Geotechnical Monitoring of the Excavation for the Transbay Transit Center

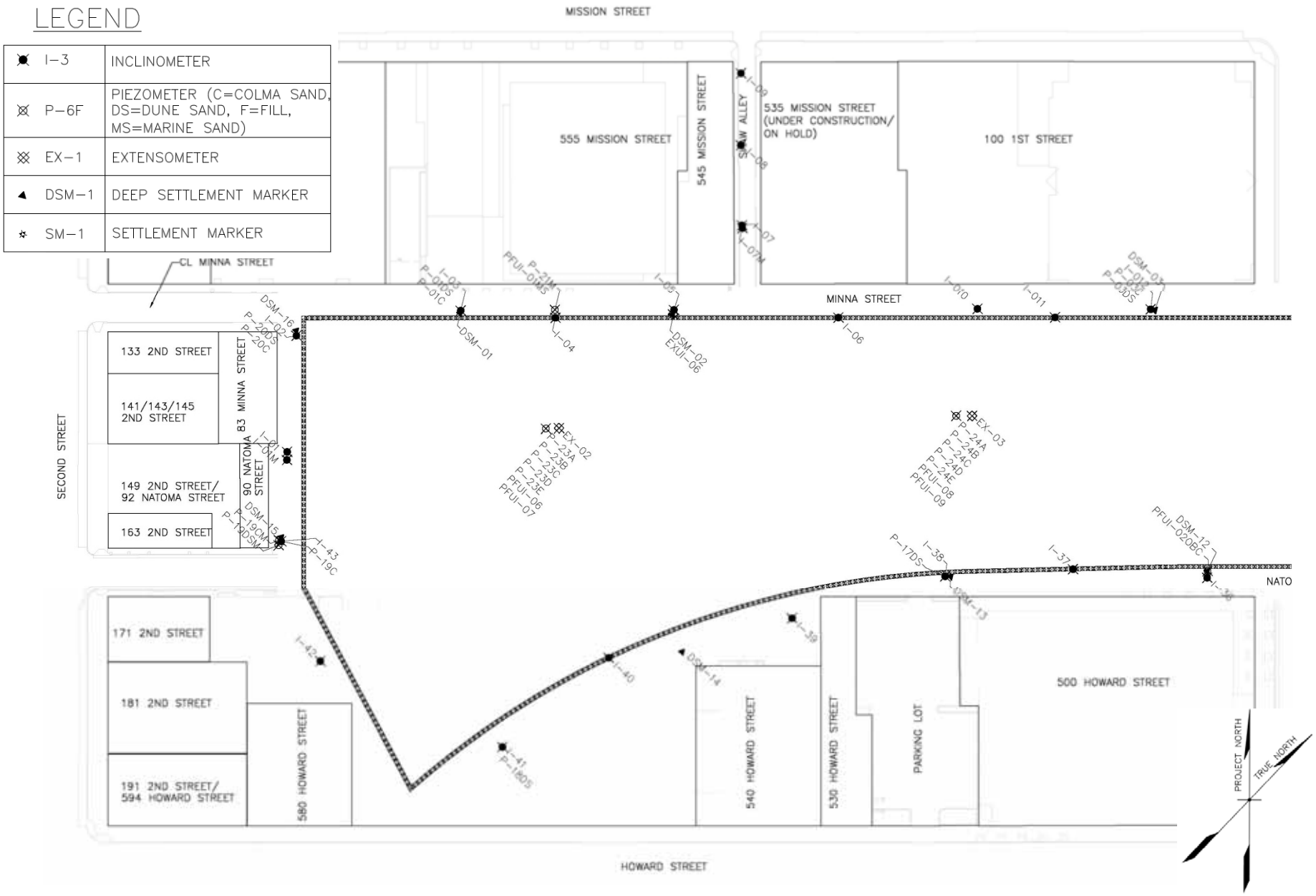
Citizens Advisory Committee - March 13, 2012

Stephen McLandrich

ARUP

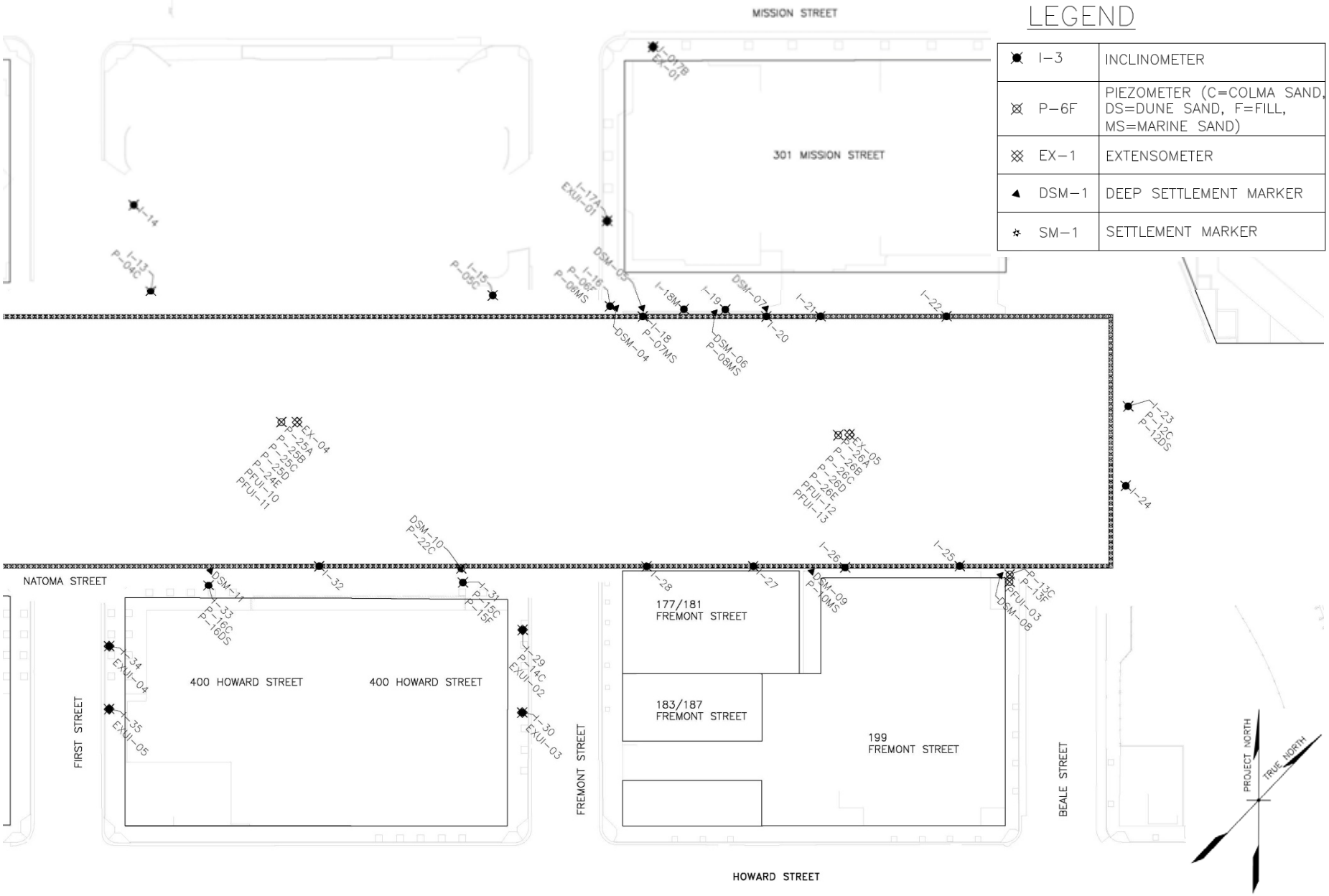
- Instrumentation Plan
- Instrument Types
- Data Distribution
- Data Interpretation and Actions

ARUP



Plan of Instrumentation – First Street to Second Street

ARUP



Plan of Instrumentation – First Street to Beale Street

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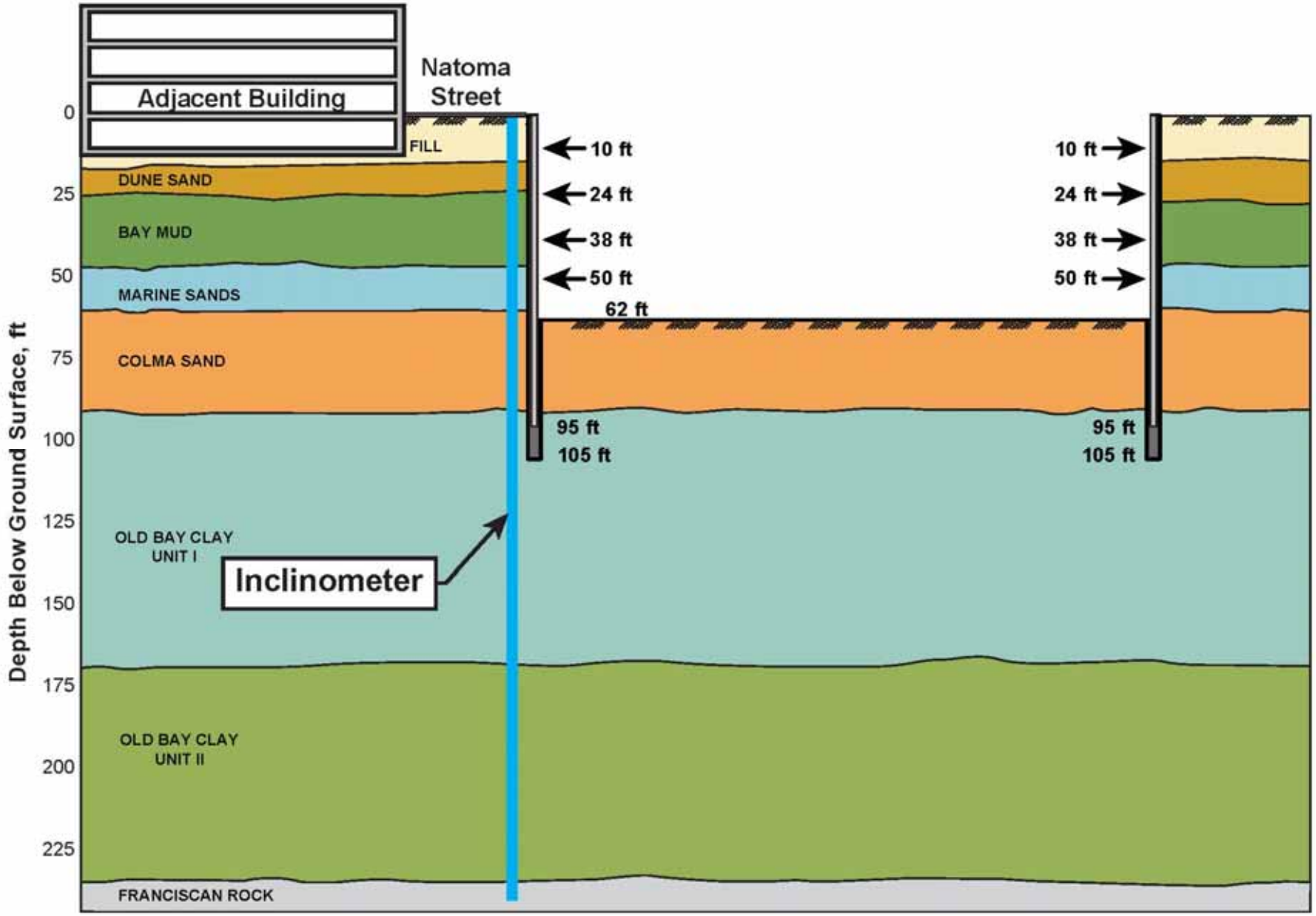
- **Inclinometers** – 44 digital, 3 manual
  - Measures the horizontal movement at various depths
- **Piezometers** – 51 digital, 5 manual
  - Measures the elevation of groundwater
- **Deep Settlement Markers** – 16 digital
  - Measures the settlement or heave of anchor installed beneath the ground surface
- **Extensometers** – 11 digital
  - Measures the settlement or heave of an array of anchors installed at a variety of depths beneath the ground surface
- **Survey Monuments** – ~100 monitored by **A**utomated **M**otorized **T**otal **S**tation (AMTS)
  - Measures the horizontal and vertical movement of a survey prism
- Instrumentation supplied by our subcontractor, GEO-Instruments


Adjacent Building
Natoma Street
FILL
DUNE SAND
BAY MUD
MARINE SANDS
COLMA SAND
OLD BAY CLAY UNIT I
OLD BAY CLAY UNIT II
FRANCISCAN ROCK
Inclinometer
10 ft
24 ft
38 ft
50 ft
62 ft
95 ft
105 ft
Depth Below Ground Surface, ft
0
25
50
75
100
125
150
175
200
225

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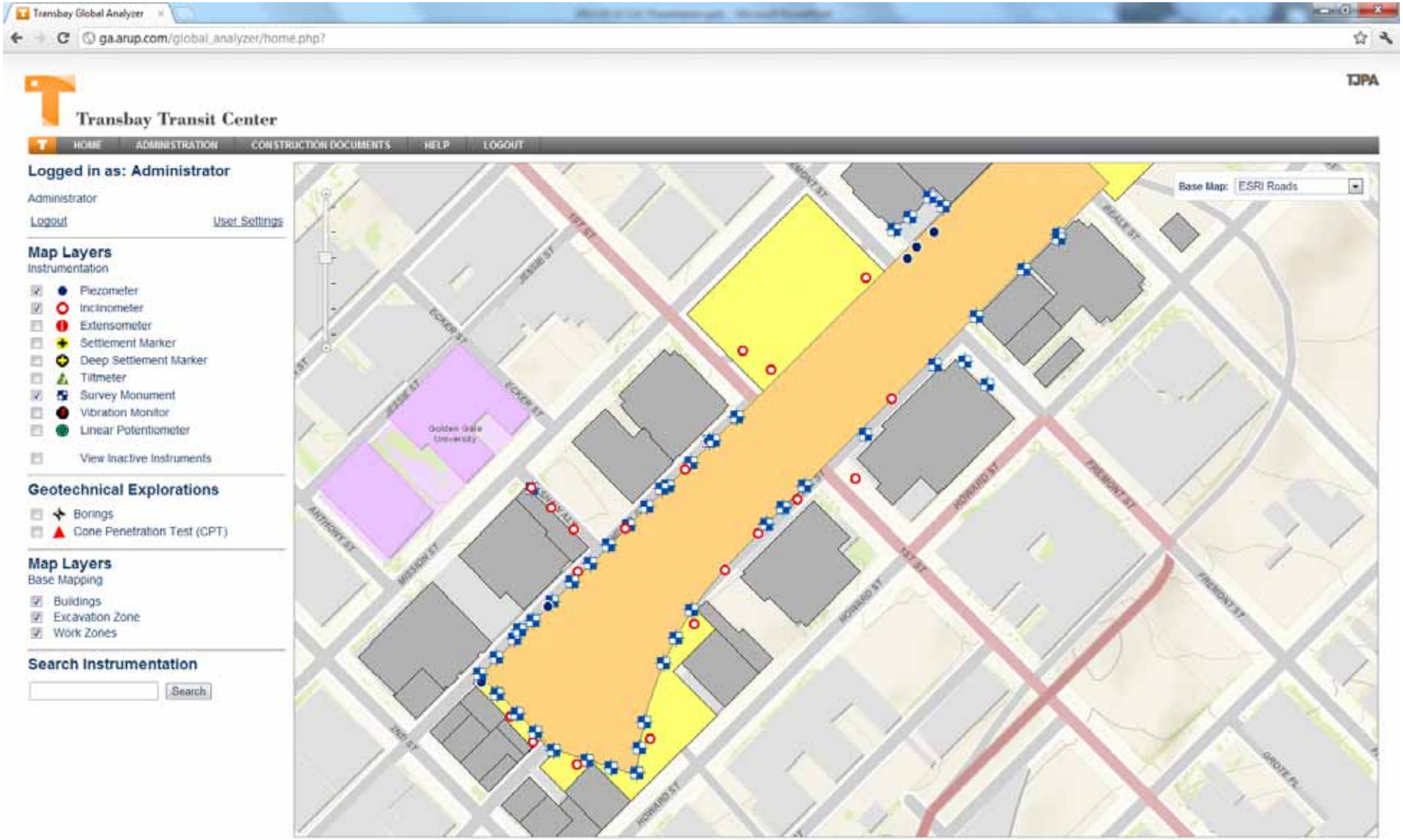
- Datalogger located in underground vault box
- Vault box lid works as an antenna for the wireless transfer of digitally collected data
- Data is uploaded to an ftp site
- Arup has created a web portal to display data in real-time to allow efficient review and interpretation

- **A**utomated **M**otorized **T**otal **S**tation (AMTS) reads the location of over 100 Survey Monuments once every 2 hours.
- Correction of readings based on the AMTS's location using backsight prisms located away from the excavation.


Transbay Global Analyzer
ga.arup.com/global_analyzer/home.php?
TJPA
Transbay Transit Center
HOME
ADMINISTRATION
CONSTRUCTION DOCUMENTS
HELP
LOGOUT
Logged in as: Administrator
Administrator
Logout
User Settings
Map Layers
Instrumentation
Piezometer
Inclinometer
Extensometer
Settlement Marker
Deep Settlement Marker
Tiltmeter
Survey Monument
Vibration Monitor
Linear Potentiometer
View Inactive Instruments
Geotechnical Explorations
Borings
Cone Penetration Test (CPT)
Map Layers
Base Mapping
Buildings
Excavation Zone
Work Zones
Search Instrumentation
Search
Base Map:
ESRI Roads

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 Typical Plot of Survey Monument from the Global Analyzer

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- Transbay Movement Review Panel
- Action Trigger Levels (Yellow/Orange)
- Maximum Allowable Movement Levels (Red)
- On-going review of data allows detection of areas which are not performing to plan prior to significant problems occurring
- Design adjustments can be made prior to the most critical stages of excavation

Questions