REGION 9
SAN FRANCISCO, CA 94105

September 26, 2025

MEMORANDUM

SUBJECT: Response to CSTAG recommendations on the Palos Verdes Shelf Operable Unit of the Montrose Chemical Company Superfund Site. Milestone 2 and 3 review

FROM: Renee Jordan Ward, Remedial Project Manager, Superfund and Emergency Management Division, EPA Region 9

RENEE JORDAN WARD Digitally signed by RENEE JORDAN WARD
Date: 2025.09.26 12:15:36 -07'00'

THRU: John Chesnutt, Supervisory Environmental Engineer, Superfund and Emergency Management Division, EPA Region 9

TO: Karl Gustavson, Chair, on behalf of the Contaminated Sediments Technical Advisory Group (CSTAG), Office of Superfund Remediation and Technology Innovation, U.S. Environmental Protection Agency (EPA)

This document provides EPA Region 9's responses to recommendations provided in the memorandum "CSTAG recommendations on the Palos Verdes Shelf Operable Unit of the Montrose Chemical Corp. Superfund Site. Milestone 2 and 3 review" dated May 8, 2025. The Montrose Chemical Corp. OU 5 (Palos Verdes Shelf) Superfund Site is a Tier 2 sediment site, and the contaminated sediment areas and actions are subject to Contaminated Sediment Technical Advisory Group (CSTAG) review per the CSTAG's policies and procedures. The CSTAG memorandum provides a brief description of the project area and final recommendations associated with the in-person Milestone 2-3 consultation meeting between Region 9 and CSTAG on February 25-26, 2025. Specifically, the CSTAG memo provides recommendations regarding the development of preliminary remediation goals, remedial action objectives (RAO), and the overall cleanup strategy and evaluation of remedial alternatives for the Palos Verdes (PV) Shelf site.

Region 9 greatly appreciates CSTAG's thorough review and thoughtful recommendations. The Region's specific responses to the CSTAG's recommendations are provided below. The Region will consider CSTAG's recommendations throughout the process of developing the technical memorandums, Feasibility Study, and through the selection and implementation of remedies for the site.

RESPONSE TO RECOMMENDATIONS

2. Remedial Action Objectives (RAOs)

CSTAG recommends that the Region update the proposed RAO language such that each objective is measurable and achievable, and includes the six components: purpose of action, receptors, exposure pathway, environmental media of concern, contaminants of concern (COC), and level to be achieved. CSTAG recommends that RAOs or associated text should identify levels in media that are protective of receptors. Because RAO 4 does not directly address COC sources or risk, CSTAG recommends that the Region remove this as an RAO and instead include a discussion of how each alternative would strive to minimize impacts to sensitive habitats and biological communities in the remedial alternative descriptions. Finally, CSTAG recommends that the Region consider a source control RAO to address off-site migration of COCs in sediments prone to transport.

Response: The Region appreciates CSTAG's guidance on developing appropriate RAOs for the site. Based on CSTAG's recommendation, the Region has revised the draft RAOs, provided below, to clarify measurable and achievable objectives. During the development of the Feasibility Study, the Region plans to develop specific preliminary remedial goals for fish tissue and sediment that are protective of human health and ecological receptors based on the Human Health and Ecological Risk Assessment (HHERA) and Conceptual Site Model (CSM) for the PV Shelf study area. The Region also plans to include a discussion of how each remedial alternative would strive to minimize impacts to the environment during remedy implementation.

Region 9 appreciates the CSTAG's recommendation regarding the development of a separate RAO for source control; however, the Region does not intend to include a source control RAO. Multiple lines of evidence suggest that while some suspended sediment transport does occur, the shelf is generally stable, and the contaminated footprint is not expanding. Long-term monitoring of the PV Shelf study area suggests that the geometry of the effluent-affected sediment deposit has not substantially changed since 1992. The effluent-affected sediment deposit is thickest at a water depth of 60m, which corresponds to the depth of the 90" and 120" outfall diffusers. The effluent-affected deposit thins in a shoreward direction and with increasing water depth and ceases to be a recognizable deposit a short distance down the slope (see results of the 2024 MNR study). Additionally, sediment transport studies indicate that the bottom sediments near the outfalls are largely stable under typical oceanographic conditions. While transport of fine suspended particles can occur, these particles are likely to be transported by predominant northwest currents and remain on the shelf and within the PV Shelf site. The fraction of contaminated sediment that is transported offshore outside of the PV Shelf study area is small relative to the total contaminated mass near the outfalls (Ferre et a., 2010). Furthermore, studies in the San Pedro Basin indicate that off-shelf transport of contaminated sediment occurred primarily during the 1960s-1970s when high organic loading and effluent discharge from the White Point outfalls occurred (Schmidt et al., 2024).

Overall, the Region understands that the contaminated sediment on the shelf, particularly around the outfall area, poses risk to human health and the environment through bioaccumulation pathways that are addressed in the three revised RAOs.

RAO 1: Reduce human exposure to site-related DDT and PCBs by reducing the ingestion of contaminated fish to levels that are protective of human health

RAO Component Description	RAO Component
Purpose of action	Reduce human exposure
COC	DDT and PCBs
Media	Fish tissue
Exposure pathway	Ingestion
Receptors	Humans
Level to be achieved	Protective levels for human health

RAO 2: Reduce risks to ecological receptors, including benthic invertebrates, fishes, and piscivorous marine birds and mammals, from total DDT and PCBs in sediment to below unacceptable levels

RAO Component Description	RAO Component
Purpose of action	Reduce risks
COC	DDT and PCBs
Media	Sediment
Exposure pathway	Dermal contact or ingestion
Receptors	Benthic invertebrates, fishes, and piscivorous organisms
Level to be achieved	Protective levels for ecological receptors

RAO 3: Reduce concentrations of total DDT and PCBs in ocean waters over the PV Shelf to levels that meet ambient water quality criteria for human health and aquatic life

RAO Component Description	RAO Component
Purpose of action	Reduce concentrations
COC	DDT and PCBs
Media	Ocean water
Exposure pathway	Dermal contact/ingestion
Receptors	Humans and aquatic life
Level to be achieved	Ambient water quality criteria

3. Remediation Goals

The PV Shelf site is a highly dynamic and complex environment that is difficult to model. Because of the many assumptions required about the nature of the site, receptors, and exposure scenarios, CSTAG recommends that Region 9 consider whether a sediment remediation goal is appropriate for site decisions, or whether the remediation goal should be limited to fish tissue concentrations. If the Region decides to develop sediment remediation goals, CSTAG recommends that the Region consider the area over which it will be applied and communicate the uncertainties and assumptions used to derive the remedial goals. The CSTAG also recommends that the Region move forward with goal development rather than conduct additional studies to lessen model uncertainty. If the Region decides not to develop sediment remediation goals, CSTAG suggests that the food web model could be used to assess and derive sediment action levels or areas to remediate unacceptable risk.

Response: The Region appreciates CSTAG's recommendation on appropriate remediation goals and agrees that the complexity of the site and model assumptions limit the food web model's ability to accurately predict sediment to fish relationships. The Region agrees that a sediment remediation goal is not necessary to address human health because the risks are driven by consumption of contaminated fish. However, the Region believes that a sediment remediation goal may be helpful to address risks to ecological receptors and evaluate remedial alternatives based on cleanup of contaminated sediment. If the Region does adopt a sediment remediation goal, the Region will consider the area over which to apply the goal and clearly state assumptions and uncertainties inherent to the development of the goal. The Region anticipates applying specific remediation goals to the outfall area hotspot where data indicate risks to benthic invertebrates and higher trophic level organisms are highest. Further delineation of this area will occur with the development of the Feasibility Study, as well as whether the remediation goals will be applied as not-to-exceed point concentrations or averages over a defined area (e.g., the outfall area). The Region is not planning to conduct additional studies to reduce model uncertainty at this time.

4. Technologies and Alternative Development

The PV Shelf site faces several challenges to selecting and implementing an active remedy, including deep water, active outfall pipes, and distance from the shoreline. At the in-person CSTAG consultation, several stakeholders expressed concerns with a remedial alternative that includes a capping component because of the potential impacts to receptors and Los Angeles County Sanitation District (LACSD) outfall function. The CSTAG recommends that Region 9 ensures that stakeholders are informed and aware of recent and ongoing site histories as well as advances in remediation technologies since 2009. Particularly, the CSTAG recommends that stakeholders be made aware of advancements in capping and dredging technologies that would allow for more precise treatment of contaminated sediment. CSTAG also recommends that the Region evaluate Monitored Natural Recovery (MNR) and Enhanced Natural Recovery (ENR) separately. Additionally, CSTAG recommends that Region 9 fully consider in-situ treatment using aggregate particles coated with powdered activated carbon to sequester available DDT and PCBs. Lastly, CSTAG recommends that the Region evaluate alternatives consistent with the NCP (300.430(a)(iii)(D)) language.

Response: Region 9 appreciates and agrees with CSTAG's recommendations regarding stakeholder engagement and the evaluation of remediation alternatives for the PV Shelf site. The Region continues

to engage stakeholders through the Palos Verdes Shelf Technical Information Exchange Group (PVSTIEG), which provides regular opportunities for engagement in site activities during annual meetings, review of technical documents, and submission of comments on draft deliverables. The Region will continue to involve the PVSTIEG in all site activities and reports, including opportunities to review and comment on the Detailed Alternatives Analysis Technical Memorandum that will discuss advancements in capping and dredging technologies appropriate for the site.

The Region agrees with the CSTAG's recommendation to evaluate MNR and ENR as separate remedial technologies. The Region may consider applying MNR and ENR in spatially distinct areas. For example, one preliminary alternative may consider ENR in the outfall hotspot area and MNR elsewhere on the shelf. The Region understands that effective ENR relies on the presence of natural recovery processes already occurring. Site data show that concentrations of both DDT and PCBs in surface sediment have generally declined since the early 2000s, although more recent trends are more variable and show an increase in concentrations between 2009 and 2024. For DDT, site data indicate that natural recovery is occurring, as shown by increasing proportions of degradation products such as DDMU and DDNU. For PCBs, there is limited evidence of natural attenuation. The Region also agrees that applying net deposition estimates across the entire PV Shelf study area obscures spatial variability and may not be appropriate for evaluating localized conditions near the outfall area, where sedimentation rates may differ.

The Region agrees that in-situ treatment is a viable technology to consider for the PV Shelf site. In-situ treatment using aggregate particles coated with powdered activated carbon to sequester DDT and PCBs was evaluated and retained in the Preliminary Remedial Alternatives Analysis Technical Memorandum. The Region will further evaluate this technology in the Detailed Alternatives Analysis Technical Memorandum.

The Region will evaluate all appropriate remedial technologies and alternatives in accordance with the NCP, including consideration of effectiveness, implementability, and cost.

5. Monitored Natural Recovery

The CSTAG recommends that the Region carefully evaluate the data indicating whether natural recovery is occuring at the site, particularly within the outfall area where DDT and PCB concentrations are highest, and whether MNR has the potential to reduce site risks to acceptable levels within a reasonable time frame. If included as a remedial approach, the CSTAG recommends that the Region include monitoring of natural recovery rates, processes, and effectiveness. CSTAG also suggests that the Region develop a spatiotemporal understanding of erosion and deposition if the selected remedy relies on natural recovery. Specifically, the CSTAG recommends high-resolution bathymetric surveys to depict larger-scale changes in the outfall area over time and provide a measure of stability.

Response: The Region appreciates CSTAG's observations and recommendations regarding the evaluation of MNR at the PV Shelf site, particularly the importance of avoiding site-wide generalizations and the need to evaluate spatial and temporal variability in contaminant trends and sediment processes. The 2009 Interim Record of Decision (IROD) established cleanup goals based on area-weighted averages. Accordingly, the Region's analysis of DDT and PCB trends has been generalized across the broader shelf area to align with these IROD goals. The previous MNR studies

assessed and compared broad site-side trends in PCB and DDT concentrations and net deposition across the PV Shelf to understand progress toward the IROD remediation goals. These trends were not intended to define localized contaminant dynamics, such as that near the outfall area. If MNR is selected as a component of the final remedy, the Region agrees that future MNR studies would benefit from evaluations of localized sediment transport processes and contaminant trends, particularly within the outfall area. The Feasibility Study will evaluate whether existing lines of evidence support MNR as a viable alternative capable of achieving risk reduction within a reasonable timeframe.

If MNR is retained, the Region anticipates that higher-resolution, targeted monitoring will be necessary to verify ongoing recovery processes and assess remedy performance in key areas. Existing MNR datasets would inform the design of a refined monitoring program, which could include repeat sampling of multiple media (e.g., surface and subsurface sediments, water, and fish tissue) and coordination with ongoing regional monitoring programs. Additional studies, such as bathymetric surveys, may also support improved understanding of sediment stability and depositional processes near the outfalls.

6. Considerations of Spatial Scale in the Remedial Alternatives

The CSTAG recommends that the Region consider spatial scales in evaluating remedial alternatives and suggests the development of sediment management areas (SMAs) to address areas with the highest concentrations. Remedial technologies could be applied in combination to reduce exposure at high concentration SMAs. CSTAG also recommends that remedial alternatives with active technologies such as capping or dredging include additional sampling in high concentration areas to delineate SMAs and focus areas of active remediation.

Response: The Region appreciates this comment and agrees that developing SMAs will help evaluate technologies at varying spatial scales and better address contaminant hotspots. The goal of the preliminary alternatives analysis was to screen remedial technologies that are not suitable for the site, and the Region acknowledges that the preliminary alternatives analysis technical memo did not provide a basis for the six proposed remedial alternatives.

In the detailed alternatives analysis, the Region anticipates dividing the site into two SMAs: one encompassing the hotspot area around the 90” outfall and one covering the remainder of the site. The Region plans to adopt SMAs using available data and will further delineate these areas during remedial design if an active remedy is selected. This approach will allow the Region to compare remedial alternatives and ensure the spatial application of technologies is appropriate to achieve the RAOs.

7. Alternative Evaluation and Site Strategy

The CSTAG recommends that the Region consider whether alternatives are protective of human health and the environment in the long-term. The CSTAG suggests that the Region explicitly state the basis for determining protectiveness and evaluating long-term effectiveness in terms of residual risk and adequacy of controls to manage untreated waste. If considerable uncertainty in the evaluations of protectiveness or long-term effectiveness remain, the Region may consider whether an interim remedy is appropriate while a final remedial solution is developed.

Response: Region 9 appreciates CSTAG's recommendations regarding alternative evaluation for protectiveness and long-term effectiveness. The Region believes that there is sufficient data to proceed directly with a final remedy for the PV Shelf site. The community has consistently expressed that it does not support an interim remedy, and the Region is committed to selecting a final remedy that provides long-term protection for human and ecological health. Furthermore, the Region will continue to review and evaluate remedy protectiveness through the Five Year Review process.

In the Feasibility Study, protectiveness will be evaluated based on the ability of an alternative to achieve the site's RAOs within a reasonable timeframe. For PV Shelf, this includes reducing risks to human and ecological health from the consumption of contaminated fish and exposure to contaminated sediment. The basis for determining protectiveness will include site-specific measures such as PCB and DDT concentrations in fish tissue. Long-term effectiveness will be evaluated on residual risk following implementation of the selected remedy, the permanence and reliability of the remedy, and the adequacy of institutional controls to manage any untreated contamination. This evaluation will explicitly consider whether the alternative can achieve the RAOs in a reasonable timeframe. The Region recognizes that an alternative relying primarily on MNR may leave higher levels of contamination in place for longer durations and therefore may have greater residual risk.

8. Outfall Easements

The CSTAG recommends that the Region consider remedial actions within the easement area of the LACSD outfalls. The CSTAG anticipates that appropriate setbacks may differ depending on the technologies in the selected remedy. If the setbacks limit remediation of the hotspot area, remediation of larger areas of less contaminated sediment may be needed to achieve RAOs.

Response: The Region appreciates CSTAG's recommendations regarding the outfall easements and agrees that these areas encompass a substantial portion of the highest sediment DDT and PCB concentrations at the site. The Region will evaluate remedial technologies within the LACSD easement areas that do not pose a risk to the integrity of the outfall system. The active outfalls are critical to the operations of the LACSD wastewater system and must remain functional throughout any remedial action. Following the CSTAG meeting, the Region initiated discussions with LACSD to understand how different remedial technologies could be applied around the outfalls without negatively impacting the function of the outfall system. LACSD expressed concerns about remedies that have the potential to clog the diffuser ports, destabilize the outfalls, disrupt grit mounds, and/or detach outfall anodes. The Region will continue to coordinate closely with the PVSTIEG and LACSD to evaluate remedial technologies and throughout the CERCLA process to ensure that remedial design and actions address cleanup objectives while maintaining outfall operations. If an active technology is selected as part of the final remedy, the Region will work with LACSD to design and implement remedial actions that allow for remediation of hotspot areas while maintaining operation of critical infrastructure.

9. Monitoring and Pre-Design Considerations

The CSTAG recommends that Region 9 continue fish tissue monitoring but also consider which sentinel species would be the most appropriate indicators of progress toward the RAOs and for informing the CSM. To accomplish this, CSTAG advises that sentinel species be sampled from the areas of the site they are intended to represent (e.g., collecting barred sand bass from closer to the outfall area) and

that studies include tracers of diet and trophic level, such as stable isotope analysis, to confirm site fidelity. CSTAG emphasizes the importance of focusing on fish species with high site fidelity that are regularly consumed by anglers.

The CSTAG also recommends further investigation into the sources and processes contributing to elevated near-bed and mid-water column COC concentrations, including potential influence from the outfall discharge.

Finally, CSTAG advises the Region to consider a technology's ability to address contaminant flux when evaluating and comparing alternatives and that further treatability or pilot studies may be useful during design to optimize approaches.

Response: The Region appreciates CSTAG's recommendations on future site monitoring and pre-design considerations and agrees that sentinel species selection should balance site fidelity, trophic complexity, and relevance to human health and ecological risk. For the PV Shelf site, the Region has historically used white croaker as the primary indicator species because they live near the outfall area hotspot, consistently exhibit the highest concentrations of DDT and PCBs, and are routinely consumed by anglers which make them directly relevant to evaluating risks to human health. Additionally, the MNR studies identified a chemical signature in white croaker collected from the outfall zone (Zone 1), indicating their applicability for assessing localized conditions despite evidence of migration to other areas off the shelf (Wolfe and Lowe, 2015).

While the CSTAG has noted that hornyhead turbot may have higher site fidelity, these fish are not commonly consumed by the local fishing community and therefore would not provide a meaningful measure of human health risk reduction. Vermilion rockfish are a potential sentinel species; LACSD outfall inspections have documented high abundancies of these fish at the outfalls in recent years, particularly at the terminus of the 90" outfall where the highest concentrations of DDT and PCBs in sediment are located. Vermilion rockfish are known to have high site fidelity, occupy a higher trophic position than white croaker, and are consumed by anglers. However, past monitoring conducted by LACSD in 2018 indicates that DDT and PCB concentrations in vermilion rockfish are low compared to both white croaker and barred sand bass. Based on these considerations, the Region believes that the white croaker remains the most appropriate indicator species for evaluating progress toward RAOs at this time, though other species may be considered.

Following the CSTAG meeting, Region 9 reached out to LACSD to understand what might have contributed to the increases in mid-water column DDT and PCB concentrations between the first and second MNR studies, including the potential for residual DDT- and PCB-contaminated material to remain within the outfall pipes. According to LACSD, it is unlikely that solids remain within the non-diffuser portion of the 90" outfall. LACSD inspected the interior of the 90" outfall pipe in 1972 and found no evidence of sediment buildup in this portion of the pipe, indicating that flow conditions are sufficient to keep sediments from depositing within the pipe. However, it is possible that some pre-2002 solids remain in the diffuser portions of the pipe. The 1972 inspection showed some grit and grease in the last few diffuser segments, and a 1987 inspection found some sand and grease deposits in the eastern diffuser. However, these inspections occurred during a period when the Warren Facility was discharging primary-treated wastewater that was higher in solids. In 2002, LACSD implemented full secondary wastewater treatment that reduced the amount of suspended solids in wastewater

effluent by about 97% (LACSD, 2024). DDT and PCBs have not been detected in effluent that enters the outfalls since the early 2000s. Given the velocities of water coming out of the diffuser pipes, it is likely that much of the remaining solids have been flushed from the pipeline since these inspections. Current velocities range from about 1-10 feet per second under typical flows, depending on the distance from the end of the diffuser. The velocity of effluent in the outfall pipes increases with higher flows, including storm events. LACSD has not tested effluent immediately exiting the outfall diffusers due to the high exit velocities and rapid dilution. However, LACSD has observed grit mounds (sediments overlaying ballast material) around the east diffuser leg of the 90" outfall, which could be formed from sediment from the outside of the pipes and sediment remaining inside the pipes from before the plant implemented full secondary treatment. Overall, the Region agrees with the CSTAG that this is a potential data gap and have begun discussions with LACSD to understand the potential for DDT and PCB contaminated material to remain within the outfall pipes and the grit mound areas, particularly the grit mounds around the east diffuser leg of the 90" outfall.

The Region acknowledges the CSTAG's interest in understanding the sources and processes contributing to elevated near-bottom and mid-column concentrations, particularly near the outfall area. As part of evaluating remedial alternatives, the Region will consider the extent to which remedial technologies can address or reduce contaminant flux and may evaluate treatability or pilot studies during remedial design as needed.