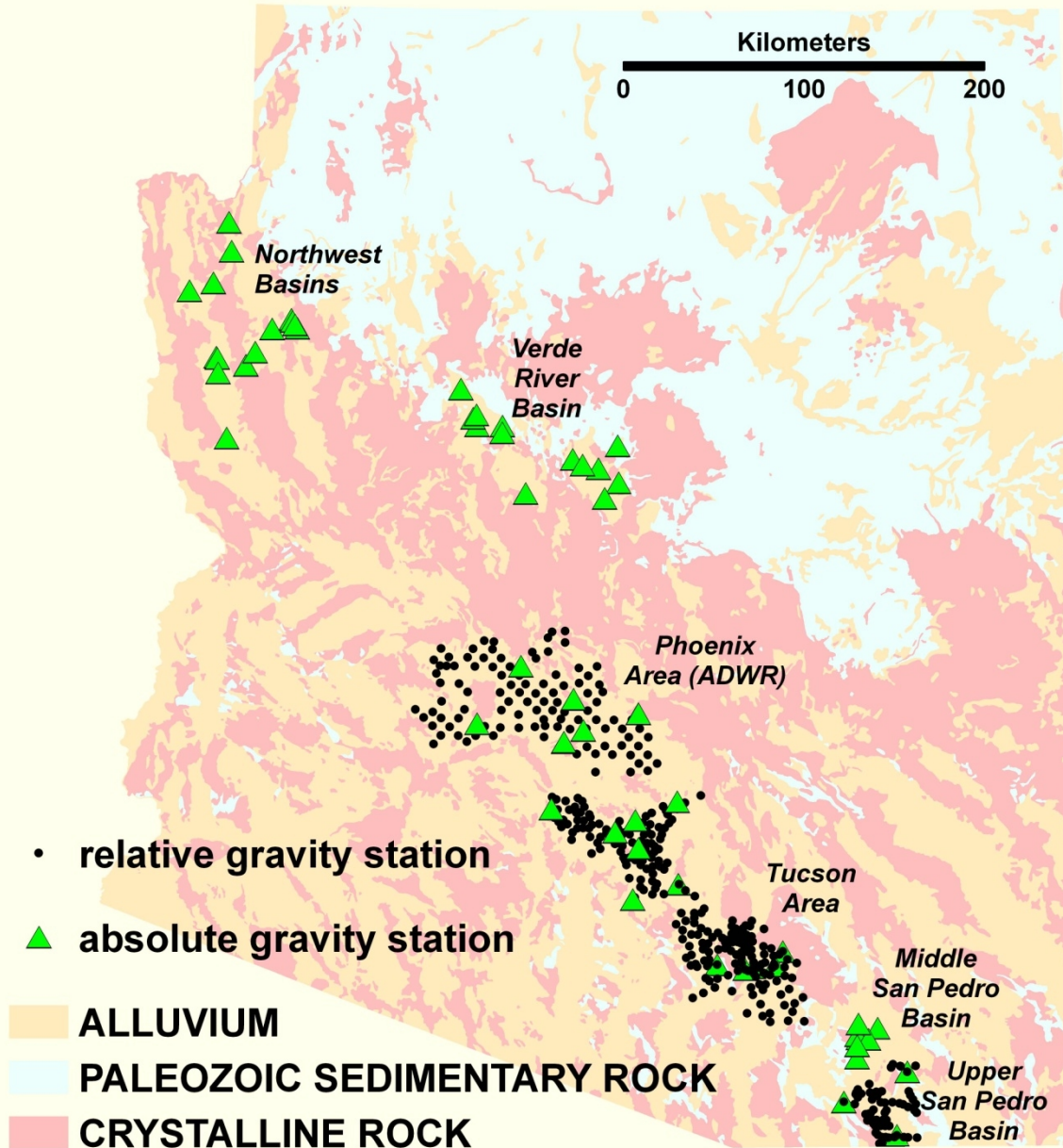


USGS Arizona Water Science Center Gravity Program



Don Pool and Jeff Kennedy, USGS
Brian Conway, Arizona Dept. Water
Resources

Gravity monitoring networks in Arizona



Black Hills Limestone Aquifer Project DUSEL project



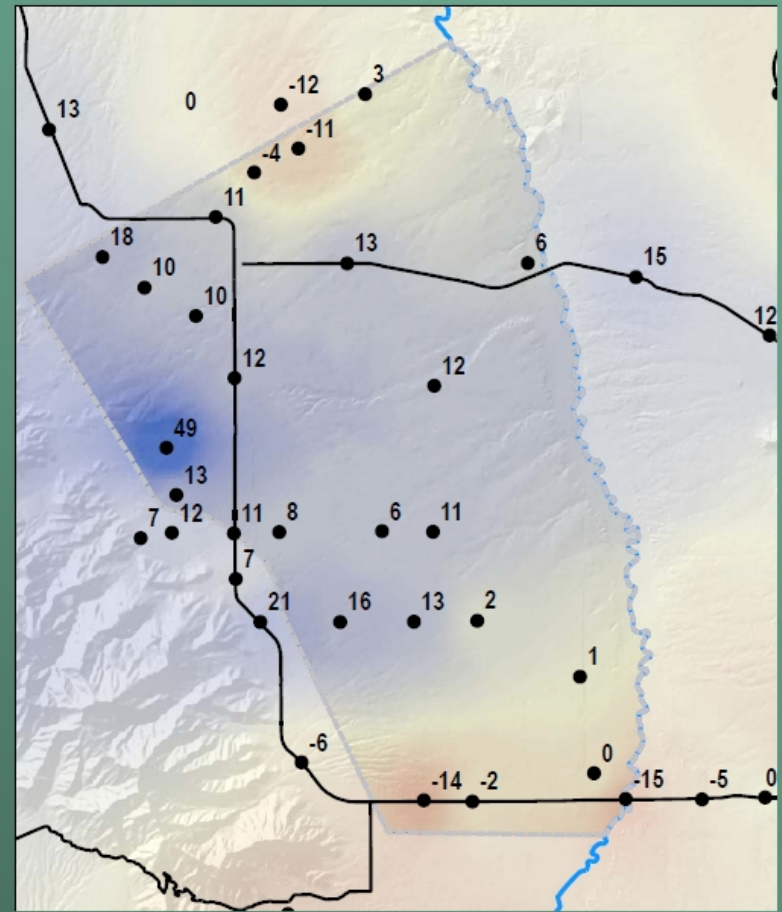
Sagehen Creek Sierra Nevada



0 1.25 2.5 5 Kilometers

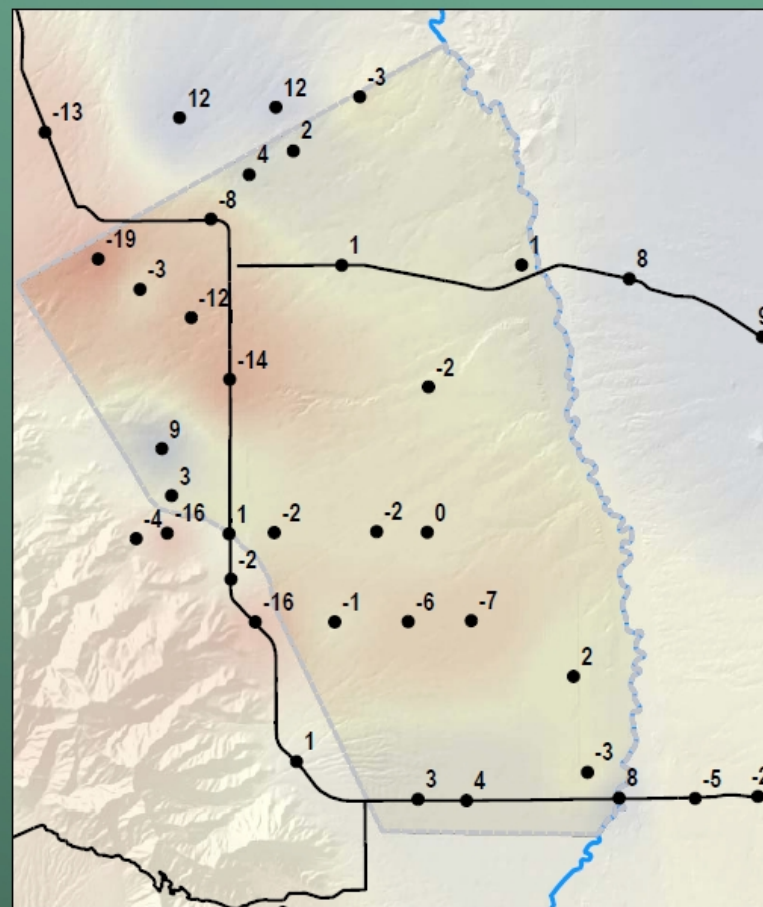
Aquifer Storage Change

- May 2008 to November 2008
- Very wet monsoon with about 1 m of rainfall at highest elevations of Huachuca Mountains



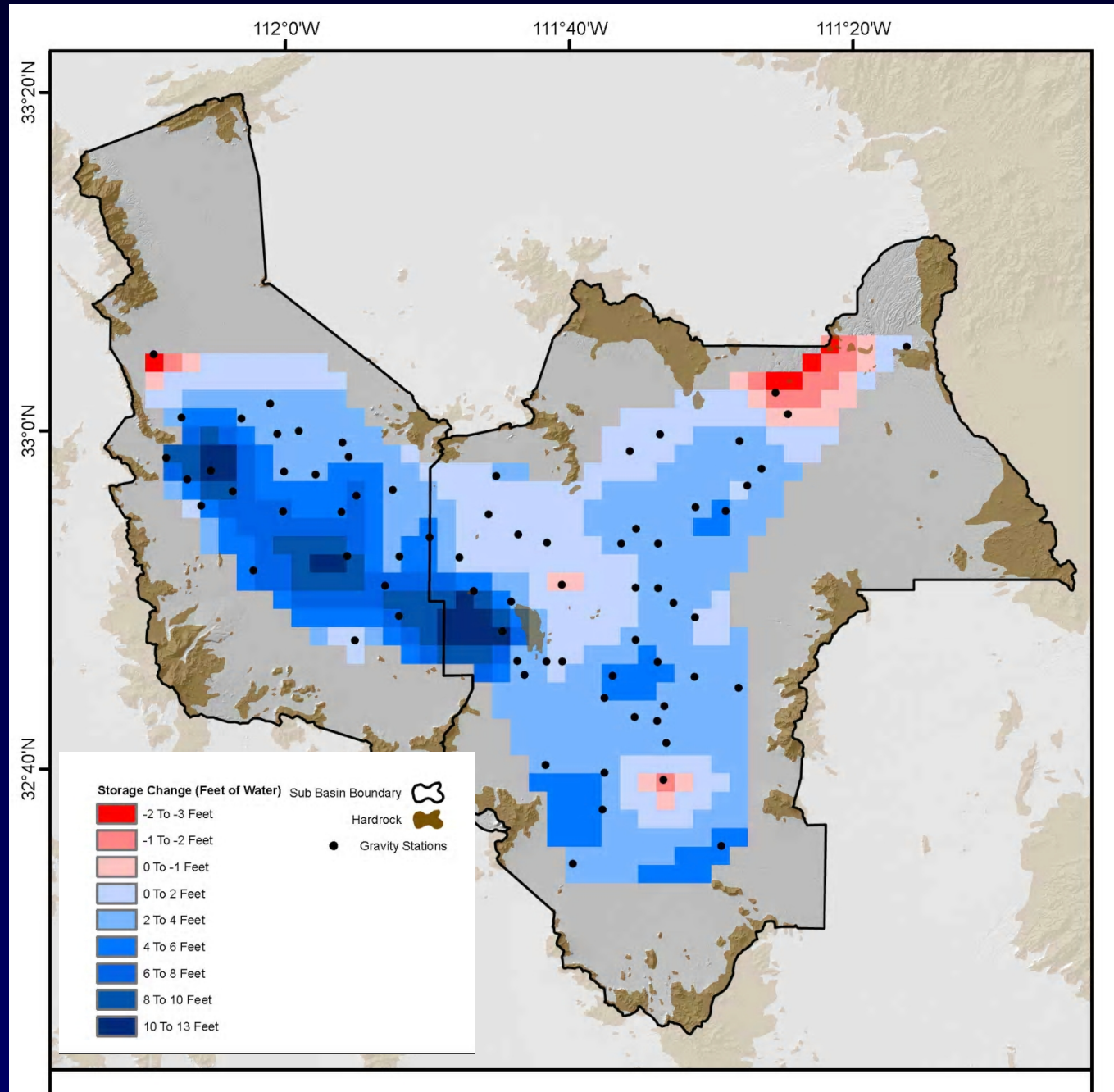
Aquifer Storage Change

- November 2008 to May 2009
- Dry winter, typical of the past few years

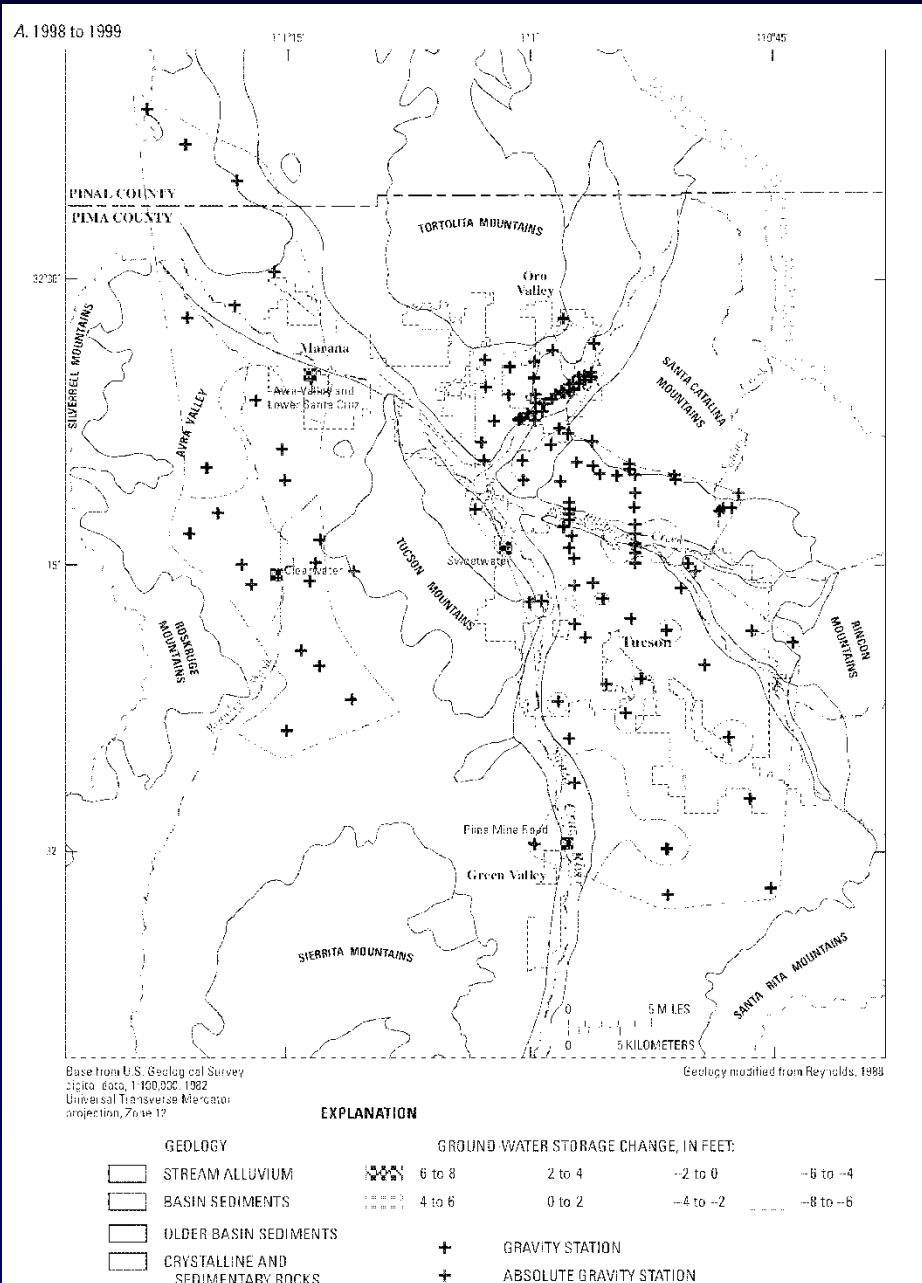
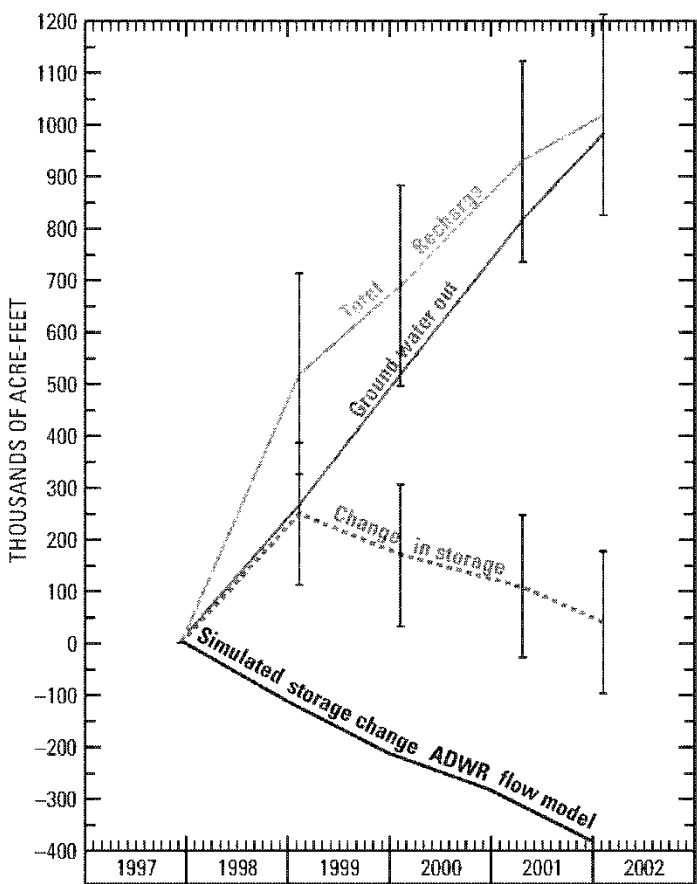


ADWR PINAL AMA

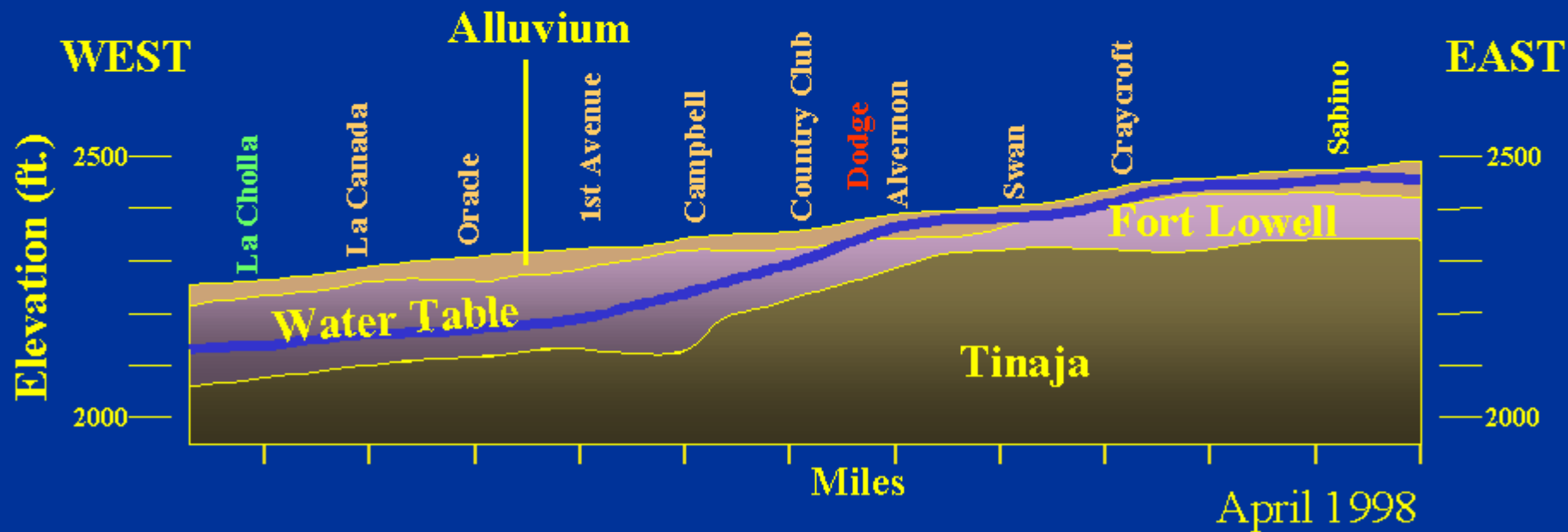
1999- 2007



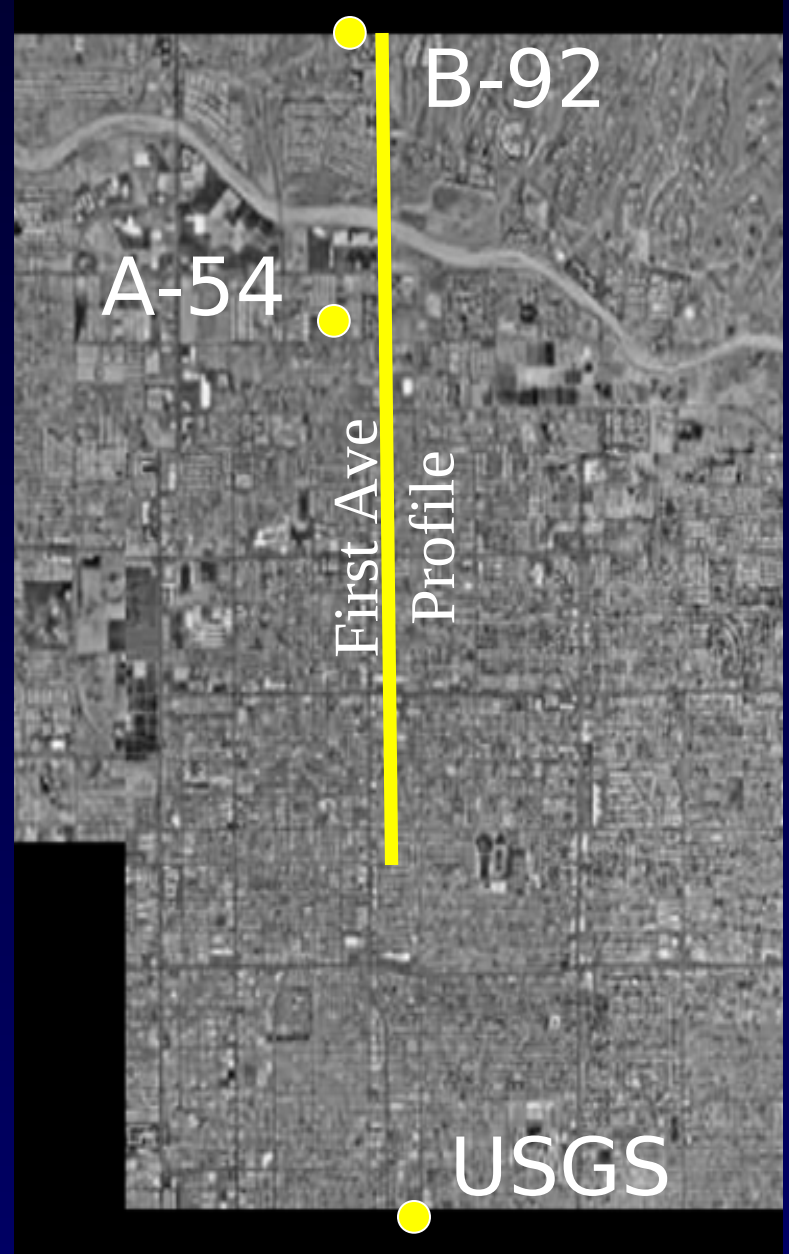
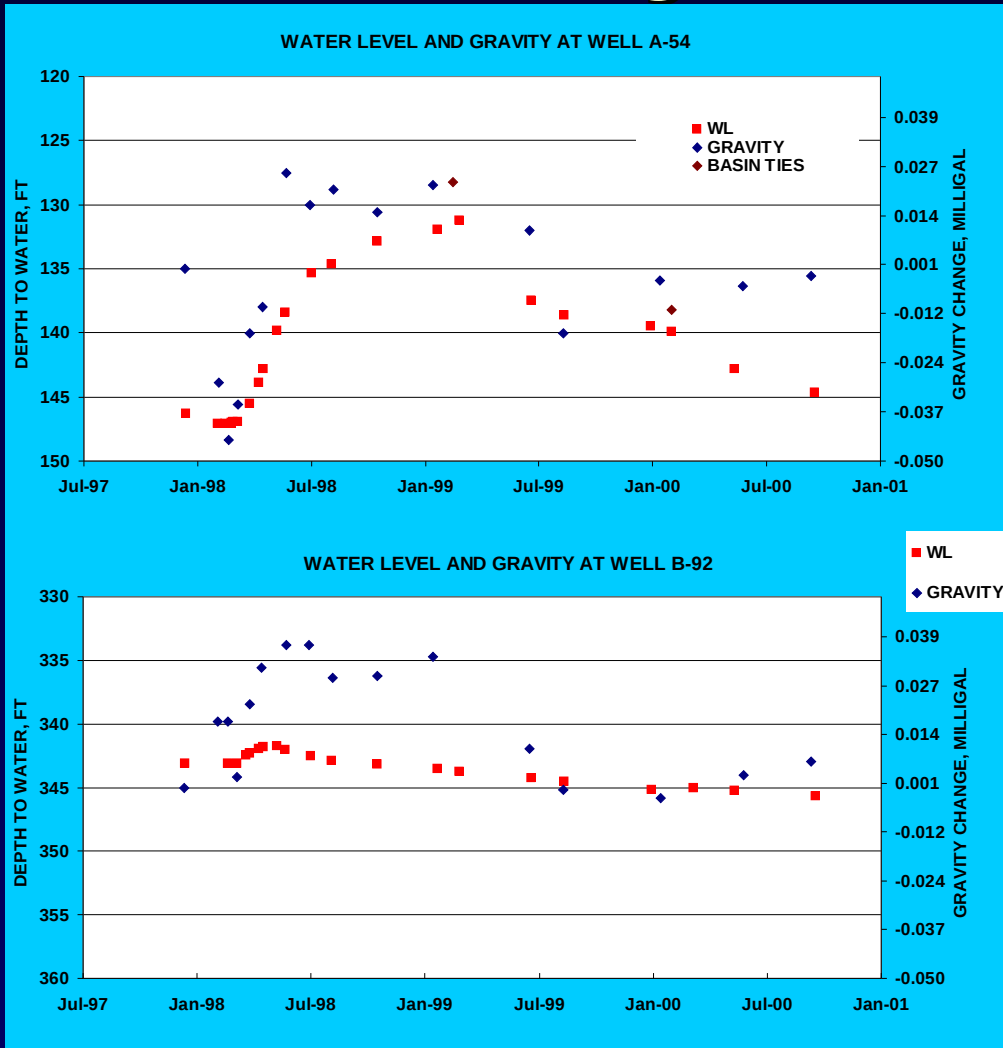
Tucson basin storage change



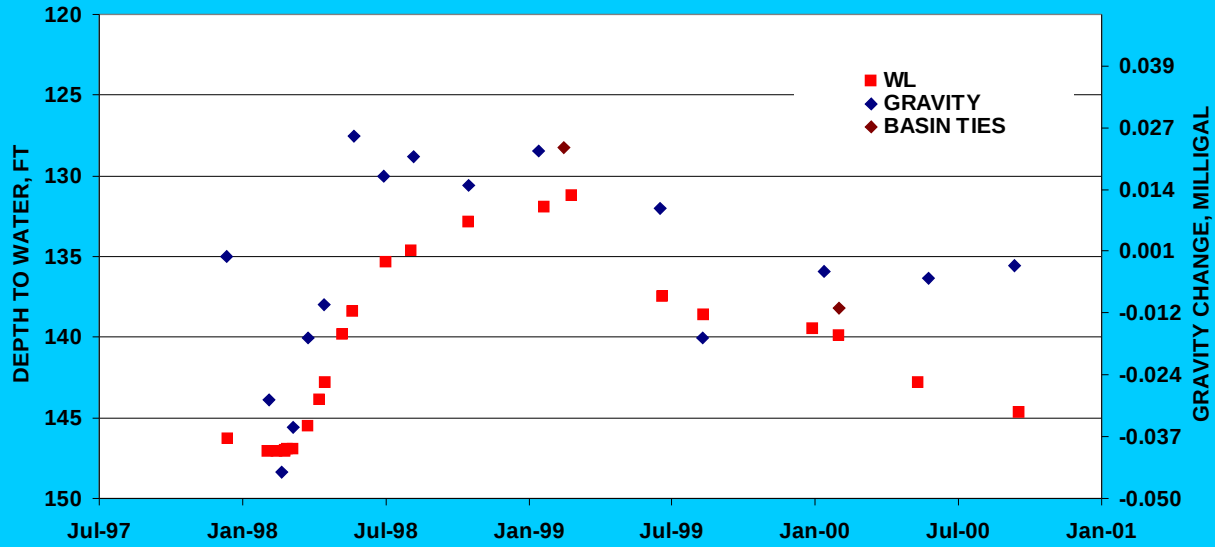
Profile Along Rillito Creek



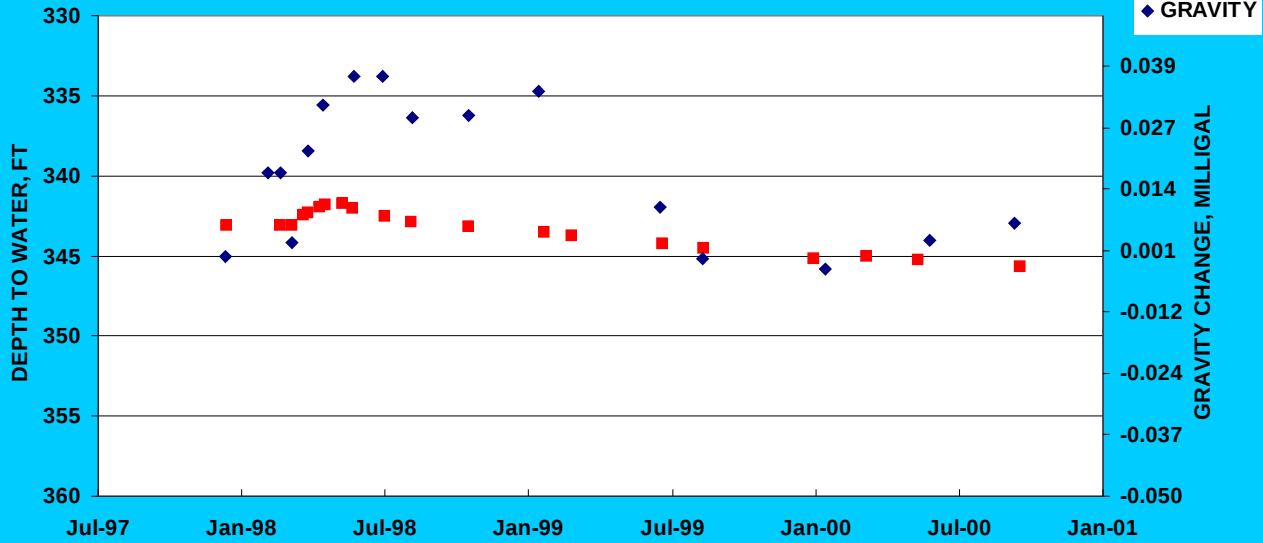
Rillito Creek Ephemeral Channel Recharge



WATER LEVEL AND GRAVITY AT WELL A-54

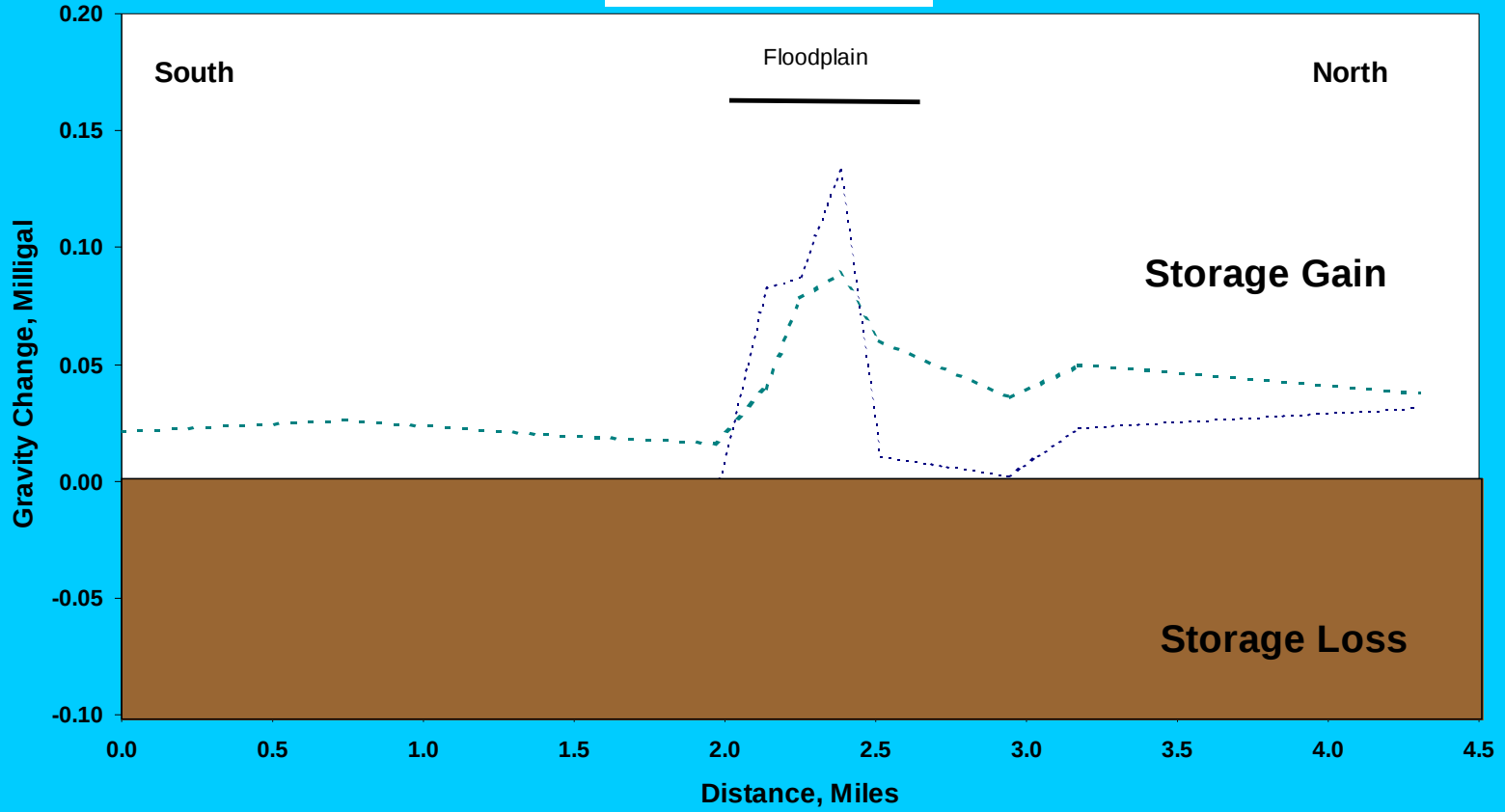


WATER LEVEL AND GRAVITY AT WELL B-92



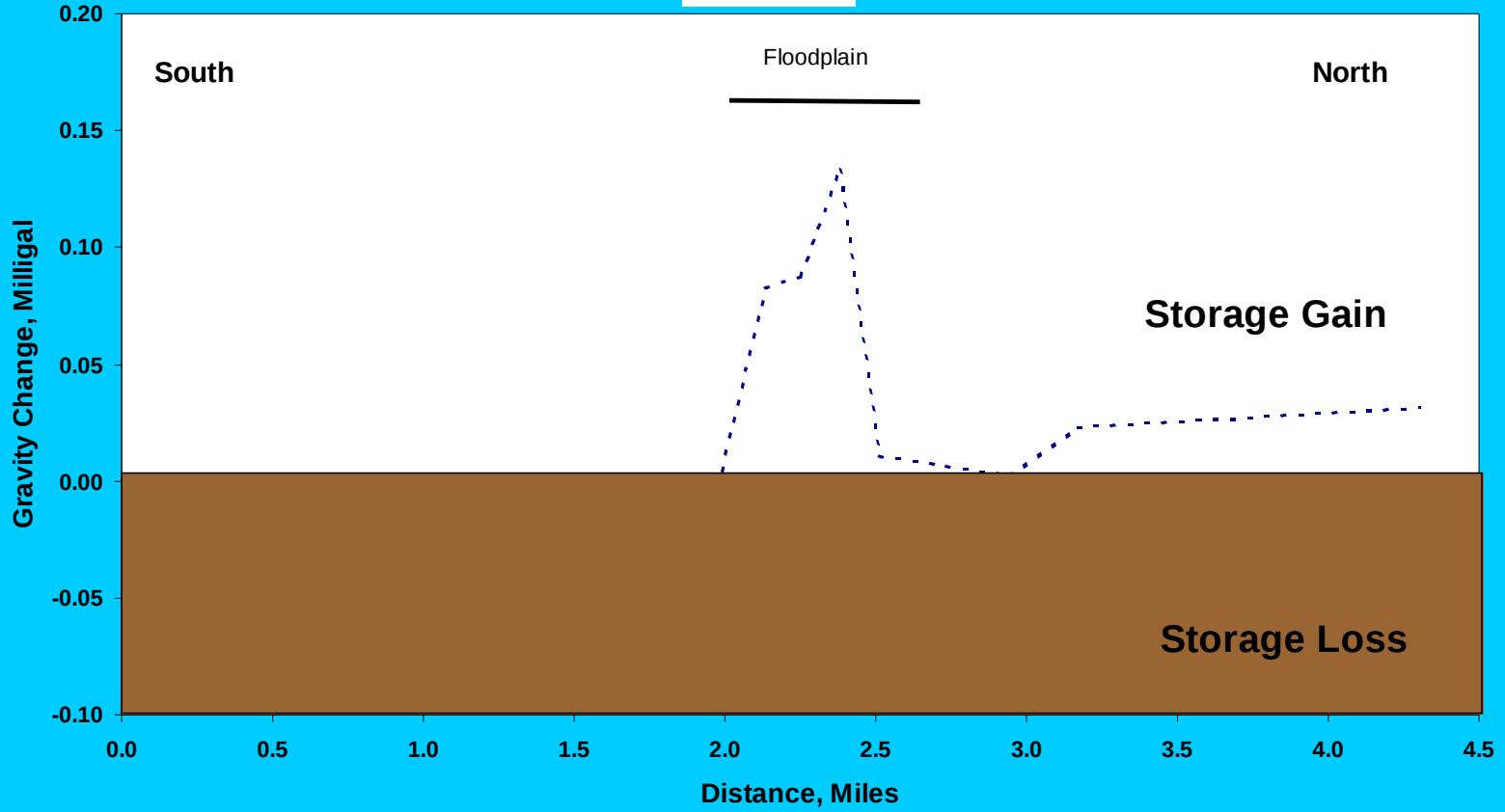
Gravity Change along First Avenue, Since Dec. 97

..... 4/21/98 - - - - 7/6/98



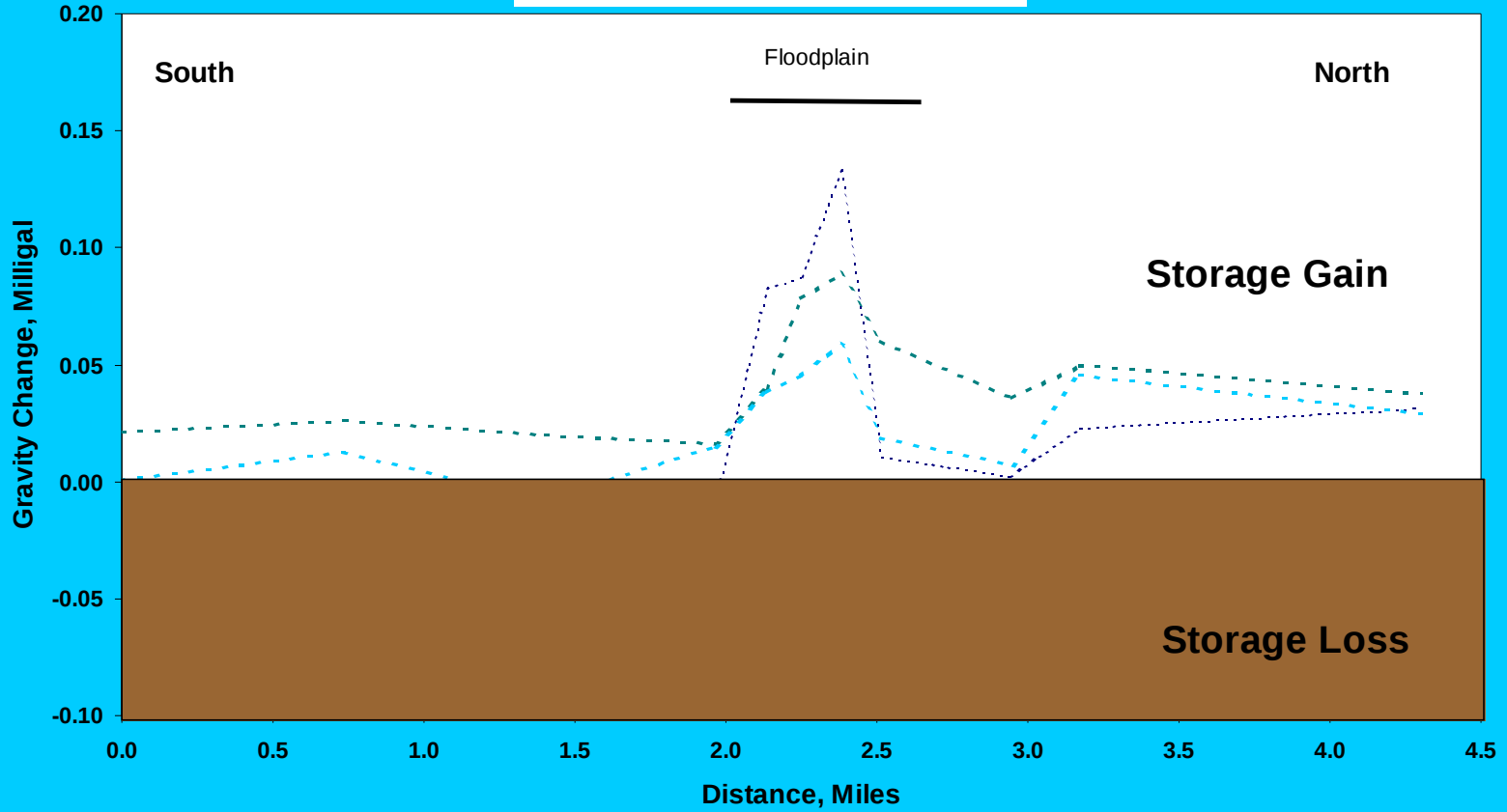
Gravity Change along First Avenue, Since Dec. 97

--- 4/21/98



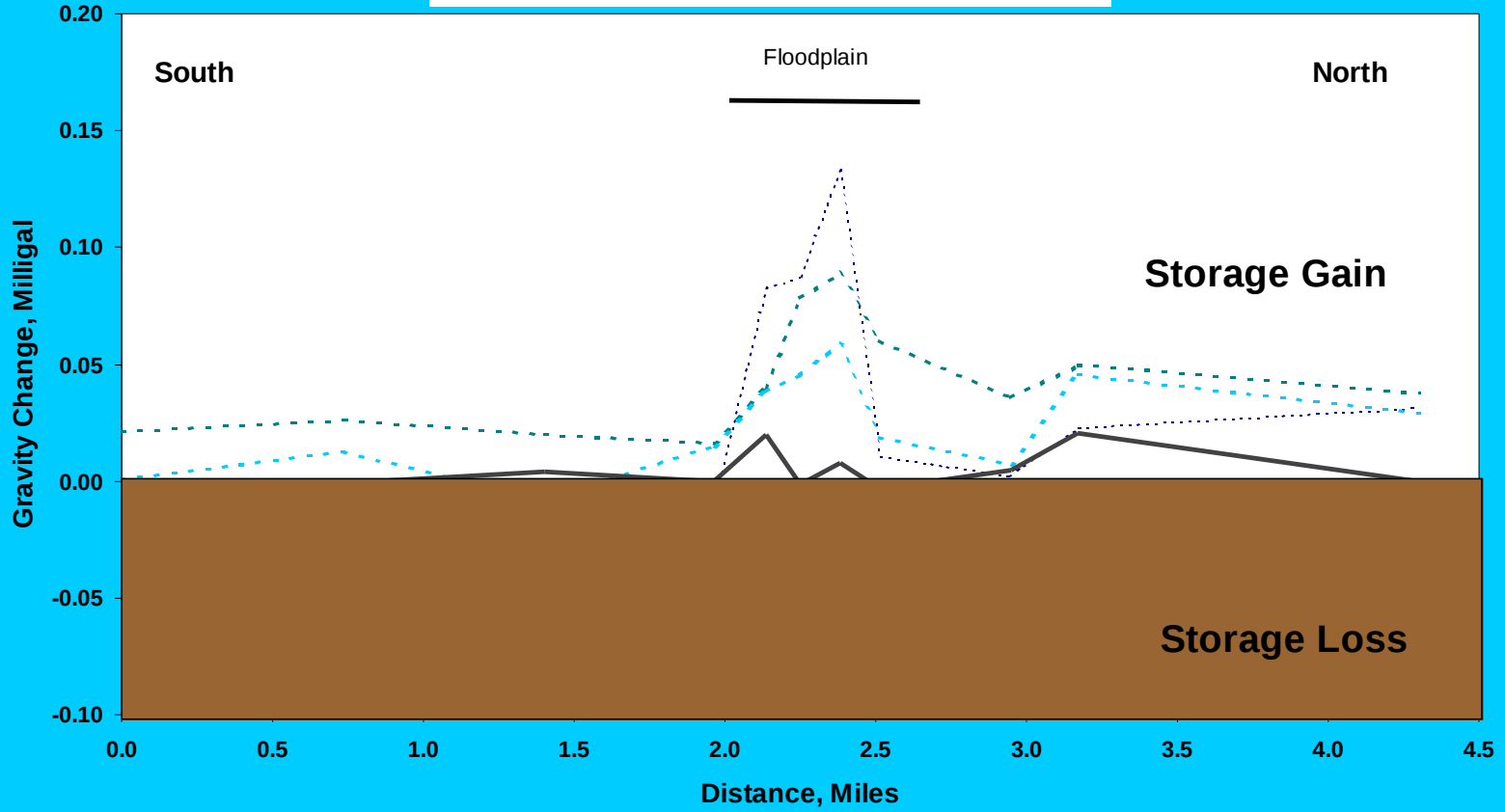
Gravity Change along First Avenue, Since Dec. 97

..... 4/21/98 - - - 7/6/98 - . - . 10/23/98



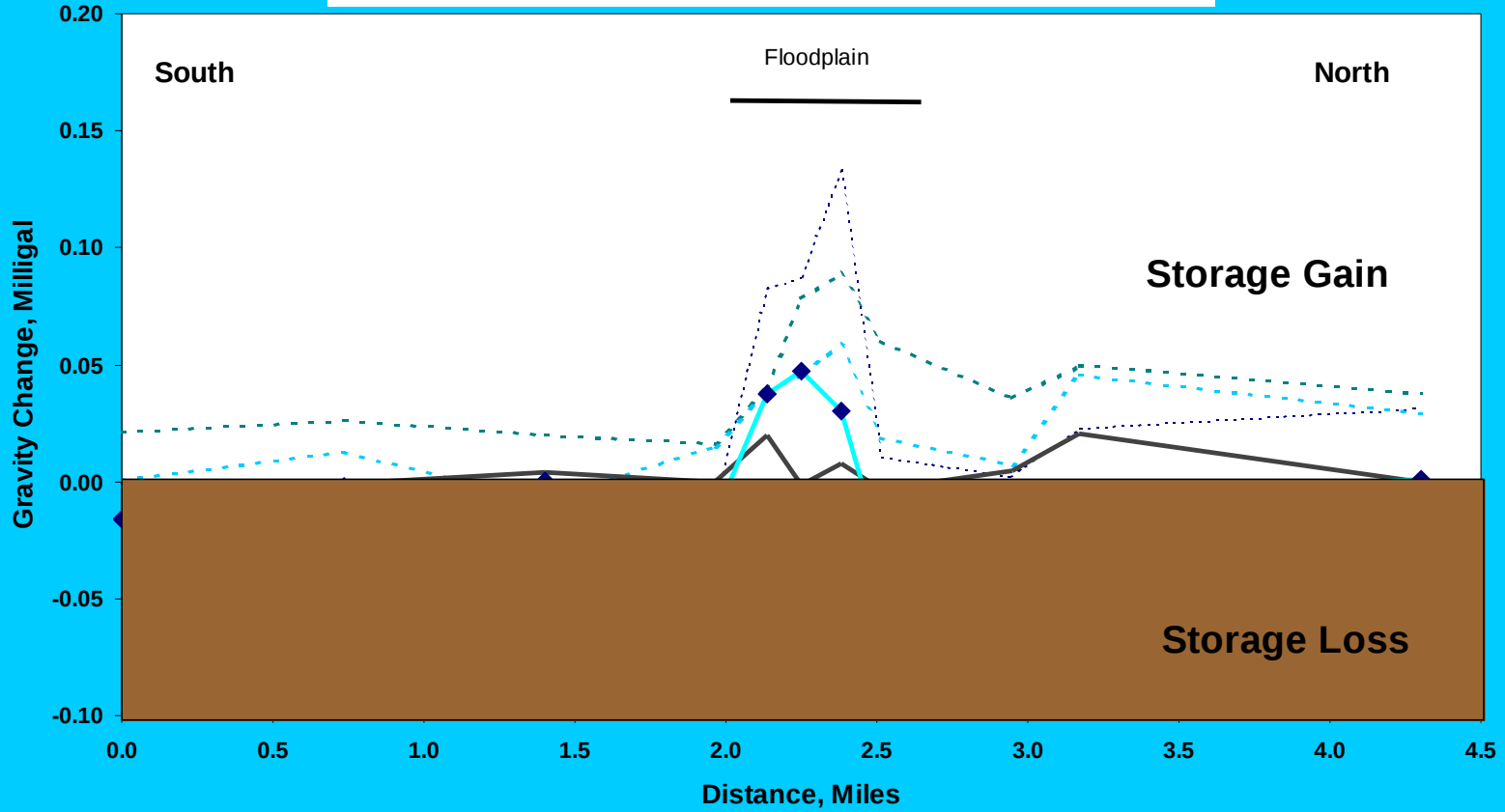
Gravity Change along First Avenue, Since Dec. 97

..... 4/21/98 - - - 7/6/98 - . - . 10/23/98 ——— 6/25/99



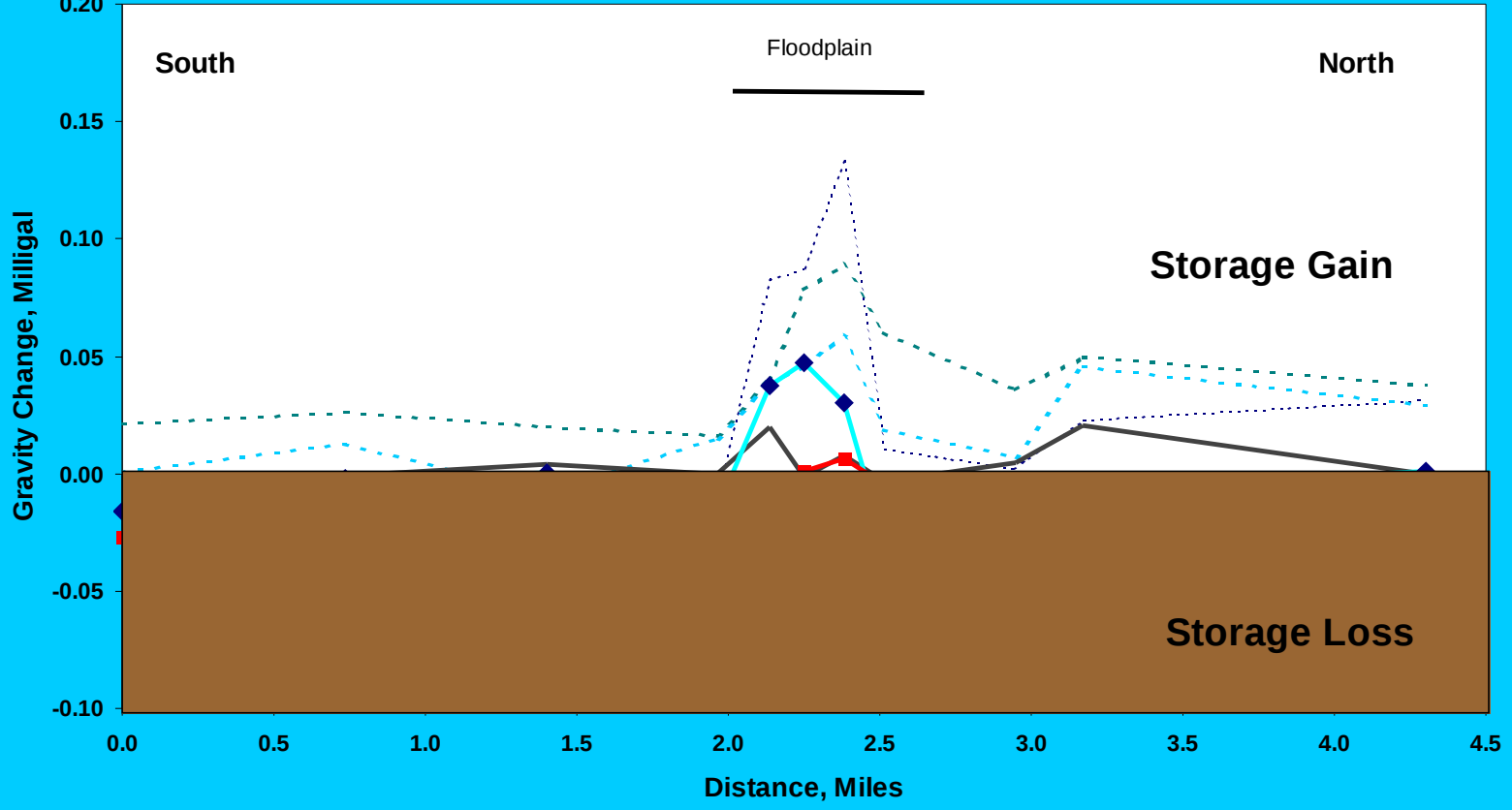
Gravity Change along First Avenue, Since Dec. 97

..... 4/21/98 - - - 7/6/98 - · - · 10/23/98 — 6/25/99 ◆ 8/18/99

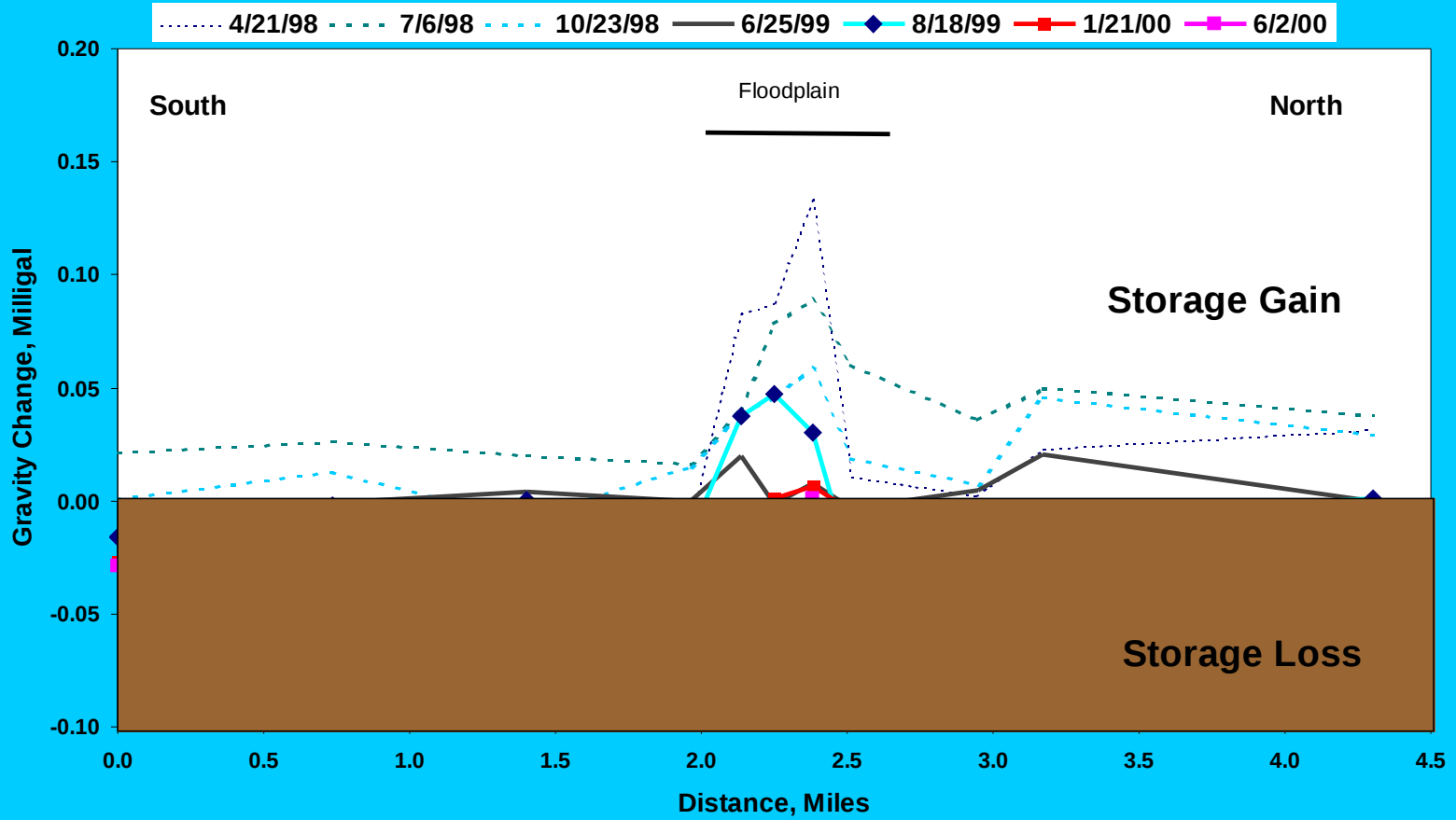


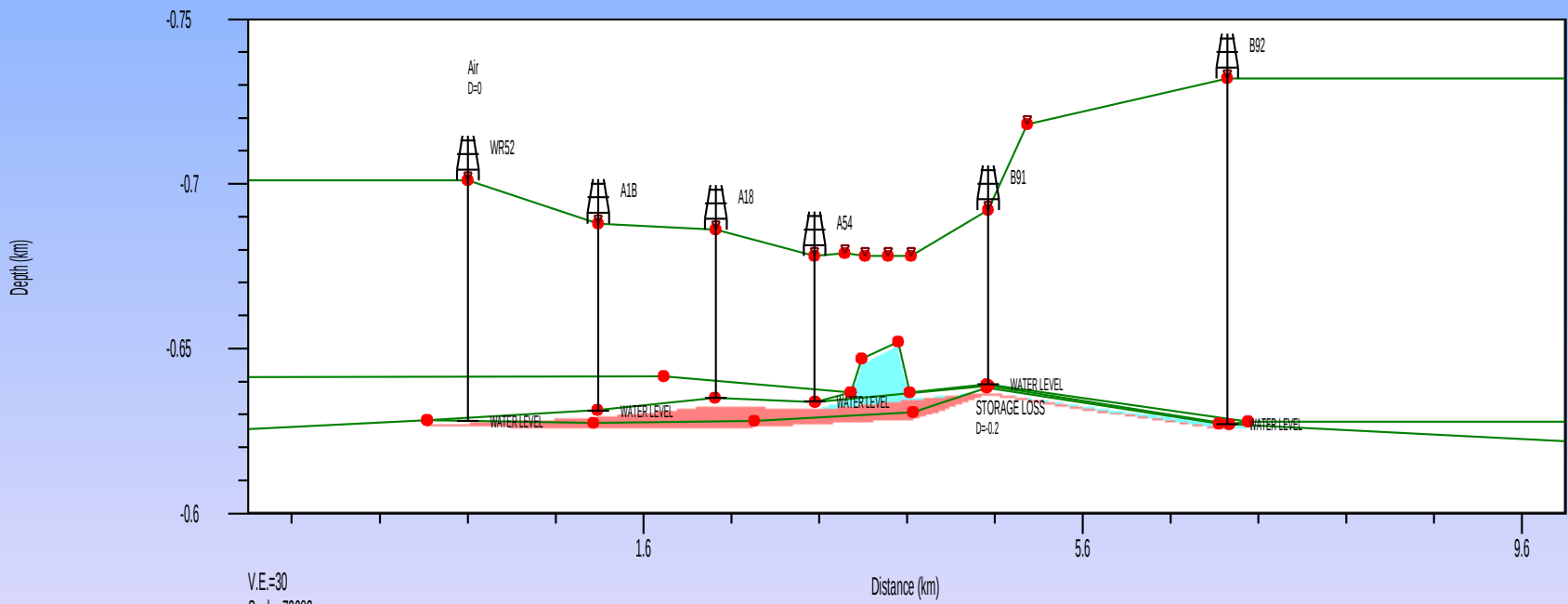
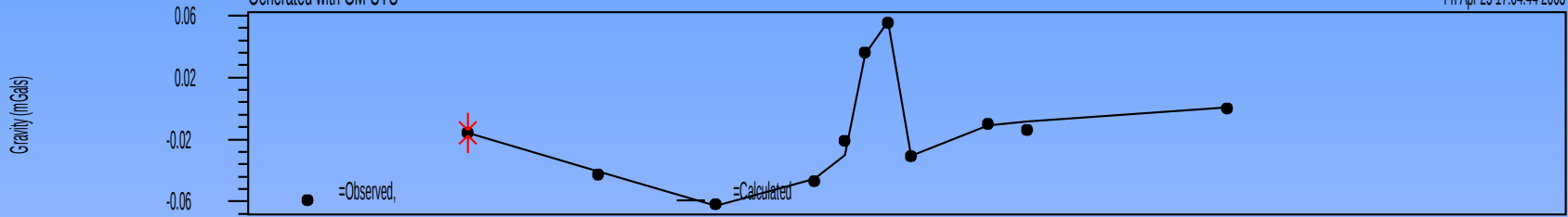
Gravity Change along First Avenue, Since Dec. 97

..... 4/21/98 - - - 7/6/98 - . - . 10/23/98 — 6/25/99 ◆ 8/18/99 ■ 1/21/00

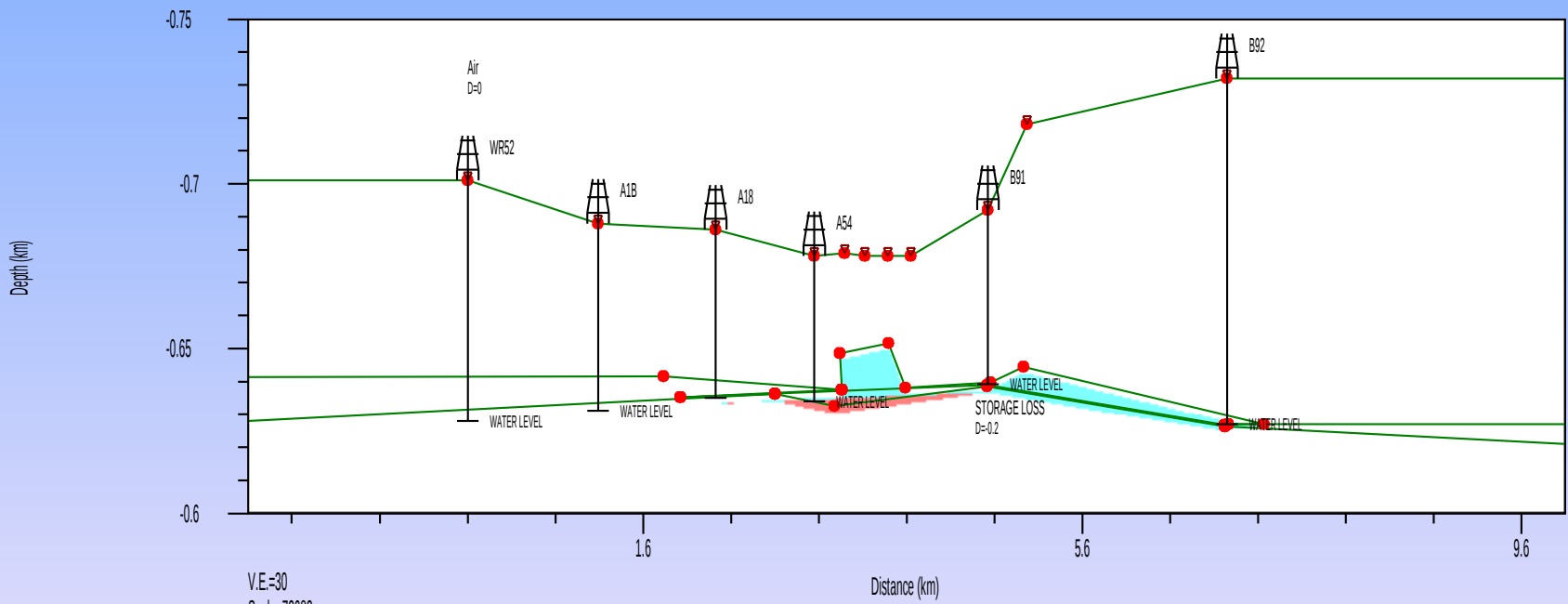
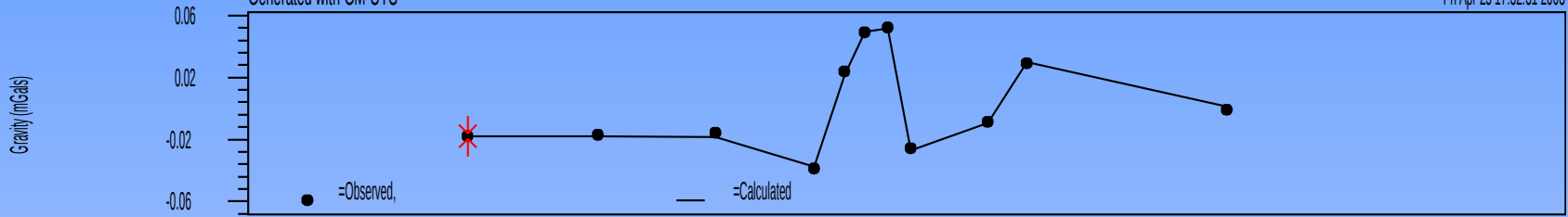


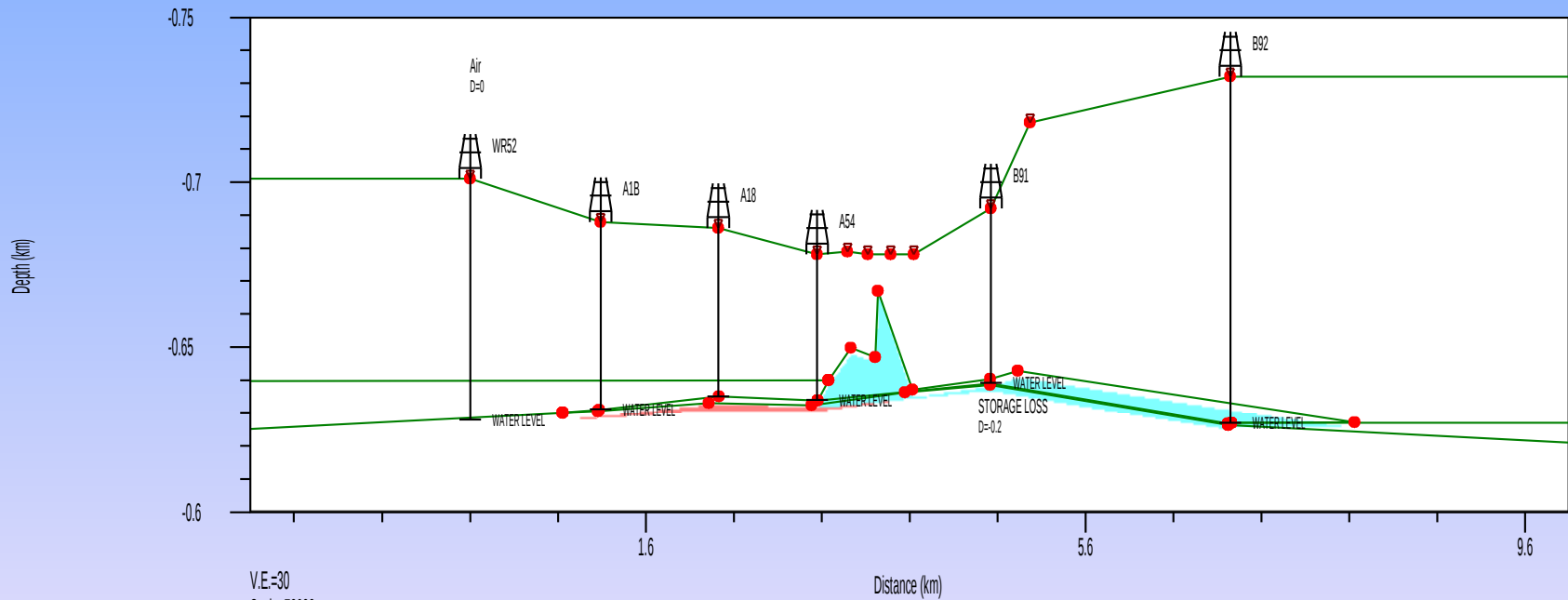
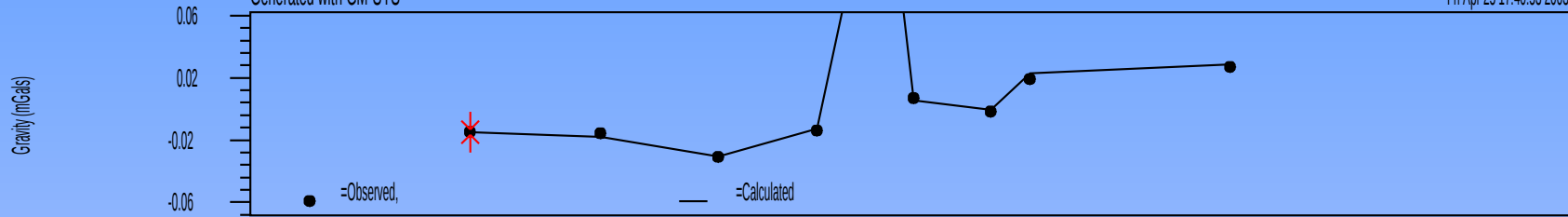
Gravity Change along First Avenue, Since Dec. 97



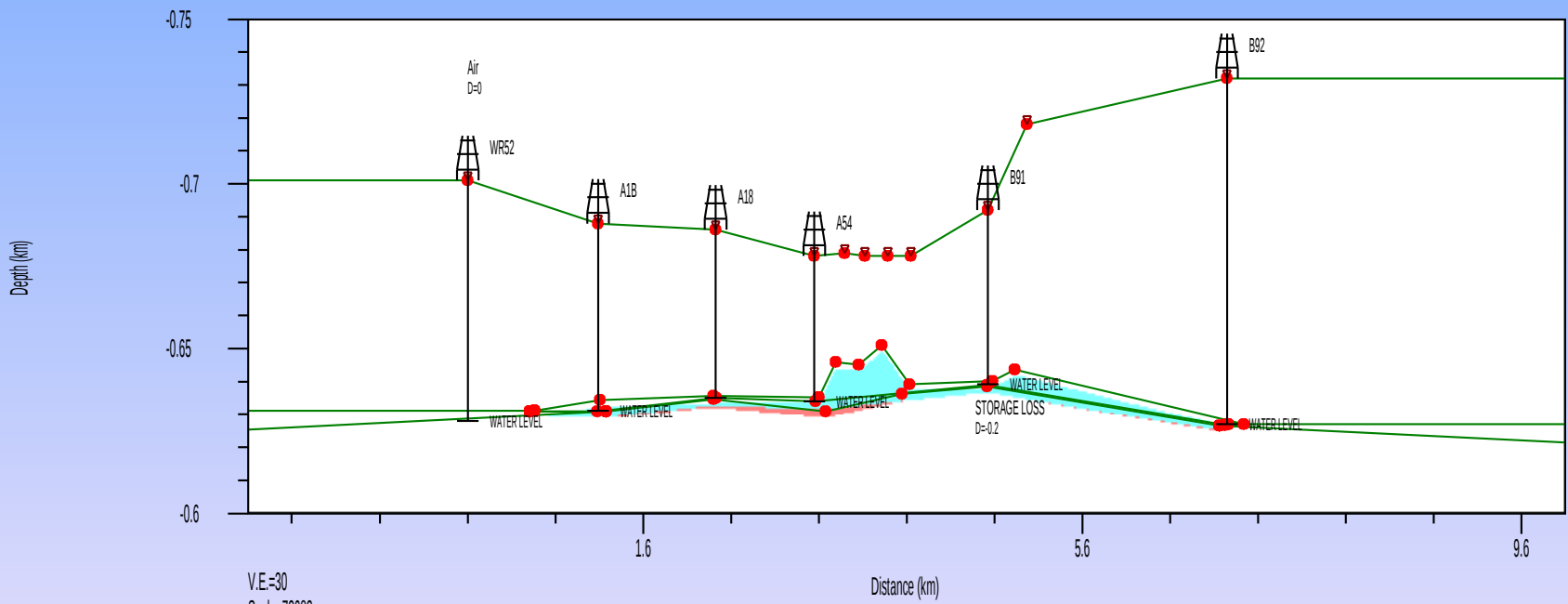
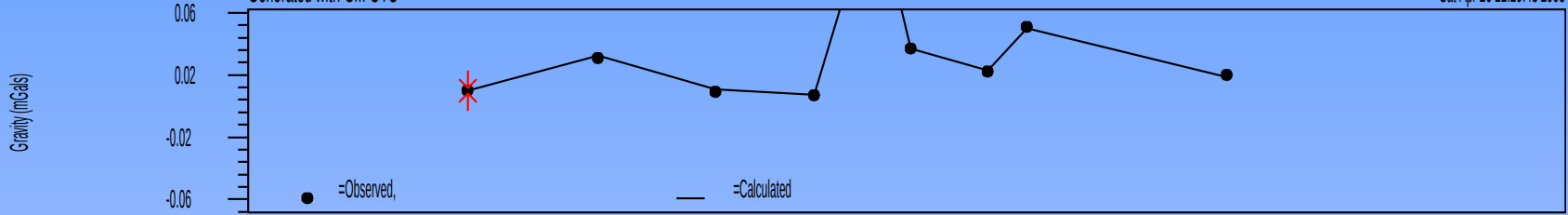


V.E.=30
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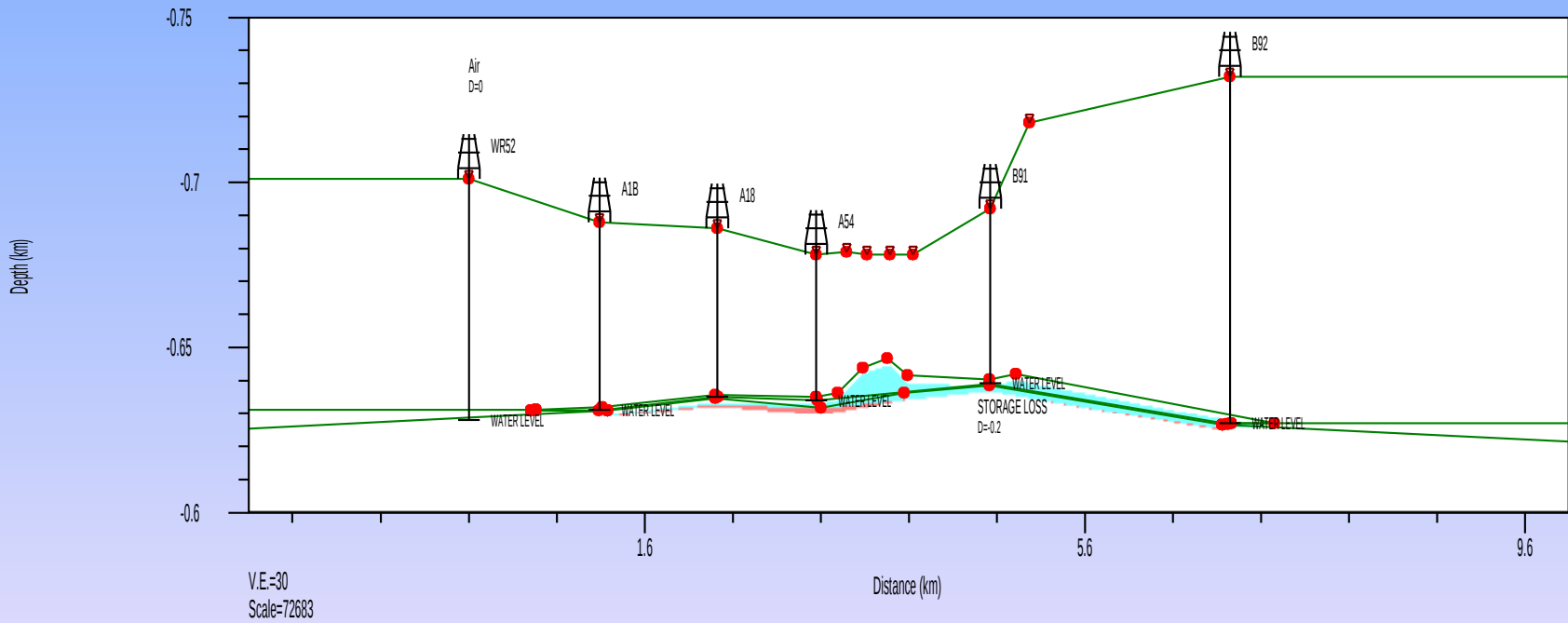
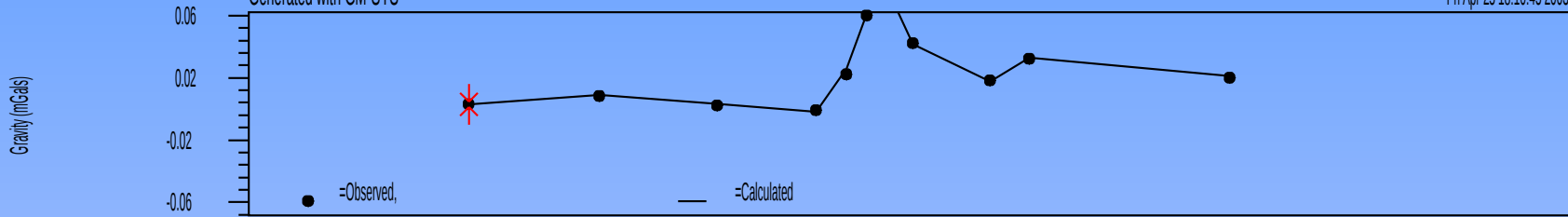


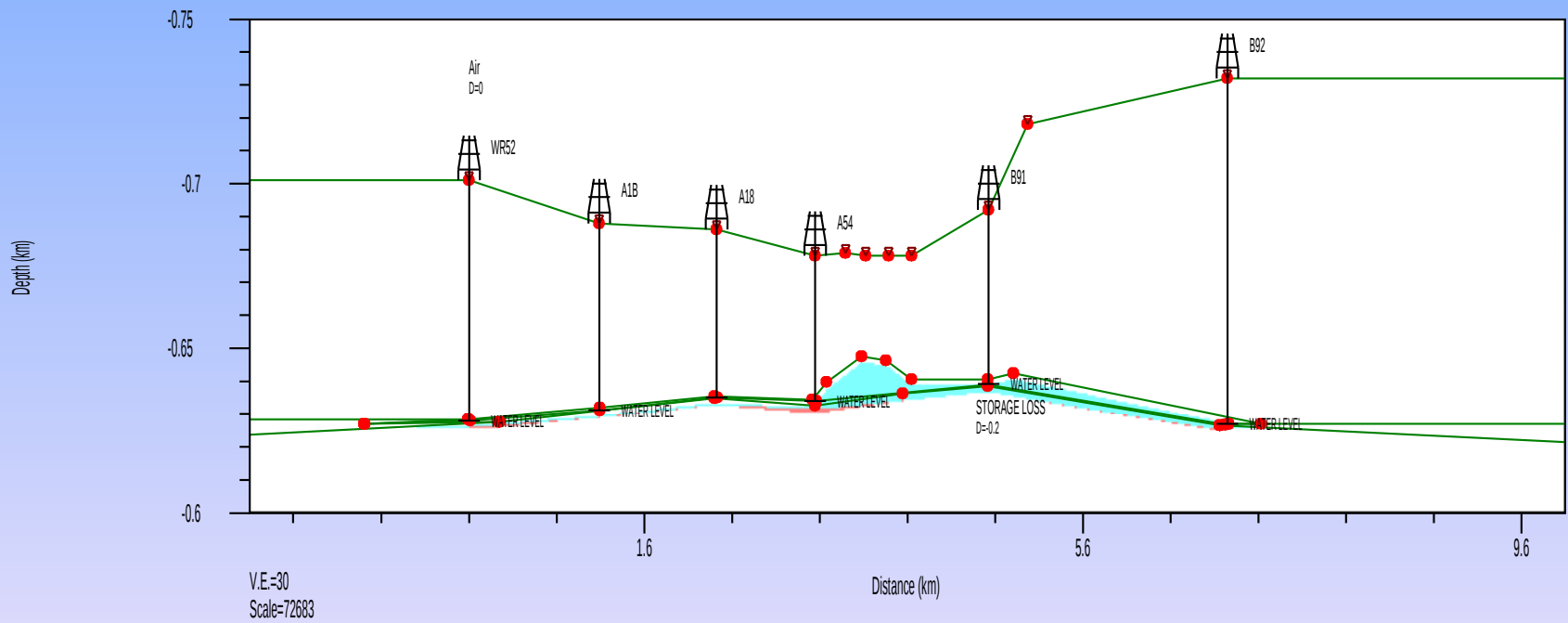
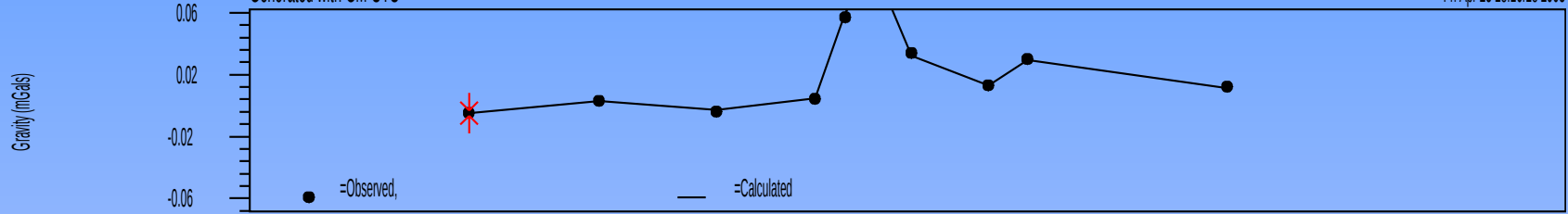


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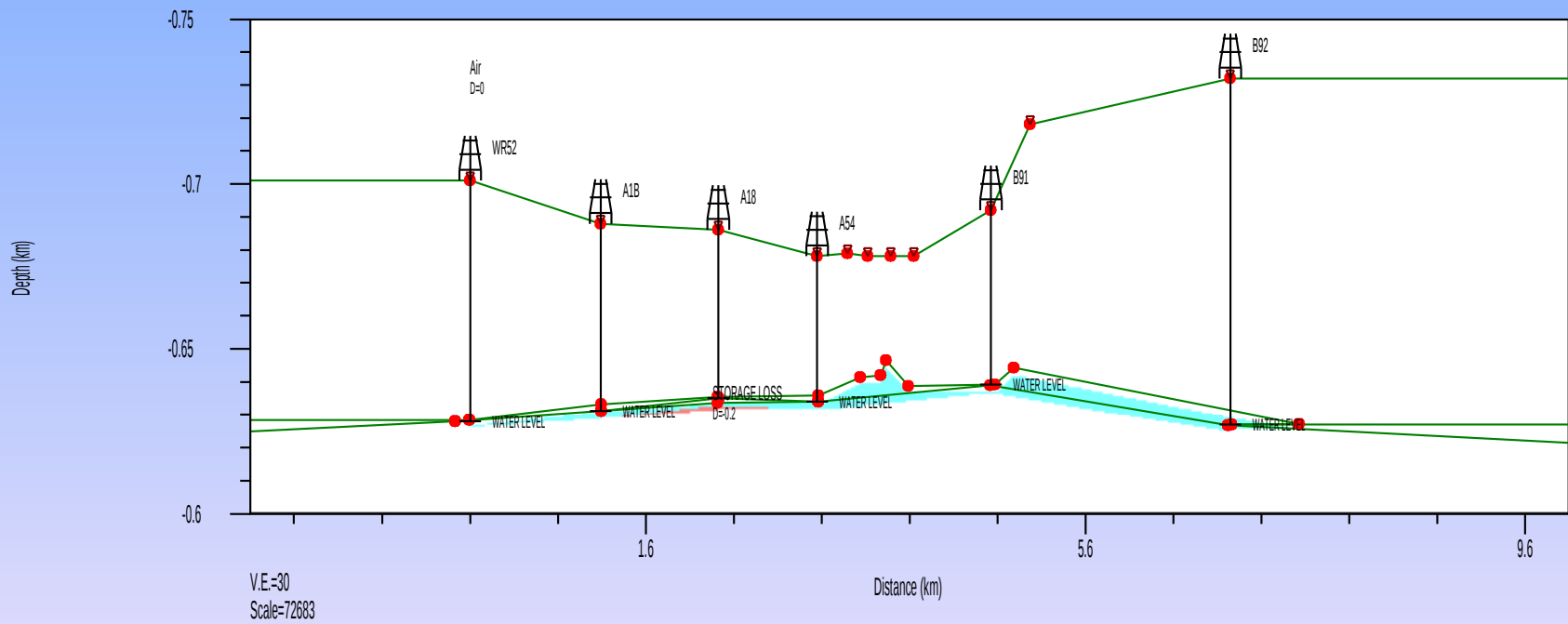
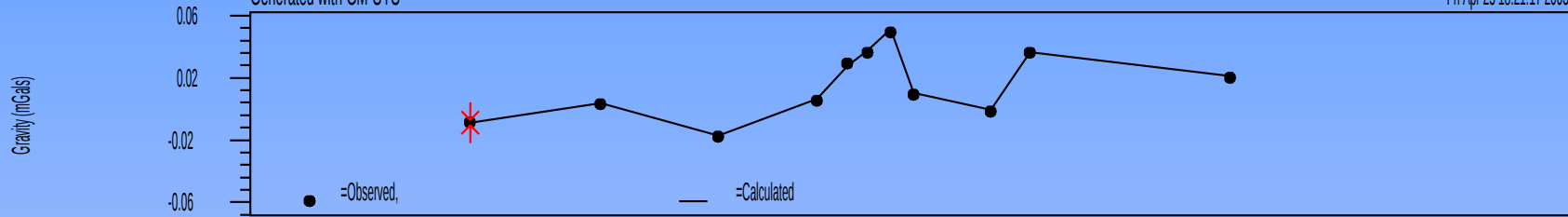


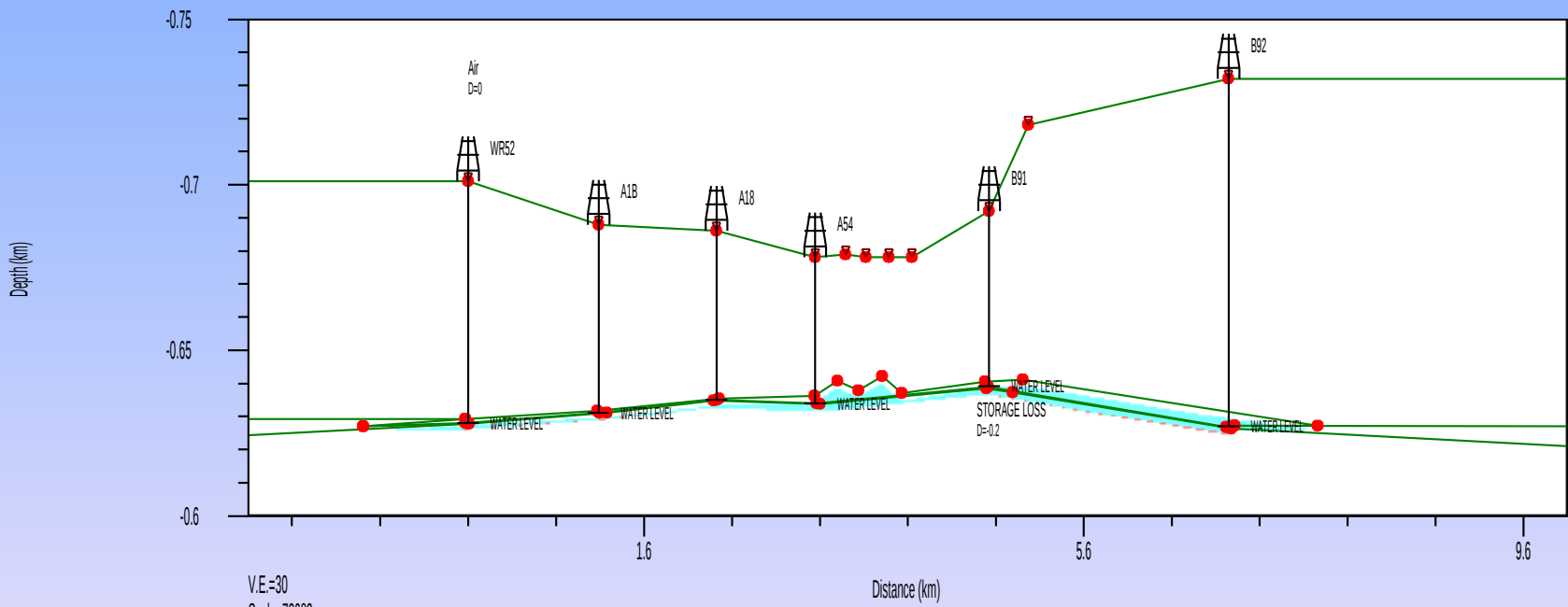
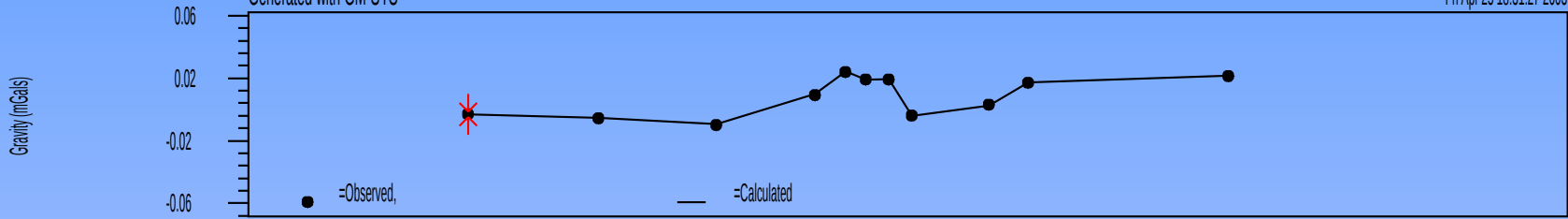
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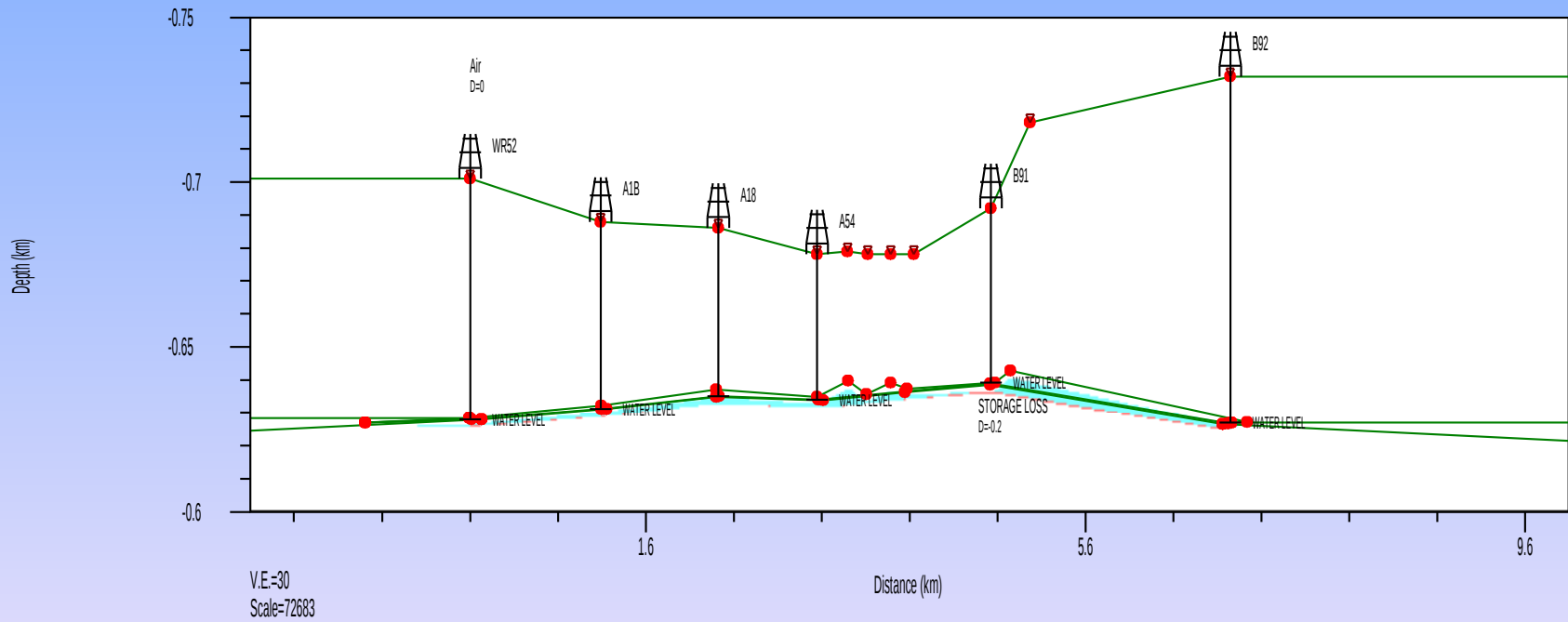
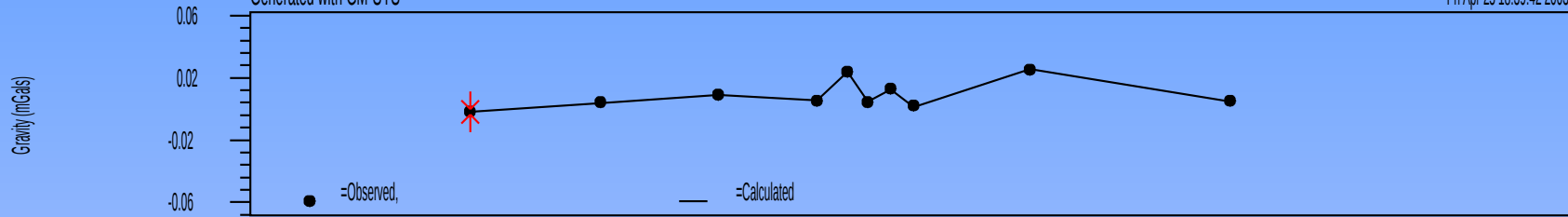


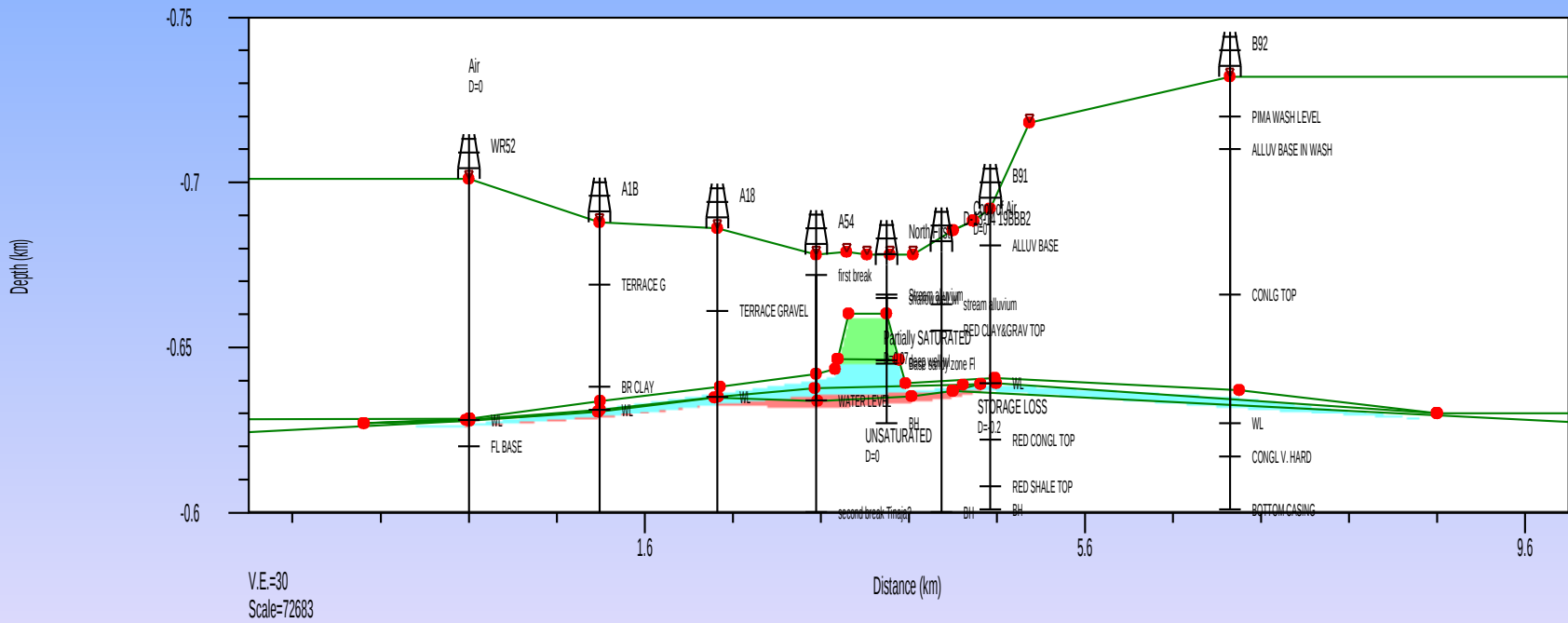
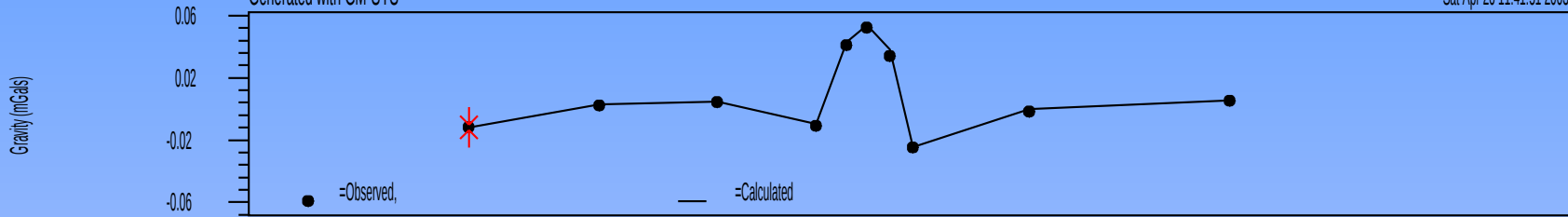


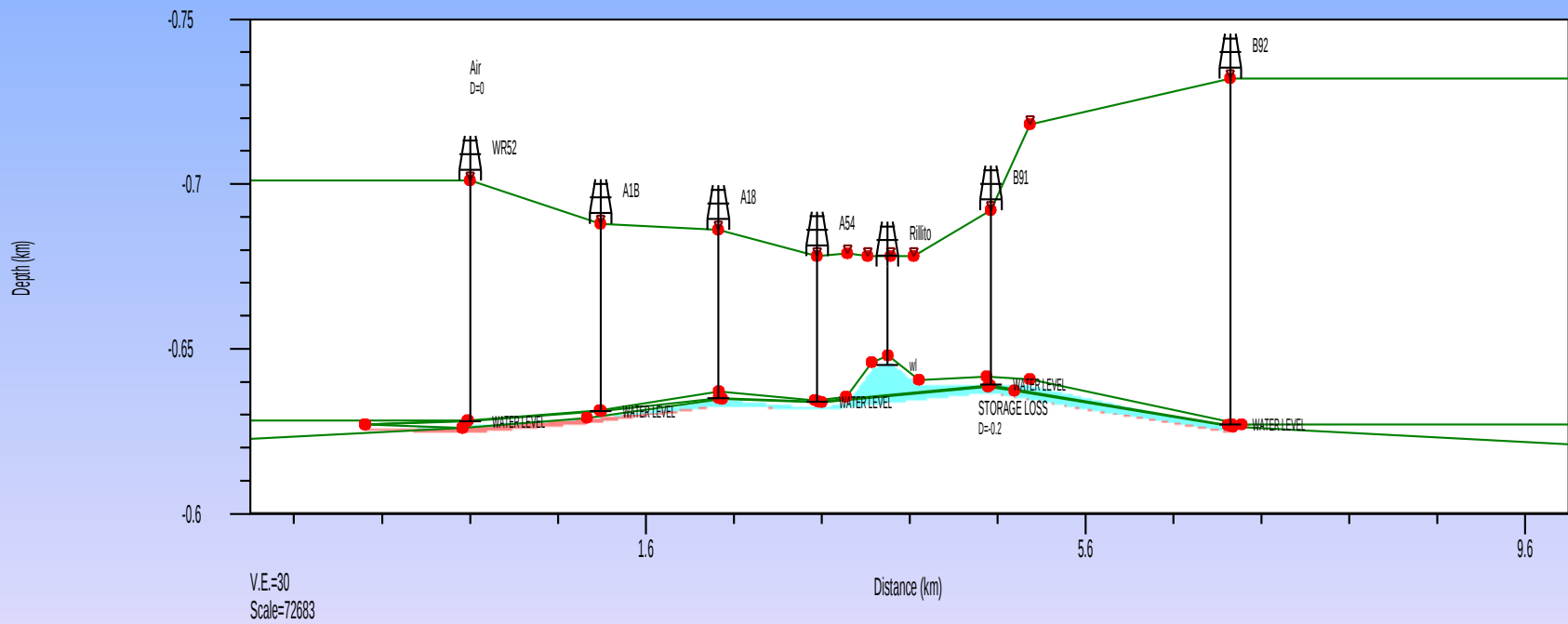
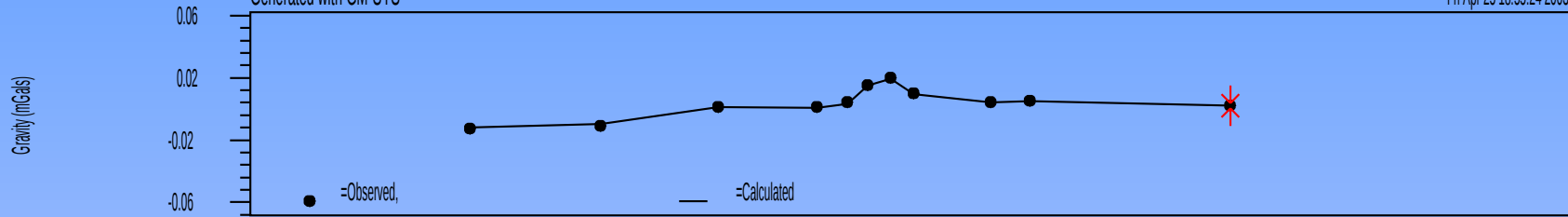
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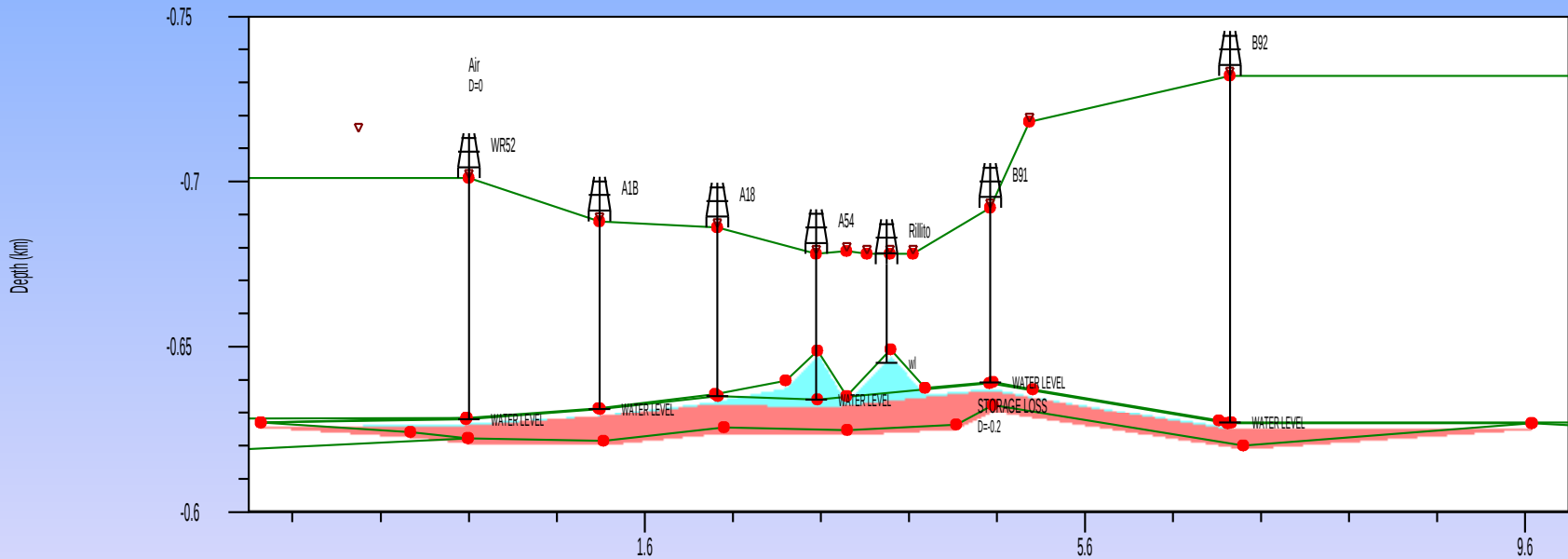
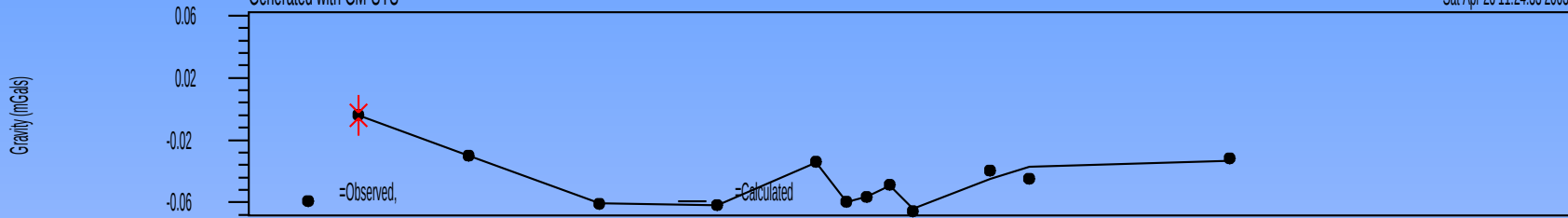








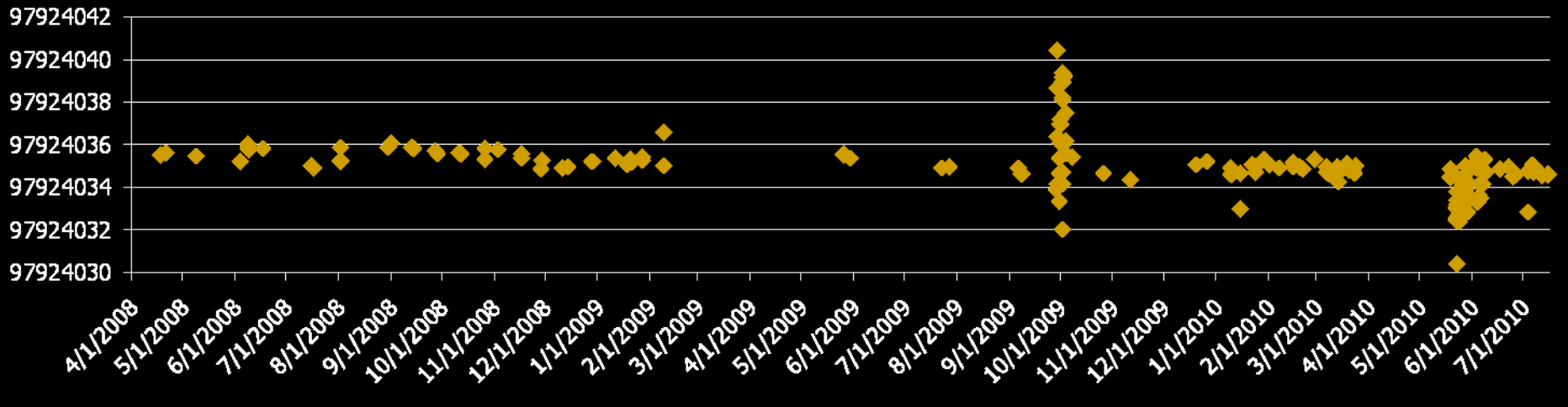
V.E.=30
Scale=72683



V.E.=30
Scale=72683

Distance (km)

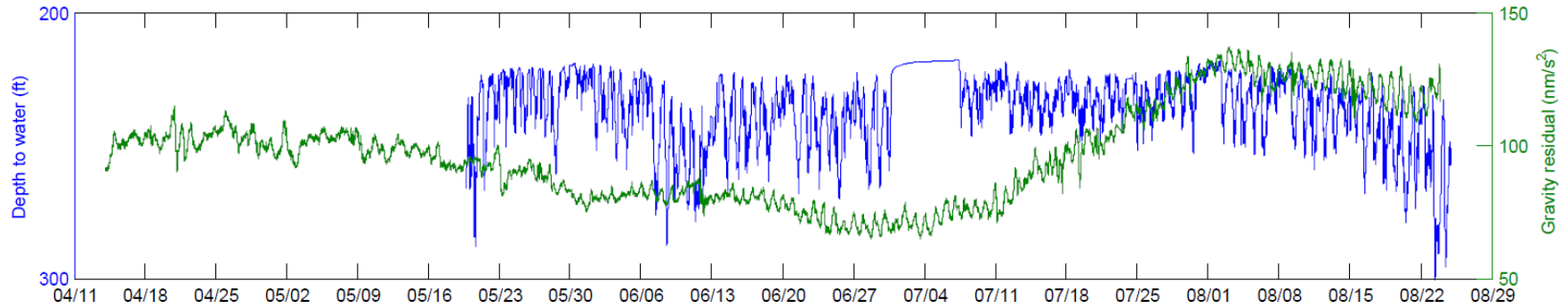
Absolute Gravity Observations USGS Office



New Withdrawal Well Near USGS Office



SG Meter Gravity Record USGS Office



Spatial and temporal distributions of gravity change

- Largest changes (>40 microGal)
 - Rapid change in areas with large periodic input
Drainage over weeks to months
 - Near ephemeral stream channels, large depth to water
 - Porous rocks in high elevations
 - Long-term trends
 - Groundwater mining
 - Change from GW to SW irrigation
- Smaller changes
 - across broad areas of alluvial basins
 - locally in areas of low porosity rocks