



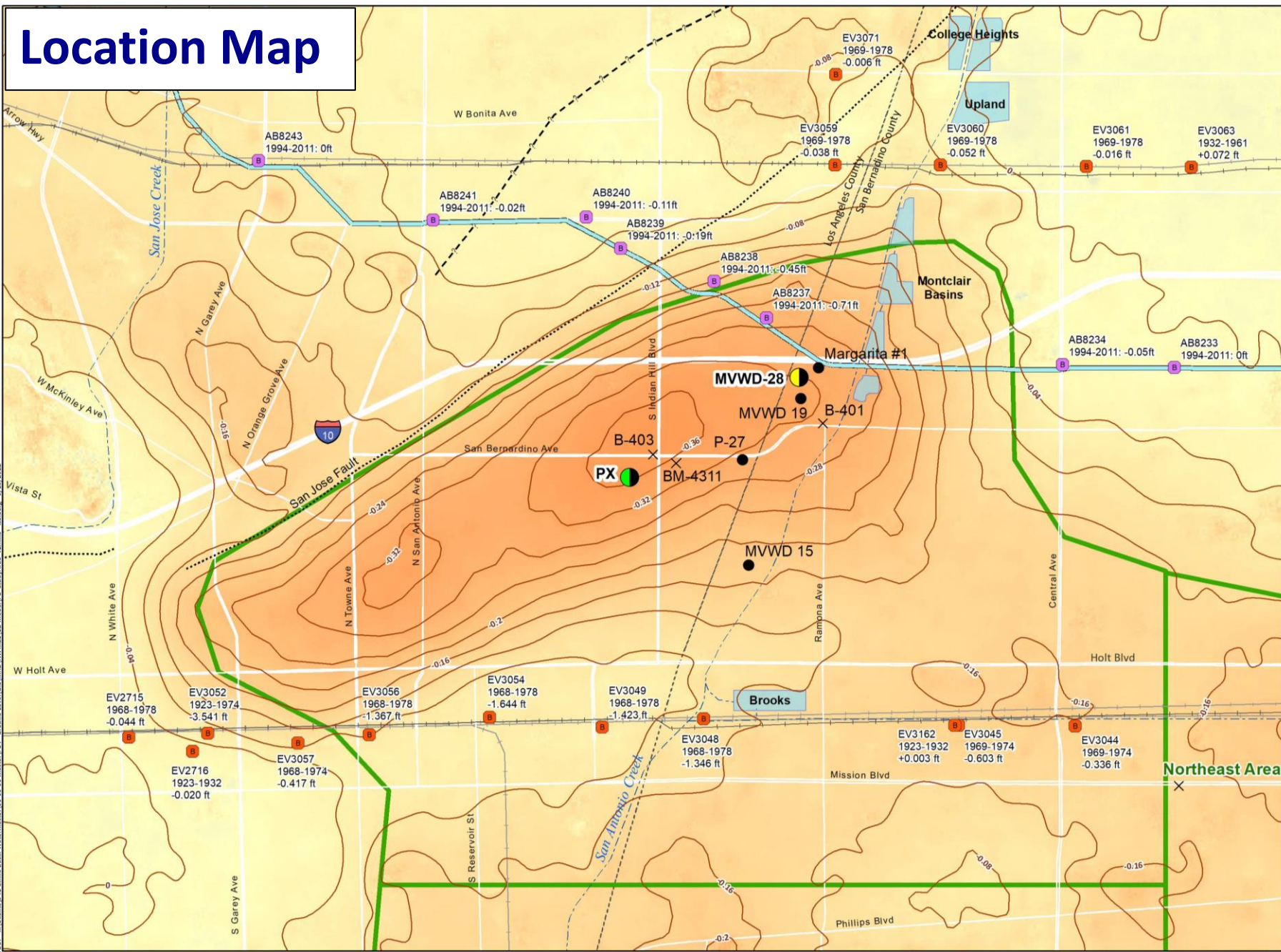
# Ground-Level Monitoring Committee

March 7, 2024

# Agenda

1. **Responses to Comments: *1D Model Simulation of Subsidence in Northwest MZ-1—Subsidence Management Alternative #1***
2. **Draft Technical Memorandum: *Proposed Locations and Data for Construction and Calibration of Additional 1D Models***
3. **Draft Technical Memorandum: Recommended Scope of Work and Budget for the Ground Level Monitoring Program for Fiscal Year 2024/25**
4. **GLMC Next Steps**
  - Comments due on both draft TMs – April 4, 2024
  - Next GLMC meeting – in April (if needed)

# Location Map



## 1D compaction models in Northwest MZ-1

**1D Model Sites:**  
PX and MVWD-28

**Benchmarks:**  
BM-4311, BM-2867, B-401, B-403, EV3052, EV3054

**Contours of InSAR-derived ground motion (ft; 2011-2021)**

**1D Model Locations**

- MVWD-28
- PX

**Land Subsidence Features**

+0.55 ft  
0 ft  
-0.55 ft

Relative Change in Land Surface Elevation as Estimated by InSAR (March 2011 to March 2022)

Contours of Relative Change in Land Surface Elevation as Estimated by InSAR (March 2011 to March 2022)

Benchmark used for 1D Model Calibration

NGS Benchmarks

MWD Benchmarks

Figure 2. PX Site: CVM Layers, Borehole Lithology, 1D Model Cells, and Resistivity Log

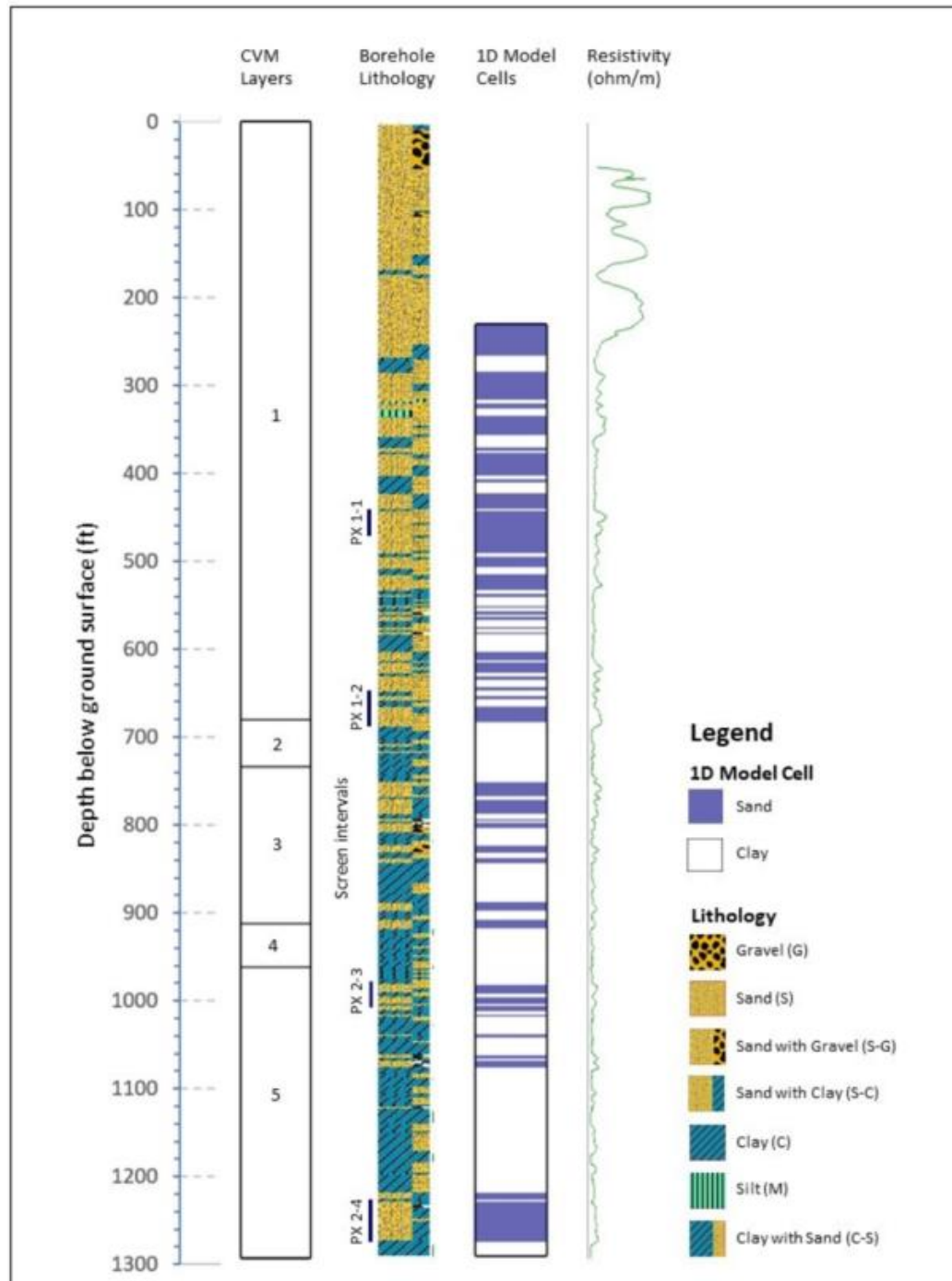


Figure 9. Simulated Heads and Modeled Compaction at the PX Site under SMA-1 (1930-2050)

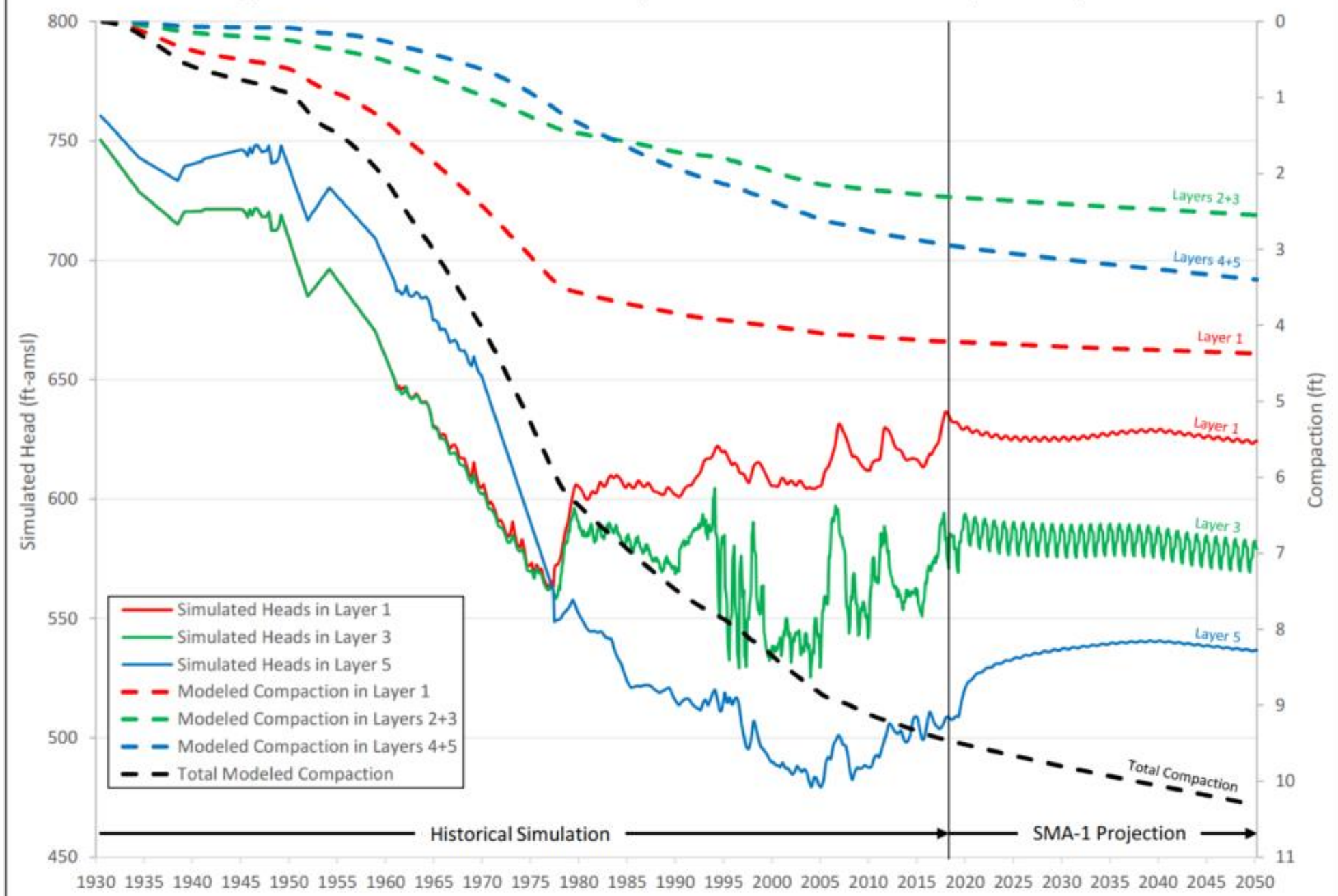
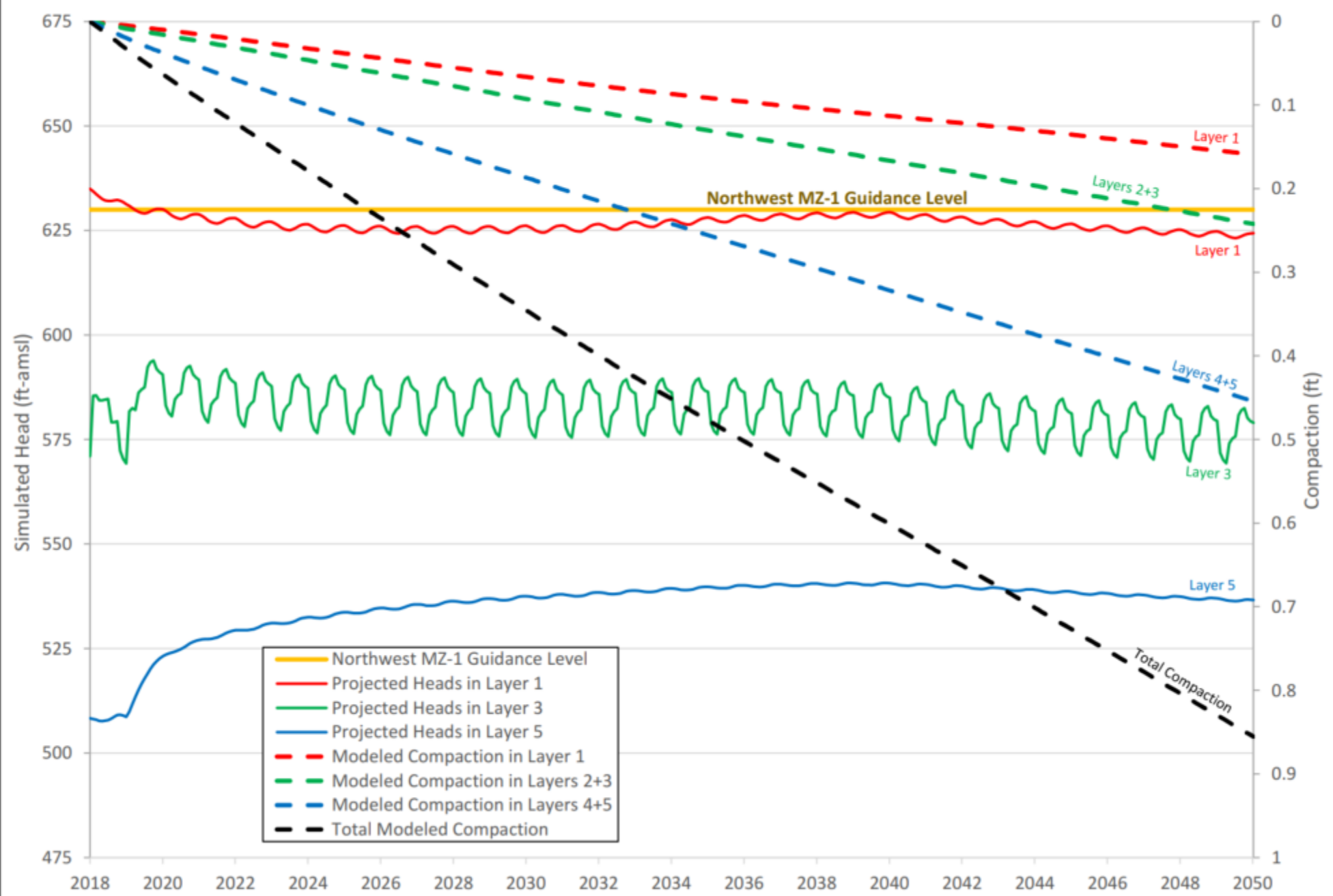


Figure 13. Northwest MZ-1 Guidance Level versus Projected Heads and Modeled Compaction at PX under SMA-1



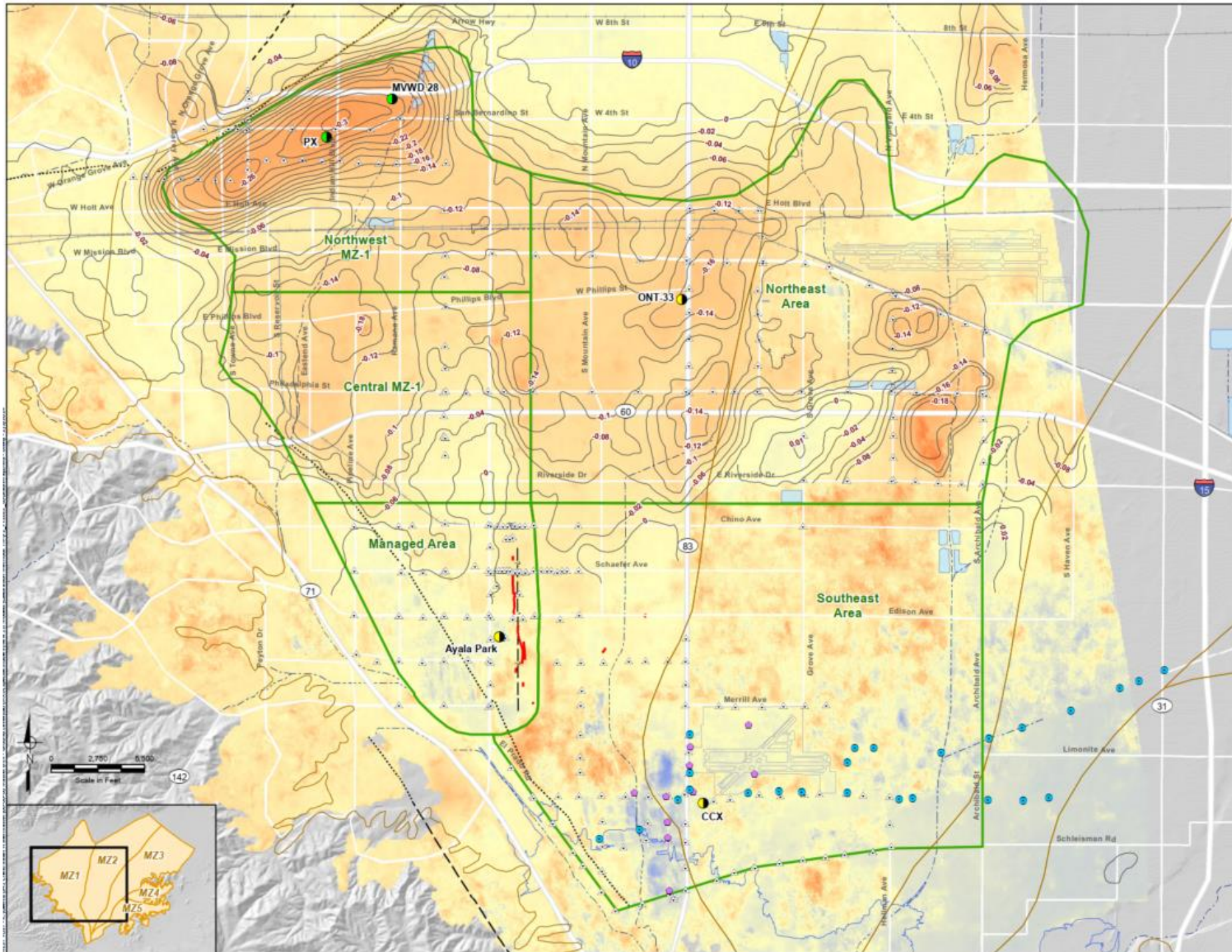
# Main Responses to Comments on SMA-1

- 1. The preliminary “Guidance Level” is the Watermaster Engineer’s best current estimate for depth-specific hydraulic heads in Northwest MZ-1 to reduce or abate the future occurrence of subsidence.**
- 2. The methods to achieve the Guidance Level have not yet been explored and developed, nor has the effectiveness of these methods to comply with the Guidance Level been simulated and evaluated....The practicality and costs of implementing these methods have not been determined. Hence, the Guidance Level proposed herein should be considered “preliminary” until such work is performed.**
- 3. We encourage the parties to begin to explore potential methods to achieve the Guidance Level during the 2025 Safe Yield Reevaluation and the development of the Storage and Recover Master Plan.**
- 4. The monitoring program in Northwest MZ-1 is planned to proceed and the additional data collected (e.g., hydraulic heads, ground motion, etc.) can be used in the future to verify and/or improve the 1D Models and refine the Guidance Level scenarios.**

# **Draft TM: *Proposed Locations and Data for Construction and Calibration of Additional 1D Models***

- **Watermaster is using 1D Models to characterize the potential for future subsidence across the western Chino Basin for the following purposes:**
  - Evaluate for subsidence-related MPI during the 2025 Safe Yield Re-evaluation (as well as other future MPI evaluations as they arise).
  - Support the evaluate for the minimum recharge quantity of supplemental water in MZ-1 as required in Section 8.4 of the Peace II Agreement.
  - Inform future updates to the Subsidence Management Plan
- **Objectives of TM:**
  - Describe the proposed locations for the three additional 1D Models
    - Northeast Area (in Ontario)
    - Southeast Area (near CDA Well Field)
    - Managed Area (at Ayala Park)
  - Describe the data that should be used to construct and calibrate the new 1D Models





1D Compaction Model Locations

- Existing
- New

Relative Change in Land Surface Altitude  
as Estimated by InSAR  
(March 2011 to March 2022)



InSAR absent or incoherent

Other Features

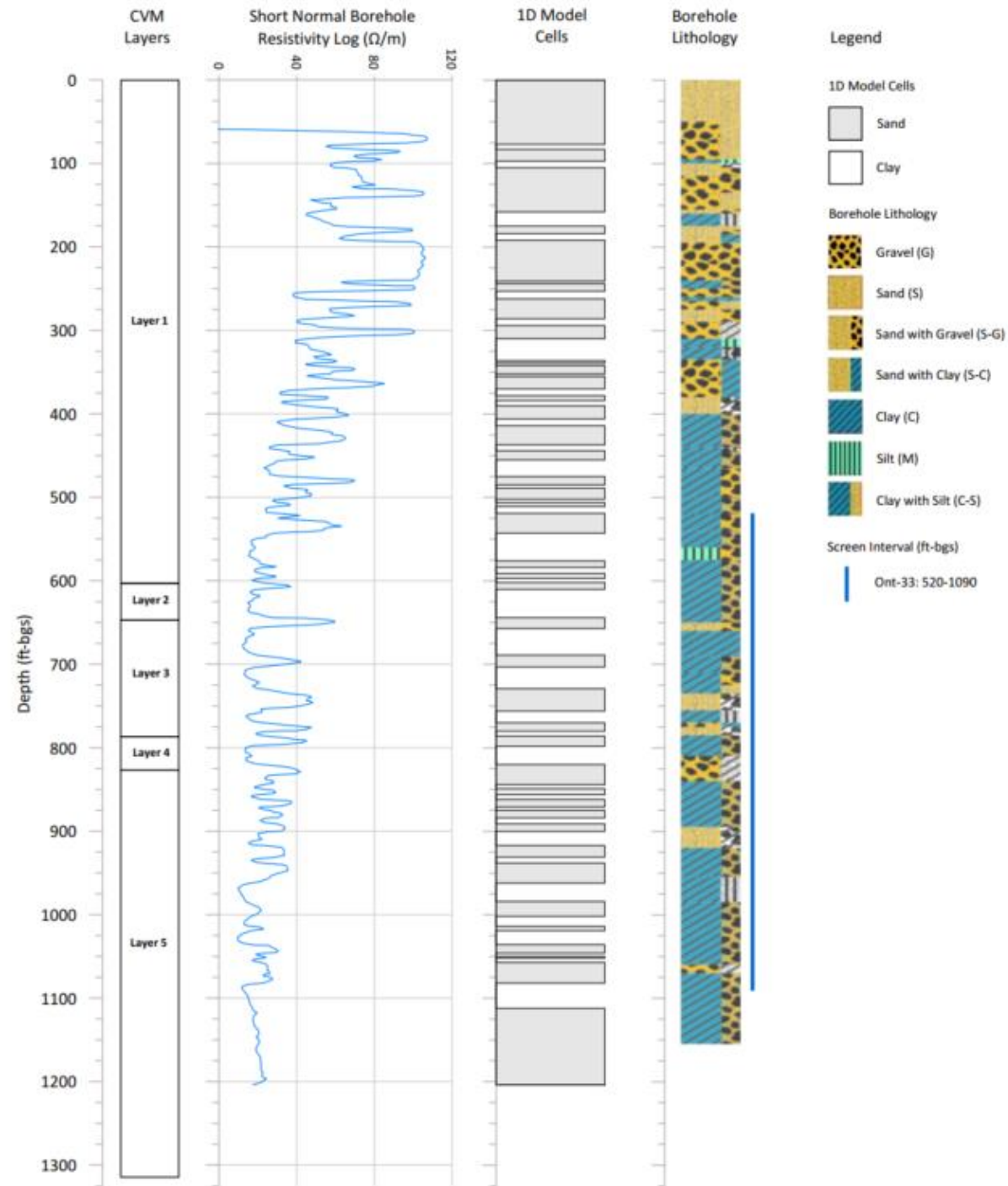
- Areas of Subsidence Concern
- Chino Desalter Authority Well
- SB County Proposed Extraction Well
- ▲ Ground-Level Survey Benchmark
- Ground Fissures
- Approximate Location of the Riley Barrier



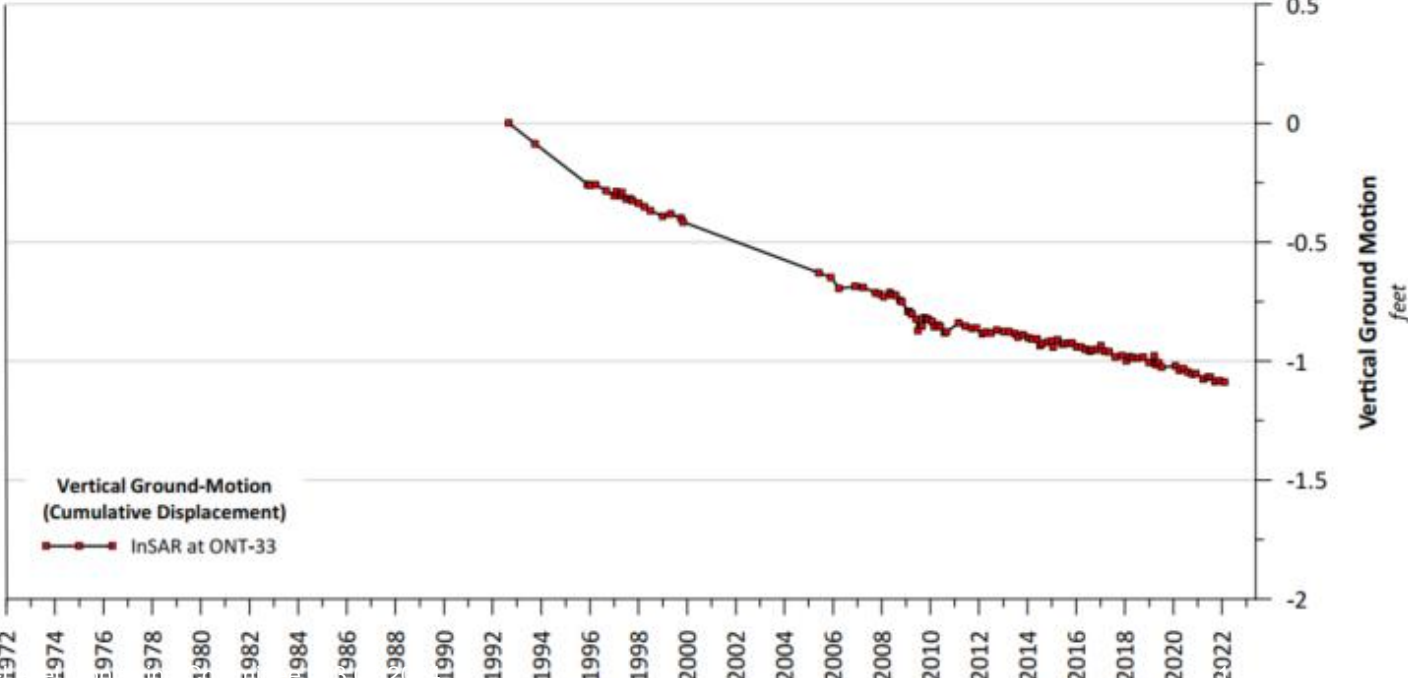
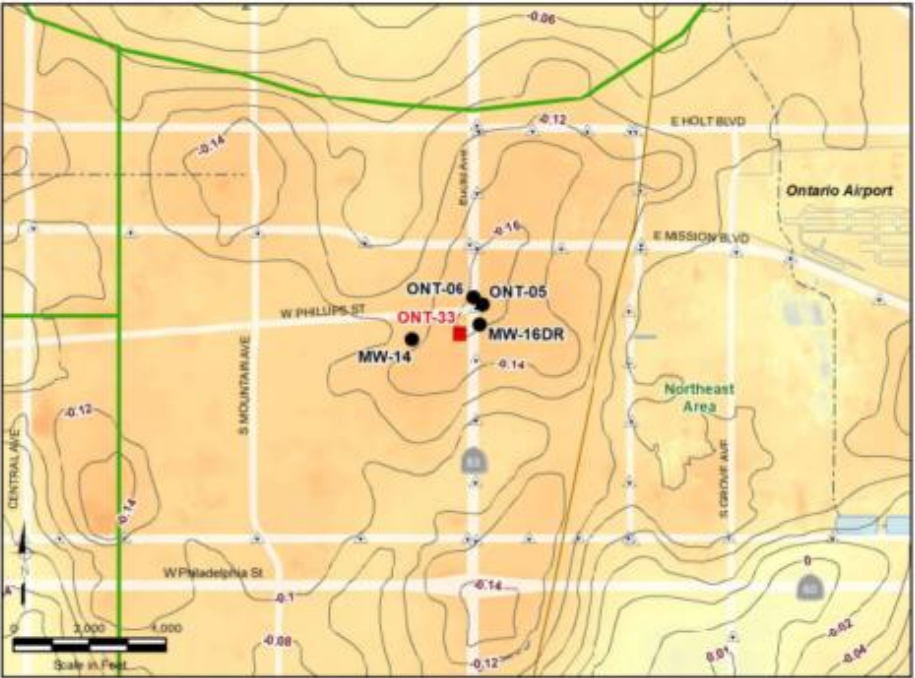
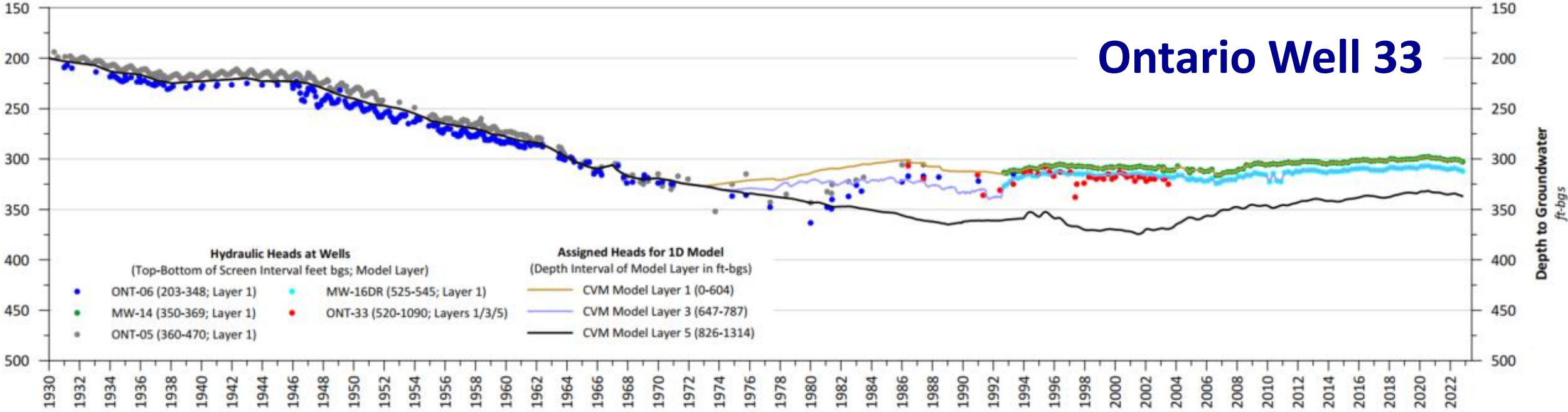
**Chino Basin Watermaster**  
Construction/Calibration of Additional  
1D Compaction Models

**Figure 2**  
**Locations of One-Dimensional**  
**Compaction Models**

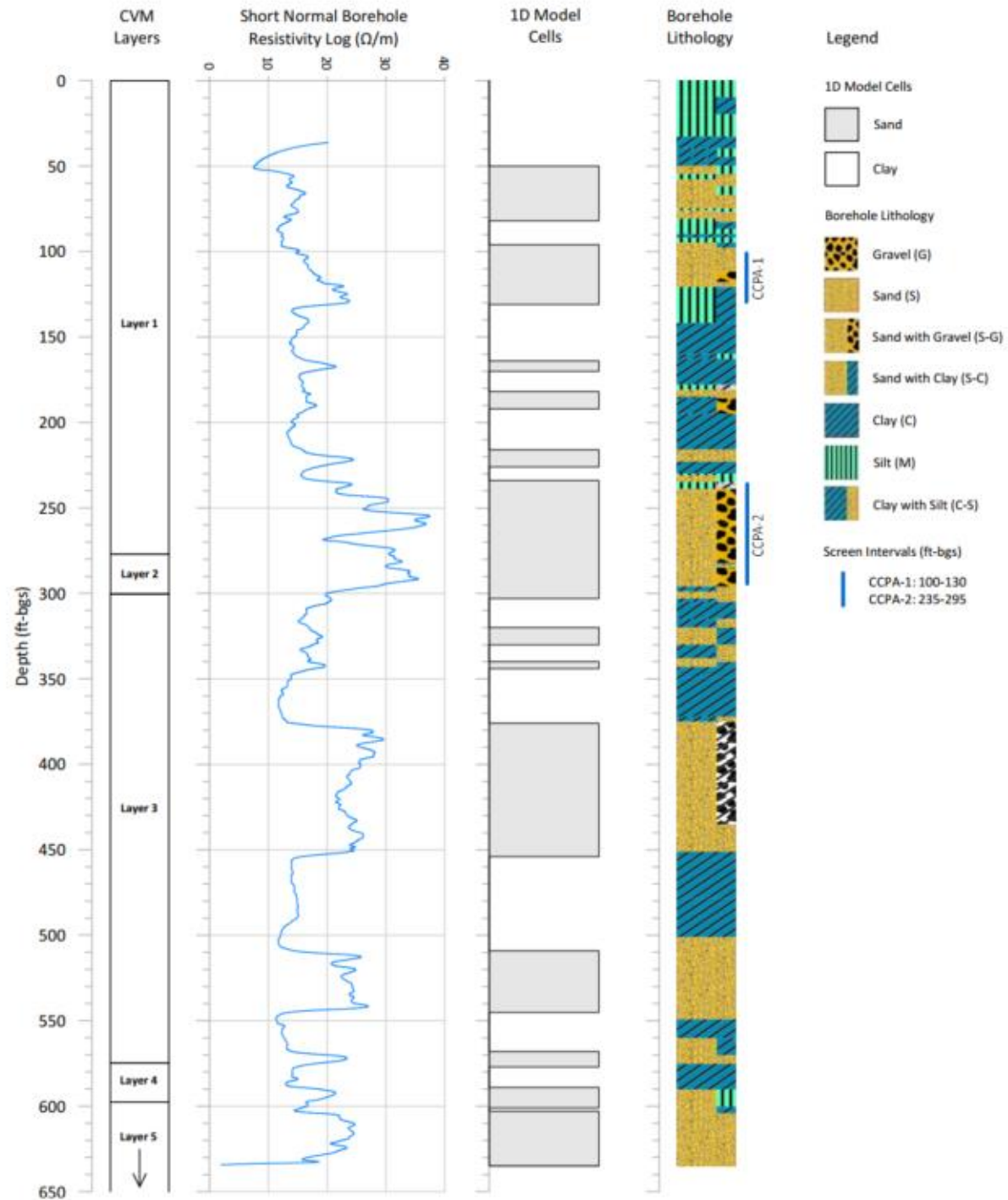
# Ontario Well 33

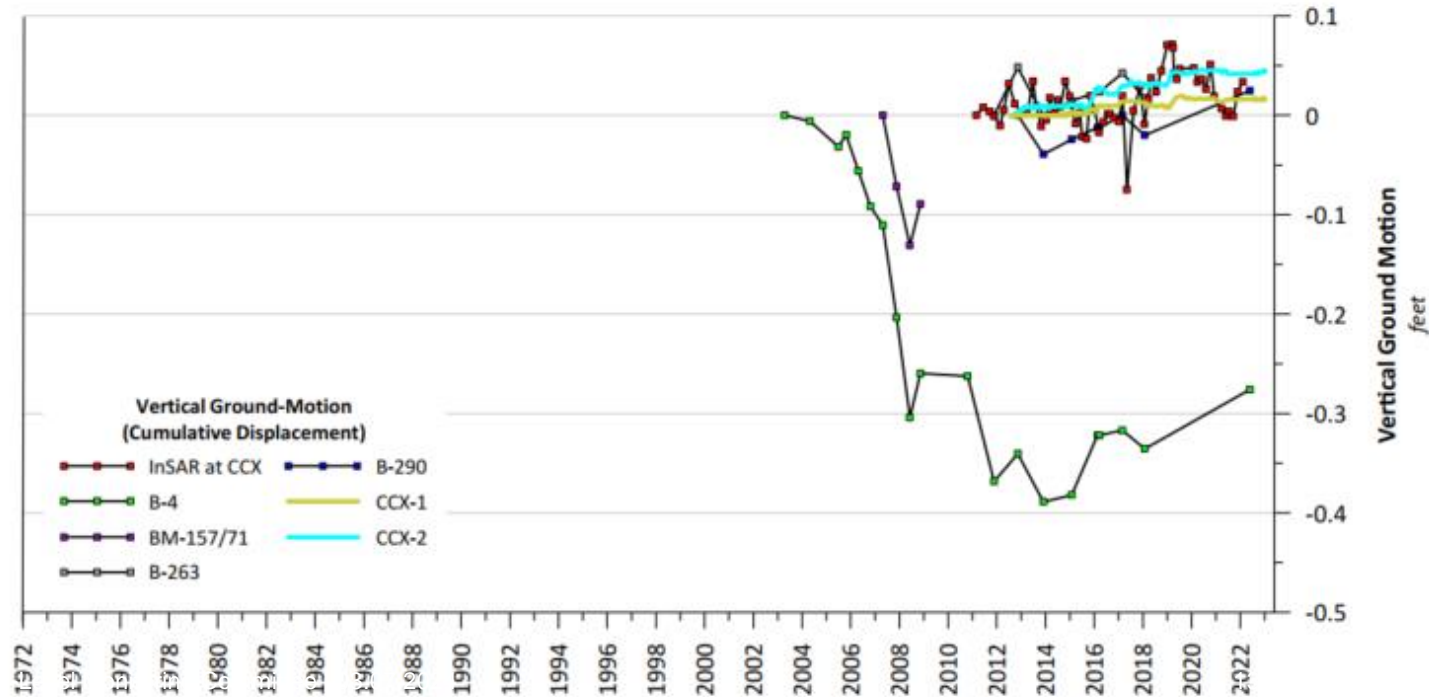
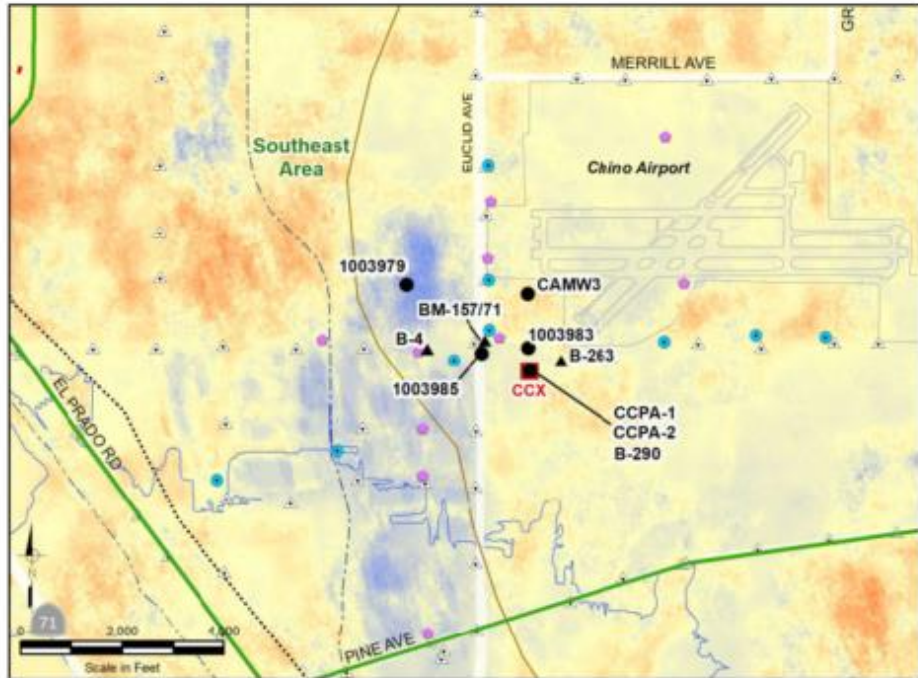
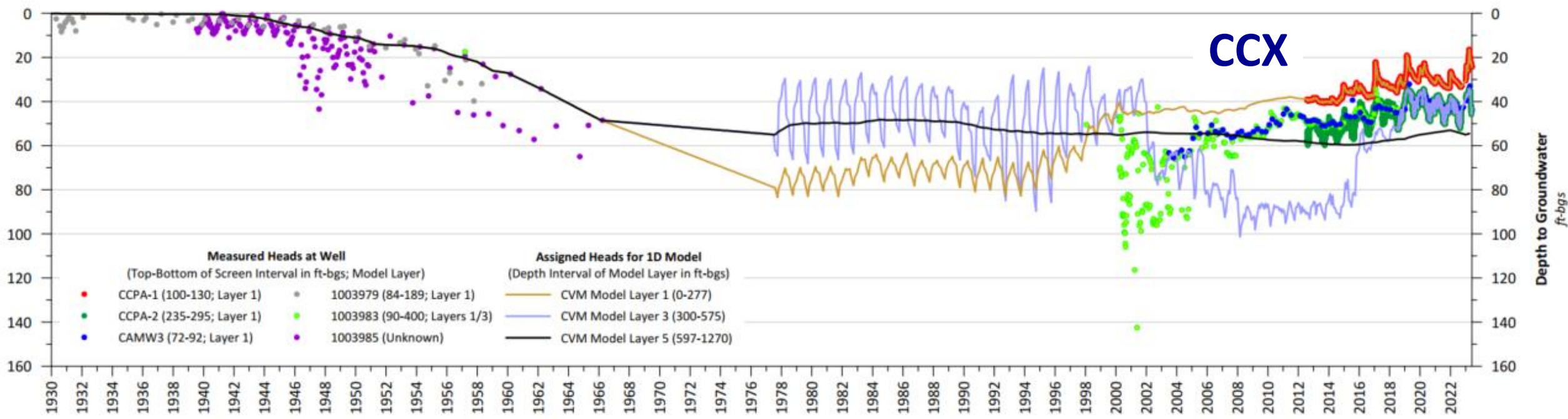


# Ontario Well 33

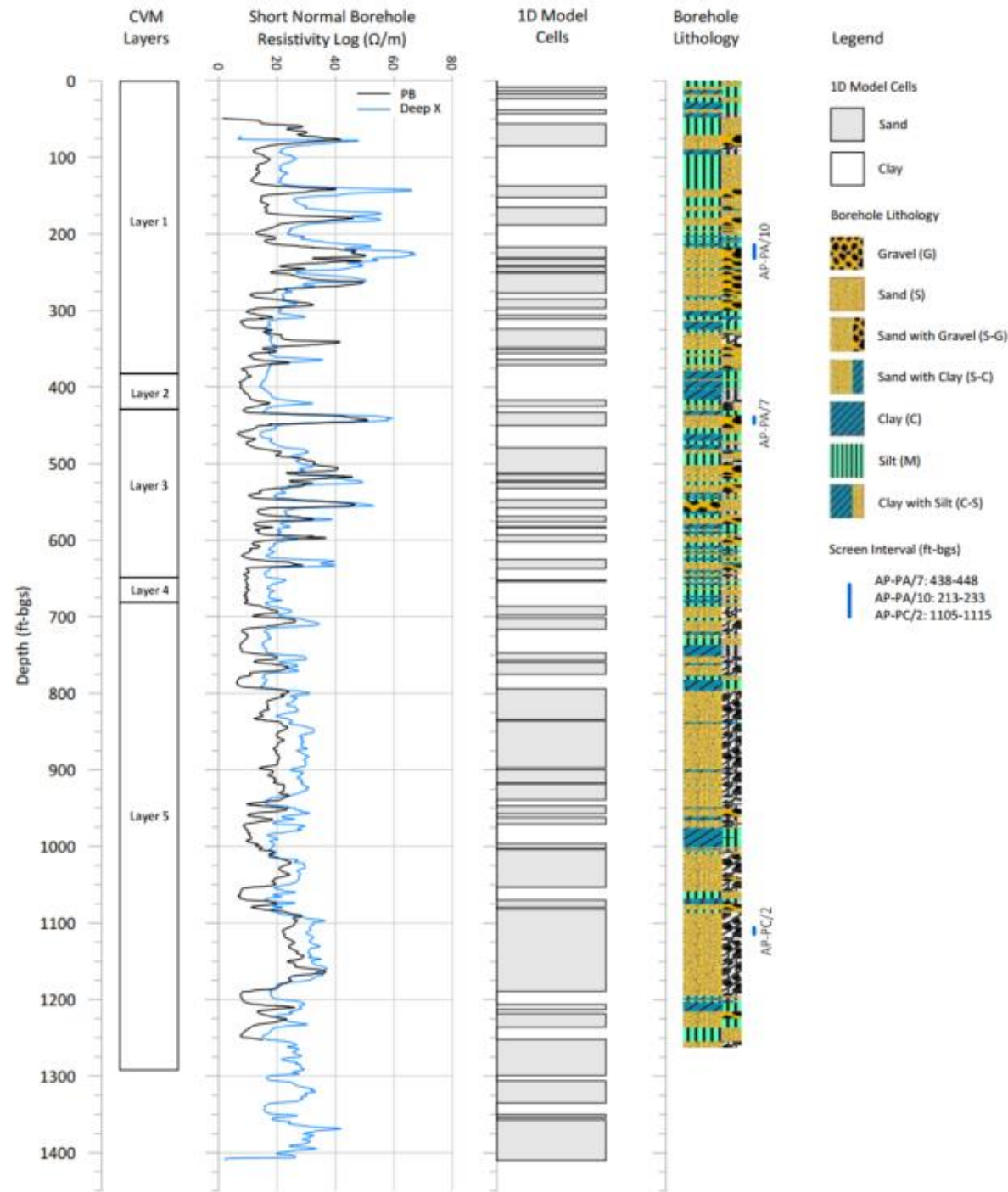


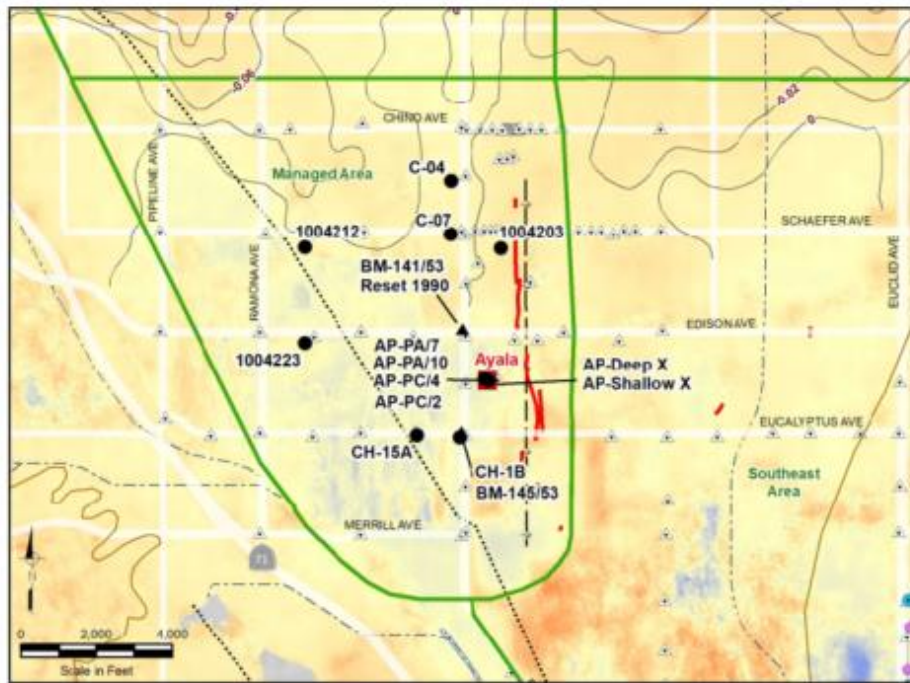
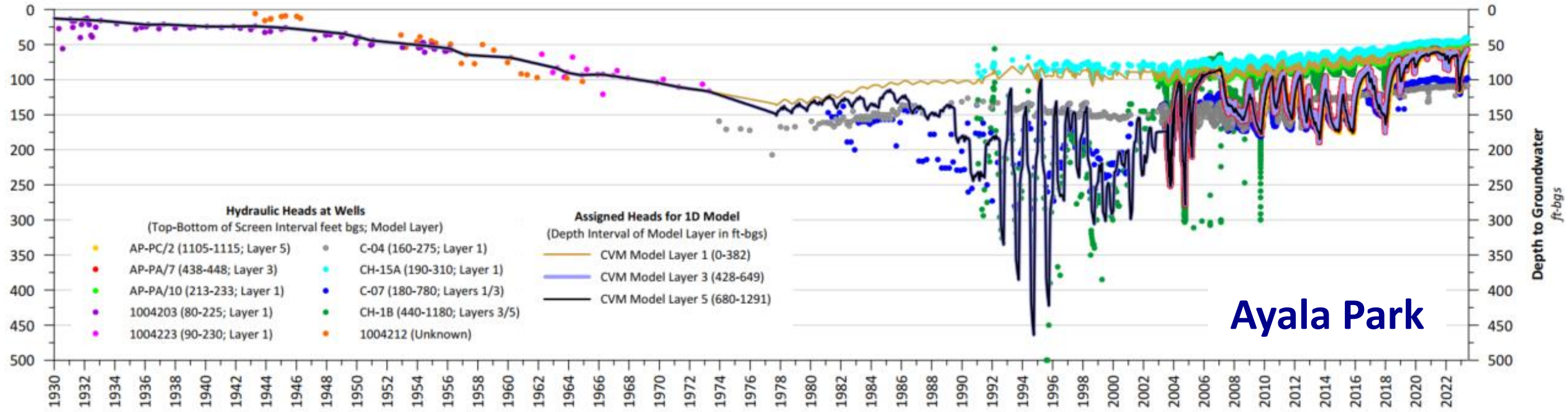
InSAR from March 2011 to March 2022 (see Figure 2)



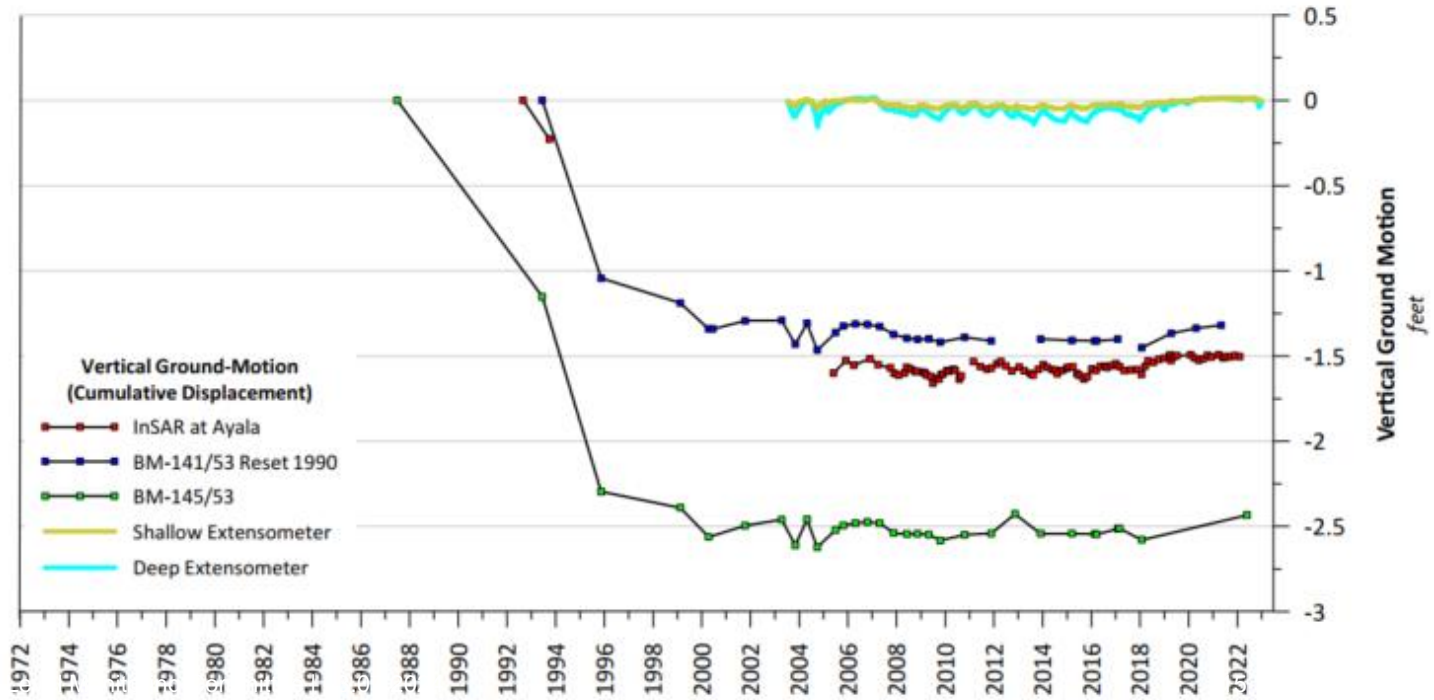


# Ayala Park





InSAR from March 2011 to March 2022 (see Figure 2)



# Recommended Ground-Level Monitoring Program – FY 2024/25

- **Conduct Ground-Level Monitoring Program**
  - Extensometers
  - Groundwater levels
  - InSAR (spring-2024 to spring-2025)
  - Ground-level surveys (spring-2025 → Northwest MZ-1)
  - Prepare 2023/24 Annual Report for the GLMP
  - GLMC meetings and administration
- **Develop Subsidence Management Plan in Northwest MZ-1**
  - Continue monitoring program
  - Provide advice in the development of the 2025 SYR Scenarios → No cost



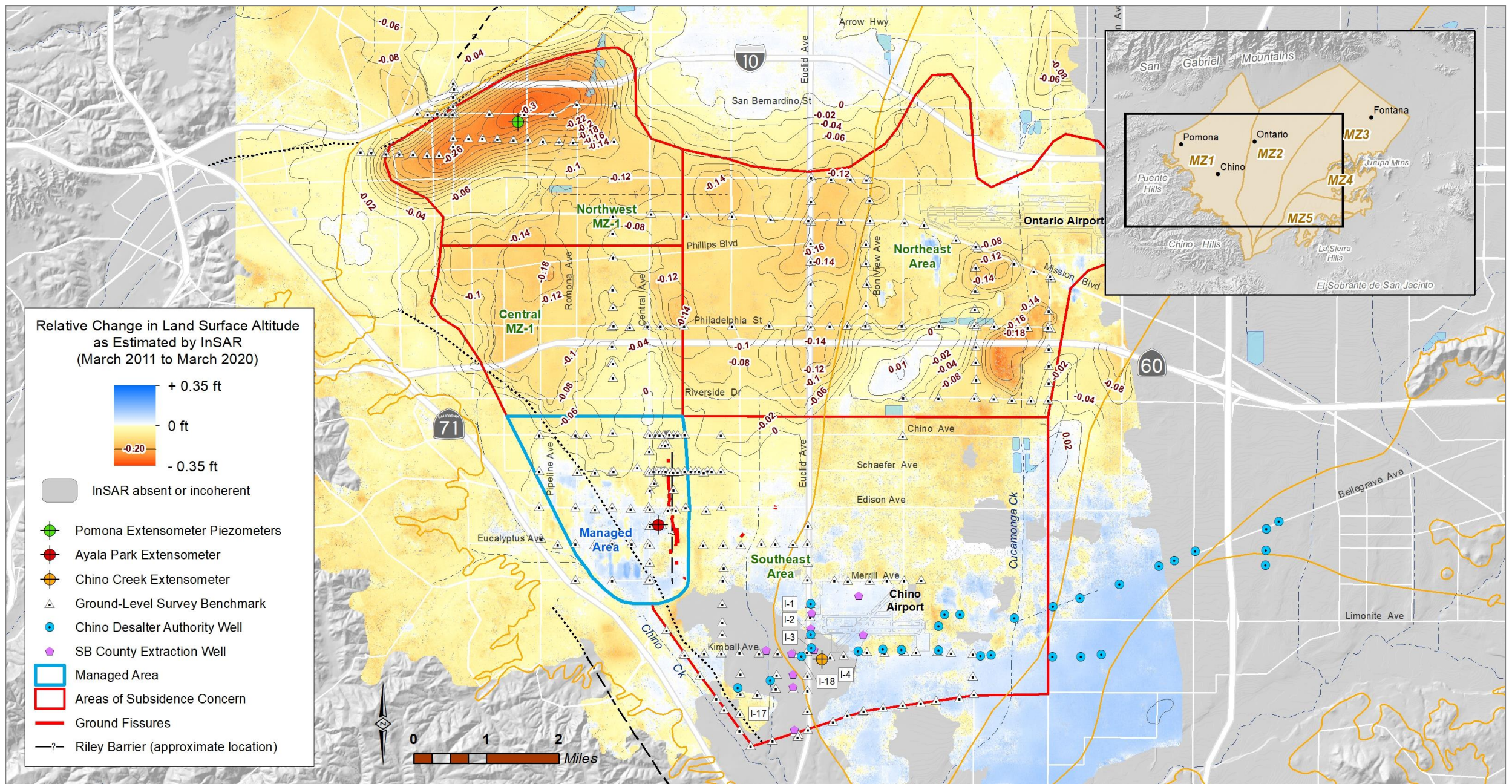


Table 1. Work Breakdown Structure and Cost Estimates for the Ground-Level Monitoring Program: FY 2024/25

Task Description	Notes	Labor (days)		Other Direct Costs						Totals			
		Person Days	Total	Travel	New Equip.	Equip. Rental	Outside Pro	Misc.	Total	Totals by Task	Recommended Budget 2024/25	Approved Budget 2023/24	Net Change from 2023/24
											a	b	a - b
<b>Task 1. Setup and Maintenance of the Monitoring Network</b>			<b>\$40,221</b>						<b>\$8,018</b>	<b>\$48,239</b>	<b>\$48,239</b>	<b>\$47,789</b>	<b>\$450</b>
1.1 Maintain Extensometer Facilities													
1.1.1 Routine maintenance of Ayala Park, Chino Creek, and Pomona extensometer facilities		21	\$29,437	\$649	\$250	\$350			\$1,249	\$30,685	\$30,685	\$33,707	-\$3,022
1.1.2 Replacement/repair of equipment at extensometer facilities		6	\$10,784	\$173	\$2,500		\$2,500		\$5,173	\$15,957	\$15,957	\$12,485	\$3,472
1.2 Annual Lease Fees for the Chino Creek extensometer facility		0	\$0					\$1,596	\$1,596	\$1,596	\$1,596	\$1,596	\$0
<b>Task 2. MZ-1: Aquifer-System Monitoring and Testing</b>			<b>\$32,724</b>						<b>\$784</b>	<b>\$33,508</b>	<b>\$33,508</b>	<b>\$31,456</b>	<b>\$2,052</b>
2.1 Conduct Quarterly Monitoring at Extensometers Facilities													
2.1.1 Download data from the Ayala Park Extensometer facility		4	\$5,436	\$332		\$40			\$372	\$5,808	\$5,808	\$3,032	\$2,776
2.1.2 Download data from the Chino Creek Extensometer facility		4	\$5,436			\$40			\$40	\$5,476	\$5,476	\$2,700	\$2,776
2.1.3 Download data from Pomona Extensometer facility		4	\$5,436	\$332		\$40			\$372	\$5,808	\$5,808	\$10,492	-\$4,684
2.1.4 Process, check, and upload data to database		10	\$16,416						\$0	\$16,416	\$16,416	\$15,232	\$1,184
<b>Task 3. Basin Wide Ground-Level Monitoring Program (InSAR)</b>			<b>\$64,880</b>						<b>\$39,600</b>	<b>\$104,480</b>	<b>\$104,480</b>	<b>\$96,560</b>	<b>\$7,920</b>
3.1 Satellite tasking and data selection with Airbus for 2024/25		0.5	\$1,144					\$1,000	\$1,000	\$2,144	\$2,144		
3.2 Assess SAR baselines for 2024/25 and select/purchase TerraSAR-X frames from Airbus		0.5	\$1,144					\$10,000	\$10,000	\$11,144	\$11,144	\$96,560	\$7,920
3.3 Prepare and check interferograms for 2024/25		28	\$62,592						\$0	\$62,592	\$62,592		
3.4 GAMMA software for InSAR processing (initial purchase + annual maintenance)		0	\$0					\$28,600	\$28,600	\$28,600	\$28,600		
<b>Task 4. Perform Ground-Level Surveys</b>			<b>\$7,144</b>						<b>\$38,600</b>	<b>\$45,744</b>	<b>\$45,744</b>	<b>\$84,280</b>	<b>-\$38,536</b>
4.1 Conduct Spring-2024 Elevation surveys in Northwest MZ-1		0.5	\$1,288				\$28,600		\$28,600	\$29,888	\$29,888	\$28,360	\$1,528
4.2 Conduct Spring-2024 Elevation Survey in the Northeast Area		0	\$0				\$53,416		\$0	\$0	\$0	\$0	\$0
4.3 Conduct Spring-2024 Elevation Survey in the Southeast Area		0	\$0				\$56,584		\$0	\$0	\$0	\$0	\$0
4.4 Conduct Spring-2024 Elevation and EDM Surveys in the Managed Area/Fissure Zone		0	\$0				\$46,800		\$0	\$0	\$0	\$31,248	-\$31,248
4.5 Replace Destroyed Benchmarks (if needed)		0	\$0				\$10,000		\$10,000	\$10,000	\$10,000	\$19,280	-\$9,280
4.6 Process, Check, and Update Database		3	\$5,856						\$0	\$5,856	\$5,856	\$5,392	\$464
<b>Task 5. Data Analysis and Reporting</b>			<b>\$87,084</b>						<b>\$0</b>	<b>\$87,084</b>	<b>\$87,084</b>	<b>\$85,412</b>	<b>\$1,672</b>
5.1 Prepare Draft 2023/24 Annual Report of the Ground-Level Monitoring Committee		19	\$36,744						\$0	\$36,744	\$36,744	\$36,136	\$608
5.2 Prepare Final 2023/24 Annual Report of the Ground-Level Monitoring Committee		8.5	\$16,820						\$0	\$16,820	\$16,820	\$15,732	\$1,088
5.3 Compile and Analyze Data from the 2024/25 Ground-Level Monitoring Program		14	\$23,520						\$0	\$23,520	\$23,520	\$23,544	-\$24
5.4 Continue Whispering Lakes Subsidence Investigation		0	\$10,000						\$0	\$10,000	\$10,000	\$10,000	\$0
<b>Task 6. Develop a Subsidence-Management Plan for Northwest MZ-1</b>			<b>\$16,656</b>						<b>\$0</b>	<b>\$16,656</b>	<b>\$16,656</b>	<b>\$15,536</b>	<b>\$1,120</b>
6.1 Aquifer-System Monitoring													
6.1.1 Collect pumping and piezometric data from agencies every three months; check and upload data to HDX		6	\$8,448						\$0	\$8,448	\$8,448	\$10,560	-\$2,112
6.1.2 Prepare and analyze charts and data graphics of pumping and recharge (Northwest MZ-1), piezometric levels, and aquifer-system deformation from PX		5	\$8,208						\$0	\$8,208	\$8,208	\$4,976	\$3,232
<b>Task 7. Construct and Calibrate Additional 1D Models Across Western Chino Basin</b>			<b>\$0</b>						<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$192,511</b>	<b>-\$192,511</b>
7.1 Prepare a draft TM summarizing the background, objectives, and methods; distribute to the GLMC		0	\$0						\$0	\$0	\$0	\$12,760	-\$12,760
7.2 Prepare for and conduct a GLMC meeting to receive feedback and comments on the draft TM		0	\$0						\$0	\$0	\$0	\$5,110	-\$5,110
7.3 Verify and/or recalibrate the 1D Model at Ayala Park Extensometer location		0	\$0						\$0	\$0	\$0	\$22,736	-\$22,736
7.4 Construct two additional 1D Models in the Southeast Area and Northeast Area		0	\$0						\$0	\$0	\$0	\$62,368	-\$62,368
7.5 Calibrate new 1D Models to derive properties of aquifers/aquifers and estimate the pre-consolidation stress(es)		0	\$0						\$0	\$0	\$0	\$45,472	-\$45,472
7.6 Prepare a draft TM summarizing the construction/calibration of additional 1D Models; distribute to the GLMC		0	\$0						\$0	\$0	\$0	\$37,024	-\$37,024
7.7 Prepare for and conduct a GLMC meeting to receive feedback and comments on the draft TM		0	\$0						\$0	\$0	\$0	\$5,110	-\$5,110
7.8 Incorporate the GLMC comments and prepare a final technical memorandum		0	\$0						\$0	\$0	\$0	\$1,932	-\$1,932
<b>Task 8. Meetings and Administration</b>			<b>\$57,562</b>						<b>\$375</b>	<b>\$57,937</b>	<b>\$57,937</b>	<b>\$59,228</b>	<b>-\$1,292</b>
8.1 Prepare for and Conduct Four Meetings of the Ground-Level Monitoring Committee	a	14	\$31,744	\$291					\$291	\$32,035	\$32,035	\$32,636	-\$602
8.2 Prepare for and Conduct One As-Requested Ad-Hoc Meeting	a	3	\$6,792	\$84					\$84	\$6,876	\$6,876	\$5,470	\$1,406
8.3 Perform Monthly Project Management		3	\$7,728						\$0	\$7,728	\$7,728	\$11,592	-\$3,864
8.4 Prepare a Recommended Scope and Budget for the GLMC for FY 2023/24		5.25	\$11,298						\$0	\$11,298	\$11,298	\$9,530	\$1,768
<b>Totals</b>			<b>\$306,271</b>						<b>\$87,376</b>	<b>\$393,647</b>	<b>\$393,647</b>	<b>\$612,772</b>	<b>-\$219,125</b>

# **Recommended Task 1 – Setup/Maintenance of Monitoring Network**

## **Recommended Task 2 – Monitoring and Testing**

- **No significant changes in the scope of work**

## **Recommended Task 3 – InSAR**

- **Continue to use TerraSAR-X, at least until the Northwest MZ-1 Subsidence Management Plan is completed**
  - **Cost saving are being realized by hiring Sean Yarborough directly**
  - **GAMMA software is a one-time expense, except for annual maintenance fee**

# Recommended Task 4 – Ground-Level Surveys

- **Conduct vertical survey across Northwest MZ-1**
  - Northwest MZ-1 should be surveyed annually until Subsidence Management Plan is complete
  - Surveys include high-precision GPS acquisition at PX and Ayala Park

Ground-Level Survey Area	Ground-Level Survey Completed (Y/N)?						
	2018	2019	2020	2021	2022	2023	2024 <sup>(b)</sup>
Managed Area	Y	N	N	N	N	N	Y
Fissure Zone Area <sup>(a)</sup>	Y	N	N	N	N	N	N
Central Area	N	N	N	N	N	N	N
Northwest Area	Y	Y	Y	Y	Y	Y	Y
San Jose Fault Zone Area <sup>(a)</sup>	Y	Y	Y	Y	Y	N	N
Southeast Area	Y	N	N	N	Y	N	N
Northeast Area	Y	Y	Y	N	N	N	N

(a) Denotes EDM survey area (measurements of horizontal strain).

(b) The 2024 ground-level surveys are scheduled to begin in March 2024.

# Recommended Task 5 – Data Analysis and Reporting

- **No changes to the Annual Report**
- **Potential follow-on work for Whispering Lakes Subsidence Investigation**
  - Current investigation is ongoing (*e.g.*, data collection, well inspections, transducer installation)
  - Annual report will contain recommendations for follow-on work
  - Contingency budget of \$10,000 to implement recommendations

# Recommended Task 6 – Subsidence Management Plan for NWMZ1

- 1. Continue aquifer system monitoring in Northwest MZ-1**
- 2. Provide advice to Watermaster during the 2025 Safe Yield reevaluation**
  - **Development of planning scenarios**
  - **Evaluation of subsidence predicted by 1D Models**

# GLMC Next Steps

- **April 4, 2023: Comments due on both TMs**
  - [etellezfoster@cbwm.org](mailto:etellezfoster@cbwm.org); [amalone@westyost.com](mailto:amalone@westyost.com)
- **Schedule additional GLMC meeting in April (if needed)**
  - Revised *Recommended Scope and Budget for FY 2024/25*



# THANK YOU

WESTYOST.COM