Flood Risk Management and Silver Jackets Workshop

Metropolitan Water Reclamation District of Greater Chicago

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February 28, 2017
Flood Risk Management in Chicagoland

- 1900’s – Canal System
- 1970’s – Tunnel and Reservoir Plan
- 1980’s – Stormwater Reservoirs
- 2004 – Stormwater Management, Cook County
- 2014 – Local Program
- 2016 – The Robbins Plan
“Sanitary District of Chicago”
City grew rapidly.
Prior to Canal Construction

Chicago discharged sewage into the Chicago River, which drained into Lake Michigan.
St. Louis filed an injunction to stop flow in the CSSC.
Lockport Lock and Dam
Chicago Area Waterway System

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611-3156

The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) is a 133-year-old public wastewater agency responsible for serving the water needs of more than 5.5 million people in a 5,400 square mile area in a 5-county region of northeastern Illinois. We serve Lake County, Cook County, DuPage County, and Will County by providing wastewater collection, treatment and Disposal of effluent, and sludge and solid waste disposal. The Agency operates nine wastewater treatment plants, nine pump stations, 12 sludge facilities, nine sanitary and storm water systems, four wastewater disposal plants, and more than 5,000 miles of sewers. We recycle water for ecosystem and agricultural purposes, and operate a 1,000-acre research center to advance the science and art of water treatment. We also provide water quality monitoring, public education, and engineering services to the region.
• Chicago’s first water tunnel placed in service in 1847
  • 5’ brick tunnel in clay
  • 60 feet below Lake Michigan
  • Extended 2 miles into the lake

• Chicago’s first rock tunnel completed 1911
  • 9’ to 14’
  • 102 to 160 feet deep
  • $79/foot for the concrete lined 14’ section

• Over 65 miles of water tunnels larger than 9’
Press Plan
For Flood Curbs Here

Sanitary district trustees voted yesterday to erect flood control gates on the Strother branch dam on the Illinois River at La Salle. The gates will be constructed by the Illinois Waterway Commission.

The Illinois-Michigan canal will be dredged to a depth of 50 feet and a width of 60 feet, John P. Corey, chief engineer of the Waterway Commission, said.

Corey estimated that the cost of the project would be $500,000,000, and that the Illinois-Michigan canal would be completed in 1957.

The Illinois-Michigan canal would be used for flood control and navigation, he said.

"Sanitary district trustees must keep pace with the City of Chicago," Fuller said. "We must have a septic tank to handle sewage."
FLOOD CONTROL
for
THE METROPOLITAN SANITARY DISTRICT
OF GREATER CHICAGO

PREPARED BY
John F. Meissner Engineers, Inc.
300 West Washington Street
Chicago, Ill., Illinois
A tabulation, showing the storage basin volumes and the channel discharges for 17 sub-basins, for drainage, covering the entire Cook County region, is shown (page 52). The total of all the channel discharges amounts to 148,000 cfs.

Then (page 53) is listed the suggested program and works recommended for construction, as follows:

1. Creation of a central authority for flood control.
2. Installation of transmitting instruments and centralised recording devices for control of operation of works.
3. Chicago River Pumping Station
4. Widening and deepening of the Ship Canal
5. Reservoirs and channel improvements on the North Branch of the Chicago River.
6. Channel improvement and pumping station for the North Shore Channel.
7. Reservoir to control the upper Des Plaines River.
8. Reservoirs and channel improvements on Salt Creek.
10. Reservoirs and channel improvements on Thorn Creek.
11. A pumping station, new channels, and improvements for the Little Calumet River.
12. New sewer pumping stations at 135th and 95th Streets, and reservoirs on Tuley and Stony Creeks.

These items will be discussed individually, below.

Central Authority for Flood Control

The need for a central authority for Flood Control is so obvious that it needs no discussion. Water always runs down hill, without regard to any political lines. A comprehensive flood control plan must be devised on an ares-wide basis; and the waterfolds of the streams involved are items which must be considered, rather than the limits of the municipalities served. The most obvious agency, now in existence, to handle flood problems, is, of course, The Metropolitan Sanitary
Flood Control Coordination Committee

- In existence on and off since 1957
- Consisted of representatives of:
  - Illinois Department of Public Works
  - Cook County
  - The City Chicago
  - District
- Created a Technical Advisory Committee in 1968 to review various plans and develop recommendations for course of action
Tunnel and Reservoir Plan (TARP)

- More than 50 Alternative Planes Developed and Evaluated Over a 7 Year Period
- TARP was the Composite of the 8 Best Alternatives
- Recommend by Flood Control Coordination Committee
- Adopted by MWRDGC on October 26, 1972 - eight days after the Clean Water Act was enacted.
What Was Constructed?

- 109.4 Miles of Deep Tunnels
  - 10’ - 35’ in Excavated Diameter
  - 150’ - 350’ Below Ground
- 264 Dropshafts 4’ – 25’ in Diameter
- 19 Construction Shafts 25’ -32’ in Diameter
- 3 Major Pumping Stations
- Over 600 Near-Surface Connecting and Regulating Structures
TARP or “Deep Tunnel”
4. TARP Reservoir
Majewski Reservoir: Completed 1998
Thornton Composite Reservoir: Completed 2015
McCook Reservoir, Stage 1: 2017
(Stage 2: Est. Completion 2029)
Tunnel and Reservoir Plan Costs

Phase 1 Tunnels………………...$  2.3 Billion
O’Hare CUP Reservoir…………$  45 Million
Thornton Reservoir……………..$420 Million
McCook Reservoir………………$800 Million
Total TARP……………………....$3.6 Billion
Above Average Rainfall in Cook County
1990 - 2014

Average Annual Rainfall 36"
Mean Number of Fish Collected Below the Outfall

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Legend:
- Red: 1970's
- Orange: 1980's
- Blue: 1990's
- Dark Blue: 2000's
Existing Flood Control Reservoirs

• 35 Existing Reservoirs

• Constructed from 1960s to 1990s in cooperation with NRCS, USACE, and other regional agencies

• Total Volume of 12,000 acre-feet
Stormwater Management Programs

Flooding remains our #1 issue

• Stormwater Phase I Projects
  • Design and Construction of Regional Flood Control and Streambank Stabilization Projects

• Stormwater Phase II Projects
  • Funding of Shovel-Ready Projects
  • Design of Conceptual Projects

• Green Infrastructure
  • Partnerships with Local Communities

• Flood-Prone Property Acquisitions
  • Voluntary buyouts where no practical engineered solution exists
MWRD conveyed authority in November 2004 to plan, manage, implement, and finance activities relating to stormwater management in Cook County

Cook County Stormwater Management Plan (CCSMP) adopted in 2007 establishing program framework

Primary Stormwater Management Activities:

- Develop Capital Improvement Program (CIP) to address REGIONAL stormwater problems
- Comprehensive uniform stormwater regulations to ensure future development and redevelopment does not exacerbate flooding
Detailed Watershed Plan Development

- Poplar Creek
- Upper Salt Creek
- Lower Des Plaines River
- North Branch Chicago River
- Calumet-Sag Channel
- Little Calumet River
Projects

Regional Flooding or Streambank Stabilization Projects recommended in Detailed Watershed Plans

Projects previously approved by Federal or State Agencies
15 Flood Control Projects to address overbank flooding

12 Streambank Stabilization Projects to address critical erosion

Prioritized based on Benefit-to-Cost Ratio and Distributed across Cook County
Regional Streambank Projects

Streambank Stabilization Projects

- Address erosion threatening structures, roadways, utilities on regional waterways
- Natural channel design is our goal where practical
- Structural measures when necessary
  - Concrete walls
  - Sheet piles
  - Gabions
Heritage Park Flood Control Facility

- 150 Acre-feet of New Stormwater Storage
- Flood Control improvements integrated into Park District master plan
- Provides Compensatory Storage for USACE Levee 37 which protects 600 homes and businesses from flooding
- Tri-party IGA with MWRD, Wheeling and Wheeling Park District
Flood Control and Streambank Stabilization Project on Tinley Creek in Crestwood
Legislative Amendment to MWRD’s Stormwater Management Authority

Public Act 98-0652 enacted into Law June 2014

- Allowed the District to move forward on new initiatives under its **Phase II** program including partnering with local communities and agencies to address **local** drainage problems, and setting up a program for purchasing flood prone and flood damaged property on a voluntary basis.

- District-wide call for local projects/problem areas in 2013, future calls to be done on biennial basis starting in 2017

- Application process developed for flood-prone acquisitions
Phase II Projects

Shovel-ready and Conceptual projects
Distributed throughout county

Types of Projects include:

• Green infrastructure
• Localized detention
• Upsizing critical storm sewers/culverts
• Pump stations
• Establishing drainage ways
Shovel-Ready Example: Mayfair Reservoir Expansion

- 27 Acre-feet of New Stormwater Storage in Westchester
- 60 Structures Protected
- Village responsible for design, construction, and maintenance
- MWRD provided $2.1M for construction
- Project completed 2015
Conceptual Example: Natalie Creek Flood Control Proj.

- Conveyance and Storage Improvements in Village of Midlothian (est. $8.3M)
- 237 structures to be protected
- MWRD to design and construct
- Village to own and maintain all new improvements
- Project to be constructed in 2017
Stormwater Project Hurdles

• For local projects to be eligible for MWRD funding assistance, communities must follow MWRD Procurement Rules, Diversity Requirements, and comply with Multi-Project Labor Agreement

• Local communities must own and maintain new improvements

• Locals must provide up-front construction funding (MWRD funding is reimbursement-based)

• Project benefits must be clearly defined and quantifiable

• Socio-economic challenged communities have stormwater issues that go beyond flooding
Flood-Prone Property Acquisition Program

- Policy adopted by Board of Commissioners August 2014 after PA 98-0652

- Three Distinct Components
  1. Local Sponsor Assistance Program
  2. District Initiated Program
  3. Local Government Application
Minimum Criterion
1. Property must be within 100-year floodplain and/or DWP inundation area.
2. The Project’s Benefit-to-Cost Ratio must be greater than 1.0.

Factors Applicable to Each Program
1. Local government agency must serve as a local sponsor
2. Duties of local sponsor include:
   • Local Sponsor will be party responsible for direct contact with the private property owners during the acquisition process
   • Accept ownership of acquired property
   • Remove existing structures
   • Place deed restrictions against future development
   • Maintain property upon return to open land
   • Provide regular reports certifying property meets terms and conditions
Flood-Prone Property Acquisition Program

Program Progress

- Glenview - 17 homes purchased
- Des Plaines (Ph. 1) – 3 homes acquired 10 more in process (13 total)
- Riverside-Lawn – 17 homes acquired 22 more in process (39 total)
- Northlake – in process of acquiring 7 homes
- Des Plaines (Ph. 2) – in process of acquiring 47 homes
- Stone Park – finalizing agreement to acquire 35 homes
- Flossmoor – finalizing agreement to acquire 2 homes
- Franklin Park – In negotiation to acquire 32 homes
- Wheeling Township – facilitating Cook Co. partnership to acquire 6 homes.
Green Infrastructure

Program Components

• Rain Barrel Program
• Comprehensive Land Use Policy
• Community Assistance and Public Outreach
• Projects and Design Retention Capacity
The District’s Rain Barrel Program utilized three distribution networks:

- Municipalities
- NGOs and community groups
- Campus-type facilities

Through 2016, nearly 120,000 MWRD rain barrels have been distributed in 108 communities across Cook County.
MWRD’s Comprehensive Land Use Policy requires public entities leasing MWRD property to provide GI based on the size of the leasehold and the desired use.

Private developers are required to comply with the terms of the Watershed Management Ordinance.

- Capture 1-inch of runoff from impervious surfaces using Green Infrastructure
- In 2014 and 2015 15, 119 permits issued requiring a total of 7,795,627 Gallons of GI retention volume
MWRD is committed to providing administrative and technical assistance to communities within its service area to facilitate the implementation of GI projects.

MWRD worked with numerous stakeholders to share and gain knowledge on the:

- Design
- Installation
- Maintenance of GI
Green Infrastructure Projects

Prioritize projects based on various criteria, including:

• The likelihood of flooding and/or basement backup reduction
• Number of benefitting structures
• Project cost
• Project location with consideration given to maintenance and educational opportunities
• Socio-economic considerations

Develop partnerships
Green Infrastructure Partnerships

Space to Grow
- Managed by Healthy Schools Campaign and Openlands
- Funding and technical assistance from
  - Chicago Public Schools
  - Chicago Dept. of Water Management
  - MWRDGC

Chicago Housing Authority
- Dearborn Homes Rainwater Harvesting

Local Municipalities
- Evanston, Blue Island, Kenilworth, Wilmette, Northbrook (complete)
- Skokie, Niles, Berwyn (under design)
Preliminary engineering alternatives developed to address flooding along Midlothian Creek which affects ~100 structures in a 100-year storm event

Evaluation of alternatives with community revealed need to consider other issues such as:
  - Limited local capacity
  - Development limitations
  - Lack of coordinated planning

Need to rethink approach
MWRD’s goal is to redefine the meaning of infrastructure investment by implementing solutions that not only promote resiliency, but also promote the economic growth, health, and “well being” of a community.