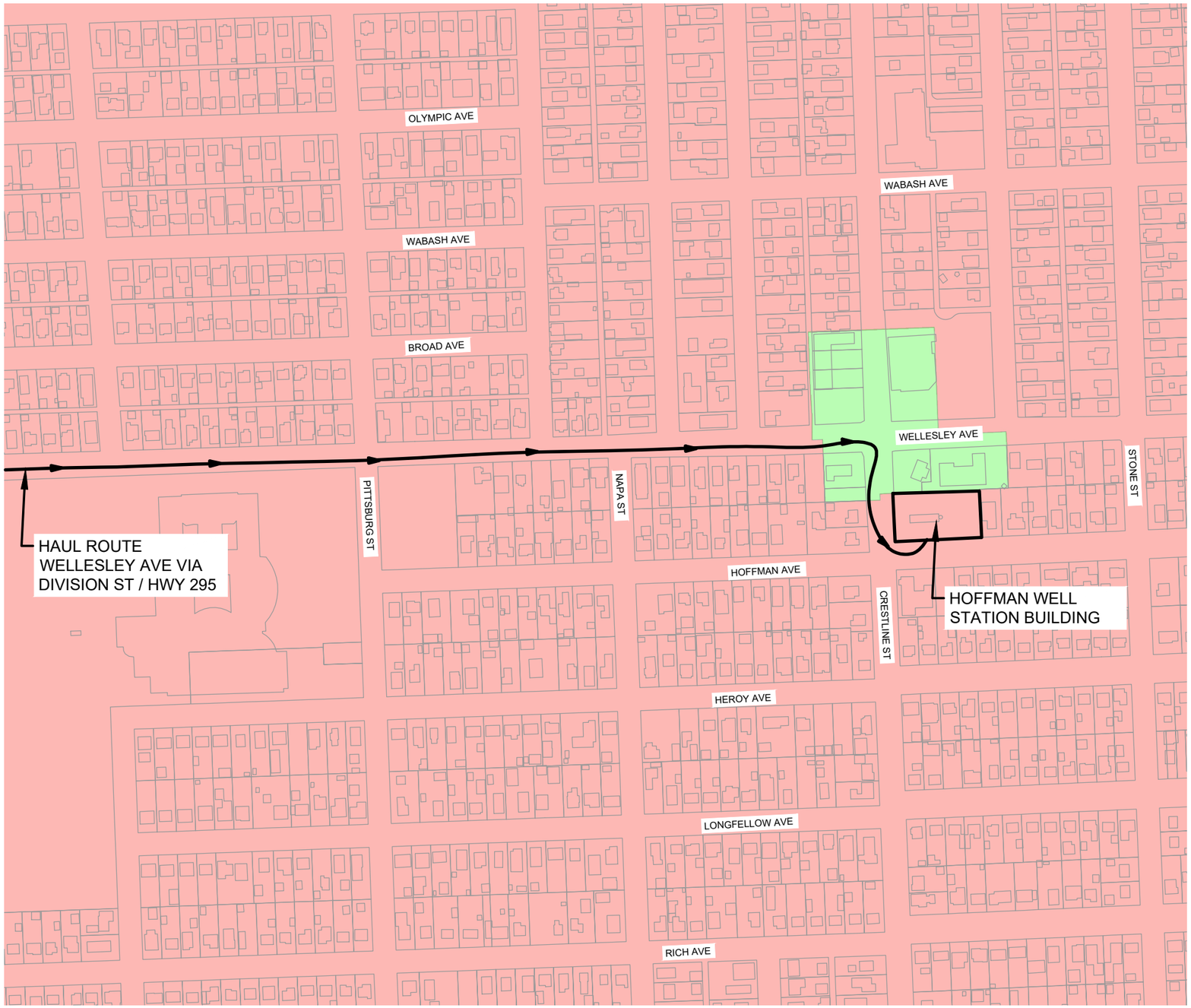
LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE



NORTH

300 150 0 300 600

SCALE FEET

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

- DESIGNED
- DRAWN
- CHECKED

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

HOFFMAN WELL SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

ATTACHMENT X

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APPENDIX I

Havana Well Station Figures

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Havana Well Station Photos

Well Station A

Example Well Casing

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LEGEND

RESIDENTIAL ZONING

COMMERCIAL ZONING

INDUSTRIAL ZONING

DELIVERY ROUTE

INTERSTATE 90

3RD AVE

3RD AVE

HAUL ROUTE 3RD AVE VIA THE INTERSTATE 90 THOR-FREYA EXIT

5TH AVE

5TH AVE

6TH AVE

6TH AVE

REBECCA ST

MYRTLE ST

FLORIDA ST

HAVANA ST

7TH AVE

7TH AVE

HAVANA WELL STATION LOCATION

NORTH

200 100 0 200 400

SCALE FEET

NO.	DATE	BY	REVISION

NOTICE

0 ½ 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED -

DRAWN -

CHECKED -

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CITY OF SPOKANE

SPOKANE FLUORIDATION STUDY

HAVANA WELL SITE DELIVERY ROUTE

PROJECT NO.: 00-0000.000 | SCALE: AS SHOWN | DATE: JULY 2022

ATTACHMENT X

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