California Regional Water Quality Control Board
Central Coast Region

Terry Tamminen
Secretary for Environmental Protection

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Arnold Schwarzenegger
Governor

February 9, 2004

Mr. Richard W. McClure
Olin Corporation
Environmental Remediation Group
PO Box 248
Charleston, TN 37310-0248

Mr. Jay McLaughlin
President and CEO
Standard Fusee Corporation
PO Box 1047
Easton, MD 21601

Dear Mr. McClure and Mr. McLaughlin:

SLIC: 425 TENNANT AVENUE, MORGAN HILL; SOIL FEASABILITY STUDY REVIEW AND APPROVAL, 425 TENNANT AVENUE FACILITY, SANTA CLARA COUNTY

Regional Board staff has reviewed the Soil Remediation Feasibility Study (Soil FS) submitted November 24, 2003. We have also considered information obtained in our recent teleconference meeting on February 3, 2004. The teleconference meeting was held to discuss and clarify issues arising from our Soil FS review. In addition, we have received and considered Soil FS comments from the Santa Clara Valley Water District (SCVWD), City of Morgan Hill, City of Gilroy, and the Perchlorate Community Advisory Group. Related written comments are attached for your review and consideration.

This letter outlines Olin's agreement to implement Soil FS option 4A: **Focused Excavation and Ex Situ Bioremediation Coupled with In Situ Bioremediation** as presented in the Soil FS. As we discussed and as outlined in the Soil FS, soils with perchlorate concentrations exceeding 7.8 mg/kg will be excavated and anaerobically treated onsite by adding an electron donor carbon substrate. The remaining soils will be left in place and treated with the same carbon based electron donor. In both cases the remediation goal will be 50 µg/kg, perchlorate. This remediation goal is derived from the methods described in the United States Environmental Protection Agency's *Soil Screening Guidance*: *Users Guide* and is the calculated concentration of perchlorate that would not result in groundwater impacts above the current DHS action level of 4 µg/l. We understand, a confirmation sampling protocol will be included in the report as described below.

At your request, we will allow you to combine the Soil Remedial Action Work Plan with the 90% Design Report. The combined report is due April 8, 2004. As discussed and agreed to in our recent meeting, the following elements will be evaluated in the combined report:

- Shallow unsaturated zone-monitoring network.
- Shallow groundwater monitoring network.
- Proposed response in case the accepted treatment method is not effective.

- Sampling plan to demonstrate the 50 µg/kg level has been achieved in impacted soil.

Justification shall be provided if the above noted elements are not included in the combined report. We look forward to meeting with you on or about April 15, 2004, to discuss the combined report and review its' findings.

Pursuant to Section 13267 of the California Water Code, Olin is required to provide the above-requested information by April 8, 2004. Failure to submit adequate or complete information may subject you to a Regional Board enforcement action based on the original due date of the Soil Remediation Feasibility Study. The Regional Board requires Olin Corporation to submit the combined report in accordance with Section 13267 of the Water Code to determine the concentrations and movement of the perchlorate plume in the vicinity of the Olin site. We require Olin Corporation to submit the information as the owner of the property and one of the previous operators of a flare manufacturing facility that caused soil and groundwater perchlorate contamination at and in the vicinity of the Olin site at 425 Tennant Avenue, Morgan Hill.

We are enclosing copies of comments received from the SCVWD and the Cities of Morgan Hill and Gilroy via Komex consulting for your review and consideration. If you have any questions, please contact **David Athey at (805) 542-4644** or Eric Gobler at (805) 549-3467.

Sincerely,

Roger W. Briggs
Executive Officer

Enclosures:

1. Santa Clara Valley Water District
2. Komex – For the Cities of Morgan Hill and Gilroy

DA: S:\SLIC\Regulated Sites\Santa Clara Co\Olin\OLIN-425 TENNANT AVENUE\COMMUNICATIONS - RICK McCLURE\Comments on Soil Feasability Study.doc

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AN EQUAL OPPORTUNITY EMPLOYER

December 16, 2003

Mr. David M. Athey, P.E.
Water Resources Control Engineer
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401-5411

Subject: Comments on Soil Remediation Feasibility Study, Olin/Standard Fusee Site, Morgan Hill, California

Dear Mr. Athey:

The Santa Clara Valley Water District appreciates the opportunity to submit comments on the subject report. Overall, the report represents an improvement over the first submittal to evaluate feasibility of remediating perchlorate in soil, and provides more data on the properties of the unsaturated zone at the site. These efforts allow a more informed consideration of soil remediation alternatives.

We call out one section of the report: ". . . Olin is committed to reducing the duration of perchlorate remediation activities for soil and groundwater at the Site, and is therefore committed to reducing perchlorate concentrations to an appropriate target concentration that will allow eventual decommissioning of the on-Site groundwater containment and treatment system, provided that the soil remediation activities can be conducted in such a manner to provide realistic and verifiable benefit at an acceptable level of cost."[1] We are pleased that Olin's stated commitment to Site cleanup has changed from its "containment" strategy presented in the groundwater remediation plan.

The recommended solution, in situ bioremediation, is likely to reduce perchlorate concentrations in soil in a rapid timeframe. However, the feasibility analysis makes some assumptions and omissions that favor selection of in situ bioremediation over other alternatives. We believe that addressing the comments below would more likely conclude that a combination of excavation and landfilling or ex situ bioremediation of the zones of highest concentration, and in situ bioremediation of the lower risk soils is the optimal solution. We support the in situ bioremediation approach as modified by the comments below. We request that RWQCB give consideration to these comments when determining the best framework for remediation of perchlorate contaminated soils at the 425 Tennant Road site; however, we understand that RWQCB's professional staff may hold and act upon different technical views than those presented here.

[1] *Section 3, Page 19*

1. The alternatives selected for review are comprehensive, representing the full spectrum of available technologies for soil treatment. The analysis of the in situ bioremediation remedy does not account for the cost of careful monitoring of moisture movement in the unsaturated zone. The infiltration modeling study (Appendix D) finds that considerable lateral movement of infiltrated water is likely to occur, possibly exceeding 300 feet. Monitoring for migration of infiltrated liquid is therefore warranted to ensure that perchlorate isn't transported to uncontaminated areas. If the response to comments (Appendix E), we're given assurance that Olin will provide details regarding moisture profile and wetting front delineation and monitoring to assess infiltration behavior within the Remedial Action Workplan. The costs for this monitoring are not presented in the cost analysis for in situ bioremediation (Table 5-4b). Similarly, tracer testing is proposed to assess infiltration behavior, but the costs for this are not provided in the cost summary. Consequently, the soil flushing/in situ bioremediation option may be more expensive than characterized in the Feasibility Study. Because a number of the options ranked within a similar narrow range, factoring realistic costs for monitoring sufficient to prevent lateral transport or displacement of perchlorate into unaffected areas may change the rankings of the remedial alternatives evaluated. It is possible that when these costs are accounted for, a different alternative, such as excavation and ex situ bioremediation of highest concentration soils, may be most favored.

2. The restrictive limitation for off-site landfilling is self-imposed. By citing Olin's corporate policy of only using permitted Class I facilities, nearby facilities operated by the same corporation that may be acceptable are rejected. The Kirby Canyon Landfill is close by, and would greatly decrease the cost of landfilling. Olin should explore whether the facility can accept the waste and provide indemnification. All policies have exceptions. By failing to consider area landfills as potential repositories for soil excavated from localized zones of elevated perchlorate concentrations, the feasibility analysis is unduly biased against this option.

   We disagree with the assertion that landfilling perchlorate contaminated soils "transfers the risk to another site". There are many available landfills that are lined with RCRA SubTitle D compliant flexible membrane liners, from which all leachate is collected and managed, and which are carefully monitored. Moreover, municipal landfills accepting substantial quantities of household refuse rich in organic matter should be viewed as highly effective bioreactors for the reduction of perchlorate, due to the highly bioactive and anaerobic environment created by decomposing refuse. Landfilling perchlorate contaminated soil would be a very effective means of eliminating the environmental risks posed by perchlorate contaminated soil.

3. The remedy that ranked highest, in situ bioremediation, is likely to succeed on the basis that this approach has worked successfully at a number of similar sites, and many of these successes are attributable to GeoSyntec and their resident expert, Evan Cox. A few issues related to this approach may warrant further examination.

   The carbon based electron donor liquid must be introduced to the locations where perchlorate resides in the unsaturated zone. Delivery of the liquid to these locations may be dependent upon the physico-chemical properties governing fate and transport. Differences in solubility, partition coefficients, affinity for sorption to soil organic matter and mineral surfaces, density, viscosity, hydrated ionic radii, and other factors may

prevent the liquid carbon substrate from occupying pore spaces in fine grained material. If perchlorate permeates the soil matrix to a greater degree than the substrate can, the effectiveness of the in situ bioremediation may be reduced.

To confirm that the selected liquid carbon substrate will effectively enable bioremediation of the bulk of the contamination, the fate and transport properties of the chosen substrate should be compared with perchlorate. A conceptual model of the distribution of perchlorate within unsaturated soil would also be of assistance in quantifying the portion of perchlorate mass that would be addressed by the selected remedy. For example, a substrate such as edible food oil may not be as effective at reaching perchlorate occupying the smallest pores in a clayey silt, while a fully miscible substrate such as ethanol could. Knowing whether the perchlorate is predominantly found in the finest grained material would assist with selection of an appropriate carbon substrate.

We recommend that the work plan for the selected remedy include an analysis of the distribution of perchlorate within the soil types encountered in the Target Soil Area. We further suggest that the workplan identify the degree to which the chosen substrate can be delivered to the locus of perchlorate residing in unsaturated soil.

4, The laboratory test results for biodegradability of perchlorate on site soils are very impressive, and we are encouraged by the rapid rates that biodegradation of perchlorate on site soils can occur. The control sample also biodegraded perchlorate at an inexplicably high rate. We believe this finding warrants further explanation, as outlined below:

- Is the soil organic carbon fraction, f_{oc} (0.25% soil organic matter) sufficient to sustain biodegradation of perchlorate at these rates?
- Do the sample preparation and handling processes impart exposure of a larger soil surface area to substrate than may occur in situ?
- If the laboratory half-life for biodegradation of the control sample is so rapid, why hasn't perchlorate been reduced further?

5. To appreciate the duration needed to complete bioremediation, and the stoichiometrically determined mass of liquid carbon substrate required, the authors should provide their estimate(s) of the mass of perchlorate resident in the Target Soil Area. This would aide in determining the likely success of the various technologies contrasted in the feasibility study.

6. The measurement of infiltration rates is helpful. We expect that over time, the infiltration capacity of site soils will diminish due to swelling clays, growth of bacterial slimes, and clogging. Some reduction in infiltration rates over time should be accommodated in plans for long term infiltration.

7. Contingency plans should be made for the occurrence of a very shallow water table, or perched zone, as was observed 7 feet below ground surface in 1997. Soil borings and aquifer testing identified a confining clay layer occupying a shallow soil horizon across parts of the site. The proposal to infiltrate liquid carbon substrate has not accounted for the presence of this soil structure, which may harbor substantial quantities of perchlorate. The work plan should identify whether saturated or unsaturated conditions will be created by the application of the liquid carbon substrate, and how this may affect substrate delivery to the locations where the greatest mass of perchlorate resides.

8. On Page 18, the authors make the following statements: "to address direct contact exposures, values such as the United States Environmental Protection Agency (USEPA) residential or industrial preliminary remediation goals (PRGs) are commonly used. For perchlorate, the residential and industrial PRGs are 7.8 and 100 mg/kg, respectively..... At this Site, an alternative remedial goal (to achieving PRGs) would be reduction of perchlorate mass in the soil to a level that would not result in perchlorate impacts to groundwater in excess of the current DHS action level of 4 µg/L....The additional Site-specific data confirmed the Site-specific soil remediation goal of 50 µg/kg."

   The RWQCB Environmental Screening Level[2] for drinking water impacts is 0.007 mg/kg. All applicable regulatory standards should be discussed. As this site has already impacted drinking water supplies, the ESL would be a more appropriate level.

9. The on-Site groundwater containment and treatment system will be operational at the Site by December 31, 2003. The shallowest groundwater may not be adequately monitored to ensure adequate capture. The planned monitoring wells for the groundwater containment system are screened at 25 to 50 feet. Using Olin's estimates of minimum depth to water (16 feet), the monitoring system may not be adequate to measure capture if additional water is infiltrated. Cross-gradient monitoring will be especially important under the infiltration alternative. We recommend that RWQCB closely scrutinize the adequacy of monitoring wells in the cross-gradient direction.

10. The proposed time line for implementation appears to be too compressed. Allowing only two weeks between workplan approval and submittal of a 90% design report assumes that there will be no major changes required in response to RWQCB comments. While GeoSyntec and Olin have demonstrated an impressive ability to complete a large volume of work in a short time frame, a realistic time frame would allow more time for the feedback loop to be meaningfully completed.

11. We strongly advocate focused excavation of soils from the locations of highest concentrations and those areas above which contaminating activities occurred. The inherent uncertainty of the completeness of in situ remediation can be mitigated by excising the highest risk soils and hauling off to a secure SubTitle D landfill where perchlorate will be reduced, or bioremediating ex situ on site.

The feasibility analysis is not sufficiently diminished by the limitations we've identified above to warrant rejection. We recommend the report be accepted, and that Olin be caused to give consideration to these points and modify their approach accordingly. In summary, our recommendations are as follows:

a) include an analysis of the distribution of perchlorate within the soil types encountered in the Target Soil Area

b) The workplan should identify the degree to which the chosen substrate can be delivered to the locus of perchlorate residing in unsaturated soil

c) The adequacy of monitoring wells in the cross-gradient direction should be revisited.

d) The cost of unsaturated zone monitoring and tracer studies should be accounted for and incorporated into the rankings of remedial solutions

[2] http://www.swrcb.ca.gov/rwqcb2/esl.htm

e) A realistic review of landfilling options for the most contaminated soils should be performed, and the rankings should be adjusted accordingly. At a minimum, exploratory discussion with area landfills should occur to evaluate whether soil could be accepted, and what costs and liability may be incurred.

f) The ability of the carbon substrate to reach those soils where perchlorate resides should be quantitatively evaluated.

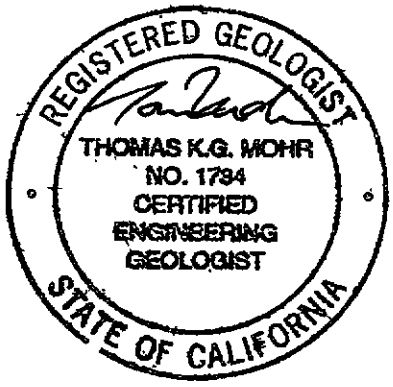
g) The ESL of 0.007 mg/kg should be used to as a remediation goal.

h) Existing and planned monitoring wells are not screened in above 25 feet bgs. Addition of infiltrated water may compromise the ability of wells screened below 25 feet to monitor perchlorate migration to groundwater induced by the addition of a liquid substrate. Monitoring infrastructure for the in situ bioremediation should include groundwater monitoring in the zone of seasonal high groundwater, i.e. 16 ft bgs, and perched groundwater at 7 ft bgs.

i) The report should be accepted and the forthcoming Work Plan should address the limitations identified here.

We appreciate your attention to these comments. If you require clarification of any of these points, please call me.

Sincerely,



Thomas K.G. Mohr, R.G., C.E.G., C.H.
Solvents and Toxics Cleanup Liaison
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cc: Rick McClure, Olin Corporation
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Jim Ashcraft, City of Morgan Hill Public Works Director
Carla Ruigh, Community Services Manager, City of Gilroy
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ENVIRONMENT AND WATER RESOURCES

December 23, 2003
Project No.: 127-005

California Regional Water Quality Control Board,
Central Coast Region
895 Aero Vista Drive, Suite 101
San Luis Obispo, CA 93401
Attn: Mr. David Athey

Re: Comments on "Soil Remediation Feasibility Study, Olin/Standard Fusee Site, Morgan Hill, California"

Dear Mr. Athey,

Komex has performed a review of the document entitled *Soil Remediation Feasibility Study, Oil/Standard Fusee Site, Morgan Hill, California,* dated November 21, 2003, and prepared by GeoSyntec Consultants (GeoSyntec) for the Olin Corporation (Olin). We are pleased to submit our comments on behalf of the Cities of Morgan Hill and Gilroy.

The former Olin facility at 425 Tennant Avenue in Morgan Hill is herein referred to as the Site. The Soil Remediation Feasibility Study (SRFS) was submitted by Olin to the California Regional Water Quality Control Board, Central Coast Region (Regional Board) to comply with a directive from the Regional Board on September 30, 2003. That directive required submittal of a report considering the effectiveness, feasibility, and relative costs of appropriate methods to remove perchlorate from soil at the Site.

Our review of this document should in no way be considered a validation of the document contents or any portion of the document, including findings, interpretation, conclusions or opinions expressed therein. If we do not provide comments, corrections or questions for a respective sentence, paragraph or section, this should not be construed as agreement with the information presented within that respective sentence, paragraph or section.

GENERAL COMMENTS

In summary, the SRFS evaluates five alternative methods for remediation of perchlorate-impacted soil at the Site, these include 1) no further action/monitored natural attenuation, 2) in situ soil washing, 3) in situ bioremediation, 4) excavation and ex situ bioremediation, and 5) excavation and off-Site disposal. Olin recommends implementation of Alternative 3, in situ bioremediation, for on-Site soil remediation.

We have concerns with interpretation of the data that led Olin to conclude that Alternative 3 was the most appropriate means of on-Site soil remediation. We believe consideration of factors that were either not addressed in the SRFS, or not adequately addressed, would indicate that Alternatives 4 or 5 might be more appropriate than Alternative 3. Our concerns are discussed in greater detail below.

SPECIFIC COMMENTS

The SRFS fails to adequately address the fact that a groundwater pumping test conducted in September and October 2003 (as reported in the *90% Design Report for On-Site Containment and Treatment of Perchlorate in Groundwater*, October 24, 2003, By GeoSyntec) indicated that "The hydraulic response in the A zone was confined..." If groundwater in the A zone was confined then a shallow fine-grained layer that would likely inhibit downward infiltration of treated and amended water must exist throughout a significant portion of the Site. Such a confining layer would likely promote lateral flow with increased risk of off-Site migration of perchlorate. The SRFS states in Appendix E that "Based on laboratory permeability tests, there do not appear to be any laterally continuous layers that would induce significant lateral migration." Based on the results of the groundwater pumping test, which is more reliable than laboratory permeability tests of ten soil samples collected from three boreholes, there is at least one laterally continuous layer that would induce significant lateral migration.

The Regional Board, in correspondence to Olin dated September 19, 2003, stated that "The cost of performing an appropriate investigation of subsurface properties prior to initiation of soil flushing, combined with cost of installing, operating, and maintaining a network of instruments sufficient to monitor and prevent lateral migration of perchlorate, may be more expensive than excavation of impacted soil with off-site disposal or on-site ex-situ treatment." This statement is repeated in Appendix E of the SRFS; however, the cost estimate for Alternative 3 presented in Table 5-4d does not include any cost for monitoring moisture in the vadose zone to determine if lateral migration is occurring. The potential for lateral migration

indicates that such a monitoring program would be necessary if Alternative 3 is implemented; therefore, an estimated cost for equipment, installation, operations, maintenance, and monitoring should have been included. We agree with the Regional Board that these costs would likely make Alternative 3 more expensive than excavation.

The SRFS indicates in Table 5-1 that community acceptance of Alternative 3 "is anticipated to be moderate" and in the rating system for the remedial options community acceptance was given a rating of 3 (with 0 being the lowest and 5 the highest). Based on discussions with our clients and on comments presented in meetings of the Perchlorate Citizens Action Group we believe that the level of community acceptance for Alternative 3 should have been given a rating of 0. The SRFS states, "...a ranking of 0 in any of the five classification criteria was sufficient to justification to reject that process option from further consideration." Alternative 3 could not be considered as a feasible soil remediation option if community acceptance is realistically evaluated by both Olin and the Regional Board.

In discussing Alternative 3, the SRFS does not address the issue of long-term reduction of the infiltration rate, which is likely to occur due to swelling clay and/or biofouling. In addition to reducing the infiltration, and thereby increasing the estimated two-year time period for soil remediation, these processes would likely increase the potential for lateral migration of perchlorate.

The SRFS evaluated soil remediation based on six equally weighted criteria: 1) applicability, 2) implementability, 3) effectiveness, 4) community acceptance, 5) cost, and 6) schedule. Olin's actions have impacted the quality of the drinking water for thousands of residents in Morgan Hill, San Martin, and Gilroy. Decisions regarding appropriate soil and groundwater remediation should not consider cost-savings for the responsible party.

CLOSING

For the reasons cited above we believe that Olin's Alternative 3 is not appropriate for the remediation of on-Site soil. Within Appendix E of the SRFS it is stated that "Olin is willing to consider a soil remediation approach that couples focused excavation of on-Site soils...with in situ bioremediation." We believe that excavation of soil containing perchlorate in concentrations of 500 ug/kg or greater, with a concentration of 10 ug/kg for a Site soil cleanup level (as suggested by the Regional Board in correspondence to Olin dated September 19, 2003) would be protective of groundwater and would receive community acceptance. Excavated soil could be either disposed off-Site or treated on-Site.

Komex is pleased to provide our comments to the Regional Board. If you have any questions or need additional information please call Rich Chandler at (805) 787-0307 x244.

Sincerely,
KOMEX

Rich Chandler, R.G.
Senior Geologist

cc: Mr. Steve Hoch, Hatch and Parent
Mr. Jim Ashcraft, City of Morgan Hill
Mr. Mike Goodhue, City of Gilroy