

# RFID and GNSS for Underground Asset Management

NGAC

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Xavier Irias, P.E.

# EBMUD System

## EBMUD WATER SUPPLY



**EBMUD MOKELUMNE AQUEDUCTS**  
3 - 85 MILE LONG WATER SUPPLY PIPELINES

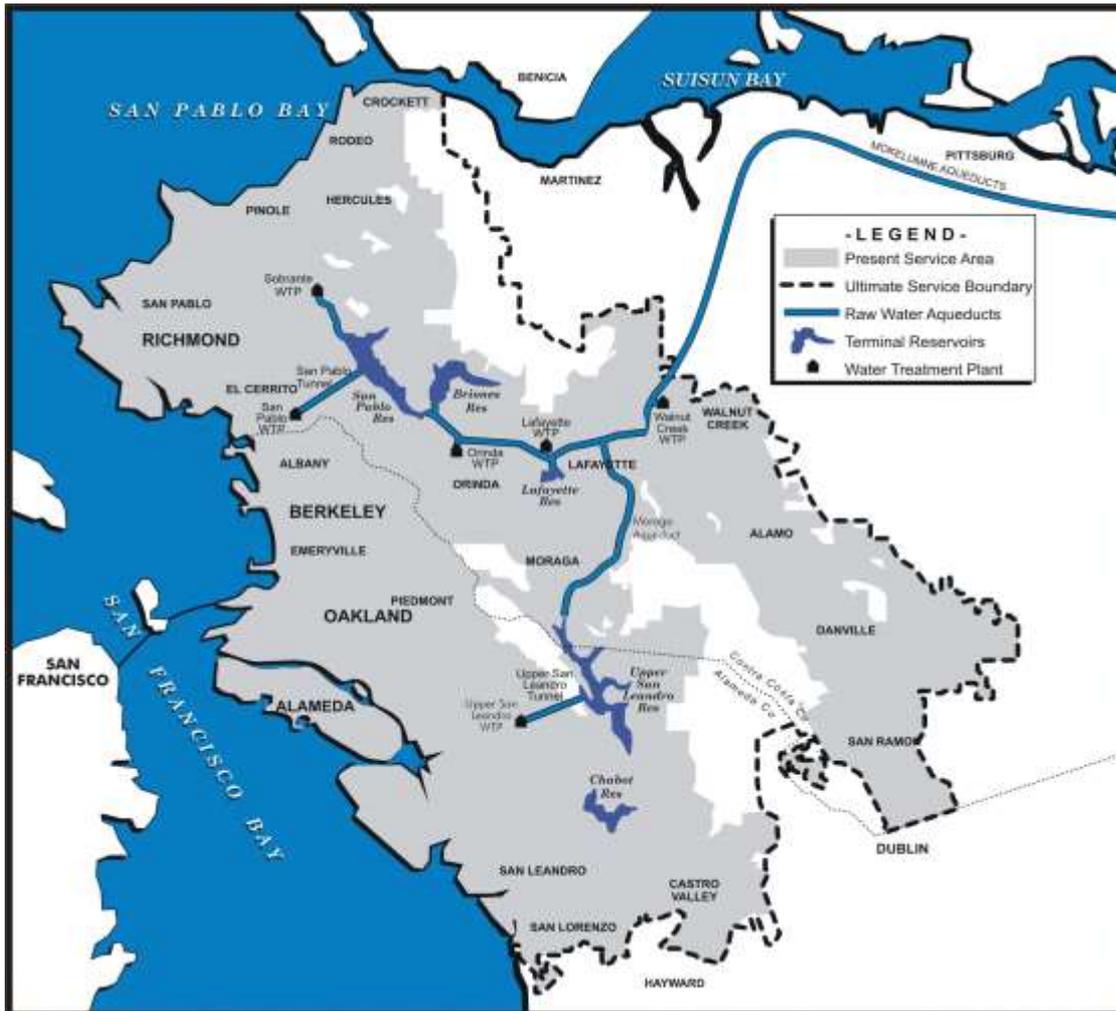
**FREEPORT REGIONAL WATER FACILITY**  
SUPPLEMENTAL WATER SUPPLY FOR DRY YEARS

**PARDEE RESERVOIR**  
MUNICIPAL WATER SUPPLY

**MOKELUMNE RIVER WATERSHED**

**EBMUD SERVICE AREA**  
332 SQUARE MILES

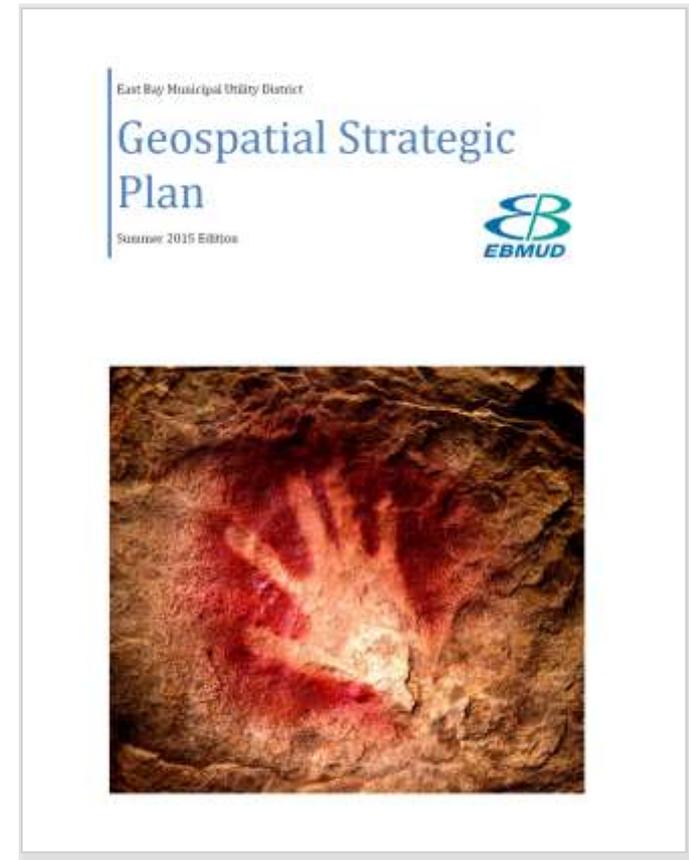
# EBMUD's Service Area



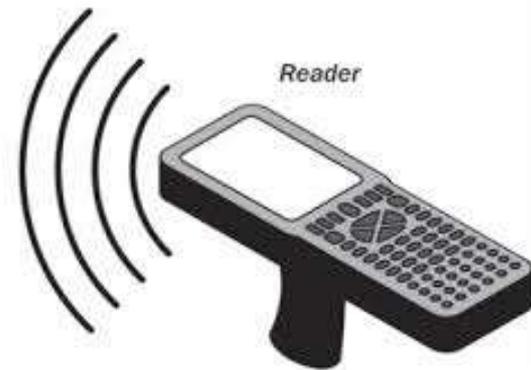
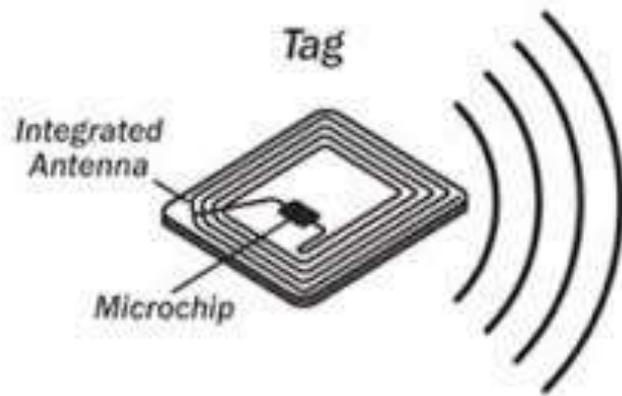
- 1,400,000 retail customers
- 400,000 services
- 6,600 km pipe
- 28 dams
- 5 treatment plants
- 126 pumping plants
- 165 reservoirs/tanks
- 122 pressure zones
- Elevation: MSL-442 m

# Background

- EBMUD 2015 Geospatial Strategic Plan, among many things:
  - Identified RFID, GNSS key technologies
  - Recommended RFID and/or other forms of asset tags be implemented in concert with replacement of procurement system
  - Recommended RTN GNSS be used by designers and inspectors to stake out and locate assets, in lieu of traditional surveys



# Background: RFID Essentials



# RFID History

- June 2003: WalMart rolled out RFID plans, 2005 effective date
- 2008: WalMart backs off RFID initiatives
- 2010-2016: RFID continues to mature, prices plunge, over-hype subsides
- Present day: usage has grown across many sectors including:
  - Inventory
  - Asset management
  - Many others such as retail, access control, animals
- Timing is good for EBMUD to further explore as we replace software systems, re-engineer our pipeline work



WalMart Sam's Club  
Distribution center



# RFID Inventory Management Benefits

## FY16:

4,973 orders

\$170M value

## Inventory

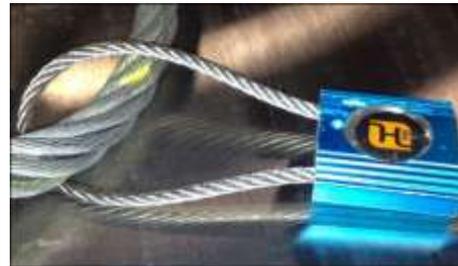
\$15M value

12,000 distinct items

Fixed RFID readers could record material entering or leaving warehouses



Some items are, or could be, embedded with RFID by manufacturer



Other items can be tagged with tamper-evident RFID zip-ties at any point in the life cycle

# RFID Could Add Value Over Entire Asset Life Cycle

- Reduce manual tracking of enormous volume of inspections
- Track in detail which asset is installed where
- Facilitate response to defective or counterfeit items
- Assist in locating assets quickly

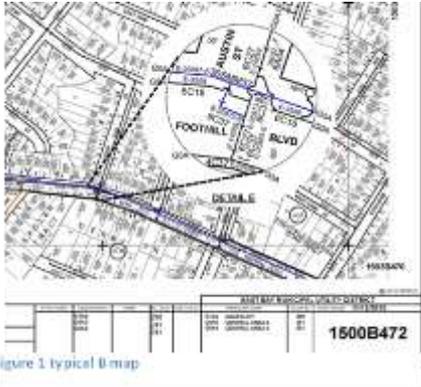


## In FY16 staff:

- Inspected 70,000' of pipe
- Inspected 800 hydrants
- Inspected 1,070 valves
- Located 50,000 assets

# RFID/GNSS Asset Management Example

## Existing workflow to locate our pipes



1. Orient with a map



2. Find pipes and valves with magnetic locator



3. Mark location of our utilities

# Utility Location Is Challenging



# GNSS+RFID Can Streamline Asset Management



1. Locate asset using GNSS-enabled live map (someday, 3D augmented reality)



2. Zero in with pipe locator



3. Confirm with RFID, eliminate data entry



What Do We Not Know?

# Workflow-specific Study Needs

Workflow	Current	Value proposition	TBD
Location of existing asset	8 FTE perform 50K locates/year	Use RFID/GNSS to improve speed and accuracy  Reduce data entry	Buried-tag issues. Which data go on tag vs database.  Best ways to capture and retain GNSS metadata for datum, epoch, precision.
Inventory control	Manual receipt, disbursement, picking, inventory	Automate all functions to reduce labor, reduce errors, improve accuracy	Which assets, at what level of detail?  When to tag?
Documentation of new assets	Only sparse data are recorded as asset is placed into service.	Track assets cradle to grave with specific, reliable data to support asset mgmt.	When to tag? Which assets first? Which software to use?

# Crosscutting Study Needs

Workflow	Questions	Specifics
Interoperability and future-proofing	Which specific tags should be used to ensure that they are usable many years into the future?	<p>Verify UHF EPC Class 1 Gen 2 tags are interoperable.</p> <p>Buried-tag issues.</p> <p>Which data go on tag vs database.</p>
Security	How can we ensure that data on the tag are appropriately secure from unauthorized reading or writing?	<p>Feasibility of field-update of tag data.</p> <p>Which data can safely be put on tag?</p> <p>How should data be protected from reading/tampering?</p>
Which assets tagged, level of granularity	Which specific assets should be tagged, by whom, and when?	<p>When in asset life to apply tag?</p> <p>When/how to update tag data?</p> <p>Which assets first?</p>
Upgrading schematic maps to geographically accurate maps	What do maps look like in transition zones (partial schematic, partial geographically accurate)	<p>Will ESRI “representations” mature sufficiently to address display issues?</p> <p>What is a good process to harvest data from USA locates?</p> <p>What sort of QA and approval are needed if we seek to internally “crowd-source” map updates?</p> <p>Legal issues surrounding location of objects.</p>

# Summary

- RFID and GNSS have potential to enable substantial efficiencies
- Replacement of major software systems poses an opportunity to advance these technologies