MWD Real Time Network Utilizing Continuous GPS (CGPS) stations

"GNPS"
CGPS at MWD
Genewash Reservoir

California Spatial Reference Center (CSRC) Seminar
February 4, 2005
Who is the Metropolitan Water District of Southern California?

- Provide approximately 60% of the drinking water used by 17 million people in Southern California
- Water supplies come from the Colorado River via a 242 mile aqueduct that carries 1.3 million acre-feet annually
  - includes 5 pump plants, 92 mi. of tunnel, 144 underground siphons, 1617 ft. of total lift
- 775 miles of pipeline for water distribution spread over 6 counties, 5200 sq.mi. and 240 cities
- 10 reservoirs
  - from 212 ac-ft to 800,000 ac-ft capacity
- 5 filtration plants each encompassing:
  - an average of 8 settling and mixing basins
  - 1 or 2 finished water reservoirs
- 15 hydroelectric plants
Overview of MWD RTN

- 17 CGPS sites on MWD property in RVCo (4 PBO)
- Will include data collection of 18 additional CGPS sites in RVCo
- Data collection over MWD Communications backbone – 5 main locations
- MWD server to transmit data to MWD crews only
- Data transmission to SOPAC/CSRC for archiving and further transmission if needed
- Data transmission to Orange Co. for temporary serving of data to public (until RVCo is ready)
Planned Installation Schedule

- First equipment arrived last week
- Installation of upgrades to communications backbone to begin this month
- Installation of first CGPS site upgrade by end of month
- MWD server is currently being set up
- Data transmission to begin as sites upgraded
- As soon as data flows into MWD server it will be available at Orange Co. and CSRC
- Complete initial installation by May 2005 (?)
Current Status of MWD RTN

The Metropolitan Water District (MWD) February 2005
Programs to run network:
RTD = network solution
CLP = handles incoming raw data

The Metropolitan Water District (MWD)
The Metropolitan Water District (MWD)

February 2005

Robotic total stations = 8
GPS stations = 9

DVL Geodetic Monitoring Array

Figure No. 2: Geodetic Control Network Monuments
ESE2 – New Base at South Abutment of East Dam (replaced ESRE)
DVSE “Rover” Station on South End of East Dam Crest
Real-Time GPS with RTS Verification
DVSE – Real Time GPS Equipment Box
CGPS Upgrade Equipment

- Each site upgrade includes:
- Ethernet 2.4GHz WiLAN (wireless LAN) radio
- SIO telemetry buffer and cable
- Appropriate antenna (usually 24 dBi semi-parabolic grid antenna)
- WiLAN radio cable
- Miscellaneous parts (pipe clamps, etc.)
Rover Equipment

- Each rover setup will be running the network version of RTD
- Allows for solution of an adjusted position based on two CGPS in the network available at your site – not a radial solution
- Better accuracy, less possibility for error
- Currently testing program on a PDA device
- PDA not great for field use – not rugged enough, but less expensive for testing
RTD-Rover

- PIN Positioning: Precise Instantaneous Network Positioning
- Instantaneous Multiply-Determined Solutions
- Employs Geodetics Epoch-by-Epoch™ Technology
- Utilizes any reference geodetic receiver (does not require RTK software).
- Can utilize L1 only geodetic receivers on short baselines ( < 5km).
- Works on laptops, tablet PC’s and PDA’s.
RTD Total Solution

Platform Independent Reference Network

II-GPS
Precise Instantaneous GPS

Internet

Sprint, Verizon or Cingular Wireless Data

Bluetooth

PIN Positioning
Precise Instantaneous Network Positioning

Compatible with existing Rovers

Compatible with various Data Loggers

The Metropolitan Water District (MWD)

February 2005
Cost Summary for Network

- 5 backbone sites - $2000 per location
- 11 initial CGPS sites - $5000 per site
- MWD will provide the labor
- MWD already owned the RTD software to run the server, just purchased latest upgrade
- Rover costs – rugged field device - $2500 + software cost
Benefits for MWD

- Labor cost savings
  - one person crews
  - shorter field set up time
  - useable at most of our facilities
  - will save us money on outside contracts

- Emergency response
  - Available 24/7
  - Allows for instant response

- Coverage
  - Covers most of our aqueduct and desert facilities
  - Covers most of our service area in conjunction with OCRTN, LARTN and SDRTN
A CONTRACT FOR NAVD88 LEVELING TO CONTINUOUS OPERATING REFERENCE STATIONS (CORS) FOR THE CALIFORNIA SPATIAL REFERENCE CENTER (CSRC)

- NAVD88 Elevations/Levels per this contract
- Possible alternative sites
- NAVD88 Elevations completed
Measurement from Base of Adaptor to Top of Adaptor

0.0083 mm
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<th>Name</th>
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Deformation and Geodetic Control Programs

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The California Spatial Reference Center
CSRC website: http://csrc.ucsd.edu

The Metropolitan Water District (MWD)