Internal Monitoring Report

Policy #: O-2A Water Quantity
Monitoring Frequency: Twice a year **Date**: October 16, 2012

I certify that the following information is true.

Signed _____, General Manager

Policy Language:

Current and future customers will receive water that meets or exceeds industry-accepted levels of service for fire protection and pressure.

This includes:

1. Water delivered to hydrants at proper flow rates for fire protection.
2. Water delivered to the customer tap at a pressure that meets industry-accepted low, high, and emergency operation criteria.
3. Water used for outdoor irrigation under drought-free conditions.

General Manager's interpretation and its justification:

This Outcomes policy requires that the Utility budget for, fund, prioritize, plan for, design, and construct the necessary system improvements to provide adequate water quantity to all areas of the system. The Level of Service Memo developed as part of the East Side Water Supply project for the Utility, attached, establishes minimum standards for system pressure and fire protection capacity. These standards guide system component design, evaluation, and expansion. A copy of the 6 year capital budget (2014-2019) outlining planned capital projects to address identified deficiencies is attached for your information and use.

Actual system performance is measured against the Utility's established level of service. Data is obtained using the Utility's Supervisory Control and Data Acquisition (SCADA) system and from information derived from the Utility's distribution system computer model. The most recent system wide master plan update was finished in 2006 and adopted in 2008. It is our intent to regularly review the Utility Master Plan and update the capital project list as needed but no less than annually. A major update of a portion of the master plan and capital improvement plan was completed as part of the East Side Water Supply project in mid 2012. This update included Pressure Zones 3, 4, 5 and 6E. An update of the west side of the system is tentatively scheduled to begin in 2014.

Other sources of data that will be used for this monitoring report will be consumer complaints and other records maintained by the Utility.

Data directly addressing the General Manager's interpretation:

1. *Water delivered to hydrants at proper flow rates for fire protection.*

The fire flow analysis developed in the 2006 Water Master Plan, Figure 5-8, is attached to this memo for information and use. This figure will be updated during the Master Plan update during 2014. A similar computer model analysis of the fire flow capacity of the east and north sides was completed as part of the 2012 ESWS study. This analysis is included as Figure B6. These documents provide a graphical representation of the fire flow capacity across the system and identify areas of deficiency.

To address significant fire flow capacity issues, the Master Plan identifies projects that will mitigate the identified areas of need. These plans require significant capital investment and are typically implemented over the course of several years. We have reported on these projects in previous reports to the Board.

Two areas of fire flow deficiency were identified in the 2006 Water Master Plan and given top priority in the Utility's Capital Improvement Program. The Arbor Hills neighborhood had a significant redundancy and reliability deficiency in addition to a limitation on fire flow capacity. Pressure Zone 4 had a similar reliability and fire flow capacity issue. The Utility started working on these two areas to bring them up to established standards in 2009 and will complete the necessary upgrades by the year 2016. Details of each project area follow:

Arbor Hills
Identified Project Alternative:
16-inch transmission main between Zones 6 & 7 and a booster pump station.

Project Phases:

- Phase 1: 2009 Installation of approximately 2 miles of 16-inch transmission main
- Phase 2: 2010 Installation of approximately 1 mile of 16-inch transmission main – this phase completed the connection complete between Raymond Road and Greenway View
- Phase 3: 2012 Installation of 0.55 miles of 16-inch transmission main north of Pump Station 118 to the UW Arboretum – Includes a crossing of the beltline highway
- Phase 4: 2012 Construction of Booster Pump Station 118, a 2,000 gallon per minute capacity facility located in Leopold Park
- Phase 5: 2014: Planned Installation of 0.8 miles of 16-inch transmission main from Fish Hatchery Road to Park Street to improve the connection to Well 18

Results:
The Cannonball pipeline and BPS 118 transfer water between Pressure Zone 6 and Pressure Zone 7 and back again. With construction of the Cannonball pipeline and BPS 118, the Arbor Hills neighborhood and the Todd Drive area of the Beltline Highway now have a redundant water supply. Fire flow capacity within the area has been significantly improved. At Leopold Elementary School the fire flow capacity increased from approximately 1500 gpm to an

estimated 4000 gpm bringing it into compliance with Utility fire flow capacity standards. Similar increases in fire fighting capacity were realized throughout the Arbor Hills neighborhood.

Pressure Zone 4

Identified Project Alternative:

Construct a second well, pump station and reservoir in Zone 4 to provide redundancy and improve fire protection to bring it into compliance with Utility standards.

Project Phases:

- Phase 1: 2009/2010 Well Siting: Identified the Tradewinds Parkway area as the preferred well site with the Dairy Drive area as an alternative.
- Phase 2: 2011/2012 Test well: Drilled a test well at Tradewinds Parkway, water quality was acceptable, water quantity was less than desired. Moved to Dairy Drive and drilled a second test well but found similar results.
- Phase 3: 2013: Production Well: Currently drilling a production well on the Tradewinds Parkway site. This site was selected based on its location south of the Beltline Highway and its proximity to a 16-inch transmission main. Anticipated completion, November 2013.
- Phase 4: 2014: Design development of the pump station and reservoir facility
- Phase 5: 2015: Construction of the reservoir and pump station facility.

Results:

Fire flow capacity and water supply redundancy in Zone 4 will be augmented by Well 31. With the completion of this new supply facility, fire flow capacity, and system reliability within Pressure Zone 4 will be greatly improved.

East Side Water Supply Analysis

Fire flow availability was evaluated for the east side during the assessment of the system for the East Side Water Supply project. Figure B6 from the report presents the results of the fire flow analysis based on 2010 maximum day demands. Figure B6 indicates fire flow deficiencies in the south end of Zone 6E, around the Northport Drive reservoir, in Zone 4 south of the beltline, and in a few isolated areas around the system. Piping and facility projects are planned as noted in the Capital Improvement Plan that will address these issues over the next several years.

Master Plan and Infrastructure Management Plan Update and Development of an Asset Management Program

The Utility has budgeted for an update of its Master Plan, Infrastructure Management Plan and to begin the development of an Asset Management Program starting in 2014. The Master Plan provides the long term planning necessary to meet future needs. The Infrastructure Management Plan assesses the condition of and plans for the renewal of existing assets. An Asset Management Program will track all costs associated with providing the established standard of service including the cost of operation, maintenance and replacement. The objective of the asset management program is minimizing the lifecycle cost of all assets. Each of these

programs will guide the Utility's capital planning to sustain the long term fire protection capability of the Madison system.

Hydrant Maintenance and Testing
The Utility routinely adds to, replaces, retires, and maintains the approximately 8,600 hydrants in the system. We work closely with Madison Fire Department to ensure adequate fire protection capacity throughout the system. Flow testing is performed as requested on fire hydrants and recorded in the GIS database. The Utility's unidirectional flushing program systematically operates and exercises the majority of the Utility's hydrants annually. This program of hydrant maintenance and testing meets and exceeds WDNR requirements.

I report non-compliance with mitigation projects in progress and scheduled.

2. *Water delivered to the customer tap at a pressure that meets industry-accepted low, high, and emergency operation criteria.*

Pressure planning and design criteria for Madison Water Utility are established in Table 2 of the attached Level of Service Memo. A query of the system indicated that of approximately 8,600 fire hydrants with static pressure readings, approximately 0.2% were below 35 psi, 3.9% were greater than 100 psi, and 0.1% were greater than 125 psi. Per Utility guidelines, the Utility pays 100% of the cost to install pressure reducing valves for customers in areas where pressures exceed 125 psi. The Utility pays 50% of the cost to install pressure reducing valves for customers in area where pressures exceed 110 psi.

The master plan has identified areas with high pressures. High pressure areas are evaluated as to the feasibility of moving them to a lower pressure zone or creating another pressure sub-zone using system pressure reducing valves. Maintaining adequate fire flow in the area will remain a prime objective in considering any changes to pressure zone boundaries.

An area of chronic low pressure exists within the system around the Bunker Hill Reservoir (Reservoir 115) in the area just west of East Towne Mall. A project that will convert this area from Pressure Zone 6E to Pressure Zone 3 has been identified in the Master Plan and is included in the Utility Capital Budget for the year 2014. Projects are being planned for other low pressure areas as project opportunities and funding becomes available.

I report non-compliance with mitigation projects in progress and scheduled.

3. *Water used for outdoor irrigation under drought-free conditions*

During the 2013 reporting period, Madison Water Utility was not required to and did not issue an irrigation restriction due to water supply limitations within the system.

I report compliance.

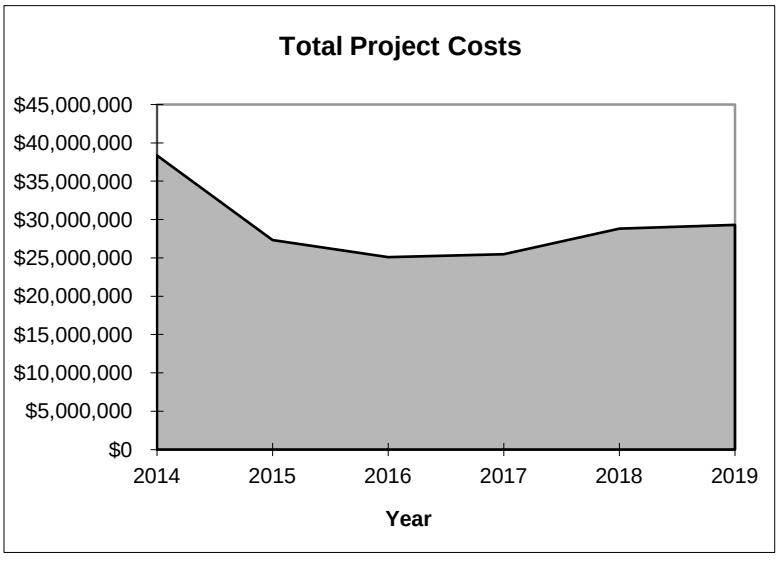
Attachments:

1. 2014 proposed capital budget
2. Level of Service Memo – January 10, 2011
3. 2006 Master Plan Fire Flow Capacity Map Figure 5-8
4. Figure B6 – 2010 East Side Maximum Day Fire Flow Availability

2014
Capital Budget
Capital Improvement Program

Agency Name: **Water Utility** **Agency Number:** 64

	Project Name	Capital Budget 2014	Future Year Estimates 2015	2016	2017	2018	2019
1	Water Mains - Replace/Rehab/Impr.	$11,718,000	$ 9,033,000	$ 9,938,000	$10,262,000	$11,032,000	$11,869,000
2	Water Mains - New	1,366,000	1,795,000	1,962,000	2,145,000	2,346,000	2,567,000
3	Zone 4 Fire Flow Supply Augment	415,000	5,362,000	654,000	673,000	0	0
4	Arbor Hills Suppl Fire Flow Supply	642,000	0	0	0	0	0
5	East Side - Well 7 Fe&Mn Filtration	5,300,000	0	981,000	673,000	0	0
6	East Side Replacement Well (Well 3)	480,000	0	0	1,124,000	6,494,000	1,071,000
7	Zones 7 & 8 Supplemental Supply	397,000	1,122,000	5,894,000	893,000	0	0
8	Lakeview Reservoir Reconstruction	2,974,000	1,956,000	0	0	0	0
9	Booster Pump Station 114	0	0	0	0	647,000	3,170,000
10	Northeast Side Supplemental Supply	0	0	0	60,000	472,000	1,346,000
11	System Wide Miscellaneous Projects	2,737,000	1,598,000	1,852,000	2,008,000	2,550,000	2,106,000
12	Paterson St. Bldg Remodel/Upgrade	6,847,000	400,000	0	0	0	0
13	Booster Station 106 Reconstruction	1,698,000	635,000	654,000	0	0	0
14	Zone 11 Blackhawk Elevated Reservoir	0	0	0	0	0	63,000
15	Misc. Pump Station/PRV/Facility Projs.	2,944,000	704,000	1,241,000	1,301,000	1,365,000	1,432,000
16	Booster Pump Station 129 Reconstr.	0	56,000	121,000	1,609,000	919,000	947,000
17	Iron & Manganese Filter at Well 19	344,000	3,350,000	0	0	0	0
18	Iron & Manganese Filter at Well 30	0	0	380,000	3,774,000	0	0
19	Near West Side Water Supply Project	0	0	0	0	0	63,000
20	Well 29 Filter Capacity Expansion	446,000	0	0	0	0	0
21	Well 12 Conversion to Two-Zone Well	48,000	991,000	0	0	0	0
22	Booster Pump Station 109	0	320,000	1,357,000	765,000	657,000	0
23	Zone 10 Far West Elevated Reservoir	0	0	0	60,000	655,000	3,717,000
24	Booster Pump Station/PRV 124 Constr.	0	0	58,000	126,000	1,674,000	947,000
	Total	$38,356,000	$27,322,000	$25,092,000	$25,473,000	$28,811,000	$29,298,000



2014
Capital Budget
Expenditure Categories and Funding Sources

Agency Name: **Water Utility** **Agency No.:** 64

All Projects	Capital Budget 2014	Future Year Estimates 2015	2016	2017	2018	2019
Expenditures:						
Purchased Services	$ 1,883,000	$ 653,000	$ 559,000	$ 734,000	$ 1,034,000	$ 710,000
Materials & Supplies	0	0	0	0	0	0
Inter-Agency Charges	0	0	0	0	0	0
Loans	0	0	0	0	0	0
Professional Fees	1,175,000	631,000	633,000	542,000	599,000	555,000
Land & Land Improve	15,831,000	13,438,000	14,189,000	15,411,000	16,151,000	20,048,000
Building & Bldg Improve	16,976,000	10,713,000	8,124,000	7,122,000	9,519,000	6,407,000
Equipment and Vehicles	2,106,000	1,854,000	1,552,000	1,627,000	1,469,000	1,537,000
Other	385,000	33,000	35,000	37,000	39,000	41,000
Total Project Costs	$ 38,356,000	$ 27,322,000	$ 25,092,000	$ 25,473,000	$ 28,811,000	$ 29,298,000
Funding Sources:						
Federal Sources	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
State Sources	0	0	0	0	0	0
Impact Fees	0	0	0	0	0	0
Private Contributions	0	0	0	0	0	0
Revenue Bonds	38,356,000	27,322,000	25,092,000	25,473,000	28,811,000	29,298,000
Special Assessments	0	0	0	0	0	0
TIF Cash	0	0	0	0	0	0
County Sources	0	0	0	0	0	0
Reserves Applied	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total Other Sources	$ 38,356,000	$ 27,322,000	$ 25,092,000	$ 25,473,000	$ 28,811,000	$ 29,298,000
G.O. General Fund	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
G.O. Non-General Fund	0	0	0	0	0	0
Total G.O. Debt	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Estimated Annual Debt Service						
G.O. General Fund	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
G.O. Non-General Fund	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0

Capital Budget

Water Utility

Water Mains - Replace/Rehab/Impr. Project No. **1** Acct. No. 810455

GO	$ 0
Other	11,718,000
	$ 11,718,000

Madison Water Utility has a planned system replacement and upgrade program that provides for annual main replacement and rehabilitation. The Utility needs to replace or rehabilitate over 400 miles of pipe in approximately a 40 year period to renew and maintain the system. A planned annual increase in spending to accomplish this goal by 2050 will be continued. The budget for 2014 includes pipeline replacement on East Johnson Street ($2.6 million) and Verona Road ($1.4 million). Other funding includes $1,700,000 in reauthorized revenue bonds from 2013.

Water Mains - New Project No. **2** Acct. No. 810455

GO	$ 0
Other	1,366,000
	$ 1,366,000

This project installs new water mains to help strengthen the existing distribution system, improve pressures, improve fire protection, allow transfer of water from pressure zone to pressure zone, and serve the growing Madison area. Mains installed within this project will implement recommended hydraulic improvements from the Utility's Master Plan that was adopted in 2006. The Capital Improvement Program proposes to significantly increase pipeline investment for hydraulic needs beginning in 2015, and then increase this portion of the budget over the next succeeding 15 years to meet Master Plan recommendations. Other funding includes $400,000 in reauthorized revenue bonds from 2013.

Zone 4 Fire Flow Supply Augment Project No. **3** Acct. No. 810517

GO	$ 0
Other	415,000
	$ 415,000

Two test wells were constructed in 2012, and the production well is scheduled to be drilled in 2013. Well 31 is scheduled to be designed and construction to start in 2014. The well is to be finished and placed in service in 2015. Pipeline work is scheduled for 2016 and 2017. Other funding includes $415,000 in reauthorized revenue bonds from 2013.

Arbor Hills Suppl Fire Flow Supply Project No. **4** Acct. No. 810516

GO	$ 0
Other	642,000
	$ 642,000

Booster pump station #118 was constructed and put into service in 2012. Pipeline improvements also were constructed in 2012, and the last phase of the project, Phase 4 of the 'Cannonball Pipeline,' will be constructed in 2014.

East Side - Well 7 Fe&Mn Filtration Project No. **5** Acct. No. 810459

GO	$ 0
Other	5,300,000
	$ 5,300,000

The East Side Water Supply Study verified the need for a filter at Well 7. The public engagement process is proceeding and the project will be constructed and fully operational in 2014. Construction of the filter at Well 7 addresses water quality issues that exist due to iron and manganese levels that exceed or approach the Environmental Protection Agency's secondary standards. The filter will significantly reduce iron and manganese levels in the water pumped from the facility into the distribution system. This project also will allow the Utility to increase its use of Well 7. The new facility required the purchase of additional property. Other funding includes $5,300,000 in reauthorized revenue bonds from 2013.

East Side Replacement Well (Well 3) Project No. **6** Acct. No. 810517

GO	$ 0
Other	480,000
	$ 480,000

Well 3 was abandoned early in 2008 due to elevated levels of Carbon Tetrachloride. This project is intended to replace that lost supply capacity in Pressure Zone 6E, the East Isthmus area. The need for a replacement well was verified by the East Side Water Supply Study. It is expected that the well will need a filter for iron and manganese removal, and this is included in the budget. There also is the possibility that VOC (volatile organic compounds) contamination will be present due to long term industrial land use on the Isthmus. This well will be designed with the intention of adding treatment, if necessary. If the test well indicates that iron and manganese filtration is not needed, the capital cost will be significantly reduced.

Zones 7 & 8 Supplemental Supply Project No. **7** Acct. No. 810517

GO	$ 0
Other	397,000
	$ 397,000

The well, pump station and reservoir on the near west side (Whitney Way and Mineral Point Road) will provide a new source of water supply to improve service levels, system redundancy and reliability to Pressure Zones 7 and 8. The public participation process began in 2009. Property purchase and the drilling of a test well are scheduled in 2014, with a production well to be drilled in 2015. Design of the pump house is scheduled in 2015, with construction of the well, pump house and reservoir in 2016. The project will be fully operational in 2017.

Lakeview Reservoir Reconstruction Project No. **8** Acct. No. 810458

GO	$ 0
Other	2,974,000
	$ 2,974,000

This project will construct a two zone water storage reservoir to provide needed additional storage capacity for peak demand and fire flow reserves in Pressure Zones 5 and 6. This facility also will replace an aging elevated water reservoir in Pressure Zone 5. Improvements to the existing pump station feeding Zone 5 also are included in this project. The public participation process will begin in 2013 and continue in 2014, with design also in 2013 and 2014. Construction of the reservoir will begin in 2014, and be finished and on line in 2015, with water main improvements and upgrades to booster pumps also occurring in 2015. Other funding includes $160,000 in reauthorized revenue bonds from 2013.

Booster Pump Station 114 Project No. **9** Acct. No. 810516

GO	$ 0
Other	0
	$ 0

This project will construct a dual zone pump station that will transfer water from Pressure Zone 6W to Pressure Zone 8 and back again. This will improve operational flexibility of the west side supply system and fully utilize existing Utility facilities. This project is scheduled to begin in 2018, and be completed and in service in 2019.

Northeast Side Supplemental Supply Project No. **10** Acct. No. 810517

GO	$ 0
Other	0
	$ 0

This project will construct a well, reservoir and pump station to provide additional drinking water supply to Pressure Zones 3 and 6E. This well would tentatively be located in the northeast corner of the system. While no specific site has been identified at this point, the Utility owns property for this purpose on Hoepker Road. The public participation process, expected to be used to site the well and develop the details of this project, is scheduled to begin in 2017.

System Wide Miscellaneous Projects Project No. **11** Acct. No. 810458

GO	$ 0
Other	2,737,000
	$ 2,737,000

These miscellaneous projects repair, rehabilitate and improve Utility facilities, as well as improve security and monitoring of facilities. These projects include but are not necessarily limited to lighting, roofing, painting, video camera surveillance, improved doors and hatches, fencing, alarm systems, online monitoring, and other upgrades to the Utility's 32 remote sites, the administration building, and operations center's vehicle storage building. Other funding includes $857,000 in reauthorized revenue bonds from 2013.

Paterson St. Bldg Remodel/Upgrade Project No. **12** Acct. No. 810703

GO	$ 0
Other	6,847,000
	$ 6,847,000

This project funds major renovation of the Water Utility field operations center at 110 S Paterson Street, including the demolition and rebuilding of the vehicle maintenance facility. This project is scheduled to begin construction in 2014, and be finished and in service in early 2015. The project also includes the construction of a materials handling building that will free up space in the operation center's vehicle storage building and improve efficiency during winter operations. Other funding includes $381,000 in reauthorized revenue bonds from 2013.

Booster Station 106 Reconstruction Project No. **13** Acct. No. 810516

GO	$ 0
Other	1,698,000
	$ 1,698,000

This project will replace the 80 year old booster pump station at Glenway. The booster station moves water from Pressure Zone 6 to Pressure Zone 7 and provides a necessary source of water to the northeast corner of Pressure Zone 7. With the pump station upgrade, some pipeline replacement will be necessary to increase hydraulic capacity. Construction is scheduled to start in 2013, with the facility completed and in service in early 2014. Pipeline improvements continue in 2015 and 2016. Other funding includes $1,082,000 in reauthorized revenue bonds from 2013.

Zone 11 Blackhawk Elevated Reservoir Project No. **14** Acct. No. 810458

GO	$ 0
Other	0
	$ 0

This project will construct a 750,000 gallon elevated storage reservoir on the far west side of the service area to serve developing areas and provide fire protection to Pressure Zone 11. The Utility currently owns property on the far west side for the purpose of siting a reservoir. The public engagement process is projected to begin in 2019.

Misc. Pump Station/PRV/Facility Projs. Project No. **15** Acct. No. 810458

GO	$ 0
Other	2,944,000
	$ 2,944,000

This project included various pump station, pressure reducing valve (PRV) stations, and well improvement and upgrade projects recommended by the Water Utility Master Plan. Projects for 2014 include completing the upgrade of booster pumps at Well 20, upgrading the booster pumps and adding a generator at Reservoir 115, installing a PRV station on Gammon Road, and completing installation of a generator at Well 26. Other funding includes $424,000 in reauthorized revenue bonds from 2013.

Booster Pump Station 129 Reconstr. Project No. **16** Acct. No. 810516

GO	$ 0
Other	0
	$ 0

Construction of a new and upgraded booster pump station 129 is scheduled for 2017. This project will replace the temporary pump station constructed on the Well 29 site back in 1990. Pump station 129 will continue to transfer water from Pressure Zone 6E to Zone 3 and back again through a PRV. The operation will provide supply and fire flow capability to the far east side of the system. It will benefit customers through increased reliability and flexibility of operations.

Iron & Manganese Filter at Well 19 Project No. **17** Acct. No. 810459

GO	$ 0
Other	344,000
	$ 344,000

Construction of an Iron and Manganese Filter at Well 19 will address the water quality issues and resulting customer complaints about colored water due to elevated levels of iron and manganese that exist at Well 19. The budget anticipates construction of a filter in 2015, following a significant public participation process and evaluation beginning in 2014. The facility should be fully operational in 2016.

Iron & Manganese Filter at Well 30 Project No. **18** Acct. No. 810459

GO	$ 0
Other	0
	$ 0

Construction of an Iron and Manganese Filter at Well 30 will address the water quality issues and resulting customer complaints about colored water due to elevated levels of iron and manganese that exist at Well 30. The budget anticipates construction of a filter in 2017, following a significant public participation process and evaluation beginning in 2016.

Near West Side Water Supply Project Project No. **19** Acct. No. 810517

GO	$ 0
Other	0
	$ 0

Construction of an additional well is scheduled for 2023. The Water Master Plan has identified this well project to mitigate a supply deficiency in Pressure Zones 6 and 7. The project will provide additional water supply capacity to both Zones 6 and 7. The final location of the proposed well will be determined following a significant public participation process and evaluation period beginning in 2019.

Well 29 Filter Capacity Expansion Project No. **20** Acct. No. 810459

GO	$ 0
Other	446,000
	$ 446,000

The filter system at Well 29 was constructed with a capacity of 1,100 gallons per minute (gpm) due to a concern about contaminants under the Sycamore Landfill. A sentry well was installed between the landfill and the well to monitor water quality. At this time, based on pumping and water quality data, there is no indication of a problem with the Sycamore Landfill with regard to Well 29, so this project will increase the capacity of the filtration system to 2,200 gpm. This will provide the Utility with improved flexibility and supply capacity on the east side of Pressure Zone 6. Other funding includes $446,000 in reauthorized revenue bonds from 2013.

Well 12 Conversion to Two-Zone Well Project No. **21** Acct. No. 810459

GO	$ 0
Other	48,000
	$ 48,000

The 2006 Water Utility Master Plan recommended that Well 12 be converted to a two zone well. This conversion will provide operational flexibility and reliability to the west side supply system. Pumps and a pressure reducing valve will be added to the Well 12 facility to move water from Pressure Zone 7 to Pressure Zone 8 and vice versa.

Booster Pump Station 109 Project No. **22** Acct. No. 810516

GO	$	0
Other		0
	$	0

Booster Pump Station 109 will provide operational functionality to the east side and improve reliability to the water supply system. The pump station will move water from Pressure Zone 4 to Pressure Zone 6E, and a pressure reducing valve will allow water to move from Pressure Zone 6E to Pressure Zone 4.

Zone 10 Far West Elevated Reservoir Project No. **23** Acct. No. 810458

GO	$	0
Other		0
	$	0

Construction of the Zone 10 Far West Side 750,000 gallon elevated reservoir is scheduled for 2019, and will follow a public engagement process and evaluation. The completed project will provide additional gravity fed water storage capacity within Pressure Zone 10. As Pressure Zone 10 has developed not only with residential, but commercial and institutional facilities, the existing 250,000 gallon elevated tank on High Point Road no longer provides sufficient emergency reserve capacity. Providing minimum fire flow requirements to this area of the distribution system is necessary to meet minimum Utility standards. This project is identified in the 2006 Water Utility Master Plan.

Booster Pump Station/PRV 124 Constr. Project No. **24** Fund No. 810516

GO	$	0
Other		0
	$	0

Construction of a new booster pump station, numbered 124, will allow water to be transferred across the Yahara River and provide operational flexibility to the system. Pump Station 124 will transfer water from Zone 6W to Zone 6E and back again through a PRV. This operation will benefit customers through increased reliability and flexibility. The pump station will allow the transfer of water from multiple wells, if needed, during a water shortage or equipment maintenance period.

All funding is from Water Utility resources.

2014
Capital Budget
Summary

Agency Name: **Water Utility** **Agency Number:** 64

	Project Name	Agency Request	Executive	Executive G.O. Debt	Executive Other Funding	Executive Total
1	Water Mains - Replace/Rehab/Impr.	$ 11,718,000	$ 11,718,000	$ 0	$ 11,718,000	$ 11,718,000
2	Water Mains - New	1,366,000	1,366,000	0	1,366,000	1,366,000
3	Zone 4 Fire Flow Supply Augment	415,000	415,000	0	415,000	415,000
4	Arbor Hills Suppl Fire Flow Supply	642,000	642,000	0	642,000	642,000
5	East Side - Well 7 Fe&Mn Filtration	5,300,000	5,300,000	0	5,300,000	5,300,000
6	East Side Replacement Well (Well 3)	480,000	480,000	0	480,000	480,000
7	Zones 7 & 8 Supplemental Supply	397,000	397,000	0	397,000	397,000
8	Lakeview Reservoir Reconstruction	2,974,000	2,974,000	0	2,974,000	2,974,000
9	Booster Pump Station 114	0	0	0	0	0
10	Northeast Side Supplemental Supply	0	0	0	0	0
11	System Wide Miscellaneous Projects	2,737,000	2,737,000	0	2,737,000	2,737,000
12	Paterson St. Bldg Remodel/Upgrade	6,847,000	6,847,000	0	6,847,000	6,847,000
13	Booster Station 106 Reconstruction	1,698,000	1,698,000	0	1,698,000	1,698,000
14	Zone 11 Blackhawk Elevated Reservoir	0	0	0	0	0
15	Misc. Pump Station/PRV/Facility Projs.	2,944,000	2,944,000	0	2,944,000	2,944,000
16	Booster Pump Station 129 Reconstr.	0	0	0	0	0
17	Iron & Manganese Filter at Well 19	344,000	344,000	0	344,000	344,000
18	Iron & Manganese Filter at Well 30	0	0	0	0	0
19	Near West Side Water Supply Project	0	0	0	0	0
20	Well 29 Filter Capacity Expansion	446,000	446,000	0	446,000	446,000
21	Well 12 Conversion to Two-Zone Well	48,000	48,000	0	48,000	48,000
22	Booster Pump Station 109	0	0	0	0	0
23	Zone 10 Far West Elevated Reservoir	0	0	0	0	0
24	Booster Pump Station/PRV 124 Constr.	0	0	0	0	0
	Total	$ 38,356,000	$ 38,356,000	$ 0	$ 38,356,000	$ 38,356,000

LEVEL OF SERVICE MEMO

Madison Water Utility
Madison, Wisconsin
119 East Olin Avenue
Madison, WI 53713

Black & Veatch Corporation
B&V Project 169092.0100
B&V File 41.0800

Black & Veatch Corporation
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Milwaukee, Wisconsin 53202

January 10, 2011

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TABLES

1. BACKGROUND

Criteria for evaluating the performance of existing facilities and for designing future facilities is a combination of regulations established by the Wisconsin Department of Natural Resources (DNR), Madison Water Utility (MWU) service level goals, and industry standards. Often the DNR establishes a minimum level of service, which is exceeded by MWU goals. Planning and Design Criteria are generally guidelines and provide a framework in which to evaluate the performance of the existing system and evaluate recommended facilities to serve future growth or changes in the distribution system.

2. UNIT WELLS

Criteria established for the unit wells include well capacity and emergency power/pumping. They are summarized in Table 1.

Table 1 – Unit Well Planning and Design Criteria

Criteria	Guideline
Well Capacity	For each pressure zone served by a well the well capacity must meet all of the following: • Average run time on unit wells less than 12 hours during the average day demand (ADD). • Total capacity of wells at least 115% of the maximum day demand (MDD). • Firm capacity (largest well in the zone out of service) of wells at least 100% of MDD. For pressure zones 6E and 6W, firm capacity shall be based on two wells out of service. (1)
Emergency Operation	Emergency power generation (or engine powered pump capacity) to meet at least the ADD.
Notes: (1) Alternate guidelines for pressure zones 6E and 6W based on their size and importance.	

3. PRESSURE

Pressure criteria are established for low, high and emergency operations. The low pressure criterion is established to provide customers with adequate pressures for normal operation of residential and commercial fixtures including irrigation systems. The high pressure criterion is established to protect fixtures and pipelines from undue stress. Customers with normal operating pressures over 90 psi may consider installing a pressure reducing valve (PRV) on their service to protect indoor fixtures. MWU will reimburse 50 percent of the cost of the PRV for customers with normal pressures over 110 psi and 100 percent of the cost of the PRV for pressures over 125 psi. The emergency operating criterion is established to prevent negative system pressures during emergency and fire flow events. Table 2 summarizes the pressure criteria.

Table 2 – Pressure Planning and Design Criteria

Criteria	Guideline
Minimum Pressure Peak Demands	
Non-emergency	40 psi
Emergency	20 psi (at any point in the pressure zone)
Preferred Operating Pressure	50 – 90 psi
Maximum Operating Pressure	<125 psi (everywhere) <100 psi (expansion areas)

4. PIPELINES

Pipeline criteria are established for velocity, pipe roughness, minimum sizing, and pipe material. Velocity criteria are used to minimize system headlosses due to pipe size or roughness and to minimize the impact of transients in the distribution system. A roughness criterion is generally assumed or measured and is used for hydraulic model calibration and evaluation. Minimum sizing is used to ensure adequate capacity for fire protection. Table 3 summarizes planning and design criteria for pipelines.

Table 3 – Pipeline Planning and Design Criteria

Criteria	Guideline
Maximum Velocity	
Maximum Hour during MDD	< 5 fps
Fire during MDD	< 10 fps
Hazen-Williams Roughness Coefficient (C)	
Existing Pipes	125[(1)]
High Density Polyethylene (HDPE) (new)	150[(2)] (horizontal directional drilling only)
Ductile Iron (new, cement lined)	140[(2)]
Pipe Diameter[(3)]	
General Grid Considerations	16-inch minimum diameter on 1 mile grid 12-inch minimum diameter on 0.5 mile grid (Larger diameter or closer spacing may be required based on use or zoning).
Arterial Collector Roads	12-inch minimum diameter
ICI Areas	10-inch minimum diameter
Residential Areas	8-inch minimum diameter (6-inch may be permitted for residential dead-end lines that are less than 200 feet in length with a fireflow requirement less than 1000 gpm).
Pipe Material	Ductile Iron Class 52 or greater[(4)]

Notes:
(1) From the 2006 IDSE hydraulic model calibration
(2) WAC NR 811.70
(3) MWU Planning Guidelines
(4) HDPE is permitted for directional drilling or slip lining only (minimum pressure class 160 psi).

5. BOOSTER PUMP STATIONS AND STORAGE

Pump station and storage criteria are designed to ensure adequate capacity for maximum hour, fireflow, or emergency demands. Table 4 summarizes planning and design guidelines for booster pump stations and storage.

Table 4 – Booster Pump Station and Storage
Planning and Design Criteria

Criteria	Guideline
Booster Pump Stations	
Capacity	Firm Capacity (largest pump out of service) able to meet either: • MDD for pressure zones with equalization storage • Maximum hour plus fireflow for pressure zones without equalization storage.(1)
Storage	
Volume	Every pressure zone be able to meet both of the following: • 12 hour supply at ADD(2) • Fire flow plus equalization storage
Equalization storage	Volume required to deliver difference between maximum hour demand (MHD) and MDD for each pressure zone (normally 15 – 30% of MDD)
Fire Storage	Fire flow goal X fire duration (see Table 5 for fire flow and duration recommendations)
Notes: (2) Pressure zone 11 is the only existing pressure zone without equalization storage. (3) Emergency reserve	

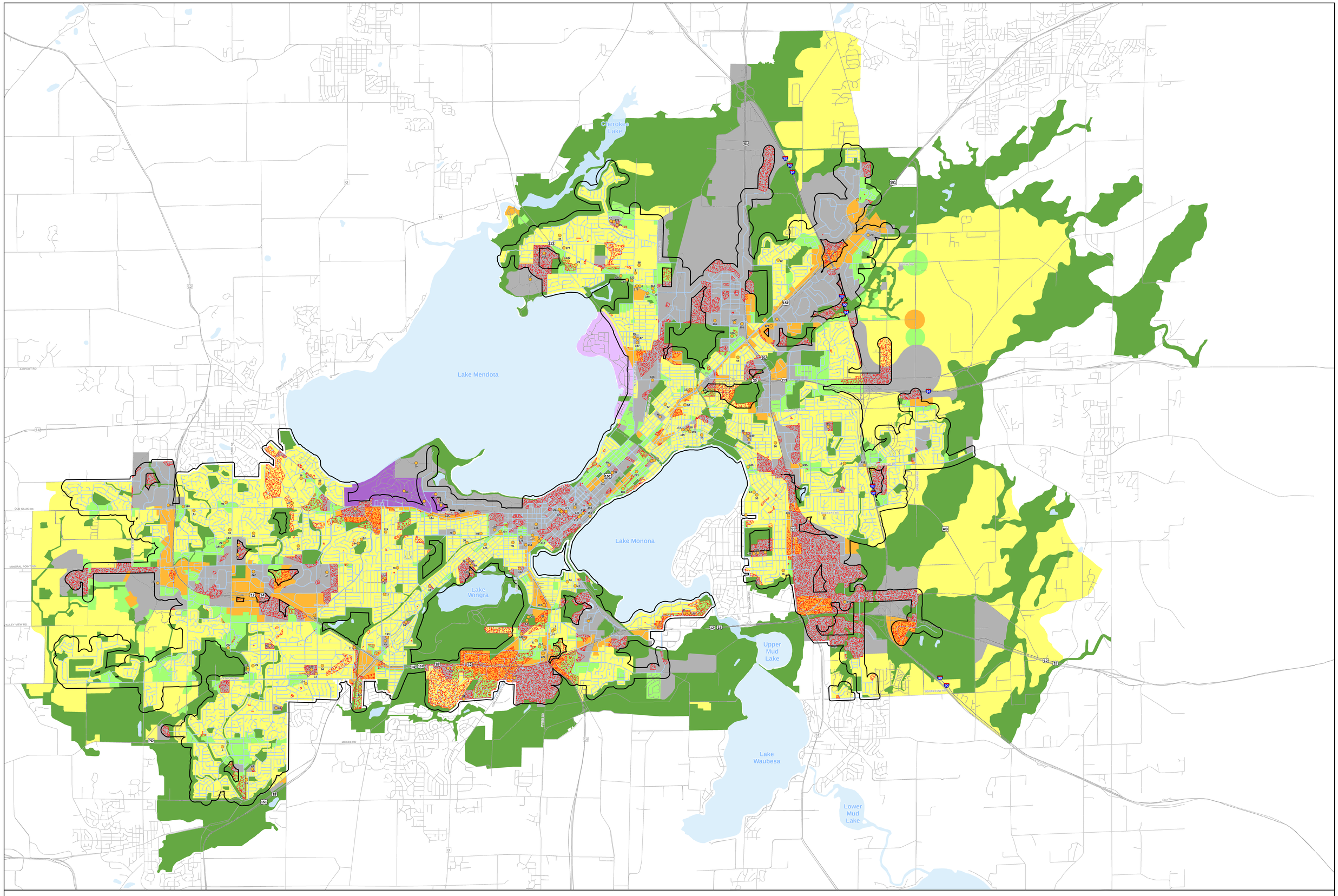
6. FIRE FIGHTING CRITERIA

Projected water demands are developed from existing water demands and the anticipated impact of growth and conservation on the demand. Table 5 summarizes the fire flow goals and durations.

Table 5 – Fire Fighting Planning and Design Criteria[1]

Land Use	Fire Flow Goal (gpm)	Fire Duration[2] (hrs)	Hydrant Spacing (feet)
Low Density Residential (LDR), Neighborhood Planning Area (NPA), Traditional Neighborhood Development (TND)	1,000	2	400
Medium Density Residential (MDR), Neighborhood Mixed Use (NMU)	2,000	2	375
High Density Residential (HDR), Community Mixed Use (CMU), General Commercial (GC)	2,500	2	360
Regional Mixed Use (RMU), Regional Commercial (RC), Employment (E), Special Institutional (SI), Downtown (D), Campus (C), Airport (SP), Industrial (I)	3,500	3	300

Notes:
(1) Fire flow in addition to MDD.
(2) *Distribution System Requirements for Fire Protection*, AWWA M31, 1989



Legend

- Practical limit of Fire Flow delivery
- Area of deficient Fire Flow capacity
- Public Gathering & Services Facility (with Facility ID Number - see Table)
- Existing Pipeline
- Major roads
- Minor Roads

Minimum Fire Flow Service Criteria

- 3,500 gpm
- 2,500 gpm
- 2,000 gpm
- 1,000 gpm
- 0 gpm - Parks
- 0 gpm - Village of Maple Bluff
- 0 gpm - Village of Shorewood Hills
- Water body

N W E S

1:35,000

0 1 2 3 Miles

File: C:\PROJECTS\Madison_WI_87269.411\10_GIS\ProjectFiles\FireFlow\FireFlowScenarios\FireFlow_Scenario_Summer1.mxd

Version: 1

By: DJW

Date: Nov 17, 2006

Figure 5-8 - Fire Flow Analysis

Madison Water Utility Planning Area

Water Master Plan Update

B&V PN 138101.3120

Madison Water Utility MWU

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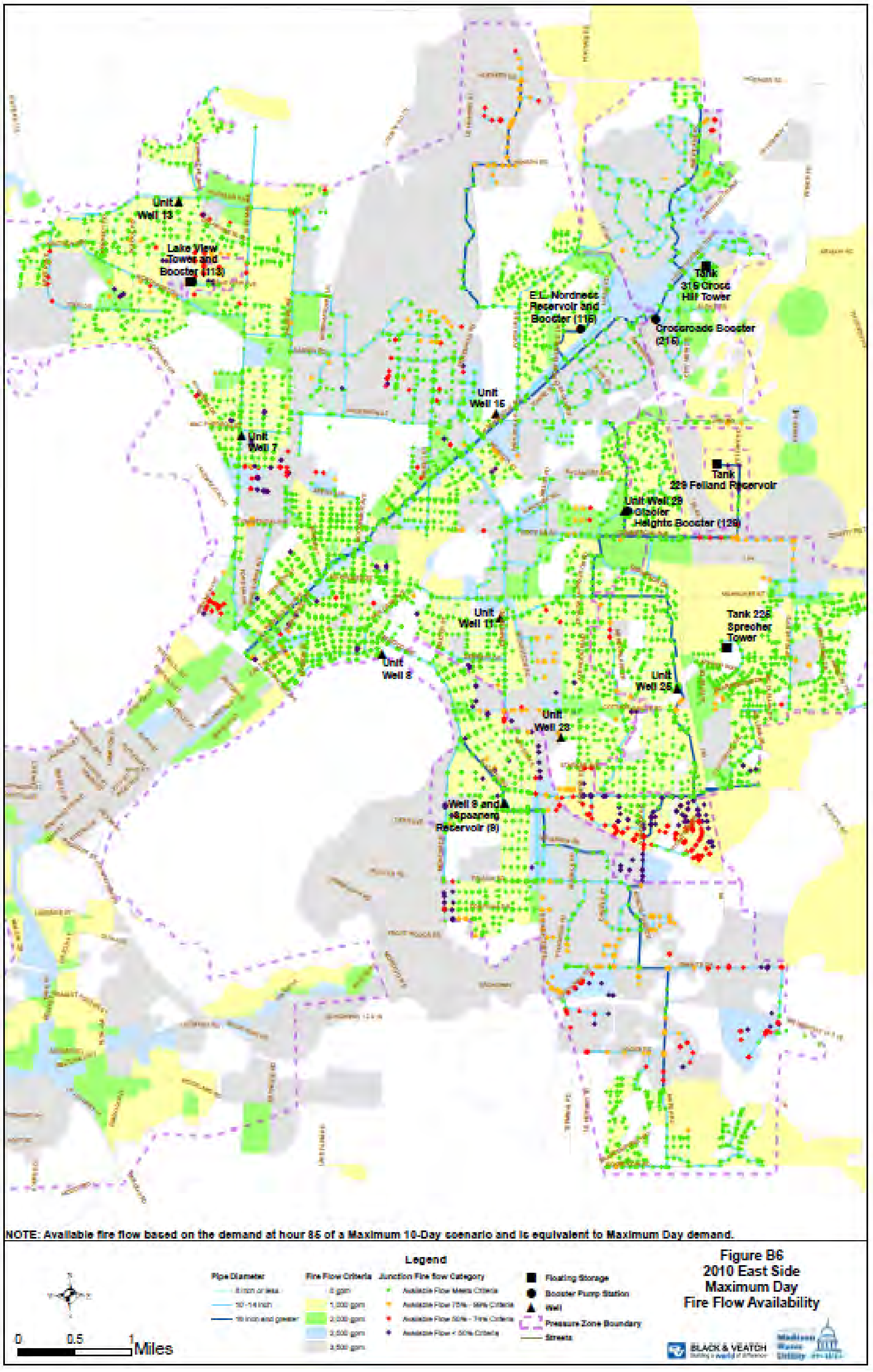

Figure 4-2: 2010 East Side Maximum Day Fire Flow