Mattress and Box Spring Diversion Program

Presented To:	Operations Committee
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Recommended by:	General Manager of Growth and Infrastructure

Report Summary

This report provides a recommendation regarding the findings of the mattress diversion pilot project along with key challenges associated with the disposal of mattresses in landfill sites.

Resolution

THAT the City of Greater Sudbury directs staff to prepare a business case for consideration during the 2023 Budget process to fund a mattress and box spring diversion program, as outlined in the report entitled "Mattress and Box Spring Diversion Program", from the General Manager of Growth and Infrastructure, as presented at the Operations Committee meeting on June 20, 2022.

Relationship to the Strategic Plan, Health Impact Assessment and Community Energy & Emissions Plan (CEEP)

This report refers to Asset Management and Service Excellence as well as Climate Change goals as outlined in the 2019-2027 Strategic Plan adopted by City Council as well as goal # 6 "Achieve 90% solid waste diversion by 2050 in the Community Energy & Emissions Plan.

Financial Implications

If approved, the Diversion of Mattresses and Box Springs program would require annual funding of $425,000 for on-site handling, record keeping, transportation and recycling fees at the receiving facility to divert these items. Staff will submit a business case as part of the 2023 Budget deliberations to seek the required funding.

Background

Current Collection & Disposal of Mattresses and Box Springs

Mattresses and box springs are currently collected roadside from low density residential units (6 units or less) as part of the City's large furniture collection program. Other generators of used mattresses and box springs may dispose of these items by delivering them directly to any waste disposal site. Presently, all mattresses and box springs are disposed in the City's landfill sites.

Challenges with the Disposal of Mattresses and Box Springs

The disposal of mattresses and box springs in landfills has always posed challenges for municipalities and landfill operators. Some of theses key challenges are listed below.

- Difficult to handle and compact: mattresses and box springs are large, bulky items built to withstand continuous compression (compaction) forces. Landfill operations require compaction of waste to maximize the use of landfill space.
- Continuous return to surface: stored energy in the mattress springs will cause the mattress to pop out during compaction.
- Damage to equipment: during compaction metal springs often get tangled in the moving parts of equipment. Repairing these equipment's can be costly for the contractor and ultimately the municipality.
- Poor use of space: due to very low density and compaction ratio, mattresses occupy large volumes. Compared to other garbage, mattresses occupy 400% more space.
- Slow decomposition: materials used are highly durable, long-life materials that take a very long time to decay, a mattress can take anywhere from 80 to 120 years to fully decompose.
- Impact on leachate flow: Mattresses decomposing in landfills slowly release toxic chemicals. Landfilled mattresses may also cause leachate to percolate up rather than down through the waste. Leachate that seeps up through the soil cover may cause nuisance odours.

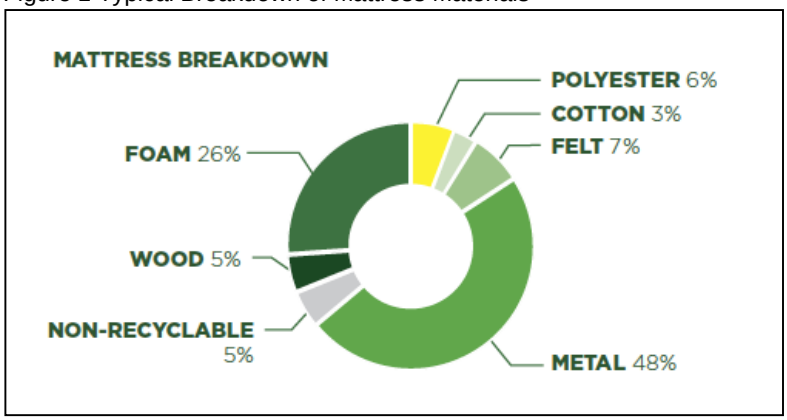
Mattress and Box Spring Recycling & Diversion

A standard mattress typically consists of metal, polyether & polyurethane foam, felt, polyester, wood and cotton (see Figure 1), the vast majority of which can be recycled. The items are manually cut apart and sorted into their various parts. These products are then sent to other companies for recycling.

The metal is shredded to be used as raw metal; the wood is ground and turned into mulch or particle board; the cotton and felt is used in thermal isolation and noise reduction in automobiles, the polyurethane/foam is used in the fabrication of carpet underlay. More than 95% of all discarded mattresses and box springs materials can be transformed into new products.

Recycling of these mattresses and box springs is a relatively new market. Private recycling companies in Canada currently exist in Alberta, British Columbia, Quebec, and Ontario (Woodbridge).

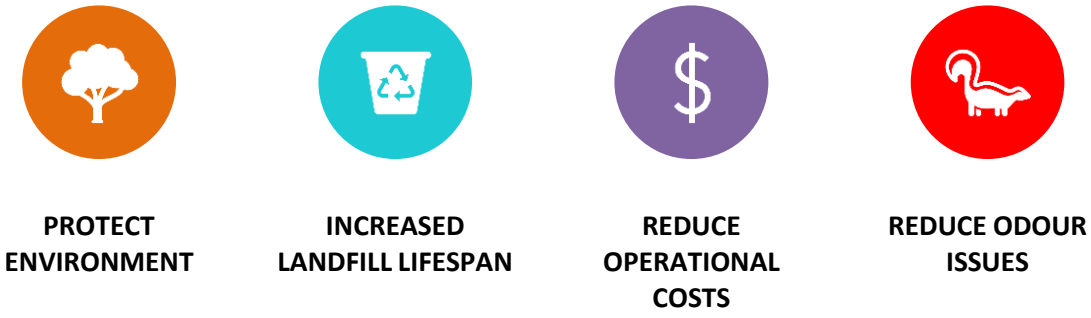
Figure 1 Typical Breakdown of Mattress Materials



Mattress processing can be observed in a brief video prepared by *Recyc-Mattress* (see the YouTube video link https://youtu.be/jzXpSFExL1c)

Benefits of Mattresses and Box Springs Diversion

- Protect the Environment.
- Increase the landfill lifespan.
- Reduce operational costs.
- Reduce nuisance odours.



Future Legislation

Under the Ontario Resource Recovery and Circular Economy Act, 2016, more and more items are set to be designated under the producer responsibility regulation. The initial target for mattresses was in the year 2020.

Producer responsibility regulation means that producers will be environmentally accountable and financially responsible for recovering resources and reducing waste associated with their products. Although there are no specific details on how these items will be recovered, staff anticipates consultation from producers will be undertaken once the Minister of the Environment, Conservation and Parks (MECP) designates these items under the regulation at an undetermined date in the future. Since the date to designate mattresses and box springs has stagnated, Staff have conducted pilot projects to gain a better understanding of diversion challenges and costs, determine the potential cost savings that would result from landfill space savings and progression towards the CEEP goal of diverting 90% of solid waste.

There has been no update to the Ontario Resource Recovery and Circular Economy Act, 2016 so far and we are still waiting for direction from the MECP. Meanwhile, with the knowledge that a long-term viable market exists, the City should consider a permanent program for the diversion of mattresses and box springs program

in order to take action to meet the CEEP goals outlined by Council. If mattresses and box springs are designated under a full producer responsibility system in the future, the City would transition the program at that time and benefit from additional financial saving involved in the recycling of these products.

Pilot Project

Two separate mattress and box spring pilot projects were completed at the Sudbury Landfill and Waste Diversion Site. The mattresses and box springs diverted under these pilots consisted primarily of materials collected as part of the roadside collection program; however, the landfill operator did divert some materials that were delivered to the site directly by residents.

The first pilot project was completed in 2017/2018 and the mattresses and box springs were sent to a recycling company in Barrie (Ontario), named "*Ontario Mattress Recycling*". This company closed operations shortly after completion of the pilot project. Due to this closure disposal fees, transportation costs and other assumptions based on sending material to this facility are no longer valid. A second pilot project was completed during 2021/2022 with another company "*Recyc-Mattress*", which has mattress recycling facilities in both Ontario (Woodbridge) and Quebec. While located farther from the site than the initial recycling company (*Ontario Mattress Recycling – Closed), Recyc-Mattress* has been in business since 2007 providing mattress recycling services to other municipalities and private companies across Ontario.

For both pilot projects a dedicated temporary storage location was established at the leaf & yard processing pad within Sudbury Landfill and Waste Diversion Site was established. The landfill operator was asked to handle all aspects of the pilot project. This included receiving, inspecting, provision of a storage container, loading, record keeping, transporting and processing fees for recycling at the receiving facility.

During the first pilot project a total of 874 mattresses and box springs were diverted in the months of November 2017, February 2018 and March 2018. The total cost to divert the mattresses and box springs was $28,842 ($33.00 per unit).

During the second pilot project approximately a total of 1,099 units were diverted between the period of September 2021 to January 2022. The total cost to divert the mattresses and box springs was $40,663 ($37.00 per unit).

Landfill Space and Cost Saving During Pilot Projects

Landfill space is a valuable resource and in 2022 the cost for disposal is $90 per tonne (non-compacted). Although, this cost is expected to increase in 2023 when fees are adjusted to a full cost recovery, a tipping fee of $90 per tonne was used for the purpose of this report.

The mattresses shipped for diversion under both pilot projects allowed the equivalent landfill space to be used for the disposal of other waste. The landfill space saved from the diversion of 1,973 mattress during the pilot projects allowed the equivalent of 1,345 tonnes of regular garbage to be landfilled. This has an estimated landfill space value of 1,746 m^3 and is equivalent to $121,026. After deducting the cost to divert the mattresses, the pilot project generated an estimated net saving of $51,521.

Details of the estimated cost savings during pilot projects are provided in Table 1.

Table 1.

Total mattresses shipped	1,973	Units
Weight of mattresses shipped	56	tonne
Estimated volume of mattresses shipped*	1,746	m^3
Estimated equivalent weight of garbage**	1,345	tonne
Estimated cost to landfill equivalent garbage (tipping fee)	$121,026	
Cost of both pilot programs	$69,505	
Net savings	**$51,521**	

* Using average density of 32 kg/m3 (Typical mattress density ranges from 28 to 36 Kg/m3).
** Using average 5 years density of 770 kg/m3 at the Sudbury Landfill.

Savings in GHG Emissions

Limited literature is available to properly assess the quantity of the greenhouse emissions for the disposal of mattresses only. However, some references are available to evaluate the CO_2 emissions for landfilling of the municipal solid wastes (MSW). The estimated quantity of the CO_2 emissions for landfilling the equivalent weight of the MSW was compared with estimated CO_2 emissions for the approximate quantity of diesel fuel used for the transportation of the mattresses during the pilot projects. Table 2 provides this comparison of CO_2 emission to evaluate the emission savings.

Based on the limitation of the data available, overall, it is estimated that diverting the mattresses rather than landfill them had a net CO_2 emissions savings of 2,132,735 kg.

Table 2.

CO_2 emissions from landfilling MSW		
Equivalent waste diverted	1,345	tonne
CO_2 emission rate *	1,610	kg/tonne
Net CO_2 emissions	2,165,015	kg
CO_2 emission for transportation to Woodbridge		
Number of trips to Woodbridge during pilot project	15	Trips
Distance per round trip	800	km
Fuel consumption per Km	1	litre
Total fuel consumption during pilot	12,000	litre
CO_2 emission per litre of gas **	2.7	kg
Total CO_2 emission during pilot	32,280	kg
Net CO_2 emission savings	**2,132,735**	kg

* Municipal Solid Waste and its Role in Sustainability, A Position Paper Prepared by IEA Bioenergy, ExCo 2003:02
** US EPA website: https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle#burning

Analysis

Annual Quantity of Mattresses and Box Springs

The total number of mattresses collected under the City's roadside collection program and dropped-off by the public at the landfill sites during 2021 are estimated and presented in Table 3. The pilot project data indicates that approximately 37% of the total mattresses collected at Sudbury Landfill are dropped-off by the public. Roadside collection data of 2021 shows that about 8%, 11% and 81% of the total mattresses are received at Azilda, Hanmer and Sudbury Landfill Sites, respectively. Overall, approximately 11,460 mattresses and box springs were received during 2021.

Table 3

2021	Roadside	Public Drop-Off			Total
Month	Collections	SLF	ALF	HLF	
January	385	225	49	67	726
February	238	139	30	41	449
March	591	345	75	103	1,114
April	624	365	79	109	1,177
May	508	297	64	89	958
June	539	315	68	94	1,016
July	622	364	79	108	1,173
August	599	350	76	104	1,129
September	617	361	78	108	1,163
October	582	340	74	101	1,097
November	483	282	61	84	911
December	290	169	37	51	547
Total	**6,078**	**3,552**	**770**	**1,059**	**11,460**

Annual Space and Cost Savings

The total weight of the mattresses and box springs is calculated based on the estimated number of units received during 2021 and the average unit weight of a mattress noted during the pilot projects. The density of mattresses and box springs varies from 28 to 36 kg/m^3. An average density of 32 kg/m^3 was used to determine the volume of landfill space that would be occupied by the mattresses and box springs. The equivalent weight of the waste to occupy this volume is assessed using average 5-year waste density at Sudbury Landfill Site. The potential net annual savings are shown in Table 4 using the current waste disposal tipping fee and estimated unit cost to divert a mattress or box spring.

Table 4

Total number of mattresses and box springs diverted annually	11,460	Unit
Average unit weight of a mattress	28.32	kg/Unit
Total weight of mattresses diverted annually	324,547	Kg
Average mattress density	32	kg/m^3
Total volume to be occupied by mattresses annually	10,142	m^3
Average 5 years density of waste at Sudbury landfill	770	kg/m^3
Equivalent weight of waste	7,809	tonnes
Tipping Fee per Tonne of the waste	$90	
Total Cost to landfill equivalent garbage (Tipping Fee)	**$702,848**	
Unit mattress diversion cost	$37	
Total anticipated annual diversion Cost	**$424,020**	
Net annual savings	**$278,828**	

Overall, it is estimated that the implementation of a permanent mattress diversion program would have a potential annual net savings of approximately $278,828 in the form of saved landfill space. In addition, a permanent mattress and box spring diversion program is estimated to save ten percent (10%) of the landfill volume over the course the expected remaining lifespan which is equivalent to approximately 3 years of additional usage.

Approaches Used by Other Municipalities

A survey of other municipalities in Ontario revealed that out of the 37 municipalities that responded, currently only five (5) have implemented mattress recycling programs to date: Barrie, Muskoka, Peterborough, Simcoe and Toronto. All these municipalities collect mattresses and ship them to the Recyc-Mattress facility in Ontario. Costs for each mattress program is recouped from residents. Various municipalities and their programs are summarized in Table 5.

Table 5

Municipality	Population	Mattress Diversion Program	Roadside Mattress Collection	Fee for Residents	End Market
District of Muskoka	60,599	Yes	No	$28/mattress	Recyc-Mattress
City of Peterborough	138,236	Yes	Yes	Roadside $30/mattress; Landfill $16/mattress (1-10 items) $22/mattress (11+ items)	Recyc-Mattress
City of Barrie	153,356	Yes	No	$15/mattress	Recyc-Mattress
County of Simcoe	307,050	Yes	No	$15/mattress, OR $10/mattress and $155/t.	Recyc-Mattress
City of Toronto	2,930,000	Yes	Yes	Each house charged $20.34/year (for all oversized items)	Recyc-Mattress

Estimated Cost of Implementing a Permanent Mattress and Box Spring Diversion Program

For estimation purposes the total annual cost to divert the mattresses and box springs is calculated based on the total numbers of units diverted during 2021 and unit diversion cost used during the 2021 pilot project. This cost involves all on-site handling, record keeping, transportation and recycling fee at the receiving facility.

Total number of mattresses and box springs in a year = 11,460

Diversion cost per unit during the second pilot project = $37

Total annual diversion cost = $424,020

If approved, the mattress and box spring diversion program would require an estimated annual funding of $424,020 (2021) that would be adjusted annually in future budget years based on inflationary rates and actual program use.

Next Steps

At the direction of Council, Staff will submit a business case to fund the mattresses and box springs program as part of the 2023 Budget process.

Staff will continue to monitor future developments in the mattress and box spring diversion plans under the Ontario Resource Recovery and Circular Economy Act, 2016. If producers become responsible to fund and operate a mattress diversion program, Staff will work towards transitioning the program at that time.

Conclusion

By diverting mattresses and box springs, the key challenges associated with their disposal is eliminated and landfill space that would have been occupied by these materials can be reserved for other waste requiring disposal. Implementation of a permanent program will result in a longer lifespan of the existing landfill assets.

Taking action to implement a mattress and box spring diversion program now will assist in meeting our future CEEP goals of diverting 90% of solid waste.

While there is a cost to operate such a program, the City will benefit from a net savings in the form of landfill space and make contributions to environmental sustainability by reducing greenhouse gas emissions.

Resources Cited

Assessment of Economic and Environmental Impacts of Mattress Recycling in BC, Metro Vancouver, Prepared by *Morrison Hershfield*, 2017.

Canadian Mattress Recycling Inc., website: https://canadianmattressrecycling.com

Municipal Solid Waste and its Role in Sustainability, A Position Paper Prepared by *IEA Bioenergy*, ExCo 2003:02

Recyc–Mattress Canada, website: https://www.recyc-matelas.com/en/

Strategy for a Waste-Free Ontario, Building the Circular Economy, February 2017

US EPA Green House Gas Emissions from a Typical Passenger Vehicle, 2018, website: https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle#burning