August 10, 2026

Commissioner Katrina Kessler
Minnesota Pollution Control Agency
520 Lafayette Rd. N.
St. Paul, MN 55155

Dear Commissioner Kessler:

The Minnesota Resource Recovery Association (MRRA) is a statewide public-private membership organization that supports the utilization of today's waste as a local, renewable, and sustainable resource for tomorrow's energy. Our membership represents more than one-third of Minnesota counties and their solid waste management and recycling programs.

The MRRA appreciates the challenge undertaken by the Minnesota Pollution Control Agency (MPCA) to conduct a study and present a plan to get to a 90% reduction in the amount of materials disposed of in landfills or incinerators across Minnesota within the next twenty years. The report represents an opportunity to reimagine Minnesota's solid waste management system and look towards a future that is focused on community and regional collaboration centered around a circular economy. The scope of such an undertaking is daunting, and we appreciate the MPCA's efforts to fulfill this ambitious legislative charge.

To contextualize the magnitude of this challenge, Minnesota's current system is starting from recycling levels in the range of roughly 40–50 percent and organics diversion that remains comparatively low (often near or below 10 percent in many communities). Moving from these baseline conditions to a system that achieves a 90 percent reduction in landfill and waste-to-energy disposal within approximately two decades would require not only transformational infrastructure buildout, but also sustained changes in human behavior, public policy, markets, and funding over multiple implementation phases.

The cost of this transition is substantial: the report itself points to nearly $1 billion in capital investment for new facilities, in addition to ongoing program costs that could exceed tens of millions of dollars annually statewide for education, outreach, and system support. These investments come at a time when counties and local governments already face constrained resources, limited staffing, and competing priorities, raising serious questions about how such a system could be equitably funded and sustained.

Equally important, achieving the participation rates assumed in the model would require widespread and durable changes in human behavior—across residents, businesses, and property owners—without clear evidence of the policy tools, incentives, or enforcement mechanisms needed to drive that change. Experience shows that participation is neither automatic nor guaranteed, particularly when costs increase or systems become more complex, and failure to account for these behavioral realities introduces significant risk into the feasibility of achieving a 90 percent diversion goal.

To ensure this opportunity results in a practical and implementable path forward, we recommend that the report more clearly define a set of actionable solutions that address system governance, funding, and the role of existing infrastructure. Specifically, the report should consider:

- Establishing an organizational structure that enables regional collaboration through the formation of solid waste management districts or similar governance models to coordinate planning, investment, and system operations across jurisdictions;
- Identifying sustainable financial strategies, including mechanisms to support public–private partnerships, to fund the significant capital and ongoing programmatic investments required to transform the system;
- Clearly distinguishing between waste-to-energy (WTE) and landfill within the system framework, recognizing WTE as a preferred waste management strategy, consistent with Minnesota's waste hierarchy, and Minnesota WTE facilities operate with modern, well-maintained equipment, including air pollution control devices, that result in low emissions and low levels of human health impact, as well as serve as a critical transition tool to reduce landfill reliance while advancing materials up the hierarchy; and
- Providing a more comprehensive assessment of feasibility, including realistic timelines, funding pathways, and the behavioral changes required to achieve system-wide transformation.

Strengthening these elements will help align the report's vision with an actionable and implementable strategy that can be successfully advanced by counties, municipalities, and partners across the state.

For clarity and ease of understanding, we have aligned our comments with the report requirements laid out by the 2023 Minnesota legislature.

(1) an overview of how municipal solid waste is currently managed, including how much material is generated in the state and is reused, recycled, composted, digested, or disposed of;

The Resource Management Report (RMR) builds from existing reporting documentation to the MPCA, like SCORE reporting from counties, to present a picture of Minnesota's existing waste management system. The report presents a good analysis of materials to target for reduction in the waste stream based on waste characterization studies conducted across Minnesota. Unfortunately, the report brings in irrelevant waste data from Wisconsin and Iowa, states that have different regulations surrounding recycling and disposal. This results in flawed assumptions about Minnesota's waste stream. MRRA recommends the report limit its analysis to Minnesota-specific data for waste characterization and, if possible given current timelines, incorporate data from the recently completed waste characterization studies conducted by the MPCA.

Additionally, the report leans heavily on terminology shorthand to refer to broad concepts, which results in a lack of clarity and an unfortunate combining of concepts that should be considered separately. This oversimplification does a disservice to describing both the current waste system in Minnesota and the potential vision for 90% diversion. For example, the report combines waste-to-energy (WTE) and landfill into a combined "disposal" category, which ignores the value WTE currently brings to Minnesota for energy recovery and landfill reduction. Similarly, the report conflates downstream municipal solid waste (MSW) materials recovery with mixed waste processing. While the processes may be similar, the upstream systems leading to each are distinct and should be noted as such. Downstream materials recovery supports and relies on residents appropriately sorting their waste upstream, with resource recovery occurring only as a "last chance" resort. Conversely, mixed waste processing is a system where recyclable materials are not source separated upstream but instead focuses on the recovery process as the recycling opportunity. MRRA recommends that the authors define terms up front

with adequate and relevant differentiation of similar terms and processes and then use these terms consistently and with intention.

RMR does not align with existing and upcoming reports and policy changes that impact Minnesota's waste management system. For example, concurrently with the development of this report, the MPCA completed the Critical Materials Recycling and Recovery Task Force report. This report has a series of clearly identified recommendations regarding governance, implementation, and measurement that should at least be referenced by this analysis. Additionally, the framework outlined in the RMR fails to note upcoming mandates from the MPCA's Metro Policy Plan, including requirements for organics recycling and pre-processing of materials prior to landfill. Any scenario built to move Minnesota towards 90% diversion should consider and include these policy recommendations and changes.

(2) a summary of infrastructure, programs, policies, and resources needed to reduce the amount of materials disposed of in landfills or incinerators statewide by more than 90 percent over a 2021 baseline by 2045 or sooner. The summary must include analysis and recommendations of scenarios above Waste-to-Energy on the state's Waste Hierarchy that maximizes the environmental benefits when meeting the 90 percent reduction target;

The RMR presents the 90% diversion scenario as an attainable model, however, in reality the inputs that built the model are not currently achievable. The model relies on achieving an idealized 75% capture rate for curbside recycling and a 90% capture rate for yard waste, which is overly optimistic given current rates across Minnesota. The report offers no empirical evidence or behavioral mechanism to explain how the state will suddenly achieve these unprecedented participation metrics. Similarly, to reach its targets, the report assumes universal recycling access. However, current data shows that an abysmal 33% of multi-family complexes in Minnesota have any recycling infrastructure at all. The report fails to account for the massive, unfunded mandates that would be placed on property owners and/or counties to bridge that gap. The target of recovering 55% of wasted food is also unlikely given the current infrastructure. The report glosses over the current lack of commercial organic composting and anaerobic digestion facilities outside major metropolitan areas, leaving Greater Minnesota with no viable processing pathways without significant new investments.

The RMR presents an idealized mathematical model but leaves local municipalities completely in the dark regarding implementation costs. Achieving a 90% reduction requires a massive, multi-billion-dollar overhaul of collection fleets, transfer stations, and sorting facilities that local taxpayers will ultimately have to subsidize. In some ways the report attempts to acknowledge this reality. Buried on page 57, the report alludes to the unlikelihood of achieving the proposed scenario:

"Achieving the 90% diversion scenario assumes **near-optimal** participation and capture rates across all programs, increased reliance on MWP, and successful deployment of emerging or **unproven technologies**. Achieving this level would require significant new investments, regulatory development, and market creation, and **may not be realistic without major breakthroughs**." These limitations should be clearly identified at the outset to highlight the real limitations to achieving an idealized 90% diversion scenario.

(3) an analysis of: (i) waste prevention program impacts and opportunities; (ii) how much additional capacity is needed after prevention for reuse, recycling, composting, and anaerobic digestion systems to achieve that goal; and (iii) what steps can be taken to implement that additional capacity, including working collaboratively with local governments, industry, and community-based organizations to invest in such facilities and to work together to seek additional state and federal funding assistance;

MRRA appreciates the strong focus the RMR puts on the need for upstream programming, outreach, education and engagement. It is important for the report to recognize that this type of programming comes at a significant

cost that should be considered as part of the overall analysis. For example, Ramsey and Washington Counties invested over $12.5 million in 2025 on programs focused on food waste prevention, commercial and residential recycling, building materials reuse, and similar upstream efforts. Ramsey and Washington Counties represent 14% of the state's population. Using rough math, expanding similar efforts statewide would cost approximately $89 million each year. Even with these efforts, the average recycling rate between both counties in 2024 SCORE data is 48.7%, well below this report's stated goals.

The RMR's discussion of the need for upstream infrastructure for reuse, repair, and rental programs is a welcome addition to consideration of the need for additional waste processing infrastructure like composting, anaerobic digestion, and recycling facilities. The report notes, "Minnesota already has pockets of repair and reuse activity in every county, but these networks require additional support to expand, modernize, and scale their impact". It would be beneficial if the report provided more detailed recommendations of what that support should look like. What market support and incentives would be necessary and in what format (e.g., tax incentives, grant programs, etc.)? How much should SCORE funding be expanded so counties have the resources to support these efforts on a larger scale?

The RMR does an excellent job of recognizing the need for cross-jurisdictional collaboration to achieve these ambitious goals. Counties are responsible for managing solid waste, but they do not do it in a vacuum. The report calls for the creation of over 381 new facilities across Minnesota at a combined initial capital expenditure cost of over $980 million. Even if counties take on only a portion of this investment, with private industry and nonprofits addressing the remainder, the investment is still more than most counties could manage on their own. Investment of this scale will require regional coordination and management through comprehensive joint powers agreements, solid waste management districts, hub-and-spoke models, or other governance approaches.

(4) strategic programmatic, regulatory, and policy initiatives that will be required to produce source reduction, rethink and redesign products and packaging to more efficiently use resources, and maximize diversion from disposal of materials in a way that prevents pollution and does not discharge to land, water, or air or threaten the environment or human health;

Minnesota cannot continue to create and landfill millions of tons of garbage every year. We appreciate the RMR focuses on extended producer responsibility efforts, like the Packaging Waste and Cost Reduction Act, to address the upstream producer causes of waste in our system. If we are to achieve a zero-waste future, the continuous creation and consumption of products will need to be addressed.

Other policies that would need to be addressed under this scenario include how to manage out-of-state leakage and illegal dumping. The report artificially claims a 90% reduction in waste by tracking only what is disposed of *within* Minnesota borders. Without strict export controls, this policy may cause some private haulers to truck hundreds of thousands of tons of waste into neighboring states. Additionally, while the report prioritizes protecting internal Minnesota Environmental Justice (EJ) areas, its framework ignores the ethics of waste migration. Diverting Minnesota's trash across state lines unloads the state's environmental burdens onto disadvantaged, lower-income rural communities in Iowa, Wisconsin, and the Dakotas.

Similarly, if the costs related to additional processing facilities and recycling infrastructure become too burdensome for local residents, particularly in rural areas, illegal dumping in convenient ditches is likely to increase. The report takes a "if you build it, they will come" mentality to the use of these facilities and fails to account for consumer behavior that is resistant to change and particularly resistant to a cost increase when another "free" option exists. Appropriate state investment to address tipping fees and other barriers will be necessary to ensure the success of the scenario envisioned.

(5) recommendations for reducing the environmental and human health impacts of waste management, especially across environmental justice areas as defined under Minnesota Statutes, section 115A.03, and ensuring that the benefits of these resource management investments, including the creation of well-paying green jobs, flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution and that land, water, air, and climate impacts are considered; and

To address this requirement, the report goes beyond the legislative charge to model two scenarios, one where the remaining 10% of waste is handled with a combination of WTE and landfill, and a second scenario that eliminates WTE and relies solely on landfill. The report introduces bias into the analysis by not considering a third scenario that centers WTE with limited landfill only for that which cannot be managed in any other way. This biased framework is in direct contradiction to Minnesota's waste management hierarchy. MRRA recommends the report analyze the impacts of a third scenario utilizing current and expanded WTE facilities with minimal landfilling in alignment with established state waste management goals.

(6) the RMR human health and cumulative risks assessment does not provide sufficient analysis to support the conclusions that are drawn regarding the relative human health impacts, cumulative risks, or environmental justice outcomes associated with the waste management scenarios because:

- **Facility type/location by SVI quartile is not a robust assessment of human health impacts.** The current state of the science shows strong and consistent evidence that air pollution exposures and health risks are unevenly distributed across populations, with disadvantaged communities experiencing both higher exposures and worse outcomes. However, the science is still evolving in its ability to quantitatively attribute incremental health impacts to specific sources when social vulnerability is included. Evidence is also mixed on how much social vulnerability modifies the biological response to pollution versus simply reflecting higher exposures and baseline health risks. Furthermore, the analysis departs from standard risk assessment practices by discussing potential health effects associated with contaminants that ***may*** be present at various waste facility types without quantifying exposure concentrations, doses, or risk at a representative sample of WTE facilities.

- **MPCA fails to acknowledge key operational realities about WTE facilities. Human health risk impact is actually lower than what is presumed in the analysis.** Specifically, WTE facilities with high temperatures, appropriate residence times, and effective air pollution control systems have low emissions of dioxins, furans, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, particulate matter and volatile organic compounds (VOCs). This has been borne out based on actual emissions testing data. The WTEs in Minnesota operate with modern, well-maintained equipment, including air pollution control devices, which result in low emissions and low levels of human health impact.

- **Limitations and uncertainties acknowledged in the analysis do not appear to be accounted for in the conclusions.** For example, the report states: "While this assessment draws on reported data and literature, it does not include direct analysis of facility-level monitoring datasets. As a result, risk characterization reflects a screening-level evaluation and involves uncertainty." Thus, it is our opinion based on this limitation alone, conclusions regarding health risks associated with particular types of waste management facilities should not be made without more comprehensive analyses.

- **The analysis ignores emissions and human health risk tradeoffs or unintended impacts associated with the replacement infrastructure required for the various diversion scenarios.** Here are four examples illustrating the unintended impacts.
    - Shifting waste management from WTE facilities and landfills relies on a more distributed system to accommodate a larger volume of reuse and recycling. Reuse and recycling introduce additional collection, sorting and redistribution (to get the materials from the processing facility to the new users) steps that could conceivably result in more vehicle miles traveled (VMT), fuel use, and resulting emissions that could occur in environmental justice areas. For urban locations, this could be significant because mobile sources already dominate pollutant emission rates and drive human health risk.
    - Recycling is not an impact-free activity – it is an industrial, energy-intensive process with emissions and potential impacts that largely depend on what is being recycled and by what process. The report does not address the offset of WTE or landfill impacts with recycling impacts.
    - If processing at WTE facilities is reduced or shut down, the impact of shifting the energy generation capacity from WTE to other, potentially fossil fuel-combustion sources, is not accounted for or acknowledged in the analysis.
    - As waste is diverted from WTE and landfills to reuse and recycling, there is an increased risk that materials (like PFAS, for example) unintentionally reach the reuse or recycling stream and are not treated or contained in the more protective way as with WTE facilities and landfills. This could pose additional risk of exposure to these materials to workers and nearby receptors.

  More detailed comments by report page number related to the human health and cumulative risks assessment are described in Attachment A.

(7) a review of feasibility, assumptions, costs, and milestones necessary to meet study goals.

While the report presents a vision for achieving a 90 percent reduction in landfill and waste-to-energy disposal, it does not provide a realistic or actionable pathway for implementation. The assumptions underlying the model—particularly related to participation rates, infrastructure deployment, and funding—are not supported by current system performance or demonstrated experience in Minnesota.

From a baseline of recycling rates in the range of approximately 40–50 percent and organics diversion that often remains near or below 10 percent in many communities, achieving a 90 percent reduction within approximately two decades represents a generational transformation of the entire solid waste system. This level of change would require not only rapid and sustained infrastructure development, but also coordinated policy alignment, market expansion, and programmatic scaling across all regions of the state.

The cost of this transition is substantial and significantly underrepresented in the report. The analysis identifies the need for more than 381 new facilities across Minnesota, with an estimated initial capital investment exceeding $980 million. In addition to capital costs, ongoing programmatic expenses are considerable. The analysis does not fully account for additional costs related to collection system changes, contamination reduction, enforcement, staffing, or long-term system maintenance.

These investments must be considered in the context of existing resource constraints. Counties and local governments—who bear primary responsibility for solid waste management—already face limited funding, staffing capacity, and competing infrastructure priorities. The report acknowledges these constraints through stakeholder feedback but does not provide a clear strategy for addressing them or identifying sustainable

funding mechanisms. Without a defined approach to financing and governance, the proposed system risks place an untenable burden on local jurisdictions and ratepayers.

Equally important, the model relies on achieving near-optimal participation and capture rates across recycling and organics systems, yet it does not identify the behavioral, policy, or enforcement mechanisms necessary to reach those levels. Experience in Minnesota and nationally demonstrates that participation is highly variable and sensitive to system complexity, convenience, and cost. Even in regions with significant investment in outreach and education, recycling rates remain well below the levels assumed in the report.

The RMR also underestimates the challenge of sustained behavior change. Achieving widespread adoption of new sorting requirements, organics participation, and waste reduction practices across residents, businesses, and property owners requires long-term investment in education, incentives, and compliance mechanisms. The potential for unintended consequences—including increased contamination, non-participation, or illegal dumping—should be more fully evaluated as part of any implementation strategy.

Finally, the report acknowledges that achieving the 90 percent diversion scenario depends on near-optimal system performance and, in some cases, emerging or unproven technologies. These key variables introduce significant uncertainty into the model and reinforce the need for a phased, milestone-based approach that includes realistic assumptions, pilot validation, and transparent evaluation of risks.

In summary, while the goal of significantly reducing waste disposal is broadly shared, the pathway outlined in the report does not yet meet the standard of feasibility required for statewide implementation. A credible strategy must include a comprehensive accounting of costs, a realistic assessment of system capacity and consumer behavior, and a clear framework for funding, governance, and phased execution.

(b) The commissioner must obtain input from counties and cities inside and outside the seven-county metropolitan area; reuse, recycling, and composting facilities; anaerobic digestion facilities; waste haulers; environmental organizations; community-based organizations; Tribal representatives; and diverse communities located in environmental justice areas that contain a waste facility.

We appreciate the attempts at outreach the MPCA put forward when pulling together this report. However, the RMR does not appear to adequately address many of the current and anticipated barriers raised by stakeholders. For example, the report notes that “Local governments consistently underscored the strain of limited capacity and funding, particularly in smaller counties and rural areas, where long hauling distances and low population density make recycling and composting costly. Respondents emphasized that the most useful support for county and municipal recycling operations would be increased and more flexible funding, particularly through expanded SCORE allocations and state grants, noting that financial constraints and limited staffing remain the most significant barriers” (p. 174). Unfortunately, the report does nothing to address these concerns or to outline how they must be met to expand the system effectively.

MRRA also has concerns about the disproportionate engagement that happened with certain groups in the development of the report and not with others. Two public meetings were convened with environmental justice organizations, but industry stakeholders only received a presentation at a large, already scheduled conference. Additionally, comments from advocacy coalitions were accepted early, prior to the public comment period, and had a direct impact on the recommendations of this report. This creates a skewed feedback system outside the established structure that results in certain groups having a disproportionate impact on the development of the RMR.

As we look at the future of solid waste management in Minnesota, the RMR presents some useful guidance for areas of needed investment and policy changes to reduce the amount of waste created and processed in Minnesota. As a next step, MRRA recommends the creation of a task force of key stakeholders, including

counties and local governments, solid waste industry experts, and environmental advocacy coalitions to work together to discuss concrete actions that can be taken to move Minnesota's solid waste management system forward.

Sincerely,

Sam Holl
Acting Chair
Minnesota Resource Recovery Association

Comments on Minnesota Pollution Control Agency May 2026 Draft Minnesota Resource Management Report – Human Health and Cumulative Risks and Ecological Risk Potential Assessment Sections

Human Health and Cumulative Risks

In general, the Human Health and Cumulative Risks section does not provide sufficient analysis to support the conclusions that are drawn regarding the relative human health impacts, cumulative risks, or environmental justice outcomes associated with the waste management scenarios because:

- Facility type/location by social vulnerability index (SVI) quartile is not a robust assessment of human health impacts.
- MPCA fails to acknowledge key operational realities about WTE facilities that indicate human health risk impact is lower than what is presumed in the analysis.
- Limitations and uncertainties acknowledged in the section do not appear to be accounted for in the conclusions.
- The analysis ignores emissions and human health risk tradeoffs or unintended impacts associated with the replacement infrastructure required for the diversion scenarios.

1. Page 108. The Human Health and Cumulative Risks section notes that human health risk assessment is done with hazard identification, dose-response assessment, exposure assessment and risk characterization. These are steps typically associated with human health risk assessment conducted by the U.S. Environmental Protection Agency (USEPA), Minnesota Pollution Control Agency (MPCA), and Minnesota Department of Health (MDH) and in particular, evaluating human health risk associated with a specific facility's operations and emissions. The assessment in this section of the report does not use core concepts of quantitative risk assessment, and therefore, conclusions cannot and should not be drawn regarding risks from specific facilities or types of facilities. Further, "Cumulative Risk" and cumulative risk assessments are a developing science, with no clear and consistent definition or process from the USEPA. The use of facility count by social vulnerability index (see Comment 9) is not a process contemplated by USEPA, MPCA or other states with programs.

   The section departs from standard risk assessment practice by discussing potential health effects associated with contaminants that may be present at various waste facility types without quantifying exposure concentrations, doses, or risk. The report acknowledges that contaminant concentrations and dose estimates were unavailable, so health concerns are prioritized based largely on epidemiological studies reporting correlations between proximity to waste facilities and adverse outcomes. Epidemiological studies may be useful for identifying potential associations, but they do not establish causation, facility-specific risk, or applicability to Minnesota facilities operating under current regulatory and technological conditions. Without concentrations, exposure assessment, dose-response analysis, or

quantitative risk characterization, the MPCA cannot determine whether potential exposures exceed health-based benchmarks or whether the magnitude of any resulting risk is likely to be significant. Based on these limitations, the title of the section overstates what is addressed and the conclusions therein are not supported by the analysis.

2. Page 108. The report states: “While this assessment draws on reported data and literature, it does not include direct analysis of facility-level monitoring datasets. As a result, risk characterization reflects a screening-level evaluation and involves uncertainty.” Based on this qualification, conclusions regarding health risk associated with particular types of waste management facilities should not be made.

3. Page 109. The report states: “MSW facilities can release a diverse assortment of contaminants and pollutants, many of which have a known potential to negatively impact human health.” This sentence should be revised to include the following: “…known potential to negatively impact human health <u>if the release results in receptors being exposed to concentrations above specific thresholds or benchmarks.</u>” The presence of chemicals alone does not result in negative impacts to human health. According to the MDH, there are levels of pollutant, below which, are not likely to contribute to negative health impact. As noted above, “dose-response”, or the amount of a pollutant, is significant in the human health assessment process typically used by the USEPA, MPCA, and MDH. The analysis in the Human Health and Cumulative Risks section does not account for the dose-response assessment.

4. Page 109. The report states: “Potential exposure pathways were identified for each group of contaminants in relation to specific types of MSW facilities. Although contaminant concentrations extrapolated to dosages were not available, the potential health implications of these contaminants found from exposure to MSW facilities were evaluated. Health impacts were prioritized based on prior epidemiological studies that showed a correlation between the potential presence of the contaminant in MSW facilities, and the health implications reported.” Without concentrations and the dose-response evaluation, health implications cannot be evaluated.

5. Page 110, Table 38. WTE facilities with high temperatures, appropriate residence times, and effective air pollution control systems are expected to have very low emissions of dioxins, furans, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, particulate matter and volatile organic compounds (VOCs). This has been borne out based on emissions testing.

6. Page 110. The report states: “While the magnitude and route of exposure for pollutants may vary by facility type, the cumulative burden on human health by Minnesota’s MSW infrastructure is driven by facility conditions, presence and mobility of contaminants, proximity to humans, and social vulnerability of populations.” The presence of contaminants alone does not result in a burden on human health. There are benchmark concentrations

below which, they are not likely to result in adverse human health. This oversight makes any conclusions and interpretations of this report section unsupportable.

7. Page 111. The report states: “Influencing factors for WTE facilities include the age of the facility, the type of fuel used (e.g., feedstock, refuse-derived fuel), how that fuel was created (e.g., pyrolysis, gasification, direct combustion), and the types of air pollution control devices in place. Older facilities, or those without sufficient air pollution control devices, do not limit the level of emissions of pollutants compared to facilities with modern, well-maintained equipment.” For a given facility type, it is not clear whether MPCA considers the type to be represented by the older, less effectively-controlled facility, or the modern, well-controlled facility. If there is such a range, it is not clear how MPCA can draw conclusions about the facility type as a whole. Any conclusion regarding the collective group of WTE facilities, or diversion from these facilities, would fail to acknowledge the range of this influence. The WTEs in Minnesota operate with modern, well-maintained equipment, including air pollution control devices, that result in low emissions and low levels of human health impact. Note also, “fuel” is not “created” by pyrolysis, gasification or direct combustion.

8. Page 112 and Table 12. The report states that “Each contaminant has been assessed as to the likelihood of existing in each MSW facility compared to the other facilities, and whether the existence would cause health impacts… As an example, PCDDs, PCDFs, and PCBs are combustion byproducts, so they are more likely to be found in WTE facilities and ash landfills, compared to facilities without incineration. Therefore, the likelihood is considered “high” compared to other facilities, but does not mean there is a definite high prevalence of PCDDs, PCDFs, and PCBs in Minnesota’s WTE facilities and ash landfills.” A “high likelihood”, but no “definite high prevalence” appears to be a direct contradiction. Given the high temperatures at which WTE facilities are operated, a high prevalence of organic compounds like VOCs, PAHs, PCDDs, PCDFs, PCBs, or contaminants that cause noxious or odorous gases would not be expected. Also, with proper air pollution controls, we would expect low prevalence of particulate matter and heavy metals. Further, the existence of chemicals alone, does not result in negative impacts to human health. According to the MDH, there are levels of pollutant, below which, are not likely to contribute to negative health impact.

9. Page 114-131. The report relates social vulnerability (via the CDC/ATSDR social vulnerability index (SVI)) to facility location to “assess risk of burden to human health” for the baseline and two diversion scenarios. On Page 131, the report states: “Therefore, the diversion scenario without WTE facilities and ash landfills operating may be the most equitable in terms of environmental justice and social vulnerability.” It draws this conclusion because that scenario:
    - Reduces the exposure to (i.e., there are fewer MSW facilities in) 4th quartile populations at a greater rate than current operations
    - Reduces the number of facilities in the regions with the highest number of facilities operating in 4th quartile communities

- Has the most equal distribution of facilities operating in the 4th quartile across all regions of Minnesota, as well as the state as a whole.

Notably, on Page 75, the report acknowledges that the diversion scenarios will require additional processing locations. The report states the following: "To understand how new diversion infrastructure could be distributed statewide, the modeling included a hypothetical siting analysis. This analysis considered population density, existing facilities, drive times, and distances to transfer stations in order to maximize coverage while minimizing overlap. Environmental justice areas were also mapped, with a 5-mile buffer applied to guide siting decisions and reduce disproportionate impacts." If the new hypothetical processing facilities were sited away from environmental justice areas, they would be less likely to be in higher SVI quartiles. Therefore, it is difficult to tell whether the diversion scenarios are more "equitable" because the WTE facilities and landfills are not operating, or because siting assumptions placed the new hypothetical facilities in areas with lower SVI scores.

The presence and count of facility type by SVI quartile, nor the corresponding change of such based on a particular diversion scenario, is not a conclusive measure of an equitable scenario to support solid waste management policy decisions. In addition, monitoring potential exposures near actual facilities (i.e., conducting human health risk assessments using the procedures in the first paragraph of the section) may also show that certain facilities pose low risk.

The current state of the science shows strong and consistent evidence that air pollution exposures and health risks are unevenly distributed across populations, with disadvantaged communities experiencing both higher exposures and worse outcomes. However, the science is still evolving in its ability to quantitatively attribute incremental health impacts to specific sources when social vulnerability is included. Evidence is also mixed on how much social vulnerability modifies the biological response to pollution versus simply reflecting higher exposures and baseline health risks.

10. Page 133. The report states: "While facility characteristics vary, the literature consistently indicates that MSW landfills, ash landfills and WTE facilities historically present the greatest risks to human health." The literature that is referenced here should be cited and it should be clear whether this is based on human health risk assessment or epidemiological studies. If epidemiological studies, then it should not be stated as "present the greatest risk." Epidemiological studies evaluate correlation; they do not establish causation or measure risk. Further, if the statement is based on assessment of risk, it should clarify "present the greatest risk" compared to what? Other types of waste management facilities? Other types of emissions sources (point sources, area sources, mobile sources)? MPCA's own MNRISKs data have shown that human health risks in the Twin Cities Metro Area (TCMA) is largely driven by emissions from mobile and area sources. If the risk data is specific for MSW landfills, ash landfills and WTE facilities, it should also clarify whether those risks exceed MDH or corresponding agency health benchmarks (e.g., non-cancer hazard index greater than 1.0, cancer risk greater than 1×10^{-5}). Also, this sentence seems to be in direct contrast to the following statement on Page 134: "…a well-maintained, modern WTE facility

with stringent pollution controls may pose less risk than a poorly maintained MRF." Because of air quality permit requirements, all Minnesota WTE facilities are well-maintained and operate stringent air pollution control systems. Therefore, it is not accurate to indicate that they present the greatest risks to human health.

If this statement is based on epidemiological studies, it should be noted that there are limited studies on MRFs, compost sites and other types of processing facilities that will be relied on under the divergence scenarios. Therefore, it is difficult to draw conclusions around one facility type versus another.

11. Page 134. Based on the limitations of the analysis, the human health risk assessment section appropriately draws the following conclusion: "…eliminating a single facility type should not be assumed to consistently shift human health risks in one direction" – i.e., reduce human health risk. The Human Health and Cumulative Risks section ignores the potential for new reasonably foreseeable human health risks resulting from the diversion scenarios. The following are four examples of how diversion could result in emissions and risks that are not accounted for in the report's analysis:

    - Shifting waste management from WTE facilities and landfills relies on a more distributed system to accommodate a larger volume of reuse and recycling. Reuse and recycling introduce additional collection, sorting and redistribution (to get the materials from the processing facility to the new users) steps that could conceivably result in more vehicle miles traveled (VMT), fuel use, and resulting emissions that could occur in environmental justice areas. For urban locations, this could be significant because mobile sources already dominate pollutant emission rates and drive human health risk.
    - Recycling is not an impact-free activity – it is an industrial, energy-intensive process with emissions and potential impacts that largely depend on what is being recycled and by what process. The report does not address the off-set of WTE or landfill impacts with recycling impacts.
    - If processing at WTE facilities is reduced or shut down, the impact of shifting the energy generation capacity from WTE to other, potentially fossil fuel-combustion sources, is not accounted for or acknowledged in the analysis.
    - As waste is diverted from WTE and landfills to reuse and recycling, there is an increased risk that materials (like PFAS, for example) unintentionally reach the reuse or recycling stream and are not treated or contained in the more protective way they are in WTE facilities and landfills. This could pose additional risk of exposure to these materials to workers and nearby receptors.

The analysis does not appear to quantify whether adding dozens of recycling, composting, and MWP facilities could create new community-level impacts (truck traffic, odors, bioaerosols, noise, local air emissions, stormwater, etc.) that offset some of the benefits associated with reducing landfill or WTE activity.

Ecological Risk Potential Assessment

In general, the ecological risk potential assessment provides a very high-level analysis of potential environmental impacts of MSW infrastructure to the environment, including identifying areas where waste management infrastructure, contaminant transport pathways, and ecologically sensitive resources may coincide. However, the analysis incorrectly asserts that the methodology used is consistent with USEPA ecological risk framework and guidance for an ecological risk screening-level assessment. The lack of a conceptual site model that links COPCs with exposure routes and environmental media to determine whether exposure pathways to MSW infrastructure-related COPCs exist for ecological receptors, the lack of discussion and acknowledgment of site-specific variables impacting potential for ecological exposure, and the use of qualitative assignment of generalized factors for assessment results in a largely simplified evaluation of potential ecological impacts posed by WTE facilities. In addition, several aspects of the methodology and interpretation require additional clarification to improve transparency and allow readers to fully understand how ecological concern scores were developed and applied.

1. The chapter relies heavily on numbered citations; however, the accompanying reference list is not numbered, making it difficult to identify the source associated with individual citations and verify the evidence supporting key assumptions and conclusions. In addition, it is not clear that all references cited in the report are included in the Works Cited section (e.g., U.S. EPA Guidance [1-3]).

2. Citations are used to support ecological receptors, exposure pathways, vulnerability datasets, and ecological effects conclusions; however, the Works Cited section does not contain references directly related to ecological risk assessment. Therefore, it is difficult to verify the evidence supporting key assumptions and conclusions.

3. The sources are not identified for several frequently cited references (e.g., Refs. 39, 88, and 89), which are relied upon to support key assumptions regarding contaminant pathways, ecological vulnerability, and cumulative ecological concern. Therefore, it is difficult to verify the evidence supporting key assumptions and conclusions.

4. Page 137. The report states: “The complete inventory of COPCs, including CAS numbers and regulatory designations, provided in the Appendix B - Human Health and Cumulative Risks, summarizes the major contaminant groups included in the ERA, their regulatory anchors, and dominant exposure pathways.” The information is not provided in Appendix B. Therefore, it is difficult to verify the evidence supporting key assumptions and conclusions.

5. Page 139. The report states: “A full list of datasets and layers [used in the Pressure x Exposure x Vulnerability framework] can be found in Appendix B - Human Health and Cumulative Risks.” The referenced information is not provided; therefore, it is difficult to verify the evidence supporting key assumptions and conclusions.

COPCs and Model Development

6. Page 137, Table 47. The rationale for COPC selection is not always clear. Additional discussion of how COPCs were screened, prioritized, or excluded would improve transparency and help readers evaluate whether the selected COPCs appropriately represent ecological stressors associated with Minnesota's waste management infrastructure. Examples of this include the following:

    - Mercury is identified as a contaminant of concern; however, the assessment does not discuss methylmercury, which is generally the more ecologically relevant form in aquatic systems due to its bioavailability, bioaccumulation, and trophic transfer potential. Consider discussing the relevance of methylmercury to aquatic food webs and clarifying whether mercury-related ecological concerns are intended to encompass methylmercury exposure pathways.
    - Sulfur is not identified as a contaminant of concern. However, sulfate is identified elsewhere in the assessment as a contaminant of concern associated with ash landfills, indicating that sulfur-related releases were considered relevant to at least some waste management facilities. Minnesota also contains ecological receptors that may be particularly sensitive to sulfur loading, including wild rice systems. Please discuss whether sulfur-related stressors were evaluated during the COPC screening process and provide the basis for excluding sulfur from the list of COPCs, if applicable.

7. Page 138-140, Figure 54 and Model Design and Approach. The assessment appears to function primarily as a vulnerability model, identifying locations where contaminant sources and transport pathways overlap with ecologically sensitive resources. While the report provides substantial discussion of vulnerable habitats and ecological sensitivity indicators, there is comparatively limited discussion of how contaminant exposures may translate into ecological effects on identified receptors. Additional discussion of ecological assessment endpoints, receptor-specific sensitivities, contaminant-specific effects, and available ecological thresholds would strengthen the ecological basis of the risk characterization and improve the linkage between ecological vulnerability and ecological effects.

8. Page 140, Table 49. Table 49 identifies risk-influencing facility conditions for each facility type; however, the purpose of these conditions within the ecological risk assessment is unclear. Later in the section, the report indicates that exposure potential was not differentiated based on facility-specific engineering controls or containment infrastructure and was instead characterized using facility type and landscape context. As a result, it is unclear how the listed conditions (e.g., aging liner systems, unlined ash monofills, outdated air pollution controls, lack of runoff management infrastructure) were used in the analysis or how they influenced ecological concern scores. Additional explanation of the purpose and application of these conditions would improve transparency and help readers understand their relevance to the assessment.

9. Page 138, Table 48. The conceptual site model summarized in Table 48 lacks a linkage of transport mechanisms to ecological receptors through environmental media (e.g., soil, water) and exposure routes (e.g., direct contact, dietary ingestion) that is needed to make conclusions about whether exposure pathways to site COPCs is complete or incomplete (all are listed as “complete” or “potential”).

10. Page 154, Table 50. Table 50 identifies the exposure and vulnerability drivers used in the ecological risk model; however, limited information is provided regarding the derivation, scoring, normalization, and relative influence of individual drivers. While the report identifies the datasets used to represent exposure and vulnerability, additional documentation describing how each driver was incorporated into the analysis would improve transparency and allow readers to better understand the basis for the ecological concern rankings.

Exposure and Vulnerability Assessment

The assessment relies heavily on landscape-scale exposure and vulnerability indicators. While appropriate for a generally high-level evaluation, the relationship between these indicators and site-specific ecological risk is not always clear.

11. Page 153-156, Regional Ecological Concern Analysis. The planning-region analysis provides a useful statewide perspective on how ecological sensitivity and waste infrastructure are distributed across Minnesota. However, ecological concern scores should not be interpreted as indicators of facility siting suitability. Facility siting decisions are driven by site-specific factors such as hydrogeology, receptor proximity, engineering controls, facility design, and local environmental conditions that may not be reflected in regional-scale averages. Additional discussion of the distinction between regional ecological vulnerability and site-specific suitability would help prevent overinterpretation of the results.

Problem Formulation and Intended Use

12. Page 135-169, Ecological Risk Potential Assessment Problem Formulation and Intended Use. The purpose of the Ecological Risk Potential Assessment is not always clearly articulated. While the chapter discusses diversion scenarios, ecological vulnerability, and planning applications, the specific management question and intended use of the results are not explicitly stated. The section lacks a concise problem formulation statement describing why the assessment was conducted, what decision-making needs it is intended to support, and how the resulting ecological concern scores should be interpreted and applied. This would provide important context for any subsequent modeling and risk characterization.

Results Interpretation

13. Page 156-157, Table 51. Table 51 identifies high-risk facilities; however, the criteria used to define or select these facilities are not clearly stated. Please clarify whether facilities were identified based on a specific ecological concern score threshold, percentile ranking, regional ranking, or another screening criterion. Defining the basis for inclusion would improve transparency and interpretation of the results.

14. Page 157-158. The discussion of cumulative areas of elevated concern in the TCMA is conceptually reasonable; however, it is not clear whether cumulative ecological concern was quantitatively evaluated or inferred from the co-occurrence of facilities and sensitive ecological resources. Multiple pathways (e.g., leachate, stormwater runoff, and atmospheric deposition) are identified, but the report does not explain how these pathways were integrated or whether additive effects were explicitly assessed. Additional discussion of the evidence supporting the TCMA as an area of cumulative ecological concern, including the relative contributions of facility density, exposure drivers, and ecological vulnerability, would improve transparency and strengthen interpretation of the results.

15. Page 160, Table 52. The report would benefit from additional explanation of the diversion scenarios and how they were incorporated into the ecological concern model. Table 52 presents summary statistics for facility-level ecological concern scores under current and modeled diversion scenarios; however, it is unclear how facility counts, facility locations, and facility-level scores were determined under the future scenarios. Additional documentation of the modeled facility network, siting assumptions, and calculation methodology would improve transparency and allow readers to better understand the basis for the reported changes in ecological concern.

Synthesis and Planning Relevance

16. Page 169. The conclusions presented in this section occasionally appear more definitive than the underlying analysis supports. Throughout the report, the ecological concern score is described as a relative indicator of ecological risk potential and not a prediction of ecological effects or site-specific impacts. However, several conclusions extend beyond relative concern and imply demonstrated ecological outcomes or cumulative effects. The conclusions should reflect that the results identify relative ecological concern and planning priorities rather than quantified ecological impacts, cumulative effects, or facility-specific management needs.

    The assessment appropriately identifies ecological sensitivity zones and facility classes that may warrant enhanced monitoring, management, and planning attention. However, the findings could be interpreted as implying regional suitability or unsuitability for future facilities. Because the assessment is based on general ecological concern indicators rather than site-specific evaluations, it would be helpful to clarify that the results are intended to support prioritization and planning rather than direct facility siting decisions.

> Site suitability is ultimately influenced by local environmental conditions, facility design, engineering controls, and operational practices that are not captured in the regional ecological concern framework.

Overall, the ecological risk potential assessment provides a high-level screening framework for evaluating where waste management infrastructure, potential contaminant transport pathways, and ecologically sensitive resources may coincide. The assessment identifies several important considerations for long-term planning, including the influence of regional ecological vulnerability, facility density, facility type, and contaminant transport pathways on relative ecological concern. However, the linkage between the conceptual model, quantitative scoring framework, and resulting conclusions is not always clear.

Several findings and planning implications appear more definitive than the underlying screening-level analysis supports, particularly statements suggesting that specific facility classes represent persistent high-concern categories, that cumulative ecological stress has been demonstrated in specific regions, or that monitoring, technological controls, and residuals management are warranted based on the ecological concern scores. As an example, Page 170 of the report states: “For MPCA, these findings provide a clear basis for prioritization. The assessment indicates that WTE facilities, MSW landfills, and ash landfills represent persistent high-concern facility classes where sustained monitoring, technological controls, and residuals management are warranted." The level of analysis does not support this statement.

The analysis may be reasonable as planning considerations, but the assessment does not appear to quantify contaminant loading, site-specific exposure, ecological response thresholds, cumulative effects, or facility-specific risk. As a result, while the general conclusions may be useful for informing broad waste management planning and identifying priorities for further evaluation, additional transparency regarding model assumptions, data sources, COPC selection, conceptual model implementation, vulnerability drivers, facility siting assumptions, and interpretation of model outputs would improve confidence in the ecological concern rankings and the conclusions drawn from them.