Project Overview

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This report will examine multiple different uses of spent foundry sand for the Lancaster County Engineering Department (LCED). These include use in main roadway and structural fill, low traffic roadway fill, asphalt mix design, concrete mix design, flowable fill mix design, and as an additive in snow melt brine. Each of these applications was investigated to determine the potential benefits and concerns by conducting a review of the current literature, a logistical analysis for how that use would be implemented at the LCED, and an assessment of its economic and environmental impact.

The producer of the spent foundry sand examined for this report is Deeter Foundry located in north Lincoln. This foundry produces about 4000 tons of spent sand each year which currently is all being disposed of at the G&P Landfill near Milford, Nebraska. Deeter Foundry currently is spending roughly $240,000 on the storage, transportation, and disposal fees required to dispose of this material. Their management is willing to consider alternative uses for their spent foundry sand given that a meaningful and consistent amount of the waste material is collected for that use. A minimal and sporadic collection of their spent foundry sand will likely not satisfy Deeter Foundry and so any potential applications will need to use a significant amount of their yearly production.

The trucking of the spent sand to the disposal site is also producing an estimate of 81,000 kg of CO_2 per year. These emissions can be reduced by 2,548 kg per year for every mile reduced in the trucking route the spent sand takes. Additionally, reusing this material will help reduce the amount of waste stored in Nebraska's landfills. In addition to the environmental benefits of alternative uses for the spent sand, there could be great cost savings as well. Replacing more expensive sands with this cheaper material can lower the price of various LCED projects.

After investigation, it was determined that this material would be undesirable for any roadway or structural fill because of its physical characteristics. Further research and testing could provide otherwise, but the evidence available indicates it would substantially diminish the quality of LCED roadway projects. Test results for this specific sand show that it is also not suitable as a fine aggregate in concrete mix as it does not meet the necessary standards proposed in the 2017 NDOT Standard Specifications. For asphalt and flowable fill mixtures however, it has been reported to be a beneficial substitute for virgin sands. Finally, judging from the physical and mechanical characteristics of this spent sand, it likely will not function well in snow melt brine either as it is likely too rounded or fine to provide additional traction for vehicles.