

**Construction, Renovation
And Demolition Wastes
Market Profile Report**

Prepared for

ALBERTA ENVIRONMENT

by

WILLOW ROOT ENVIRONMENTAL LIMITED

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NOTICE TO READERS

The mention of any specific operator in this report is done for the purpose of providing examples only and does not constitute an endorsement of that business. Effort has been made to ensure that this report accurately reflects operators and market conditions based on the information available at the time of writing. The activities of operators, fees charged, and prices paid for materials may change over time. Market values presented in this report are not quotations for the purposes of conducting business. Readers interested in specific information relating to any operator, their service, or the sale of goods must contact the operators directly.

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1/ PURPOSE

This report has been prepared for the use of the Construction, Renovation, and Demolition Waste Reduction Advisory Committee. The purpose of the work conducted was to update current understanding of opportunities for marketing construction, renovation, and demolition (CRD) materials in Alberta. This has been achieved by:

- a) Reviewing Alberta Environment's 1995 Recycling Market Profiles for CRD wastes;
- b) Preparing an updated inventory of CRD materials recyclers in Alberta;
- c) Contacting CRD materials recyclers to determine market information;
- d) Preparing updated market profiles including trends and issues for the large CRD waste classes.

The four large (by weight) categories of CRD wastes were identified as

Concrete, asphalt, bricks and mortar;
Wood wastes;
Wallboard; and
Other building materials.

2/ METHODOLOGY

Information gathering consisted of three components. Research was initiated by undertaking a background study to identify current issues, markets and developments in CRD waste minimization. This background information was gathered by reviewing the 1995 Recycling Market Profiles for C&D Wastes in Alberta and conducting an on-line and library literature search with support from more recent CRD background reports provided by Alberta Environment.

Secondly, a questionnaire was developed to address and gather information on the specific CRD waste recycling in Alberta. The questionnaire was used to direct phone interviews and site visits with CRD recyclers which were identified in the Province. Personal on-site interviews were conducted with a number of representatives of key CRD materials recyclers. Potential recyclers were identified during the gathering of the background information, through industry contacts including participants on the CRD Waste Reduction Advisory Committee, and through formal interviews with recyclers and others involved in the CRD industry.

Finally, the information gathered in this manner was used to prepare the market profiles presented in Appendix I and the updated list of CRD recyclers and related contacts presented in Appendix II. It should be noted that the term recycling is used in a generic sense. Although this project did not investigate reduction practices it does include other types of waste minimization practice such as reuse, energy recovery and composting.

3/ OVERVIEW OF CRD RECYCLING MARKETS IN ALBERTA

The following overview discusses the general findings of this investigation into recyclers and recycling markets. More specific information and discussion relating to the materials and Alberta diversion practices, is included in the market profiles.

Alberta is well positioned to improve CRD waste diversion. The recurring theme arising from discussions with recyclers is that, for the largest CRD waste classes, there are market options that are viable, or soon will be viable. Pilot projects as the Rocky Ridge Housing development recycling program and the Harvey Barracks decommissioning have shown that where there is institutional encouragement industry operators can achieve significant success in diverting CRD wastes from landfill. These successes have occurred in spite of the various perceived barriers such as low landfill tipping fees, transportation costs and waste stream separation issues. These successes could only be achieved if viable markets existed for materials.

Some of the current market success results from materials, such as aggregate, being in high demand. A material such as CRD wood waste has viable markets in Alberta because of its proximity to agricultural demand combined with the opportunity to be captured by diversion processes which are well developed to deal with wood waste from other Alberta industries such as forestry. Gypsum wallboard is readily recyclable but capture rates need be improved and industry participation encouraged. Metal has a long history as a recyclable waste. The only large waste category that does not have access to proven markets in Alberta is asphalt roofing. At present, a few private sector operators are investigating market opportunities for these materials and, given successes in other jurisdictions, these markets are likely to begin opening up in the coming years. Some support from governments to assist the establishment of recycled content specifications may be helpful for this material.

For some materials Alberta may have the luxury of choosing between markets. The issue may not be whether there is a market for a given material, but which market is the most appropriate to encourage. For example, land application of wallboard may be feasible but given the proven feasibility of incorporating waste into new wallboard products perhaps the latter should be encouraged.

4/ MATERIAL SUMMARIES AND RECENT TRENDS

Concrete and Asphalt

Over recent years the recycling of concrete and asphalt into aggregate products to replace natural aggregate has become well established in the province. Several operators and a number of municipalities now have well established stockpiling or recycling programs. Waste material can be delivered to recyclers for a variety tipping fees ranging from zero to \$20.00 per tonne. In some cases, the tipping fee is charged according to truck-load at about \$20.00 per tandem load and \$40.00 per end-dump. Processed aggregate is sold in the \$6.00 to \$10.00 per tonne range that is close to natural aggregate prices. Processing and sale of the recycled aggregate is considered to be competitive with natural aggregate when full cost-benefit analysis is done. This analysis should include disposal fees for old material and all transportation costs as well as the costs of new aggregate to replace any aggregate disposed of in landfill.

Most processors have mobile crushing equipment which can move to the location of stockpiles to process material when enough has been accumulated to make processing economical. Approximately 30,000 to 50,000 tonnes has been considered a suitable volume to justify processing and operators will move 200 to 300 kilometres to stockpiles of this magnitude. One operator is using smaller processing equipment that can economically process much smaller stockpiles as well as conduct on-site processing where space is limited. On-site processing is likely to be the activity that experiences the largest growth in the coming years.

Many smaller municipalities are realizing cost savings by stockpiling concrete and asphalt until processing is viable. However, processing is not as widespread in rural areas as it is in the major centres of Calgary and Edmonton.

Current concrete and asphalt diversion from landfill is estimated at 305,000 tonnes per year. It is estimated that only 81,000 tonnes currently go to landfills each year. Given the growing demand for recycled aggregate expressed by processors, it is possible that Alberta could move to complete recovery of asphalt and concrete in the future.

Wood

Diversion opportunities for wood are also well developed in Alberta but are not well utilized by the CRD industry. Diversion opportunities seem to have become dominated by a few processors who grind or chip wood for a variety of end uses including manufacturing asphalt products, livestock bedding, landscaping applications, road fill chips and fuel. Retail outlets that sell used building materials indicate that, when available, used dimension wood sells quickly at prices that are half of the price of new products.

Clean wood can be delivered to processors where a tipping fee is usually charged. The fee is typically in the range of \$10.00 to \$12.00 per tonne or charged according to volume where fees are in the \$1.00 to \$2.50 per cubic metre range. Prices paid for already processed wood chips were found to be in the \$3.00 to \$10.00 per tonne range and approximately \$45.00 per bone dry unit.

Operators exist that can chip wood at a rate of up to 100 tonnes per day at times when demand is high. In spite of this processing capacity, CRD wood has not become a significant source of wood supply identified by processors. If barriers to diverting wood from the CRD waste stream can be overcome it should be possible for the 98,000 tonnes currently going to landfill disposal to find reuse or recycled markets.

Wallboard

Waste gypsum wallboard is commonly recycled into new wallboard products in jurisdictions where there are restrictions on disposing of wallboard into landfills. However, in Alberta only one manufacturer was found to have become involved in recycling waste CRD wallboard on a limited basis. The waste CRD material is combined with production wastes for recycling. Clean waste wallboard can be disposed at this processor for \$13 per tonne. Approximately 1600 tonnes per year of CRD waste wallboard is processed in this operation. A variety of other markets for processed waste wallboard exist including land applications in landscaping and agricultural practices. No examples of exploiting these markets were found in Alberta.

It is estimated that 78,000 tonnes of waste wallboard are going to landfill annually in Alberta. Given the proven feasibility of recycling wallboard significant improvement in diversion should be possible if barriers can be overcome.

Asphalt Roofing

Current estimates indicate that approximately 68,000 tonnes per year of roofing material is being disposed of in Alberta landfills. Because of this current ranking, asphalt shingles were added to the list of CRD waste classes that deserve a more focussed market profile.

Asphalt shingles can be ground and incorporated into roadbed mixes, asphalt pavement and the manufacture of new asphalt roofing products. A number of other jurisdictions outside Alberta are either recycling this material or undertaking testing to determine the feasibility and appropriate specifications that may apply. While no ongoing examples of recycling asphalt roofing materials were found in Alberta, a number of operators expressed interest and examples of stockpiling exist. Operators with stockpiles in both Calgary and Edmonton are investigating suitable recycling opportunities. One Calgary grinding operation has invested \$400,000 in the purchase of specialized equipment to be able to process asphalt shingles. If specifications for incorporating this material into applications such as asphalt pavement mixes can be

determined it should be possible to divert significant amounts of the material from landfill in the future.

Other Building Materials

A variety of other building materials are currently going to landfill in Alberta. This includes materials such as carpet and underlay, glass, metal, insulation, cardboard, electrical fixtures, plumbing fixtures and other removables from buildings being decommissioned. Individually, these materials make up relatively small portions of the CRD disposal waste stream. Altogether, this group makes up approximately 25.5 percent of the Alberta CRD waste stream disposed of in landfills.

Local markets continue to exist for glass and metal. A fee is charged to have glass collected or, if delivered to the processor, operators can be paid up to \$10.00 per tonne. It should be noted that markets for recycling metals have been established for many years but metal remains one of the largest CRD disposal streams with approximately 64,000 tonnes per year going to landfill in Alberta. One demolition operator has identified a market for metal in Saskatchewan where metal can be delivered directly to the foundry to realize better prices than would be possible through scrap metal dealers in Alberta.

A potential new trend in Alberta is the recycling of used carpet. In Calgary one operator is exploring the viability of recovering used nylon (N6) carpet. The carpet can be baled and shipped to the United States for recycling where a number of large firms pay 0.04 cents U.S. per pound to receive the used carpet for processing into recycled nylon fibre. The viability of collecting suitable carpet for shipment remains to be proven.

A number of retail operations, some of which are closely tied to demolition operations, exist in Alberta for marketing building removables and construction materials. Standard practice is to offer items for sale at half of the new price if the products are in good condition. Recently, these operations are becoming better integrated with other CRD operators such as demolition specialists. Marketing of materials salvaged from buildings is becoming more sophisticated with the assistance of an umbrella association and the implementation of internet marketing.

5/ SUMMARY OF MARKET BARRIERS AND INCENTIVES

To be successful, a market for CRD materials must have the following elements in balance:

- a/ A supply of materials;
- b/ A processor/handler for those materials; and
- c/ A market for the processed product.

Each of these elements can have a number of different components that can fail to support successful recycling of the material involved.

To achieve balance in these elements there must be co-ordination among industry participants. Unfortunately, the CRD industry is divided into a variety of specialized sectors which include engineering and design firms, a variety of specialized construction trades, waste management services, recycling, landfill, and deconstruction/reuse operations. Each of these sectors has relatively independent roles at different times in the building life cycle. However, many of these operators find that to make waste minimization advances they must co-ordinate their activities with the other sectors. This is not always easy. For example, if source separation is to be achieved to ensure a supply that meets recycler specifications, waste separation and collection often needs to be synchronized with the activity of specific trades. If items are to be salvaged from decommissioned buildings, project planners need to match the timing of new construction on the site with the

needs of deconstruction specialists. Without these relationships, it is found that waste management practices based on the convenience of landfills take precedence.

Another common thread is that exploitation of recycling markets is inhibited by the low cost of landfill options. Yet, given the success of some efforts in Alberta, this may only be a perceived barrier for some materials. Experience with aggregates, for example, clearly shows that recycling can be competitive with the natural product if full cost accounting is applied.

It should be noted that while recycling options exist in Alberta, any given option might not be available in all areas of the province. This means that efforts to restrict landfill disposal of CRD waste material may not immediately redirect material to recycling markets. Landfill restrictions must be associated with opportunities to properly stockpile materials pending the development of mature reuse, recycling, or energy recovery options that are appropriate for the local setting.

The following is an overview of some barriers and incentives that were identified in the background research, or by Alberta operators, as potentially affecting CRD markets in Alberta. For discussion of any given material the more detailed profiles in the appendices should be reviewed.

Separation

Achieving separation of waste materials to maintain the quality of individual materials supplied to recycling processors is a common problem. A significant barrier to separation is a reluctance to use expensive trade labour on the sorting of wastes. Having enough space on a project site to handle bins for individual materials is also a problem for many projects. The use of specialized clean-up services is an option that could be used more extensively in Alberta to overcome this issue, especially for residential construction where materials are dispersed over large development areas.

Timing

Timing can also be a problem. Often deconstruction of buildings takes time to preserve the value of materials being salvaged or processed for markets. If predetermined project schedules do not allow for this time, the materials and their value cannot be recovered. Processing operations must also be able to account for the potential for cycles in CRD activity. New construction in particular is susceptible to booms and recessions in activity which affect the generation of materials and adds risk to investing in waste diversion operations.

Planning

In many cases separation of materials, identification of the most appropriate market, and allotting space for the separated materials requires advance planning. Attempts to gather materials without these issues being resolved in advance are not likely to be successful. For projects where space is not available, careful planning early in project design may allow for the identification of ways to reduce the generation of waste. This may be more feasible than struggling to find ways to manage waste material after it is generated.

Co-operation

In most cases CRD projects include a variety of specialized activities which are not necessarily in communication with one another. Yet, to successfully separate waste materials and deter contamination, all participants in the project must be equally informed and co-operate. In addition, trades often move from one project to another. If waste management practices differ between job sites, then staff education becomes a barrier to effective diversion programs which require knowledge of the system being used on any given project.

Transportation

Transportation costs are a major part of the economics that determine the final price of recycled materials. If the source of material, processors, and end markets become too dispersed then processing becomes less

viable. This is especially true in scenarios where landfills are close to CRD projects.

If materials are separated it is likely that each material may have to be delivered to a different processor or market which has potential to increase the staff time and transportation costs especially for small operators. Pooling waste materials, stockpiling space and waste management services may help to overcome this issue. It has been suggested that establishing centralized material drop-off and processing locations for CRD operators may also help to address this problem.

Cheaper New Materials

In Alberta the availability of cheap natural materials such as aggregate and wood products discourages recycling and reuse of waste materials recovered from CRD activities.

Cheaper Options

The supply of materials for recycling is restricted because tipping fees at landfills are low enough to discourage diverting waste to recycling or reuse options. In some cases, value added processing is discouraged by lower disposal options such as burning which accept wood at much lower tipping fees than a value added processor can offer.

Low Volumes

CRD material may be generated in small volumes in dispersed locations that cannot justify transportation of material to processors or for processors to travel to the supply of material. Stockpiling and pooling of material among operators and jurisdictions may be used to overcome this barrier.

Technology

The equipment required to process CRD materials can be very expensive. For example, the technology to separate adulterants from carpet underlay during recycling is about \$1,000,000. The specialized grinding equipment needed to process asphalt roofing shingles efficiently can cost \$400,000. These investments require secure supplies of materials to justify the expense. In these investment scenarios the recycling of some CRD materials may require a few operations to process large amounts of material rather than many smaller operations that cannot justify the cost of appropriate technology.

Perception

For many recycled CRD products there is a perception by the public, and often in the design and engineering community, that the salvaged or recycled product is inferior to new or natural products. This perception needs to be addressed through awareness programs. Indeed, there are situations where the recycled product may be inferior to a new product. However, awareness programs should be careful to explain the capabilities of salvaged and recycled products and raise awareness of the appropriate uses where they can effectively compete with traditional new or natural products.

Specifications

The incorporation of processed CRD waste materials into new products may require that the new product meets standard specifications. Research and testing to determine the appropriate specifications in Alberta is required before these markets can be developed.

6/ SUMMARY OF POSSIBLE MARKET INCENTIVES

With the exception of asphalt roofing material, viable markets for CRD waste materials are operating in Alberta. Evidence suggests that markets for shingles may become established in the near future. However, with the possible exception of recycled concrete and asphalt aggregate these markets are under utilized. Low landfill tipping fees, lack of confidence in the processed product, and inconvenience of separating materials at the source were most often identified as key barriers to using these markets. Given the existence of viable markets, the application of some basic incentives are likely to achieve significant waste diversion results. In many CRD project scenarios the application of only one or two incentives may be enough to significantly increase diversion to the existing markets. These suggested incentives include:

Including waste diversion as a condition of building permits.

Applying a surcharge to building permit fees with refunds possible for verified recycling practices.

Include waste diversion specifications in CRD project terms of reference.

Improve awareness of the viability of waste diversion options including awareness of full cost accounting.

Use selective tipping fee structures or apply restrictions on disposal at landfills which target marketable CRD materials.

Research and establish specifications for including recycled materials into new products or for replacing traditional products.

Establish a high profile recognition and reward program for industry operators and organizations that achieve leadership in waste diversion rates.

7/ KEY SOURCES OF INFORMATION

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APPENDIX I
DETAILED MATERIAL PROFILES

WOOD

DESCRIPTION

Wood waste is generated in construction, renovation and demolition (CRD) projects in many forms. In construction, waste wood is generated during framing (including walls, flooring and roofing) and from damaged concrete forms as well as from damaged pallets and packing crates. During renovation and demolition activities, wood is generated from the removal of wooden structural components. Wood generated from these activities is often referred to as “white” wood. When new construction is associated with site clearing, wood - waste may result from the removal of trees and brush. This wood is often referred to as “green” wood.

SOURCES AND QUANTITIES

Wood waste is generated in any type of construction, renovation and demolition activity although most is generated during small building and residential construction and during the demolition of older buildings of varying sizes including residential demolition. In Alberta wood waste entering landfills currently amounts to approximately 98,000 tonnes per year which is equivalent to 19 percent of the total CRD waste stream going to landfill.

RECYCLING PROCESS AND MATERIAL SPECIFICATIONS

Wood waste can be diverted from landfills through a variety of reduction, reuse, recycling, and energy recovery options. Positive results can be achieved through efficient building designs that minimize the consumption of wood and reduce the cost of construction materials. Efficient designs also reduce the amount of wood waste and the associated disposal costs. However, application of these designs is still relatively new. In the immediate future the greatest diversion success will be achieved through reuse, recycling, composting and energy recovery options.

Processing wood for reuse in its original form involves careful removal and separation of wood during new construction or at a remote separation facility. Applying cautious deconstruction techniques that protect the value of wood during the demolition of structures will also generate significant amounts of reusable wood. Once the wood is removed from the work site a number of practices can be applied to protect its value in the reuse market. In most cases any fasteners such as nails, screws and metal brackets need to be removed

SUMMARY INFORMATION

MATERIAL: White and Green Wood.

PROCESS: Grinding.

SPECIFICATIONS: Should be free of foreign matter such as soil, cement, paint, preservatives, and gypsum products. Nails and fasteners may be allowed depending on the type of processing and end use. Some applications may require minimum lengths and be clear of knots and other blemishes.

USUAL PRODUCTS: Dust, chips, dimension lumber and removables such as flooring, siding and frames.

PRODUCT PRICES: Salvaged items can be sold at auction or in reuse stores starting at prices that are 50 percent of the price of new products. Milled products will sell for higher values depending on the product and market. Chips can usually be sold between \$3.00 and \$10.00 tonne. In some cases chips are paid for according to ‘bone dry units’ at approximately \$45.00 per BDU (BDU = 1.179 tonnes).

prior to processing or sale. This is not always the case since some reuse stores will accept and resell rough framing wood with fasteners still attached. Magnets can be used in some processing operations to remove ferrous metals. For higher value products such as wood flooring, care is used in dismantling the original feature to protect its value. While this may be time consuming the value of the product usually offsets the disadvantages. If they are carefully removed, large structural timbers may also be valuable for special architectural applications and secure a high price in the resale market.

If the wood that is removed from a structure is of suitable size and quality but the surface is too blemished for immediate resale it may be subjected to re-milling. Re-milling can produce a number of different products without completely destroying the integrity of the original piece of wood. Larger pieces can be re-sawn into smaller wood products such as dimensional lumber used in framing or siding. Shorter pieces can be used in finger-jointing operations as long as the quality of the wood is suitable. Finger jointing wood usually needs to be very clean, 50 centimetres in length, and contain very few knots or surface damage.

More intense processing of wood is accomplished by grinding wood scraps into chips. Grinding requires that the wood be separated from all foreign material such as fasteners, concrete, wallboard and miscellaneous metal. Moisture can be a problem depending on the end use of the ground wood product. Fuel applications, for example, require low moisture content. In most cases, treated wood and painted wood cannot be processed. This is because the treatment creates hazards during processing or in the final product. Once the wood is free of contaminants it is ground into pieces approximately five centimetres or less in length. For some applications the wood is processed to dust size. A certain proportion of larger chips may be tolerated depending on the specifications for the intended use of the chipped product.

It is possible to grind wood on the site where it is generated or to transport it directly to a more distant processing site. The off-site processor may be independent or it may be associated with a specific market for the ground product, such as a manufacturing plant, that uses the chips in its process. On-site grinding of wood is an effective way to reduce the volume of material that must be transported. Volume reduction by as much as fifty percent may be realized. The volume reduction achieved can significantly reduce transportation costs by maximizing the amount of material that can be carried in a single load. Transportation costs can be completely eliminated by finding uses for the product, such as erosion control and landscaping applications, on the site where it was generated.

RECYCLED PRODUCTS AND THEIR USES

Wooden items that are recovered for resale can include any wooden item within a building. These range from framing wood to flooring and cabinets. While high quality items may be used in high visibility applications, due to the potential for blemishes, many of these products are sold through reuse stores into low profile applications such as farm buildings, cottages, rental suite renovations and behind the scenes uses such as framing.

Re-milled wood beams can be used in structural applications, most often in custom built residences or in post and beam construction which uses traditional joinery. If the wood is of high quality these large pieces may also be used for aesthetics in non-structural applications. While the volume of wood consumed in this way is small the value can be relatively high, especially in areas where large first growth wood or the type of recovered wood is uncommon. Re-milling to produce flooring, siding, panelling and shaped or jointed products such as rails, moulding, trim and sills can produce products that add value that readily exceeds the production costs.

Other small specialty markets for high quality old wood includes boat building and musical instruments. Again these have very high quality standards but may fetch high prices.

Wood chips have a number of end use markets that can justify the costs of collection and processing. These uses for wood chips include the following.

- Fibre stock for the production of roofing materials.
- Landscape mulch and decorative ground covers.
- Fuel.
- Road bed stabilization.
- Erosion control on construction sites.
- Compost amendment.
- Livestock bedding.
- Spreading on tree root zones to protect from damage by construction equipment.
- Chips and more finely grained processed wood can also be used in value added products such as strand board and particle board.

As a fuel, wood is most often used in electrical power generating plants. These plants can be designed to use a variety of products including □as is□ wood, wood pellets, and wood dust.

CURRENT ALBERTA PRACTICE AND RECYCLING ECONOMICS

Most CRD wood waste in Alberta is sent to landfill as part of commingled loads in normal waste collection and disposal services. In some cases wood destined for landfill is separated and burned to avoid taking up landfill space or to avoid higher tipping fees. There are, however, a number of operations that are seeking to divert wood to more valuable uses.

A number of reuse stores in Alberta sell salvaged wood from demolition projects. These products generally sell for half of the new price but price will vary depending on the quality of the product. Dimensional lumber, in particular, sells well at these outlets when it is available.

Value added activities in Alberta such as milling and finger-jointing operations are not large consumers of CRD waste wood due to the prevalence of new wood and a good supply of high quality wood from suppliers such as furniture manufacturers. These milling operations in Alberta could use CRD materials if they were supplied in clean enough loads with pieces sufficiently long for their purposes.

Other users of salvaged wood include operations such as the Creative Employment Development Association (CEDA) that manufacture products such as tables, cabinets, benches and stools from wood waste. These products are sold in local craft shows and farmers markets. CEDA has tried using construction projects as a source of wood. They have discontinued the practice. Problems relating to poorly sorted loads arose and other industries, such as the oil industry, provide supplies of wood (packing crates) that are cleaner than wood from current CRD sources. It is interesting to note that this organization provides a site

clean-up service which involves sending unsalvageable wood to a wood recycler but they have found it difficult to get wood pieces large enough to meet the needs of their own reuse operation.

The majority of wood diverted from landfills in Alberta is processed into chips. Typically these operations will charge a tipping fee in the range of \$10.00 to \$12.00 per tonne or in some cases between \$1.50 and \$2.00 per cubic yard to receive suitable unprocessed product. One operation charges fees for waste collection service on construction sites but separates wood for recycling from the commingled loads it handles.

Wood chips can be sold for \$3.00 to \$10.00 per tonne or \$45.00 per bone dry unit depending on the use. Typically the tipping or collection fee is used to cover the cost of processing while profit is raised through the sale of the product. The largest consumer of wood chips in Alberta is IKO Industries which uses the material in the production of asphalt roofing products.

Examples of Alberta wood diversion and processing operations are described briefly below. Although not all of these examples are intentionally diverting wood from CRD sources they demonstrate that, once separated from the CRD waste stream, there is significant potential to find markets for wood wastes if the material can meet the specifications of the end user.

1/ Kedon Waste Services in Lethbridge chips green and white wood on the landfill site they operate and takes their mobile equipment to stockpile locations. The processed product is sold primarily as livestock bedding, compost and landscaping material. Some of the chips may be coloured and sold to the landscape industry. The product can be collected by buyers at the point of processing or delivered for an additional trucking fee.

2/ J. E. Martin Transport is a trucking firm that operates in the Edmonton area to buy, transport and sell wood waste, mostly from sawmills. Most wood is sold unprocessed although a mobile grinding service is offered. Typical products are livestock bedding, landscape materials and hog fuel. Demand continues to exceed the wood supply. While in the past most of the wood handled in the operation has come from the forest industry there is concern about this source as a long-term wood supply. The operator is considering CRD sources as a means to ensure supply. This operator is partnered with a wood fuel-pellet project that is reported to be unsuccessful because wood waste supplies are being diverted to cheaper disposal in tee-pee burners.

3/ Klyne & Ward Industries is an Edmonton area operation that accepts approximately 300-500 tonnes of wood waste per day from sawmills, re-manufacturing operations and pallet manufacturers. Some wood is received from as far away as Red Deer. About 200 tonnes per day is received as already processed material and 50 tonnes per day consists of green wood. A large component of the operation is stockpiling pending the identification of buyers. Material is processed in a tub grinder as buyers are found. This approach allowed the development of an inventory of approximately 120,000 tonnes. The operation can process about 100 tonnes per day and currently sells about 20-30 tonnes per day when demand is high.

4/ Interior Wood Grinders offers a province wide site clearing and grinding service for \$350.00 per hour. The ground wood product is sold as composting material, land application, fuel, livestock bedding, and landscaping. A market for coloured wood chips is also being developed. Because the operation is a mobile on-site service it can take advantage of whatever markets are close to the job site. These markets are often local niche markets such as composting and livestock operations.

5/ All Waste Systems Ltd. is Calgary waste management firm that contracts with residential builders to handle their waste disposal needs. When bins are collected which contain significant amounts of wood the commingled load is sorted in their yard and the separated wood is sold to a manufacturer of roofing products. Dimension lumber is also separated and sold. This practice results in approximately 2542 tonnes of wood per year being diverted from landfill while generating revenue for the business.

KEY MARKET INCENTIVES AND BARRIERS

Opportunities for cheap disposal of wood waste in landfills close to urban areas remains a significant barrier to diverting wood from landfill disposal. When wood is diverted a number of problems inhibit full exploitation of the markets that are currently available.

Reuse operators reported that dimension wood sells well but more public awareness is needed to ensure that the full market potential is realized. Education about the uses of salvaged wood and efforts to change false perceptions about the quality of salvaged material are needed. Given the current trend towards sustainable harvest purchasing practices there is an opportunity to highlight the value of using salvaged wood in construction.

Lack of awareness and commitment to the importance of separating wood from other materials on the job site also inhibits recyclers getting access to wood that meets market specifications. While part of this problem is related to awareness it is also closely tied to the economics of construction and recycling. Given the costs of labour, contractors are reluctant to have staff spend valuable time sorting waste materials. Similarly, given the low tipping fees and low value of the processed product, it is not viable for waste management companies and recyclers to spend labour dollars sorting co-mingled loads unless the proportion of wood is high.

In spite of the barriers, Alberta has an increasingly well established wood recycling infrastructure which includes a variety of opportunities for diverting wood from landfill. Changes in current job specifications or permitting policies that favour wood diversion, have potential to divert wood and stimulate private sector initiatives to develop markets. The presence of a variety of other established industries such as forestry, power generation, agriculture, and manufacture of roofing products offers a number of opportunities for partnerships which can develop more collection, transportation and marketing options for wood wastes.

FUTURE POSSIBILITIES FOR ALBERTA

A variety of markets for wood waste exist in Alberta. These markets are currently not fully exploited by CRD operators. However, as issues of easy landfill options, separation, and collection are resolved there is potential for these markets to consume an increasing amount of the wood material generated by CRD projects.

One growing opportunity for consuming CRD wood waste is a trend towards power generation plants capable of burning wood. A wood burning power plant in Westlock currently takes wood waste from forestry operations. Initial investigations indicate that the specifications for wood received at this plant may tolerate low levels of the type of contaminants typical of crudely separated CRD sources. Other power plants may also have potential to consume large volumes of CRD wood waste if it is processed into an appropriate form such as dust which is compatible with the current burning technology used at the power plant.

CONTACTS

The following firms are involved in or have investigated becoming involved in the recycling of wood materials from CRD sources in Alberta. Those wishing to investigate reuse or recycling of wood waste should contact these firms directly to understand the opportunities that may be available.

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CONCRETE AND ASPHALT

DESCRIPTION

When buildings and other structures such as roads, curbs, and sidewalks are demolished the resulting debris often includes large amounts of concrete or asphalt.

Concrete is a hardened mixture of aggregate (granular material such as sand and gravel), cement, and water. The water and cement serve as a paste that coats the aggregate and occupies the spaces between the aggregate components. A chemical reaction caused by the water allows the material to harden. The cement is usually a mixture of lime, silica, alumina, iron oxide, and gypsum. The specific characteristics of concrete depend on the characteristics and mixing proportions of the aggregate and cement. Concrete is often made stronger by incorporating steel bars or wire mesh.

Asphalt is a member of a heavy, brownish-black group of hydrocarbons called bitumens. Asphalt can be taken from natural deposits or it may be produced artificially as a by-product of the petroleum industry (petroleum asphalt). When mixed with gravel or other aggregates the resulting mixture can be used to pave roads, parking lots and pathways.

SOURCES AND QUANTITIES

Concrete and asphalt waste is primarily generated during municipal infrastructure and commercial projects in which buildings, roads, sidewalks, sewer works and curbs are removed. These materials are often mixed with broken bricks, cinder blocks and other stone rubble during demolition and renovation activities.

It is difficult to determine the amount of waste concrete and asphalt generated annually in Alberta due to the difficulty in tracking material from dispersed sources. In addition, the amount of construction, renovation and demolition (CRD) occurring in any year may vary, especially within municipal works programs. However, some numbers are available to offer insight.

A study has recently indicated that approximately 81,500 tonnes (43,000 tonnes of concrete, 38,500 tonnes of asphalt) are currently going to landfill annually in Alberta. This represents 16 percent of the CRD waste stream going to landfill disposal. A previous study indicated that 613,629 tonnes of concrete and asphalt were processed by recyclers in the Calgary and Edmonton regions in 1997. In 2000, numbers provided by recyclers suggest that 352,075 tonnes are processed annually in the Calgary, Edmonton and Lethbridge regions. The drop in processing is likely due to a reduction in stockpiles in the years leading up, to 2000. More frequent processing appears to be the current trend which leads to less tonnage processed in any

SUMMARY INFORMATION

MATERIAL: Predominantly concrete and asphalt, also bricks, block and mortar.

PROCESS: Crushing and screening to size specifications.

SPECIFICATIONS: Free of other waste materials, especially wood. Broken into manageable size.

USUAL PRODUCTS: Aggregate, landscaping rock.

PRODUCT PRICES: Varies, depending on recycler and location, between \$6.00 to \$9.50 per tonne.

given year. It should be noted that these figures do not include the amounts of concrete and asphalt that may be diverted from landfill and used directly for other purposes such as stream bank stabilization.

RECYCLING PROCESS AND MATERIAL SPECIFICATIONS

In order to be accepted for recycling, asphalt, concrete and other 'stone' materials need to be free of other CRD waste materials such as paper, plastic, wood, wallboard, and roofing materials. Fine material such as clay can also pose problems during processing. It is helpful to separate different types of materials to be crushed since they may have different end uses or need to be recombined in specific proportions according to specifications. Concrete, asphalt, brick and mortar are processed into a new aggregate product by crushing and screening the crushed material to specific size ranges. The concrete or asphalt is broken up with wrecking balls or hydraulic crushers. For smaller jobs, jack hammers can be used. Using this equipment the material is broken up into pieces that can be handled by loaders and accepted by the crushing technology being used. Pieces up to 75 cm X 75 cm X 30 cm are typical. Processing operations often use shears and magnets mounted on heavy equipment to remove rebar and wire mesh or other reinforcing materials from concrete. In some cases these metals can be hand picked from the rubble pile as the material is crushed. Once separated, the metals can be sold to metal recyclers to retrieve the value of the metals and offset processing costs.

Material passing through the crushing equipment is screened to ensure that the size of aggregate being produced is within the specifications of the intended end use of the product. Due to the expense of operating crushing equipment and moving portable equipment to the locations of stockpiles, a minimum amount of material must be available to make crushing viable. Typically this requires stockpiles in the 30,000 to 50,000 tonne range. However, smaller processors are now available that can be financially viable crushing piles as small as 3,000 tonnes.

Processing requires space for the unprocessed material, the crushing and screening equipment and for the finished product. Depending on the size of the stockpile to be processed minimum space requirements for processing range between .5 and 2 hectares (1 to 5 acres). In areas where the dust generated by the processing of these materials is likely to be a nuisance, mitigating steps such as foam spray incorporated into the crushing equipment can be taken. Noise may also be a nuisance depending on the location of the processing operation.

RECYCLED PRODUCTS AND THEIR USES

The material that results from crushing asphalt and concrete can be substituted in applications where new aggregate is used. This includes use in asphalt pavement and new concrete production, as a road base and as backfill. It is now common practice to recycle old asphalt pavement into new pavement and often the material is processed on the construction site for immediate mixing into the new pavement structure.

As aggregate the various waste materials may be applied separately or combined. Most operators who use recycled aggregate material find that it is equivalent to or better than new aggregate. Advantages of crushed concrete include setting properties that give it more strength and stability than natural aggregate. For operators who crush their own materials having a stockpile of recycled aggregate means that they often have a supply of aggregate in hand without waiting for deliveries from outside suppliers. There is some concern that recycled asphalt aggregate may become less stable as a fill material if it is applied during wet conditions. Using a mix of concrete and asphalt tends to eliminate this problem.

Crushed brick and mortar can be added to concrete and asphalt mixes or be used alone to serve as an aggregate fill or as road, laneway or parking lot gravel. Brick can also be kept separate and the crushed material used in landscaping applications. Brick and cinder blocks can also be reused as building material if they can be salvaged intact.

CURRENT ALBERTA PRACTICE AND RECYCLING ECONOMICS

Recycling has been going on longer, and is more advanced for concrete and asphalt than any of the other dominant CRD waste streams. Crushing operations exist in both Edmonton and Calgary with a number of operators offering service throughout the province if stockpiles are large enough to make the processing economical. The majority of stockpiling and processing involves concrete and asphalt while much of the brick and mortar generated continues to go to landfill.

An increasing number of smaller municipalities are recognizing the value of recycling aggregate materials. A recent study in the Edmonton area has shown that smaller municipalities that can make use of the recycled product can realize significant savings by stockpiling and processing these materials to significantly reduce the costs of obtaining natural aggregate. This study demonstrated that when all costs are considered, the recycling approach yields equal volumes of aggregate at less than half the cost of obtaining 100 percent natural aggregate.

The following examples of recycling concrete and asphalt provide insight into the current practices for handling waste concrete and asphalt rubble in Alberta.

- 1/ The City of Edmonton accepts, free of charge, concrete and asphalt rubble from its own projects (70 percent, typically road works) as well as from commercial contractors (30% percent). In contrast, the tipping fee at the City's landfill site is \$25.00 to \$30.00 per tonne. The materials accepted include concrete, asphalt, brick, mortar and miscellaneous rubble. Following processing, these materials are mixed to produce recycled aggregate composed of 60 percent concrete, 30 percent asphalt, and 10 percent brick and mortar.

The materials are processed by a City-owned crusher. Occasionally, if annual demand exceeds the production capacity of this crusher, a private mobile crusher is hired. The material is usually processed to a 63 millimetre size for use in road base applications and to 20 millimetres for use in sidewalk construction. About 60 tonnes of metal, including rebar, are recovered annually for recycling from the concrete that is processed. After being cleaned by a magnetic separator the metal is sold in Edmonton at a price of approximately \$50.00 per tonne.

When sufficient amounts of rubble are stockpiled the material is processed for a cost of \$4.00 per tonne which includes administration and stockpiling. While the City prefers to accumulate larger amounts, it is estimated that at least 25,000 tonnes are required to make processing feasible at that cost. Virgin aggregate typically costs the City \$7.00 to \$9.00 per tonne and involves trucking costs since the source is located outside of the city. With a convenient source of recycled aggregate located inside the city, a cost saving of approximately \$4.00 to \$5.00 per tonne can be obtained.

The City has found that by using the recycled material in their asphalt mix they can reduce pavement thickness by 20 percent due to the extra strength and binding properties of the concrete. After running for 20 years the program has grown from accepting 20,000 tonnes per year to now accepting 120,000 tonnes with a capacity to process up to 200,000 tonnes per year. Most city contractors are aware of the City's stockpiling and processing program and take advantage of it although some contractors will take advantage of lower tipping fees at landfills outside the city when it is more convenient and incurs lower trucking costs.

- 2/ Inland Construction Limited, in Edmonton, accepts concrete and asphalt rubble at its yard. No tipping fee is charged. When a pile of about 40,000 to 50,000 tonnes is accumulated, usually after about two years, a crusher is hired from a sister company and the processed material is offered for sale. Asphalt is processed to 12.5 millimetres for the recycled asphalt pavement market and concrete is

prepared to a 50 millimetre size for use in a variety of aggregate applications in the construction industry. The material is sold for a price between \$8.50 and \$10.00 per tonne and the stockpile is sold within a year.

- 3/ In Calgary, Canadian Crushers Ltd. accepts concrete at its yard and charges a tipping fee of \$20.00 per tonne. The fee is higher if the concrete includes rebar. The material, about 80,000 tonnes per year, is processed to 20 millimetres in size with the company's own crushing equipment. The processed aggregate is used primarily in their own contracts although approximately 30 percent is sold to other contractors. The company also operates portable crushing equipment that is economical to use on small amounts of rubble (3,000 tonnes) and can be moved to a site and set up within 4 to 5 hours. This allows the company to capitalize on job site processing. On-site processing makes processing more viable by reducing or avoiding transportation costs to a processing facility. The greatest cost advantage is obtained when the processed material is reused on the job site or collected directly from the site by new buyers.

The material sells very quickly in the \$6.50 to \$8.00 per tonne price range and the concrete is received from sources inside and outside of the city. As a stand alone activity the recycling operation is not always profitable but when it is considered as part of an integrated CRD package offered by the company it is felt to be worthwhile. A significant advantage is considered to be the convenience of having ready supply of aggregate available on demand to be used in the company's own projects.

- 4/ Pro Form Construction in Red Deer has been accepting concrete and asphalt at its yard and has now accumulated a stockpile of approximately 50,000 tonnes. Tipping fees are charged at approximately \$25.00 per tandem and \$45.00 per end-dump load. A portable crushing unit from Calgary will be hired to process this stockpile. The City of Lethbridge operates a similar program of stockpiling concrete and asphalt from City projects until sufficient volume is accumulated to facilitate economical processing by a crushing unit from Calgary.
- 5/ Kedon Waste Services is the operator of the Class 3 landfill for the City of Lethbridge and accepts clean concrete for a tipping fee of \$10.00 per tonne. The material that is received is disposed of in a coulee on the landfill site. Asphalt is accepted at no charge and is used to surface roads within the landfill site. Processing of concrete at the site has been considered but was rejected due to small volumes, lack of storage space and the availability of natural aggregate for \$1.00 less than processing costs.

KEY MARKET INCENTIVES AND BARRIERS

Recycling of concrete and asphalt is well established in Alberta and demand continues to exceed supplies. In spite of high demand, a number of operators indicate that the barrier to increasing the amount that is captured in recycling operations is a lack of awareness of the opportunity. Recycling operators also suggest that there needs to be more awareness among demolition operators that recycling of materials such as brick and mortar is feasible in Alberta.

Another barrier to more universal recycling is the lack of awareness on the part of project designers and engineers that the product is equal to or better than natural aggregate in most applications and can be included in specifications. The latter is mostly true for commercial operations. Recycled aggregate is readily finding its way into many municipal projects especially in Edmonton and Calgary as well as a number of smaller municipalities who have recognized the financial benefits.

Industry operators also need to be encouraged to reconsider the perception that natural aggregate sources are cheaper. Project planners should undertake more detailed cost benefit analysis on a project by project

basis to accurately determine real cost of using recycled aggregate versus using an equivalent amount of natural aggregate. In most cases, even at landfill costs in the range of \$10 per tonne, the cost of landfill disposal combined with purchase of replacement natural aggregate is likely to be higher than using recycled aggregate. This advantage works for operators who are active in both construction and demolition. In these cases, the materials generated in demolition can be processed and re-applied to the new project on the same

site or to the operator's future projects. For operators who are active only in demolition, costs are more related to immediate disposal fees for individual projects. In these cases, low tipping fees at nearby landfill sites remain an economic deterrent to delivery of concrete and asphalt waste to recycling operators. However, if landfill operators undertake to stockpile clean concrete, these reserves will provide an opportunity for revenue to the landfill when volumes that justify processing have been accumulated.

FUTURE POSSIBILITIES FOR ALBERTA

Re-applying recycled concrete and asphalt into the range of applications they were originally used for will continue in Alberta. The future trend of aggregate recycling in Alberta is likely to be dominated by improving the diversion rates to maximize this opportunity. A number of trends towards this end are evident.

There is growing awareness that recycled aggregate can serve as well or better than natural aggregate and be competitive in price with natural aggregate. As this awareness increases, demand for recycled aggregate and diversion rates will also increase. As more portable crushing equipment becomes available and project space permits, there will be a trend towards more on-site processing to try to reduce transportation costs and facilitate use of the recycled material in the new project. This trend is currently demonstrated by common use of paving operations that work on-site to lift, process and return old asphalt into new asphalt mix. In addition to these trends, an increasing number of smaller municipalities are likely to realize the economic value of stockpiling independently or co-operatively with other municipalities. Rural diversion rates may also be enhanced by smaller, portable crushing operations that can take advantage of the smaller generation rates in rural areas. If the key barriers to aggregate recycling can be reduced, the trend towards complete recovery of aggregate waste for reuse and recycling will continue.

CONTACTS

The following firms are involved in or have investigated becoming involved in the recycling of concrete, asphalt, brick and mortar products in Alberta. Those wishing to investigate recycling these materials should contact these firms directly to understand the options that are available to them.

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GYPSUM WALLBOARD

DESCRIPTION

Gypsum is an evaporite mineral ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, calcium sulphate dehydrate). Gypsum wallboard, also known as dry wall or sheet rock, consists of a gypsum mixture which is compacted into a flat sheet and covered with a paper facing material. When placed in landfills that generate moist anaerobic conditions for decomposition there is potential for the buried wallboard to generate hydrogen sulphide gas. Some jurisdictions have banned loads containing significant amounts of gypsum wallboard from landfills because of this issue.

SOURCES AND QUANTITIES

Gypsum wallboard is generated as a waste material in construction, renovation and demolition (CRD) activities. During renovation and demolition, wallboard will be more predominant in newer buildings than older buildings built when the use of plaster was prevalent. Estimates suggest that new construction generates 64 percent, demolition generates 14 percent and renovation generates 10 percent of total CRD waste wallboard. Manufacturing waste is responsible for the remaining 12 percent. In new construction, drywall is generated at a rate of about 4.89 kilograms per square metre of floor space although waste generation will vary according to type of construction. A recent study indicates that waste wallboard constitutes up to 10.5 percent (60,550 tonnes) of the CRD waste disposed of in Alberta landfills with only minor seasonal fluctuation.

RECYCLING PROCESS AND MATERIAL SPECIFICATIONS

Wallboard is processed by passing it through a grinder or hammer mill. The gypsum is chipped or pulverised and the paper backing is shredded. For most applications, the material is reduced to pieces less than 5 centimetres. If necessary, according to the intended end use, the two materials may then be passed through a screening system which separates the gypsum from the paper. The processing can be done at a fixed location or small portable grinders can process the waste material on-site at the source. On-site processing allows the material to be used on-site or reduces transportation costs to market or a landfill by reducing the volume of material.

The wallboard must be clean and free of contaminants such as fasteners, insulation, soil, and paint or petroleum products. Magnets can be used to remove ferrous metal debris during processing. Other CRD waste materials should be separated from the wallboard before processing. Wallboard that has been treated for water resistance or painted may not be accepted for recycling applications.

SUMMARY INFORMATION

MATERIAL: Gypsum wallboard.

PROCESS: Grinding and screening.

SPECIFICATIONS: Separated, clean and dry.

USUAL PRODUCTS: Recycled into new wallboard or used in land application.

PRODUCT PRICES: Maybe delivered to the processor for \$13.00 per tonne tipping fee.

RECYCLED PRODUCTS AND THEIR USES

Processed wallboard waste has a variety of potential uses. These include being reprocessed into new wallboard where recycled content can reach as high as 15 to 20 percent. The amount of recycled content will depend on the efficiency with which the paper is removed from the gypsum and the size of any paper contamination that may remain in the gypsum. Wallboard must meet strict fire resistance standards. Paper remaining in the recycled product may reduce fire resistance.

Gypsum from wallboard processing has been found suitable as a soil amendment in agricultural applications by performing in a similar manner to agricultural grade gypsum. In high clay content soils, recycled gypsum has been shown to improve soil tilth and permeability. Gypsum can also be used as a buffer in acidic soils and in reclamation programs where control of acidity, sodium adsorption ratio (SAR) or stabilization of soils is required. No disturbance to carbon-nitrogen ratio and no heavy metal issues have been found.

Gypsum can be incorporated into landscaping mulch. Gypsum has also been shown to reduce ammonia odours and loss of available nitrogen in compost operations. Other miscellaneous uses of recycled wallboard gypsum include adding it to animal bedding, grease absorption and athletic field markers.

CURRENT ALBERTA PRACTICE AND RECYCLING ECONOMICS

The only processing of waste gypsum wallboard in Alberta is done by Wearmouth Canada, a waste management firm based in Calgary. Wearmouth operates a mobile processing plant on the site of BPB Westroc Industrial. Westroc is a manufacturer of gypsum wallboard and contracts Wearmouth to process wallboard waste that is generated during production. About 1600 tonnes of processed wallboard are produced each year. Wearmouth incorporates about 120 tonnes of waste wallboard per year from construction waste into their processing operation. Most of this waste wallboard is collected from residential construction sites with a tipping fee of approximately \$13.00 per tonne being charged.

KEY MARKET INCENTIVES AND BARRIERS

Recycling waste gypsum wallboard into new wallboard is feasible and practised in Alberta although it is only practised on a limited scale. Yet, in jurisdictions where there are restrictions on landfill disposal of wallboard, recycled wallboard gypsum is commonly accepted by manufacturers. The greatest barrier to increasing recycling of wallboard in Alberta, assuming the participation of manufacturers, is overcoming the issue of separation from other CRD wastes. Most builders and trades do not believe that it is worth their time to separate wallboard and prefer the convenience and perceived lower cost of including waste wallboard in commingled landfill disposal programs. Given the proven feasibility of wallboard recycling, the practice will benefit most from increasing the awareness within the construction industry of the opportunities to have wallboard diverted to recycling initiatives with little impact on builders or trades personnel.

FUTURE POSSIBILITIES FOR ALBERTA

Pilot studies have shown that well organized collection, separation and disposal for recycling can be achieved with minimal effort on the part of trades staff and builders. In addition, it has been demonstrated that the service can be offered at rates that are in line with traditional waste disposal charges. With wallboard manufacturers in both Calgary and Edmonton there is a potential market for recycled wallboard in the province. At present the amount of wallboard diverted from landfills is low and it remains to be seen how much recycled material can be incorporated into the manufacturing process in Alberta.

If enough material can be generated and separated on-site it may become economically viable to use small mobile grinders on project sites. On-site processing can increase cost savings through volume reduction or by finding ways to incorporate the processed material into the new project design through landscaping applications. At least one pilot project in the United States demonstrated that these savings can be achieved. In a residential construction setting where tipping fees were similar to Alberta, on-site processing of wallboard realized savings of between \$85.00 and \$264.00 per house over traditional landfill disposal.

Given the variety of possible uses of processed gypsum from wallboard recycling it is worth investigating the feasibility and possible regulatory implications of developing options such as landscaping and agricultural practices. Awareness of these options will allow operators to select the diversion practice that is most appropriate to each project setting.

CONTACTS

The following firms are involved in or have investigated becoming involved in the recycling of gypsum wallboard in Alberta. Those wishing to investigate recycling wallboard should contact these firms directly to understand the options that are available to them.

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ASPHALT ROOFING PRODUCTS

DESCRIPTION

Asphalt roofing products typically consist of waste asphalt roofing products, asphalt felt and asphalt coated rolls. Typical components of these materials include a fibre base, asphalt, stabilizer and granules. Due to the common availability of wood, the base is usually composed of wood fibre in Alberta. Fibreglass is sometimes used. The granular material is a fine-grained crushed rock that helps to block ultraviolet light and to add the desired colour to the shingle. Asphalt is mixed with the fibres and granules to serve as both waterproofing agent and adhesive. A mineral filler is mixed with the asphalt to assist with the bonding of the other materials.

SOURCES AND QUANTITIES

Asphalt roofing products are usually generated from manufacturing, residential new roof and re-roofing activities. Estimates indicate that 90 percent of this amount is generated by re-roofing activities. In Alberta, a recent waste characterization study indicated that approximately 68,000 tonnes of waste roofing products are going into landfills each year. This represents 13 percent of the estimated total construction, renovation and demolition (CRD) waste stream.

Much of the generation of roofing material waste is associated with residential re-roofing activity. Approximately 2.5 tonnes of waste asphalt roofing products are generated during a typical residential re-roofing project. Since this is often the only activity occurring at the time of the project, much of the re-roofing waste stream is readily separated from other CRD wastes.

RECYCLING PROCESS AND MATERIAL SPECIFICATIONS

Asphalt roofing products are recycled by grinding them into chips that are usually less than 5 centimetres in size. The chips may be added to new asphalt mix (pre-consumer/new roof trimming waste) or to aggregate base material (old asphalt roofing products). The grinding process is assisted if the asphalt roofing products are made brittle by grinding in cold weather or by adding cooling water if grinding is done during warmer temperatures. Grinding warm asphalt roofing products increases the cost of grinding by allowing the granular material in the asphalt roofing products to generate more wear on the machinery involved.

As with most waste materials destined for recycling, clean sorted material is easiest to use and does not incur the added labour, equipment and energy costs of extra sorting and cleaning processes. Therefore, asphalt roofing products that are to be ground need to be free of foreign materials such as nails, metal

SUMMARY INFORMATION

MATERIAL: Asphalt roofing products.

PROCESS: Grinding.

SPECIFICATIONS: Should be free of foreign material.

USUAL PRODUCTS: Ground to size specification for incorporation into new asphalt road or roofing products. Incorporation into road base aggregate.

PRODUCT PRICES: Not yet established.

flashing, wrapping paper, wood and other construction wastes that may be mixed with the asphalt roofing products. It may be important to separate used roofing material from new roofing waste, depending on the intended

application. If the material received for recycling is contaminated, magnetic processing can be used to remove ferrous metals such as nails. Water baths may be used to separate paper and wood that may be mixed with asphalt roofing products. Older asphalt roofing products may raise concern over contamination with asbestos.

RECYCLED PRODUCTS AND THEIR USES

Recycled asphalt roofing products are primarily used for addition to hot and cold asphalt mixes for road, parking lot and pathway paving, and sub-base applications. Before mixing a batch of ground asphalt shingle to asphalt mix it important to know the size, moisture content, and asphalt content of the recycled batch to ensure quality of the product. Excessive water can be a serious safety hazard due to the high temperatures (approximately 190 °C) in the asphalt mixing process which create potential for explosive steam ejection from the mix.

It has been reported that the addition of asphalt shingle chips has produced road surfaces with comparable life span to traditional pavements. Some studies show that pavements containing asphalt shingle chips have potential to increase durability of the pavement through increased rutting resistance and reduced cracking. However, caution must be used to ensure that the mix meets any specifications for the jurisdiction and contract where it is being used.

The asphalt chips may also be added to road base aggregate mixes. Other uses for recycled asphalt roofing products include pothole patch, new asphalt roofing and fuel oil.

CURRENT ALBERTA PRACTICE AND RECYCLING ECONOMICS

Asphalt roofing products in Alberta are mostly being disposed of in landfills. Stockpiling is becoming more common as awareness of their potential to be recycled into asphalt products increases. A few operations in Calgary and one in Edmonton, have indicated their intention to process asphalt roofing products within a year. In one of these cases, it is estimated that up to 15,000 tonnes of material will be processed in the first year of operation. This operation, Beaver Grinding, has purchased a specialized grinder for approximately \$400,000 to efficiently grind asphalt roofing products to size specifications.

Several years ago one company in Alberta completed feasibility study for processing shingles as part of a larger CRD waste processing feasibility study. It was estimated that the start-up cost for an asphalt shingle recycling operation would be in the order of \$1,000,000 and that tipping fees for the source material would need to be approximately \$38.00 per tonne.

Dry landfill tipping fees in Alberta are typically in the \$10.00 to \$40.00 range with most fees below a level that would support an independent recycling operation. This compares to British Columbia where recycling is being done for disposal fee of \$30.00 per tonne clean, and \$45.00 for contaminated material. Where shingle processing is being considered in Alberta it is in close association with established asphalt industries rather than as an independent processor.

KEY MARKET INCENTIVES AND BARRIERS

As with many CRD waste materials the opportunity for cheap landfill disposal of materials discourages the effort required to separate asphalt roofing products for recycling. Concern about the quality of the pavement

products that use recycled asphalt roofing also serves to inhibit incorporation of the product into pavement surfaces. There are currently no specifications that allow recycled asphalt roofing products to be included in Alberta highway pavement. No testing is underway to determine if this is an appropriate option under Alberta operating conditions. In spite of these drawbacks, there are inherent characteristics that facilitate the diverting of this material from landfill. Source separation of shingle material is often easier than for other CRD materials especially during re-roofing when it is the only activity generating waste on the job site, eliminating the problem of commingled materials. With the establishment of confidence in the products that may be produced from asphalt shingle waste this will become an efficient material to handle in recycling programs.

FUTURE POSSIBILITIES FOR ALBERTA

Other jurisdictions in North America including New Jersey, Minnesota, Ontario, North Carolina, and Massachusetts are finding markets for recycled asphalt roofing products. In Ontario, used shingles are used to enhance road pavement properties. A business in Halifax processes 8,000 to 9,000 tonnes of roofing wastes per year for use in driveways and other low-grade roads. Testing is underway in California to determine the specifications that may be required for the use of recycled asphalt shingle in road construction and pavement applications. These examples show that there is good potential to divert asphalt roofing products from landfill. Given the recent emergence of processors, and if the use of asphalt roofing products in asphalt pavement and road base applications can be tested and accepted in Alberta, it should be possible to achieve significant diversion of asphalt roofing products from landfills in Alberta.

CONTACTS

The following firms are involved in or have investigated becoming involved in the recycling of asphalt roofing materials in Alberta. Those wishing to investigate recycling asphalt roofing materials should contact these firms directly to understand the options that are available to them.

Beaver Grinding
Dave Brazel
Box 30148
6455 McLeod Trail
Calgary, Alberta T2H 2V8
PH: 403-651-0590

EMCO Limited Building Products
Morley Currey
P.O. Box 576
Edmonton, Alberta T5J 2K8
PH: 780-466-1135

IKO Industries Ltd.
Shane Miln
1600 - 42 Avenue
Calgary, Alberta T2G 5B5
PH: 403-265-6022

Lafarge Canada Inc.
Harvey Stoek
9501 Stadium Road
Edmonton, Alberta T5J 2J1
PH: 780-426-4770

Nature's Edge Developments
Bob Pavelich
15710 St. Albert Trail
Edmonton, Alberta T6V 1K1
PH: 780-447-7202

Vintage Roofing
George Sanders
373 17A Avenue
Edmonton, Alberta T6L 2R3
PH: 780-450-8364

OTHER BUILDING MATERIALS

DESCRIPTION

This profile covers a variety of building materials that together represent approximately 25 percent of the construction, renovation and demolition material going to landfill disposal. This group includes used building materials such as electrical and plumbing fixtures, appliances and other equipment, and hardware. It also includes some materials such as metals, carpets and glass that are singled out as specific marketable items while other materials are treated more generically. While a detailed list of materials that can be removed and resold would be extensive the following provides an insight into the types of used building materials that are currently salvaged and sold.

- Attic baffles
- Carpets and underlay
- Doors and windows including frames
- Eaves troughs and down spouts
- Electrical fixtures and wiring
- Fixtures such as cupboards and vanities, counter tops
- Floor and ceiling tiles
- Glass
- Hardware such as door knobs, hinges and brackets
- Insulation
- Partitions
- Plumbing including pipe, sinks, toilets

SUMMARY INFORMATION

MATERIAL: Glass, metal, carpet, and used building materials such as hardware, fixtures, electrical and plumbing supplies.

PROCESSING: Glass, metal, N6 carpet, recycled into new products. Used building materials carefully removed and sold in auction or at retail outlets

SPECIFICATIONS: Separation from other materials, undamaged.

USUAL PRODUCTS: Variable.

PRODUCT PRICES: Metal: 1 to 4 cents per pound. Glass: \$10.00 per tonne if delivered. N6 Carpet: 4 cents per pound U.S. if delivered. Used building materials usually sell at 'half of new' for high quality merchandise.

SOURCES AND QUANTITIES

These materials can be salvaged from any renovation or demolition project although they are typically received from large demolition projects that attract attention because of the amount of marketable material involved. In some cases salvage specialists may work with demolition and renovation contractors to coordinate planning and identify projects that contain appropriate material. In most cases the amount of any specific item is not closely tracked so it is difficult to specify the quantities of most of these items which are resold in Alberta.

RECYCLING PROCESS AND MATERIAL SPECIFICATIONS

Used Building Materials

The material is usually salvaged through a deconstruction process which strives to remove saleable items

from buildings without damaging them. Removing items for salvage can require careful planning to ensure that the removal activities for one material does not destroy the value of another. Some materials such as glass and metal can be removed with less care as long as they remain separated from other materials. This process is often labour intensive but with careful planning need not delay projects.

Specifications in the used building material industry are more often related to retail issues rather than the process of removing the material. Retail or auction facilities need to have large space to display materials in a tidy and professional manner so that both buyers and retailers can get efficient access to the inventory. The space should protect material from the weather and allow items to be moved around without causing damage to other materials.

Glass

Glass can be removed intact for resale or it can be broken and kept separated from other materials. Glass can be collected by a recycler if enough material has been accumulated.

Metals

Metals can be recovered from demolition projects and separated from other materials in a variety of forms. These include reinforcing metals, structural metal such a building frames and metal studs, wiring, duct work, and pipes. Often this material can be resold for its intended use or it can be sold to metal recyclers at current scrap metal prices. Metal being separated for recycling will return the highest prices if it is sorted and cut to a manageable size. Categories of metal are usually ferrous, copper, aluminium and mixed metals.

Carpets and Underlay

Carpets are predominantly salvaged from commercial renovation projects. Often commercial renovation occurs well before the useful life of the carpet has expired. For example, new building tenants may remove existing carpet to suit their own decorating needs or hotels and businesses may replace carpet regularly to maintain image. In these cases the removed carpet is in relatively good shape and if it is not stained may be resold as carpet. Unfortunately, carpet is often not given priority by reuse retail centres because it requires a large space to be adequately displayed so that potential buyers can be assured of its quality. However, carpet is occasionally sold from these outlets.

Some types of carpet fibre can be recycled. The carpet must be removed without tears and with effort being made to keep it free of fasteners and miscellaneous metal such as knife blades. Foam carpet underlay can also be removed and recycled if it is free of fasteners and other contamination and has not lost its lift.

RECYCLED PRODUCTS AND THEIR USE

Typical uses of used building materials include purchase for recreational homes, farm use, or for low profile office or industry needs and rental suite furnishings in private residences. Removable items are either removed to a retail centre or sold directly from the building site. Auctions on or off-site are also used as a means of selling removable items. It is not uncommon for a metal building frame, and sometimes wood frame components, to be purchased for reconstructing the frame at another location. Many other components of the building such as doors, windows, electrical, heating and plumbing fixtures may be purchased and moved with the building frame.

Recycling of carpets is dominated by recovery of 'N6' fibres for processing into new nylon fibre. Retail outlets for used building materials may pay about \$1.00 per square metre to obtain good quality carpet. It is then resold at prices between \$1.00 to \$4.00 per square metre depending on the quality. New trimmings may sell for as much as \$8.00 per square metre.

Glass is crushed and processed into reflective beads for highway painting applications and for the production of fibreglass insulation. Metals that are not reused for their original purpose are sold for recycling into new metal products.

CURRENT ALBERTA PRACTICE AND RECYCLING ECONOMICS

There are a number of retail outlets for used building materials in Alberta. Some of these specialize in the removal of items from buildings prior to demolition. Others are integrated with construction and demolition activities within the same operation or they maintain close links to CRD operators so that they may coordinate the activities.

The following are a sample of Alberta operations involved in retailing removable items and recovering glass metal and carpet for recycling.

- 1/ Architectural Clearing House in Edmonton operates a used building materials retail outlet and runs its own demolition company to provide materials to the retail operation. Fifty percent of the materials gathered are derived from their own demolition company while the remaining materials are obtained from donations and purchases. A small amount of material is obtained from other commercial contractors. Most material is collected and sold within the City of Edmonton. All sales are conducted through the retail outlet. While demand is not strong, the company is considering becoming associated with a second demolition contractor to increase the supply of material to the retail outlet.
- 2/ Challenger Demolition Incorporated in Calgary has started specializing in deconstruction. Salvageable items are taken to their own retail operation where they claim to sell every thing from □sewer to ceiling□ that can be removed from a building. They currently claim to have a steady following of customers who travel from well beyond Calgary, and out of province in some cases, to view the inventory and to make purchases. The firm accepts that careful deconstruction may take more time than traditional demolition practices. The company compensates by working extra shifts to reduce the time required to complete a project and, therefore, to compete with traditional demolition.
- 3/ The EnviroBuild Exchange in Edmonton offers services in predemolition auditing for salvageable materials, preselling of material and demolition services. Typically 10 to 15 projects, mostly commercial properties, are underway in the city at any given time. Material is promoted through a web site and reaches a global market.
- 4/ Metals, typically steel, copper and aluminium can be sent to a variety of recyclers in Alberta. Metal can be sold at a price which is typically in the 1 cent per pound range for steel, 60 to 95 cents per pound for copper and 10 to 50 cents per pound for aluminium. It has been found that if the metal is cut to a manageable size it can be sold for higher prices, approximately \$90.00 per tonne (\$0.04 per pound) for steel if the material is stockpiled and shipped directly to a foundry when a large enough inventory has accumulated.
- 5/ Ecco Waste Systems operates a private Calgary landfill. Ecco has established a relationship with a local metals recycler. The recycler provides staff on-site to remove and sort metal from cominlged loads that are dumped for a tipping fee of \$23.00 per tonne. The salvaged metal is taken by the recycler to their yard and weighed with the resulting payment being sent to the landfill operator.
- 6/ Harvey Enterprises specializes in recycling glass for use in producing highway reflective beads. They accept glass at their plant for \$10.00 per tonne. Glass will be collected at no charge if the amount

collected is regularly at least 10,000 pounds per month. Smaller loads are collected for a fee if the source operation prefers to have regular collection. Glass is also collected from anywhere in the province if the remote location has accumulated loads in the 35 to 45 tonne range. All of the glass received from CRD activities is generated by renovation activity and they estimate that one third of all renovation projects actually choose to recover glass.

- 7/ Wearmouth Canada Incorporated is experimenting to determine if the collection and shipping of carpets for recycling is economically viable. They are examining three ways of recovering carpet from the waste stream. The first approach involves offering a disposal service in which Wearmouth will come to the site of the renovation and dispose of the old carpet for a fixed fee. This carpet is tested on the renovation site to determine if it is composed of N6 nylon that suitable for recycling. If tests are positive the carpet is taken to the company warehouse and baled for shipment. In another approach, Wearmouth is negotiating an agreement with the City of Calgary to collect recyclable carpet from designated bins at a recycling depot in a City landfill. Recyclable carpet is also collected from bins located at the warehouse of a carpet installation firm. The loads of baled carpet may be shipped to the United States where it is purchased for \$0.04 (US) per pound by a carpet recycler.

KEY MARKET INCENTIVES AND BARRIERS

The main barrier to reuse stores being able to sell more CRD reusable products appears to be a perception of the product as being of inferior quality relative to new products. Lack of awareness of the potential uses for the products is also an obstacle to resale.

With low profit margins, finding funds for promotion can also be a problem. One Calgary operator has experimented with a cable television information advertisement as part of a promotion offered by the cable server. The operator was impressed with the increased interest in their business but was discouraged by the fact the fact that advertising on that scale is expensive on an ongoing basis.

Other typical barriers to the reuse market and to the recovery of glass, metals and carpet include low landfill tipping fees and the expense of having retail space large enough to properly display items and manage inventory. If these problems can be overcome, operators are confident that most demolition operators are prepared to recover material of value if they are made aware of the markets.

FUTURE POSSIBILITIES FOR ALBERTA

Given current demand levels, some used building material retail operators in Edmonton felt that supply and demand are in balance. It was felt that an increase in retail outlets would diffuse the available market and reduce their viability. At least one operator in Calgary was more optimistic and indicated that they would be seeking to expand their retail space to allow for better display and this would greatly improve their ability to sell inventory. They felt that with better awareness of retail locations and the types of products they offer that demand could be increased. As this sector becomes more sophisticated with more suitable retail space and the use of internet marketing techniques its potential to divert material from landfill will increase.

The most significant new trend in the materials discussed above is the initial effort to recycle N6 carpet. If the collection and shipping of this material proves to be economically viable this could be a viable business activity and valuable component to diverting CRD material from landfill.

CONTACTS

The following firms are involved in or have investigated becoming involved in retail of used building materials or the recycling of glass, metals, and carpet in Alberta. Those wishing to investigate recycling these materials should contact these firms directly to understand the options that are available to them.

Allied Signal (Carpet Recycling)
Michael Costello
15801 Woods Edge Road
Colonial Heights, Virginia USA Zip: 23834
PH: 804-520-3165

Architectural Clearinghouse (Demolition/Used building material sales)
Don Erdmann
5920 - 103 Street
Edmonton, Alberta T6H 2H6
PH: 780-436-1222

Awax Manufacturing (Plastics recycling)
Jerry Chen
6333 35 St. S.E.
Calgary, Alberta T2C 1N1
PH: 403-203-0302

Calgary Metal (Metal recycling)
Rick Dvorkin
3415 Ogden Rd. S.E.
Calgary, Alberta T2G 4N4
PH: 403-262-4542

Challenger Demolition Inc. (Demolition/Used building material sales)
Ed Dragon
Calgary, Alberta T2G 0V1
PH: 403-294-0710

E.I. Du Pont De Nemours & Co., Inc. (Carpet recycling)
Robb E. Lee
1002 Industrial Road, Jackson Bldg
Old Hickory Tennessee USA 371383693
PH: 615-847-6069

Ecco Waste Systems (Metal recycling)
Brian Johnson
Box 49037, 7740 - 18 Street SE
Calgary, Alberta T2C 3W5
PH: 403-720-3855

<p>Enviro Build Exchange Brad Gerrand 6047 - 88 Street Edmonton, Alberta T6E 5T4 PH: 780-413-9857</p>	<p>(Demolition Audit/Demolition/Used building material sales)</p>
<p>Habitat Restore Box 9, 3620 29 Street Calgary, Alberta T1Y 5Z8 PH: 403-291-5424</p>	<p>(Used building material sales)</p>
<p>Happy Harry's Used Building Materials Ray Banville 125 - 61 Ave. SE Calgary, Alberta T2H 0R4 PH: 403-255-9505</p>	<p>(Used building material sales)</p>
<p>Happy Harry's Used Building Materials Travis Reed 5044 45th Street Red Deer, Alberta T4N 1K6 PH: 403-343-1818</p>	<p>(Used building material sales)</p>
<p>Harper's Metals Al Laplante 8149 Edgar Industrial Close Red Deer, Alberta T4P 3R4 PH: 403-346-4185</p>	<p>(Metals recycling)</p>
<p>Harvey Enterprises Holly Boucher 23132 Connaught Postal Outlet Calgary, Alberta T2S 3B1 PH: 403-660-4518</p>	<p>(Glass recycling)</p>
<p>Jillian Builders Derek Deibert 6850 112A St. Edmonton, Alberta T6H 3K6 PH: 780-444-4404</p>	<p>(Deconstruction)</p>
<p>Planet Recycling Inc. Sal Palopoli 201 W. Hilton Ave Phoenix, Arizona USA 85003 PH: 602-258-5600</p>	<p>(Carpet Recycling)</p>
<p>Tim's Reusables 3621 3rd Street NE Calgary, Alberta T2E 5V1 PH: 403-276-1616</p>	<p>(Used building material sales)</p>

Used Building Materials Association (Used building material sales and information)
Joy MacPherson
1096 Queen Street, Suite 126
Halifax, Nova Scotia B3H 2R9
PH: 902-852-3880

Vitreous Environmental Group (Glass Recycling)
Damian Woodhead
212 Eastlake Blvd.
Airdrie, Alberta T4B 2B5
PH: 403-948-7811

Wearmouth Canada (1951) Inc. (Carpet recycling)
Greg Wearmouth
Box 35088, Sarcee P.O.
Calgary, Alberta T3E 7C7
PH: 403-236-4096

APPENDIX II
ALBERTA CRD WASTE REDUCTION CONTACT LIST

ALBERTA CRD WASTE REDUCTION CONTACT LIST

APRIL 2000

Acme Scrap Iron and Metal
16405 130th Avenue
Edmonton Alberta T5V 1K5
Ph: 780-447-1623
Notes: Accepts metals for recycling.

Alberta Environment Dave Whitfield
2nd Floor Deerfoot Square
Calgary Alberta T2E 7L7
Ph: 403-297-8255
Notes: Alberta Government Regional Waste Minimization Specialist.

Alberta Environment Judy Morris
5th Floor 9820 - 106th Street
Edmonton Alberta T5K 2J6
Ph: 780-422-2144
Notes: Alberta Government Waste Management Specialist.

Alberta Environment Recycle Info Line Betty Gray
5th Floor 9820 - 106th Street
Edmonton Alberta T5K 2J6
800-463-6326
Notes: Government service providing information on waste minimization in Alberta.

Alberta Infrastructure Tim Leung
3rd Floor, 6950 - 113 Street
Edmonton Alberta T6H 5V7
Ph: 780-422-7440
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

All Waste Systems Ltd. Mike Kolankowski
Box 3502, Station A
Calgary Alberta T2H 1X6
Ph: 403-540-0069
Notes: Provides waste collection and sorting for recycling of materials such as wood, wallboard, paper, and metals from residential construction. Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

Allied Paper Savers Jack Astill
16345 - 130 Ave.
Edmonton Alberta T5V 1K5
Ph: 780-447-1648
Notes: Paper recycling.

Allied Signal (Honeywell International Inc.) Michael Costello
15801 Woods Edge Road
Colonial Heights Virginia
Ph: 804-520-3165
Notes: Accepts N6 carpet for recycling. Toll Free: 877 N6 CYCLE (877-662-9253). USA Zip:
23834.

Architectural Clearinghouse Don Erdmann
5920 - 103 Street
Edmonton Alberta T6H 2H6
Ph: 780-436-1222
Notes: Used building materials retail outlet and materials salvage service.

Awax Manufacturing Jerry Chen
6333 35 St. S.E.
Calgary Alberta T2C 1N1
Ph: 403-203-0302
Notes: Takes plastic for recycling. No charges if delivered to yard. C&D items could include
clean plastic wrap and cleaned pails (eg. wall mud pails).

Beaver Grinding Dave Brazel
Box 30148, 6455 McLeod Tr.
Calgary Alberta T2H 2V8
Ph: 403-651-0590
Notes: Grinding wood, mostly from manufacturer sources. Has purchased processor specifically for
asphalt shingles. Yard is located at 8900 Barlow Tr. Calgary.

Binder Construction Duncan Binder
11635 - 160 Street
Edmonton Alberta T5M 3Z3
Ph: 780-452-2740
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee
member representing Alberta Construction Association.

Blackfoot Metal Attn: Bruce
40 25 90th Avenue S.E.
Calgary Alberta T2C 2S5
Ph: 403-720-5970
Notes: Accepts metals for recycling.

Border Paving Bill Rogers
6711 Golden West Avenue
Red Deer Alberta T4P 1A7
Ph: 403-343-1177
Notes: Paving operation which has at times incorporated asphalt shingles.

BPB Westroc Industrial Ken Burley
6715 Ogdendale Rd. SE
Calgary Alberta T2C 2A4
Ph: 403-279-0916
Notes: Wallboard manufacturer involved in recycling wallboard. Construction, Renovation, and

Demolition Waste Reduction Advisory Committee member.

Building Owners and Managers Association
815 - 8 Avenue SW
Calgary Alberta T2P 3P2
Ph: 403-237-0567

Bill Partridge

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

C & C Enterprises
813 2nd Street SW
Calgary Alberta T2G 5G7
Ph: 403-279-2660

Kim Christiansen

Notes: Will collect any clean sorted materials. Typically collecting paper products for recycling.

Calgary Aggregate Recyclers
6020 - 94 Ave. SW
Calgary Alberta T2C 3Z3
Ph: 403-279-8330

Notes: Processes concrete and asphalt.

Calgary Metal
3415 Ogden Rd. S.E.
Calgary Alberta T2G 4N4
Ph: 403-262-4542

Rick Dvorkin

Notes: Scrap metal recycling.

Calgary Regional Home Builders Association
#3, 3850 - 19th Street NE
Calgary Alberta T2E 6V2
Ph: 403-291-9761

Kelvin Choy

Notes: Construction, Renovation, and Demolition Waste Advisory Committee member.

Can-Cell Industries Inc.
14715 - 114 Avenue
Edmonton Alberta T5M 2Y8
Ph: 780-447-1255

Harold Tiemstra

Notes: Paper recycler.

Canadian Crushers Ltd.
4115 80th Avenue N.E.
Calgary Alberta T3J 4B9
Ph: 403-248-2885

Rod Porteous

Notes: Small portable crushing system for asphalt and concrete. Can economically crush small volumes of material and can crush on-site for immediate reuse in new construction.

Canadian Tire Real Estate Ltd.
301, 519 - 2 Street SW
Calgary Alberta T2H 0H3
Ph: 403-216-4656

Robert G. Thompson

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

CE3-Westlock Power
Box 4021
Spruce Grove Alberta T7X 3B2
Ph: 780-962-6835
Notes: Operates a wood burning power plant. Not currently using CRD material but willing to discuss specifications with interested parties. Looking at locating a plant closer to Edmonton.

Wilf Ouellette

Challenger Demolition Inc.
1839 9th Avenue SE
Calgary Alberta T2G 0V1
Ph: 403-294-0710
Notes: Deconstruction and diversion of waste materials to their own reuse sales operation.

Ed Dragon

City of Airdrie
Postal Bag #5,
Airdrie Alberta T4B 2C9
Ph: 403-948-0246
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee Member.

Daryl Wolski

City of Calgary, Solid Waste Services
Box 2100, Station M
Calgary Alberta T2P 2M5
Ph: 403-230-6630
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Asphalt and concrete processing.

Darren Martin

City of Edmonton Engineering Services
11404 - 60 Avenue
Edmonton Alberta T6H 1J5
Ph: 780-496-6776
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Processing concrete, asphalt, brick and mortar.

John Mundy

City of Lethbridge
910 4th Avenue S
Lethbridge Alberta T1J 0P6
Ph: 403-329-7355
Notes: Stockpiles and processes concrete and asphalt.

Cynthia Coates

Clareco Industries
15635 - 112 Avenue
Edmonton Alberta T5M 2V8
Ph: 780-452-0909
Notes: Finger jointing operation. Could take construction materials if clean and meet other specifications.

Terry Smith

Creative Employment Development Association
12155 William Short Road
Edmonton Alberta T5B 2E1
Ph: 780-413-7051

Gerald Webster

Notes: Accepts and collect clean used wood for reconstruction into benches, tables, furniture.

Crown Packaging Ltd.
4646 Builders Road
Calgary Alberta T2G 4C6
Ph: 403-243-5700
Notes: Recycler of paper and cardboard.

Mike Digby

Crown Packaging Ltd.
2015 87th Ave.
Edmonton Alberta T6P 1L5
Ph: 780-464-4761
Notes: Recycler of paper and cardboard.

Steve Barczai

Defence Construction Canada
Unit 206, 12222 - 137 Ave.
Edmonton Alberta T5L 4X5
Ph: 780-495-2555

Hans Mooij

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Includes waste diversion requirements in contract specifications.

E.I. Du Pont De Nemours & Co., Inc.
1002 Industrial Road, Jackson
Old Hickory Tennessee
Ph: 615-847-6069

Robb E. Lee

Notes: Accepts Carpet for Recycling. Toll Free: 800 438 7668. USA Zip: 37138-3693.

EBA Engineering
14535 - 118 Ave. NW
Edmonton Alberta T5L 2M7
Ph: 780-451-2121

Paul Ruffell

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member representing Consulting Engineers of Alberta.

Ecco Waste Systems
Box 49037, 7740 - 18 Street
Calgary Alberta T2C 3W5
Ph: 403-720-3855

Brian Johnson

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Private landfill operation diverting some CRD materials.

EI-Russ Aggregate Systems
4409 Glenmore Trail
Calgary Alberta T2C 2R8
Ph: 403-279-7741

Notes: Aggregate processing equipment sales.

EMCO Limited Building Products
P.O. Box 576, 3703 - 101 Ave.
Edmonton Alberta T5J 2K8
Ph: 780-466-1135
Notes: Asphalt shingle manufacturer. Sends manufacturing waste to an 'outside' private stockpile.

Morley Currey

Enviro Build Exchange
6047 - 88 Street
Edmonton Alberta T6E 5T4
Ph: 780-413-9857
Notes: Predemolition auditing, preselling of salvageable items, consulting.

Brad Gerrand

Falvo Electrical Supply
5838 - 87A Street
Edmonton Alberta T6E 5Z1
Ph: 780-466-8078
Notes: Retailer of salvaged electrical supplies from CRD sources.

Ralph Falvo

Fish Creek Excavating Ltd.
5007 - 28 Street SE
Calgary Alberta T2B 3B4
Ph: 403-248-8222
Notes: Accept asphalt and concrete. Mobile processor. Sales of processed aggregate.

Don Scheurman

General Scrap Iron and Metal
11915 156 Street
Edmonton Alberta T5V 1E8
Ph: 780-452-5865
Notes: Accepts metals for recycling.

Golden Hill Regional Division
435 Highway 1
Strathmore Alberta T1P 1J4
Ph: 403-934-5361
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

Bob Bardal

Greater Edmonton Home Builders Association
201, 10544 - 114 Street
Edmonton Alberta T5H 3J7
Ph: 780-425-1020
Notes: The association has participated in CRD waste minimization pilot projects

Habitat Restore
Box 9, 3620 29 Street
Calgary Alberta T1Y 5Z8
Ph: 403-291-5424
Notes: Sales of used building materials.

<p>Handyman Used Building Materials 1052 32nd Street Medicine Hat Alberta T1B 4E6 Ph: 403-529-0801 Notes: Sales of used building materials.</p>	Glen Roeder
<p>Happy Harry's Used Building Materials 125 - 61 Ave. SE Calgary Alberta T2H 0R4 Ph: 403-255-9505 Notes: Retail outlet for CRD building materials.</p>	Ray Banville
<p>Happy Harry's Used Building Materials 5044 45th Street Red Deer Alberta T4N 1K6 Ph: 403-343-1818 Notes: Retail outlet for CRD building materials.</p>	Travis Reed
<p>Harper's Metals 8149 Edgar Industrial Close Red Deer Alberta T4P 3R4 Ph: 403-346-4185 Notes: Accepts metals for recycling.</p>	Al Laplante
<p>Harvey Enterprises 23132 Connaught Postal Outlet Calgary Alberta T2S 3B1 Ph: 403-660-4518 Notes: Accepts and collects glass for recycling.</p>	Holly Boucher
<p>IG Paper Recycling P.O. Box 1325, 4300 - 15 Calgary Alberta T2P 2L2 Ph: 403-265-2128 Notes: Recycler of paper and cardboard.</p>	Alan Thiele
<p>IKO Industries Ltd. 1600 - 42 Ave. Calgary Alberta T2G 5B5 Ph: 403-265-6022 Notes: Manufacturer of asphalt shingles. Recycling of pre-consumer shingle waste.</p>	Shane Miln
<p>Inland Construction Ltd. 23 Bellerose Drive St. Albert Alberta T8N 1M9 Ph: 780-447-1550 Notes: Accepts, stockpiles, and crushes concrete and asphalt. Sales of recycled aggregate.</p>	Robert Wilson

Integrated Construction Engineering Systems
8213 Davies Rd.
Edmonton Alberta T6E 4N1
Ph: 780-944-0231

M. Shokry Rashwan

Notes: I.C.E.S. Inc. designs and fabricates mobile recycling plants (3 models) for concrete, block and brick. The company offers its recycling services to the local market through rental and lease options and has begun selling its products in the U.S.

Interior Wood Grinders (Div. of R215 Enterprises)
16011 110 57 Street
Edmonton Alberta T5X 4S1
Ph: 780-975-4523

Clayton McCormick

Notes: Clears land for construction, some demolition. Grinds green and white wood on site

J.E. Martin Transport
R.R. 2
Spruce Grove Alberta T7X 3R9
Ph: 780-962-2341

Jerry Martin

Notes: Mobile custom grinding of wood wastes. Purchases and markets wood wastes.

Jillian Builders
6850 112A St.
Edmonton Alberta T6H 3K6
Ph: 780-444-4404

Derek Deibert

Notes: Salvages construction and demolition materials for incorporation into new buildings. Small projects including building entire company shop from salvaged materials.

K-Lor Contractors Services Ltd.
210, 610 - 70 Ave. SE
Calgary Alberta T2H 2J6
Ph: 403-255-7303

Ross Charlesworth

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Full service specialists in deconstruction and diverting demolition waste from landfill.

Kedon Waste Services Ltd.
Box 608
Lethbridge Alberta T1J 3Z4
Ph: 403-328-0220

Tim Waters

Notes: Operates landfill for City of Lethbridge. Processes and sells waste wood, applies old asphalt on landfill roads.

Klyne & Ward Industries
Box 269
Enoch Alberta T7X 3Y3
Ph: 780-470-0016

Albert Klyne

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Accepts processes and sells wood waste.

Kraemer Taipale Partnership
300, 520 - 5th Ave. SW
Calgary Alberta T2P 3R7
Ph: 403-237-7890

Len Kraemer

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member. Interior design.

Lafarge Canada Inc.
9501 Stadium Road
Edmonton Alberta T5J 2J1
Ph: 780-426-4770

Harvey Stoek

Notes: Currently not using CRD wastes but are studying it. Stockpiling asphalt shingles in Edmonton for future processing. Calgary operation - contact Kim Walkowski at 403-292-1555.

National Electric
3738 97th Street
Edmonton Alberta T6E 5S8
Ph: 780-461-6122

Wayne Maisonneuve

Notes: Salvage and resale of electrical components and fixtures from demolition projects.

Nature's Edge Developments
15710 St. Albert Trail
Edmonton Alberta T6V 1K1
Ph: 780-447-7202

Bob Pavelich

Notes: Stockpiling used asphalt shingles and developing processing program. See partner in Calgary - Beaver Grinding.

Oxford Properties Group
290, 400 - 3 Ave. SW
Calgary Alberta T2P 4H2
Ph: 403-221-0694

Bruce MacKenzie

Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

Park Paving
9025 101 St E
Edmonton Alberta T6E 0A4
Ph: 780-435-8338

Kerry Hetu

Notes: Recycles old asphalt into new paving mix.

PCL Construction Management Inc.
Box 150, Station M, 2882 - 11
Calgary Alberta T2P 2H6
Ph: 403-250-4814

John Denomme

Notes: Have tried some CRD diversion projects with mixed results.

Planet Recycling Inc.
201 W. Hilton Ave
Phoenix Arizona
Ph: 602-258-5600

Sal Palopoli

Notes: Accepts N6 carpet for recycling. USA Zip: 85003

Precision Plastics
9620 27 Avenue
Edmonton Alberta T6N 1B2
Ph: 780-462-3969
Notes: Plastics recycling.

Karen Millington

Pro Form Construction
5501 43rd Street
Red Deer Alberta T4N 1C8
Ph: 403-343-6099
Notes: Mostly road construction. Currently receiving and stockpiling concrete and asphalt. Uses external firm to do crushing.

Curtis Bouteiller

Revlyn Demolition and Recycling Ltd.
11104 - 210 Street
Edmonton Alberta T5S 2K6
Ph: 780-454-8167
Notes: Salvages materials from demolition projects for resale from their yard. Stockpiles clean concrete for periodic processing into aggregate.

Roy Prentice

RocTec Equipment Ltd.
21010 - 108 Ave.
Edmonton Alberta T5S 1X4
Ph: 780-447-3535
Notes: Sales of concrete and aggregate processing equipment.

Barry Burrows

SCMED International
10 Scmed Lane
Calgary Alberta T2C 4T5
Ph: 403-203-6000
Notes: Manufacturer of office partitions. Have drywall reduction program.

Tim's Reusables
3621 3rd Street NE
Calgary Alberta T2E 5V1
Ph: 403-276-1616
Notes: Sells used building materials including dimension wood, fixtures, white goods.

Tim Sitter

Twin Cities Excavating Ltd.
20907 107 Ave. NW
Edmonton Alberta T5S 1W6
Ph: 780-447-4737
Notes: Crushes own concrete and contract to crush for others.

Bill Kelly

University of Calgary, Environmental Design
2500 University Drive NW
Calgary Alberta T2N 1N4
Ph: 403-220-6608
Notes: Construction, Renovation, and Demolition Waste Reduction Advisory Committee member.

Tang Lee

Used Building Materials Association
1096 Queen Street, Suite 126
Halifax NS B3H 2R9
Ph: 902-852-3880

Joy MacPherson

Notes: International association of used building materials retailers. Toll Free: 1-887-221-8262, Web: www.ubma.org.

Vic-Air Drilling
215 39015, Highway 2A
Red Deer Alberta T4S 2A3
Ph: 403-342-4350

Joe Pobihushchy

Notes: Pile extracting and pipe salvage. Also 1-800-651-2990.

Vintage Roofing
373 17A Ave
Edmonton Alberta T6L 2R3
Ph: 780-450-8364

George Sanders

Notes: Has developed comprehensive CRD waste processing plan including markets. Plan is on hold due to low tipping fees and acceptance of materials at area landfills.

Visco Demolition
Box 8, Site 8, Rural Route
Edmonton Alberta T6H 4N6
Ph: 780-929-5667

Shirley Visser

Notes: Demolition specialists who work to reuse or recycle as much as possible from buildings. Large part of their business is reselling salvageable goods.

Vitreous Environmental Group
212 Eastlake Blvd.
Airdrie Alberta T4B 2B5
Ph: 403-948-7811

Damian Woodhead

Notes: Accepts clean window glass (no laminating, tint or ceramic) for processing to glass sand for use in fiberglass manufacturing. Call first for detailed specifications.

Wearmouth Canada (1951) Inc.
Box 35088, Sarcee P.O.
Calgary Alberta T3E 7C7
Ph: 403-236-4096

Shelley Wearmouth

Notes: Recycles drywall for Westroc. Member of Construction, Renovation, and Demolition Waste Reduction Advisory Committee.

Wells Construction Ltd.
12311 17 St. NE
Edmonton Alberta T5E 6K4
Ph: 780-472-1752

Bob Spence

Notes: Company is involved in shingle recycling in other jurisdictions but not currently in Alberta.

Wood Again
12155 William Short Road
Edmonton Alberta T5B 2E1
Ph: 780-413-7051

Doreen Webster

Notes: Non-profit group provides site clean-up service. Separates and salvages wood.