CRETE
CONSULTING, INC.

TO: William Evans, Dan Crawford, and Jan Shawyer, Port of Tacoma

FROM: Grant Hainsworth and Nicole Ott, CRETE Consulting Inc.

PROJECT: 1940 E. 11th Street (former Brown & Haley)

SUBJECT: Review of RI and FS Documents

DATE: January 8, 2014

This memorandum provides CRETE's review of Pacific Crest's investigation of solvent-related soil and groundwater impacts, as documented in the following reports:

1. Focused Site Investigation, Shaub-Ellison Corporation, 1132 Thorne Road, Pacific Crest Environmental, LLC, June 13, 2006. (The document title was somewhat obscured on the version that was reviewed and may not be entirely correct.)
2. Remedial Investigation Report, Sound Mattress and Felt Property, 1940 East 11th Street, Tacoma, Washington, FS ID 1232087, Pacific Crest Environmental, LLC, December 1, 2009. (Appendix B Laboratory Analytical Reports was not included.)
3. Data Gap Investigation Report, Sound Mattress and Felt Property, 1940 East 11th Street, Tacoma, Washington, FS ID 1232087, Pacific Crest Environmental, LLC, April 4, 2010.
4. Draft Feasibility Study Report, Sound Mattress and Felt Property, 1940 East 11th Street, Tacoma, Washington, FS ID 1232087, Pacific Crest Environmental, LLC, April 12, 2013. (Appendix C Laboratory Analytical Reports was not included.)

Several historical photographs, drawings, reports, and other documentation specific to the subject property and surrounding tideflats were also reviewed to support this assessment. Additionally, general information related to solvent use/behavior and to metal plating was relied upon. Review of the following property-specific reports may provide a more thorough understanding of the subject property; however, they were not available to review at the time this memorandum was prepared:

1. Environmental Associates, Inc. 2000. Phase 1 Environmental Site Assessment. Shaub-Ellison Property.
2. Environmental Associates, Inc. 2004. Preliminary Subsurface Exploration, RevChem Plastics, Inc., 1132 Thorne Road, Tacoma, Washington. June 10
3. Environmental Associates, Inc. 2004. Groundwater Plume Delineation, Revchem Plastics Facility, 1132 Thorne Road, Tacoma, Washington. July 23
4. Environmental Associates, Inc. 2005. Offsite Groundwater Plume Delineation, Former Automotive Tire Service Facility, 1132 Thorne Road, Tacoma, Washington. February 11
5. Environmental Management Services, LLC. 2005. Groundwater Sampling Report. July 20
6. LSI Adapt. 2005. Supplemental Characterization, Groundwater Monitoring Well Installation and July 2005 Groundwater Quality Monitoring Report, Former Automotive Tire Service.

Our review focused on key technical and regulatory issues. Overall we believe there are some significant site characterization shortcomings which make it difficult to assess the extent of soil and groundwater impacts and whether the selected cleanup approach for the property is appropriate. Discussion of key concerns is provided in the sections below. Further evaluation of cleanup approaches and costs would be appropriate once the site characterization is more complete.

Source Identification

The referenced reports have identified the primary sources of contamination as the polyvinyl chloride (PVC) sewer pipe in the alleyway southeast of the building and the plating area within the building. The site history is minimally understood or documented. There is little to no information on manufacturing processes, raw materials used, or waste products produced, stored, or disposed. It is not clear that other potential sources have been identified or investigated, including:

- Septic tanks and associated drain fields
- Other sinks/drains, several of which were noted between the plating area and paint room in the general vicinity of MW-11 and MW-16; one is identified in a "dark room" in Drawing EP559820 (Sheet 19 of Port Demolition Bid Set)
- Below-slab fill material that includes a significant amount of silt, that is not characteristic of locally produced hydraulic dredge fill or "select fill" commonly used in this application
- Other tanks/sumps associated with site operations
- The parking lot dry well noted in one Phase 1 Environmental Site Assessment (Saltbush, 1991)
- Other site uses not thoroughly characterized; e.g., an early-2000s tenant stored equipment which leaked hydraulic fluid onsite.
- The former General Chemical facility and other up-gradient operations.

As a result, there may be source materials present in the subsurface that have not been identified. Elsewhere, there are chemicals present (such as the elevated perchloroethene [PCE] concentrations present in shallow soil at B-19 under the former painting/drying area) for which no potential source has been presented.

Contaminants of Concern

A full evaluation of potential contaminants of concern (COCs) has not been completed. With the exception of data associated with an excavation of hydraulic fluid-impacted soil, removal of USTs, and regulated building materials, soil and groundwater samples have only been analyzed for chlorinated volatile organic compounds and non-chlorinated breakdown byproducts (methane, ethane, and ethene). A thorough evaluation of other contaminants associated with the plating and enameling processes used by Washington Steel Products has not been conducted. Similarly, a discussion of the operations performed in the subject property building is void of any detail in the documents reviewed.

Plating and enameling of metal products presents the potential for releases of cyanide, metals (including cadmium, chromium [hexavalent and trivalent], cobalt, nickel, tin, and zinc), oil, and grease. Impacts to

groundwater pH from acids and caustics may also be present, which in some cases can release/mobilize naturally occurring chemicals, such as arsenic. An acid sludge tank was noted just outside the building by the plating area in a 1960 Sanborn map.

The identification of a dark room on a site drawing could indicate the potential for silver contamination, if film developing occurred here. A "die shop" was noted in Drawing EP559820 (Sheet 17) that could be a source of lubricating/coolant oil contamination. PCBs have been used in some lubricating and cooling oils and in other manufacturing-related materials. PCBs were commonly found in transformers and in building materials and coatings applied prior to 1979. Elevated concentrations of PCBs which appear to be associated with exterior paints and caulks have been documented in site soil and groundwater.

The soil vapor survey report (W.L. Gore & Associates Inc., October 1, 2009; Appendix D of the RI) contains several chromatograms that have unique signatures that do not appear to be reflected in the data tables, suggesting that other compounds may be present that were not quantified. These specific locations include 604236, 604240, and 604264. It may be useful to identify and quantify these compounds from this report and the previous Gore report of soil gas in the alley behind the subject property building.

Groundwater Contaminant Distribution (Dissolved and DNAPL)

Free-phase chlorinated solvent dense non-aqueous phase liquid (DNAPL) may be present. It was noted in the RI that PCE groundwater concentrations at MW-11 were potentially indicative of DNAPL; MW-11 is screened above the silt unit located at about 15 feet below ground surface (ft bgs). Based on the cross-sections provided in the RI and FS, the silt unit is dipping to the southeast and northeast suggesting that DNAPL could be migrating up-gradient or cross-gradient to the flow of shallow groundwater.

The borehole log for B-10 indicates that the old plating area did not have a concrete floor. The only concrete in the log is the newer surface concrete that is presumed to have been placed over the plating area after it was no longer in use. Materials spilled in this area could have infiltrated the soil under the building and migrated laterally and downward. Beneath the source area in the building (B-10, B-19, and MW-11) the investigation did not encounter the silt unit that is located at about 30 ft bgs in other areas. Although the groundwater grab samples collected from the sand above this depth do not have elevated solvent concentrations, there is potential for DNAPL to be present. The silt unit should be identified, if present, so that soil and groundwater samples can be collected from immediately above the silt.

The silt layer encountered at about 30 ft bgs is of unknown thickness. Also unknown is whether groundwater beneath this silt horizon contains solvents or other COCs. A thorough understanding of the vertical distribution of COCs is needed to determine the viability of remedial alternatives.

Overall, the distribution of groundwater contamination needs to be re-evaluated based on a better characterization of site geology/hydrogeology, including underground utilities and structures which intercept the groundwater table (details below). Groundwater plumes (flow directions and contaminant

concentrations) should be mapped separately for the two groundwater units known to be impacted; additional groundwater plume mapping may be needed if deeper water bearing zones are impacted. Potential sources and past remedial actions (e.g., UST removals) should be identified on the figures. Groundwater data from MW-12 and MW-13 are of limited value because these wells are screened across a silt layer. No other comments on the distribution can be made until these data are re-evaluated.

Site Geology/Hydrogeology

The reviewed documents contain inconsistent discussions of the man-made fill and silt units. The silt units located at 15 and 30 ft bgs are both referred to as the Upper Silt, which is interbedded with the Middle Sand. The 15-ft bgs silt unit is consistent with the elevation of the former mudflats. Southeast of East 11th Street, this unit is largely continuous throughout the area; however, an exception was identified in a 1940 aerial photograph. Surface drainage crossed the property from the southwestern corner to the northeastern corner. Wells MW-12 and MW-13 are located close to this drainage, and B-13 appears to have been advanced through this drainage, as there is no silt present at about 15 ft bgs.

Soil present above the 15-ft bgs silt unit is fill, believed to have been placed after about 1890. One of the early fill features was the 11th Street embankment, presumably built from local fill sources which may have included wood and industrial wastes from sawmills/other businesses. Hydraulic filling associated with expansion of nearby waterways was placed in the area subsequent to construction of 11th Street.

Upper shallow groundwater in the fill above the former mudflat would generally be expected to behave differently than the lower shallow groundwater unit between the silt units. When wells screened in the upper groundwater are evaluated independently from the other wells, groundwater flow appears to be to the north, consistent with previous groundwater flow maps created by LSI Adapt (provided in Focused Site Investigation). This northern flow may be consistent with surface drainage prior to tideflat filling or it may be due to short-circuiting caused by structures/utilities. For example, a 60-inch diameter storm drain is present along the western side of Thorne Road. Between Ross Way and East 11th Street, this pipe has invert elevations from 5.7 to 4.4 ft MLLW. In this elevation range, the storm drain would be intercepting groundwater. Furthermore, tidal influence in the upper groundwater would not be expected to be transmitted more than 100 to 200 feet inland. Minor water level variations were noted at MW-14 during the tidal study, about 500 ft inland from the Sitcum Waterway. These water level variations may indicate that the storm drain or its backfill create a preferential shallow groundwater flow path.

The nature of the fill placed to construct East 11th Street may also be having an effect on groundwater flow toward the Sitcum Waterway. If the fill is gravel/rock, groundwater may flow through unimpeded. However, if the road fill is relatively dense wood waste and/or fine grained soil, the embankment may be functioning as a dam, diverting shallow groundwater flow to the northeast or southwest.

East 11th Street was originally constructed in the late 1800s and early 1900s as a thin strip of filled land connecting Marine View Drive to Downtown Tacoma via the Murray Morgan Bridge. In the vicinity of the subject site, tidal water was present on both sides of the roadway until at least 1934 (Figure 1). A 1943 drawing describing widening of East 11th Street shows a pre-existing bulkhead on the southeastern side of the existing road and constructed backfill at a 2:1 slope extending further to the southeast (Figure 2). To date there has been no investigation of the 11th Street embankment, underground utilities within the road right-of-way, or other features in that area which may be influencing local hydrogeology.

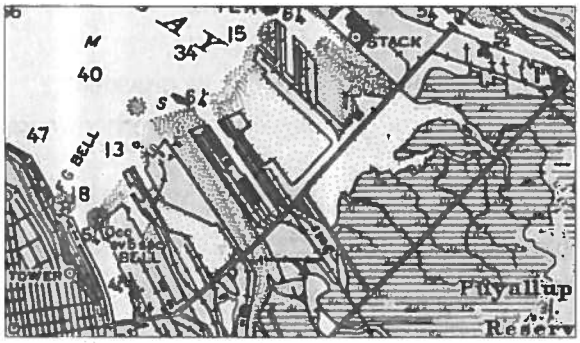

Figure 1. 1934 Nautical Chart.

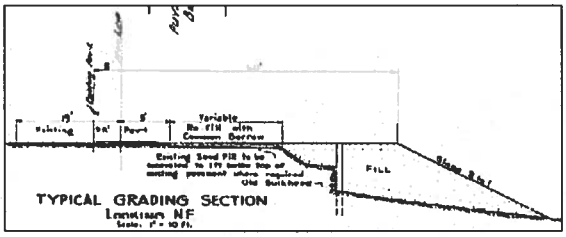

Figure 2. 1943 11th Street Widening Section

The lower shallow groundwater unit (below the silt layer encountered at about 15 ft bgs) is directly connected to the Sitcum Waterway, and tidal influence in this unit can be measured farther than several hundred ft inland. MW-12, screened at 10 to 20 ft bgs and located about 450 ft inland, showed significant tidal response during the tidal study. Both MW-12 and MW-13 are screened across the former mudflat silt unit located at about 15 ft bgs and, and as a result, provide very little data of value with respect to groundwater elevation or contaminant concentrations in either of the interconnected groundwater units.

In the future, groundwater flow maps should be prepared independently for the two groundwater units. The interconnection between the two units at the former drainage channel, the potential for preferential flow paths such as the storm sewer line, and the potential for flow barriers such as the former 11th Street bulk bulkhead should be considered when evaluating contaminant fate and transport.

Lastly, all borehole and monitoring well elevations should be surveyed to a standard recognized benchmark, such as the Port of Tacoma vertical datum (0 ft = Commencement Bay mean lower low water level). The elevations used in the reports reviewed are in an "arbitrary" datum.

Data Collection Methods

It is not clear that groundwater sampling in areas with tidal influence was performed in a manner consistent with standard practice. In order to capture discharging groundwater, as opposed to marine water, samples should be collected following an appropriate lag time after a negative low tide. If this approach was used, it needs to be documented.

Feasibility Study

As indicated in our above comments, we do not believe that the conceptual site model and site characterization are complete. Without this information, it is not possible to review the feasibility study, evaluate cleanup approaches for the property, and select a final remedy. However, based on our review, we do have a few comments on the Draft Feasibility Study Report:

- The data gaps identified above may substantially impact remedy selection.
- The extent of each remedial alternative needs to be clearly illustrated on figures.
- Cost estimates need to be provided.
- Anticipated Waste Listing(s) and the associated "contained-in" criteria need to be provided.
- Cleanup and remediation levels need to reflect the presence of down-gradient property owners with unrestricted land uses.
- The use of a conditional point of compliance and surface water cleanup levels in groundwater requires written permission of down-gradient property owners (WAC 173-340-720(8) (d) (ii)).
- Cleanup levels need to reflect all cross-media pathways, including:
    - Groundwater protective of indoor air
    - Revised soil protective of groundwater, if needed per above
- Since the Purchase and Sale Agreement does not include cleanup standards, it appears that written Port permission would be required for use of Model Toxics Control Act Method C cleanup levels.

We would be happy to discuss these comments with the Port or the consultant representatives of the previous owner's insurance at a convenient time. I may be contacted via phone at 253-797-6323 or via e-mail at grant.hainsworth@creteconsulting.com.