

September 13, 2018

**VIA ELECTRONIC & U.S. MAIL**

Paul Mercer, Commissioner  
Maine Department of Environmental Protection  
17 State House Station  
28 Tyson Drive  
Augusta, Maine 04333-0017

**Re: Petition for Modification of Board Order**

Dear Commissioner Mercer:

Pursuant to Chapter 2, Section 26(B) of the Department's rules, Mallinckrodt US LLC ("Mallinckrodt") respectfully petitions the Commissioner to initiate proceedings before the Board of Environmental Protection (the "Board" or "BEP") to modify its order concerning remediation of a chlor-alkali manufacturing facility in Orrington, Penobscot County, Maine, dated August 19, 2010, effective April 3, 2014 (the "BEP Order" or "Order"). The modification proposed by this Petition, as detailed below, is to allow limits on the depth of excavation in the Plant Area that are necessary to protect human health and the environment.<sup>1</sup>

Significant progress has been made on the Site remediation. In fact, the plant area is the final area left to remediate under the BEP Order. Mallinckrodt submitted a Corrective Measures Implementation Plan ("CMIP") for this remaining work that is protective of human health and the environment and consistent with the BEP Order.

The Board explicitly and pragmatically recognized in the Order that: (1) the depth of excavation below the groundwater table could pose problems for the remediation; (2) Site conditions may require modifications once in the field; and (3) the remediation should be implemented consistent with any applicable legal standards and requirements.

Reading the Order to require extensive and lengthy excavation at depth (below the groundwater table), with such soils posing a limited threat to human health or the environment, fails to recognize the decreasing marginal gains from removing such deep material (while the risks to workers increase), and is inconsistent with DEP Guidance (Maine RAGs), Occupational Health and Safety Administration ("OSHA") standards for worker safety, and the BEP Order itself. Maine DEP has the authority, under its regulations and the BEP Order, to approve of Site

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<sup>1</sup> The BEP Order incorporates the Order by the Maine Department of Environmental Protection dated November 24, 2008 ("DEP Order").

remediation work that complies with health and safety considerations and existing guidance for risk exposure.

If the Maine DEP insists that a modification to the Order is necessary, Chapter 2 specifies that the Department may take action to modify a requirement based on a number of criteria, including:

- (1) The Order “fails to include any standard or limitation legally required on the date of issuance” 06-096 C.M.R. c. 2 § 27(D);
- (2) The Ordered “activity poses a threat to human health or the environment” 06-096 C.M.R. c. 2 § 27(C); or
- (3) “There has been a change in any condition or circumstance that requires . . . temporary or permanent modification.” 06-096 C.M.R. c. 2 § 27(F).

Mallinckrodt respectfully requests that, if needed, the Maine DEP recommend that the Board modify the Order to clarify that isolated material above the Media Protection Standards (“MPS”) may remain in place under certain circumstances, such as where its removal would pose a threat to worker safety and there is no significant risk to human health and the environment from the residual mercury.

## **I. Background & Procedural History**

Mallinckrodt is in the process of remediating the Site. This work involves excavation and removal of a large quantity of environmental media that has been contaminated by various waste materials, including mercury and other contaminants of concern. Facility dismantling and demolition activities began in 2010 and continued as required by the BEP Order. All buildings and infrastructure not being used for the current remedial work have now been removed from the Site. As outlined in the BEP Order, Mallinckrodt has submitted, and the Department has approved, remedial designs (CMIPs) for seven distinct areas at the Site, six of which are currently complete. The Department also approved Phase 1 work within the Plant Area, which is nearly complete. Further, the Landfill 1 CMIP was recently approved by the Department, and work has begun under this plan.

Since 2015, Mallinckrodt has excavated over 205,612 tons of non-hazardous soils and 41,462 tons of soils containing listed waste from the Site. These soils have been stockpiled, sampled, segregated, loaded into 2,537 railcars, shipped, and disposed of at offsite licensed disposal facilities.

Due to health and safety concerns associated with chloropicrin, in situ treatment of chloropicrin-impacted soils using injections and soil vapor extraction methods is also in progress. A new groundwater treatment plant was also constructed and began full-scale operation in 2012. As required in the BEP Order, a groundwater model has been developed for the Site and was approved by the Department in September of 2017. Groundwater extraction wells have continued to operate at the Site, and the conceptual design for the Final Groundwater

Extraction System was approved by the Maine DEP in January 2018. The well locations for the system were approved in August of 2018.

This remediation work is being carried out pursuant to the BEP Order, incorporating portions of the DEP Order, which required “[e]xcavation of all solid media exceeding the [MPS]. This includes all Plant Area Soils, Cell Building Soils, Retort and Old Retort Building Soils, Sediments, Landfill Ridge Soils, and sludge and other mercury-contaminated material from all five landfills.” Order at 32, ¶ 3(a). The BEP Order modified the DEP Order, in pertinent part, by not requiring removal of Landfills 3, 4, and 5,<sup>2</sup> and allowing material exceeding the MPS in Landfills 1 and 2 to remain on-site in certain circumstances. The BEP Order prescribes the following:

Excavation of solid media exceeding the Media Protection Standards. This includes all Plant Area Soils, Cell Building Soils, Retort and Old Retort Building Soils, Sediments, Landfill Ridge Soils, and sludges and other mercury contaminated material from Landfill Area 1 and Landfill 2, except that the depth to which contaminated soil under Landfills 1 and 2 will be removed shall be determined as specified in Finding of Fact 10(D) of this Decision.

BEP Order at 53, ¶ 3(a). Finding of Fact 10(D) of the BEP Order specifies that:

. . . Mallinckrodt must conduct a study, propose to and approved by the Department, to determine the approximate distribution of concentrations of mercury [and other materials] in the soils (both saturated and unsaturated) under Landfills [sic] 1 and mercury and carbon tetrachloride under Landfill 2. Mallinckrodt shall conduct column leaching tests such that the adsorption/desorption or other degradation processes of the residual soil contamination beneath the landfills can be quantified, and on this basis the Department shall determine the area and depth of soil excavation beneath the landfills. This determination must be based on modeling natural desorption/degradation processes and other considerations such as the type of final cover to be placed over the area of the landfills after they are excavated.

BEP Order at 39.

**II. The Order Requires Adherence to Legally Required Standards or Limitations, and Provided DEP with Discretion to Balance Removal of COCs with Human Health Risks to Worker Safety.**

The Board explicitly recognized that “as remediation proceeds, circumstances will undoubtedly arise as more information is obtained about the nature and extent of contamination at the Site which will need to be addressed.” Order at 48-49. Although this statement was made

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<sup>2</sup> The materials in Landfills 3, 4, and 5 include wastes that contain mercury at levels greater than the MPS for mercury.

in relation to the section entitled “additional work,” it shows that the Board recognized the need for flexibility to address Site conditions during the remediation.

The Order also incorporates the findings and conclusions in the DEP Order which provides that the DEP may approve or modify the Facility Corrective Measures Implementation Plan, with such modification becoming a part of the Order. See DEP Order at 35-36 (“DEP’s modification shall be deemed incorporated into and enforceable under this Order”).

The DEP Order requires that “[a]ll work undertaken by Mallinckrodt or any other person acting on its behalf pursuant to this Order shall be performed in compliance with all applicable Federal, State, and local laws and regulations, including all Occupational Safety and Health Act and Department of Transportation regulations.” DEP Order at 38 (¶ 29).

The Board Order, which incorporates the DEP Order, requires and certainly allows DEP to make adjustments to the remediation plans to limit the depth of excavation in certain areas of the Site, such as the plant area, especially where such remediation would pose a threat to worker safety (human health).

New samples, taken after the Order was issued, now show that there is some material that exceeds the MPS below the groundwater table in portions of the plant area that would require very deep excavation (below the groundwater table and in some cases more than 15 feet below the water table) for long periods of time that would provide minimal remedial benefits while significantly increasing risk to workers.

The Department’s Remedial Action Guidelines (“Maine RAGs”) (as revised February 5, 2016) state that material below 15’ is “**isolated**” from a health and safety perspective, making it highly unlikely to pose a risk to human health. Maine RAGs at 22 (¶14). For context, at the Orrington site, attempts to remove this deep material (characterized as “isolated” in the Maine RAGs) in several areas of the plant will require excavation at depth for long periods of time, and will pose an unnecessary threat to worker safety. The Order does not explicitly incorporate the Maine RAGs, but since this is a site cleanup, the Maine RAGs would be applicable.

Although the Board allowed limits to the depth of excavation in Landfills 1 and 2, where material above the MPS was known to exist at depth, the Board did not explicitly state the same limitations for the plant area. Instead, such a limitation is implied in the Order. Furthermore, the Order also allows the Department flexibility to address conditions that arise during the remediation. Therefore, the Department can allow material in the plant area that is above the MPS to remain in place consistent with the Order.

If the Department determines, however, that the Order does not allow such flexibility, the Order should be modified for failure to “include any standard or limitation legally required on the date of issuance.” 06-096 C.M.R. c. 2 § 27(D).

### **III. Extensive and Lengthy Excavation at Depth Poses a Threat to Human Health.**

Chapter 2 permits modification of an Order when the ordered “activity poses a threat to human health or the environment.” 06-096 C.M.R. c. 2 § 27(C).

Trenching and excavation work presents potentially serious hazards to workers. Harry Wetherbee, a Maine Professional Engineer with 25 years of experience regarding the OSHA rules concerning excavation and trenching, examined applicable requirements and potential risks associated with the Site work. *See* Attached Affidavit of Harry Wetherbee (“Wetherbee Aff.”) ¶ 1. “A review of multiple national databases by the [National Institute for Occupational Safety and Health (“NIOSH”)] researchers found that trenching and excavation hazards during construction activities resulted in 488 deaths between 1992 and 2000 - an average of 54 fatalities each year.” NIOSH, *Trenching and Excavation*, CENTERS FOR DISEASE CONTROL AND PREVENTION (Dec. 30, 2013), <https://www.cdc.gov/niosh/topics/trenching/default.html>.

OSHA has recently announced its Agency Priority Goal for 2018 to reduce trenching and excavation hazards. Cave-ins during trenching pose a significant risk of death or serious injury and are more likely than most other construction-related incidents to result in worker fatality. There are differing levels of risk (and therefore risk management requirements) associated with different excavation and trenching situations, depending upon, among other things, the depth of the excavation, the soil classifications of the material being excavated (*see* 29 C.F.R. Subpart P, Appendix A (“Soil Classification”)), the depth below ground surface of the water table, whether an excavation needs to be dewatered, the length of time the excavation has been open and exposed to varying weather conditions, and the length of time personnel are working in the excavation. Wetherbee Aff. ¶ 7.

The deeper the excavation and the longer timeframe that workers are expected to be in the excavation (both from an individual entry point of view and the number of entries over an extended timeframe), the higher the potential for an incident. Wetherbee Aff. ¶ 6. Expanding the size and footprint of an excavation that requires trenches below the groundwater table disproportionately increases the risks to worker safety. *Id.* Excavating small isolated areas at depth generally requires less risk than larger areas where work at depth will take a relatively long period of time. *Id.*

For example, in May of 2018, a worker died in California after a trench about seventeen feet deep collapsed at a construction site, burying his body underneath the dirt. Alene Tchekmedyan, *Worker dies after a trench collapses at a Lake Forest Construction Site*, L.A. TIMES (May 9, 2018), <http://www.latimes.com/local/lanow/la-me-ln-lake-forest-construction-death-20180509-story.html>. In 2016, OSHA reported that deaths from trench collapses had doubled, with 23 deaths that year. *OSHA News Release—Region 5*, U.S. DEPT. OF LABOR (Nov. 17, 2016), <https://www.osha.gov/news/newsreleases/region5/11172016>.

New soil data shows that if all materials above the MPS need to be excavated from the plant area, regardless of depth, it would require extensive excavation below the water table and dewatering of the excavated area. Wetherbee Aff. at Appendix A, Item 3. Such excavations, that occur below the water table with associated dewatering, are inherently more unstable than dry excavations. Wetherbee Aff. ¶ 8.

The soils to be excavated are likely to be OSHA Type C soils. See “Type C” definition in 29 C.F.R. 1926 Subpart P, Appendix A (b). Type C soils are the least stable of the soil types classified by OSHA and require extensive and time-consuming safety engineering.

Due to the depth of excavation and types of soils, a complex excavation support system involving not only sheet pile walls but bracing and supports, would be required. An extensive dewatering system of well points and pumps would be required to dewater the excavation both inside and outside the sheet piles. The significant areas requiring deep excavation pose risks to human health, including risks associated with trench collapse, groundwater infiltration, and adverse air quality.

Although Mallinckrodt excavated material to 22’ below ground surface (“bgs”) in Landfill 2, the area excavated was much smaller. Deep excavation may be appropriate in selected small, isolated areas in the Plant Area or under the former cell processing building, where there is visible mercury or very high concentrations. In fact, Mallinckrodt’s draft CMIP for the Plant Area identifies two areas where visible mercury was noted at 25.6’ and 21.1’ bgs. However, excavation over a large footprint of the Plant Area to remove all material above MPS poses an unreasonable threat to worker safety (human health), which is not warranted due to the very low risk of direct mercury exposure or mercury transport off-site (due to the pump and treat system) from the mercury remaining at depth.

The excavation support systems necessary in the Plant Area to remove fill and native soils with mercury concentrations greater than 2.2 mg/kg are significantly more complex than were used in the Landfill 2 remediation work. This is due to the size of the excavation, depth of the excavation, different subsurface conditions (e.g., groundwater levels and soils) and duration in which the excavation will be required to stay open to complete the work.

The work within the Landfill 2 excavation surrounded by sheeting could be completed much faster than the timeframe that will be required for the Plant Area and therefore a temporary sheeting system to remain in place for roughly 1 month was appropriate. The excavation support systems for the Plant Area excavations will require larger (e.g. thicker) and longer sheet piles than what was required in Landfill 2. Additionally, due to the dense till underlying the Plant Area, it is anticipated that it may be difficult (if not impossible) to drive the sheet piles to the required tip elevation to achieve appropriate factors of safety. The excavation support systems will require internal bracing and supports, which will limit production rates and the types of equipment that can be used. Depending upon weather and subsurface conditions encountered, this could create a delay in the remediation of several years.

In addition, the subsurface conditions are quite different in the Plant Area as compared to Landfill 2. The soils in Landfill 2 generally had lower hydraulic conductivity (e.g. higher percentage of fines) while the Plant Area soils are coarser grained. This means a higher rate of dewatering will be required to maintain a dry excavation. There is also a much higher potential for bottom stability issues due to groundwater upwelling at the bottom of the deep excavations in the Plant Area compared to Landfill 2. Additionally, the excavations in the Plant Area will

extend deeper below the groundwater table than in Landfill 2. All of these factors will result in increased volumes of water to remove from the excavation areas and potential stability issues at the bottom of the excavations. To manage the groundwater in the Plant Area, a dewatering system consisting of well points and/or sumps will need to be designed to lower the groundwater elevation both within the sheet pile walls and outside of the excavation support systems.

Once the sheet piles are installed, the excavation work will likely be in a confined space with potential air quality issues. The issue of mercury air emissions in a confined space will be an additional, unnecessary, health and safety issue and will potentially require additional worker personal protection equipment which can increase the stress to workers as they complete tasks. *See* 29 C.F.R. § 1926.651(g) regarding specific excavation requirements regarding hazardous atmospheres.

Activities other than excavation will take place within these areas and production time will be significantly slower and more complicated due to multiple individuals working in the excavation area, which will compound the health and safety risks.

Further, unnecessary health and safety risks will be incurred by using cranes to move equipment in or out of the excavations. Even if a ramp is used, eventually the ramp within the excavation area will need to be removed and cranes employed to remove equipment.

The internal bracing and supports will further limit production rates, types of equipment that may be used, and will increase the risk of work injury. Confirmation sampling, surveying, backfilling and compaction testing will all need to be conducted in these confined spaces as well as the excavation work.

Smaller, deep excavations are fundamentally different than working in large open holes up to 15' below the water table. *Wetherbee Aff.* ¶6. If all Plant Area soils must be removed to below the MPS, the deep excavations will be over a much larger area. For example, the Landfill 2 sheet pile area was 15,296 sq ft. In contrast, the total Cell Building and Chlorate Building areas that would need to be enclosed by sheet pile would be closer to 125,433 sq ft, over eight times larger (Cell = 60,500 sq ft; Chlorate = 64,933 sq ft).

The significantly larger area will expose workers to deep trenches for a much longer amount of time. The Landfill 2 sheet pile area took about a month to complete. If the Order text is not modified, workers would be excavating soils, sampling, and backfilling within sheet pile areas in the Plant Area for about a year. In the areas of both the former Cell Building and former Chlorate Building footprints excavation will be required well below the water table with the deepest excavation at approximately 25 feet bgs. Having workers in deep trenches for a year poses a threat to human health and the environment warranting a modification of the Order. 06-096 C.M.R. c. 2 § 27(C); *Wetherbee Aff.* ¶10 (“removal of that material by excavation poses a threat to worker safety”).

**IV. New Data Shows that Removal of All Mercury-Containing Materials in the Plant Area Above 2.2 ppm Poses an Unacceptable Threat to Human Health Requiring A Modification of the Order.**

Modification of the BEP Order is appropriate due to “a change in any condition or circumstance that requires . . . a temporary or permanent modification of the terms of the license.”<sup>3</sup> 06-096 C.M.R. c. 2, § 27(F); *see also* 06-096 C.M.R. c. 2, § 26(B). Mallinckrodt has engaged in significant additional sampling at the Site in connection with carrying out the remedial activities prescribed by the BEP Order. At the time of the BEP Order, 113 borings had been undertaken in the Plant Area; however, only 42 of these were deeper than 2 feet. Since then, an additional 188 borings have been completed in this area resulting in over 2,000 additional samples that have been characterized and analyzed to date. This has allowed Mallinckrodt and the Department to obtain a better understanding of Site conditions than what the agencies required and everyone relied upon in the Site Investigation.

Analysis of the new samples indicates that the Plant Area volume of material exceeding the MPS for mercury was significantly underestimated at the time of the BEP proceeding. If this information had been available during the BEP proceedings, Mallinckrodt would have pursued a different approach to management of the Plant Area material.

The new Site data indicates that volumes of Plant Area at-depth material exceeding applicable standards are deeper and significantly greater than stated in the BEP Order (or the predecessor Department Order.) This new information makes the depth of excavation as important in the Plant Area as it was in Landfills 1 and 2. Since the Board Order allows the use of leachability studies to determine the appropriate depth of excavation based on leachability to groundwater for Landfills 1 and 2, this approach also should be allowed in the Plant Area.

The express language of the BEP Order grants the Commissioner flexibility to address changed circumstances as they arise in the course of the remediation and to impose reasonable terms and conditions to complete the remediation in a safe and responsible manner. The BEP Order requires “excavation of solid media exceeding the Media Protection Standards [(“MPS”)]” of 2.2 ppm total mercury at the former chlor-alkali plant site in Orrington, Maine (the “Site”). BEP Order at 53, ¶ 3(a); *see also* BEP Order at 15, ¶6 (D). The BEP Order, however, also permits material exceeding the MPS to remain in place in some instances. For example, material located in Landfills 1 and 2 exceeding the MPS may remain on-site if the results of a study regarding the distribution of contaminants and desorption supports leaving those materials in place. BEP Order at 39, ¶10 (D). In other words, depth of excavation of soils beneath Landfills 1 and 2 is determined based on an assessment of the potential for contaminants of concern adsorbed to soils beneath the landfills to desorb at concentrations that would cause groundwater to exceed the MPS. *See* BEP Order at 34, ¶10 (C)(2)(i). Further, as the Board explained in its order:

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<sup>3</sup> “License” is defined to include approvals or “similar forms of permissions issued by the Department that is required by law, and represents the State’s exercise of regulatory or police powers.” 06-096 C.M.R. c. 2, § 1(L).

[A]s remediation proceeds, circumstances will undoubtedly arise as more information is obtained about the nature and extent of contamination at the Site which will need to be addressed.

BEP Order at 48-49, ¶12 (I). In addition, the Board also noted in its findings that the DEP Commissioner has broad authority regarding all aspects of remedial activities at Uncontrolled Sites. For example, in the context of requiring an independent oversight inspector for the remediation, the Board stated:

[T]he Commissioner's authority under the Uncontrolled Sites Law includes not only the authority to order necessary remediation, but also the implied authority to impose reasonable terms and conditions to ensure that the required remediation is completed safely, responsibly, and in a manner that does not jeopardize public resources.

BEP Order at 51, ¶14 (B). *See also* BEP Order at 49, ¶14 (A) (requiring financial assurance; BEP Order at 51, ¶14 (C) (requiring a hold harmless indemnification); BEP Order at 51, ¶14 (D) (requiring assurance); BEP Order at 52, ¶14 (E) (requiring attendance at public meetings).

The Board order does not explicitly require removal of all material below the groundwater table. The Board allowed leachability testing to exempt removal of materials at depth known to have mercury above 2.2 ppm. from excavation in Landfills 1 and 2. The main reason the Board allowed deep soils above the MPS to remain in place in Landfills 1 and 2 was because working in the groundwater table is problematic from an engineering standpoint. This is also true for the plant area. If certain portions of the plant area must be excavated below the groundwater table, the volume of water from groundwater must be pumped from the trenches. The volume of this water is expected to be high with significant velocities. The volume of water required to be treated from the dewatering system will exceed the current capacity of the GWTP.

Allowing some soils above the MPS that are deep and isolated is consistent with the Order and the Department has the discretion under the Order to make this decision. If all soils above the MPS must be removed from the plant area, it will require significant excavation below the water table and work in deep trenches for a significant amount of time, posing a risk to human health (worker safety). This requires modification of the Order.

#### **A. Pre-BEP Order Plant Area Volumes Were Underestimated and Would Have Impacted the BEP's Analysis.**

The estimated volume of material for removal from the Plant Area at the time of the BEP hearing was 59,920 cubic yards (CY), based on data collected by DEP and Mallinckrodt prior to issuance of the DEP order. Data that is now available indicates that the actual volume of material exceeding the MPS in the Plant Area is 164,000 CY, nearly three times greater. This new estimate is based in part on the 188 additional Plant Area borings and over 2,000 additional samples completed since the BEP Order was finalized. Material exceeding the MPS was observed deeper than 12 feet, with the deepest concentration of material exceeding the MPS observed at 26 feet bgs. The groundwater in this area ranges from 3 feet to 13 feet bgs with an average depth of 9 feet bgs.

None of the regulatory agencies were aware of these volumes or the extent of materials above the MPS below the water table prior to the new samples being taken in the Plant Area. Maine DEP and the USEPA were fully involved in the development of work plans for the initial site investigation that resulted in the 1998 Site Investigation Report (“SI (1998)”). There is no indication that the Department expected contamination to be deeper than what was indicated from prior investigations. For example, in 2016 Mallinckrodt submitted predesign remedial work plans that did not contemplate extensive deep trench work in the Plant Area. The Department made comments, but did not suggest planning for deeper material.

“The sampling performed in 1995 adequately identified the areas of the plant where elevated concentrations are likely and defined the general limits of those areas.” SI (1998) at 3-48. Furthermore, “[d]uring the monitoring well installation program, mercury samples were collected to profile contamination with depth at four locations surrounding the manufacturing plant .... Mercury was not detected above the method detection limit of 0.1 mg/kg below the 12-foot depth (mercury in the 16 to 18 foot sample was at the detection limit).” SI (1998) at 7-10. After a review of the Plant Area soil borings, it was concluded in the Site Investigation Report that:

[C]ontaminated soils in the areas peripheral to the plant area appear to be confined to the surface or near surface. Data from in plant surface and near surface soil sampling and from the Brine Tank Investigation performed by Acheron indicate that, in general, mercury contamination in the plant is also limited to surface and near surface soils. However, areas within the plant which may have received large brine spills (e.g. the brine sludge receiver tanks, the clarifier and the heat exchanger) have localized areas where mercury contamination extends to greater depths.

SI (1998) at 7-10. In short, the data from the Site Investigation supported the conclusion that soils above the MPS were at shallow depths in the plant area.<sup>4</sup>

These greater Plant Area volumes exceeding the MPS represent a changed condition or circumstance that requires modification of the BEP Order for several reasons. First, greater Plant Area volumes will result in a significantly extended remediation schedule. Aside from cost implications, this delay will require re-analysis under RCRA guidance. For instance, the RCRA 2020 Program sets forth the goal of implementing final remedies at 95 percent of facilities requiring corrective action by the year 2020. If Mallinckrodt is required to remove the additional at-depth material exceeding the MPS in the Plant Area, the construction schedule will extend for years.

Re-analysis is also required under the following RCRA corrective action balancing criteria:

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<sup>4</sup> For example, “[b]elow four feet, mercury concentrations were generally below 1 mg/kg. Mercury concentrations in B-502 were consistently below 1 mg/kg, with a maximum concentration off approximately 1 mg/kg at the surface. Concentrations of mercury in B-503 were also consistently below 1 mg/kg, with a maximum concentration of 0.28 in the top 2 feet. Contaminated subsurface soils in the area directly below the plant area appear to be confined to surficial fill material.” SI (1998) at 7-10.

- Implementability: Issues associated with greater-than-anticipated Plant Area excavations include impacts on materials, construction methods, personnel, and capacity at offsite disposal facilities.<sup>5</sup>
- Short-Term Effectiveness: Increased Plant Area volumes for removal may cause a greater quantity of mercury to become re-mobilized during excavation than initially anticipated. Increased volumes also mean that a greater quantity of material will require off-site removal with associated truck/rail traffic. There will be greater noise, dust, volatilization, and exposure potential over what was initially anticipated. A greater potential for mercury vaporization or colloidal transport exists because more hazardous material will be handled.
- Cost: The total cost of the remediation will increase significantly.

Further, the volume of material itself factored into the BEP's remedy selection decision. The total volume for removal required under the DEP's initially proposed remedy (240,220 CY) was much greater than the volume to be removed under Mallinckrodt's proposed remedy (131,320 CY). The BEP concluded that balancing the protectiveness that would be achieved against the cost of removal overall, the lower volume for removal made the Mallinckrodt proposal more favorable. *See* BEP Order at 30 (indicating that the Board cut back the remedy required in the Commissioner's Order to what was "technically necessary to protect public health, safety and the environment from contaminants at the Site."); BEP Order at 37 ("[T]he Board finds that excavation and off-site disposal of Landfills 3 and 4 is not necessary to protect health and safety and the environment. The board is persuaded that the wastes contained in Landfills 3 and 4 can be effectively isolated from the environment.")

**B. Mallinckrodt Would Have Challenged Depth of Plant Area Excavation at the BEP Hearing If the Current Volume Estimate Had Been Available.**

During the BEP proceedings, Mallinckrodt objected to the requirement that it remove all soils exceeding the MPS from the Site. *See* BEP Order at 16, n. 13. Where the depth of excavation significantly impacted the amount of material to be removed, as was the case with respect to Landfill 1, Mallinckrodt challenged the depth of excavation.<sup>6</sup> Because the Plant Area volumes were, at that time, deemed small in comparison, the landfills were the primary focus.

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<sup>5</sup> Mr. Karl Kasper testified on behalf of Mallinckrodt at the BEP hearing that Stablex, the contaminated soil disposal facility located in Canada, would not be able to process the volume of material to be removed per the Commissioner's Order. BEP Order at 27-28. This was based on estimates of 240,000 tons of hazardous waste for removal from the Site. It is unknown whether Stablex could process a significantly greater volume of material from the Plant Area.

<sup>6</sup> For instance, Mallinckrodt agreed that Landfill 1 should be removed, but the Commissioner and Mallinckrodt disagreed on the depth to which contaminated media beneath the landfill should be removed. BEP Order at 31. The Commissioner's witness, Dr. John Beane, argued that removal of contaminated soil should proceed through the water table to glacial till in order to remove the source of contamination. Mallinckrodt's witness, Mr. Guy Vaillancourt, testified that Mallinckrodt would remove waste in Landfill 1 and address remaining soil contamination through a new groundwater extraction and treatment system. Mr. Vaillancourt explained that excavation to the till layer would be problematic given the groundwater flow through overburden and the location of the landfill with

As noted above, at the time of the BEP hearing it was anticipated that only 59,920 CY of material would be removed from the entire Plant Area at the Site to a depth of approximately 12 feet bgs. The additional data Mallinckrodt has collected in connection with performing work at the Site, however, indicates that the maximum depth of soils with concentrations above the MPS is now approximately 26 feet bgs, well below the groundwater table and 2 to 3 times deeper than originally expected. This increased depth results in 164,000 CY of additional material that would be excavated, which is nearly a three-fold increase over the amount originally anticipated. If that fact had been known at the time of the BEP hearing, Mallinckrodt would have challenged the depth of the excavation in the Plant Area the same way it challenged the depth of excavation in other areas at the Site (*e.g.*, Landfill 1) due to the difficulty of working at depth and below the water table. Moreover, the Board’s decision regarding the depth of excavation in Landfill 1 strongly suggests that the Board would have ruled in Mallinckrodt’s favor on the issue of the Plant Area soils, consistent with its treatment of Landfill 1, as similar concerns are implicated. BEP Order at 31-32, 39.

Since the MPS for site soils were set in order to be protective of fish in the river, the risk posed from mercury in soils in the Plant Area is even less than from Landfill 1, which is adjacent to the river.

**C. The Risk Associated with Leaving Material-At-Depth Exceeding the MPS is Low.**

There is little to no benefit (and certainly no net benefit in light of the worker safety risks) to removal of additional soils below the groundwater table in the Plant Area. Leachability studies, which were also conducted in Landfills 1 and 2, have been conducted for the Plant Area and show little risk of groundwater contamination if soils above the MPS are left in place below the groundwater table. Even if mercury were to leach into groundwater, it would be captured by the extraction well system.

Further, the MPS of 2.2 ppm for total mercury is considerably more protective than the Maine DEP’s RAGs. See RAGs for soils:

EXPOSURE PATHWAY	GUIDELINE EXPOSURE CONCENTRATION
Groundwater Exposure Residential (elemental mercury)	None applicable, as the guideline for this exposure scenario is based upon the Maine Bureau of Health Maximum Exposure Guidelines (“MEGs”) and there is no MEG set for elemental mercury.
Groundwater Exposure Construction Worker (elemental mercury)	1,500 ppb
Soil Residential (inorganic mercury compounds and mercuric chloride)	51 mg/kg

respect to the river. The Board found that Mr. Vaillancourt’s testimony regarding limitations on depth of excavation was persuasive. The Order required Mallinckrodt to conduct tests to determine the concentration of contaminants in soils beneath the waste in Landfill 1 and the ability of the contaminants of concern to desorb from the soils. BEP Order at 31-32.

Soil Commercial Worker (inorganic mercury compounds and mercuric chloride)	510 mg/kg
Soil Construction Worker (inorganic mercury compounds and mercuric chloride)	930 mg/kg

In formulating the RAGs, the exposure concentrations “were derived using conservative default exposure factors.” RAGs at 26.<sup>7</sup> The lowest guideline exposure concentration for mercury, associated with the Soil Residential exposure pathway, is 51 mg/kg (ppm)—more than an order of magnitude higher than the MPS of 2.2 ppm. Therefore, the risk associated with leaving materials exceeding 2.2 ppm in place is low.

The groundwater extraction system provides additional protection to prevent mercury in groundwater from reaching the Penobscot River. Prior to the excavation of soil in the Plant Area, the final extraction system (shown in Appendix A, Item 4 to the Wetherbee Aff.) will be installed in the former Landfill 1 area (between the plant and the Penobscot River). Groundwater monitoring to date shows significant improvement in mercury concentrations. Moreover, particle tracking has shown that mercury in groundwater at depth will be captured by the groundwater extraction system.

Leaving soils above the MPS in the Plant Area will not delay the time period for reaching the groundwater MPS compared to removal of all soils above the MPS. Groundwater data obtained from the Landfill 1 excavation with some soils left in place that are above the MPS shows that leaving such soils in place does not significantly extend the time for groundwater to reach the MPS. Based upon the low mercury concentrations in groundwater in the Plant Area, leaving certain deep soils in that area with mercury above the MPS would likely not increase the time for groundwater to meet the MPS.

**V. Proposed Modification.**

Mallinckrodt proposes to modify the BEP Order language as follows highlighted in red:

Excavation of solid media exceeding the Media Protection Standards. This includes all Plant Area Soils, Cell Building Soils, Retort and Old Retort Building Soils, Sediments, Landfill Ridge Soils, and sludges and other mercury contaminated material from Landfill 1 and Landfill 2, except the depth to which contaminated soil under **the Plant Area and Landfills 1 and 2** will be removed shall be determined as specified in Finding of Fact 10(D) of this Decision.

BEP Order at 53 ¶ 3(a).

...Mallinckrodt must conduct a study, proposed to and approved by the Department, to determine the approximate distribution of concentrations of mercury [and other materials]

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<sup>7</sup> The exposure concentrations established in the RAGs are considered to be “conservative” because they “were derived using conservative default exposure factors because all potential pathways were not considered.” RAGs at 26. The RAGs indicate that less conservative exposure assumptions may be employed where a site is adequately characterized and a full risk assessment is conducted. *Id.*

in the soils (both saturated and unsaturated) under Landfills[sic] 1, and mercury and carbon tetrachloride under Landfill 2, **and mercury in the soils (both saturated and unsaturated) in the Plant Area**. Mallinckrodt shall conduct column leaching tests such that the adsorption/desorption or other degradation processes of the residual soil contamination ~~beneath the landfills~~ can be quantified, and on this basis the Department shall determine the areas and depth of soil excavation ~~beneath the landfills~~. This determination must be based on modeling natural desorption/degradation processes and other considerations such as the type of final cover to be placed over the area of the landfills after they are excavated.

BEP Order at 39 ¶ 10(D).

#### **VI. Conclusion**

For the foregoing reasons, Mallinckrodt respectfully requests that the Commissioner initiate a modification of the Order before the BEP to allow certain soils above the MPS in the Plant Area to remain in place.

Thank you for your consideration of this matter. Please contact me at 314-797-7197 or 314-753-0413(cell) should you require additional information.

Very Truly Yours,

Patricia Duft  
On behalf of  
Mallinckrodt US LLC