Appendix K

PPG/Honeywell Site 199 Agreement

PROTOCOL FOR DIFFERENTIATING CHROMIUM CHEMICAL PRODUCTION WASTE AT ADJACENT SITES

Site 199 is a Shared Honeywell – PPG Site, subject to the Shared Orphan Site Agreement (“Agreement”) that was accepted and agreed to by PPG and Honeywell in February 2016. Section III of the Agreement calls for a 50-50 cost share between Honeywell and PPG for Shared Sewer Site costs, with the exception of Site 199 where, pursuant to Paragraph 3.5, PPG agrees to pay Honeywell 100% of the costs of remediating any chromate chemical production waste (CCPW) at Site 199 Sludge Line 2 that the Parties conclude migrated from Site 114. Paragraph 3.5 requires that Honeywell and PPG (the Parties) “develop a protocol for identifying CCPW at Site 199, Sludge Line 2, that migrated from Site 114.” CCPW includes chromite ore processing residue (COPR), and/or hexavalent chromium associated with COPR, and or other metals (i.e., antimony nickel, thallium, and vanadium) associated with COPR.

The procedure provided below (Protocol), once agreed and approved by both Parties, is intended to be the mechanism that will be applied to differentiate between CCPW at Site 199 that may be present as a result of two different sets of activities with two different Responsible Parties (RP). Specifically, the Protocol has been developed to differentiate between (a) chromium impacts, including impacts to soil and/or groundwater, that are identified at Site 199 which may be associated with the adjacent Site 114 Garfield Avenue Site, for which PPG is obligated to compensate Honeywell entirely, and (b) impacts associated solely with Site 199 Sludge Line 2, for which Honeywell and PPG are responsible for a 50-50 cost share.

The evaluation procedures contained in this Protocol will be implemented by Honeywell, as the party performing the remedial actions at Site 199 on behalf of both PPG and Honeywell, and will be shared with PPG for discussion, input and final agreement. The attached flow chart provides a summary of the Protocol.

Evaluation methods will include the following:

1. Evaluate RI data and map extent of chromium impacts in soil and groundwater for Site 199. Review soil and groundwater results for hexavalent and total chromium collected as part of the Site 199 delineation, including Site 199 and adjacent areas as may be requested by NJDEP.

    a. Review field observations (boring logs and field notes) for visual observation of CCPW, including but not limited to chromite ore processing residue (COPR) and other fill material.

    b. Identify within that data any areas where results appear to be inconsistent with typical findings at a sewer site, e.g., increases in hexavalent chromium concentrations away from the sewer line, or groundwater data that is inconsistent with respect to soils concentrations, etc.

2. Identify those areas which, based on above evaluation, need to be further investigated to determine whether the impacts at those areas are associated with Site 199 or Site 114. [Refer to step 4a below for information on different types of CCPW.]

3. For the areas where there are inconsistencies or gaps:

   a. Obtain from PPG Site 114 reports or data as necessary to evaluate data gaps and/or discrepancies identified through the initial data review. Assess chromium occurrence (and other relevant indicators, if necessary) and distribution that may be indicative of material origin.

   b. Review field observations (boring logs and field notes) for visual observation of CCPW and other fill material.

   c. If necessary, collect additional data to close data gaps that may be present based on existing data.

4. Analyze soil and/or groundwater chromium data compiled in previous steps, to assess whether the areas being further investigated represent chromium impacts that are attributable to Site 114. The impacts may be the result of contaminant migration or may be the result of actual placement of material.

   a. For soil, compare visual observations of the contamination based on the descriptions contained in the boring logs and evaluate data as follows:

      i. Evaluate information on the placement of CCPW fill material at Site 199 to determine if the material has been placed along sewer lines as bedding material or has been placed more randomly site-wide.

      ii. Evaluate CCPW visual appearance and other characteristics based on the following criteria:

         a) For Honeywell sites, CCPW is generally characterized as COPR (gray-black fine to coarse sand with yellow-green streaks). Typical approximate range of hexavalent chromium is between 1,000 and 5,000 milligrams per kilogram (mg/kg) with pH values typically greater than 11. Green-Gray Mud (GGM), which is a CCPW material found at PPG Site 114, is not present at Honeywell sites.

         b) For PPG sites, CCPW is generally characterized as COPR and GGM. COPR is characterized at Site 114 (Remedial Investigation Report – Soil, AECOM, 2012) as a reddish brown, coarse to fine, gravel with varying amounts of sand and silt particles. The gravel portion of the matrix is typically defined as nodules from the chromium manufacturing process that range in size from 3/4 to 1/8 inches in diameter. Typical approximate range of hexavalent chromium concentration is between 300 and 5,000 mg/kg. GGM is generally a lime green dense silt, with minor amounts of fine sand and clay. Typical approximate range of hexavalent chromium is greater than 5,000 mg/kg.

      iii. Compare hexavalent chromium concentrations including gradients and ratios with other potential CCPW related metals (antimony, nickel, thallium, vanadium) from areas with CCPW to site boundaries and offsite as necessary; compare data sets between the two sites including statistical evaluation.

iv. If needed to provide additional information for evaluation, consider differences in manufacturing methods and feedstocks. These different methods and feedstocks may have resulted in differences in the composition of the process residual. Such differences can be visualized with data graphing tools commonly used in geology. For example, plots of relative concentrations of calcium, iron, and magnesium with respect to hexavalent chromium, which reflect differences in manufacturing methods and feedstocks (see Figures 1 and 2), can distinguish CCPW from two different sources. Similar plots of other relevant elements can also be constructed and compared to Site 199 data.

b. For groundwater, conduct a phased analysis as follows:

i. Compare groundwater impacts to the geographic extent of the impacted soil and review the site conceptual model in terms of potential source areas and groundwater flow patterns. Incorporate conventional groundwater geochemistry data (e.g., pH, Eh) from each of the sites into the analysis. The objective of this analysis is to assess how observed groundwater analytical data relate to known source areas. For example, RI data from COPR fill sites shows that hexavalent chromium groundwater impacts are limited in areal extent and typically do not migrate beyond the COPR fill material. Hexavalent chromium impacts in groundwater are subject to reduction within short distances from the source and, therefore, are substantially diminished or dissipated at a distance beyond the source. Based on Site 114 data evaluated to date, CCPW present in soil as Green Gray mud may result in groundwater impacts that extend beyond the source, depending on the magnitude of the source and migration pathways.

ii. Utilize common geochemical tools like Piper and Stiff diagrams to evaluate type and evolution of groundwater. These methods utilize concentration data of conventional ions to visualize groupings or type of groundwater based on ambient impacts. For example, it may be possible to discern whether groundwater is changing type (i.e. abundance of conventional ions is changing systematically) from upgradient to downgradient) or whether zones of distinct groundwater type (i.e. no mixing) exist.

iii. The above geochemical modeling would require the collection of additional parameters beyond chromium (i.e. calcium, magnesium, sodium, potassium, sulfate, chloride, carbonate plus hydrogen carbonate).

iv. If the above modeling does not provide a clear conclusion, advanced statistical methods may be used to assess whether the groundwater sampling data represent one or more populations. Techniques such as principal component analysis and cluster analysis could be used. These methods aim to correlate and aggregate samples into groups that are statistically correlated, based on the analytical data.

v. The above statistical analysis would require the collection of additional data (such as additional metals analyses) to allow the identification of patterns. The statistical significance and confidence of these calculations also depends on the number of samples available.

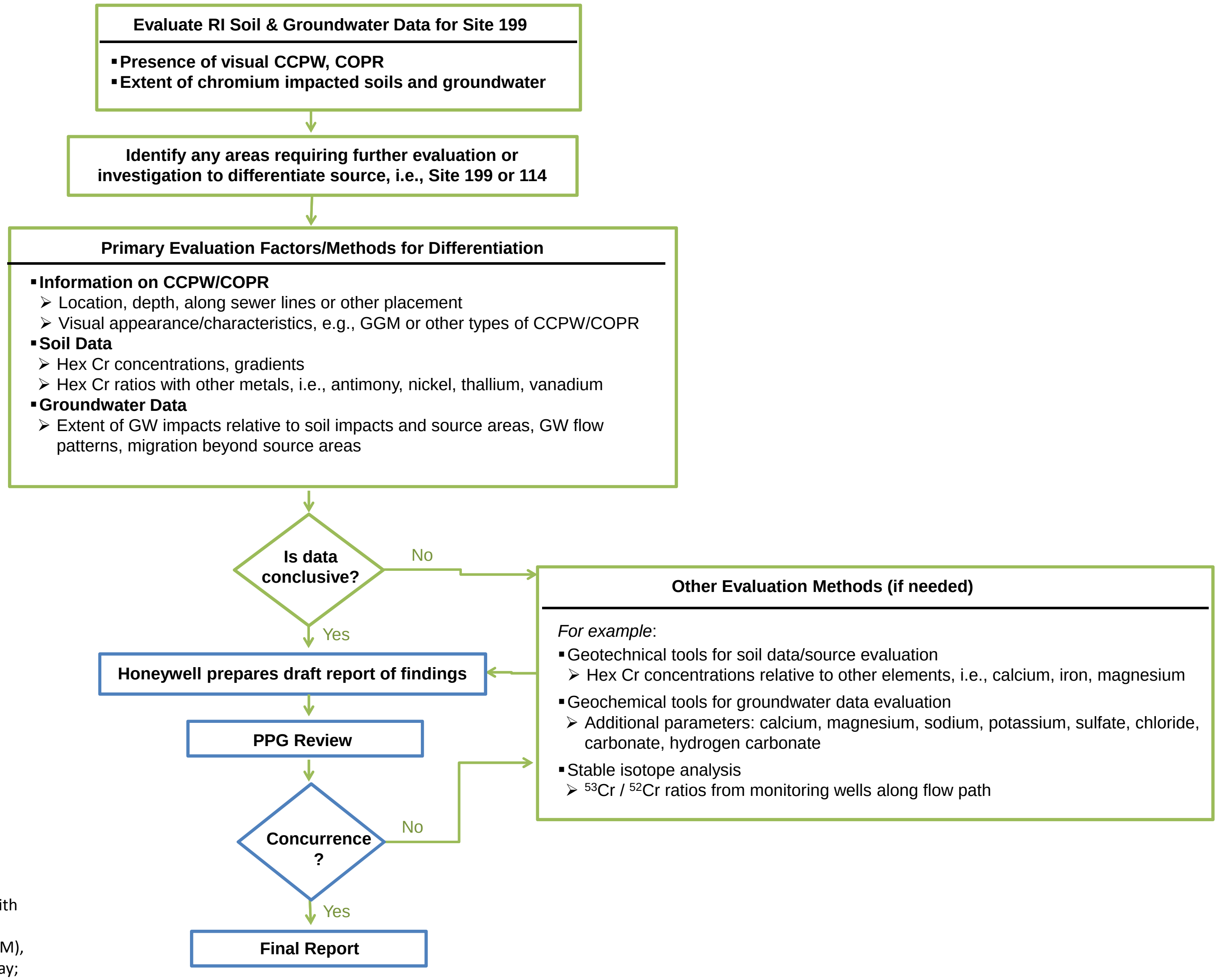
vi. If the above methodologies do not provide a confident answer, additional techniques may be utilized. Stable isotope analysis has been utilized for a number of years with good success and is now considered a mature technique. $^{53}Cr/^{52}Cr$ ratios from wells located on groundwater flow lines may yield change patterns indicative of source relationships. Differences in stable isotope ratios are due to preferential chemical kinetics. Linear changes of concentration with distance can be used to correlate sampling locations to source areas.

Following completion of the evaluation, a draft report will be generated that details the findings and conclusions regarding the evaluation. The draft evaluation report will be generated by Honeywell and provided to PPG for review and as the basis of discussion. Following discussions, review of the draft report and incorporation of comments, a final draft report will be issued for review and approval by Honeywell and PPG prior to issuance of a final report.

It is expected that the conclusions would include identification of the responsible party for remedial action, i.e., shared between Honeywell and PPG for Site 199 or PPG for impacts related to Site 114. The overall evaluation results would be included as part of the next remedial phase report for each site, as applicable.

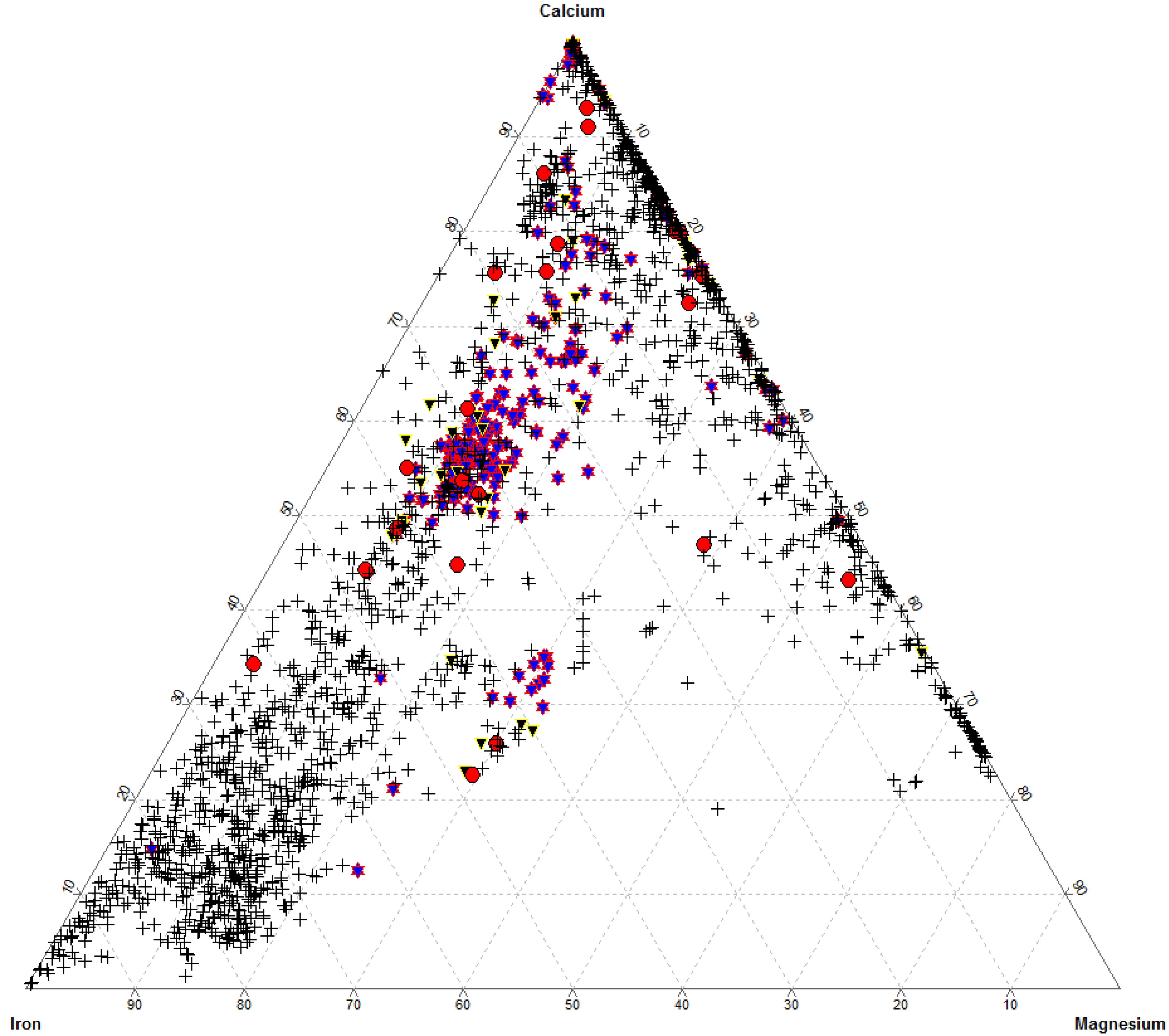
FLOW CHART

Protocol for Differentiating Chromate Chemical Production Waste (CCPW) at Adjacent Sites (199 and 114)



Notes Regarding CCPW/COPR:
Honeywell Sites: CCPW is typically characterized as chromite ore processing residue (COPR), e.g., gray-black fine to coarse sand, with yellow-green streaks
PPG Sites: CCPW is typically characterized as green gray mud (GGM), i.e., lime green dense silt with minor amounts of fine sand and clay; or COPR, e.g., reddish brown, coarse to fine gravel with varying amounts of sand and silt particles

FIGURES



Legend

Honeywell Hexavalent Chromium Concentrations

- >1000 mg/kg
- 500-1000 mg/kg
- 300-500 mg/kg
- <300 mg/kg

Note:
Hexavalent chromium concentrations are symbolized for each sample. Sample points are plotted proportionally relative to their calcium, iron, and magnesium concentrations.

Concentrations are presented in milligrams per kilogram (mg/kg)

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Rev No.	Date	Status	Checked By	Approved By

PROJECT NUMBER:
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PREPARED/DATE:
EB 11/10/2017

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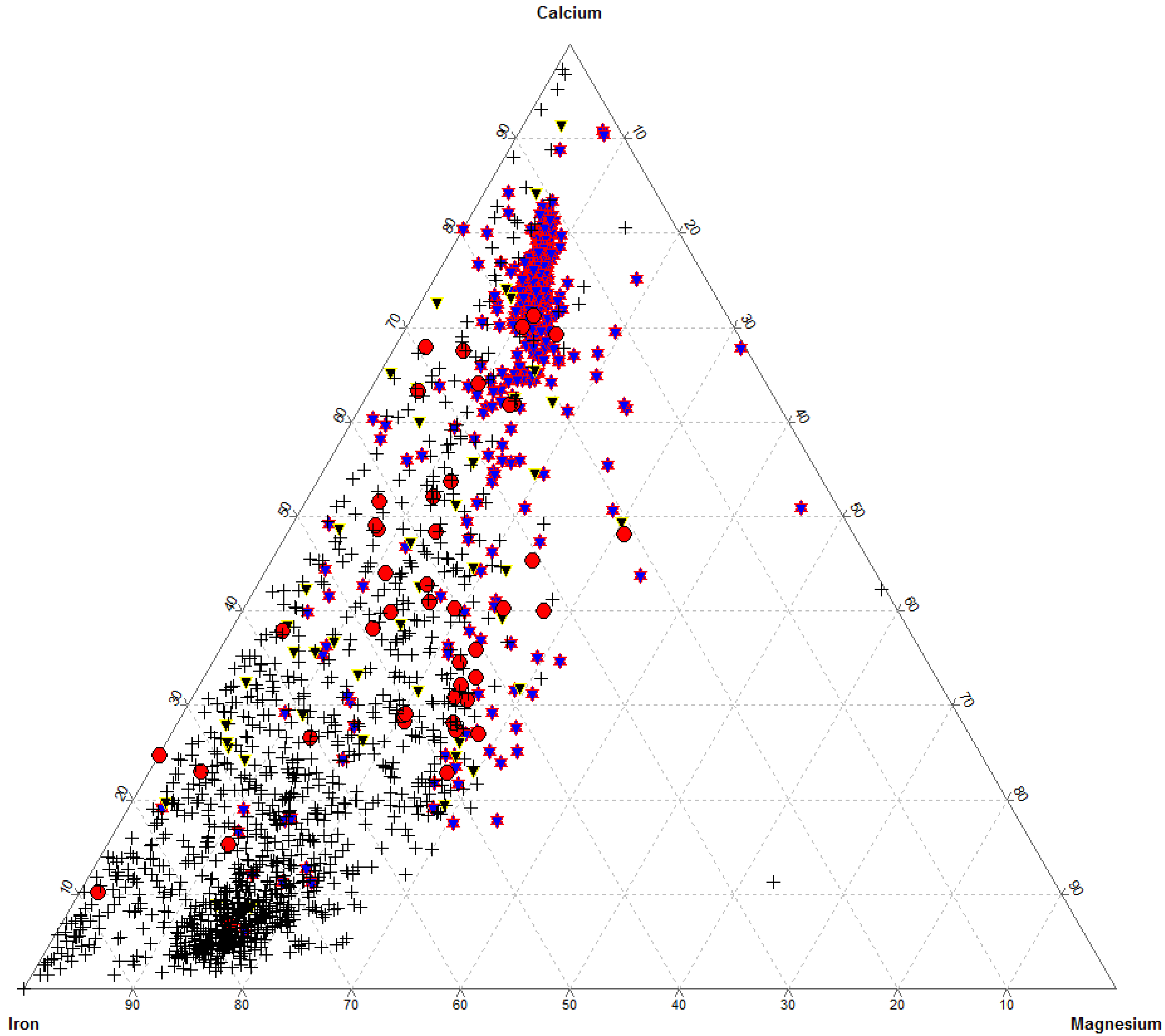
FIGURE 1
CORRELATION OF CALCIUM, IRON, AND MAGNESIUM DETECTED AT HONEYWELL CHROMIUM SITES



Legend

PPG Hexavalent Chromium Concentrations

- >1000 mg/kg
- 500-1000 mg/kg
- 300-500 mg/kg
- <300 mg/kg

Note:
Hexavalent chromium concentrations are symbolized for each sample. Sample points are plotted proportionally relative to their calcium, iron, and magnesium concentrations.

Concentrations are presented in milligrams per kilogram (mg/kg)

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FIGURE 2
CORRELATION OF CALCIUM, IRON, AND MAGNESIUM DETECTED AT PPG CHROMIUM SITES