City of Biggs

Agenda Item Staff Report
for the Regular City Council Meeting:
May 10, 2016

TO: Honorable Mayor and Members of the City Council
FROM: Mark Sorensen, City Administrator
Subject: Authorization to purchase water well services.

Background:

The C Street well (AKA: Willard well) had an operational issue caused by a significant blockage of the inlet screens in the well casing from accumulated scale buildup which required a very aggressive cleaning procedure.

Additionally, after cleaning, water testing was completed to see if one or two the inlet screen depths were significantly responsible for SMCL (secondary maximum contaminant levels), and if so, determine the feasibility of blocking those screen depths. Unfortunately no one existing inlet depth is significantly responsible for the SMCL issue. This is discussed extensively in the attached technical memorandum.

As the city continues to explore long-term methods of improving the utilization of the C Street well, it recommended that the City reinstall the submersible pump to its previous depth, and restore the well to stand-by service.

Recommendation:

Authorize the City Administrator to purchase water well professional services in an amount not to exceed $3,500 with proceeds from Water Improvement Fund 110.

_____
Mark Sorensen, City Administrator

cpm COMMERCIAL PUMP & MECHANICAL INC.
11254 Midway | 530.899.1583v
Chico CA 95928 | 530.899.7225f

April 14, 2016

Mark Sorensen
City of Biggs
Mark@biggs-ca.gov

RE: Proposal for Installation of Willard Well Pump at Original Setting

1 – 110' 2/3WG Flat Jacket Submersible Cable	$ 312.00
1 - #2 4-Wire Splice Kit	$ 20.00
Sales Tax (7.50%)	$ 24.90
Incoming Freight	$ 100.00
Reassemble Pump, Deliver and Reinstall	$2,400.00
Total	$2,856.90

Thank you for your continued confidence in Commercial Pump and Mechanical.

Grant Stanley
Commercial Pump & Mechanical, Inc.

TECHNICAL MEMORANDUM

TO:	Mark Sorensen, Trin Campos
FROM:	Mike Massaro, Steven Ainsworth, Gabriel Rodriguez
DATE:	April 7, 2016
SUBJECT:	C Street Well – Short Term Strategy
PROJECT:	11-416-12 City of Biggs – C Street Well Assessment

BEN|EN
TRUSTED ENGINEERING ADVISORS
Bennett Engineering Services
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Introduction

The City of Biggs assessed the C Street Well (aka Well 2 - Willard Well) in order to evaluate bringing the well into service on the city water system. Currently, the well is designated as "stand-by" by the California Department of Public Health (CDPH). Additional flow from this well is necessary to provide adequate flows during emergency or fire flow scenarios. The well also needs to be utilized on a regular basis to keep functional and productive when needed.

The City is currently served by two wells. The Park Well (aka Well 1 - Bertha Well) and the 2nd Street Well (aka Well 3 - Henry Well). The C Street Well has been mostly idle since it was installed in 2005 and has served as only a standby source of water. If the C Street Well had adequate water quality, it could be utilized as a third production well.

Water samples taken from the C Street Well in late 2015 indicated levels of Manganese (Mn) and Arsenic (As) that exceed EPA Secondary Maximum Contaminant Levels (SMCL) for Mn and primary MCL for As. In California, the secondary MCL's are considered enforceable. It should be noted the MCL is for water levels delivered to the customer. In other words, source water above levels may not indicate a violation if it is blended with source water well below levels and the resultant water quality is within tolerance. Manganese is generally not considered a human health risk but represents a taste and odor issue. The SMCL for Mn is 50 µg/L. Arsenic, although naturally occurring (20th most common element in nature), it is considered a toxin and has a primary MCL of 10 µg/L. The oxides of arsenic are the most common threat to health since arsenite and arsenate salts are the most toxic.

Background

The City of Biggs water system is comprised of approximately ten miles of water mains, a 100-foot elevated 40,000-gallon storage tank, a 10,000- gallon hydrostatic tank, and three source wells. Table 1 provides an overview to general City of Biggs water system parameters.

Table 1 – City of Biggs Water System Overview

System Average Day Demand (gpm)	250
Number of Service Connections	695
Average Day to Max Day Multiplier	2.72
Well 1 Production Capacity (gpm)	850
Well 3 Production Capacity (gpm)	850
C Street Well Production Capacity (gpm)	800

Water Quality Samples from December 2, 2015 for Well 1 had Manganese (Mn) and Arsenic (As) levels at 10 µg/L and 4 µg/L, respectively. Well 3 had Mn and As levels at 31.7 µg/L and 4 µg/L, respectively.

C Street Well indicated 185.8 µg/L for Mn and 11 µg/L for As. Initial assessment of the well indicated difficulty in pumping which led to a recommendation to inspect and potentially clean the well to restore its original pumping capacity. Subsequent water samples have indicated As levels at between 12 and 8 µg/L. Table 2 summarizes the water quality results for Mn and As in Well 1, Well 3, and C Street Well from the December 2015 sampling event.

Table 2 – Manganese and Arsenic Levels in Well 1, Well 3, and C Street Well (December 2015)

Well ID	Manganese (µg/L)	Arsenic (µg/L)
Maximum Contaminant Level	50	10
Well 1 (Bertha)	10	4
Well 3 (Henry)	31.7	4
C Street Well (Willard)	185.8	11

Well Cleaning and Assessment

The C Street Well was installed with a 24-inch rotary to a depth of 400 feet. A 36-inch conductor casing was installed from 0 to 30-ft depth. A 12-inch steel casing was installed from 30 feet depth to a depth of 300 feet. A sanitary seal is at 75-ft depth. The casing has filter pack from 75 to 330-ft depth. There are no barriers in between the filter pack at the water bearing/screened zones.

Table 3 – C Street Well Construction (June 2005)

Well Screen Depth (ft)	Water Bearing Zone	Screen Slot Size (inches)
120 – 140	Zone 1	0.06
160 – 180	Zone 2	0.06
200 – 290	Zone 3	0.06

The C Street Well was inspected on December 9, 2015. The static water level at the time of inspection was 9 feet below land surface (BLS). The well inspection video showed some greenish-yellow scaling from 0-20 feet depth. Casing welds were visible every 20 feet for the first 100 feet of inspection depth. Casing welds were not visible from the 100+ foot depth to the bottom of the well due to the build-up of scale. The inspection ended at a depth of 298 feet when bottom sediment was impacted by the inspection camera. The three screened zones of the well were not visible in the inspection video. The casing and screens were completely obscured by the scale build-up.

The well inspection contractor was then instructed to clean the casing and screens. The casing and screens were cleaned (brushed, air lifted, swabbed, and disinfected) the week of January 4th, 2016. The well was then re-inspected via video camera.

The second well inspection video showed a clear view of the screens and removal of the majority of scale. The well casing still showed mottled discoloration. Some of the joint welds look rough and slightly corroded at 200-ft depth.

Water samples from each screened interval were taken on January 13, 2016 and analyzed per state sampling protocols. The samples were analyzed for a suite of inorganics by FGL Laboratories. The C Street well indicated As levels at 12, 8, and 10 µg/L for screened zones 1, 2, and 3, respectively. Therefore, after cleaning and pumping to reestablish the well's productivity, the water quality is still at or near the MCL for As. Manganese levels were corrupted by the well cleaning process. Well casing and screen scrapings yielded exceptionally high readings for Aluminum, Iron, and Manganese. The samples indicated Mn levels of 1200, 720, and 1040 µg/L for zones 1, 2, and 3 respectively. Table 4 summarizes water quality results for Arsenic and Manganese in C Street

Well from the January 2016 sampling event. Our interpretation is that the Mn levels are not representative of the surrounding water quality. Therefore, our system water quality modeling effort utilized prior sample data from December 2015 that was more consistent with data taken in 2005 (well build) and in 2008 (Ca DPH certification as "stand-by").

Table 4 – Arsenic and Manganese Levels in C Street Well (January 2016)

Zone	Arsenic (µg/L)	Manganese (µg/L)
Maximum Contaminant Level	10	50
Zone 1	12	1200
Zone 2	8	720
Zone 3	10	1040

Now that the well has been cleaned and reestablished, it will need to be cycled on a regular basis to keep the screened zones from re-clogging and to prevent the build-up of scale on the casing. The water will likely need to be pumped to waste (City Storm Drain System).

Water Quality Modeling Utilizing H2OMap

One of the three source wells (Willard Well, or C Street Well) is noncompliant in arsenic and manganese levels. Bertha Well (Well 1) and Henry Well (Well 3) arsenic and manganese levels are below their respective maximum contaminant levels (MCLs). Because of the noncompliance in Willard Well, a water system model was built using Innovyze's H2OMap Water software to determine how the noncompliant water would affect the water system under different pumping scenarios.

To build the water model, known system information was incorporated into the software such as well pump data, storage tank information, and water quality laboratory results. Specific well pump parameters included nominal production capacity of the wells in gallons per minute (gpm), pump horsepower, and pump drawdown levels (see Table 5). Tank information included volume, storage levels, and tank geometry. Lab results included arsenic and manganese levels (µg/L) sampled at each of the three pump locations on December 2, 2015 (see Table 2). Additionally, system demands were approximated at each node throughout the system using historical average daily use values provided by the City from 2014 (250 gpm).

Table 5 – City of Biggs Well Pump Data

Pump Data	Well 1 (Bertha)	Well 3 (Henry)	C Street Well (Willard)
Production Capacity (gpm)	850	850	800
Pump Horsepower (hp)	60	40	50
Pump Drawdown Level (ft)	42	21	42

Four scenarios were performed in H2OMap Water under the following well conditions:

- Scenario 1 – Bertha on, Henry on, Willard on
- Scenario 2 – Bertha on, Henry off, Willard on
- Scenario 3 – Bertha off, Henry on, Willard on
- Scenario 4 – Bertha on, Henry on, Willard off

All scenarios were performed with run durations of 12 hours. Results for arsenic and manganese from each scenario are displayed on the attached system maps. Green nodes indicate points of compliance, yellow points are compliant but nearing noncompliance, and red nodes are above the maximum contaminant level (MCL), or noncompliant. Time-dependent graphs showing specific junctions in the water system at three different locations under all scenarios for arsenic and manganese are attached in the Appendix.

The water model provides conclusive results indicating that C Street Well - Willard Well cannot be run under normal conditions without some level of treatment, and confirms that it should only be on standby due to the

propagation of high levels of arsenic and manganese throughout the system. If it is to be used in tandem with another well, the model suggests that C Street - Willard Well should be operated with Henry Well (Scenario 3) due to better mixing throughout the system compared to Willard and Bertha Wells running in tandem (Scenario 2).

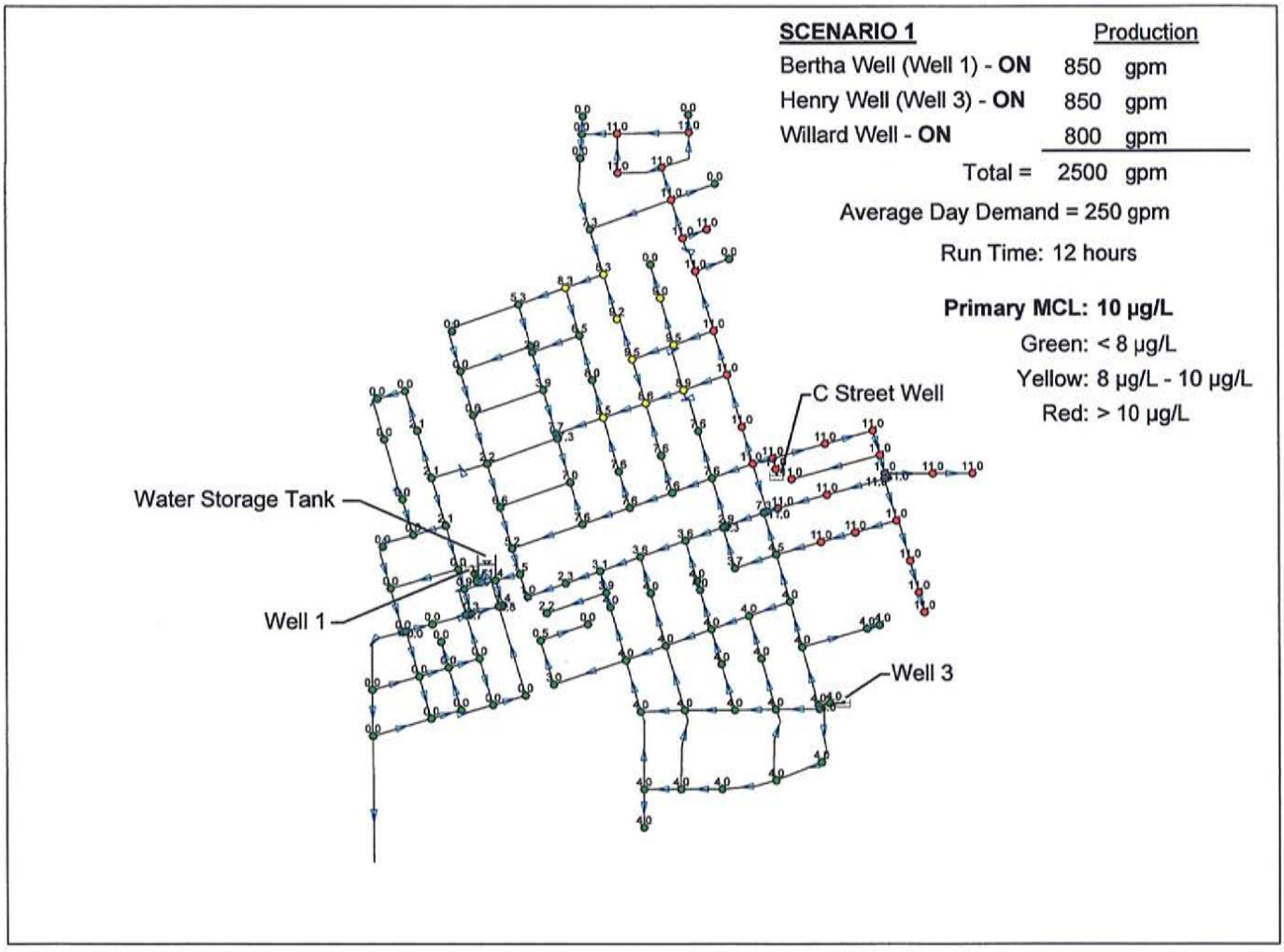
As would be expected, the model shows the water quality of the northeastern parts of town, including the high school, being dominated by the water quality of the C Street well when it is running.

Conclusions and Short-term Recommendations

Long-term strategy options for the C Street Well will be discussed in another Technical Memorandum. In the short-term, our analysis shows that the well must remain as "stand-by" status and only used in emergency shut down or fire flow scenarios. In order to keep the well viable for use, the well should be cycled weekly to purge and maintain conductivity through the screened zones. It is our opinion that the well should be retro-fitted with a tee and valve to allow for discharge to a drain with a pipeline connection to an adjacent storm drain system to the west of the well site. This would allow regular purging of the well without localized street flooding and impacts to the neighbors adjacent to the well site.

Appendix – H2O Map Output

Biggs Water Model - Arsenic (Scenario 1)



Prepared By: G. Rodriguez

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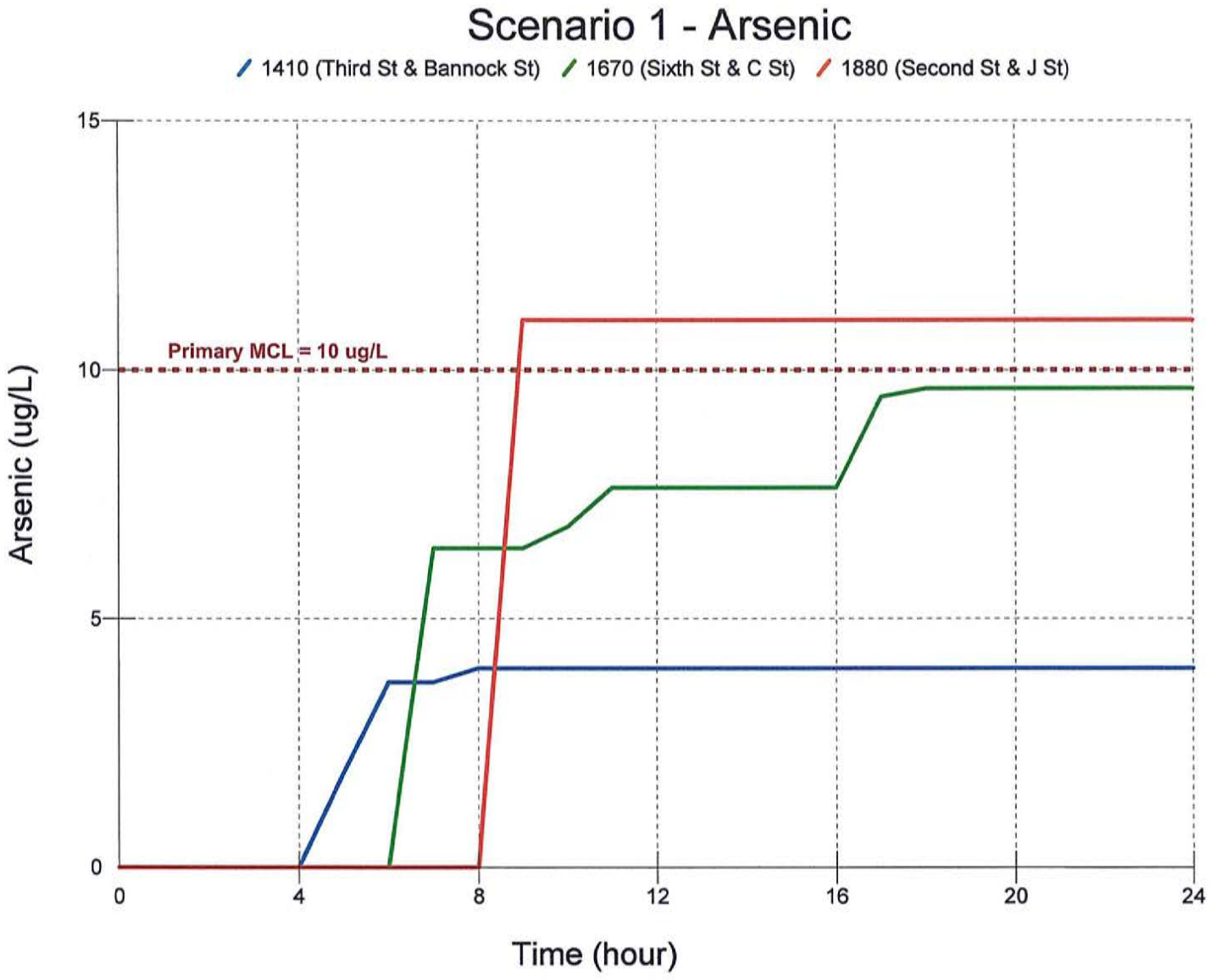
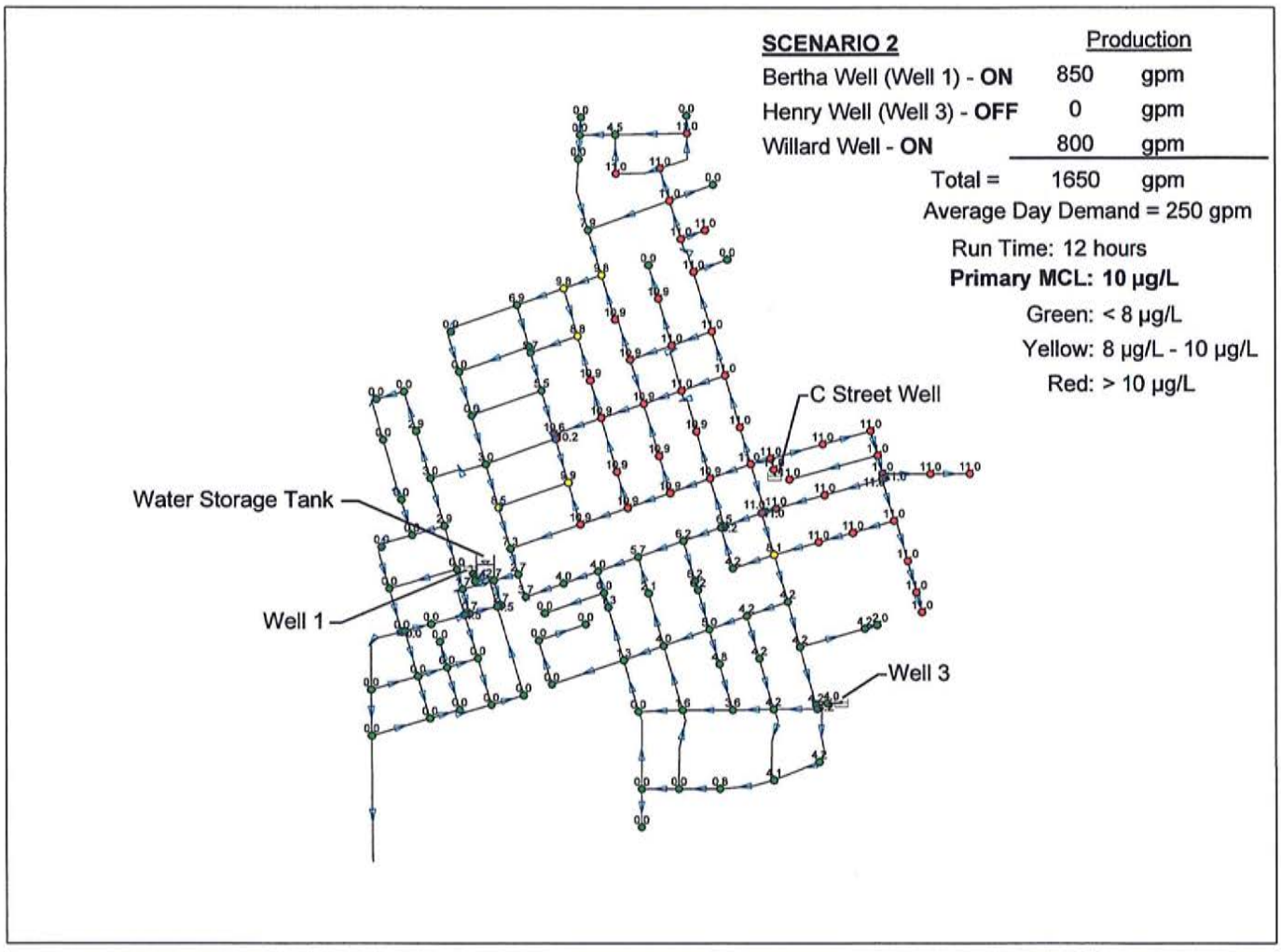

Scenario 1 - Arsenic
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Primary MCL = 10 ug/L
Arsenic (ug/L)
15
10
5
0
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Arsenic (Scenario 2)



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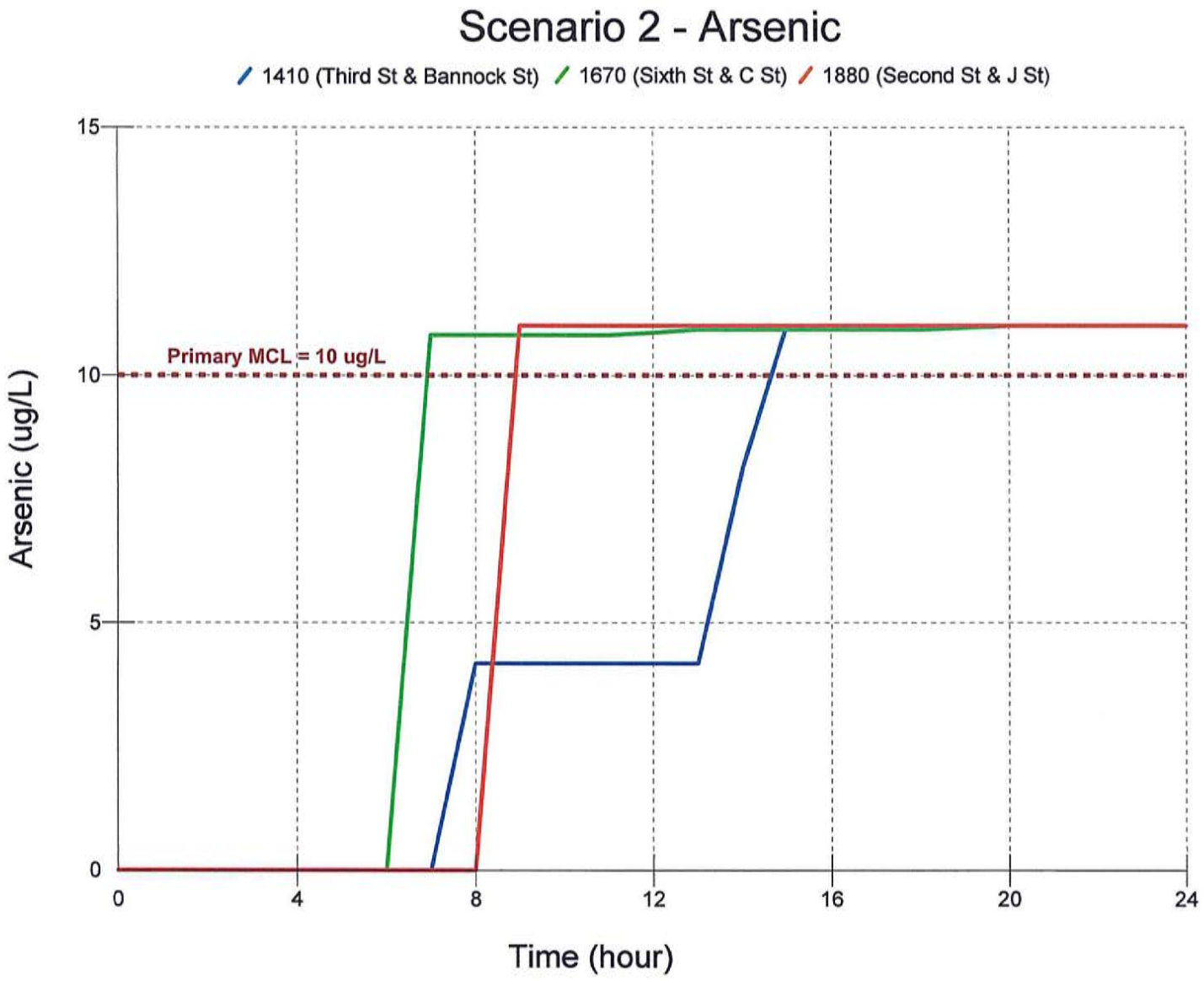
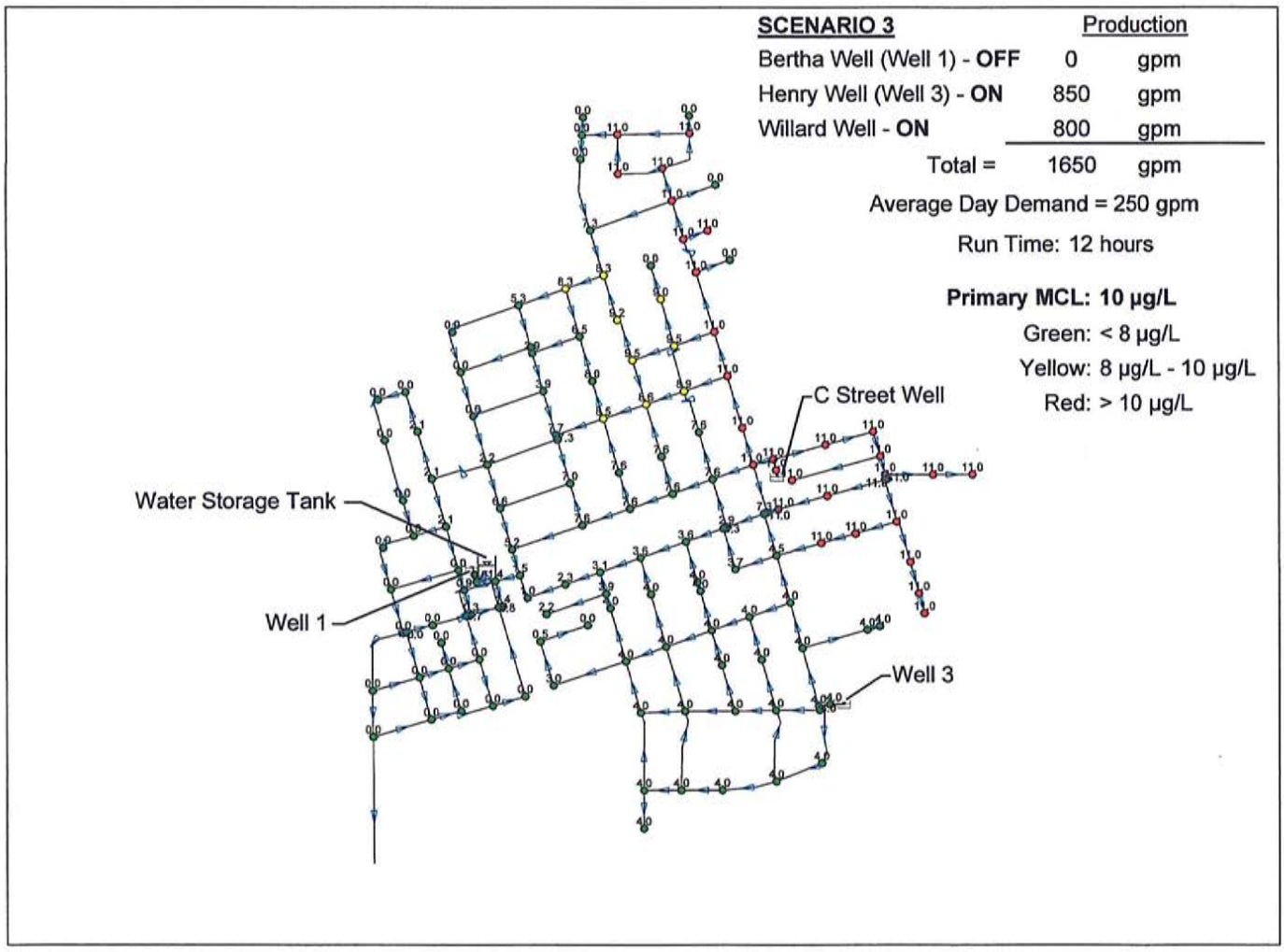

Scenario 2 - Arsenic
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Primary MCL = 10 ug/L
Arsenic (ug/L)
15
10
5
0
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Arsenic (Scenario 3)



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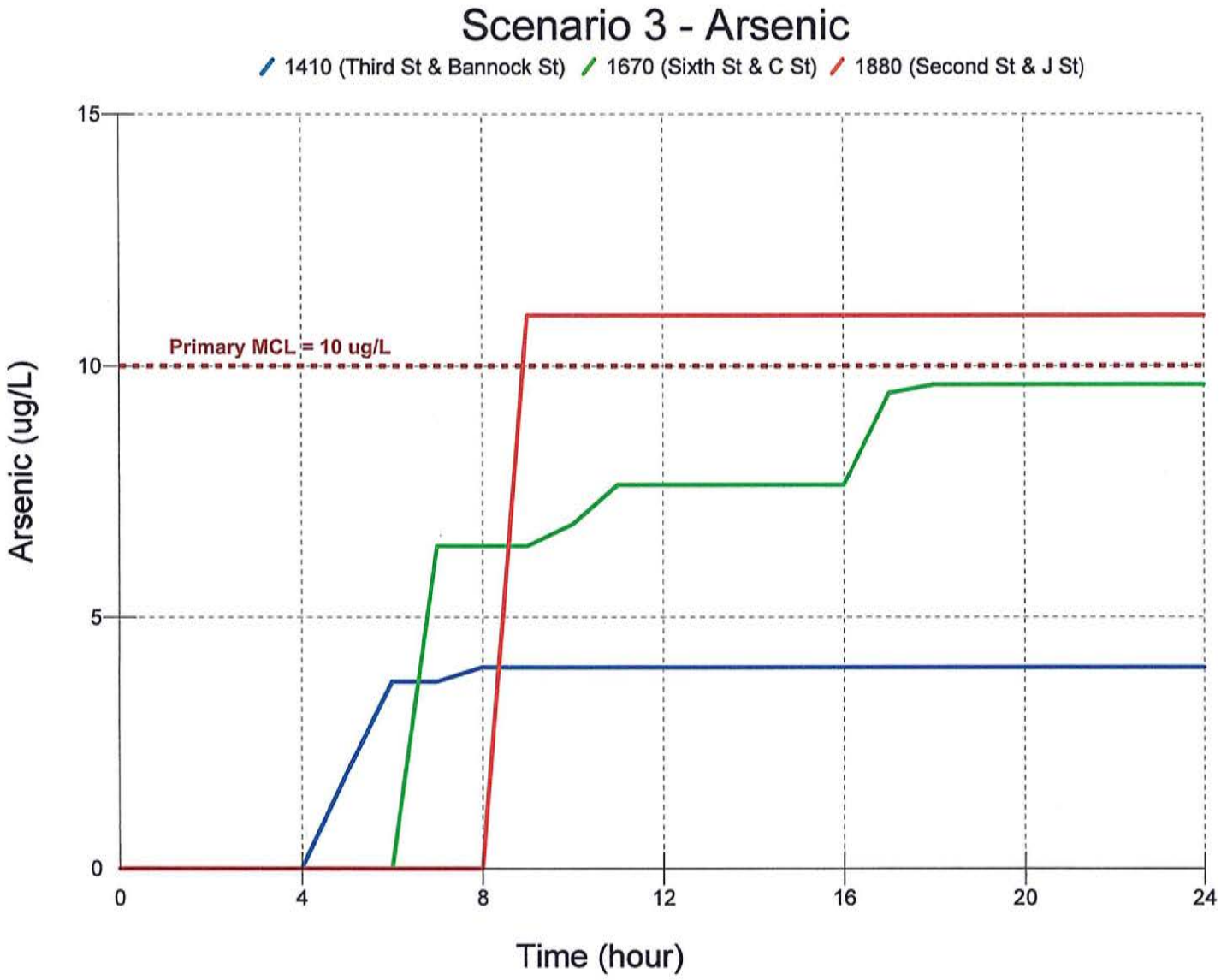
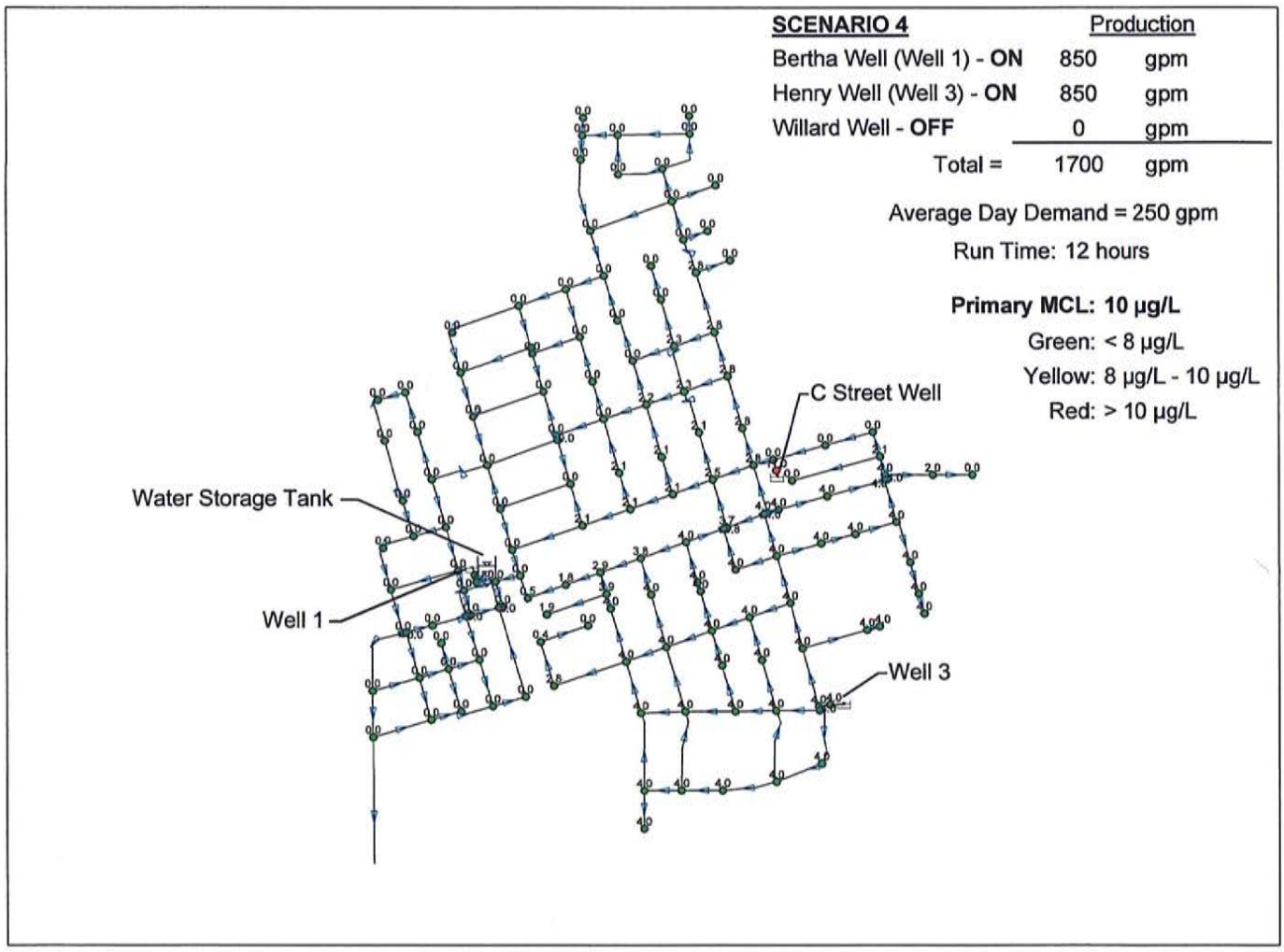

Scenario 3 - Arsenic
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Primary MCL = 10 ug/L
Arsenic (ug/L)
15
10
5
0
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Arsenic (Scenario 4)



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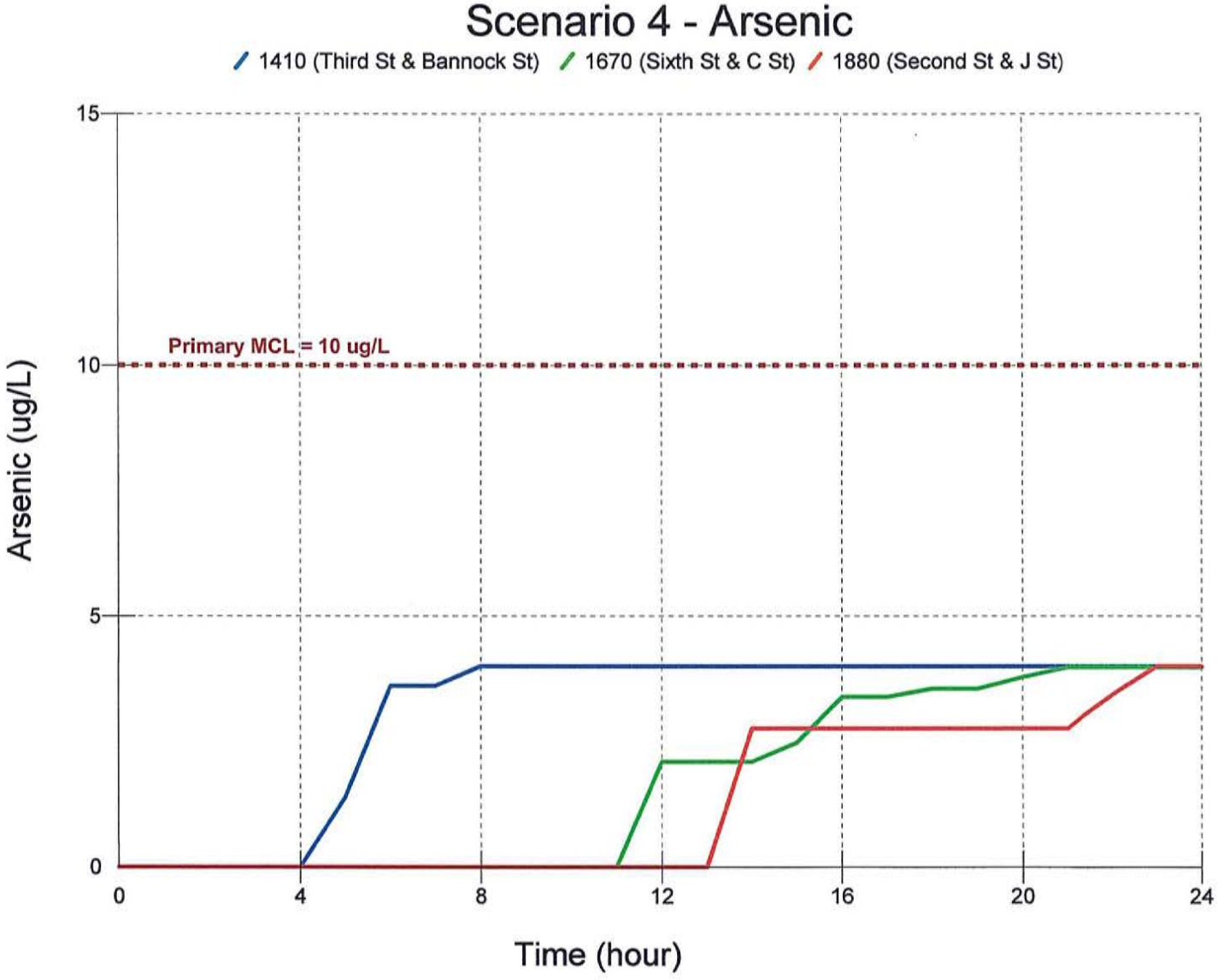
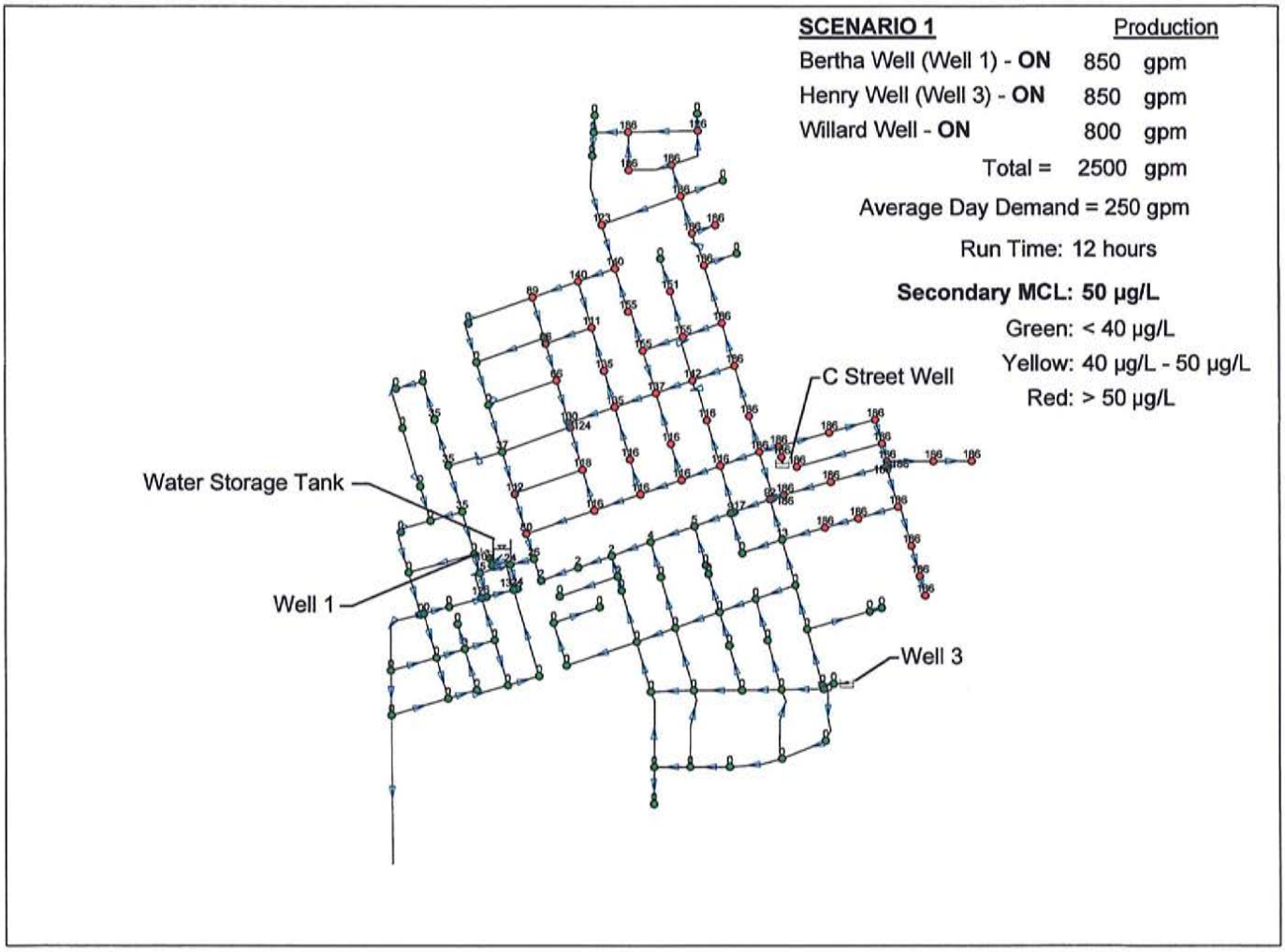

Scenario 4 - Arsenic
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Primary MCL = 10 ug/L
Arsenic (ug/L)
15
10
5
0
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Manganese (Scenario 1)



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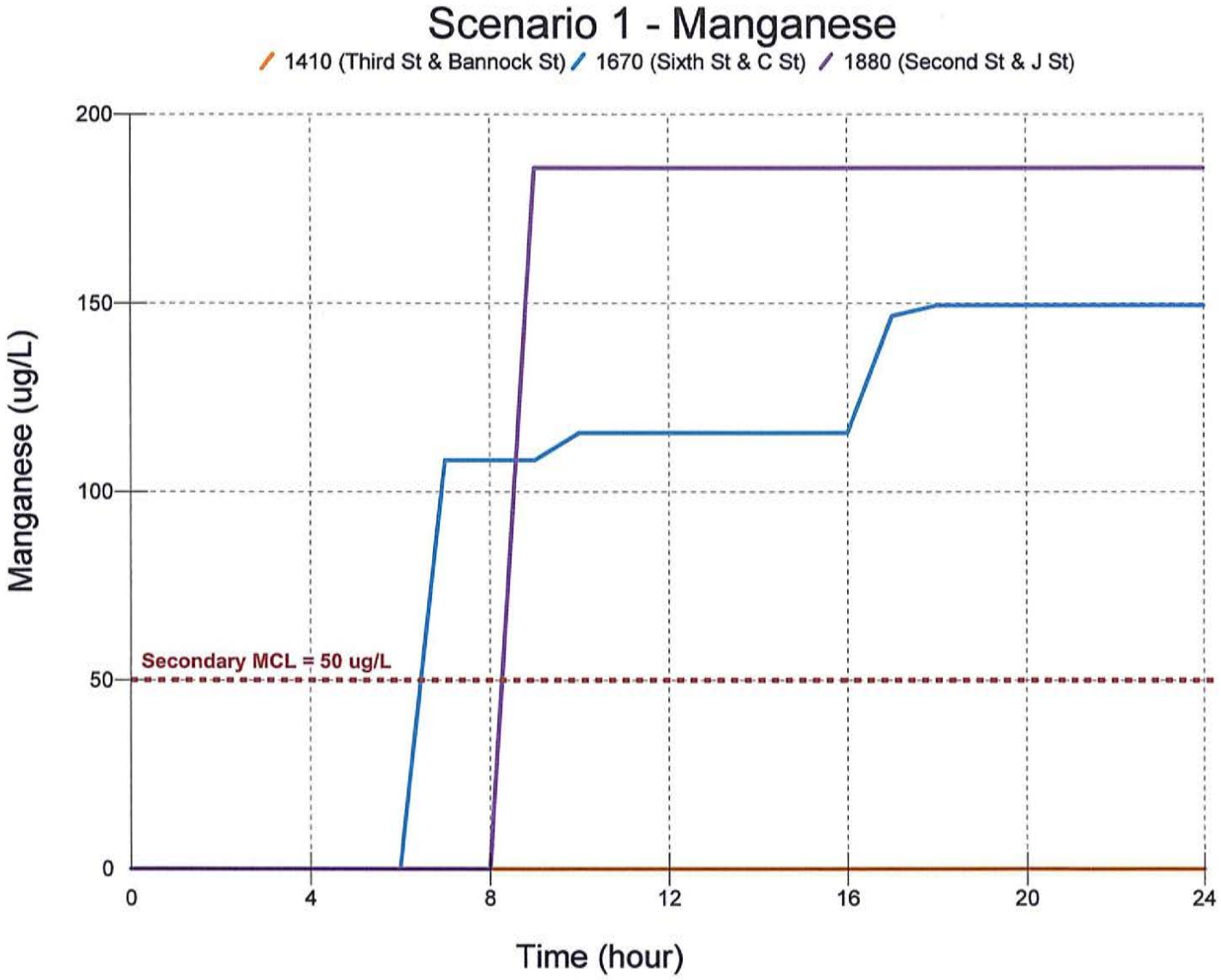
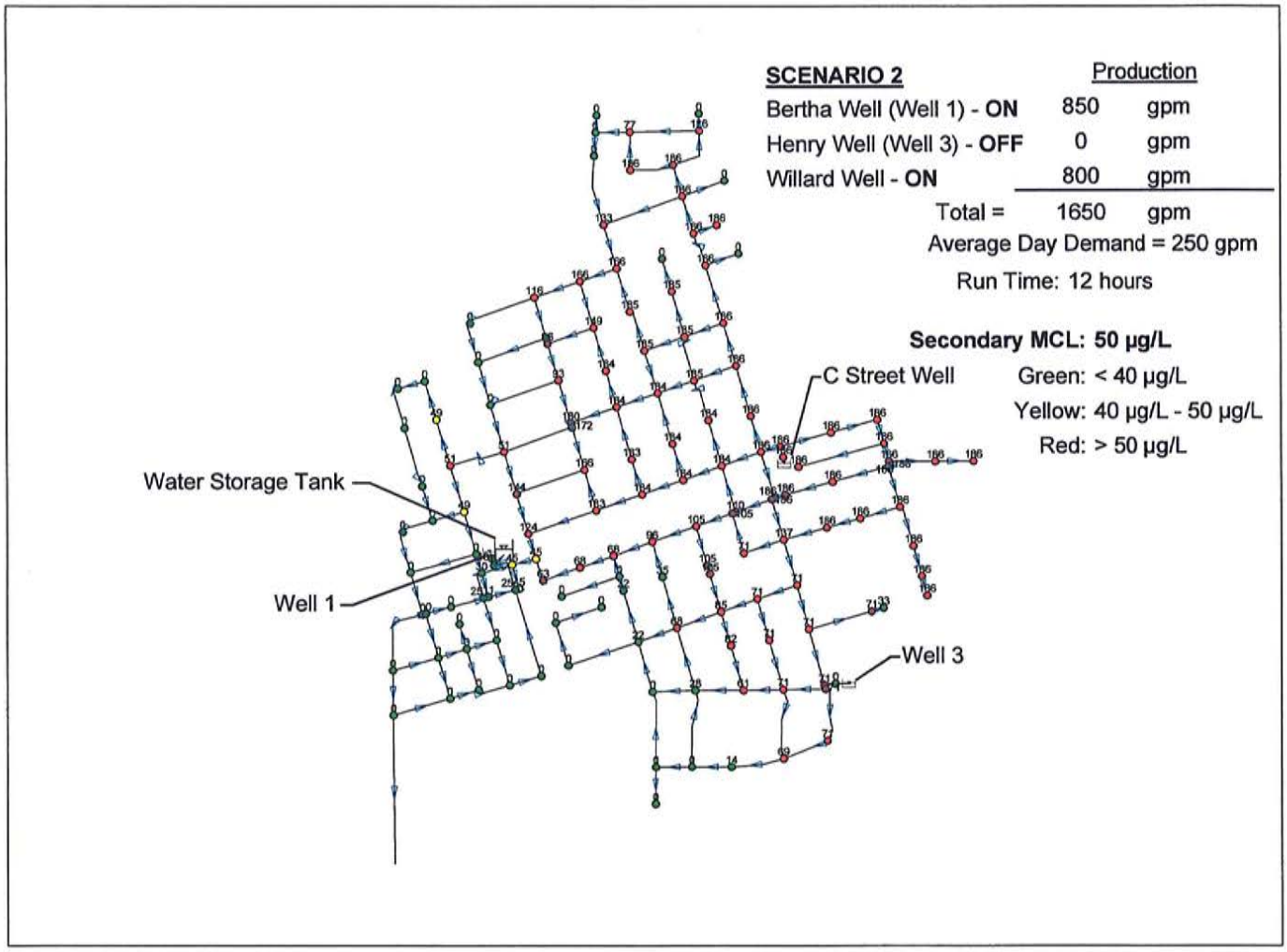

Scenario 1 - Manganese
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Manganese (ug/L)
200
150
100
50
0
Secondary MCL = 50 ug/L
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Manganese (Scenario 2)



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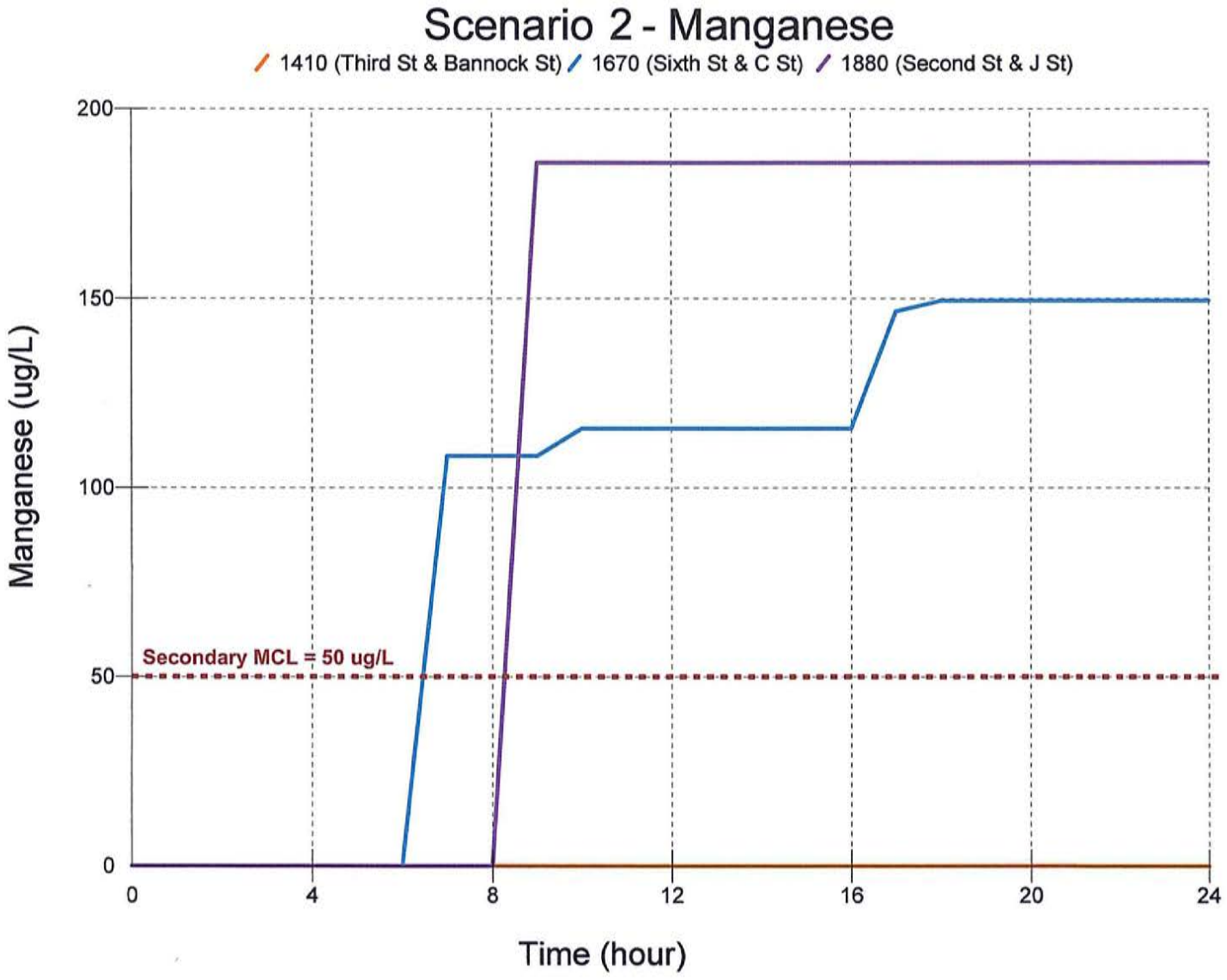
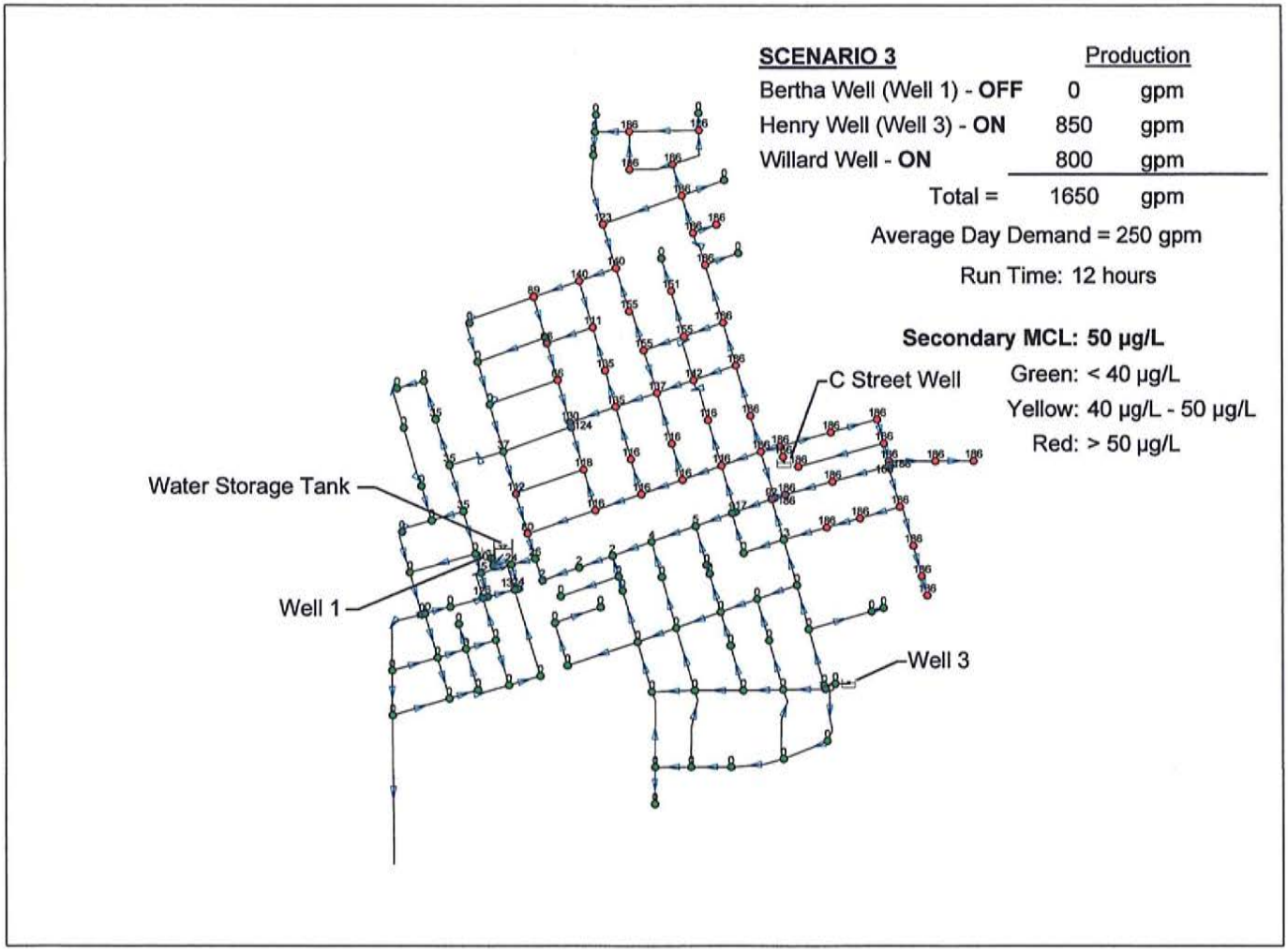

Scenario 2 - Manganese
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Manganese (ug/L)
200
150
100
50
0
Secondary MCL = 50 ug/L
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Manganese (Scenario 3)



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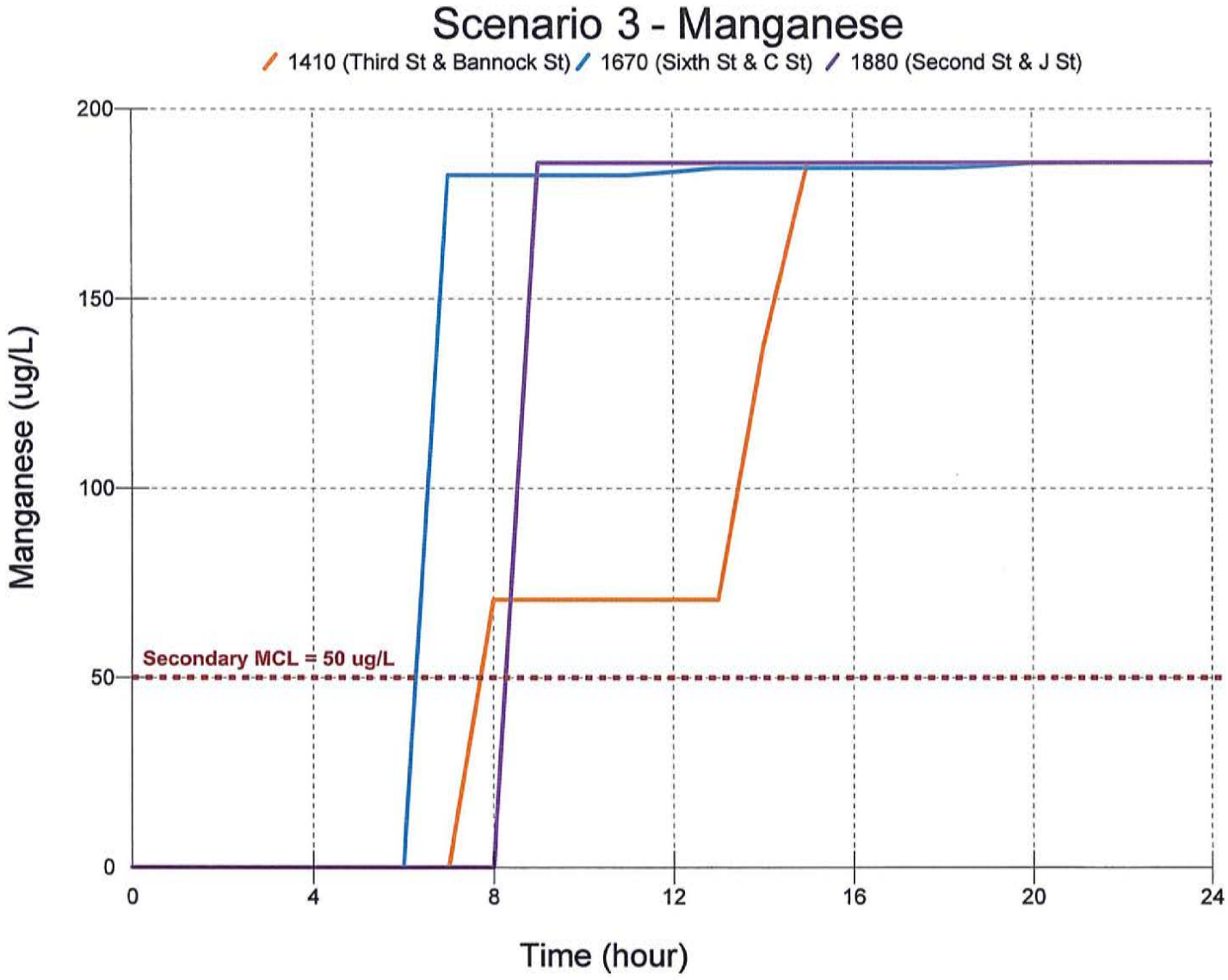
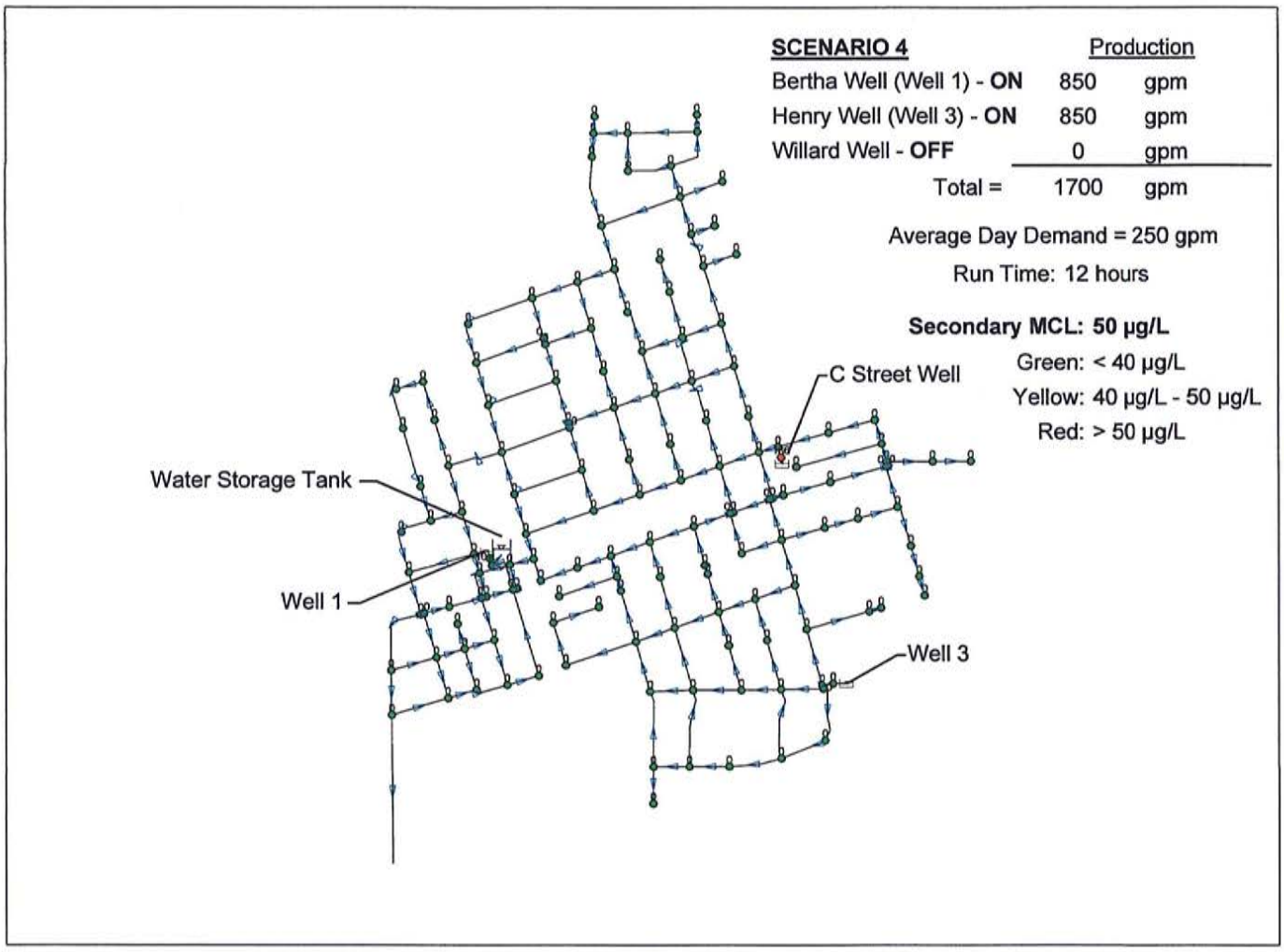

Scenario 3 - Manganese
1410 (Third St & Bannock St)
1670 (Sixth St & C St)
1880 (Second St & J St)
Manganese (ug/L)
200
150
100
50
0
Secondary MCL = 50 ug/L
0
4
8
12
16
20
24
Time (hour)

Biggs Water Model - Manganese (Scenario 4)



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Scenario 4 - Manganese