

# RSM FY12 IPR

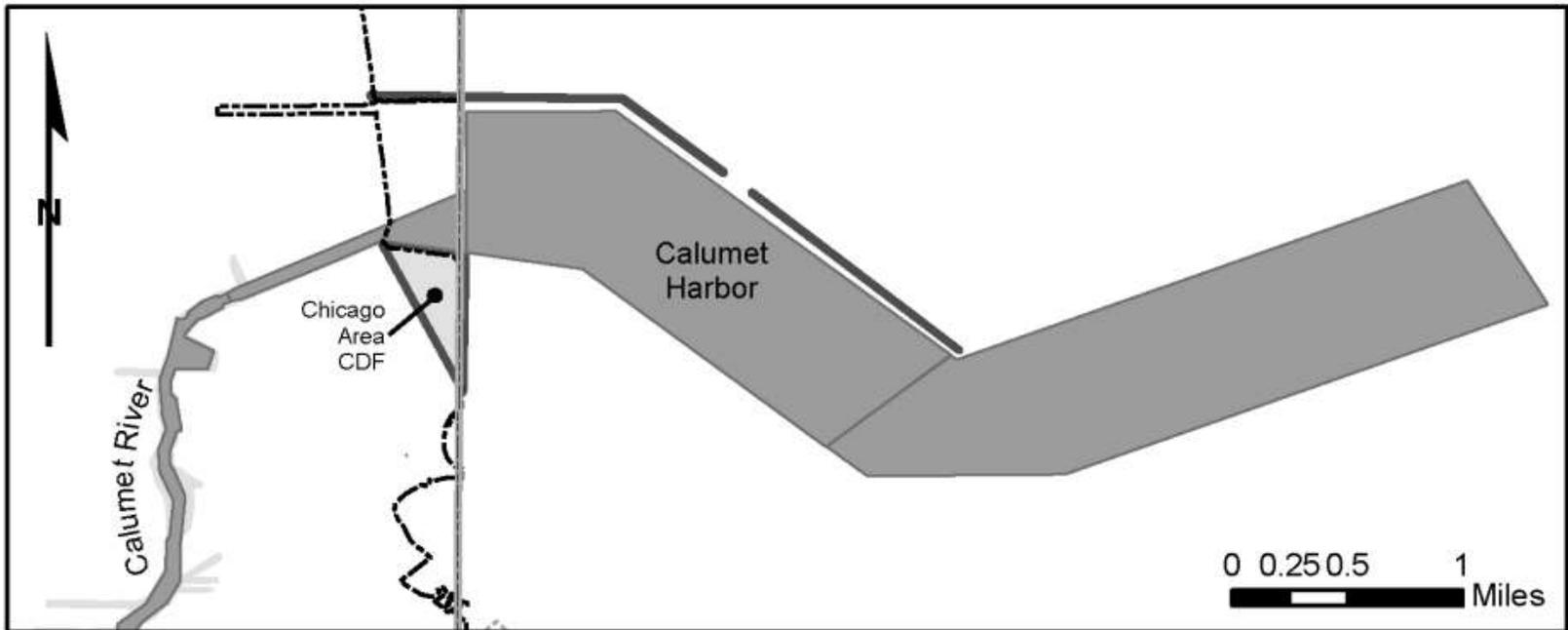
## Chicago District, Calumet Harbor Sediment Transport Analysis, David F. Bucaro, P.E.

### Description/Challenge

- Ongoing maintenance dredging requirements (25,000 cy annual average in Harbor)
- District is developing Dredged Material Management Plan
- Unknown sediment sources

### Goals/Issues to Address

- Improve predictions of sediment sources in harbor: shoaling patterns
- Aid in evaluation of management alternatives
- If material can be used beneficially, aid in planning for placement sites



**BLUF:** From an understanding of sediment transport, the District can evaluate alternatives to either prevent shoaling in the Federal channel or better manage the material beneficially.

# RSM FY12 IPR

## Chicago District, Calumet Harbor Sediment Transport Analysis

### District PDT Members

- David Bucaro, Planning
- Sara Brodzinsky, Planning
- Joel Schmidt, Hydraulic Engineering
- Jeff Fuller, Hydraulic Engineering

### ERDC Assistance

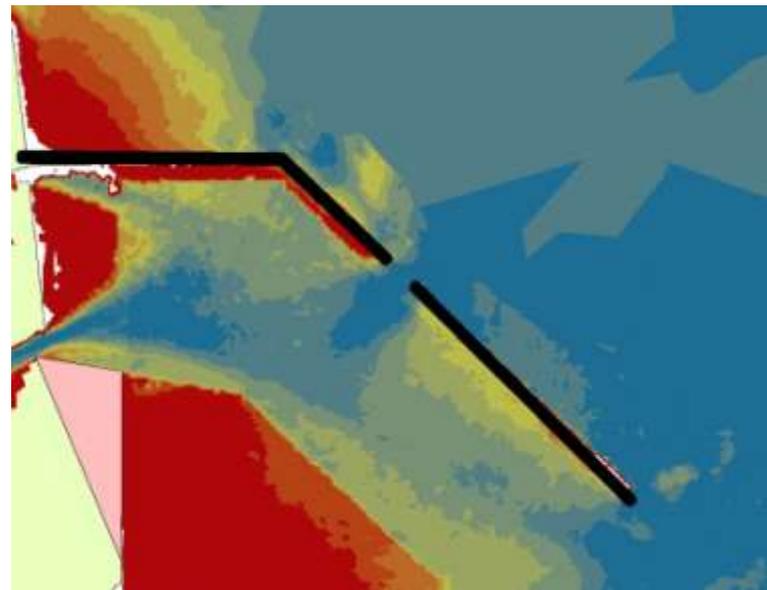
- Alex Sanchez, Coastal Hydraulics Laboratory
- Zeki Demirbilek, Coastal Hydraulics Laboratory (ATR)
- Rob Thomas, Coastal Hydraulics Laboratory
- Mary Cialone, Coastal Hydraulics Laboratory

### Leveraging/Collaborative Opportunities

- High resolution bathymetry from JALBTCX for area outside of Federal channel
- ADCIRC storm model library developed by ERDC for FEMA's Great Lakes Coastal Flood Study currently underway
- Review of technical framework by ERDC technical expert

### Stakeholders and Partners

- DMMP is being developed in partnership with
  - Illinois International Port District
  - City of Chicago
  - Chicago Park District



# RSM FY12 IPR

## Chicago District, Calumet Harbor Sediment Transport Analysis

### Approach

- Use output from regional ADCIRC model as boundary condition for local-scale CMS model
- Couple multiple discrete storm events during period of interest to simulate significant components of shoaling
- Calibrate/validate model based on survey data
- Compare effects of proposed alternatives to baseline conditions to determine effectiveness in reducing sand transport into harbor

### Models, Tools, Databases, etc Used

- CMS v4.00
- ERDC's ADCIRC Storm Library
  - fort.63 and fort.64 files

### FY12 Milestones/Deliverables (\$70k)

<u>Milestone</u>	<u>Due</u>	<u>% Completed</u>
• Sediment transport analysis	6/15/12	60%
• Sediment balance (SBAS)	6/30/12	25%
• Evaluation of measures	7/31/12	25%
• Presentation of analysis to DMMP PDT	7/31/12	25%
• Study documentation	9/20/12	35%

# RSM FY12 IPR

## Chicago District, Calumet Harbor Sediment Transport Analysis

### Opportunities to take action:

- Predict maintenance needs
- Communication with harbor users and stakeholders
- Identify areas for further study

### Study Benefits

- Understanding of coarse grained sediment pathways into Federal channel
- Develop modeling approach and experience for application to other harbors within District

### Accomplishments

- Developed CMS model of Calumet Harbor for transport of coarse grained sediments
- Modeling work prompted the correction of a CMS bug that would have made future use of the ADCIRC storm library limited

### Lessons Learned

- This is a very complicated system: both hydrodynamically and sediment transport
  - Consider effects from both storm setup and setdown conditions
- Assumed conceptual site model can change once you gather more data:
  - Recent sediment sampling in harbor showed more silts/clays than sand
  - Unknown relative contributions from Calumet River versus Lake Michigan
  - Recognize limitation of CMS models and its ability to model system at hand
- Reliant upon data and expertise only available from ERDC-CHL
  - Boundary conditions based on ADCIRC storms
  - Establishing representative storms