



Gila River Health Care
Red Tail Hawk Water Production Facility

Technical Memorandum 1
PRELIMINARY ANALYSIS AND
COST STUDY

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Abbreviations

μS/cm	microsiemens per centimeter
AACE	Association for the Advancement of Cost Engineering
Carollo	Carollo Engineers, Inc.
Center	Red Tail Hawk Health Center
CIP	clean-in-place
gpm	gallons per minute
GRHC	Gila River Health Care
I&C	instrumentation and controls
IHS	Indian Health Services
mg/L	milligrams per liter
mV	millivolts
NTU	nephelometric turbidity unit
O&M	operations and maintenance
ORP	oxidation-reduction potential
PLC	programmable logic controller
ppm	parts per million
RO	reverse osmosis
RTH	Red Tail Hawk
s.u.	standard units
SES	Service Entrance Section
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
UV	ultraviolet
WPF	water production facility

Technical Memorandum 1

PRELIMINARY ANALYSIS AND COST STUDY

1.1 Background

Carollo Engineers, Inc. (Carollo) was contracted by Gila River Health Care (GRHC) to evaluate the on-going operational and water quality challenges associated with the water production facility at the Hau'pai (Red Tail Hawk) Health Center.

The Community, through GRHC, constructed the Red Tail Hawk Health Center (Center) in 2016 to support the medical needs of the growing community. To provide potable water service, the Center included a new water production facility (WPF) consisting of a well, storage tank, pump station and associated ancillary facilities. While the system has, and continues to meet water quality regulations for potable use, the current configuration is not resulting in optimal operations or water quality.

Since its initial construction, the WPF has been experiencing operational and non-permit related water quality issues including, but not limited to:

- High total dissolved solids (TDS)
- Corrosion of the fixtures and piping in the Center
- Well Sanding (resulting in frequent repair/rehabilitation of well seals and other components)

In an attempt to mitigate these issues, GRHC installed a Reverse Osmosis (RO) skid, including pre-filtration and chemical feed. The RO system has provided value, but it is operating at significantly less than design capacity and requires frequent change out of the upstream cartridge filters. In addition, the concentrate/reject discharged from the system to the City of Chandler represents a significant operations and maintenance (O&M) cost.

To assist GRHC in addressing these on-going challenges, this study included the following tasks:

- Data Collection/Evaluation
- Facility Condition Assessment
- Facility Treatment Evaluation
- Recommendations and Opinion of Probable Cost

It is understood that GRHC has funding available from Indian Health Services (IHS) that may be used for necessary repairs and improvements to this facility. If unallocated, the funding will be lost by January 1, 2019. In support of the schedule challenges faced by GRHC, Carollo has issued this report documenting preliminary results of the evaluation. Data collection and water quality sampling results are ongoing. However, based upon preliminary analysis, Carollo has identified several primary items of concern and associated recommendations to address the water quality, reliability, and operations and maintenance challenges.

1.2 Water Production Facility Condition Assessment

The Red Tail Hawk WPF includes a well head, pumping station, above ground water storage tank, RO system, chlorine storage building, Service Entrance Section (SES) and Pump Control Building, and Generator. The existing WPF Site plan is shown on Figure 1.1. Carollo's team of discipline and process engineers visited the site on December 17, 2018 and completed a high level condition assessment to determine any significant issues which may impact the safety, performance, or reliable operation of the facility. The scope of the condition assessment was generally limited to a general review of the major above ground system components.

1.2.1 Civil/Site Assessment

The WPF site is secured by an 8 foot concrete masonry wall with three vehicle access gates and one man gate. The wall and gates were all in good condition.

- *Civil Issue 1: As the facility produces critical potable water for the health center, additional site security may be required to meet best practices for water production facilities.*
 - **Civil Recommendation 1: It is recommended that GRHC complete a security assessment of the site to ensure it meets best practices for water production facilities. The assessment would likely recommend installation of an anti-climb wall topper and the addition of perimeter and interior intrusion detection systems.**

The site was covered by small rocks and riprap for drainage. Figure 1.2 illustrates the typical ground cover at the site. Based on visual inspection and anecdotal information, there do not appear to be any significant drainage issues on-site. Operations staff noted that tank overflows and drains are adequately evacuated from the site to the adjacent farm land via the rip rap and drain block in the perimeter wall. Ground cover was sufficient for the site usage.

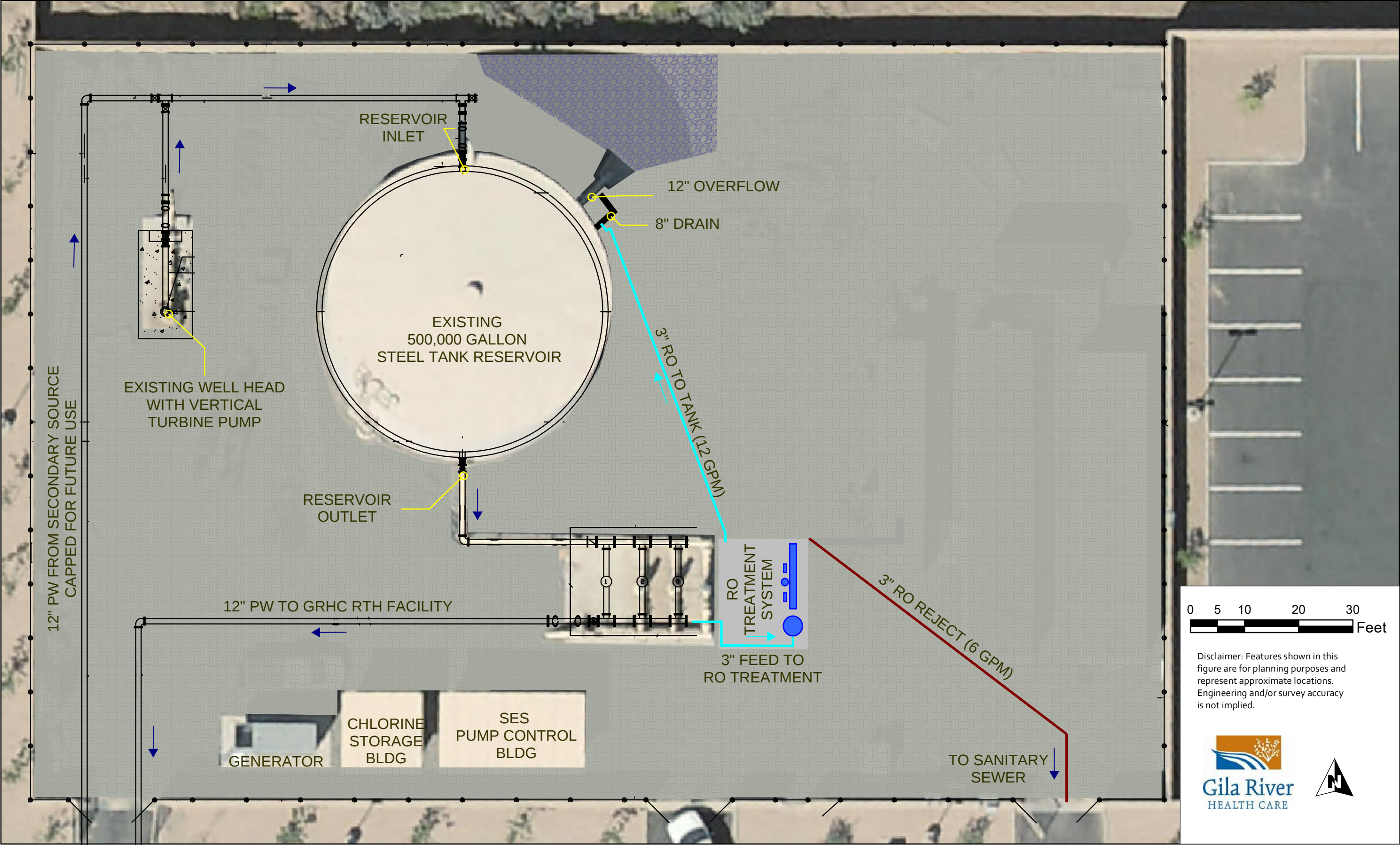


Figure 1.1 Existing RTH WPF Site Plan



Figure 1.2 Health Center Water Production Facility Site Typical Ground Cover

1.2.2 Structural Assessment

There were no significant issues identified with any of the structural assets on site. As the facility is only 7 years old and has been in service for less than 2 years, significant structural issues were expected to be rare if appropriate geotechnical and structural design criteria were utilized and construction was completed per plan.

No spalling or deterioration was evident at the various concrete slabs throughout the site. The facility structures are non-full height block buildings with steel deck roofing. The buildings are equipped with steel picket man-doors that were all in good condition.

- **Structural Issue 1:** *The building roofs appear to be in good condition, but were not accessed to complete an in-depth assessment.*
 - **Structural Recommendation 1:** The roofing in the Chlorine Building should be inspected on a regular basis to ensure off-gassing is not causing accelerated corrosion of the metal decking.

The team also completed a visual assessment of the exterior of the 500,000 gallon storage tank and ancillary structural assets. The tank was manufactured by MMI Tank & Industrial Services with a 3/8-inch shell course 1 and 1/4-inch shell Courses 2-4. The exterior of the tank, including the roof, appears to be in good condition, with no notable corrosion or coatings issues.

- ***Structural Issue 2:** The team did not complete an assessment of the tank interior. However, staff has reported previous corrosion concerns (including the access ladder) and it is likely there has been significant accumulation of sand and iron precipitate in the tank bottom.*
 - **Structural Recommendation 2:** Based on these considerations, it is recommended that GRHC complete a thorough evaluation of the tank interior to determine the current condition and identify any coating failure or corrosion concerns. This assessment can be completed using divers to allow the tank to remain in service during the assessment.

1.2.3 Mechanical Assessment

With several exceptions, the mechanical assets at the site were in good overall condition. Each component is discussed in detail below.

1.2.3.1 Well System

At the time of the site visit, the original 1,000 gallons per minute (gpm) capacity well pump had been pulled from service due to a mechanical shaft seal failure. Consequently, inspection of this asset was not possible. A temporary submersible 250 gpm well pump was installed to replace the out of service well pump.

- ***Well Issue 1:** The originally installed well pump was designed to service a significantly larger system and associated demand. Consequently, it is oversized for the current system, which results in frequent shut downs. Pumping at higher flow rates may also be resulting in increased sanding, which can lead to wear of equipment and seals and accumulation in the bottom of the storage tank.*
 - **Well Recommendation 1:** Assuming there are no significant future demands associated with the site, it is recommended that GRHC consider replacing the original 1,000 gpm pump with a more appropriate sized pump (250 - 500 gpm) to optimize operation and reduce potential sanding issues. The optimum well pump size would need to be determined in coordination with GRHC staff based on future projected flows.
- ***Well Issue 2:** Unlike most municipal well installations, the current site is not equipped with a well pump-to-waste system. Pump-to-waste systems can be an important tool for operators to address potentially poor aquifer water quality that can occur after the well is shut off due to low demand or maintenance activities. Based on anecdotal information from operations staff, the well pump is frequently shut down due to current demands versus the well pump capacity. During water quality testing, the team observed potential water quality concerns (specifically more turbid and discolored water) when the well was started-up after a shutdown.*
 - **Well Recommendation 2:** It is recommended that a pump-to-waste system be constructed at the site. Incorporating pump-to-waste into the well operation can provide operational and water quality benefits - allowing initial lower quality flows to be diverted away from the potable water storage tank and minimizing the likelihood of discharging lower quality water to the system. Additional details associated with this recommendation are included in Section 1.4.

1.2.3.2 Storage Tank

While the mechanical components of the storage tank appeared to be in good condition and were providing adequate service, several potential issues were identified which impact operational flexibility and overall system reliability.

- **Storage Issue 1:** *Based on current development, operations staff noted that the existing water storage tank provides only 15 days of storage during the peak demand periods (summer months). Staff has requested 30 days of storage capacity to provide additional operational flexibility in the event of a well outage. In addition, the current single storage tank would provide no redundancy/resiliency should the tank need to be taken out of service for repair or maintenance. For example, recoating of the tank interior, which is required every 7-10 years (depending on service conditions) may require several months to accomplish. During this time, the site would be left without adequate potable water or fire water storage to meet code requirements.*
 - **Storage Recommendation 1:** To address these redundancy/resiliency and code/safety issues, it is recommended that a second storage tank be constructed at the site in parallel to the existing tank. The site was master planned for a second 500,000 gallon tank. Additional details associated with this recommendation are included in Section 1.5.
- **Storage Issue 2:** *Staff noted that a tank mixing system would be beneficial to prevent settling of solids in the tank. While settling issues should be minimized by the proposed treatment system (described later in this memo), mixing would promote more consistent water quality in the tank during low demand periods.*
 - **Storage Recommendation 2:** This issue will be further evaluated during design to determine the optimum tank mixing mechanism.

1.2.3.3 RO System

The RO water treatment system, which was installed in 2016, showed no signs of corrosion or required maintenance (beyond the excessive cartridge filter and RO element replacement requirements which are addressed later in this document). However, the team identified several operational and code related issues associated with system which should be addressed:

- **RO Issue 1:** *The RO system resin bed pre-filter is not effective at removing the iron particulate, which plugs the fine particle cartridge filter at the inlet to the RO system, and ultimately results in inefficient operation of the system and discharge of large volumes of reject to the City of Chandler sewer system.*
 - **RO Recommendation 1:** To address these issues, it is recommended that GRHC install a new pretreatment system at the site, as described in Section 1.3. Following installation of the proposed pretreatment system, it is anticipated that the noted RO operational efficiency issues will be minimized.
- **RO Issue 2:** *The RO system reject connection to the City of Chandler sewer system is not equipped with an air gap. The current installation does not meet code and provides the potential for contamination of the potable water system.*
 - **RO Recommendation 2:** Provide an air gap fitting above grade at the current RO System reject connection to the drain.

1.2.3.4 Sodium Hypochlorite Feed System

While the existing sodium hypochlorite feed system is generally in reasonable condition, the team identified a number of potential items which could improve the operational flexibility, reliability and safety of the system. The issues and recommendations associated with the existing sodium hypochlorite chemical feed systems include:

- **CFS Issue 1:** *The current sodium hypochlorite building stores a large number of 6 gallons containers which are manually transferred to day tanks prior to feed. The current system does not include any mechanism for spill control/containment.*
 - **CFS Recommendation 1:** The building should be equipped with a spill pallet to store the sodium hypochlorite containers and minimize the impacts of an accidental spill.
- **CFS Issue 2:** *The current practice of transferring 6 gallon containers to the day tanks requires regular chemical handling and increases the likelihood of spills or accidental exposure.*
 - **CFS Recommendation 2:** Staff should consider using 55 gallon drums or totes of sodium hypochlorite in lieu of the 6 gallon containers to minimize handling and reduce the opportunities for spillage. This recommendation would need to be balanced with proposed usage rates to ensure degradation does not become an issue during summer months.
- **CFS Issue 3:** *The current sodium hypochlorite injection quills are configured on the bottom side of the receiving piping – making it difficult/impossible to access and remove the quill for service.*
 - **CFS Recommendation 3:** The injection points should be relocated to the top or side of the receiving pipe to provide a more serviceable installation.
- **CFS Issue 4:** *Direct buried sodium hypochlorite lines are failing in several locations and do not represent current best practices for chemical feed.*
 - **CFS Recommendation 4:** Replace all direct buried lines with 2-inch containment piping with Teflon (PFA) carrier tubing.

1.2.3.5 Miscellaneous Recommendations

In addition to the items listed above, the mechanical condition assessment identified several other miscellaneous recommendations to improve the operational efficiency, flexibility and safety of the existing systems including:

- **Misc. Issue 1:** *The current booster pump station pipe supports do not meet design standards.*
 - **Misc. Recommendation 1:** Install pipe supports on all three booster pump suction and discharge pipes adjacent to the expansion fittings to provide appropriate support during all operational conditions. The existing booster pump station is shown on Figure 1.3.
- **Misc. Issue 2:** *Exposed PVC piping is showing signs of UV degradation which could impact the service life of the system.*
 - **Misc. Recommendation 2:** Paint all exposed PVC piping to minimize the impacts of ultraviolet (UV) degradation.
- **Misc. Issue 3:** *Existing emergency eyewashes are not equipped with anti-scald devices to prevent burns during summer months.*
 - **Misc. Recommendation 3:** Provide all emergency eyewashes with anti-scald devices. Alternatively, publish administrative procedures which instruct operators to flush eyewash stations before working in the associated area.



Figure 1.3 Health Center Water Production Facility Booster Pump Station

1.2.4 Electrical Assessment

In general, the electrical and control equipment at the site is in good condition. Electrical drawings were not available to review so all observations are based on visual inspection of the facilities.

A 500kVA oil filled pad mounted transformer provides 480V power to the facility. The meter on the service is GRICUA-10952758. A pad mounted diesel generator provides emergency power in the event of a utility power failure.

All electrical equipment is located in a 4-welled block structure with man doors at each end. The structure is open to the elements between the top of the block wall and a roof. A roof provides cover from direct sun but wind, dust, and rain can all enter the structure.

The following equipment is housed inside the structure:

- A 600A Service Entrance Section
- A 600A Automatic Transfer Switch – ASCO 4000 Power Transfer Switch
- A PLC based control panel – Built by Southwest Controls

There were no issues noted with the existing electrical equipment. Spare buckets appear to be available to support installation of future treatment equipment.

1.2.5 Instrumentation & Controls (I&C) Assessment

Similar to the electrical assessment, drawings were not available to review so all observations are based on visual inspection of the facilities. In general, the I&C facilities at the site consisted of the following:

- Programmable Logic Controller (PLC) Control Panel:
 - NEMA 3R enclosure approximately 36 inches wide by 72 inches tall by 24 inches deep containing a PLC control system. Panel was provided by Southwest Controls and there was an Operations and Maintenance Manual from Quantum Integration Services in the panel. Staff indicated that the PLC runs the plant in full automatic mode and that it is not currently possible to bypass the PLC and operate the motors manually.
- Well Pump Instrumentation on the discharge header:
 - 1 each snap action pressure switch
 - 1 each thermal style flow switch
 - 1 each pressure gauge
 - 1 each 8-inch Master Meter propeller style flowmeter with flow totalizer and remote transmitter
- Booster Pump Instrumentation:
 - 1 each Thermal dispersion style flow switch on pump suction – not in service, not wired up
 - 1 each pressure switch on pump discharge
 - 1 each pressure gauge on the pump discharge
- Miscellaneous Instrumentation and Controls:
 - 1 each well water tank level switch
 - 1 each propeller style flowmeter on the main outflow check valve bypass. (This bypass was installed post initial construction to ensure sufficient flow for chlorine mixing)
 - Chlorine injection is performed with LMI metering pumps. These are plugged into a timing module which is manually programmable and runs the pump (currently) for 12 seconds a minute with the pump set at 55 gallons per hour.
- ***I&C Issue 1:** The flow meter associated with the well pump was not operational at the time of the site visit, making it impossible to determine the flow rate being produced by the well.*
 - **I&C Recommendation 1: The existing flow meter should be repaired or replaced to ensure proper operation. Accurate flow readings from the well will be critical to support future chlorination operations associated with the proposed pretreatment system.**

1.3 Water Quality Testing

GRHC has provided preliminary well water quality data supporting compliance with applicable regulations. However, additional water quality data is critical to better understand and evaluate the cause of the noted operational issues at the site. Carollo established a list of critical water quality parameters to be tested and obtained the required samples for laboratory testing.

Samples were collected at the well head and downstream of the RO unit (pre-Chlorination). In general, samples collected at the well head were analyzed for the suite of tests associated with a "new source" sample plus several additional parameters specific to the RO system operation.

Samples collected downstream of RO (pre- Chlorination) were analyzed for alkalinity, calcium, chloride and sulfate.

In addition to the samples collected for laboratory testing, onsite measurements were also collected for a number of other parameters using field instruments. The results of the field testing are summarized in Table 1.1.

Table 1.1 Field Testing Results

Date of Sampling:	12/17/2018			
Sample Location:	Well Head			
Time of Sampling:		10:30 AM	10:40 AM	
Parameter	Units	Sample#1	Sample#2	Average
Conductivity	µS/cm	3,007	2,802	2,905
TDS	ppm	2,206	2,063	2,135
ORP	mV	59	27	43
pH	s.u.	7.00	7.09	7.05
Temperature	deg C	28.0	28.4	28.20
Turbidity	NTU	3.95	2.22	3.09

Abbreviations:

ORP = oxidation-reduction potential; µS/cm = microsiemens per centimeter; ppm = parts per million; mV = millivolts; s.u. = standard units; deg C = degrees Celsius; NTU = nephelometric turbidity unit

At the time of this preliminary report, the final results of the water quality sampling were still pending. However, preliminary results, in conjunction with visual observations at the site, indicated that iron (and potentially manganese) are present in the well water.

1.4 Addition of Well Pump-to-Waste Basin

As discussed in Section 1.2.2, the current site is not equipped with a well pump-to-waste system, which can be an important tool for operators to address potentially poor aquifer water quality that can occur after the well is shut off due to low demand or maintenance activities.

Consequently, it is recommended that a pump-to-waste system be constructed at the site. Incorporating pump-to-waste into the well operation can provide operational and water quality benefits - allowing initial lower quality flows to be diverted away from the potable water storage tank and minimizing the likelihood of discharging lower quality water to the system.

The team developed several potential options for a pump-to-waste system including discharge to a new, dedicated basin in the adjacent farm fields as well as several potential options for discharge to the City of Chandler sewer system directly. The potential alternatives are illustrated on Figure 1.4.

The optimal alternative will be developed during detailed design in close collaboration with GRHC and will likely depend on availability of land, desire to minimize additional flows to the City, and life cycle cost. For the purposes of this study, cost estimating was based on construction of a dedicated pump-to-waste basin on the adjacent farm field as it would have the highest initial capital cost.

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1.5 Addition of Second Potable Water Storage Tank

As discussed in Section 1.2.3, the existing water storage tank provides only 15 days of storage capacity during peak demand periods, offering limited operational flexibility in the event of a well outage. In addition, the current single storage tank would provide no redundancy/resiliency should the tank need to be taken out of service for repair or maintenance (i.e. tank recoating). During this time, the site would be left without adequate potable water or fire water storage to meet code requirements.

To address these redundancy/resiliency and code/safety issues, it is recommended that a second storage tank be constructed at the site in parallel to the existing tank. The site was master planned for a second 500,000 gallon tank and adequate footprint is available to accommodate the proposed installation. In addition, the existing feed piping from the well is equipped with a blind flange that can be used to connect the new tank to the system, in parallel to the existing tank. It is anticipated that the tank construction would be similar to the existing steel tank and could be completed while the facility was in service.

The proposed installation is shown on Figure 1.4. Note that Figure 1.4 represents preliminary concepts for the storage tank only. A detailed design would be required to confirm the proposed installation and design criteria, as well as operation of the RO system under the revised configuration.

1.6 Pre-Treatment Analysis

As noted previously, the site is experiencing water quality issues that are impacting the efficient operation of the system. While final water quality results were still pending at the time of this report, preliminary testing results confirmed the presence of iron and manganese in the groundwater. These results are consistent with visual observations at the site including:

- Reddish brown deposits in the pump station strainer baskets
- Reddish brown material deposits on the RO cartridge filters
- Yellow/red discoloration of water discharged from the storage tank after a pump station shutdown (indicating oxidation/precipitation in the tank)

While the metals may not be present in concentrations exceeding the secondary standards established by the United States Environmental Protection Agency (USEPA) - 0.30 milligrams per liter (mg/L) for iron and 0.05 mg/L for manganese – they are resulting in aesthetic issues and likely impacting the operation of the RO system.

Under the current system configuration, well water is pumped directly to the storage tank. While staff is not currently adding chlorine upstream of the tank, the water is exposed to the atmosphere/air for 15-45 days in the tank. This exposure to the air results in some degree of oxidation of the iron and manganese in the water and subsequent precipitation in the tank. The presence of oxidized (i.e. non-dissolved) iron and manganese in the feed water to the RO also results in frequent clogging of the cartridge filter upstream of the unit and inefficient operation of the RO system.

Efficient operation of the RO system is critical to addressing the aesthetic issues associated with high TDS in the groundwater and to minimizing the operational costs associated with discharge of RO reject to the City of Chandler sewer system.

To address these issues, the team evaluated several potential pretreatment alternatives.

1.6.1 Treatment Alternatives for Iron and Manganese Removal

In groundwater, iron occurs in one of two oxidation states: Divalent ferrous iron in its reduced state (Fe^{2+}), which is soluble or trivalent ferric iron in its oxidized state (Fe^{3+}), which is insoluble. Ferric hydroxide ($\text{Fe}(\text{OH})_3$) is formed when ferrous iron in ground water is oxidized. The ferric form is insoluble and therefore can be precipitated.

Manganese is present in multiple oxidation states in aqueous environments. Table 1.2 lists all oxidation states for Mn present in the aquatic environment. The oxidation states that are relevant for this study include the +2 valence state, which is the form of dissolved Mn, and the +4 valence state, which is the form of particulate and colloidal Mn.

Mn^{2+} , when oxidized in water systems, forms Mn^{4+} , which is responsible for the poor aesthetic water quality and other undesirable effects that includes pipe failures due to the deposits. Mn^{4+} is insoluble and can be removed by precipitation.

Table 1.2 Manganese Oxidation States

Valency (Oxidation State)	Species	Description
0	Mn (s)	Manganese Metal
+2	Mn^{2+}	Manganous Ion, Light Pink Color
+3	Mn^{3+}	Manganic Ion, Dark Pink Color
+4	MnO_2 (s)	Solid, Black or Brown
+6	MnO_4^{2-}	Manganate Ion, Dark Green
+7	MnO_4^-	Permanganate Ion, Purple

There are several options for the removal of Iron and Manganese, including sequestration, ion exchange, and oxidation/precipitation technologies. Each of these alternatives is discussed further in the subsequent sections.

Note that the team also evaluated the potential to discharge well water directly to the existing RO system. However, this option was eliminated from further consideration based on the limited capacity of the system, the likelihood of undissolved iron/manganese in the feed water, and the reasonably high turbidity in the initial well samples.

1.6.2 Sequestration

Sequestering is defined as "a chemical combination of a chelating agent and metal ions in which soluble complexes are formed. Iron and manganese sequestered as colorless complexes before chlorination will remain colorless after chlorination" (American Chemistry Council, the Use of Phosphates for Potable Water treatment, 2004). That said, sequestration is not a removal process. Rather, sequesterants function as chelating or binding agents by isolating the element from further chemical reaction such as oxidation and precipitation. Some of the popular sequestering agents for iron and manganese are phosphates, polyphosphates, or sodium silicates.

The effectiveness of sequestration is dependent on variety of factors including:

- Water temperature
- Type of the fraction that a metal is present in – dissolved, colloidal, and particulate
- Sources water hardness (may be ineffective above 250 mg/L as CaCO_3)

Detailed bench scale testing is typically required to determine the potential effectiveness of sequestration, the optimum sequestering agent, and associated dose for the specific application.

1.6.3 Cation Exchange

Cation exchange is an ion exchange method that uses conventional softening resins to remove iron and manganese from the system. The treatment utilizes iron and manganese adsorption onto resin-type media and the removal is accomplished by exchanging for sodium. Iron and manganese are then removed from the system by backwashing and the resin is regenerated using concentrated sodium chloride solution (i.e., brine).

1.6.4 Oxidation/Filtration

Oxidation/Filtration is one of the most popular and proven methods to remove iron and manganese from a ground water. A majority of the commercially available systems are based on accomplishing the following two steps in sequence:

1. Oxidizing the dissolved species, for example Fe^{2+} and Mn^{2+} to their particulate or insoluble states (Fe^{4+} and Mn^{4+}). Oxidants commonly include chlorine, air, potassium permanganate, etc.
2. Filtering the insoluble species via conventional multimedia filtration.

There are a variety of commercially available systems for oxidation/filtration of iron and manganese.

1.7 Evaluation of Treatment Alternatives

To assist in selecting the optimal iron and manganese mitigation alternative for this application, each alternative was evaluated based on the following criteria.

1. Effectiveness – ability to effectively remove anticipated iron and manganese concentrations to enhance the water quality, while minimizing the potential for precipitation in the storage tank and improving the operation and efficiency of the RO system
2. Reliability – ability to reliably and consistently meet the treatment objectives
3. Ease of operations – ability to operate the system without significant impacts on current operations (labor force, costs, operational expertise, etc.)
4. Residuals handling – ability to easily and cost effectively handle any residual streams generated by the system
5. Constructability – ease of construction
6. Footprint – ability to fit the proposed system within the current site footprint
7. Successful installations – documented successful application of the system on similar water supplies

Note that the time sensitive nature of the project limited the level of analysis that was possible. However, based on Carollo's knowledge of, and experience with the proposed alternatives, in conjunction with the specific goals of this project, the team was able to complete a high level analysis of the systems and provide a recommendation as outlined below.

1.7.1 Sequestration

While sequestration can be an effective means of preventing iron and manganese precipitation (and the resulting water quality challenges), it does not actually remove the iron and manganese

from the water. In addition, there is still some disagreement among water treatment professionals regarding sequestering's ability to eliminate subsequent chemical reactions. Further, sequesterants will likely be unable to control precipitation of iron and manganese in the RO system, as these constituents are significantly concentrated as dissolved solids are rejected and removed by the RO membranes.

As noted above, extensive testing must be performed to determine the potential effectiveness of sequestering, as well as which sequestering agent would be most effective based on site specific conditions.

Even if an effective sequestering agent can be identified, feeding phosphates and polyphosphates to the water can have unintended consequences. Consideration must be given to the location of the feed as aggressive behavior of sequesterants towards metals could lead to pipe failures. In addition, the long chain polyphosphates could further negatively impact the operation of the RO system.

Table 1.3 summarizes the results of the evaluation against the defined criteria.

Table 1.3 Evaluation Summary for Sequestration

Criteria	Analysis
Effectiveness	Potentially effective. Additional testing would be required to identify optimum sequestering agent and dose, as well as the ability to prevent future chemical reactions.
Reliability	Assuming an appropriate sequestering agent can be identified, the technology would be effective at minimizing oxidation and precipitation of iron and manganese. However, precipitation would likely still occur in the RO system, resulting in operational challenges.
Ease of Operations	Sequestering system would be relatively easy to operate. However, the addition of the chemical could have significant negative impacts on the operation of the RO.
Disposal of Residuals	NA
Constructability	The system would be easily constructible.
Footprint	The system would fit within the footprint available on the site.
Successful Installations	Several, including a temporary system at the City of Yuma. However, none of the noted systems are equipped with a downstream RO process.

1.7.2 Cation Exchange

Cation exchange (ion exchange) is a complex process that involves pumps, generation of waste brine, and periodic removal or discharge of waste brine to the sewer. Research and literature review of various similar installations indicated that that ion exchange for iron and manganese removal can be efficient and reliable only if the elements are in the dissolved state. Oxidized forms will foul the resin more quickly, leading to decreased performance, and more frequent regeneration. Fouling could also lead to a high pressure drop and subsequent bleed through, which can impact the treated water quality. The actual form of the iron and manganese is pending final water quality analysis, but observation of the well water during the site visits

indicates the potential for rapid oxidation of the iron. Consequently, there are concerns about the effectiveness of this technology for the application.

Finally, regenerated waste from the cation exchange resins can create flash scaling problems when combined with the RO reject, resulting in potential operational challenges. Table 1.4 summarizes the findings of the evaluation against the defined criteria.

Table 1.4 Evaluation Summary for Cation Exchange

Criteria	Analysis
Effectiveness	Dependent on the form of the elements in the water. If not dissolved (i.e. oxidized), the system effectiveness would be limited.
Reliability	Dependent on water quality as noted above. Waste from the system could also result in operational challenges when combined with RO reject.
Ease of Operations	Ion Exchange is a relatively complex process that involves a variety of mechanical components.
Disposal of Residuals to the Sanitary Sewer	Spent regenerate would need to be discharged to the City of Chandler sewer. Volumes would be dependent on the ultimate water quality.
Constructability	The system would be easily constructible.
Footprint	The system would fit within the footprint available on the site.
Successful Installations	There are multiple successful installations in similar applications.

1.7.3 Oxidation/Filtration

Oxidation/filtration is fairly a flexible and robust treatment method with proven process performance. The systems are operationally simple and well understood, reliable and easy to operate, and provide the following benefits:

1. Minimizes the potential for precipitation in the storage tank.
2. Provides a higher quality water for the RO system thereby:
 - a. Reducing the frequency of cartridge filter changeouts.
 - b. Reducing the frequency of membrane replacements or clean-in-place (CIP) events.
 - c. Potentially allowing for higher operating recovery, which would reduce brine discharge volumes to the City of Chandler.
3. Allows the current RO system to continue operating "as-is" (i.e., pulling water from the storage tank and discharging back to the tank to reduce TDS to the desired levels).

The oxidation/filtration system must periodically backwash the filter media to remove accumulated particles. The backwash rates are higher than the normal filtration rates, and the existing 12-inch sanitary sewer is not large enough to hold the additional backwash waste that would be generated using this system. The GRHC site has space to install backwash equalization tanks, which would allow the backwash waste to be stored and metered slowly into the collection system.

Table 1.5 summarizes the findings of the evaluation against the defined criteria.

Table 1.5 Evaluation Summary for Oxidation/Filtration

Criteria	Analysis
Effectiveness	The system would be effective for treating the entire flow stream at the expected levels of iron and manganese. This approach would minimize the potential for precipitation in the storage tank and carryover to the RO unit.
Reliability	Oxidation/Filtration Systems are highly effective and reliable with proper oxidant addition and filtration system maintenance.
Ease of Operations	Systems are easy to operate and maintain.
Disposal of Residuals to the Sanitary Sewer	The systems do generate a backwash waste which must be disposed of via sewer. Backwash flows can be metered to the sewer to minimize flow and loading concerns.
Constructability	The packaged system would be easily constructible
Footprint	The system would fit within the footprint available on the site.
Successful Installations	There are multiple successful installations in similar applications, including several in the southwest.

1.8 Recommended Treatment Option

Sequestering is not recommended for the GRHC site. While the technology could minimize the likelihood of oxidation and precipitation in the tank, the iron and manganese remains in the water and could result in subsequent water quality issues (due to future chemical reactions). Most critically, the sequestering agent could result in issues associated with the operation of the downstream RO.

Similarly, Ion Exchange is not recommended for installation. While the technology could be effective for removal of iron and manganese (pending final water quality), it is likely that undissolved iron could result in treatment challenges. In addition, the process is relatively complex and may present challenges relative to the disposal of regenerate

Recommendation: Oxidation/Filtration is recommended for installation at the GRHC site. This technology provides the ability to effectively and reliably treat the entire flow stream upstream of the storage tank, providing high quality water to support optimum operation of the RO system and eliminating concerns associated with additional impacts on the RO system due to reactions with RO reject.

To further develop this alternative, Carollo contacted multiple manufacturers of oxidation/filtration systems, including Pureflow and Filtronics, which specifically target iron and manganese removal. Design criteria layouts presented herein are based on the Pureflow system, although multiple options exist that could be competitively procured.

In general, the proposed treatment system oxidizes the iron and manganese and sulfide-based species dissolved in the water into their insoluble forms and physically removes the constituents from the water through a filtration process. The existing sodium hypochlorite system, with some modifications, is proposed as the oxidant source for this system.

Figure 1.5 shows the proposed Pureflow treatment system components and design parameters. Additional design criteria are under development in conjunction with the vendor and will be provided upon completion.

- | | |
|----------------|-------------|
| TITLE | |
| DRAWN BY | T. MORALES |
| CHECKED BY | |
| APPROVED BY | |
| DATE | 7/8/13 |
| DRAWING NO. | 1211 |
| 'B' SIZE SCALE | 3/8"=1'-0" |
| JOB NO. | PROP |
| SHEET | 1 OF 1 |
| REVISION | NC |

DRAFT | DECEMBER 2018 | 1-18

1.9 Recommended Site Improvements

Section 1.2 of this report outlined the results of the field assessment completed for the water production facility. The list below summarizes the recommended improvements, in general order of priority. Additional details are provided in the associated sections. The proposed RHT WPF Site Plan is included as Figure 1.4. The proposed RHT Site Civil Improvements Plan is included as Figure 1.6.

1. Install a new oxidation/precipitation pretreatment system at the site to address tank precipitation and RO operational issues.
2. Construct a second potable water storage tank at the site to address potential redundancy/resiliency and code/safety issues.
3. Install a pump-to-waste system at the site. Incorporating pump-to-waste will provide operational and water quality benefits.
4. Assuming there are no significant future demands associated with the site, consider replacing the original 1,000 gpm pump with a more appropriate sized pump (250 - 500 gpm) to optimize operation and reduce potential sanding issues.
5. Relocate chemical injection points to the top or side of the receiving pipe to provide a more serviceable installation.
6. Complete a thorough evaluation of the tank interior to determine the current condition and identify any coating failure or corrosion concerns.
7. Replace all direct buried lines with 2-inch containment piping with Teflon (PFA) carrier tubing.
8. Install pipe supports on all three booster pump suction and discharge pipes adjacent to the expansion fittings to provide appropriate support during all operational conditions.
9. Paint all exposed PVC piping to minimize the impacts of UV degradation.
10. Further evaluate the benefits of adding tank mixing to the potable water storage tank(s).
11. Provide an air gap fitting above grade at the current RO System reject connection to the drain.
12. Provide a spill pallet in the sodium hypochlorite building to store the sodium hypochlorite containers and minimize the impacts of an accidental spill.
13. Consider using 55 gallon drums or totes of sodium hypochlorite in lieu of the 6 gallon containers to minimize handling and reduce the opportunities for spillage.
14. Provide all emergency eyewashes with anti-scald devices. Alternatively, publish administrative procedures which instruct operators to flush eyewash stations before working in the associated area.
15. Complete a security assessment of the site to ensure it meets best practices for water production facilities.
16. Inspect the roofing in the Chlorine Building on a regular basis to ensure off-gassing is not causing accelerated corrosion of the metal decking.

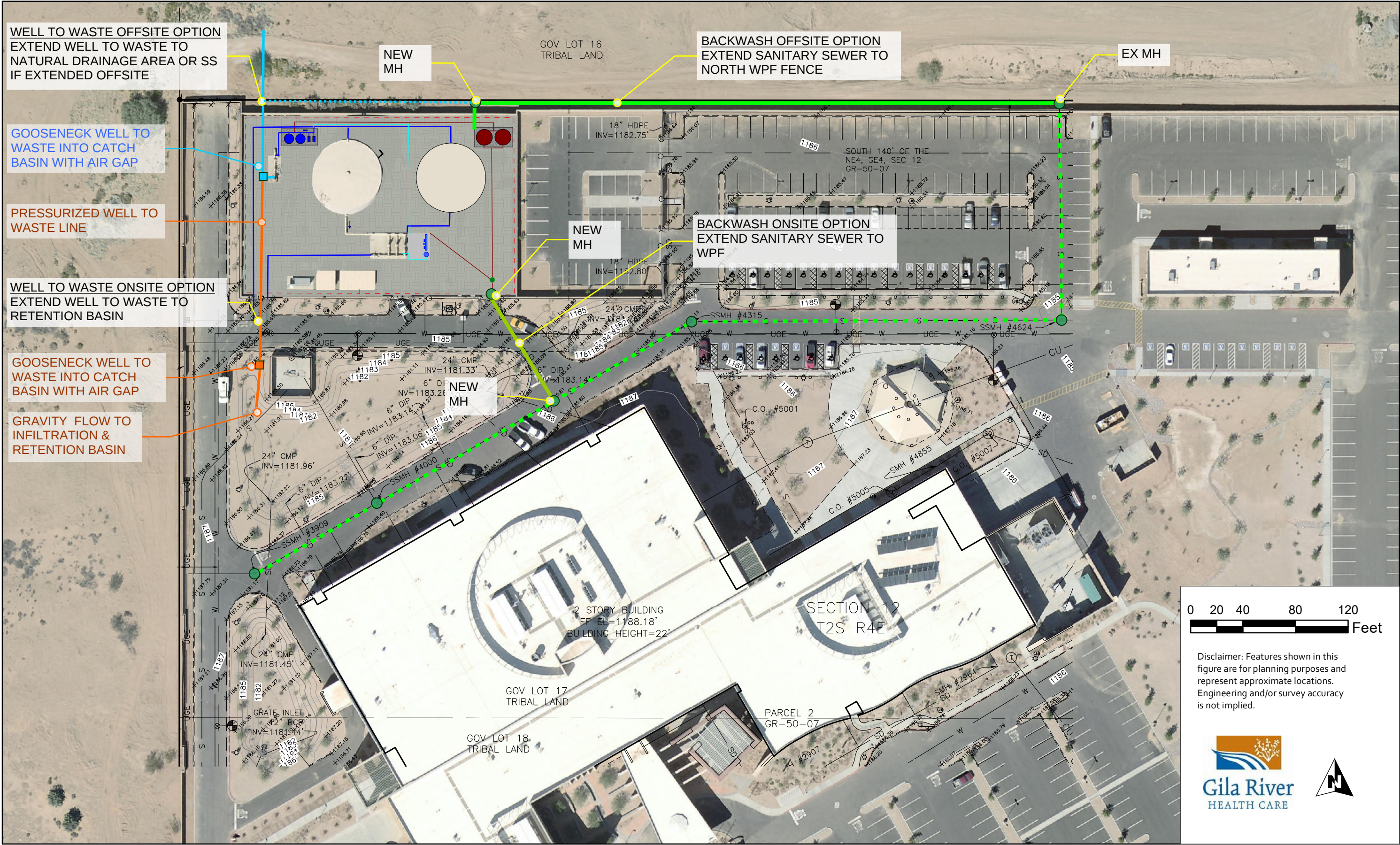


Figure 1.6 RTH Site Civil Improvements

1.10 Opinion of Probable Cost

For the purposes of this preliminary evaluation, cost estimates were prepared for only the large capital cost items as summarized in Table 1.6.

Table 1.6 Capital Improvements Cost Estimate

Improvement	Description	Opinion of Probable Cost ⁽¹⁾
Well-to-Waste	Well to waste control valve, air gap, yard piping	\$103,000
Additional Water Storage Tank	Second 500,000 gallon Storage tank and associated appurtenances	\$970,000
Oxidation/Filtration System	Addition of new Oxidation/Filtration Treatment System to remove iron/manganese	\$2,003,000
Total		\$3,076,000

Notes:

(1) AACE Class 5 Cost Estimate

Many characteristics can be used to categorize the level of detail and expected accuracy of a cost estimate. The most significant are the degree of project definition, how the estimate will be used, estimate methodology, and the effort and time needed to prepare the estimate. In following the Association for the Advancement of Cost Engineering (AACE) International Cost Estimate Classification System, this estimate class designation is a Class 5 estimate. A Class 5 estimate is based on a low level of project definition for the purpose of screening or feasibility.

Construction costs, were developed based on the following assumptions:

- 30 percent Contingency for unknown conditions.
- 10 percent for General Conditions, including mobilization and general contractor risk.
- 15 percent Contractor overhead and profit.
- 10 percent Owner's Reserve for potential change orders

Refer to Appendix A for the conceptual cost estimates.

Engineering costs were developed as a percentage of the capital improvement costs. Total project costs are summarized in Table 1.7.

Table 1.7 Total Project Costs

Task	Description	Fee Estimate
Capital Improvement Costs	Summary provided in previous table.	\$3,076,000
Engineering Design Services	Project Management, Basis of Design Report, 60%, 90%, 100% Design Documents, permitting, Bid-Ready Documents. 10% of Capital Improvement Costs	\$310,000
Total Project Costs		\$3,386,000

Appendix A

CONCEPTUAL COST ESTIMATES

PROJECT SUMMARY

Estimate Class: 5

Project: GRHC WPF - 0.5 MG Tank
 Client: Gila River Health Care
 Location: Red Tail Hawk Health Center
 Zip Code: 85286

PIC: Dave Sobeck
 PM: Alicia Esmay
 Date: December 18, 2018
 By: Alicia Esmay

Carollo Job # 11312A00

Reviewed:

NO.	DESCRIPTION	TOTAL
01	General Conditions	\$50,000
02	Site Work	\$14,068
03	Equipment	\$476,777
04	EI&C	\$30,800
		\$0
		\$0
TOTAL DIRECT COST		\$571,645
	Contingency 30.0%	\$171,494
	Subtotal	\$743,139
	General Contractor Overhead & Profit 15.0%	\$111,471
	Subtotal	\$854,609
	Escalation to Mid-Point 2.9%	\$24,784
	Subtotal	\$879,393
	Sales Tax (Based on) 0.0%	\$0
	Subtotal	\$879,393
	Bid Market Allowance 0.0%	\$0
TOTAL ESTIMATED CONSTRUCTION COST		\$879,393
	Engineering, Legal & Administration Fees 0.0%	\$0
	Owner's Reserve for Change Orders 10.0%	\$87,939
TOTAL ESTIMATED PROJECT COST		\$967,332

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

PROJECT SUMMARY

Estimate Class: 5

Project: GRHC WPF - Water Treatment Process
 Client: Gila River Health Care
 Location: Red Tail Hawk Health Center
 Zip Code: 85286

PIC: Dave Sobeck
 PM: Alicia Esmay
 Date: December 18, 2018
 By: Alicia Esmay

Carollo Job # 11312A00

Reviewed:

NO.	DESCRIPTION	TOTAL
01	General Conditions	\$118,850
02	Site Work	\$90,430
03	Equipment	\$779,368
04	Piping & Valves	\$79,876
05	EI&C	\$115,000
		\$0
	TOTAL DIRECT COST	\$1,183,524
	Contingency 30.0%	\$355,057
	Subtotal	\$1,538,582
	General Contractor Overhead & Profit 15.0%	\$230,787
	Subtotal	\$1,769,369
	Escalation to Mid-Point 2.9%	\$51,312
	Subtotal	\$1,820,681
	Sales Tax (Based on) 0.0%	\$0
	Subtotal	\$1,820,681
	Bid Market Allowance 0.0%	\$0
	TOTAL ESTIMATED CONSTRUCTION COST	\$1,820,681
	Engineering, Legal & Administration Fees 0.0%	\$0
	Owner's Reserve for Change Orders 10.0%	\$182,068
	TOTAL ESTIMATED PROJECT COST	\$2,002,749

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

PROJECT SUMMARY

Estimate Class: 5

Project: GRHC WPF - Well to Waste Cost Estimate
 Client: Gila River Health Care
 Location: Red Tail Hawk Health Center
 Zip Code: 85286

PIC: Dave Sobeck
 PM: Alicia Esmay
 Date: December 18, 2018
 By: Alicia Esmay

Carollo Job # 11312A00

Reviewed:

NO.	DESCRIPTION	TOTAL
01	General Conditions	\$8,100
02	Site Work	\$22,595
03	Well to Waste	\$30,134
TOTAL DIRECT COST		\$60,830
Contingency	30.0%	\$18,249
	Subtotal	\$79,079
General Contractor Overhead & Profit	15.0%	\$11,862
	Subtotal	\$90,940
Escalation to Mid-Point	2.9%	\$2,637
	Subtotal	\$93,578
Sales Tax (Based on)	0.0%	\$0
	Subtotal	\$93,578
Bid Market Allowance	0.0%	\$0
TOTAL ESTIMATED CONSTRUCTION COST		\$93,578
Engineering, Legal & Administration Fees	0.0%	\$0
Owner's Reserve for Change Orders	10.0%	\$9,358
TOTAL ESTIMATED PROJECT COST		\$102,935
<i>The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.</i>		

Appendix B

PRELIMINARY WATER QUALITY RESULTS

21 December 2018

Srikanth Grandhi
Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

RE: New Source plus additional parameters

Laboratory Work Order No.: 18L1641

Legend Technical Services of Arizona, Inc. is pleased to provide the enclosed analytical results for the aforementioned project. These results relate only to the items tested. This cover letter and the accompanying pages represent the full report for these analyses and should only be reproduced in full. Samples for this project were received by the laboratory on 12/17/18 13:33.

The samples were processed in accordance with the Chain of Custody document and the results presented relate only to the samples tested. The Chain of Custody is considered part of this report.

All samples will be retained by LEGEND for 30 days from the date of this report and then discarded unless other arrangements are made. Due to hold-time and method sample volume requirements, microbiological samples are not retained unless other arrangements are made.

This entire report was reviewed and approved for release by the undersigned. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

LEGEND TECHNICAL SERVICES OF ARIZONA, INC.

DRAFT REPORT
DATA SUBJECT TO CHANGE
(602) 324-6100

This laboratory report is confidential and is intended for the sole use of LEGEND and it's client.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Type	Date Sampled	Date Received
Well Head	18L1641-01	Drinking Water	Grab	12/17/18 10:45	12/17/18 13:33

Sample Condition Upon Receipt:

Temperature: 4.80 C

All samples were received in acceptable condition unless noted otherwise in the case narrative.

Case Narrative:

Holding Times: All holding times were met unless otherwise qualified.

QA/QC Criteria: All analyses met method requirements unless otherwise qualified.

Certifications: **AZ(PHX)0004, AZ(TUC)0004, AIHA#102982, CDC ELITE Member.**

Accreditation is applicable only to the test methods specified on each scope of accreditation held by LEGEND.

Comments: There were no problems encountered during the processing of the samples, unless otherwise noted.
All samples were analyzed on a "wet" basis unless designated as "dry weight".

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Well Head (18L1641-01) Drinking Water (Grab) Sampled: 12/17/18 10:45 Received: 12/17/18 13:33

Analyte	Result	PQL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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Legend Technical Services of Arizona, Inc.

Microbiology

E. coli	Absent		P/A	1	B8L1485	12/17/18 15:40	12/18/18 09:40	SM 9223B	
Total Coliforms	Absent		P/A	1	B8L1485	12/17/18 15:40	12/18/18 09:40	SM 9223B	

Total Metals

Aluminum	<0.20	0.20	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Barium	0.086	0.010	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Beryllium	<0.0020	0.0020	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Boron	0.21	0.10	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Calcium	110	1.0	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Chromium	0.0096	0.0050	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Copper	<0.010	0.010	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Iron	0.18	0.050	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Magnesium	55	1.0	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Manganese	<0.020	0.020	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Mercury	<0.0002	0.0002	mg/L	1	B8L1480	12/19/18 09:17	12/19/18 16:25	EPA 245.1	
Nickel	<0.020	0.020	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Sodium	390	5.0	mg/L	5	B8L1451	12/19/18 08:30	12/19/18 10:02	EPA 200.7	D2
Strontium	1.8	0.020	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:13	EPA 200.7	
Calcium Hardness as CaCO ₃	260	2.5	mg/L	1	[CALC]	12/19/18 08:30	12/19/18 10:13	SM2340B	
Magnesium Hardness as CaCO ₃	230	4.1	mg/L	1	[CALC]	12/19/18 08:30	12/19/18 10:13	SM2340B	
Total Hardness as CaCO ₃	490	4.1	mg/L	1	[CALC]	12/19/18 08:30	12/19/18 10:13	SM2340B	

Dissolved Metals

Iron	0.091	0.050	mg/L	1	B8L1453	12/17/18 16:10	12/19/18 11:00	EPA 200.7	H6
Manganese	<0.020	0.020	mg/L	1	B8L1453	12/17/18 16:10	12/19/18 11:00	EPA 200.7	H6
Silica, Dissolved	20	0.21	mg/L	1	[CALC]	12/17/18 16:10	12/19/18 11:00	EPA 200.7	
Silicon	9.1	0.10	mg/L	1	B8L1453	12/17/18 16:10	12/19/18 11:00	EPA 200.7	H6

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Well Head (18L1641-01) Drinking Water (Grab) Sampled: 12/17/18 10:45 Received: 12/17/18 13:33

Analyte	Result	PQL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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Legend Technical Services of Arizona, Inc.

Inorganic Chemistry

Cyanide, Total	<0.010	0.010	mg/L	1	B8L1447	12/19/18 09:04	12/19/18 10:43	SM 4500 CN E	
Fluoride	0.41	0.10	mg/L	1	B8L1466	12/18/18 08:53	12/18/18 16:26	EPA 300.0	
Hydrogen Sulfide (HS)	<0.0400	0.0400	mg/L	1	B8L1441	12/17/18 15:10	12/18/18 13:45	SM 4500 S2- H	
Nitrate as N	6.78	0.10	mg/L	1	B8L1466	12/18/18 08:53	12/18/18 16:26	EPA 300.0	
Nitrite as N	<0.10	0.10	mg/L	1	B8L1466	12/18/18 08:53	12/18/18 16:26	EPA 300.0	
pH	8.0		pH Units	1	B8L1368	12/17/18 14:49	12/17/18 14:49	SM 4500H B	H5
Temperature	12.9		°C	1	B8L1368	12/17/18 14:49	12/17/18 14:49	pH Temperature	H5
Phosphate	<0.153	0.153	mg/L	1	[CALC]	12/19/18 14:15	12/20/18 17:15	Calculation	
Total Phosphorous	<0.05	0.05	mg/L	1	B8L1460	12/19/18 14:15	12/20/18 17:15	EPA 365.3	
Sulfide, Dissolved	<0.0400	0.0400	mg/L	1	B8L1441	12/17/18 15:10	12/18/18 13:45	HACH 8131	
Total Organic Carbon	<1.00	1.00	mg/L	1	B8L1562	12/20/18 09:12	12/20/18 09:12	SM 5310 C	

Volatile Organic Compounds

1,1,1-Trichloroethane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,1,2-Trichloroethane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,1-Dichloroethene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,2,4-Trichlorobenzene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,2-Dichlorobenzene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,2-Dichloroethane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,2-Dichloropropane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
1,4-Dichlorobenzene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Benzene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Bromodichloromethane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Bromoform	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Carbon tetrachloride	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Chlorobenzene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Chloroform	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
cis-1,2-Dichloroethylene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Dibromochloromethane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Dichloromethane	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Ethylbenzene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
m,p-Xylene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
o-Xylene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Styrene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Tetrachloroethene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Toluene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Total THMs	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
trans-1,2-Dichloroethene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Trichloroethene	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Vinyl chloride	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Xylenes (total)	<0.0005	0.0005	mg/L	1	B8L1484	12/20/18 11:00	12/20/18 11:43	EPA 524.2	
Surrogate: 1,2-Dichlorobenzene-d4		104 %		70-130	B8L1484	12/20/18	12/20/18	EPA 524.2	
Surrogate: 1,2-Dichloroethane-d4		97 %		70-130	B8L1484	12/20/18	12/20/18	EPA 524.2	
Surrogate: 4-Bromofluorobenzene		95 %		70-130	B8L1484	12/20/18	12/20/18	EPA 524.2	
Surrogate: Pentafluorobenzene		109 %		70-130	B8L1484	12/20/18	12/20/18	EPA 524.2	

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Well Head (18L1641-01) Drinking Water (Grab) Sampled: 12/17/18 10:45 Received: 12/17/18 13:33

Analyte	Result	PQL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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Legend Technical Services of Arizona, Inc.

Semi-Volatile Organic Compounds

3-Hydroxycarbofuran	<0.0005	0.0005	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Aldicarb	<0.0005	0.0005	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Aldicarb sulfone	<0.0008	0.0008	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Aldicarb sulfoxide	<0.0005	0.0005	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Carbaryl	<0.0005	0.0005	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Carbofuran	<0.0009	0.0009	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Methomyl	<0.0005	0.0005	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Oxamyl	<0.0020	0.0020	mg/L	1	B8L1417	12/18/18 11:00	12/18/18 20:14	EPA 531.2	
Surrogate: 4-Bromo-3,5-dimethylphenyl-N-methylcarbamate	98 %			70-130	B8L1417	12/18/18	12/18/18	EPA 531.2	

Fiberquant Analytical Services #AZ0633

EPA 100.1

Asbestos	<0.2	0.2	MFL	1	N/A	12/18/18 14:00	12/20/18 10:00	EPA 100.1	
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DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Microbiology - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1485 - micro_prep

Blank (B8L1485-BLK1)

Prepared: 12/17/18 Analyzed: 12/18/18

E. coli	Absent		P/A							
Total Coliforms	Absent		P/A							

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Total Metals - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1451 - EPA 200.7

Blank (B8L1451-BLK1)

Prepared & Analyzed: 12/19/18

Aluminum	<0.20	0.20	mg/L							
Barium	<0.010	0.010	mg/L							
Beryllium	<0.0020	0.0020	mg/L							
Boron	<0.10	0.10	mg/L							
Calcium	<1.0	1.0	mg/L							
Chromium	<0.0050	0.0050	mg/L							
Copper	<0.010	0.010	mg/L							
Iron	<0.050	0.050	mg/L							
Magnesium	<1.0	1.0	mg/L							
Manganese	<0.020	0.020	mg/L							
Nickel	<0.020	0.020	mg/L							
Sodium	<1.0	1.0	mg/L							
Strontium	<0.020	0.020	mg/L							

LCS (B8L1451-BS1)

Prepared & Analyzed: 12/19/18

Aluminum	2.0	0.20	mg/L	2.00		102	85-115
Barium	0.93	0.010	mg/L	1.00		93	85-115
Beryllium	0.18	0.0020	mg/L	0.200		92	85-115
Boron	0.96	0.10	mg/L	1.00		96	85-115
Calcium	19	1.0	mg/L	20.0		95	85-115
Chromium	0.47	0.0050	mg/L	0.500		94	85-115
Copper	0.98	0.010	mg/L	1.00		98	85-115
Iron	0.92	0.050	mg/L	1.00		92	85-115
Magnesium	19	1.0	mg/L	20.0		95	85-115
Manganese	0.94	0.020	mg/L	1.00		94	85-115
Nickel	0.91	0.020	mg/L	1.00		91	85-115
Sodium	19	1.0	mg/L	20.0		97	85-115
Strontium	0.37	0.020	mg/L	0.400		93	85-115

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Total Metals - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1451 - EPA 200.7

LCS Dup (B8L1451-BSD1)

Prepared & Analyzed: 12/19/18

Aluminum	2.0	0.20	mg/L	2.00		102	85-115	0.2	20	
Barium	0.94	0.010	mg/L	1.00		94	85-115	0.9	20	
Beryllium	0.19	0.0020	mg/L	0.200		93	85-115	0.9	20	
Boron	0.97	0.10	mg/L	1.00		97	85-115	0.9	20	
Calcium	19	1.0	mg/L	20.0		96	85-115	1	20	
Chromium	0.47	0.0050	mg/L	0.500		94	85-115	1	20	
Copper	0.98	0.010	mg/L	1.00		98	85-115	0.6	20	
Iron	0.93	0.050	mg/L	1.00		93	85-115	1	20	
Magnesium	19	1.0	mg/L	20.0		96	85-115	0.9	20	
Manganese	0.95	0.020	mg/L	1.00		95	85-115	0.8	20	
Nickel	0.92	0.020	mg/L	1.00		92	85-115	1	20	
Sodium	20	1.0	mg/L	20.0		98	85-115	0.8	20	
Strontium	0.37	0.020	mg/L	0.400		93	85-115	0.8	20	

Matrix Spike (B8L1451-MS1)

Source: 18L1546-06

Prepared & Analyzed: 12/19/18

Aluminum	2.2	0.20	mg/L	2.00	0.0080	107	70-130			
Barium	0.99	0.010	mg/L	1.00	0.046	94	70-130			
Beryllium	0.19	0.0020	mg/L	0.200	<0.0020	97	70-130			
Boron	1.1	0.10	mg/L	1.00	0.12	101	70-130			
Calcium	46	1.0	mg/L	20.0	26	98	70-130			
Chromium	0.49	0.0050	mg/L	0.500	0.0087	96	70-130			
Copper	1.0	0.010	mg/L	1.00	0.0070	101	70-130			
Iron	0.99	0.050	mg/L	1.00	0.055	94	70-130			
Magnesium	33	1.0	mg/L	20.0	13	99	70-130			
Manganese	0.95	0.020	mg/L	1.00	<0.020	95	70-130			
Nickel	0.93	0.020	mg/L	1.00	<0.020	93	70-130			
Sodium	110	1.0	mg/L	20.0	91	104	70-130			
Strontium	0.88	0.020	mg/L	0.400	0.50	93	70-130			

DRAFT REPORT

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Total Metals - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1451 - EPA 200.7

Matrix Spike (B8L1451-MS2)	Source: 18L1819-05			Prepared & Analyzed: 12/19/18						
Aluminum	2.1	0.20	mg/L	2.00	0.0087	106	70-130			
Barium	1.0	0.010	mg/L	1.00	0.10	92	70-130			
Beryllium	0.19	0.0020	mg/L	0.200	0.0001	94	70-130			
Boron	1.2	0.10	mg/L	1.00	0.24	99	70-130			
Calcium	67	1.0	mg/L	20.0	50	85	70-130			
Chromium	0.46	0.0050	mg/L	0.500	<0.0050	92	70-130			
Copper	1.0	0.010	mg/L	1.00	0.0030	99	70-130			
Iron	0.91	0.050	mg/L	1.00	0.0040	90	70-130			
Magnesium	56	1.0	mg/L	20.0	38	90	70-130			
Manganese	0.92	0.020	mg/L	1.00	<0.020	92	70-130			
Nickel	0.89	0.020	mg/L	1.00	<0.020	89	70-130			
Sodium	140	1.0	mg/L	20.0	130	75	70-130			
Strontium	1.8	0.020	mg/L	0.400	1.5	75	70-130			

Matrix Spike Dup (B8L1451-MSD1)	Source: 18L1546-06			Prepared & Analyzed: 12/19/18						
Aluminum	2.2	0.20	mg/L	2.00	0.0080	107	70-130	0.09	20	
Barium	0.99	0.010	mg/L	1.00	0.046	94	70-130	0.2	20	
Beryllium	0.19	0.0020	mg/L	0.200	<0.0020	96	70-130	0.5	20	
Boron	1.1	0.10	mg/L	1.00	0.12	101	70-130	0.3	20	
Calcium	46	1.0	mg/L	20.0	26	97	70-130	0.6	20	
Chromium	0.48	0.0050	mg/L	0.500	0.0087	95	70-130	0.5	20	
Copper	1.0	0.010	mg/L	1.00	0.0070	100	70-130	0.5	20	
Iron	0.99	0.050	mg/L	1.00	0.055	94	70-130	0.08	20	
Magnesium	33	1.0	mg/L	20.0	13	99	70-130	0.4	20	
Manganese	0.94	0.020	mg/L	1.00	<0.020	94	70-130	0.9	20	
Nickel	0.92	0.020	mg/L	1.00	<0.020	92	70-130	0.6	20	
Sodium	110	1.0	mg/L	20.0	91	101	70-130	0.4	20	
Strontium	0.87	0.020	mg/L	0.400	0.50	92	70-130	0.5	20	

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Total Metals - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1451 - EPA 200.7

Matrix Spike Dup (B8L1451-MSD2)	Source: 18L1819-05			<i>Prepared & Analyzed: 12/19/18</i>						
Aluminum	2.2	0.20	mg/L	2.00	0.0087	108	70-130	2	20	
Barium	1.1	0.010	mg/L	1.00	0.10	96	70-130	3	20	
Beryllium	0.19	0.0020	mg/L	0.200	0.0001	97	70-130	3	20	
Boron	1.3	0.10	mg/L	1.00	0.24	104	70-130	4	20	
Calcium	69	1.0	mg/L	20.0	50	96	70-130	3	20	
Chromium	0.48	0.0050	mg/L	0.500	<0.0050	95	70-130	3	20	
Copper	1.0	0.010	mg/L	1.00	0.0030	102	70-130	3	20	
Iron	0.94	0.050	mg/L	1.00	0.0040	94	70-130	4	20	
Magnesium	58	1.0	mg/L	20.0	38	100	70-130	3	20	
Manganese	0.94	0.020	mg/L	1.00	<0.020	94	70-130	3	20	
Nickel	0.92	0.020	mg/L	1.00	<0.020	92	70-130	3	20	
Sodium	140	1.0	mg/L	20.0	130	99	70-130	3	20	
Strontium	1.8	0.020	mg/L	0.400	1.5	89	70-130	3	20	

Batch B8L1480 - EPA 245.1/245.2 Prep

Blank (B8L1480-BLK1)	<i>Prepared & Analyzed: 12/19/18</i>									
Mercury	<0.0002	0.0002	mg/L							
LCS (B8L1480-BS1)	<i>Prepared & Analyzed: 12/19/18</i>									
Mercury	0.0009	0.0002	mg/L	0.00100		94	85-115			
LCS Dup (B8L1480-BSD1)	<i>Prepared & Analyzed: 12/19/18</i>									
Mercury	0.0009	0.0002	mg/L	0.00100		94	85-115	0	20	
Matrix Spike (B8L1480-MS1)	Source: 18L1485-01			<i>Prepared & Analyzed: 12/19/18</i>						
Mercury	0.0009	0.0002	mg/L	0.00100	<0.0002	93	70-130			

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Total Metals - Quality Control

Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1480 - EPA 245.1/245.2 Prep

Matrix Spike Dup (B8L1480-MSD1)

Source: 18L1485-01

Prepared & Analyzed: 12/19/18

Mercury	0.0009	0.0002	mg/L	0.00100	<0.0002	93	70-130	0	20	
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DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Dissolved Metals - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1453 - EPA 200.7										
Blank (B8L1453-BLK1)				<i>Prepared & Analyzed: 12/19/18</i>						
Iron	<0.050	0.050	mg/L							
Manganese	<0.020	0.020	mg/L							
Silicon	<0.10	0.10	mg/L							
LCS (B8L1453-BS1)				<i>Prepared & Analyzed: 12/19/18</i>						
Iron	0.93	0.050	mg/L	1.00		93	85-115			
Manganese	0.94	0.020	mg/L	1.00		94	85-115			
Silicon	3.7	0.10	mg/L	4.00		93	85-115			
LCS Dup (B8L1453-BSD1)				<i>Prepared & Analyzed: 12/19/18</i>						
Iron	0.94	0.050	mg/L	1.00		94	85-115	0.7	20	
Manganese	0.95	0.020	mg/L	1.00		95	85-115	1	20	
Silicon	3.8	0.10	mg/L	4.00		94	85-115	0.6	20	
Matrix Spike (B8L1453-MS1)				Source: 18L1641-01		<i>Prepared & Analyzed: 12/19/18</i>				
Iron	1.0	0.050	mg/L	1.00	0.091	93	70-130			
Manganese	0.94	0.020	mg/L	1.00	0.0061	94	70-130			
Silicon	13	0.10	mg/L	4.00	9.1	97	70-130			
Matrix Spike Dup (B8L1453-MSD1)				Source: 18L1641-01		<i>Prepared & Analyzed: 12/19/18</i>				
Iron	1.0	0.050	mg/L	1.00	0.091	93	70-130	0.3	20	
Manganese	0.95	0.020	mg/L	1.00	0.0061	94	70-130	0.6	20	
Silicon	13	0.10	mg/L	4.00	9.1	99	70-130	0.6	20	

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Inorganic Chemistry - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1368 - NO PREP										
Duplicate (B8L1368-DUP1)		Source: 18L1486-02		<i>Prepared & Analyzed: 12/17/18</i>						
pH	8.3		pH Units	8.2				0.6	10	H5
Batch B8L1441 - NO PREP										
Blank (B8L1441-BLK1)				<i>Prepared & Analyzed: 12/18/18</i>						
Sulfide, Dissolved	<0.0400	0.0400	mg/L							
LCS (B8L1441-BS1)				<i>Prepared & Analyzed: 12/18/18</i>						
Sulfide, Dissolved	0.112	0.0400	mg/L	0.120		93	80-120			
LCS Dup (B8L1441-BSD1)				<i>Prepared & Analyzed: 12/18/18</i>						
Sulfide, Dissolved	0.114	0.0400	mg/L	0.120		95	80-120	2	20	
Matrix Spike (B8L1441-MS1)		Source: 18L1419-01		<i>Prepared & Analyzed: 12/18/18</i>						
Sulfide, Dissolved	0.114	0.0400	mg/L	0.120	<0.0400	95	80-120			
Matrix Spike Dup (B8L1441-MSD1)		Source: 18L1419-01		<i>Prepared & Analyzed: 12/18/18</i>						
Sulfide, Dissolved	0.109	0.0400	mg/L	0.120	<0.0400	91	80-120	4	20	
Batch B8L1447 - NO PREP										
Blank (B8L1447-BLK1)				<i>Prepared & Analyzed: 12/19/18</i>						
Cyanide, Total	<0.010	0.010	mg/L							
LCS (B8L1447-BS1)				<i>Prepared & Analyzed: 12/19/18</i>						
Cyanide, Total	0.056	0.010	mg/L	0.0500		112	80-120			

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Inorganic Chemistry - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1447 - NO PREP

LCS Dup (B8L1447-BSD1)				<i>Prepared & Analyzed: 12/19/18</i>						
Cyanide, Total	0.057	0.010	mg/L	0.0500		114	80-120	2	20	
Matrix Spike (B8L1447-MS1)				Source: 18L1527-02		<i>Prepared & Analyzed: 12/19/18</i>				
Cyanide, Total	0.055	0.010	mg/L	0.0500	<0.010	110	80-120			
Matrix Spike Dup (B8L1447-MSD1)				Source: 18L1527-02		<i>Prepared & Analyzed: 12/19/18</i>				
Cyanide, Total	0.055	0.010	mg/L	0.0500	<0.010	110	80-120	0	20	

Batch B8L1460 - NO PREP

Blank (B8L1460-BLK1)				<i>Prepared: 12/19/18 Analyzed: 12/20/18</i>						
Total Phosphorous	<0.05	0.05	mg/L							
LCS (B8L1460-BS1)				<i>Prepared: 12/19/18 Analyzed: 12/20/18</i>						
Total Phosphorous	0.10	0.05	mg/L	0.100		98	90-110			
LCS Dup (B8L1460-BSD1)				<i>Prepared: 12/19/18 Analyzed: 12/20/18</i>						
Total Phosphorous	0.10	0.05	mg/L	0.100		100	90-110	2	20	
Matrix Spike (B8L1460-MS1)				Source: 18L1819-01		<i>Prepared: 12/19/18 Analyzed: 12/20/18</i>				
Total Phosphorous	0.11	0.05	mg/L	0.100	<0.05	109	90-110			
Matrix Spike Dup (B8L1460-MSD1)				Source: 18L1819-01		<i>Prepared: 12/19/18 Analyzed: 12/20/18</i>				
Total Phosphorous	0.10	0.05	mg/L	0.100	<0.05	97	90-110	11	20	

Batch B8L1466 - NO PREP

Blank (B8L1466-BLK1)				<i>Prepared & Analyzed: 12/18/18</i>						
Fluoride	<0.10	0.10	mg/L							
Nitrate as N	<0.10	0.10	mg/L							
Nitrite as N	<0.10	0.10	mg/L							

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Inorganic Chemistry - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1466 - NO PREP										
Blank (B8L1466-BLK2)				<i>Prepared & Analyzed: 12/18/18</i>						
Fluoride	<0.10	0.10	mg/L							
Nitrate as N	<0.10	0.10	mg/L							
Nitrite as N	<0.10	0.10	mg/L							
Blank (B8L1466-BLK3)				<i>Prepared: 12/18/18 Analyzed: 12/19/18</i>						
Fluoride	<0.10	0.10	mg/L							
Nitrate as N	<0.10	0.10	mg/L							
Nitrite as N	<0.10	0.10	mg/L							
Blank (B8L1466-BLK4)				<i>Prepared: 12/18/18 Analyzed: 12/19/18</i>						
Fluoride	<0.10	0.10	mg/L							
Nitrate as N	<0.10	0.10	mg/L							
Nitrite as N	<0.10	0.10	mg/L							
LCS (B8L1466-BS1)				<i>Prepared & Analyzed: 12/18/18</i>						
Fluoride	10.5	0.10	mg/L	10.0		105	90-110			
Nitrate as N	5.25	0.10	mg/L	5.00		105	90-110			
Nitrite as N	10.5	0.10	mg/L	10.0		105	90-110			
LCS (B8L1466-BS2)				<i>Prepared: 12/18/18 Analyzed: 12/19/18</i>						
Fluoride	10.6	0.10	mg/L	10.0		106	90-110			
Nitrate as N	5.26	0.10	mg/L	5.00		105	90-110			
Nitrite as N	10.5	0.10	mg/L	10.0		105	90-110			
LCS (B8L1466-BS3)				<i>Prepared: 12/18/18 Analyzed: 12/20/18</i>						
Fluoride	10.6	0.10	mg/L	10.0		106	90-110			
Nitrate as N	5.27	0.10	mg/L	5.00		105	90-110			
Nitrite as N	10.5	0.10	mg/L	10.0		105	90-110			

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Inorganic Chemistry - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1466 - NO PREP										
LCS Dup (B8L1466-BSD1)				<i>Prepared & Analyzed: 12/18/18</i>						
Fluoride	10.5	0.10	mg/L	10.0		105	90-110	0.1	20	
Nitrate as N	5.22	0.10	mg/L	5.00		104	90-110	0.7	20	
Nitrite as N	10.4	0.10	mg/L	10.0		104	90-110	0.5	20	
LCS Dup (B8L1466-BSD2)				<i>Prepared: 12/18/18 Analyzed: 12/19/18</i>						
Fluoride	10.6	0.10	mg/L	10.0		106	90-110	0.1	20	
Nitrate as N	5.27	0.10	mg/L	5.00		105	90-110	0.2	20	
Nitrite as N	10.5	0.10	mg/L	10.0		105	90-110	0.3	20	
LCS Dup (B8L1466-BSD3)				<i>Prepared: 12/18/18 Analyzed: 12/20/18</i>						
Fluoride	10.6	0.10	mg/L	10.0		106	90-110	0.008	20	
Nitrate as N	5.26	0.10	mg/L	5.00		105	90-110	0.1	20	
Nitrite as N	10.5	0.10	mg/L	10.0		105	90-110	0.004	20	
Matrix Spike (B8L1466-MS1)				Source: 18L1680-01		<i>Prepared & Analyzed: 12/18/18</i>				
Fluoride	10.3	0.10	mg/L	10.0	0.09	102	90-110			
Nitrate as N	5.06	0.10	mg/L	5.00	<0.10	101	90-110			
Nitrite as N	10.1	0.10	mg/L	10.0	0.03	101	90-110			
Matrix Spike (B8L1466-MS2)				Source: 18L1680-03		<i>Prepared & Analyzed: 12/18/18</i>				
Fluoride	10.4	0.10	mg/L	10.0	0.09	103	90-110			
Nitrate as N	5.10	0.10	mg/L	5.00	<0.10	102	90-110			
Nitrite as N	10.2	0.10	mg/L	10.0	0.03	102	90-110			
Matrix Spike (B8L1466-MS3)				Source: 18L1819-01		<i>Prepared: 12/18/18 Analyzed: 12/19/18</i>				
Fluoride	10.5	0.10	mg/L	10.0	0.31	102	90-110			
Nitrate as N	5.48	0.10	mg/L	5.00	0.30	103	90-110			
Nitrite as N	9.81	0.10	mg/L	10.0	<0.10	98	90-110			

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Inorganic Chemistry - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1466 - NO PREP									
Matrix Spike (B8L1466-MS4)		Source: 18L1968-03		Prepared: 12/18/18 Analyzed: 12/20/18					
Fluoride	10.4	0.10	mg/L	10.0	0.19	102	90-110		M2
Nitrate as N	19.4	0.10	mg/L	5.00	15.6	77	90-110		
Nitrite as N	10.6	0.10	mg/L	10.0	<0.10	106	90-110		
Matrix Spike Dup (B8L1466-MSD1)		Source: 18L1680-01		Prepared & Analyzed: 12/18/18					
Fluoride	10.4	0.10	mg/L	10.0	0.09	103	90-110	0.6	20
Nitrate as N	5.09	0.10	mg/L	5.00	<0.10	102	90-110	0.6	20
Nitrite as N	10.2	0.10	mg/L	10.0	0.03	101	90-110	0.6	20
Matrix Spike Dup (B8L1466-MSD2)		Source: 18L1680-03		Prepared & Analyzed: 12/18/18					
Fluoride	10.4	0.10	mg/L	10.0	0.09	103	90-110	0.02	20
Nitrate as N	5.14	0.10	mg/L	5.00	<0.10	103	90-110	0.8	20
Nitrite as N	10.2	0.10	mg/L	10.0	0.03	101	90-110	0.3	20
Matrix Spike Dup (B8L1466-MSD3)		Source: 18L1819-01		Prepared: 12/18/18 Analyzed: 12/19/18					
Fluoride	10.5	0.10	mg/L	10.0	0.31	102	90-110	0.02	20
Nitrate as N	5.49	0.10	mg/L	5.00	0.30	104	90-110	0.2	20
Nitrite as N	9.80	0.10	mg/L	10.0	<0.10	98	90-110	0.1	20
Matrix Spike Dup (B8L1466-MSD4)		Source: 18L1968-03		Prepared: 12/18/18 Analyzed: 12/20/18					
Fluoride	10.5	0.10	mg/L	10.0	0.19	103	90-110	0.7	20
Nitrate as N	19.6	0.10	mg/L	5.00	15.6	80	90-110	0.8	20
Nitrite as N	10.7	0.10	mg/L	10.0	<0.10	107	90-110	0.7	20
Batch B8L1562 - NO PREP									
Blank (B8L1562-BLK1)		Prepared & Analyzed: 12/20/18							
Total Organic Carbon	<1.00	1.00	mg/L						

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Inorganic Chemistry - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1562 - NO PREP										
Blank (B8L1562-BLK2)				<i>Prepared & Analyzed: 12/20/18</i>						
Total Organic Carbon	<1.00	1.00	mg/L							
LCS (B8L1562-BS1)				<i>Prepared & Analyzed: 12/20/18</i>						
Total Organic Carbon	9.74	1.00	mg/L	10.0		97	80-120			
LCS Dup (B8L1562-BSD1)				<i>Prepared & Analyzed: 12/20/18</i>						
Total Organic Carbon	9.73	1.00	mg/L	10.0		97	80-120	0.1	20	
Matrix Spike (B8L1562-MS1)				Source: 18L1641-01		<i>Prepared & Analyzed: 12/20/18</i>				
Total Organic Carbon	8.41	1.00	mg/L	10.0	0.231	82	80-120			
Matrix Spike (B8L1562-MS2)				Source: 18L1819-05		<i>Prepared & Analyzed: 12/20/18</i>				
Total Organic Carbon	9.22	1.00	mg/L	10.0	<1.00	92	80-120			
Matrix Spike Dup (B8L1562-MSD1)				Source: 18L1641-01		<i>Prepared & Analyzed: 12/20/18</i>				
Total Organic Carbon	8.41	1.00	mg/L	10.0	0.231	82	80-120	0	20	
Matrix Spike Dup (B8L1562-MSD2)				Source: 18L1819-05		<i>Prepared & Analyzed: 12/20/18</i>				
Total Organic Carbon	9.24	1.00	mg/L	10.0	<1.00	92	80-120	0.2	20	

DRAFT REPORT

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Volatile Organic Compounds - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1484 - Default Prep VOC

Blank (B8L1484-BLK1)

Prepared & Analyzed: 12/20/18

1,1,1-Trichloroethane	<0.0005	0.0005	mg/L							
1,1,2-Trichloroethane	<0.0005	0.0005	mg/L							
1,1-Dichloroethene	<0.0005	0.0005	mg/L							
1,2,4-Trichlorobenzene	<0.0005	0.0005	mg/L							
1,2-Dichlorobenzene	<0.0005	0.0005	mg/L							
1,2-Dichloroethane	<0.0005	0.0005	mg/L							
1,2-Dichloropropane	<0.0005	0.0005	mg/L							
1,4-Dichlorobenzene	<0.0005	0.0005	mg/L							
Benzene	<0.0005	0.0005	mg/L							
Bromodichloromethane	<0.0005	0.0005	mg/L							
Bromoform	<0.0005	0.0005	mg/L							
Carbon tetrachloride	<0.0005	0.0005	mg/L							
Chlorobenzene	<0.0005	0.0005	mg/L							
Chloroform	<0.0005	0.0005	mg/L							
cis-1,2-Dichloroethylene	<0.0005	0.0005	mg/L							
Dibromochloromethane	<0.0005	0.0005	mg/L							
Dichloromethane	<0.0005	0.0005	mg/L							
Ethylbenzene	<0.0005	0.0005	mg/L							
m,p-Xylene	<0.0005	0.0005	mg/L							
o-Xylene	<0.0005	0.0005	mg/L							
Styrene	<0.0005	0.0005	mg/L							
Tetrachloroethene	<0.0005	0.0005	mg/L							
Toluene	<0.0005	0.0005	mg/L							
Total THMs	<0.0005	0.0005	mg/L							
trans-1,2-Dichloroethene	<0.0005	0.0005	mg/L							
Trichloroethene	<0.0005	0.0005	mg/L							
Vinyl chloride	<0.0005	0.0005	mg/L							
Xylenes (total)	<0.0005	0.0005	mg/L							

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Volatile Organic Compounds - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1484 - Default Prep VOC

LCS (B8L1484-BS1)

Prepared & Analyzed: 12/20/18

1,1,1-Trichloroethane	0.0023	0.0005	mg/L	0.00200		113	70-130			
1,1,2-Trichloroethane	0.0021	0.0005	mg/L	0.00200		104	70-130			
1,1-Dichloroethene	0.0022	0.0005	mg/L	0.00200		108	70-130			
1,2,4-Trichlorobenzene	0.0021	0.0005	mg/L	0.00200		104	70-130			
1,2-Dichlorobenzene	0.0022	0.0005	mg/L	0.00200		108	70-130			
1,2-Dichloroethane	0.0021	0.0005	mg/L	0.00200		106	70-130			
1,2-Dichloropropane	0.0021	0.0005	mg/L	0.00200		104	70-130			
1,4-Dichlorobenzene	0.0022	0.0005	mg/L	0.00200		108	70-130			
Benzene	0.0021	0.0005	mg/L	0.00200		106	70-130			
Bromodichloromethane	0.0022	0.0005	mg/L	0.00200		110	70-130			
Bromoform	0.0022	0.0005	mg/L	0.00200		110	70-130			
Carbon tetrachloride	0.0021	0.0005	mg/L	0.00200		106	70-130			
Chlorobenzene	0.0022	0.0005	mg/L	0.00200		108	70-130			
Chloroform	0.0022	0.0005	mg/L	0.00200		112	70-130			
cis-1,2-Dichloroethylene	0.0022	0.0005	mg/L	0.00200		108	70-130			
Dibromochloromethane	0.0022	0.0005	mg/L	0.00200		110	70-130			
Dichloromethane	0.0023	0.0005	mg/L	0.00200		114	70-130			
Ethylbenzene	0.0021	0.0005	mg/L	0.00200		105	70-130			
m,p-Xylene	0.0021	0.0005	mg/L	0.00200		105	70-130			
o-Xylene	0.0021	0.0005	mg/L	0.00200		105	70-130			
Styrene	0.0021	0.0005	mg/L	0.00200		104	70-130			
Tetrachloroethene	0.0022	0.0005	mg/L	0.00200		109	70-130			
Toluene	0.0020	0.0005	mg/L	0.00200		102	70-130			
Total THMs	0.0089	0.0005	mg/L	0.00800		111	0-200			
trans-1,2-Dichloroethene	0.0022	0.0005	mg/L	0.00200		110	70-130			
Trichloroethene	0.0022	0.0005	mg/L	0.00200		108	70-130			
Vinyl chloride	0.0020	0.0005	mg/L	0.00200		99	70-130			
Xylenes (total)	0.0042	0.0005	mg/L	0.00400		105	0-200			

DRAFT REPORT

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Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Volatile Organic Compounds - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1484 - Default Prep VOC

LCS Dup (B8L1484-BSD1)

Prepared & Analyzed: 12/20/18

1,1,1-Trichloroethane	0.0022	0.0005	mg/L	0.00200		108	70-130	4	20	
1,1,2-Trichloroethane	0.0022	0.0005	mg/L	0.00200		109	70-130	5	20	
1,1-Dichloroethene	0.0022	0.0005	mg/L	0.00200		112	70-130	3	20	
1,2,4-Trichlorobenzene	0.0023	0.0005	mg/L	0.00200		113	70-130	9	20	
1,2-Dichlorobenzene	0.0022	0.0005	mg/L	0.00200		110	70-130	2	20	
1,2-Dichloroethane	0.0022	0.0005	mg/L	0.00200		112	70-130	6	20	
1,2-Dichloropropane	0.0020	0.0005	mg/L	0.00200		102	70-130	1	20	
1,4-Dichlorobenzene	0.0022	0.0005	mg/L	0.00200		110	70-130	0.9	20	
Benzene	0.0021	0.0005	mg/L	0.00200		106	70-130	0.5	20	
Bromodichloromethane	0.0022	0.0005	mg/L	0.00200		108	70-130	2	20	
Bromoform	0.0021	0.0005	mg/L	0.00200		104	70-130	6	20	
Carbon tetrachloride	0.0023	0.0005	mg/L	0.00200		114	70-130	7	20	
Chlorobenzene	0.0022	0.0005	mg/L	0.00200		108	70-130	0	20	
Chloroform	0.0022	0.0005	mg/L	0.00200		112	70-130	0.4	20	
cis-1,2-Dichloroethylene	0.0022	0.0005	mg/L	0.00200		108	70-130	0	20	
Dibromochloromethane	0.0022	0.0005	mg/L	0.00200		109	70-130	1	20	
Dichloromethane	0.0023	0.0005	mg/L	0.00200		113	70-130	0.4	20	
Ethylbenzene	0.0021	0.0005	mg/L	0.00200		103	70-130	2	20	
m,p-Xylene	0.0020	0.0005	mg/L	0.00200		102	70-130	3	20	
o-Xylene	0.0021	0.0005	mg/L	0.00200		104	70-130	0.5	20	
Styrene	0.0021	0.0005	mg/L	0.00200		103	70-130	1	20	
Tetrachloroethene	0.0022	0.0005	mg/L	0.00200		109	70-130	0	20	
Toluene	0.0020	0.0005	mg/L	0.00200		101	70-130	0.5	20	
Total THMs	0.0087	0.0005	mg/L	0.00800		108	0-200	2	200	
trans-1,2-Dichloroethene	0.0022	0.0005	mg/L	0.00200		112	70-130	2	20	
Trichloroethene	0.0022	0.0005	mg/L	0.00200		110	70-130	2	20	
Vinyl chloride	0.0021	0.0005	mg/L	0.00200		106	70-130	7	20	
Xylenes (total)	0.0041	0.0005	mg/L	0.00400		103	0-200	2	200	

DRAFT REPORT

Laboratory Work Order No.: 18L1641

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Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Semi-Volatile Organic Compounds - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B8L1417 - Default Prep GC-Semi

Blank (B8L1417-BLK1)

Prepared & Analyzed: 12/18/18

3-Hydroxycarbofuran	<0.0005	0.0005	mg/L
Aldicarb	<0.0005	0.0005	mg/L
Aldicarb sulfone	<0.0008	0.0008	mg/L
Aldicarb sulfoxide	<0.0005	0.0005	mg/L
Carbaryl	<0.0005	0.0005	mg/L
Carbofuran	<0.0009	0.0009	mg/L
Methomyl	<0.0005	0.0005	mg/L
Oxamyl	<0.0020	0.0020	mg/L

LCS (B8L1417-BS1)

Prepared & Analyzed: 12/18/18

3-Hydroxycarbofuran	0.0020	0.0005	mg/L	0.00200	99	70-130
Aldicarb	0.0019	0.0005	mg/L	0.00200	95	70-130
Aldicarb sulfone	0.0019	0.0008	mg/L	0.00200	95	70-130
Aldicarb sulfoxide	0.0019	0.0005	mg/L	0.00200	93	70-130
Carbaryl	0.0019	0.0005	mg/L	0.00200	96	70-130
Carbofuran	0.0020	0.0009	mg/L	0.00200	100	70-130
Methomyl	0.0019	0.0005	mg/L	0.00200	96	70-130
Oxamyl	0.0019	0.0020	mg/L	0.00200	96	70-130

LCS Dup (B8L1417-BSD1)

Prepared & Analyzed: 12/18/18

3-Hydroxycarbofuran	0.0020	0.0005	mg/L	0.00200	100	70-130	0.9	20
Aldicarb	0.0019	0.0005	mg/L	0.00200	93	70-130	2	20
Aldicarb sulfone	0.0019	0.0008	mg/L	0.00200	94	70-130	0.2	20
Aldicarb sulfoxide	0.0018	0.0005	mg/L	0.00200	92	70-130	0.7	20
Carbaryl	0.0019	0.0005	mg/L	0.00200	94	70-130	2	20
Carbofuran	0.0020	0.0009	mg/L	0.00200	100	70-130	0.05	20
Methomyl	0.0019	0.0005	mg/L	0.00200	95	70-130	1	20
Oxamyl	0.0019	0.0020	mg/L	0.00200	95	70-130	1	20

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Semi-Volatile Organic Compounds - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Batch B8L1417 - Default Prep GC-Semi

Matrix Spike (B8L1417-MS1)	Source: 18L0549-01			Prepared & Analyzed: 12/18/18						
3-Hydroxycarbofuran	0.0021	0.0005	mg/L	0.00200	<0.0005	103	70-130			
Aldicarb	0.0020	0.0005	mg/L	0.00200	<0.0005	101	70-130			
Aldicarb sulfone	0.0020	0.0008	mg/L	0.00200	<0.0008	99	70-130			
Aldicarb sulfoxide	0.0019	0.0005	mg/L	0.00200	<0.0005	97	70-130			
Carbaryl	0.0020	0.0005	mg/L	0.00200	<0.0005	99	70-130			
Carbofuran	0.0021	0.0009	mg/L	0.00200	<0.0009	103	70-130			
Methomyl	0.0020	0.0005	mg/L	0.00200	<0.0005	99	70-130			
Oxamyl	0.0020	0.0020	mg/L	0.00200	<0.0020	99	70-130			

Matrix Spike Dup (B8L1417-MSD1)	Source: 18L0549-01			Prepared & Analyzed: 12/18/18						
3-Hydroxycarbofuran	0.0020	0.0005	mg/L	0.00200	<0.0005	101	70-130	2	30	
Aldicarb	0.0020	0.0005	mg/L	0.00200	<0.0005	101	70-130	0.4	30	
Aldicarb sulfone	0.0020	0.0008	mg/L	0.00200	<0.0008	98	70-130	1	30	
Aldicarb sulfoxide	0.0020	0.0005	mg/L	0.00200	<0.0005	98	70-130	0.3	30	
Carbaryl	0.0019	0.0005	mg/L	0.00200	<0.0005	97	70-130	2	30	
Carbofuran	0.0021	0.0009	mg/L	0.00200	<0.0009	103	70-130	0.4	30	
Methomyl	0.0020	0.0005	mg/L	0.00200	<0.0005	99	70-130	0	30	
Oxamyl	0.0020	0.0020	mg/L	0.00200	<0.0020	98	70-130	1	30	

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Notes and Definitions

M2	Matrix spike recovery was low; the associated blank spike recovery was acceptable.
H6	The filtration was not done within the required 15 minutes of sampling, the sample was filtered in the laboratory.
H5	This test is specified to be performed in the field within 15 minutes of sampling; sample was received and analyzed past the regulatory holding time.
D2	Sample required dilution due to high concentration of target analyte.
BLK	Method Blank
LCS/Dup	Laboratory Control Sample/Laboratory Fortified Blank/Duplicate
MS/Dup	Matrix Spike/Duplicate
Dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Legend Technical Services of Arizona, Inc.
LEGEND
Technical Services, Inc.

SUBCONTRACT ORDER
18L1641

PO Number: 18L1641
Sampled By:
Compliance?: Yes No

SENDING LABORATORY:

Legend Technical Services of Arizona, Inc.
17631 North 25th Avenue
Phoenix, AZ 85023
Phone: 602-324-6100
Fax: 602-324-6101
Project Manager: Barbara Frank

RECEIVING LABORATORY:

Radiation Safety Engineering
3245 N. Washington
Chandler, AZ 85225
Phone: (480) 897-9459
Fax: (480) 892-5446

Analysis	Due	Expires	Sample Type circle one	Sample Comments
Sample ID: 18L1641-01	Drinking W.	Sampled: 12/17/18 10:45	Grab Composite N/A	
Radium 228	12/28/18 15:00	06/15/19 10:45		
Radium 226	12/28/18 15:00	06/15/19 10:45		
Gross Alpha, Measured	12/28/18 15:00	06/15/19 10:45		
Gross Alpha, Deviation	12/28/18 15:00	06/15/19 10:45		
Containers Supplied:				
06_1000mL Plastic pH <2 w/ HNO3 (A)				
06_1000mL Plastic pH <2 w/ HNO3 (B)				
06_1000mL Plastic pH <2 w/ HNO3 (C)				
06_1000mL Plastic pH <2 w/ HNO3 (D)				

Released By (Print & Sign) C. Crawford Date 12/18/18 Time 11:49
Received By (Print & Sign) C. Crawford Date 12/18/18 Time 11:49
Released By (Print & Sign) C. Crawford Date 12/18/18 Time 13:31
Received By (Print & Sign) C. Crawford Date 12/18/18 Time 13:31

Page 1 of 1

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Legend Technical Services of Arizona, Inc.

LEGEND
Technical Services, Inc.

SUBCONTRACT ORDER
18L1641

PO Number: 18L1641
Sampled By: Srikanth Grandhi
Compliance?: Yes No

SENDING LABORATORY:

Legend Technical Services of Arizona, Inc.
17631 North 25th Avenue
Phoenix, AZ 85023
Phone: 602-324-6100
Fax: 602-324-6101
Project Manager: Barbara Frank

RECEIVING LABORATORY:

Fiberquant Analytical Services
5025 S. 33rd Street
Phoenix, AZ 85040
Phone : (602) 276-6139
Fax: (602) 276-4558

Analysis	Due	Expires	Sample Type circle one	Sample Comments
Sample ID: 18L1641-01	Drinking W.	Sampled: 12/17/18 10:45	Grab Composite N/A	
Asbestos	12/28/18 15:00	12/19/18 10:45		
Containers Supplied: 03_1000mL Plastic Cool to 4° C (E)				

Review of Analysis Request (Initials) KLK

	<u>12.18.18</u>	<u>1149</u>	<u>C. Crawford</u>	<u>X C. Crawford</u>	<u>12.18.18</u>	<u>1149</u>
Released By (Print & Sign)	Date	Time	Received By (Print & Sign)		Date	Time
<u>C. Crawford</u>	<u>12.18.18</u>	<u>1302</u>	<u>K. Knowles</u>	<u>Matty Knowles</u>	<u>12.18.18</u>	<u>13:02</u>
Released By (Print & Sign)	Date	Time	Received By (Print & Sign)		Date	Time

Page 1 of 1

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Legend Technical Services of Arizona, Inc.
LEGEND
Technical Services, Inc.

SUBCONTRACT ORDER
18L1641

PO Number: 18L1641

SENDING LABORATORY:

Legend Technical Services of Arizona, Inc.
17631 North 25th Avenue
Phoenix, AZ 85023
Phone: 602-324-6100
Fax: 602-324-6101
Project Manager: Barbara Frank

RECEIVING LABORATORY:

Pace Analytical Services, Inc.
1700 Elm Street, Suite 200
Minneapolis, MN 55414
Phone: (612) 607-1700
Fax: (612) 607-6444

Analysis	Due	Expires	Sample Type circle one	Sample Comments
Sample ID: 18L1641-01 Drinking W.		Sampled: 12/17/18 10:45	Grab Composite	N/A
1613-Subcontract	12/28/18 15:00	03/17/19 10:45		
Containers Supplied:				
02_1000mL Amber Glass Cool to 4° C (Q)				
02_1000mL Amber Glass Cool to 4° C (R)				

Released By (Print & Sign)  12/17/18 1630 x UPS 12/17/18 1630
Date Time Received By (Print & Sign) Date Time

Released By (Print & Sign)  Date Time Received By (Print & Sign) Date Time

Page 1 of 1

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Page 27 of 29

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Legend Technical Services of Arizona, Inc.

LEGEND
Technical Services, Inc.

SUBCONTRACT ORDER
18L1641

PO Number: 18L1641

SENDING LABORATORY:

Legend Technical Services of Arizona, Inc.
17631 North 25th Avenue
Phoenix, AZ 85023
Phone: 602-324-6100
Fax: 602-324-6101
Project Manager: Barbara Frank

RECEIVING LABORATORY:

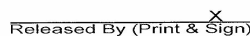
Eurofins Eaton Analytical, Inc.
110 S. Hill Street
South Bend, IN 46617
Phone : (800) 332-4345
Fax: (574) 233-8207

Analysis	Due	Expires	Sample Type circle one	Sample Comments
Sample ID: 18L1641-01	Drinking W.	Sampled: 12/17/18 10:45	Grab Composite N/A	
549-Subcontract	12/28/18 15:00	12/24/18 10:45		
548-Subcontract	12/28/18 15:00	12/24/18 10:45		
525-Subcontract	12/28/18 15:00	12/31/18 10:45		
515-Subcontract	12/28/18 15:00	12/31/18 10:45		
505-Subcontract	12/28/18 15:00	12/31/18 10:45		
504-Subcontract	12/28/18 15:00	12/31/18 10:45		

Containers Supplied:

10_40mL Sodium Thiosulfate Clear Vial Cool to 4° C (AI)
10_40mL Sodium Thiosulfate Clear Vial Cool to 4° C (AJ)
10_40mL Sodium Thiosulfate Clear Vial Cool to 4° C (AK)
10_40mL Sodium Thiosulfate Clear Vial Cool to 4° C (AL)
10_40mL Sodium Thiosulfate Clear Vial Cool to 4° C (AM)
40_40mL Amber Glass Vial; Sodium Thio;Cool to 4° C (AN)
40_40mL Amber Glass Vial; Sodium Thio;Cool to 4° C (AO)
07_1000mL Amber Glass pH <2 w/ SS & HCl (S)
07_1000mL Amber Glass pH <2 w/ SS & HCl (T)
20_500mL Amber Plastic w/ S. T. & H2SO4 (U)
11_125mL Amber Glass Bottle w/ Sodium Sulfite (V)
11_125mL Amber Glass Bottle w/ Sodium Sulfite (W)

Released By (Print & Sign)  Date 12/17/18 Time 1630 x UPS Received By (Print & Sign) Date 12/17/18 Time 1630

Released By (Print & Sign)  Date Date Time Received By (Print & Sign) Date Time

Page 1 of 1

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: New Source plus additional parameters
Project Number: [none]
Project Manager: Srikanth Grandhi

Reported:
12/21/18 15:01

Laboratory Sample ID:
18L1641

CHAIN OF CUSTODY RECORD



17631 N. 25th Avenue • Phoenix, AZ 85023 • (602) 324-8100 • Fax (602) 324-6101
4565 S. Palo Verde Rd, Ste 423 • Tucson, AZ 85706 • (520) 327-1234 • Fax (520) 327-0518

Page 1 of 1

Please Print Clearly

CLIENT INFORMATION

Client Name: **Carollo Engineers, Inc.** Address: **4600 E Washington St. #500** City: **Phoenix** State: **AZ** Zip: **85034** Phone: **602-474-4053** Fax Number or Email Address: **Sgrandhi@carollo.com**

Project Name: **New Source plus Additional Parameters**

Project Number/PWS

Contact: **Srikanth Grandhi**

P.O. No.

Fax Results: ☐

Email Results: ☐

QC Report ☐ EDD ☐

Special Detection Limits ☐

SAMPLE TYPE CODES

DW=Drinking Water
WW=Wastewater
SW=Surface Water
G=Groundwater

S=Soil/Solid
T=Travel Blank
F=Food
G=Sludge/Biosolids
G=Other

TURN AROUND TIME

Laboratory Authorization
Required for Rush

☐ Standard 15-20 Working Days

☐ Other _____ (Laboratory Authorization Required)

Client's Date Time Sample Location/POE/DWR

Travel Blank (Do Not Open) 12/17/18 1045 WELL HEAD

Composite
Grab
Sample Type
Compliance
No. of Containers
pH ✓ (Lab Use Only)

REQUESTED ANALYSES

Metals* Phosphate
Asbestos TOC
Cyanide Chloride
Nitrate Nitrite
Langlier Index**
Total Coliform
Sulfate Bromide
Fluoride
Total Hardness***
Diss. Metals****
531 547 548 525
549 Dioxin
524 504 505 515
Gross Alpha
Radium 226/228
Hydro Sulfide PpM

LAB NO.

TO ENSURE COMPLETION OF ANALYSIS, SAMPLES MUST BE RECEIVED AT LEAST 3 HOURS PRIOR TO THE HOLD TIME EXPIRATION

Comments / Special Instructions:

*Metals=Al, Sb, As, Ba, Be, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, K, Ni, Se, Si, Na, Sr, Ti **Langlier Index= Ca, Alkalinity, TDS, pH ***Total Hardness= Ca, Mg

If sample source is chlorinated, different sample containers/preservatives must be used for dechlorination. ****Dissolved Metals: Fe, Mn, Silica

SAMPLE CONDITION UPON RECEIPT (Lab Use)

No. of Containers: 43
Temperature: 28.8°C
Custody Seals: Y (N)
Seals Intact: Y (N)
Preserved: Y (N)

WHITE-LAB YELLOW-CLIENT

RELINQUISHED BY

Sampler Signature: *Srikanth Grandhi*
Sampler Printed Name: **SRIKANTH GRANDHI**
Signature: _____
Printed Name: _____
Signature: _____
Printed Name: _____

Date: 12/17/18

Time: 1333

SAMPLES RECEIVED BY

Signature: *Williamson*
Printed Name: _____
Signature: _____
Printed Name: _____
Signature: _____
Printed Name: _____

Date: 12/17/18

Time: 1333

Sample time taken from bottle MW 12/17/18

FORM GEN-170 (05/06)

DRAFT REPORT

Laboratory Work Order No.: 18L1641

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

21 December 2018

Srikanth Grandhi
Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

RE: RO Testing

Laboratory Work Order No.: 18L1700

Legend Technical Services of Arizona, Inc. is pleased to provide the enclosed analytical results for the aforementioned project. These results relate only to the items tested. This cover letter and the accompanying pages represent the full report for these analyses and should only be reproduced in full. Samples for this project were received by the laboratory on 12/17/18 13:33.

The samples were processed in accordance with the Chain of Custody document and the results presented relate only to the samples tested. The Chain of Custody is considered part of this report.

All samples will be retained by LEGEND for 30 days from the date of this report and then discarded unless other arrangements are made. Due to hold-time and method sample volume requirements, microbiological samples are not retained unless other arrangements are made.

This entire report was reviewed and approved for release by the undersigned. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

LEGEND TECHNICAL SERVICES OF ARIZONA, INC.

DRAFT REPORT
DATA SUBJECT TO CHANGE
(602) 324-6100

This laboratory report is confidential and is intended for the sole use of LEGEND and it's client.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: RO Testing
Project Number: 12/17/18
Project Manager: Srikanth Grandhi

Reported:
12/21/18 14:56

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Type	Date Sampled	Date Received
Post RO (Post RO)	18L1700-01	Drinking Water	Grab	12/17/18 12:12	12/17/18 13:33

Sample Condition Upon Receipt:

Temperature: 3.80 C

All samples were received in acceptable condition unless noted otherwise in the case narrative.

Case Narrative:

Holding Times: All holding times were met unless otherwise qualified.

QA/QC Criteria: All analyses met method requirements unless otherwise qualified.

Certifications: **AZ(PHX)0004, AZ(TUC)0004, AIHA#102982, CDC ELITE Member.**

Accreditation is applicable only to the test methods specified on each scope of accreditation held by LEGEND.

Comments: There were no problems encountered during the processing of the samples, unless otherwise noted.
All samples were analyzed on a "wet" basis unless designated as "dry weight".

Emailed prelim results for Ca on 12/21/18 BF

DRAFT REPORT

Laboratory Work Order No.: 18L1700

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: RO Testing
Project Number: 12/17/18
Project Manager: Srikanth Grandhi

Reported:
12/21/18 14:56

Post RO (Post RO) (18L1700-01) Drinking Water (Grab) Sampled: 12/17/18 12:12 Received: 12/17/18 13:33

Analyte	Result	PQL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
---------	--------	-----	-------	----------	-------	----------	----------	--------	-------

Legend Technical Services of Arizona, Inc.

Total Metals

Calcium	33	1.0	mg/L	1	B8L1451	12/19/18 08:30	12/19/18 10:19	EPA 200.7	
---------	----	-----	------	---	---------	----------------	----------------	-----------	--

DRAFT REPORT

Laboratory Work Order No.: 18L1700

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: RO Testing
Project Number: 12/17/18
Project Manager: Srikanth Grandhi

Reported:
12/21/18 14:56

Total Metals - Quality Control
Legend Technical Services of Arizona, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B8L1451 - EPA 200.7										
Blank (B8L1451-BLK1)				<i>Prepared & Analyzed: 12/19/18</i>						
Calcium	<1.0	1.0	mg/L							
LCS (B8L1451-BS1)				<i>Prepared & Analyzed: 12/19/18</i>						
Calcium	19	1.0	mg/L	20.0		95	85-115			
LCS Dup (B8L1451-BSD1)				<i>Prepared & Analyzed: 12/19/18</i>						
Calcium	19	1.0	mg/L	20.0		96	85-115	1	20	
Matrix Spike (B8L1451-MS1)				Source: 18L1546-06 <i>Prepared & Analyzed: 12/19/18</i>						
Calcium	46	1.0	mg/L	20.0	26	98	70-130			
Matrix Spike (B8L1451-MS2)				Source: 18L1819-05 <i>Prepared & Analyzed: 12/19/18</i>						
Calcium	67	1.0	mg/L	20.0	50	85	70-130			
Matrix Spike Dup (B8L1451-MSD1)				Source: 18L1546-06 <i>Prepared & Analyzed: 12/19/18</i>						
Calcium	46	1.0	mg/L	20.0	26	97	70-130	0.6	20	
Matrix Spike Dup (B8L1451-MSD2)				Source: 18L1819-05 <i>Prepared & Analyzed: 12/19/18</i>						
Calcium	69	1.0	mg/L	20.0	50	96	70-130	3	20	

DRAFT REPORT

Laboratory Work Order No.: 18L1700

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Carollo Engineers, Inc.
4600 East Washington Street Ste.500
Phoenix, AZ 85034

Project: RO Testing
Project Number: 12/17/18
Project Manager: Srikanth Grandhi

Reported:
12/21/18 14:56

Notes and Definitions

BLK	Method Blank
LCS/Dup	Laboratory Control Sample/Laboratory Fortified Blank/Duplicate
MS/Dup	Matrix Spike/Duplicate
Dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

DRAFT REPORT

Laboratory Work Order No.: 18L1700

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Reported:
12/21/18 14:56

Page 1 of 1

Appendix C

CONDITION ASSESSMENT FORMS



Condition Assessment Form

Mechanical Asset

Facility:

GRIC HARPAI-HEALTH

Date:

12-17-18

Process Area:

Asset Name:

WALL PUMP

Asset ID:

Reviewer Initials:

SHG

Condition Assessment Rating*

Condition Rating:

1 2 3 4 5

Performance Rating:

1 2 3 4 5

Recommendation:

Equipment Summary

Equipment Information

Type

Manufacturer

Model Number

Serial Number

Capacity

1000 GPM

Head

22 PSI

Speed

Outdoor/Indoor

Installation Year

Motor Nameplate Information

Manufacturer

Model

Type

Serial Number

Voltage/φ/HP

100 HP

Installation Year

Additional Information

WALL PUMP NOT IN
SERVICE - SAMING FAILED
WEEK. SENT

TEMP PUMP INSTALLED

WITH SUBMERSIBLE

MOTOR 15 HP 280 GPM

RUNNING @ 200 GPM

@ 30 PSI

THROTTLES DISCH VALVE

NO PUMP TO WASTE INSTALLED

Inspection Information

Mechanical

Yes No N/A

Safety issues?

☐ ☐ ☐

Capable of running when inspected?

☐ ☐ ☐

Excessive vibration?

☐ ☐ ☐

Excessive noise?

☐ ☐ ☐

Excessive corrosion?

☐ ☐ ☐

Leaks?

☐ ☐ ☐

Running hot?

☐ ☐ ☐

Coating in good condition?

☐ ☐ ☐

Parts missing?

☐ ☐ ☐

Support equipment functional?

☐ ☐ ☐

Adequate for intended service?

☐ ☐ ☐

Maintenance parts available?

☐ ☐ ☐**Instrumentation**

Yes No N/A

All critical indications functioning?

☐ ☐ ☐

Alarms functional?

☐ ☐ ☐

Equipment or parts missing?

☐ ☐ ☐

Parts available for maintenance?

☐ ☐ ☐**Electrical**

Yes No N/A

Excessive corrosion?

☐ ☐ ☐

Clean, well maintained contacts?

☐ ☐ ☐

Parts available for maintenance?

☐ ☐ ☐**Piping and Valves**

Yes No N/A

Excessive Corrosion?

☐ ☐ ☐

Excessive leaks?

☐ ☐ ☐

Paint in good condition?

☐ ☐ ☐

Valve operates?

☐ ☐ ☐*** Condition Rating***** Performance Rating**

1 - No Issues

1 - Functioning as Intended

2 - Minor Deterioration

2 - Minor Impairment

3 - Moderate Deterioration

3 - Moderately Impaired Functionality

4 - Severe Deterioration

4 - Severely Impaired Functionality

5 - Immediate Attention

5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility: GRIC HEALTH CENTER Date: 12-17-18

Process Area: _____ Condition Assessment Rating* _____

Asset Name: STORAGE TANK Condition Rating: 1 2 3 4 5

Asset ID: _____ Performance Rating: 1 2 3 4 5

Reviewer Initials: SKG Recommendation: _____

Equipment Summary

Equipment Information

Type: STEEL

Manufacturer: MMI

Model Number: 52' Ø, 34' HIGH

Serial Number: 11-001

Capacity: 300,000

Head: _____

Speed: _____

Outdoor/Indoor: _____

Installation Year: 2011

Motor Nameplate Information

Manufacturer: _____

Model: _____

Type: _____

Serial Number: _____

Voltage/φ/HP: _____

Installation Year: _____

Additional Information

Summary: 32,000 GPM/DAY

USAGE

ONLY 15.69 DAY OF STORAGE

- SECOND TANK REQ'D
- FILTER BEFORE TANK
- CHLORINATE " "

Inspection Information

Mechanical

	Yes	No	N/A
Safety issues?	☐	☐	☐
Capable of running when inspected?	☐	☐	☐
Excessive vibration?	☐	☐	☐
Excessive noise?	☐	☐	☐
Excessive corrosion?	☐	☐	☐
Leaks?	☐	☐	☐
Running hot?	☐	☐	☐
Coating in good condition?	☐	☐	☐
Parts missing?	☐	☐	☐
Support equipment functional?	☐	☐	☐
Adequate for intended service?	☐	☐	☐
Maintenance parts available?	☐	☐	☐

Instrumentation

	Yes	No	N/A
All critical indications functioning?	☐	☐	☐
Alarms functional?	☐	☐	☐
Equipment or parts missing?	☐	☐	☐
Parts available for maintenance?	☐	☐	☐

Electrical

	Yes	No	N/A
Excessive corrosion?	☐	☐	☐
Clean, well maintained contacts?	☐	☐	☐
Parts available for maintenance?	☐	☐	☐

Piping and Valves

	Yes	No	N/A
Excessive Corrosion?	☐	☐	☐
Excessive leaks?	☐	☐	☐
Paint in good condition?	☐	☐	☐
Valve operates?	☐	☐	☐

* Condition Rating

* Performance Rating

1 - No Issues	1 - Functioning as Intended
2 - Minor Deterioration	2 - Minor Impairment
3 - Moderate Deterioration	3 - Moderately Impaired Functionality
4 - Severe Deterioration	4 - Severely Impaired Functionality
5 - Immediate Attention	5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility:

GRIC HEALTH CENTER Date:12-17-18

Process Area:

Condition Assessment Rating*

Asset Name:

BOOSTER PUMP #1

Condition Rating:

1 2 3 4 5

Asset ID:

Performance Rating:

1 2 3 4 5

Reviewer Initials:

SKG

Recommendation:

Equipment Summary

Inspection Information

Equipment Information

Type

VOLT TURBINE

Manufacturer

GOULDS

Model Number

WAA LC

Serial Number

3J1XN-1

Capacity

200

Head

144

Speed

1775 RPM

Outdoor/Indoor

Installation Year

11-28-11

Motor Nameplate Information

Manufacturer

MIDEC

Model

1.15 SF

Type

400C

Serial Number

Voltage/φ/HP

15 / 460 V

Installation Year

Additional Information

CANNED PUMP4 STAGES @ 61.9"φINLET FLOW SWITCH NOTIN SERVICE BUT HASDISCH HIGH PRESS SWITCHPUMP INLET PIPING INCLUDESSTRAINER THAT WAS FILLEDWITH IRON COLORED SLAGRUNNING @ 42 HZ

Mechanical

Safety issues?

Capable of running when inspected?

Excessive vibration?

Excessive noise?

Excessive corrosion?

Leaks?

Running hot?

Coating in good condition?

Parts missing?

Support equipment functional?

Adequate for intended service?

Maintenance parts available?

Instrumentation

All critical indications functioning?

Alarms functional?

Equipment or parts missing?

Parts available for maintenance?

Electrical

Excessive corrosion?

Clean, well maintained contacts?

Parts available for maintenance?

Piping and Valves

Excessive Corrosion?

Excessive leaks?

Paint in good condition?

Valve operates?

* Condition Rating

1 - No Issues

2 - Minor Deterioration

3 - Moderate Deterioration

4 - Severe Deterioration

5 - Immediate Attention

* Performance Rating

1 - Functioning as Intended

2 - Minor Impairment

3 - Moderately Impaired Functionality

4 - Severely Impaired Functionality

5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility:	<u>GRAC HEALTH CENTER</u>	Date:	<u>12-17-18</u>
Process Area:		Condition Assessment Rating*	
Asset Name:	<u>BOOSTER PUMP #2</u>	Condition Rating:	1 <u>2</u> 3 4 5
Asset ID:		Performance Rating:	1 <u>2</u> 3 4 5
Reviewer Initials:	<u>SKG</u>	Recommendation:	

Equipment Summary

Equipment Information

Type VERT TURBINE
Manufacturer COBOLPS
Model Number 10R1LC
Serial Number 351XW-2
Capacity 200 GPM
Head 14LF
Speed 1775
Outdoor/Indoor
Installation Year 11-20-11

Motor Nameplate Information

Manufacturer NIPAC
Model 1.15 SF
Type 400C
Serial Number
Voltage/φ/HP 15 / 400 V
Installation Year

Additional Information

SEE NOTES PUMP #1

Inspection Information

	Yes	No	N/A
Mechanical			
Safety issues?	☐	☐	☐
Capable of running when inspected?	☐	☐	☐
Excessive vibration?	☐	☐	☐
Excessive noise?	☐	☐	☐
Excessive corrosion?	☐	☐	☐
Leaks?	☐	☐	☐
Running hot?	☐	☐	☐
Coating in good condition?	☐	☐	☐
Parts missing?	☐	☐	☐
Support equipment functional?	☐	☐	☐
Adequate for intended service?	☐	☐	☐
Maintenance parts available?	☐	☐	☐
Instrumentation			
All critical indications functioning?	☐	☐	☐
Alarms functional?	☐	☐	☐
Equipment or parts missing?	☐	☐	☐
Parts available for maintenance?	☐	☐	☐
Electrical			
Excessive corrosion?	☐	☐	☐
Clean, well maintained contacts?	☐	☐	☐
Parts available for maintenance?	☐	☐	☐
Piping and Valves			
Excessive Corrosion?	☐	☐	☐
Excessive leaks?	☐	☐	☐
Paint in good condition?	☐	☐	☐
Valve operates?	☐	☐	☐
* Condition Rating	* Performance Rating		
1 - No Issues	1 - Functioning as Intended		
2 - Minor Deterioration	2 - Minor Impairment		
3 - Moderate Deterioration	3 - Moderately Impaired Functionality		
4 - Severe Deterioration	4 - Severely Impaired Functionality		
5 - Immediate Attention	5 - Immediate Attention		



Condition Assessment Form

Mechanical Asset

Facility: GRAC HEALTH CENTER Date: 12-17-18

Process Area: _____ Condition Assessment Rating* _____

Asset Name: BOOSTER pump #3 Condition Rating: 1 (2) 3 4 5

Asset ID: _____ Performance Rating: 1 (2) 3 4 5

Reviewer Initials: SKG Recommendation: _____

Equipment Summary

Equipment Information

Type: VENT TURB

Manufacturer: GOULDS

Model Number: 14RTMO

Serial Number: 3T1XN

Capacity: 2000 GPM

Head: 154'

Speed: _____

Outdoor/Indoor: _____

Installation Year: 11-8-11

Motor Nameplate Information

Manufacturer: NIDEC

Model: 1.15 SF

Type: 40°C

Serial Number: _____

Voltage/φ/HP: 100 HP / 400V

Installation Year: _____

Additional Information

CANNED PUMP

2 STAGES @ 9.8" φ

INLET FLOW SWITCH NOT

IN SERVICE BUT HAS

DISCH HIGH PRESS SWITCH

Inspection Information

Mechanical	Yes	No	N/A
Safety issues?	☐	☐	☐
Capable of running when inspected?	☐	☐	☐
Excessive vibration?	☐	☐	☐
Excessive noise?	☐	☐	☐
Excessive corrosion?	☐	☐	☐
Leaks?	☐	☐	☐
Running hot?	☐	☐	☐
Coating in good condition?	☐	☐	☐
Parts missing?	☐	☐	☐
Support equipment functional?	☐	☐	☐
Adequate for intended service?	☐	☐	☐
Maintenance parts available?	☐	☐	☐

Instrumentation	Yes	No	N/A
All critical indications functioning?	☐	☐	☐
Alarms functional?	☐	☐	☐
Equipment or parts missing?	☐	☐	☐
Parts available for maintenance?	☐	☐	☐

Electrical	Yes	No	N/A
Excessive corrosion?	☐	☐	☐
Clean, well maintained contacts?	☐	☐	☐
Parts available for maintenance?	☐	☐	☐

Piping and Valves	Yes	No	N/A
Excessive Corrosion?	☐	☐	☐
Excessive leaks?	☐	☐	☐
Paint in good condition?	☐	☐	☐
Valve operates?	☐	☐	☐

* Condition Rating

* Performance Rating

1 - No Issues	1 - Functioning as Intended
2 - Minor Deterioration	2 - Minor Impairment
3 - Moderate Deterioration	3 - Moderately Impaired Functionality
4 - Severe Deterioration	4 - Severely Impaired Functionality
5 - Immediate Attention	5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility: GRIC HEALTH CENTER Date: 12-17-18

Process Area: _____ Condition Assessment Rating*

Asset Name: BLEACH TANK #1 & 2 Condition Rating: 1 2 3 4 5

Asset ID: _____ Performance Rating: 1 2 3 4 5

Reviewer Initials: SRG Recommendation: _____

Equipment Summary

Equipment Information

Type: POLYETHYLENE

Manufacturer: _____

Model Number: _____

Serial Number: _____

Capacity: 100 GAL

Head: 3' BY 2.5'

Speed: _____

Outdoor/Indoor: _____

Installation Year: _____

Motor Nameplate Information

Manufacturer: _____

Model: _____

Type: _____

Serial Number: _____

Voltage/φ/HP: _____

Installation Year: _____

Additional Information

12.5% SODIUM HYPOCHLORITE

2 TANKS INSTALLED

FILLED BY MANUALLY

POURING 6 GALLON

TUBS INTO TANKS

12.5% HYPO 6 GALLON

CONTAINERS NOT STORED

ON SPILL PALLET

Inspection Information

Mechanical

Safety issues? ☐ Yes ☐ No ☐ N/A

Capable of running when inspected? ☐ Yes ☐ No ☐ N/A

Excessive vibration? ☐ Yes ☐ No ☐ N/A

Excessive noise? ☐ Yes ☐ No ☐ N/A

Excessive corrosion? ☐ Yes ☐ No ☐ N/A

Leaks? ☐ Yes ☐ No ☐ N/A

Running hot? ☐ Yes ☐ No ☐ N/A

Coating in good condition? ☐ Yes ☐ No ☐ N/A

Parts missing? ☐ Yes ☐ No ☐ N/A

Support equipment functional? ☐ Yes ☐ No ☐ N/A

Adequate for intended service? ☐ Yes ☐ No ☐ N/A

Maintenance parts available? ☐ Yes ☐ No ☐ N/A

Instrumentation

All critical indications functioning? ☐ Yes ☐ No ☐ N/A

Alarms functional? ☐ Yes ☐ No ☐ N/A

Equipment or parts missing? ☐ Yes ☐ No ☐ N/A

Parts available for maintenance? ☐ Yes ☐ No ☐ N/A

Electrical

Excessive corrosion? ☐ Yes ☐ No ☐ N/A

Clean, well maintained contacts? ☐ Yes ☐ No ☐ N/A

Parts available for maintenance? ☐ Yes ☐ No ☐ N/A

Piping and Valves

Excessive Corrosion? ☐ Yes ☐ No ☐ N/A

Excessive leaks? ☐ Yes ☐ No ☐ N/A

Paint in good condition? ☐ Yes ☐ No ☐ N/A

Valve operates? ☐ Yes ☐ No ☐ N/A

* Condition Rating

1 - No Issues

2 - Minor Deterioration

3 - Moderate Deterioration

4 - Severe Deterioration

5 - Immediate Attention

* Performance Rating

1 - Functioning as Intended

2 - Minor Impairment

3 - Moderately Impaired Functionality

4 - Severely Impaired Functionality

5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility: GRIC HEALTH CENTER Date: 12-17-18

Process Area: _____ Condition Assessment Rating*

Asset Name: BLEACH PUMP #1 Condition Rating: 1 2 3 4 5

Asset ID: _____ Performance Rating: 1 2 3 4 5

Reviewer Initials: SKG Recommendation: _____

Equipment Summary

Inspection Information

Equipment Information

Type _____

Manufacturer LMJ

Model Number AAB51-A30HF

Serial Number _____

Capacity 0.8 GPH

Head 110 PSI

Speed _____

Outdoor/Indoor _____

Installation Year _____

Motor Nameplate Information

Manufacturer _____

Model _____

Type _____

Serial Number _____

Voltage/φ/HP 20 WASTS

Installation Year _____

Additional Information

- Running @ .55 GPH
- 12 SECOND INTERVALS
- SET OFF TIMER
- ON EVERY 25 GAL OF PRODUCTION

Mechanical

Safety issues? ☐

Capable of running when inspected? ☐

Excessive vibration? ☐

Excessive noise? ☐

Excessive corrosion? ☐

Leaks? ☐

Running hot? ☐

Coating in good condition? ☐

Parts missing? ☐

Support equipment functional? ☐

Adequate for intended service? ☐

Maintenance parts available? ☐

Instrumentation

All critical indications functioning? ☐

Alarms functional? ☐

Equipment or parts missing? ☐

Parts available for maintenance? ☐

Electrical

Excessive corrosion? ☐

Clean, well maintained contacts? ☐

Parts available for maintenance? ☐

Piping and Valves

Excessive Corrosion? ☐

Excessive leaks? ☐

Paint in good condition? ☐

Valve operates? ☐

* Condition Rating

- 1 - No Issues
- 2 - Minor Deterioration
- 3 - Moderate Deterioration
- 4 - Severe Deterioration
- 5 - Immediate Attention

* Performance Rating

- 1 - Functioning as Intended
- 2 - Minor Impairment
- 3 - Moderately Impaired Functionality
- 4 - Severely Impaired Functionality
- 5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility:

GRACE HEALTH CENTER

Date:

12-17-18

Process Area:

Condition Assessment Rating*

Asset Name:

BLEACH PUMP #2

Condition Rating:

1 ② 3 4 5

Asset ID:

Performance Rating:

1 ② 3 4 5

Reviewer Initials:

SKG

Recommendation:

Equipment Summary

Inspection Information

Equipment Information

Type

SOLENOID MATH/REM

Manufacturer

LMI

Model Number

AA851-A30H1

Serial Number

Capacity

0.8 GPM

Head

110 PSI

Speed

Outdoor/Indoor

Installation Year

Motor Nameplate Information

Manufacturer

Model

Type

Serial Number

Voltage/φ/HP

20 WATTS

Installation Year

Additional Information

SEE PUMP #1 NOTES

Mechanical

Safety issues?

Capable of running when inspected?

Excessive vibration?

Excessive noise?

Excessive corrosion?

Leaks?

Running hot?

Coating in good condition?

Parts missing?

Support equipment functional?

Adequate for intended service?

Maintenance parts available?

Instrumentation

All critical indications functioning?

Alarms functional?

Equipment or parts missing?

Parts available for maintenance?

Electrical

Excessive corrosion?

Clean, well maintained contacts?

Parts available for maintenance?

Piping and Valves

Excessive Corrosion?

Excessive leaks?

Paint in good condition?

Valve operates?

Yes

No

N/A

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Yes

No

N/A

☐☐☐☐☐☐☐☐☐☐☐☐

Yes

No

N/A

☐☐☐☐☐☐☐☐☐

Yes

No

N/A

☐☐☐☐☐☐☐☐☐☐☐☐

* Condition Rating

* Performance Rating

1 - No Issues

1 - Functioning as Intended

2 - Minor Deterioration

2 - Minor Impairment

3 - Moderate Deterioration

3 - Moderately Impaired Functionality

4 - Severe Deterioration

4 - Severely Impaired Functionality

5 - Immediate Attention

5 - Immediate Attention



Condition Assessment Form

Mechanical Asset

Facility: GRAC HEALTH CENTER Date: 12-17-18

Process Area: _____ Condition Assessment Rating* _____

Asset Name: RO SYSTEM Condition Rating: 1 2 3 4 5

Asset ID: _____ Performance Rating: 1 2 3 4 5

Reviewer Initials: SKB Recommendation: _____

Equipment Summary

Inspection Information

Equipment Information

Type: HIGH PRESS RO

Manufacturer: EVOLIVA

Model Number: PROTEC PRO-4-300-SP

Serial Number: _____

Capacity: PRODUCT 11-12 GPM

Head: WASTE 6-7 GPM

Speed: _____

Outdoor/Indoor: _____

Installation Year: FEB 2018

Motor Nameplate Information

Manufacturer: _____

Model: BOOSTER PUMP

Type: VERT MULTI-STAGE

Serial Number: _____

Voltage/φ/HP: 10 HP 400/3

Installation Year: _____

Additional Information

A PORTION OF PRODUCT

WATER USED TO MIX

50000 GAL STORAGE TANK

WASTE STREAM TO SEWER

BUT NO AIR GAP

CHEM TREAT RL9009

ANTI-SCALEANT USED

WITH 24 GPD PUMP

CARTRIDGE (5 IN) (FINAL)

CHANGES FREQUENTLY

4.5" Ø BY 20" LONG

RESIN BED PRE-FILTER DOES

NOT REMOVE IRON COLLOIDS

PARTICLES

Mechanical

Yes No N/A

Safety issues? ☐ ☐ ☐

Capable of running when inspected? ☐ ☐ ☐

Excessive vibration? ☐ ☐ ☐

Excessive noise? ☐ ☐ ☐

Excessive corrosion? ☐ ☐ ☐

Leaks? ☐ ☐ ☐

Running hot? ☐ ☐ ☐

Coating in good condition? ☐ ☐ ☐

Parts missing? ☐ ☐ ☐

Support equipment functional? ☐ ☐ ☐

Adequate for intended service? ☐ ☐ ☐

Maintenance parts available? ☐ ☐ ☐

Instrumentation

Yes No N/A

All critical indications functioning? ☐ ☐ ☐

Alarms functional? ☐ ☐ ☐

Equipment or parts missing? ☐ ☐ ☐

Parts available for maintenance? ☐ ☐ ☐

Electrical

Yes No N/A

Excessive corrosion? ☐ ☐ ☐

Clean, well maintained contacts? ☐ ☐ ☐

Parts available for maintenance? ☐ ☐ ☐

Piping and Valves

Yes No N/A

Excessive Corrosion? ☐ ☐ ☐

Excessive leaks? ☐ ☐ ☐

Paint in good condition? ☐ ☐ ☐

Valve operates? ☐ ☐ ☐

* Condition Rating

* Performance Rating

1 - No Issues 1 - Functioning as Intended

2 - Minor Deterioration 2 - Minor Impairment

3 - Moderate Deterioration 3 - Moderately Impaired Functionality

4 - Severe Deterioration 4 - Severely Impaired Functionality

5 - Immediate Attention 5 - Immediate Attention