



Appendix G

Current Conditions Data

Introduction

This appendix includes additional analysis and data related to Chapter 5. Current and Historical Conditions. Figures G-1 and G-2 are additional analysis related to the development of the cumulative groundwater elevation plots. Table G-1 lists the wells used to develop current conditions figures and analyses. Table G-2 is the list of wells used for the example hydrographs analysis of groundwater elevations with depth. Table G-3 contains the fall 2022 groundwater elevation measurements used for the development of contours. Figures G-3 through G-16 are adapted MCWRA figures of pressure head difference between the Deep Aquifers and the 400-Foot Aquifer.

Cumulative Groundwater Elevations

Cumulative groundwater level change in the Deep Aquifers shown on Figure 5-5 of the report is calculated by averaging annual change in fall groundwater elevations for wells with available groundwater elevation measurements. Figure G-1 shows groundwater elevations for Deep Aquifers well 14S/02E-28H04 and monthly extraction volumes for wells within 2-mile radius of this selected well from August 2006—when the first groundwater measurement was taken in this well—to December 2022. The red markers shown on Figure G-1 represent August groundwater elevations, and the green markers represent fall groundwater elevations measured from November to December after the irrigation season is complete. The monthly pumping highlighted in green corresponds with the month the fall measurement was collected for that given year.

Well 14S/02E-28H04 is an agricultural supply pumping well, and its groundwater elevations can be highly variable between irrigation seasons as demonstrated by its hydrograph (Figure G-1). The hydrograph also shows that fall groundwater elevations in this well have generally declined since 2006. However, as shown on Figure 5-5 of this report, rises in the cumulative fall groundwater elevations are observed in years like 2019 and 2021, despite increases in total annual extraction in the Northern Region of the Deep Aquifers. Similarly, the hydrograph for well 14S/02E-28H04 shows that groundwater elevations increased in 2019 and 2021. Figure G-1 indicates that groundwater elevation measurements are generally inversely related to total monthly extractions near 14S/02E-28H04. For example, the 2019 fall groundwater elevation was higher than that in 2018 due to lower pumping in December 2019 compared to December 2018. Seasonal reduction in pumping results in a rebound of the potentiometric surface which contributes to the observed seasonal rise in groundwater elevations. Conversely, 2020 fall groundwater elevation was lower than in 2019 due to higher pumping in December 2020. This indicates that groundwater elevations' sensitivity to groundwater extraction is not being captured by analyzing these data on an annual basis, as was done for the cumulative groundwater elevation hydrograph on Figure 5-5.

Figure G-2 shows a comparison of data correlations using monthly and annual data. The figure shows the correlation between fall groundwater elevations in well 14S/02E-28H04 and monthly

pumping corresponding to the month the fall groundwater measurement was taken, and the correlation between fall groundwater elevations measured at well 14S/02E-28H04 and the total annual pumping for the Northern Region of the Deep Aquifers. The fall groundwater elevations at well 14S/02E-28H04 are more strongly correlated to the monthly pumping that occurs in the month that the fall measurement is taken ($R = 0.7801$) than the annual total Deep Aquifers pumping for the Northern Region ($R = 0.5169$). This reiterates that comparing annual fall groundwater elevations to total annual extractions does not accurately reflect groundwater elevations' sensitivity to extraction in the Deep Aquifers.

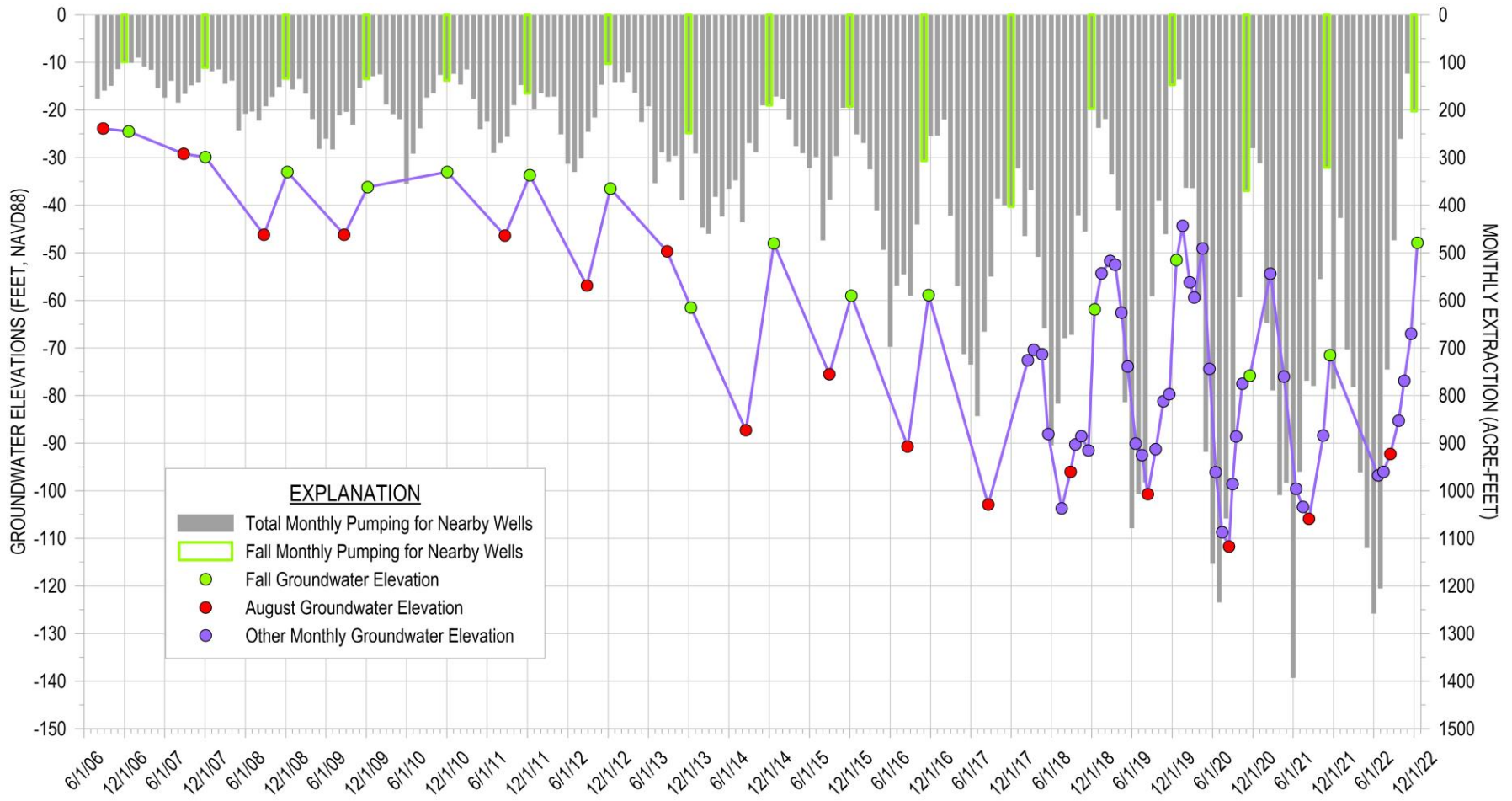


Figure G-1. Comparison of Groundwater Elevations in Well 14S/02E-28H04 and Total Monthly Groundwater Extraction for well 14S/02E-28H04 and Nearby Wells

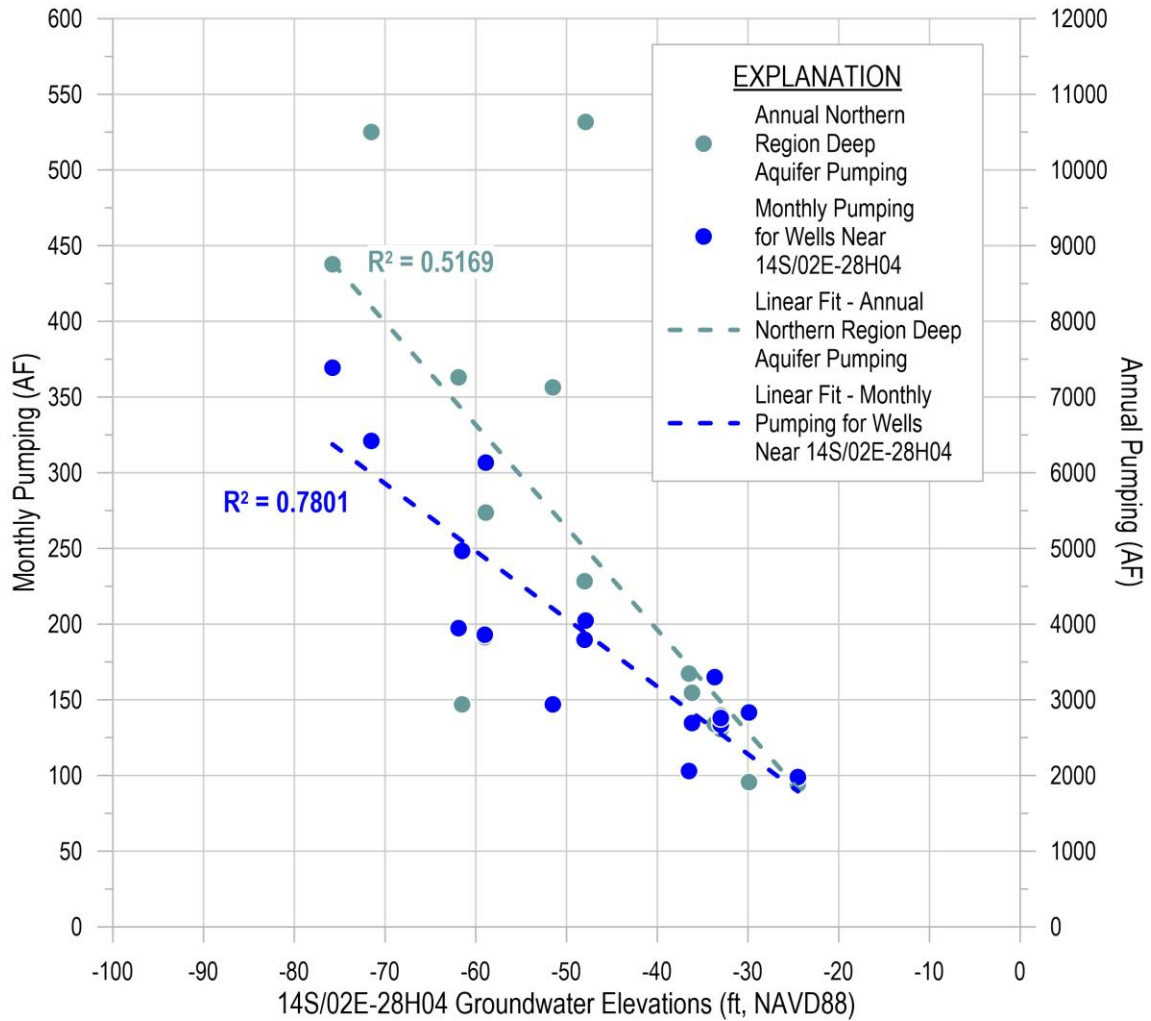


Figure G-2. Correlation Between Fall Groundwater Elevations in Well 14S/02E-28H04 and Total Monthly Groundwater Extraction for Well 14S/02E-28H04 and Nearby Wells and Total Annual Deep Aquifers Pumping in the Northern Region

Table G-1. Summary of Wells used in Current Conditions Figures and Analyses

Well Name	Aquifer	Well Use	Subbasin	Region	Well Used in Current Conditions Figure			
					Extraction/ Injection	Cumulative Hydrographs	Fall 2022 Contours	Example Hydrographs
13S/01E-25R01	Deep Aquifers	Domestic	180/400-ft. Aquifer	Northern	Extraction	X	X	
13S/01E-36J02	Deep Aquifers	Domestic	180/400-ft. Aquifer	Northern	Extraction	X	X	X
13S/02E-19Q03	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
13S/02E-28L03	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	X
13S/02E-31A02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
13S/02E-32E05	Deep Aquifers	Monitoring	180/400-ft. Aquifer	Northern		X	X	
13S/03E-30K50	Deep Aquifers	Agricultural	Langley Area	Northern	Extraction			
14S/01E-24L02	Deep Aquifers	Monitoring	Monterey	Northern		X	X	
14S/01E-24L03	Deep Aquifers	Monitoring	Monterey	Northern		X	X	
14S/01E-24L04	Deep Aquifers	Monitoring	Monterey	Northern		X	X	
14S/01E-24L05	Deep Aquifers	Monitoring	Monterey	Northern		X	X	
14S/02E-06L01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	X
14S/02E-07J03	Deep Aquifers	Industrial	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-14R02	Deep Aquifers	Monitoring	180/400-ft. Aquifer	Northern	Extraction			
14S/02E-18B01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			
14S/02E-19G01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-20E01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	X
14S/02E-21K04	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-21L02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-22A03	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	X
14S/02E-22J02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-23J02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-23P02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-25A03	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-26A10	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-26D01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			
14S/02E-26G01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			
14S/02E-26J04	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			

Well Name	Aquifer	Well Use	Subbasin	Region	Well Used in Current Conditions Figure			
					Extraction/ Injection	Cumulative Hydrographs	Fall 2022 Contours	Example Hydrographs
14S/02E-27J02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-27K02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-28C02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-28H04	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	X
14S/02E-33E01	Deep Aquifers	Monitoring	Monterey	Northern		X	X	X
14S/02E-33E02	Deep Aquifers	Monitoring	Monterey	Northern		X	X	X
14S/02E-34M01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	
14S/02E-35B01	Deep Aquifers	Monitoring	180/400-ft. Aquifer	Northern	Extraction			
14S/03E-19C01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction	X	X	X
15S/02E-04A03	Deep Aquifers	Monitoring	Monterey	Northern		X	X	
13S/02E-15M03	400-ft and Deep Aquifers	Industrial	180/400-ft. Aquifer	Northern	Extraction			
14S/03E-07P50	400-ft and Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			
15S/03E-10D04	400-ft and Deep Aquifers	Urban	180/400-ft. Aquifer	Northern	Extraction		X	
Camp Huffman (D)	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	X
FO-07-Deep	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
FO-08-Deep	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
FO-09-Deep	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	X
FO-10-Deep	Deep Aquifers	Monitoring	Monterey	Seaside		X	X	
FO-11-Deep	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	X
Military	Deep Aquifers	Urban	Seaside	Seaside	Extraction			
Ord Grove #2	Deep Aquifers	Urban	Seaside	Seaside	Extraction	X	X	
Ord Grove Test	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	X
Ord Terrace-Shallow	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
Paralta	Deep Aquifers	Urban	Seaside	Seaside	Extraction	X		
Paralta Test Well	Deep Aquifers	Monitoring	Seaside	Seaside		X		
PCA-E Deep	Deep Aquifers	Monitoring	Seaside	Seaside		X		
PCA-E Shallow	Deep Aquifers	Monitoring	Seaside	Seaside		X		
PCA-W Deep	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
Seaside Golf - Reservoir	Deep Aquifers	Urban	Seaside	Seaside	Extraction	X		

Well Name	Aquifer	Well Use	Subbasin	Region	Well Used in Current Conditions Figure			
					Extraction/ Injection	Cumulative Hydrographs	Fall 2022 Contours	Example Hydrographs
Sentinel MW #1	Deep Aquifers	Monitoring	Monterey	Seaside		X	X	
Sentinel MW #2	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
Sentinel MW #3	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
Sentinel MW #4	Deep Aquifers	Monitoring	Seaside	Seaside		X	X	
17S/05E-21F50	Deep Aquifers	Agricultural	Forebay Aquifer	Southeastern	Extraction			
15S/03E-13D01	400-ft and Deep Aquifers	Agricultural	180/400-ft. Aquifer	Southeastern	Extraction			
17S/05E-08L02	400-ft and Deep Aquifers	Agricultural	Forebay Aquifer	Southeastern		X	X	X
16S/04E-03K01	Eastside Deep Zone	Agricultural	180/400-ft. Aquifer	Outside DA Extent	Extraction			X
16S/05E-28K50	Eastside Deep Zone	Agricultural	Eastside Aquifer	Outside DA Extent	Extraction			
13S/01E-36J01*	Deep Aquifers	Urban	180/400-ft. Aquifer	Northern	Extraction	X		
13S/02E-15M51	400-ft and Deep Aquifers	Industrial	180/400-ft. Aquifer	Northern	Extraction			
13S/02E-32M02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			
14S/02E-23G02	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction		X	
14S/02E-29C01	Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction			
14S/02E-30G03	Deep Aquifers	Urban	Monterey	Northern	Extraction			
14S/02E-31H01	Deep Aquifers	Urban	Monterey	Northern	Extraction	X		
14S/02E-32D04	Deep Aquifers	Urban	Monterey	Northern	Extraction	X		
14S/03E-06D50	400-ft and Deep Aquifers	Agricultural	Eastside Aquifer	Northern	Extraction			
15S/02E-04A04	Deep Aquifers	Urban	Monterey	Northern	Extraction	X		
15S/03E-05R52	400-ft and Deep Aquifers	Agricultural	180/400-ft. Aquifer	Northern	Extraction		X	X
15S/04E-32H02	400-ft and Deep Aquifers	Agricultural	180/400-ft. Aquifer	Southeastern	Extraction			
Mission Memorial	Deep Aquifers	Urban	Seaside	Seaside	Extraction			
ASR-1	Deep Aquifers	ASR	Seaside	Seaside	Extraction			
ASR-2	Deep Aquifers	ASR	Seaside	Seaside	Injection			
ASR-3	Deep Aquifers	ASR	Seaside	Seaside	Extraction			
ASR-4	Deep Aquifers	ASR	Seaside	Seaside	Injection			
DIW-1	Deep Aquifers	Injection	Seaside	Seaside	Injection			
DIW-2	Deep Aquifers	Injection	Seaside	Seaside	Injection			
DIW-3	Deep Aquifers	Injection	Seaside	Seaside	Injection			

Well Name	Aquifer	Well Use	Subbasin	Region	Well Used in Current Conditions Figure			
					Extraction/ Injection	Cumulative Hydrographs	Fall 2022 Contours	Example Hydrographs
DIW-4	Deep Aquifers	Injection	Seaside	Seaside	Injection			
14S/02E-20B03*	400-ft and Deep Aquifers	Industrial	180/400-ft. Aquifer	Northern	Extraction			X
13S/02E-31N02	400-ft Aquifer	Agricultural	180/400-ft. Aquifer	Northern				X
14S/02E-34A03	400-ft Aquifer	Agricultural	180/400-ft. Aquifer	Northern				X
MP-BW-50-289	Lower 180-Foot, 400-Foot Aquifer	Monitoring	Monterey	Northern				X
FO-11-Shallow	Overlying Aquifer (upper Paso Robles Formation)	Monitoring	Monterey	Seaside				X

*Highlighted well is destroyed.

Table G-2. Wells Used for Example Hydrographs for Analysis of Groundwater Elevations with Depth

Well Name	Deep Aquifers Zone	Screen Interval (ft)	Well Use	Subbasin	Region
13S/01E-36J02	Upper/Lower	1301-1361	Domestic	180/400-ft. Aquifer	Northern
13S/02E-28L03	Upper	1080-1330	Agricultural	180/400-ft. Aquifer	Northern
14S/02E-06L01	Upper	860-1540	Agricultural	180/400-ft. Aquifer	Northern
14S/02E-20E01	Upper	1120-2020	Agricultural	180/400-ft. Aquifer	Northern
14S/02E-22A03	Upper	980-1640	Agricultural	180/400-ft. Aquifer	Northern
14S/02E-28H04	Lower	940-1030	Agricultural	180/400-ft. Aquifer	Northern
14S/02E-33E01	Lower	1045-1095	Monitoring	Monterey	Northern
14S/02E-33E02	Upper/Lower	1680-1760	Monitoring	Monterey	Northern
Camp Huffman (D)	Upper/Lower	950-1320	Monitoring	Seaside	Seaside
FO-09-Deep	Lower	790-830	Monitoring	Seaside	Seaside
FO-11-Deep	Upper/Lower	1090-1120	Monitoring	Seaside	Seaside
Ord Grove Test	Lower	355-480	Monitoring	Seaside	Seaside

Table G-3. Fall 2022 Groundwater Elevations Used for Contours

Well Name	Fall 2022 Groundwater Elevation (feet, NAVD88)	Data Source
13S/01E-25R01	-6.0	MCWRA
13S/01E-36J02	-11.6	MCWRA
13S/02E-19Q03	-10.9	MCWRA
13S/02E-28L03	-56.0	MCWRA
13S/02E-31A02	-11.1	MCWRA
13S/02E-32E05	-16.7	MCWRA
14S/01E-24L02	-29.0	MCWRA
14S/01E-24L03	-11.4	MCWRA
14S/01E-24L04	-27.3	MCWRA
14S/01E-24L05	-22.5	MCWRA
14S/02E-06L01	-14.3	MCWRA
14S/02E-07J03	-13.0	MCWRA
14S/02E-19G01	-29.0	MCWRA
14S/02E-20E01	-30.7	MCWRA
14S/02E-21K04	-33.2	MCWRA
14S/02E-21L02	-36.1	MCWRA
14S/02E-22A03	-52.1	MCWRA
14S/02E-22J02	-47.7	MCWRA
14S/02E-23G02	-109.8	MCWRA
14S/02E-23J02	-52.1	MCWRA
14S/02E-23P02	-37.0	MCWRA

Well Name	Fall 2022 Groundwater Elevation (feet, NAVD88)	Data Source
14S/02E-25A03	-44.0	MCWRA
14S/02E-26A10	-51.1	MCWRA
14S/02E-27J02	-49.5	MCWRA
14S/02E-27K02	-41.8	MCWRA
14S/02E-28C02	-45.5	MCWRA
14S/02E-28H04	-47.9	MCWRA
14S/02E-33E01	-45.2	MCWRA
14S/02E-33E02	-21.5	MCWRA
14S/02E-34M01	-30.1	MCWRA
14S/03E-19C01	-45.5	MCWRA
15S/02E-04A03	-44.7	MCWRA
Camp Huffman (D)	-12.7	Seaside Watermaster
FO-11-Deep	-12.7	Seaside Watermaster
FO-10-Deep	-12.7	Seaside Watermaster
FO-08-Deep	-20.3	Seaside Watermaster
FO-07_Deep	-20.4	Seaside Watermaster
Sentinel MW #1	-19.8	Seaside Watermaster
Sentinel MW #2	-16.7	Seaside Watermaster
Sentinel MW #3	-15.8	Seaside Watermaster
Sentinel MW #4	-15.0	Seaside Watermaster
PCA-W Deep	-23.1	Seaside Watermaster
Ord Grove #2*	-62.6	Seaside Watermaster
Ord Grove Test	-39.7	Seaside Watermaster
FO-09-Deep	-22.4	Seaside Watermaster
Ord Terrace-Shallow	-30.2	Seaside Watermaster
15S/03E-05R52**	-21.9	MCWRA
15S/03E-10D04**	-22.7	MCWRA
17S/05E-08L02**	90.2	MCWRA

*Pump on.

**Well is completed in the 400-Foot and Deep Aquifers and was indirectly used to inform contours where true Deep Aquifers data is lacking.

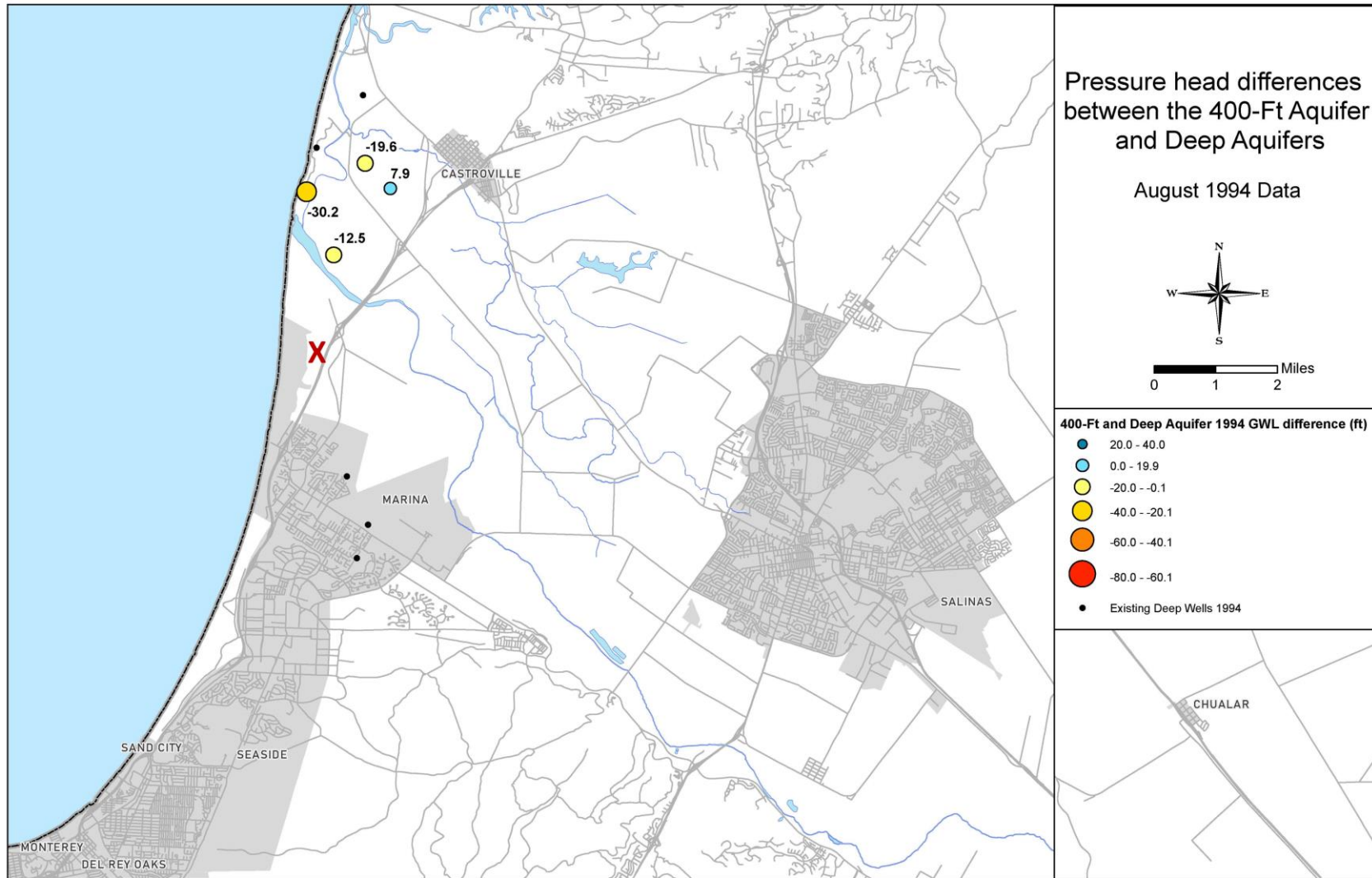


Figure G-3. August 1994 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication, personal communication)

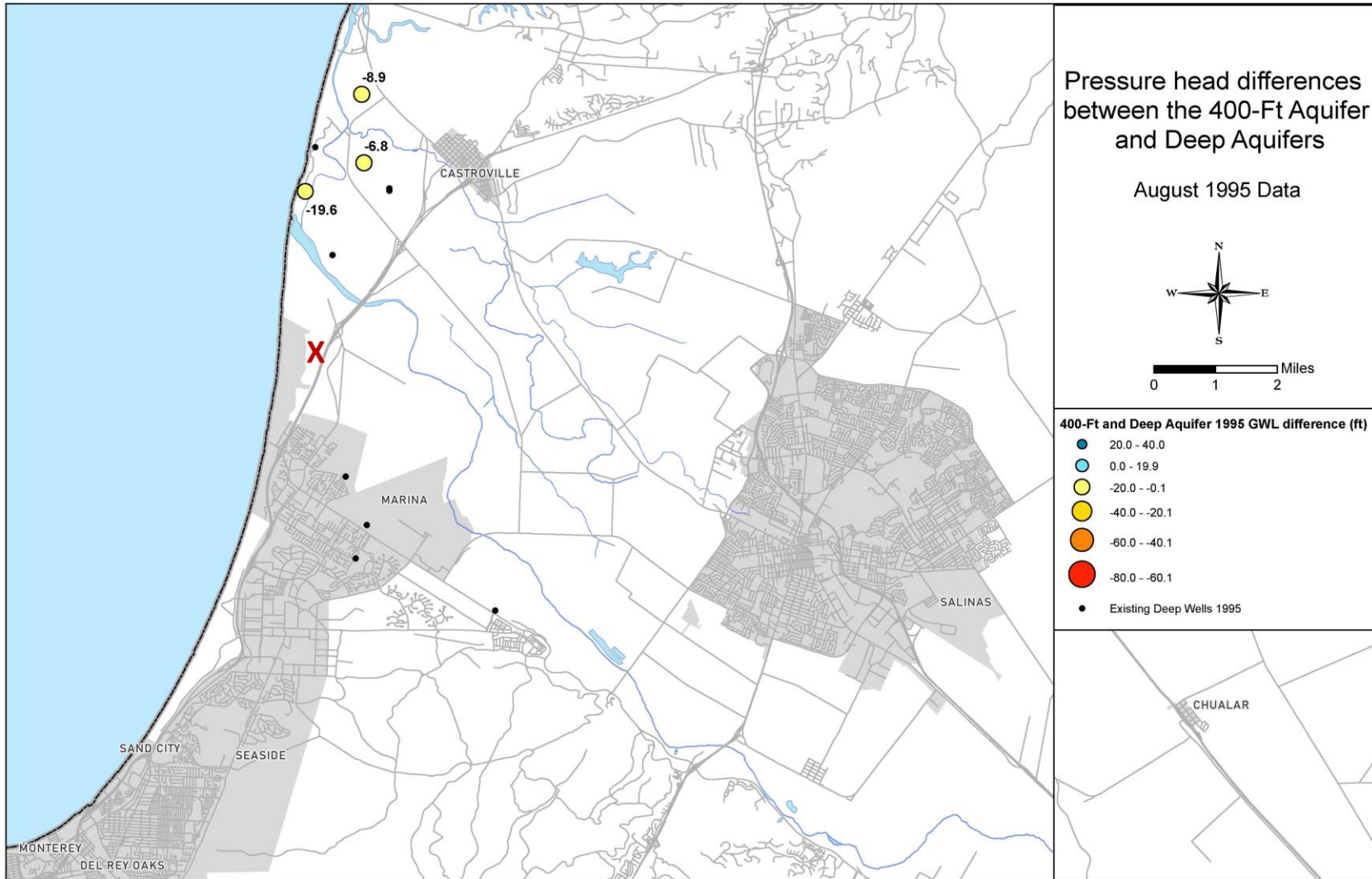


Figure G-4. August 1995 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

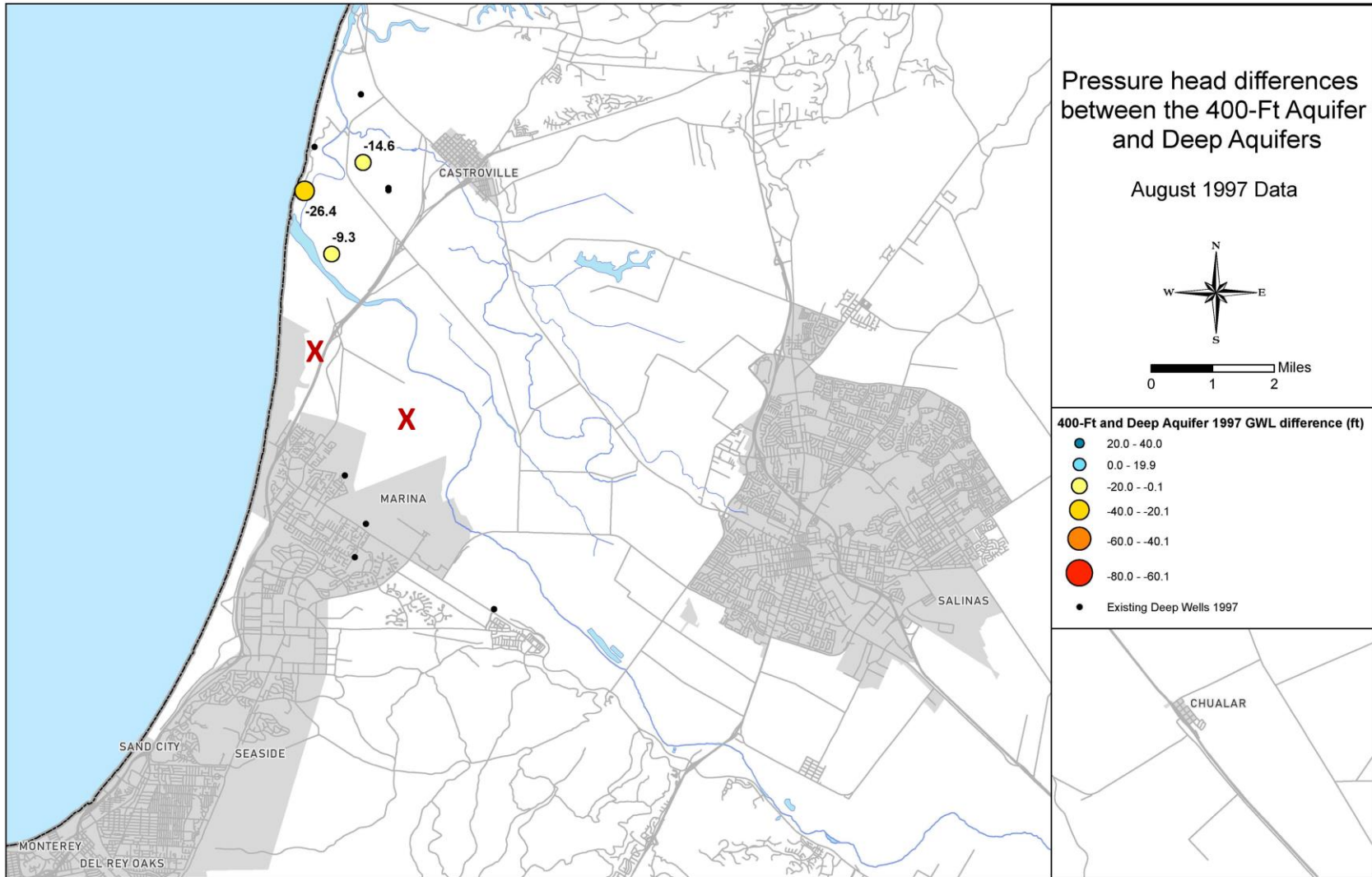


Figure G-5. August 1997 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

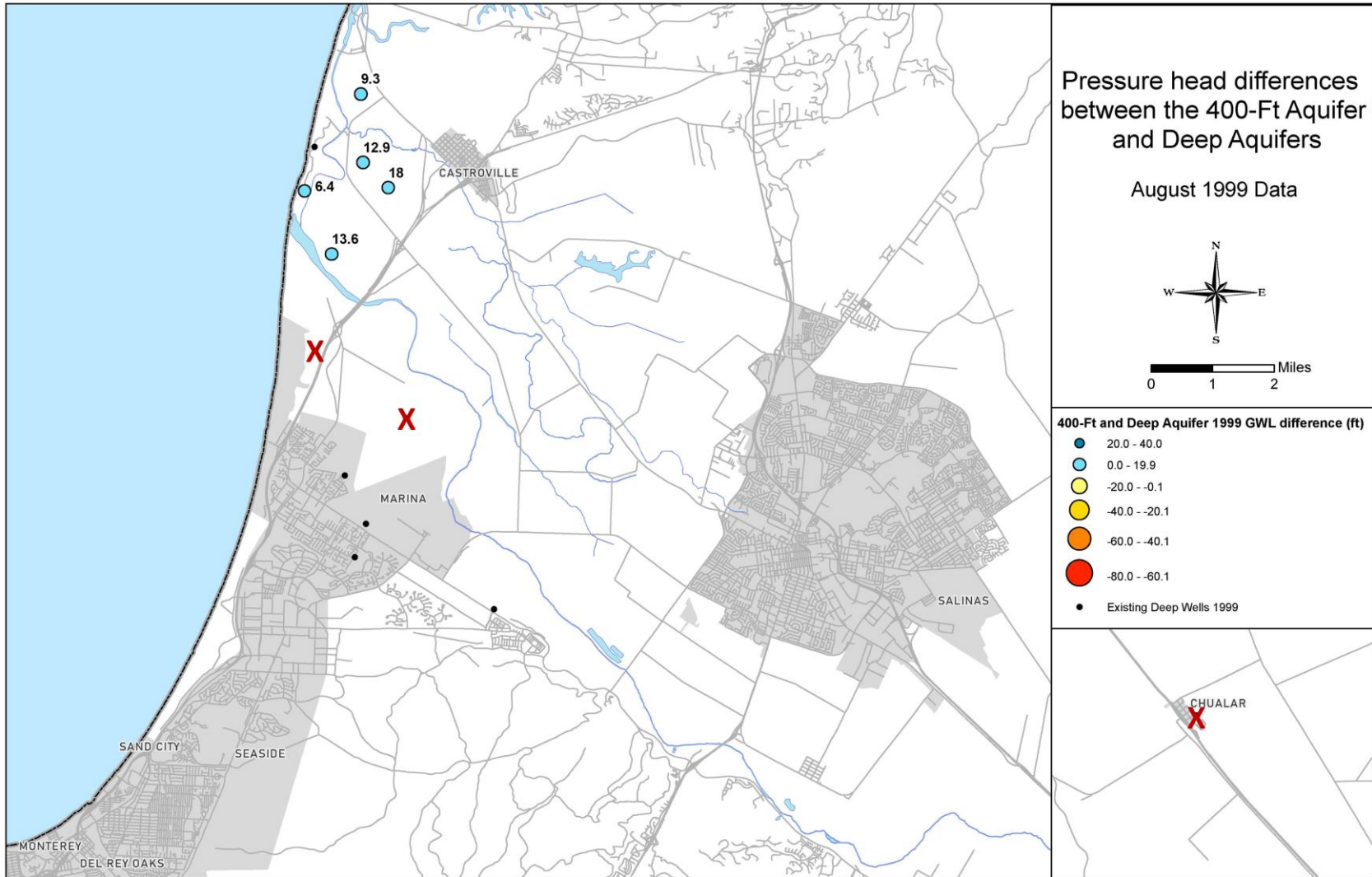


Figure G-6. August 1999 Pressure Head Difference Between the Deep Aquifers and 400-Footer Aquifer (red X marks wells no longer considered true Deep Aquifer wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

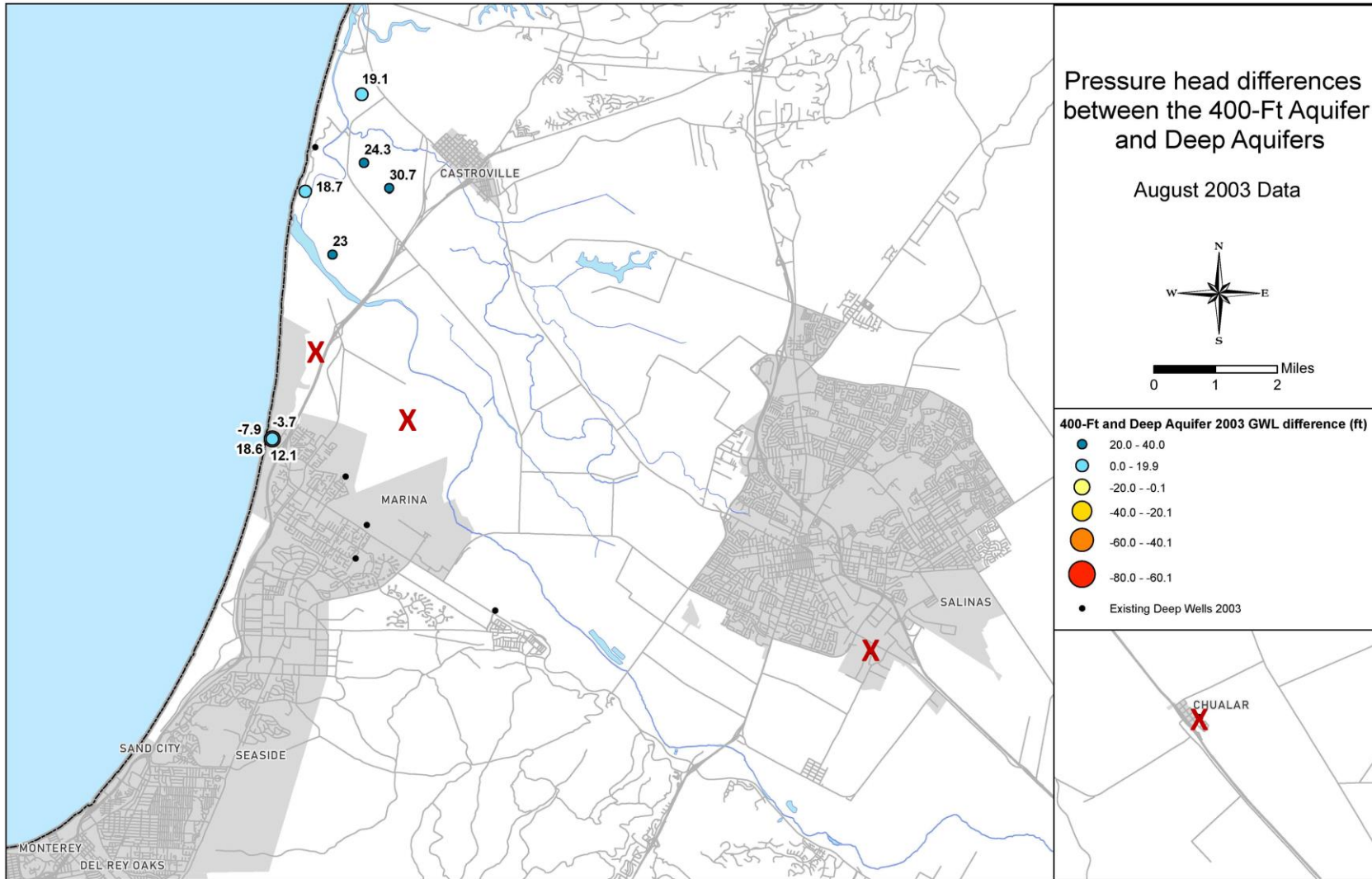


Figure G-7. August 2003 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

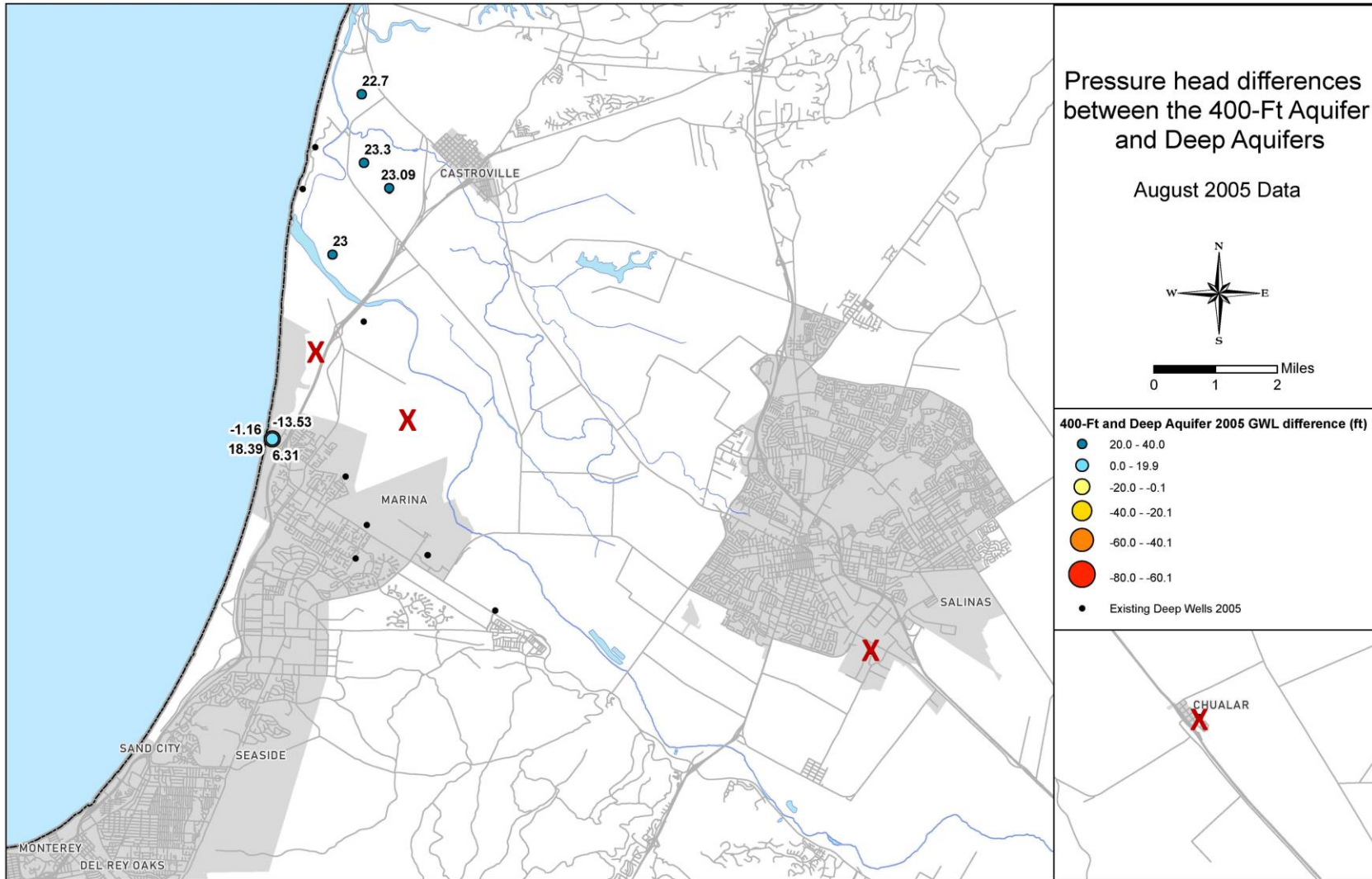


Figure G-8. August 2005 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

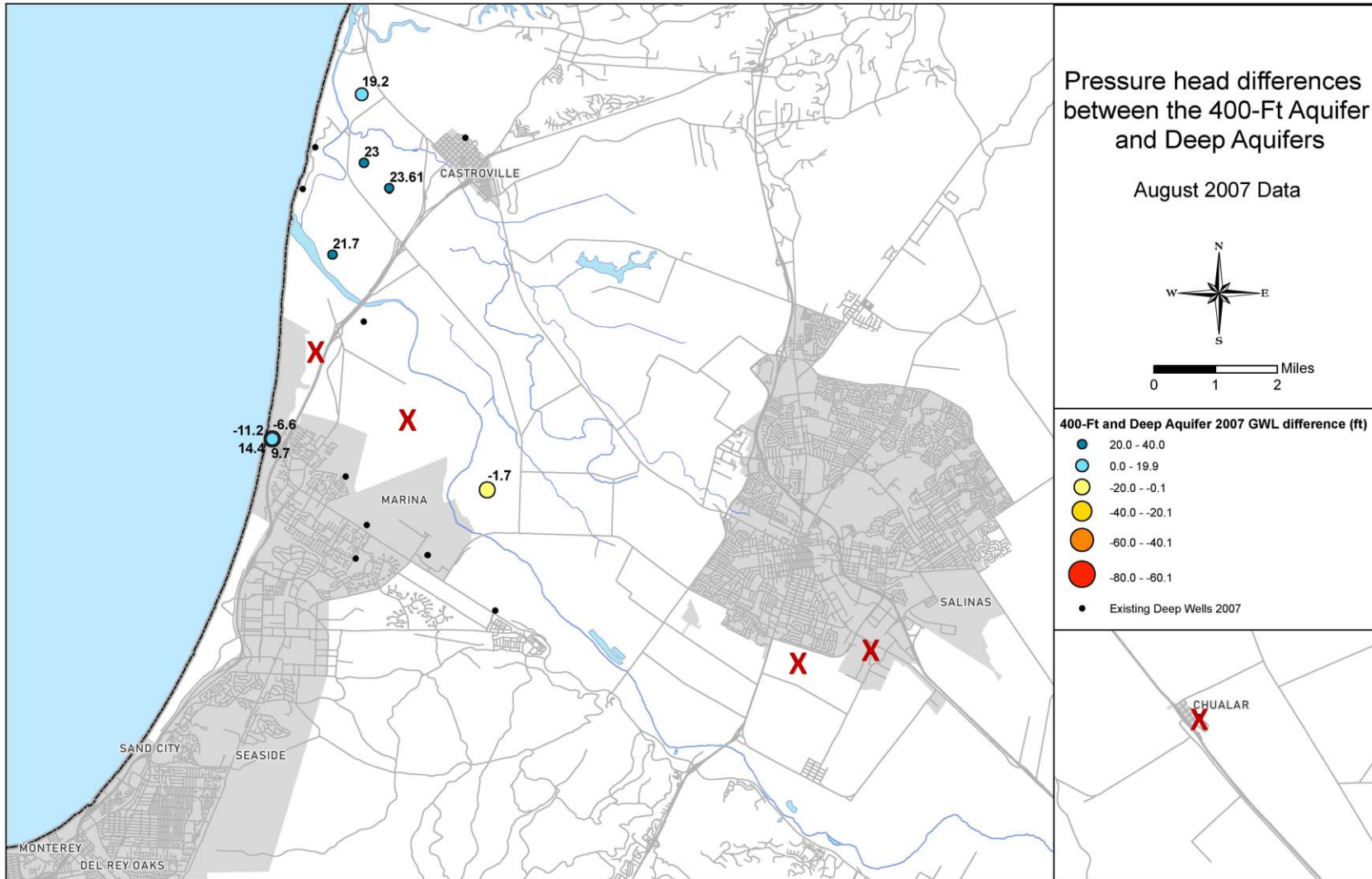


Figure G-9. August 2007 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

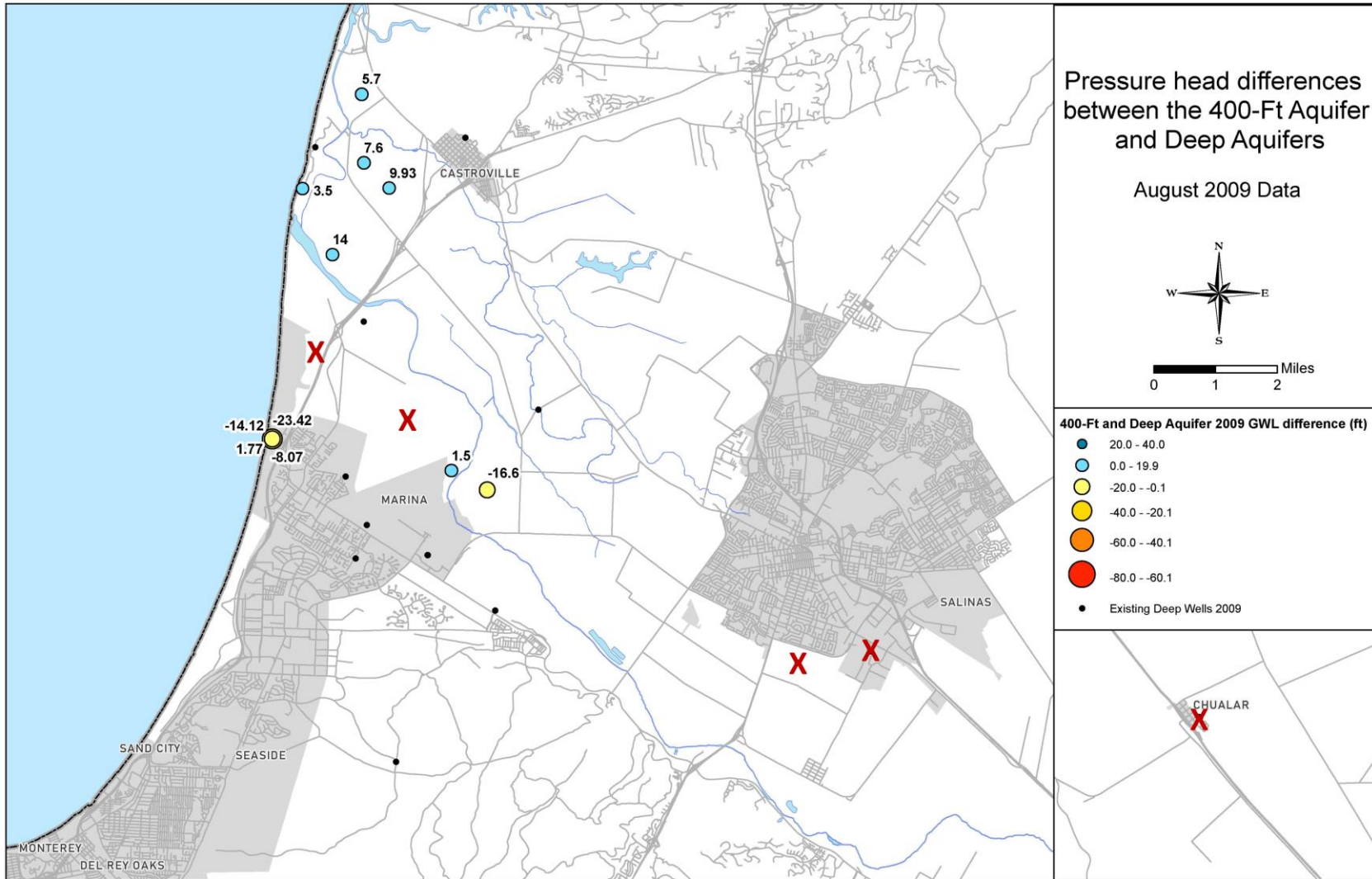


Figure G-10. August 2009 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

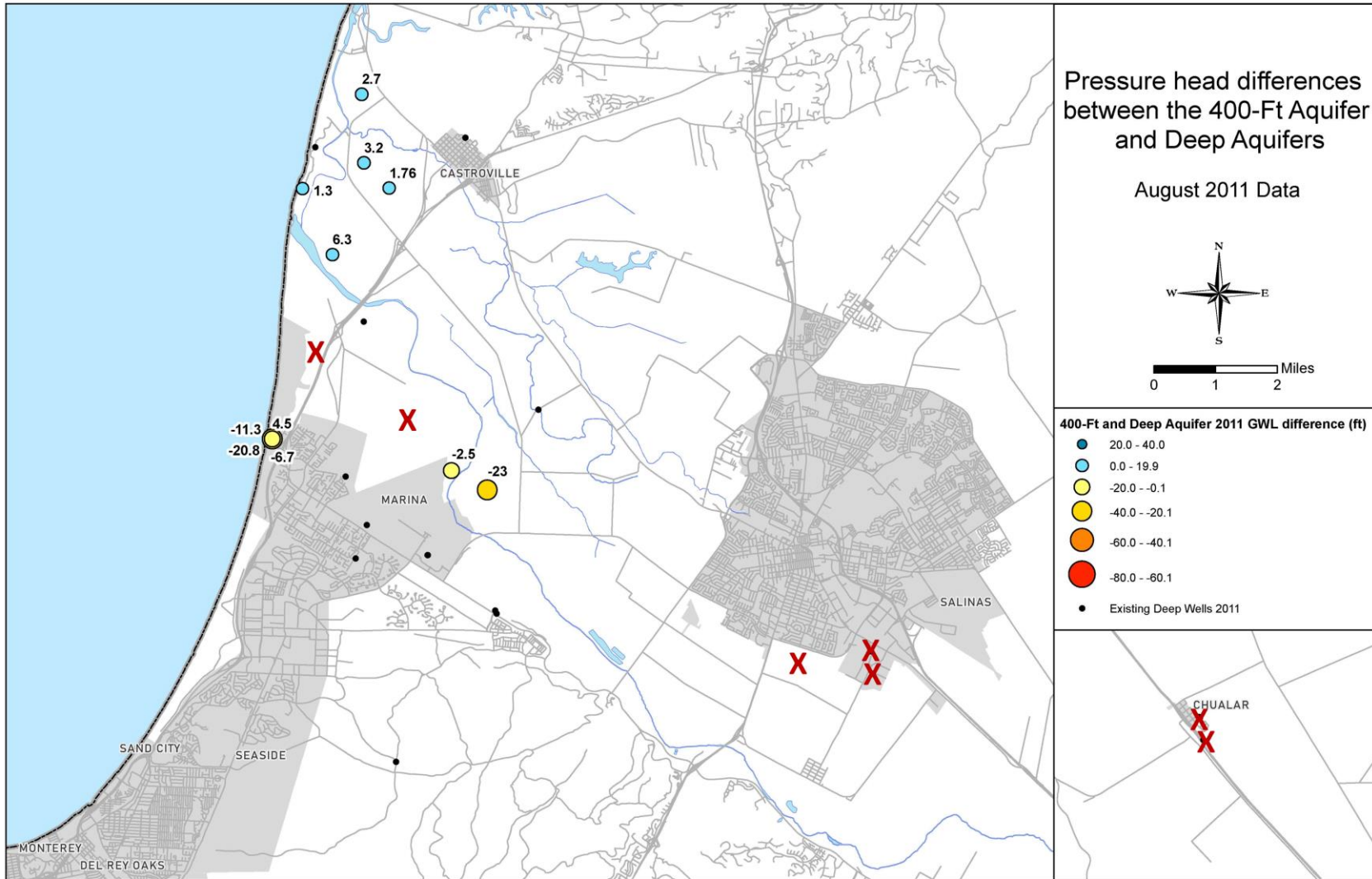


Figure G-11. August 2011 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

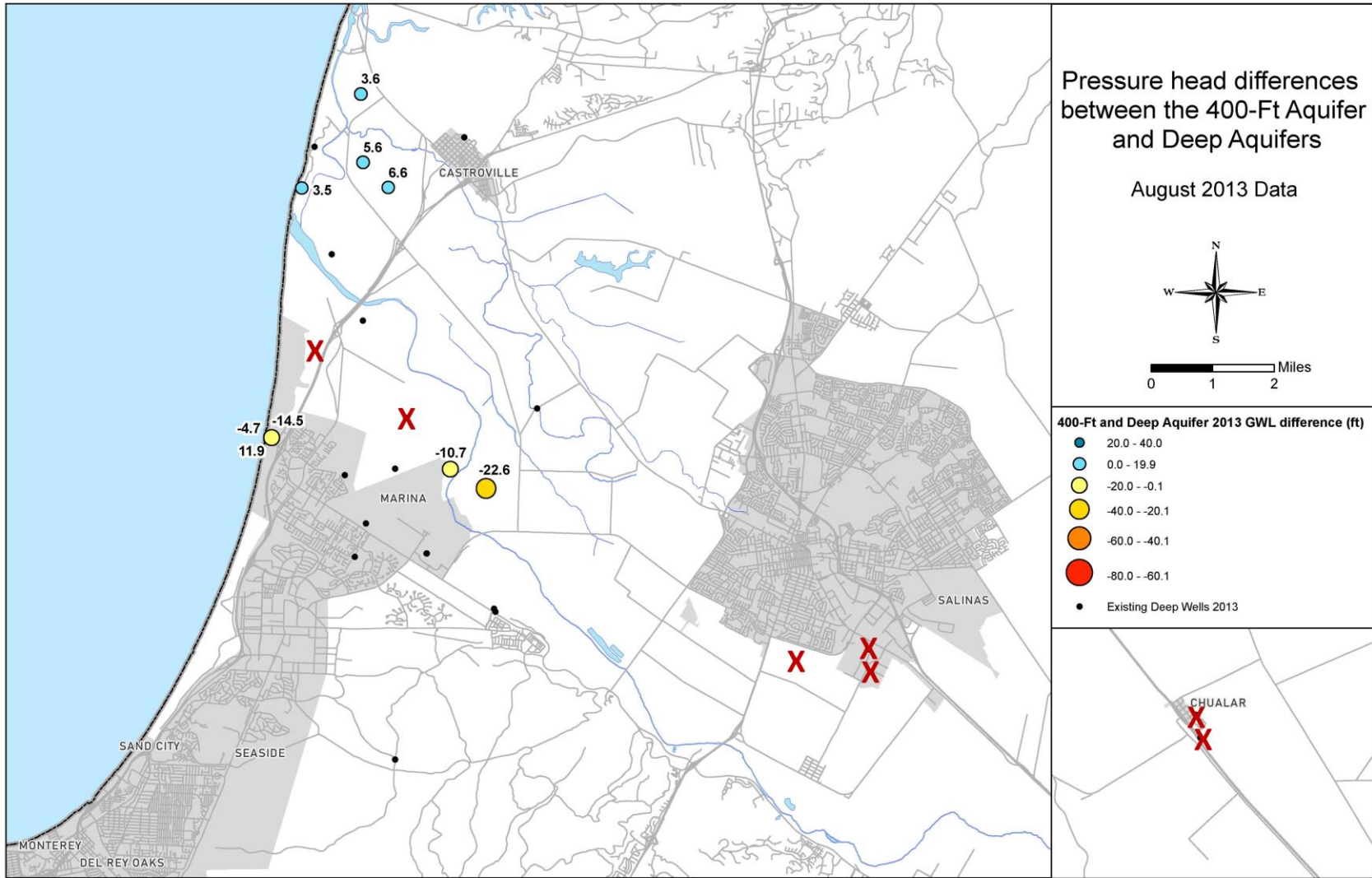


Figure G-12. August 2013 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

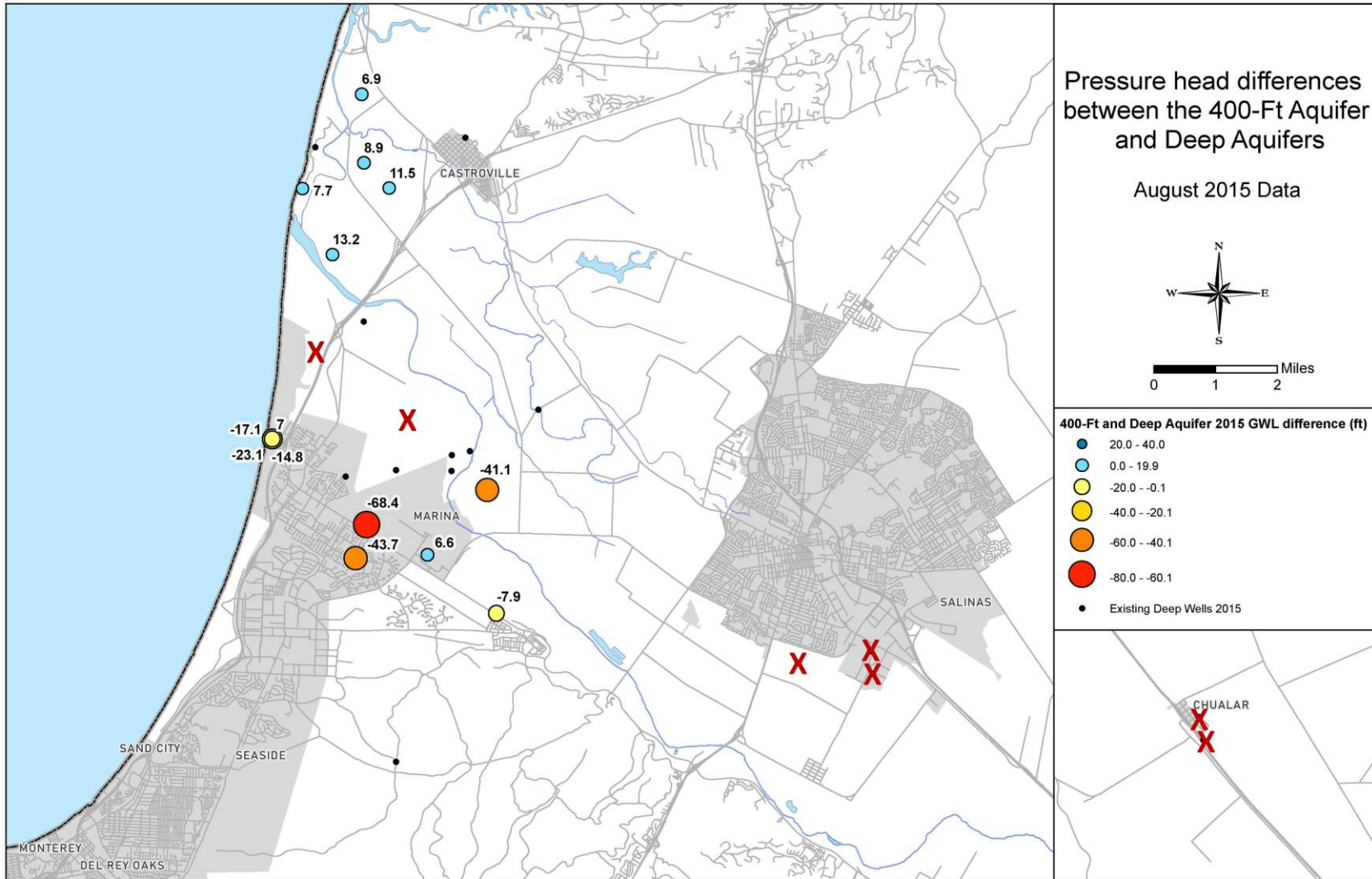


Figure G-13. August 2015 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

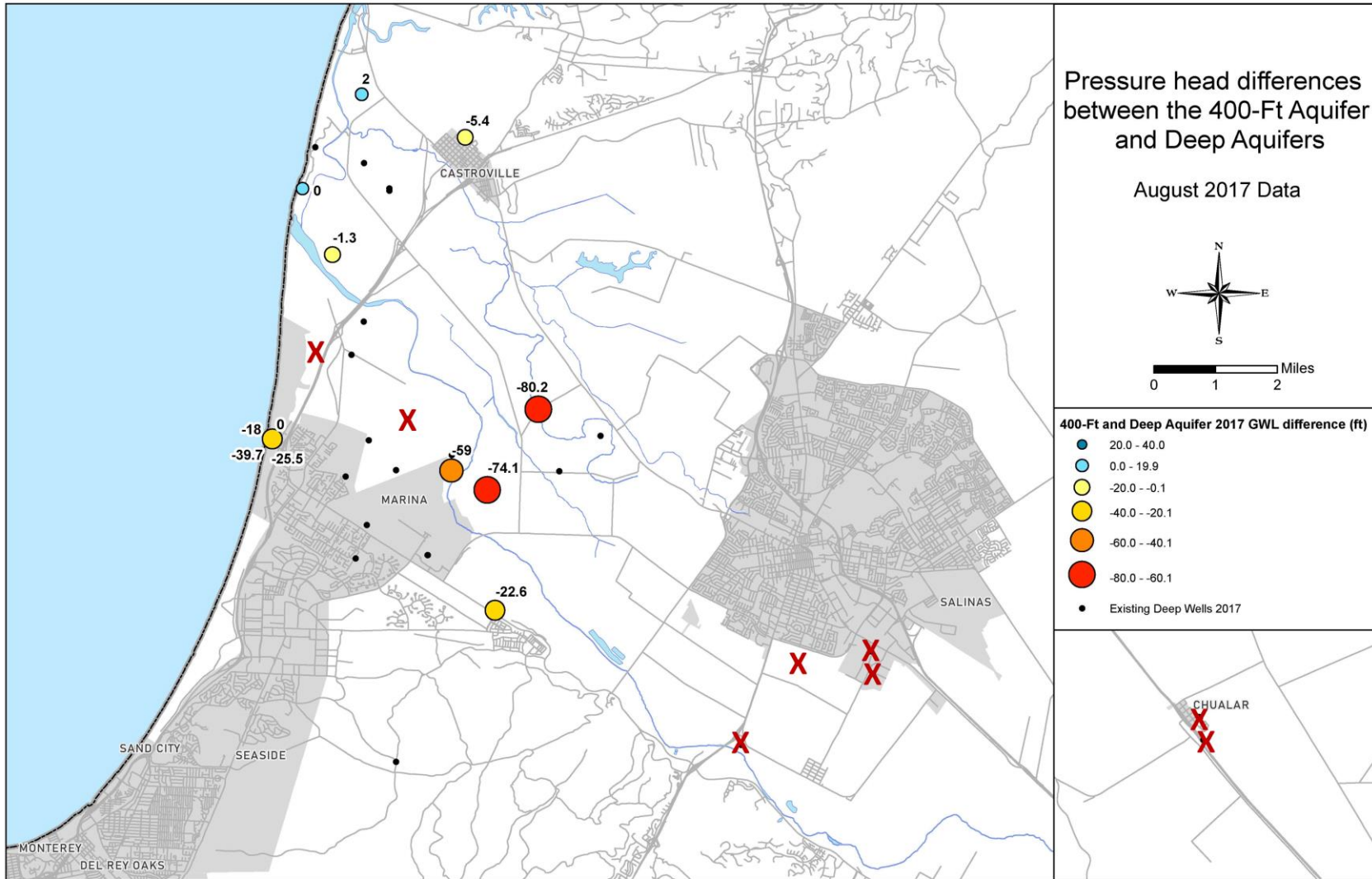


Figure G-14. August 2017 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

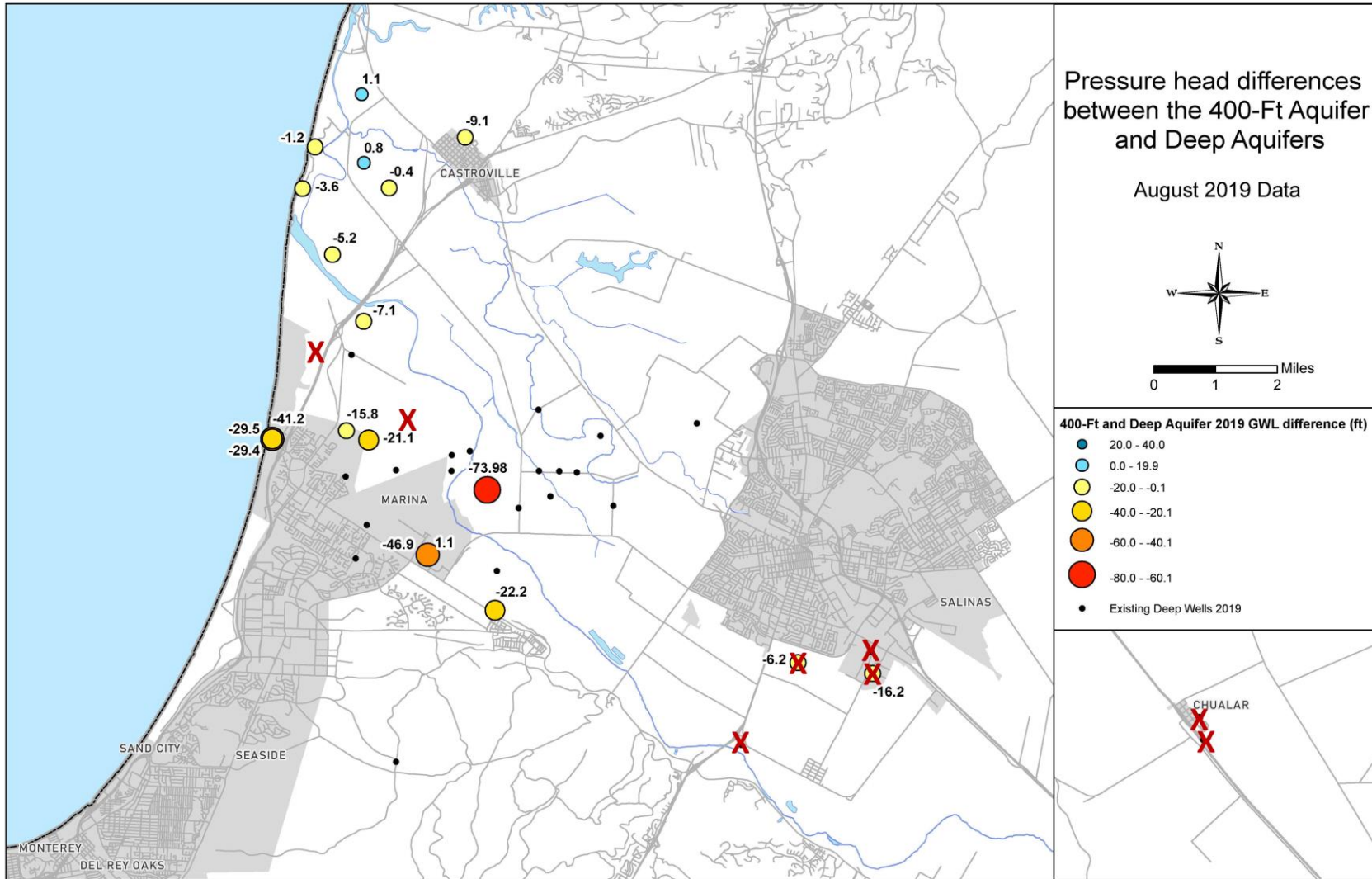


Figure G-15. August 2019 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

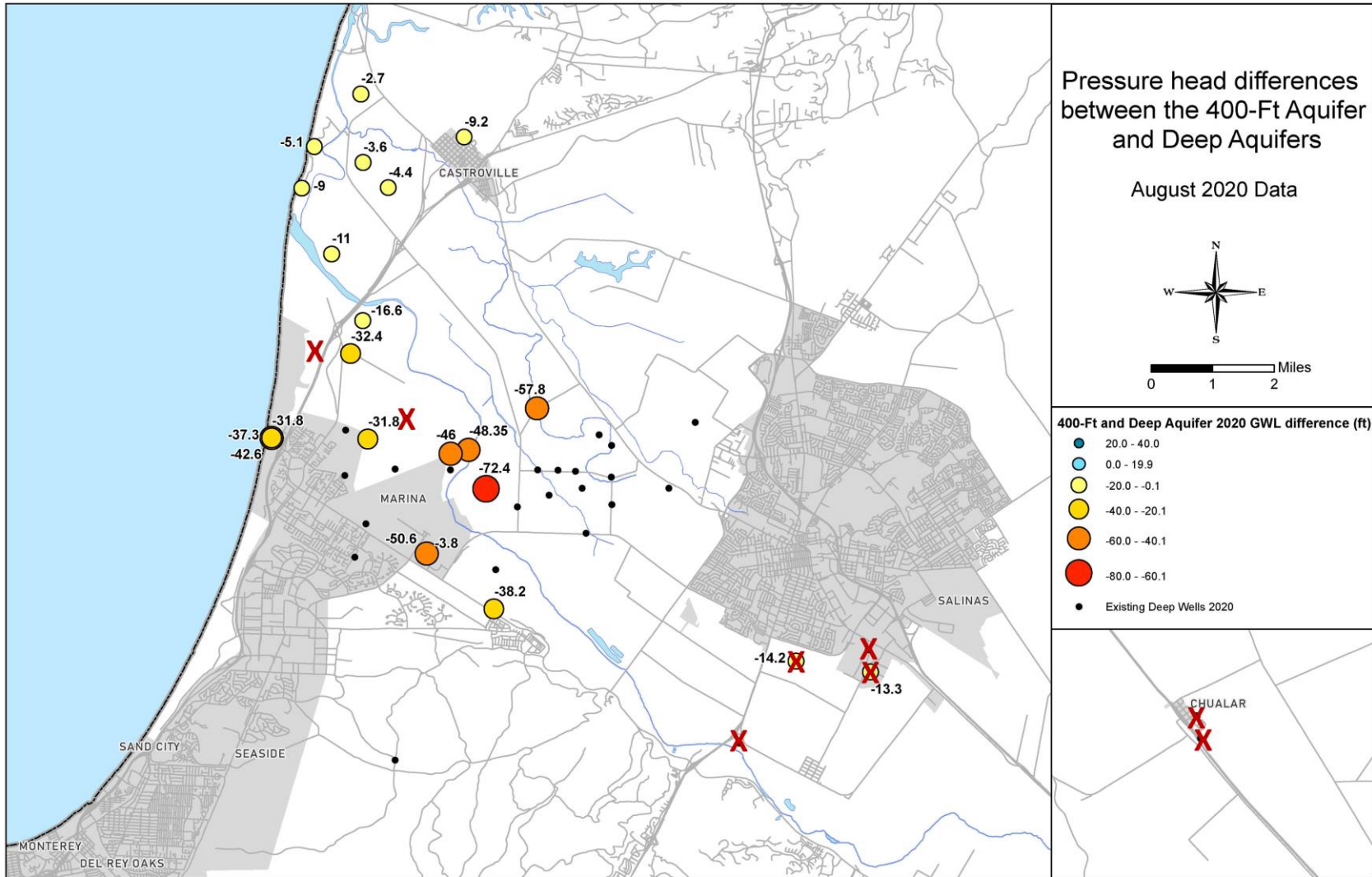


Figure G-16. August 2020 Pressure Head Difference Between the Deep Aquifers and 400-Foot Aquifer (red X marks wells no longer considered true Deep Aquifers wells based on the definition set forth in this Study; adapted from MCWRA, 2022, personal communication)

References

MCWRA (Monterey County Water Resources Agency). 2022. Personal Communication.