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Solid Waste Management Coordinating Board Construction Waste Project Memo #1

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EXECUTIVE SUMMARY

Executive Summary

URS Corporation (URS) was contracted by the Solid Waste Management Coordinating Board (SWMCB) to research, identify, coordinate and evaluate two construction waste demonstration projects in the Twin Cities Metropolitan Area. This document identifies recycling and waste reduction options, existing situations, and potential opportunities for construction waste in the Twin Cities Metropolitan Area. Two construction waste demonstration projects are proposed. The demonstration projects will focus on increasing source reduction and recycling of construction waste in Minnesota and reducing the volume and toxicity of construction waste landfilled. The barriers and incentives of each demonstration project are examined, and specific actions for each are recommended.

Demonstration Project Number 1 is the on-site grinding of construction wastes and beneficial reuse of the materials at the building site. The purpose of this project is to explore the technological feasibility, cost effectiveness, environmental soundness and regulatory issues associated with on-site grinding and the beneficial reuse of construction wastes. Source separated untreated dimensional lumber, oriented strand board (OSB), plywood, gypsum drywall, shingles, brick, and small quantities of unrecyclable cardboard and paper packaging will be evaluated for beneficial reuse on-site. The materials may then be ground and land applied at the construction job site as a soil amendment, erosion control method or driveway base, as appropriate. In addition, construction waste reduction, reuse and recycling options will be explored and evaluated to reduce the volume and toxicity of the construction waste stream.

Demonstration Project Number 2 is the examination of the existing industry conditions that affect the optimal utilization of a construction waste processing facility in the Twin Cities Metropolitan Area, such as South Metro Sort and Recycle, Inc. in Shakopee, Minnesota. The facility accepts mixed loads of construction and demolition waste which are unloaded onto a sorting floor. Materials with ready markets are separated by hand and recovered for recycling. Any residual material is disposed. There are many challenges, including economic and policy disincentives, affecting the success of a construction waste processing facility in the Twin Cities Metropolitan Area. These issues and others will be evaluated during this demonstration project.

SECTION ONE

1.0 INTRODUCTION

1.1 Purpose

URS Corporation (URS) was contracted by the Solid Waste Management Coordinating Board (SWMCB) to research, identify, coordinate and evaluate two construction waste demonstration projects in the Twin Cities Metropolitan Area. The SWMCB is a joint powers board, comprised of two county commissioners from each county in the SWMCB area. The SWMCB area consists of six of the seven Twin Cities Metropolitan Area counties, and includes Anoka, Washington, Ramsey, Hennepin, Dakota and Carver Counties (shown below). The demonstration projects will focus on increasing source reduction and recycling of construction waste in Minnesota and reducing the volume and toxicity of construction waste landfilled.



SWMCB Counties in the Twin Cities Metropolitan Area

1.2 Objective

This document, referred to as “Memo #1”, is the first in a series of two memorandums and a final report, which will document the work proposed and completed for this project. The work for Memo #1 includes the following:

- Identifying recycling and waste reduction opportunities for construction waste
- Examining potential opportunities for construction waste and existing situations
- Examining existing regulatory framework for construction waste
- Assessing local markets and feasibility
- Soliciting feedback from government entities and industry
- Recommending two construction waste demonstration projects

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Memo #1 outlines the construction waste minimization or recycling opportunities, examines the barriers and incentives, and recommends a specific action for each opportunity. It is likely that a combination of all or some of the opportunities will be needed for successful long-term reduction and recycling of construction waste.

1.3 Memo Organization

Memo #1 is organized into several sections. The first section provides background information on construction waste in Minnesota, including definitions, and current construction waste management practices. The second section provides estimates on the generation and composition of construction waste in the Twin Cities Metropolitan Area. The third section discusses the potential markets for construction waste material in Minnesota. A review of applicable successful waste reduction and recycling operations in other states is also included. In the last section, two demonstration projects are recommended and discussed in detail.

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2.0 MINNESOTA OVERVIEW

2.1 Definitions

This section defines specific meanings for terms as they are used in this document:

Construction debris – waste building materials, packaging, and rubble resulting from construction, remodeling, repair, and demolition of buildings and roads (Minnesota Statute 115A.03, Subd. 7). Also referred to as construction waste.

Demolition debris – solid waste resulting from the demolition of buildings, roads, and other structures including concrete, brick, bituminous concrete, untreated wood, masonry, glass, trees, rock, and plastic building parts. Demolition debris does not include asbestos wastes (Minnesota Rules Chapter 7035.0300, Subp. 30). Also referred to as demolition waste.

Demolition debris land disposal facility – a site used to dispose of demolition debris (Minnesota Rules Chapter 7035.0300, Subp. 31). Also referred to as demolition landfill.

Twin Cities Metropolitan Area – the seven counties surrounding the cities of Minneapolis and St. Paul, Minnesota: Hennepin, Ramsey, Anoka, Carver, Washington, Scott, and Dakota.

SWMCB Area – the counties that make up the Solid Waste Management Coordinating Board Area (SWMCB): Hennepin, Ramsey, Anoka, Carver, Washington and Dakota.

Disposal facility – a waste facility permitted by the agency (MPCA) that is designed or operated for the purpose of disposing of waste on or in the land, together with any appurtenant facilities needed to process waste for disposal or transfer to another waste facility (Minnesota Statute 115A.03, Subd. 10)

Processing – the treatment of waste after collection and before disposal. Processing includes but is not limited to reduction, storage, separation, exchange, resource recovery, physical, chemical, or biological modification, and transfer from one waste facility to another (Minnesota Statute 115A.03, Subd. 25)

Waste facility – all property, real or personal, including negative and positive easements and water and air rights, which is or may be needed or useful for the processing or disposal of waste, except property for the collection of the waste and property used primarily for the manufacture of scrap metal or paper. Waste facility includes but is not limited to transfer stations, processing facilities, and disposal sites and facilities (Minnesota Statute 115A.03, Subd. 35)

NonMSW – solid waste that is not considered mixed municipal solid waste, and includes construction waste, demolition debris and nonhazardous industrial waste.

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2.2 Current Management

Current construction waste management practices were examined to determine the most favorable recycling scenarios and potential changes needed to make recycling more feasible in the Twin Cities Metropolitan Area.

The Minnesota Office of Environmental Assistance (OEA) discusses the management of both construction and demolition waste in Minnesota on its internet web site (http://www.moea.state.mn.us/res/V9_1/Barriers.cfm). The OEA explains there are many barriers to recycling construction debris in Minnesota.

Since the tipping fees at demolition landfills are so low in Minnesota, there is less financial motivation for generators to find other options of waste management. Markets for recycled construction materials are not widely established in Minnesota. Timber and lumber have the most established market, while recycling of shingles and sheetrock has been examined. Policy options are currently being evaluated by a state task force to encourage and develop construction waste reduction and recycling practices (OEA, 2001). This SWMCB-sponsored project supplements the state research and examines specific scenarios through demonstration projects.

The recently published Regional Solid Waste Master Plan (SWMCB, 2001) is a plan for managing the SWMCB area's solid waste through 2017. The management of nonMSW has been included in the Regional Solid Waste Master Plan for the first time. The Regional Solid Waste Master Plan states the principal nonMSW management outcome to be the following:

"By 2003, the region will see an increase in the reduction, reuse, recycling or processing of nonMSW to preserve landfill capacity as a resource."

NonMSW policies and goals will be developed for source reduction, recycling, processing, landfilling, and reducing the toxic character of the waste. In order to accomplish these goals, data must be collected, environmental impacts and regulatory issues must be evaluated, and best management practices must be identified.

2.2.1 Disposal

Currently, landfilling is the most common waste management method for construction waste in Minnesota. Construction waste, even though it is considered to be nonMSW, is disposed in both mixed municipal solid waste (MSW) and demolition debris landfills permitted by the state. Minnesota's MSW landfills have bottom liner systems that protect the groundwater from contamination, as required by federal and state regulations. Most demolition debris landfills are unlined. Although the waste materials approved for disposal in a demolition landfill vary depending upon the specific facility and its permit conditions, demolition landfills typically accept construction waste that is similar to demolition waste. Construction waste that is mixed with MSW or nonhazardous industrial waste may go to an MSW landfill.

Demolition debris landfills are currently required by the state of Minnesota to meet certain requirements in order to obtain a construction and operation permit. Minnesota Rules Chapter

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7035.2825 outlines requirements relative to location and design standards; operation and maintenance procedures; hydrogeologic evaluations; cover design; water quality monitoring; financial assurance; and closure and post-closure care. County and local regulations may have additional requirements. For example, although the state of Minnesota does not require demolition landfills to have liners at this time, one Twin Cities Metropolitan Area county (Dakota County), requires demolition landfills established after September 1, 1993 to have an approved single liner system with leachate collection and groundwater monitoring. From a policy perspective, more stringent design requirements for demolition landfills could increase disposal costs and encourage recycling.

Minnesota completed a Statewide MSW Composition Study in 1999-2000 (OEA, 2000). The study provided a representative and statistically defensible estimate of the composition of the municipal solid waste in Minnesota. Construction and demolition debris (C&D), not including wood, was included under "Other Waste" in the study; however, trucks containing only C&D were not sampled or included in the study. A total of 47.3 tons of waste was sorted from eight participating facilities. The percentage of C&D in the aggregate MSW waste stream (a combination of residential, industrial/commercial/institutional (ICI), and mixed) was reportedly 2.7% by weight. The percentage of wood in the organic portion of the waste was 3.6%, 3.8% and 2.3% for wood pallets, treated wood and untreated wood, respectively. Based on the total MSW produced in the Twin Cities Metropolitan Area of 3.3 million tons in 1999 (OEA, 2000), this results in approximately 89,100 tons of C&D and 320,100 tons of wood waste produced in the Twin Cities Metropolitan Area alone.

Permitted disposal facilities are required to report waste quantities to the MPCA annually. For a look at construction and demolition waste disposal in the Twin Cities Metropolitan Area, nonMSW facility data was gathered for the following facilities by Dakota County Environmental Management Department (2001):

| County | Facility Name | Facility Type |
|---------------|-------------------------------------|------------------------------|
| Dakota | Burnsville Dem/Con Landfill | Demolition |
| Dakota | Dawnway Demo Landfill | Demolition |
| Dakota | SKB Rich Valley Demolition Landfill | Demolition |
| Dakota | Burnsville Sanitary Landfill | Sanitary Landfill/Industrial |
| Dakota | Pine Bend Sanitary Landfill | Sanitary Landfill/Industrial |
| Scott | Dem-Con Landfill | Demolition |

It is difficult to differentiate between demolition and construction waste quantities disposed in Minnesota since both are primarily disposed in demolition debris landfills. The total amount of C&D waste disposed reported by the six facilities in 1998 was 464,836 tons. In 1999, 655,290 tons of C&D was disposed. The generation and disposal of C&D waste can vary greatly from year to year and depends upon factors such as economic development and repair after natural disasters. These factors may also affect the composition of C&D waste.

2.2.2 Reuse and Recycling

There are several options available for recycling construction waste. The waste may be separated and processed at the construction job site for recycling on or off the job site. Waste

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may also be transported (mixed or separated) to a central facility, such as a materials recovery facility (MRF) for processing and recycling. A number of markets are available for the materials recovered from construction waste. These are discussed in detail in Section Four. The success of recycling in other areas of solid waste (e.g. MSW) has resulted in the development of an industry based solely on the recycling of recovered waste materials. According to the MPCA data, approximately 20,697 tons of C&D was reportedly recycled in 1998 (4.3% of the total amount generated). In 1999, 16,518 tons of C&D was recycled, which is 2.5% of the total amount generated. These percentages are small and likely consist of mostly demolition material (OEA, 2000).

2.3 Regulatory Issues

Construction waste is a solid waste, which falls under federal Resource Conservation and Recovery Act (RCRA) regulations. However, each state typically administers the federal guidelines and may have additional solid waste regulations. In Minnesota, the management and recycling of construction waste is regulated by state, county, and local agencies. Construction waste generated or disposed in the SWMCB area is regulated by the following agencies:

- Minnesota Pollution Control Agency (MPCA)
- Minnesota Office of Environmental Assistance (OEA)
- Anoka County and its Cities
- Carver County and its Cities
- Dakota County and its Cities
- Hennepin County and its Cities
- Ramsey County and its Cities
- Washington County and its Cities

Solid waste facilities are permitted and inspected by the MPCA as well as county environmental staff, when applicable. A solid waste management tax is imposed on nonMSW managed in Minnesota. Commercial generators of nonMSW, including construction waste, pay a tax of 60 cents per noncompacted cubic yard of nonMSW. The fee is calculated according to container capacity, actual volume, or weight (Minnesota Statute 297H.04). Regulatory issues were explored further for each demonstration project discussed in Section Five.

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3.0 CONSTRUCTION WASTE CHARACTERIZATION

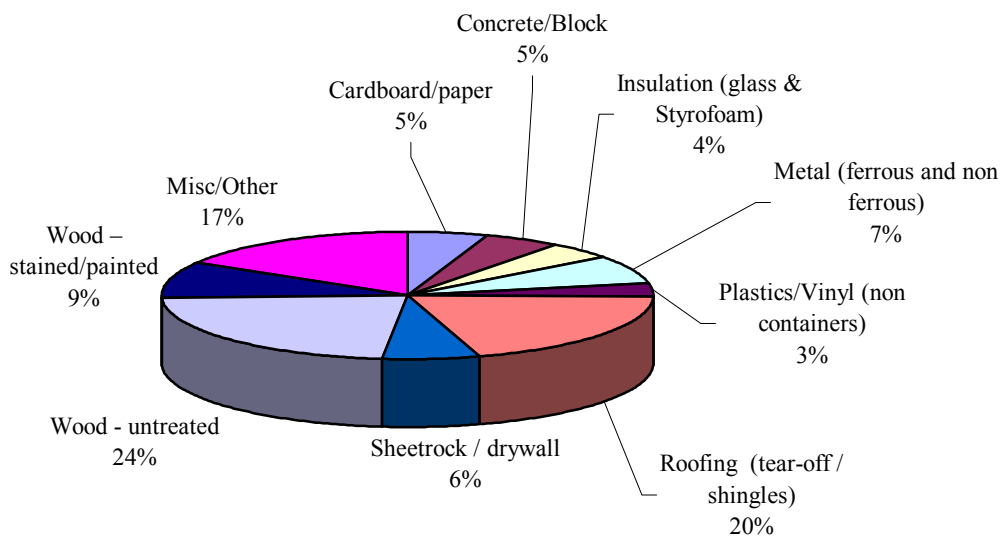
3.1 Composition of Construction Waste

The composition of construction waste is essential when developing the approach and feasibility of any waste reduction and recycling project. Construction waste composition varies and depends on the characteristics and type of structure (e.g. wood frame versus concrete block). While construction and demolition waste sorts and composition studies have been conducted for various C&D activities throughout the country (U.S. EPA, 1998), there is little specific information for Minnesota. The Minnesota construction waste composition data that is available was examined. Since many of these composition studies were conducted at the disposal facilities, it is difficult to differentiate between construction and demolition waste. Although the waste sorts conducted at the disposal facilities in Minnesota consisted of both construction and demolition waste, they are referenced here to get an overall idea of the types of waste materials generated.

When comparing the results of waste characterization studies, it is important to consider how estimates were made. There are two primary ways of classifying waste composition: by mass or by volume. While volume percentages may be visually estimated, mass compositions require obtaining the weight or mass of each component. The density (mass/volume) of different construction waste materials varies widely. As a result, volume-based estimates of a low density material (e.g. cardboard) may be higher than a mass-based estimate of the same quantity of material.

A visual survey of the waste components at seven disposal sites (SKB Transfer Station, SKB Rich Valley Demolition Landfill, Veit Transfer Station, Dem-Con Landfill, Recyco Landfill, Elk River C&D Landfill and Burnsville Sanitary Landfill) in the Twin Cities Metropolitan Area was completed by SWMCB in 1999-2000. The general composition was noted for a total of 539 loads. A percentage range for each component for each load was estimated. SWMCB's results of these visual observations were that most of the waste was generated from construction or remodeling projects. However, the percentage of shingles generated is likely to come from roof tear-off work (and a damaging wind storm in Dakota County in 1998 generated more roof replacement activities than usual) and the concrete could be from demolition. The pie chart below presents the most frequently observed components along with a weighted average percentage observed for each. The raw data for this study is presented in Appendix A.

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**Average Percentage Observed
(SWMCB, 2000)**

In the document, “Measure Twice Cut Once” (MPCA, 1993) the composition of waste received for five days in 1992 at two demolition debris landfills (SKB Rich Valley Demolition Landfill, Inver Grove Heights, MN and Dem-Con Landfill, Jordan, MN) was documented. A total of 21,253 cubic yards of waste was characterized from the two sites.

Composition of Waste from Two C&D Facilities in Minnesota (MPCA, 1993)

| Component | Percent (by volume) |
|--------------------|--------------------------------|
| Wood | 40-45% |
| Concrete and Brick | 15-20% |
| Roofing | 15-20% |
| Drywall | 5-7% |
| Dirt, Gravel, Rock | 2-7% |
| Rubber | 2-6% |
| Metal | 2-5% |
| Asphalt | 1-2% |
| Insulation | 1-2% |
| Other | 1-5% |

The percentages of the components observed in the waste stream in the Twin Cities Metropolitan Area compare with other waste composition studies. A summary of 13 various mass-based waste composition studies from throughout the nation compiled by the University of Florida

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(UF) shows that wood (59% of the waste stream) and drywall (24% of the waste stream) are the two most prominent wastes generated from residential construction. In other mass-based composition studies examined by UF, wood (61%) and concrete (69%) were primarily generated from two non-residential waste composition studies (Cochran, 2001). A volume-based composition study conducted in Florida showed that dimensional wood (44%), cardboard (11%), drywall (8%) and roofing shingles (6%) were the primary components contained in the C&D waste stream (FDEP, 2001). Each one of these components is technically recyclable. Further examination of the construction waste management structure and market availability will determine how to promote reduction and recycling of these materials in the Twin Cities Metropolitan Area.

3.2 Construction Waste Generation

The construction waste stream in Minnesota was characterized using available data in order to examine potential waste reduction and recycling opportunities. Even though the SWMCB Area consists of six counties, the seven county Twin Cities Metropolitan Area was examined for the purpose of these estimates. The feasibility of particular demonstration projects will depend upon the amount and type of construction waste generated in Minnesota. In 1998, the U.S. EPA published “Characterization of Building-Related Construction and Demolition Debris in the United States.” This report estimated construction and demolition waste from building related activities with a series of predictive equations.

Similar calculations in this section estimate construction waste generation in the Twin Cities Metropolitan Area (defined by the Metropolitan Council as Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington Counties). Data for the equations was obtained from the Metropolitan Council’s report on residential building permits issued in the Twin Cities Area (Metropolitan Council, 2001). The Metropolitan Council’s report utilizes data collected by the U.S. Department of Commerce, U. S. Bureau of the Census, and local governmental units in Minnesota. Data taken directly from the U.S. Census Bureau is presented in Appendix B. Both residential and commercial construction activities generate construction waste in the Twin Cities Metropolitan Area. Residential waste is generated from single-family and multi-family residential units.

The basic approach used in calculating the construction waste produced in the Twin Cities Metropolitan Area is as follows: the average square footage of a structure (obtained from the U.S. Census Bureau) was multiplied by the total number of structures built in the Twin Cities Metropolitan Area in one year. This provided a total square footage for both single family and multi-family residential construction. Non-residential construction total square footage was reported by the state. In each case the total square footage was multiplied by a U.S. EPA waste generation rate to obtain a total amount of construction waste generated from that activity. The total waste from each construction activity was summed to obtain the total amount of construction waste produced in the Twin Cities Metropolitan Area in one year.

Residential activity is measured in terms of *residential units* (housing units) in the Metropolitan Council report. A residential unit is defined as a “house or apartment unit intended for occupancy as separate living quarters, having either a kitchen or cooking facilities for the exclusive use of

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the occupant(s) and direct access from the outside or through a common hall.” Residential units do not include group quarters such as institutions, dormitories, hotels, and motels; however, townhouse units are included in the single-family category. The valuation assigned to a building permit at the time the permit is issued is the building cost. In general, the building permit valuation is determined by the local governmental official on the basis of average square footage costs for various types of construction, according to Minnesota Administration Department guidelines. The valuation measures the cost of construction, and is typically lower than the unit sales price. For example, the cost of the lot is typically not included in the valuation and consideration is also given to various other factors.

3.2.1 Residential Construction Waste

Single-Family Units

The total valuation of single-family units constructed in the Twin Cities Metropolitan Area for the year 2000 was \$2,009,391,044. The total number of units constructed was 11,970, which results in a per unit valuation of \$167,900 (Metropolitan Council, 2001). To calculate the amount of waste generated from single-family residential construction activity in the year 2000, the following equation is used:

$$C_{SF} = A_{SF} * N_{SF} * R_R$$

Where:

C_{SF} = Single family construction waste generated per year

A_{SF} = Average square footage of a single family home in the Midwest (U.S. Census Bureau, 2000)

U_{SF} = Number of units constructed in the Metro Area (Metropolitan Council, 2001)

R = Rate of residential construction waste generation (lb/ft²) (U. S. EPA, 1998)

$$C_{SF} = \frac{2,170 \text{ ft}^2}{\text{unit}} * 11,970 \text{ units} * \frac{4.38 \text{ lb}}{\text{ft}^2}$$

$$C_{SF} = 113,770,062 \text{ lbs} = 56,900 \text{ tons}$$

Multi-Family Units

The total valuation of multi-family units constructed in the Twin Cities Metropolitan Area for the year 2000 was \$381,142,189. The total number of units constructed was 4,468, which results in a per unit valuation of \$85,300. A weighted average of the square footage of multi-family residential construction in the Midwest was taken to find the average square footage of residential construction in the Twin Cities Metropolitan Area (953 ft²). The raw data for this calculation is presented in Appendix B. To calculate the amount of waste generated from multi-family residential construction activity in the year 2000, the following equation is used:

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$$C_{MF} = A_{MF} * N_{MF} * R_R$$

Where:

C_{MF} = Multi-family construction waste generated per year

A_{MF} = Average square footage of a multi-family unit in the Midwest (U.S. Census Bureau, 2000)

U_{MF} = Number of units constructed in the Metro Area (Metropolitan Council, 2001)

R_R = Rate of residential construction waste generation (lb/ft²) (U. S. EPA, 1998)

$$C_{MF} = \frac{953 \text{ ft}^2}{\text{unit}} * 4,468 \text{ units} * \frac{4.38 \text{ lb}}{\text{ft}^2}$$

$$C_{MF} = 18,650,000 \text{ lbs} = 9,325 \text{ tons}$$

3.2.2 Non-Residential Construction Waste

Non-residential construction activity was examined by the Metropolitan Council in a report entitled "Major Nonresidential Construction Projects in the Twin Cities Metropolitan Area 1999." This report provided regional economic trends, construction starts, and three categories of non-residential construction including commercial, industrial, and public. Major construction projects were defined in the report as new buildings or additions with an estimated value of at least \$1 million. If the value of the project was unknown, projects of at least 10,000 square feet were included. Larger renovations or alterations were also included (projects \$5 million or more in value or at least 50,000 square feet). A construction project may also consist of more than one building. Projects with activity during 1999 or expected completion dates of 2000 or beyond were included in the report. To calculate the amount of waste generated from non-residential construction activity in the year 1999, the following equation is used:

$$C_{NR} = S_{NR} * R_{NR}$$

Where:

C_{NR} = Construction waste generated per year

S_{NR} = Square footage of non-residential construction projects (Metropolitan Council, 2000)

R_{NR} = Rate of non-residential construction waste generation (lb/ft²) (U.S. EPA, 1998)

$$C_{NR} = 51,640,000 \text{ ft}^2 * \frac{4.02 \text{ lb}}{\text{ft}^2}$$

$$C_{NR} = 207,592,800 \text{ lbs} = 103,800 \text{ tons}$$

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3.2.3 Total Construction Waste

The total construction waste generation in the Twin Cities Metropolitan Area was estimated by summing the amounts of residential single family, residential multi-family, and non-residential construction waste. The following equation presents an estimate of the total amount of construction waste generated annually in the Twin Cities Metropolitan Area:

$$C_{TOTAL} = C_{SF} + C_{MF} + C_{NR}$$

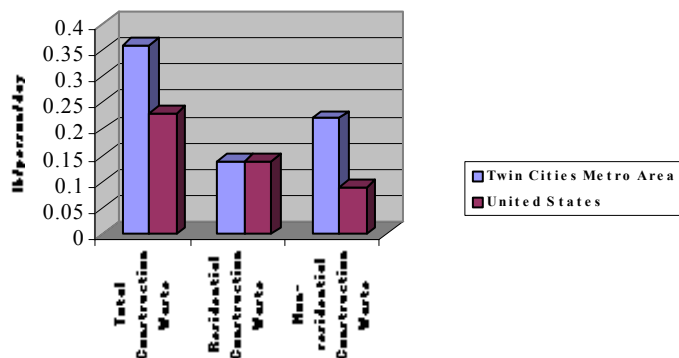
Where:

| | | |
|-------------|---|---|
| C_{TOTAL} | = | Total construction waste generated per year |
| C_{SF} | = | Single family construction waste generated per year |
| C_{MF} | = | Multi-family construction waste generated per year |
| C_{NR} | = | Non-residential construction waste generated per year |

$$C_{TOTAL} = 56,900\text{tons} + 9,325\text{tons} + 103,800\text{tons}$$

$$C_{TOTAL} = 170,000\text{tons}$$

The current total amount of construction waste generated annually in the Twin Cities Metropolitan Area is approximately 170,000 tons. Based upon the Twin Cities Metropolitan Area 1999 population of 2,578, 272, the per capita generation of construction waste is 0.36 lb/person/day (0.14 lb/person/day of residential construction waste and 0.22 lb/person/day of non-residential construction waste). This is slightly higher than the national average of 0.23lb/person/day of construction waste (0.14 lb/person/day of residential construction waste and 0.09 lb/person/day of non-residential construction waste) reported by the U.S. EPA in 1998. However, it should be noted that 0.36/lb/person/day is for the Twin Cities Metropolitan Area construction waste only and does not include waste from outside the seven county area or demolition waste. The bar chart below shows the comparison between the per capita construction waste generation rate for the U.S. and the Twin Cities Metropolitan Area. The residential construction generation rate is comparable while the non-residential rate is higher, which is not surprising for a metropolitan area.



Estimated Per Capita Generation of Construction Waste

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4.0 CONSTRUCTION WASTE REDUCTION AND RECYCLING

A review of potential recycling opportunities in Minnesota was completed by URS. The market review also examined current practices of the construction industry in Minnesota. Overall, construction waste is a low value material. Recycling of construction waste may not be economically viable (e.g. for processing only) unless tipping fees, collection and/or hauling costs are included. The fact that construction waste is a low value material contributes to the barriers for recycling in Minnesota and elsewhere.

4.1 Reusing Building Supplies

Unused building supplies may be recovered, sold, and reused. This is a favorable way to reduce waste and keep materials from the waste stream. The materials typically do not require processing and may be used in the manner for which they were originally produced. Lumber, shingles, whole bricks, siding, insulation and other materials have a potential for reuse in construction. The recycling and reuse of building materials in new construction can be encouraged by maintaining a storage area for discards and remnants that could possibly be used in other projects. This may be more feasible in projects with multiple structures under construction (e.g. a production builder's site).

Remnants and cutoffs of building materials can be maintained on-site or in one central area, and can be readily identified and reused in construction in place of new materials. There are concerns with color matching in this regard (e.g. one batch of shingles may not exactly match another) and builders would not want to use a noticeably different shade of building product on one structure. This barrier, along with the fact that materials for each house are ordered in advance and storing materials on-site is not perceived as practical, are reasons that many new construction materials are not reused. Disposal is relatively inexpensive and already built into the cost of the structure, so unused materials are typically thrown away for convenience and without much thought to waste generation.

Materials generated during construction activities can also be used in other construction projects such as roads, foundations, and earth fill. Examples are further outlined in Section 4.2. Organizations such as Habitat for Humanity and Minnesota Waste Wise may have an interest in reusable material. Certain industries may also represent a market for recovered construction materials. This includes the reuse of materials by an industry for the manufacture of the same product (e.g. the recycling of gypsum drywall in the manufacture of new drywall), or other unrelated industries may use construction materials as a component in the manufacturing process, or in the production of fuel (e.g. asphalt shingles used in the production of hot-mix asphalt).

4.2 Markets and Materials

4.2.1 Wood

Wood recovered from construction waste is commonly used for fuel. Wood has a high heating value and has been used by a number of industries as boiler fuel. Most wood shipped for fuel is

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chipped prior to transportation, and is an added cost. Wood that has minimal soil and other foreign objects and a low moisture content is most desirable. The presence of large amounts of treated wood creates air emission control and ash disposal problems. Treated wood¹ should be removed from the recovered wood stream prior to grinding. Xcel Energy (formerly NSP) examined the use of wood as a partial substitute for coal in some of its cyclone coal burners. The A.S. King Plant in Bayport, MN is permitted to use some wood scrap from nearby Anderson Windows (MPCA, 1993). The St. Paul Energy District is planning to build a plant in the near future which will fire bio-mass (wood and other materials) to produce electricity (White, Personal Communication, 2001).

A number of engineered wood products are produced from chipped wood material. These products include fiberboard, oriented strand board (OSB), and particle board. The wood chips are formed into boards by various pressing methods and adhesives. No foreign materials should be present. Construction wood has been suggested as a source of chipped wood for the manufacture of engineered wood (Donovan and Associates, 1998). A key characteristic of the wood is its particle size. Some manufacturers may accept larger pieces of wood if they maintain their own size-reduction equipment.

Chipped wood may be used for mulch in horticultural and agricultural applications. The wood should be free of foreign material to the extent practical and should contain no treated wood. The reuse possibilities of mulch from recovered construction wood typically revolve around aesthetics. Foreign materials such as nails and plastic greatly limit appeal. Construction wood does not have the typical dark mulch color that is often preferred, but some companies market coloring agents for mulch. The National Association of Homebuilders has suggested that wood can be chipped at the construction site for use in landscaping (NAHB 1997). For example, Dunham Brothers Wood Recycling, Lakeville, MN is grinding clean wood waste into animal bedding and South Metro Sort and Recycle, Shakopee, MN, is coloring wood mulch and offering it for sale. Because of the moisture absorptive capacity of the wood, another application for recovered construction wood is use as a bulking agent in composting. All of these uses require a clean wood stream with little or no foreign material. No treated wood should be present.

4.2.2 Sheetrock/Drywall

Gypsum drywall (also known as wallboard) is composed of the mineral calcium sulfate dihydrate ($\text{Ca}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$) and a paper backing. It is used as an interior wall building material because of its fire resistant properties. Recycled gypsum drywall may be used as a feedstock material in the production of new drywall; however, manufacturers often own gypsum mines and utilize their own scrap from manufacturing for reuse, so there is not much motivation to incorporate post-consumer recycled drywall back into the manufacturing process.

¹ A number of different wood preservatives are used for treating wood, including creosote and pentachlorophenol, but the most common preservative encountered in construction is copper chromated arsenate (CCA). As part of a research study conducted by the University of Florida, it was determined that approximately 5 to 6% of the C&D wood stream at Florida C&D recycling facilities was composed of CCA treated wood. See "Generation, Use, Disposal, and Management Options for CCA-Treated Wood." Final report, Florida Center for Solid and Hazardous Waste Management.(1998).

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Gypsum is commonly applied to soil for the following agricultural purposes:

- as a source of plant nutrients
- improving soil structure
- reclamation of sodic soils
- correction of subsoil acidity

If drywall is used as the gypsum source, it must be crushed prior to application. The paper backing biodegrades once applied to the soil and exposed to the elements. The National Association of Homebuilders suggests that individual contractors can crush drywall on-site and land apply it as a soil amendment (NAHB 1997). It should be noted that sulfate will dissolve from drywall in water. Sulfate has a federal secondary drinking water standard (250 mg/L) and under anaerobic conditions hydrogen sulfide (a noxious smelling gas) may be produced. Local environmental officials should be consulted prior to land applying crushed drywall.

Crushed gypsum drywall has also been proposed for use as animal bedding material and as a compost amendment. Gypsum's ability to absorb moisture and control odors has been cited as a benefit for animal bedding (Kalvin 1991, Turley 1998). As a compost amendment, gypsum drywall provides a bulking agent to absorb moisture and allow airflow.

4.2.3 Asphalt Roofing Shingles

Excess asphalt roofing can be used in the manufacture of new asphalt shingles. The reuse of asphalt shingles has also been proposed for a number of reuse options related to roadways. Crushed shingles can be used as a source of asphalt in the manufacture of hot mix asphalt concrete (Button et al., 1998). Crushed shingles have also been used as a primary road surface material for rural roads. Recovered asphalt roof waste has also been marketed for the patching of potholes and ruts in roadways.

Chipped asphalt shingles have also been proposed for use under driveways during home construction. The shingles would be prepared for this application using an on-site grinding process. A concern with grinding and recycling asphalt shingles is the potential for them to contain asbestos; however, if the shingles to be ground are new, a certificate may be obtained from the manufacturer certifying that the shingles are asbestos-free. In the United States, asbestos has not been used in the manufacturing of asphalt shingles since the 1970s. The Construction Materials Recycling Association (CMRA), under a grant from the U.S. EPA, is currently conducting a study and creating a web site addressing all aspects of asphalt shingle recycling. It will ultimately be up to state and local regulatory agencies to determine the guidelines if this recycling practice is allowed. The Minnesota Department of Transportation (Mn/DOT) has examined the use of shingle scrap in hot mix asphalt since 1990 and issued a report in October 1996 entitled "Minnesota's Experience Using Shingle Scrap in Bituminous Pavements". The report examined the use of shingle manufacturing scrap as a salvage material in hot mix asphalt. Mn/DOT determined that test sections using post-manufacturer shingle scrap performed as well as control sections where no shingle scrap was used. Based upon the results of these tests, Mn/DOT developed specifications (2331.E2e) to use shingle manufacturer scrap in hot mix asphalt (Mn/DOT, 1996).

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Construction waste shingles could be used in a similar manner as long as they were certified to not contain asbestos. Mn/DOT continues to research the use of shingle scrap in roadbase.

4.2.4 Concrete and Brick

Crushed concrete and brick are often used as base fill in the construction of roads. The crushed material is used in place of limestone. This reuse option represents a large potential market. The economics of such reuse are often dictated by the local availability of limestone deposits, as hauling costs are substantial. The purity (i.e. presence of wood, dirt, and other contamination) of the concrete material can be a concern. Crushed concrete and brick may also be used as primary road surface material on unpaved roads in rural areas. The use of crushed concrete for driveways is also practiced, with portable crushing equipment available for crushing and grinding directly on-site.

4.2.5 Metal

A number of different metals are frequently encountered in the C&D waste stream. Metal is used as a structural support material in larger construction projects. Residential construction projects may encounter small amounts of metal associated with wiring, siding, fasteners, and roof flashing. Typical metals associated with construction projects are copper from pipe and wire, iron from structural beams and supports, and aluminum and tin from siding. When present in sufficient amounts, the recycling of metal is an attractive option because of the ready market for recycled scrap metal.

4.2.6 Cardboard

Cardboard is one of the most commonly recycled components of the solid waste stream. It is advantageous to recycle cardboard from new construction projects because cardboard can consume substantial volume in a waste container. The cardboard recycling market is already developed and recycling cardboard from construction activities should be quite feasible. The market value for cardboard is extremely variable, but is usually cheaper than waste disposal. Recycled cardboard is typically processed by mills into new cardboard products.

4.2.7 Plastic/Vinyl

A number of types of plastics may be encountered in construction waste. Plastic components include plastic sheeting, containers such as caulk tubes, and vinyl siding. A guide to recycling vinyl siding has been published by the American Plastics Council. Unfortunately, there does not appear to be much of a local recycling market for vinyl siding unless there is a very large volume of it and it is all the same color. In most cases it is not feasible to recycle other plastics from the construction waste stream because of the wide variety of items and plastic resins encountered.

4.3 Construction Waste Recycling Projects

Other construction waste demonstration projects have been conducted elsewhere in the United States. Evaluating these projects and the data generated can be useful. Determining gaps in

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construction waste generation, reduction, and recycling data and reviewing outcomes of past projects can direct future studies. Successes by other projects can be learned from and built upon. The following is a brief description of recent and relevant construction waste projects performed in the United States:

- *Recycling of Construction and Demolition Wastes through Source Separation: A Demonstration Project, Florida, 1998*
A research project examining the recycling of C&D debris at the job site was conducted by the University of Florida with funds from the Florida Department of Environmental Protection. The project consisted of recycling the construction materials from several houses at a production builder's site. Based on the experience, a guide was developed entitled "A Guide to Job Site Recycling of Construction and Demolition Waste."
- *Recycling of Gypsum Drywall in Florida, 2001*
This project examined three separate Innovative Recycling Grants given by the Florida Department of Environmental Protection within the State of Florida. The University of Florida, Jones Edmunds and Associates, and R.W. Beck assisted with each grant. A grant was given to Citrus and Putnam Counties to assess the feasibility of recycling drywall at cement kilns and recycling into new drywall. The New River Solid Waste association was given a grant to grind drywall and use it as an agricultural amendment and as landfill road base material. In Okaloosa County, drywall was used as a compost amendment. The most feasible recycling option was identified as processing drywall at a central location with a trommel screen and recycling it at a cement kiln. Recycling into new drywall and using it for agricultural applications is favorable; however, these markets require additional development through education and more willingness from potential participants.
- *WasteCap, Wisconsin, 2001*
WasteCap, WI is a non-profit organization that provides waste reduction and recycling assistance through business-to-business peer exchange targeting construction and demolition debris, food waste, computers and other electronics. WasteCap has completed several research and demonstration projects regarding C&D debris. WasteCap oversaw the recycling of materials from the Metropolitan Builders Association of Greater Milwaukee and highlighted results during the Parade of Homes. Both wood and cardboard were separated on site and recycled through a time-management based approach. Recycling dumpsters were placed on-site during framing (for wood) and during the installation of appliances and other devices (cardboard). Another WasteCap project examines the recycling of construction waste at a commercial job site. The subcontractors of an Alliant Energy construction project separated wood, cardboard, drywall, metal, office paper, styrofoam packaging, cans, bottles, and clean fill for recycling. Opus North Corporation, the design build firm, appears to be pleased with the results. Separating materials for recycling was both feasible, and cheaper than disposal. The subcontractors also tried to reduce and reuse waste.

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- *On-Site Grinding of Residential Construction Debris: The Indiana Grinder Pilot, 1999*
The objective of the pilot project documented in this report was to determine the feasibility of on-site grinding and application of clean wood, drywall, and cardboard waste from new residential construction as an alternative to conventional landfilling. The evaluation included the identification and assessment of the major technological, economic, and environmental factors associated with the grinding technique. The pilot project was established near Indianapolis, IN and involved several organizations, including residential builders and a waste management firm. A comprehensive cost analysis was completed and a “Guidelines of Land Application of Processed Wood, Gypsum Wallboard and Cardboard” was developed.
- *On-site Separation of Materials and Land Application of Drywall at a Residential Construction Job Site, Georgia, 2001*
The Pollution Prevention Assistance Division (P²AD) of the Georgia Department of Natural Resources contracted with Southface Energy Institute to conduct two construction waste demonstration projects. The first project involved on-site separation of materials on the job site; the second project entailed land applying drywall. On-site separation of construction materials was not a common practice in the Atlanta area. Based on waste assessments and discussion with builders, most builders in the Atlanta area use cleanup services that "sweep" the house several times during construction and manually load and haul materials from the job site. The manual loading process presents an opportunity to separate materials for recycling. Hedgewood, a large production builder in Atlanta, committed to separate the construction waste generated at nine job sites. Their waste hauler agreed to weigh the materials and track labor associated with the on-site separation. P²AD identified existing recycling markets for the materials, and Hedgewood agreed to recycle or reuse as many items as possible. Packer Industries donated the use of their materials grinder to grind wood waste and drywall. Upon completion of the project, P²AD will prepare a guide for on-site separation of materials for recycling and specifications for land applying drywall and using wood chips on-site.

4.4 Summary of Recycling Options in Minnesota

Based on available markets, some materials will be diverted from the landfill and others will be targeted for reuse. To assist in deciding on the appropriate demonstration projects, the recycling options for construction waste in the SWMCB Area were evaluated. The following table summarizes the primary construction materials targeted and the potential recycling opportunities in Minnesota. The opportunities for recycling are rated by URS as poor, fair, good or excellent. These ratings are the opinion of URS based on the results of this study and are not the result of a formal survey.

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| Material | Recycling/Reuse options | Recycling/Reuse Rating |
|--------------------------|---|---|
| Wood | <ul style="list-style-type: none"> • Fuel • Mulch • Animal bedding • On-site soil amendment | <ul style="list-style-type: none"> • Fair; may not be economical to prepare for fuel • Excellent; currently practiced • Excellent; currently practiced • Good; potential exists, successful in other locations |
| Drywall | <ul style="list-style-type: none"> • New drywall • Cement • Agriculture soil amendment • On-site soil amendment | <ul style="list-style-type: none"> • Poor; little interest by local drywall manufacturers • Poor; no local cement kilns • Fair; some potential, transportation may be issue • Good; potential exists, successful in other locations |
| Asphalt Roofing Shingles | <ul style="list-style-type: none"> • Hot mix asphalt • On-site driveway and other applications | <ul style="list-style-type: none"> • Good; has been tested and practiced, needs market development • Good; potential exists, successful in other locations |
| Concrete and brick | <ul style="list-style-type: none"> • Aggregate in new concrete • On-site grinding | <ul style="list-style-type: none"> • Fair; little concrete in construction waste • Good; possible road application |
| Metal | <ul style="list-style-type: none"> • New metal products | <ul style="list-style-type: none"> • Excellent; markets established and currently practiced |
| Cardboard | <ul style="list-style-type: none"> • Cardboard products | <ul style="list-style-type: none"> • Fair; market established, but lots of market variability and low prices |
| Plastic/Vinyl | <ul style="list-style-type: none"> • Plastic/vinyl products | <ul style="list-style-type: none"> • Poor; no local recyclers for this type of material |

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5.0 DEMONSTRATION PROJECTS

5.1 Demonstration Project Number 1: On-site Grinding

5.1.1 Introduction and Purpose

The purpose of Demonstration Project Number 1 is to explore the technological feasibility, cost effectiveness, environmental soundness and regulatory issues associated with on-site grinding and the beneficial reuse of construction wastes. Source separated untreated dimensional lumber, oriented strand board (OSB), plywood, gypsum drywall, shingles, brick, and small quantities of unrecyclable cardboard and paper packaging may be ground and land applied at the construction job site as a soil amendment, erosion control method or driveway base, depending upon the materials. In addition, construction waste reduction, reuse and recycling options will be explored and evaluated to reduce the volume and toxicity of the construction waste stream.

Partners in this demonstration project include Construction Debris Management, the Packer Industries on-site grinder representative; Construction Waste Solutions, the on-site service provider and grinder operator; and the production builder, Pulte Homes.

Pulte Homes is the nation's largest homebuilder. The Bloomfield Hills, Michigan-based company is a publicly-held residential builder present in 44 markets in the United States, Mexico, Argentina and Puerto Rico. Pulte Homes has built more than 407,000 homes and serves all buyer market segments. Most of the homes built by Pulte Homes in the Twin Cities Metropolitan Area are multi-family residences. Pulte Homes utilizes on-site wood framing methods. The large volume builder is interested in reducing the cost of construction waste disposal. The proposed demonstration project locations are the Pioneer Point development in Chaska (Carver County), and the Regatta Development in Apple Valley (Dakota County). These locations are presented below.



Location of Pulte Homes On-Site Grinding Demonstration Projects

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5.1.2 Scope of Services

The scope of services for Demonstration Project Number 1 was developed based upon the waste management hierarchy:

- Reduce/minimize waste generation,
- Reuse materials for their original intended purpose,
- Recycle materials for other use, and
- Dispose of remaining materials.

Demonstration Project Number 1 is expected to commence in mid-December 2001 and end in the fall of 2002, or when the two housing projects are completed, whichever is sooner.

Construction Wastes Generated

According to Mr. Kevin Peterson, Construction Debris Management, Pulte Homes currently pays approximately \$700 per housing unit for disposal of construction waste. The primary waste materials generated are wood, drywall, vinyl, shingles, insulation and metal. The approximate quantities of materials proposed to be suitable for grinding and land application are presented in the table below.

According to Mr. Peterson, Pulte Homes generates the following approximate amounts of construction waste for a typical 2,000 square foot home.

| Waste Material | Quantity Generated |
|-------------------|----------------------------------|
| Solid Sawn Lumber | 1,600 pounds |
| Engineered Lumber | 1,400 pounds |
| Drywall | 2,000 pounds |
| Cardboard | 500 pounds |
| TOTAL | 5,500 pounds or 2.75 tons |

The square footage of a Pulte townhome is typically a bit less than 2,000 square feet. Mr. Peterson noted that the construction of an average a single family home built by Pulte generates approximately two 30 cubic yard dumpsters full of waste, and an average Pulte townhome generates approximately one and a half 30 cubic yard dumpsters of waste. The construction waste is currently being disposed at a demolition debris landfill.

Minimize Waste Generation

1. Pulte Homes will provide URS with building materials purchasing practices information; URS will evaluate this information and make recommendations to minimize the purchase of excess materials as appropriate.
2. Pulte Homes will provide URS with construction techniques used to minimize waste generation; URS will evaluate this information and make recommendations for increased waste minimization as appropriate.

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Reuse of Excess Materials

1. URS will explore options of material reuse with Pulte Homes. Since materials will be source separated for recycling and on-site grinding, excess material may potentially be stored on-site for reuse opportunities as discussed in Section 4.1 of this memo. Materials that will be targeted for reuse include vinyl siding, roofing shingles, drywall, wood, brick and insulation. URS will assess the feasibility of this practice through feedback from the builder. Issues to explore include the feasibility of on-site storage; color/material matching from unit to unit; sub-contractor cooperation; and a comparison of time and energy of reuse efforts versus cost of disposal.
2. The possibilities of returning excess materials, such as unopened squares of shingles and pallets of brick, to the manufacturer will be explored.

Recycling of Construction Waste Materials

Construction waste that cannot be reused will be recycled to the extent possible and practical. The primary recycling process chosen for this demonstration project is on-site grinding and on-site land application of the construction materials. The process will be as follows:

1. Pulte Homes, Construction Debris Management and Construction Waste Solutions will provide URS with reliable, actual, on-site construction waste quantity data.
2. Pulte Homes, Construction Debris Management and Construction Waste Solutions will source separate clean wood, OSB (if approved for land application), shingles, brick and drywall.
3. Pulte Homes, Construction Debris Management and Construction Waste Solutions will provide URS with the dates, quantities and types of waste processed in the on-site grinder.
4. Pulte Homes, Construction Debris Management and Construction Waste Solutions will provide URS with data pertaining to the types, quantities, and locations of materials land applied and dates of application.
5. Soil samples will be obtained before and after the addition of construction waste materials to the soil; samples will be analyzed for carbon and nitrogen ratios and total metals.
6. Pulte Homes, Construction Debris Management and Construction Waste Solutions will provide URS with financial information pertaining to the avoided disposal costs, unprocessable material disposal costs, and costs associated with use of the grinder including operations and maintenance costs and labor.
7. Pulte Homes, Construction Debris Management and Construction Waste Solutions will inform URS of all issues pertinent to the project, such as material separation or storage challenges, operational issues, weather impacts, etc.

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8. URS will monitor the progress and keep track of all data as reported by Pulte Homes, Construction Debris Management and Construction Waste Solutions.

Regulatory Issues

Prior to commencing Demonstration Project Number 1, URS will assist Pulte Homes with their efforts to obtain regulatory approvals to perform the on-site grinding method of construction waste management. This approval process may require the involvement of several state and local regulatory agencies. The following table summarizes the potential regulatory issues and regulatory agencies and other organizations involved.

| Category | Questions/Issues | Agencies & Contacts |
|-------------------------------|---|--|
| Air | <ul style="list-style-type: none"> • Generation of particulate dust during grinding | <ul style="list-style-type: none"> • MPCA |
| Stormwater | <ul style="list-style-type: none"> • Run-off from materials grinding, storage and soil application • Use of wood chips for erosion control • NPDES permit issues | <ul style="list-style-type: none"> • MPCA • Carver County • Dakota County • City of Chaska • City of Apple Valley • Watershed districts, if applicable |
| Land Application of Materials | <ul style="list-style-type: none"> • Gypsum as soil amendment • Land application of OSB and other glued wood • Shingles as driveway base • Beneficial reuse of brick • Storage of source separated materials on-site | <ul style="list-style-type: none"> • Department of Agriculture • U of M: Soil Scientists • MPCA • Office of Environmental Assistance • Carver County • Dakota County • City of Chaska • City of Apple Valley |
| Building Permits | <ul style="list-style-type: none"> • Modifications to building permit or zoning, if applicable | <ul style="list-style-type: none"> • City of Chaska Building Inspector • City of Apple Valley Building Inspector |
| OSHA | <ul style="list-style-type: none"> • Worker safety | <ul style="list-style-type: none"> • MNOSHA, if applicable |

The University of Minnesota County Extension Service will be a valuable resource for soil amendment issues.

Other Recycling Opportunities

In addition to the construction materials slated to be ground on-site and land applied, the following construction waste materials will be source separated and outlets for recycling will be sought:

- All metals
- Aluminum beverage containers (left on site by construction workers)
- Cardboard
- Concrete
- Paper packaging

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- Glass
- Insulation
- Vinyl
- Other materials as identified

Disposal of Construction Waste Materials

1. Construction wastes that cannot be reused, ground, or recycled will be disposed by Pulte Homes, Construction Debris Management and Construction Waste Solutions. Reasons for disposal, costs, quantities, types of materials, disposal location and dates will be provided to URS.
2. URS will calculate and evaluate waste reduction, reuse, recycling, and disposal percentages based on the total amount of waste generated and managed.

5.1.3 Evaluation of Demonstration Project Number 1

The following section outlines possible challenges, benefits and recommended actions relative to the on-site grinding demonstration project:

Possible Barriers

Potential barriers or challenges to the on-site grinding process are the following:

- Inclement and cold weather
- Separating materials on-site
- On-site storage of materials and keeping materials free from contamination
- Labor intensiveness of on-site grinding
- Environmental concerns by regulatory agencies or community
- Cost effectiveness
- Recycling opportunities for other materials separated on-site

Possible Incentives

Potential incentives to managing construction waste through on-site grinding may be the following:

- Reduced quantities of waste landfilled
- Source separation of materials to be ground on-site may lead to additional recycling of other materials at the job site, such as metal and cardboard
- Cost effectiveness may lead others to manage waste in this manner, thereby reducing the amount of waste landfilled
- Project may increase awareness and practicality of waste reduction measures
- Builder may gain marketing advantages
- Builder benefits from the reuse of material
- Process promotes sustainable development in the community

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Recommended Actions

URS will evaluate this demonstration project by examining the feasibility of a full-scale construction waste on-site grinding operation in the Twin Cities Metropolitan Area. The economic incentives or disincentives for the builder will be examined. Environmental issues, such as gypsum application rates in soils, and regulatory issues and processes will be examined and evaluated.

Based upon the findings of the demonstration project, URS will make recommendations relative to solid waste management policy and regulation; legislation; pilot programs; financial incentives; education; contract specifications; and purchasing to encourage and establish construction waste reduction and recycling in the SWMCB Area.

5.2 Demonstration Project Number 2: Construction Materials Recovery Facility

5.2.1 Introduction and Purpose

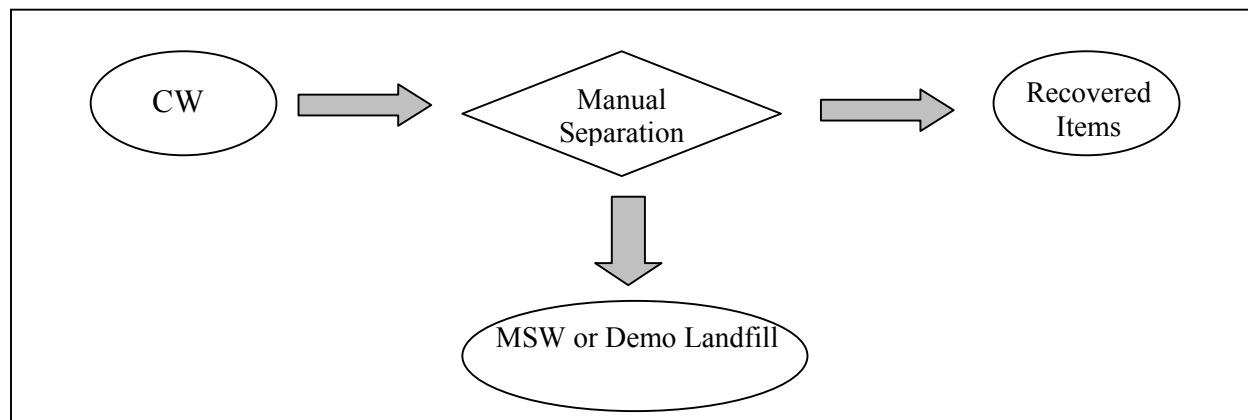
South Metro Sort and Recycle, Inc. (SMS&R), Shakopee, MN is a recycling facility owned and operated by HP Environmental, Inc., the owners and operators of the adjacent Dem-Con Landfill, a demolition debris disposal facility. Mr. Jason Haus is Vice President of SMS&R, which began operations in October 1999. Although SMS&R is located in Scott County, which is outside of the SWMCB area, it accepts waste from counties located in the SWMCB region, and is an important component of the construction and demolition debris management system in the Twin Cities Metropolitan Area.



Location of South Metro Sort and Recycle

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The facility is a “dump and sort” facility. Construction and demolition waste is unloaded on to the sorting floor and materials with ready markets are separated out by hand. Any remaining material is sent to the adjacent DemCon Landfill or an MSW landfill, as appropriate. The flow chart below illustrates this technique. Using manual separation alone typically has a high reject value close to 50% (FDEP, 2001). This is the simplest way of recovering mixed (non-source separated) construction waste. Other methods include combining mechanical and manual, and mechanical only approaches.



Dump and Sort Approach

5.2.2 Scope of Services

The scope of services for Demonstration Project Number 2 was developed based upon the waste management hierarchy:

- Reduce/minimize waste generation,
- Reuse materials for their original intended purpose,
- Recycle materials for other use, and
- Dispose of remaining materials.

Demonstration Project Number 2 is expected to commence in mid-December 2001 and end in the fall of 2002.

5.3 Study Focus

There are many challenges affecting the success of a dump and sort facility in the Twin Cities Metropolitan Area. The focus of the study is to examine the existing industry conditions that affect the optimal utilization of the SMS&R facility. Issues to be evaluated include the following:

1. Prevailing in-state and out-of-state construction waste disposal fees and their effect on construction waste disposal choices
2. Distance to construction waste disposal and processing facilities and the effect on construction waste disposal choices

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3. Construction waste processing incentive programs
4. Operational permit conditions affecting construction waste disposal and processing facilities
5. The financial effects of charging by the ton versus by the cubic yard
6. Fees and taxes on nonMSW and the landfilling of residuals
7. Perceived disincentives for construction waste processing by the construction waste industry including costs and material sorting at job site
8. Markets for end products

5.3.1 Evaluation of Demonstration Project Number 2

The following section outlines possible challenges, benefits and recommended actions relative to the SMS&R demonstration project:

Possible Barriers

Potential barriers or challenges to the mixed construction waste dump and sort process are the following:

- Industry pricing inequities
- Taxation issues
- End market limitations
- Lack of construction industry incentive and education

Possible Incentives

Potential benefits to managing construction waste through a dump and sort facility may be the following:

- Reduced quantities of waste landfilled
- Reduced toxicity of construction waste inadvertently entering landfills
- Reduced need to source separate materials on-site prior to delivery at the facility may encourage use of the facility
- Increased recycling of materials such as metal and cardboard
- Project may increase awareness and practicality of waste reduction measures

5.4 Recommended Actions

URS will evaluate this demonstration project by examining the incentives and disincentives of processing construction waste at a dump and sort facility in the Twin Cities Metropolitan Area. The associated economics, taxes, and logistics of the process will be evaluated.

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Based upon the findings of the demonstration project, URS will make recommendations relative to solid waste management policy and regulation; legislation; pilot programs; financial incentives; education; contract specifications; and purchasing to encourage and establish construction waste reduction and recycling in the SWMCB Area.

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