Source: Water & Light

Agenda Item No: Item B

To: City Council
From: City Manager and Staff

Council Meeting Date: Jan 21, 2013

Re: Public Hearing - Construction of Alluvial Wells No. 16, 17, and 18.

EXECUTIVE SUMMARY:

Staff has prepared for Council consideration a resolution setting a public hearing on February 18, 2013 concerning the construction of the McBaine Alluvial Wells No. 16, 17, and 18 needed for additional raw water supply to the McBaine Water Treatment Plant. Funding for these improvements in the amount of $1,030,000 has been programmed in the Capital Improvement Program from the sale of revenue bonds approved by voters in 2008. A public hearing concerning the construction of Alluvial Well No. 16 was conducted September 21, 2009. This project was subsequently tabled after reports were presented to Council by; the United States Geological Survey and the University of Missouri's Civil and Environmental Engineering Group, concerning water quality in the McBaine bottoms alluvium on November 2, 2009. At that time staff was directed to review and analyze additional sites for the proposed wells. The need for additional water production capacity at the Water Treatment Plant was accentuated during Summer 2012 conditions when a new maximum peak production of 25.3 MGD was reached on July 21, 2012.

DISCUSSION:

A public hearing for the construction of Alluvial Well No. 16 was held on September 21, 2009 at which time a motion was made and approved by Council directing staff to proceed with the preparation of plans and specifications for the construction of Well No. 16. This motion was made with the condition that approval of Well No. 16 construction could be retracted at a later date, after presentations concerning water quality in the McBaine Bottoms could be made to Council regarding the findings of reports prepared by the United States Geological Survey (USGS), and the University of Missouri's Civil and Environmental Engineering Group. These reports were presented to Council on November 2, 2009, and based on the findings, Council directed staff to hold off on the construction of Well No. 16 and review and analyze alternate locations for the well.

Findings in the USGS "Ground-Water Flow 2004 -07, and Water Quality, 1992 -2007, in the McBaine Bottoms" report suggested that seventeen of the monitoring wells were affected by effluent based on chloride concentrations larger than 80 milligrams per liter. The probable source of the large chloride concentration in monitoring well samples adjacent to treatment wetland unit 1 was identified as leakage from the wastewater treatment unit. The source for the large chloride concentrations in the other monitoring well samples was identified as effluent mixed with ground water and Missouri River water that is used to fill pools on the Eagle Bluffs Conservation Area.

During the same time period as the USGS study, the City of Columbia was also monitoring samples from the production wells for selected constituents after the beginning of the treatment wetland operations, including those constituents that have shown the most substantial changes. Results from this sampling showed concentrations in the southernmost Alluvial Well No. 5 and 6 ranging from 21 and 24 mg/L in January 1999 to 103 and 69 mg/L in January 2007. Typical chloride levels in the Missouri River are approximately 19 mg/L, so conclusions were drawn that the source of chloride in the alluvium were coming from the wastewater treatment cells and the Eagle Bluffs wetlands.

In the USGS study, chloride has been identified as a readily traceable indicator compound for the tracking the movement of effluent within the ground water. Chloride is considered traceable good wastewater indicator because of it's unique and stable chemical behavior. Chloride ions do not significantly enter into oxidation or reduction reactions, do not form salts of low solubility, and are not significantly adsorbed on mineral surfaces. The same properties that promote chloride's persistence within the environment make it a poor tracer compound for other less stable contaminants within the groundwater. Chloride's unique stability and poor reactance with other compounds in the alluvium strata allow it to migrate much more quickly, and in higher concentrations, through the porous alluvial aquifer than other potential contaminants that tend to chemically react or bond to other compounds within the alluvium. Chloride is also abundant in the natural environment and is present in all natural water, although concentrations are typically low unless effected by natural deposits commonly referred to as salt deposits.

Chloride is an unregulated compound in the Environmental Protection Agency's (EPA) National Primary Drinking Water Regulations. However, Missouri has set a secondary maximum contaminant level (MCL) for chloride in drinking water of 250 mg/L. These secondary MCL standards are set to address taste and odor issues only and the chloride levels identified in the standards, are not considered to present a risk to human health at the secondary MCL. This secondary MCL is established because chloride levels above 250 mg/L in drinking water can contribute to a salty taste in the water.

The current McBaine well field, depicted in Exhibit "A", has fifteen vertical wells, each capable of producing approximately 2 MGD, with a theoretical peak pumping capacity of approximately 28 million gallons per day when all wells are in service. Due to the age of the wells and the partial plugging/fouling of the well screens and surrounding strata, the actual pumping capacity of the well field has been reduced to approximately 24.5 MGD. Observations and flow data have shown that with all wells in operation the well field has experienced a reduction in capacity equivalent to nearly two wells. Even with continued acid treatments of the well screens and surrounding strata, the specific capacity of all the wells continue to diminish as the wells age and encrustation is formed on the well screens. The declination of the specific capacity of all the wells in the well field are shown in the chart labeled Exhibit "B". At the time the three additional wells were programmed into the Capital Improvement Plan, the need for these three 2 MGD wells was determined in order to provide a firm well field capacity of 32 MGD to match the raw water treatment capacity of the Water Treatment Plant, and to provide one standby well as recommended by the Missouri DNR Design Guide for Community Water Systems. Currently due to the natural reduction in capacity of the existing 15 wells, the addition of these three wells will only return the well field to a design capacity of 28 MGD with one well in standby, thus still falling short of the 32 MGD of firm water treatment capacity of the Plant.

Ideally, standby wells are not utilized to meet maximum day production requirements, as the standby wells are typically reserved for backup in the event another well is out of service during periods of peak pumping rates. The need for standby wells was pronounced by the summer of 2012 water demands when average pumping rates for the months of July and August were 20.1 MGD and a new maximum daily peak was set on July 21, 2012 with 25.3 MGD of water delivered to the distribution system with approximately 1.7 MGD of this demand being supplemented by ASR wells. During this time, all fifteen wells in addition to occasional production from the ASR wells were in nearly continuous operation for a two month time period. Subsequently, during fall 2012 preventative maintenance routines, six wells have been required to be taken out of service for major repairs for the failure of items such as bearings, pump assemblies, and motors. If these items were to have failed on one or more wells during the times of peak demands, the existing ASR wells would not have been able to supplement enough water supply to meet the system demand, and system storage such as towers and reservoirs in the distribution system would have been diminished. Drawing down storage in the distribution system to meet daily demands is highly detrimental because these stores of water are necessary to ensure that excess capacity is available for public safety in the form of fire protection.

A study completed by Black and Veatch has identified several potential locations for the three new wells to meet the City's production requirements while maintaining acceptable water quality. This study included the review of previous engineering studies and available operational data to provide opinions on the need and possible locations for the new wells. As part of this study, a planning-level groundwater model using MODFLOW was developed to assist in understanding the flow paths of groundwater within the well field. This model was developed using broad assumptions based on data gathered from a 1968 well field study conducted by Layne when the well field was first developed, and from aquifer level data from USGS field measurements. The intent of this assumptive model was to serve as a tool to assist in understanding the flow of groundwater toward the well field, the affects of surrounding surface waters, and to assist in evaluating locations for the proposed new wells.

The results of this modeling analysis demonstrated that production wells located anywhere within the McBaine well field tend to draw groundwater from areas near the wastewater treatment cells, the Eagle Bluffs Conservation Area, and the Missouri River towards the groundwater depression created by the pumping operations within the well field. Although the Black and Veatch study recommended locating the new wells in the north end of the well field to protect water quality for the longest duration possible as reflected in their modeling, staff has determined that these well sites would still draw groundwater from these surface waters toward and potentially effect the water quality of the other production wells that continue to be necessary for the overall base level production capacity of the well field.

Staff determined that at this time it would be more prudent to site the new wells as far north on Starr School Road as possible while still being able to utilize the capacity of the large mains in the south end of the well field and preserve the north end of the well field for a future high capacity raw water source, such as a potential collector well. The proposed well locations would be able to utilize some existing City owned property and utilize the higher hydraulic efficiencies of the larger mains in the southern portion of the well field. Efficiencies improvements are achieved through lower operating pressures, lower water transmission velocities that reduce hydraulic energy losses and increase energy efficiency, and reduction of the adverse affects caused by water hammer. The development of the proposed wells, together with the possible addition of some monitoring wells, will provide an opportunity to gather the aquifer data necessary to conduct accurate hydro-geological studies for future well field expansions.

The attached Exhibit "C" shows all the sites that were considered for siting of the new wells. Staff is requesting the City Council's approval of sites "A", "C1", and "C2", as it will allow the best chance for the construction of wells this spring thus ensuring the water utility is able to meet the immediate water demands of the system while preserving the northern areas of the McBaine aquifer for the future development of high capacity and high quality raw water sources in the future. These proposed well sites have been presented to and approved by the Water and Light Advisory Board.

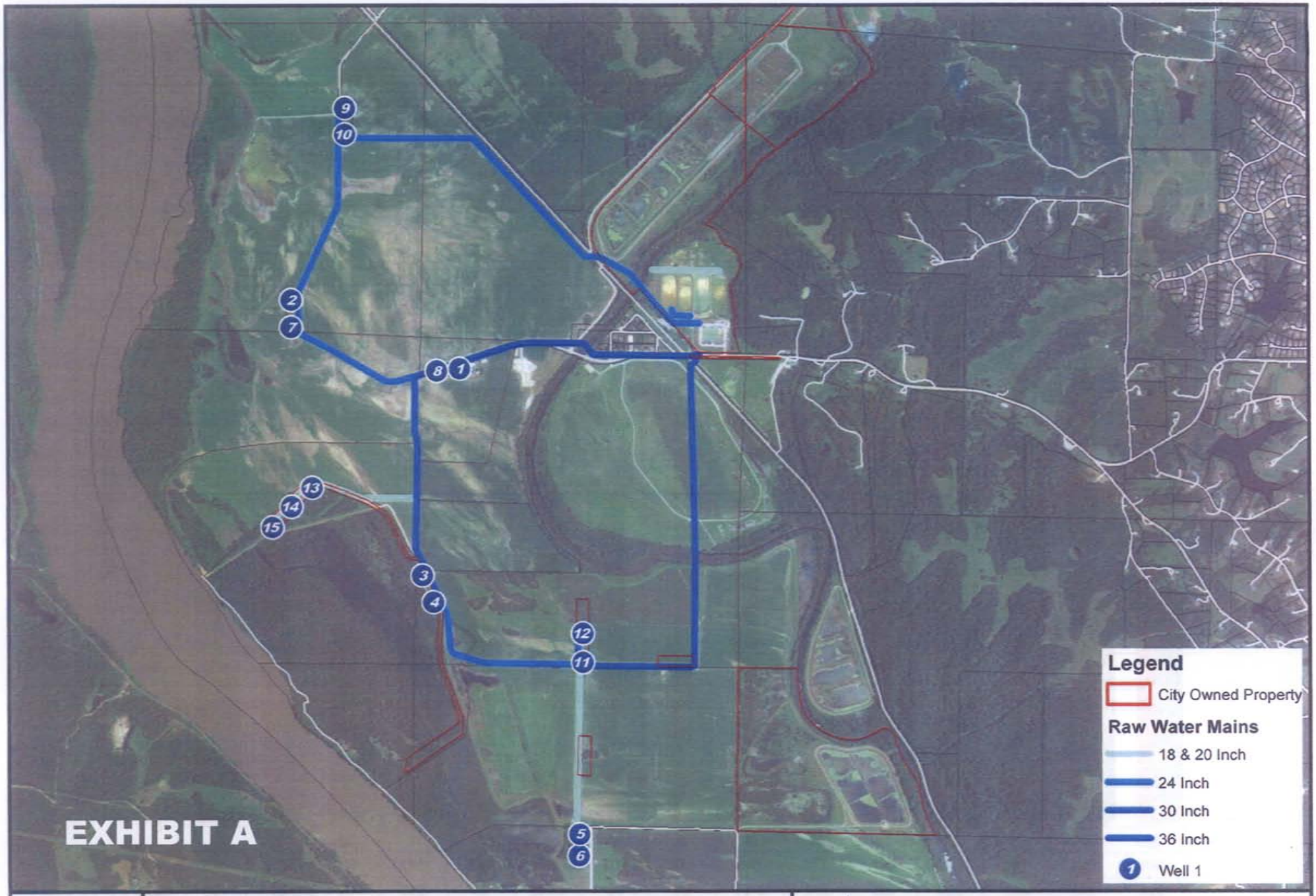
Some Advisory Board members have expressed strong interests in promoting water conservation, efficiency, re-use, and the adjustment of rate structures as method to curtail use and avoid costly infrastructure improvements. While these discussions and initiatives, together with reducing unaccounted for water, hold promise for reducing future water use and potentially offsetting the need for large infrastructure investments such as the expansion of the Water Treatment Plant and construction of a future collector well, these measures could not be implemented in time to limit the immediate need for the three proposed wells. Water conservation and demand reduction efforts should be encouraged by the City in order to delay additional expensive infrastructure improvements necessary in the future.

FISCAL IMPACT:
Funding for these improvements in the amount of $1,030,000 has been programmed in the current Capital Improvement Program from the sale of revenue bonds approved by voters in 2008.

VISION IMPACT:
http://www.gocolumbiamo.com/Council/Meetings/visionimpact.php

SUGGESTED COUNCIL ACTIONS:
Approval of a resolution calling for a public hearing on February 18, 2013 for the construction of Alluvial Wells No. 16, 17 and 18 for raw water production in the McBaine aquifer.

FISCAL and VISION NOTES:					
City Fiscal Impact Enter all that apply		**Program Impact**		**Mandates**	
City's current net FY cost	$0.00	New Program/ Agency?		Federal or State mandated?	
Amount of funds already appropriated	$1,030,000.0(	Duplicates/Expands an existing program?		**Vision Implementation impact**	
Amount of budget amendment needed	$0.00	Fiscal Impact on any local political subdivision?		Enter all that apply: Refer to Web site	
Estimated 2 year net costs:		**Resources Required**		Vision Impact?	
One Time	$0.00	Requires add'l FTE Personnel?		Primary Vision, Strategy and/or Goal Item #	
Operating/ Ongoing	$0.00	Requires add'l facilities?		Secondary Vision, Strategy and/or Goal Item #	
		Requires add'l capital equipment?		Fiscal year implementation Task #	



WATER & LIGHT

McBaine Wellfield Configuration

1 inch = 2,000 feet

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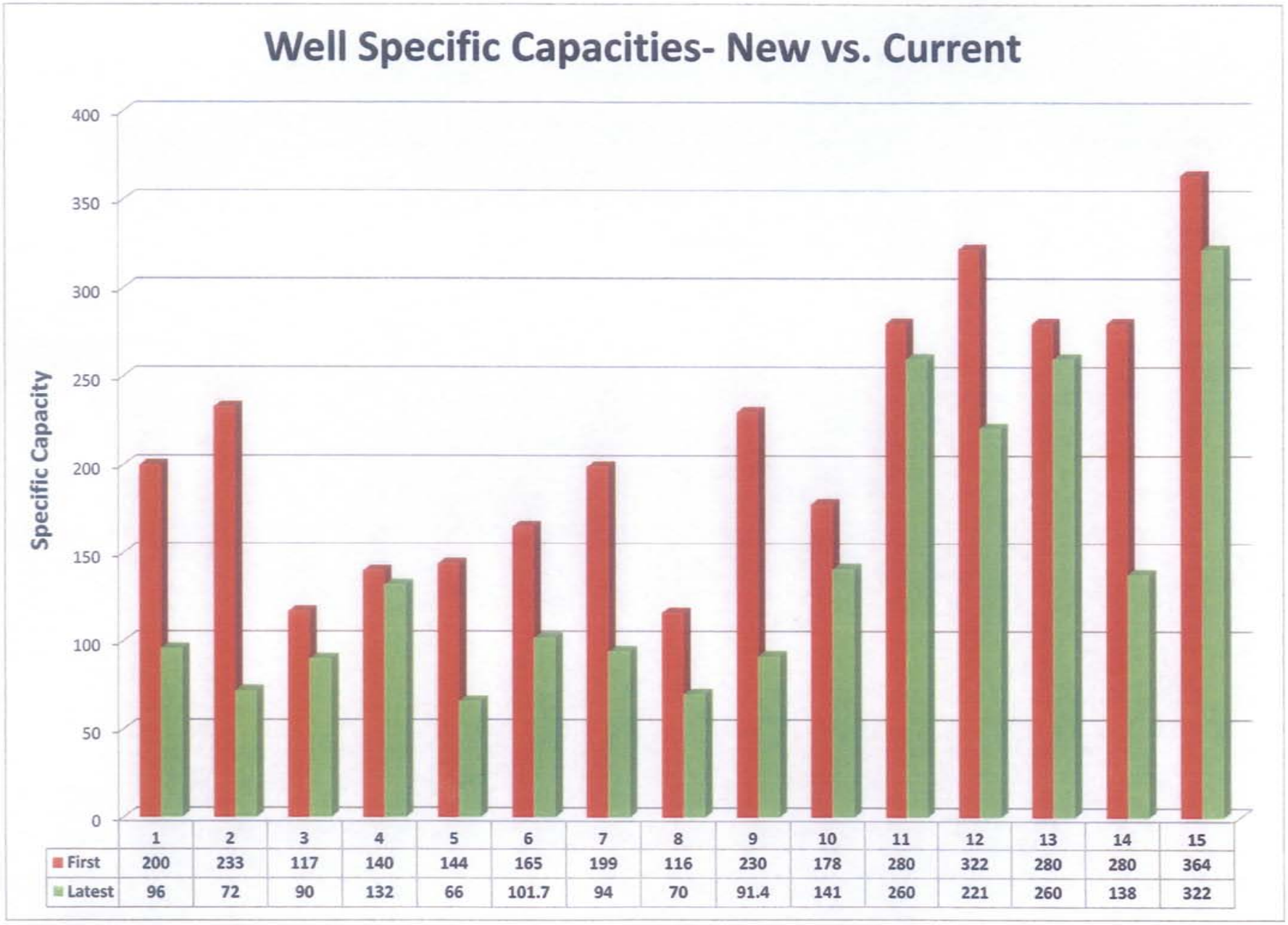
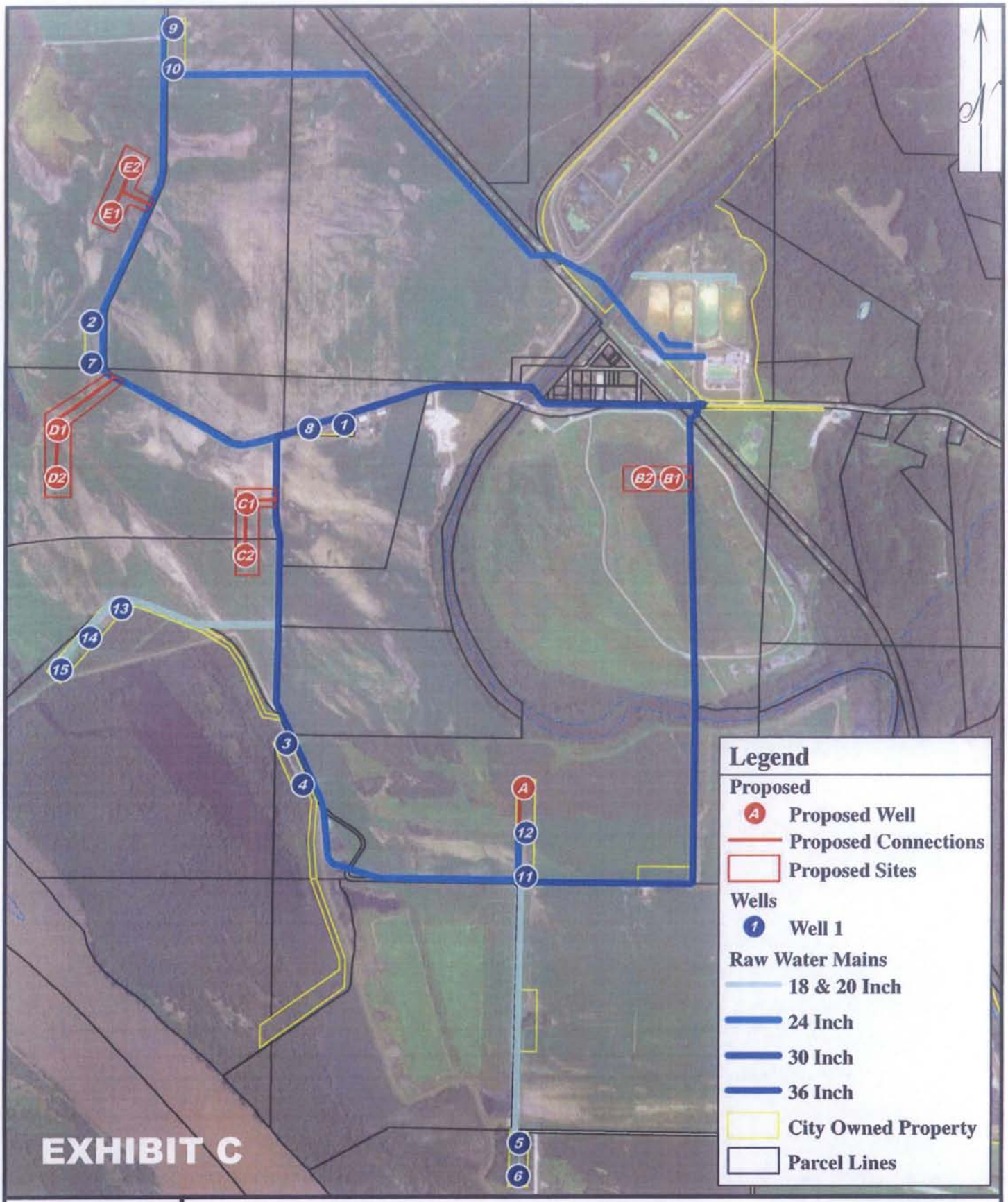


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
First	200	233	117	140	144	165	199	116	230	178	280	322	280	280	364
Latest	96	72	90	132	66	101.7	94	70	91.4	141	260	221	260	138	322

EXHIBIT B



COLUMBIA WATER & LIGHT

McBaine Proposed Wellfield Sites

1 in = 0.25 miles

Sheet 1 of 1

Introduced by _____ Council Bill No. _____R 12-13_____

A RESOLUTION

declaring the necessity for construction of Alluvial Wells No. 16, No. 17 and No. 18 in the McBaine Bottoms; stating the nature of and the estimate of the cost of the improvement; providing for payment for the improvement; providing for compliance with the prevailing wage law; and setting a public hearing.

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF COLUMBIA, MISSOURI, AS FOLLOWS:

SECTION 1. The City Council deems the construction Alluvial Wells No. 16, No. 17 and No. 18 in the McBaine Bottoms, necessary to the welfare and improvement of the City.

SECTION 2. The nature and scope of the improvement shall consist of furnishing all labor, materials, transportation, insurance and all other items, accessories and incidentals thereto necessary for the complete construction of the improvements.

SECTION 3. The estimated cost of this improvement is $1,030,000.00.

SECTION 4. Payment for this improvement shall be made from water system improvement revenue bonds and such other funds as may be lawfully appropriated.

SECTION 5. Any work done in connection with the construction of the improvement specified above shall be in compliance with the provisions of the prevailing wage laws of the State of Missouri.

SECTION 6. A public hearing in respect to this improvement will be held in the Council Chamber of the City Hall Building, 701 E. Broadway, Columbia, Missouri, at 7:00 p.m. on February 18, 2013. The City Clerk shall cause notice of this hearing to be published in a newspaper published in the City.

ADOPTED this _____ day of _____, 2013.

ATTEST:

_____ _____

City Clerk Mayor and Presiding Officer

APPROVED AS TO FORM:

_____
City Counselor