



March 10, 2022

Tom Ferrell, PE

TomF@paceengrs.com

PACE Engineering Services Company - 503.597.3222
 4500 Kruse Way, Ste 250
 Lake Oswego, OR 97035

**Re: On-site Generated Sodium Hypochlorite, Plan Review # 146-2021
 Crystal Springs Water District (PWS ID # 00386)
 Final Approval**

Dear Mr. Ferrell:

Thank you for your submittal on 3/9/22 to the Oregon Health Authority’s Drinking Water Services (DWS) of the *Project Final Approval Request* form. **This project consisted of an on-site generated sodium hypochlorite system** installed to replace the existing calcium hypochlorite system used to maintain a residual disinfectant at Crystal Springs Water District. On September 8, 2021, I received an e-mail containing the plans, equipment specification, and narrative of the project for which a Conditional Approval was granted on September 10, 2021. A review fee of \$825 was received on September 9, 2021. I inspected the equipment as part of a water system survey conducted on October 14, 2021 and found no deficiencies at that time. **This project is granted Final Plan Approval.**

Project Background and Summary:

The Crystal Springs Water District (District) had been adding sodium hypochlorite, as a disinfectant and for residual maintenance, to their system utilizing diluted bulk 12.5% sodium hypochlorite temporarily after its existing Constant Chlor Plus Cal-Hypo tablet feeder stopped working.

The project consisted of changing from calcium hypochlorite to on-site sodium hypochlorite generation, for the same purpose of maintaining a chlorine residual concentration in the water system. Because the calcium hypochlorite system had previously replaced an on-site generated sodium hypochlorite system, two 6-month lead and copper demonstration rounds are not required. 4-log viral disinfection is not required; however, 17.2 minutes of contact time is available through 4,325-ft of 14” diameter pipe (34,584 gallons) using a

Table E5: Projected Water System Demands¹

| Year | Water Demands | | | |
|--------------------------|---------------|------------|----------|-----------|
| | Average | Max. Month | Max. Day | Peak Hour |
| gallons per day x 1,000 | | | | |
| 2014 | 1,770 | 1,930 | 2,140 | 2,770 |
| 2015 | 1,770 | 1,930 | 2,150 | 2,780 |
| 2020 | 1,800 | 1,960 | 2,190 | 2,840 |
| 2025 | 1,820 | 1,990 | 2,230 | 2,900 |
| 2030 | 1,840 | 2,020 | 2,270 | 2,970 |
| 2035 | 1,870 | 2,060 | 2,310 | 3,040 |
| gallons per minute (gpm) | | | | |
| 2014 | 1,230 | 1,340 | 1,490 | 1,920 |
| 2015 | 1,230 | 1,340 | 1,490 | 1,930 |
| 2020 | 1,250 | 1,360 | 1,520 | 1,970 |
| 2025 | 1,260 | 1,380 | 1,550 | 2,010 |
| 2030 | 1,280 | 1,410 | 1,570 | 2,060 |
| 2035 | 1,300 | 1,430 | 1,600 | 2,110 |

¹ Projected customer demand plus annual overages for: Booth Hill overflow of 584,510 gpd, Pine Grove overflow of 120,375 gpd and unaccounted for water of 441,558 gpd.

Table E5 of the November 2015 Master Plan

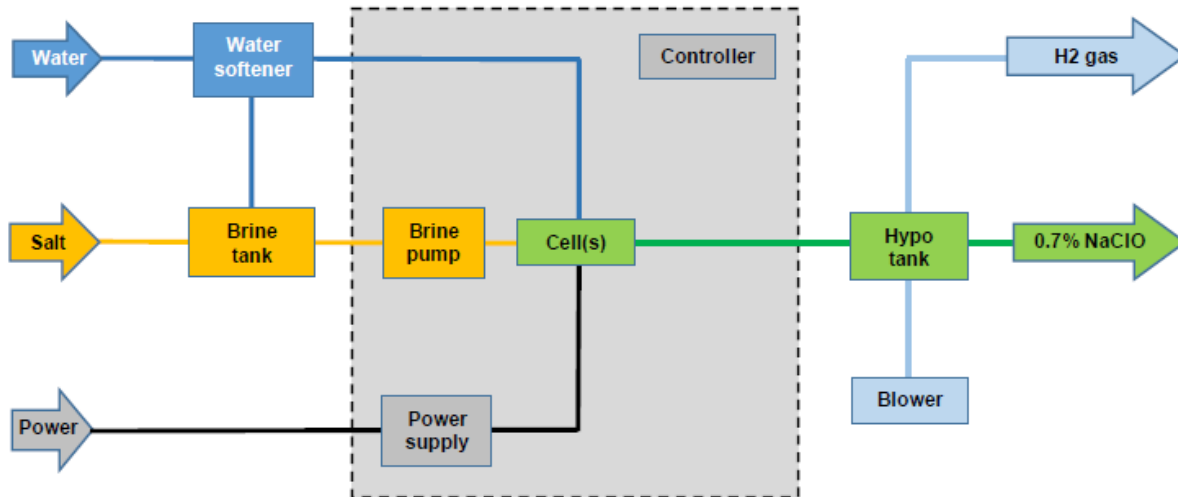
2025 peak hour demand flow of 2,010 gpm from Table E5 of the November 2015 master plan. A chlorine residual of 0.35 mg/l would yield a CT of 6 with 17.2 minutes of contact time.

Equipment Description:

On-site sodium hypochlorite generation system (0.7% NaClO):

The on-site sodium hypochlorite system generates 0.7% NaClO as shown in the process flow diagram below.

Process flow diagram

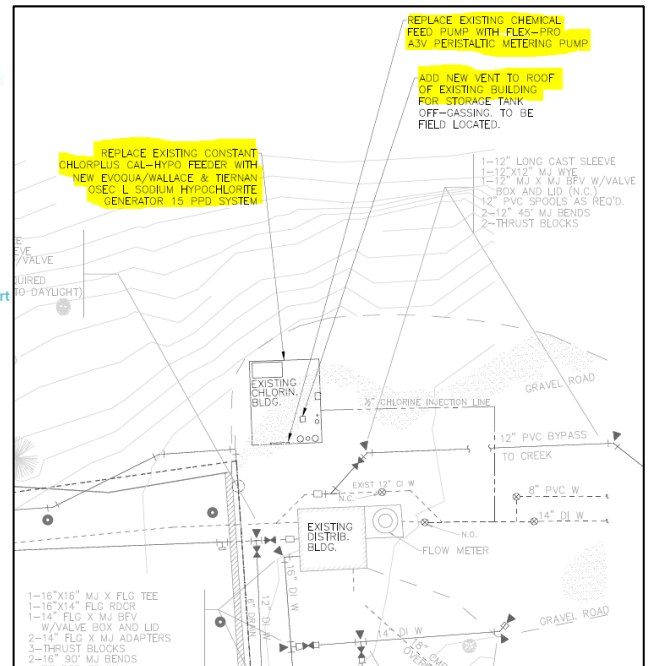
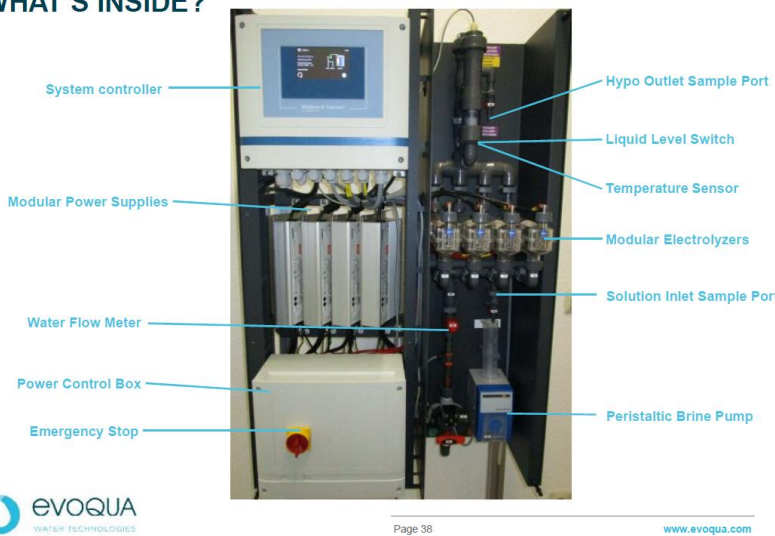


The on-site sodium hypochlorite system is an ANSI/NSF-61 certified Evoqua/Wallace & Tiernan OSEC L Sodium Hypochlorite Generator 15 PPD (pound per day) System which uses 3 electrolyzer cartridges fed by a 100-gallon brine tank (ANSI/NSF-60 certified Diamond Crystal® Solar Naturals Salt Crystals) and a softened water supply (Kinetico water softener) to generate a 0.7 percent hypochlorite solution. The 15 PPD system is sized to be able to disinfect up to 1,800 gallons per minute source flow. The mixed solution is stored in dual 160-gallon solution tanks sized to hold one day supply. Roughly 3-lbs of salt are needed to make 3-lbs of Cl₂. A diagram of what is inside the generator enclosure is shown the following page.

New Chlorine Metering Pump:
 An ANSI/NSF-61 certified Blue-White Flex-Pro A3V Peristaltic Metering Pump replaced the existing electric feed pump which is used to introduce the disinfectant to the system. The hypochlorite feed equipment is flow-paced from the District’s source water meter. The chlorination system is located in a treatment building next to the Crystal Springs source.



WHAT'S INSIDE?



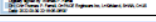
SCADA Monitoring:

In conformance with OAR 333-061-0050(5)(e), the District monitors the chlorination process using a new SCADA system. At the spring site, the SCADA system will alarm if the level in the chlorine storage tanks is too high or too low, if the pump is off, or if power is off at the site. As a back-up to the SCADA system (and prior to the SCADA being brought online), the District has an auto-dialer at the spring site that is set up with the same alarms. At the new South Reservoir site, residual chlorine levels are to be monitored prior to the first user in the system. The SCADA system will monitor chlorine levels, with a high alarm set at 1.5 mg/L and a low alarm set at 0.4 mg/L. These set points will alert the District in advance of chlorine levels in the system being too high or too low.

Oregon Health Services Drinking Water Services
Project Final Approval Request Form Print

Project Name On-site Generated Sodium Hypochlorite Disinfection Equip PR# 146-2021
 Public Water System ID# 41-386
 PWS Name Crystal Springs Water District Click to locate PWS ID#

| | YES | NO | DATE |
|--|-------------------------------------|-------------------------------------|------------|
| 1. Was the project undertaken? If so, what was the starting date? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 08/01/2021 |
| 2. If project was not undertaken, has the project been abandoned? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 3. Was the project completed? If so, when? If project not complete, estimated completion date: _____ | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 08/25/2021 |
| 4. If completed, was the work accomplished in conformance with all conditions listed in the Conditional Approval letter and DWS Construction Standards, Oregon Administrative Rule (OAR) 61-0050? In the comments below or on a separate sheet please make clear how all conditions specified in the Conditional Approval letter were met. | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 5. If the project was completed, were there any differences between what is shown on the plans and what was actually installed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 6. If the completed project is different from what is shown on the plans, were the plans modified to show as-built conditions? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 7. Have as-builts been sent to Drinking Water Services? NOTE: As-builts are not required if there were no significant changes noted in 5. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Are the facilities operating? If so, starting when? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 08/25/2021 |

Signature of Engineer Thomas P. Ferrell  Date 03/09/2022
 Name Thomas Ferrell OR PE# 79447
 Firm PACE Engineers, Inc. Phone (503) 597-3222

Comments
 The on-site sodium hypochlorite generation equipment was installed per the Disinfection Equipment Replacement Plan submittal dated September 8, 2021. There were no significant changes from what was shown in the submittal and what was installed.
 See below for an explanation of meeting the condition in the Conditional Approval letter.

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
Comments

The OHA Conditional Approval letter, dated September 10, 2021, listed a single condition.
 1. Raw (unchlorinated) and a treated (chlorinated) sample taps are both provided.


A raw water sample tap is located at the District's spring site. Because sodium hypochlorite is injected in the existing distribution building, there is not space for a sample tap on the watermain as it exits to the system. A sample taken in this location would be immediately after injection, and the measured chlorine residual in the watermain would likely be inaccurate. The District currently takes its treated water samples at the fire hydrant at the south end of Dog River Road, prior to the first user.

As part of the South Reservoir project (currently under construction), a sample tap was added to the outlet line from the reservoir. This tap will function as the District's treated sample tap, beginning by June 2022. Because water will flow through the new reservoir prior to being sampled, there will be an increase in contact time. If the new reservoir ever needs to be taken offline, the backup sample point will continue to be the fire hydrant on Dog River Road.

RE: Conditional Approval (PR# 146-2021) On-site generated sodiu...

 Tom Ferrell <TomF@paceengrs.com>
 To:  Hofeld Evan E
 Cc:  Fred Schatz
 Wed 10:23 PM

You replied to this message on 3/10/2022 8:46 AM.

 OHA Drinking Water Services Project Final Approval Request Form for Disinfection Replacement sign... 260 KB

Evan,

My apologies. The Final Plan Approval form for the on-site generation equipment is attached. I used estimated dates from last summer, as the on-site equipment had been installed prior to the sanitary survey you performed. The new vent from the building is indicated on the plans. No hydrogen or chlorine gas detectors have been installed.

Please let me know if you have any questions.

Tom

Tom Ferrell, PE
 Project Engineer
 4500 Kuyper Meadows, Suite 250

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If you have any questions, please feel free to email me at evan.e.hofeld@dhsoha.state.or.us or call me at (971) 200-0288. Thank you for your patience and cooperation in completing this plan review process.

Sincerely,



Evan Hofeld, PE, Regional Engineer
 Drinking Water Services

cc: Fred Schatz, Superintendent, via e-mail
 Crystal Springs Water District
 P.O. Box 186, Odell, OR 97044
fred@cswdhr.com

Ian Stromquist, REHS, Hood River County Environmental Health, via e-mail
ian.stromquist@co.hood-river.or.us