



AGENCY:	City Council
MEETING DATE:	January 5, 2016
DEPARTMENT:	Admin, Public Works, CDD
PRESENTED BY:	Staff

AGENDA ITEM SUMMARY

TITLE:

CONDUCT CITY COUNCIL WORKSHOP TO RECEIVE REPORTS AND DISCUSS VARIOUS TOPICS RELATED TO THE CITY OF FORT BRAGG'S WATER SUPPLY

ISSUE:

This workshop is intended to help educate the City Council and the public about Fort Bragg's water supply issues. At the workshop, staff will identify and frame a number of policy issues that will require Council deliberation and action in the future. The discussion is intended to help establish priorities and expectations regarding timeframes for various actions.

RECOMMENDED ACTION:

The workshop is intended to provide information. No Council actions are necessary.

ALTERNATIVE ACTION(S):

None

ANALYSIS:

The following discussion outline will be used to guide the presentation of information at the Council workshop. The outline is annotated with a number of attachments that provide background and summary information on various discussion topics.

1. INTRODUCTION

2. 2015 WATER EMERGENCY – STATUS UPDATE

- a. Noyo River extreme low flows– what did we learn? (Attachment 1)
- b. Supplemental emergency water sources (CVSCC & FBUSD shallow wells; Westport Water District) (Attachment 2)
- c. Governmental and regulatory assistance
- d. Role of Summers Lane Reservoir in preventing future Stage 3 Water Emergencies (Attachment 3)

3. CITY'S WATER SUPPLY, TREATMENT, STORAGE AND DELIVERY SYSTEM

- a. Three surface water diversions – operated in compliance with all license/permit requirements (Attachments 4 and 5)
 - i. Noyo River (Madsen Hole)
 - ii. Newman Gulch
 - iii. Waterfall Gulch

- b. California Fish & Game Code Section 1602 (Lake & Streambed Alteration Agreement) process and other regulatory issues
- c. Priority Water Enterprise Capital Improvement Projects (Attachment 6)
 - i. Summers Lane Reservoir (\$1.5M)
 - ii. New Water Tank (\$1M)
 - iii. Water Treatment Plant Rehabilitation (\$1.35M)
 - iv. Raw Water Line Replacement (\$2.3M)
 - v. Cedar Street Distribution Line Replacement (\$420k)
 - vi. East Fort Bragg Pressure Zone Upgrades(\$1.5M)

d. PRIORITIES

- i. Construct and fill the Summers Lane Reservoir in summer 2016*
- ii. Find funding for New Water Tank project*

4. WATER SOURCE DEVELOPMENT OPTIONS (Attachments 7 and 8)

- a. Summary of City's 1994-1996 Test Well Program
- b. Deep Groundwater- >50-feet deep
 - i. Water can be injected directly into distribution system
 - ii. Potential locations:
 - 1. Water Treatment Plant
 - 2. Willow Street pump station (CVSCC)
 - iii. Other potential deep well locations?
- c. Shallow Groundwater- <50-feet deep
 - i. Requires treatment unit; storage tank, prior to injection into distribution system
 - ii. Alternatively, construct pressure line(s) to Water Treatment Plant and treat as raw water
 - iii. Potential locations:
 - 1. Water Treatment Plant
 - 2. Willow Street pump station (CVSCC)
 - iv. Other potential shallow well locations?
- d. Other water sources - plumbed directly into raw water system
 - i. Hwy 20 Regional Park property – shallow well field (Attachment 9)
 - ii. Boddy property, Pryor property, Goble flats, etc.
 - iii. Waterfall Gulch property
- e. Desalination & Alternate Water Supply Technologies
 - i. Summarize Public Works Committee investigations to date

- f. Georgia-Pacific's water rights
 - i. Noyo River license
 - ii. Pudding Creek water rights
 - iii. Pudding Creek Reservoir

g. PRIORITIES

- i. ***Drill test wells at Water Treatment Plant and Willow Street pump station. Determine yield. If further investigation is warranted: prepare hydrological study/dry weather pump tests, identify development costs, define funding, implement.***
- ii. ***Continue to investigate other potential water sources.***

5. WATER SUPPLY FOR FUTURE DEVELOPMENT (Attachment 10)

- a. Historic water use trends
- b. Water availability for new development
- c. Water supply model – scenarios
- d. ***POLICY ISSUES (for discussion purposes only- no direction is sought at this time)***
 - i. ***Consider whether to limit issuance of new water connections***
 - ii. ***Consider whether modifications are needed to FBMC section 14.04.125 "Wells for Domestic Use" (Attachment 11)***

FISCAL IMPACT:

There are many facets to the fiscal ramifications of this discussion:

- The City spent a considerable sum of money this fall responding to the Stage 3 Water Emergency. The State allocated up to \$50k in emergency drought grant funds to cover the costs incurred by the City.
- The Summers Lane Reservoir project is estimated to cost \$1.5 million (including design, engineering, permitting, and construction). The City received a \$700k Prop 84 grant for construction of the reservoir. Additional funds for construction will come from the Water Enterprise fund balance.
- Drilling test wells at the Water Treatment Plant and Willow Street pump station is expected to cost \$50k total. If the wells produce sufficient water volumes, additional costs will be incurred to complete the groundwater development project.
- The Water Enterprise's 5-Year Capital Improvement Program includes about \$6M of unfunded projects. While grants may be available to fund some of these improvements, some portion of the costs will be borne by ratepayers.
- An analysis of first quarter Water Enterprise revenues from sales of water over the past three years reveals that, despite the reduced sales during the Stage 3 Water Emergency, the Water Enterprise is expected to stay on budget with regard to revenues in FY 2015-16. This is good news. (Attachment 12)

IMPLEMENTATION/TIMEFRAMES:

The Summers Lane Reservoir project will be put out to bid in February 2016, construction is expected to begin in April and be completed in early July. We plan to immediately begin filling the reservoir in order that some supplemental water will be available in late fall 2016.

The two test wells (Water Treatment Plant; Willow Street Pump Station) will be drilled in approximately 3 months, and should initial production tests warrant further investigation, dry weather testing and a hydrologic analysis would occur in the fall. If feasible, the new wells could be permitted, online and operational in 2017.

The City's evaluation of other potential water sources is ongoing.

Additional Council discussions of water policy issues will be scheduled as needed and/or as directed by the Council.

ATTACHMENTS:

1. Noyo River Extreme Low Flows – What did we learn?
2. 2015 Supplemental Emergency Water Sources
3. Role of Summers Lane Reservoir in Preventing Future Stage 3 Water Emergencies
4. City of Fort Bragg's Three Surface Water Diversions
5. Map of City Water System
6. Priority Water Enterprise Capital Improvement Projects
7. Water Source Development Options
8. Data Regarding 1994-1996 Test Well Program
9. Preliminary Engineer's Cost Estimate for Highway 20 Wellfield
10. Water Supply and New Development
11. FBMC Section 14.04.125 "Wells for Domestic Use"
12. 2015 Water Conservation Effects on Water Enterprise Revenues

NOTIFICATION:

1. None

City Clerk's Office Use Only

Agency Action ☐ Approved ☐ Denied ☐ Approved as Amended

Resolution No.: _____ Ordinance No.: _____

Moved by: _____ Seconded by: _____

Vote: _____

☐ Deferred/Continued to meeting of: _____

☐ Referred to: _____

ATTACHMENT 1 - Noyo River extreme low flows – what did we learn?

During the fall seasons of 2014 and 2015 Noyo River flows and projections hit new, record lows of less than 1 cubic foot per second (cfs). River flows this low had not been experienced by staff before. These extreme minimum flows set a new standard for emergency water operations. The timing of high tides and especially the “King” tides of greater than seven feet becomes a matter of concern when river flows drop below 6 cfs and the tides can completely overwhelm river flows at approximately 1 cfs. At such a time, Noyo River flows no longer reliably flush salt water out of Madsen hole after a high tide. This is especially problematic when both daily high tides exceed 6-feet. During river flows less than 6 cfs, high tides above 6-feet need to be closely monitored; when above 7-feet, at least temporary salt water intrusion can be expected. Water production from the spring sources, (Water Gulch and Newman Gulch), during extended drought conditions was measured to be approximately 300,000 gallons per day. Based on previous experience, it is expected that about three years of average to above average rainfall is needed to recharge the groundwater back to normal levels and flows.

In general, weather forecasts lose their reliability 7 to 10 days into the future. A two week look ahead is the limit for anticipating long-term weather conditions. Beyond that horizon, anticipated weather conditions are statistical estimates of the likelihood that weather will be similar/dissimilar to historic conditions and are not true forecasts. Actual dry or wet weather predictions are only loosely understood more than two weeks into the future. Consequently, planning for changes in the City’s water availability and operational modifications are limited to this two week horizon. As an additional point of information, “El Nino” is a phenomenon of abnormally warm water in the mid-Pacific. It can sometimes lead to increased chances for wet weather. “El Nino” is not a storm system or collection of storm systems.

The City purchased a bladder dam that can be placed on the river bottom to hold back salty, high tides from flooding Madsen hole when river flows are too low to adequately flush the hole out between high tide cycles.

At this time, normal winter conditions appear to have settled in. The usual cycle of storms are bringing rain to the area every few days and has been in place since the beginning of December. The long range, climatological expectation is for average to above average rainfall until about May 2016. Next fall and winter are expected to be generally normal. Noyo River flows have been at or above levels typical for this time of year. The most likely scenario is for a reasonably wet winter and spring leading to average river source availability through the summer and fall of 2016. The spring fed sources at Newman Gulch and Waterfall Gulch have not recovered and will probably not do so for another two to three years. The National Weather Service’s U.S. Drought Monitor shows our region in a severe drought that is predicted to improve, but nevertheless persist.

ATTACHMENT 2 - Supplemental emergency water sources

Operational adjustments during very low river flows now include the pumping of water around high tide periods. With the 2014 installation of a TDS (Total Dissolved Solids) meter at the pump intake, salt water intrusion can be monitored nearly in “real time”. This allows pump operations to be very finely tuned to river water salinity levels. This in turn allows much greater flexibility in blending water from the raw water ponds as well as the two spring sources. Because salt water can be prevented from reaching the raw water ponds, blending of low TDS water and moderately brackish river water is possible over longer periods of time that better work around high tides during very low river flow periods.

In fall 2015, supplemental emergency water was provided by deliveries from Westport that were made by the North Coast Brewing Company. This supplemental water was added to the City’s raw water to help the Brewery maintain adequate production. These deliveries were on top of work done modifying production volume and timing to minimize impacts to the water system.

The City also developed a supplemental well source at the CV Starr Center by re-activating an old de-watering well. This water was placed into tanks and then trucked to the raw water ponds.

Additional supplemental sources were lined up to further bolster supplies if necessary from: Willits via the Skunk Train and a pond in the vicinity of Jughandle Park.

ATTACHMENT 3 - Role of Summers Lane Reservoir in preventing future Stage 3 Water Emergencies

A fully operational reservoir at Summers Lane will hold 45 acre-feet of water. This is equivalent to nearly 15,000,000 gallons. This water is not intended to replace the existing water sources, but rather to provide additional water should existing sources be inadequate.

Using the fall of 2015 as a benchmark, up to 200,000 gallons per day was needed when high tide, salt water intrusion took the Noyo River source temporarily off-line. Full reservoir capacity would have provided approximately 75 days of additional water. If used continuously, this represents 2-1/2 months of water. If this water was only used during double, high tides episodes lasting seven to ten days per month, nine months of additional water would have been available.

Filling of the reservoir in 2016 will need to be suspended by August 31st so the Waterfall Gulch source can be returned to the regular water supply. Assuming six weeks of fill time and diverting all available flows from Waterfall Gulch, approximately 18 acre-feet of water can be stored in the new reservoir in 2016. This is about 40% of the reservoir's capacity of 45 acre-feet. At a daily use of 200,000 gallons per day, (equivalent to the daily water supply shortfall during the fall of 2015), about 30 days of supplemental water would be available under drought conditions similar to this fall.

In 2015, critical water supply problems were experienced during "King" tides. Therefore, 19 acre-feet of water would be adequate for at about four months of high tide problems, (e.g. September, October, November, and one additional month).

ATTACHMENT 4 - City of Fort Bragg's three surface water diversions

Existing water sources for the City operate under the following water rights:

Noyo River Appropriative Permit, 11383 (A017345)

Diversions from the Noyo River are permitted up to a maximum of 3.0 cfs. Bypass flows are required to maintain a flow of at least 10 cfs below the pumps whenever tides are below 2-feet during the period from October 1 through May 31. For the period June 1 through September 30, the minimum flow is required to be 3 cfs. When tides are above 2-feet, diversions are permitted. These requirements are met when the pumps are in operation.

Newman Gulch Statement of Diversion & Use, S009340 01

Newman Gulch diversions are limited to an annual maximum of 300 acre-feet. Actual diversions are below this limit.

Waterfall Gulch Appropriative License, 12171 (P017900)

Waterfall Gulch has a maximum, permitted diversion of 430 acre-feet at a maximum rate of 0.668 cfs. Actual diversions are below these limits. The Summers Lane Reservoir will be filled with water from Waterfall Gulch. The license for Waterfall Gulch is being updated to reflect this change.

During the recent water emergency, the City's two spring sources, Newman Gulch and Waterfall Gulch, together supplied about 300,000 gallons a day. On average, about 200,000 gallons per day was being drawn from the Noyo River. During extreme tidal conditions, the river water was not available. After process and testing losses, treated water distributed into the City's water system was between 450,000 and 500,000 gallons per day. Overall, water customers used less than 500,000 gallons per day after the declaration of the Stage 3 Water Emergency.

Under normal circumstances, the Noyo River provides approximately half of the City's raw water supply. The two spring sources usually supply an equal amount of the remaining raw water.

Attachment 5 shows the locations of the City's existing water sources (along with other water source development information).

ATTACHMENT 5- Map of City's Water System



ATTACHMENT 6 - Priority Water Enterprise Capital Improvement Projects (identified in 5-Year CIP)

The City's water supply is part of a larger system that includes treatment and distribution. Water supply planning operates within the context of this larger system. This is reflected by the water system improvements shown in the 5-Year Capital Improvement Program (CIP):

- Summers Lane Reservoir - \$1,500,000

This 45 acre-foot reservoir as in off-stream impoundment next to Newman Gulch that will store much needed water to supplement raw water supplies during low flow periods.

-New Water Tank - \$1,000,000

The City's oldest tank was built in 1955 and stores nearly half of the City's finished drinking water. It is ready for replacement with a new, corrosion resistant, glass-lined tank. Before it can be taken off-line for either rehabilitation or replacement, a new Water Tank must be installed. The location would be on City property on the north side of Cedar Street across from the Corp Yard/Water Plant.

- Water Treatment Plant Rehabilitation - \$1,350,000

The existing filters and clarifiers are 30 years old and the time has come for a full scale rehabilitation of these facilities.

- Raw Water Line Replacements (multiple projects) - \$2,300,000

The City of Fort Bragg has three raw water sources, two of which deliver water to the water treatment facility through the use of a transmission line. Parts of the line have been in place for decades and are ready for replacement.

- Cedar Street Distribution Line Replacement - \$420,000

The City of Fort Bragg has two water transmission lines from the Water Treatment storage tanks that provide water for the entire City. One of these is between the transmission line in Sherwood Road/Oak Street and the City Water treatment plant. It lies partially on private property and should be relocated.

- East Fort Bragg Pressure Zone Upgrade - \$1,500,000

In recent years, the pumps serving the pressure zone have been rehabilitated. However, the pipes are in need of upgrades or replacement.

ATTACHMENT 7 – Water Source Development Options

During the recent, extreme drought conditions, our existing water sources were stretched to their maximum limit for water production. Supplemental, long-term, water supply is necessary for robust water reserves as well as anticipating future water needs. Groundwater is the most expeditious and economic source available to the City of Fort Bragg. A combination of sources producing, in aggregate, 200 gallons per minute (gpm) or more is the goal. In general, it is unlikely that supplemental groundwater sources can be put directly into the City's distribution system without some sort of treatment.

Deep Groundwater

These are sources that are generally deeper than 50 feet. They are considered separate from surface waters and do not require chlorination similar to surface water.

The first choice for developing new wells that can tap groundwater will be on City owned property. These locations are very convenient locations for access to power and the City's water system where any supplementary water treatment is easy to accomplish. A test well will be drilled at the Corporation Yard near the raw water ponds. In addition, a well is being developed on the City's property at the CV Starr Center. It will be a new well and not the former dewatering well that was used during this year's water emergency. Drilling a test well, (4-inch diameter and 150-feet deep), is estimated to be about \$25,000 per well.

The City owns property on Highway 20 next to the water tank. There is evidence that deep wells in the vicinity of the Highway 20 tank may not be very high producers. This location will not be investigated further.

Furthermore, in 1995, wells were drilled near the Noyo River. Those downstream of the river's confluence with Newman Gulch produced brackish water which was not desirable for direct injection into the City's water distribution system. Test wells farther up the river were less salty. Production amounts were often in excess of 100 gpm which is encouraging.

Shallow Groundwater

Shallow wells, (generally less than 50 feet deep), cannot ordinarily be properly sealed to protect water from pathogens and other contaminants in surface water that can easily reach the groundwater. This water is essentially considered surface water with the similar chlorine treatment requiring large tanks like a normal water treatment plant. Small wells would require tanks of 100,000 gallons or larger to ensure adequate contact time and concentrations between chlorine and the water being treated. If shallow wells are pursued, it would be appropriate to use multiple wells supplying a single, satellite, water treatment facility. Ideally, the existing water treatment plant could be used for this purpose.

In the event that the well next to the CV Starr is developed as a shallow water well, the City may work with the Fort Bragg Unified School District (FBUSD) to supplement it with water from a nearby well at Redwood School.

Groundwater- direct connection to raw water system

Between 1994 and 1996, the City investigated several locations, (private and public property), within the City to develop as new water sources, (see attached table and map). Development of

these sources was abandoned for a variety of reasons: low yields, groundwater drawdown concerns, and potential contamination. Other potential locations on private property are being considered: (a) the Boddy parcel – 20100 Hanson Road, and (b) Pryor parcel – A&W haul road. Preliminary review of these sites indicates that water quality may be a challenge at these sites, (either tannins or brackish water).

The City has also been considering the creation of a well field on the Mendocino Coast Recreation and Park District property adjacent to the Newman Gulch reservoir. There are numerous, low yield wells that could be collectively used as a water source. The total water yield is thought to be between 150 and 200 gpm. Hurdles to overcome include: water quality issues (elevated levels of tannins), the cost of over 20 pumps plus the associated plumbing, and groundwater availability just upstream of Newman Gulch during drought episodes. Also, purchase of the site and long-term management are important cost issues. See Attachment 8 for Engineers estimate of costs of wellfield development.

The City owns 40 acres around and upstream of its Waterfall Gulch spring. This area will be investigated for possible development of additional wells.

Desalination and Alternate Water Supply Technologies

Longer term, alternate water supply technologies, including desalination and other recent technological innovations are being examined. Data is being collected from other coastal California communities that have recently added reverse osmosis desalination facilities to their water systems. Desalination technology is of special interest in combination with the higher yielding, brackish water sources that are under investigation. Other technologies that are of interest include: fog harvesting, solar desalination, and water reclamation from the Waste Water Treatment Plant

Georgia Pacific's Water Rights

GP has asserted three different water rights:

1. A pre-1914 right to divert and store water from Pudding Creek. Diversion rate: approximately 0.8 cfs. Timing: Year-round Storage: 60 AF. This right is not well-documented and may be subject to a claim of abandonment.
2. A licensed right to divert and store water from Pudding Creek. Diversion rate: 1 cfs. Timing: Year-round. Storage: 200 AF (October 1 – June 30). Water right is for Industrial purposes; Place of use is restricted to the GP mill site property.
3. A licensed right to divert water from Noyo River. Diversion rate: 1.3 cfs; maximum 475 acre-feet per annum; Timing: May 15-Dec 1. Water right is for Industrial purposes; Place of use is restricted to the GP mill site property.

Pudding Creek Reservoir:

- Only GP's two Pudding Creek water rights include storage, though historically GP has commingled all of its water rights at the Pudding Creek reservoir.
- In 2011, the available capacity on the Pudding Creek Reservoir was estimated at 67 acre feet of fresh water storage based on saltwater intrusion. The water stored in the dam

above the isocline which is formed at the height of the high tide is salt free and GP's engineers (West Yost) determined that this would limit the amount of fresh water which could be withdrawn from the reservoir to 67 acre feet.

- The capacity of the reservoir is also considerably diminished by the substantial amount of sedimentation that has occurred over the years.
- The structural viability of the dam is questionable.
- GP is considering removal of the dam.
- The infrastructure for piping Noyo River water to the Pudding Creek reservoir is not operational.

ATTACHMENT 8 – Data Regarding 1994-1996 Test Well Program

City Test Wells (c. 1994 – 1996)

Name	Type of Well	Location	Date Completed	Depth of Well (Feet)	Estimated Well Production (GPM)	Water Quality Issues	Status of Well	Comments
"Alley Well", Franklin	Test Well	E. of Franklin & N. of Walnut	1/20/1995	125	100	N/A	Abandoned	N. of Walnut Apts. See Note (a)
"Alley Well" Franklin	Production Well	E. of Franklin & N. of Walnut	9/10/1996	140	Low Yield	Contamination? No record	Abandoned	N. of Walnut Apts. See Note (a)
"Water Plant"	Test Well	Water Plant/Corp Yard	11/15/1994	205	30	N/A	Abandoned	See Note (b)
"Water Plant"	Production Well	Water Plant/Corp Yard	6/26/1996	200	N/A	N/A	Abandoned	See Note (b)
"Rose Memorial" Well #1	Test Well	760 N. Franklin	11/28/1994	310	1	N/A	Abandoned	
"Rose Memorial" Well #2 (Northerly)	Test Well	760 N. Franklin	4/20/1995	230	5	N/A	Cased	
"Rose Memorial" Well (Southerly)	Test Well	760 N. Franklin	4/21/1995	155	12	N/A	Cased	
"Pudding Creek"	Test Well	32800 Pudding Creek Rd	4/26/1995	196	4	N/A	Abandoned	FB Waste Mgmt. Transfer Station
Cedar/Rasmussen Area	Test Well	Cedar/Rasmussen- Precise Location is Unknown	11/20/1994	120	2.5	N/A	Abandoned	Sink Hole

Noyo Test Wells (c. 1995)

Name	Type of Well	Location	Date Completed	Depth of Well (Feet)	Estimated Well Production (GPM)	Water Quality Issues	Status of Well	Comments
"Goble" Well #1	Test Well	30731 Sherwood Rd.	11/1995	105	5	Salty/ Brackish	Abandoned	See Note (d)
"Goble" Well #2	Test Well	30731 Sherwood Rd.	11/1995	100	150	Salty/Brackish	Abandoned	See Note (d)
"Goble" Well #3	Test Well	30731 Sherwood Rd.	11/1995	120	3	Salty/Brackish	Abandoned	See Note (d)
"Avilla" Well	Test Well	31551 Chestnut St.	6/1995	125	300+	Salty	Abandoned	Most likely abandoned and not pursued due to salt.
"Peavy" Well #1	Test Well	31300 Chestnut St.	6/1995	120	200+	Salty	Abandoned	Most likely abandoned and not pursued due to salt.
"Peavy" Well #2	Test Well	31300 Chestnut St.	6/1995	125	No Record	No Record	Abandoned	Most likely abandoned and not pursued due to salt
"Peavy" Well #3	Production Well	31300 Chestnut St.	8/1995	126	210	No Record	Cased	Record unclear, water may have been less salty.

NOTES REGARDING TEST WELL PROGRAM:

- (a) Alley East of Franklin Street Well. In 1995-1996 the City decided to pursue two locations, (this location and Water Plant), with the possibility of drilling production wells. Work on the Alley Well stopped at 140 feet after realizing that the material in the well below 70 feet was not conducive to the development of more than a low yielding shallow well. Soils different from those in the test well was discovered. The well could have been completed and sealed to a depth of 50 feet, but the City decided to abandon the well. The City was concerned that constant pumping from the upper aquifer would reduce the amount of water available to other wells in the area. Also, there was a concern that the water in the upper aquifer could potentially be contaminated records are unclear as to nature of possible contamination).
- (b) Water Plant Well. In 1995-1996 the City decided to pursue two locations, (this location and the alley east of Franklin Street), with the possibility of drilling production wells. The City moved on to the Water Plant Well after the disappointing results from the Franklin Street alley well. The record is not entirely clear; there is a well completion report from the correct time frame that states that the well was drilled and abandoned. However, there is also a summary to the City Council stating that the construction of the production wells was cancelled. It is believed the well was drilled and then abandoned but the reason(s) for the decision is not stated. The preliminary production was estimated to be 30-40 gpm. Subsequently, the well driller estimated that well production from a 200-foot well would likely be 50 gpm. There was a bid alternate for this project to add a second well that apparently was not exercised.
- (c) Noyo Test Wells, in general. During 1994-1995, the City drilled test wells on 3 private properties: Peavy, Avilla and Goble. They all bordered the Noyo River. At each location they found estimated yields of 100 gpm or more. While the yield was a really positive sign, the water quality was noted as salty or brackish. In 1996, after the Franklin Alley and Water Plant project was cancelled, the City had more test wells drilled east, (upstream, along the Noyo River), of the initial test wells. Apparently, three wells were drilled in an attempt to find the interface between freshwater and the saltwater encountered downstream. Fairly deep water bearing gravel strata was found on all three sites and one location on each side of the river had quite good conditions. While these results were positive and the City considered developing one or more production wells, it appears water rights issues were too great a concern. Correspondence between the City and the SWRCB discussed the high probability that the water being pumped would be considered Noyo River underflow. A new water right permit or license would be required to pump water from the wells and not have it count against our current Noyo River diversion limits.
- (d) Goble Wells. The water from these wells was found to be brackish. Being relatively close to the ocean this condition was surprising. However, it is worth noting that one of the wells was cased. Future development of this well may have been intended. Again the water from these wells is likely Noyo River underflow with the associated water rights issues.

ATTACHMENT 9: Preliminary Engineers Cost Estimate for Hwy 20 Well Field (Regional Park property)



015062.00

December 30, 2015

Ms. Linda Ruffing
City Manager
416 N. Franklin Street
Fort Bragg, CA 95437

Dear Ms. Ruffing:

SUBJECT: PRELIMINARY ENGINEER'S ESTIMATE FOR THE DESIGN AND CONSTRUCTION OF THE HIGHWAY 20 SITE WATER-SUPPLY WELLS, FORT BRAGG, CA

INTRODUCTION

Attached is a conceptual engineer's estimate for a potential water-supply well system on the property north of Highway 20 and east of Summers Lane, northeast of the City of Fort Bragg (City), California (**Figure 1**).

Lawrence & Associates (L&A) understands the City wishes to explore the cost of installing municipal water-supply well system on the property. Because groundwater is found within a relatively shallow (typically less than 80 feet thick) alluvial aquifer, numerous shallow wells would be needed to provide a suitable quantity of water. To prevent overdrought and well interference, the wells would be dispersed in accessible portions of the site outside of the sensitive Pygmy Forest area. Based on earlier studies performed by L&A, assuming the wellfield would consist of 28, 60-foot deep wells, the new well field would be anticipated to yield approximately 270 gpm.

Based on our previous work on the property, L&A understands that there is an existing system of poorly maintained unpaved trails, and a power line easement surrounded by dense trees and brush and periodically crossed by ephemeral or seasonal drainages. Our scope of work did not include a review of the condition of the existing trails.

ATTACHMENT 9: (Cont'd)

This estimate is not based on an engineered design or calculations. All quantities were taken from a 1-inch-equals-400-foot scale maps and should be considered approximate. The assumptions for site development and system installation described herein are intended to provide a general scope suitable for a conceptual estimate and do not contain the detail needed for design-based engineer's estimate.

ASSUMPTIONS

Access to Well Sites

Access to the well field system (**Figures 2 & 3**) would utilize the existing rough trail system to the extent feasible, although five wells would require new, pioneered access paths. For this estimate, we assume that the existing trails would require, for the most part, minor grading to one 15-foot wide lane using a motor grader, an average of one 20-foot long, 18-inch diameter culvert for every 500 feet of trail, and no additional clearing. We assume that the trails would be finished with a 12-foot wide by 4-inch thick $\frac{3}{4}$ -inch minus aggregate base.

For construction of new access roads, we assume that a brush hog would clear the path and spray the chips into the surrounding forest, and dozer would grub the path and create a pad for the water well drill. Fine grading would be provided by a grader as described above for existing roads. Stumps and roots would be spread and disposed on site.

At each well site, a pad would be established for the water-well drill rig and later covered with aggregate base. We assume that the wells would be drilled during the summer and that the well locations will be in accessible firm soil.

Depending on the needs of the City, the costs for access can vary greatly. For this estimate we have assumed all weather access to all wells with a four-wheel-drive vehicle. If limited access is acceptable, the cost could be reduced. If access by non-four-wheel-drive vehicles is required, the cost will increase.

Well Construction

To reduce the potential for vandalism and eliminate the cost of a well house, we assume that each well would connect to distribution piping underground via a pitless adapter. If a pitless adapter is not allowed by the local health department, prefabricated well house would be required. Each well would be isolated from the distribution system using check valve and can be shut off using a gate valve. Both valves would be located in a utility vault adjacent to the well. If a well house is required, the valves would be above ground in the well house. The well site

ATTACHMENT 9: (Cont'd)

would include a concrete housekeeping pad, a 10-foot x 20-foot gravel parking area, and a 10-foot by 10-foot fenced area.

Water from each well would be transmitted by a minimum 2-inch diameter buried lateral pipeline. A 6-inch diameter PVC main would collect water from multiple laterals and direct the flow to the existing water supply piping at Newman Gulch Reservoir. Air/vacuum relief valves would be located at high points in the system and at main control valves.

Electrical Supply

Based on Lawrence & Associates 2006 investigation, our records show that power for the site is available at entrance to the property along Highway 20 and not from the powerline that runs through the property. We assume that the 69-kV line power would be routed overhead to a central distribution point where a service connection and transformer would step the voltage down to 480 V three-phase power for distribution to the wells. More than one service drop may be required, but it is impossible to determine the number of drops before design. To reduce cost, we assume that the 480 V lateral power to wells would be run on overhead lines.

We assume that a pole would be installed adjacent each well would be outfitted with backer board containing a transformer, power disconnect, and pump control with pump saver (to protect pump in a pump-dry condition). The pole at each well would be fitted with an overhead LED light and 110 v convenience receptacle.

Design and Permitting

We assume that the Environmental Impact Report (EIR) developed for the uncompleted golf course project can be used as a reference document for the much smaller well project, that the City Planning Department would prepare an initial study for the project in-house (if needed) and that only limited budget would be required for biological and archaeological review to support an Initial Study.

We assume that design would add roughly 10% to the cost of construction and contract management and special inspections would add another 8% to the cost of construction. L&A recommends using a 20% contingency for unexpected conditions.

COST ESTIMATE

The total estimated cost for design, construction, and construction monitoring is estimated to be approximately \$3,560,800 including a 20% contingency. The following page includes a table summarizing the attached conceptual engineer's estimate.

ATTACHMENT 9: (Cont'd)

Conceptual Estimate

Item	Cost	Notes
Permitting	\$30,000	Assumes City would prepare CEQA documents, cost is for expert support
Design	\$254,226	Estimated at 10% of construction costs
General Requirements	\$140,845	Surveying, Mobilization, and Bonds
Sitework	\$1,138,312	Access grading, clearing and grubbing, water line in trench, finish grading and gravel, well site improvements
Equipment	\$280,200	Well head and well, valves, vaults, and fittings
Electrical	\$1,123,750	Main power supply, later power distribution, electrical equipment, pump controls
Subtotal	\$2,967,333	
20% Contingency	\$593,466	
Total	\$3,560,800	

The unit prices used for this estimate were a combination of RS Means 2014, pricing from local material suppliers, and prices from comparable projects managed by Lawrence & Associates.

Please feel free to contact either me if you have questions regarding the estimate.

Sincerely,



Jesse Solorio, PE
Senior Civil Engineer
jsolorio@lwrnc.com

ATTACHMENT 10 - Water Supply and New Development

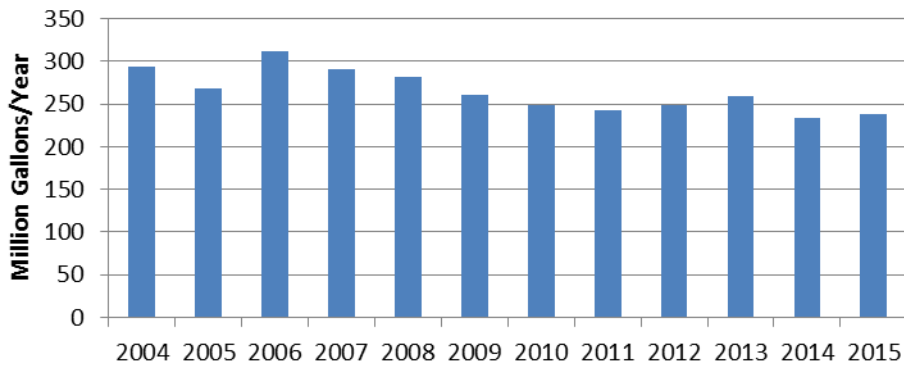
The City's recent experience with a prolonged Stage III drought emergency appropriately raises questions about the impact of new development on water demand and what steps the City could take to apportion water capacity to new development projects.

Water is a very fluid resource, and so are the community's water demand, supply and storage capacity. The City's annual water demand is not linear: it goes up and down over the years, although the overall trend is down - towards less water use. Our water use as a community has declined (see Chart 1) due to a multitude of factors including: user conservation, water processing improvements, fixing leaks, and changing standards for fixtures and equipment. Likewise, our water supply is also in flux due to: the quality and quantity of the annual rain fall, our ability to store water, potential ground water resources, regulatory changes that may impact our diversion rates of surface waters, and many other factors. The City Council would be well served to make a review of our water demand and resources a regular (annual) part of our business, so that the City Council and community have a good understanding of water on a going-forward basis and so that City Council can make timely policy and capital improvement decisions.

In order to understand the potential demand for water in the future, it is important to look at how past demand has changed due to new development, conservation and changes in the water pricing structure. Chart 1, below, illustrates trends in historic water production which are tied to conservation, pricing and development trends. The chart illustrates:

- 1) Stable overall water usage during a time of economic growth (2004-2007) due to the water moratorium that required new development projects to install water retrofits in existing residences so that the new development would have no net increase in water use;
- 2) An artificial water use spike in 2006, due to the City's water maximization effort, which was geared at increasing water use so that the City could apply for a permanent water license on the Noyo;
- 3) Declining water use from 2007 through 2011, which parallels both the recession and community efforts at conservation given new higher water rates; and
- 4) Relatively flat water usage between 2011 and 2015, illustrating the combined effects of continued conservation with a small increase in new development.
- 5) A slight rise in water use in 2015 due to two large leaks in the City's water distribution system.

**Chart 1: Fort Bragg Water Production
2004-2015**



Over the past five years the City has approved 66 discretionary and ministerial projects which have resulted in net total demand for an additional 5.5 million gallons/year or about 2.3% of all current water use, which is 245,000,000 gallons/year. Ministerial projects accounted for 11% or 605,000 gallons of the net new water use, while discretionary projects accounted for 89% or 5 million gallons of net new water use. As the largest single user, the North Coast Brewery was responsible for 61% of all water use or 3,388,380 gallons.

New Residential Development & Water Use. Table 1 enumerates the change in water demand resulting from 51 discretionary and ministerial residential projects which were approved between 2010 and 2015. New residential development resulted in an average annual increase in demand of 271,000 gallons per year and an increase in total water use of 1.6 million gallons by the end of the five year period. Seventy percent of the new water demand was from discretionary projects which required planning approvals while 30% was from ministerial projects which only required a building permit. The Cypress Street Cottages affordable housing project was the single largest new residential water user with 406,000 gallons per year.

Table 1: Discretionary & Ministerial Residential Projects With Water Use Increase (2010-2015)

Year	Project Type	Gallon of Water Per Year		
	Residential Projects	Discretionary	Ministerial	Total
2015	Two Single Family & One Duplex	171,374	-	171,374
2014	Two SFR, One Duplex, One 2nd Unit	85,687	107,109	192,796
2013	Two Second Units	42,844	-	42,844
2012	27 Affordable Senior Residences, 1 SFR	406,260	42,844	449,104
2011	Two Second Units, One Duplex, One Modular	64,265	128,531	192,796
2010	Three Second Units, 4 unit Subdivision, 4-Unit complex, 1 Modular	364,170	214,218	578,388
	Total Residential Demand (2010-2015)	1,134,601	492,701	1,627,302
	Average Annual Residential Demand	189,100	82,117	271,217

New Commercial Development & Water Use. Table 2 illustrates total water use of 15 new commercial projects approved between 2010 and 2015.

- New discretionary commercial development resulted in an average annual increase in demand of 75,000 gallons per year (excluding the North Coast brewery expansion). Total average annual water demand from new development over the past five years amounted to about 680,000 gallons per year or about 0.26% of the City's annual water production of 245 million gallons of water.
- Over the five year period, commercial development added 3.9 million gallons of annual demand for about 1.6% of current water production. Again, the majority of this demand, 3.3 million gallons, was by the Brewery. The Brewery has reduced its water use on a per barrel of production basis, however it has increased production significantly. As the largest single water user, future North Coastal Brewery expansion plans have the potential to place large demands on the City's water.
- Other new commercial development, excluding the Brewery, has increased water demand by a relatively small amount by 564,000 gallons over the five year period, which totals 0.23% of all water use for the five year period. On an annual basis, other new commercial development added 112,000 gallon/year, or an annual growth rate of 0.04% in new water use.

Table 2: Discretionary & Ministerial Commercial Projects With Water Use Increase (2010-2015)

	Commercial Projects	Discretionary	Ministerial	Total
2015	Small Brewery	274,000		274,000
2014	Taco Bell, Auto Towing and Repair, Expansion of Existing Restaurant/Bar	306,360	112,601	418,961
2013	825 S Main, Change of Use from Office to Retail (Affinito)	(111,000)		(111,000)
2012	Expansion of Brewery, Demolition of GP Buildings, Expansion of Casa Del Noyo Restaurant, Demo of 221 & 221 E Redwood	3,403,860		3,403,860
2011	Convert Bowling Alley with Restaurant into a Church, Expand Coast Clinics Healthcare Facility, Install County Office at 790 S Franklin	(65,120)		(65,120)
2010	Demo and Install slightly larger garage for Auto Repair, Install two portable classrooms	31,820		31,820
	Total Commercial Demand (2010-2015)	3,839,920	112,601	3,952,521
	Average Annual Commercial Demand	639,987	112,601	658,754
	Average Annual Commercial Demand (w/o North Coast Brewery)	75,257		94,024

14.04.125 WELLS FOR DOMESTIC USE. SHARE

A. For the purposes of this chapter, wells for domestic use, shall be construed as wells for residential, commercial and industrial uses with water quality suitable for human consumption and other personal needs.

B. The City will allow connection of appropriately permitted new domestic wells only during a time of a water hook-up moratorium, i.e. where a moratorium on water connections or added use has been imposed by a state agency or the City, or when there is an absence of infrastructure to serve the property. Once the moratorium is lifted or the necessary infrastructure is provided, the property owner must connect to the City water system within sixty days of written notice from the City and convert the domestic well to a nondomestic well (see § [14.04.127](#)).

C. EXCEPTIONS:

1. Domestic wells existing prior to June 9, 1994 shall be recognized by the City as legally allowable.
2. The City may allow domestic wells on a permanent basis in lieu of connecting to the City's water system under specified circumstances. Specified circumstances would include, but are not limited to:
 - a. A well having hydrological study conducted by a licensed professional during the dry summer months, said study concluding that the well would support the proposed land use and there that would be no significant impact on adjacent ground water wells; and
 - b. The water quality from said well is found acceptable to the State Department of Health Services or other appropriate agency.

D. Where any well is located on a property where there is also a connection to the City's water system, there must be an approved backflow prevention device installed at the water service connection.

(Ord. 757 § 2, passed -- 1993; Am. Ord. 812 § 1, passed -- 1999)

14.04.127 WELLS FOR NONDOMESTIC USE. SHARE

Wells for landscaping, irrigation or industrial purposes shall be allowed on any City lot. Such well shall meet the City's backflow preventive standards and shall be used for no other purpose but supporting the irrigation system or industrial use. (Ord. 755 § 2, passed -- 1993; Am. Ord. 773 § 1, passed -- 1994)

ATTACHMENT 12 - 2015 Water Conservation Effects on Water Enterprise Revenues

Although the Water Enterprise has various revenue streams, the primary revenue source is sales of water in the City. The following analysis focuses exclusively on the primary revenue source. FY 2015-16 (i.e., FY 16) first quarter sales of water in the City total \$697,255. By way of comparison Q1 FY15 totaled \$606,027. Year over year first quarter sales of water in the City increased \$91,228 or 15%.

Three Year Comparison of Q1 Sales

July Thru September 2014	\$ 587,565
July Thru September 2015	\$ 606,027
July Thru September 2016	\$ 697,255

Water Sales in the City during the months of October and November (during the Stage 3 Water Emergency) tell a different story. October and November FY16 sales total \$389,928 while the total for the same period in the prior year was \$387,982. Year over year sales during this two month period are essentially flat.

Three Year Comparison of Oct. & Nov. Sales

October Thru November 2014	\$ 357,390
October Thru November 2015	\$ 387,982
October Thru November 2016	\$ 389,928

Strong revenues generated in the first quarter appear to have negated the effect of rigorous conservation efforts during the months of October and November. FY16 sales through the first five months of the year are 45% of budget. Analysis of the previous five years shows this to be an appropriate level at this point in the year. The five year average is 43%.

Sales Thru November as % of Total Budget

2012 - 43%
2013 - 46%
2014 - 44%
2015 - 39%
2016 - 45%
Five Year Average - 43%

