Matthew Rodriquez
Secretary for
Environmental Protection

Department of Toxic Substances Control

Barbara A. Lee, Director
1001 "I" Street
P.O. Box 806
Sacramento, California 95812-0806

Edmund G. Brown Jr.
Governor

October 12, 2015

Ms. Margaret Rosegay
Pillsbury Winthrop Shaw Pittman, LLP
Four Embarcadero Center, 22nd Floor
San Francisco, California 94111-5998

METAL SHREDDER WASTE TREATABILITY STUDY

Dear Ms. Rosegay:

This letter is a follow up to prior meetings and discussions between the Department of Toxic Substances Control (DTSC), you and other representatives of metal shredding facilities, and Terraphase Engineering, Inc. (Terraphase), regarding the Metal Shredder Residue Treatability Study (Treatability Study) being conducted on behalf of the California Chapter of the Institute of Scrap Recycling Industries (ISRI).

At a meeting on August 12, 2015, Terraphase presented information summarizing its work to date to implement the Metal Shredder Residue Treatability Study Work Plan (Work Plan), dated July 10, 2014. Terraphase also provided information on the sampling and analytical procedures found in the Draft Quality Assurance Metal Shredder Residue Treatability Study Plan - Appendix A - Contract Laboratories Standard Operating Procedures (SOP), dated August 19, 2014.

DTSC acknowledges that it has previously reviewed the Work Plan and provided comments to you at that time. However, as has been discussed with you on previous occasions, the circumstances under which the Work Plan was prepared in 2014 have significantly changed. Previously, the metal shredding facilities developed and submitted the Work Plan voluntarily, in response to informal discussions with DTSC that occurred in 2013 and 2014. Since that time, SB 1249 (Hill, Chapter 756, Statutes of 2014) was enacted and became law. SB 1249 establishes additional mandates on DTSC to evaluate metal shredding facilities and metal shredder waste. SB 1249 also authorizes DTSC to, as part of any alternative management standards that it may adopt, allow for treated metal shredder waste to be classified and managed as nonhazardous waste. The authority to allow for nonhazardous waste classification and management is conditioned on DTSC's analysis demonstrating that classification and management as hazardous waste is not necessary to prevent or mitigate potential hazards to human

health or safety or to the environment posed by the treated metal shredder waste. Because of the additional mandates in SB 1249, and in order to ensure that its analysis can make the required demonstration if warranted, DTSC must rely more significantly on the data the Treatability Study produces.

To be able to utilize the data the Treatability Study is to produce in its analysis and required demonstration, DTSC must ensure that activities described by the Work Plan conform to technical standards that generally apply to work plans of this type. To evaluate whether the Work Plan meets these standards, and to assess whether it will yield the type and quality of data that DTSC requires, DTSC's Engineering and Special Project Office (ESPO) of the Brownfields and Environmental Restoration Program was asked to review and comment on the Work Plan. Likewise, DTSC's Environmental Chemistry Laboratory (ECL) was asked to review and comment on the SOP. ESPO's and ECL's comments, questions, and recommendations based on their review are enclosed.

Before proceeding with any further implementation of the Work Plan or SOP, you will need to revise them in response to the attached comments, questions, and recommendations. Before Terraphase attempts to revise the Work Plan, it would be beneficial for you and Terraphase to first meet with DTSC and the ESPO and ECL staff that provided the comments to better understand their comments and to identify the information and revisions that are needed to respond to their comments. To schedule the suggested meeting regarding the revisions to the Work Plan and SOP, or if you have any questions or concerns regarding DTSC's requirements, please contact Mr. Kevin Sanchez of my staff at (916) 322-8677 or Kevin.Sanchez@dtsc..ca.gov.

Sincerely,

Rick Brausch, Chief
Policy and Program Support Division
Hazardous Waste Management Program

Enclosures

cc: Mr. Christopher Cho
Staff Attorney
Office of Legal Affairs
Department of Toxic Substances Control
1001 I Street, 23rd Floor
P.O. Box 806
Sacramento, California 95812-0806

COPY

cc: Mr. Kevin Sanchez
Senior Environmental Scientist (Specialist)
Research and Policy Development Branch
Policy and Program Support Division
Hazardous Waste Management Program
Department of Toxic Substances Control
1001 I Street, 11th Floor
P.O. Box 806
Sacramento, California 95812-0806

Department of Toxic Substances Control

Barbara A. Lee, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Matthew Rodriquez
Secretary for
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Governor

MEMORANDUM

TO: Kevin Sanchez
Senior Environmental Scientist
Research and Policy Development
Hazardous Waste Management Program

VIA: Juan Koponen, Unit Chief
Engineering and Special Project Office
Brownfields and Environmental Restoration Program

FROM: Jesus I. Sotelo, P.E.
Hazardous Substances Engineer
Engineering and Special Projects Office
Brownfields and Environmental Restoration Program

REGISTERED PROFESSIONAL ENGINEER
JESUS IGNACIO SOTELO
C 67508
EXP. 06/30/17
CIVIL
STATE OF CALIFORNIA

SUBJECT: REVIEW OF THE METAL SHREDDER RESIDUE TREATABILITY STUDY WORK PLAN, INSTITUTE OF SCRAP RECYCLING INDUSTRIES, CALIFORNIA CHAPTER

DATE: SEPTEMBER 15, 2015

DOCUMENTS REVIEWED

1. *Metal Shredder Residue Treatability Study Work Plan,* (Treatability Study) dated July 10, 2014, prepared by Terraphase Engineering, Incorporated, Oakland, California.

INTRODUCTION

Per your request, the Engineering and Special Projects Office (ESPO) of the Department of Toxic Substances Control (DTSC) has completed its review of the above-referenced Treatability Study and provides the following comments and recommendations. If you have any questions, please contact me at 916-255-6670 or jesus.sotelo@dtsc.ca.gov.

PROJECT SUMMARY

Terraphase Engineering Inc. (Terraphase) prepared the Metal Shredder Residue Treatability Study Work Plan (Treatability Study) on behalf of the California Chapter of the Institute of Scrap Recycling Industries (ISRI). The Work Plan presents an approach and laboratory methods for the implementation of a Treatability Study. The overarching purpose of the study is to confirm the effectiveness of previously established methods that are currently used to treat metal shredder residue (MSR) prior to disposal or use of the treated material as alternative daily cover (ADC). The study will evaluate the reduction in leachability and long-term leachability of treated MSR.

The work described in this Treatability Study includes:

- Collection of untreated MSR from three scrap metal shredding facilities in California that currently treat MSR
- Baseline characterization of the untreated MSR
- Bench-scale treatability testing using metal stabilization methods
- Leachability testing of treated MSR
- Pilot testing of MSR using the optimal mix of stabilization reagents

The Treatability Study is based on a draft work plan previously prepared by ISRI and submitted to DTSC on September 26, 2013. The Treatability Study provides additional details regarding the treatability testing methods and addresses comments received from the DTSC in a letter dated March 21, 2014.

COMMENTS AND RECOMMENDATIONS

1. Page 3 – Section 1.3 Purpose of Treatability Study. In the second paragraph, first sentence, reference is made regarding the expectations of the study from industry's perspective, specifically to provide a scientific basis for the establishment of uniform statewide treatment standards that are protective. While DTSC is aware that treatment standards are a potential outcome of the study, this expectation presupposes that current regulatory threshold levels are not achievable and thus narrows the scope of the plan prematurely. ESPO recommends the overall purpose of the plan be to demonstrate that metal shredder waste can be treated so that soluble levels of Title 22 metals are reduced to the extent they do not pose potential hazards to ground or surface water resources when disposed in a solid waste disposal facility in California.

2. Page 4, last paragraph, DTSC cannot provide guarantees to the industry that they will stay viable. Market and economic factors will determine this. ESPO recommends removal of this paragraph from this document.

3. Page 7, Section 2.1.3 Chemical Additions. Reference is made to the addition of 5% cement. Please clarify the basis for this percentage, that is, by volume i.e. cubic feet or yards or by weight i.e., pounds or tons.

4. Page 7, Section 2.1.4 Mixing. Reference is made to mixing the MSR using a front end loader. Is there any data with regard to the mixing process? It is not clear how the mixing is performed by the front end loader.

5. Page 7, Section 2.1.5 Curing. Reference is made to allowing the MSR to continue its curing process after initial mixing and treatment. ESPO recommends that this treatability study further evaluate the WET test for the curing time as it may change the way the material should be handled and disposed of, which appears to be the goal of the treatability study.

6. Page 7, Section 2.1.6 Moisture Content. Reference is made to MSR moisture content. How was the outlined range of moisture content (17% to 23%) determined? Please provide supporting documentation.

7. Page 10, Section 4.0 Study Limitations, Third Bullet. The text states that the study is limited to an evaluation of MSR, residual material that remains after removal of ferrous and nonferrous metal, and that the study will analyze for metals but not address the other constituents that may be encountered in the MSR. It is recommended that some additional analysis of these other constituents be included to better understand the actual composition of the MSR.

8. Page 10, Section 4.0 Study Limitations, Fourth Bullet. The text states the treatment process does not materially affect total concentrations of metals in the waste and it is anticipated similar total concentrations of lead, zinc and copper will routinely be observed in both the untreated and treated samples analyzed. ESPO recommends that testing for total concentrations in both treated and untreated MSR samples be done for comparison and effectiveness of the treatment process.

9. Page 11, Section 5.1 Sample Size Requirements. It is proposed to evaluate the effectiveness of treatment using an upper confidence limit (UCL) of 90% in this study. ESPO recommends requiring use of the 95% upper confidence limit and not 90%, as DTSC usually uses 95% UCL for defining background.

10. Page 11, Section 5.1 Sample Size Requirements. Reference is made to the number of minimum samples required to estimate a mean at 90% UCL. Use of the 95% UCL, as recommended above, requires a higher number of minimum samples to be collected and tested to affirm the mean.

11. Page 11, Section 5.1 Sample Size Requirements. Reference is made to a MSR comparison criteria and the statistical distribution of the data. Please describe the comparison criteria that will be used in Phase 2 and 3 of this study.

12. Page 11, Section 5.2 Collection of MSR for Baseline Characterization and Bench Testing. If the sampling method along with the homogenization procedure does not properly characterize the untreated metal shredder waste there is a high probability that the treatment formulas subsequently chosen at the bench scale testing phase, solely based on their ability to reduce soluble metals to a specific level, will not be accurately representative, particularly in the next test phase of the pilot study.

    a. How was 40 kg determined to be the estimated composite sample amount?
    b. Was untreated MSR collected for DTSC?
    c. If so, is this untreated MSR collected for DTSC available in a 55 gallon drum and/or has it been homogenized and subsampled as described in Section 5.2.2 of this plan?
    d. Have the baseline characteristics of metal shredder waste been evaluated based on particle size distribution in order to determine if the hazardous constituents reside in specific parts of metal shredder waste (e.g., the fines)?
    e. Have any subsamples been analyzed individually to determine the variability within that particular sample (e.g., take the 6.5 kg subsample, split it and mill both portions and perform the WET method)?

13. Page 12, Section 5.2.2 Homogenization of Composite MSR Material. - Was a set of sieves used and if so, what were the sizes? Is this homogenization activity representative of what is occurring at the facility regarding treatment for bench scale testing? That is, mixing of MSR followed by the addition of the silicate then re-mixing occurs at the bench scale, but at full scale silicate is added then mixing occurs. Additionally, please further describe how these samples are handled and provided to the laboratories, including Cal Science and Terraphase or PRIMA.

14. Page 16, Section 7.0 Treatability Study Methodology. This introduction may not be needed as it is basically a sales pitch for Terraphase and PRIMA. ESPO recommends removal of this paragraph.

15. Page 16, Section 7.1 Baseline Analysis of Untreated Material. Reference is made to the constituents for analysis. National Pollutant Discharge Elimination System and analytical requirements should also be included for the untreated and treated material.

16. Page 16, Section 7.1 Baseline Analysis of Untreated Material. Reference is made to limit the testing to principal metals of interest, in particular lead, cadmium, and zinc. ESPO is concerned that other metals may have some effects on the treatment and believes they should be considered.

17. Page 17, Section 7.3 Phase 1 Bench-Scale Test: Multiple Reagent Combinations and Page 8, Section 3.0 Treatability Study Goals, Second Bullet. Reference is made to the evaluation of several treatment mixes at bench-scale testing including the selection of an optimal formula. The bullet item also states "Conduct pilot-scale tests using a selected treatment formula to confirm effectiveness at the field scale." ESPO recommends a clarifying sentence be added to this section that industry consult with DTSC prior to choosing reagents at the bench scale for application during pilot scale tests. Please further describe the criteria to be used for the following:
    a. For setting the mixtures and the criteria for selection of the optimal combination of reagents.
        i. Was sample tested (by WET) after the addition of the silicate only?
        ii. Was sample tested (by WET) after the addition of alkaline activator only?
        iii. What data do you have that demonstrates the silicate, as an additive, improves the treatment?
    b. For determining the treatment formula for pilot-scale testing.
    c. The methods or criteria used to arrive at these percentages. Based upon the size of the anticipated sample the amount of silicate will be minimal, making cement the main ingredient for the treatment process. Identify the types of silicates used and the weight ratio (e.g., potassium silicate [23% SiO2 and 14% K2O]) and the type of cement (e.g. Portland cement). Lastly, there is no description or discussion with regard to the amount of water needed to hydrate the cement.

18. Page 18, Section 7.3 Phase 1 Bench-Scale Test: Multiple Reagent Combinations, Second Bullet. The Treatment Study presents a procedure for testing the mixtures. ESPO is concerned that the described mixing time for the samples do not represent the actual conditions of the current systems operation (e.g., the document states that vigorous shaking will be done on the sample). Therefore, ESPO has the following questions about the Phase 1 Bench-Scale test:
    a. Is the vigorous shaking of the sample representative of the actual pug mill system application currently in use? If not, how will this be representative?
    b. How does the pug mill process introduce water?
    c. Does increasing the mixing time (e.g., from 1 minute to 2 minutes) improve treatment?

d. Additionally, was there any pretreatment of the MSR performed before treatment with the silicate/cement mix, including any separation of the fines and/or larger components based on particle size before vigorous shaking? If so, were these components treated separately in order to determine if the treatment formula was more effective or less effective based on the make-up of those components (e.g., is the treatment formula less effective on rubber or plastic components and more effective for the fines)?

19. If a pretreatment method has not been considered for this study, ESPO recommends that untreated MSR be separated into components (e.g., fines and oversized) and each be analyzed via the WET, TCLP and for total metals to determine if treatment is warranted or if it is more effective on certain components.

20. Page 18, Section 7.3.1. Phase 1 Bench-Scale Test: Multiple Reagent Combinations, Fourth Bullet. The Treatment Study presents a procedure for testing the mixtures. The test procedure only outlines analysis via WET-leachable metals. ESPO recommends that these samples or aliquots also be submitted for analysis for total metals and TCLP for comparison and completeness of the Treatability Study.

21. Page 18, Section 7.3.1. Data Evaluation. Reference is made to possible additional testing in Phase 1 if data is inconclusive due to an insufficient number of samples or if data analysis indicates potential benefits to additional reagent combinations. Please describe how the additional analysis will be achieved and what the criteria for changing or proposing a new reagent mixture will be. Lastly, ESPO recommends that if additional reagent combinations are to be proposed that DTSC be notified with the reasons for the additional trials and approval by us would be required.

22. Page 19, Section 7.4 Phase 2 Bench-Scale Test: Additional Leachability Testing. The Phase 2 testing proposes using the Synthetic Precipitation Leaching Procedure (SPLP) and the WET using Municipal Solid Waste Leachate (MSWL) extraction solutions. The WET using the MSWL extraction solutions is a method for the metal analytes lead and cadmium, but not for zinc. Please explain how these methodologies will be compared to previous techniques and other metals, i.e., zinc. Why is the SPLP analysis not performed on the MSR samples before treatment for comparison and completeness of the Treatability Study?

23. Page 19, Section 7.5 Phase 3 Bench-scale test: Long-term Efficacy of Treatment. Reference is made to the use of the Multiple Extraction Procedure Method (MEP). The method outlined in this section is incorrect as the

Method (MEP). The method outlined in this section is incorrect as the termination of the test is not once the pH is 3 +/- 0.2 standard units is achieved. The test is required to be repeated at least 8 times and on the ninth test if the concentration is increasing after each extraction then you continue until the concentrations ceases to increase. ESPO recommends that the Workplan reflect the USEPA Method 1320 and also use multiple WET test procedures to demonstrate the efficacy of treatment of metal shredder waste. ESPO also recommends that the MEP be performed on the untreated metal shredder waste as well.

24. Page 20, Section 7.6 Pilot-Scale Field Test. ESPO recommends a meeting with all parties before the Pilot-Scale phase to discuss and provide input, including the following:

    a. What Pilot-Scale steps are needed or proposed?
    b. What are the objectives of the Pilot-Scale?
    c. Further discussion regarding the collection of representative samples.
    d. Possible new or revised mixtures for treatment, if necessary.
    e. QAPP/SAP requirements/needs.
    f. Prediction of full-scale performance.
    g. Implementability of treatment train.
    h. Treatment train performance.
    i. Material handling requirements/characteristics.
    j. Costs.
    k. Confirmation of treatment occurring, as previously demonstrated or not in the Bench-Scale, to be performed in the Pilot-Scale Phase.
    l. Residuals generation and treatment/disposal.
    m. Pilot-Scale schedule.
    n. Field screening analytical methods, etc.

25. Page 20, Section 7.7 Management of Treatment Residuals. Reference is made to handling the treatment residuals as non-RCRA hazardous waste. The handling of the residuals should be based upon the results of the analytical results for hazardous waste characterization, not on assumptions.

26. Page 22, Section 8.1 Evaluation of Potential Impacts to Groundwater at Landfills. Generally, the Treatability Study does not propose further investigation regarding other treatment technologies of this waste as an additional purpose of the treatability study. ESPO recommends that evaluation or discussion of other possible technologies should be also considered.

27. Page 22, Section 8.2 Cost Analysis. Reference is made to consideration of costs both independently and in the context of the broader economics of facility

operations, taking into consideration fluctuating prices for raw materials and metal commodities. Since DTSC may be required to cleanup this type of site then financial assurance requirements should be followed in determining costs. These require costs be for actual treatment, handling, transportation and disposal without consideration of fluctuating prices. Discounting for salvage or recycling values to reduce costs is not allowed for financial assurance. Lastly, ESPO recommends removal of this reference in the paragraph as the treatability costs are only being evaluated and not the industry as a whole.

28. Page 23, Section 9.0 Schedule. ESPO recommends updating the schedule as the current schedule states the study should have been completed.

Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
Environmental Protection

Barbara A. Lee, Director
Environmental Chemistry Laboratory – Pasadena
757 S. Raymond Ave., Suite 100
Pasadena, CA 91105

Edmund G. Brown Jr.
Governor

DATE: June 4, 2015

TO: Ed Benelli, Hazardous Substances Engineer
Hazardous Waste Management Program

FROM: Mui S. Koltunov, Research Scientist Supervisor I
Environmental Chemistry Laboratory - Pasadena

SUBJECT: HWM SB 1249 - Compare Cal Science's WET and TCLP SOPs to DTSC-ECL's SOPs to ensure metal shredder samples are prepared for analysis to be consistent or equivalent to ECL's DCN 05.0024.00 Rev No. 1 (Jan 23, 2015).

Summaries of findings:

1. Review of Cal Science SOP on Waste Extraction Test (WET) did not outline how metal shredder samples are prepared (i.e. crush, mill or grind) to achieve the specified particle size for extraction/digestion and analysis. Only general statements are made regarding particle size reduction and the need to mill solid by crushing and grinding. These general statements are found in Sections 5.1.2.1 and 14.10 of the SOP.

2. Review of Cal Science SOP on Toxicity Characteristic Leaching Procedure (TCLP) did not outline how metal shredder samples are prepared (i.e. crush, mill or grind) before extraction/digestion and analysis. General statements are made regarding particle size reduction and the need to mill solid by crushing and grinding. These general statements are found in Sections 5.1.2.1 and 14.2.9 of the SOP.

3. It is recommended that:
   a. Cal Science develops its own SOP for sample pre-preparation of metal shredder samples that is equivalent to ECL's DCN 05.0024.00 Rev No. 1 (Jan 23, 2015).
   b. All metal shredder samples should be milled to the appropriate particle sizes to accommodate all the analyses performed on the samples. For example, if sample is subjected to WET follow by metals analysis, TCLP follow by metals analysis and PCBs analysis, sample should be milled to the particle size specified by those test methods before conducting the testing. This pre-preparation step is necessary to increase the

homogeneity of the sample and allow for more representative subsampling.

c. In the SOP, it should also specify the types of materials as part of the metal shredder samples. Also the SOP should define what "non-friable solid particles are considered extraneous and irrelevant" from the metal shredder samples that laboratory may omit from extraction/digestion and analysis.

4. Beyond the scope of this request, the following questions/comments should be considered based on review of the Quality Assurance Project Plan:

   a. Section 5.1 Data Reporting Format – the information that is supplied by the laboratory for data validation is not sufficient for a thorough review of the data quality produced by the lab. It is essential to establish from the beginning that the lab is providing high data quality. ECL recommends that lab provides upon request Level 4 Type data packages. Level 4 Type data packages include, but not limited to the following:
      i. Case narrative including discussion of nonconformance and corrective actions
      ii. Sample data and QC data summaries
      iii. COC forms, sample receipt forms, logbook pages, shipping manifests
      iv. Verification of sample temperature on receipt
      v. SOPs
      vi. Tune summaries for GC/MS methods
      vii. Initial Calibration summary (response factors, %RSD, etc.)
      viii. Instrument check standard (CCV, ICV, ICB/CCB, interference check, etc.) summaries
      ix. Internal standard recovery
      x. Retention time summaries
      xi. Instrument sequence logs
      xii. Sample preparation logs
      xiii. Raw data files (samples, QCs and instrument checks)
      xiv. Standard preparation forms

   b. Section 6.1 Quality Control Procedures –
      i. Insert bullet to include sample pre-preparation procedure to homogenize metal shredder samples to the appropriate particle size specified by the test methods before conducting any testing. This is to emphasize the importance of milling samples using the equivalent of ECL's DCN 05.0024.00 Rev No. 1 (Jan 23, 2015) SOP.
      ii. Specify in the matrix spike (MS) and matrix spike duplicate (MSD) that sample used should be from the same sampling batch and site. This can help to verify any matrix interferences associated with the analysis.

c. Section 6.3.1 QC Samples – If the lab detects common laboratory contaminants in the reagent blanks, the lab should first try to eliminate the contaminants. A statement of corrective action to resolve the contaminant issue should be the priority rather than qualifying the presence of the contaminants.

d. Section 9.0 Data Reconciliation – Terraphase needs to ensure that QC acceptance criteria specified in the Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Superfund Data Review are consistent with the laboratory specific acceptance criteria. There may be discrepancies between the CLP guidelines and Cal Science's acceptance criteria. For example, in the CLP guidelines for metals analysis, the initial calibration must consist of a blank and at least five calibration standards, whereas, in the Cal Science SOP for metals analysis using EPA 6010B, the initial calibration is a one-point calibration standard forced through zero.
    i. Clear QC acceptance criteria should be established for each test method.

e. Should the latest version of EPA methods be used to conduct the test? Usually the latest version of methods has stricter QC requirements. However, ELAP would not be able to accredit commercial lab on the latest test method.

f. QAPP references Table 4, but Table 4 is no-where to be found.

g. QAPP discusses SAP (Sampling Analysis Plan), but it is not clear what or where is SAP located?