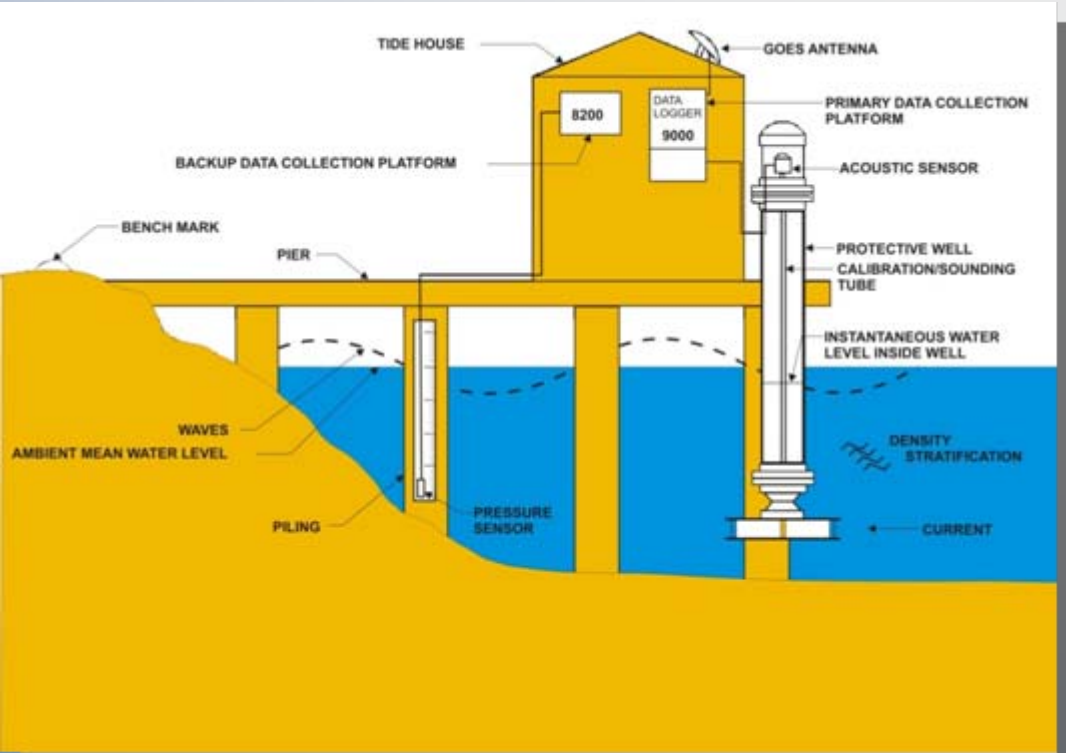
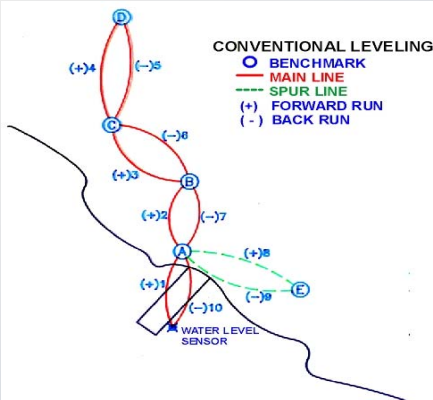


# Operation of Tide Gauges

## Tide Gauges and Benchmark Networks



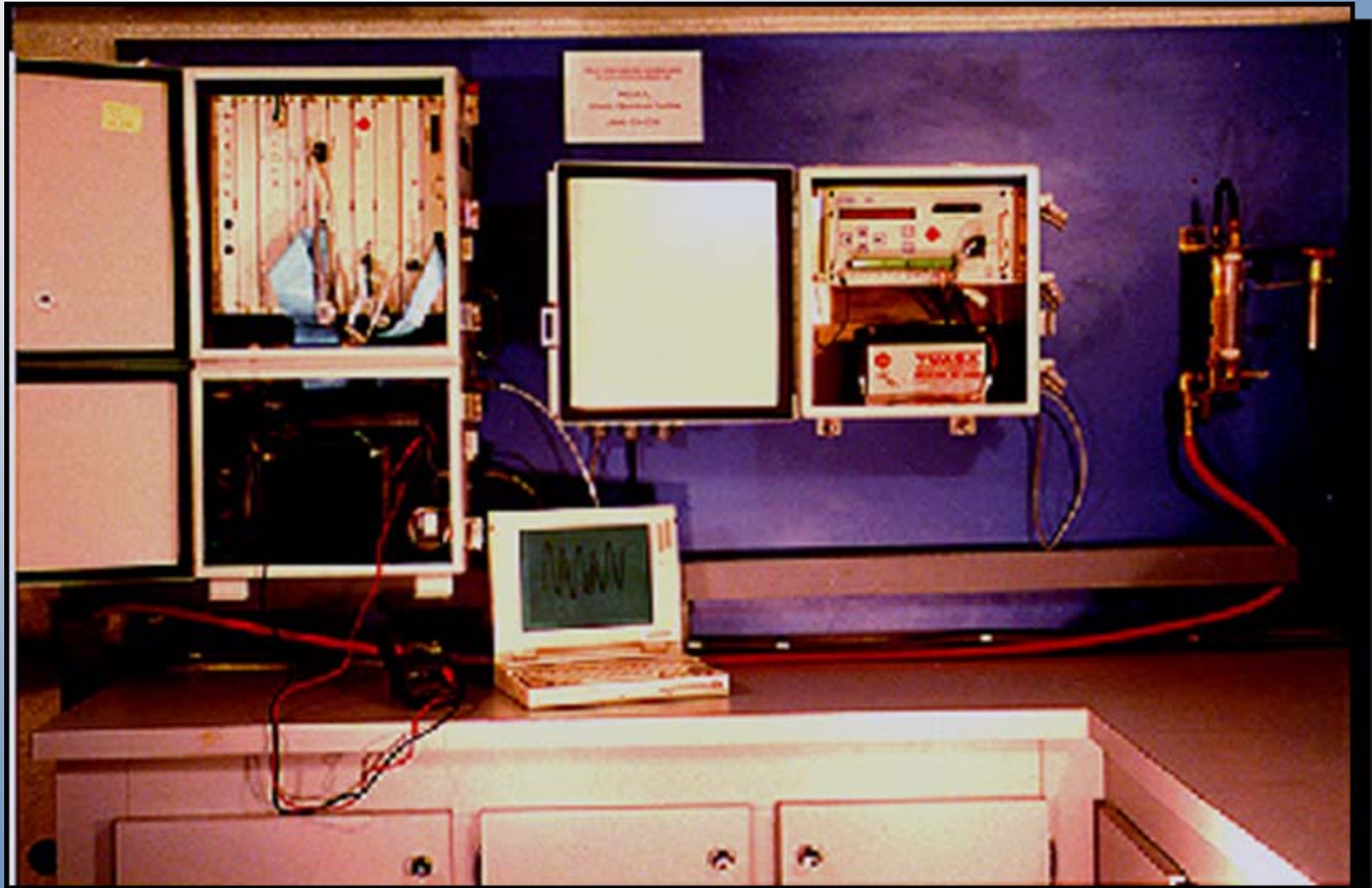
# National Water Level Observation Network

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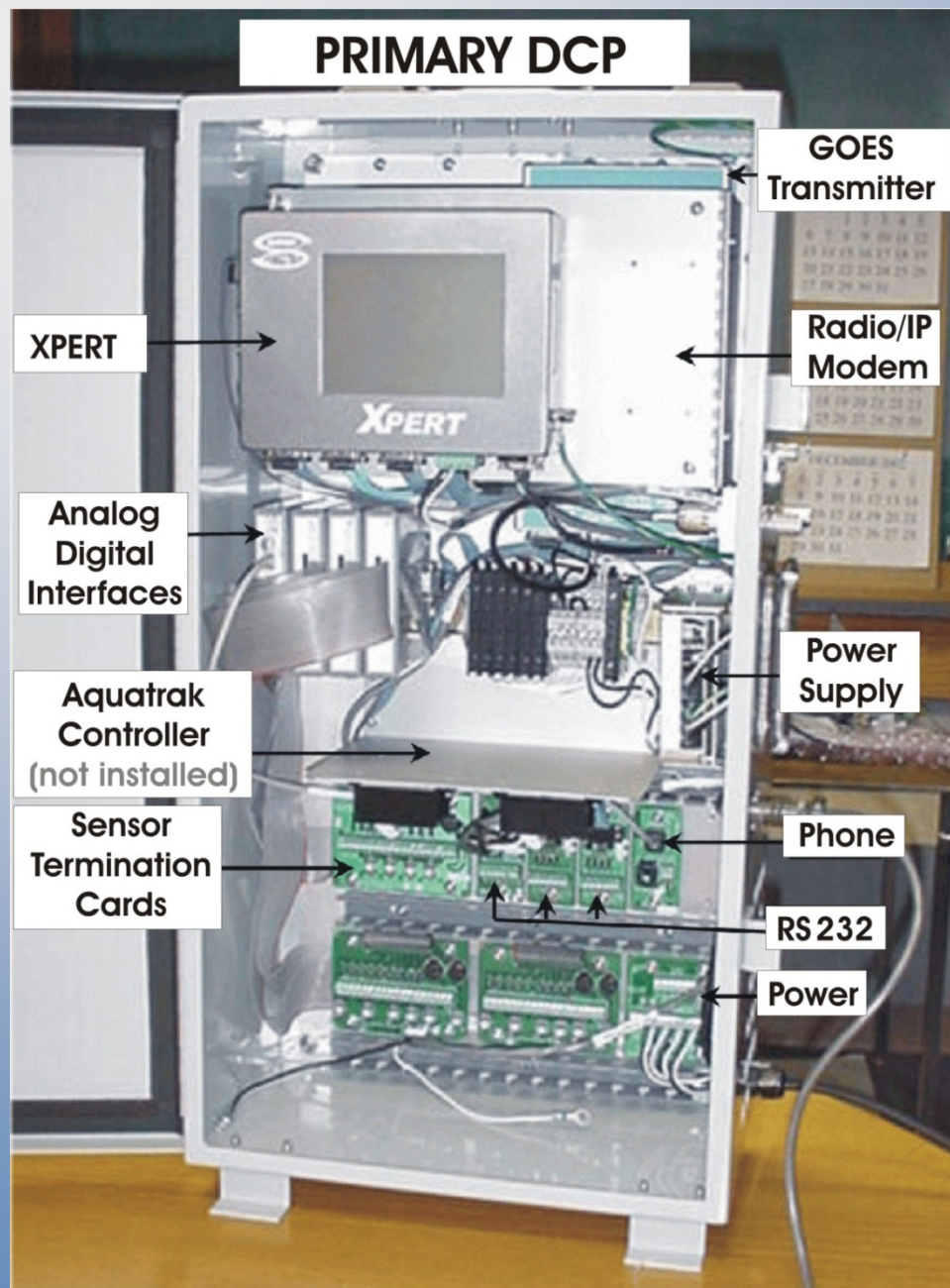
- Water Level
- Wind Speed/Direction
- Barometric Pressure
- Air/Water Temp.
- Conductivity/Temp
- Chart Datum
- Tsunami/Storm Surge



# Water Level Data Collection Systems



# Water Level Data Collection Systems



## Sutron Xpert System

# Water Level Measurement Systems

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## Primary Measurement System

- **Aquatrak<sup>®</sup> Air Acoustic water level sensor**
  - Self-calibrating measurement technique
  - Directly Leveled to local benchmark network
- **Sutron data collection platform**
  - Multitasking Operating system
  - 30 Days of Data Storage
  - Satellite Data Telemetry
  - Telephone Modem - Data retrieval and software upgrades



# Water Level Measurement Systems

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## Backup Measurement System

- Pressure sensor based water level sensor
- Sutron Data Collection Platform
  - 60 Days of Data Storage
  - Transfers data to Primary Measurement System



# National Water Level Network Station The Battery, NY



# Water Level Measurement System

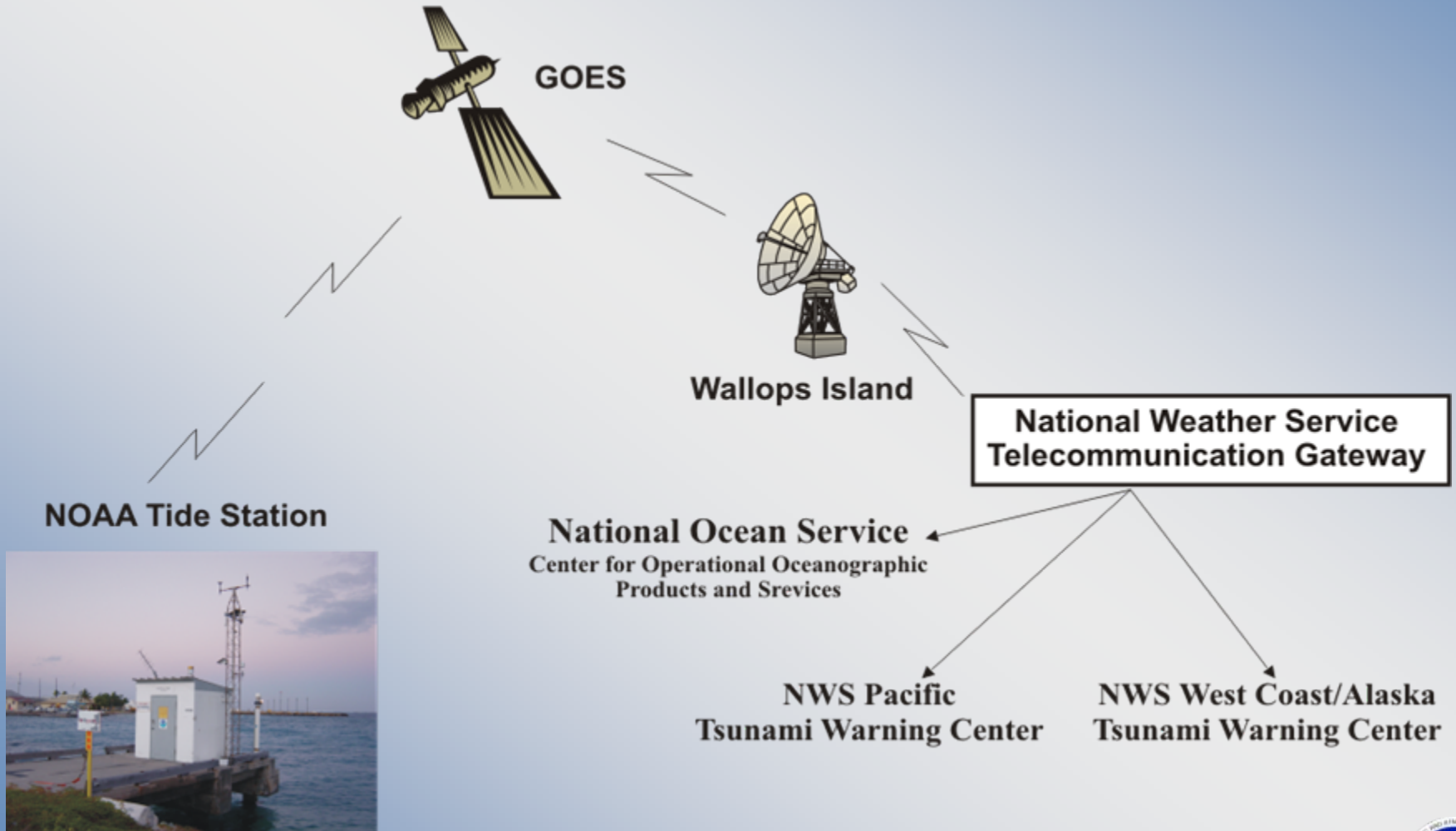
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## Water Level Measurements

- **3 Minute average of discrete 1 second samples**
- **Measurement includes Standard Deviation**
- **Includes a 3 Sigma outlier data filter**



# Data from NOAA Water Level Stations are Transmitted via GOES



# Short-term Water Level Measurement Stations

- Data Collection Platform
- Acoustic or pressure sensor
- Solar Panel
- GOES Transmitter



# Leveling at Water Level Stations

- **NGS Accuracy Standards**
  - 2<sup>nd</sup> Order, Class I for long-term stations
  - 3<sup>rd</sup> Order for short-term stations
- **Electronic Digital Barcode Leveling Equipment standard**
- **Annual leveling for NWLON; installation and removal levels for short-term stations**
- **Emergency leveling for storm events**



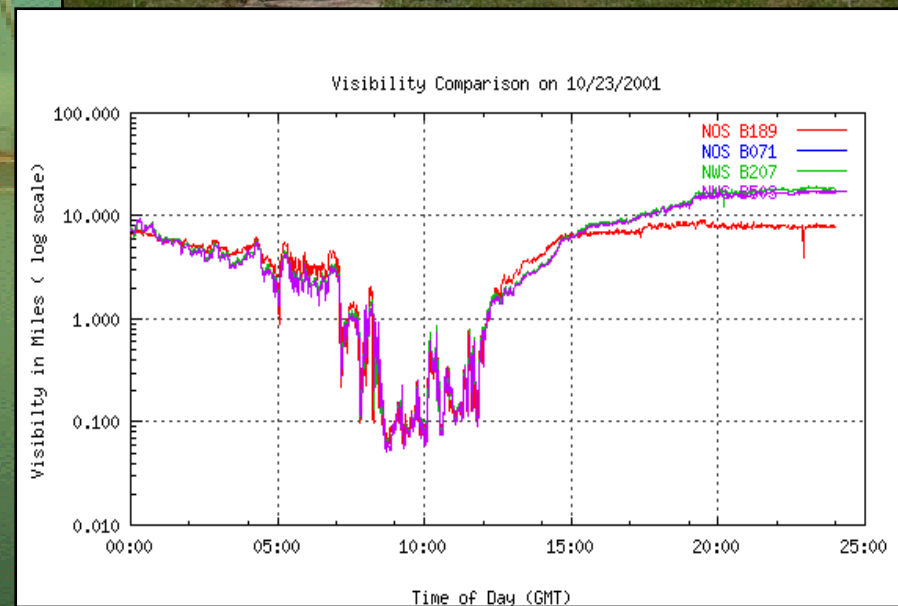
# Database Configuration

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- **New Installations/Annual Maintenance**
  - **Station Parameters**
  - **Maintenance Actions: DCP and Sensor Configuration.**
  - **Transmission Parameters**
  - **Sensor Parameters: sensor and datum offsets**
  - **Protective well and sounding tube information**
  - **Bench mark vertical mark data, descriptions**
  - **Leveling equipment information**
  - **Bench mark and sensor elevations above station datum**

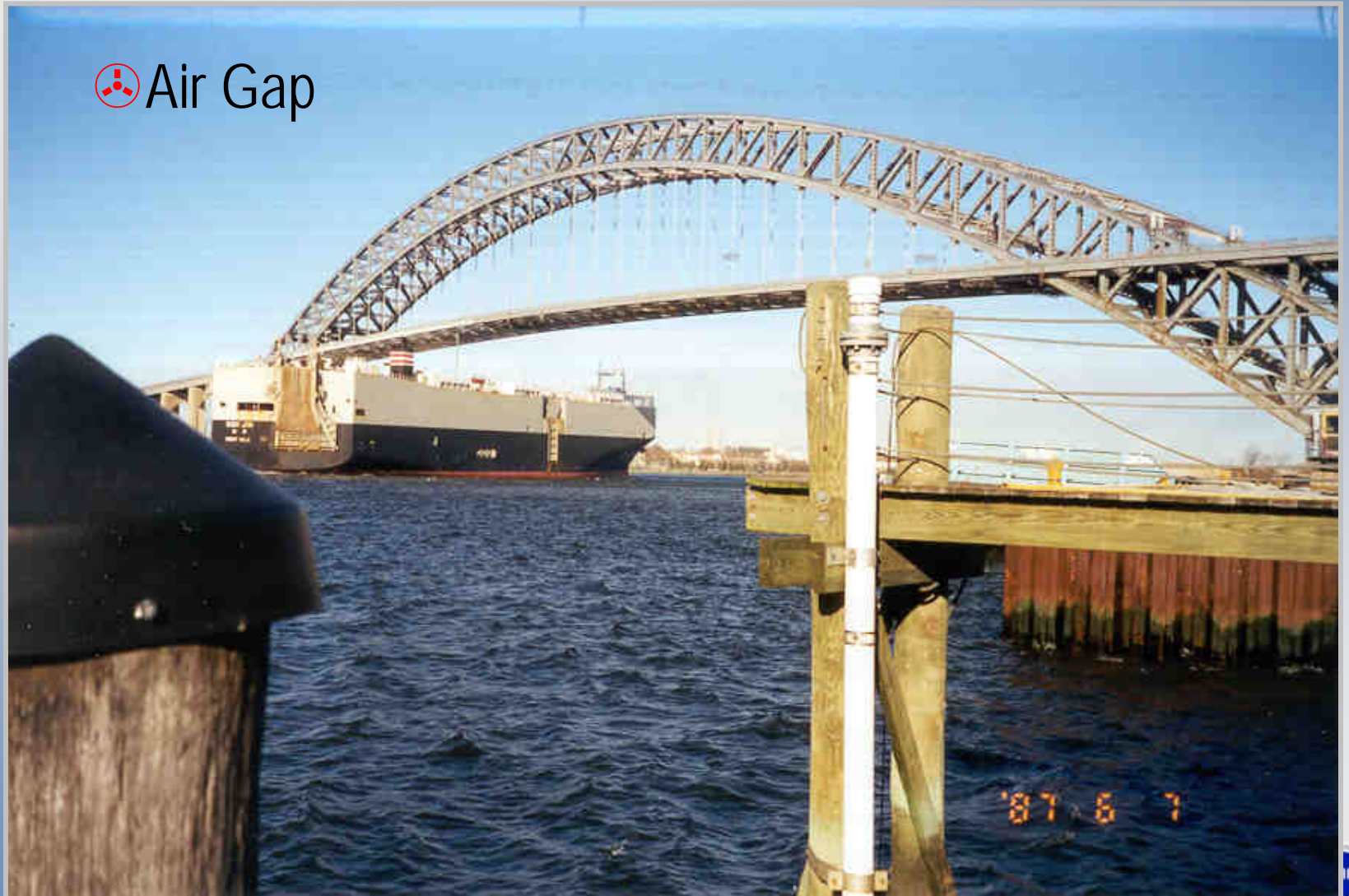


# VISIBILITY



# AIR GAP/ BRIDGE CLEARANCE

 Air Gap



# Operation of Tide Gauges

## Tide Gauges and Benchmark Networks

