

BUILDING A WORLD OF DIFFERENCE®



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Madison Water Utility Water Master Plan



February 17, 2009

Outline of Master Plan Presentation

- Level of Service Criteria
- Study Area Characteristics
- Water Requirements
- Water System Improvements

This Water Master Plan is a program of improvements to make the MWU system able to provide a Level of Service that meets established standards.

Level Of Service Criteria

- Max Day Demand = 250 gal/person/day
- Water Quality meets drinking water standards
- Normal operating pressures = 40 – 90 psi
- Equalization + Fire Storage in gravity tanks
- Emergency storage
- Effectively manage groundwater resource

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Study Area Characteristics

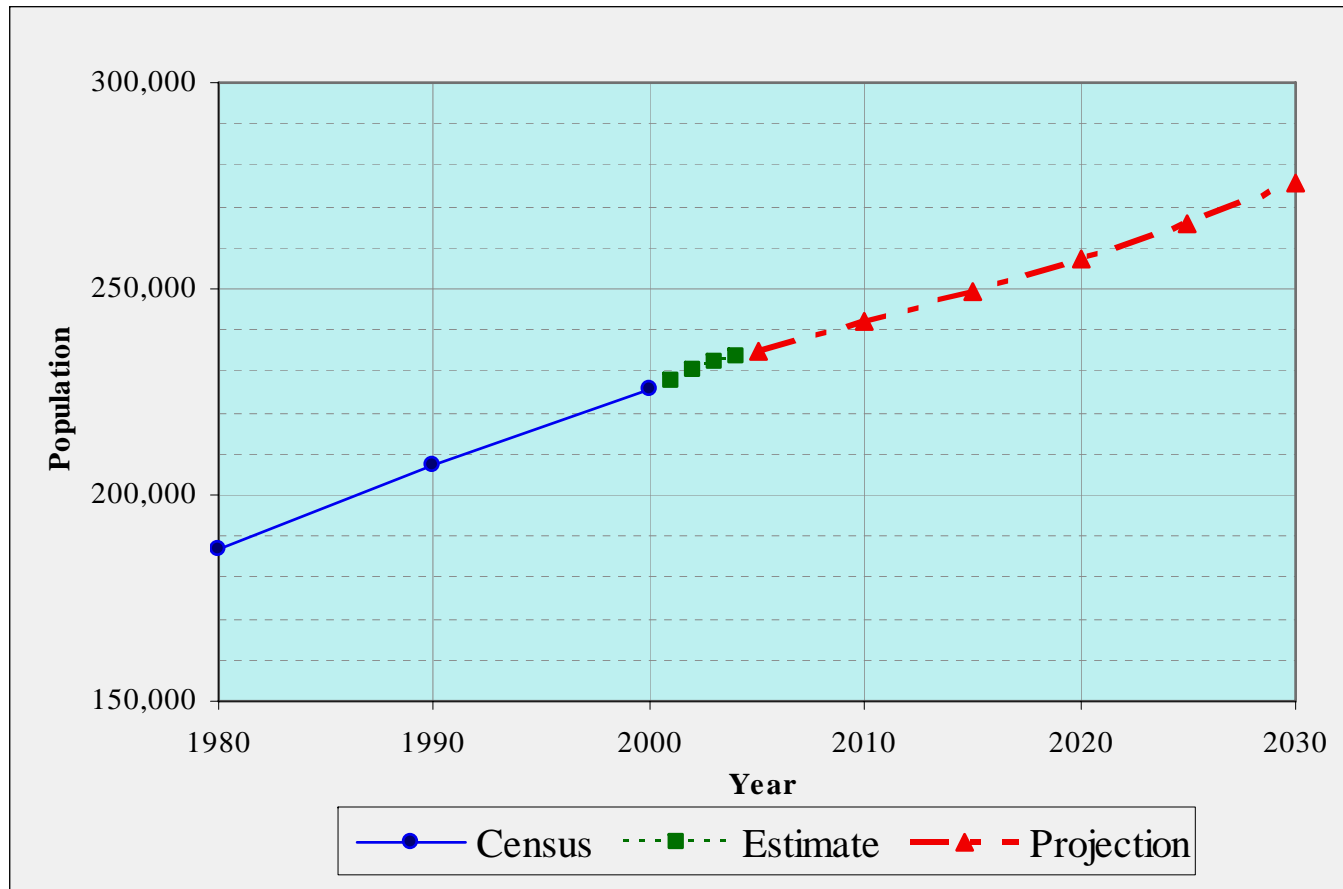
Study area characteristics were defined by the City's 2005 Comprehensive Plan.

Key Study Area Criteria

- Study area boundary
- Future land use
- Demographics
 - Population
 - Employment

Population was a key demographic used for projecting future water use.

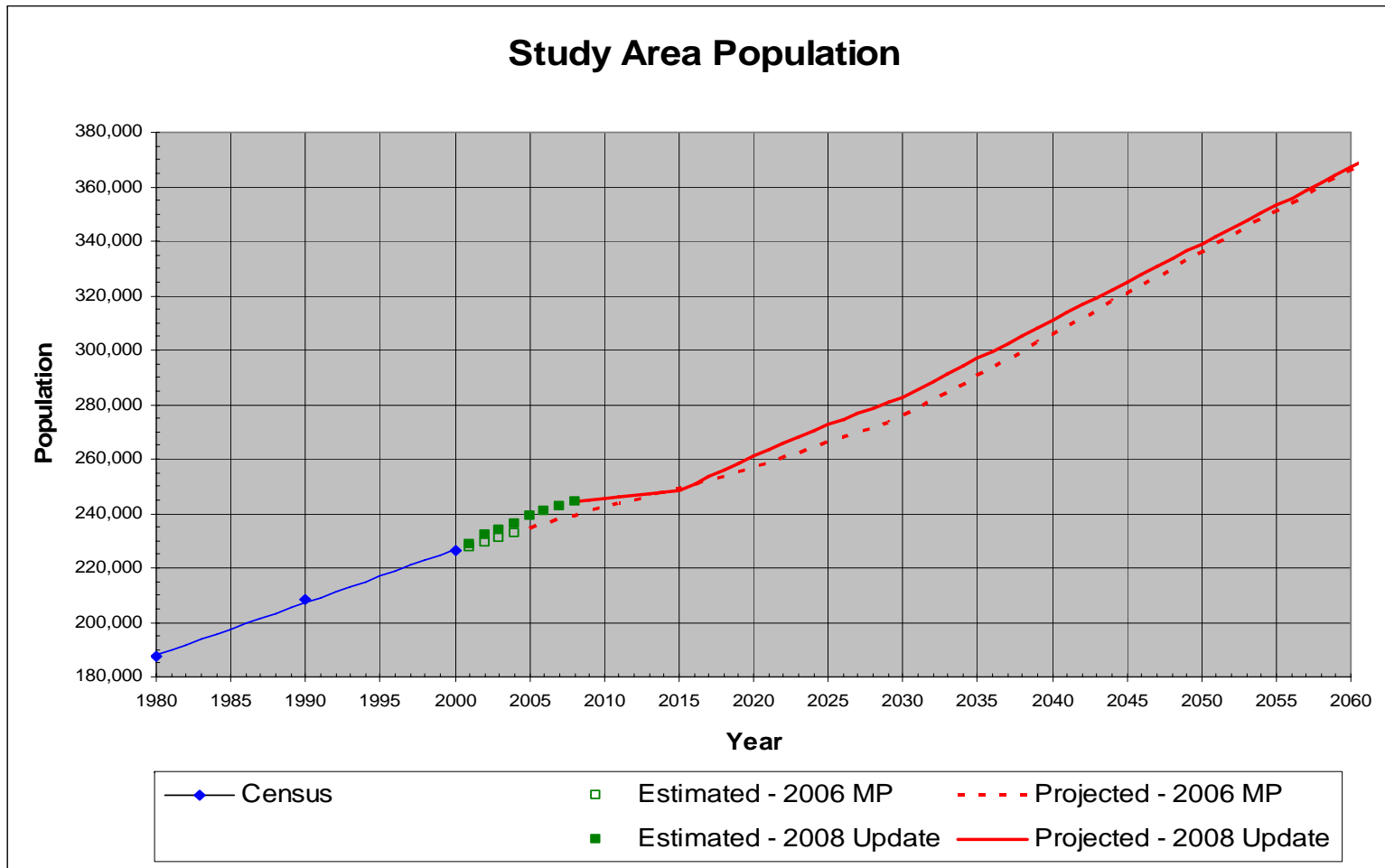
Study Area Population



Source: Final Official Population Projections for Wisconsin Municipalities, Jan 2004, Demographics Services Center, Wisconsin Department of Administration



2008 Update – The current study area population projection reflects impact anticipated from current economic conditions



Source: Final Official Population Projections for Wisconsin Municipalities, Oct 2008, Demographics Services Center, Wisconsin Department of Administration



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Water Requirements

Historical water production and metered use was used to define unit demands, water use rates and patterns.

Key Water Use Categories

- Residential
- Largest ICI (a) customers
- Other ICI (a)
- Schools
- Non-Revenue

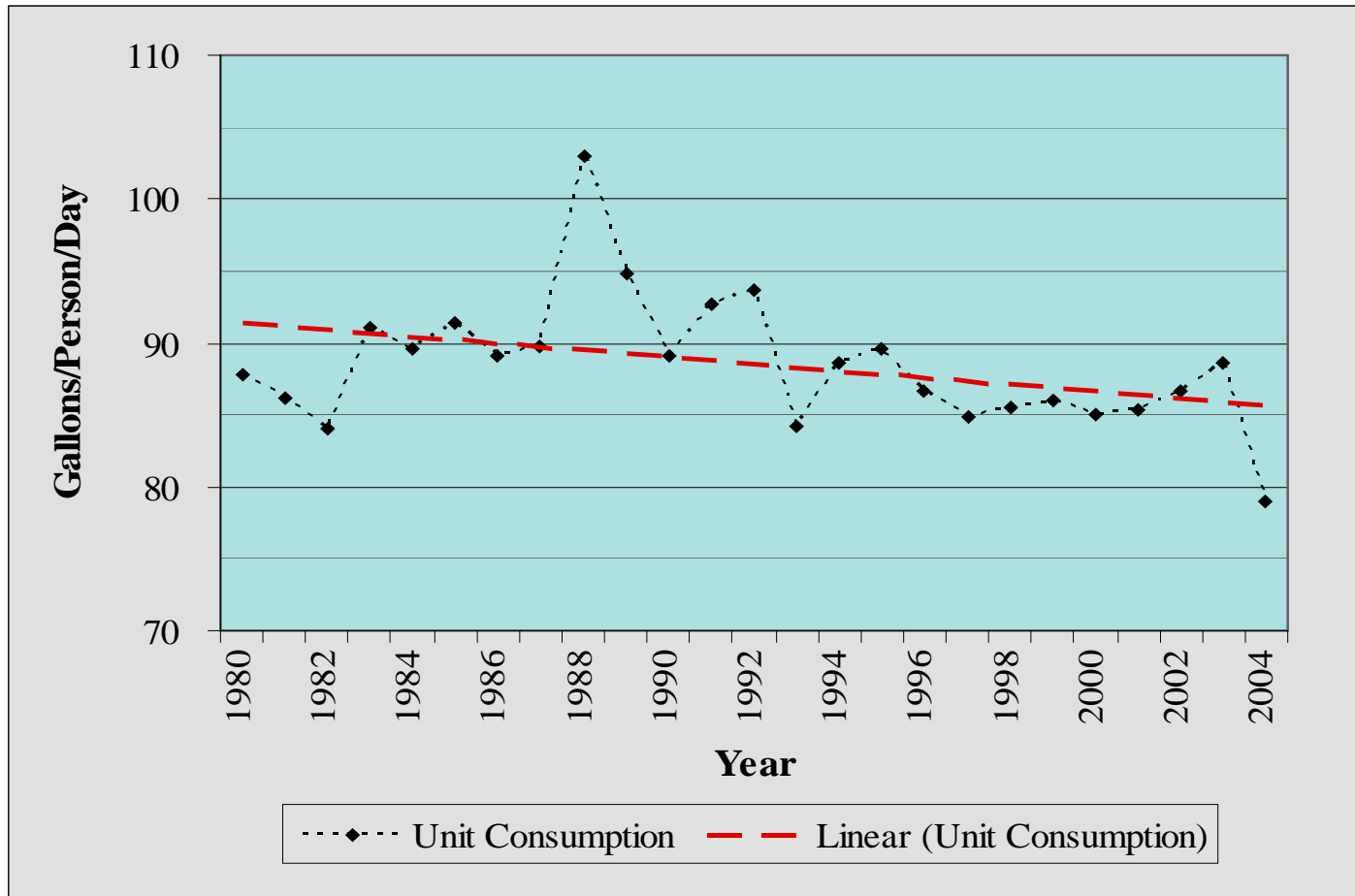
(a) ICI = Industrial – Commercial - Institutional

Projections of Annual Average (AA) demand based on unit demands are the beginning point for determining design demands.

Customer Category	Portion of Total System Demand Current - to - Buildout	Basis of Determination
Residential	66%	Population x Unit Demand No. Residents x gal/person/day
15 Largest Industrial/Commercial	25% to 18%	Individual Projections of Total Usage
Other Industrial/Commercial	9% to 15%	Employment x Unit Demand No. Employees x gal/employee/day

Master Plan Assessment: The residential unit demand has trended down to about 85 gallons per person per day.

Historical Residential Unit Demand

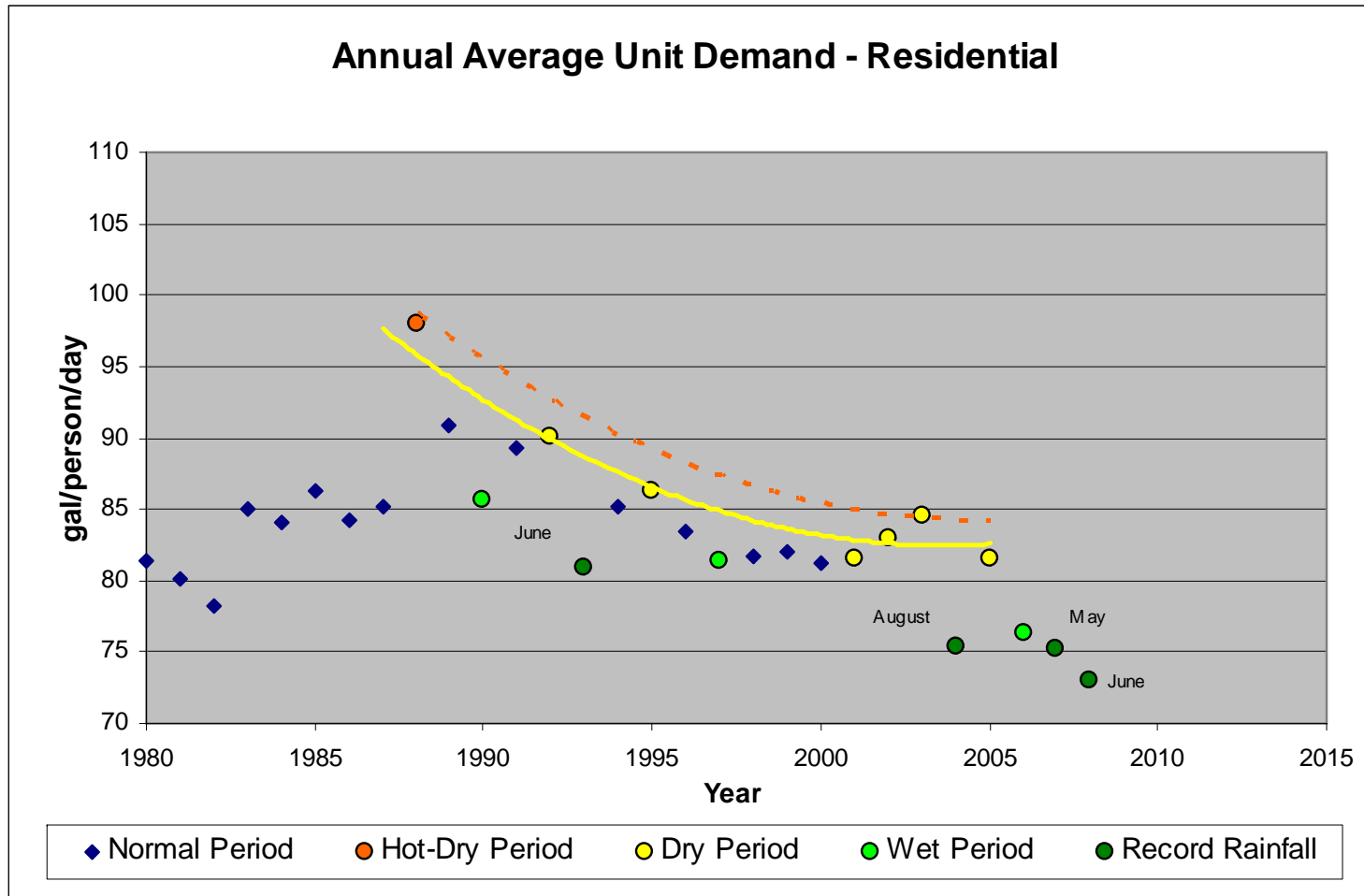


Master Plan Assessment: The two key design unit demands were related to residential and industrial/commercial/institutional (ICI) customers.

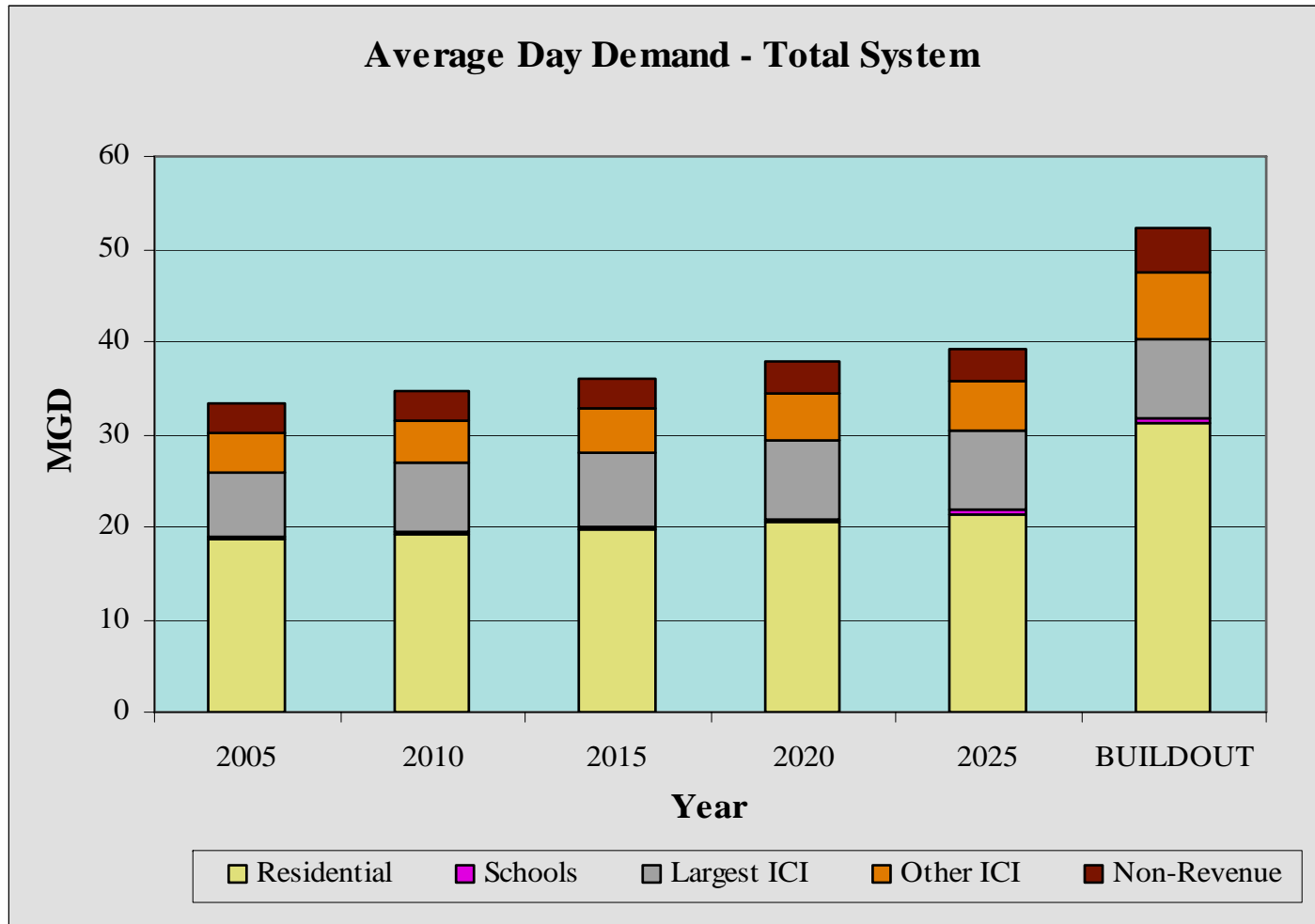
Customer Category	Annual Average Unit Demand Current – to – 2015 and after
Residential	87 to 85 gal/person/day
Other ICI	27 to 25 gal/employee/day

For system capacity to be adequately planned, design criteria must define high demand associated with periods of warm dry weather.

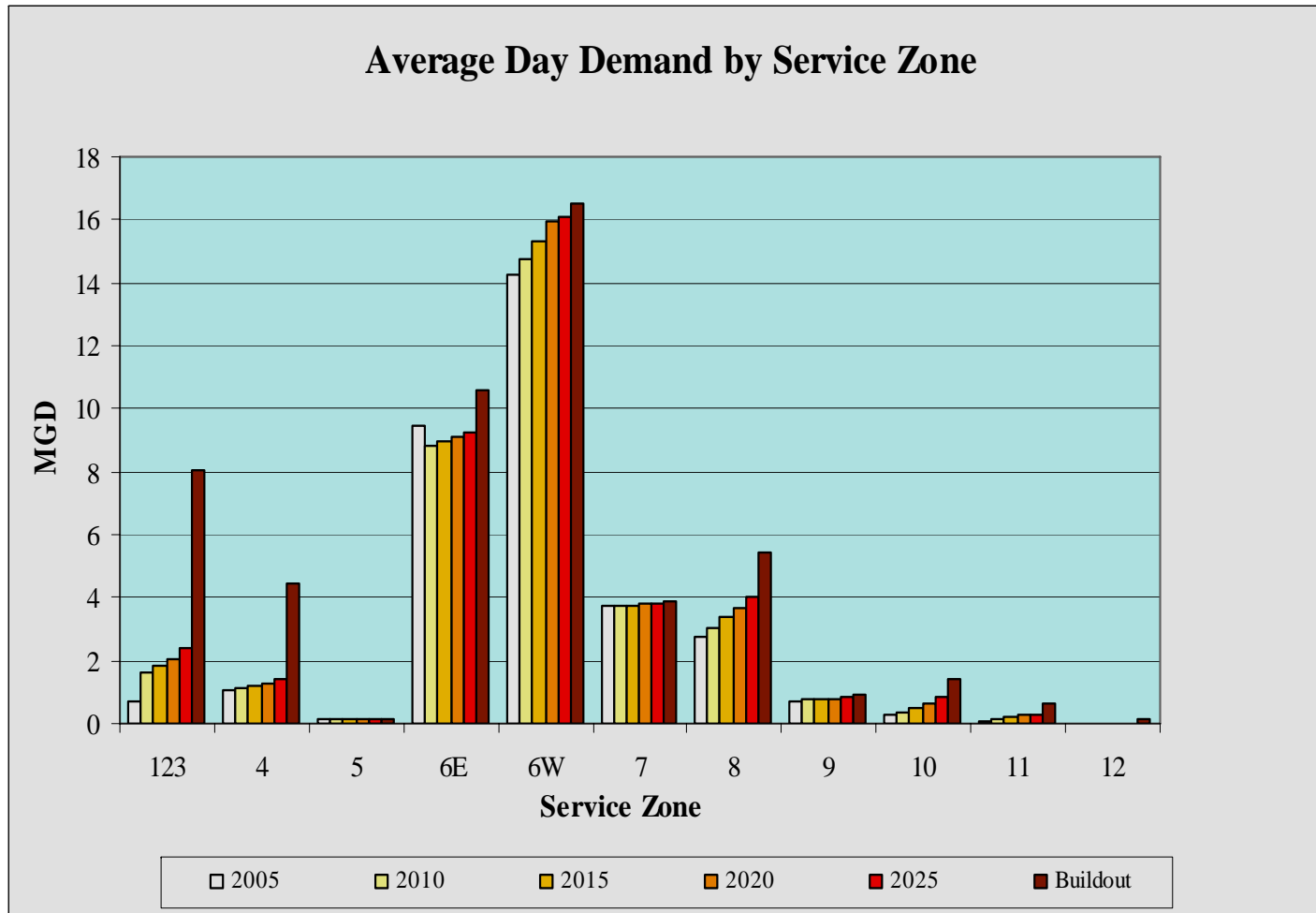
2008 Update – Design residential unit demand is substantiated by historic dry period usage



Projected demographics and design unit demands were used to calculate projected future design water demand.



The key water use rates were also calculated for each service zone using demographics, unit demands, and water use peaking factors .



Master Plan Assessment: Design Maximum Day (MD) demand is determined by applying a peaking factor to Annual Average (AA) demand

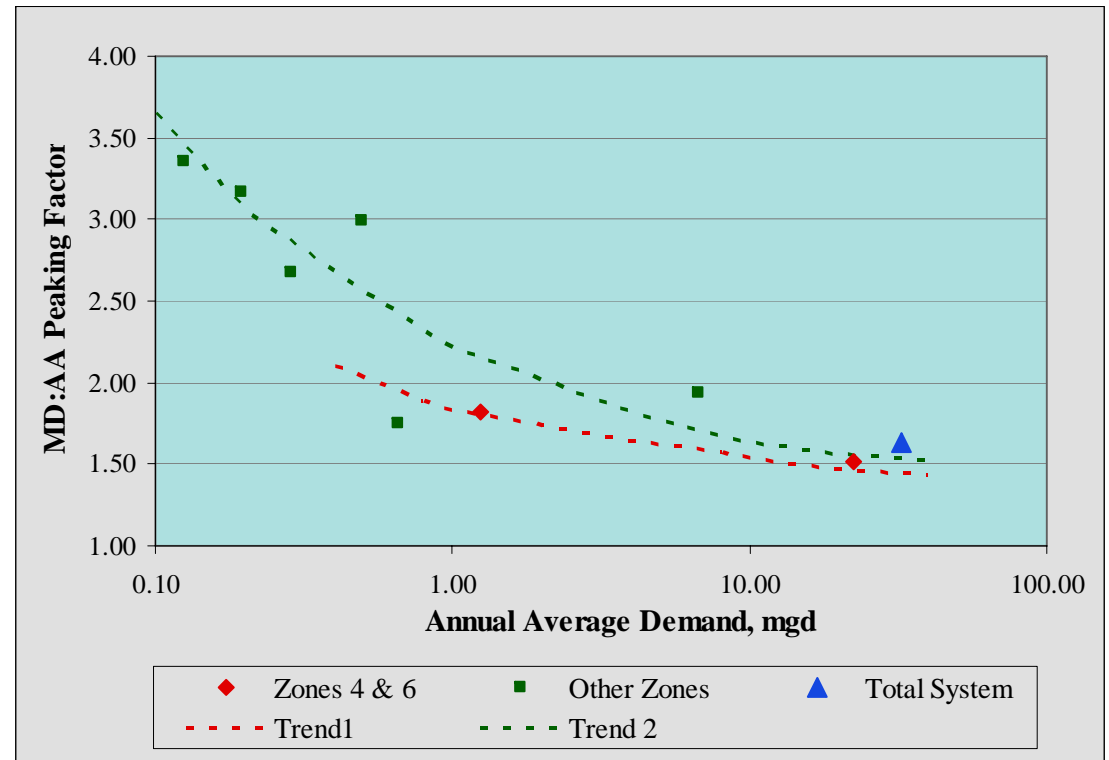
Approach	Example
Design AA Demand	10.0 MG
<u> x MD:AA Ratio</u>	<u> x 1.74</u>
Design MD Demand	17.4 MG

Design MD:AA = 1.74 is defined from historic production records

Design

Historic

Table 3-20 Design MD:AA Peaking Factors		
Service Zone	Max Day-to-Ann Ave Peaking Factor (MD:AA)	
	Design Year 2010	Design Year 2025
123	2.42	2.33
4	1.82	1.80
5	3.38	3.37
6 East	1.74	1.72
6 West	1.51	1.50
7	2.05	2.04
8	2.06	1.96
9	2.70	2.65
10	3.04	2.56
11	3.42	2.83
12	NA	6.75
Total System	1.74	1.74



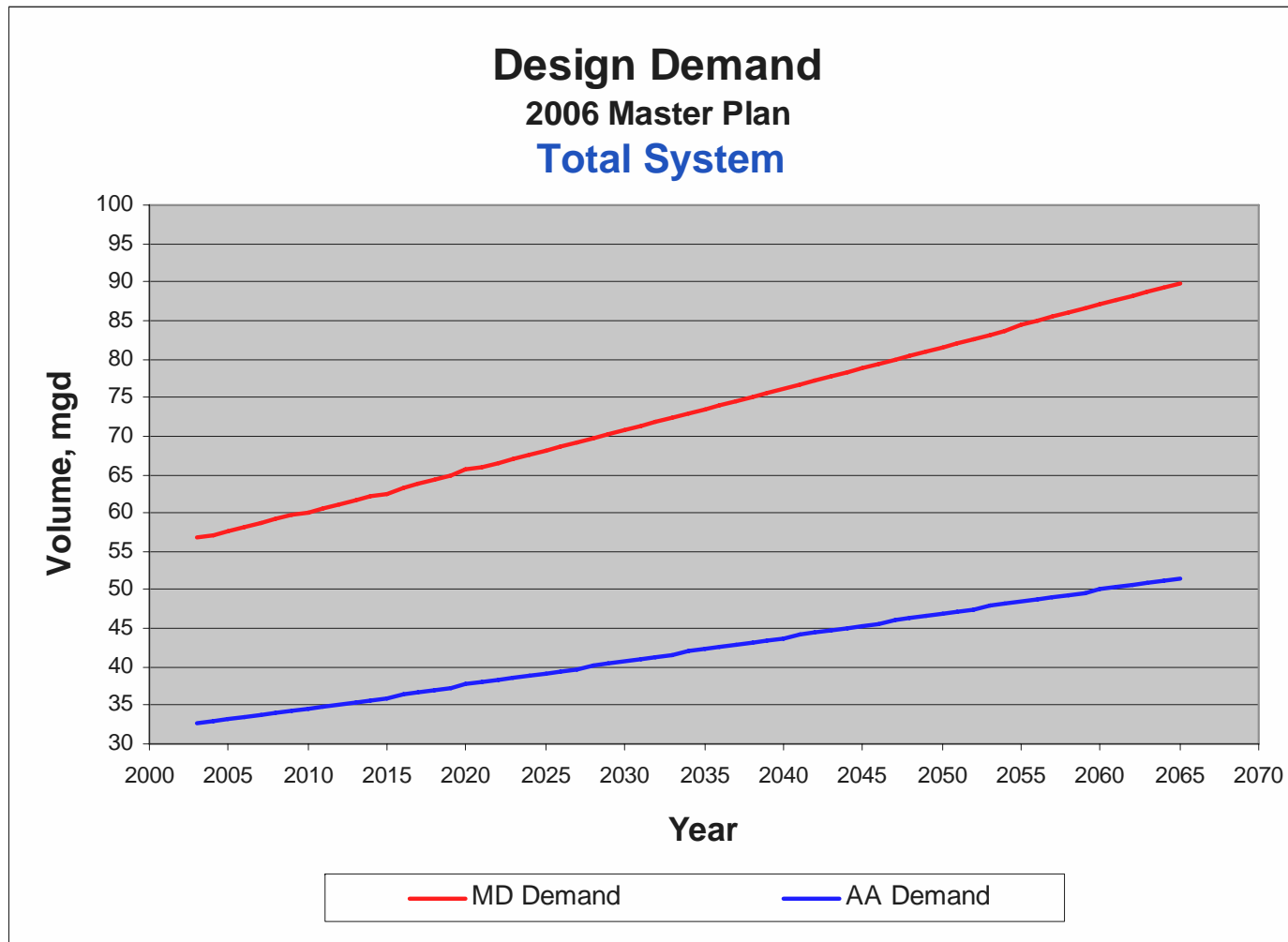
2008 Update - Design MD:AA = 1.74 is Substantiated by recent production

- Dry periods define design MD:AA peaking factor
- Required supply capacity is defined by dry period MD demand

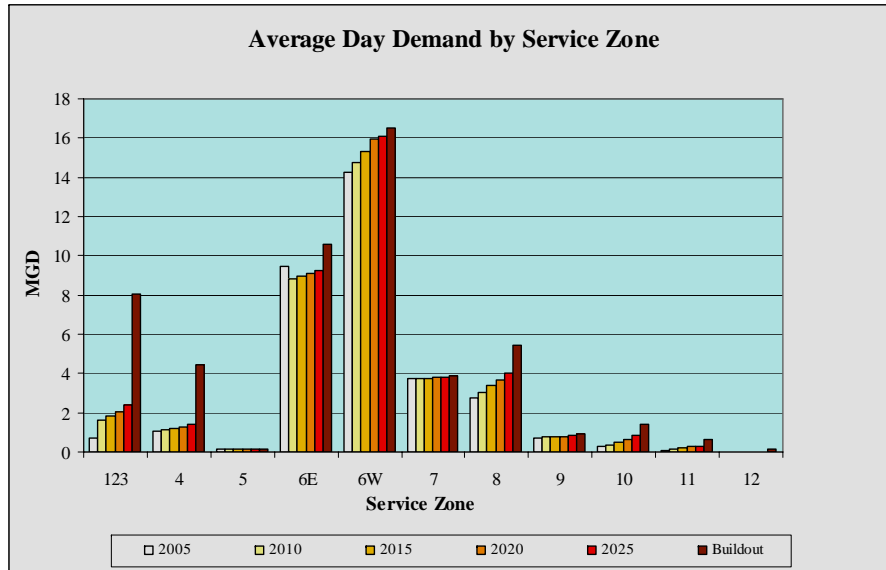
Wet
Dry

Year	Total System Demand			
	Ann Ave	Max Day		Peaking Factor
	MGD	MGD	Date	MD:AA
1997	31.3	43.19	17-Aug	1.38
1998	32.9	49.37	29-Jul	1.50
1999	32.5	49.97	16-Jul	1.54
2000	31.8	43.50	16-Aug	1.37
2001	33.2	54.21	12-Jul	1.63
2002	32.5	53.27	16-Jul	1.64
2003	32.0	52.89	22-Aug	1.65
2004	30.2	40.34	15-Sep	1.34
2005	32.5	54.77	24-Jun	1.69
2006	30.5	47.17	18-Jul	1.55
2007	30.9	53.97	26-Jul	1.75
2008	29.9	45.10	18-Aug	1.51

Design Demand is the projected dry period maximum day demand



Design MD Demand was also defined for each individual service zone.



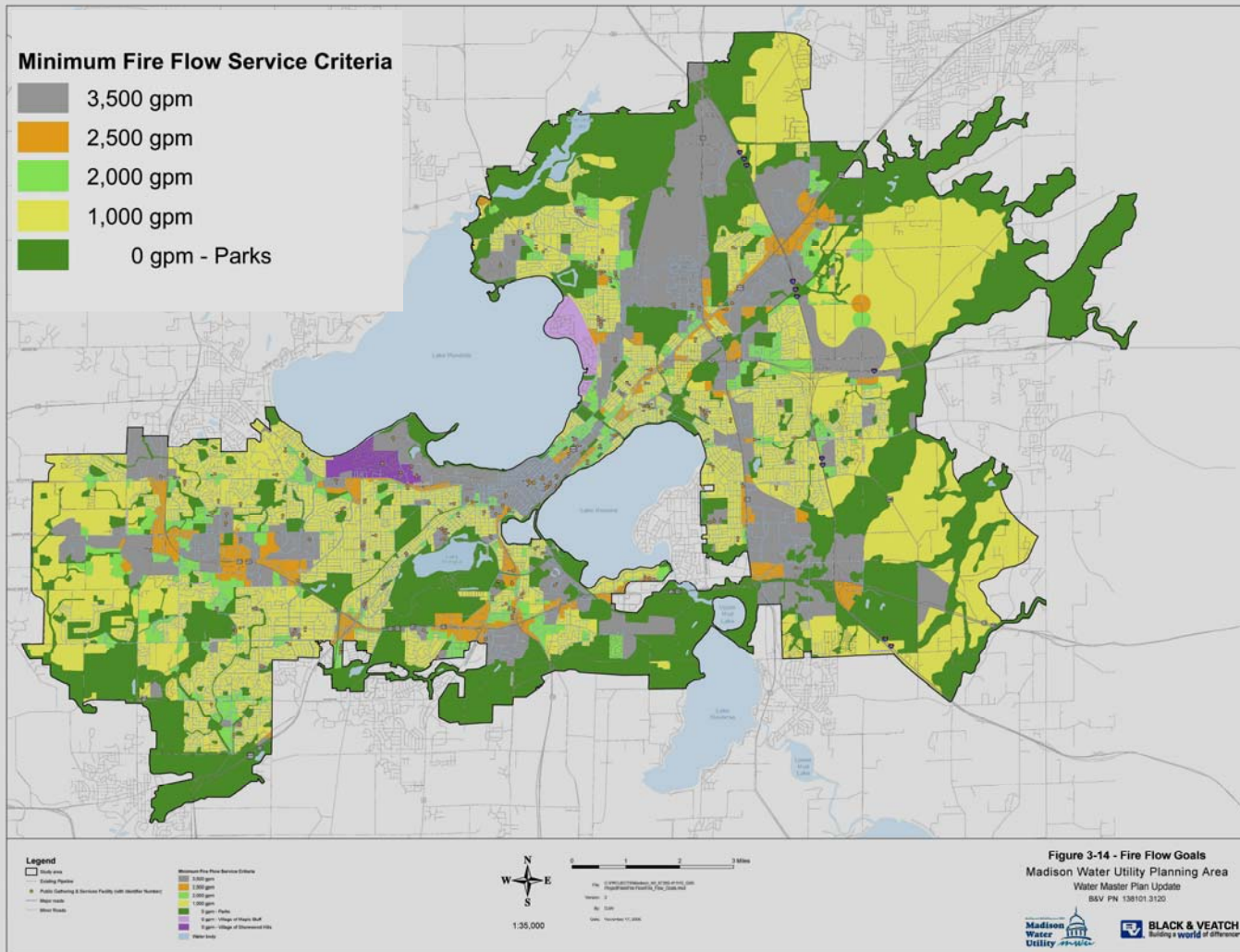
X

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Service Zone Max Day Demands

Fire flow goals were defined based on land use types and ISO requirements for buildings typical for land use types.



Land Use Category	Fire Flow Goal, gpm
Residential - SF	
Low - Density	1,000
Medium-Density	2,000
High-Density	2,500
Mixed Use	
Neighborhood	2,000
Community	2,500
Regional	3,500
Commercial	
General	2,500
Regional	3,500
Employment	3,500
Industrial	3,500
Other	
Special Institutional	3,500
Downtown	3,500
Campus	3,500
Airport	3,500



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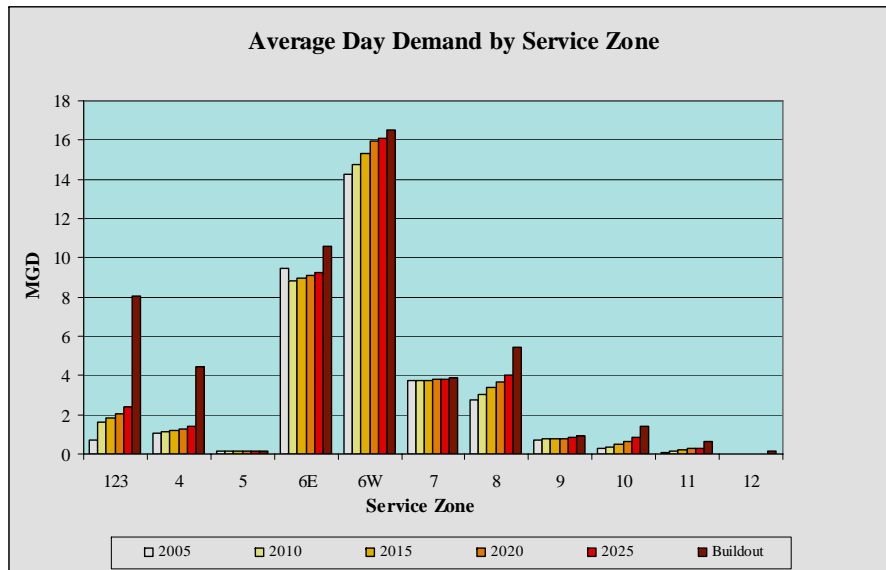


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Water System Evaluation

Design MD Demand was also defined for each individual service zone.



X

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Service Zone Max Day Demands

Required supply capacity was then determined for each service zone.



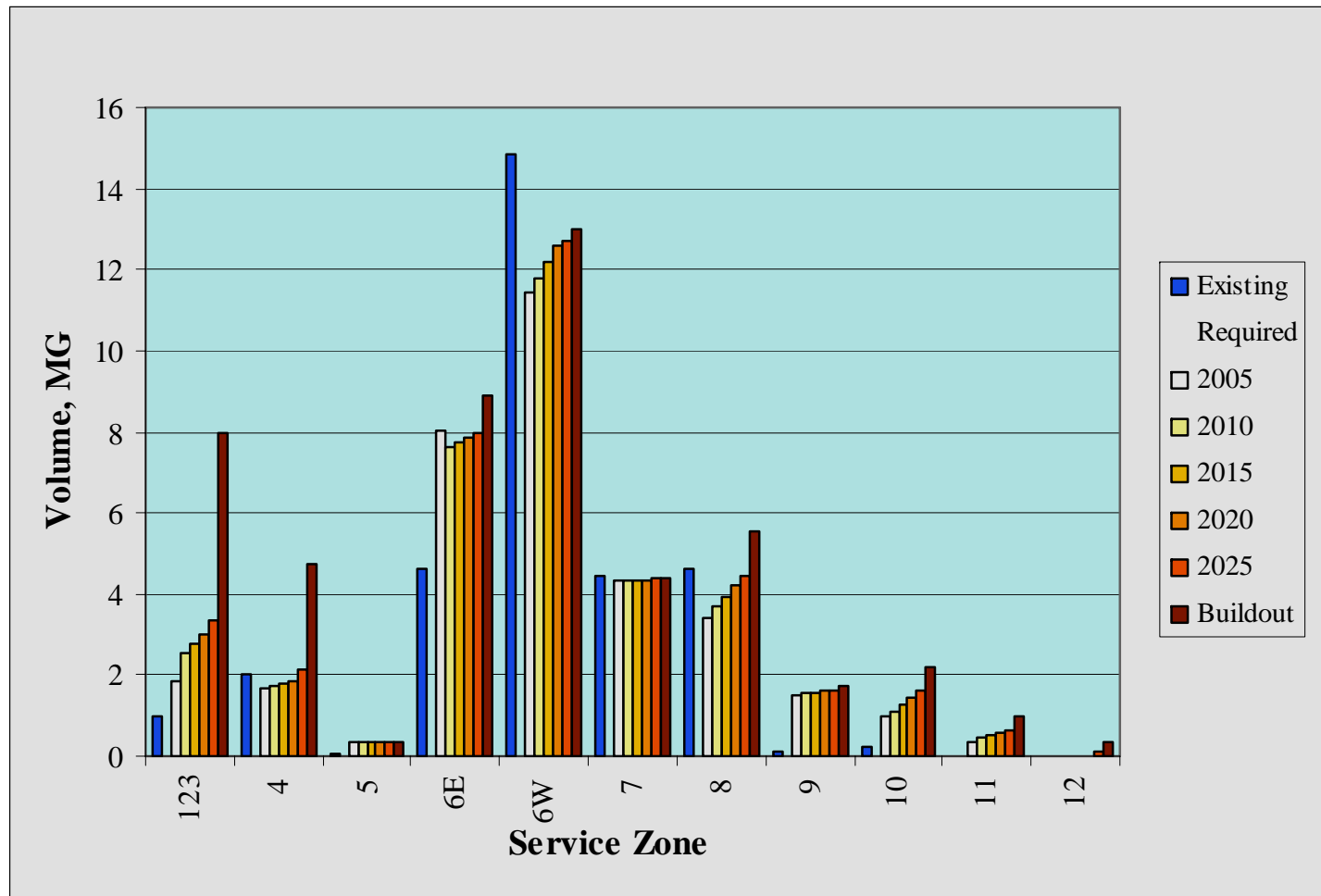
Inter-zone transfer, required to balance supply and demand, will vary over time with incremental demand growth and step increases in supply capacity.

Inter-zone transfer capacity assessed

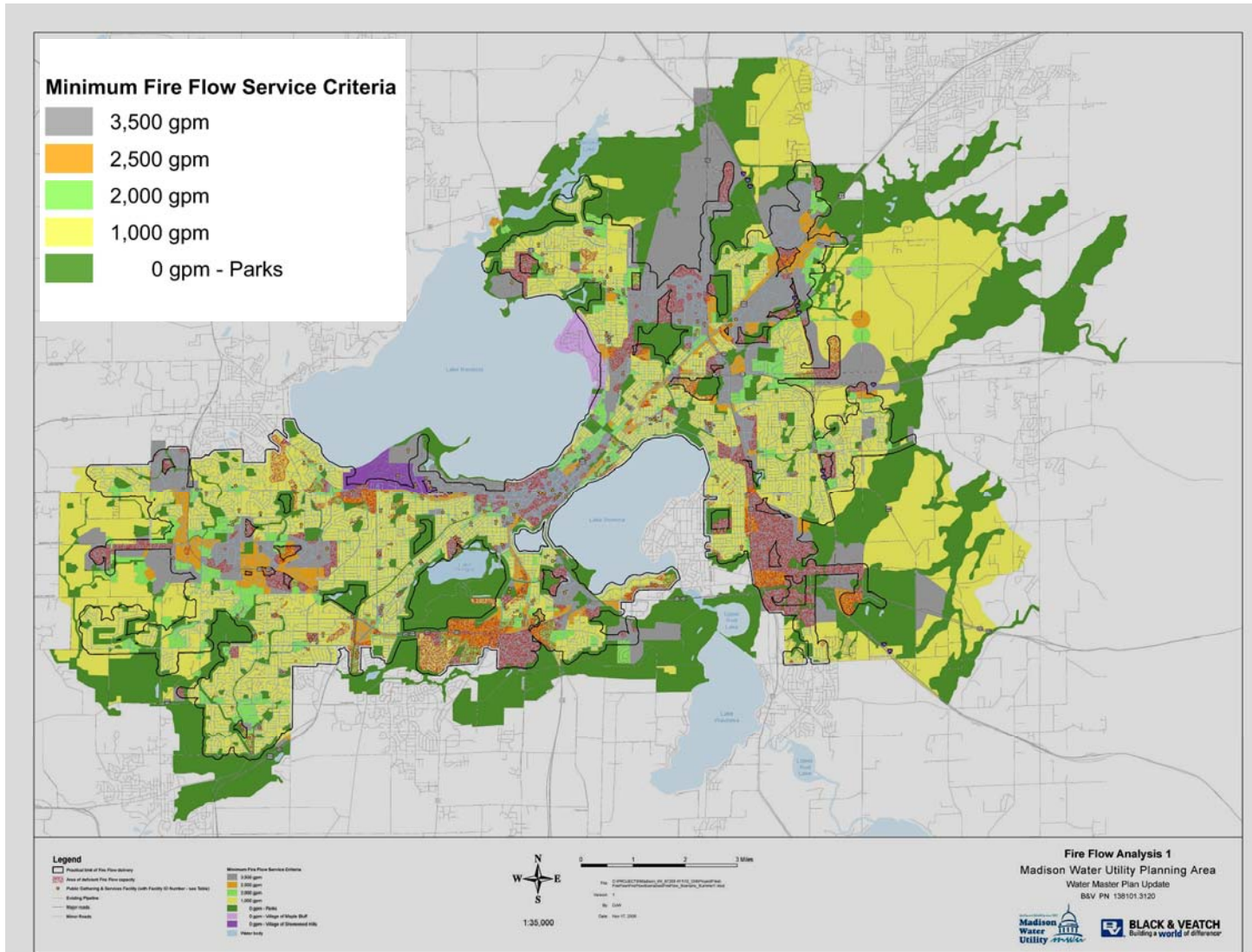
- Booster stations
- Pressure reducing valves

Storage improvements were defined by comparing current storage volume with needed Equalization, Fire and Emergency Storage volume.

Total Storage Volumes



A fire flow analysis of the existing system identified areas of needed capacity improvements.



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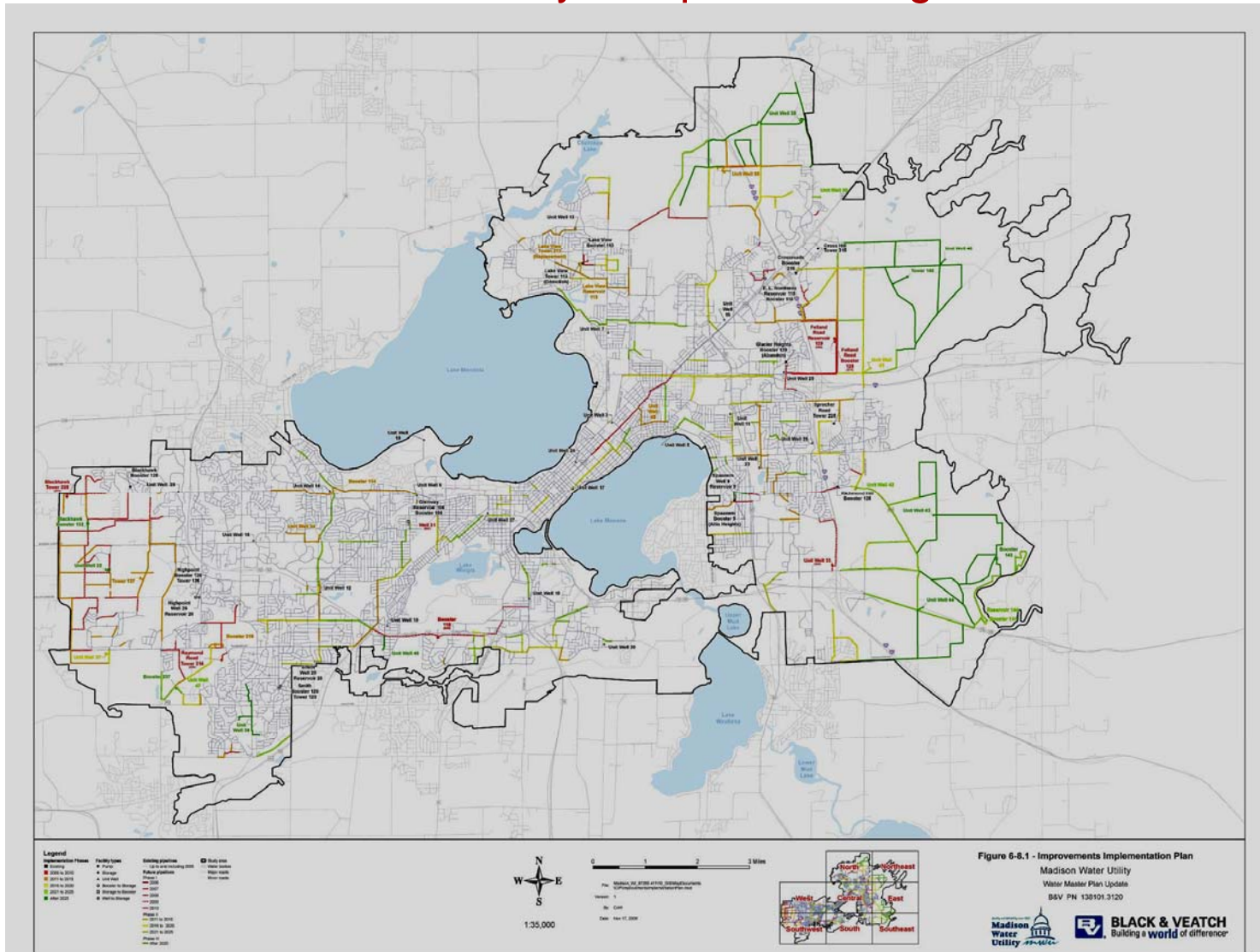


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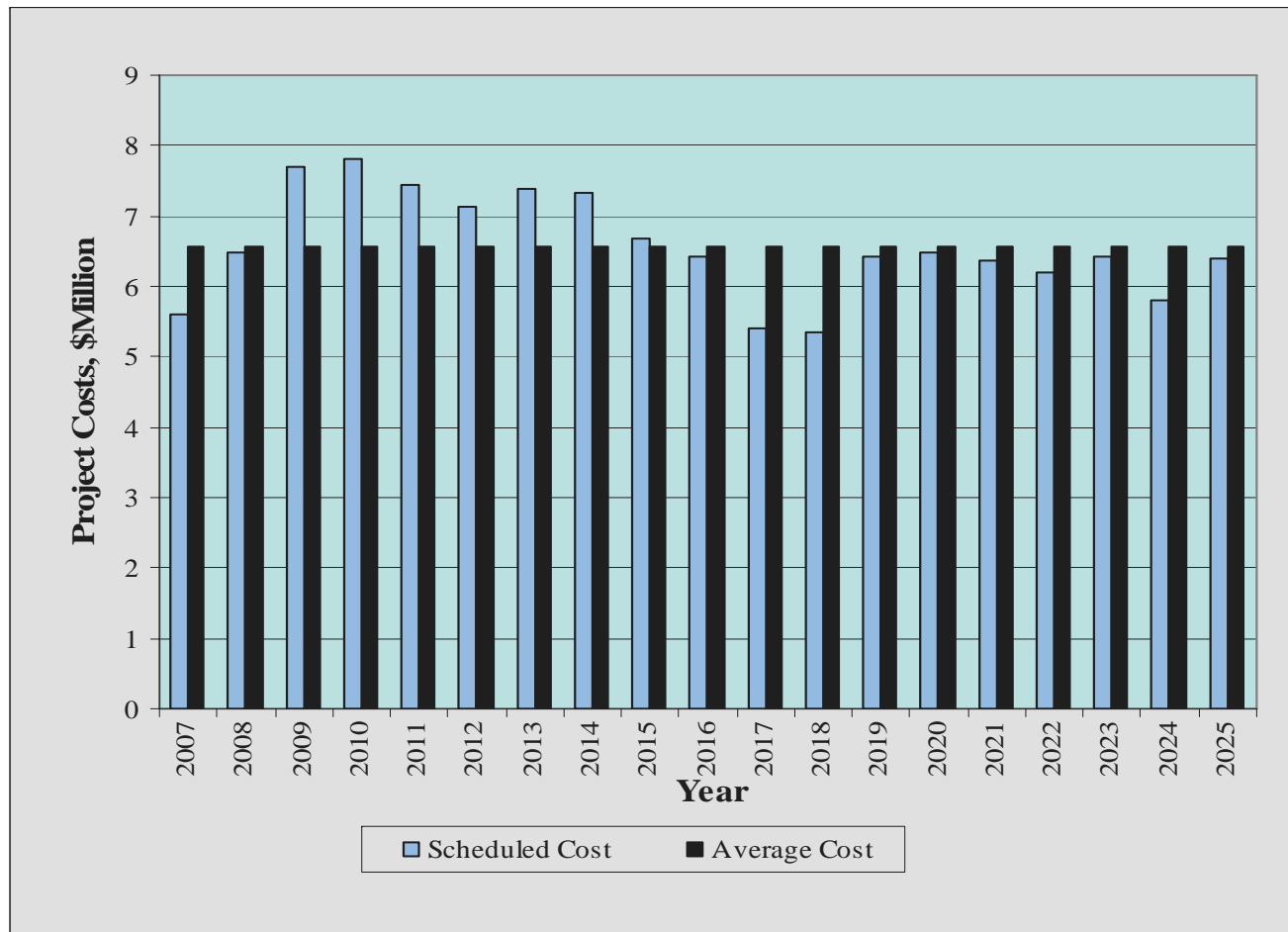
Capital Improvements Program

...then a strategy for implementing Master Plan improvements was devised to correct current deficiencies early and provide for growth over time.



Project timing balances need for the improvements with required revenue stream and project delivery capacity.

Yearly CIP Cost



Current system challenges are addressed by the Five-Year CIP.

Improve East-side Pressure

- Zone 6E above elevation 988 ft
- Consolidate into Zone 123
 - Transmission pipeline connections / enhancements
 - Valve closures
 - Unit Well 25 supply
 - Increased booster capacity; Booster Stations 115 and 129

Current system challenges are addressed by the Five-Year CIP.

Improve Fire Flow Capacity

- Arbor Hills
 - Cannon Ball Trail transmission pipeline
 - Booster Station 118 (new)
- Service Zone 123
 - Reservoir 229 – Felland Road (new in 2007)
 - Booster Station 115 – Bunker Hill (upgrade)
 - Booster Station 129 – Felland Road (new)
- Service Zone 4
 - Transmission pipeline from Unit Well 9 (2008)
 - Pressure Reducing Station (new)
 - Unit Well 33 (new)

Current system challenges are addressed by the Five-Year CIP.

Improve Fire Flow Capacity

- Service Zone 5
 - Booster Station 113 – Northport Drive (upgrade)
 - Elevated Reservoir 113 (new)
- Service Zone 9; Elevated Reservoir 216 (new)
- Service Zone 10; Elevated Reservoir 137 (new)
- Service Zone 11; Elevated Reservoir 228 (new)

Current system challenges are addressed by the Five-Year CIP.

Manage Water Quality

- Unit Well 3: Abandoned in 2008
- Unit Well 8: Construct a filter
- Unit Well 10: Reserve capacity; Either filter or replace
- Unit Well 29: Filter on line 2009

Five-Year CIP – Year 1

Only Unit Well 29 filter has been completed

Year 2007 Improvements		
Description	Purpose	Cost, \$
Wells		
Well31: New deep well	Meet increased West Campus demand; Replace capacity lost to reduced use of UW10.	1,300,000
UW29: Treat or Replace	Provide treatment or replace existing well.	2,400,000
Booster Stations		
BS106: Demolish & rebuild	Replace aging facility; Increase capacity and reliability; transfer normal supply to postpone supply expansion in Zone 7; transfer emergency supply until unit wells are built.	850,000
BS113: Change / add pumps	Improve fire supply capacity until fire storage is built in year 2012. Transfer normal and emergency supplies.	200,000
PRV Stations (booster station)		
@ BS106	Improve RES106 refill ability; Improve reliability	30,000
PRV Stations (above-grade structure)		
@ Vondron Rd	Improve fire flow capacity in Zone 4; Improve reliability	75,000
@ Gammon Rd	Provide emergency supply transfer capability; Improve reliability	75,000
Pipelines		
Year 2007 Subtotal		7,010,000



Five-Year CIP – Year 2

Only some of the pipeline work was completed

Year 2008 Improvements		
Description	Purpose	Cost, \$
Booster Stations		
BS120: Change / add pumps	Increase capacity and reliability; transfer normal supply to postpone supply expansion in Zone 9; transfer emergency supply until unit wells are built	320,000
PRV Stations (booster station)		
@ UW120	Improve reliability; supply transfer during abnormal conditions	30,000
Storage		
TWR216 (Raymond Road) –New 1.0 MG elevated tank	Eliminate current storage deficiency in Zone 9	1,500,000
Pipelines		
		5,630,000
Year 2008 Subtotal		7,480,000

Five-Year CIP – Year 3

No progress on this list

Year 2009 Improvements		
Description	Purpose	Cost, \$
Unit Wells		
UW25: Change pumps	Provide head to deliver to Zone 123; First Zone 123 unit well	200,000
UW33: New unit well	Increase Zone 4 fire flow capacity; Reliability via dual zone supply	3,000,000
Booster Stations		
BS115: Change pump, add VFD	Improve pressure in RES 115 area; transfer normal supply to postpone supply expansion in Zone 123; supplement fire supply; transfer emergency supply until unit wells are built	100,000
BS118: New booster station	Transfer normal supply to replace capacity lost by reduced use of Unit Well 10 and to postpone supply expansion in Zone 7	640,000
PRV Stations (booster station)		
@ UW33	Improve reliability; supply transfer during abnormal conditions	30,000
@ BS115	Improve reliability; supply transfer during abnormal conditions	30,000
@ BS118	Improve reliability; supply transfer during abnormal conditions	30,000
@ BS126	Improve reliability; supply transfer during abnormal conditions	30,000
Pipelines		3,630,000
Year 2009 Subtotal		7,690,000



Five-Year CIP – Year 4
 No progress on this list

Year 2010 Improvements		
Description	Purpose	Cost, \$
Booster Stations		
BS129 (Felland Road): New booster station	Replace BS129 Glacier Heights; Provide capacity to transfer fire flows from storage in Zone 6E	1,200,000
PRV Stations (booster station)		
@ BS129	Improve reliability; supply transfer during abnormal conditions	30,000
Storage		
TWR228 (Blackhawk) – New 0.75 MG elevated tank	Eliminate current storage deficiency in Zone 11	1,200,000
Pipelines		5,380,000
Year 2010 Subtotal		7,810,000



Five-Year CIP – Year 5

No progress on this list

Year 2011 Improvements		
Description	Purpose	Cost, \$
Unit Wells		
UW3: Abandon	Groundwater contamination renders well unusable	50,000
UW45: New unit well	Replace UW3. Maintain Zone 6E supply capacity	3,000,000
PRV Stations (booster station)		
@ BS125	Improve reliability; supply transfer during abnormal conditions	30,000
@ BS215	Improve reliability; supply transfer during abnormal conditions	30,000
Storage		
TWR137: New 1.0 MG elevated tank	Eliminate current storage deficiency in Zone 10	1,500,000
Pipelines		
Demolition		
BS129 (Glacier Heights)	Obsolete facility replaced by BS129 (Felland Road)	50,000
Year 2011 Subtotal		7,450,000



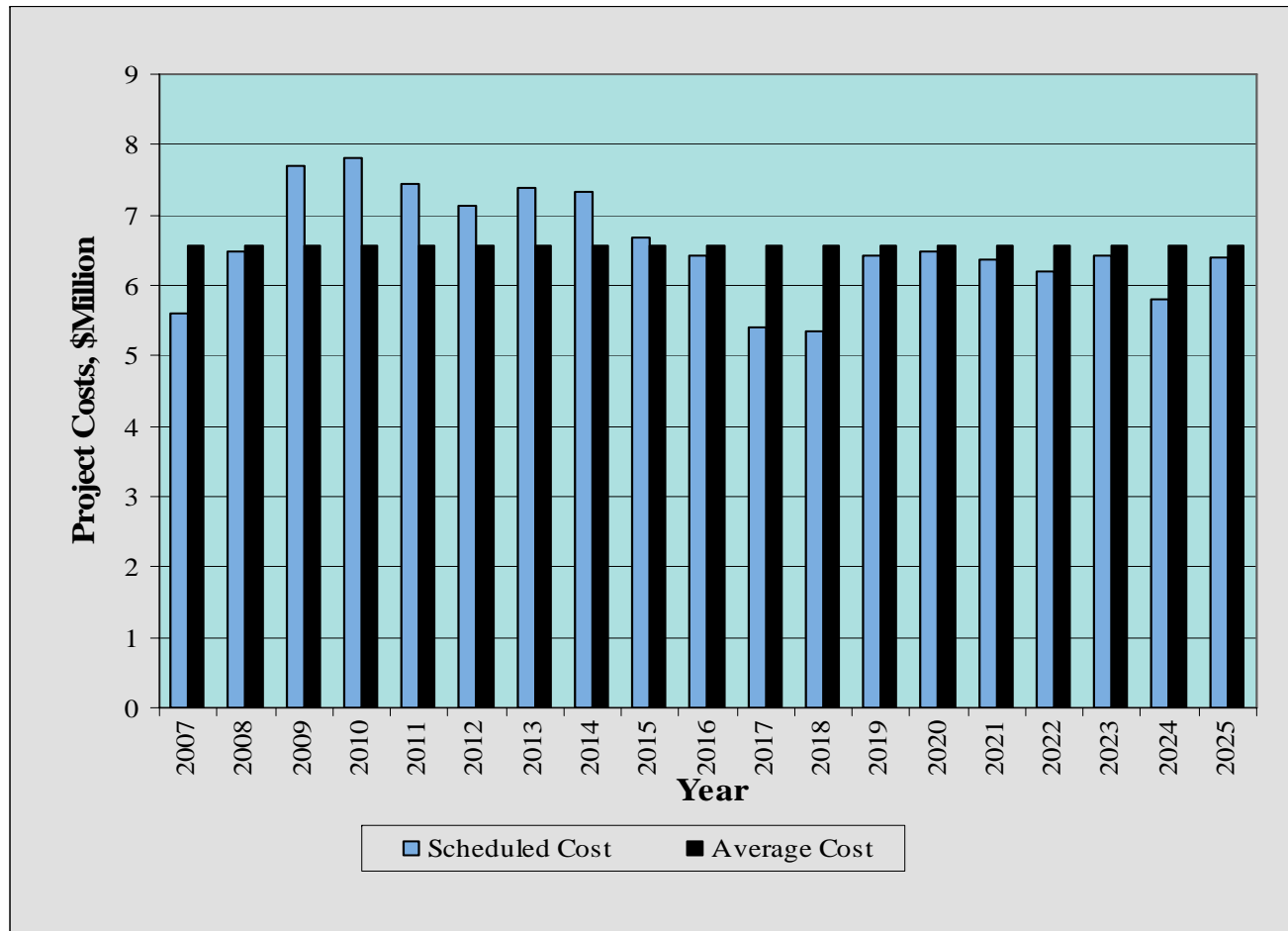
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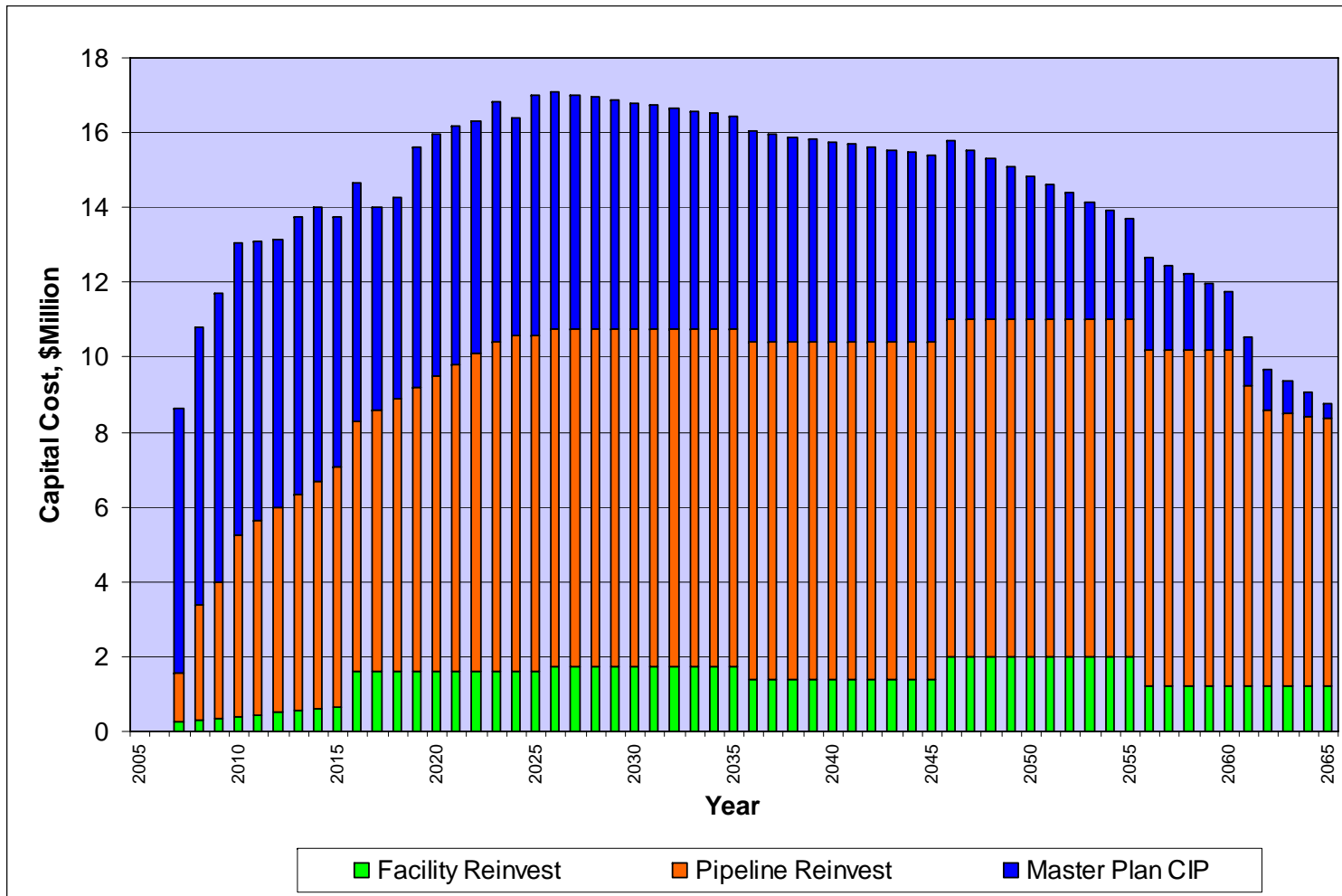
Master Plan Capital Costs

Yearly CIP Cost



Total Plan Capital Costs

IMP Reinvestment + MP Improvements



Questions ?