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# TECHNICAL MEMORANDUM

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Subject: Cooling Pond Expansion Groundwater Impacts Evaluation


## Introduction

Morning Star operates a tomato processing plant in Williams, CA that produces bulk tomato paste. The plant operates seasonally, from July through October. Wastewater from the tomato processing operations is discharged to fields just north of the processing plant, and discharge is regulated by the Central Valley Regional Water Quality Control Board (Board) under Waste Discharge Requirements (WDRs) Order No. R5-2013-0144. The groundwater monitoring network consists of nine (9) groundwater monitoring wells. Five (5) groundwater monitoring wells (MW-5, MW-6, MW-7, MW-8, and MW-9) are associated with the land application area (LAA) and are used to monitor constituents, as specified in the Monitoring and Reporting Program (MRP) of the WDRs, for potential groundwater degradation due to land application of tomato processing wastewater. Monitoring wells MW-1, MW-2, MW-3, and MW-4 are located near the processing plant, and used to monitor impacts from the tomato processing area. The facility has a 100 acre Cooling Pond, which receives condensate from the evaporation process. The WDRs indicate that the Cooling Pond receives water softener reject and boiler blowdown, but both streams were redirected several years ago. Boiler blowdown may be sent to the Cooling Pond during upset conditions. Water passes through the serpentine-shaped Cooling Pond before it is reused in the tomato evaporation process or if periodic excess, applied to the LAA.

## Regulatory Background

The 2013 WDRs identify the Cooling Pond as occupying 60 acres and acknowledge a 65% increase in production capacity anticipated in the future (WDRs, p. 12). In an August 20, 2015 inspection of the Morning Star site, Board staff observed that the Cooling Pond had been expanded to approximately 100 acres, and LAAs MS20A, MS20B, and MS21 removed to accommodate the Pond expansion. This expansion was confirmed by Morning Star to have occurred between May/June 2015.

Morning Star received a Tentative Cease and Desist Order (CDO) No. R5-2016-XXXX, dated November 20, 2015, that indicated that the Cooling Pond expansion is a violation of the 2013 WDRs. The CDO alleges that the expansion of the Cooling Pond has the potential to impact groundwater due to an increase in percolation from the Cooling Pond.

## Evaluation of Groundwater Impacts due to Expansion of the Cooling Pond

Monitoring well MW-6 is directly downgradient of the expanded Cooling Pond. Monitoring well MW-5 was used as a background for this evaluation, as MW-5 is upgradient of the site, and thus not effected by plant operations. To determine if the Cooling Pond expansion has altered water quality in the underlying groundwater, time series of relevant parameters were prepared for monitoring wells MW-5 and MW-6, and comparative statistics were computed for pre-pond expansion and post-pond expansion datasets. As described in the 2013 WDRs, Finding 45, pertinent parameters for MW- 5 and MW-6 include: total dissolved solids (TDS), chloride, nitrate, manganese and iron. Parameters for this evaluation include chloride, TDS, nitrate and electrical conductivity (EC). Manganese and iron have not been identified in the CDO as being out of compliance and therefore, are not included in this evaluation. For the purposes of this analysis, constituent concentrations reported as non-detect (ND), less than then reporting limit (RL), or less than the method detection limit (MDL), were treated as one-half the RL or MDL, whichever was available.

### Chloride Concentrations in MW-5 and MW-6

**Figure 1** shows chloride concentrations in MW-5 and MW-6 since their installation in September 2004. Since the Cooling Pond expansion in May/June 2015, chloride concentrations in MW-6 are less than those seen in MW-5. Pre-expansion chloride concentrations in MW-6 averaged 61.2 mg/L, while the post-expansion chloride concentrations data has a mean of 36.3 mg/L. A 95% confidence interval was applied to the mean of the pre-expansion chloride dataset, similar to the approach used for manganese compliance in the CDO; this showed a threshold of 68.4 mg/L for chloride concentrations in MW-6. There were no exceedances of this threshold in the post-expansion chloride dataset, and there is no impact to groundwater due to any potential increase in percolation from the Cooling Pond.

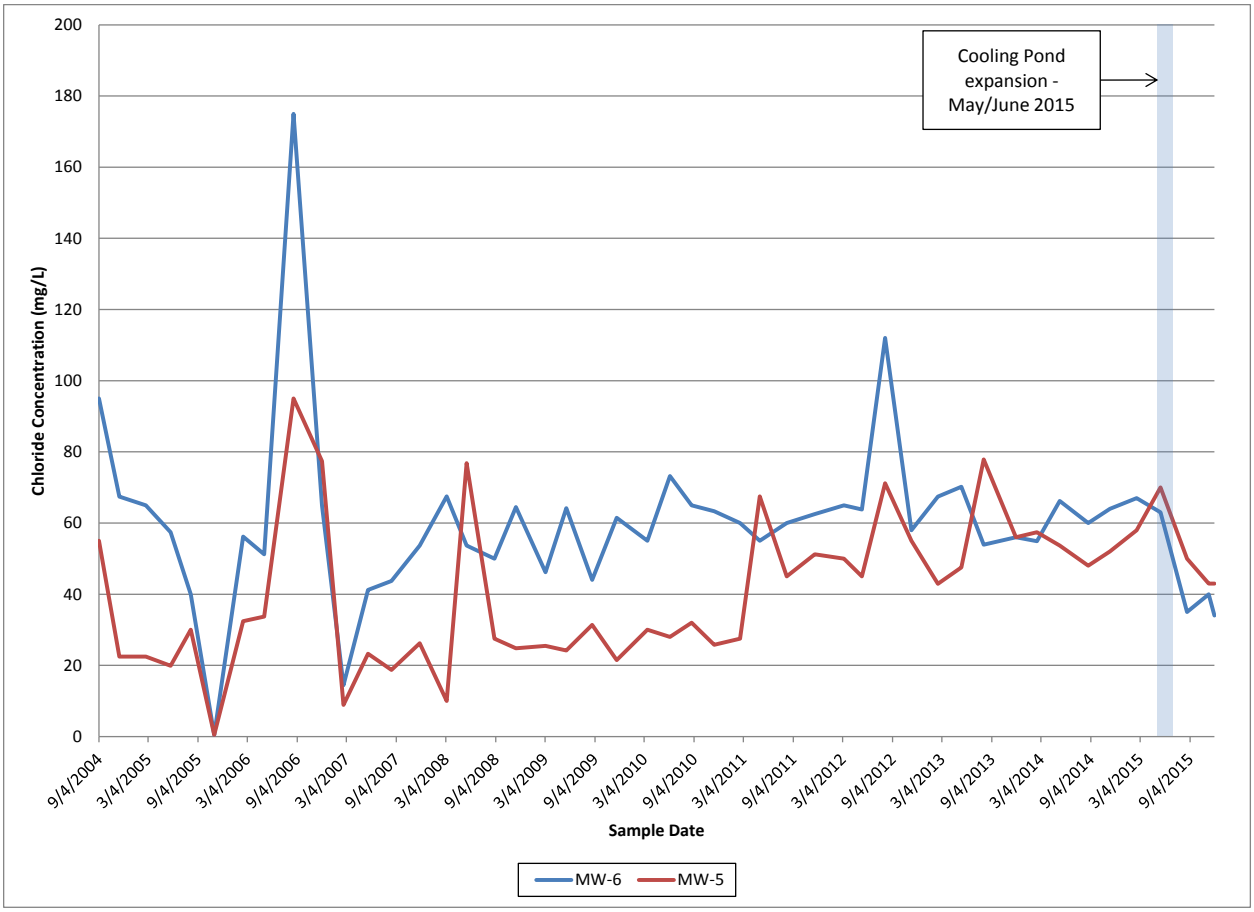


**Figure 1. Chloride concentrations time series for monitoring wells MW-5 and MW-6.**

## TDS Concentrations in MW-5 and MW-6

**Figure 2** shows the TDS concentrations time series for MW-5 and MW-6. Since the Cooling Pond expansion in May/June 2015, TDS concentrations in MW-6 are less than those seen in MW-5. Pre-expansion TDS concentrations in MW-6 averaged 723 mg/L, while the post-expansion TDS concentrations data has a mean of 630 mg/L. A 95% confidence interval was applied to the mean of the pre-expansion TDS dataset; this showed a threshold of 740.3 mg/L for TDS concentrations in MW-6. There were no exceedances of this threshold in the post-expansion TDS dataset, and there is no impact to groundwater due to any potential increase in percolation from the Cooling Pond.

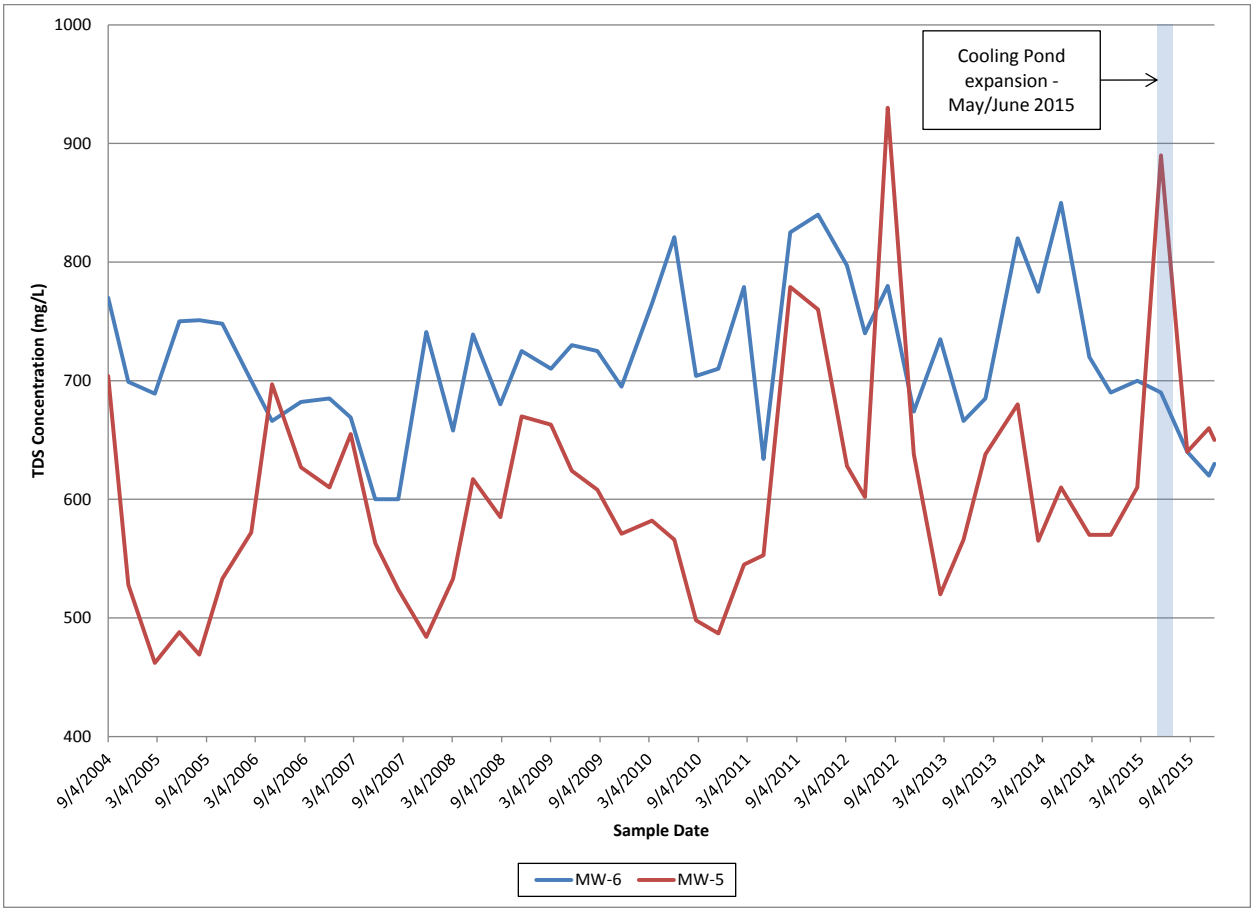


**Figure 2. TDS concentrations time series for monitoring wells MW-5 and MW-6.**

## Nitrate Concentrations in MW-5 and MW-6

**Figure 3** shows the nitrate concentrations time series for MW-5 and MW-6. Since the Cooling Pond expansion in May/June 2015, nitrate concentrations in MW-6 are less than those seen in MW-5. Pre-expansion nitrate concentrations in MW-6 averaged 7.8 mg/L as N, while the post-expansion nitrate concentrations dataset has a mean of 0.5 mg/L as N. It is evident from mean data that nitrate is significantly lesser in the post-expansion dataset. A 95% confidence interval was applied to the mean of the pre-expansion nitrate dataset; this showed a threshold of 8.9 mg/L for nitrate concentrations in MW-6. There were no exceedances of this threshold in the post-expansion nitrate dataset, and there is no impact to groundwater due to any potential increase in percolation from the Cooling Pond.

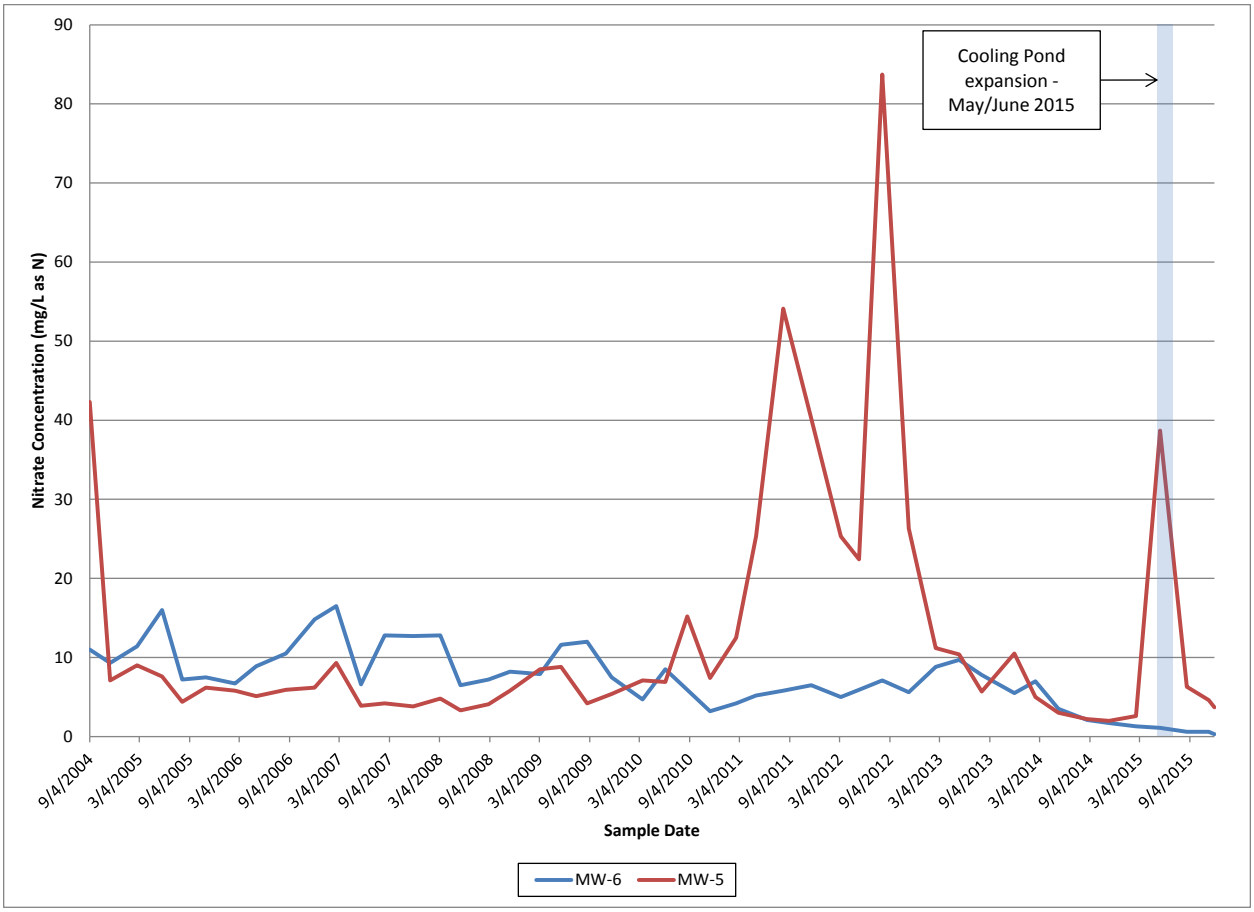


**Figure 3. Nitrate concentrations time series for monitoring wells MW-5 and MW-6.**

## Electrical Conductivity Concentrations in MW-5 and MW-6

**Figure 4** shows the EC time series for MW-5 and MW-6. Since the Cooling Pond expansion in May/June 2015, EC is typically less in MW-6 than in MW-5. Pre-expansion EC in MW-6 averaged 1215.7 µmhos/cm, while the post-expansion EC dataset has a mean of 1066.7 µmhos/cm. A 95% confidence interval was applied to the mean of the pre-expansion EC dataset; this showed a threshold of 1246.4 µmhos/cm for EC in MW-6. There were no exceedances of this threshold in the post-expansion EC dataset, and there is no impact to groundwater due to any potential increase in percolation from the Cooling Pond.

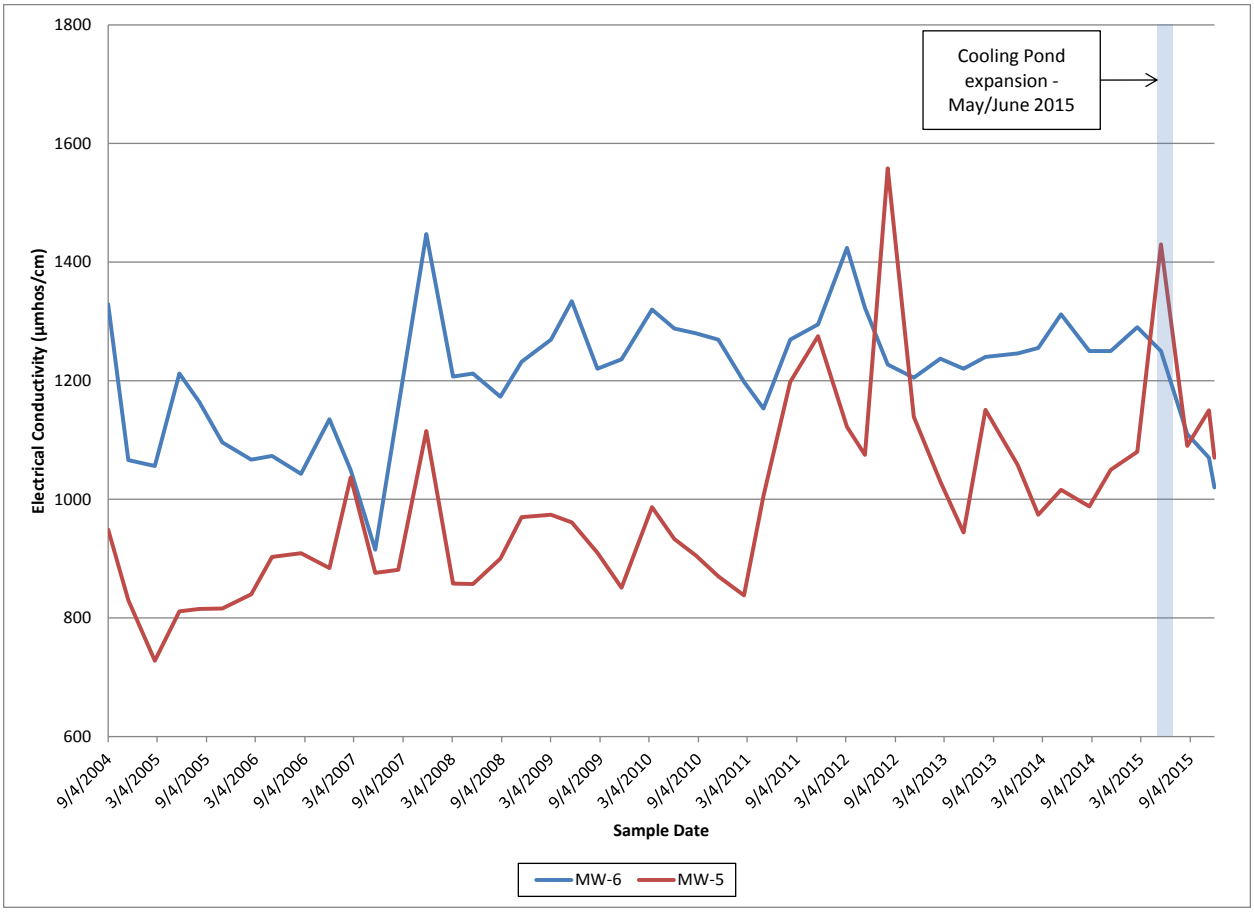


**Figure 4. Electrical conductivity time series for monitoring wells MW-5 and MW-6.**

## Conclusions

Time series analyses for chloride, TDS, nitrate, and EC in MW-5 and MW-6 show no significant differences between pre-expansion and post-expansion Cooling Pond datasets. In the post-expansion datasets, constituent concentrations in MW-6 (downgradient well) have been below those in MW-5 (background well). A 95% confidence interval was applied to the pre-expansion constituent means to develop intrawell thresholds in MW-6. There were no observed exceedances of these thresholds in the post-expansion datasets. As such, there is no evidence of groundwater degradation due to the expansion of the Cooling Pond. Constituents in these wells will continue to be monitored as prescribed in the 2013 WDRs for potential impacts from the Cooling Pond expansion.