

Soil Reuse Study

**Prepared For:
Hennepin County**

Prepared By:



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1.0 INTRODUCTION

Hennepin County retained Minnesota Brownfields to evaluate the potential for cost savings associated with the off-site reuse of soil at brownfield sites and the legal framework surrounding soil reuse. Current Minnesota regulations allow on-site reuse of marginally contaminated soils¹ at redevelopment sites under the oversight of the Minnesota Pollution Control Agency (MPCA) Brownfield Program. However, on a site-specific basis, the opportunity for on-site soil reuse may be limited by lack of space, geotechnical conditions, or other variables. In situations where soil cannot be reused on-site, excess soils with low-level impacts are usually transported to landfills for disposal, thereby increasing project costs and vehicle air emissions,² and consuming landfill capacity. The additional costs are either borne by the developer or by public brownfield grant programs. Recent MPCA programmatic developments allow for some off-site soil reuse of marginally contaminated soils. However, it appears that these changes have not been sufficient to encourage further expansion of off-site reuse. Additionally, limited documentation exists on the potential economic and environmental benefits of off-site soil reuse.

About Minnesota Brownfields

Minnesota Brownfields is a 501(c)(3) non-profit organization founded in 2006 to support and promote reuse and redevelopment of contaminated lands throughout the state of Minnesota through education, research and partnerships. Minnesota Brownfields was formed by an interdisciplinary group of public and private sector individuals with the express goal of reinvigorating policy and practices to facilitate the cleanup, reuse and redevelopment of contaminated land throughout the state. Minnesota Brownfields regularly identifies and works to remove barriers and inefficiencies in current redevelopment regulations and practices.

This study was performed in conjunction with the partners and contributors acknowledged in Appendix A. The objectives of this study were the following:

- Gather site-specific data on soil-reuse activities, costs, and limiting factors in Minnesota.
- Examine and quantify the economic impacts of off-site soil disposal versus off-site soil reuse of marginally contaminated soil.
- Examine and quantify environmental impacts of off-site soil disposal versus off-site soil reuse.
- Summarize the current regulatory and policy framework for off-site soil reuse in Minnesota.
- Define the barriers to off-site soil reuse in Minnesota, both in policy and in practical application.
- Recommend solutions to encourage and increase off-site reuse of marginally contaminated soil.

1.1 BACKGROUND INFORMATION

In practice, most brownfield sites are redevelopment sites, and brownfield cleanup is generally conducted in tandem with redevelopment construction. At any construction project, it is necessary to bring a project to the correct grade and/or to remove soils that are structurally unfit

¹In this project, “marginally contaminated soil” is defined as fill material determined through laboratory analysis to meet the MPCA definitions of “unregulated” or “regulated” fill, or fill material meeting site-specific risk-based criteria for on-site management, as further discussed in Appendix C, footnote 1.

² Vehicle air emissions associated with soil disposal are primarily diesel emissions.

for the proposed use. At a non-brownfield construction site, excess fill soils can be reused at nearby construction sites, thereby reducing hauling costs and eliminating landfill fees. Excess fill soils from regulated brownfield sites, however, are stigmatized and are typically disposed of off-site at landfills as daily cover or waste. This is true, whether the soils meet the MPCA's definition of "unregulated fill" or the MPCA's less stringent criteria for commercial or industrial land uses, because there is little market for soil coming from property with a "regulatory history."

The MPCA's Voluntary Investigation and Cleanup (VIC) Program and Petroleum Brownfields Program (PBP), collectively referred to as the "MPCA Brownfield Program," provide assurances, including statutory liability protection and site closure documents, to parties that voluntarily assess and cleanup sites under MPCA oversight. Currently, the statutory liability assurances do not extend to exporting marginally contaminated soil to an off-site property or property owners who are willing to accept such soil. The resulting lack of regulatory closure and exposure to liability serve as barriers to off-site soil reuse.

Hauling and disposing of soil at a landfill adds significant costs to brownfield redevelopment (from tens of thousands to hundreds of thousands of dollars for an individual site). Most Minnesota cleanup grant programs consider the excavation, transportation, and landfill disposal of soil – including unregulated fill – to be a grant-eligible expense. Therefore, the amount of grant funds spent on hauling and disposal of soils from brownfield sites can be considerable.

The concept of off-site reuse of excess fill soils from brownfield redevelopment has been discussed in Minnesota for many years amongst developers, consultants, and government entities. The topic was identified in 2007 by Minnesota Brownfield members as one of several barriers to more efficient and effective brownfield redevelopment. In 2008, Minnesota Brownfields held a forum titled "Reuse of Fill Soils from Brownfield Sites: National Models and the Minnesota Experience," which defined the issue and explored possibilities.

Since 2008, the MPCA policy on the off-site reuse of fill from brownfield sites has evolved. MPCA guidance distinguishes between "unregulated fill" and "regulated fill" and provides for the off-site reuse of both unregulated and regulated fill. In practice, however, the regulated fill guidance has not been implemented. Appendix B provides a summary of the current status and evolution of policy affecting the reuse of soils from brownfield sites in Minnesota.

The off-site reuse of marginally contaminated soils from brownfield sites appears to be a viable alternative to landfill disposal. There are many potential environmental and economic benefits to implementing policies that would permit the movement of marginally contaminated soil between brownfield sites, including:

- Significant cost savings for individual site cleanups.
- More efficient use of public brownfield grant funds and private investment capital that are currently spent on soil disposal and purchase of clean fill material.
- Conservation of landfill space by avoiding disposal of soils that can safely be reused.
- Preservation of greenfield space that would otherwise be mined for clean fill.

- Reduction of the carbon footprint of individual brownfield projects due to decreased hauling distances.

To date, there is no documentation of the magnitude of these potential benefits. This study strives to: a) provide this missing documentation, b) analyze barriers to realizing these potential benefits, and c) propose potential solutions to these barriers.

1.2 STUDY OVERVIEW

The Soil Reuse Study is comprised of three components: cost analysis, environmental impact analysis, and policy analysis. The cost and environmental impact analysis portions of the study focus on examining a set of redevelopment case studies to determine the economic and environmental benefits of off-site reuse of marginally contaminated soils as compared to landfill disposal. The policy analysis portion of the study assesses regulatory and statutory barriers to off-site soil reuse and evaluates potential regulatory and statutory changes to encourage off-site reuse of marginally contaminated soil.

2.0 SOIL REUSE - COST ANALYSIS

The cost analysis portion of the study sought to examine the economic impact of current soil reuse practices at brownfield redevelopment projects in Minnesota by analyzing the soil disposal, on-site reuse, and off-site reuse patterns at a set of eleven brownfield sites where remediation had occurred in the past 10 years (2004 – 2013). The eleven sites that were evaluated were distributed between the Twin Cities (8), Twin Cities suburbs (2), and out-state metro areas (2) (Appendix C - Figure 1).

Details on the soil reuse study methods, site selection process, data interpretation, site-specific findings, study limitations, results, and conclusions are presented in the text, tables, and figures in Appendix C. For purposes of analysis and discussion, the project team identified five categories of fill from brownfield sites, based on the level of contamination and presence of debris, as further defined in Appendix C. Off-site reuse was implemented at four of the eleven brownfield sites, and on-site reuse was implemented at eight of the sites. All projects relied on landfill disposal for at least a portion of the soil management.

The study clearly indicates that significant cost savings were realized by on-site and off-site reuse of soils, which avoided hauling material off-site (in the case of on-site reuse) or shortened the hauling distance compared to landfilling the material (in the case of all four off-site reuse instances evaluated in this study). Actual cost savings realized differed between sites based upon the size of the project, the volume of soils involved, and, for off-site reuse, the difference in the hauling distances between the remediation site and the landfill and reuse locations.

For off-site reuse, the cost savings realized at the case study sites ranged from \$49,736 to \$1,066,540 (i.e., 42% to 99%) when compared directly to the alternative cost of landfilling. Large-scale sites reaped the largest savings, but small scale sites benefited as well. Despite the opportunity for cost savings, and despite the MPCA's development of off-site reuse guidance, off-site soil reuse was not widely implemented.

On-site reuse offers the greatest opportunity for savings, where possible. The cost savings realized at the case study sites ranged from \$21,293 to \$6,249,674 (i.e., 78% to 92%) when

compared to the alternative cost of landfilling. While on-site reuse resulted in cost savings several of the case study sites, in practice, on-site reuse is not always possible. Some sites have excess soils that cannot be reused on-site due to time and space constraints. This is especially true for small sites and for sites in the later stages of combined cleanup/redevelopment when multiple activities may occur on-site concurrently, leaving less space to stage soils.

Nine of the eleven case study sites received brownfield remediation grant funds from one or more grantors, and for eight of the nine grant-funded sites, grant funds were used for off-site disposal or reuse (Appendix C, Table 3). Where grant funds were used for off-site disposal or reuse, the total grant funds used for these purposes ranged from \$206,429 to \$2,176,077 (i.e., 42% to 100%) of the total grant funds awarded for these sites. This indicates that the opportunity for cost savings represented by off-site reuse has implications not only for developers but for grantors as well.

The cost analysis portion of this study indicates that the following continue to be the major limiting factors for off-site reuse of unregulated fill:

- Identifying a reuse location where the soil can be used within an appropriate time frame for the redevelopment site generating the excess marginally contaminated soil.
- The lack of availability of publicly- or privately-owned and managed locations where soils can be intermediately staged, segregated, screened and stored for reuse.
- The presence of debris in otherwise reusable unregulated fill. This fill appears to almost always be landfilled, even though it presents a low environmental risk.
- The geotechnical quality of the unregulated fill.

The case studies indicate that the following elements increase the likelihood that off-site soil reuse will be implemented at a site: a) the opportunity for significant cost savings as indicated by large excess fill volumes and/or long hauling distances to the disposal site; b) a motivated development team; and c) a willing MPCA staff assigned to the site. In general, additional sampling was required to confirm that soil was sufficiently clean for reuse.

The MPCA's evolving policy has made the soil reuse process clearer and more practical. To some degree, consultants, developers, and excavation contractors are still at various points on the learning curve regarding the practical application of the evolved guidance. Nonetheless, the study results clearly illustrate that regulated fill is not commonly being reused off-site, and the issuance of the MPCA's new policy in 2012 has had no effect on this status.

3.0 SOIL REUSE - ENVIRONMENTAL IMPACT ANALYSIS

This study also sought to assess the environmental benefit provided by off-site soil reuse by comparing greenhouse gas (GHG) production between soil management strategies. Carbon Dioxide (CO₂) is the primary GHG produced during excavation and hauling activities as a product of the combustion of diesel fuel; therefore, CO₂ was selected as the marker compound for this study. CO₂ production was estimated for each soil remediation strategy implemented at the eleven case study sites using hauling distance, mileage, and number of trips. See Appendix D for detailed information on data results and analysis methods.

Study results show that on-site reuse offers the biggest potential decrease in CO₂ production, since soil is generally moved on-site less than 500 feet from the point of excavation to the point of reuse or to a stockpile for temporary storage prior to reuse. Either method results in a round-trip haul of less than 1000 feet per load, as opposed to round-trip hauling distances of miles or tens of miles typical of landfilling and off-site reuse (see Table 7 in Appendix D).

Study results indicate that off-site reuse also provides savings in CO₂ production, because hauling distances are typically shorter. In the four case study sites where off-site reuse was implemented, hauling distances to the reuse sites were 21% - 88% shorter than to the alternative landfill disposal option; CO₂ production savings consequently ranged from 21% - 88% for these sites. In absolute terms, estimated CO₂ production savings per site ranged from 5,600 kg – 217,500 kg; absolute savings is dependent upon the volume of soil reused and the difference in hauling distances between the source site and the disposal and reuse sites.

4.0 LEGAL AND POLICY BARRIERS

There are several regulatory barriers facing the off-site reuse of marginally contaminated soil at redevelopment sites in Minnesota. Current MPCA policies provide an initial foundation for a regulatory framework that could not only allow but also encourage off-site reuse of marginally contaminated soils in lieu of landfilling. However, amendments to the current policy and supporting statutes and rules are needed to fully achieve this goal. Complete details on the analysis of the legal and policy barriers to off-site soil reuse are presented in Appendix E. The barriers identified in this portion of the study are summarized below; potential solutions are presented in Section 5.0.

Liability Assurances and Site Closure

Liability assurances, for parties associated with both the importing and exporting sites, are essential to encouraging off-site soil reuse. Currently, liability assurance options are too limited to encourage reuse.

For the reuse of soil impacted with hazardous substances, pollutants, or contaminants, MPCA liability protection options that could potentially be useful include:

- No Action Determination Letters, for both the importing site and exporting sites, relative to the contaminants identified in the exported fill. Although the MPCA's current Off-site Use of Regulated Fill Policy allows for the provision of a No Action Letter for both the exporting and importing sites, none have been issued to date.
- No Association Determination (NAD) letters that state that the MPCA has determined that specific actions taken at a site will not serve to "associate" the named parties undertaking these actions with a known release at the site for purposes of MERLA liability.³ Under current policy, a NAD is not available for the acts of exporting regulated fill from the source site or importing regulated fill to a receiving site. The MPCA has taken the position that current Minnesota Statutes do not authorize the MPCA to issue No Association Determinations for the off-site reuse of contaminated soil.

³ MPCA. VIC program assurance guide. page 7.

The current MPCA assurance options available for petroleum-contaminated soil do not apply to soil reuse. Currently, the MPCA only offers an Implementation Report Approval Letter for importing or exporting sites. The MPCA does offer a “General Liability Letter for Petroleum,” but this speaks to the definition of a “responsible party” under Minn. Stat. 115C and states that if a person comes into possession of a property after petroleum tanks were removed, and where a petroleum tank release attributable to those tank(s) had previously occurred, that person is not a responsible party and cannot be ordered to take corrective action. The MPCA has taken the position that current Minnesota Statutes do not authorize the MPCA to issue a General Liability Letter for petroleum contamination that does not originate from a tank release. Furthermore, the General Liability Letter is focused on the site where the original release occurred and does not address reuse of petroleum-impacted soils.

MPCA Soil Reuse Guidance

MPCA’s current guidance, “Off-site Reuse of Regulated Fill,” provides an avenue to regulatory approval of off-site reuse and even the provision of No Action Determinations for both the importing and exporting sites. However, developers, consultants, and earthwork contractors have not been willing to utilize this guidance for off-site reuse. A survey performed as part of this study, entitled “Survey on Off-site Use of Regulated Fill Policy” (Appendix G), indicates that failure to implement off-site reuse of regulated fill is due to a) a lack of sufficient liability protection from the MPCA, b) resulting complications from the required sign-off by a local government entity, c) the inability to locate an appropriate importing site in time, d) a lack of knowledge of the MPCA’s new policies, and e) the sense that landfilling is more practical, and quicker and easier to plan for and implement, since it avoids the potential need to stockpile and simplifies site operations. Items a-c could be addressed by adjustments to the current guidance. Items d and e have to do with where consultants, developers, and earthwork contractors are on the learning curve for the new guidance and the concept of off-site reuse.

Elements of the current guidance that serve as barriers to soil reuse include:

- **Regulated Fill Definition and Risk-Based Decision Making**: Under current guidance, the MPCA defines “regulated fill” for hazardous substances as being characterized by contaminant concentration between residential and industrial soil reference values (SRVs) for metals and semi-volatile organic compounds and between Tier 1 and site-specific Tier 2 soil leaching values (SLVs) for volatile organic compounds (VOCs) at the importing site. In general, the MPCA’s guidance for the site assessment and cleanup is based upon a risk-based evaluation and decision-making rubric, which works exceptionally well and is consistent across the majority of its guidance documents. The current definition of “regulated fill” is an exception to this risk-based approach. Under a risk-based framework, decisions about fill placement would be driven by conditions at the receiving site and the requirements of the receiving site Response Action Plan (RAP).
- **Local Unit of Government Signature Requirement**: The guidance currently requires that a representative of a local unit of government (LUG) provide a signature as part of the Local Government Notification step. Although the MPCA did not intend that LUGs would need to “approve” Regulated Fill applications, the signature requirement essentially transforms the notification into an approval. Most LUGs have neither the

expertise nor the organizational structure to support this requirement. Notification is reasonable and appropriate, but the signature requirement is unnecessary.

- **Intermediate Staging:** Current guidance does not allow for intermediate staging of soils at an off-site location or at the receiving site. In many cases, space and time constraints are barriers to off-site soil reuse; most brownfield redevelopment projects are highly time-sensitive. While larger sites can overcome this problem, it is often impossible for smaller sites to pursue off-site soil reuse due to space and time constraints and the economies of scale.
- **The Problem of Debris-Containing Fill:** Currently, most unregulated debris-containing fill is being disposed of in landfills, even though doing so offers little to no reduction of environmental risk. Current MPCA guidance allows for unregulated fill to contain a “de minimis” amount of inert debris, but it does not provide a clearly defined percentage of the amount of debris that unregulated fill can contain. Furthermore, the current interpretation of the Solid Waste Rules excludes the possibility of reusing fill with larger quantities of debris, which would be possible if the soil could be mechanically screened or sorted and the debris crushed to prepare the material for off-site reuse. The failure to allow for intermediate staging also inhibits opportunities for stockpiling, screening, sorting, and crushing operations.

5.0 RECOMMENDATIONS

Based upon the cost, environmental, and legal/policy analyses performed for this study, Minnesota Brownfields has concluded that, in order to facilitate off-site reuse of marginally contaminated soil, adjustments to current Minnesota Statutes are necessary and current MPCA off-site reuse policy for regulated fill needs to be simplified and made more practical. Minnesota Brownfields provides the following recommendations to improve the opportunities for and implementation of off-site reuse of marginally contaminated fill from brownfield sites in Minnesota:

1. **The Receiving-Site RAP Should Drive Reuse Limitations.** Off-site soil reuse policy should be modified to allow the MPCA to approve the RAP governing the receiving (i.e., importing) site to dictate soil reuse conditions and criteria. Fill material originating from a brownfield site exported to another brownfield site must meet cleanup standards and soil management criteria established in the receiving site’s RAP. This would also serve to expand the definition of “regulated fill” for hazardous substances as being characterized by contaminant concentrations greater than Tier 1 SRVs (or, for mobile organic compounds, SLVs) but less than or equal to site-specific (Tier III) SRVs (or, for mobile organic compounds, site-specific SLVs) at the receiving site.
2. **Provide No Association Determinations for Exporting and Importing Fill.** The MPCA should expand the liability protection options provided to entities involved in importing and exporting regulated fill. Specifically, the MPCA should offer a No Association Determination for the acts of exporting, importing, and placing fill consistent with the receiving site’s RAP. This may involve amending the Minnesota Land Recycling Act and/or MERLA to provide for such assurances. Perhaps the most direct way to ensure liability protection for contaminated soil reuse would be to: a) modify the definition of

“release,” b) include the off-site reuse of soil as a permissible component of a response action, and c) create a legal defense to liability through amending portions of MERLA. Detailed examples of possible amendments to encourage soil reuse are included in Appendix E.

3. Provide Stronger Liability Protection for the Reuse of Soil Containing Petroleum Impacts. The current MPCA liability protections available for soils contaminated with petroleum do not advance the implementation of off-site soil reuse. The MPCA has taken the position that current Minnesota Statutes, do not authorize the MPCA to issue a General Liability Letter for petroleum contamination that does not originate from a tank release. Furthermore, the General Liability letter is focused on the site where the original release occurred and does not address soil reuse. In order to encourage off-site soil reuse, the MPCA should offer a General Liability Letter that states that if a person reuses petroleum contaminated soil in a manner consistent with MPCA guidance, and/or with an approved RAP or Soil Reuse Plan, that person is not a responsible party and cannot be ordered to take corrective action. This would likely require an amendment to Minn. Stat. § 115C.
4. Exclude the Requirement for a Signature from the LUG Notification Provision. The MPCA’s Off-site Reuse of Regulated Fill Policy currently requires a signature from a LUG as part of the local government notification process. This is essentially equivalent to a local government approval. The requirement is impractical and burdensome. Most LUGs have neither the expertise nor the organizational infrastructure to support this requirement. The signature requirement is unnecessary and should be dropped. Some form of local government notification is appropriate, but without the requirement for approval or signature.
5. Encourage the Reuse of Debris-Containing Fill. Currently, most debris-containing unregulated fill is being disposed of in landfills, even though doing so offers little to no reduction of environmental risk. A distinction should be made allowing debris-containing unregulated fill that includes a clearly defined, and practical, percentage of debris to be reused. Regulatory changes should be made to allow for the reuse of unregulated and regulated fill with debris if screening or crushing the debris is feasible. This could take the form of a reinterpretation of, or relief or exclusion from, the Solid Waste Rules (i.e. a standing Beneficial Use Determination).
6. Allow for Intermediate Off-site Staging Sites and Services. Policy and/or statutory authority should be developed that would allow marginally contaminated fill from brownfield sites to be stored at an off-site location before it is transported to the receiving site and/or to allow for temporary staging of fill soils at the receiving site. Intermediate off-site staging would allow for mechanical treatment of geotechnically unsuitable fill (such as screening, sorting, crushing, or drying), thereby increasing the possibility for reuse of such soils. It would also ease the burden of matching schedules and timing needs of the export and import sites. Intermediate staging would require appropriate soil management and documentation guidelines. Intermediate staging facilities could be managed by public- or private- entities. A pilot project would be a sensible first step. It

would also be beneficial for the MPCA to provide a No Association Determination for the act of intermediate staging for the staging properties.

On a practical level, any time soil needs to be moved, the associated financial and environmental costs and concerns increase. Importing and exporting marginally contaminated soil introduces further communication and timing complications. The intermediate staging of contaminated soil would help alleviate these issues. A website service or database that listed and matched sites with excess marginally contaminated soil could ease soil exchanges and allow for more efficient redevelopment of brownfield sites.

7. Quantify Contamination Cleanup Grant Funds and Private Funds used for Hauling. Currently, there is no clear and concise understanding of the amount of grant or private funds expended on landfill-disposal of soils that could otherwise be reused on- or off-site. It is generally understood that grant dollars are currently used to landfill marginally contaminated fill soils that could potentially be reused under existing MPCA soil reuse policies. However, the magnitude of grant dollars used this way has not been quantified. It would be beneficial to compile data from existing grantor files and/or require this data to be collected for future grants.

6.0 NEXT STEPS

Based upon the findings of this study, Minnesota Brownfields recommends the following next steps:

- A) Request that State and local grant programs gather, as part of their standard reporting, information on the disposal and reuse of the soil categories A-D listed in Appendix C. Information should be collected on the total estimated volumes of and unit cost for each soil category reused off-site and disposed of in landfills.
- B) Work with the MPCA to pursue improved liability options, as discussed in Recommendations 2 and 3; clarification regarding the movement of soils containing de minimis concentrations of debris and listed hazardous wastes; and resolution of Solid Waste Rule issues described in Recommendation 5.
- C) Work with the MPCA to pursue the improvements to the existing off-site reuse guidance for regulated fill that are listed in Recommendations 1 and 4.
- D) Investigate the possibility of a pilot intermediate staging facility coupled with a soil exchange website. Several issues need to be explored, including appropriate fee structures, appropriate tracking methodology, and relief from the Solid Waste Rules. Potential partners in this endeavor, in addition to the MPCA, could include the grantors, landfill operators, and earthwork contractors. The last two entities are likely operators for the pilot facility, since they may have the available acreage and existing tracking mechanisms that could be adapted to this use.