Water & Wastewater Systems; Watershed Management

Partners in Planning & Building the Future Lincoln

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Lincoln Public Works & Utilities
May 14, 2008

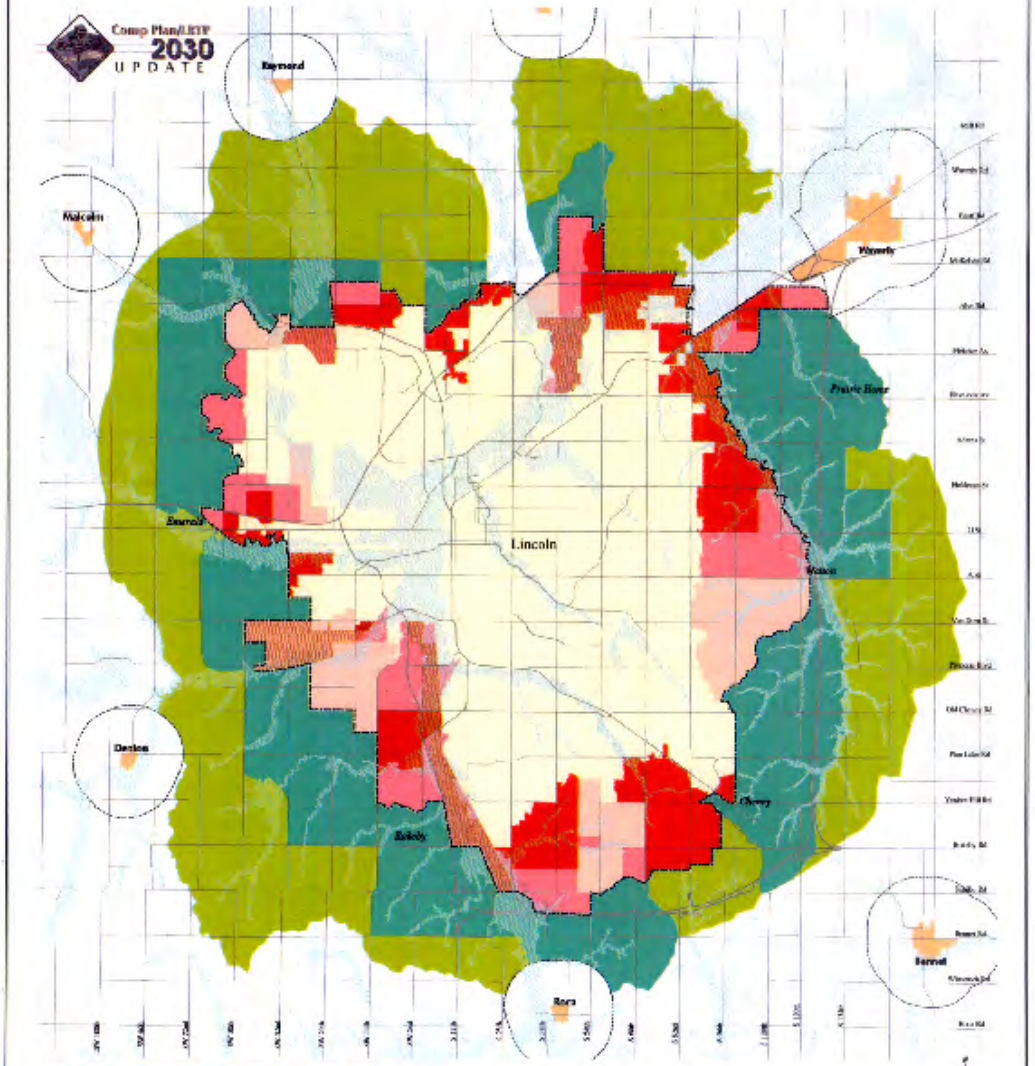
This Discussion

1. Last five years: projects & accomplishments.
2. Unique features-planning for the future.
3. Growth: implications beyond Capital Construction.

WHAT drives a programs?

- Condition/service of existing system (pipes/treatment/pumping facilities).
- 2030 Comp. Plan:Tier I- adds 52 sq. miles
- Note @ 1.5% adds 38 sq. miles
- Review. . . . . .2030 Map

URBAN GROWTH TIERS WITH PRIORITY AREAS



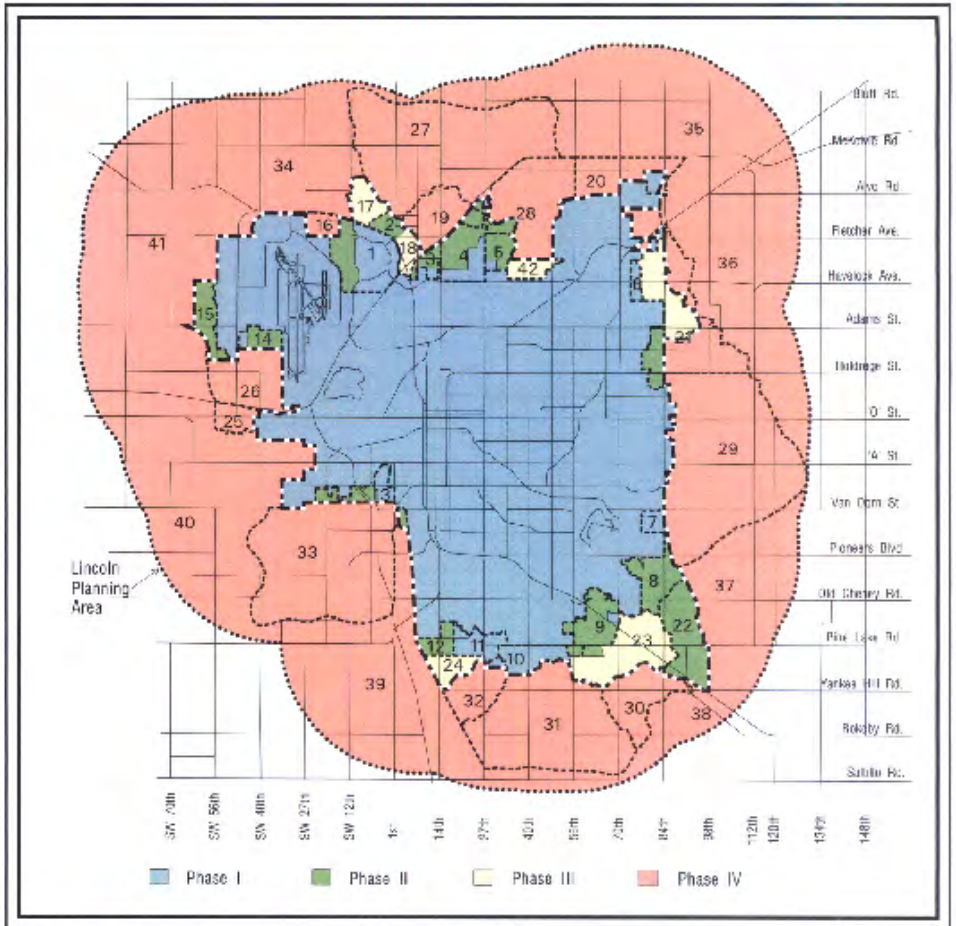


Figure 65

Anticipated 2015 Lincoln Service Limit and Phasing Plan

Miles
0 1 2 3

Lincoln City/Lancaster County
Comprehensive Plan

Anticipated Year 2015 Service Limit

SUMMARY OF PHASES IN PLAN

Phase I – Areas designated for immediate development will generally be contiguous to existing development with some or most of required infrastructure in place.

Phase II – Areas designated for near-term development will be contiguous to existing or planned development but lacking one or more major items of infrastructure, such as arterial road, park or trunk sewer.

Phase III – Areas designated for mid-term development will be contiguous to existing or planned development, lack most infrastructure required to support development, but might reasonably be expected to develop within the planning period.

Phase IV – Balance of City of Lincoln's land use jurisdiction, the future urban area, shall be held as an urban reserve. Fully within community's growth area but beyond the planning period.

Lincoln Water System

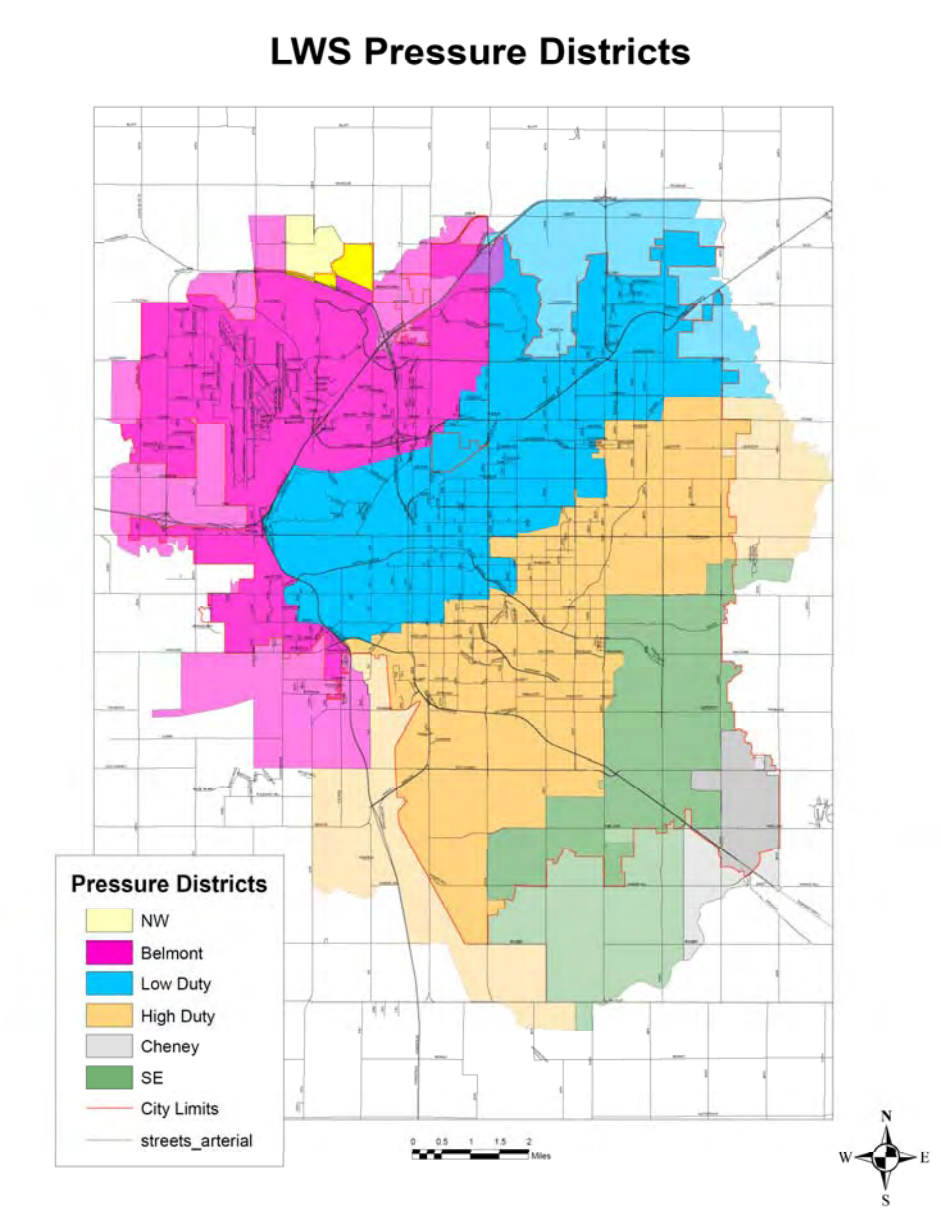
- System Overview
- Accomplishments
- Master Plan Efforts
- System Observations

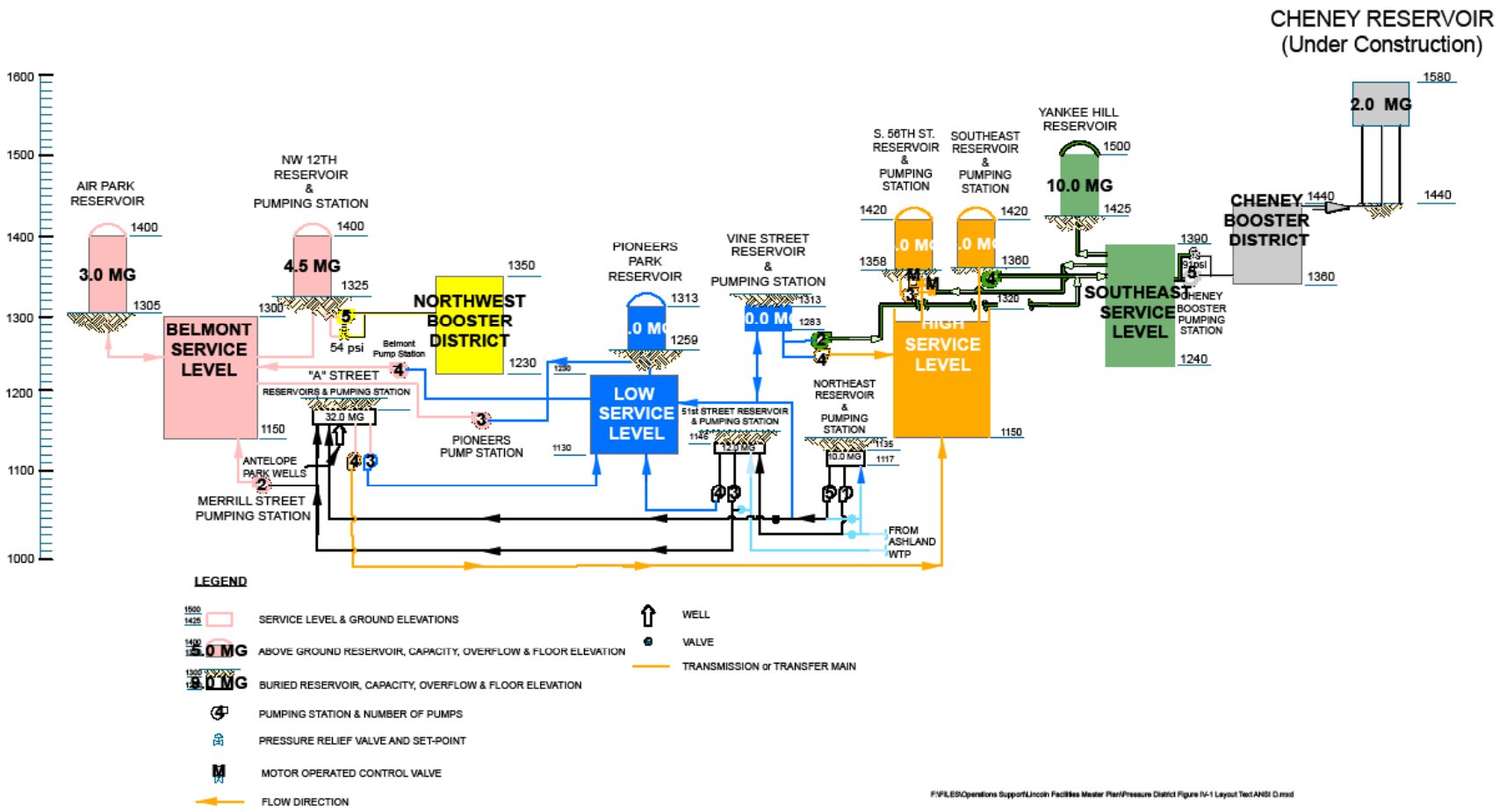
Water Supply & Treatment

- 99% of Annual Supply from Ashland
- Water pumped from wells to Treatment Plant
- West Plant – 1930s – Aeration & Filtration
- East Plant – 1994 – Ozonation & Filtration
- Iron & Manganese Removal
- Add Fluoride and Chloramines
- Total Treatment Capacity – 110 MGD
- Water Pumped to Lincoln – Total Transmission Capacity - 100 MGD

Pressure Districts

- Ground Elevations from Lowest to Highest is Almost 300 Feet – 1150 to 1440
- Pressure of 100 Feet of Water Depth is 43 PSI




CHENEY RESERVOIR
(Under Construction)
2.0 MG
1580
1440
1440
CHENEY BOOSTER DISTRICT
1360
1600
1500
1400
1300
1200
1100
1000
AIR PARK RESERVOIR
1400
3.0 MG
1305
NW 12TH RESERVOIR & PUMPING STATION
1400
4.5 MG
1325
1300
5
54 psi
Belmont Pump Station
4
"A" STREET
RESERVOIRS & PUMPING STATION
32.0 MG
1150
BELMONT SERVICE LEVEL
ANTELOPE PARK WELLS
2
MERRILL STREET PUMPING STATION
NORTHWEST BOOSTER DISTRICT
1350
1230
3
PIONEERS PUMP STATION
1130
PIONEERS PARK RESERVOIR
1313
.0 MG
1259
LOW SERVICE LEVEL
VINE STREET RESERVOIR & PUMPING STATION
1313
0.0 MG
1283
51st STREET RESERVOIR & PUMPING STATION
1146
12.0 MG
NORTHEAST RESERVOIR & PUMPING STATION
1135
10.0 MG
1117
FROM ASHLAND WTP
S. 56TH ST. RESERVOIR & PUMPING STATION
1420
.0 MG
1358
M
SOUTHEAST RESERVOIR & PUMPING STATION
1420
.0 MG
1360
1320
HIGH SERVICE LEVEL
1150
YANKEE HILL RESERVOIR
1500
10.0 MG
1425
1390
5 psi
CHENEY BOOSTER PUMPING STATION
SOUTHEAST SERVICE LEVEL
1240
LEGEND
SERVICE LEVEL & GROUND ELEVATIONS
ABOVE GROUND RESERVOIR, CAPACITY, OVERFLOW & FLOOR ELEVATION
BURIED RESERVOIR, CAPACITY, OVERFLOW & FLOOR ELEVATION
PUMPING STATION & NUMBER OF PUMPS
PRESSURE RELIEF VALVE AND SET-POINT
MOTOR OPERATED CONTROL VALVE
FLOW DIRECTION
WELL
VALVE
TRANSMISSION or TRANSFER MAIN
F:\FILES\Operations Support\Lincoln Facilities Master Plan\Pressure District Figure IV-1 Layout Text ANSI D.mxd

Reservoirs

Pump Stations

WATER
Accomplishments since 2003

- Pioneer pump station. $2.6 mil
- Northeast Pump Station. $2.1 mil
- Elevated Reservoir –S.E.Lincoln. $2.8 mil
- Security measures/installations. $1.5 mil
- Construction started - Transmission main, Greenwood to Lincoln. $22. mil
- Miles of pipe constructed. 115 miles

Accomplishments

Projects Completed

- Pioneers Pump Station
- In Service – 2004

Accomplishments

Projects Completed

24 inch Water Main Construction

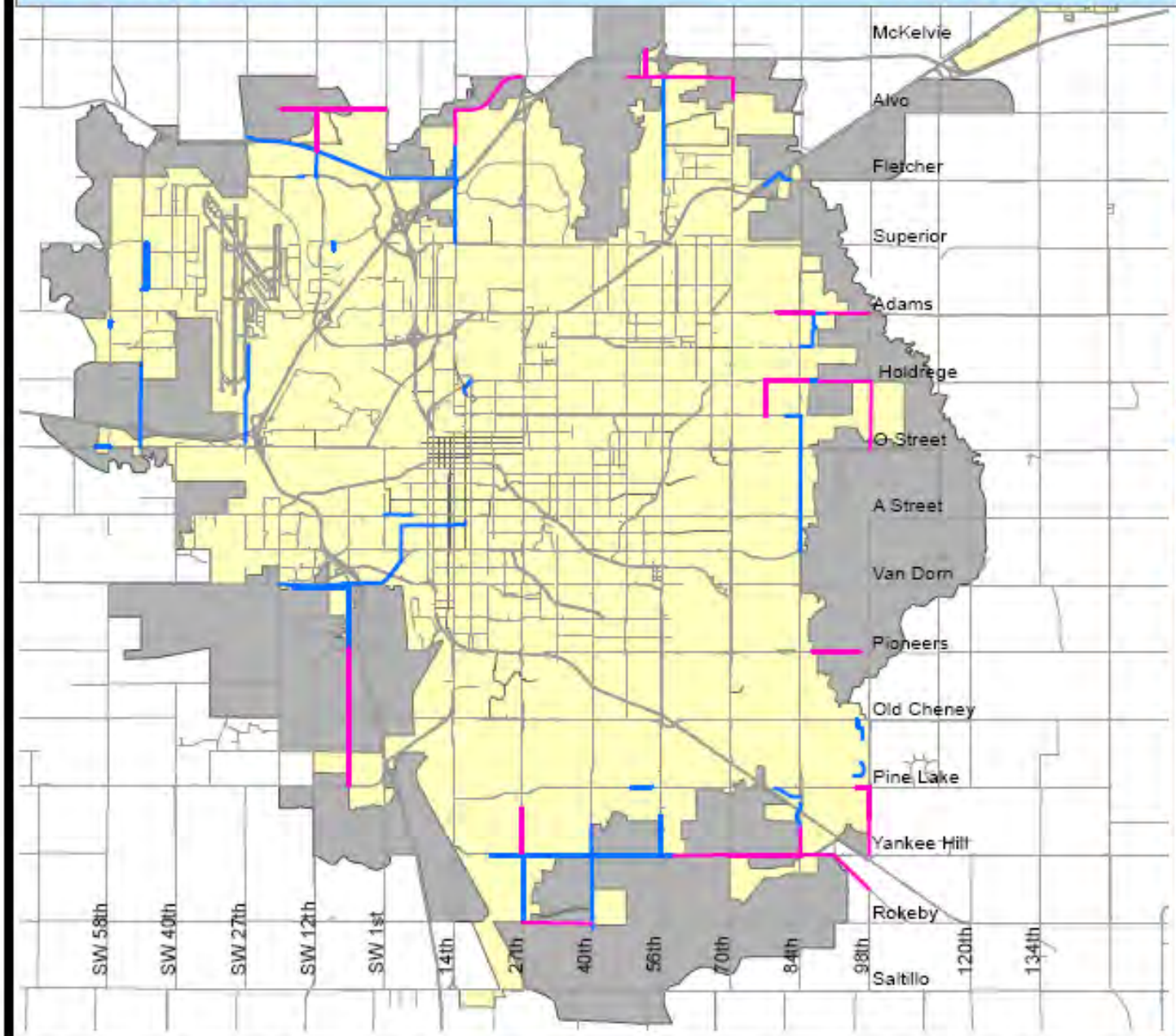
Accomplishments

Projects Under Construction

Construction 2003 to Present

Public Works & Utilities

Lincoln Water System



CITY OF LINCOLN
NEBRASKA

Under Construction/Design

Completed

2007 City Limits

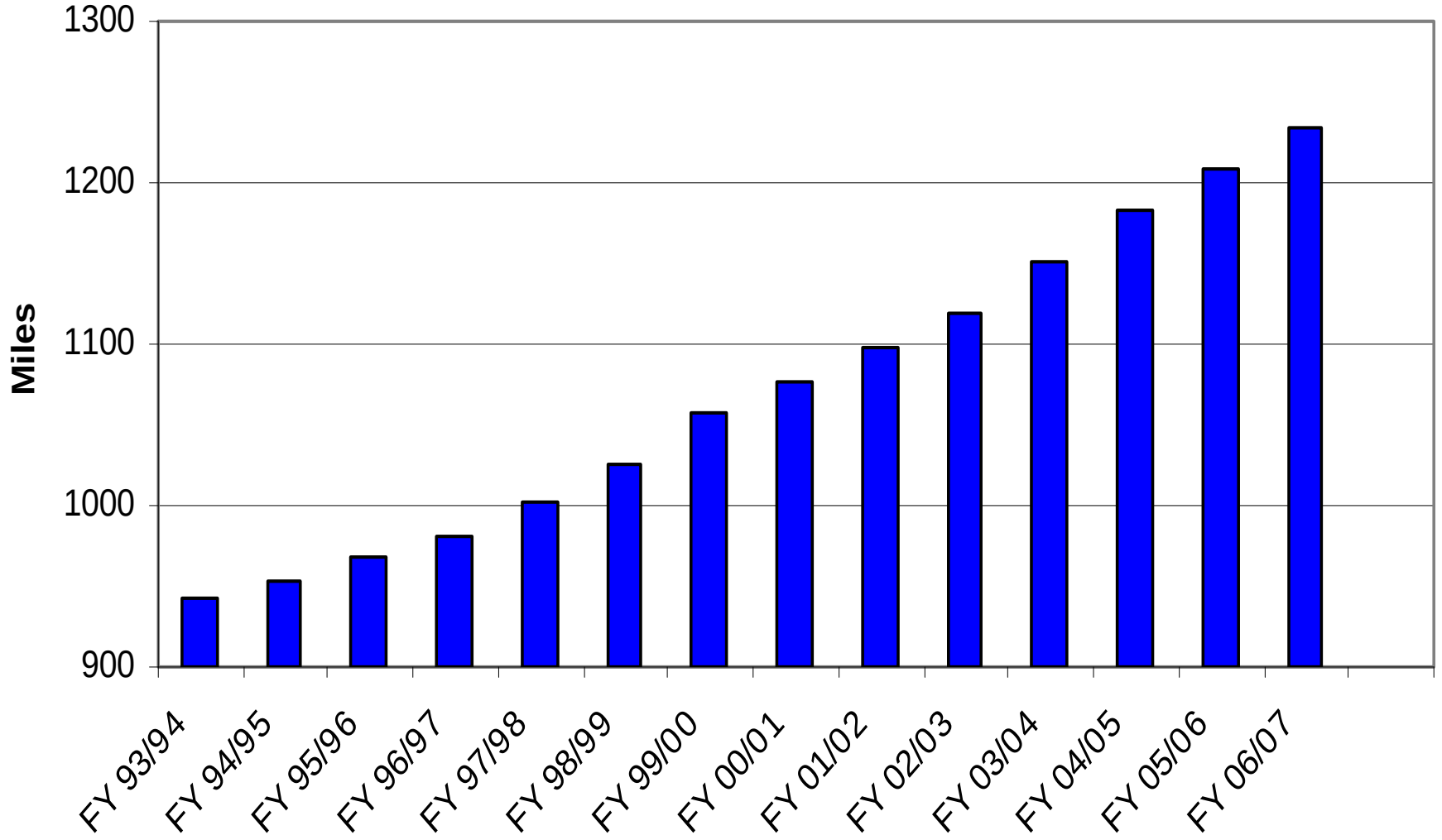
Future Service Limit

N
W
E
S

0 0.375 0.75 1.5 2.25 3 Miles

JUNE 12, 2007

Lincoln Water System
Total Miles of Water Mains by Year



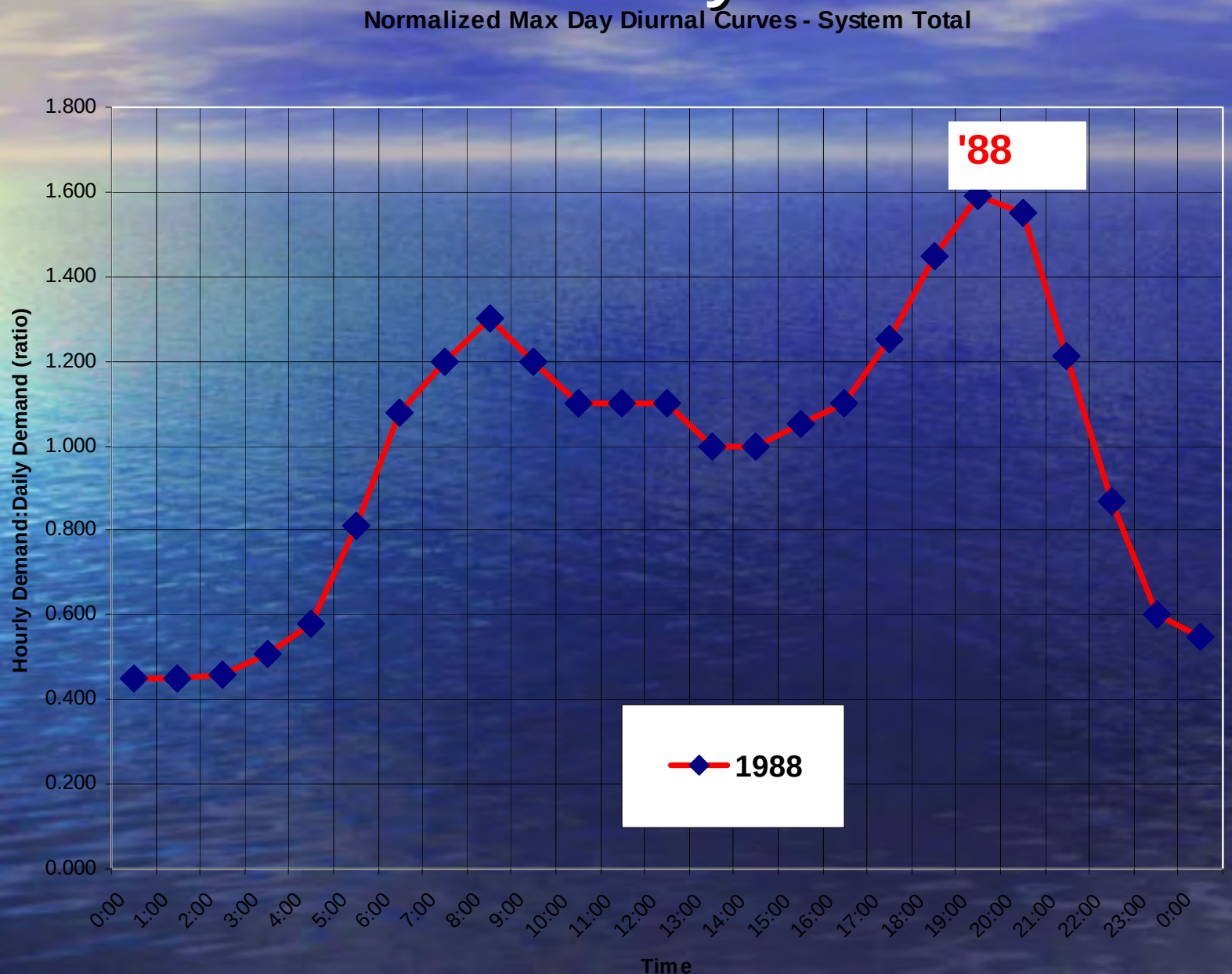
WATER FACILITIES MASTER PLAN
Project Highlights

- Update historical usage patterns
- Determine Max Day and Max Hour for Design Years
- Recommend necessary pump station and reservoir improvements
- Recommend necessary distribution system improvements
- Evaluate main replacement program

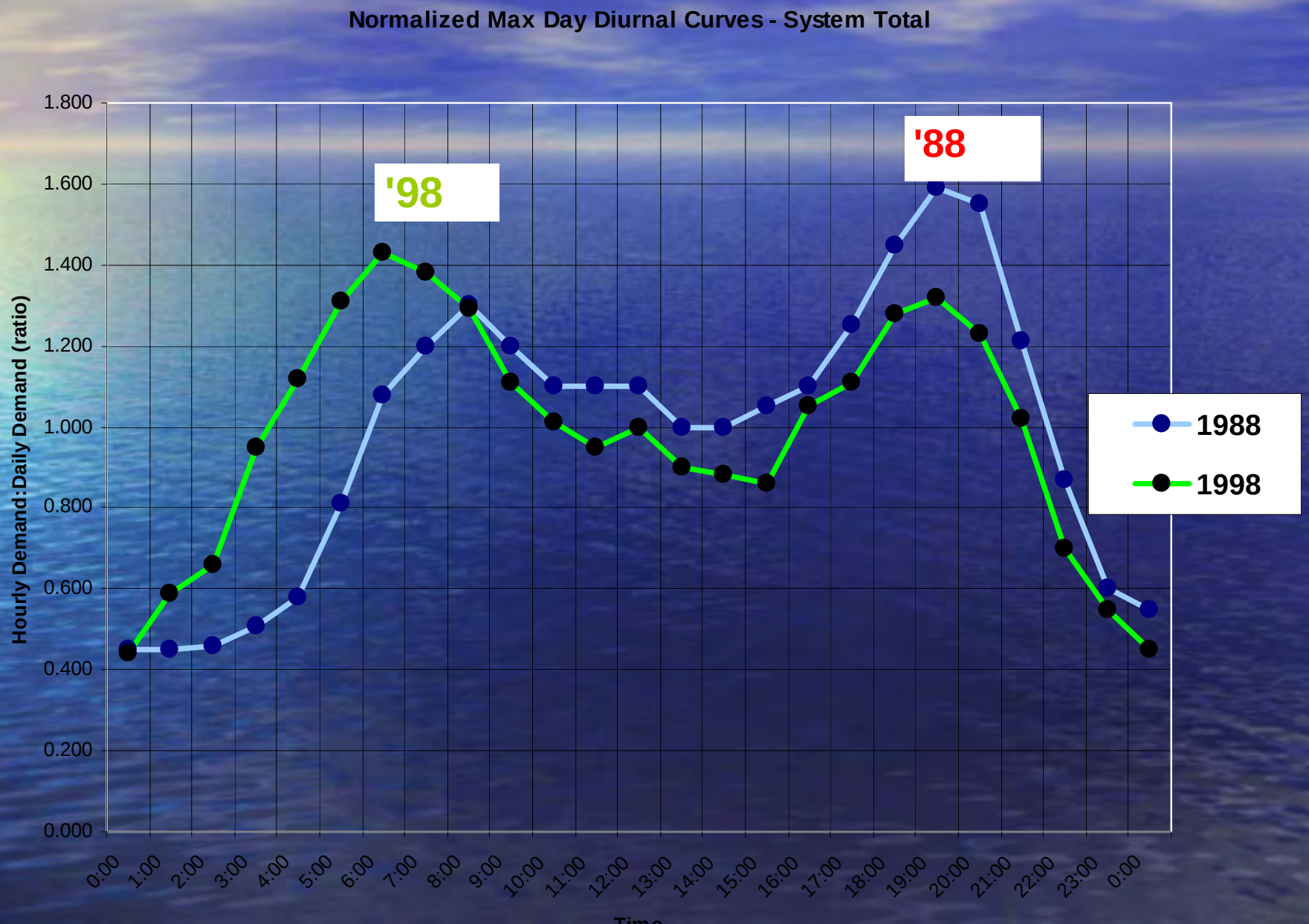
Observed Trends in Water Use

- Shift in Peak Hour Usage from PM to AM
- Reduction in Peak Hour
- Conservation of Water – Less Wasted
- Per Capita Consumption Down from Over 110 gal / person / day to under 95
- Total Consumption – 12 to 14 billion gal/yr

1988 Max Day Demands

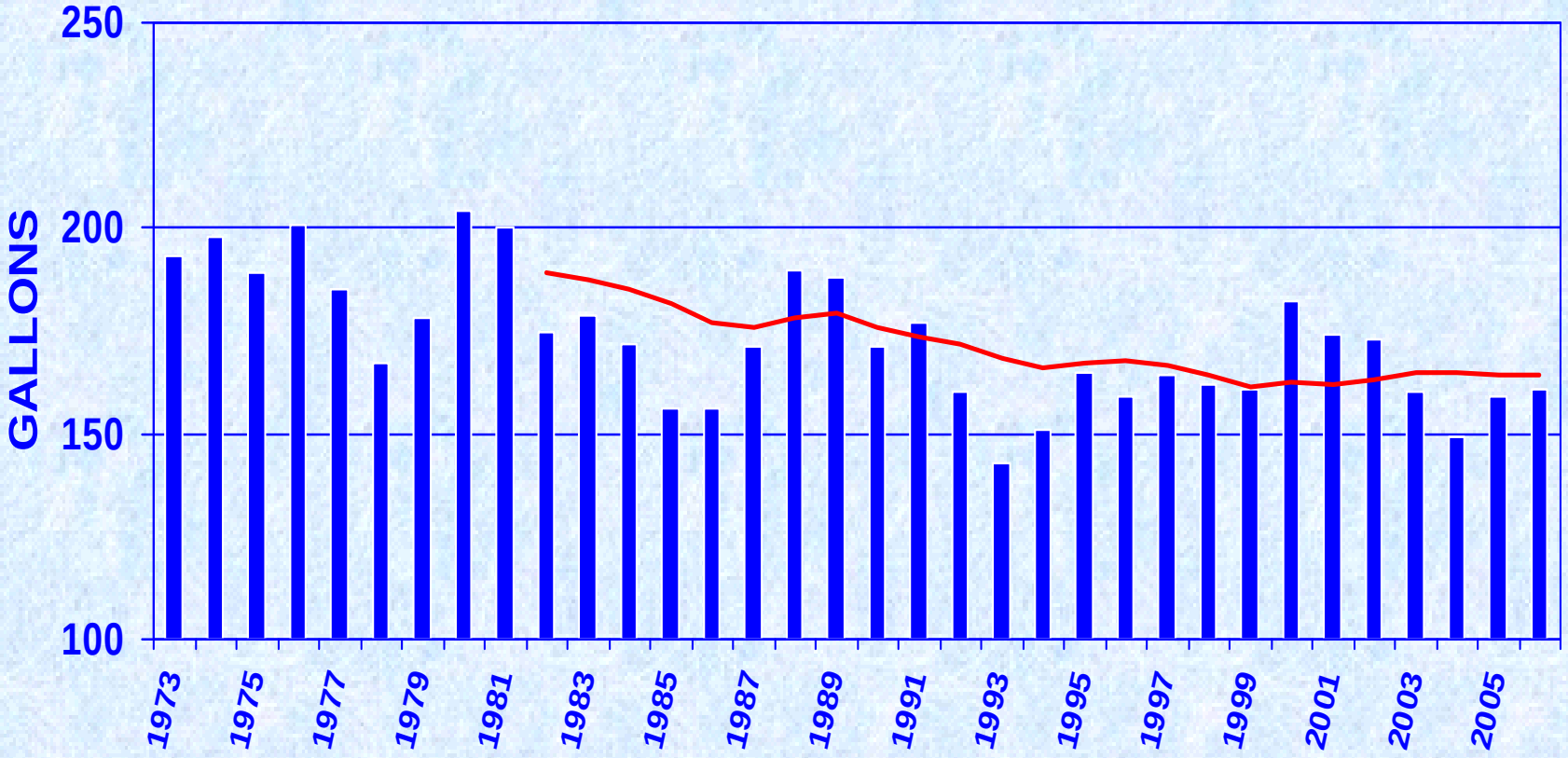


Diurnal Water Use – 1988 & 1998



PER CAPITA DEMAND

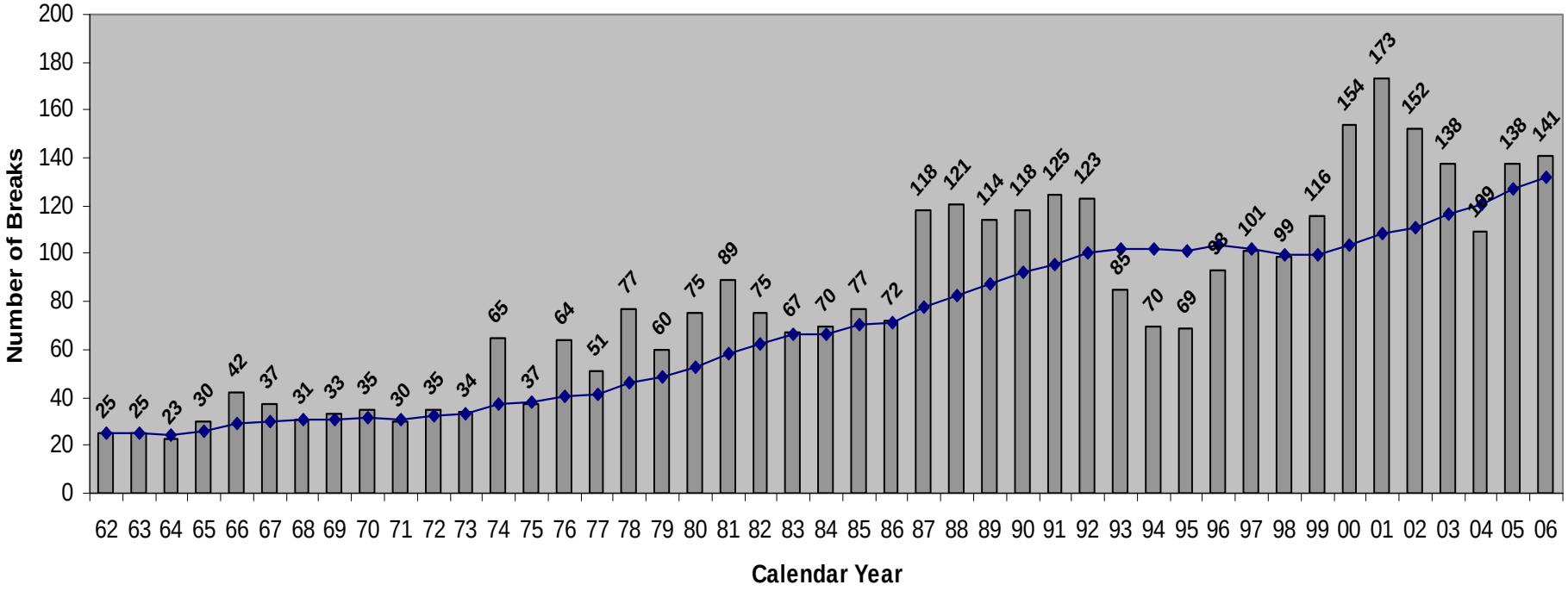
GALLONS PER DAY



Implications Beyond Construction Program

- Staffing to operate
- Increasing maintenance for pumps, motors, buildings, grounds
- Automated meter reads (use technology)
- Quality workmanship on construction on new projects
- Growth: miles of pipes, valves, hydrants
- Manage existing infrastructure / assets / replacement rate

Broken Water Mains



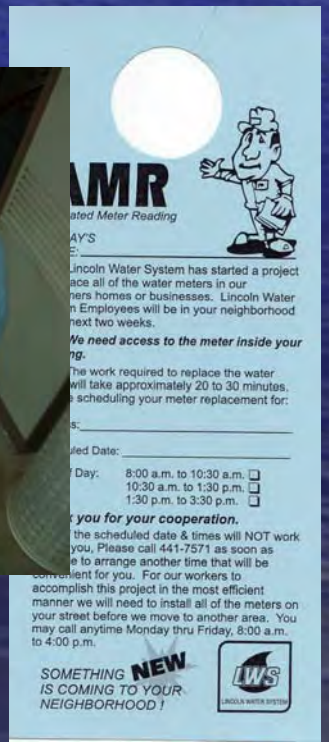
Spending on Main Replacement has increased from $250,000 per year to $2.7 million since 1992

Water Distribution System Maintenance

- 9,400 Fire Hydrants
- 22,000 Valves

Automated Meter Reading Program

- "Cash Registers" for Water and Sewer Revenues - Total meter sales FY 05-06 (water & sewer) = $43.1 million
- Over 77,000 meters.
- AMR advantages:
  - Reduces meter reading resources
  - Reduced liability and intrusion on private property
  - Reduced reading errors



AMR

ated Meter Reading

AY'S

Lincoln Water System has started a project ace all of the water meters in our ners homes or businesses. Lincoln Water n Employees will be in your neighborhood next two weeks.

We need access to the meter inside your ng.

The work required to replace the water will take approximately 20 to 30 minutes. scheduling your meter replacement for:

s:_____

led Date: _____

Day: 8:00 a.m. to 10:30 a.m. ☐
10:30 a.m. to 1:30 p.m. ☐
1:30 p.m. to 3:30 p.m. ☐

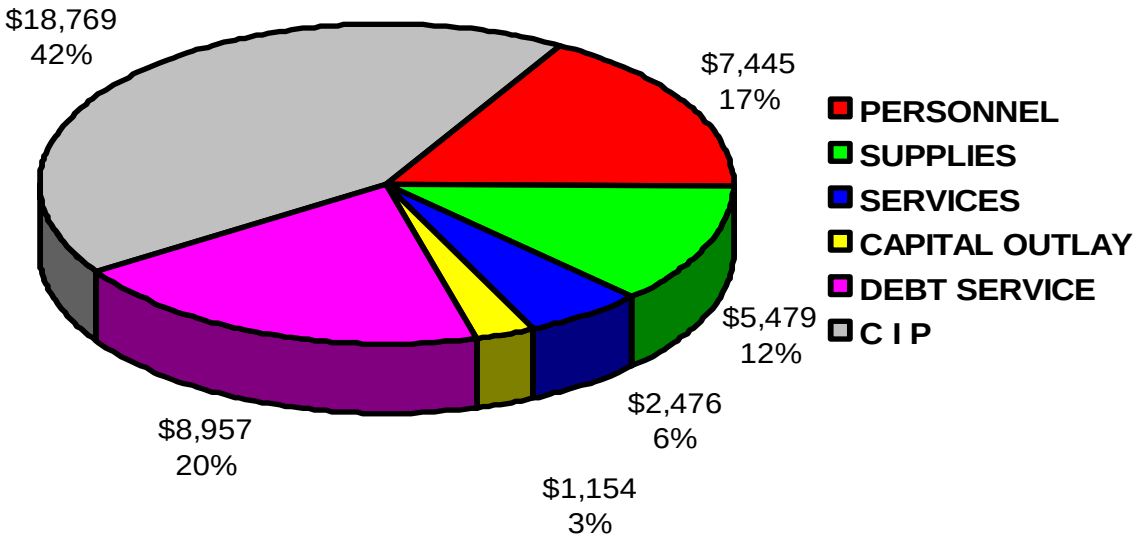
you for your cooperation.

the scheduled date & times will NOT work you, Please call 441-7571 as soon as e to arrange another time that will be enient for you. For our workers to accomplish this project in the most efficient manner we will need to install all of the meters on your street before we move to another area. You may call anytime Monday thru Friday, 8:00 a.m. to 4:00 p.m.

SOMETHING NEW IS COMING TO YOUR NEIGHBORHOOD!

LWS

LWS - 2006 - 07 O&M BUDGET w/ CIP



FY 2006-07 - $44.3 Million

PROGRAM FUNDING

- Water & Wastewater:
  - User fees
  - Revenue Bonds
  - Impact Fees
- Watershed management:
  - O&M------General Fund
  - Capital—Bond Issues

Wastewater System
"FUN FACT"

- The Theresa St. WWTP used to be LWS' biggest customer. Now, the plant uses the water it has treated for its own processes and for non-potable plant uses.
- This saves the rate-payers over $1millon per year.

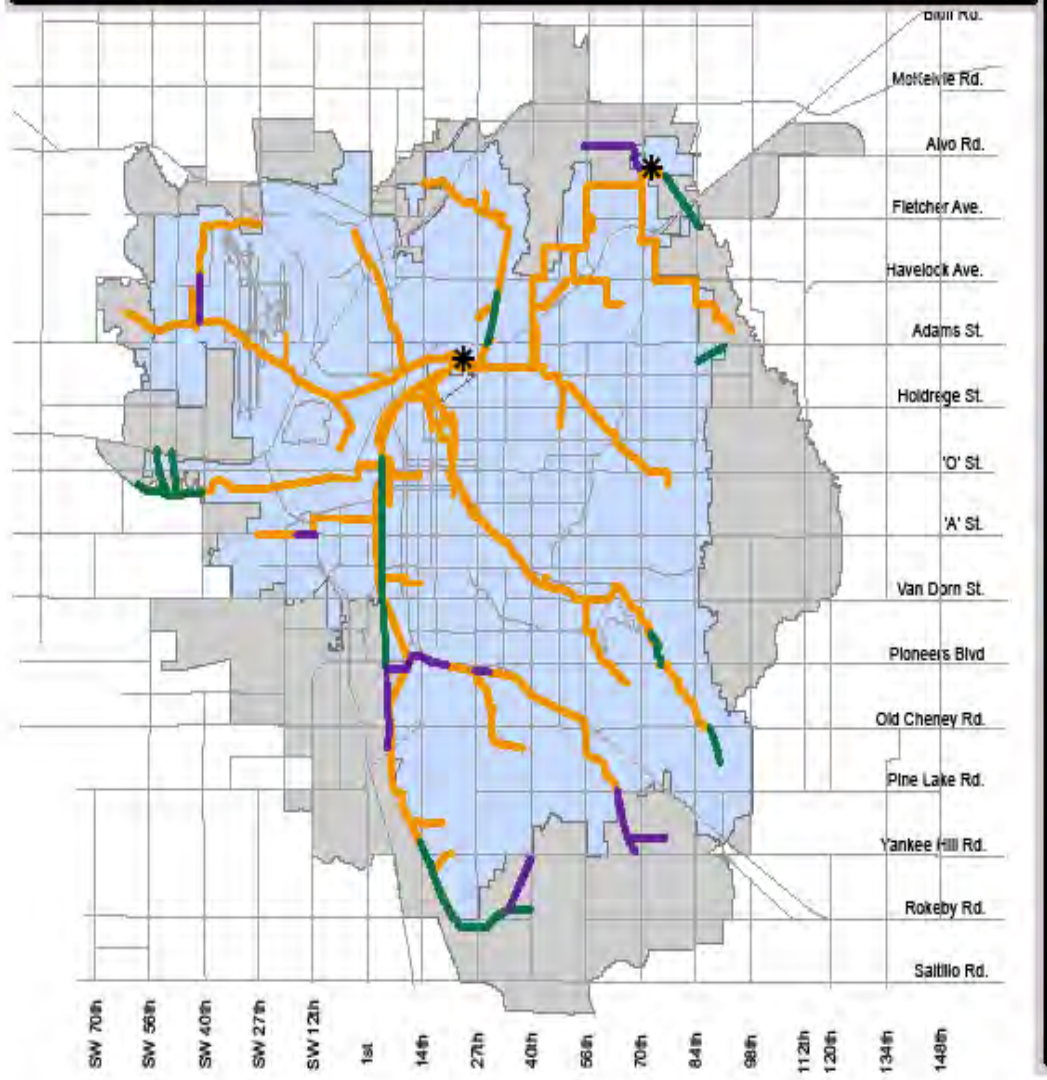
CITY OF LINCOLN
NEBRASKA
MAYOR CHRIS BEUTLER

WASTEWATER
Accomplishments since 2003

- Ammonia removal (both plants) . . . . $40+ mil
- Solids handling (Northeast) . . . . . $ 4.5 mil
- UV disinfection (both plants) . . . . . $ 3.0 mil
- Odor control (Theresa St.) . . . . . $ 4.5 mil
- Updated SCADA System
- Added 50+ miles wastewater lines
- Enhancement of Asset Mgmt & GIS System
- Additional Internal TV Inspection Unit

Construction 2003 to Present

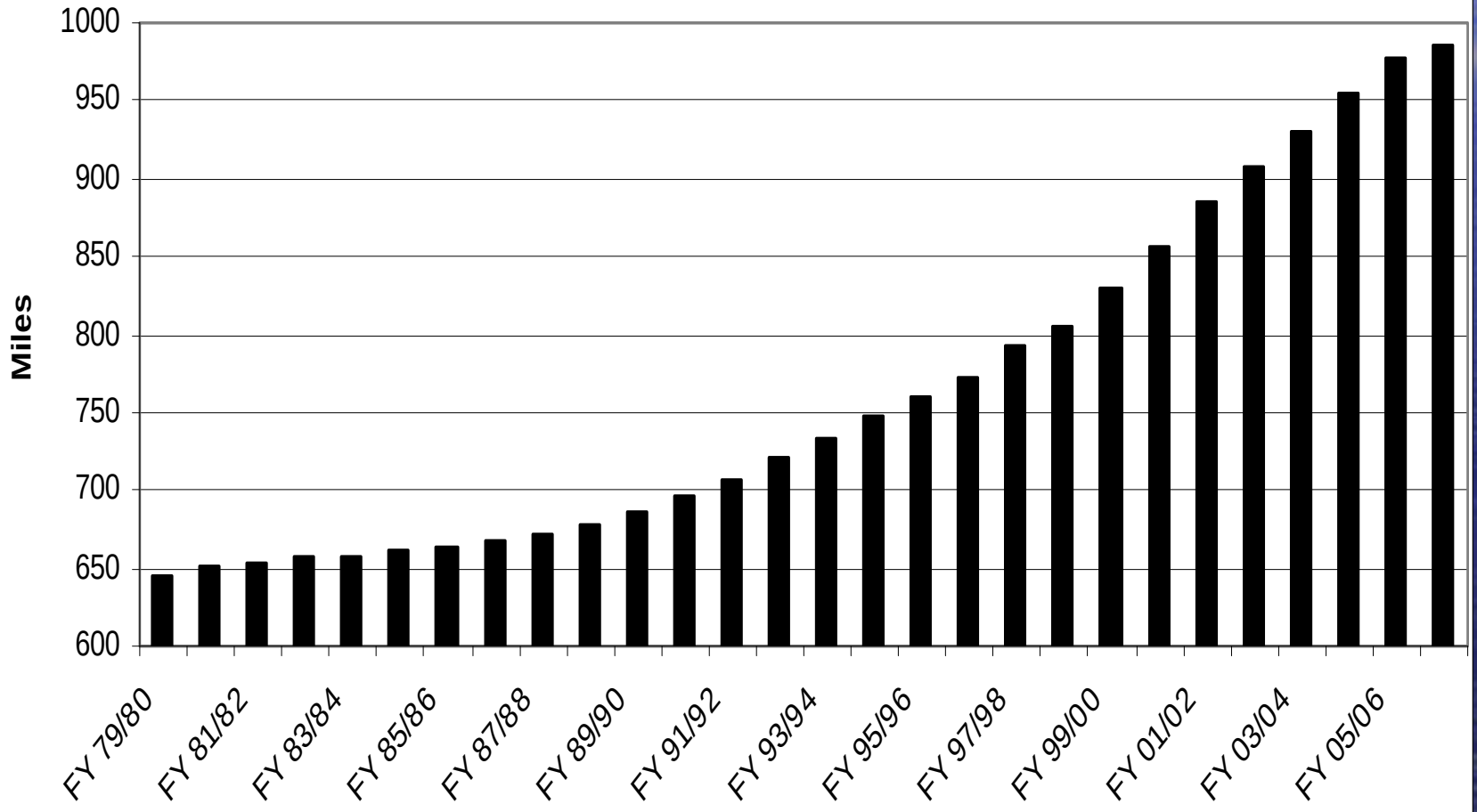
Public Works & Utilities — Wastewater



CITY OF LINCOLN
NEBRASKA

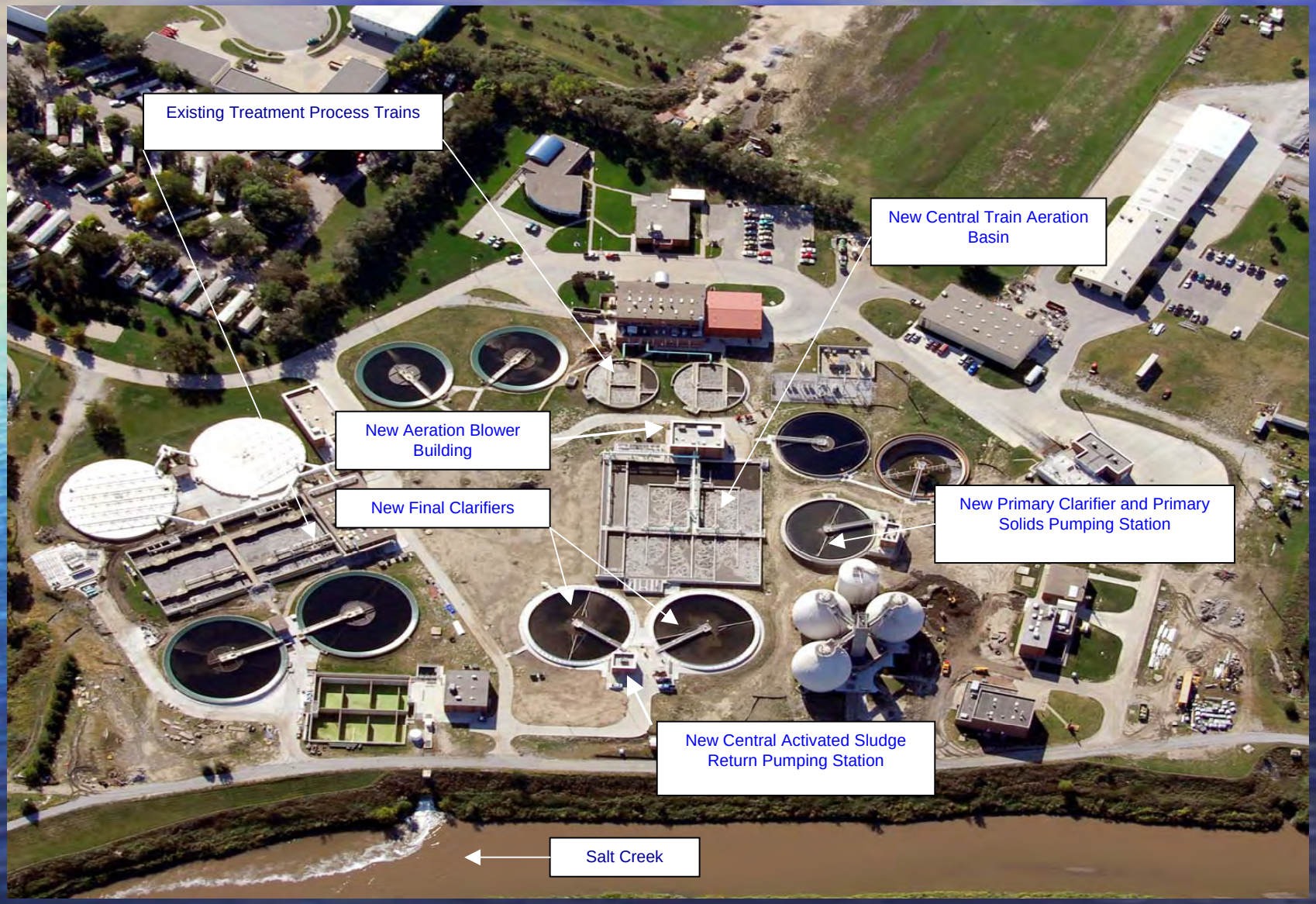
- Under Construction/Design
- Completed
- Treatment Facilities
- Trunk Lines Only
- City Limits
- Future Service Limit

N
W
E
S


Wastewater Collection System
Total Miles of Sewer by Year
Miles
1000
950
900
850
800
750
700
650
600
FY 79/80
FY 81/82
FY 83/84
FY 85/86
FY 87/88
FY 89/90
FY 91/92
FY 93/94
FY 95/96
FY 97/98
FY 99/00
FY 01/02
FY 03/04
FY 05/06

Northeast Treatment Facility
Process and Capacity Improvements

Theresa St. Treatment Facility
Process and Capacity Improvements



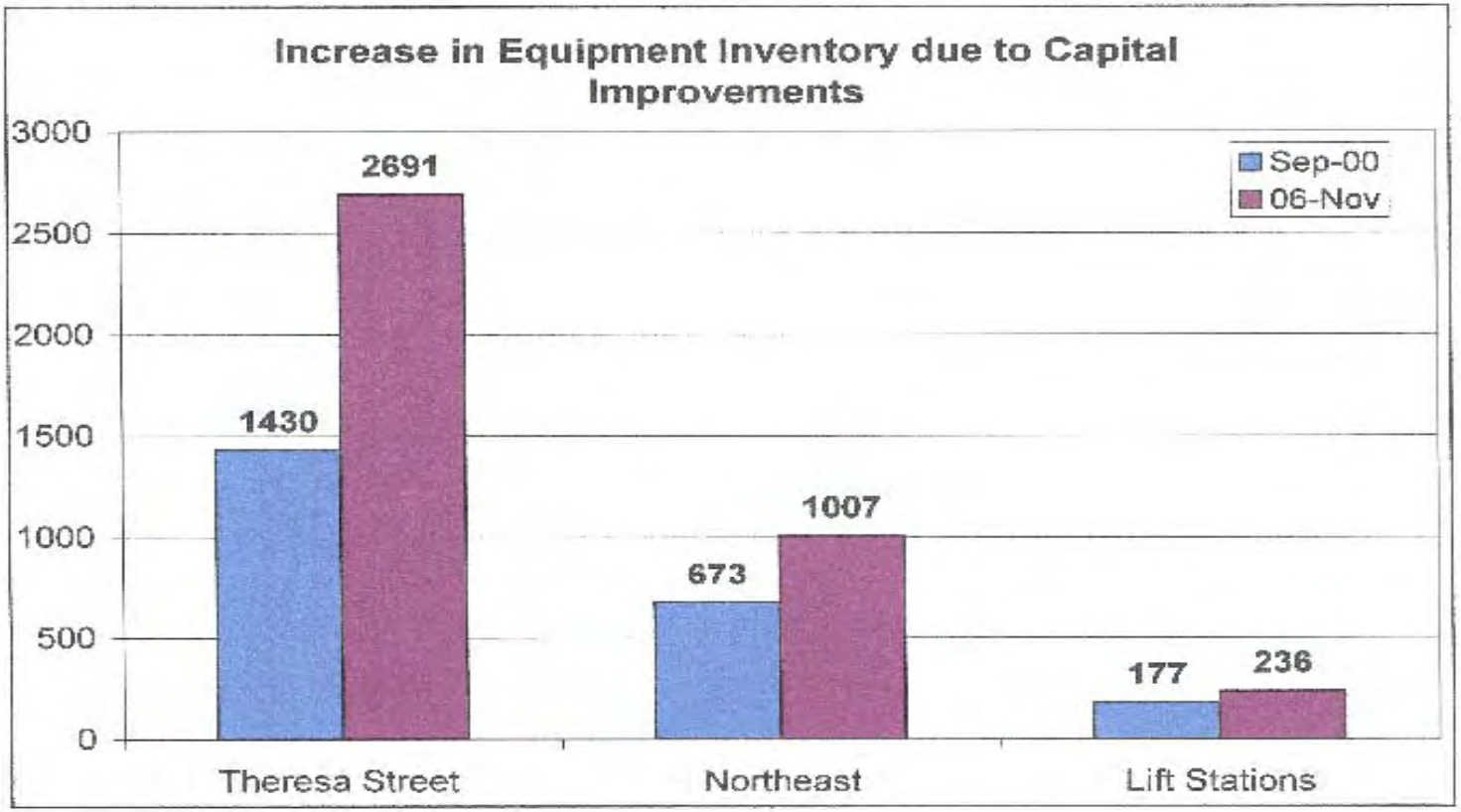
Theresa St. Process & Capacity Improvements

Central Train Aeration Basin

Central Train Aeration Blower

Primary Sludge Pump Station

Wastewater Treatment Facilities
Historical Equipment Inventory

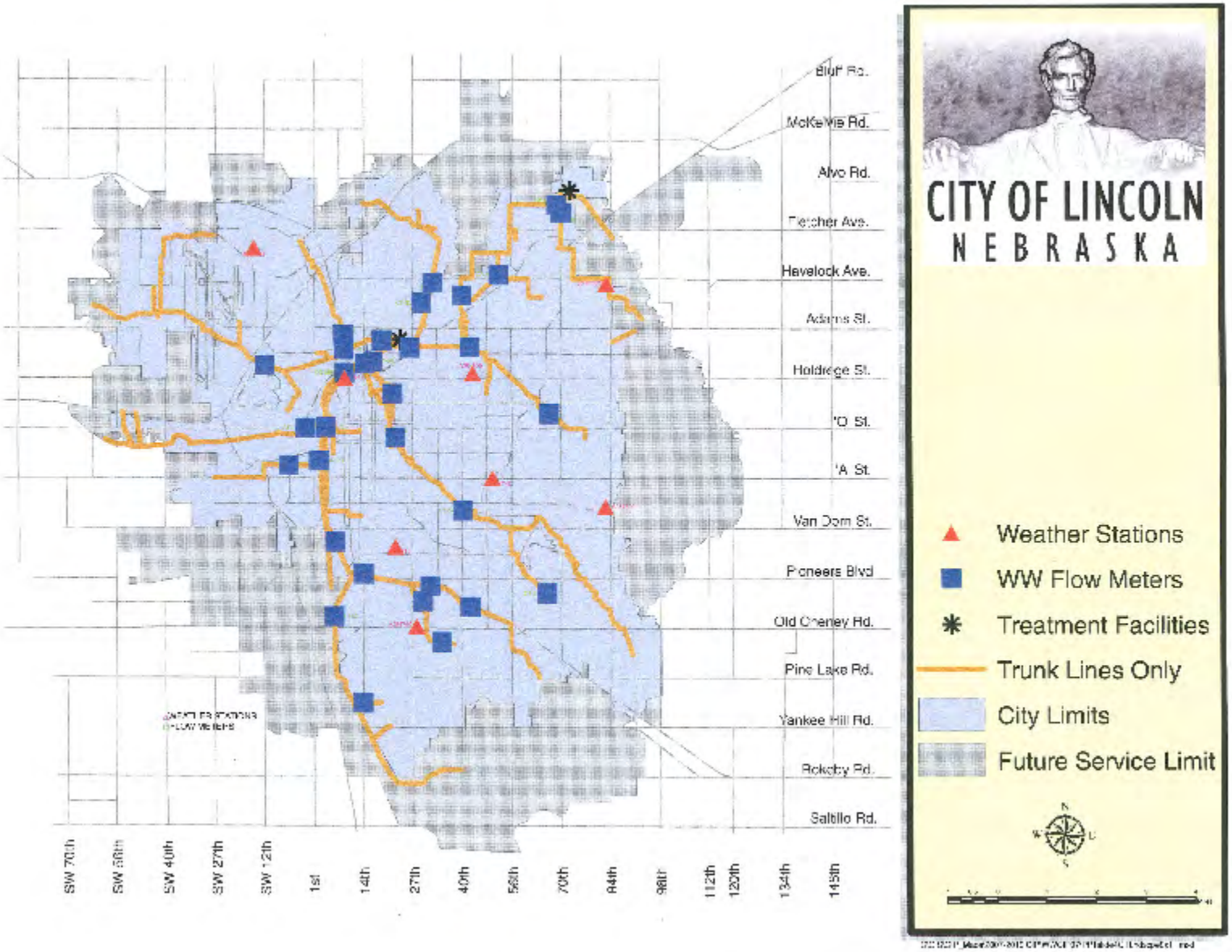


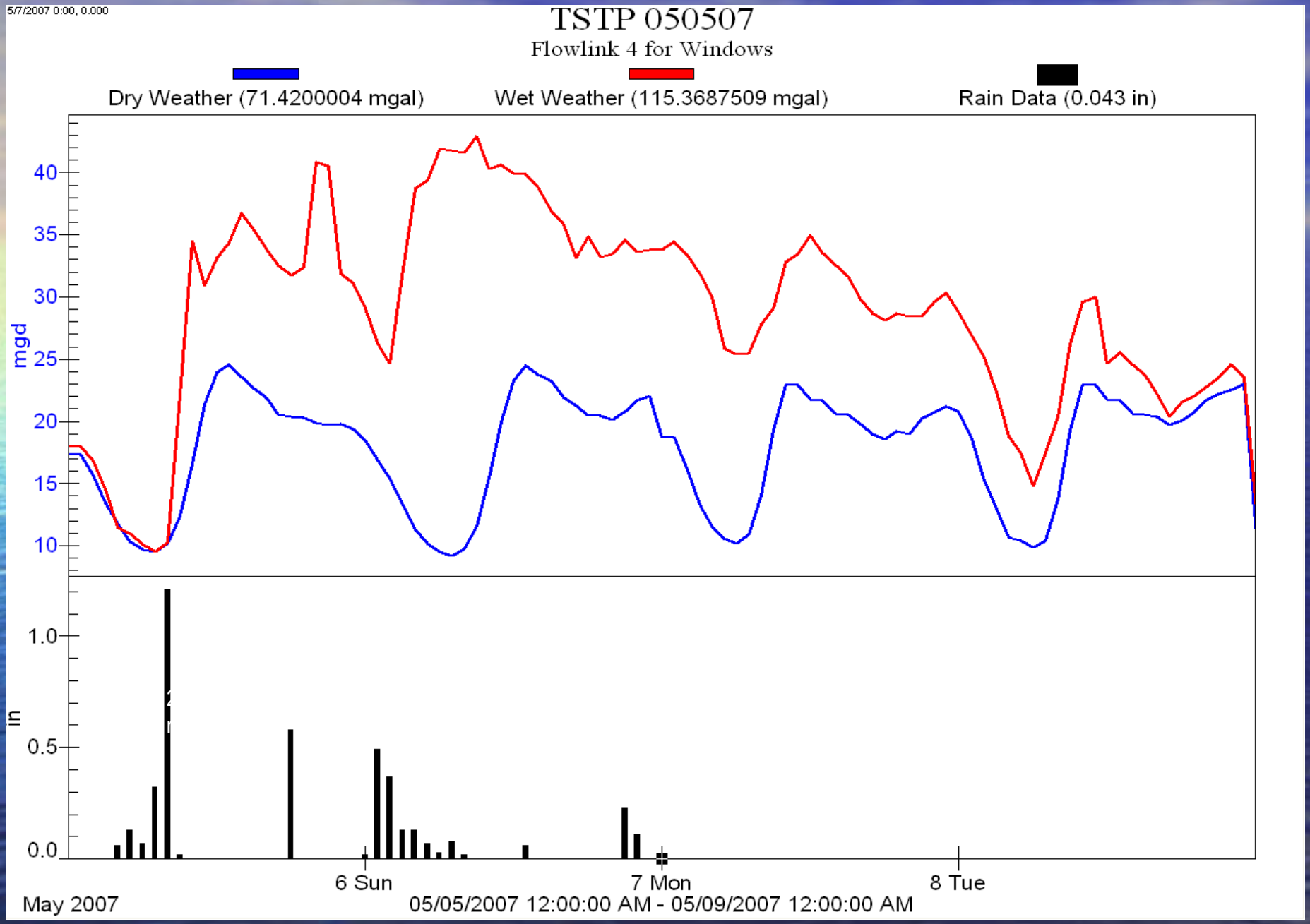
Stevens Creek Trunk Sewer
Phase I Construction

Salt Creek Relief Sewer

WASTEWATER
Unique Features in Adopted Master Plan

- Dynamic Modeling vs. static modeling
- Peak Flow Storage.
- Further evaluation of Tier III service issues.


CITY OF LINCOLN
NEBRASKA
Weather Stations
WW Flow Meters
Treatment Facilities
Trunk Lines Only
City Limits
Future Service Limit
Bluff Rd.
McKelvie Rd.
Alvo Rd.
Fletcher Ave.
Havelock Ave.
Adams St.
Holdrege St.
'O St.
'A St.
Van Dorn St.
Pioneers Blvd
Old Cheney Rd.
Pine Lake Rd.
Yankee Hill Rd.
Rokeby Rd.
Saltillo Rd.
SW 70th
SW 58th
SW 40th
SW 27th
SW 12th
1st
14th
27th
40th
56th
70th
84th
98th
112th
120th
134th
145th


5/7/2007 0:00, 0.000
TSTP 050507
Flowlink 4 for Windows
Dry Weather (71.4200004 mgal)
Wet Weather (115.3687509 mgal)
Rain Data (0.043 in)
mgd
40
35
30
25
20
15
10
in
1.0
0.5
0.0
6 Sun
7 Mon
8 Tue
May 2007
05/05/2007 12:00:00 AM - 05/09/2007 12:00:00 AM

WASTEWATER
Growth Implications beyond Capital Construction

- Essential staff to operate.
- Increasing inventory (“work order units”).
- Add high velocity pipe crew – by year 6.
- Have 4 year back log in repairs.

So WHAT is Different?

- Dynamic flow modeling.
- Consider peak flow storage.
- Evaluate Tier III Issues.
- Main replacement-predictive analysis (asset management).
- Human capital to build & maintain future components.
- Rate increases required to meet infrastructure needs of a growing community.