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November 25, 2019

Seaside Groundwater Basin
2019 Seawater Intrusion Analysis Report

Prepared for:

Seaside Groundwater Basin Watermaster

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EXECUTIVE SUMMARY

This report fulfills part of the annual reporting requirements contained in the Seaside Groundwater Basin Adjudication (California American Water v. City of Seaside, Monterey County Superior Court, Case Number M66343). The annual report addresses the potential for, and extent of, seawater intrusion in the Seaside Groundwater Basin.

Seawater intrusion may occur under basic hydrogeologic conditions as a wedge beneath fresh groundwater, or in more complex hydrogeology with various intrusion interfaces among the different aquifers. Continued pumping in excess of recharge and fresh water inflows, coastal groundwater levels well below sea level, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could occur in the Seaside Groundwater Basin.

Seawater intrusion is typically identified through regular chemical analyses of groundwater which can identify geochemical changes in response to seawater intrusion. No single analysis definitively identifies seawater intrusion, however by looking at various analyses we can ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in fresh water chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L). Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 mg/L. Common geochemical indicators of seawater intrusion are cation and anion ratios, chloride trends, sodium/chloride ratios, and electric induction logging.

Based on an evaluation of geochemical indicators for Water Year 2019 and prior, no seawater intrusion has historically been or is currently observed in existing monitoring and production wells in the Seaside Groundwater Basin. Even though seawater intrusion is not occurring, there are ongoing detrimental groundwater conditions that pose a potential threat of seawater intrusion. These are summarized below:

- Both the Paso Robles and Santa Margarita aquifers in the Seaside Groundwater Basin are susceptible to seawater intrusion. The Paso Robles aquifer is in direct hydrogeologic connection with Monterey Bay, and seawater will eventually flow into it if inland groundwater levels continue to be below sea level. The Santa Margarita aquifer may not be in direct connection with Monterey Bay. If that is the case, then seawater intrusion will take longer to appear because the pathway for seawater into that aquifer will be longer as seawater would need to move through the clay rich deposits adjacent to that aquifer before entering the aquifer itself and thereafter make its way into Santa Margarita production wells. It is not if, but when, seawater intrusion into these aquifers will occur if protective water elevations are not achieved.

- Deep groundwater in the Northern Coastal subarea continues to be below sea level. The Water Year 2019 2nd quarter (winter/spring) deep aquifer coastal groundwater levels are more than 12 feet below sea level and the 4th quarter (summer/fall) levels are more than 30 feet below sea level.
- Groundwater levels remain below protective elevations in all deep target monitoring wells (MSC deep, PCA-W deep, and sentinel well SBWM-3). Currently, MSC shallow one of the three shallow wells' groundwater levels are below protective elevations. Groundwater elevations at PCA-W shallow are just above its protective elevation, after falling below its protective elevation last fall.

Data which indicate that seawater intrusion is not occurring are described in the bulleted items below:

- All groundwater samples for Water Year 2019 from depth-discreet monitoring wells plot generally in a single cluster on Piper diagrams, with no water chemistry changes towards seawater.
- In some production wells, groundwater quality plot on Piper diagrams is different than the water quality in the monitoring wells. This may be a result of mixed water quality from both shallow and deep zones in which these wells are perforated. None of the production wells' groundwater qualities are indicative of seawater intrusion.
- None of the Stiff diagrams for monitoring and production wells show the characteristic chloride spike that typically indicates seawater intrusion in Stiff diagrams.
- Chloride concentration trends were stable for most monitoring wells. One monitoring well, FO-09 shallow, has sustained increased chloride concentrations in all three samples taken during Water Year 2019. The increase in concentrations from the previous year are between 20 and 30 mg/l. The increase is greater than fluctuations observed historically over the period of record. Elevated concentrations in themselves do not indicate seawater intrusion, however, this well should be carefully observed over the next year to determine if the increasing chloride concentrations are temporary or not.
- Sodium/chloride molar ratios in the monitoring wells remained constant or increased over the past year. Monitoring well FO-09 shallow experienced an increase in chloride as mentioned above, but its sodium/chloride ratio in Water Year 2019 is within the range of historical ratios and has not fallen below the 0.86 ratio that may identify seawater intrusion as the source of chloride as opposed to a domestic waste water source.
- Maps of chloride concentrations for the shallow aquifer do not show chlorides increasing towards the coast. The deep aquifer maps show that higher chloride concentrations are

limited to coastal monitoring wells PCA-West deep and MSC deep, but these are not indicative of seawater intrusion.

- Induction logging data at the coastal Sentinel Wells do not show historical or recent changes over time that are indicative of seawater intrusion.

Due to its distance from the coast, seawater intrusion is not an issue of concern in the Laguna Seca subarea. However, groundwater levels in the eastern Laguna Seca subarea have historically declined at rates of 0.6 feet per year in the shallow aquifers, and up to four feet per year in the deep aquifers. These declines have occurred since 2001, despite triennial reductions in allowable pumping. The cause of the declines is due in part to the Natural Safe Yield of the subarea being too high and in part due to the influence of wells to the east of the Seaside Basin. Although there was some stabilization in groundwater levels between Water Years 2014 and 2016, groundwater levels are continuing to decline. The rate of decline now, however, is less than 0.5 feet per year.

Native groundwater production in the Seaside Groundwater Basin for Water Year 2019 was 3,269.2 acre-feet, which is 94 acre-feet more than Water Year 2018. The amount of native groundwater pumped in Water Year 2019 is 91 acre-feet less than the Decision-ordered Operating Yield of 3,360 acre-feet per year that is required between October 1, 2017 and September 30, 2020.

Based on recent increases in chloride concentrations at monitoring well FO-9 shallow and its proximity to known intrusion in the Salinas Valley, it is recommended that groundwater quality results from it be reviewed after each sampling event to identify if the recent increases are part of natural fluctuations or an ongoing increasing trend. If the March 2020 sample has a greater concentration than this year’s highest concentration of 80 mg/L, it is recommended that its sampling frequency be increased to quarterly as a precaution.

With the exception of FO-09 shallow, data analyzed for this report did not deviate significantly from historical data. Therefore, besides the additional precautions recommended for the FO-09 shallow monitoring well, there are no additional recommendations on sampling frequencies.

As projects that recharge and recover water in the Basin are implemented, groundwater levels and thus groundwater flow directions will change, and possibly groundwater quality too. It is therefore important that data from new monitoring wells are reported to the Watermaster and taken into consideration in future SIARs. The first such project likely to be implemented is Pure Water Monterey. Monitoring well construction is underway and the Watermaster will identify wells that would provide the most useful information to be included in future SIARs.

1 BACKGROUND AND INTRODUCTION

Historical and persistent low groundwater elevations caused by pumping in the Seaside Groundwater Basin have led to concerns that seawater intrusion may threaten the Basin's groundwater resources. This report addresses the potential for, and extent of, seawater intrusion in the Seaside Groundwater Basin. The report first reviews seawater intrusion mechanisms, analyzes historical water quality data for indications of seawater intrusion in the Seaside Groundwater Basin, and finally reaches conclusions on the extent of seawater intrusion and proposes recommendations for continued monitoring.

This report fulfills part of the annual reporting requirements contained in the Seaside Groundwater Basin Adjudication (California American Water v. City of Seaside, Monterey County Superior Court, Case Number M66343). The analyses in this report were developed by HydroMetrics Water Resources Inc. of Oakland, CA, in cooperation with members of the Watermaster Technical Advisory Committee (TAC). Staff from the Monterey County Water Resources Agency (MWCRA) and Monterey Peninsula Water Management District (MPWMD) provided invaluable assistance, data, and review during the preparation of this report.

This report is the eleventh in a series of Seawater Intrusion Analysis Reports (SIAR) which are produced annually by the Watermaster. It builds on the work performed in the preceding SIARs.

1.1 Overview of Seawater Intrusion

Seawater intrusion is a threat to many coastal groundwater basins along the California Coast. It has been observed and documented in a number of groundwater basins in both southern and central California.

In general, groundwater in coastal basins flows from recharge areas in local highlands towards discharge areas along the coast. In most undeveloped coastal groundwater basins there is a net outflow of fresh water into the ocean. Seawater intrusion occurs when the outflow of freshwater ceases and seawater flows into the groundwater basin from the ocean.

In the simplest condition, seawater intrudes as a wedge beneath the fresh groundwater (Figure 1). This wedge shape is a result of seawater being denser than freshwater.

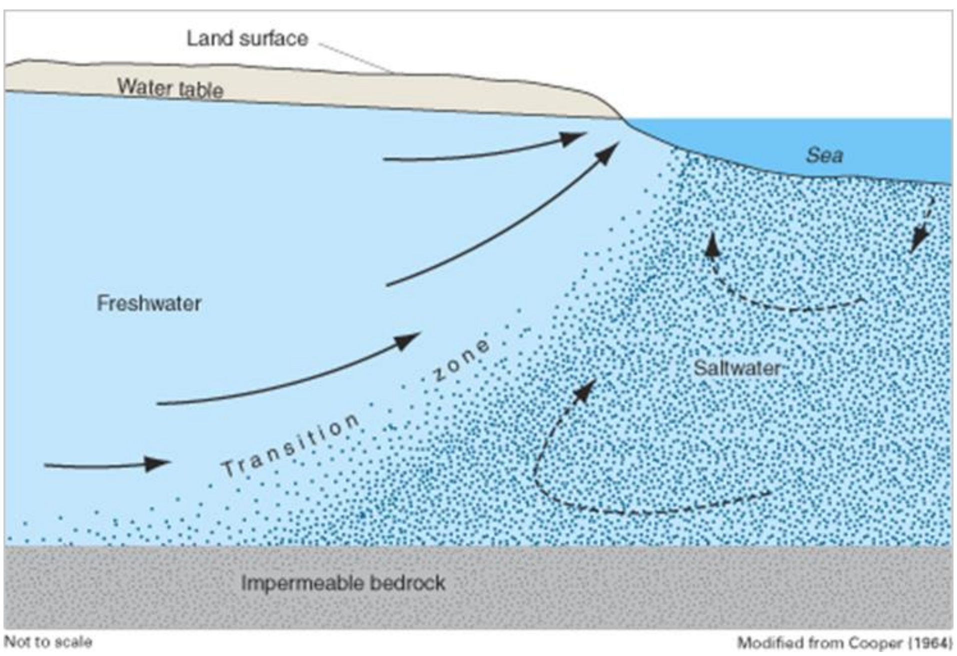

Figure 1. Seawater Wedge in a Simple Coastal Aquifer (from Barlow, 2003)

In more complex, layered groundwater systems, the location of the seawater/freshwater interface may vary among the different aquifers. Such a situation is illustrated on Figure 2. Figure 2 shows a series of aquifers in blue, which transmit water easily. The aquifers are separated by a series of tan aquitards, which transmit water relatively slowly. Each aquifer has a unique rate of outflow to the ocean, and therefore a unique location of the seawater interface. In these more complex situations, the locations of the seawater/freshwater interfaces are a complex function of the horizontal groundwater gradient in each aquifer, the aquifer hydraulic conductivities, and the vertical conductivity of the inter-layer aquitards.

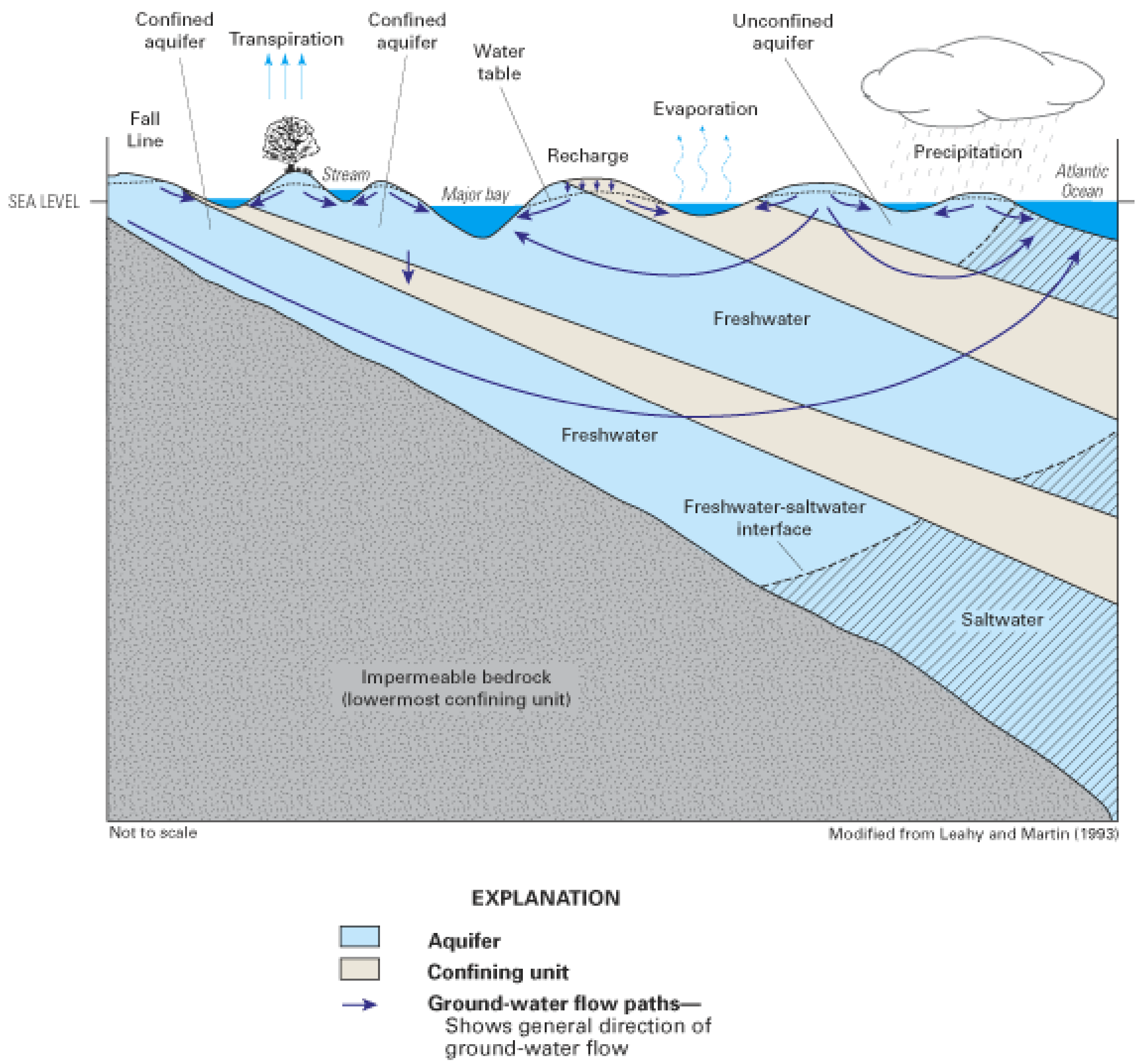

Figure 2. Seawater Wedge in a Layered Coastal Aquifer (from Barlow, 2003)

Figure 2 shows that under non-pumping conditions, the seawater interface in confined units can be located farther offshore than in surficial unconfined aquifers. The fresh water in an unconfined aquifer can flow readily into the ocean, allowing the seawater interface to exist near shore. Fresh water in the lower confined aquifers must seep out slowly through the overlying confining units. The slow seepage rates allow the fresh water to maintain pressure beneath the sea floor, pushing the seawater interface away from the coastline.

1.2 Groundwater Pumping and Seawater Intrusion

Pumping groundwater in a coastal aquifer reduces the amount of water discharging to the ocean. Sufficient pumping can eliminate ocean discharges, either locally or basin-wide, triggering seawater intrusion. The response of the seawater interface to groundwater pumping is manifested in two related ways: upconing and interface migration. Upconing refers to the ability of a pumping well to draw seawater up from below. Upconing only occurs if seawater exists directly below a pumping well. Because no seawater intrusion has been observed in the Seaside Groundwater Basin, upconing cannot occur, and only seawater interface migration will be further addressed in this report.

As mentioned earlier, groundwater pumping reduces the amount of fresh water outflow to the ocean. This allows the interface to migrate shoreward. Substantial pumping can allow the interface to move onshore, potentially impacting municipal wells, private wells, or agricultural wells. Figure 3 shows a two-dimensional cross section of how the fresh water/seawater interface may migrate in response to pumping.

As can be inferred from Figure 3, the degree of interface migration depends on the amount of water pumped from a particular aquifer, as well as the amount of leakage from overlying or underlying aquifers. Groundwater extracted from the lowest aquifer might be replaced by rainfall recharge, by seawater migrating shoreward, or by groundwater leaking from the overlying aquifer.

An additional issue that must be considered with seawater interface migration is the initial location of the seawater interface. An interface that starts far from the shore may take a considerable amount of time, often on the order of decades, to reach any production or monitoring well. Furthermore, the farther the interface is from the pumping well, the more area is available for fresh water to leak from overlying aquifers into the producing aquifer. This slows, or may completely stop, seawater intrusion in the pumped aquifer. Downward leakage, however, removes fresh water from overlying aquifers. This leakage may therefore exacerbate seawater intrusion in the overlying aquifer.

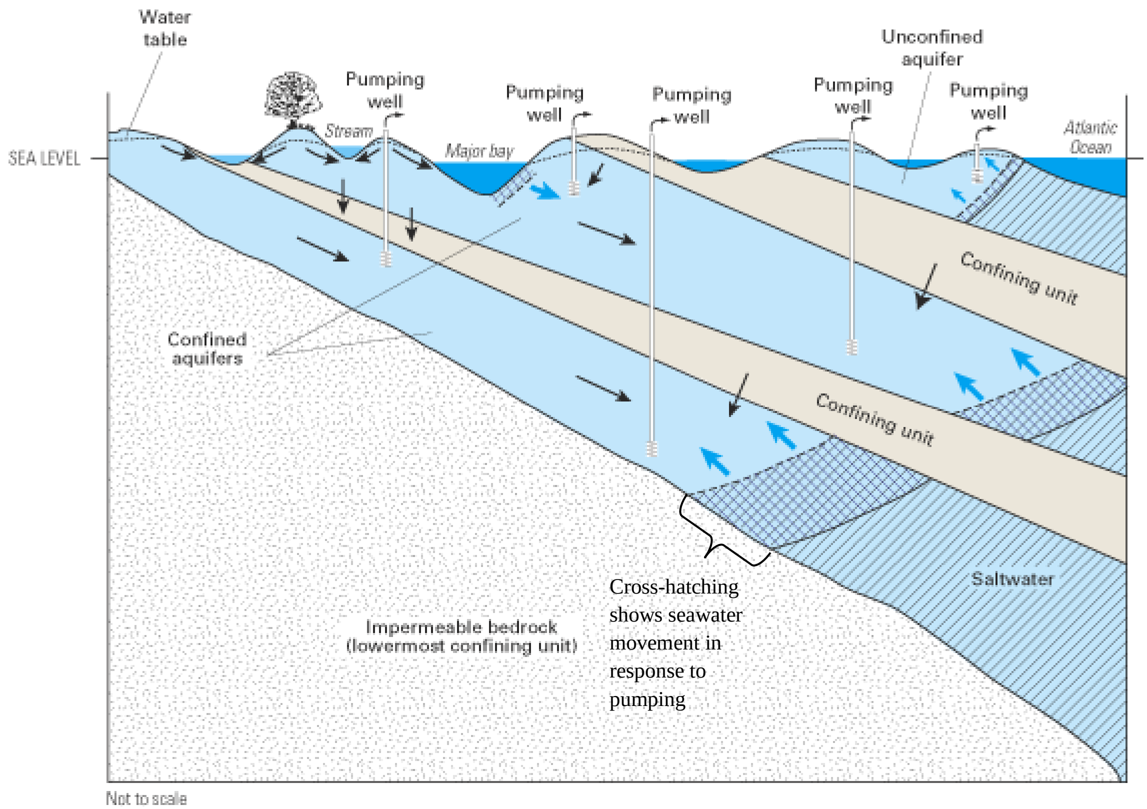

Figure 3. Interface Migration in Response to Groundwater Pumping
(from Barlow, 2003)

1.3 Indicators of Seawater Intrusion

Seawater intrusion is generally identified through chemical analyses of groundwater. Groundwater levels below or near sea level indicate an opportunity for seawater intrusion, but the actual seawater intrusion is indicated by various geochemical changes in groundwater.

No single analysis definitively identifies seawater intrusion, however by looking at various analyses we can ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in fresh water chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L) (Richter and Kreitler, 1993). Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 mg/L

Common geochemical indicators of seawater intrusion are discussed, and example analyses are presented, in the following sections.

1.3.1 Cation/Anion Ratios

Molar ratios of cations and anions can prove distinctive for various groundwater systems. Seawater intrusion is often indicated by graphically analyzing shifts in these molar ratios. Two common graphical techniques for these analyses are Piper diagrams and Stiff diagrams.

1.3.1.1 Piper Diagrams

Example Piper diagrams are shown for data from the Pajaro Valley and Salinas Valley on Figure 4 and Figure 5, respectively. These figures are included to demonstrate the utility of Piper diagrams, and show how they have been used in nearby basins. These figures are not provided for directly comparing data between basins; groundwater quality trends in one basin will not necessarily correlate with trends in other basins.

On these Piper diagrams, the relative abundances of individual cations and anions are plotted in the left and right triangles, respectively, and their combined distribution is plotted in the central diamond. Waters from similar or related sources will generally plot together. The mixture of two waters will generally plot along a straight line between the two end-member types within the central diamond. The trend towards seawater intrusion, however, often plots along a curved path as shown on Figure 4. The red arrows track the evolution of water chemistry from freshwater to seawater. Often only the first, upward leg of this curve is observed, because wells become too saline to use before reaching the downward leg, and sampling is usually discontinued.

1.3.1.2 Stiff Diagrams

Example Stiff diagrams from the Salinas Valley are shown on Figure 6 and Figure 7. These figures are included to demonstrate the utility of Stiff diagrams, and show how they have been used in nearby basins. On Stiff diagrams, the relative abundances of individual cations are plotted on the left side of the graph, and the relative abundances of anions are plotted on the right side of the graph. Waters with similar chemistries will have similarly shaped Stiff diagrams.

Figure 6 shows Stiff diagrams characteristic of the unintruded portions of the Salinas Valley Pressure 400-Foot Aquifer. By contrast, Figure 7 shows Stiff diagrams from the intruded portion of the Salinas Valley Pressure 400-Foot Aquifer. The significantly higher chloride levels in the intruded aquifer result in the noticeable spike at the upper right-hand side of the Stiff diagrams on Figure 7. This spike is indicative of incipient seawater intrusion.

The Stiff diagrams shown on Figure 7 are from wells that have acknowledged seawater intrusion, based on multiple lines of evidence. The Stiff diagrams alone are often not sufficient to identify seawater intrusion because there is no standard for Stiff diagram shapes; the diagrams are most useful as a comparative tool, showing the evolution of water chemistry over time and space. The shape of these Stiff diagrams is considered indicative of seawater intrusion in Salinas Valley only because considerable data analyses have shown that locally, Stiff diagrams adopt this shape as seawater encroaches.

The Stiff diagrams of seawater intruded wells shown on Figure 7 show calcium concentrations greater than sodium concentrations, in spite of the fact that sodium in the dominant cation in seawater. Incipient seawater intrusion is often characterized by increasing calcium and decreasing sodium, due to cation exchange between sodium and calcium on the aquifer material. This concept is discussed further on page 13.

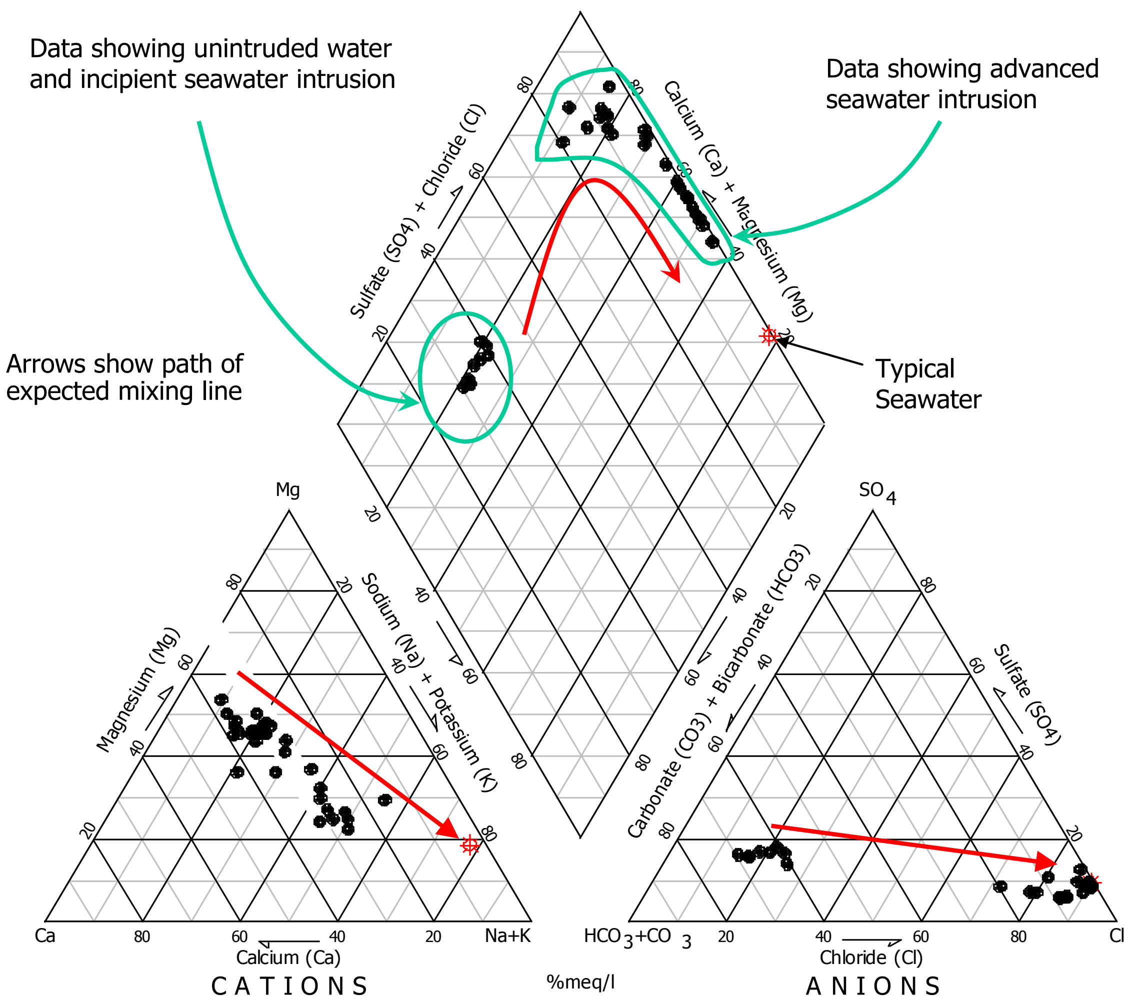

Figure 4. Piper Diagram for Groundwater in Pajaro Valley
(Data source: PVWMA)

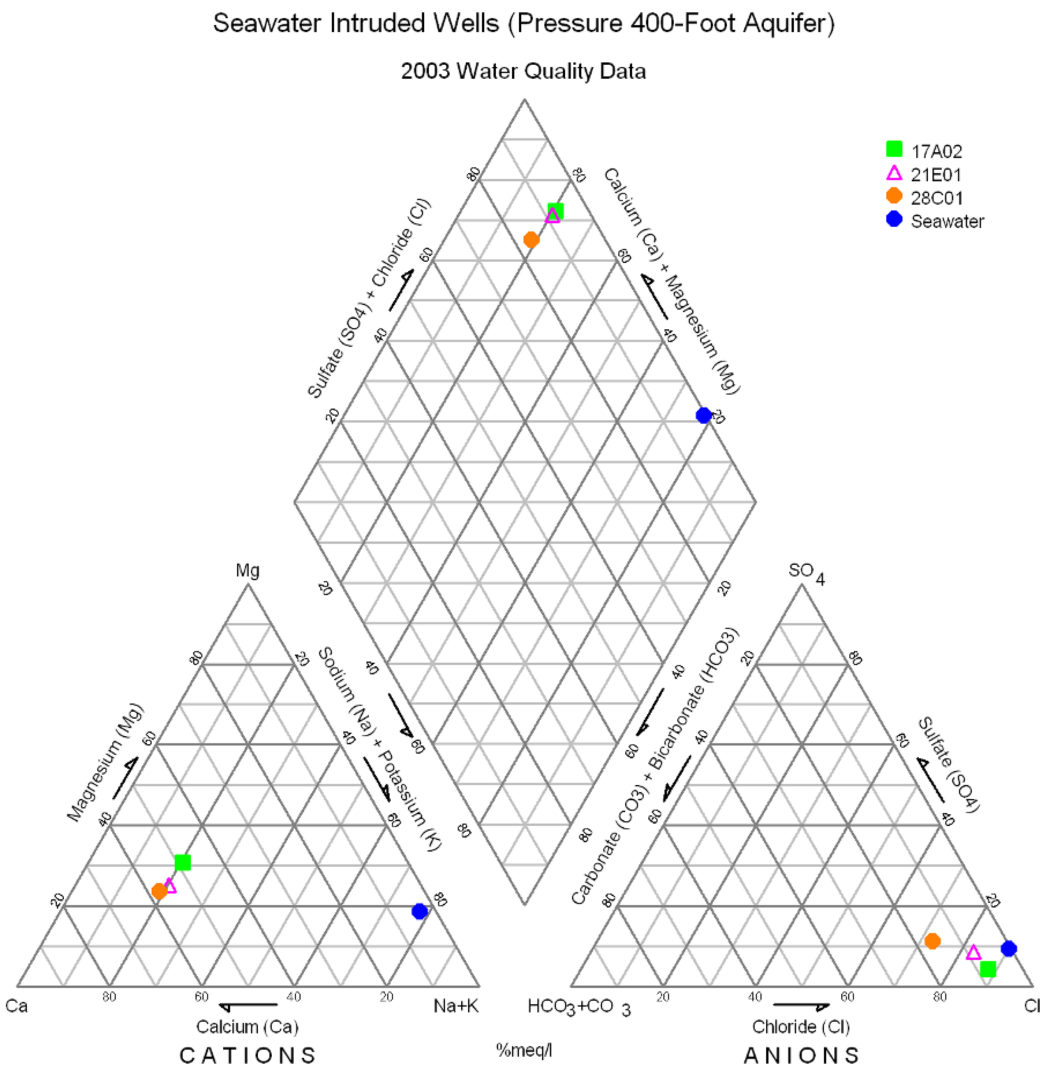

Figure 5. Piper Diagram for Groundwater in Salinas Valley
(Source: MCWRA)

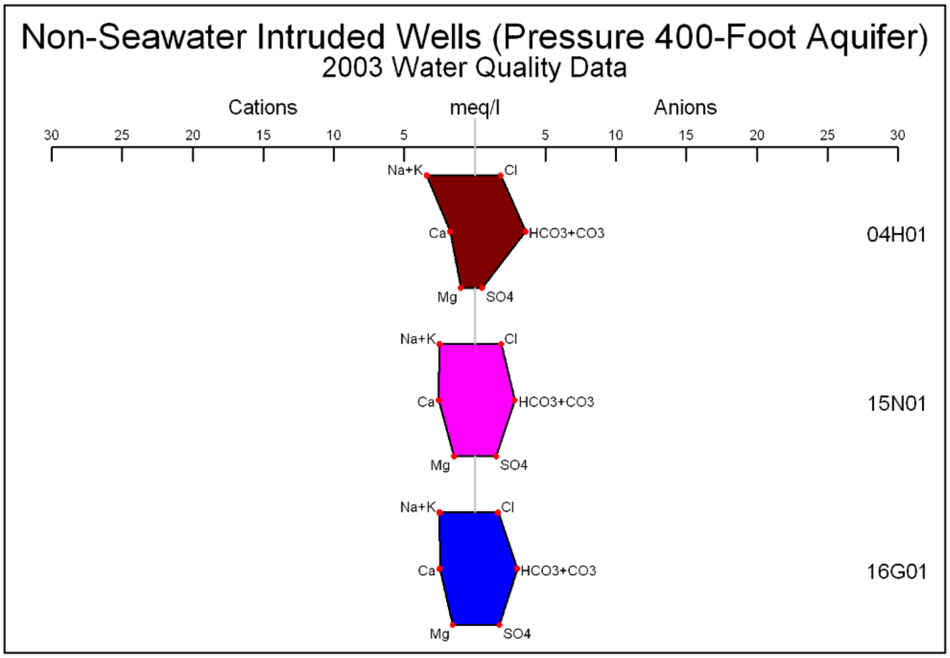

Figure 6. Stiff Diagrams from Salinas Valley Wells without Seawater Intrusion (Source: MWCRA)

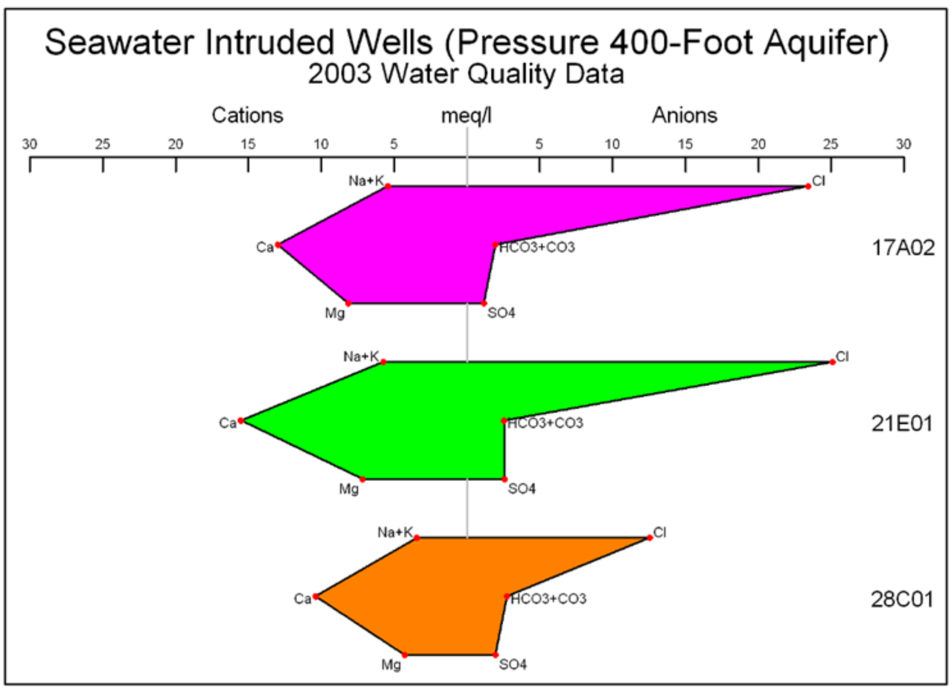

Figure 7. Stiff Diagrams from Salinas Valley Wells with Seawater Intrusion (Source: MWCRA)

1.3.2 Increasing Chloride Concentrations

Seawater is chloride rich, whereas bicarbonate or sulfate are the dominant anions in many groundwater systems. Steadily increasing chloride concentrations over time is the one of the most commonly used indicators of seawater intrusion. At low chloride concentrations, trends are often as important as absolute concentrations because of natural variations in groundwater chemistry. As an example, in 2004 the coastal shallow Pacific Cement Aggregates (PCA) West well had a chloride concentration of 46 mg/L, whereas the much more inland well 2701882-016, located in the Laguna Seca subarea, had a chloride concentration of 225 mg/L. The higher chloride concentration in well 2701882-016 is fairly consistent, showing no increasing trend, and is clearly not an indicator of seawater intrusion.

Example graphs showing historical chloride concentration increases indicative of seawater intrusion are shown on Figure 8 and Figure 9. Figure 8 graphs steadily increasing chloride concentrations in a shallow well in the Salinas Valley. Figure 9 graphs increasing chloride concentrations in a well in the Pajaro Valley. Both of these graphs show that the rise in chlorides is a lengthy and persistent process; chloride concentrations began to increase in the representative Salinas Valley well in 1982, and took six years before exceeding the Safe Drinking Water Act secondary drinking water standard of 250 mg/L. This long-term and relatively slow increase in chlorides suggests that while chloride concentrations are strongly indicative of seawater intrusion, it often takes time for the increasing chloride trend to be recognizable.

1.3.3 Sodium/Chloride Molar Ratios

As mentioned earlier in this report, sodium often replaces calcium on the aquifer matrix through ion exchange in advance of the seawater front. This effectively removes sodium from the water, and sodium/chloride ratios drop in advance of the seawater front. This can sometimes be used as an early indicator of seawater intrusion. Sodium/chloride ratios can also be used to differentiate between seawater intrusion and other sources of saltwater. Jones et al. (1999) suggest that sodium/chloride ratios in advance of a seawater intrusion front will be below 0.86 (molar ratio). This distinguishes seawater intrusion from domestic waste water, which typically has sodium/chloride ratios above 1.

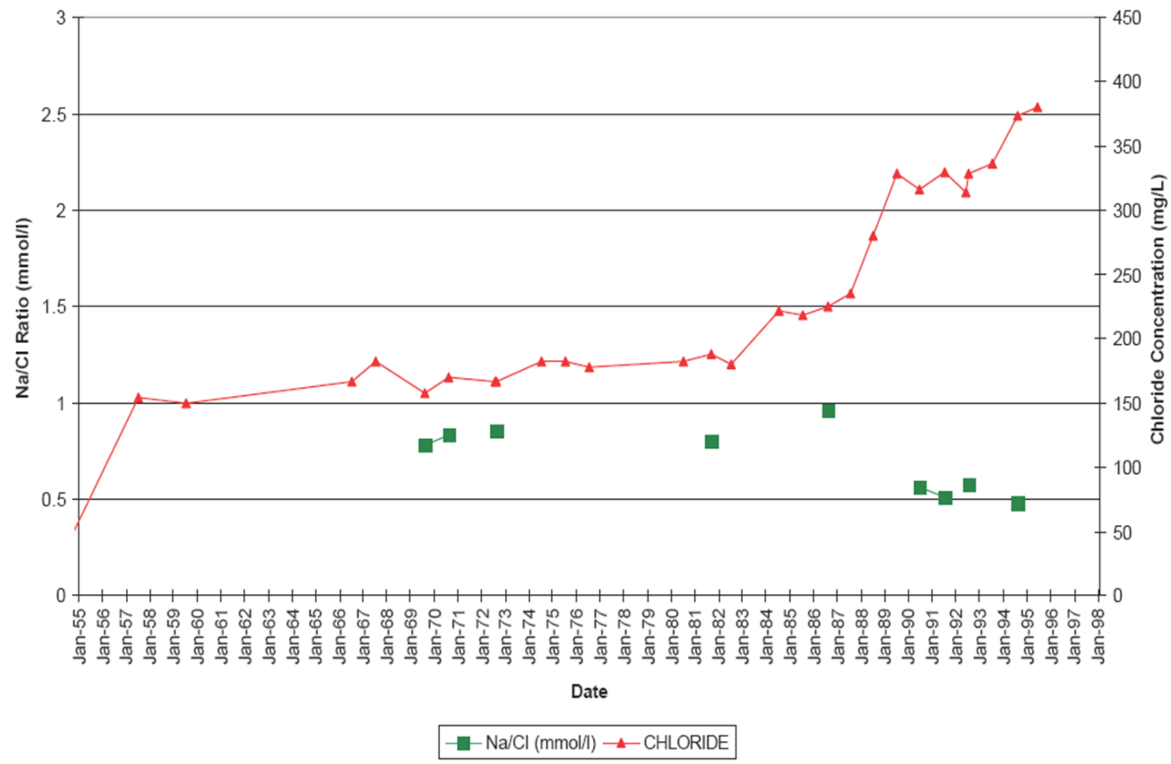

Figure 8. Historical Chloride Concentrations and Sodium/Chloride Ratios for a Well in Salinas Valley Showing Incipient Intrusion (Source: MCWRA)

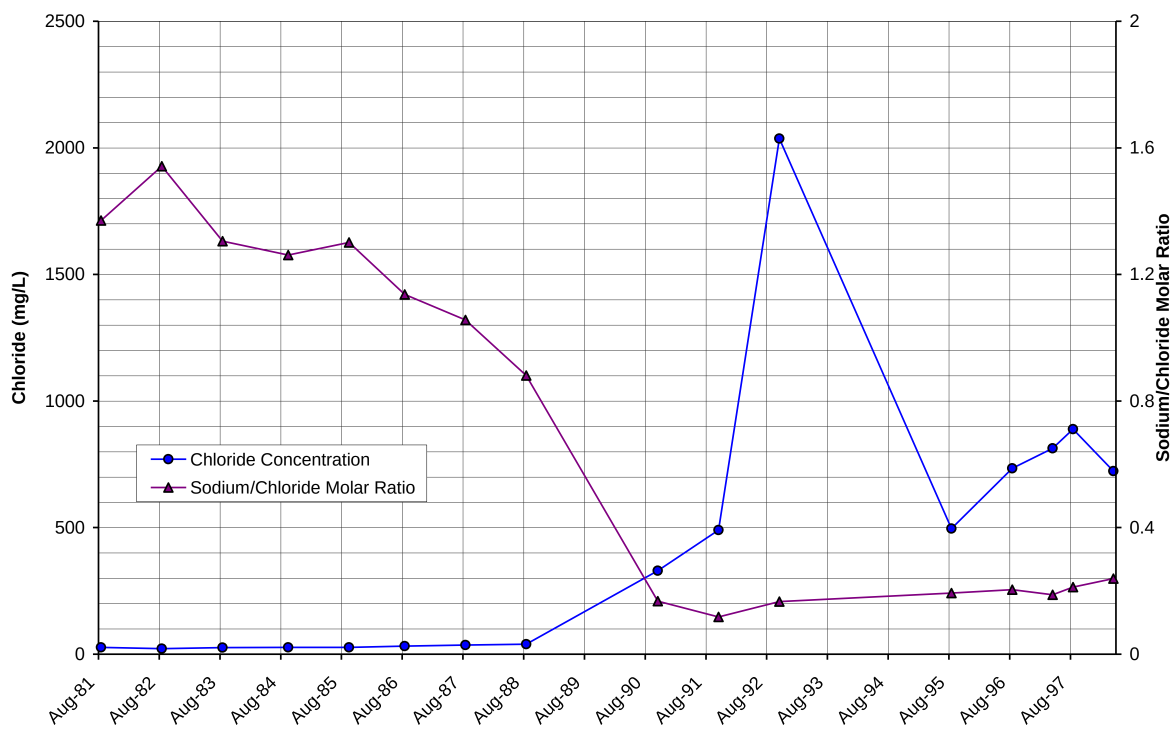

Figure 9. Historical Chloride Concentrations and Sodium/Chloride Ratios for a Well in Pajaro Valley Showing Incipient Intrusion (Data source: PVWMA)

In addition to plotting increasing chloride concentrations, decreasing sodium/chloride ratios are plotted on Figure 8 and Figure 9. The strong correlation between the two indicators of seawater intrusion can be observed on these two figures. The potential utility of sodium/chloride ratios as an early indicator of seawater intrusion is shown on Figure 9. This figure shows that by August 1988, chloride concentrations in the Pajaro Valley well had remained relatively constant, yet sodium/chloride ratios were beginning to drop, suggesting incipient seawater intrusion. By September 1990, the rising chloride levels can be clearly correlated to dropping sodium/chloride ratios; definitively associating the high chlorides with seawater intrusion.

1.3.4 Chloride-Bicarbonate Ratios

The ratio of chloride to bicarbonate-plus-carbonate contrasts the relative abundance of the dominant seawater and freshwater anions. As a ratio of concentrations expressed in mg/L, the ratio for seawater exceeds 100 and values for groundwater unaffected by seawater are generally less than 0.3. For groundwater with relatively low total dissolved solids, this ratio provides little benefit over evaluating chloride concentrations alone; and therefore is not used in the current analyses.

1.3.5 Electric Induction Logs

Changes in formation salinity can be measured from within a well using electric induction logging. Induction logging within the well measures the fluid conductivity within the adjacent formation up to a distance of three feet from the well casing. This technique can be used in wells that are completed with PVC casings and screens.

This method can be used as a cost-effective method of detecting seawater intrusion by measuring the electrical conductivity of the formation throughout the depth of the well. If over time, the conductivity increases relative to the baseline value, it could indicate seawater intrusion. One limitation of this method is that it does not provide concentrations of chloride or other ions that contribute to salinity. Therefore, the use of electric induction logs can only be used qualitatively.

Induction logging has been performed on the Watermaster's coastal Sentinel Wells since their completion in 2007.

1.3.6 Other Indicators

Hem (1989) suggested several other indicators for seawater intrusion, including the concentration ratio of calcium to magnesium (approximately 0.3 in seawater and greater in fresh water); the percentage of sulfate among all ions (approximately 8 percent in seawater and larger in fresh water); and the concentrations of minor constituents such as iodide, bromide, boron, and barium. These other indicators are not used in the current analyses for two reasons:

1. The analyses presented in the following sections overwhelmingly suggest that seawater intrusion has not advanced onshore in the Seaside Groundwater Basin.
2. No historical data exists for the minor constituents such as iodide and barium; and only limited historical data exist for bromide and boron. It should be noted that since 2012, the Watermaster has been analyzing samples from selected coastal monitoring and production wells for iodide, bromide, boron, and barium.

Using the other indicators mentioned above is not necessary in light of there being other methods available for indicating seawater intrusion, as discussed in the preceding sections. Should the other methods start showing seawater intrusion, the minor constituents of iodide, bromide, boron, and/or barium will be included in future water quality analyses so that they can be used as supplemental indicators.

2 SEAWATER INTRUSION IN THE SEASIDE GROUNDWATER BASIN

The geochemical criteria discussed above, along with various maps showing spatial distributions of concentrations, can be used to estimate the presence or lack of seawater intrusion in the Seaside Groundwater Basin. While no single analysis is a definitive indicator of seawater intrusion, the combined weight of all analyses may be instrumental in detecting seawater intrusion.

2.1 Analysis Approach

As was used in previous Seawater Intrusion Analysis Reports (RBF, 2007; HydroMetrics LLC, 2008; HydroMetrics LLC, 2009a; HydroMetrics WRI, 2010; HydroMetrics WRI, 2011; HydroMetrics WRI, 2012a; HydroMetrics WRI, 2013a; HydroMetrics WRI, 2014; HydroMetrics WRI, 2015; HydroMetrics WRI, 2016b; HydroMetrics WRI, 2017b, Montgomery & Associates, 2018b), this SIAR includes a number of approaches to evaluate seawater intrusion. Results from all groundwater quality testing in WY2019 are included in Appendix A.

Data for the 2nd quarter of Water Year 2019 (sampled and measured January-March 2019) and 4th quarter of Water Year 2019 (sampled and measured July-September 2019) were analyzed and mapped to show the spatial distribution of groundwater quality and groundwater elevations. In addition to spatial mapping, historical data are graphed to assess geochemical trends. Data from the 2nd quarter represents conditions during the wet time of the year; data from the 4th quarter represents conditions during the dry time of the year. In some cases when samples or measurements are not collected strictly within the 2nd or 4th quarter, the quarter in which they were collected is provided with the data.

Where possible, analyses are separated by depth zone. Two depth zones have been chosen, following the system of Yates et al. (2005). Wells assigned to the shallow depth zone generally correlate to the Paso Robles Formation where it exists. This shallow zone is roughly at the same depth as the Salinas Valley Pressure 400-Foot Aquifer. Wells assigned to the deep zone correlate with the Santa Margarita Sandstone where it exists in the Seaside Groundwater Basin. The deep zone is roughly at the same depth as the Salinas Valley Pressure Deep Aquifers.

2.2 Cation/Anion Ratios

For Water Year 2019, 12 monitoring wells and 16 production wells were used for geochemical trend analyses. Locations of all monitoring and production wells used in the SIAR analysis are shown on Figure 10. Some of the production wells that were included in previous years' analysis are not included in the analysis this year because they have not been pumped during the year and thus not sampled. Groundwater quality data are no longer collected in the Sentinel Wells for seawater intrusion analysis because in early 2017, it was concluded that groundwater samples collected using the low flow sampler were more representative of water within the well casing and not from the groundwater in the aquifer surrounding the well.

Eleven monitoring wells used in this analysis represent one or both well pairs from the MPWMD monitoring well network and one is an observation well (Figure 10). A well pair comprises two wells drilled in close proximity to one another: one perforated in the shallow zone and the other perforated in the deep zone. Each well pair is represented with a unique color and symbol on Piper and Stiff diagrams. The shallow well of each pair is represented by a filled square on the Piper diagrams; the deep well of each pair is represented by a filled circle on the Piper diagrams.

The production wells included in the analysis are water purveyor wells that are sampled annually for general inorganic minerals per the Seaside Basin Monitoring and Management Program (Seaside Groundwater Basin Watermaster, 2006). The current schedule includes sampling selected coastal monitoring wells quarterly. All other monitoring and production wells are sampled annually during the 4^{th} quarter. Where samples are not available for analysis, the text and figures indicate as such.

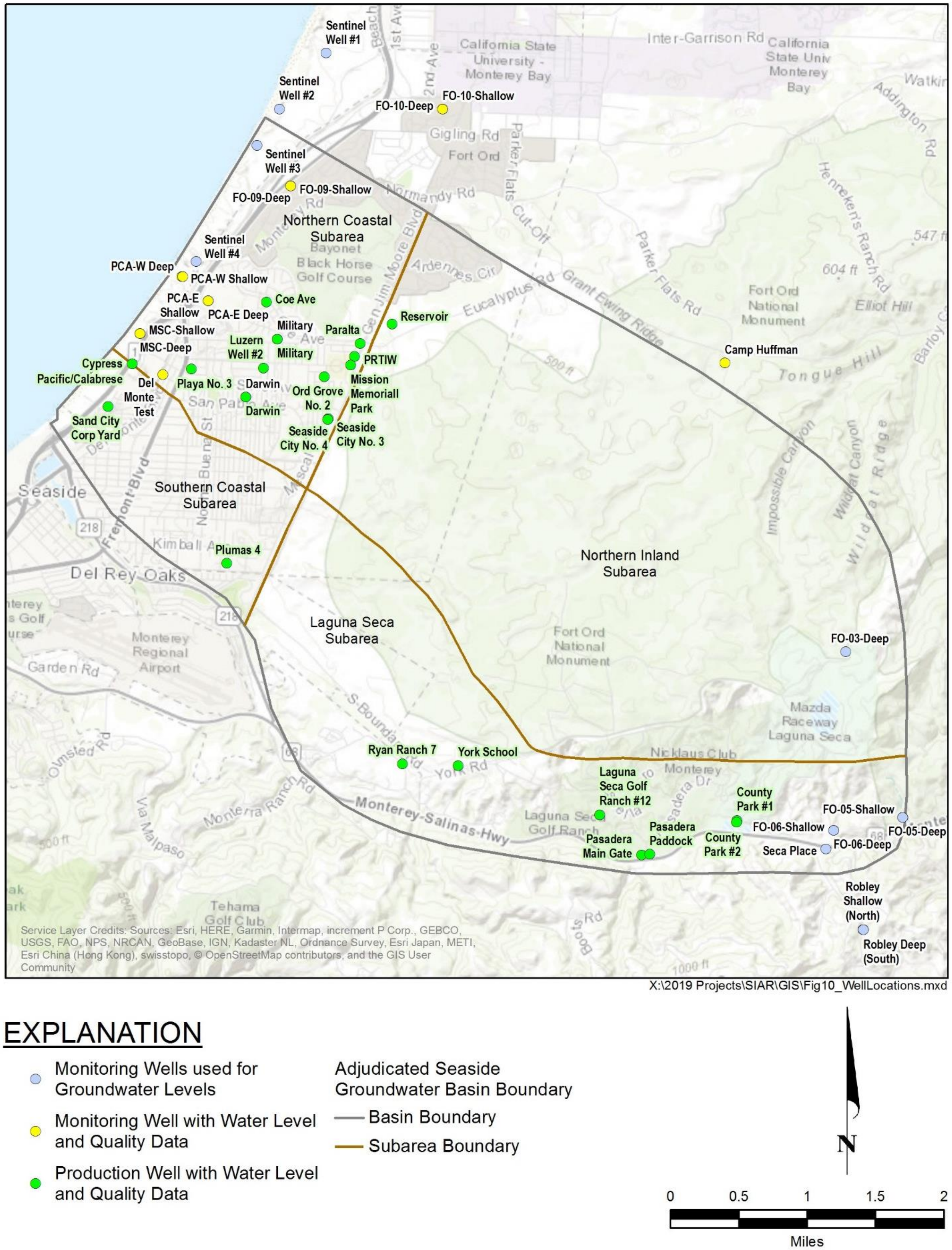

Figure 10. Wells Used for Seawater Intrusion Analyses

2.2.1 Second Quarter Water Year 2019 (January-March 2019)

A Piper diagram displaying analyses from six monitoring wells in the Seaside Groundwater Basin for the 2nd quarter Water Year 2019 (January-March 2019) is shown on Figure 11. Analyses from only six wells are shown because the Sentinel Wells are no longer sampled for groundwater quality (only used for induction logging), and most of the monitoring well pairs are not sampled during this quarter; they are only sampled annually in the 4th quarter. Appendix C includes individual Piper diagrams for each well to track their chemistry over time.

The monitoring wells generally cluster in a single area on the Piper diagram that is consistent with previous data. The location on the Piper diagram indicates that groundwater from both the deep and shallow well pairs straddle the sodium-chloride and sodium-bicarbonate type water[1]. On Figure 11, monitoring well FO-9 shallow plots slightly differently than the other wells on the Piper diagram. For more detail on this well, Appendix D: Figure D-11 shows that the last three samples from this well all sampled within this water year indicate a greater concentration of chloride anions than in previous water years.

Stiff diagrams for the monitoring wells sampled during the 2nd quarter of Water Year 2019 are shown in the left column on Figure 12 through Figure 14. None of the Stiff diagrams show the high chloride spike shown on Figure 7 that indicates seawater intrusion, this includes FO-9 shallow which has shown a recent change in chloride anions, as mentioned in the above paragraph.

[1] Where the data points fall in the Piper diagram triangle for anions and the triangle for cations determines the type of water. For example, if the points plot in the lower right corner of the anion triangle, the water is classed as chloride type water.

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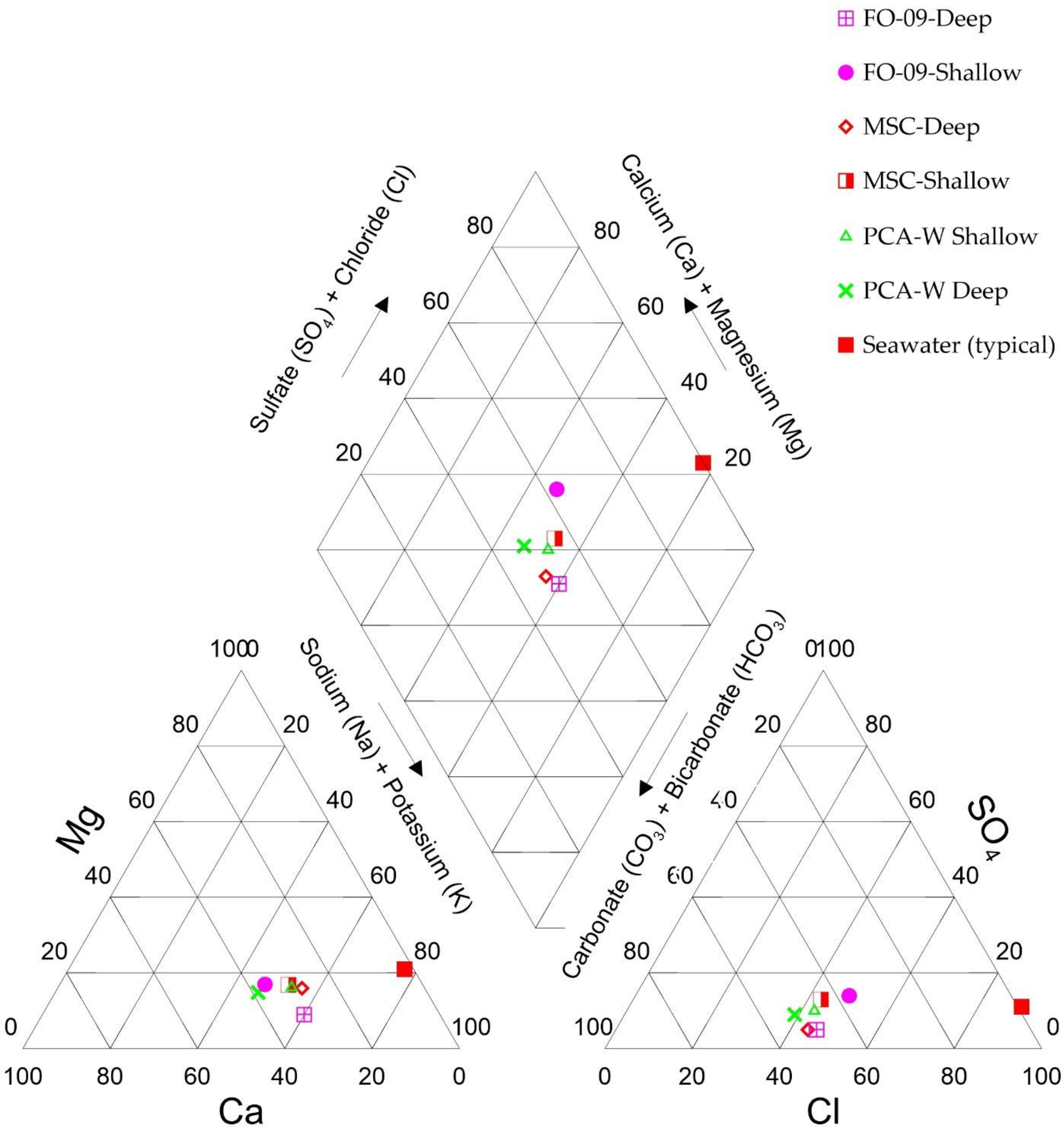

Figure 11. Piper Diagram for Seaside Groundwater Basin Monitoring Wells,
2nd Quarter Water Year 2019 (January-March 2019)
(Data source: Watermaster)

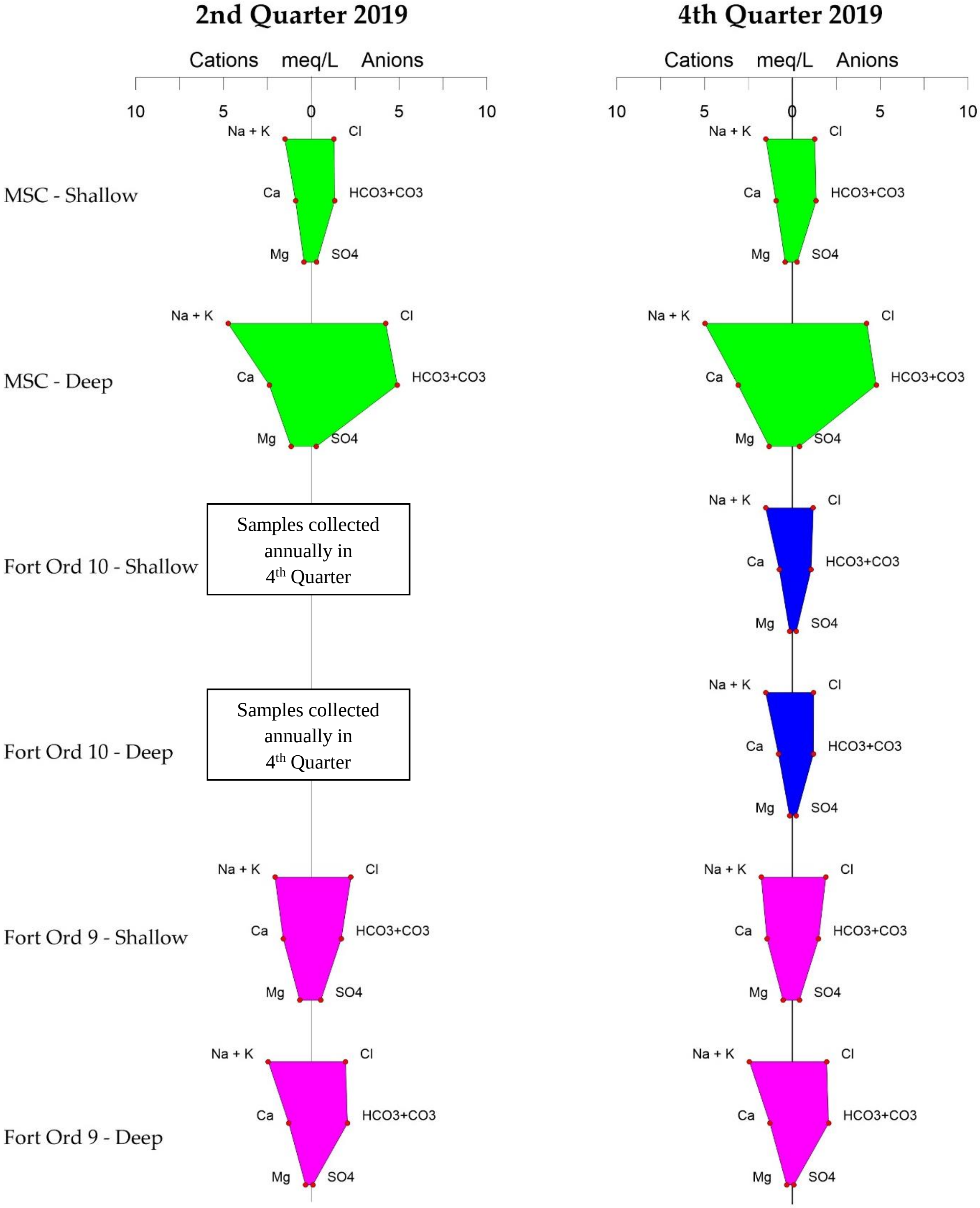

Figure 12. Stiff Diagrams for MSC, Fort Ord 9, and Fort Ord 10 Wells
(Data source: Watermaster)

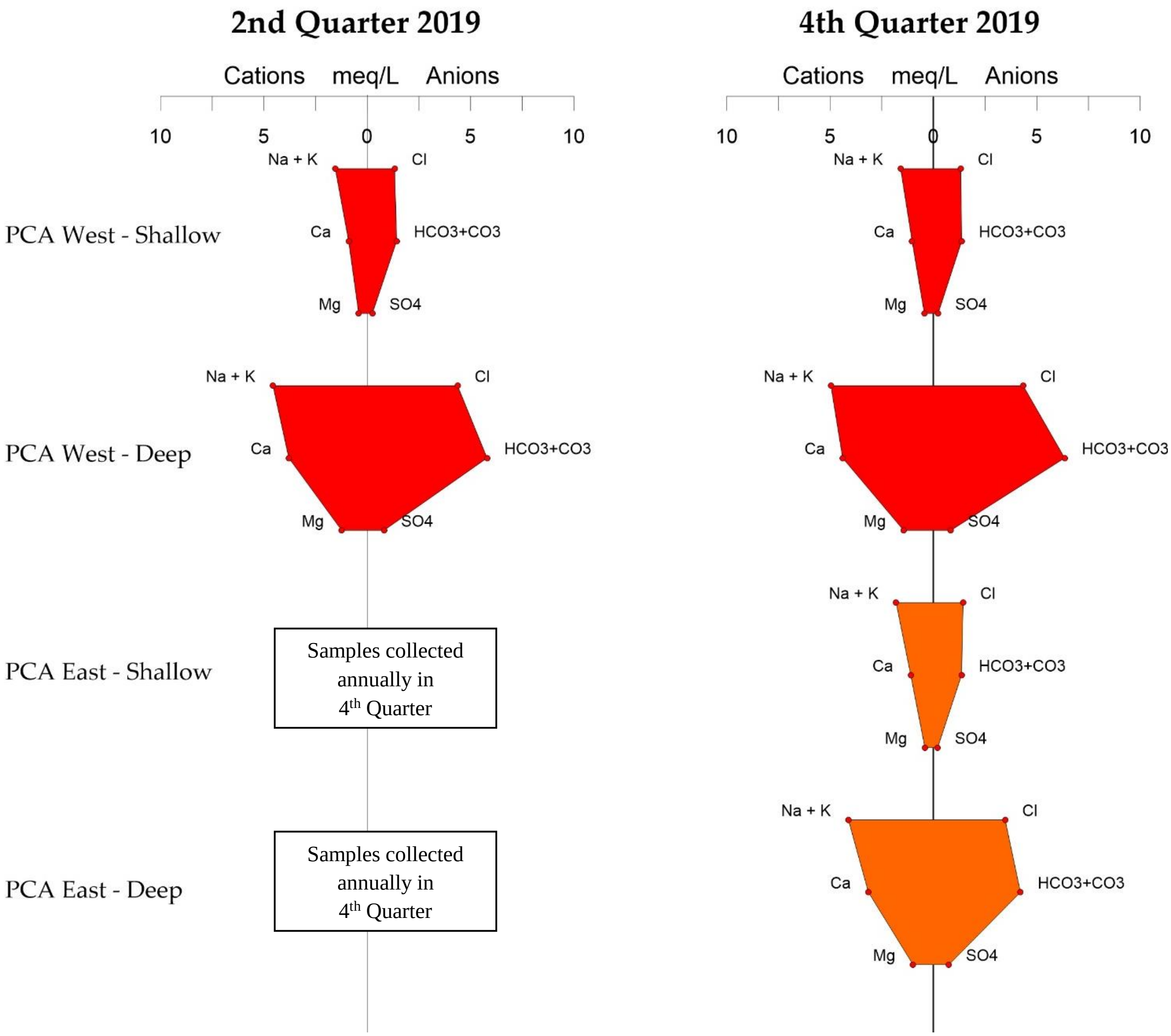

Figure 13. Stiff Diagrams for PCA West and PCA East Wells
(Data source: Watermaster)

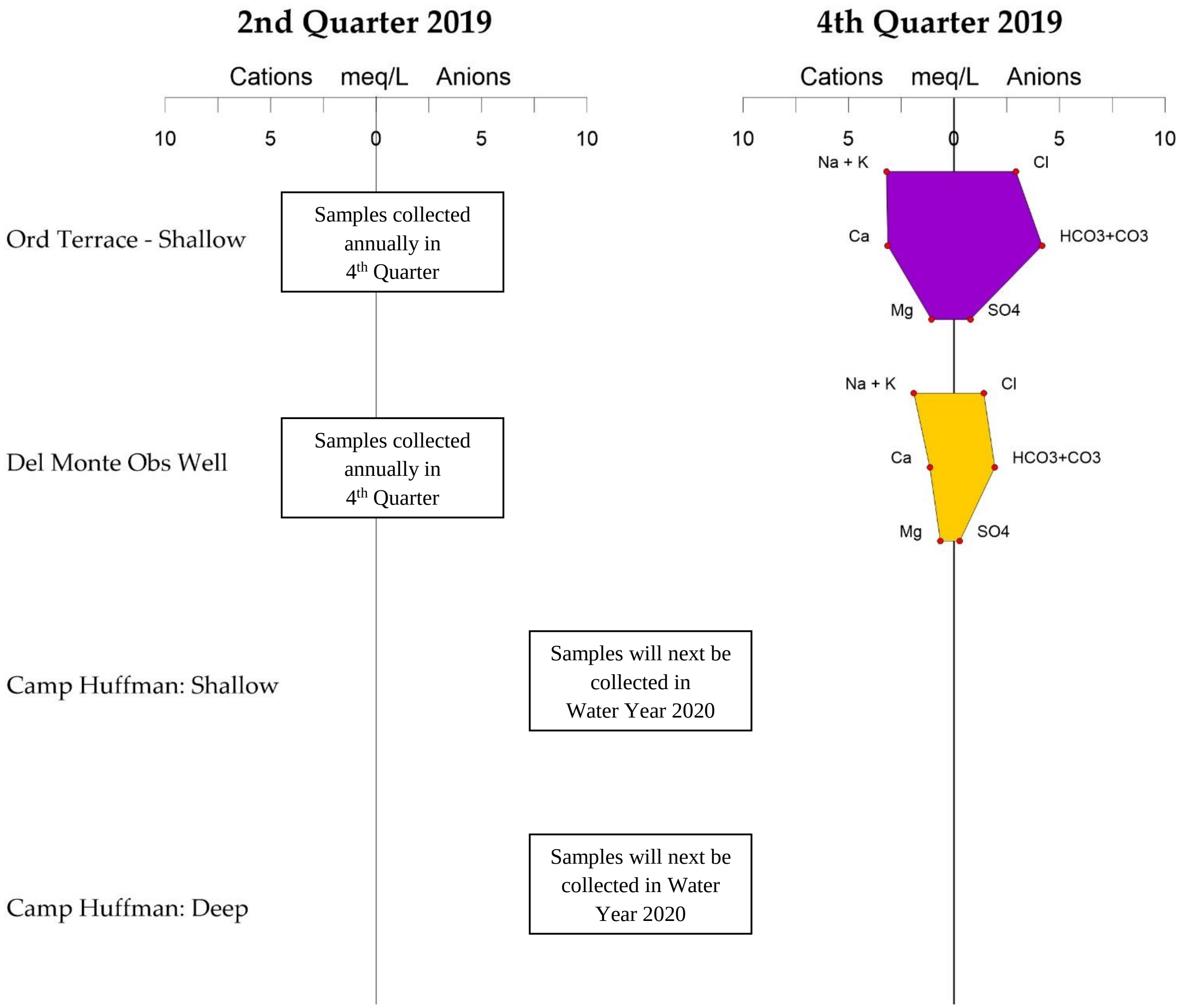

Figure 14. Stiff Diagrams for Watermaster Ord Terrace, Del Monte, and Camp Huffman Wells
(Data source: Watermaster and MPWMD)

2.2.2 Fourth Quarter Water Year 2019 (July-September 2019)

Piper diagrams displaying groundwater quality data from 12 monitoring wells and 16 production wells in the Seaside Groundwater Basin for the 4th quarter of Water Year 2019 (July-September 2019) are shown on Figure 15 and Figure 16, respectively. Appendix C includes individual Piper diagrams for each well to show trends over time.

Figure 15 shows groundwater quality data for the monitoring wells clustering generally in a single area on the Piper diagram, which is a pattern similar to that observed in previous SIARs. Groundwater is generally of a sodium-chloride/sodium-bicarbonate type and is not impacted by seawater.

Figure 16 presents a Piper diagram for 4th quarter groundwater from production wells. The production wells plot in roughly the same location on the Piper diagram as the majority of monitoring wells on Figure 15. The variation of the plot location on the Piper diagram for production wells is due to higher sulfate and chloride anions than in the monitoring wells. Groundwater from these wells is characterized as sodium-sulfate-chloride type waters. The York School well plots closest to typical seawater on this diagram, however its inland location precludes seawater intrusion as the cause for the observed water chemistry at this well. Overall, the Piper diagrams show no indication of seawater intrusion at any of the production wells.

The Sand City's Public Works Corp Yard production well Piper diagram shows that its cations, namely calcium, sodium, and potassium, vary while the anions remain more stable (Appendix C: Figure C-15). Initially it was thought this well's chemistry was evolving over time; but after multiple years of monitoring, it appears that the relative percentage of cations varies between fixed points and is not evolving in one direction only. The source of this variance is not seawater because it does not follow the pattern depicted on Figure 4 and Figure 5.

Stiff diagrams for the 12 monitoring wells sampled during the 4th quarter of Water Year 2019 are shown in the right column on Figure 12 through Figure 14. The shapes of the Stiff diagrams for the paired monitoring wells are similar to the shapes of the Stiff diagrams for the majority of prior years.

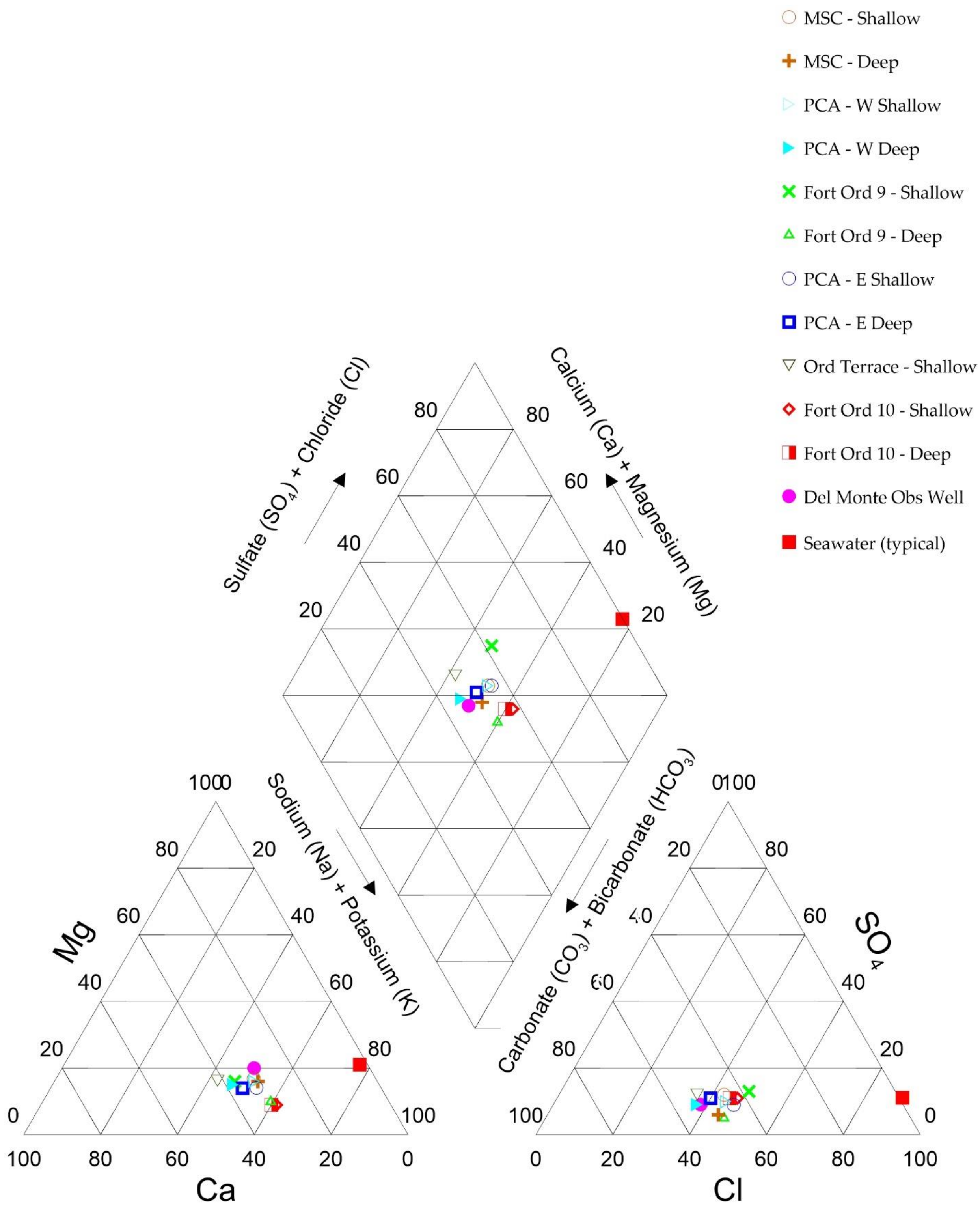

Figure 15. Piper Diagram for Seaside Groundwater Basin Monitoring Wells,
4th Quarter Water Year 2019 (July- September 2019)
(Data source: Watermaster)

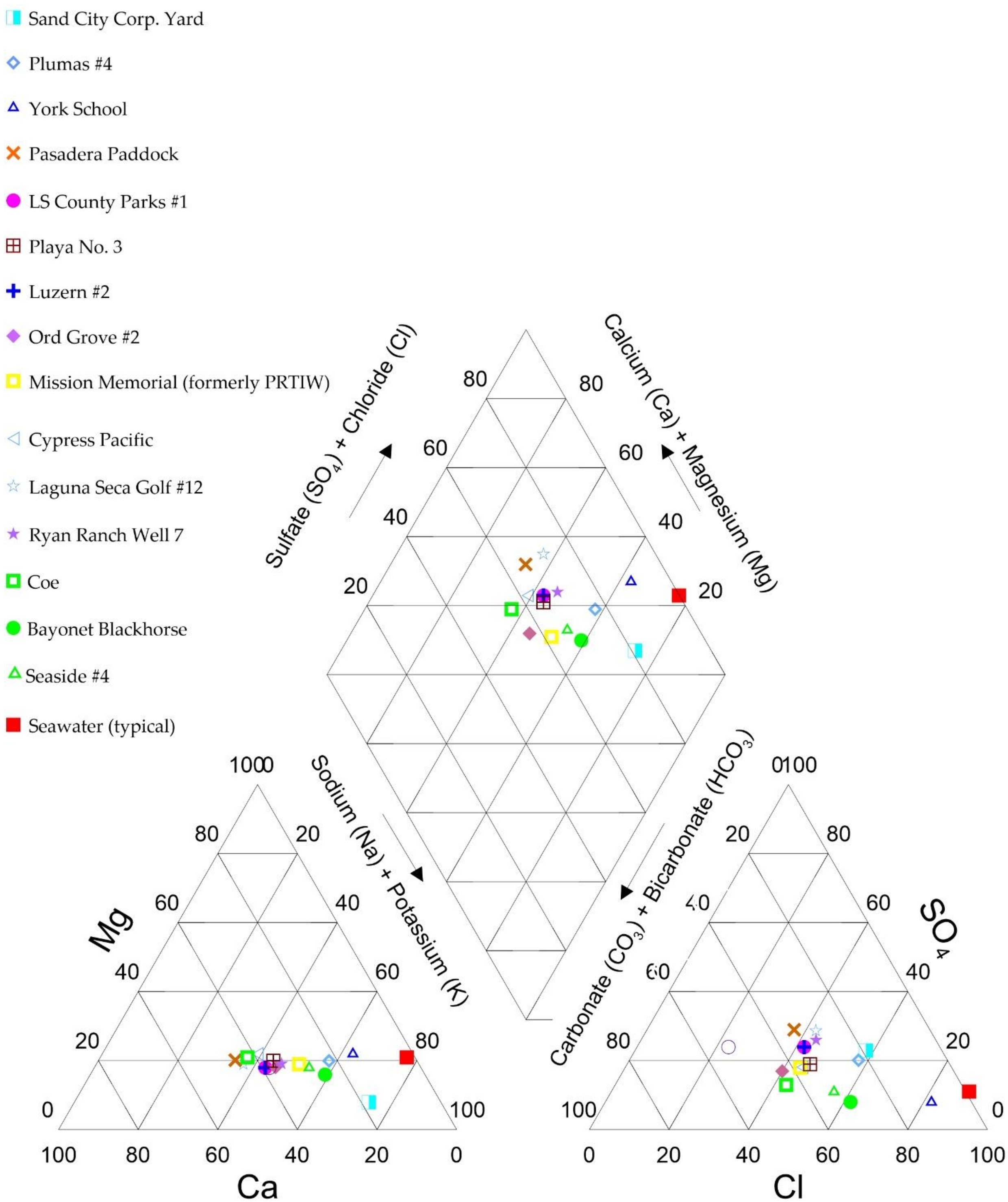

Figure 16. Piper Diagram for Seaside Groundwater Basin Production Wells,
4th Quarter Water Year 2019 (July-September 2019)
(Data source: Watermaster)

Stiff diagrams for the 15 production wells sampled during the 4th quarter of Water Year 2019 are shown on Figure 17 through Figure 20. These production well Stiff diagrams show no significant changes from the shapes observed in previous years. The Pasadera Paddock production well has a Stiff diagram shape that is different from the other wells' chemistry. The cause of this could be localized mineralization. The Laguna Seca subarea is known to have higher salts in groundwater than the rest of the basin due to the underlying Monterey shale which was deposited in a marine environment. None of the Stiff diagrams for production wells show the high chloride spike shown on Figure 7 that indicates seawater intrusion.

The York School production well, in the Laguna Seca subarea, and Sand City's Public Works Corp Yard production well, in the Southern Coastal subarea both have Stiff diagrams different from most other wells' water quality (Figure 18). Although the shapes are different, they do not display the large chloride spike associated with seawater intrusion as shown on Figure 7. None of the production wells analyzed using Stiff and Piper diagrams show an indication of seawater intrusion.

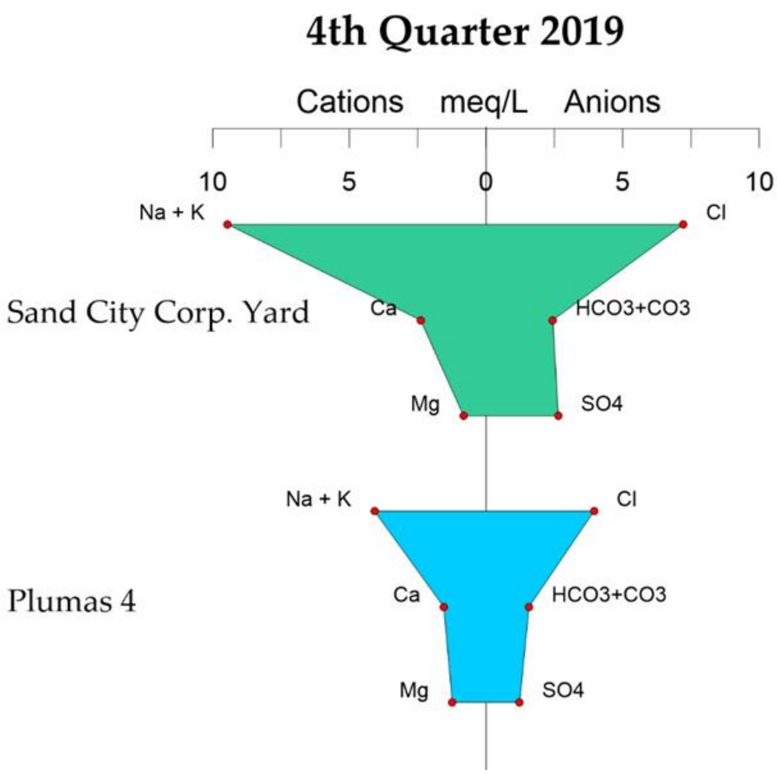

Figure 17. Stiff Diagrams for Southern Coastal Subarea Production Wells
(Data source: Watermaster)

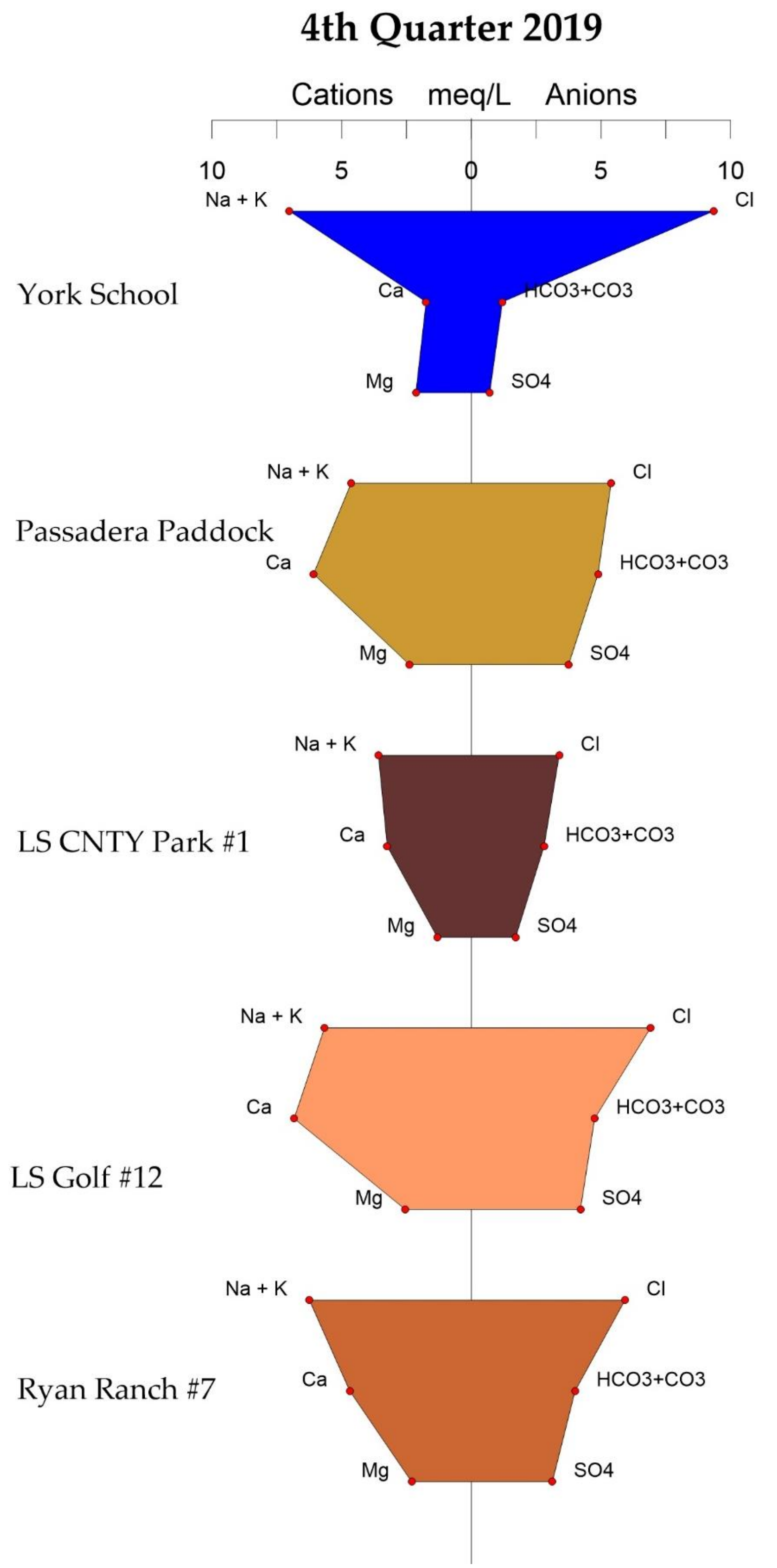

Figure 18. Stiff Diagrams for Laguna Seca Subarea Production Wells
(Data source: Watermaster)

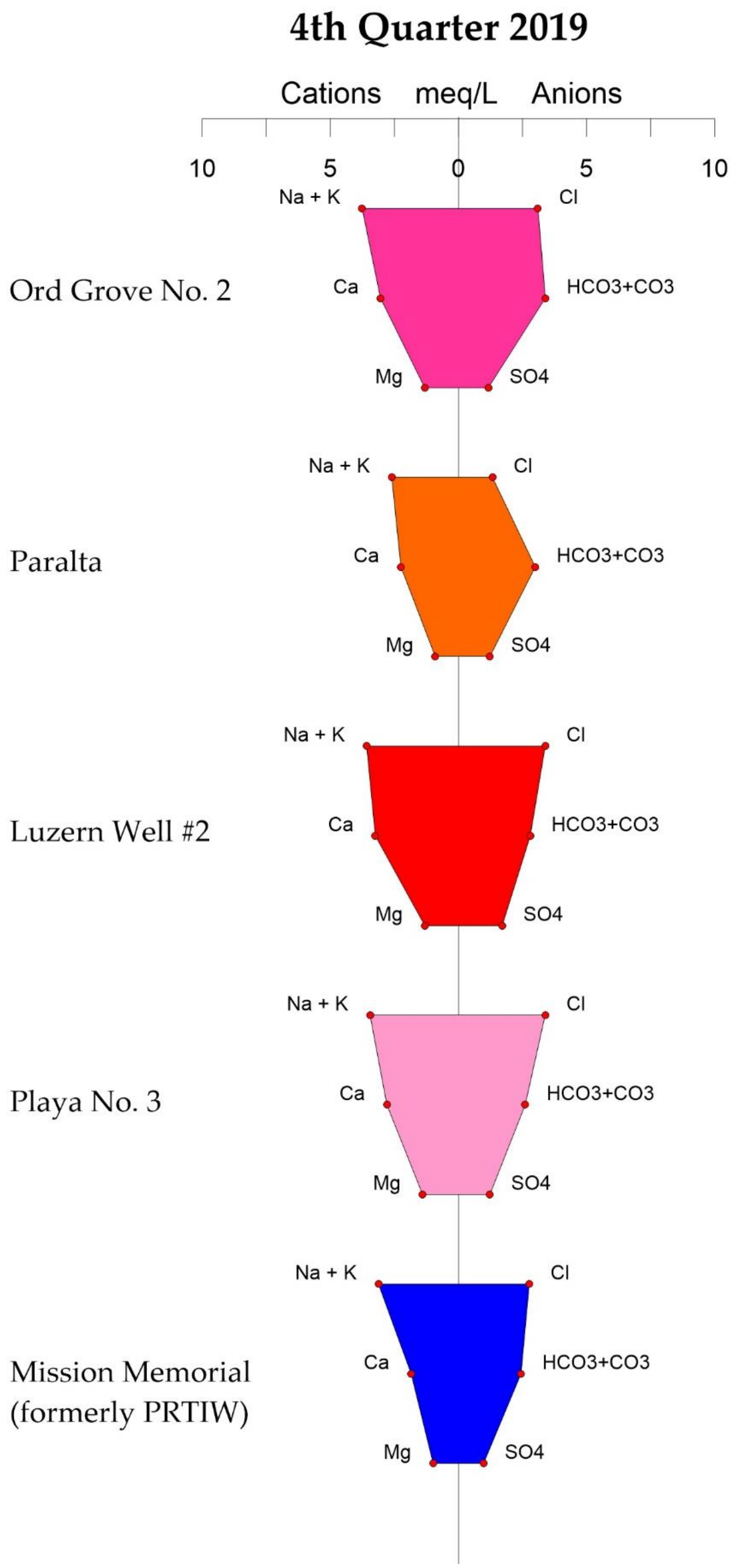

Figure 19. Stiff Diagrams for Northern Coastal Subarea CAWC and Mission Memorial Production Wells
(Data source: Watermaster)

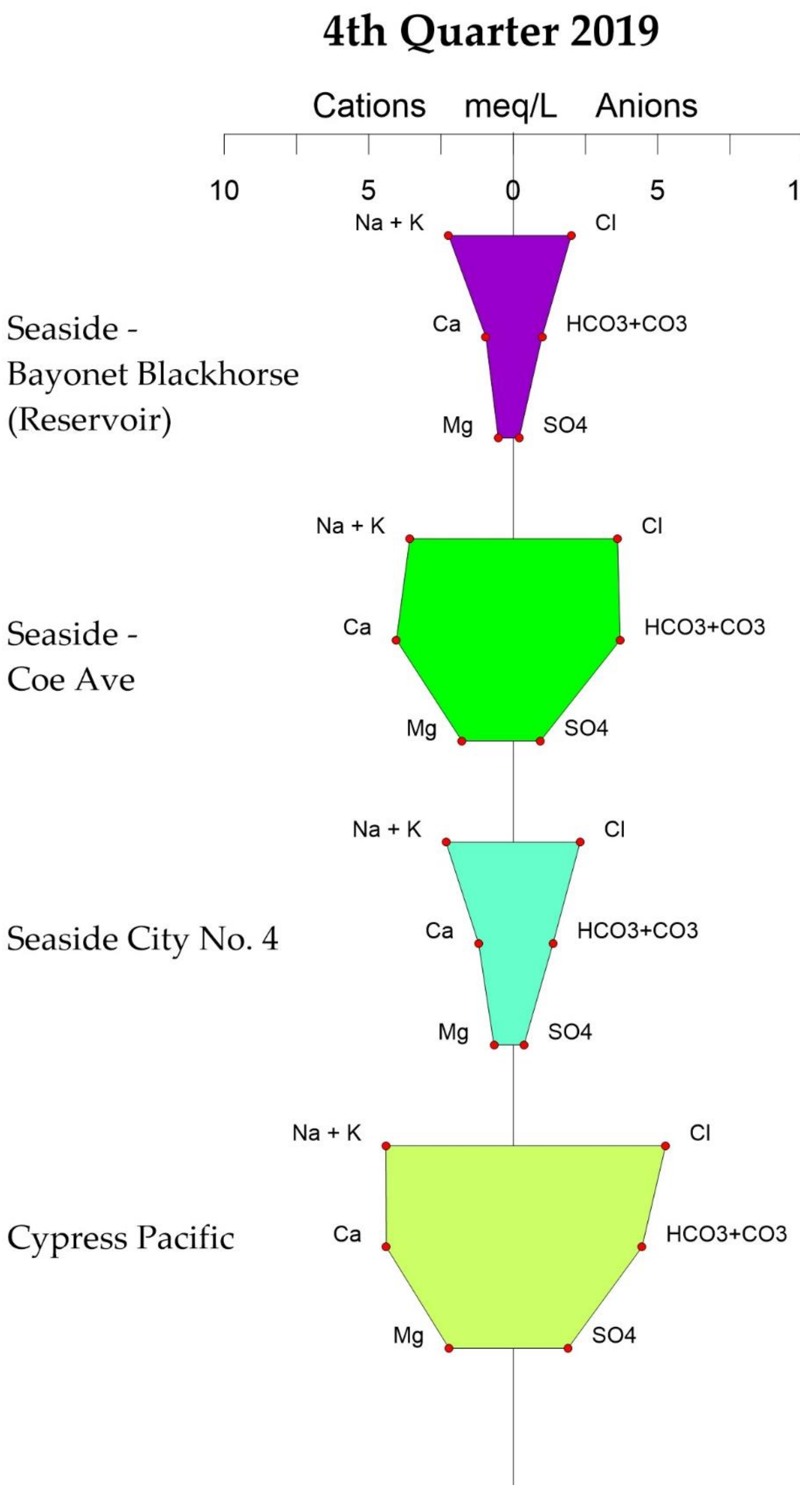

Figure 20. Stiff Diagrams for Northern Coastal Subarea City of Seaside and Cypress Pacific Wells (Data source: Watermaster)

2.3 Chloride Concentrations

2.3.1 Trends

Chemographs showing chloride concentrations over time are plotted for each of the monitoring wells shown on the Piper and Stiff diagrams and one production well. An example plot displaying chloride concentrations for the shallow PCA West well is shown on Figure 21. The complete set of chemographs is included in Appendix D. Chloride trends for most monitoring wells remain stable, or fluctuate within a historical range. One monitoring well, FO-09 shallow, has sustained increased chloride concentrations in all three samples taken during Water Year 2019 (Appendix D: Figure D-11). The increase is greater than fluctuations observed historically over the period of record but the elevated concentrations in themselves do not indicate seawater intrusion.

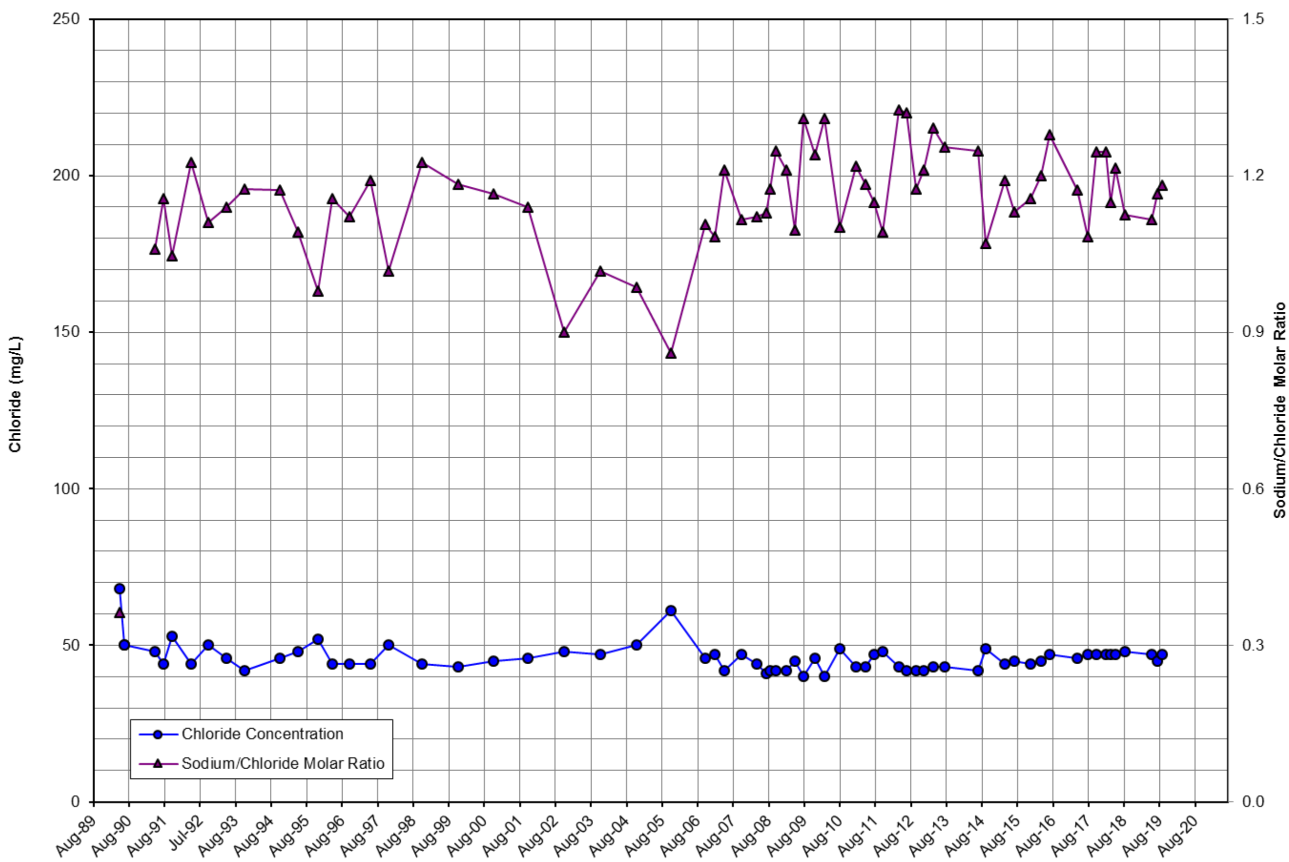

Figure 21. Historical Chloride and Sodium/Chloride Molar Ratios, PCA West Shallow

2.3.2 Chloride Concentration Maps

2.3.2.1 Fourth Quarter Water Year 2019 (July-September 2019)

Fourth quarter Water Year 2019 chloride concentrations are mapped using data from August and September 2019. The maps for the shallow and deep zones are included on Figure 22 and Figure 23, respectively.

The shallow zone 4th quarter Water Year 2019 chloride concentration map is shown on Figure 22. Chloride data from shallow wells are posted on this map but do not show a spatial distribution that can be readily contoured because of large differences in concentrations in close proximity to each other. In general, the shallow chloride concentrations have not varied much from previous water years, with the exception of FO-9 shallow which sustained a chloride concentration increase of between 20 -30 mg/L since the end of last water year. The chemograph showing historic chloride concentrations over time is in Appendix D: Figure D-11.

For the data available in the shallow zone, chloride concentrations near the coast now average slightly higher than 50 mg/L in the Northern Coastal subarea because of the increase in FO-9 shallow concentrations. The more inland Northern Coastal subarea wells have slightly higher chloride concentrations that may be due to depositional mineralization differences in the Paso Robles Formation. Based on available data, there is no discernible spatial trend of higher coastal chloride concentrations, and therefore no indication of seawater intrusion within the shallow aquifer. Sand City's Public Works Corp Yard well continues to be the only coastal well in the Southern Coastal subarea with measured chloride data, which has historically had the highest concentration of all shallow coastal monitoring wells (Appendix D: Figure D-13). The Piper and Stiff diagrams and sodium/chloride molar ratio for the well continue to suggest that the source of high chloride is not seawater.

The deep zone 4th quarter Water Year 2019 chloride concentration map is shown on Figure 23. Chloride concentrations for the Sentinel Wells are not shown on this map anymore because it was found that their groundwater samples are not representative of the aquifer. Since the chloride data shows no discernible spatial distribution, with high concentrations in close proximity to low concentrations, the data cannot be readily contoured. Deep zone chloride concentrations near the coast range between 70 mg/L and 159 mg/L.

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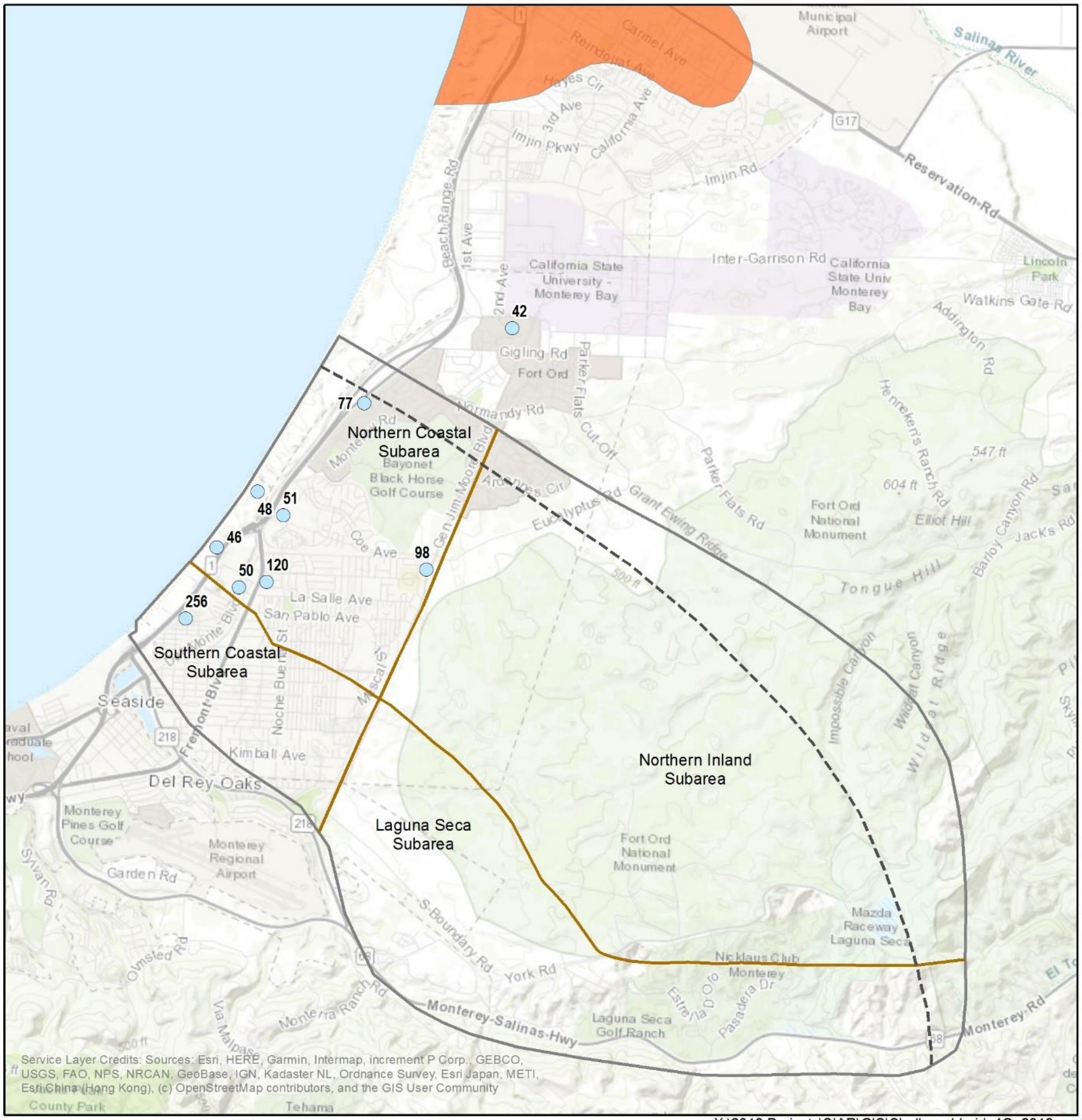

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EXPLANATION

- 4th Quarter WY 2019 Chloride Concentration in mg/L
- Approximate Shallow Aquifer Northern Boundary
- >500 mg/L Chloride Areas - 400 ft Aquifer in Salinas Valley

Adjudicated Seaside Groundwater Basin Boundary

- Basin Boundary
- Subarea Boundary

N

0 0.5 1 1.5 2
Miles

Figure 22. Shallow Zone Chloride Concentration Map – 4th Quarter WY 2019

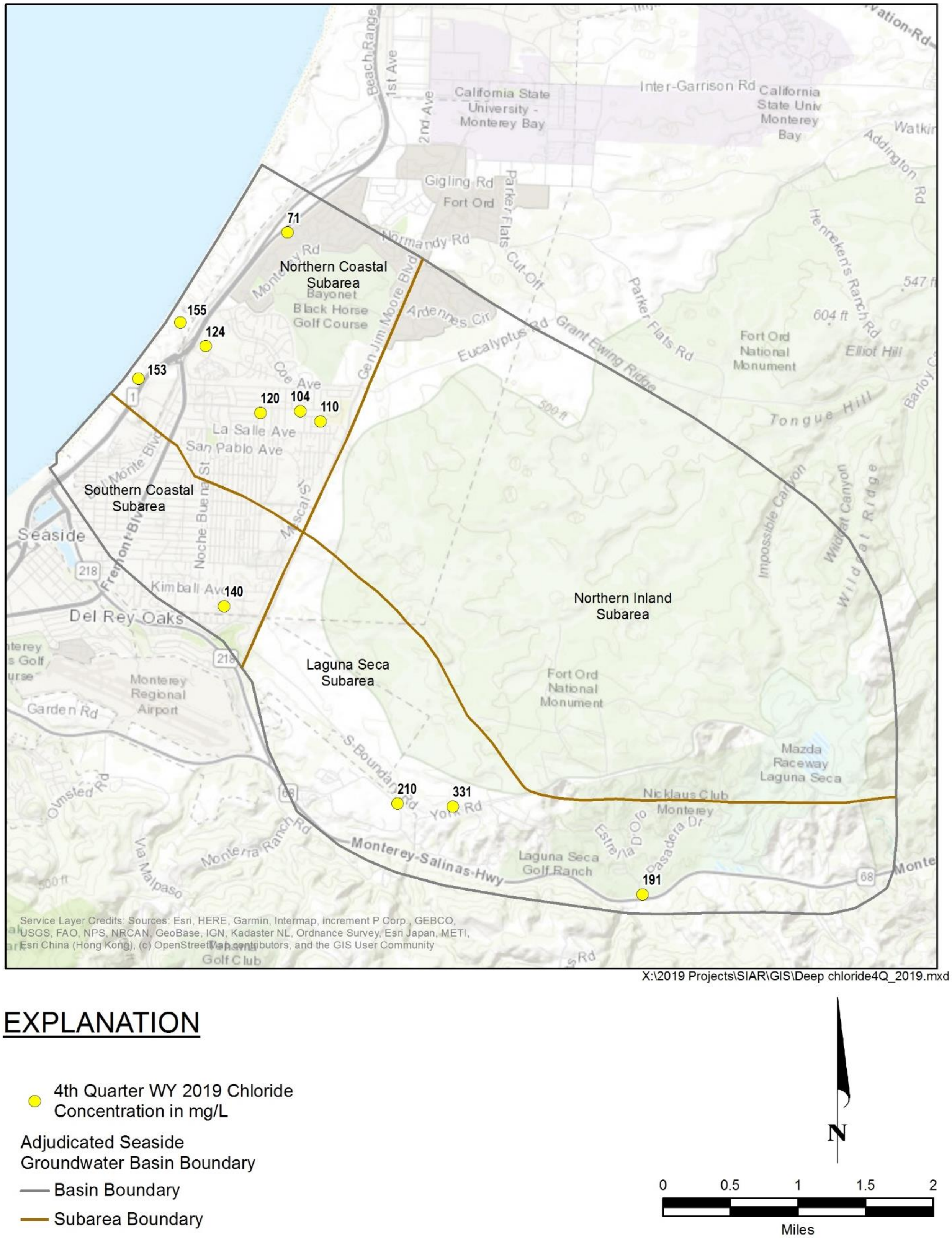

Figure 23. Deep Zone Chloride Concentration Map – 4th Quarter WY 2019

2.4 Sodium/Chloride Molar Ratios

Chemographs showing long-term sodium/chloride molar ratios over time are plotted for all of the 12 monitoring wells shown on the Piper and Stiff diagrams and one production well. Historical chemographs for monitoring wells that are not on the Water Year 2019 Piper and Stiff diagrams because they were not sampled, are also included for completeness. An example plot displaying sodium/chloride molar ratios for the shallow PCA West well are shown on Figure 21. The complete set of chemographs is included in Appendix D.

All of the sodium/chloride molar ratios in the monitoring wells remained constant or increased over the past year. Charts for the Sentinel Wells are not included because their groundwater samples are not representative of the aquifer.

2.5 Electric Induction Logs

Two induction logging events took place in the four Sentinel Wells during Water Year 2019. Pacific Surveys conducted the logging, and have done so since August 2014. The first logging event was conducted in March 2019, and the second in October 2019. The Sentinel Well 3 (SBWM-3) site was flooded in March 2019 and no induction log could be run in the well. Prior to the second logging event in October, the induction tool used during the past 10 logging events failed and it was replaced with a new tool having a slightly different response curve. Data have been normalized to known resistivities to ensure accurate comparisons with past logging events. Figure 24 through Figure 27 includes the new baseline (starting in August 2014) from which to compare all subsequent logs.

Feeney (2007) described the original 2007 baseline induction logs for each of the wells as follows:

> *"SBWM-1 — The upper 50 feet of this well shows very high conductivities. This signature is present in all of the wells and is the result of the 50-foot steel conductor casing. However, because the water table is below the conductor casing at all locations, the steel casing does not interfere with data collection within the saturated sediments below. Below the conductor casing in SBWM-1, the sediment materials are dry to a depth of approximately 115 feet. Below this depth, there is approximately 10 feet of sand containing fresh water. Below 125 feet and extending to approximately 350 – 400 feet is sand containing saline water with conductivities measuring as high as 10,000 mhos/cm. This saline water is contained within the Dune /Beach Sand Deposits and the Aromas Sand. Below this depth, conductivities are relatively low with the exception of the thick marine clay between approximately 600 -700 feet. The other conductive zones also correlate with clay zones.*

> *SBWM-2 — As in SBWM-1 there is a thin layer of fresh water overlying a zone of saline water to approximately 130 feet within the Beach/Dune Sands and Aromas Sand. Below this depth, the materials become increasingly clayey, complicating the interpretation. Below this depth, there are no obvious zones of anomalous conductivity; that is, the zones that are more conductive correlate with clay zones.*
>
> *SBWM-3 — In SBWM-3 saline water extends to a depth of approximately 100 feet within the Dune/Beach Sand and Aromas Deposits. Below 100 feet, the materials become clay and conductivities rapidly decline. Again, below the shallow saline water in the sand deposits, all zones of increased conductivity correlate with clay zones.*
>
> *SBWM-4 — As with the other wells, the induction log reveals a thin layer of fresh water overlying saline water with the Dune Sands/Beach Deposits to a depth of approximately 100 feet. Below this depth the materials become clay and there are no additional zones of increased conductivity uncorrelated with clay zones."*

Salinity changes shown on Figure 24 through Figure 27 for Sentinel Wells 1 – 4, respectively, are only relative, and do not allow direct measurement of TDS or chloride concentrations in the aquifer. They do, however, provide a means to determine changes in salinity over time. It appears that the salinity in the Dune Sands and Aromas Formation overlaying the main production aquifers fluctuates from season to season; becoming more saline in the summer months when stresses on the aquifer are greatest. As has been the case historically, none of the wells show detectable changes in conductivity to the deeper aquifers where production wells extract groundwater.

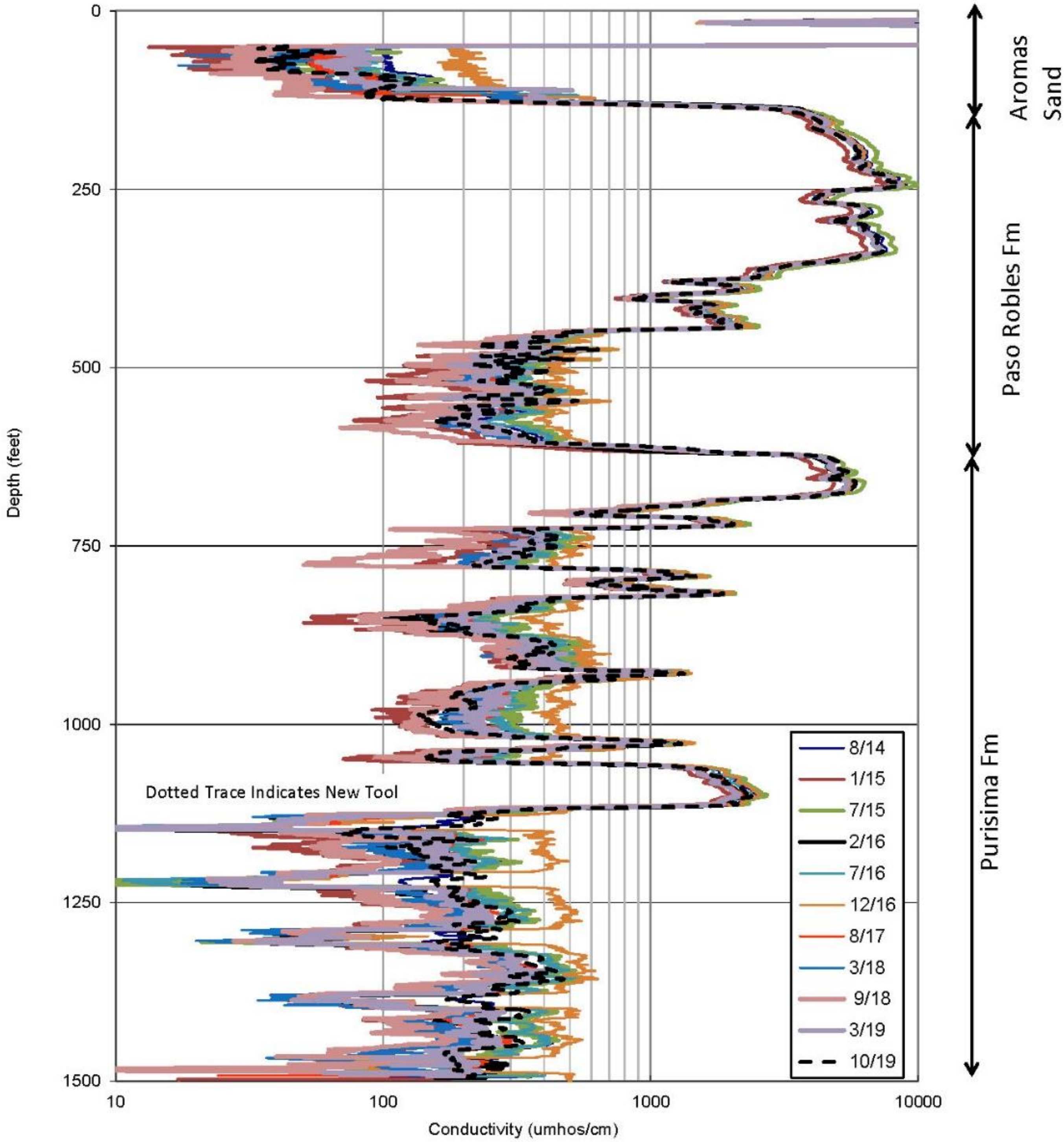

Figure 24. Sentinel Well SBWM MW-1 Induction Log

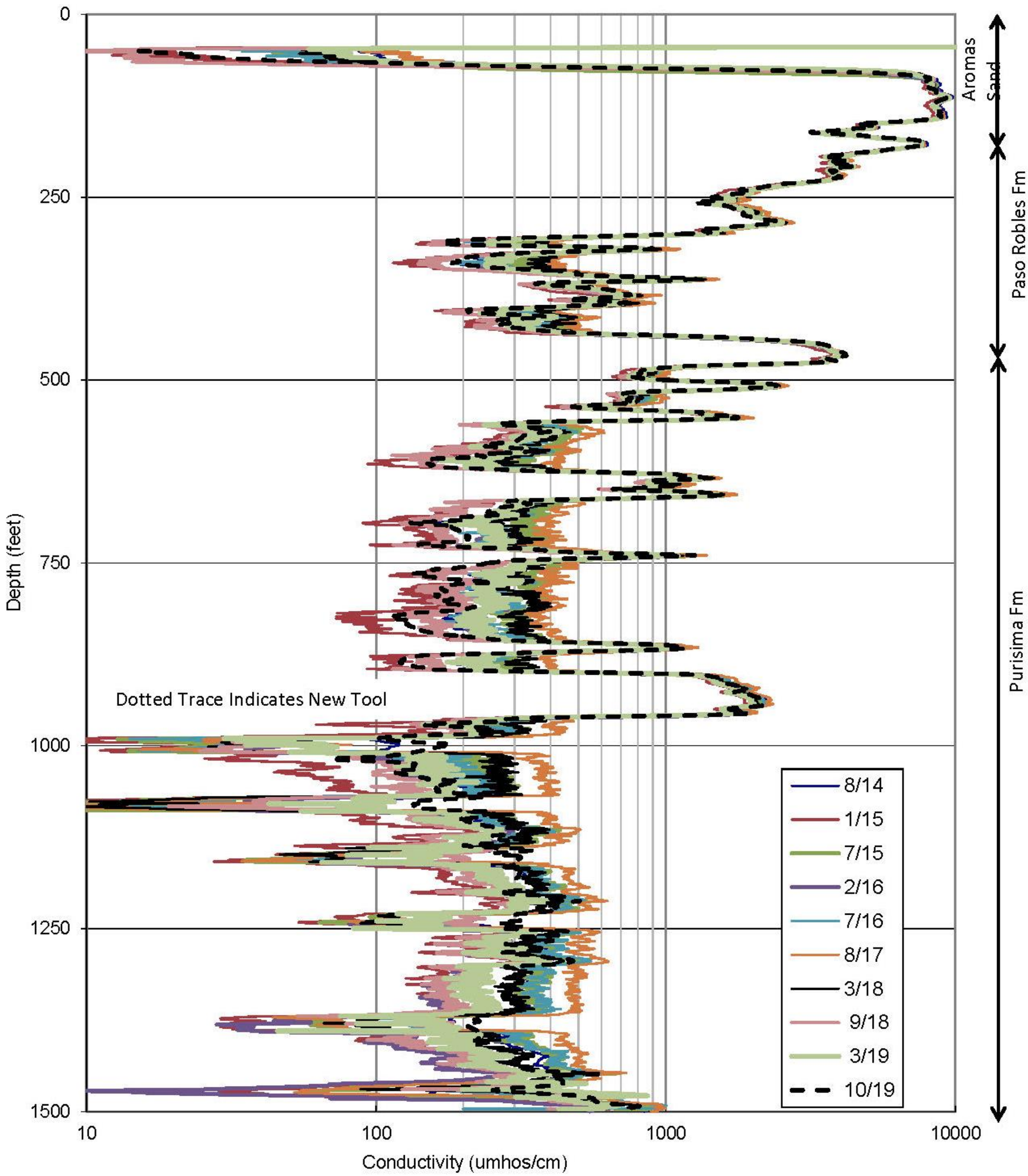

Figure 25. Sentinel Well SBWM MW-2 Induction Log

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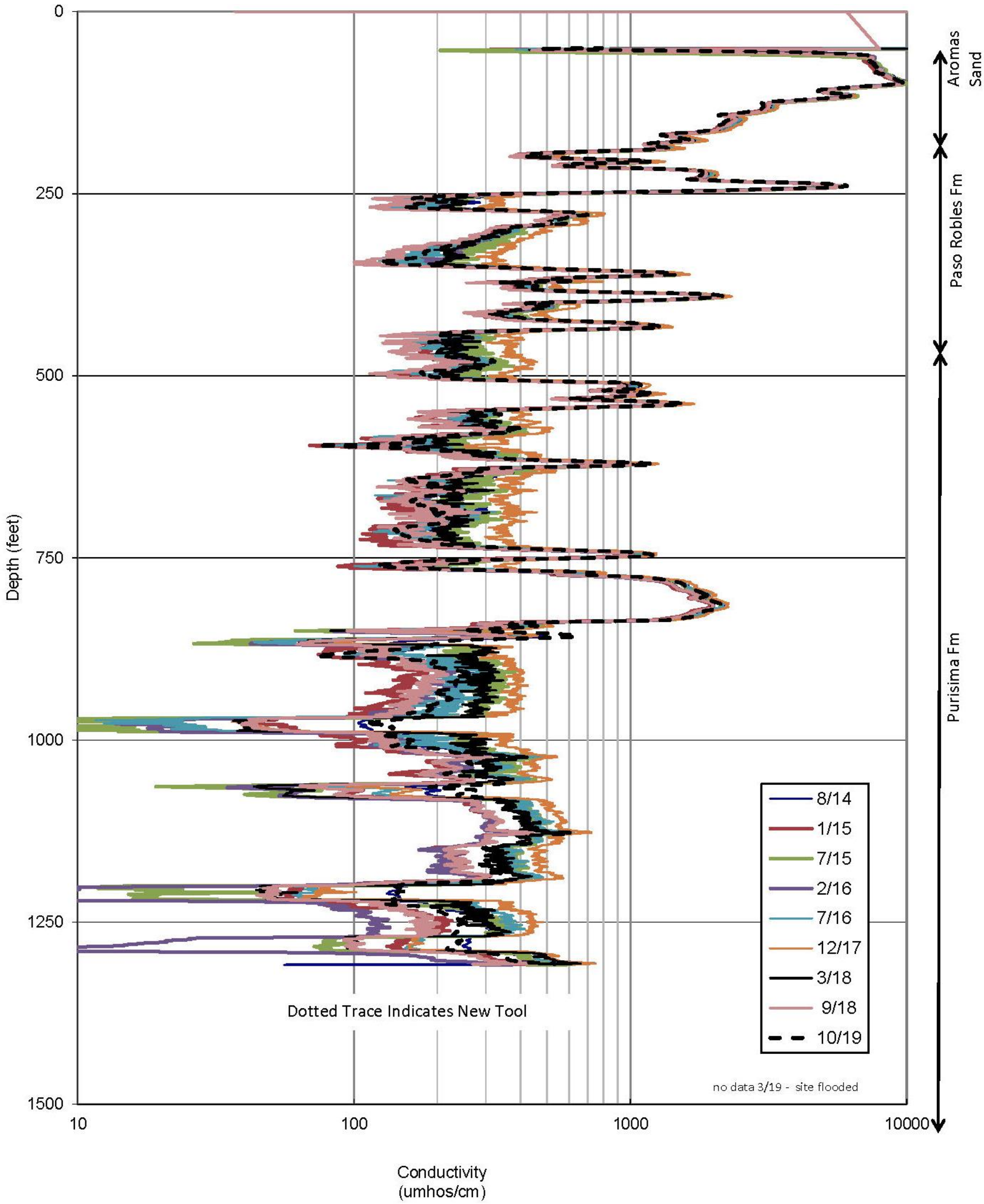

Figure 26. Sentinel Well SBWM MW-3 Induction Log

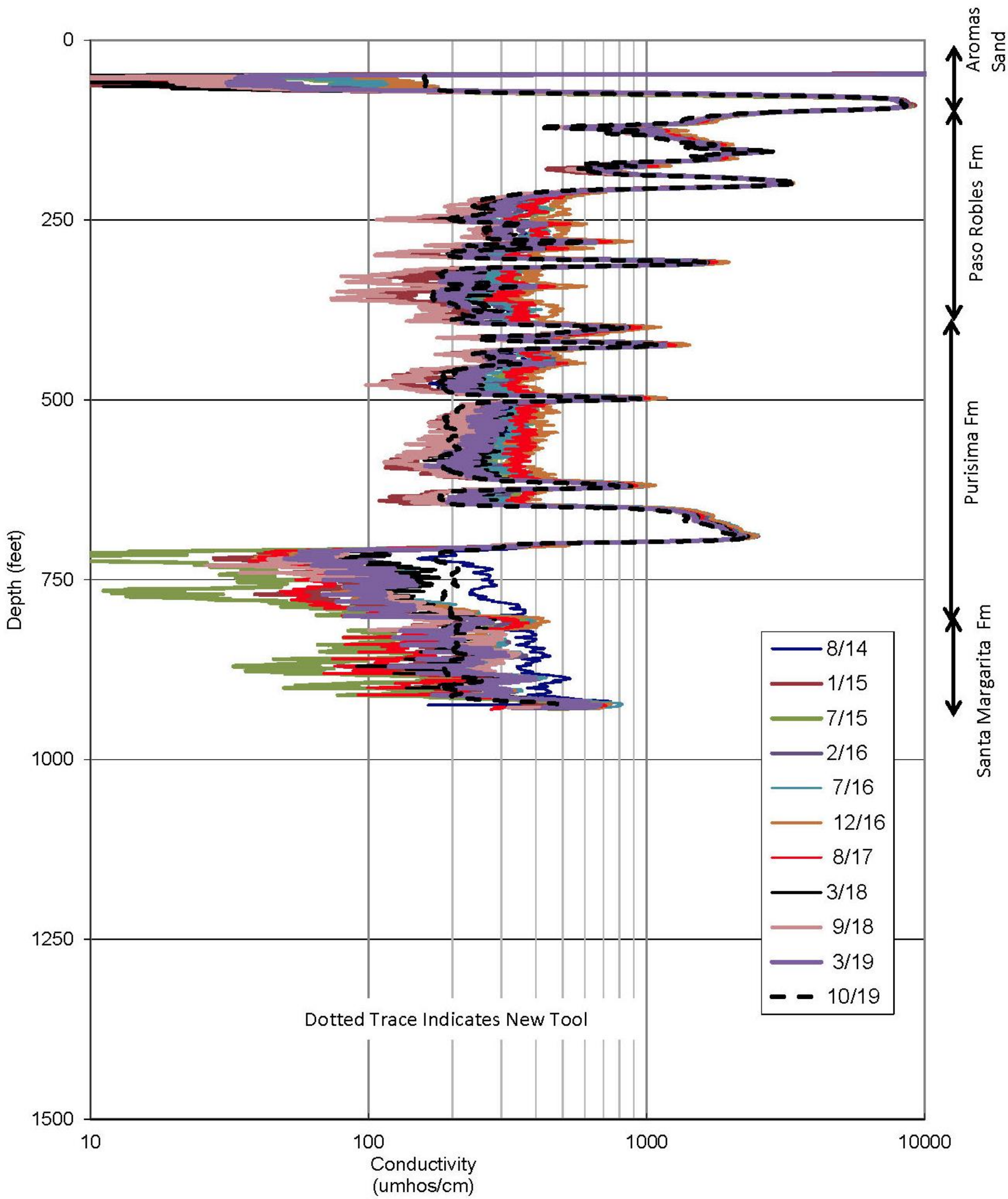

Figure 27. Sentinel Well SBWM MW-4 Induction Log

2.6 Groundwater Levels

Groundwater levels are not direct indicators of seawater intrusion, but indirectly suggest opportunities for seawater intrusion. Coastal groundwater levels at or near sea level are not sufficient to repel seawater intrusion, and will likely allow some amount of seawater intrusion unless groundwater levels increase. All groundwater level data collected in WY2019 are included in Appendix B.

2.6.1 Trends

Groundwater level hydrographs representative of well pairs in the Northern Coastal subarea and one shallow well in the Southern Coastal subarea are shown on Figure 30.

2.6.1.1 Northern Coastal Subarea

Groundwater level data from the PCA-East well are representative of groundwater levels in the Northern Coastal subarea, west of nearby production wells. The hydrograph shows peaks and lows that are strongly influenced by pumping from the nearby California American Water Company (CAWC) production wells on groundwater levels in the deep zone and injection of Carmel River water at the eastern boundary of the subarea (Figure 28). Other influences such as tides which can cause up to a one-foot fluctuation in the deep completion of PCA-East are also recognized. Because of all the possible influences on groundwater levels, it is difficult to compare the present year to the previous year directly. What is more important is to look at the long-term trends.

PCA-East deep on Figure 28 shows an overall decline in groundwater levels until 2009, levels increase and then more or less stabilize over the next two years, and then from 2011 to 2016 experienced a continued decline. Groundwater levels recovered slightly in 2017 due to record rainfall to levels similar to those experienced during the drought (2012 – 2015). Groundwater levels have remained at a somewhat similar level since 2017, with no clear increasing or decreasing trend (Figure 28). The start of the overall decline in groundwater levels in the deep completion of PCA-East corresponds with the shift in CAWC's production from their shallow Paso Robles wells to deeper Santa Margarita wells.

Seasonal fluctuations are noticeable in the winter season when groundwater elevations are at their highest for the year. For Water Year 2017, the winter high in PCA-East deep increased to a level last seen in 1995, which is 17 feet higher than the lowest winter high level experienced during the recent drought. This is because 2,345 acre-feet of excess Carmel River water was injected as it was a very wet year. A volume of 744.4 acre-feet was injected in Water Year 2019

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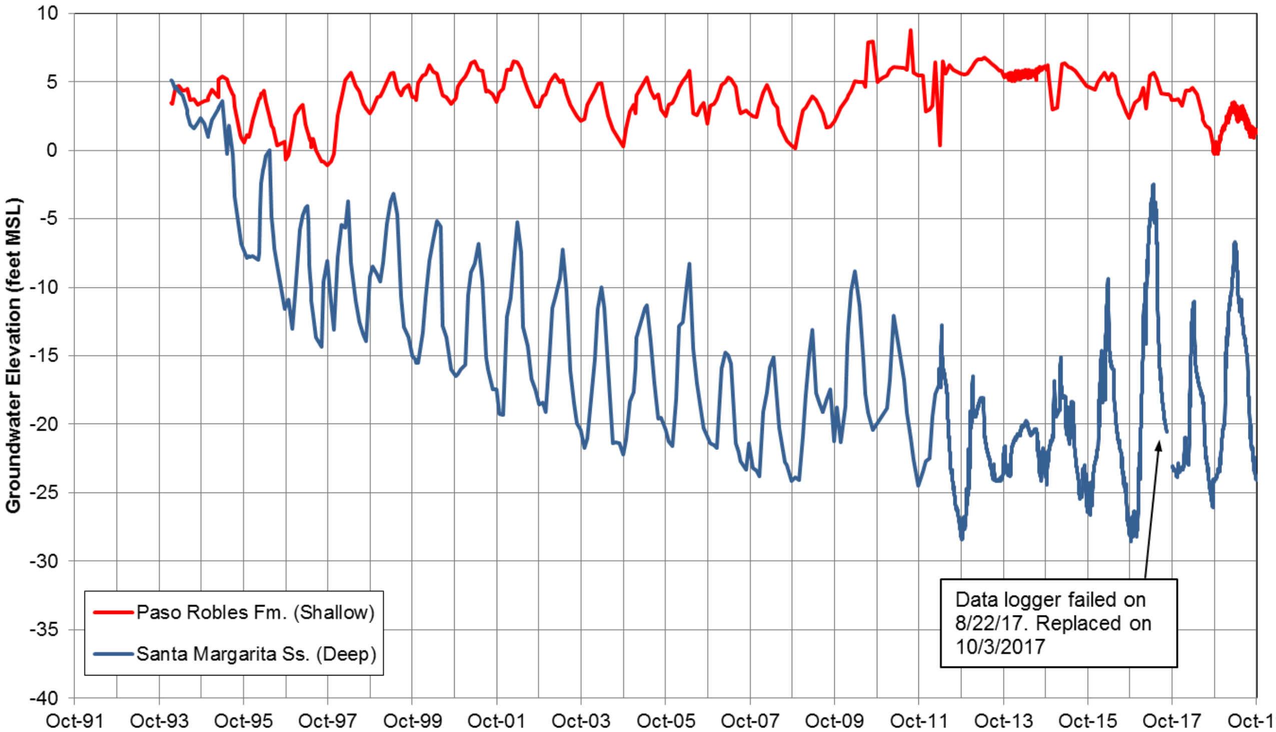


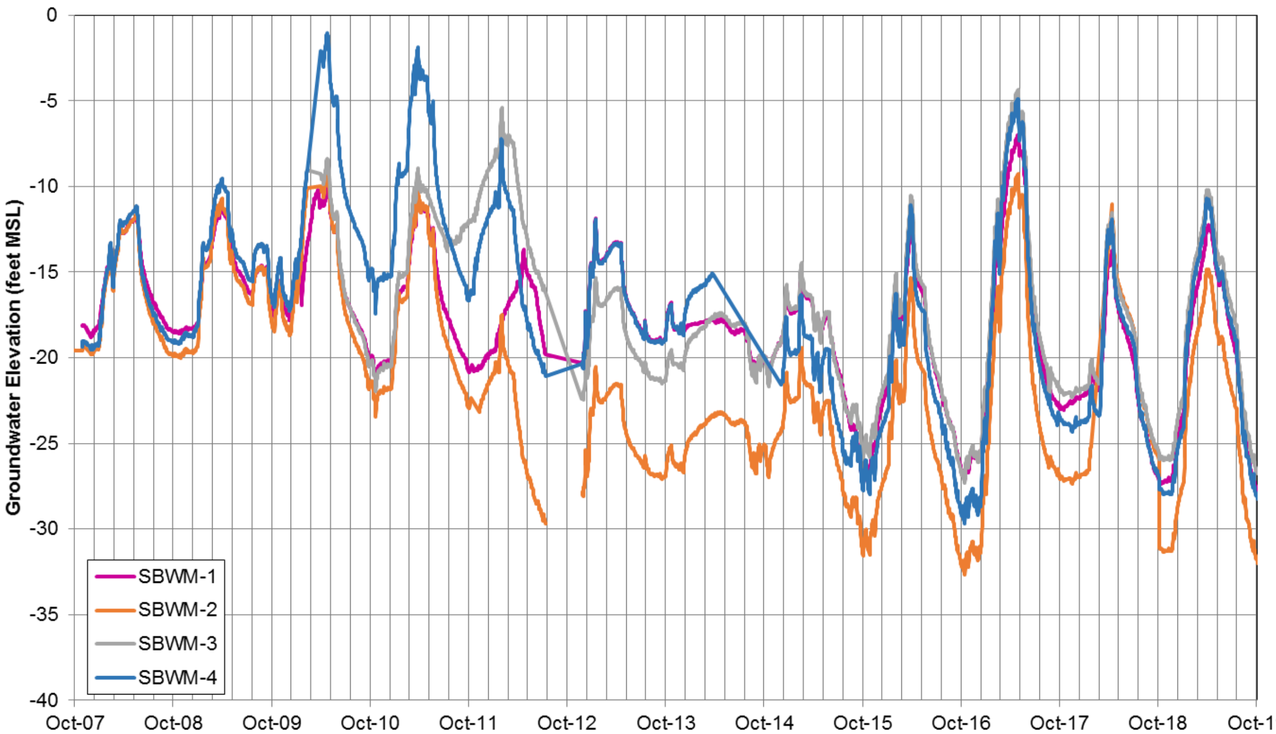
and thus the seasonal high in Water Year 2019 is much higher than 2018, when only 530 acre-feet was injected.

Figure 28. PCA-East Deep and Shallow Monitoring Well Hydrograph (Source: Watermaster)

It is important to note that the Santa Margarita Sandstone has limited connection to the ocean and is highly confined by the layers above it. This means that the amount of recharge entering the Santa Margarita Sandstone is limited and is therefore always susceptible to depletion if more water is pumped than is being recharged.

Figure 29 includes hydrographs of groundwater elevations for the four deep coastal Sentinel Wells. Groundwater elevations on this chart are collected using data loggers in each well that record levels every 30 minutes. The hydrographs plot daily average elevations, thereby smoothing out the more detailed data which are affected by tidal variations. The hydrographs for the Sentinel Wells are similar to the PCA-East deep hydrograph and show that groundwater elevations over winter and spring were the highest in Water Year 2017 because of increased injection. Groundwater levels in Water Year 2019 are similar to 2018 levels and there is no clear increasing or decreasing trend since 2015.

The hydrograph of shallow groundwater levels in PCA-East shows a declining trend since Water Year 2014, where levels have dropped about five feet over the past four years (Figure 28). The decline in shallow groundwater levels and greater seasonal fluctuations corresponds with the recommencement of pumping at the Coe Ave and Black Horse Bayonet golf course irrigation wells after being supplied water by Marina Coast Water District from Water Year 2009 through 2014/2015.Seasonal level increases in the shallow aquifer are usually related to reduced



wintertime production, and increased pumping during summer. Although the shallow seasonal fluctuations correspond with deep zone fluctuations, it is because seasonal pumping occurs in both aquifers, and not because the aquifers are closely connected.

Figure 29. Sentinel Well Hydrographs (Source: Watermaster)

2.6.1.2 Southern Coastal Subarea

In the Southern Coastal subarea, the KMART monitoring well is representative of groundwater levels near the coast (Figure 30). The hydrograph shows that groundwater elevations have always been above sea level and continue to remain fairly stable over time.

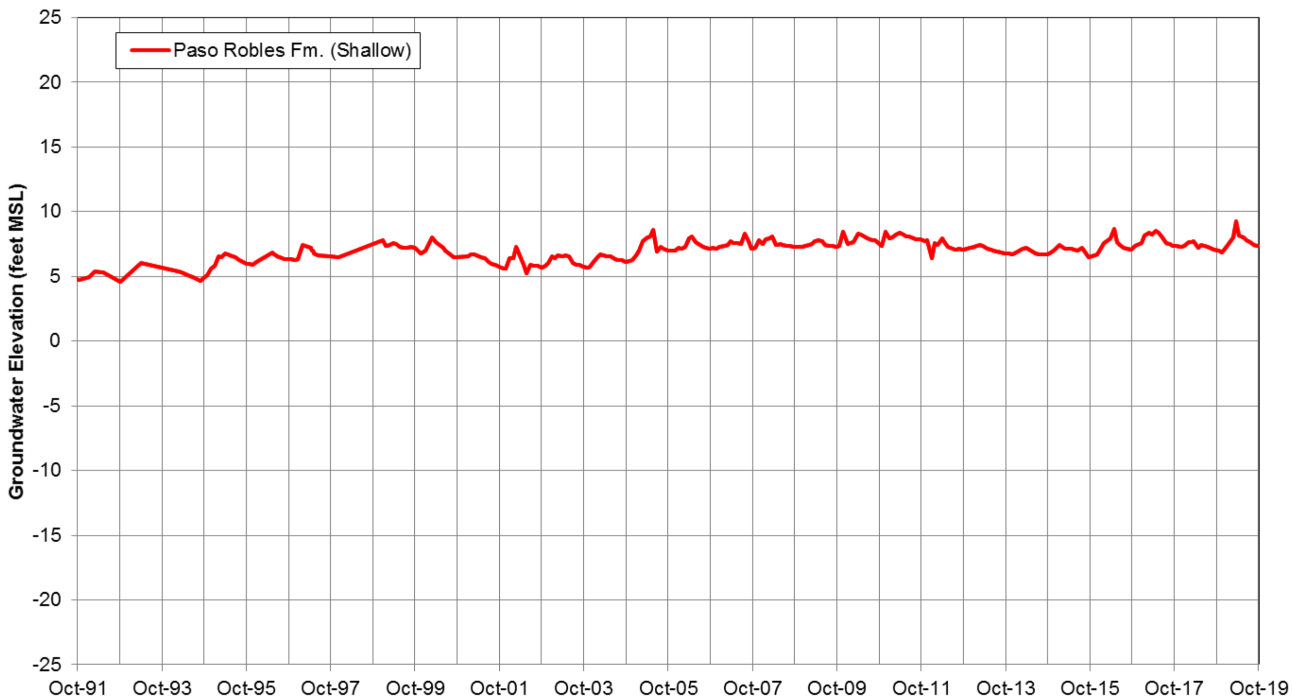


Figure 30. K-Mart Well Hydrograph (Source: Watermaster)

2.6.1.3 Laguna Seca Subarea

Although wells in the Laguna Seca subarea are far enough from the coast not to induce seawater intrusion, there is concern that since 2001 this area has experienced ongoing groundwater level declines that is not being halted or improved upon by triennial pumping reductions. It is believed this is occurring due in part to the Natural Safe Yield of the subarea being too high and in part due to influences of groundwater pumping east of the Seaside Basin boundary (HydroMetrics WRI, 2016). Figure 31 shows in the eastern portion of the subarea that between 1999 and 2014, shallow groundwater levels declined at a rate of approximately 0.6 feet per year, and deep groundwater levels declined up to 4 feet per year. Although there was some stabilization in groundwater levels between Water Years 2014 and 2016, groundwater levels are continuing to decline at a rate of less than 0.6 feet per year. Figure 10 shows the location of wells with hydrographs on Figure 31 while Figure 32 shows the location of all wells, including production wells in the eastern Laguna Seca Subarea.

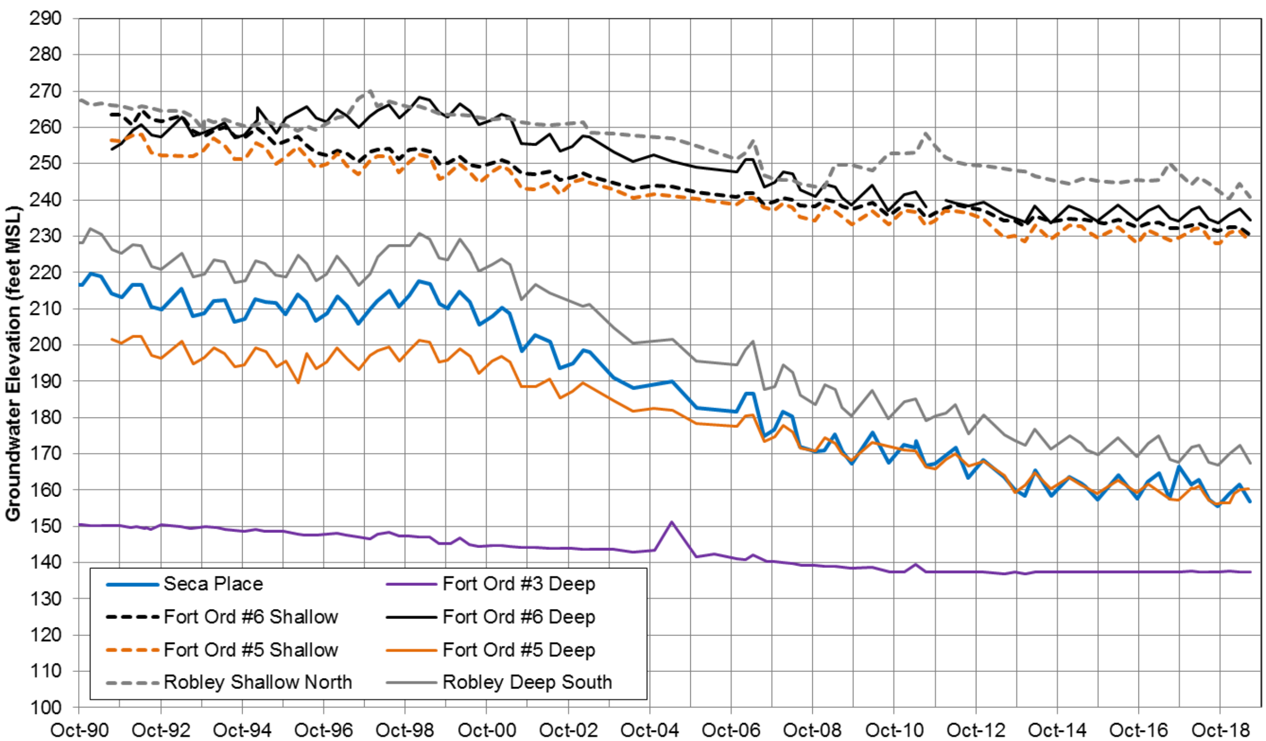
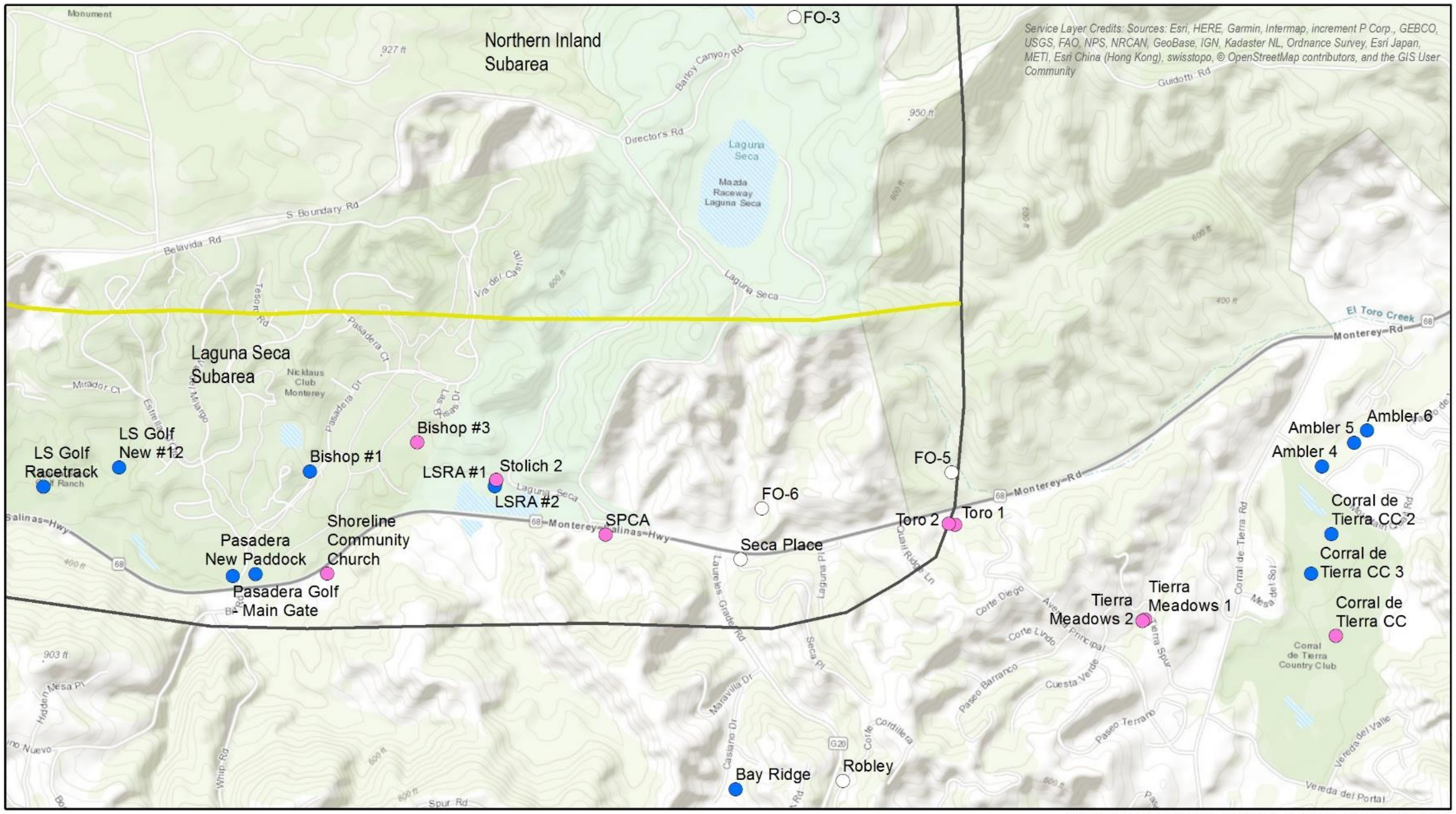


Figure 31. Eastern Laguna Seca Subarea Hydrographs



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EXPLANATION

Adjudicated Seaside Groundwater Basin

- Basin Boundary
- Subarea Boundary
- Select Monitoring Wells

Production Wells

- Well Screened Interval Entirely Within Paso Robles Aquifer (Shallow)
- Well Screened Interval Includes Santa Margarita Aquifer (Deep)

N

0 1,000 2,000 3,000 4,000
Feet

Figure 32. Eastern Laguna Seca Subarea Wells

2.6.2 Groundwater Elevation Maps

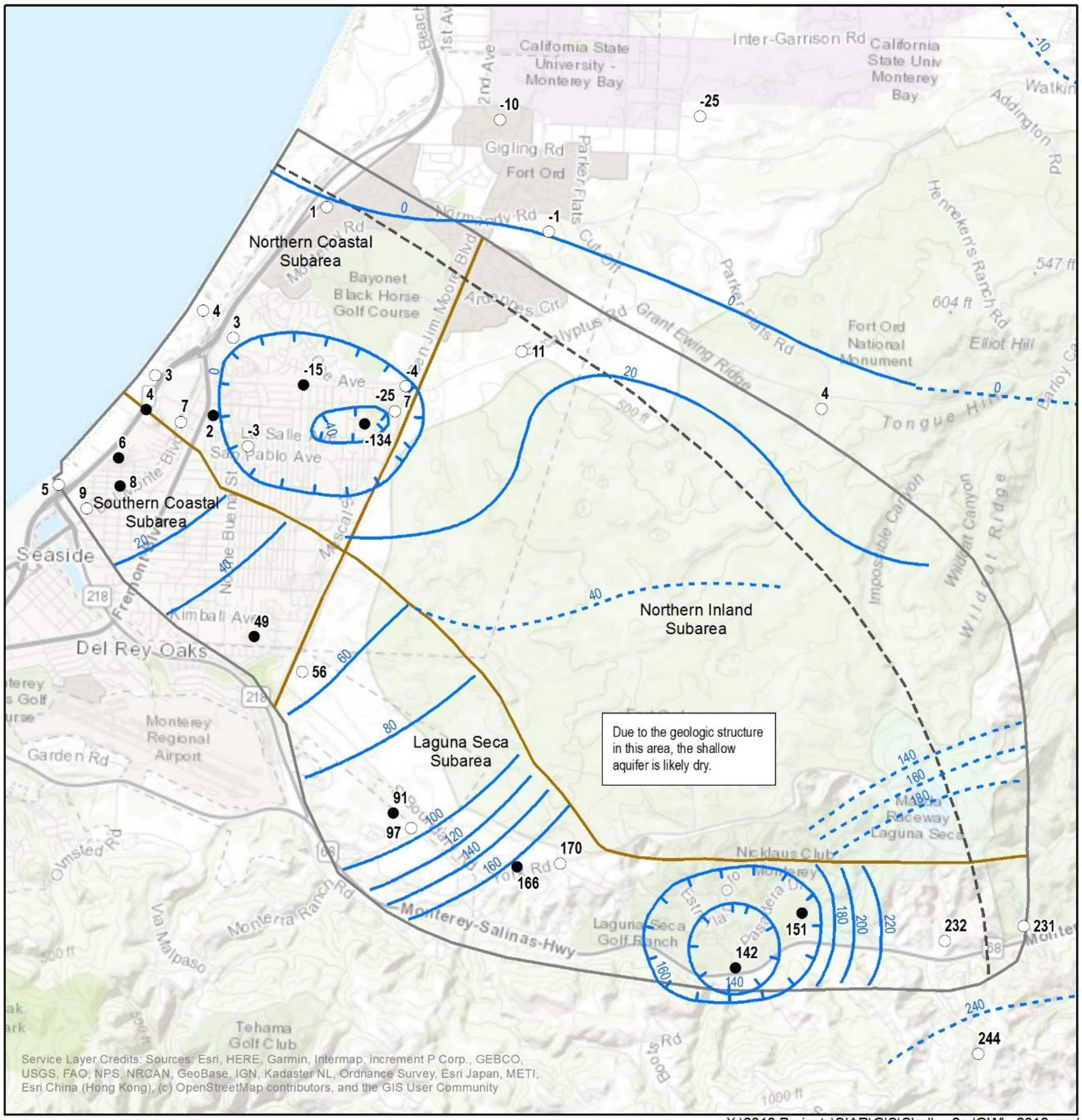
2.6.2.1 Second Quarter Water Year 2019 (January-March 2019)

Groundwater level maps for the shallow and deep aquifer zones for the 2nd quarter of Water Year 2019 are shown on Figure 33 and Figure 34, respectively.

Other than in areas of active groundwater pumping, the shallow aquifer does not show seasonal fluctuations to the same extent as the deep aquifer. Shallow groundwater levels near the coast have decreased by up to 2 feet over 2018 and 2019. Groundwater levels remain stable in the western portion of the Laguna Seca subarea, and the Laguna Seca subarea pumping depression remained similar in extent to last two water years. In the eastern portion of the Northern Inland subarea, an area of the shallow aquifer is indicated to be potentially dry due to geologic structural control (Figure 33). The shallow aquifer pumping depression in the Northern Coastal Subarea has expanded slightly since last year.

Second quarter groundwater levels in the deep aquifer, particularly along the coast, are usually higher than 4th quarter groundwater levels by up to 6 to 7 feet due to seasonal groundwater demand. Coastal deep aquifer groundwater elevations in Water Year 2019 have experienced some changes to those observed in Water Year 2018. Groundwater elevations in the Northern Coastal subarea increased by up to 5 feet in the south, and decreased by up to 7 feet in the north. The pumping depression in the Northern Coastal subarea in Water Year 2019 is slightly smaller in extent than in Water Year 2018 (Figure 34).

As pointed out from Laguna Seca subarea hydrographs on Figure 31, groundwater levels in the central and eastern Laguna Seca subarea have been declining approximately 0.6 feet per year since 2014. The pumping depression caused by the Laguna Seca Golf Ranch wells remains similar in size to recent years. Groundwater levels at the Ryan Ranch wells in the western portion of the Laguna Seca subarea have continued to experience recovery since they have not been pumped from February 2018. In Water Year 2019, 2nd quarter groundwater levels in this area have recovered approximately 11 feet for a total recovery of 26 feet over the past two years.



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EXPLANATION

Wells with Water-Level Data (2nd Quarter WY 2019, Shallow Zone)
- Monitoring Well
- Production Well

WY 2019 Shallow Zone Groundwater Elevation (feet MSL)
- Groundwater Elevation
- Pumping Depression
- Dashed where uncertain (no well data)

- Shallow Aquifer Northern Boundary

Adjudicated Seaside Groundwater Basin Boundary
- Basin Boundary
- Subarea Boundary

N

0 0.5 1 1.5 2
Miles

Figure 33. Shallow Zone Water Elevation Map – 2nd Quarter WY 2019 (January-March 2019)

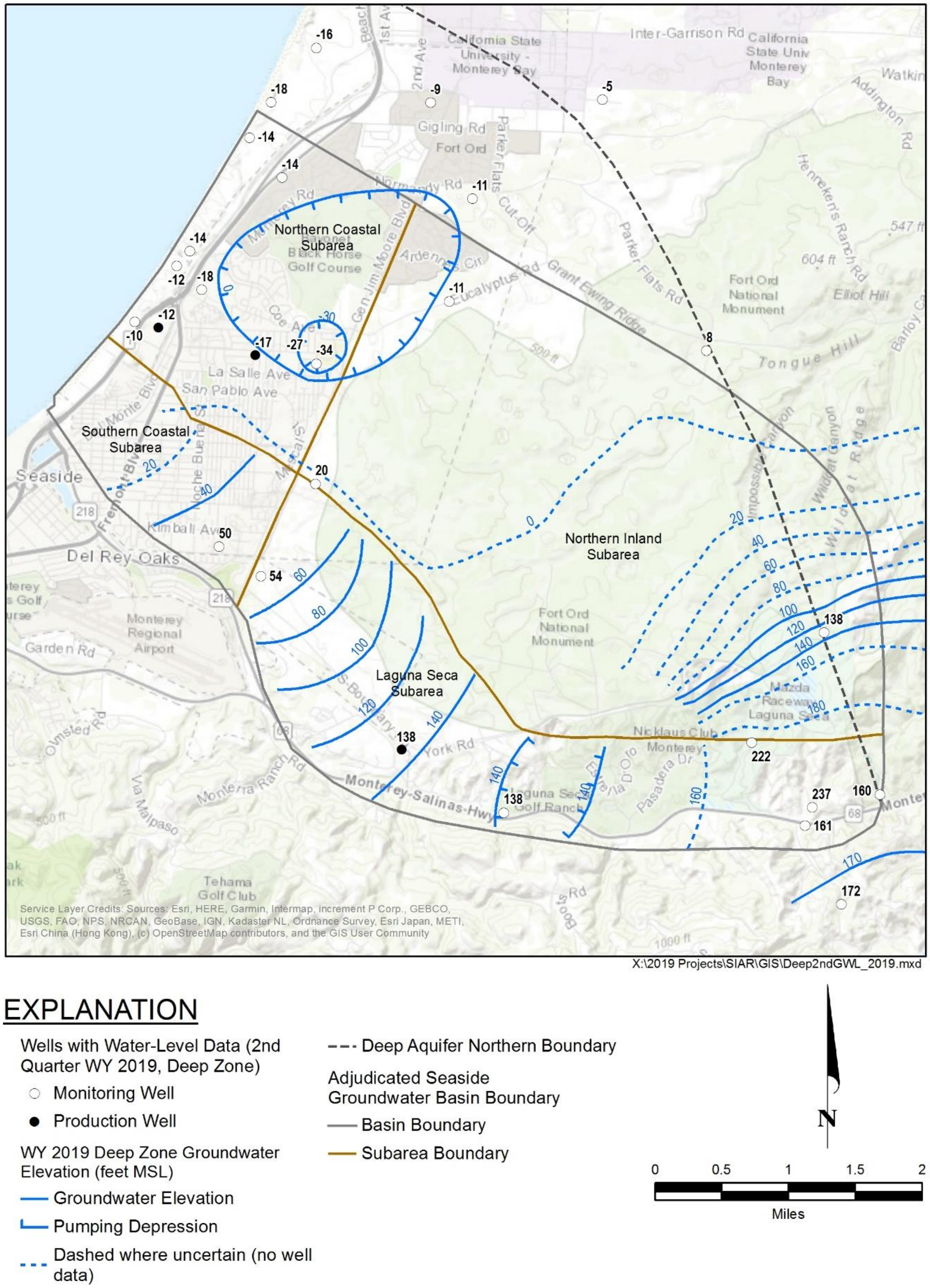
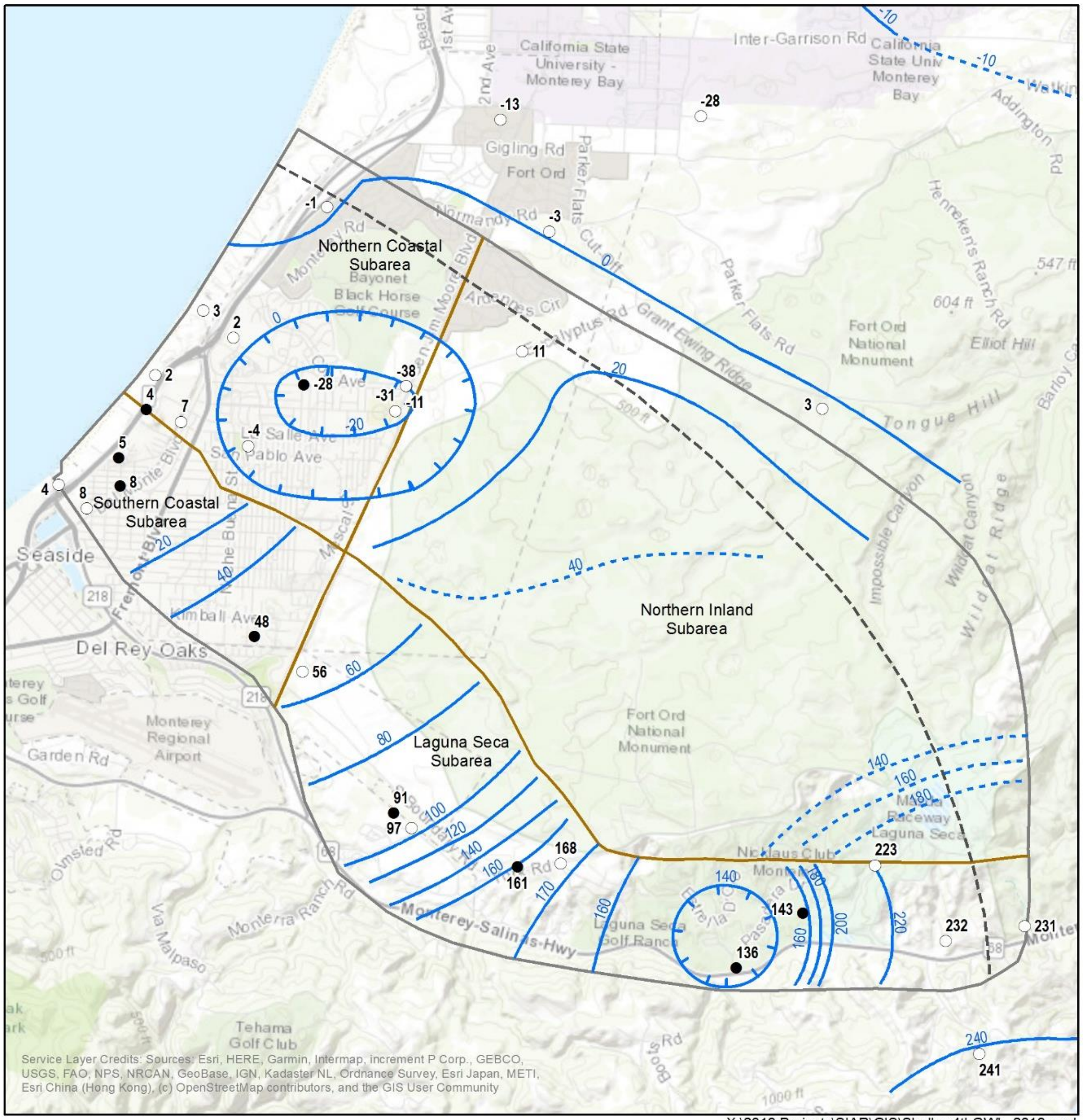


Figure 34. Deep Zone Water Elevation Map – 2nd Quarter WY 2019 (January-March 2019)

2.6.2.2 Fourth Quarter Water Year 2019 (July-September 2019)

Groundwater elevation maps for the shallow and deep aquifer zones for the 4th quarter of Water Year 2019 are shown on Figure 35 and Figure 36, respectively. The contours for the shallow aquifer along the coast show that groundwater levels increased slightly in the Northern Coastal subarea from the 2nd quarter of Water Year 2018. The pumping depression in the Laguna Seca subarea has decreased slightly since last year. The pumping depression in the Northern Coastal subarea has remained of a similar extent to Water Year 2018 but its position has shifted slightly to the north. (Figure 35).

The deep aquifer's -20 foot elevation pumping depression around the wells that pump the most in the Northern Coastal subarea was similar in extent to Water Year 2018 (Figure 36). At the coast, deep groundwater levels decreased by up to 3 feet. Groundwater elevations at Ryan Ranch in the central to western portion of Laguna Seca subarea increased by up to 6 feet since Water Year 2018. Fourth quarter groundwater level recovery at the Ryan Ranch wells was halted by Ryan Ranch #7 pumping 20 acre-feet over the summer but levels still remained similar to 4th quarter 2018 groundwater levels that had recovered 30 feet during that year. The Laguna Seca subarea pumping depression around the Laguna Seca Golf Ranch wells remained similar to last water year (Figure 36).



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EXPLANATION

Wells with Water-Level Data (4th Quarter WY 2019, Shallow Zone)

- Monitoring Well
- Production Well

WY 2019 Shallow Zone Groundwater Elevation (feet MSL)

- Groundwater Elevation
- Pumping Depression
- Dashed where uncertain (no well data)

- Shallow Aquifer Northern

Adjudicated Seaside Groundwater Basin Boundary

- Basin Boundary
- Subarea Boundary

N

0 0.5 1 1.5 2
Miles

Figure 35. Shallow Zone Water Elevation Map – 4th Quarter WY 2019 (August/September 2019)

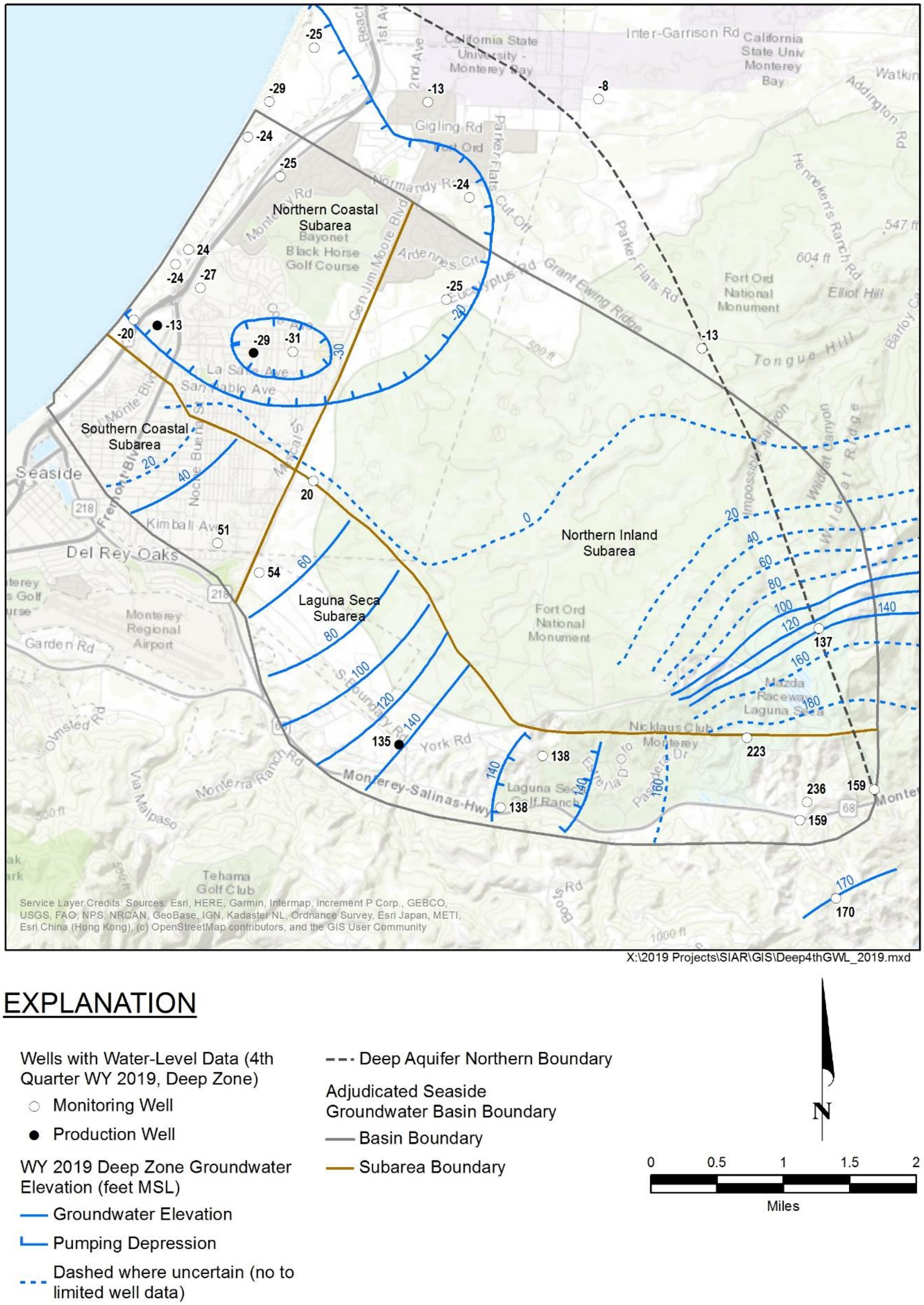


Figure 36. Deep Zone Water Elevation Map – 4th Quarter WY 2019 (August/September 2019)

2.6.3 Protective Groundwater Elevations

Protective groundwater elevations were determined in 2009 using the Seaside Groundwater Basin groundwater flow model and cross-sectional modeling (HydroMetrics LLC, 2009b). A subsequent study in 2013 to revisit and update the protective groundwater elevations concluded that the calibrated parameters in the basin wide model do not indicate that protective elevations should be lowered (HydroMetrics WRI, 2013b). Protective elevations for both the deep and shallow aquifers were established for monitoring well pairs with both a shallow and deep completion. Protective elevations for the six wells with protective elevations are shown in Table 1. Groundwater levels below protective elevations have a greater potential to cause seawater intrusion that will impact production wells.

Table 1. Summary of Protective Elevations at Coastal Monitoring Wells

Subarea	Well	Completion	Protective Elevation, Feet above sea level	Currently Above or Below Protective Elevations
Northern Coastal	MSC	Deep	17	below
		Shallow	11	below
	PCA-W	Deep	17	below
		Shallow	2	above
	Sentinel Well 3	Deep	4	below
Southern Coastal	CDM-MW4	Shallow	2	above

Figure 37 through Figure 40 show the historical groundwater elevations at each of the target protective elevation monitoring wells. Groundwater levels continue to be below protective elevations in all deep target monitoring wells (MSC deep, PCA-West deep, and Sentinel Well 3). Two of the three shallow wells' groundwater levels are again above protective elevations: the PCA-W shallow well and the CDM-MW4 well. In Water Year 2018, the PCA shallow well groundwater levels fell slightly below protective elevations. The greater seasonal fluctuations in this well are likely due to the recommencement of pumping from the shallow aquifer in 2015 at the Coe Ave well. Groundwater levels in the MSC shallow well continue to be below its protective elevation.

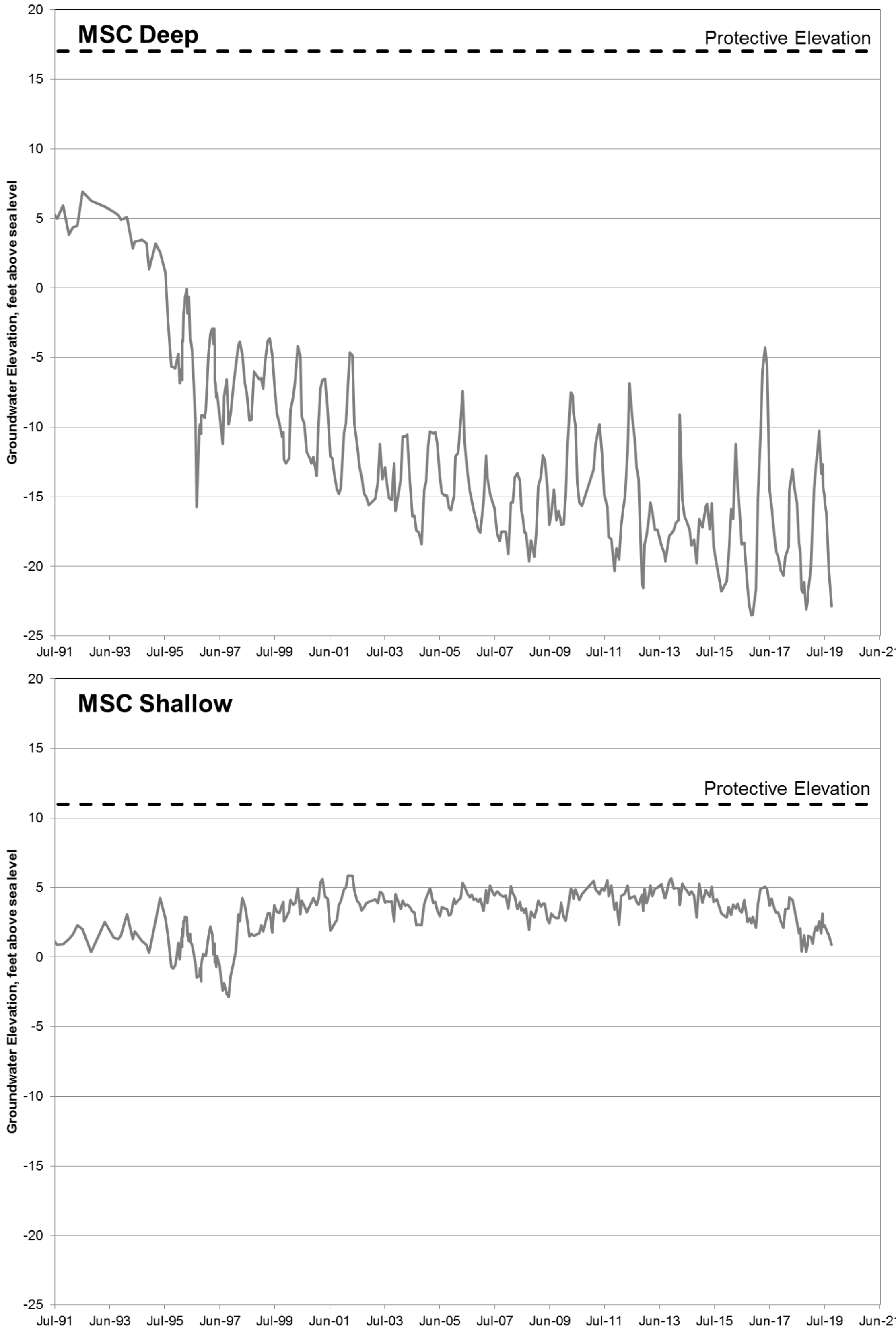
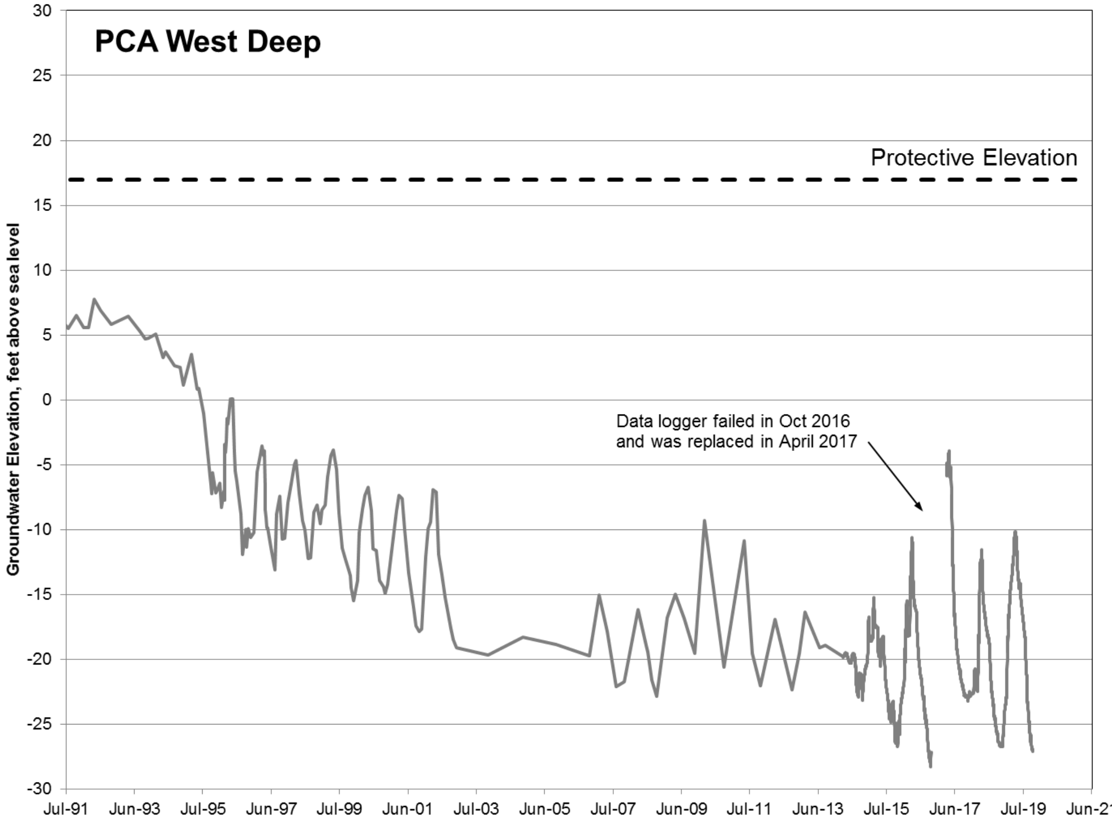


Figure 37. MSC Deep and Shallow Groundwater and Protective Elevations



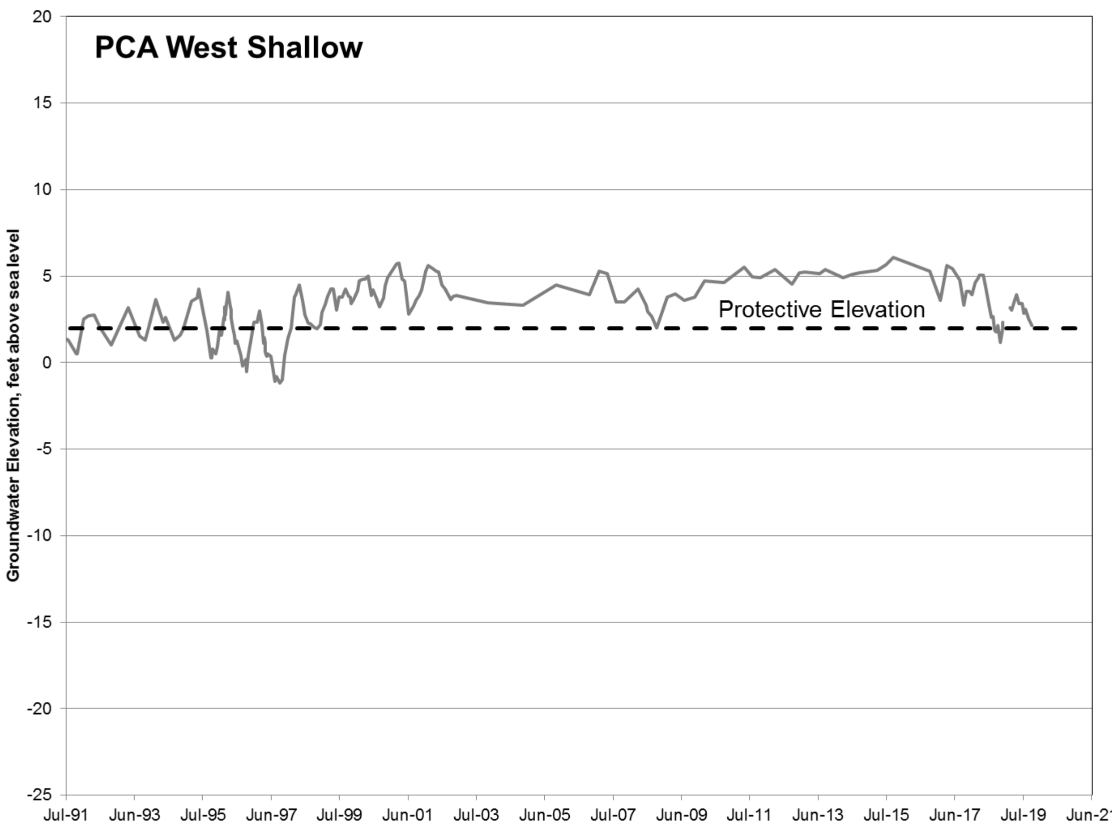


Figure 38. PCA West Deep and Shallow Groundwater and Protective Elevations

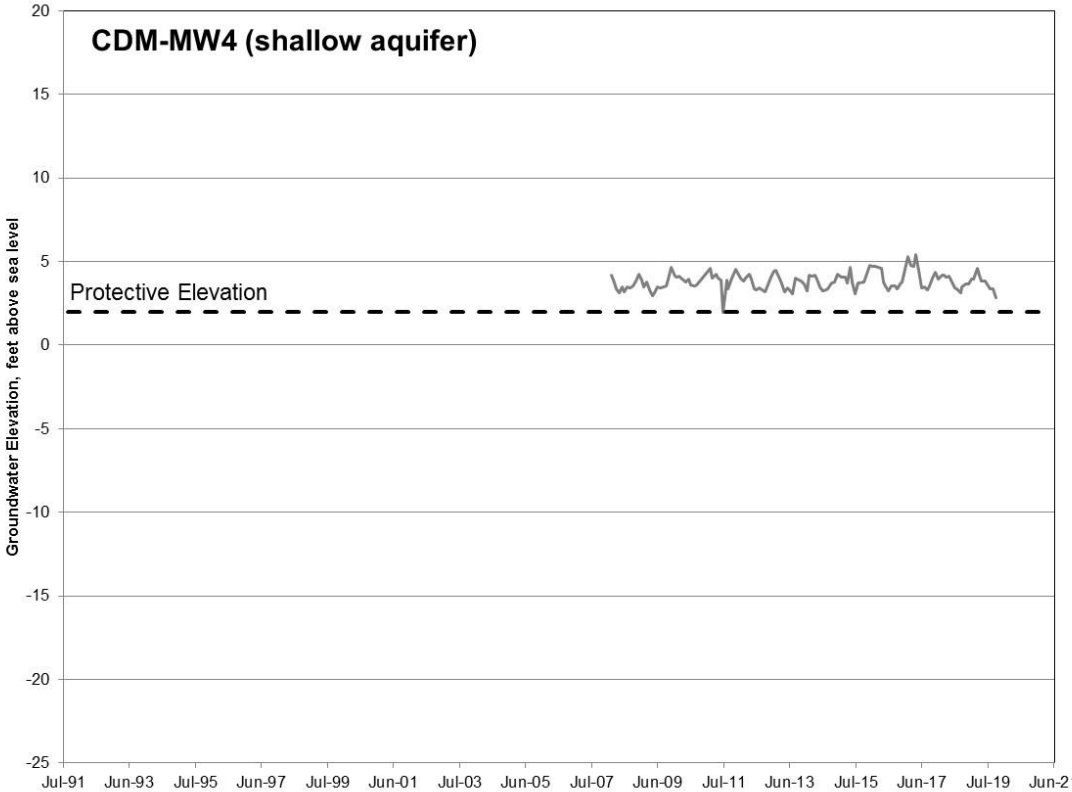


Figure 39. CDM-MW4 Groundwater and Protective Elevations

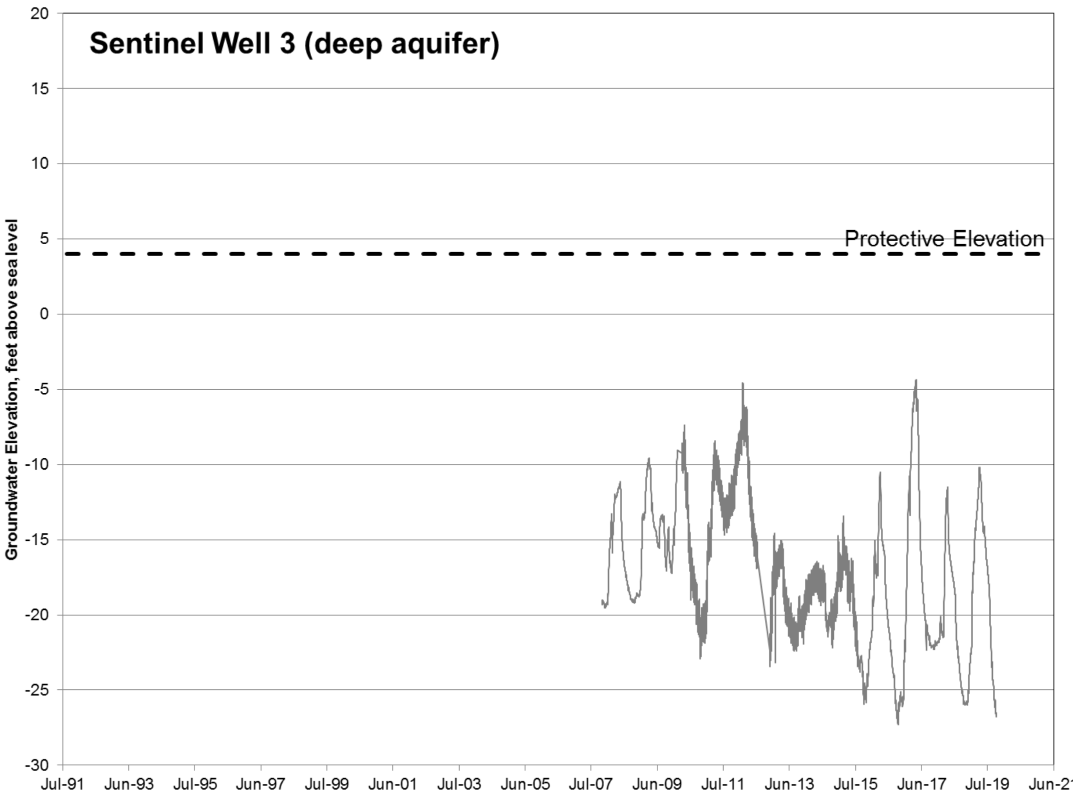


Figure 40. Sentinel Well 3 Groundwater and Protective Elevations

2.7 Groundwater Production

Groundwater pumping in excess of freshwater recharge and subsurface inflow from adjacent areas is the primary cause of seawater intrusion. Mapping pumping volumes gives an indirect indication of the threat of seawater intrusion. Ideally, pumping should be equally distributed throughout a basin, and occur relatively far inland.

Gross pumping by Watermaster producers in Water Year 2019 was 4,013.6 acre-feet, which includes recovery of 744.4 acre-feet of aquifer storage and recovery (ASR) water (Figure 41). Net or native groundwater pumping is the amount pumped after ASR recovery is taken into account. This means that in years where there is water injected and recovered, more water may be pumped from CAW's wells to recover water injected the previous operational year. In Water Year 2019, 1,335.1 acre-feet of injection took place, and 744.4 acre-feet of injected water was recovered. The net or native groundwater production is therefore 3,269.2 acre-feet, which is 91 acre-feet below the Decision-ordered Operating Yield for Water Year 2019 of 3,360 acre-feet (Figure 41). The net or native groundwater produced from the Basin in Water Year 2019 was 94 acre-feet less than in Water Year 2018.

The blue charts on Figure 42 reflect the actual or gross amounts pumped from each well, and the green chart reflects the amount of water injected at the ASR well. In Water Year 2019, the majority of pumping in the basin occurred at CAWC's Ord Grove No. 2 and Santa Margarita #1 production wells.

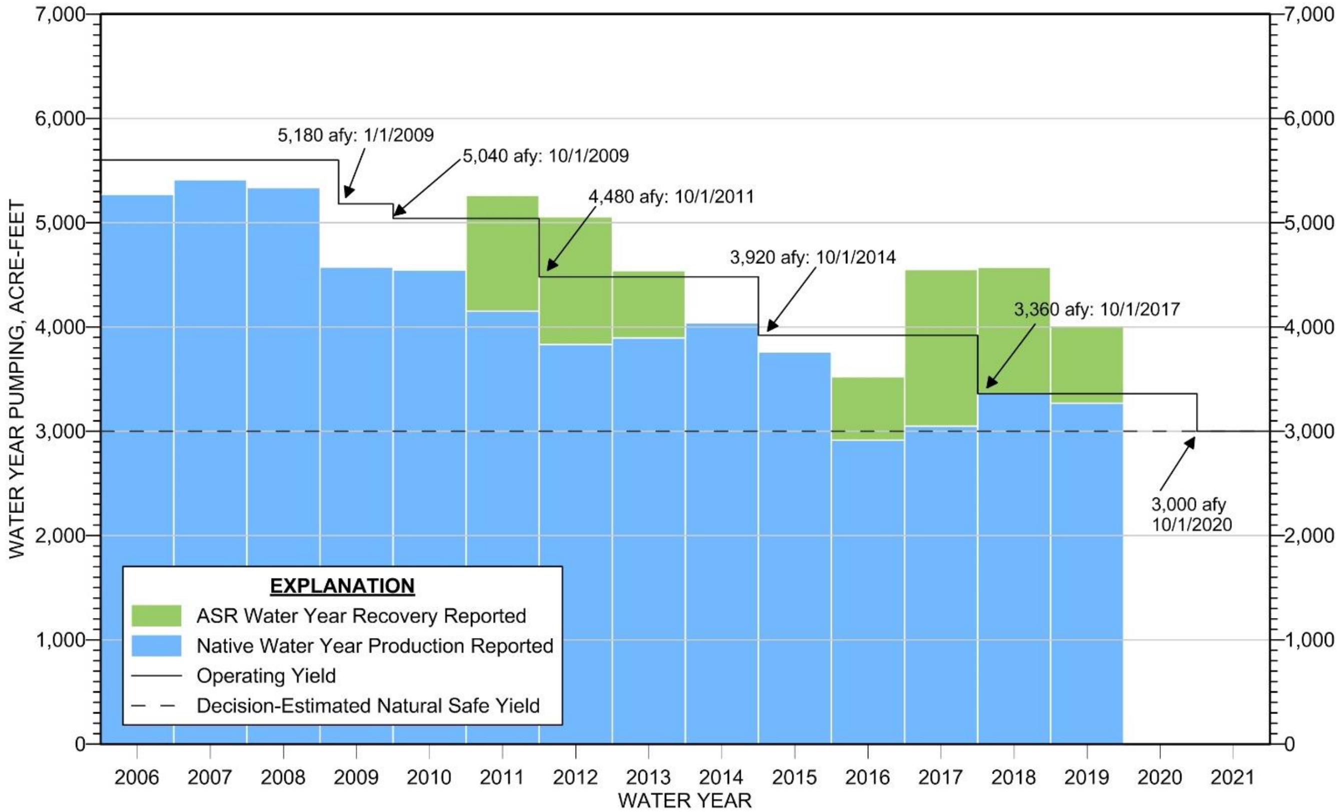
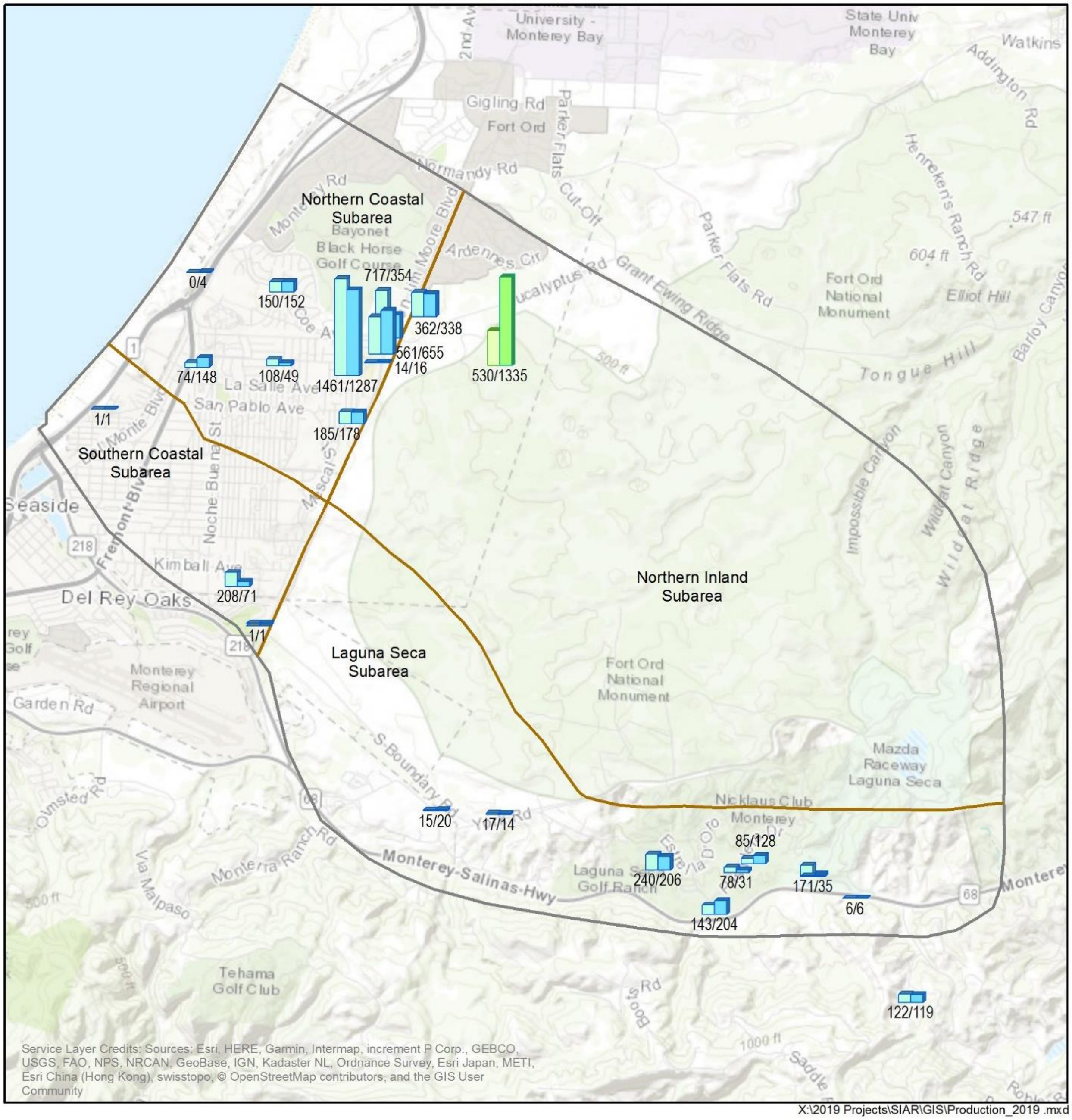


Figure 41. Annual Reported Groundwater Production and Operating Yield for Watermaster Producers



EXPLANATION

Annual Gross Production in acre-feet
730
WY2018
WY2019

Annual Injection in acre-feet
730
WY2018
WY2019

Adjudicated Seaside Groundwater Basin Boundary
Basin Boundary
Subarea Boundary

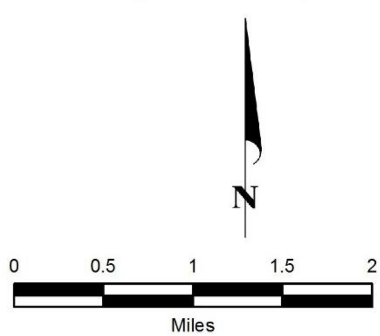


Figure 42. Watermaster Producers' Pumping Distribution for Water Years 2018 and 2019

3 CONCLUSIONS

Groundwater levels below sea level, the cumulative effect of pumping in excess of recharge and fresh water inflows, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion has the potential to occur in the Seaside Groundwater Basin. Based on the findings of this report, ongoing detrimental groundwater conditions that pose a direct threat of seawater intrusion are:

- Both the Paso Robles and Santa Margarita aquifers in the Seaside Groundwater Basin are susceptible to seawater intrusion. The Paso Robles aquifer is in direct hydrogeologic connection with Monterey Bay, and seawater will eventually flow into it if inland groundwater levels continue to be below sea level. The Santa Margarita aquifer may not be in direct connection with Monterey Bay. If that is the case, then seawater intrusion will take longer to appear because the pathway for seawater into that aquifer will be longer as seawater would need to move through the clay rich deposits adjacent to that aquifer before entering the aquifer itself and thereafter make its way into Santa Margarita production wells. It is not if, but when, seawater intrusion into these aquifers will occur if protective water elevations are not achieved.
- Deep groundwater in the Northern Coastal subarea continues to be below sea level. The Water Year 2019 2nd quarter (winter/spring) deep aquifer coastal groundwater levels are more than 12 feet below sea level and the 4th quarter (summer/fall) levels are more than 30 feet below sea level.
- Groundwater levels remain below protective elevations in all deep target monitoring wells (MSC deep, PCA-W deep, and sentinel well SBWM-3). Currently, MSC shallow one of the three shallow wells' groundwater levels are below protective elevations. Groundwater elevations at PCA-W shallow are just above its protective elevation, after falling below its protective elevation last fall.

It is important to remain vigilant and to closely monitor groundwater quality even though seawater intrusion has not yet been observed in monitoring or production wells in the Seaside Groundwater Basin. As outlined in the 2019 Basin Management Action Plan (Montgomery & Associates, 2018a), it is important that the Watermaster identify ways to reduce pumping native groundwater and/or to recover groundwater elevations with water that is left in the basin and is not extracted out as water supply.

Evidence from this report that demonstrates seawater intrusion is not occurring is:

- All groundwater samples for Water Year 2019 from depth-discreet monitoring wells plot generally in a single cluster on Piper diagrams, with no water chemistry changes towards seawater.
- In some production wells, groundwater quality plot on Piper diagrams is different than the water quality in the monitoring wells. This may be a result of mixed water quality from both shallow and deep zones in which these wells are perforated. None of the production wells' groundwater qualities are indicative of seawater intrusion.
- None of the Stiff diagrams for monitoring and production wells show the characteristic chloride spike that typically indicates seawater intrusion in Stiff diagrams.
- Chloride concentration trends were stable for most monitoring wells. One monitoring well, FO-09 shallow, has sustained increased chloride concentrations in all three samples taken during Water Year 2019. The increase in concentrations from the previous year are around 20-30 mg/l. The increase is greater than fluctuations observed historically over the period of record. The elevated concentrations in themselves do not indicate seawater intrusion, however, this well should be carefully observed over the next year to determine if the increasing chloride concentrations are temporary or not.
- Sodium/chloride molar ratios in the monitoring wells remained constant or increased over the past year. Monitoring well FO-09 shallow experienced an increase in chloride as mentioned above, but its sodium/chloride ratio in Water Year 2019 is within the range of historical ratios and has not fallen below the 0.86 ratio that may identify seawater intrusion as the source of chloride as opposed to a domestic waste water source.
- Maps of chloride concentrations for the shallow aquifer do not show chlorides increasing towards the coast. The deep aquifer maps show that higher chloride concentrations are limited to coastal monitoring wells PCA-West Deep and MSC Deep, but these are not indicative of seawater intrusion.
- Induction logging data at the coastal Sentinel Wells do not show historical or recent changes over time that are indicative of seawater intrusion.

Other important findings from the analysis contained in this report are:

- Due to its distance from the coast, seawater intrusion is not an issue of concern in the Laguna Seca subarea. However, groundwater levels in the eastern Laguna Seca subarea have historically declined at rates of 0.6 feet per year in the shallow aquifers, and up to four feet per year in the deep aquifers. These declines have occurred since 2001, despite triennial reductions in allowable pumping. The cause of the declines is due in part to the

Natural Safe Yield of the subarea being too high and in part due to the influence of wells to the east of the Seaside Basin. Although there was some stabilization in groundwater levels between Water Years 2014 and 2016, groundwater levels are continuing to decline. The rate of decline now, however, is less than 0.6 feet per year.

- Native groundwater production in the Seaside Groundwater Basin for Water Year 2019 was 3,269.2 acre-feet, which is 94 acre-feet more than Water Year 2018. The amount of native groundwater pumped in Water Year 2019 is 91 acre-feet less than the Decision-ordered Operating Yield of 3,360 acre-feet per year that is required between October 1, 2017 and September 30, 2020.

4 RECOMMENDATIONS

The analyses presented previously in this report are based on existing data. While informative, the data are spatially incomplete and temporally sporadic. The following recommendations should be implemented to monitor and track seawater intrusion.

Extra Attention Given to Groundwater Quality Results at FO-9 Shallow Monitoring Well Due to Recent Increases in Chloride Concentrations

Based on recent increases in chloride concentrations at monitoring well FO-9 shallow and its proximity to known intrusion in the Salinas Valley, it is recommended that groundwater quality results from it be reviewed after each sampling event to identify if the recent increases are part of natural fluctuations or an ongoing increasing trend. If the March 2020 sample has a greater concentration than this year's highest concentration of 80 mg/L, it is recommended that its sampling frequency be increased to quarterly as a precaution.

Continue to Analyze and Report on Water Quality Annually

Seawater intrusion is a threat to the basin, and data must be collected and analyzed regularly to identify incipient intrusion. Maps, graphs, and analyses similar to what are found in this report should continue to be developed every year.

Include Data from New Monitoring Wells Installed as Part of Recharge Projects

There are a number of projects being implemented or planned in the Seaside Basin that involve recharge and recovery of imported water. It is important that data from new monitoring wells that are part of these projects be reported to the Watermaster and taken into consideration in future SIARs. This is because is it expected that these projects will change groundwater levels in their vicinity and beyond, which in turn changes groundwater flow directions and hydraulic gradients. Being able to determine if the benefits of these projects reduce the threat of seawater intrusion is an added important aspect of the annual reporting. The first such project likely to be implemented is Pure Water Monterey. Monitoring well construction is underway and the Watermaster will identify wells that would provide the most useful information to be included in future SIARs.

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6 ACRONYMS & ABBREVIATIONS

amsl ....above mean sea level
ASR................aquifer storage and recovery
bgs ....below ground surface
Ca ....calcium
CAWC............California American Water Company
Cl....................chloride
CO_3.................carbonate
FO ....Fort Ord
HCO_3..............bicarbonate
K.....................potassium
MCWRA ....Monterey County Water Resources Agency
meq/L ....milliequivalent per liter
Mg ....magnesium
mg/L ....milligrams per liter
MPWMD........Monterey Peninsula Water Management District
MSC ....Monterey Sand Company
Na ....sodium
PCA................Pacific Cement Aggregates
PVWMA ....Pajaro Valley Water Management Agency
SBMMP ....Seaside Groundwater Basin Monitoring and Management Program
SO_4 ....sulfate
TAC................Technical Advisory Committee
WY ....Water Year

MONTGOMERY
& ASSOCIATES

Appendix A

Seaside Basin Monitoring
Groundwater Quality Data for WY 2019

Seaside Basin Monitoring Groundwater Quality Data for WY 2019

Cypress Pacific Production

WM No. 150

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190918_39-04	9/18/2019	88	98	27	5.5	272	91	0.1	187			0.097		0.16	0.6		684	

Del Monte Test

WM No. 231

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
A9I2388-01	9/18/2019	23	42	7.9	3	120	13	0.12	50	<1.0	1.8	0.055	<0.6	<0.1	0.19	7.6	230	410

FO-09-Deep

WM No. 112

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190513_28-01	5/13/2019	24	50	3	3.6	124	6	0.1	68			0.011		0.07	0.2		252	
190708_32-01	7/8/2019	24	55	4	4.2	137	1	< 0.1	66			0.017		0.08	0.2		228	
190826_21-01	8/26/2019	27	50	4	3.7	118	7	0.1	70			0.008		0.08	0.1		226	

FO-09-Shallow

WM No. 111

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190513_28-02	5/13/2019	32	45	8	4.3	104	26	0.1	80			<0.01		< 0.05	0.2		284	
190708_32-02	7/8/2019	31	45	7	4.4	95	22	< 0.1	71			< 0.01		0.05	0.2		228	
190826_21-02	8/26/2019	34	44	8	4.5	100	22	0.0	77			< 0.01		0.06	0.1		264	

< = not detected above detection limit of value following <

all values other than pH and EC are in mg/L

FO-10-Deep **WM No. 114**

Sample Id	Sample Date	Major Cations: Ca	Na	Mg	K	Major Anions: HCO3	SO4	F	Cl	NO3	Major Ions: Fe	Mn	HPO4	B	Br	Physical: pH	TDS	EC (us/cm)
190920_23-02	9/20/2019	16	34	2	1.8	73	11	< 0.1	42.9			0.026		< 0.05	0.1		174	

FO-10-Shallow **WM No. 113**

Sample Id	Sample Date	Major Cations: Ca	Na	Mg	K	Major Anions: HCO3	SO4	F	Cl	NO3	Major Ions: Fe	Mn	HPO4	B	Br	Physical: pH	TDS	EC (us/cm)
190920_23-03	9/20/2019	15	34	2	1.8	65	11	0.0	42.2			< 0.01		< 0.05	0.1		160	

LS Golf New #12 **WM No. 203**

Sample Id	Sample Date	Major Cations: Ca	Na	Mg	K	Major Anions: HCO3	SO4	F	Cl	NO3	Major Ions: Fe	Mn	HPO4	B	Br	Physical: pH	TDS	EC (us/cm)
190918_39-03	9/18/2019	137	127	31	5.4	290	202	0.5	245			0.042		0.12	0.7		934	

LS No. 1 Subdivision **WM No. 142**

Sample Id	Sample Date	Major Cations: Ca	Na	Mg	K	Major Anions: HCO3	SO4	F	Cl	NO3	Major Ions: Fe	Mn	HPO4	B	Br	Physical: pH	TDS	EC (us/cm)
AC26874	9/5/2019	65	80	16	4	180	82	0.22	120	16		< 0.0045	< 0.19	< 0.046	0.47		540	890
190910_41-02	9/10/2019	17	94	11	2.61	116		0.1	139			0.019		0.09	< 0.1		456	

Luzern #2 **WM No. 159**

Sample Id	Sample Date	Major Cations: Ca	Na	Mg	K	Major Anions: HCO3	SO4	F	Cl	NO3	Major Ions: Fe	Mn	HPO4	B	Br	Physical: pH	TDS	EC (us/cm)
A9I2383-01	9/18/2019	65	80	16	4	180	82	0.22	120	16	<0.03	<0.01	<0.6	<0.1	0.47	7.0	540	890

< = not detected above detection limit of value following < all values other than pH and EC are in mg/L

Mission Memorial — WM No. 156

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190918_39-02	9/18/2019	37	70	12	3.0	149	47	0.1	98.0			< 0.01		< 0.05	0.3		370	

MSC - Shallow — WM No. 101

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190513_28-06	5/13/2019	18	33	5	2.8	80	15	0.1	46			< 0.01		< 0.05	0.1		186	
190708_32-06	7/8/2019	19	33	5	2.8	82	14	0.1	43			< 0.01		< 0.05	0.1		162	
190826_21-06	8/26/2019	19	32	5	2.7	85	10	0.1	46			< 0.01		< 0.05	0.1		192	

Ord Grove #2 — WM No. 153

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
A9I2386-01	9/18/2019	61	84	16	4.1	210	56	0.15	110	7.3	<0.03	0.016	<0.6	0.12	0.42	7.1	500	860

Ord Terrace-Shallow — WM No. 109

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190920_23-01	9/20/2019	63	71	13	4.5	255	37	0.1	104			0.03		0.08	0.1		462	

Paralta — WM No. 169

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
A9I2384-01	9/18/2019	45	58	11	3.1	180	59	0.33	47	<1.0	<0.03	0.011	<0.6	<0.1	0.17	7.1	350	590

< = not detected above detection limit of value following <   all values other than pH and EC are in mg/L

Pasadera Golf - Paddock — WM No. 204

Sample Id	Sample Date	Major Cations				Major Anions					Major Ions					Physical		
		Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190910_41-01	9/10/2019	122	104	29	4.4	296	180	0.5	191			0.034		0.09	0.4		840	

PCA East Deep — WM No. 106

Sample Id	Sample Date	Major Cations				Major Anions					Major Ions					Physical		
		Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190813_30-01	8/13/2019	62	98	12	4.3		36	0.2	124			0.175		0.11	0.4		466	
190916_19-02	9/16/2019	63	92	12	4.3	257	36	0.2	123			0.176		0.11	0.4		480	

PCA-E Shallow — WM No. 105

Sample Id	Sample Date	Major Cations				Major Anions					Major Ions					Physical		
		Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190916_19-01	9/16/2019	22	40	5	2.5	83	10	0.1	51			< 0.01		< 0.05	0.2		176	

PCA-W Deep — WM No. 104

Sample Id	Sample Date	Major Cations				Major Anions					Major Ions					Physical		
		Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190513_28-03	5/13/2019	76	102	15	4.8	354	39	0.2	155			0.309		0.16	0.3		626	
190708_32-03	7/8/2019	85	109	16	4.7	394	41	0.3	153			0.354		0.16	0.4		608	
190826_21-03	8/26/2019	91	113	19	5.5	381	40	0.2	155			0.377		0.18	0.4		626	

PCA-W Shallow — WM No. 103

Sample Id	Sample Date	Major Cations				Major Anions					Major Ions					Physical		
		Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190513_28-04	5/13/2019	18	34	5	2.6	87	12	0.1	47			0.005		< 0.05	0.1		226	

< = not detected above detection limit of value following <

all values other than pH and EC are in mg/L

Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190708_32-04	7/8/2019	20	34	5	2.0	84	11	0.1	45			0.006		< 0.05	0.1		150	
190826_21-04	8/26/2019	22	36	6	2.8	83	11	< 0.1	47			0.009		< 0.05	0.1		204	

Playa #3 **WM No. 162**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
A9I2382-01	9/18/2019	56	77	17	4	160	59	<0.1	120	24	0.24	0.023	<0.6	0.11	0.55	6.9	510	850

Plumas #4 **WM No. 177**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
A9I2387-01	9/18/2019	31	92	15	3.1	96	59	0.15	140	21	<0.03	<0.01	<0.6	<0.1	0.5	6.6	480	820

Ryan Ranch #7 **WM No. 213**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
A9I2206-01	9/17/2019	94	140	28	6.1	240	150	0.54	210	<1.0	0.29	0.18	0.92	0.17		6.0	820	1300
A9I2206-01RE1	9/17/2019														0.72	6.0		

Sand City Corp Yard **WM No. 165**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190918_39-01	9/18/2019	48	214	10	5.5	149	127	2.0	256			0.023		0.70	0.8		734	

Seaside Golf - Coe **WM No. 189**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
191017_35-02	10/17/2019	81	80	21.5	3.9		45	0.1	128			13				7.0	486	945

< = not detected above detection limit of value following < all values other than pH and EC are in mg/L

Seaside Golf - Reservoir **WM No. 187**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
191017_35-01	10/17/2019	19	50	6.3	24		10	0.1	71.2			<0.01				7.9	190	370

Seaside Muni #4 **WM No. 173**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
191016_59-01	10/16/2019	24	52	8.1	2.4		18	0.1	82.1			<0.01		<0.1		7.3	290	461

York School 2001 **WM No. 212**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	NO3	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
190918_39-05	9/18/2019	35	159	26	4.0	73	34	0.2	331			< 0.01		0.08	1.1		702	

< = not detected above detection limit of value following < all values other than pH and EC are in mg/L

MONTGOMERY
& ASSOCIATES

Appendix B

Seaside Basin Monitoring
Groundwater Level Data for WY 2019

Seaside Basin Monitoring

Groundwater Level Data for WY 2019

Bay Ridge Watermaster No. 226 Southern Inland

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	435.1	545.92	110.82	on
11/29/2018	437.9	545.92	108.02	on
12/27/2018	395.0	545.92	150.92	off
01/31/2019	387.1	545.92	158.82	on
02/28/2019	377.2	545.92	168.72	off
03/28/2019	435.0	545.92	110.92	on
04/25/2019	434.0	545.92	111.92	on
05/30/2019	380.0	545.92	165.92	off
06/27/2019	384.0	545.92	161.92	off
07/25/2019	383.0	545.92	162.92	off
08/29/2019	387.0	545.92	158.92	off

Bishop #1 (west) Watermaster No. 209 Southern Inland

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	261.0	398.81	137.81	off
11/29/2018	NA	398.81		rehab
12/27/2018	257.2	398.81	141.61	off
01/31/2019	253.7	398.81	145.11	off
02/28/2019	251.4	398.81	147.41	off
03/28/2019	235.0	398.81	163.81	off

04/25/2019	249.0	398.81	149.81	off
05/30/2019	255.0	398.81	143.81	off
06/27/2019	338.0	398.81	60.81	on
07/25/2019	276.0	398.81	122.81	off
08/29/2019	255.0	398.81	143.81	off

Bishop #3 Watermaster No. 262 Southern Inland

Owner: CAW Aquifer Unit:

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	281.8	420.58	138.78	on
11/29/2018	388.7	420.58	31.88	on
12/27/2018	277.4	420.58	143.18	off
01/31/2019	276.4	420.58	144.18	off
02/28/2019	377.3	420.58	43.28	on
03/28/2019	281.0	420.58	139.58	off
04/25/2019	270.0	420.58	150.58	off
05/30/2019	283.0	420.58	137.58	off
06/27/2019	376.0	420.58	44.58	on
07/25/2019	355.0	420.58	65.58	on
08/29/2019	282.0	420.58	138.58	off

Blue Larkspur-East End Watermaster No. 143 Southern Inland

Owner: Laguna Seca Resorts Aquifer Unit:

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	116.67	253.29	136.62	
04/01/2019	115.95	253.29	137.34	
07/03/2019	116.40	253.29	136.89	

CalAm Granite Construction Watermaster No. 242 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	135.17	226.43	91.26	
04/01/2019	135.17	226.43	91.26	
07/12/2019	135.36	226.43	91.07	

Camp Huffman (D) Watermaster No. 250 Southen Inland

Owner: Seaside Groundwater Basin Watermas Aquifer Unit:

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	415.64	401.21	-14.43	
10/31/2018	416.33	401.21	-15.12	
11/26/2018	416.50	401.21	-15.29	
12/27/2018	415.40	401.21	-14.19	
01/29/2019	412.12	401.21	-10.91	
02/11/2019	411.68	401.21	-10.47	Failed to download, Deploy new logger
03/01/2019	410.86	401.21	-9.65	
03/27/2019	409.52	401.21	-8.31	
04/23/2019	409.23	401.21	-8.02	
06/03/2019	410.33	401.21	-9.12	Download
06/27/2019	411.29	401.21	-10.08	
07/26/2019	412.32	401.21	-11.11	
08/29/2019	414.63	401.21	-13.42	
10/01/2019	416.02	401.21	-14.81	

Camp Huffman (S) Watermaster No. 249 Southen Inland

Owner: Seaside Groundwater Basin Watermas Aquifer Unit:

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	399.34	401.21	1.87	
10/31/2018	399.23	401.21	1.98	
11/26/2018	399.07	401.21	2.14	
12/27/2018	398.33	401.21	2.88	
01/29/2019	397.82	401.21	3.39	
02/11/2019	398.13	401.21	3.08	Download
03/01/2019	398.22	401.21	2.99	
03/27/2019	397.71	401.21	3.50	
04/23/2019	397.81	401.21	3.40	
06/03/2019	398.54	401.21	2.67	Download
06/27/2019	399.81	401.21	1.40	
07/26/2019	400.58	401.21	0.63	
08/29/2019	401.46	401.21	-0.25	
10/01/2019	401.83	401.21	-0.62	

CDM MW#4 Watermaster No. 238 Southern Coastal

Owner: MPWMD Aquifer Unit: Qod

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	15.01	18.69	3.68	
12/03/2018	15.04	18.69	3.65	
12/31/2018	14.73	18.69	3.96	
01/28/2019	14.77	18.69	3.92	Intermittent signal, switch reel
03/04/2019	14.07	18.69	4.62	

03/26/2019	14.53	18.69	4.16	
04/23/2019	14.88	18.69	3.81	
06/03/2019	14.85	18.69	3.84	
07/25/2019	15.32	18.69	3.37	
08/29/2019	15.30	18.69	3.39	
10/01/2019	15.88	18.69	2.81	

CDM MW-1 Watermaster No. 251 Northern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/30/2018	90.08	95.53	5.45	
11/30/2018	89.44	95.53	6.09	
12/31/2018	88.68	95.53	6.85	
01/29/2019	88.02	95.53	7.51	
03/05/2019	88.50	95.53	7.03	
03/28/2019	88.22	95.53	7.31	
04/24/2019	88.90	95.53	6.63	
06/04/2019	89.32	95.53	6.21	
06/27/2019	89.48	95.53	6.05	Gate issues
07/31/2019	90.17	95.53	5.36	
08/30/2019	90.55	95.53	4.98	
10/02/2019	90.26	95.53	5.27	

CDM MW-2 Watermaster No. 252 Northern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	60.33	68.83	8.50	

11/30/2018	59.33	68.83	9.50	
12/31/2018	58.62	68.83	10.21	
01/29/2019	58.49	68.83	10.34	
03/05/2019	59.03	68.83	9.80	
03/28/2019	58.69	68.83	10.14	
04/24/2019	59.43	68.83	9.40	
06/04/2019	59.89	68.83	8.94	
06/27/2019	60.18	68.83	8.65	
07/31/2019	60.88	68.83	7.95	
08/30/2019	60.17	68.83	8.66	
10/02/2019	60.77	68.83	8.06	

CDM MW-3 Watermaster No. 239 Southern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	32.16	33.81	1.65	
11/27/2018	31.24	33.81	2.57	
12/26/2018	29.32	33.81	4.49	
01/28/2019	30.77	33.81	3.04	
03/04/2019	29.88	33.81	3.93	
03/26/2019	31.13	33.81	2.68	
04/22/2019	31.17	33.81	2.64	
06/03/2019	31.61	33.81	2.20	
06/26/2019	32.97	33.81	0.84	
07/25/2019	33.16	33.81	0.65	
08/29/2019	30.30	33.81	3.51	
10/01/2019	31.32	33.81	2.49	

Cypress Pacific Production Watermaster No. 150 Southern Coastal

Owner: Paul Bruno Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	47.35	50.23	2.88	DTW est due to plate off. Pump pulled.
11/27/2018	47.18	50.23	3.05	
12/26/2018	46.68	50.23	3.55	
01/28/2019	46.70	50.23	3.53	
03/04/2019	NA	50.23		Gasket in the way of access
03/28/2019	NA	50.23		Gasket in the way of access
04/23/2019	46.10	50.23	4.13	
06/04/2019	46.41	50.23	3.82	
06/26/2019	46.60	50.23	3.63	
07/25/2019	46.95	50.23	3.28	
08/29/2019	47.40	50.23	2.83	
09/18/2019	47.64	50.23	2.59	

Del Monte Test Watermaster No. 231 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	31.0	32.62	1.62	off
11/29/2018	31.0	32.62	1.62	off
12/27/2018	na	32.62		blocked
01/31/2019	30.0	32.62	2.62	off
02/28/2019	31.0	32.62	1.62	off
03/28/2019	29.5	32.62	3.12	off
04/25/2019	28.7	32.62	3.92	off

05/30/2019	29.4	32.62	3.22	off
06/27/2019	25.8	32.62	6.82	off
07/25/2019	26.1	32.62	6.52	off
08/29/2019	25.3	32.62	7.32	off

Design Ctr. Watermaster No. 167 Southern Coastal

Owner: City of Sand City Aquifer Unit: Qod/Qar/QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	13.93	21.34	7.41	
11/27/2018	14.06	21.34	7.28	
01/02/2019	13.84	21.34	7.50	
01/28/2019	13.62	21.34	7.72	
03/04/2019	13.18	21.34	8.16	
03/26/2019	13.08	21.34	8.26	
04/22/2019	13.10	21.34	8.24	
06/03/2019	13.35	21.34	7.99	
06/26/2019	13.40	21.34	7.94	
07/25/2019	13.52	21.34	7.82	
08/29/2019	13.28	21.34	8.06	
10/01/2019	13.4	21.34	7.94	

FO-01-Deep Watermaster No. 116 Northern Inland

Owner: MPWMD Aquifer Unit: Tm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	342.47	362.57	20.10	
03/15/2019	342.16	362.57	20.41	
07/02/2019	342.42	362.57	20.15	

FO-01-Shallow

Watermaster No. 115

Northern Inland

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	203.89	362.61	158.72	
03/15/2019	203.82	362.61	158.79	
07/02/2019	203.72	362.61	158.89	

FO-03-Deep

Watermaster No. 127

Southern Inland

Owner: MPWMD

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2019	637.18	774.74	137.56	
04/01/2019	637.31	774.74	137.43	
07/03/2019	637.42	774.74	137.32	

FO-04-Deep (W)

Watermaster No. 130

Southern Inland

Owner: MPWMD

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/02/2018	114.49	167.44	52.95	
11/27/2018	114.13	167.44	53.31	
01/02/2019	113.72	167.44	53.72	
01/29/2019	114.02	167.44	53.42	
03/04/2019	114.58	167.44	52.86	
03/28/2019	114.73	167.44	52.71	
04/22/2019	114.22	167.44	53.22	
06/04/2019	113.71	167.44	53.73	
06/25/2019	113.61	167.44	53.83	
07/26/2019	113.50	167.44	53.94	

08/30/2019	113.62	167.44	53.82	
10/02/2019	113.02	167.44	54.42	

FO-04-Shallow (E) Watermaster No. 129 Southern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/02/2018	113.62	168.23	54.61	Took many tries
11/27/2018	112.90	168.23	55.33	
01/02/2019	112.72	168.23	55.51	
01/29/2019	113.60	168.23	54.63	
03/04/2019	114.95	168.23	53.28	
03/28/2019	114.40	168.23	53.83	intermittent
04/22/2019	113.40	168.23	54.83	
06/04/2019	112.41	168.23	55.82	
06/25/2019	112.44	168.23	55.79	
07/26/2019	112.36	168.23	55.87	
08/30/2019	112.57	168.23	55.66	
10/02/2019	112.03	168.23	56.20	

FO-05-Deep Watermaster No. 132 Southern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	322.82	479.29	156.47	
12/26/2018	320.20	479.29	159.09	
02/12/2019	319.18	479.29	160.11	Download
03/29/2019	318.98	479.29	160.31	
06/17/2019	321.83	479.29	157.46	Download

FO-05-Shallow Watermaster No. 131 Southern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	250.95	478.97	228.02	
12/26/2018	248.09	478.97	230.88	
02/12/2019	247.66	478.97	231.31	Deployed new logger
03/29/2019	247.67	478.97	231.30	
06/17/2019	249.98	478.97	228.99	Download, replace datalogger

FO-06-Deep Watermaster No. 134 Southern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	234.76	470.62	235.86	
03/29/2019	233.21	470.62	237.41	
07/03/2019	236.10	470.62	234.52	

FO-06-Shallow Watermaster No. 133 Southern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	237.67	470.13	232.46	
03/29/2019	237.66	470.13	232.47	
07/03/2019	239.85	470.13	230.28	

FO-07-Deep Watermaster No. 119 Northern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	496.35	470.15	-26.20	
11/01/2018	497.36	470.15	-27.21	

11/26/2018	497.23	470.15	-27.08	
12/27/2018	499.12	470.15	-28.97	
01/29/2019	486.60	470.15	-16.45	
02/11/2019	484.67	470.15	-14.52	Download
03/01/2019	483.57	470.15	-13.42	
03/26/2019	481.22	470.15	-11.07	
04/23/2019	482.09	470.15	-11.94	
06/03/2019	485.94	470.15	-15.79	Download
06/27/2019	487.60	470.15	-17.45	
07/26/2019	490.51	470.15	-20.36	
08/30/2019	495.19	470.15	-25.04	
10/02/2019	497.48	470.15	-27.33	

FO-07-Shallow Watermaster No. 118 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	459.84	470.18	10.34	
10/30/2018	459.92	470.18	10.26	
11/26/2018	459.80	470.18	10.38	
12/27/2018	459.58	470.18	10.60	
01/29/2019	459.13	470.18	11.05	
02/11/2019	459.13	470.18	11.05	Download
03/01/2019	459.17	470.18	11.01	
03/26/2019	458.92	470.18	11.26	
04/23/2019	459.50	470.18	10.68	
06/03/2019	459.80	470.18	10.38	Download
06/27/2019	460.81	470.18	9.37	

07/26/2019	461.19	470.18	8.99	
08/30/2019	461.98	470.18	8.20	
10/02/2019	462.12	470.18	8.06	

FO-08-Deep Watermaster No. 121 Northern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	403.53	378.1	-25.43	
10/31/2018	404.50	378.1	-26.40	
11/27/2018	403.80	378.1	-25.70	
12/27/2018	401.51	378.1	-23.41	
01/29/2019	394.82	378.1	-16.72	
02/11/2019	393.16	378.1	-15.06	Download and replace logger
03/05/2019	391.78	378.1	-13.68	
03/28/2019	389.17	378.1	-11.07	
04/23/2019	390.51	378.1	-12.41	
06/03/2019	393.81	378.1	-15.71	Datalogger gone, deploy new logger
06/27/2019	395.50	378.1	-17.40	
07/30/2019	398.78	378.1	-20.68	
08/29/2019	402.52	378.1	-24.42	
10/02/2019	404.5	378.1	-26.40	

FO-08-Shallow Watermaster No. 120 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	381.77	378.04	-3.73	
10/31/2018	381.82	378.04	-3.78	

11/27/2018	381.83	378.04	-3.79	
12/27/2018	381.30	378.04	-3.26	
01/29/2019	380.71	378.04	-2.67	
02/11/2019	379.52	378.04	-1.48	
03/05/2019	380.21	378.04	-2.17	
03/28/2019	379.89	378.04	-1.85	
04/23/2019	379.71	378.04	-1.67	
06/03/2019	380.08	378.04	-2.04	
06/27/2019	380.87	378.04	-2.83	
07/30/2019	381.75	378.04	-3.71	
08/29/2019	382.15	378.04	-4.11	
10/02/2019	383.13	378.08	-5.05	

FO-09-Deep Watermaster No. 112 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	144.37	118.85	-25.52	
11/28/2018	144.43	118.85	-25.58	Quarterly sample
02/12/2019	133.50	118.85	-14.65	Download
05/13/2019	132.66	118.85	-13.81	Quartely sample
06/11/2019	134.63	118.85	-15.78	Download
07/08/2019	136.36	118.85	-17.51	Quarterly sample
08/26/2019	143.63	118.85	-24.78	Download. Quarterly sample.

FO-09-Shallow Watermaster No. 111 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc/Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	120.29	118.89	-1.40	
11/28/2018	120.31	118.89	-1.42	Quarterly sample
02/12/2019	118.32	118.89	0.57	Download
05/13/2019	117.48	118.89	1.41	Quarterly sample
06/11/2019	117.57	118.89	1.32	Download
07/08/2019	118.49	118.89	0.40	Quarterly sample
08/26/2019	119.53	118.89	-0.64	Download. Quarterly sample

FO-10-Deep Watermaster No. 114 Northern Coastal

Owner: MPWMD Aquifer Unit: Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	215.15	201.03	-14.12	
11/30/2018	214.68	201.03	-13.65	
12/31/2018	213.11	201.03	-12.08	
01/30/2019	211.53	201.03	-10.50	
03/04/2019	210.72	201.03	-9.69	
03/27/2019	210.18	201.03	-9.15	
04/23/2019	210.38	201.03	-9.35	
06/04/2019	211.19	201.03	-10.16	
06/27/2019	212.21	201.03	-11.18	
07/29/2019	213.01	201.03	-11.98	
08/30/2019	214.05	201.03	-13.02	
09/20/2019	214.67	201.03	-13.64	SBWM annual Standard Panel

FO-10-Shallow

Watermaster No. 113

Northern Coastal

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	215.36	200.84	-14.52	
11/30/2018	214.71	200.84	-13.87	
12/31/2018	214.30	200.84	-13.46	
01/30/2019	211.96	200.84	-11.12	
03/04/2019	211.52	200.84	-10.68	
03/27/2019	211.11	200.84	-10.27	
04/23/2019	211.29	200.84	-10.45	
06/04/2019	211.82	200.84	-10.98	
06/27/2019	212.81	200.84	-11.97	
07/29/2019	213.53	200.84	-12.69	
08/30/2019	214.02	200.84	-13.18	
09/20/2019	214.38	200.84	-13.54	SBWM annual Standard Panel

FO-11-Deep

Watermaster No. 123

Northern Inland

Owner: MPWMD

Aquifer Unit: Tp

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	343.25	332.96	-10.29	
11/30/2018	341.78	332.96	-8.82	
12/31/2018	339.61	332.96	-6.65	
01/30/2019	339.12	332.96	-6.16	
03/04/2019	338.59	332.96	-5.63	
03/27/2019	338.04	332.96	-5.08	
04/23/2019	338.23	332.96	-5.27	

06/04/2019	338.96	332.96	-6.00	
06/27/2019	340.62	332.96	-7.66	
07/29/2019	341.33	332.96	-8.37	
08/30/2019	341.20	332.96	-8.24	
10/02/2019	341.71	332.96	-8.75	

FO-11-Shallow Watermaster No. 122 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	363.26	332.93	-30.33	
11/30/2018	362.82	332.93	-29.89	
12/31/2018	362.60	332.93	-29.67	
01/30/2019	359.22	332.93	-26.29	
03/04/2019	358.83	332.93	-25.90	
03/27/2019	358.50	332.93	-25.57	
04/23/2019	358.66	332.93	-25.73	
06/04/2019	359.89	332.93	-26.96	
06/27/2019	361.15	332.93	-28.22	
07/29/2019	361.75	332.93	-28.82	
08/30/2019	361.22	332.93	-28.29	
10/02/2019	361.53	332.93	-28.60	

Hilby MGT Watermaster No. 244 Southern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	252.0	248.04	-3.96	off
11/29/2018	252.0	248.04	-3.96	off

12/27/2018	251.7	248.04	-3.66	off
01/31/2019	252.0	248.04	-3.96	off
02/28/2019	252.2	248.04	-4.16	off
03/28/2019	242.1	248.04	5.94	off
04/25/2019	241.8	248.04	6.24	off
05/30/2019	241.9	248.04	6.14	off
06/27/2019	241.7	248.04	6.34	off
07/25/2019	241.4	248.04	6.64	off
08/29/2019	240.0	248.04	8.04	off

Justin Court Watermaster No. 135 Southern Inland

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	143.13	240.28	97.15	
04/01/2019	142.97	240.28	97.31	
07/03/2019	143.29	240.28	96.99	

K-Mart Watermaster No. 125 Southern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	23.70	30.65	6.95	
11/27/2018	23.83	30.65	6.82	
12/26/2018	23.48	30.65	7.17	
03/05/2019	22.67	30.65	7.98	
03/28/2019	21.40	30.65	9.25	
04/24/2019	22.53	30.65	8.12	
06/03/2019	22.63	30.65	8.02	

06/25/2019	22.85	30.65	7.80	
07/25/2019	22.99	30.65	7.66	
08/29/2019	23.25	30.65	7.40	
10/01/2019	23.32	30.65	7.33	

LS Driving Range Watermaster No. 141 Southern Inland

Owner: County of Monterey Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/22/2018	351.02	488.34	137.32	Deployed new pump. No water produced after 20 pounds of CO2.
12/26/2018	NA	488.34		Obstructions at ~ 200' and 250', multiple attempts
04/01/2019	NA	488.34		Obstructed

LS No. 1 Subdivision Watermaster No. 142 Southern Inland

Owner: Laguna Seca Resorts Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	139.85	277.13	137.28	
04/01/2019	138.97	277.13	138.16	
07/03/2019	139.33	277.13	137.80	

LS Pistol Range Watermaster No. 136 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	291.71	514.39	222.68	
12/26/2018	292.12	514.39	222.27	
02/12/2019	291.99	514.39	222.40	Download
03/28/2019	292.22	514.39	222.17	
06/17/2019	292.37	514.39	222.02	Download, fixed line connections

Luxton Watermaster No. 243 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	97.0	89.12	-7.88	off
11/29/2018	97.6	89.12	-8.48	off
12/27/2018	97.9	89.12	-8.78	off
01/31/2019	97.0	89.12	-7.88	off
02/28/2019	97.0	89.12	-7.88	off
03/28/2019	94.3	89.12	-5.18	off
04/25/2019	93.6	89.12	-4.48	off
05/30/2019	92.8	89.12	-3.68	off
06/27/2019	92.6	89.12	-3.48	off
07/25/2019	92.7	89.12	-3.58	off
08/29/2019	92.9	89.12	-3.78	off

Luzern #2 Watermaster No. 159 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	186.0	156.99	-29.01	on
11/29/2018	202.0	156.99	-45.01	on
12/27/2018	184.2	156.99	-27.21	off
01/31/2019	182.0	156.99	-25.01	off
02/28/2019	196.0	156.99	-39.01	on
03/28/2019	175.7	156.99	-18.71	off
04/25/2019	174.2	156.99	-17.21	off
05/30/2019	174.3	156.99	-17.31	off

06/27/2019	175.7	156.99	-18.71	off
07/25/2019	179.1	156.99	-22.11	off
08/29/2019	NA	156.99		Well Rehab

Military Watermaster No. 151 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	165.5	135.8	-29.70	off
11/29/2018	165.0	135.8	-29.20	off
12/27/2018	163.6	135.8	-27.80	off
01/31/2019	158.6	135.8	-22.80	off
02/12/2019	156.77	135.8	-20.97	off. Download
02/28/2019	157.0	135.8	-21.20	off
03/28/2019	151.8	135.8	-16.00	off
04/25/2019	151.2	135.8	-15.40	off
05/30/2019	151.7	135.8	-15.90	off
06/11/2019	154.82	135.8	-19.02	off. Download
06/27/2019	153.8	135.8	-18.00	off
07/25/2019	154.2	135.8	-18.40	off
08/29/2019	158.0	135.8	-22.20	off

MMP monitor Watermaster No. 154 Northern Coastal

Owner: Mission Memorial Park Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	350.91	315.42	-35.49	on
12/03/2018	347.85	315.42	-32.43	off
12/26/2018	346.45	315.42	-31.03	off

01/28/2019	343.10	315.42	-27.68	off
03/04/2019	340.26	315.42	-24.84	off
03/26/2019	320.79	315.42	-5.37	off
04/23/2019	323.20	315.42	-7.78	on
06/04/2019	329.57	315.42	-14.15	off
06/26/2019	335.40	315.42	-19.98	on
07/29/2019	341.61	315.42	-26.19	on
08/28/2019	345.91	315.42	-30.49	off

MSC - Shallow Watermaster No. 101 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	78.49	80.1	1.61	
10/31/2018	79.73	80.1	0.37	
11/27/2018	78.98	80.1	1.12	
11/28/2018	78.54	80.1	1.56	Quarterly sample
12/26/2018	78.64	80.1	1.46	
01/28/2019	79.12	80.1	0.98	
02/12/2019	78.39	80.1	1.71	
03/04/2019	77.91	80.1	2.19	
03/26/2019	78.17	80.1	1.93	
04/22/2019	77.54	80.1	2.56	
05/13/2019	78.37	80.1	1.73	Quarterly sample
06/03/2019	76.97	80.1	3.13	
06/11/2019	77.97	80.1	2.13	
06/26/2019	77.82	80.1	2.28	
07/08/2019	77.88	80.1	2.22	Quarterly sample

07/25/2019	78.14	80.1	1.96	
08/26/2019	78.56	80.1	1.54	Quarterly sample
10/01/2019	79.21	80.1	0.89	

MSC-Deep Watermaster No. 102 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	101.40	80.29	-21.11	
10/31/2018	103.40	80.29	-23.11	
11/27/2018	102.61	80.29	-22.32	
11/28/2018	102.07	80.29	-21.78	Quarterly sample
12/26/2018	100.54	80.29	-20.25	
01/28/2019	97.05	80.29	-16.76	
02/12/2019	94.83	80.29	-14.54	Download
03/04/2019	93.02	80.29	-12.73	
03/26/2019	92.20	80.29	-11.91	
04/22/2019	90.51	80.26	-10.25	
05/13/2019	93.63	80.29	-13.34	Quarterly sample
06/03/2019	92.93	80.26	-12.67	
06/11/2019	94.59	80.29	-14.30	Download
06/26/2019	95.18	80.26	-14.92	
07/08/2019	95.83	80.29	-15.54	Quarterly sample
07/25/2019	96.42	80.26	-16.16	
08/26/2019	100.68	80.26	-20.42	Deploy new logger. Quarterly sample
10/01/2019	103.12	80.26	-22.86	

MW-BW-08-A Watermaster No. 240 Southern Coastal

Owner: U.S.A. Fort Ord Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	60.48	205.18	144.70	
11/27/2018	60.50	205.18	144.68	
12/31/2018	60.39	205.18	144.79	
01/29/2019	60.41	205.18	144.77	
03/04/2019	60.11	205.18	145.07	
03/28/2019	60.02	205.18	145.16	
04/22/2019	60.69	205.18	144.49	
06/04/2019	60.00	205.18	145.18	
06/25/2019	59.98	205.18	145.20	
07/26/2019	59.93	205.18	145.25	
08/28/2019	60.21	205.18	144.97	
10/02/2019	60.40	205.18	144.78	

MW-BW-09-180 Watermaster No. 241 Southern Coastal

Owner: U.S.A. Fort Ord Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	211.60	206.22	-5.38	
11/27/2018	211.69	206.22	-5.47	
12/31/2018	211.44	206.22	-5.22	
01/29/2019	211.58	206.22	-5.36	
03/04/2019	211.80	206.22	-5.58	
03/28/2019	211.91	206.22	-5.69	
04/22/2019	212.19	206.22	-5.97	

06/04/2019	211.71	206.22	-5.49	
06/25/2019	211.67	206.22	-5.45	
07/26/2019	211.49	206.22	-5.27	
08/28/2019	211.80	206.22	-5.58	
10/02/2019	211.99	206.22	-5.77	

Ord Grove #2 Watermaster No. 153 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	382.0	232.39	-149.61	on
11/29/2018	382.0	232.39	-149.61	on
12/27/2018	367.9	232.39	-135.51	on
01/31/2019	378.0	232.39	-145.61	on
02/28/2019	380.0	232.39	-147.61	on
03/28/2019	373.8	232.39	-141.41	on
04/25/2019	369.3	232.39	-136.91	on
05/30/2019	366.2	232.39	-133.81	on
06/27/2019	367.6	232.39	-135.21	on
07/25/2019	367.4	232.39	-135.01	on
08/29/2019	363.9	232.39	-131.51	on

Ord Grove Test Watermaster No. 107 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	344.05	294.00	-50.05	on. Screwed it back on again.
10/25/2018	344	294.00	-50.00	off
10/31/2018	344.93	294.00	-50.93	on

11/14/2018	345.08	294.00	-51.08	on. S1, G1, DBP and F1 sammple. Screwed back on again.
11/26/2018	344.92	294.00	-50.92	
11/29/2018	344.0	294.00	-50.00	off
12/26/2018	343.62	294.00	-49.62	on
12/27/2018	343.7	294.00	-49.70	off
01/28/2019	340.20	294.00	-46.20	on
01/31/2019	340.0	294.00	-46.00	off
02/12/2019	338.67	294.00	-44.67	on. Download. Re-attach RP pipe again
02/28/2019	338.0	294.00	-44.00	off
03/04/2019	337.22	294.00	-43.22	on
03/26/2019	335.10	294.00	-41.10	on
03/28/2019	332.7	294.00	-38.70	off
04/23/2019	333.60	294.00	-39.60	on
04/25/2019	331.4	294.00	-37.40	off
05/30/2019	328.2	294.00	-34.20	off
06/11/2019	333.14	294.00	-39.14	RP pipe not on again, dig out and replace pipe. Download
06/26/2019	333.60	294.00	-39.60	on
06/27/2019	329.5	294.00	-35.50	off
07/25/2019	329.4	294.00	-35.40	off
07/30/2019	334.03	294.00	-40.03	
08/28/2019	356.10	294.00	-62.10	on
08/29/2019	327.0	294.00	-33.00	off
10/01/2019	349.92	294.00	-55.92	on

Ord Terrace-Shallow Watermaster No. 109 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm (upper)

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	265.08	228.68	-36.40	
10/31/2018	265.88	228.68	-37.20	
11/26/2018	266.02	228.68	-37.34	
12/26/2018	264.90	228.68	-36.22	
01/28/2019	260.19	228.68	-31.51	
02/12/2019	259.95	228.68	-31.27	Download
03/04/2019	258.66	228.68	-29.98	
04/23/2019	255.49	228.68	-26.81	
06/11/2019	255.95	228.68	-27.27	Download
06/26/2019	256.43	228.68	-27.75	
07/30/2019	258.04	228.68	-29.36	
08/28/2019	259.97	228.68	-31.29	
09/20/2019	261.19	228.68	-32.51	SBWM annual Standard Panel
10/01/2019	261.68	228.68	-33.00	

Paralta Watermaster No. 169 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	NA	324.29		NA
11/29/2018	NA	324.29		NA
12/27/2018	na	324.29		blocked
01/31/2019	na	324.29		blocked
02/28/2019	na	324.29		blocked

03/28/2019	na	324.29		blocked
04/25/2019	328.2	324.29	-3.91	off
05/30/2019	332.7	324.29	-8.41	off
06/27/2019	339.4	324.29	-15.11	off
07/25/2019	333.1	324.29	-8.81	on
08/29/2019	362.1	324.29	-37.81	on

Paralta Test Well Watermaster No. 108 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc/Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	345.80	330.72	-15.08	off
10/25/2018	346.0	330.72	-15.28	off
10/31/2018	346.05	330.72	-15.33	off. Pump pulled.
11/27/2018	342.53	330.72	-11.81	off
11/29/2018	342.0	330.72	-11.28	off
12/26/2018	340.89	330.72	-10.17	off
12/27/2018	341.2	330.72	-10.48	off
01/29/2019	334.99	330.72	-4.27	Weber pumping with temp pump
01/31/2019	na	330.72		blocked
02/12/2019	327.29	330.72	3.43	off/rehab. Download
02/28/2019	329.6	330.72	1.12	off
03/01/2019	329.21	330.72	1.51	off
03/26/2019	327.58	330.72	3.14	
03/28/2019	323.6	330.72	7.12	off
04/23/2019	331.02	330.72	-0.30	
04/25/2019	327.1	330.72	3.62	off
05/30/2019	329.1	330.72	1.62	off

06/24/2019	337.03	330.72	-6.31	off. Download
06/25/2019	337.41	330.72	-6.69	off
06/27/2019	333.1	330.72	-2.38	off
07/25/2019	329.6	330.72	1.12	off
07/26/2019	346.50	330.72	-15.78	on
08/29/2019	341.1	330.72	-10.38	off
08/29/2019	348.93	330.72	-18.21	on
10/01/2019	353.35	330.72	-22.63	off

Pasadera Golf - Paddock Watermaster No. 204 Southern Inland

Owner: Pasadera Country Club, LLC Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	223.46	359.69	136.23	Download
02/12/2019	217.47	359.69	142.22	Download
06/17/2019	242.92	359.69	116.77	Download

PCA East Deep Watermaster No. 106 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	94.47	65.54	-28.93	
11/14/2018	95.64	65.54	-30.10	S1, G1, DBP and F1 Sample
02/12/2019	83.18	65.54	-17.64	Download
06/11/2019	84.47	65.54	-18.93	Download
08/13/2019	92.18	65.54	-26.64	S1, G1, DBP and F1 sample. Download.
09/16/2019	94.84	65.54	-29.30	SBWM annual Standard Panel

PCA Production Watermaster No. 171 Northern Coastal

Owner: Security National Guaranty Inc Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2018	68.1	72.63	4.53	
11/26/2018	68.2	72.63	4.43	
12/24/2018	68.0	72.63	4.63	
01/24/2019	68.2	72.63	4.43	
02/25/2019	68.0	72.63	4.63	
03/25/2019	68.4	72.63	4.23	
04/22/2019	68.0	72.63	4.63	
05/23/2019	68.2	72.63	4.43	
06/25/2019	68.65	72.63	3.98	
07/24/2019	69.2	72.63	3.43	
08/24/2019	67.2	72.63	5.43	
09/25/2019	68.32	72.63	4.31	

PCA-E Shallow Watermaster No. 105 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	67.54	68.51	0.97	
10/31/2018	68.18	68.51	0.33	No Time
11/26/2018	67.70	68.51	0.81	
12/26/2018	67.07	68.51	1.44	
01/28/2019	66.40	68.51	2.11	
02/12/2019	66.07	68.51	2.44	Download
03/04/2019	65.62	68.51	2.89	

04/23/2019	65.49	68.51	3.02	
06/03/2019	65.83	68.51	2.68	
06/11/2019	65.40	68.51	3.11	Download
06/26/2019	65.64	68.51	2.87	
07/29/2019	66.67	68.51	1.84	
08/13/2019	66.78	68.51	1.73	Download
09/16/2019	67.15	68.51	1.36	SBWM annual Standard Panel

PCA-W Deep Watermaster No. 104 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	89.87	65.18	-24.69	
11/01/2018	92.48	65.18	-27.30	
11/27/2018	91.10	65.18	-25.92	
11/28/2018	90.16	65.18	-24.98	Quarterly sample
12/31/2018	NA	65.18		Gate locked
01/29/2019	82.80	65.18	-17.62	
02/12/2019	80.39	65.18	-15.21	Download
03/01/2019	80.33	65.18	-15.15	
03/26/2019	77.70	65.18	-12.52	
04/23/2019	77.07	65.18	-11.89	
05/13/2019	79.42	65.18	-14.24	Quarterly sample
06/24/2019	82.17	65.18	-16.99	Download
07/08/2019	83.27	65.18	-18.09	Quarterly sample
07/25/2019	84.51	65.18	-19.33	
08/26/2019	89.18	65.18	-24.00	Download. Quarterly sample
10/03/2019	91.8	65.18	-26.62	

PCA-W Shallow Watermaster No. 103 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2018	63.08	65.22	2.14	
11/01/2018	64.04	65.22	1.18	
11/27/2018	63.20	65.22	2.02	
11/28/2018	62.87	65.22	2.35	Quarterly sample
12/31/2018	NA	65.22		Gate locked
01/29/2019	NA	65.22		Need new lock
02/12/2019	62.03	65.22	3.19	
03/01/2019	62.17	65.22	3.05	
03/26/2019	61.71	65.22	3.51	
04/23/2019	61.30	65.22	3.92	
05/13/2019	61.82	65.22	3.40	Quarterly sample
06/24/2019	61.81	65.22	3.41	Download
07/08/2019	62.39	65.22	2.83	Quarterly sample
07/25/2019	62.12	65.22	3.10	
08/26/2019	62.68	65.22	2.54	Quarterly sample
10/03/2019	63.07	65.22	2.15	

Playa #3 Watermaster No. 162 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	52.5	53.02	0.52	off
11/29/2018	52.0	53.02	1.02	off
12/27/2018	125.4	53.02	-72.38	on

01/31/2019	53.0	53.02	0.02	off
02/28/2019	52.0	53.02	1.02	off
03/28/2019	124.3	53.02	-71.28	on
04/25/2019	130.6	53.02	-77.58	on
05/30/2019	52.1	53.02	0.92	off
06/27/2019	51.5	53.02	1.52	off
07/25/2019	133.6	53.02	-80.58	on
08/29/2019	52.6	53.02	0.42	off

Plumas #4 Watermaster No. 177 Southern Coastal

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	115.0	161.48	46.48	off
11/29/2018	113.7	161.48	47.78	off
12/27/2018	114.7	161.48	46.78	off
01/31/2019	252.0	161.48	-90.52	on
02/28/2019	257.4	161.48	-95.92	on
03/28/2019	117.7	161.48	43.78	off
04/25/2019	114.3	161.48	47.18	off
05/30/2019	112.7	161.48	48.78	off
06/27/2019	112.7	161.48	48.78	off
07/25/2019	na	161.48		Well Rehab
08/29/2019	na	161.48		Well Rehab

Plumas Test 1990 Watermaster No. 124 Southern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	108.63	157.83	49.20	off
11/18/2018	108.30	157.83	49.53	off
12/31/2018	107.78	157.83	50.05	off
01/28/2019	108.36	157.83	49.47	on
03/04/2019	108.98	157.83	48.85	on
03/28/2019	109.02	157.83	48.81	off
04/22/2019	108.43	157.83	49.40	off
06/25/2019	107.67	157.83	50.16	off
07/26/2019	107.49	157.83	50.34	off, casing and pump out
08/28/2019	107.12	157.83	50.71	off, process of disinfecting
10/01/2019	106.83	157.83	51.00	off

Robley Deep (South) Watermaster No. 140 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	396.40	566.44	170.04	
03/29/2019	394.02	566.44	172.42	
07/03/2019	399.03	566.44	167.41	

Robley Shallow (North) Watermaster No. 139 Southern Inland

Owner: County of Monterey Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	326.31	566.54	240.23	
03/29/2019	322.15	566.54	244.39	

07/03/2019	325.82	566.54	240.72

Ryan Ranch #11 Watermaster No. 215 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	173.1	307.59	134.49	off
11/29/2018	171.9	307.59	135.69	off
12/27/2018	171.9	307.59	135.69	off
01/31/2019	171.4	307.59	136.19	off
02/28/2019	169.0	307.59	138.59	off
03/28/2019	168.0	307.59	139.59	off
04/25/2019	173.0	307.59	134.59	off
05/30/2019	184.0	307.59	123.59	off
06/27/2019	184.0	307.59	123.59	off
07/25/2019	184.0	307.59	123.59	off
08/29/2019	187.0	307.59	120.59	off

Ryan Ranch #7 Watermaster No. 213 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	160.5	294	133.50	off
11/29/2018	159.8	294	134.20	off
12/27/2018	158.7	294	135.30	off
01/31/2019	156.5	294	137.50	off
02/28/2019	156.4	294	137.60	off
03/28/2019	na	294		well rehab
04/25/2019	178.0	294	116.00	off

05/30/2019	190.0	294	104.00	off
06/27/2019	331.0	294	-37.00	on
07/25/2019	397.0	294	-103.00	on
08/29/2019	361.0	294	-67.00	on

Ryan Ranch #8 Watermaster No. 216 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	173.1	306.86	133.76	off
11/29/2018	172.2	306.86	134.66	off
12/27/2018	171.7	306.86	135.16	off
01/31/2019	170.9	306.86	135.96	off
02/28/2019	169.3	306.86	137.56	off
03/28/2019	169.0	306.86	137.86	off
04/25/2019	174.0	306.86	132.86	off
05/30/2019	186.0	306.86	120.86	off
06/27/2019	187.0	306.86	119.86	off
07/25/2019	186.0	306.86	120.86	off
08/29/2019	190.0	306.86	116.86	off

Sand City Corp Yard Watermaster No. 165 Southern Coastal

Owner: City of Sand City Aquifer Unit: Qod/Qar/QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	42.17	47.25	5.08	1670us/cm
11/27/2018	41.93	47.25	5.32	1910us/cm?
01/02/2019	41.72	47.25	5.53	1773us/cm
01/28/2019	41.69	47.25	5.56	1290us/cm

03/04/2019	41.41	47.25	5.84	1552us/cm
03/26/2019	41.43	47.25	5.82	1086us/cm
04/22/2019	41.73	47.25	5.52	1117us/cm
06/03/2019	42.10	47.25	5.15	1296us/cm
06/26/2019	41.69	47.25	5.56	1087us/cm
07/25/2019	42.03	47.25	5.22	1080us/cm
08/29/2019	42.12	47.25	5.13	1470us/cm
09/18/2019	42.27	47.25	4.98	1290us/cm

Seca Place Watermaster No. 138 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
12/26/2018	268.61	427.59	158.98	
03/29/2019	266.20	427.59	161.39	
07/03/2019	270.78	427.59	156.81	

Target Well Watermaster No. 152 Northern Coastal

Owner: DBO Development Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/31/2018	64.25	44.42	-19.83	
11/27/2018	63.01	44.42	-18.59	
12/26/2018	62.78	44.42	-18.36	
01/30/2019	63.04	44.42	-18.62	
03/01/2019	62.40	44.42	-17.98	
03/28/2019	62.90	44.42	-18.48	
04/24/2019	59.60	44.42	-15.18	
06/03/2019	56.20	44.42	-11.78	

06/26/2019	56.30	44.42	-11.88	
07/29/2019	56.66	44.42	-12.24	
08/30/2019	57.50	44.42	-13.08	
10/02/2019	57.90	44.42	-13.48	

Toro #3 Watermaster No. 303 Southern Inland

Owner: Cal-Am Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2018	211.8	499	287.20	off
11/29/2018	210.4	499	288.60	off
12/27/2018	210.9	499	288.10	off
01/31/2019	208.9	499	290.10	off
02/28/2019	208.9	499	290.10	off
03/28/2019	207.0	499	292.00	off
04/25/2019	208.0	499	291.00	off
05/30/2019	207.0	499	292.00	off
06/27/2019	208.0	499	291.00	off
07/25/2019	208.0	499	291.00	off
08/29/2019	211.0	499	288.00	off

York Rd-West Watermaster No. 137 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/02/2018	322.40	490.28	167.88	
12/26/2018	321.83	490.28	168.45	
02/12/2019	321.61	490.28	168.67	Deploy new logger
04/01/2019	320.21	490.28	170.07	

06/17/2019	320.48	490.28	169.80	Download, replace datalogger
07/03/2019	322.11	490.28	168.17	

York School 2001 Watermaster No. 212 Southern Inland

Owner: York School Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/01/2018	226.59	384.3	157.71	off
12/03/2018	223.11	384.3	161.19	off
01/28/2019	219.43	384.3	164.87	off
03/01/2019	219.34	384.3	164.96	off
03/27/2019	218.90	384.3	165.40	off
04/22/2019	218.49	384.3	165.81	off
05/24/2019	218.10	384.3	166.20	off
06/26/2019	218.70	384.3	165.60	off
07/26/2019	226.78	384.3	157.52	off
08/28/2019	227.91	384.3	156.39	off
10/03/2019	231.04	384.3	153.26	off

Appendix C

Piper Diagrams

Appendix C Contents

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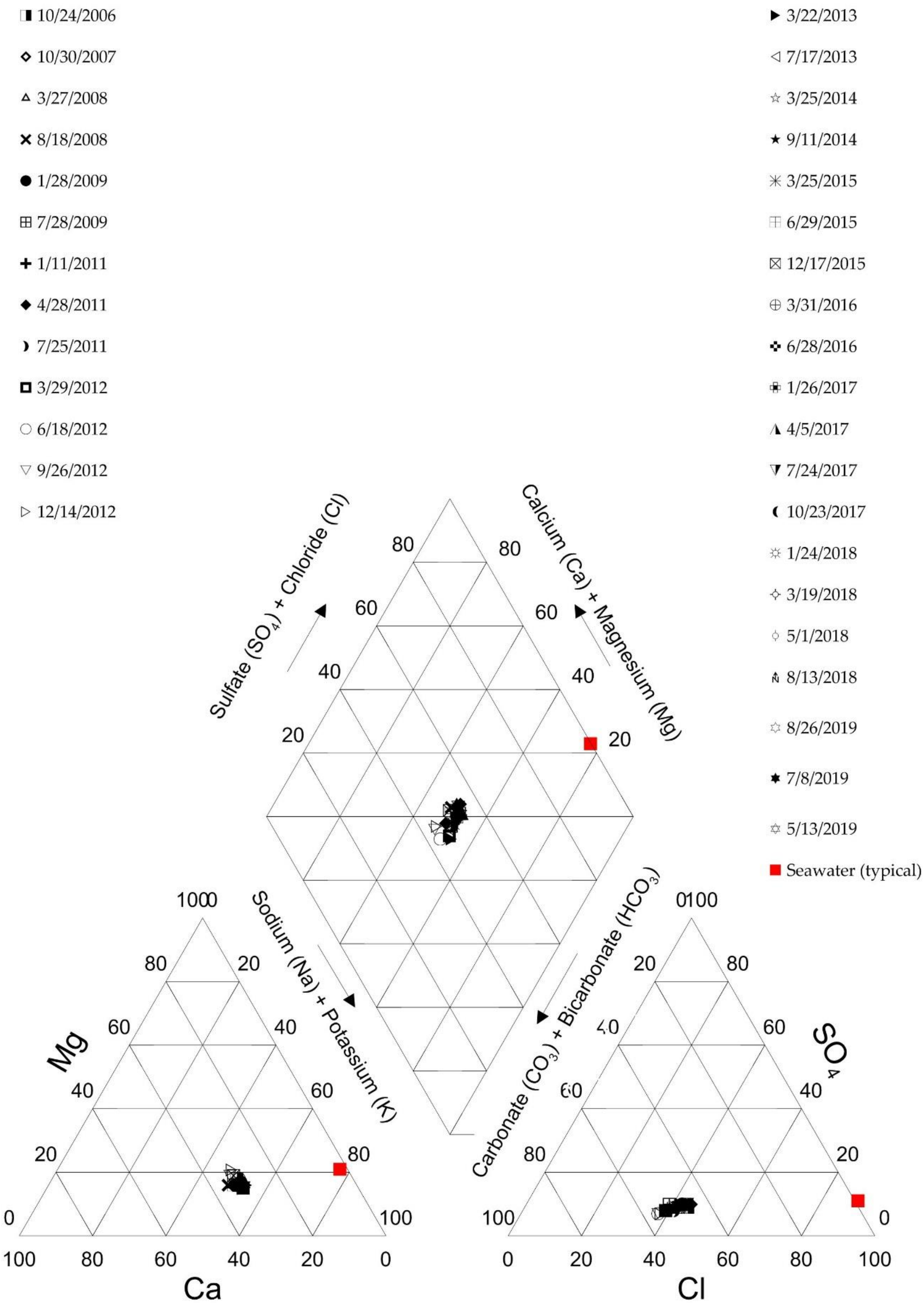

Figure C-1. Piper Diagram of PCA West Shallow

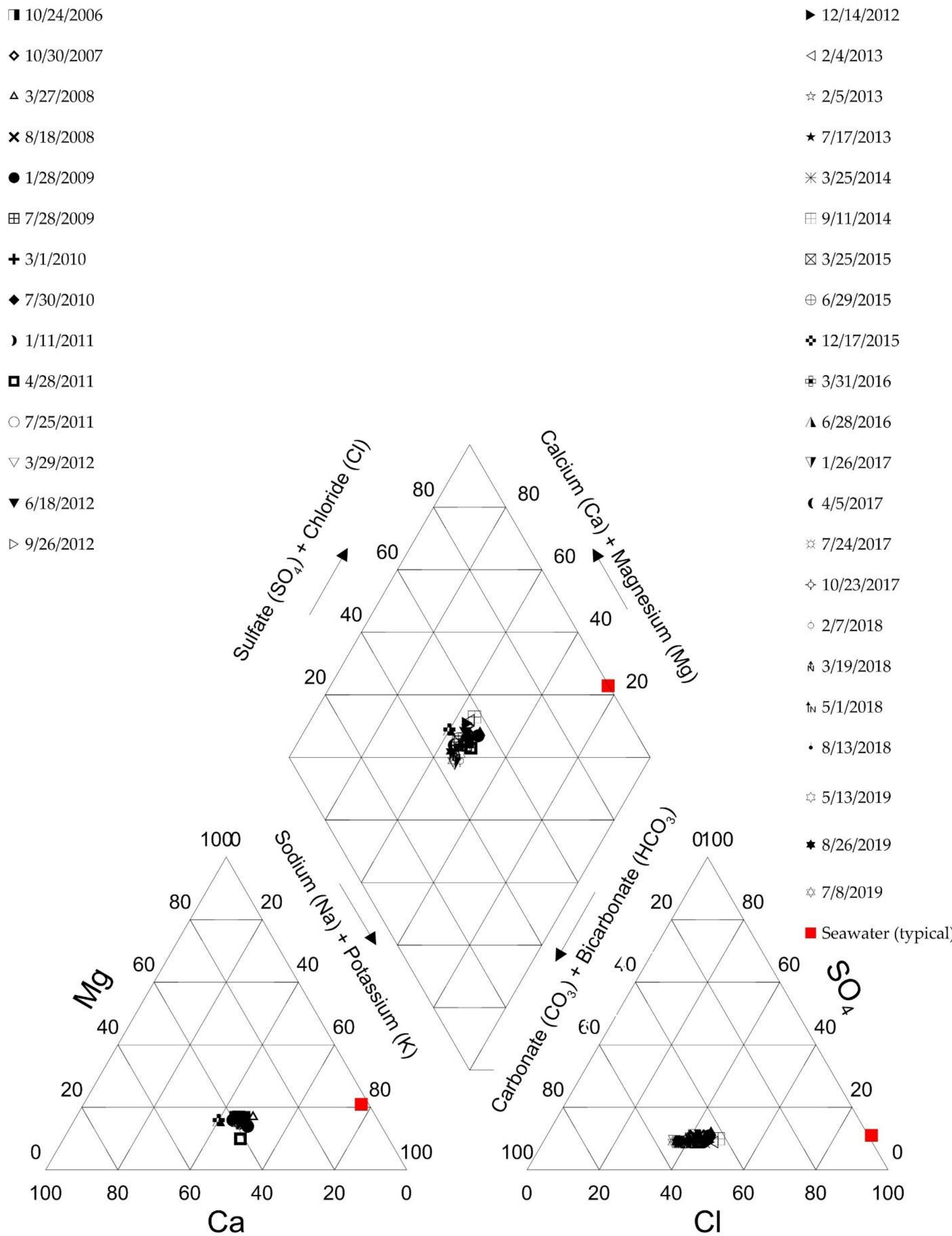

Figure C-2. Piper Diagram of PCA West Deep

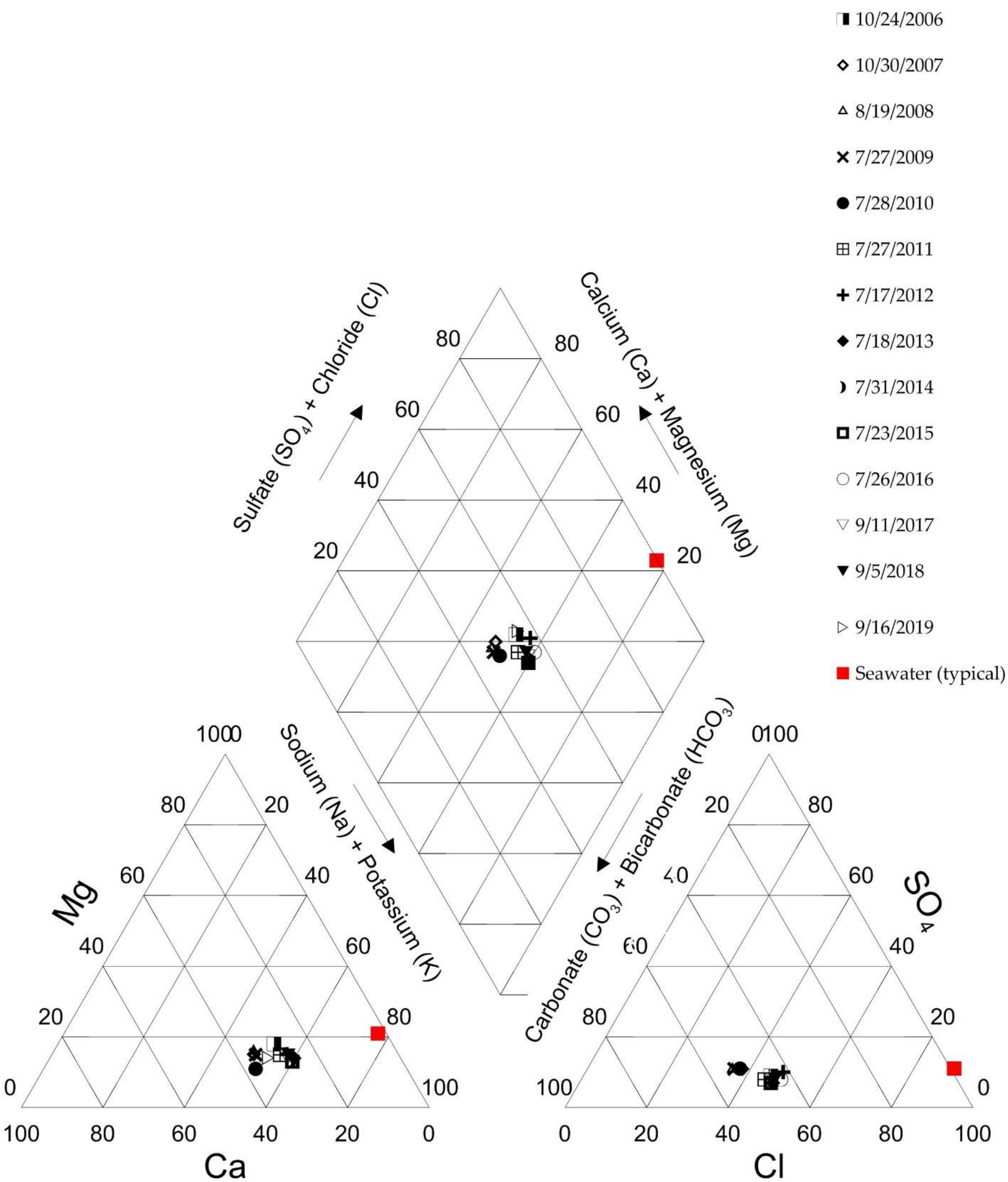

Figure C-3. Piper Diagram of PCA East Shallow

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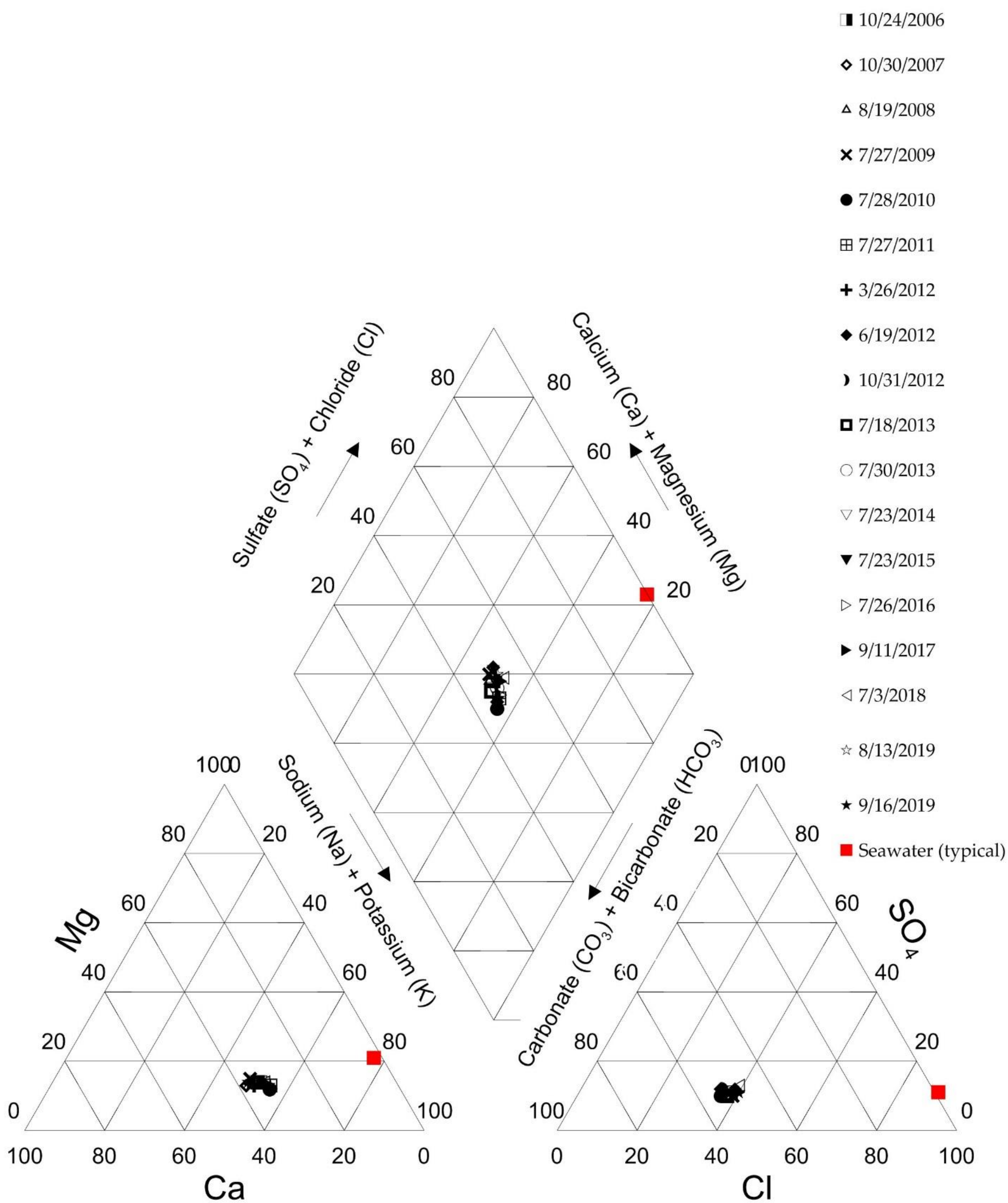

Figure C-4. Piper Diagram of PCA East Deep

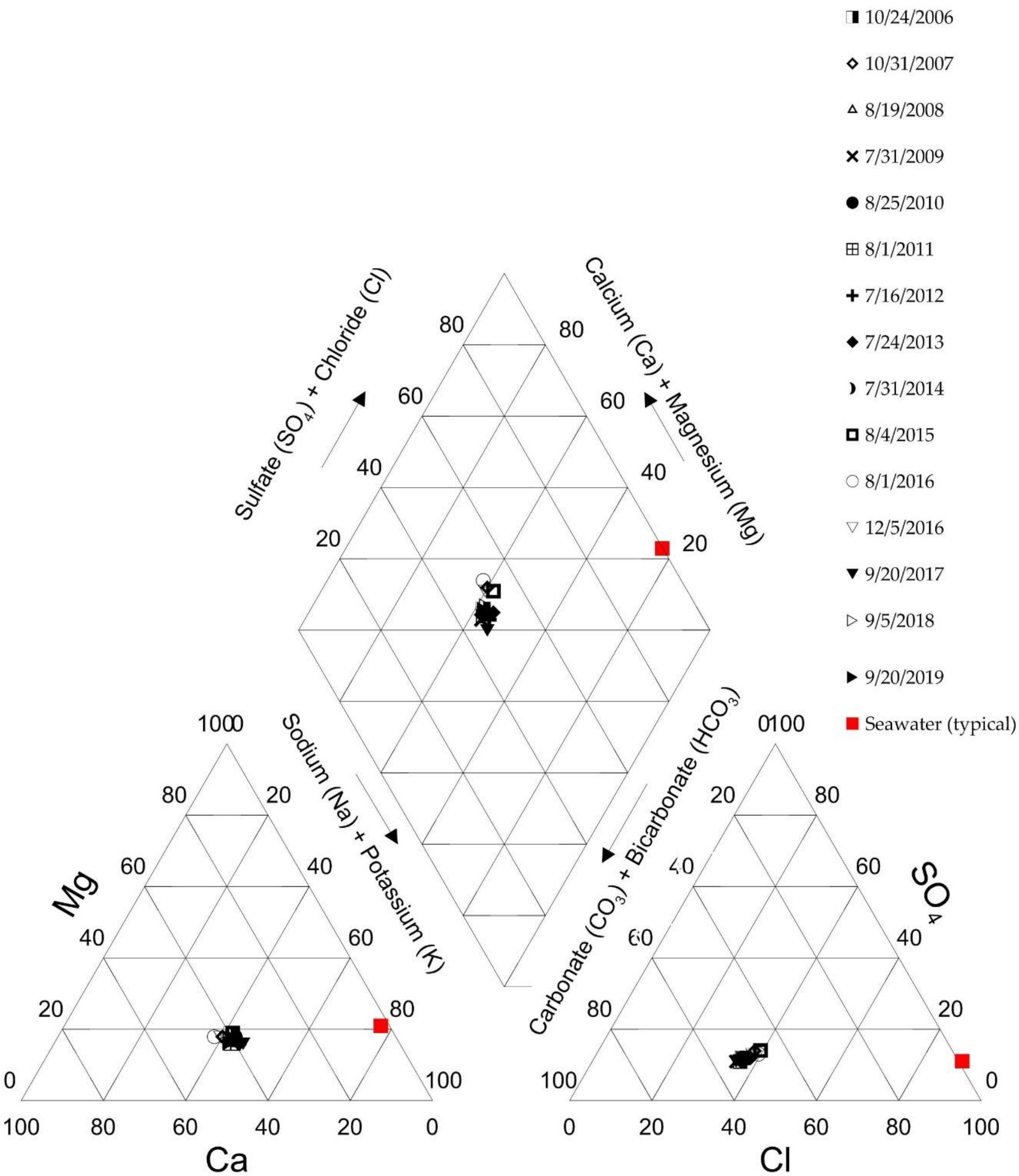

Figure C-5. Piper Diagram of Ord Terrace Shallow

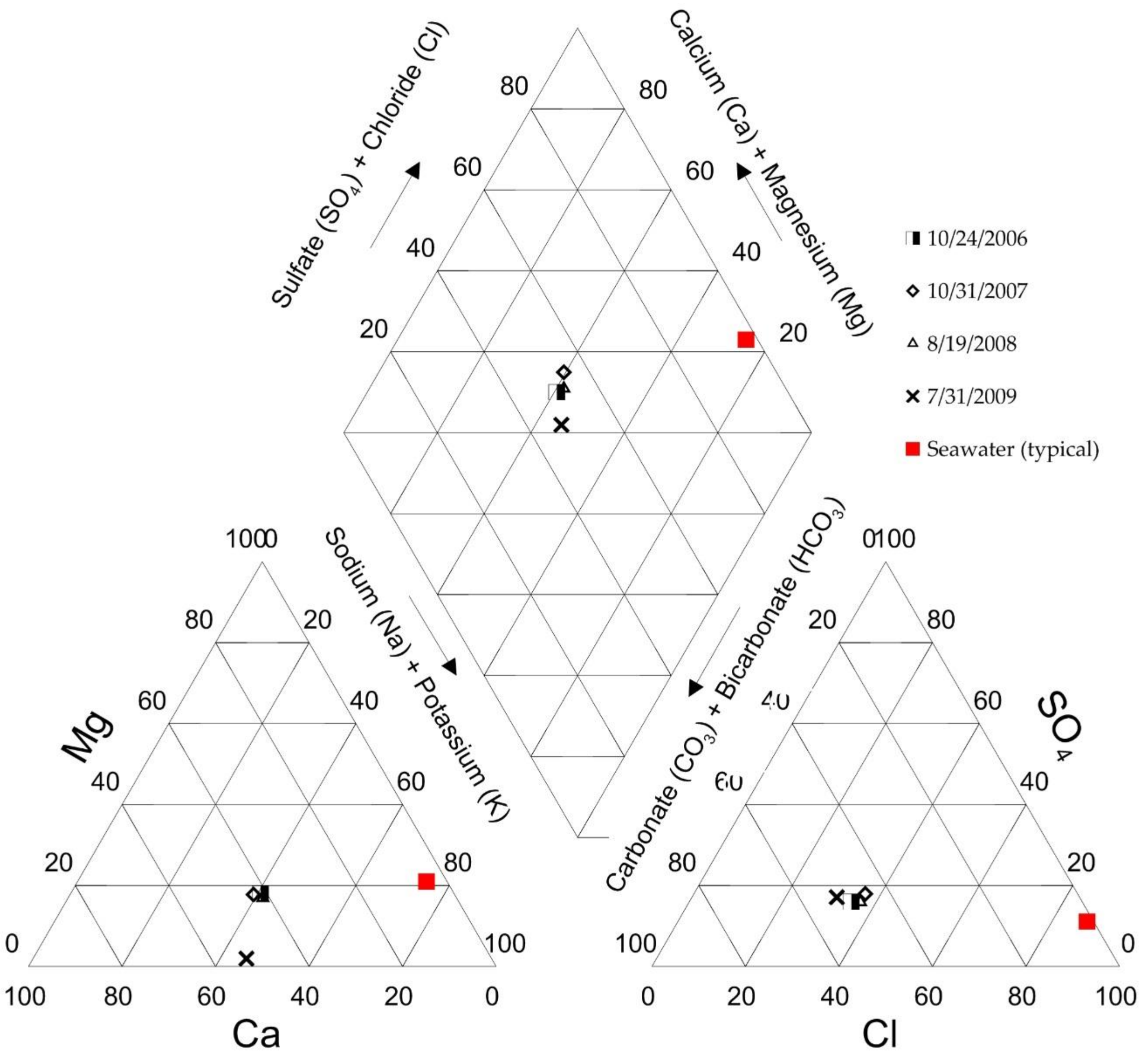

Figure C-6. Piper Diagram of Ord Terrace Deep

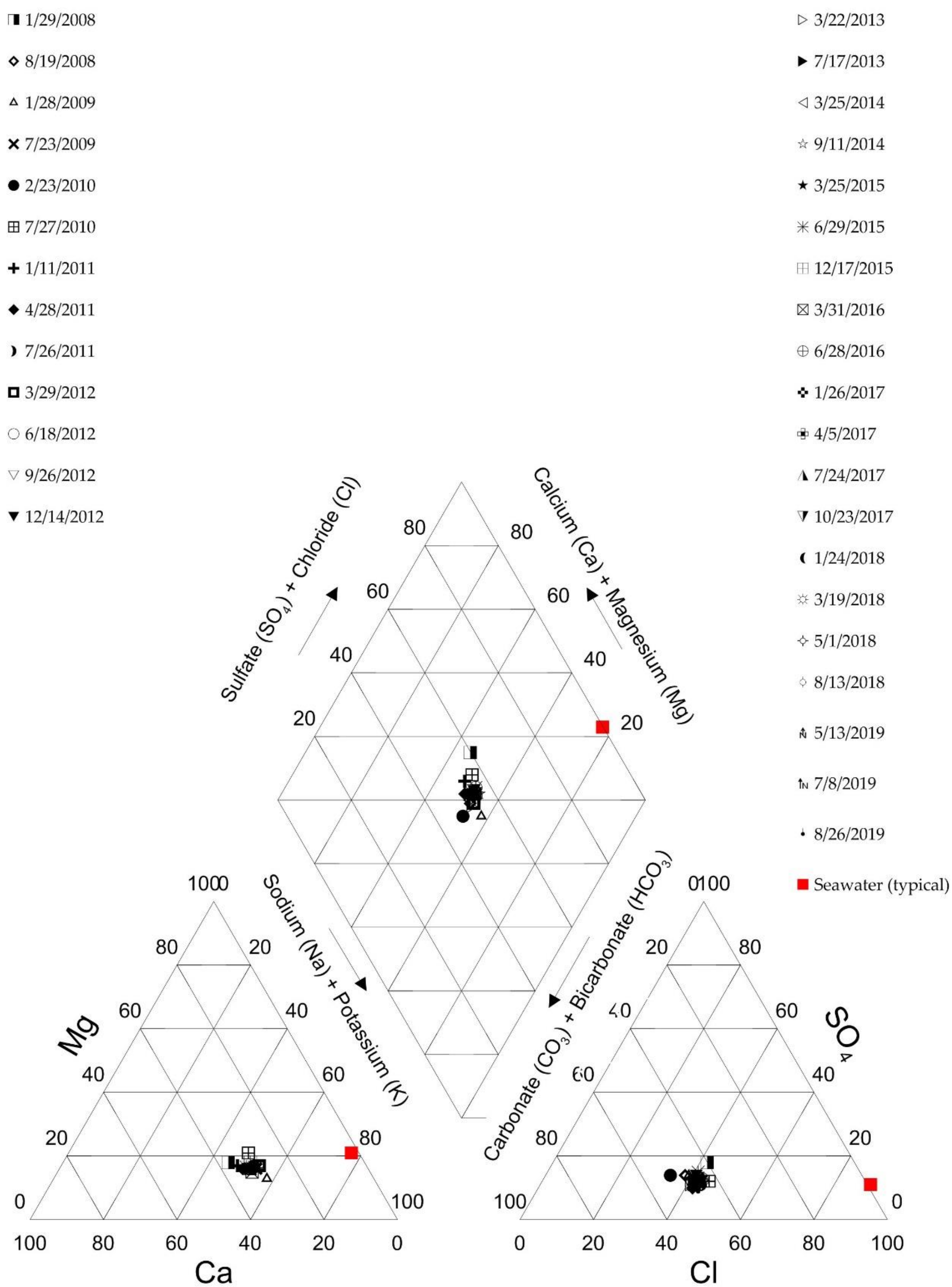

Figure C-7. Piper Diagram of MSC Shallow

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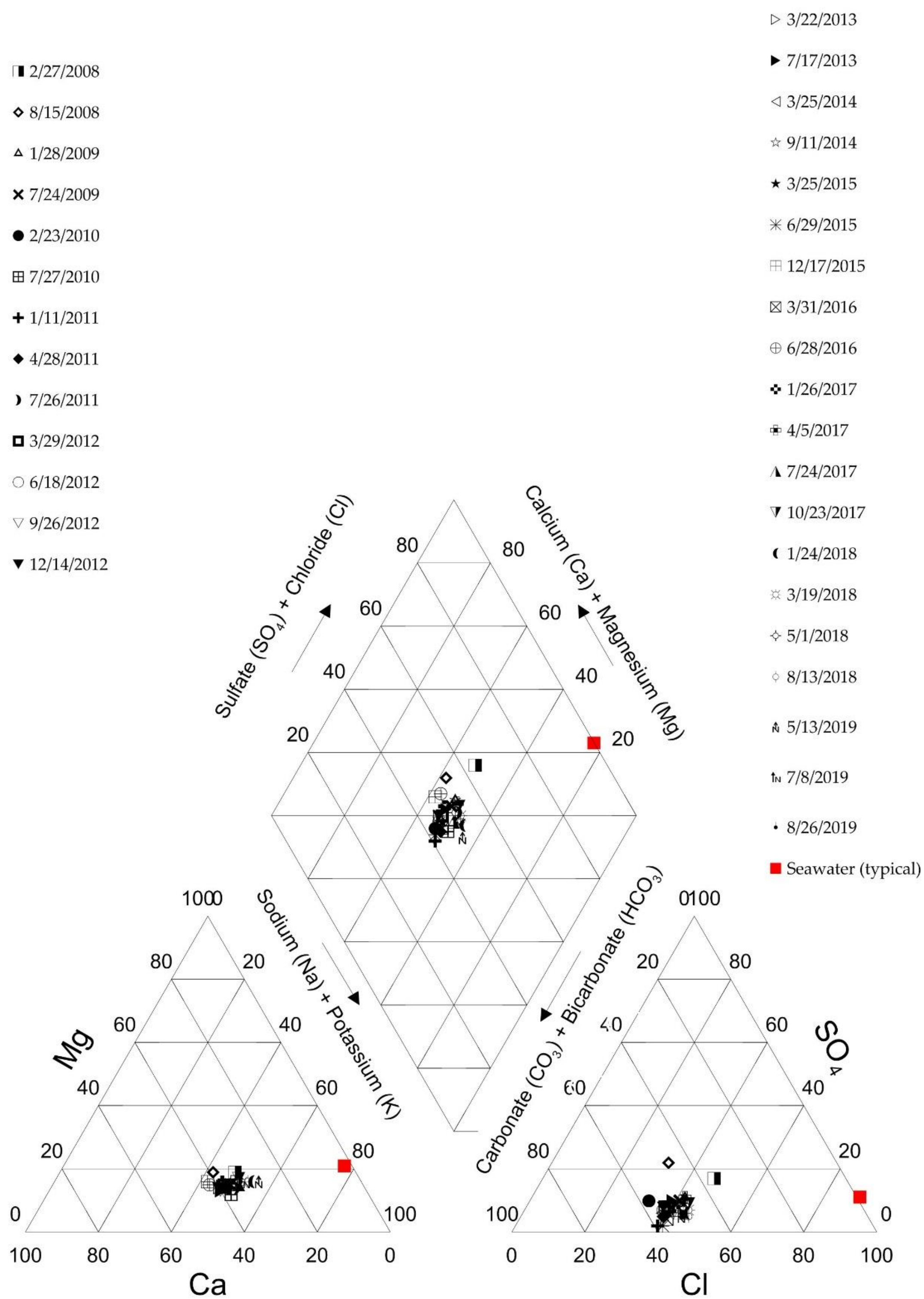

Figure C-8. Piper Diagram of MSC Deep

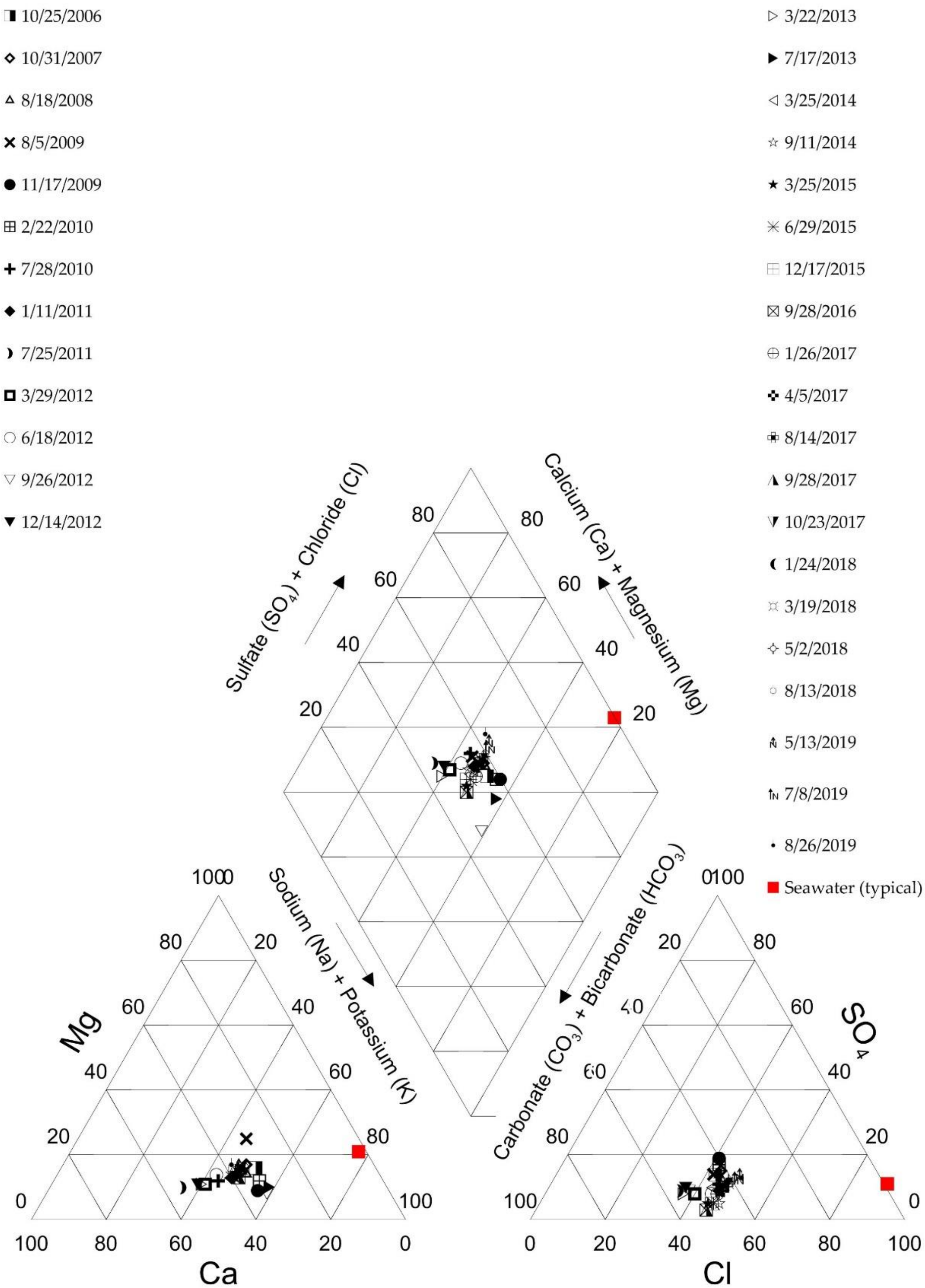

Figure C-9. Piper Diagram of Fort Ord 9 Shallow

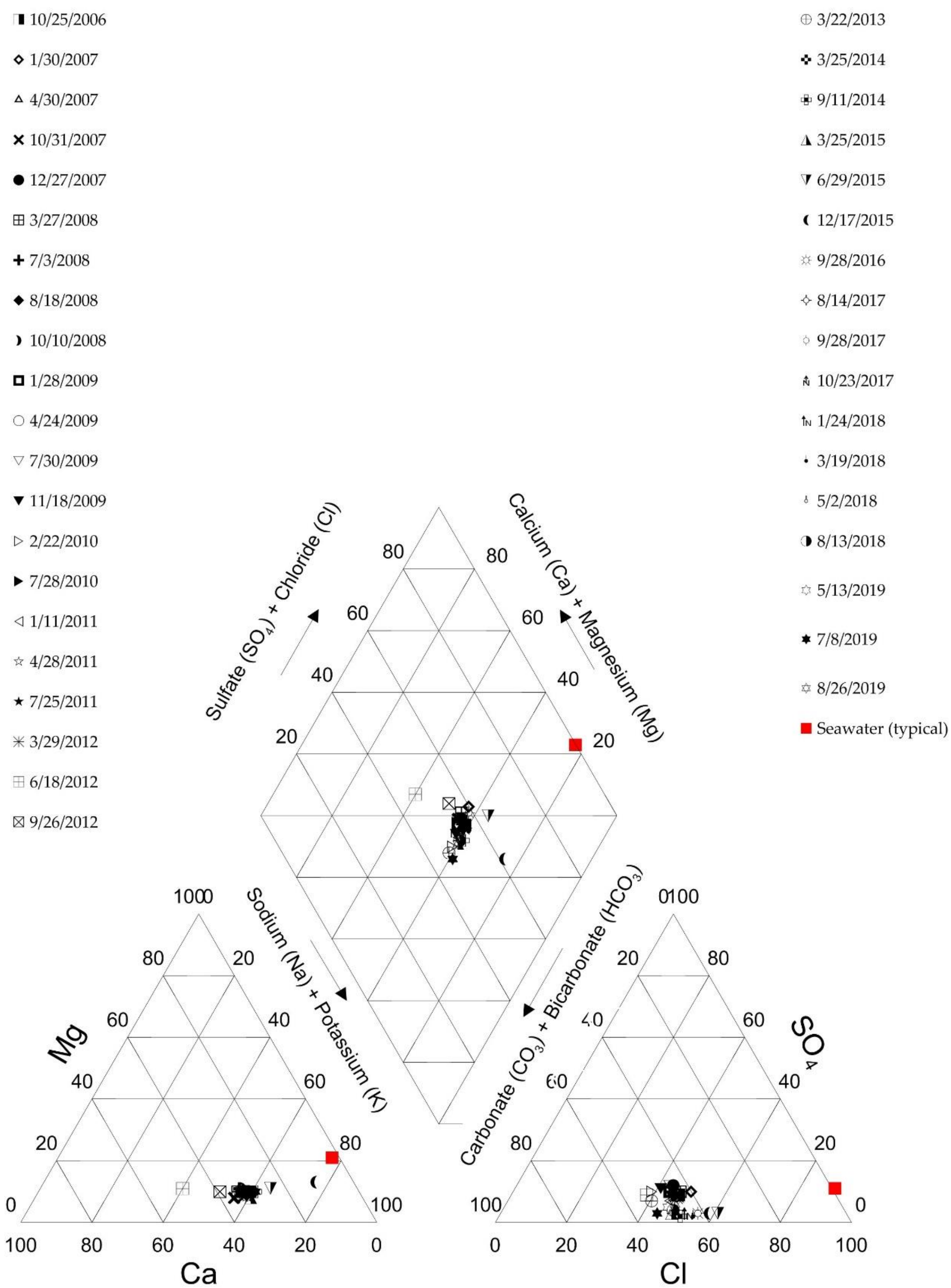

Figure C-10. Piper Diagram of Fort Ord 9 Deep

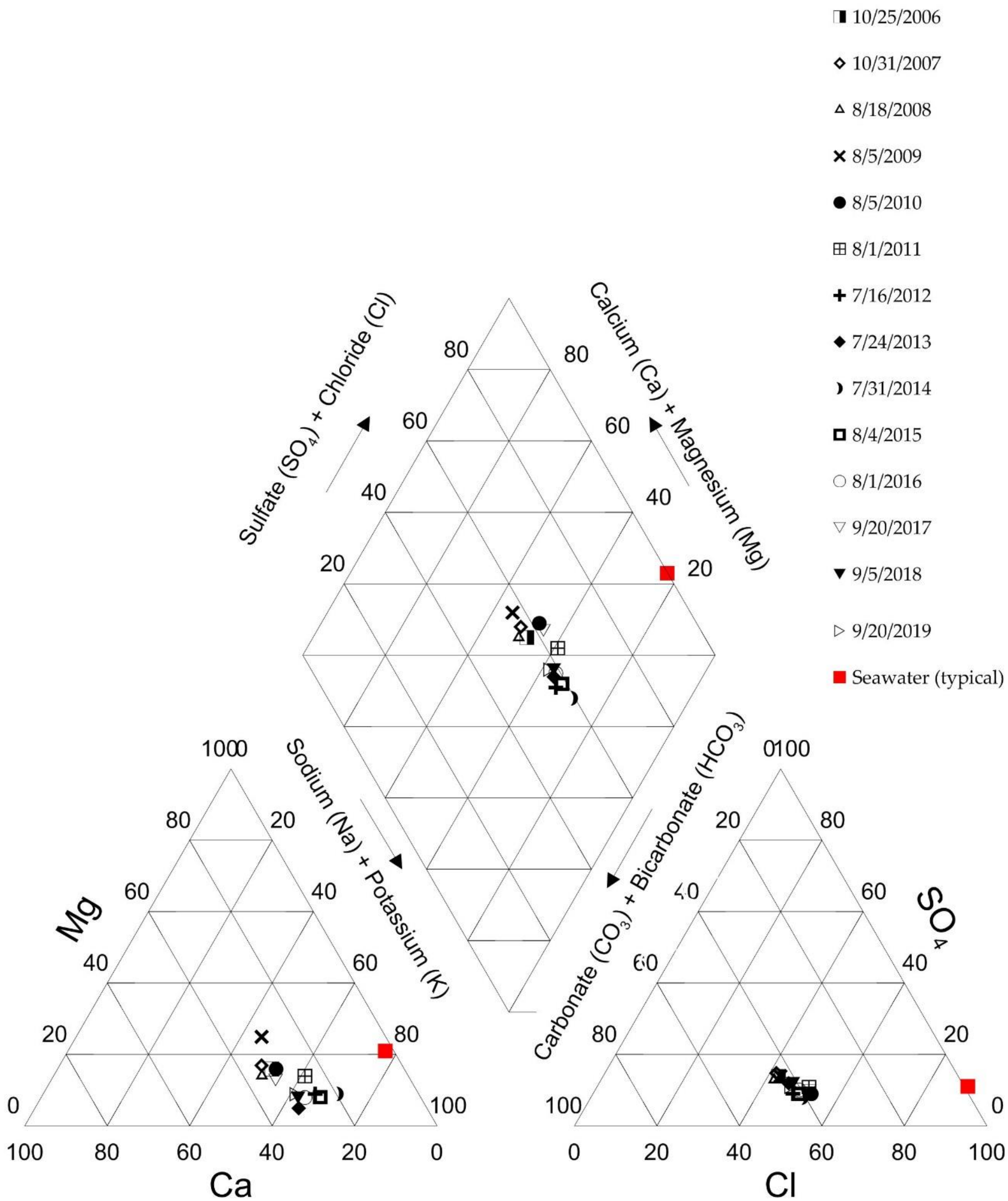

Figure C-11. Piper Diagram of Fort Ord 10 Shallow

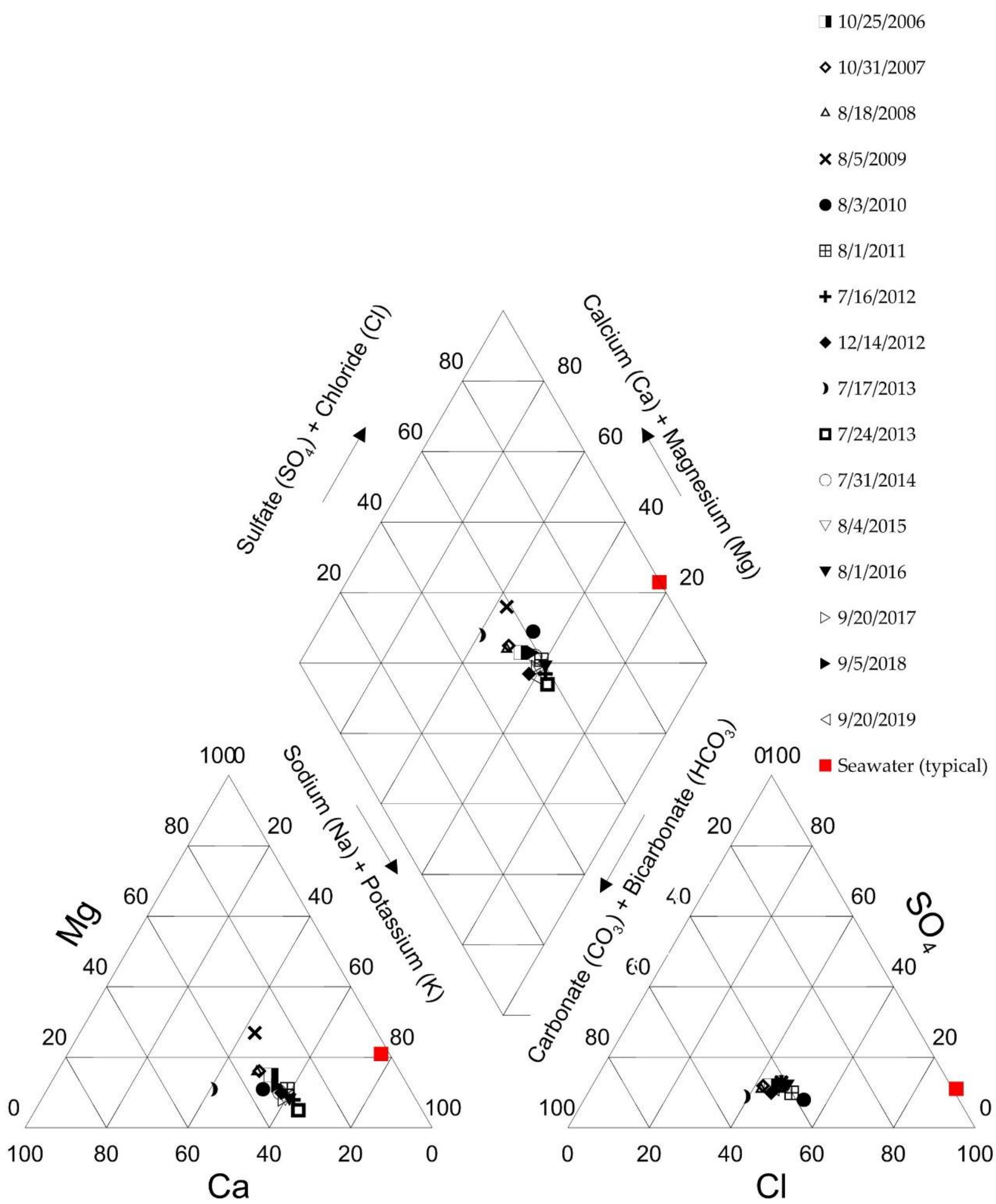

Figure C-12. Piper Diagram of Fort Ord 10 Deep

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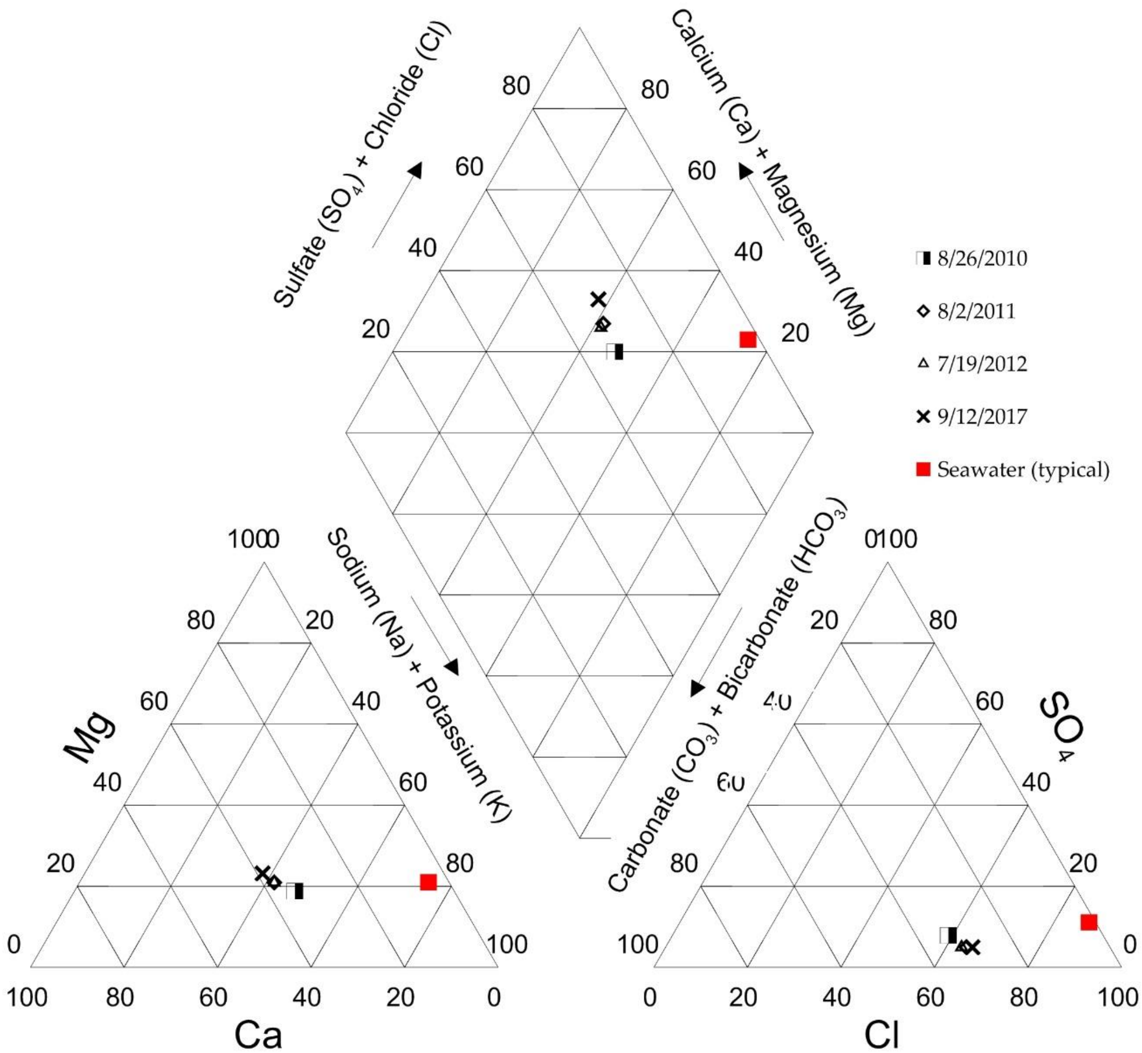

Figure C-13. Piper Diagram of Camp Huffman Shallow Well

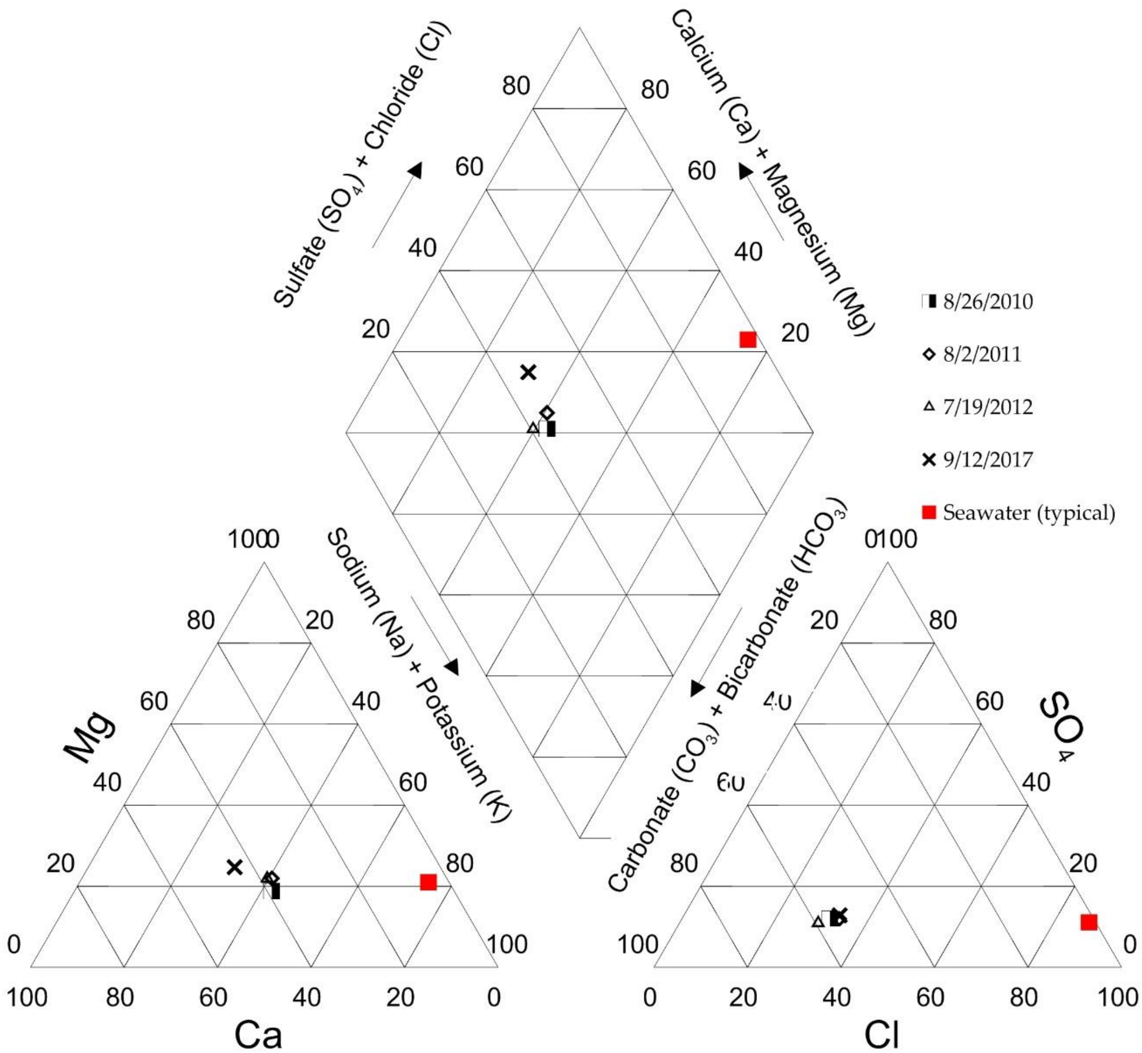

Figure C-14. Piper Diagram of Camp Huffman Deep Well

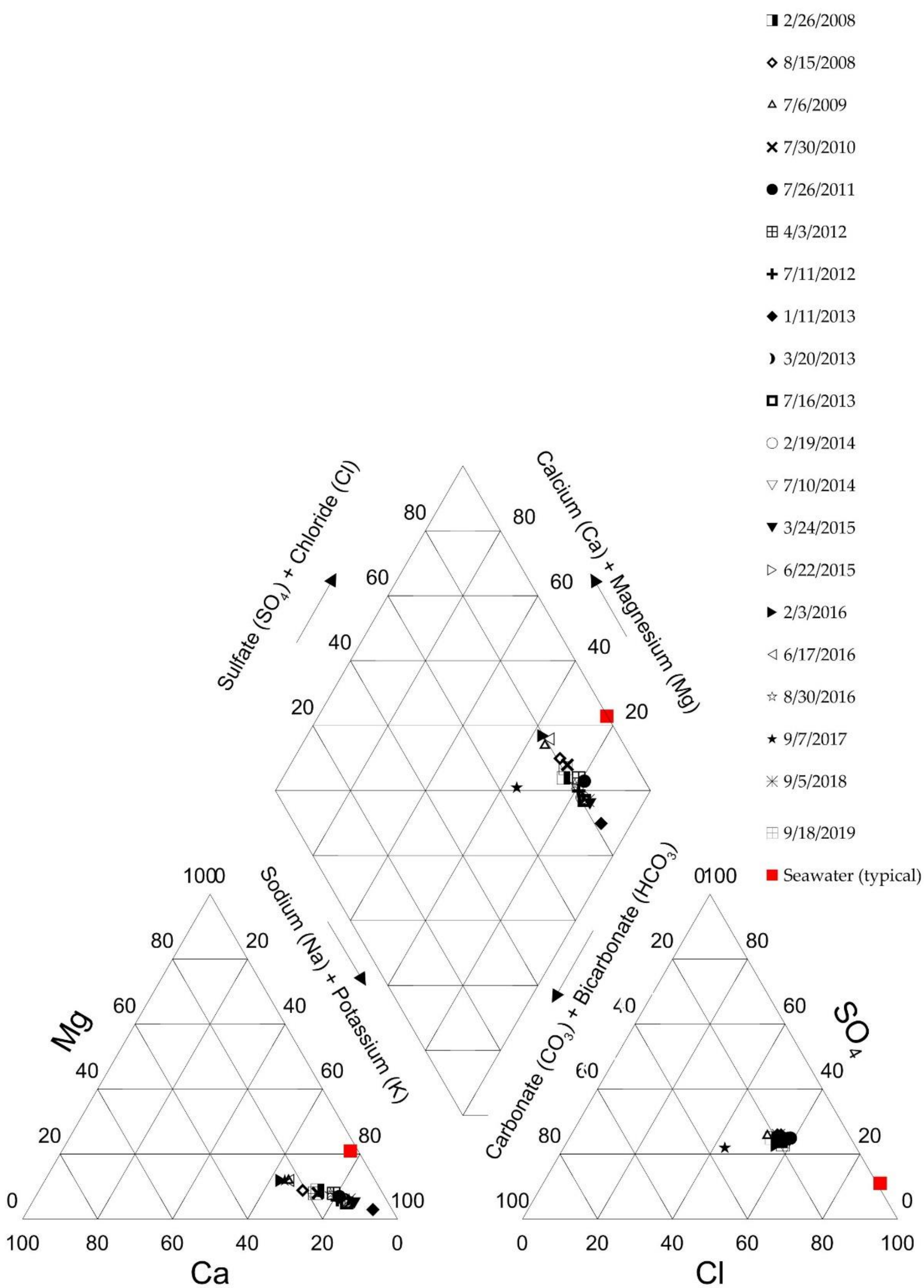

Figure C-15. Piper Diagram of Sand City Corp. Yard Production Well

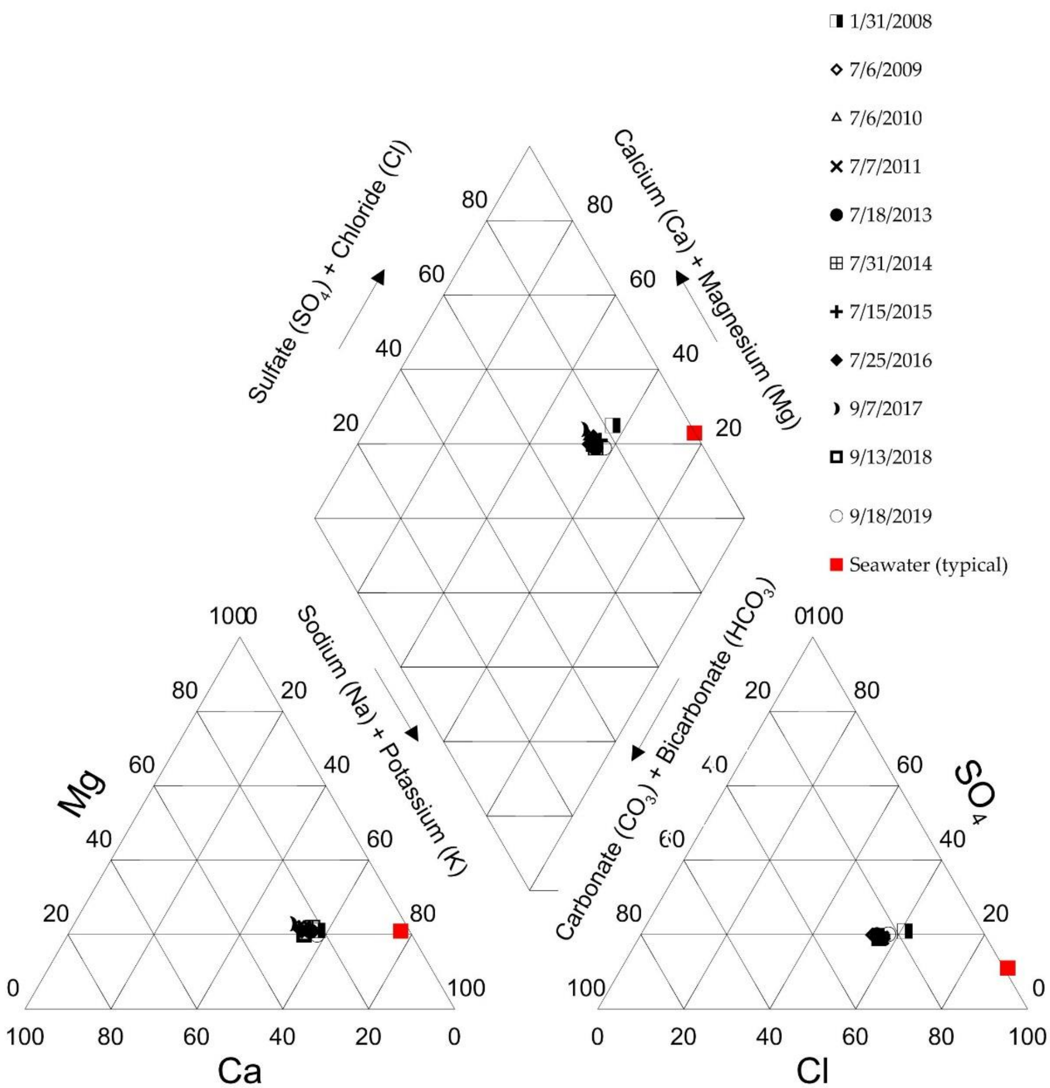

Figure C-16. Piper Diagram of Plumas 4 Production Well

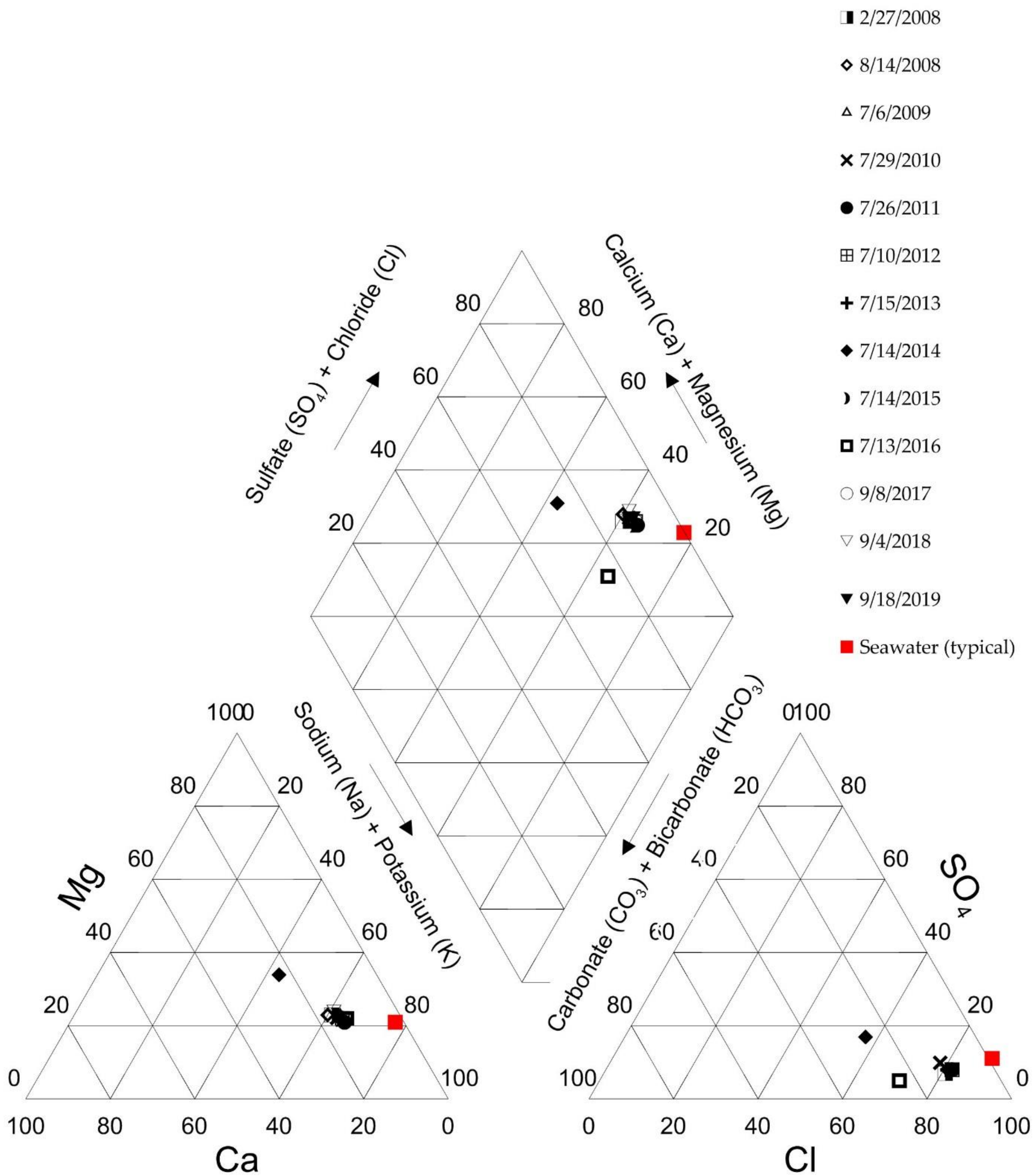

Figure C-17. Piper Diagram of York School Production Well

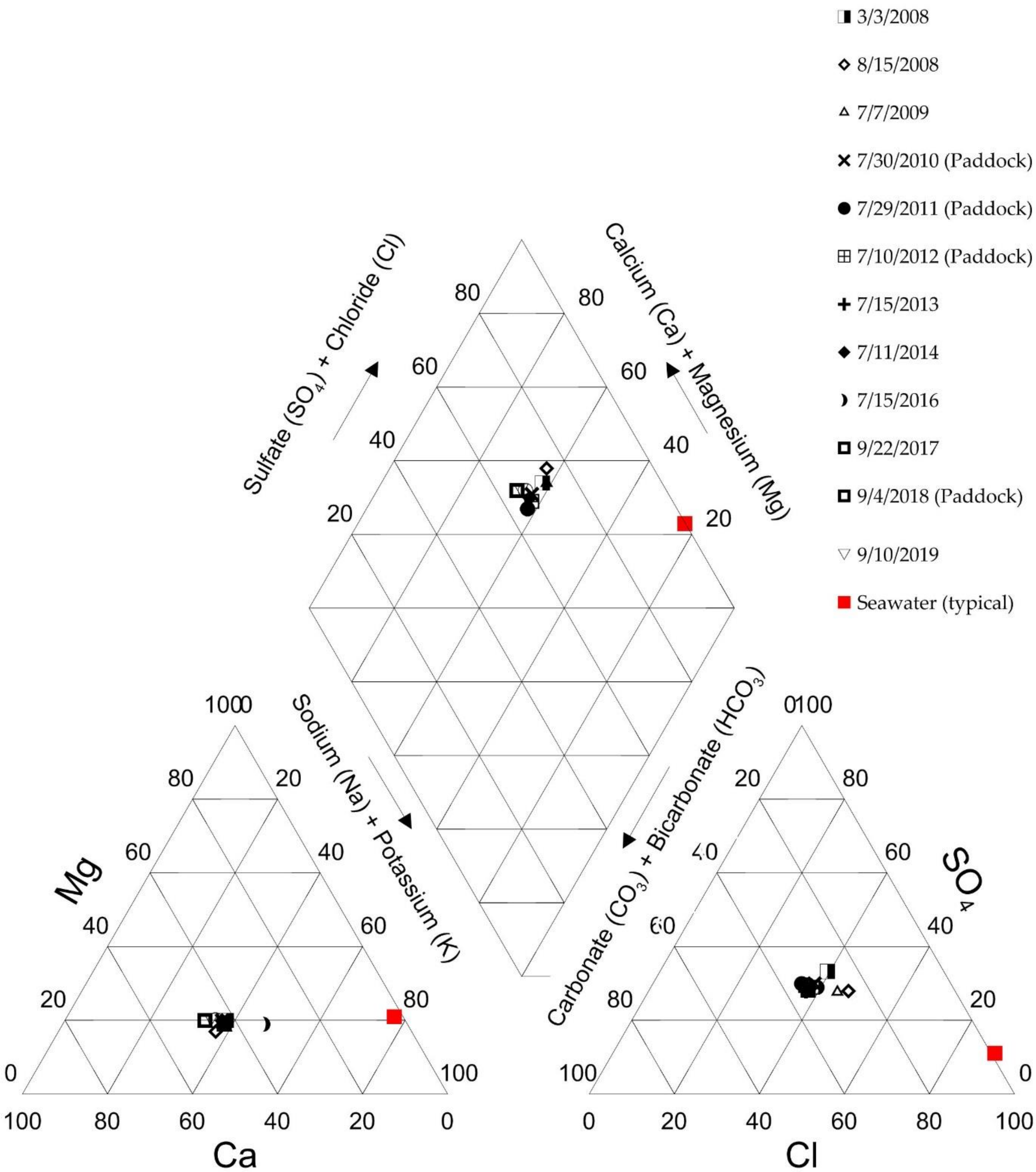

Figure C-18. Piper Diagram of Pasadera Main Gate Production Well

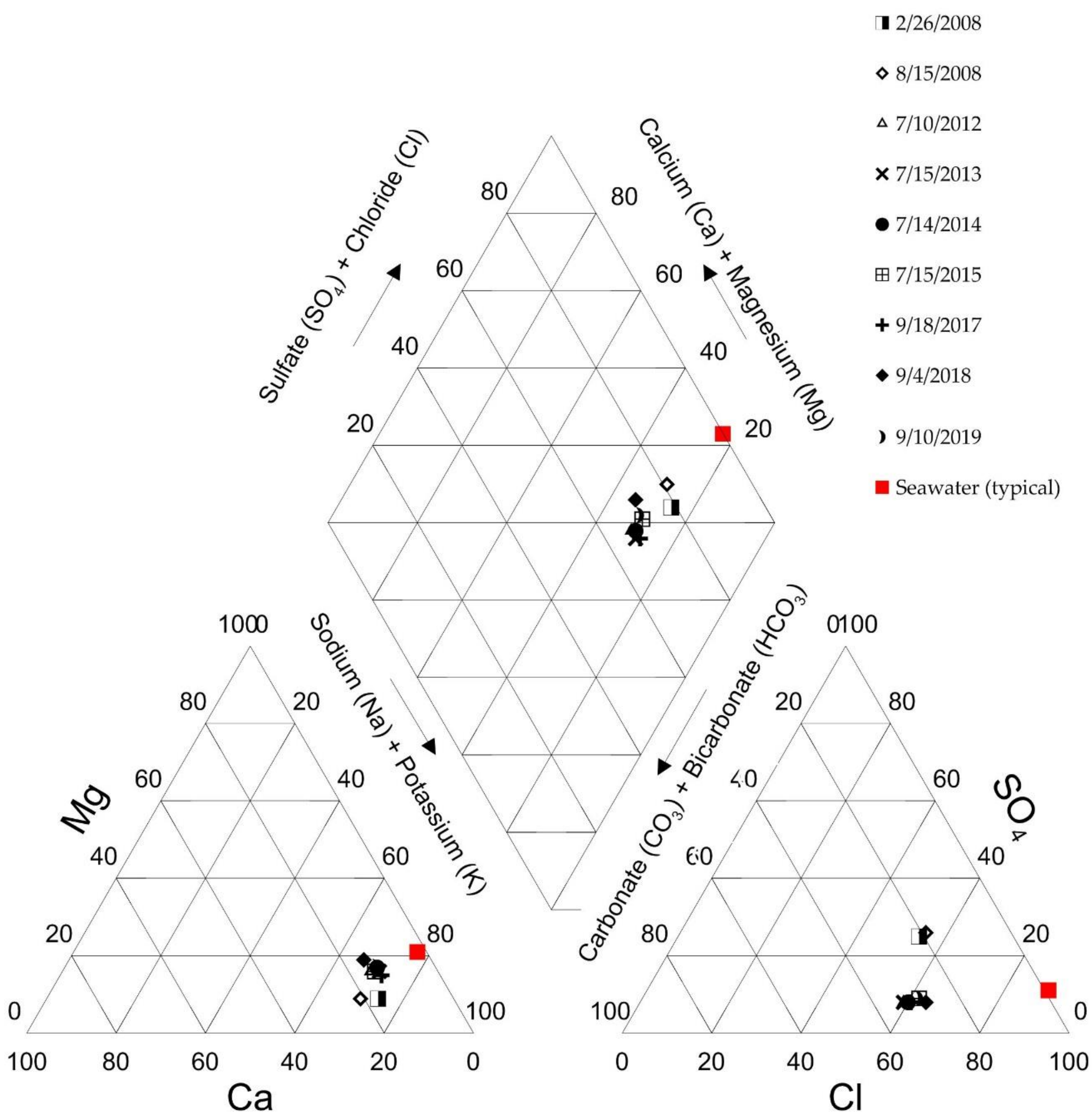

Figure C-19. Piper Diagram of LS County Park #1 Production Well

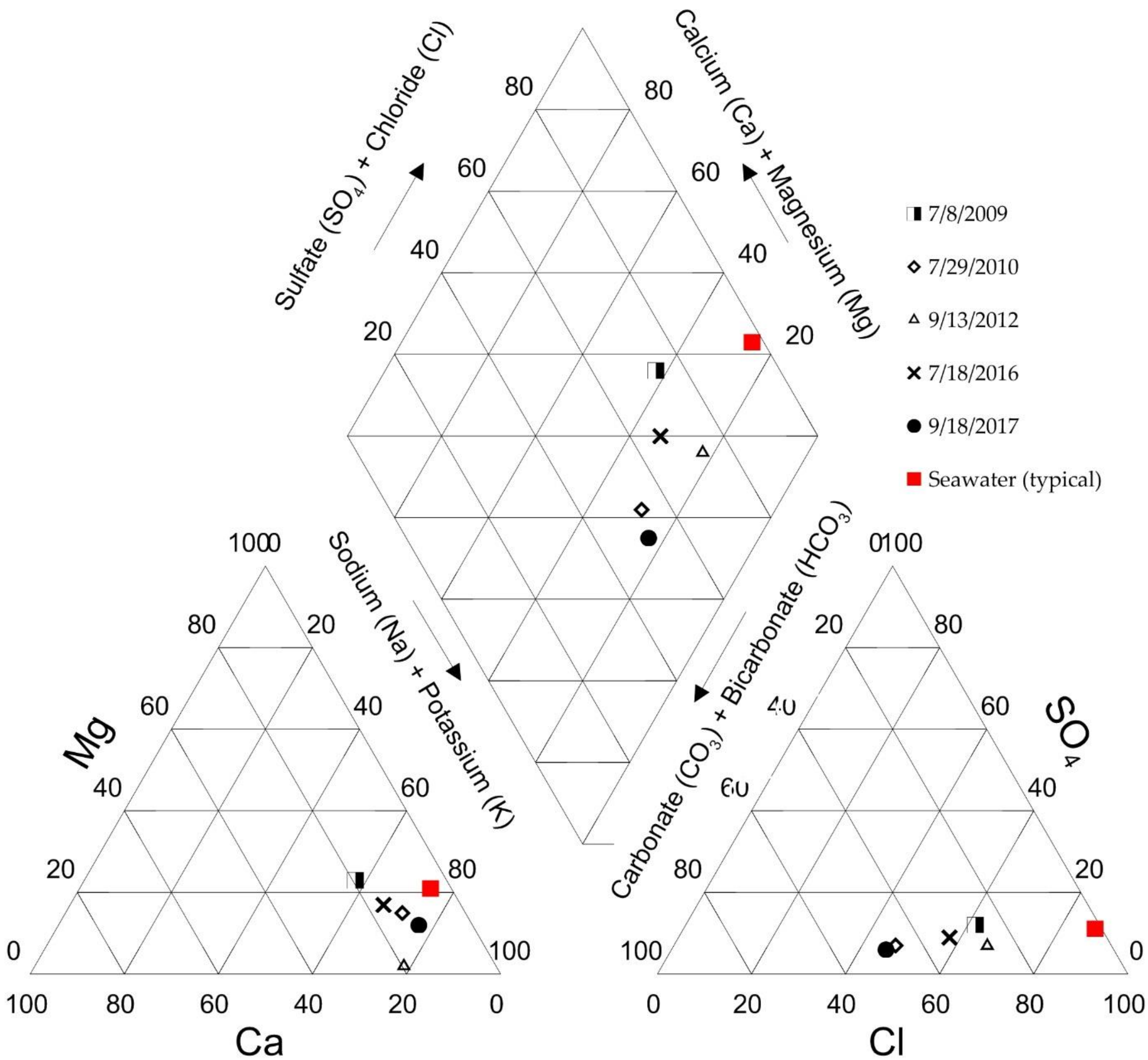

Figure C-20. Piper Diagram of LS County Park #2 Production Well

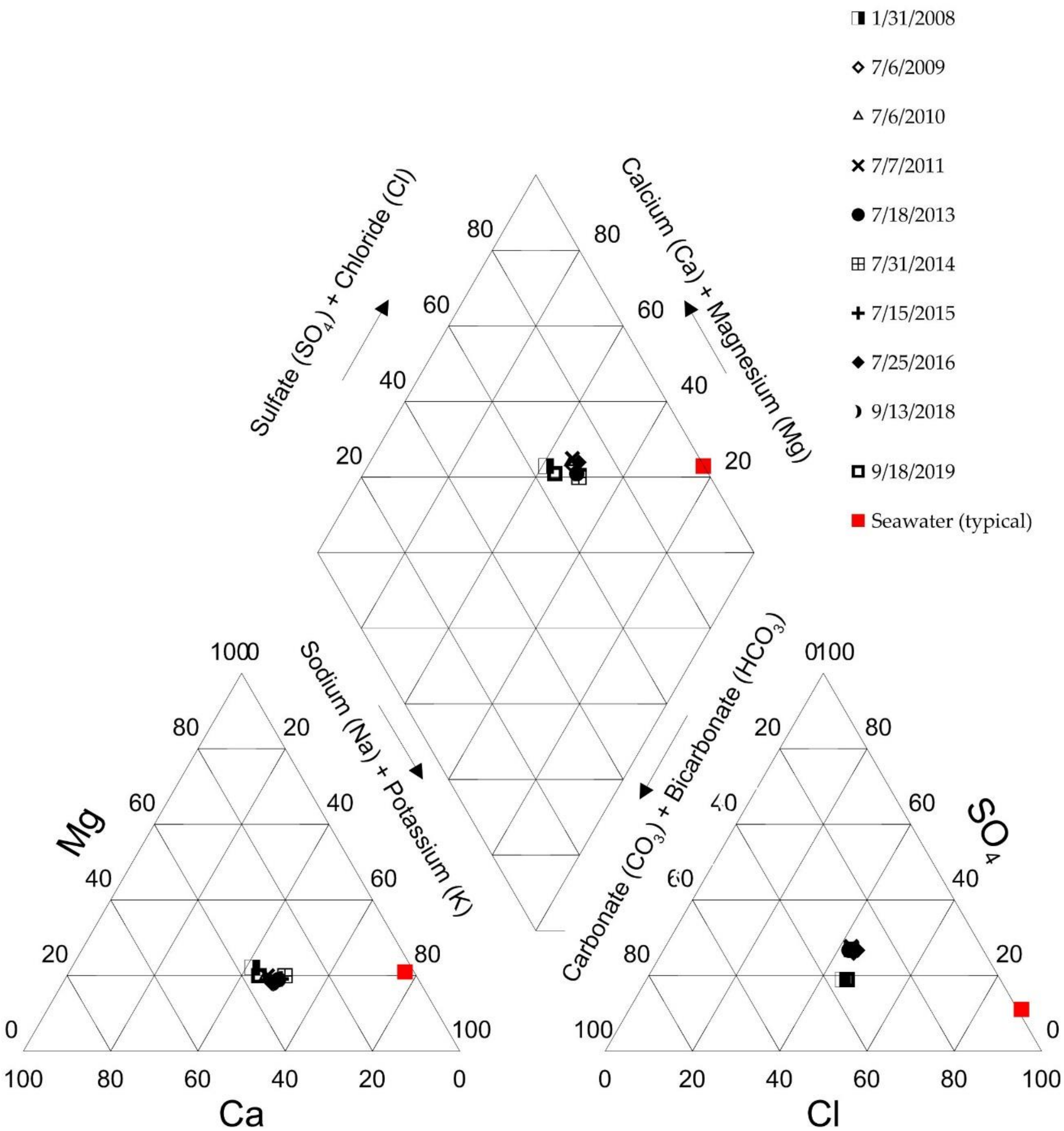

Figure C-21. Piper Diagram of Playa No. 3 Production Well

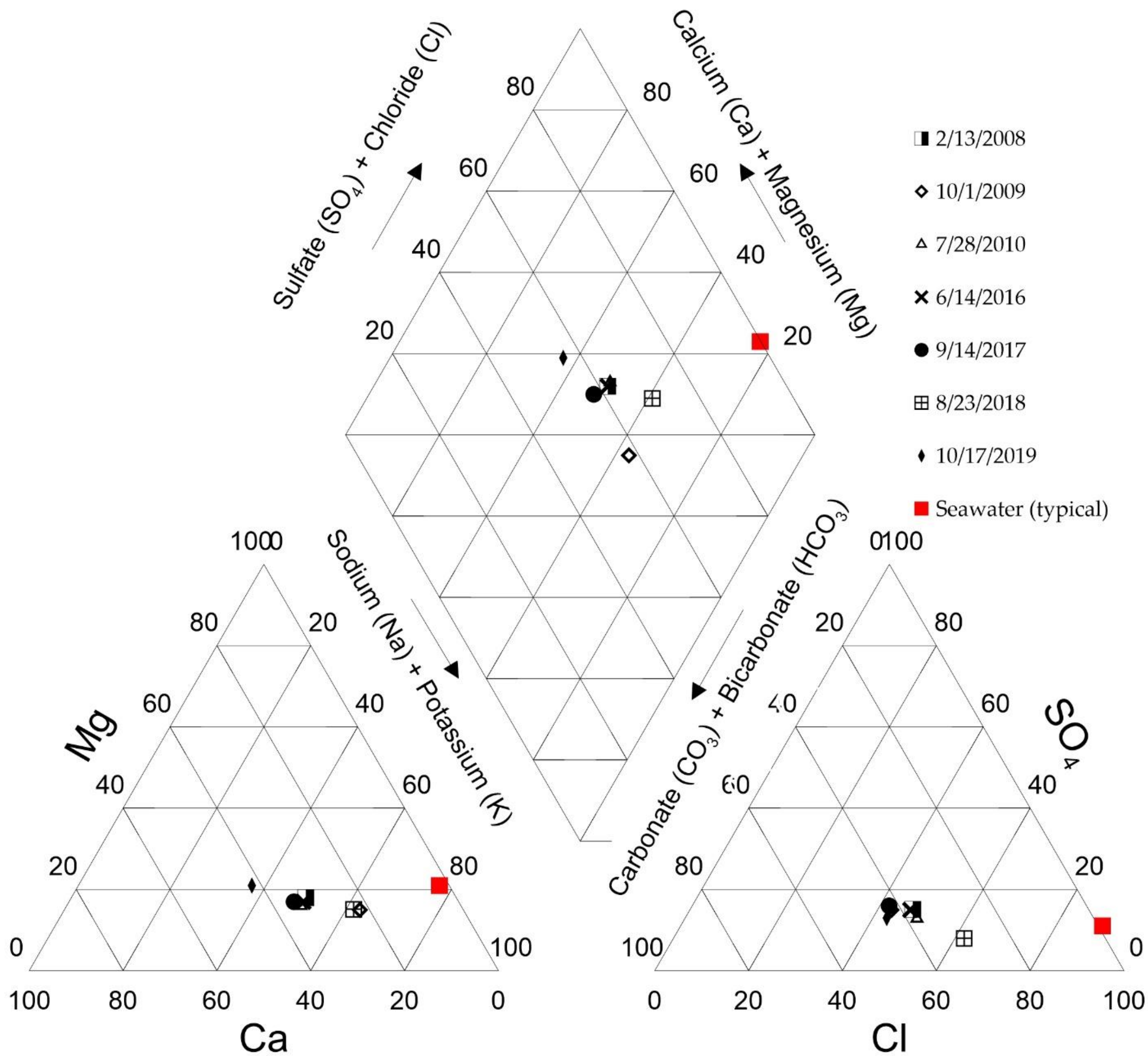

Figure C-22. Piper Diagram of Coe Ave. Production Well

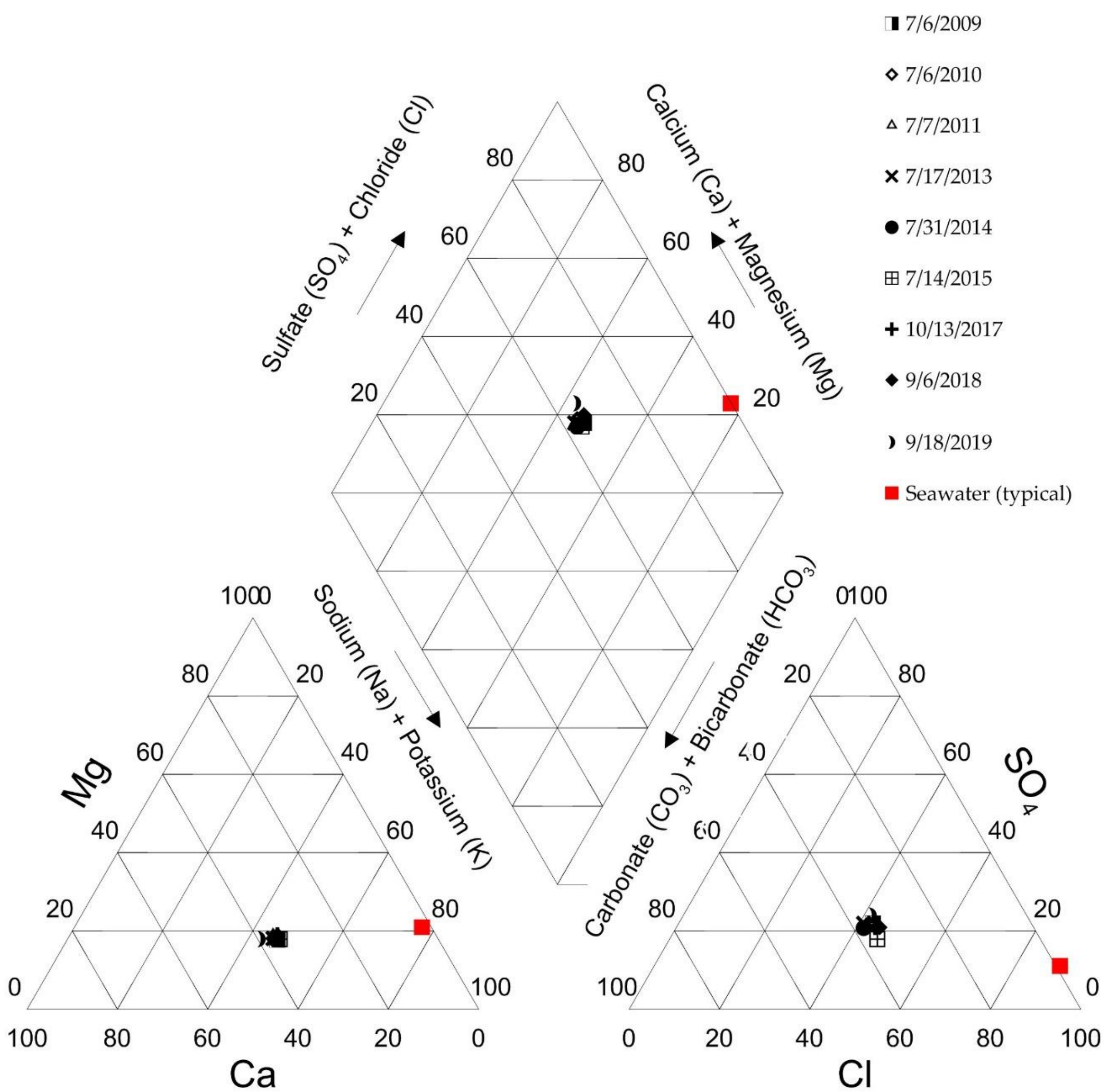

Figure C-23. Piper Diagram of Luzern #2 Production Well

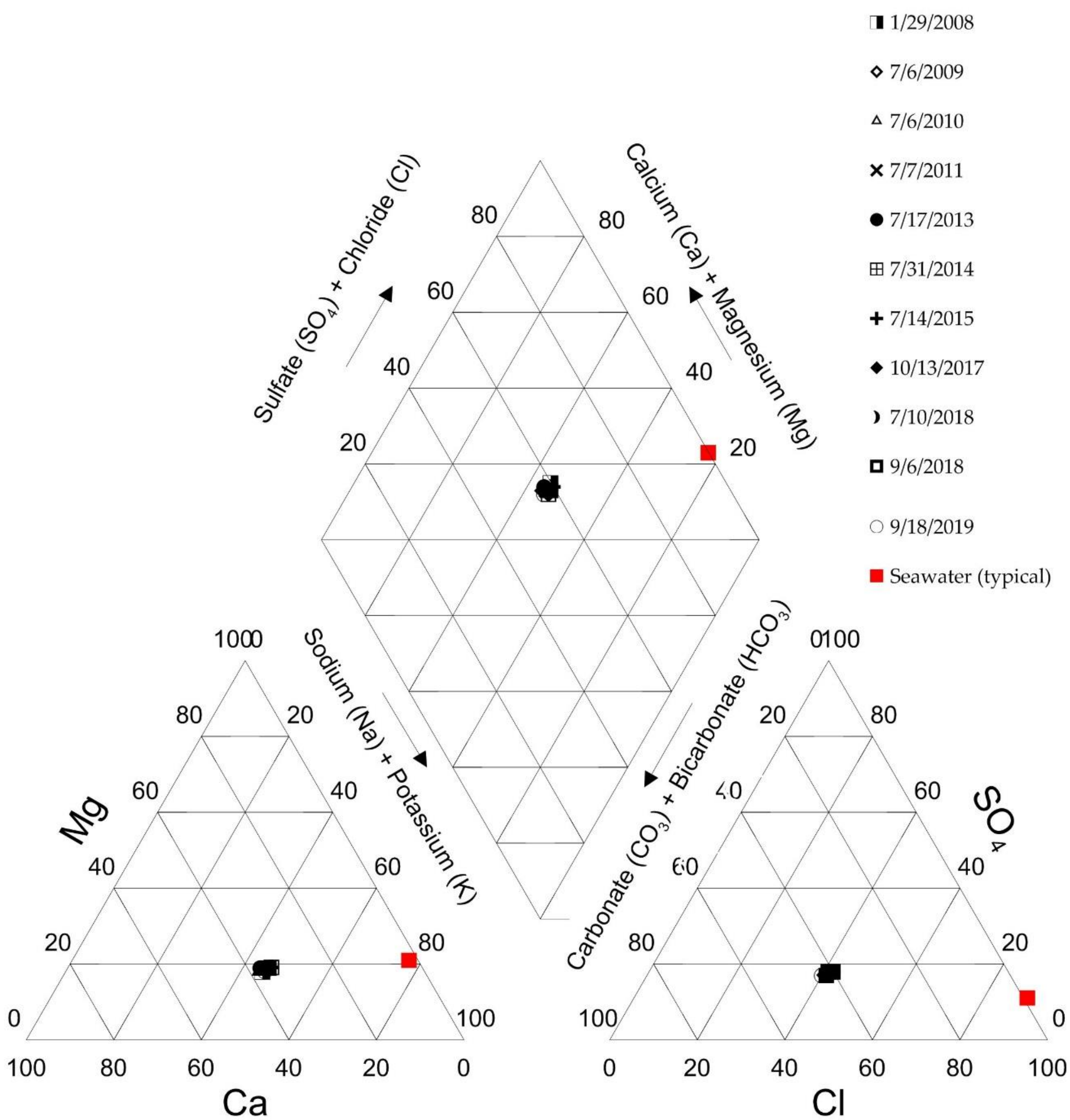

Figure C-24. Piper Diagram of Ord Grove No. 2 Production Well

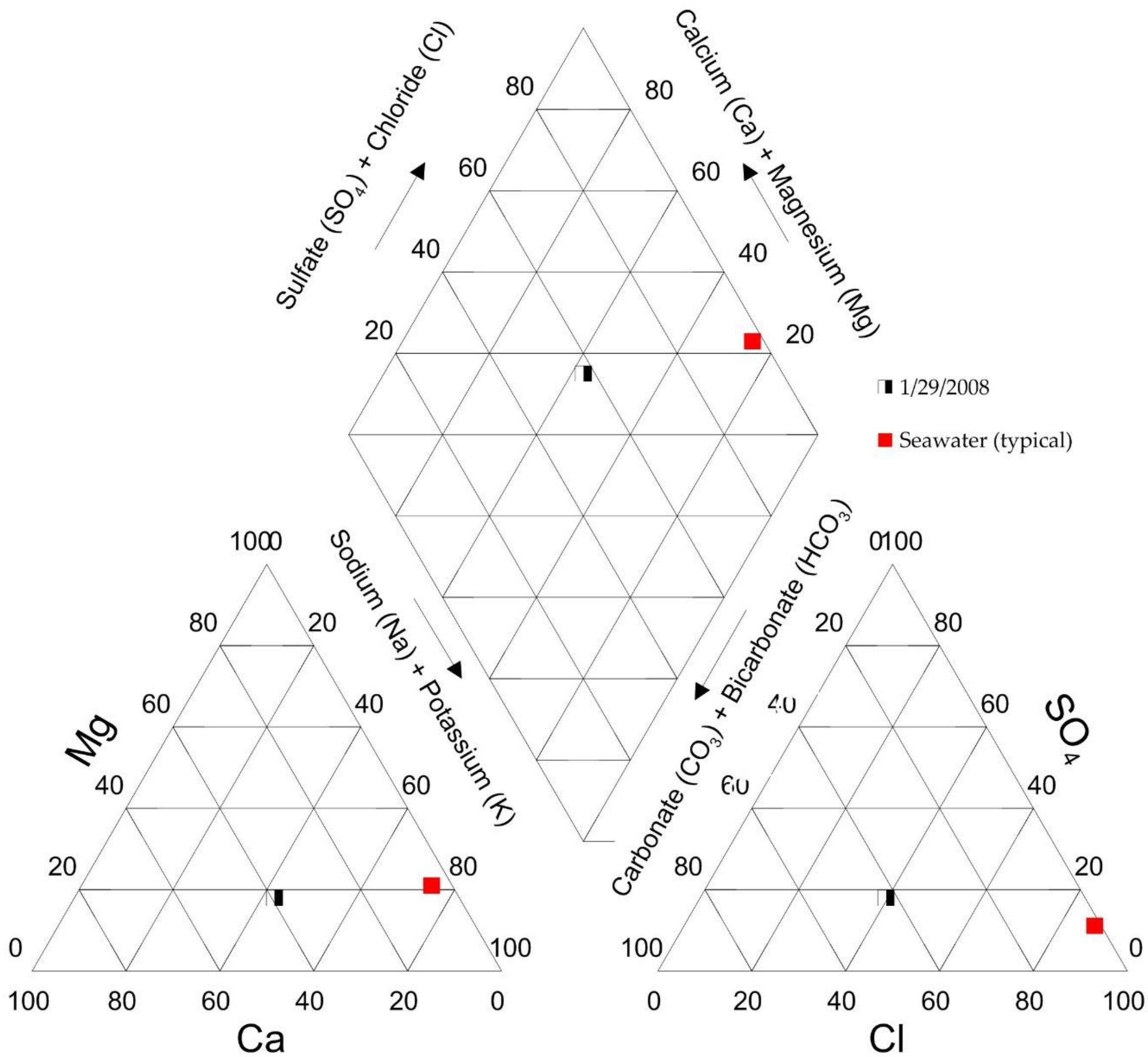

Figure C-25. Piper Diagram of Seaside City No. 3 Production Well

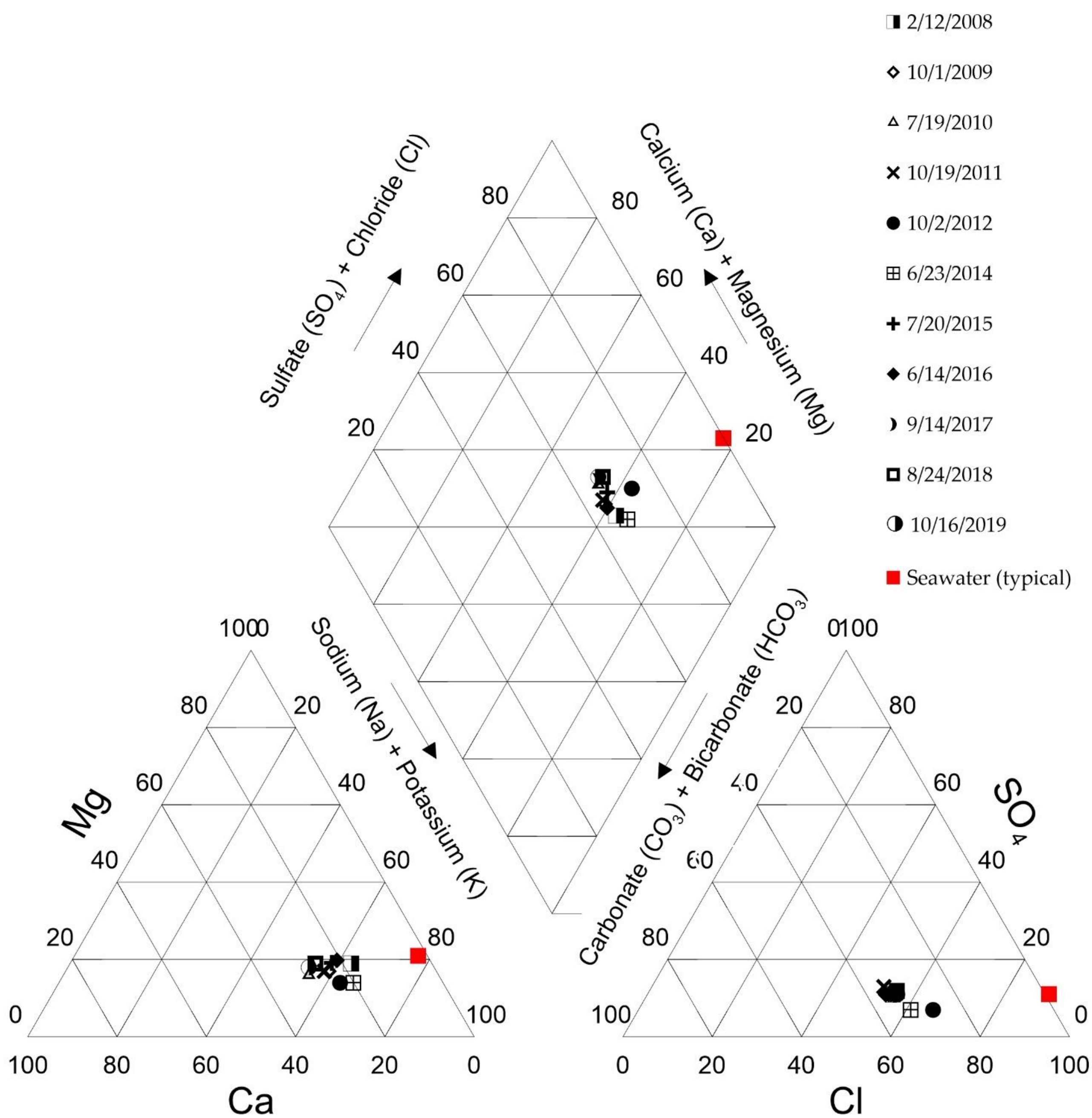

Figure C-26. Piper Diagram of Seaside City No. 4 Production Well

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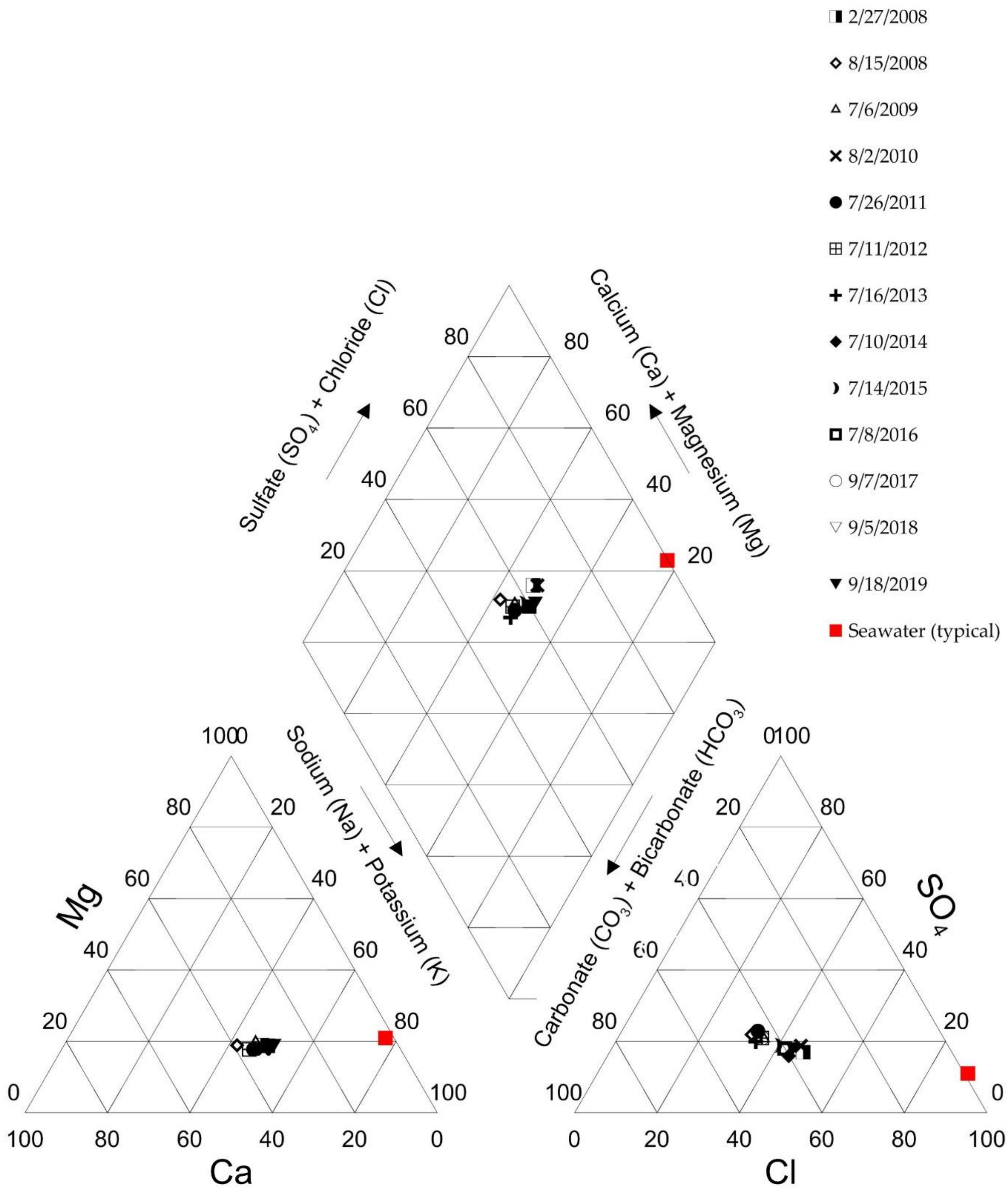

Figure C-27. Piper Diagram of Mission Memorial Park (formerly PRTIW)

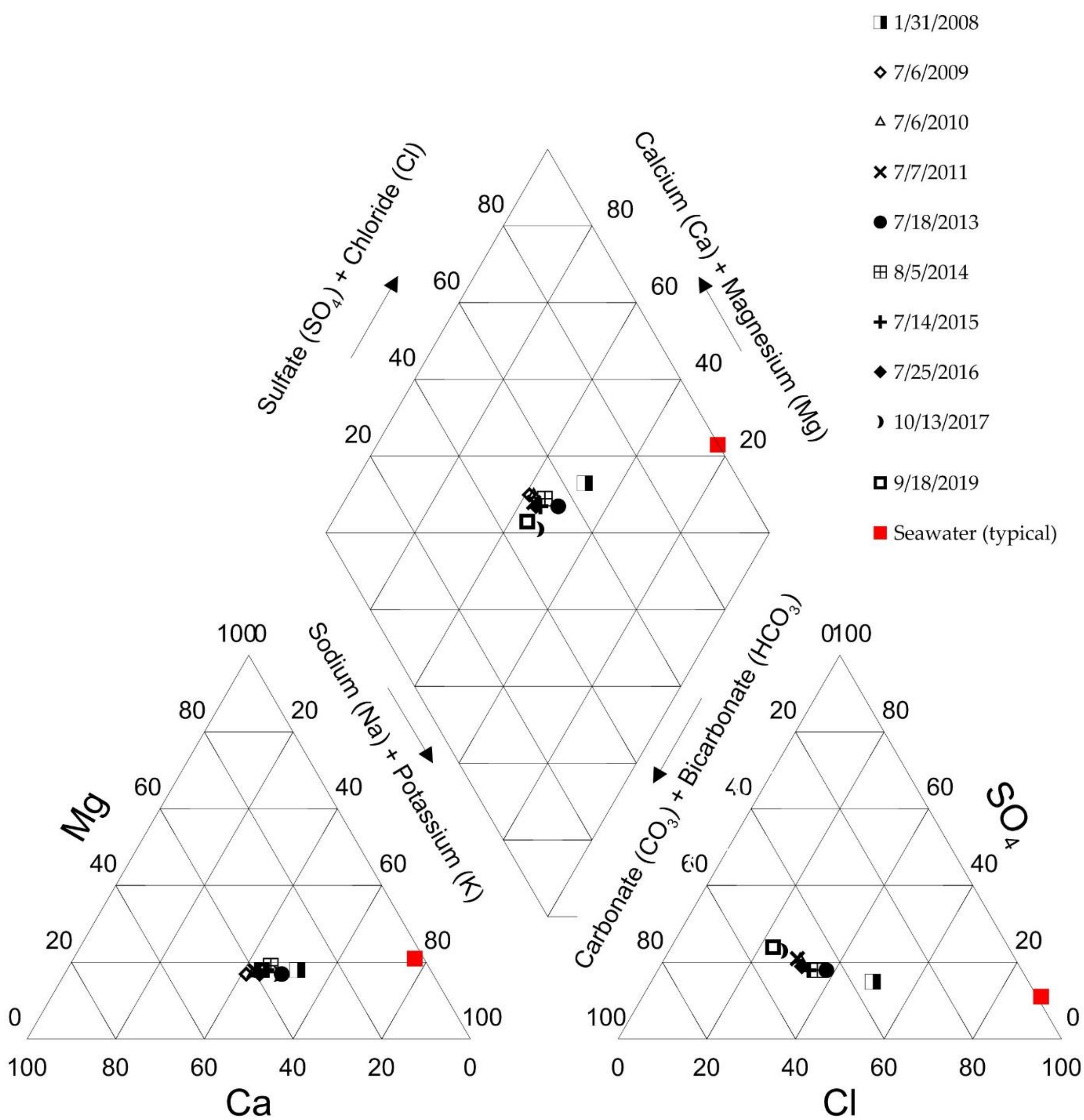

Figure C-28. Piper Diagram of Paralta Production Well

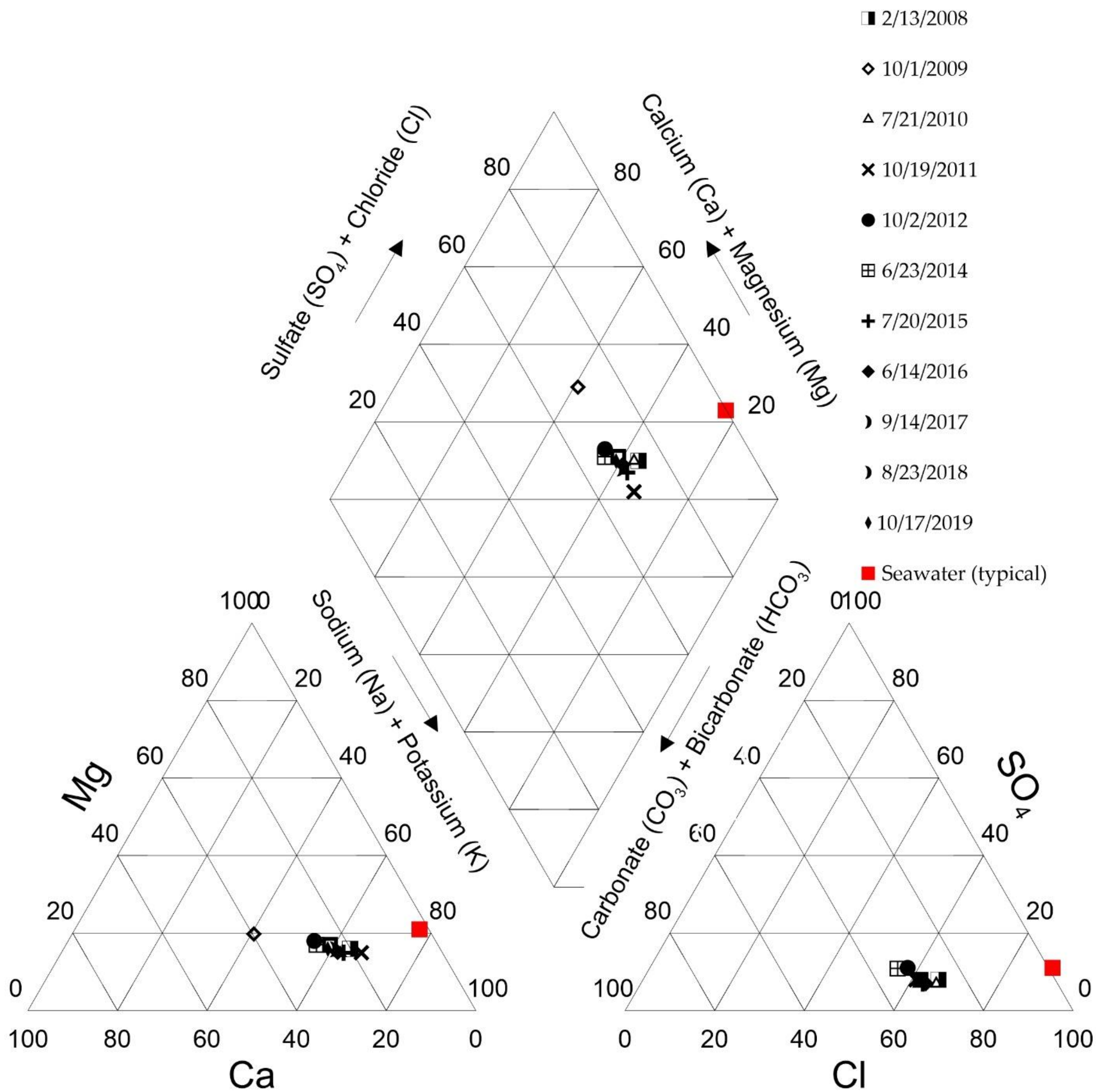

Figure C-29. Piper Diagram of Reservoir (Bayonet Blackhorse) Production Well

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Appendix D

Chloride and Sodium/Chloride Molar Ratio Graphs

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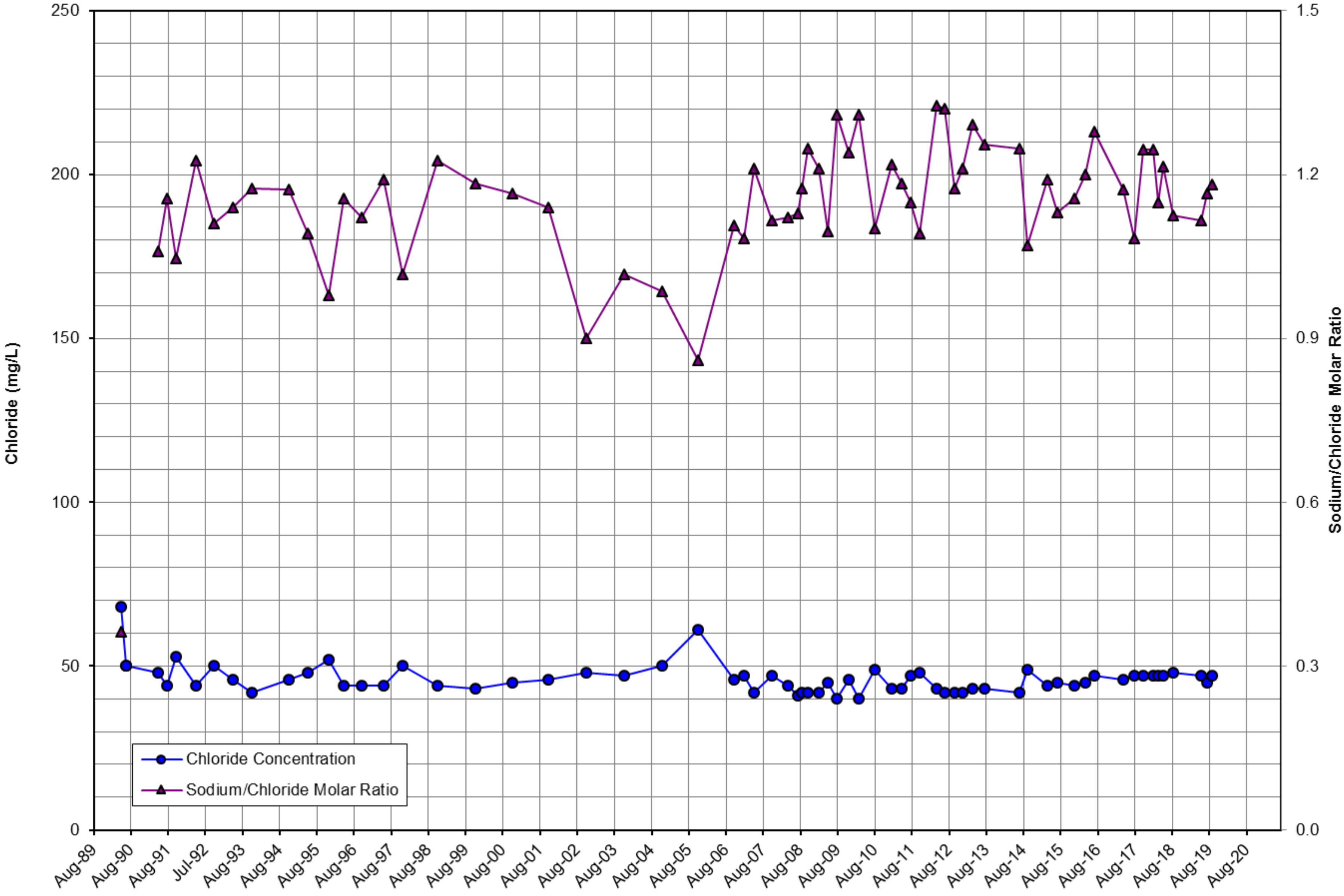

Figure D-1. PCA West Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

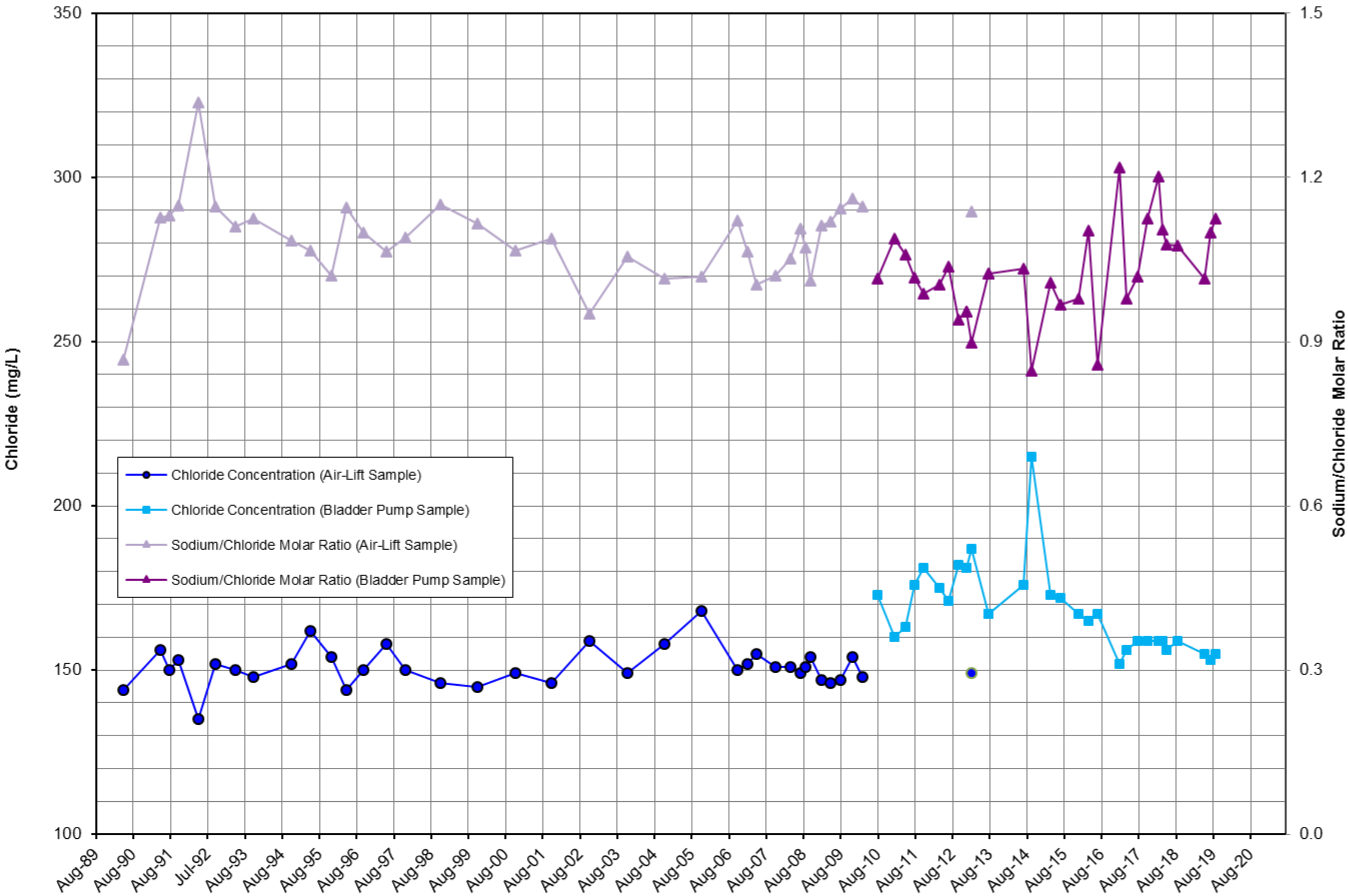

Figure D-2. PCA West Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

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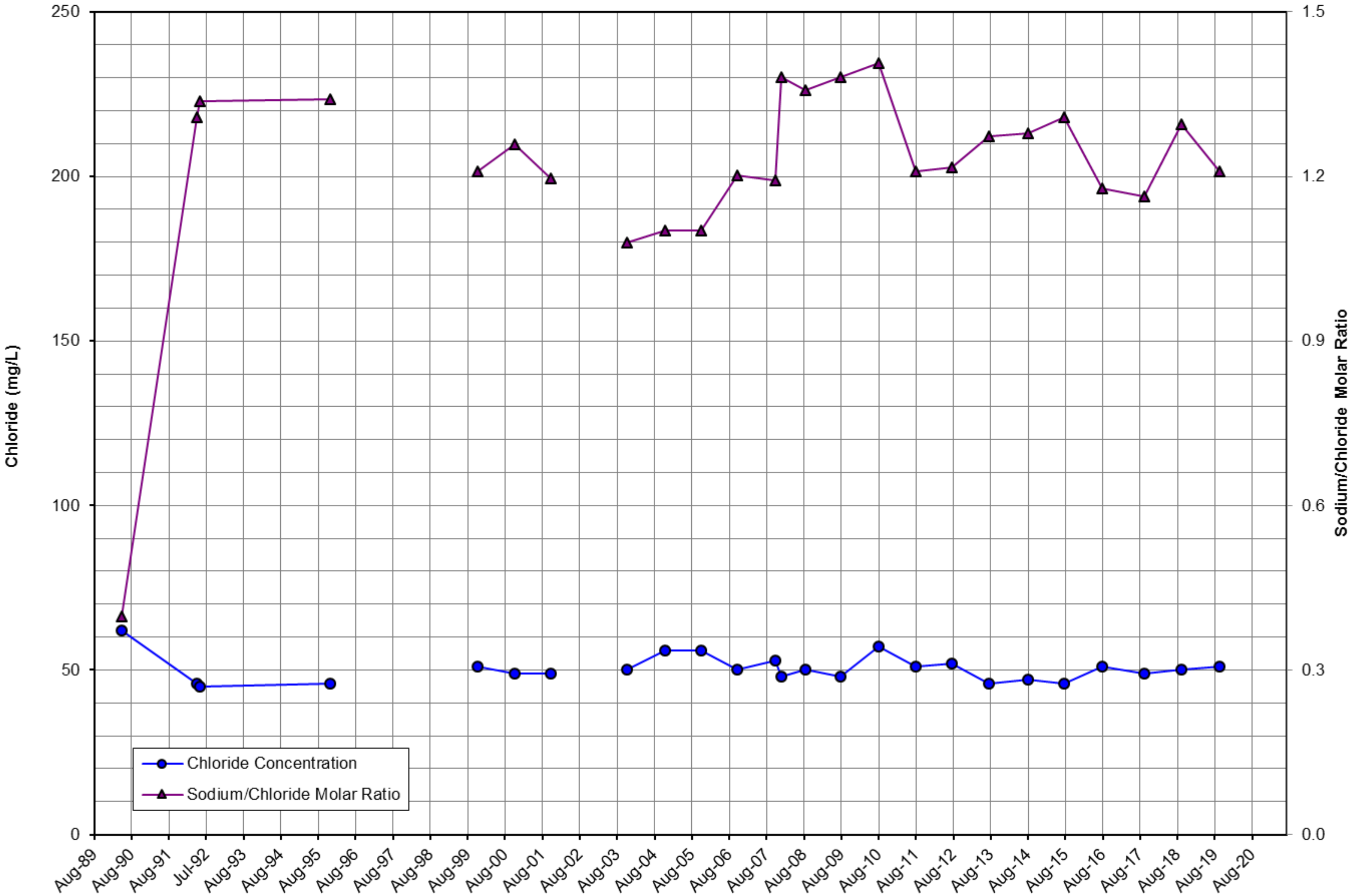

Figure D-3. PCA East Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

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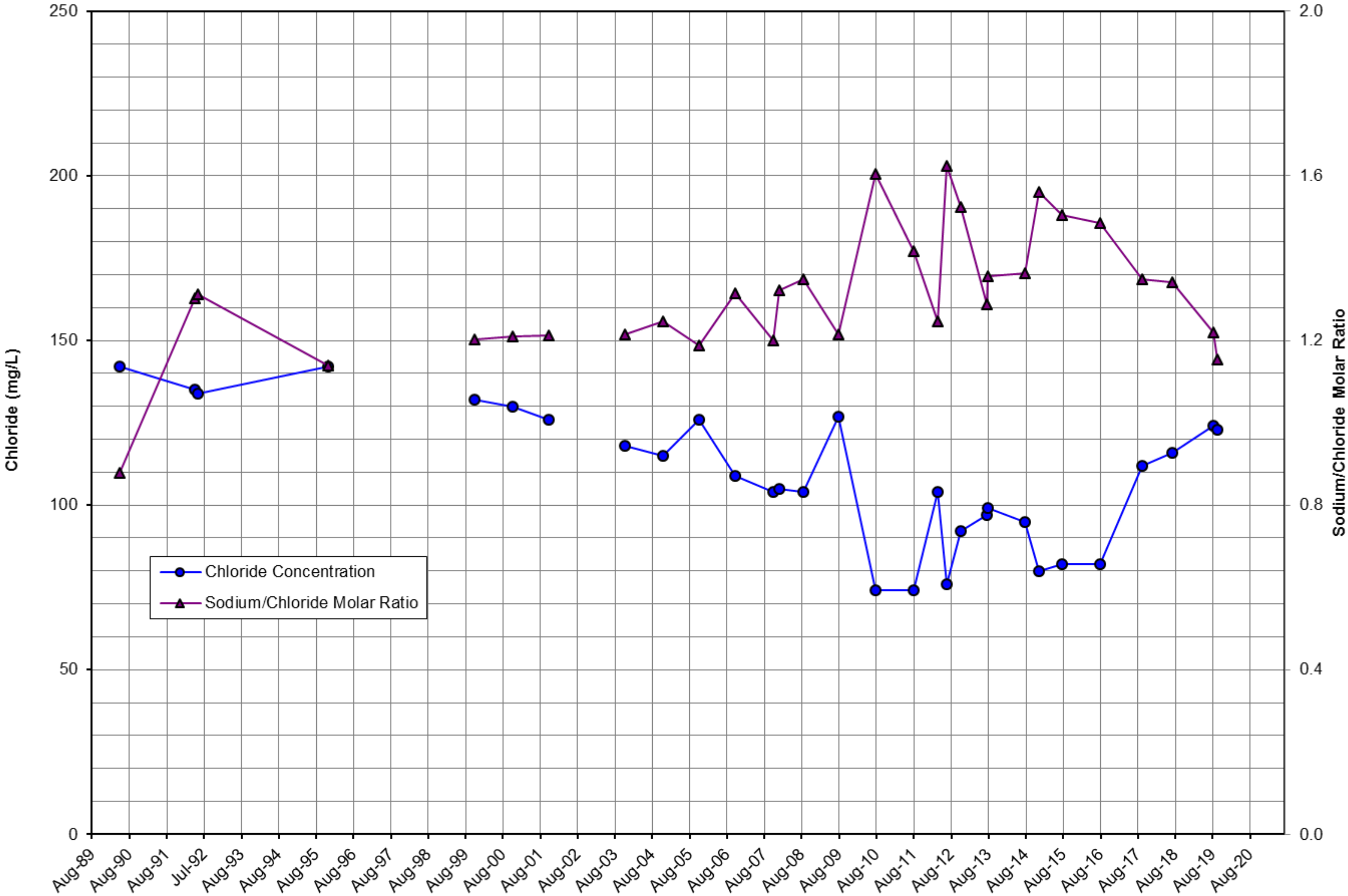

Figure D-4. PCA East Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

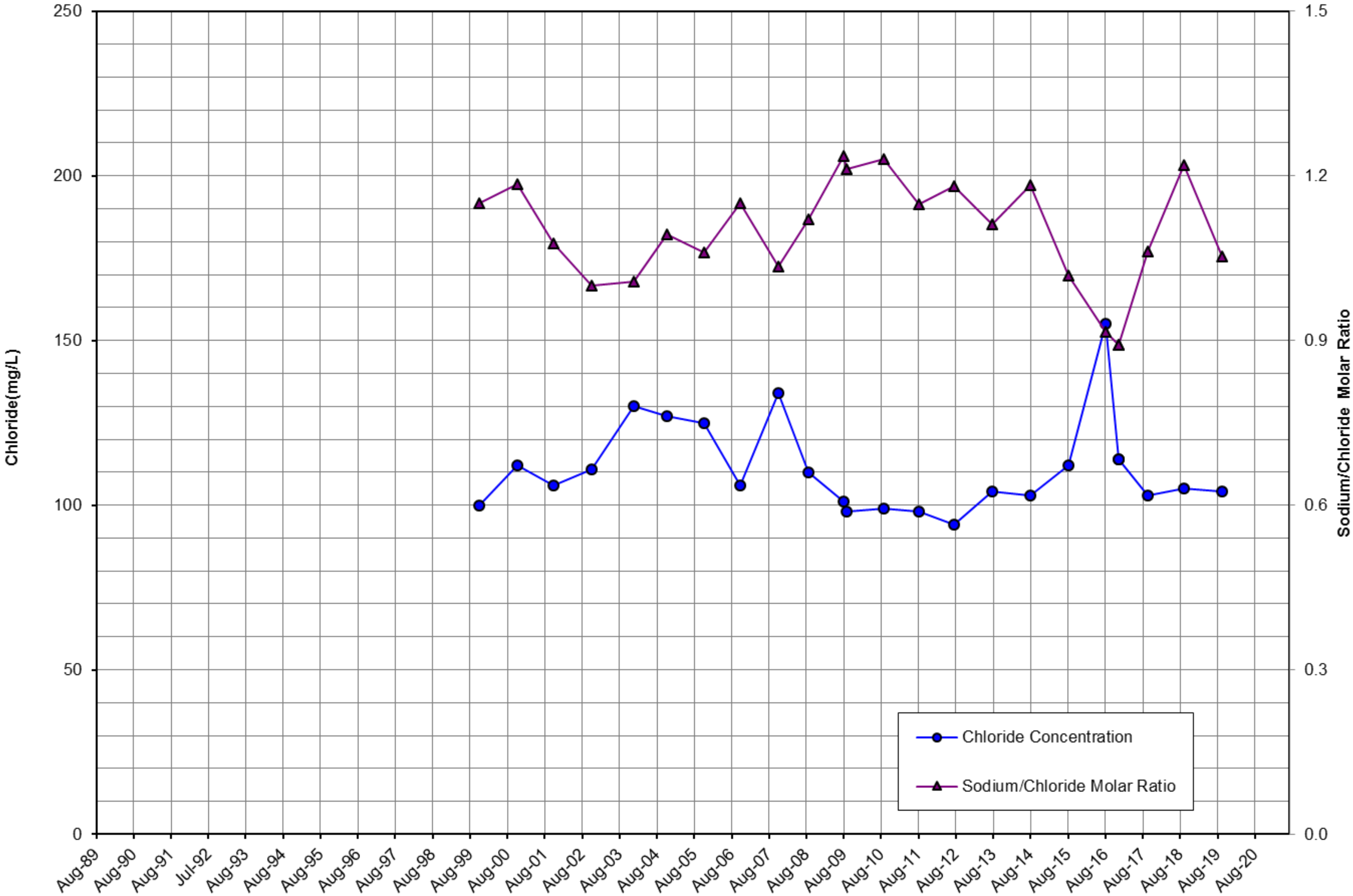

Figure D-5. Ord Terrace Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

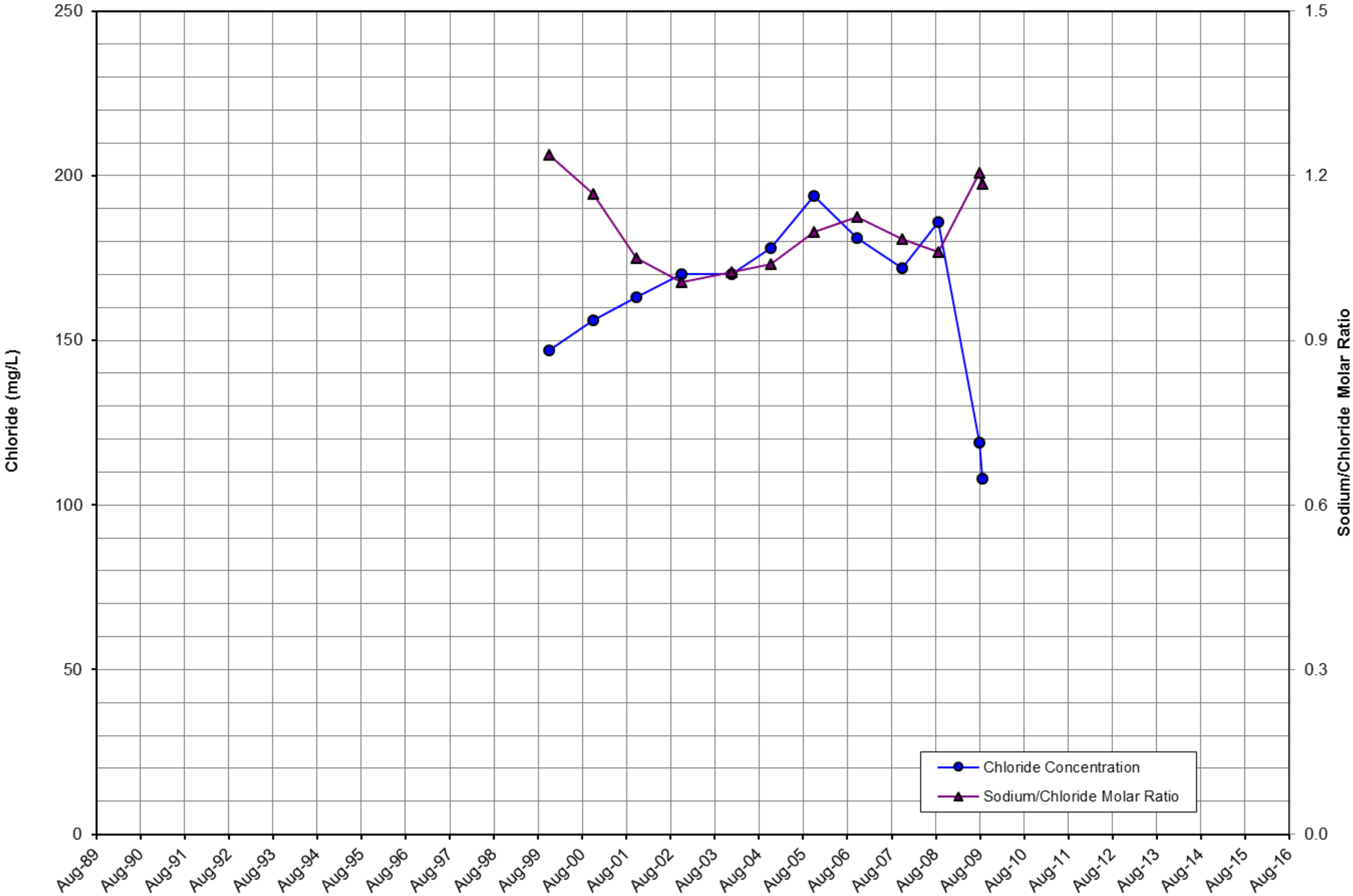

Figure D-6. Ord Terrace Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

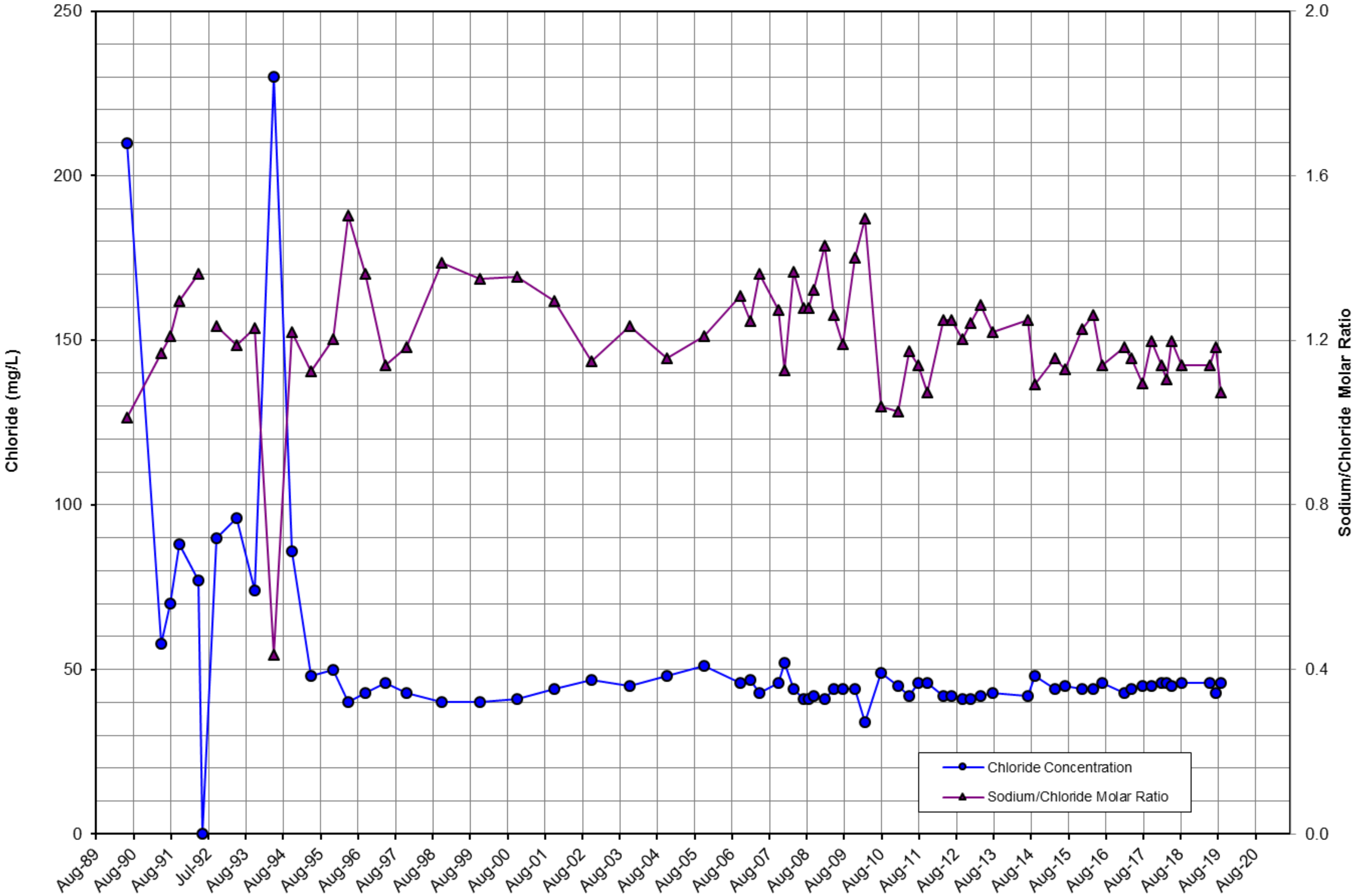

Figure D-7. MSC Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

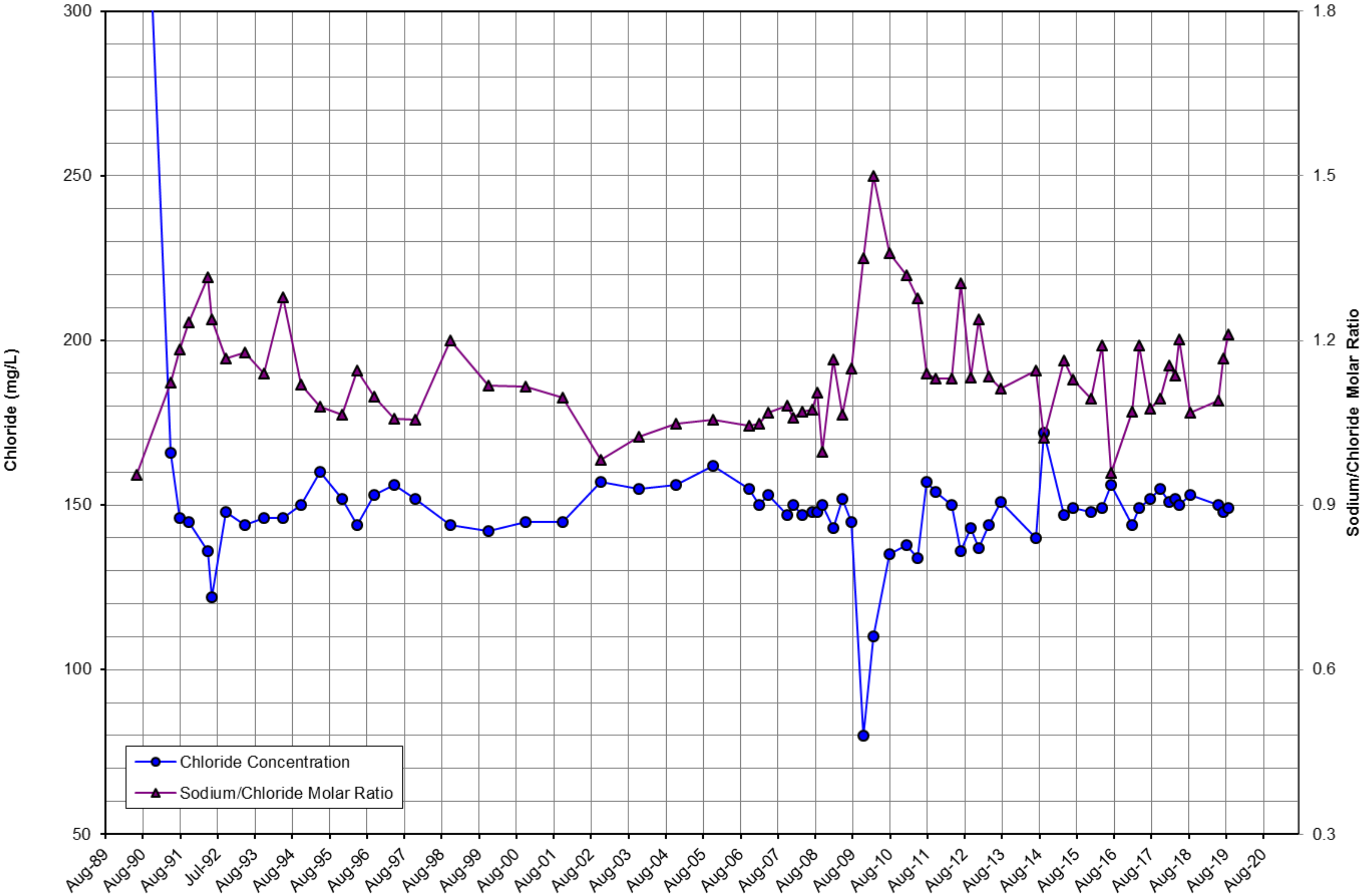

Figure D-8. MSC Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

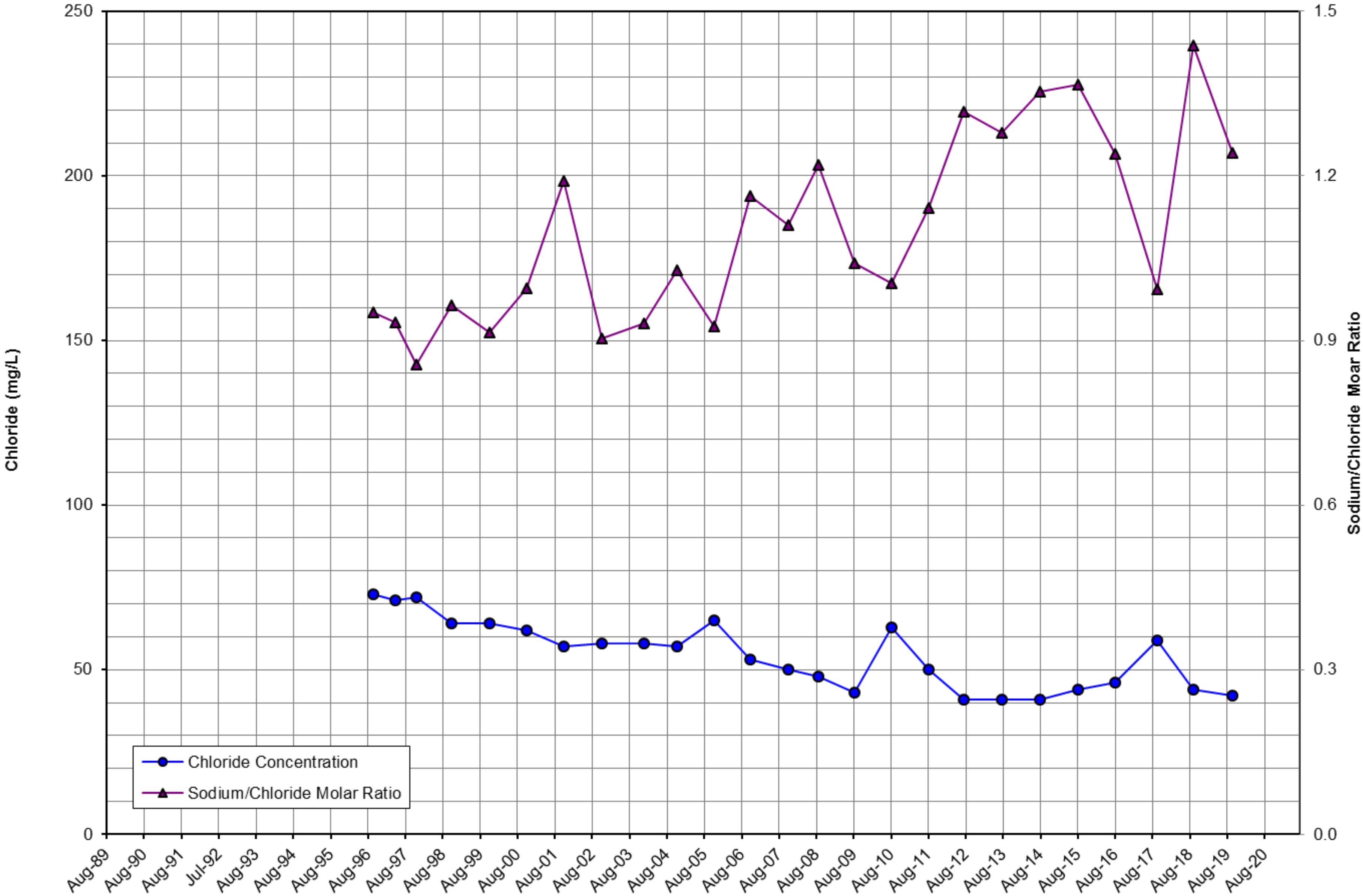

Figure D-9. Fort Ord 10 Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

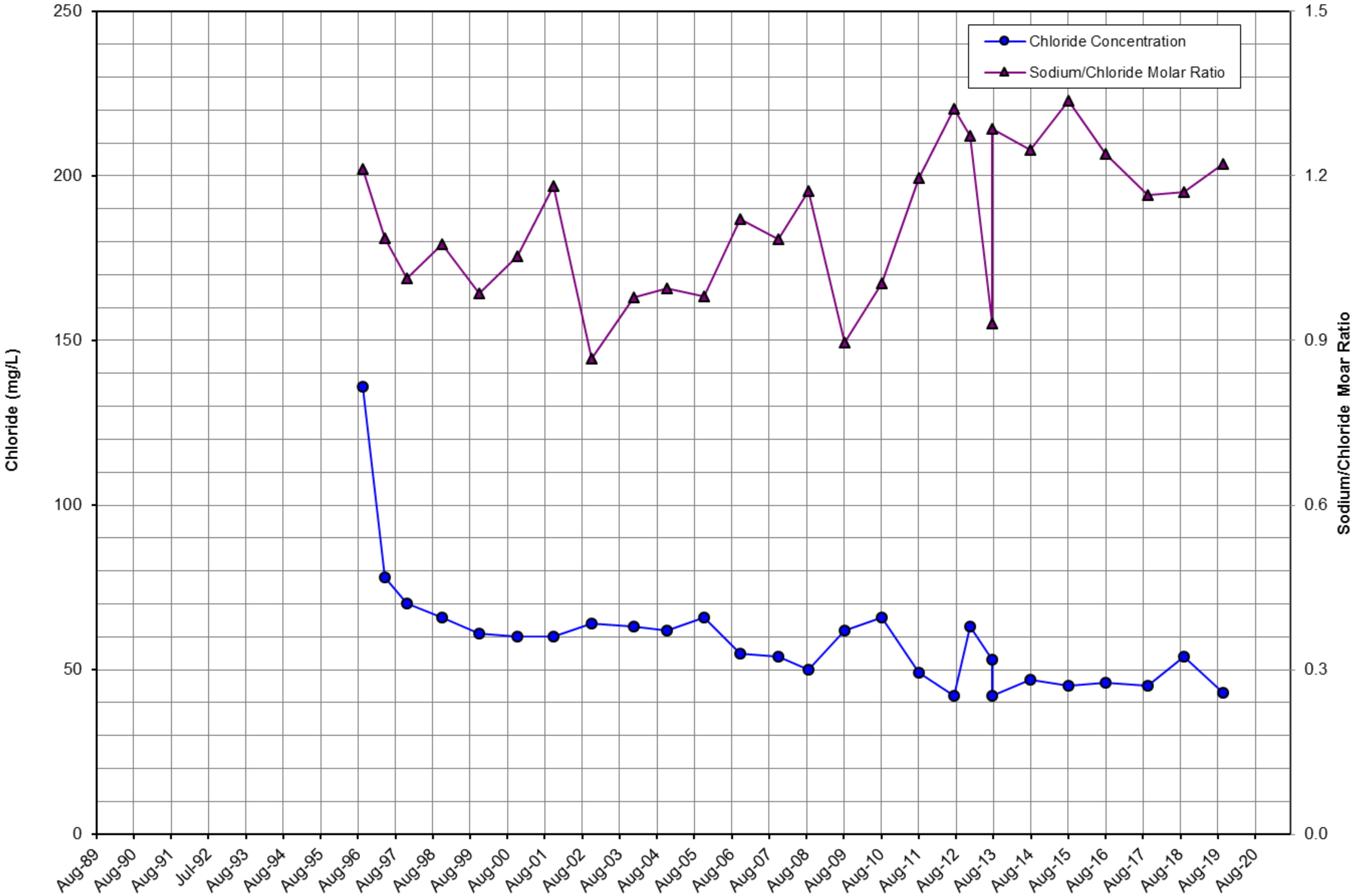

Figure D-10. Fort Ord 10 Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

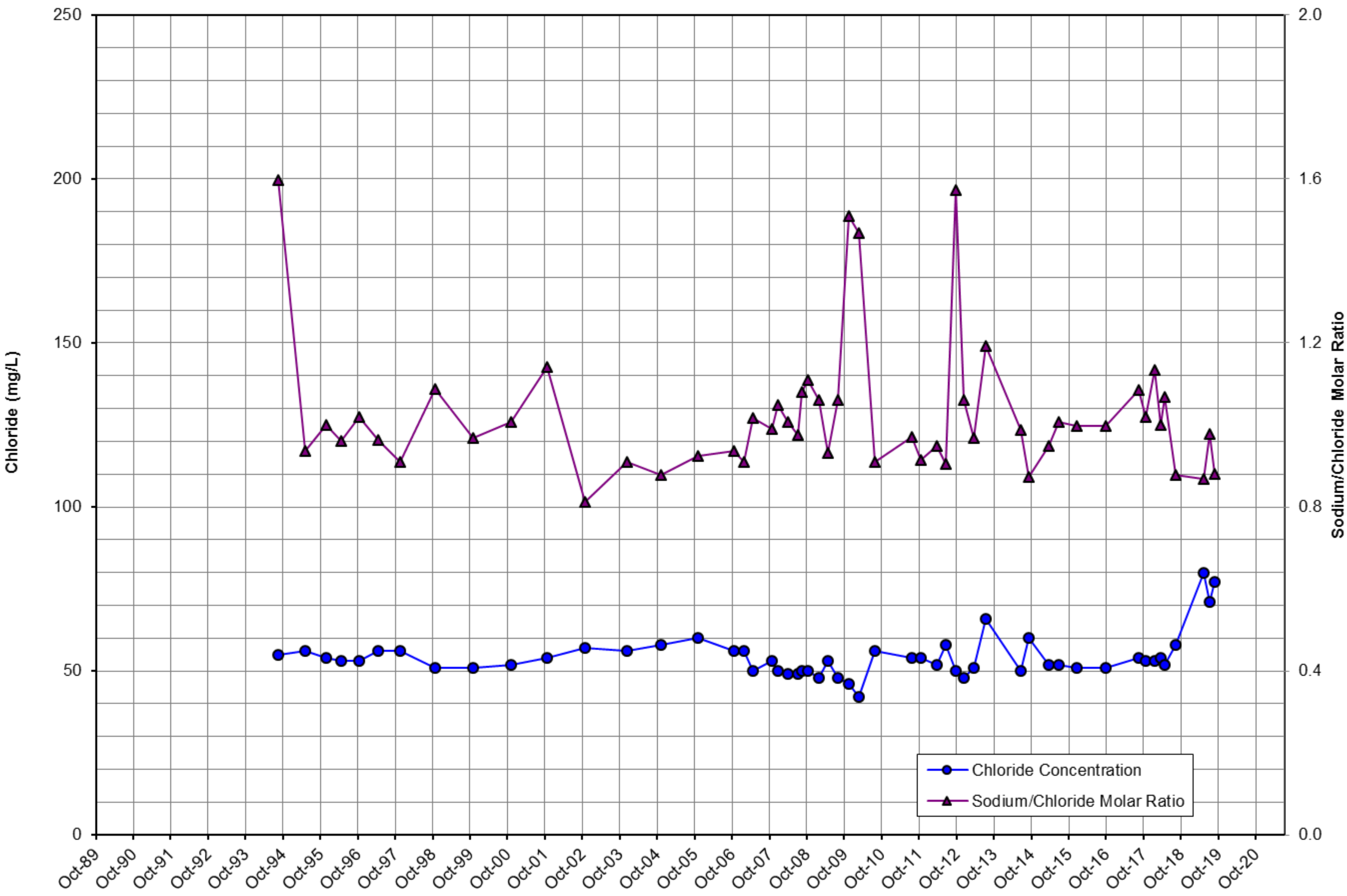

Figure D-11. Fort Ord 9 Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

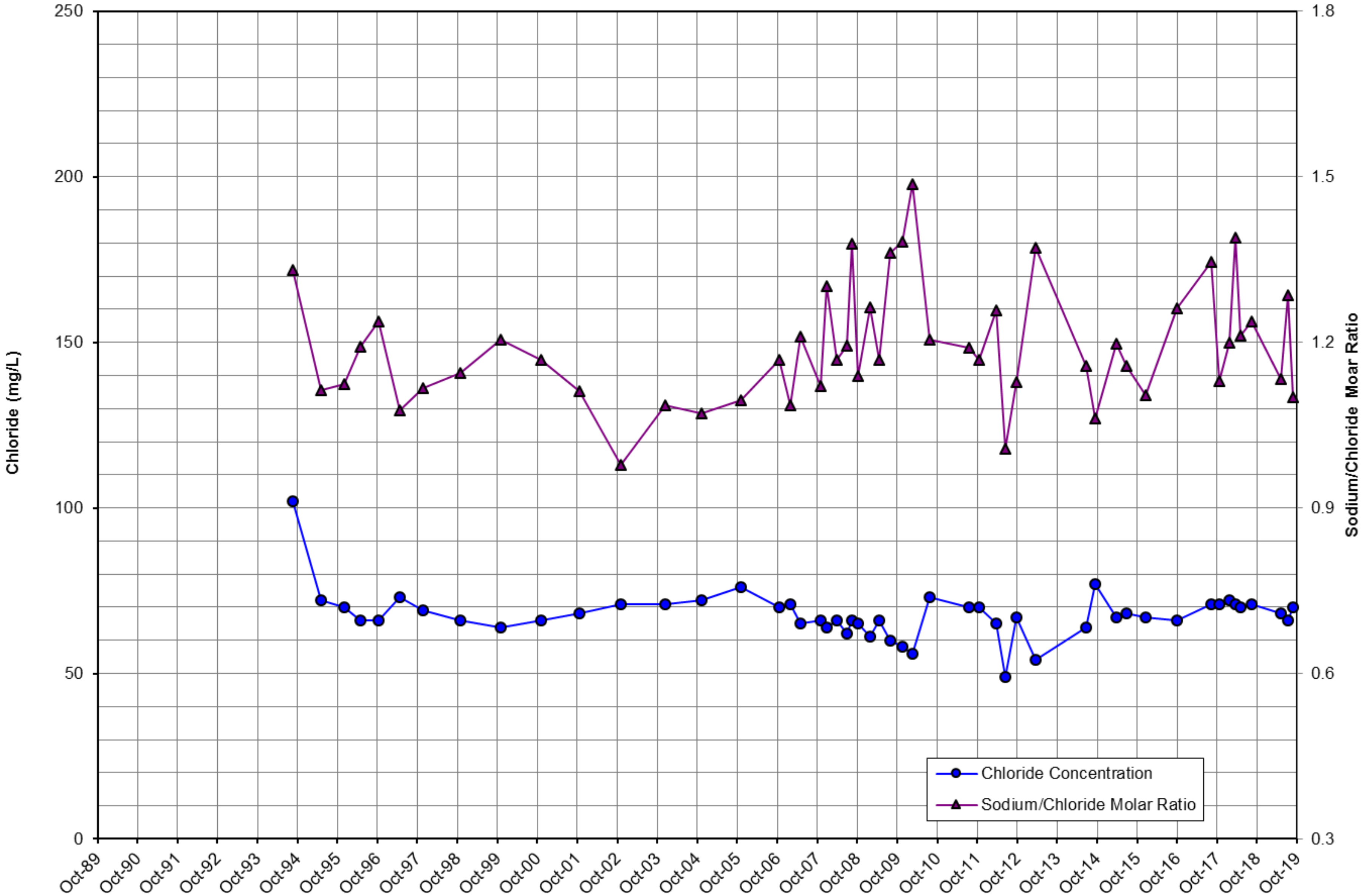

Figure D-12. Fort Ord 9 Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

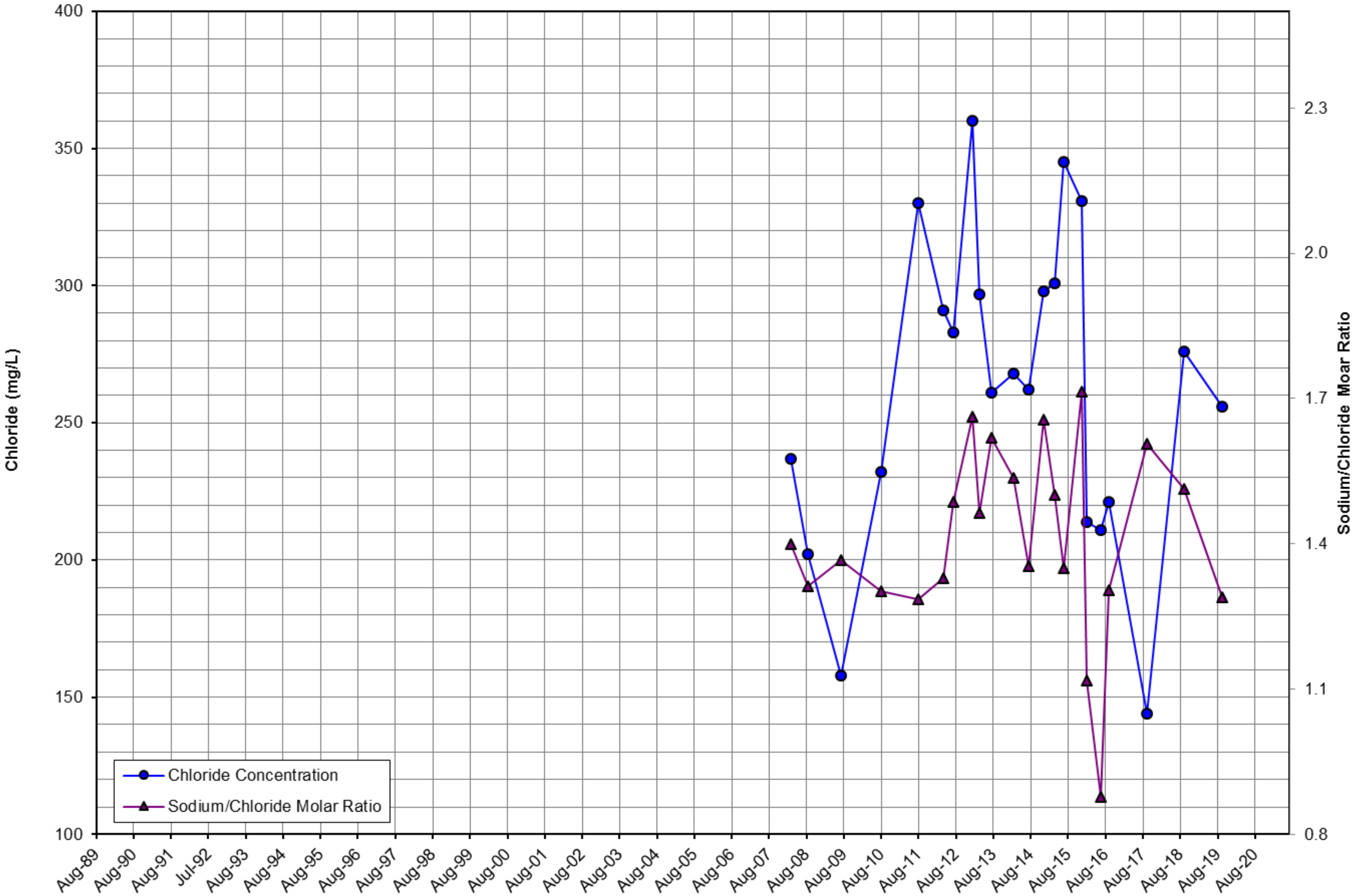

Figure D-13. Sand City Corp Yard Production Well Chloride and Sodium/Chloride Molar Ratio Graph