



LAKE WEE-MA-TUK DAM

**PLANNING, DESIGNING AND FUNDING THE CONSTRUCTION
OF AN AUXILIARY PRINCIPAL SPILLWAY FOR THE
WEE-MA-TUK HILLS DRAINAGE DISTRICT**

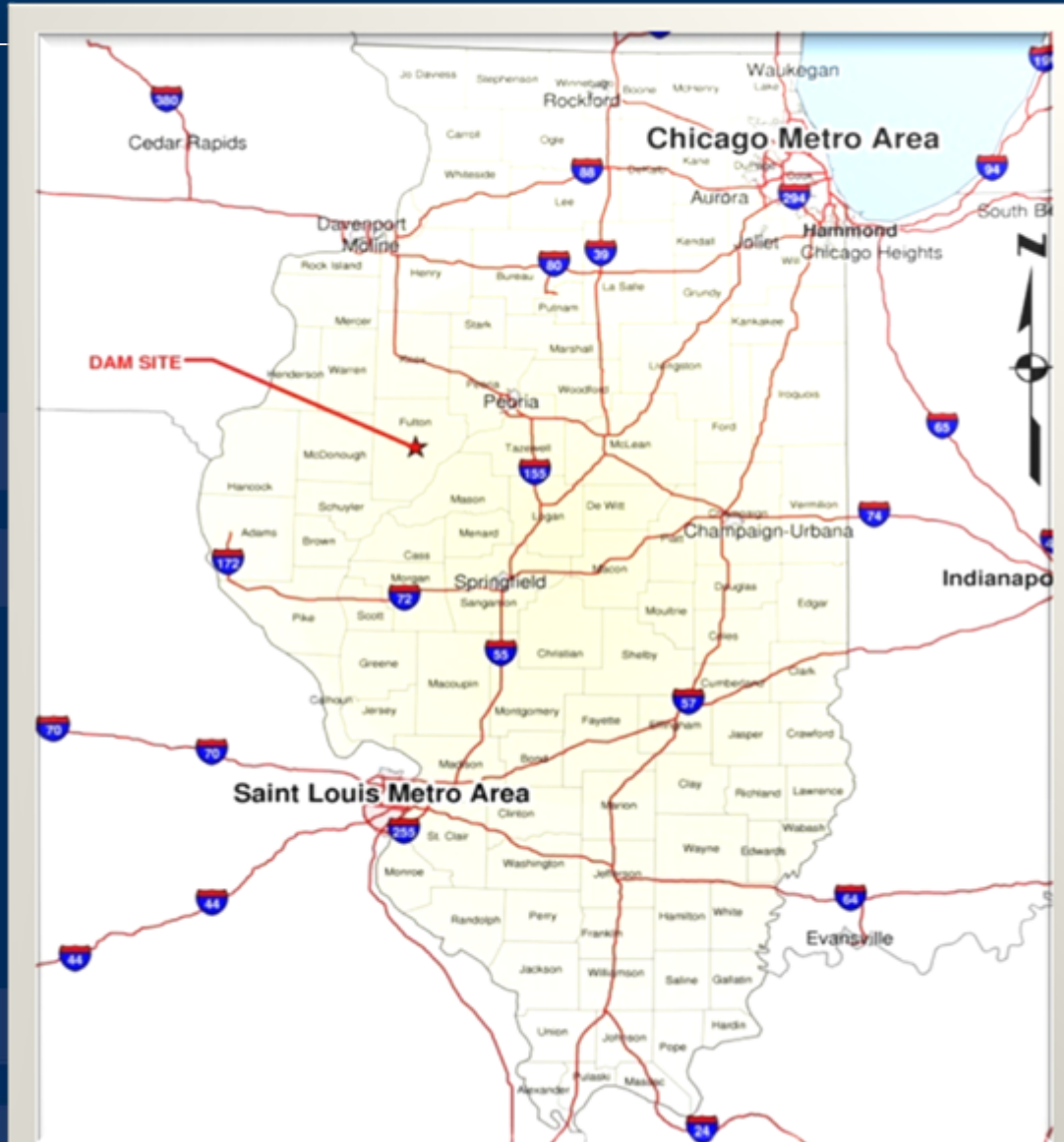
AGENDA

- **Dam Information / History**
- **Problem Identification**
- **Planning for Improvements**
- **Funding of Improvements**
- **Watershed Hydrology**
- **Spillway Hydraulics**
- **Design Challenges**
- **Base Flood Elevation Revision**
- **Bidding / Contract Award**
- **Construction**

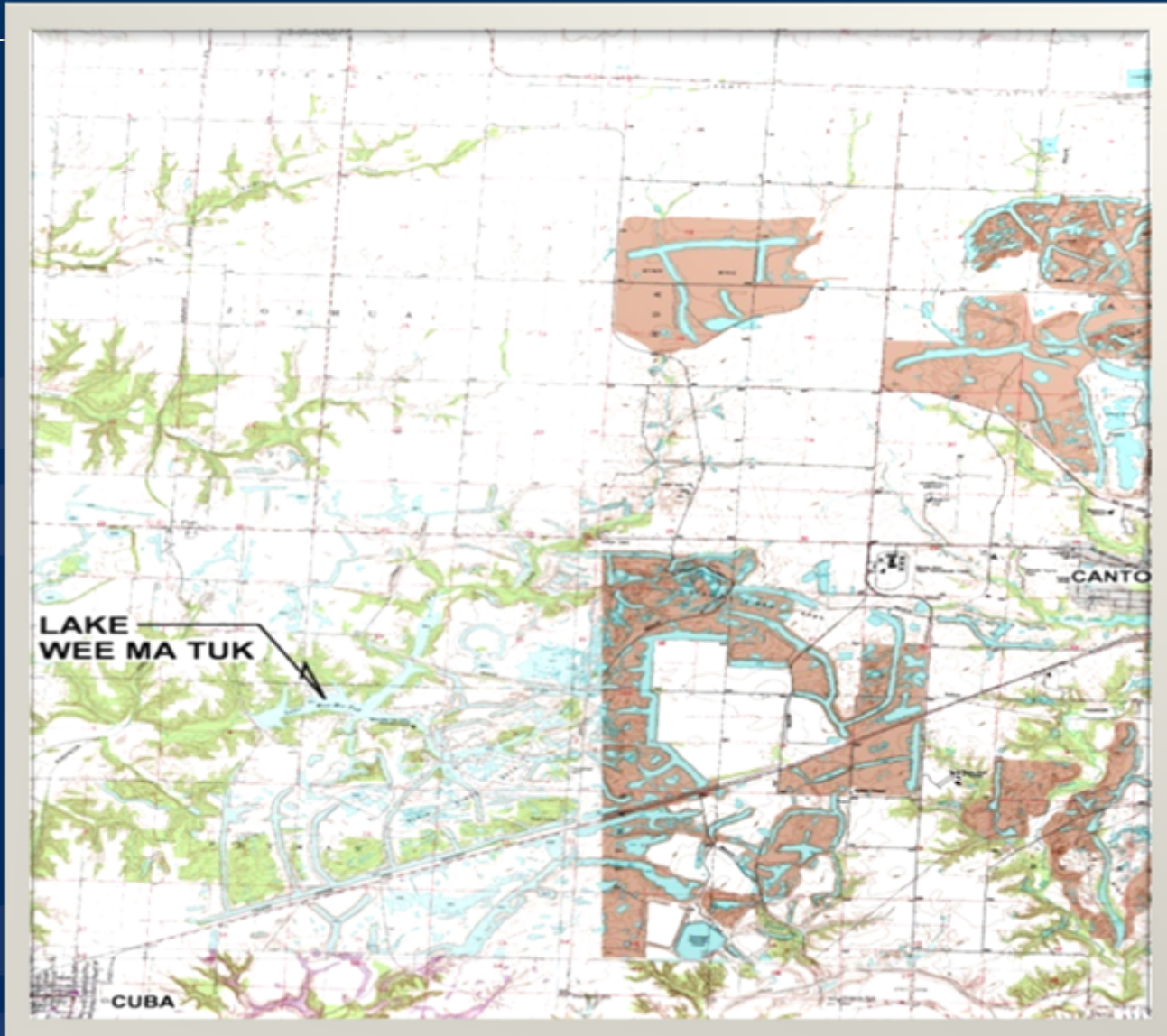
DAM STATISTICS

- Located in rural Fulton County, between Cuba and Canton
- Earthen dam constructed across Put Creek; Arrow Road crosses the dam
- Intermediate size, Class II Significant Hazard Potential
- Watershed = 18.64 square miles
- Surface Area of 124 acres @ normal pool
- Surface Area of 148 acres @ 0.3 PMF

WHERE IS WEE-MA-TUK?



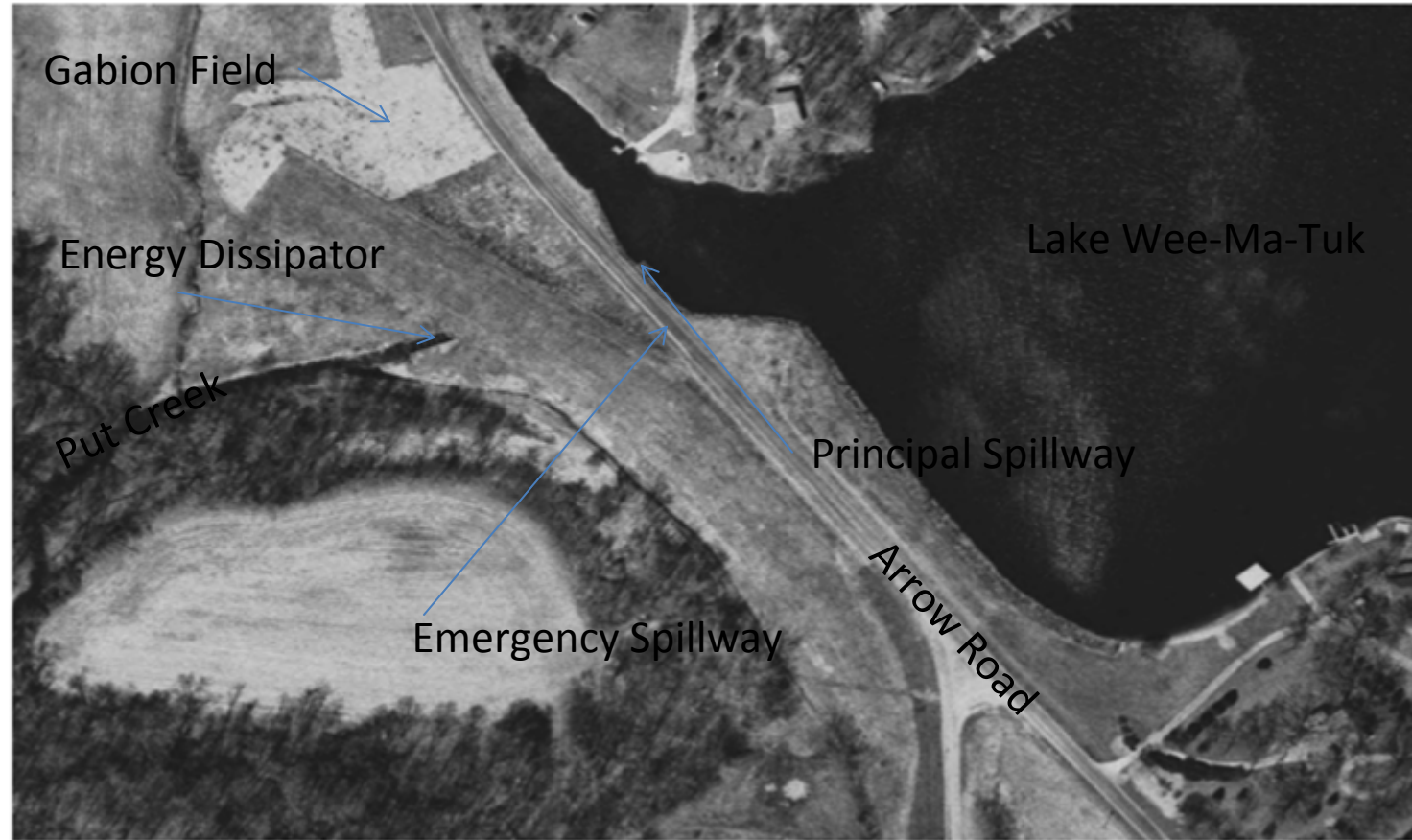
WHERE IS WEE-MA-TUK?



DAM HISTORY

- **Constructed in early 1950's by Truax-Traer Coal Company to sluice coal**
- **Sold to development company in 1959**
- **Land surrounding lake subdivided for residential lots, development continues**
- **IDNR-OWR identified problems with compliance of State dam regulations**
- **Operation & maintenance transferred to Wee-Ma-Tuk Hills Drainage District (The District) in 1989**
- **Improvements made in 1990 to bring into compliance: principal spillway shall pass 50 year storm event & total spillway shall pass 0.3 PMF**

WEE-MA-TUK DAM SITE





**Existing Lake Wee-Ma-Tuk Dam
at normal pool in 2004**

THE PROBLEM

- Between 1991 & 2003, emergency spillway (ES) topped three times
- Roadway and gabion slope protection damaged
- Local engineer is hired, but scope is limited to evaluating & mitigating damage
- CMT asked to provide second opinion
- Repairing damage did not get to the root of the problem
- Review of the 1990 HEC-1 model revealed inflow to principal spillway (PS) significantly underestimated; capacity only 10% of required

OVERTOPPING

August 1, 2003



PRELIMINARY ASSESSMENT

- District authorized CMT to prepare alternatives to provide necessary spillway capacity
- Used existing HEC-1 model to estimate more realistic inflow and required spillway capacity
- From existing construction plans, developed alternatives for providing additional spillway capacity

ALTERNATIVES

1. **No Improvements**
2. **Increase PS crest length, lower PS crest elevation, raise ES elevation**
3. **Lower PS crest elevation, raise ES crest elevation, concrete channel and energy dissipator**
4. **Lower PS crest elevation, raise ES crest elevation, upsize existing PS conduit, enlarge energy dissipator**
5. **Construct Auxiliary Principal Spillway (APS) w/ deep intake, conduit and energy dissipator, raise ES crest elevation**
6. **Preferred and accepted: construct an (APS) north of existing PS, spillway conduit through embankment, energy dissipator, outlet channel & higher ES crest**

FUNDING THE IMPROVEMENTS

- IDNR – Abandoned Mined Land Reclamation (AMLR) funded improvements in 1990
- AMLR asked to provide funding since Arrow Road was flooding
- AMLR agreed to provide \$685,000 for construction if District paid for engineering
- District decides to move ahead with improvements, knowing entire dam has to be brought up to current IDNR-OWR standards

PERMITTING APPROACH

- Since hydrology started over, a phased approach with IDNR-OWR was prudent
- Obtained individual approvals of watershed hydrology, spillway hydraulics and design of improvements

WATERSHED HYDROLOGY

- Re-evaluated the entire watershed
- Identified impoundments upstream
- Evaluated connectivity between strip mine lakes and watershed
- Identified some areas that retain water
- Added impervious area to account for some future development
- Due to peak inflow from model, APS would have to be larger & moved south of the existing PS; project costs increased

STRIP MINE LAKES

Upstream Control Structure



Double T Lakes



SPILLWAY HYDRAULICS

- With APS located in lake, wanted to minimize dimensions by utilizing enhanced weir shape
- Research yielded a rounded (1/4 round) crest on the approach side, 7 inch radius, increasing flow by 10% – 15%
- Inserted weir breaks to avoid turbulence at corners and chamfered edges

DESIGN CHALLENGES

- Used flat slope (0.87%) from APS to other side of roadway to reduce excavation and provide clearance under existing gas and water mains
- Gas and water service protected; no interruptions allowed
- Used steep slope (25%) from edge of roadway to energy dissipator
- Township and county approval required to raise Arrow Road
- Strike a balance between township requirements for road fill and IDNR-OWR
- Updated construction cost estimate: \$1,139,000

BASE FLOOD ELEVATION REVISIONS

- Revised hydrology changed BFE from 602.71 to 604.97
- Fulton County Floodplain Ordinance requires 1 foot freeboard to finished floor elevation
- One structure no longer had the required freeboard
- Requested and obtained variance from Fulton County Board
- Obtained flood easements from other affected property owners

PROPERTY OWNERSHIP

- Permanent easement document in IDNR-OWR files raises question about property ownership
- Title search revealed District did not own the dam property
- CMT & IDNR-OWR urged District to pursue purchase of dam property or require legal owners to sign permit application
- Property acquisition delayed project for two years

PERMITTING, BIDDING & CONTRACT AWARD

- After three plan review cycles and last parcel obtained, IDNR-OWR issues construction permit in November 2007
- District obtained bids & ready to award a contract, approximately \$530,000 more than IDNR – AMLR agreement & \$80,000 more than engineer's cost opinion
- IDNR-AMLR unwilling to provide all of the construction funds without justification
- District & CMT provided AMLR with cost increase summary and asked for additional funding
- One month later, AMLR recognized the value of the improvements and funded all construction
- Contract awarded on last day allowed by contract documents

CONSTRUCTION OF IMPROVEMENTS

- **Otto Baum, Inc. of Morton, IL started work in January 2008**
- **Persevered through extremely wet year**
- **APS challenging construction**
- **Protection of gas and water mains**
- **Improvements substantially complete in December 2008**



APS Intake Structure

Utilized existing embankment and piling to construct intake, stockpile area also



Spillway conduit under Arrow Road

Note gas and water main protection



USBR Type III Energy Dissipator

Note baffle blocks and low flow outlet

APS PERFORMANCE

- Heavy rainfall from Hurricane Ike In September 2008 tested the APS
- Rainfall amount comparable to three previous overtopping storms
- APS performed as expected and did not overtop the emergency spillway (Arrow Road)



APS Intake
Flowing on September 14, 2008



Energy Dissipator
Discharging on September 14, 2008

LESSONS LEARNED

- **Communicate often with regulatory agencies**
- **Coordinate between regulatory agencies**
- **Check for property ownership in the beginning**



Lake Wee-Ma-Tuk Dam
Improvements Complete: October 10, 2008

THANK YOU!

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- **CMT: Ted LaBelle, Bill Bailey, Demmon Guimard**
- **IDNR-OWR: Mike Diedrichsen**
- **IDNR-AMLR: Larry Lewis**