

**Construction Waste Reduction and Recycling Project
Alliant Energy Worldwide Headquarters Building**

DNR Solid Waste Reduction and Recycling Demonstration Grant
Final Report
August 1, 2002

Prepared by:

Josh Babiasz, Opus North Corporation
Jenna Kunde, WasteCap Wisconsin, Inc.
Heidi Rahn, Alliant Energy
Pete Runhaar, Green Valley Disposal

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1. Project Background

Construction of Alliant Energy's Corporate Worldwide Headquarters began in May of 2000 in Madison, Wisconsin and was completed in April of 2002. Alliant Energy desired to have the construction waste reduced and recycled and created a diverse team to formulate a Construction Waste Reduction and Recycling Plan for the site. A Wisconsin Department of Natural Resources (DNR) Solid Waste Reduction and Recycling Demonstration Grant was awarded in February, 2001 to implement the plan. The goal of this plan was to improve the capacity to execute recycling practices on a construction site. We identified and quantified materials to be recycled. We also believe we have improved hauler, contractor and builder capacity to execute recycling practices by educating throughout the project and sharing our results. Site-specific plans included diverting 50% of the waste generated from the landfill.

Opus North Corporation built the 324,000-ft² office building with a steel structure and precast concrete façade. The three-story building has two wings centered around an open rotunda. Construction phases were closely followed to ensure a compatible recycling program was in place throughout the duration of the project. The recycling efforts have been analyzed and are being reported in a case study available to the public. Our experiences have generated recycling interest at the local, statewide and national level, and the results are advancing the implementation of recycling at other construction sites.

2. Project Team

Alliant Energy administered the DNR grant and provided oversight to the recycling program; Heidi Rahn, Environmental Consultant, and Jim Shebesta, Construction Project Manager, represented Alliant Energy on the recycling team. Opus North Corporation, the design-build firm for the project, was responsible for on-site implementation of the plan. Josh Babiasz, Assistant Project Manager, educated the subcontractors, monitored and enforced the plan, responded to on-site issues, and tracked materials being reused, reduced or recycled. WasteCap Wisconsin was hired as a subcontractor by Opus North Corporation to provide technical assistance, educational assistance, and monitor, measure, document and publicize results of the waste reduction and recycling program. Jenna Kunde, WasteCap Wisconsin, developed a time-based management approach for placement and timing of the various recycling containers, identified methods for reducing, reusing and recycling construction materials, conducted training and waste audits, measured results, and shared the program's success through various media and outreach efforts. Green Valley Disposal was the waste and recycling hauler. Pete Runhaar, Construction Service and Sales Representative, coordinated dumpster and recycling bin placement and pick up, responded to on-site issues regarding material disposal and documented the materials leaving the site to track costs and quantities. The commitment of this team and the subcontractors on site has resulted in a successful waste reduction and recycling program.

3. Project Objectives and Status

The following information outlines how the specific objectives in our original project scope were achieved or exceeded:

A. Incorporate waste reduction, reuse and recycling considerations into specifications for building materials.

All subcontractors on site were required to comply with Opus North Corporation's General Conditions of the Subcontractor (see Attachment A). These general conditions defined the recycling program and the reuse and reduce measures the subcontractors were expected to take.

B. Work with material suppliers whose philosophy and practices include waste reduction, reuse and recycling techniques.

We worked with our suppliers to reduce, reuse and recycle any wastes generated. We also encouraged our suppliers to present us with sustainable options for material usage that they may not routinely present to their customers. For example, this resulted in the reuse of a raised floor from another Alliant Energy building, reduction in the volatile organic compounds used in the raised floor adhesive, and recycling of 244 tons of fly ash into the concrete used on site. A variety of other materials have been returned to the subcontractor or manufacturer for reuse or recycling including wire spools, pallets, and data cable (see Attachment B).

C. Train construction workers to separate for recycling selected construction materials as well as training waste haulers working on the project.

We were diligent about training everyone working on this site about the reuse and recycling program. Opus North Corporation held **weekly meetings with all of the foremen and a separate weekly meeting with the project managers. At these meetings, the recycling program was consistently discussed as an agenda item** - everyone was reminded of their role to make the program a success, and everyone was asked for their input (see Attachment C for minutes from one of these meetings). WasteCap staff attended the meetings of the foremen approximately once a month. At these meetings, WasteCap staff thanked everyone for participating, informed them of the status of the reuse and recycling program, asked for their input, and handled any problems. These meetings were an excellent opportunity for the people working on the site to bring up issues including unusual recyclables which may be able to be diverted, locations of containers, reuse challenges, etc. For example, the fact that most of the wood generated contained nails was brought up at one of these meetings. Thanks to the input of the subcontractors, we were able to find a market that would work for this and other materials of concern.

In addition, Opus North staff was very committed to the success of this project, and their staff continually monitored the recycling program and educated anyone that they found was not properly separating the recyclables. Because the trades generate very different types of trash, it was very easy for Opus North staff to determine which trade was improperly separating and talk to a representative from that trade. After the training meetings with the foremen, staff from WasteCap, Opus North, and Green Valley Disposal would conduct **site visits, do waste audits and talk to the people working on the building to see if they had any problems or suggestions.** This was an excellent way to discover any issues that needed to be addressed,

like clarifying what could and could not be recycled or moving recycling containers for easier access to where people were working. We were very pleased in these visits to discover that all of the people working on the site knew about the program and what to do. For example, in one of our visits, we talked to a person who had just started - it was his first day. We asked him if he had heard yet about the recycling program. He had, and told us exactly all the requirements of the program.

We also held **special events (see Attachment D)** where we could talk to everyone who was working on the job at once. Shortly after we received the grant, we held **a kick-off event for everyone working on the site**. We provided lunch, explained the program, and let the construction crews know that their efforts made the recycling program a success. In April, 2001, we held an **Earth Day Celebration** to educate new crews about the program and inform everyone about the status of the program and the positive difference they made. In December, we held an **end-of-the-year thank you lunch** for all of the subcontractors. We again provided lunch, explained the program, and let the construction crews know the results of their efforts. At the end of the program in **May, 2002, Alliant Energy held a recognition reception for all the contractors and subcontractors** involved in the construction project and the recycling program. Speakers at each of these events included representatives from Alliant Energy, WasteCap Wisconsin, and Opus North Corporation. These events are an excellent way to give everyone on site the information they need to know, for example, what to separate and the results their efforts are making. Response from these events has been very positive.

D. Determine and locate on site the containers required to collect each type of material to be recycled and/or reused.

Following were the containers used on site for collection of recyclables:

- 95 gallon carts (9) and small tub containers in building for cardboard/paper and commingled cans and bottles
- 6 yard covered containers (2) near building in west parking lot for cardboard
- 20 yard container near building in west parking lot for drywall
- 12 yard container near building in west parking lot for metal
- 30 yard container near building in west parking lot for wood
- 12 yard container near building in west parking lot for clean fill
- 20 yard container near building in west parking lot for trash
- 55 gallon containers (6) in building for trash

Once the building was constructed to the point that it had a working loading dock, compactors that were connected to the building were added and the above-mentioned cardboard and trash containers were removed:

- 30 yard compactor connected to building for trash
- 30 yard compactor connected to building for cardboard and paper

The majority of containers were lined up together next to the west side of the building. Keeping the containers (including the trash) together was important. If a trash container was available, it was rare for the recycling container to become a trash container. The containers were in the most accessible spot for the employees and located at the most commonly used entrance to the structure. In addition to labels and signs on and near the containers, most containers were a different size, shape, or color. We found that magnetic signs connected to the containers were not very effective, as they would often leave with the recycling container. Sandwich board signs placed in front of each container were used and were very effective as was signage that was painted right onto the containers (and therefore remained).

E. Monitor recycling containers for compliance and regularly conduct mini-waste audits of each material stream and waste.

Jack Nash, Opus North Project Manager, was **on site every day and watched the recycling bins closely**. He directed Opus North laborers and all subcontractors on site to keep the recycling containers clean and free from contamination. He and his staff checked the containers daily and followed up with anyone who improperly sorted materials to let them know the proper procedures. In addition, Mike, the Labor Foreman, and Jeff Panella, the Carpenter Foreman, oversaw the recycling program, conducted periodic audits, and talked to all of the crews if there were any problems.

As mentioned above, WasteCap staff conducted **site assessments and mini-waste audits approximately once a month**. Generally, these assessments are a team effort and include Josh Babiasz of Opus North Corporation and Pete Runhaar of Green Valley Disposal. Having the team do the assessment ensures that the proper person can handle any issues at the time the problem is identified. For example, sometimes the assessments find that additional dumpsters or pick-ups are needed. Green Valley Disposal called that in on the spot and got it taken care of. Sometimes we discover that we need additional recycling bins for commingled recyclables on the floors, or that they need to be labeled. Josh Babiasz of Opus North Corporation took care of these issues right away.

In addition to these mini audits, we conducted two full audits of the recycling and trash bins. In the first audit, we looked through recycling and trash containers inside the buildings (trash and commingled recycling containers near lunch areas and in other common areas). We found that there was almost no contamination in the recycling bins - they contained cans and bottles, as requested. In the trash, we discovered several items that were in question as to whether they could be recycled or not - yogurt containers, plastic caulk tubes, and small plastic spools. Green Valley Disposal researched these items and found that they could be recycled. Opus North educated the crews on site that they should put those items in the recycling bins in the future. Thus, this audit resulted in increased waste diversion.

The second full audit looked at all of the outdoor recycling and trash containers. The recyclables being separated at the time were drywall, wood, metal, cardboard & office paper, and commingled recyclables. We were particularly interested in doing this audit shortly after the drywall separation program began to ensure that there was no contamination (i.e. materials not designated for that dumpster) of the drywall. We climbed into the trash and recycling containers to look for contamination. We found:

- Drywall - completely free of contamination except for one food can
- Wood - completely free of contamination
- Metal - nearly free of contamination. A couple of plastic scraps, a piece of wood, and a few cans that should have gone into the commingled recycling bin were present.
- Cardboard & Office Paper - boxes were all flattened and 99% free of contamination. Two small pieces of wood (approx. 8" long each) and two cans were present.
- Commingled Recyclables - not on site at the time of the audit. The bins had just been collected
- Trash - The trash was mostly comprised of insulation scraps, non-recyclable lunch wastes, plastic bags used as packaging, and floor sweepings. We found three small cardboard boxes in the trash - these had been used as trash containers on the floors. We also found one full can of spray paint, approximately three pieces of metal banding, and two small pieces of wood.

Overall, we were extremely pleased with the results of the waste audits. The recycling bins were nearly completely free of contamination and the trash bin contained extremely few recyclables.

F. Track by weight and type each material being recycled and associated costs.

Our recycling results are summarized below and listed in further detail in Attachment E and F, Material Tracking Spreadsheet and Economic Analysis of Recycling. Costs of recycling 527 tons of recyclables totaled \$ 34,063.04. It was less expensive to recycle than to dispose of materials as trash by both volume and weight:

	Recycling	Trash
Costs per ton:	\$ 64.67	\$ 65.30
Costs per cubic yard:	\$ 4.98	\$ 7.16

Alliant Energy surpassed its 50% waste diversion goal and achieved a 74% diversion rate by volume. The project recycled 6,842 of the 9,189 cubic yards of material generated and 527 of the 784 tons of construction debris generated May, 2000 – April, 2002.

Material	Yards	Tons
Commingled	63	1.58
Cardboard	4134	72.24
Wood	1740	292.88
Metal	348	42.09
Drywall	515	96.90
Clean Fill	42	21.00
Total Recyclables	6842	527
Total Trash	2347	257
Total Material	9189	784
Recycling Rate	74%	67%

G. Evaluate techniques being implemented and contamination levels and modify techniques as needed to increase effectiveness.

It has been very helpful having a committed team on this job, as they were able to address any changes that needed to be made to the program and come up with creative solutions. Here are just a few of the issues we addressed:

- **Staging Areas** - Early in the project, the construction materials management team conducted a site visit at the Alliant Energy construction site and found that several adjustments needed to be made to the containers. We found that we were generating more recyclables than anticipated, and that the recycling containers needed to be better labeled and placed in locations that were easier to access. Based on this visit, we placed all recycling containers next to each other, put out large sandwich board style plastic signs, added additional cardboard recycling containers and commingled recycling containers, and added a container for the collection of metal. These kinds of adjustments were made on an ongoing basis based on our regular site visits and discussions with the crews.

- **Wood** - Our original market for wood could not accept wood with nails. We anticipated that most of the wood would be from cutoffs from larger pieces of wood - therefore this seemed like a reasonable market. However, through talking with the crews, we discovered that most of the wood generated on site is from packaging. For example, all the windows came in wooden frames that were disassembled in order to access the glass. This wood contained many nails, and it would have been an unreasonable expense in labor to remove all of the nails. Therefore, we researched and found recycling markets for wood which can accept wood with nails. In addition to being more convenient, this market was less expensive than our previous wood market.
- **Pallets** - At the beginning of the project, we separated all pallets for recycling. However, we discovered that most, if not all, of the pallets we collected on the job site were of irregular size and therefore unacceptable to pallet remanufacturers. These pallets are acceptable to our wood recycling market, so we are now recycling the pallets with the rest of the wood. We feel that this is very helpful information so that as recycling on construction sites becomes more prevalent, WasteCap Wisconsin, the Associated General Contractors, or others can work with construction material suppliers and pallet manufacturers to standardize the sizes of pallets that are brought onto construction sites in order to facilitate reuse.
- **Spools** - The electrical contractor, ECI Design, brought this issue to our attention at one of the meetings with the foremen. Hundreds of wooden spools were left from the wiring of the entire Alliant Energy corporate headquarters. These are normally disposed of as trash on a construction site. However, through working with ECI Design and they with the supplier, the supplier was able to take all of the spools back for reuse. This is just one example of how, when challenged to think about waste, people come up with creative solutions that make sense environmentally and economically. Now, instead of paying for the disposal of hundreds of those spools, they are being reused - saving Alliant Energy disposal costs, the supplier purchasing costs, and preserving natural resources.
- **Styrofoam** - In order to reduce waste, a subcontractor received all of the lighting fixtures in just Styrofoam and shrink wrap. Normally, the fixtures would all be placed into individual cardboard boxes, resulting in a lot of unnecessary packaging. Although an excellent waste reduction strategy, we were left with a recycling challenge for the Styrofoam. Through WasteCap Wisconsin's market information, we found a local company in Madison that accepts Styrofoam packaging and grinds it to make the insides of beanbag chairs. Although the hauling of this material still poses a challenge (because of its weight, it is not economical to transport via a typical recycling dumpster), we were able to divert approximately 40 cubic yards - two full trash dumpsters - through recovering the Styrofoam.
- **Drywall** - Before the grant was issued, Green Valley Disposal received a conditional grant of exemption from the Wisconsin DNR in order to implement the collection and land spreading of waste gypsum wallboard during the project. However, the exemption specifically excluded Type X wallboard from being land applied. We discovered shortly before the drywall was expected to arrive that all drywall used on commercial construction sites is Type X drywall. To address this issue, we worked with the following agencies and groups, among others:
 - o Wisconsin Department of Natural Resources
 - o Environmental Protection Agency
 - o local recycling coordinators
 - o UW-Madison Soil Scientists
 - o National Association of Home Builders Research Center

- o US Gypsum Company
- o The Gypsum Association
- o US Composting Council
- o American Society of Agronomy
- o State of Georgia's Department of Natural Resources
- o drywall grinding equipment manufacturers
- o Construction Materials Recycling Association
- o Environmental Building News
- o US Department of Agriculture's Research Service

We found that there has been excellent research on the effects of land application of residential construction drywall scrap. Drywall provides nutrients such as calcium and sulfur, which enhance the soil. However, to date there have been no studies done on the effect of land application of Type X drywall, commonly used in commercial construction. Type X drywall contains more fiberglass than residential drywall (less than 1% of the composition of the drywall, but it is present). We determined that a test would be necessary to study the effects of fiberglass on soil properties. Dick Wolkowski of the UW-Madison Soil Science Department conducted an ASTM test regarding this issue. The test is recognized by the USDA and the US Composting Council as a standard method for soil testing and studied the effects to the biological community from land application of Type X drywall.

The test is intended to answer the following concerns from the Wisconsin DNR (cited from correspondence with the DNR):

"As you are aware, the agronomic portion of using drywall on agricultural field has been fairly well documented. The areas that have not been well studied, to our knowledge, involve the impacts to the biological community on agricultural fields after drywall containing fiberglass has been incorporated into the soil.

In order for the Department to develop a level of comfort in allowing the application of drywall containing fiberglass on agricultural fields we will need additional study to determine what application rates will not cause a detrimental effect to the biological community.

Therefore, we are recommending that a study be conducted using a representative specie (earthworm) that can be monitored over time for any detrimental effects, such as mortality or weight loss, that may be attributed to the introduction of drywall containing fiberglass."

This test is extremely significant in that it provided some clear, scientific research results on the effects of Type X drywall on land application. It is helping determine if drywall from commercial sites, the largest single contributor to the commercial construction waste stream, can help enhance soils in Wisconsin and become an environmental and economic asset.

The test results showed no effect on the worms from Type X drywall, even in high concentrations. Based on these test results, we were able to proceed with land application of the drywall from the site on a farm. In addition, Packer Industries visited the farm and brought grinding equipment so that we could test the different kinds of grinding equipment for grinding drywall. A horizontal grinder seems to be the best type of grinder, as it results in very little dust and a finely ground product. The product is very suitable for land application.

- **Contamination** - Due to the diligence of everyone working on the job at all levels, we have had very little placement of materials into the inappropriate container. However, we have

had to monitor the containers closely and talk to crews when contamination occurs. For example, in the first load of drywall there were several trash bags below the drywall. Upon investigating why this occurred, we discovered that the drywall container had not yet been labeled when the contamination occurred, and that the drywall container looked just like the trash container and was placed in the same location that the trash container is typically placed. We then made sure the container was clearly labeled, that the crews knew exactly what the container was for, and that everyone on the site understood the seriousness of further contamination. Further loads of drywall have been completely free of contamination.

H. Track by weight the amount of material being landfilled and associated costs.

The cost of landfilling 257 tons of trash totaled \$16,801.67. These costs include the bin rental, hauler service and landfill fees. Please refer to Attachment E, Material Tracking Spreadsheet, for more information on disposal costs and quantities.

I. Track and evaluate the effectiveness of the project from an economic point of view.

Please refer to Attachment F, the Economic Analysis of Recycling at the Alliant Energy Construction Site. Based on current hauling services and market costs, our data showed that it is cheaper to recycle construction waste than to landfill the materials. An average cost per yard of recyclables is \$4.98 versus \$7.16 for trash. Using our total yardage, we have saved \$15,785.08 by recycling the materials rather than sending them to the landfill. However, these costs do not reflect the extra resources required to successfully recycle; administrative, educational and field labor are a significant cost to the Alliant Energy Worldwide Headquarters recycling project. Throughout the duration of this project, \$76,088 was spent to manage and implement the recycling program. Future projects should not require as much labor due to increased experience and efficiency. Please refer to Attachment G-J for specific labor costs.

To assess the overall economic effect of recycling on this project, we calculated the expected disposal costs assuming no recycling program. This calculation is based on the cost of most of the trash disposed this project: \$ 4.50 per cubic yard plus \$34 per ton tipping fee.

Material	Yards	Tons	Total cost*	Cost if disposed of as trash**	Avoided Disposal Cost
Commingled	9	0.25	\$360.00	\$49.00	(\$311.00)
Commingled	54	1.33	\$0.00	\$288.22	\$288.22
Cardboard	2	0.07	\$40.00	\$11.38	(\$28.62)
Cardboard	510	17.85	\$7,025.79	\$2,901.90	(\$4,123.89)
Cardboard	3622	54.32	\$3,801.31	\$18,145.88	\$14,344.57
Wood	1740	292.88	\$11,072.00	\$17,787.92	\$6,715.92
Metal	348	42.09	\$4,151.25	\$2,997.06	(\$1,154.19)
Drywall	515	96.90	\$4,772.70	\$4,908.56	\$135.86
Clean Fill	42	21.00	\$984.79	\$903.00	(\$81.79)
other charges			\$ 1,855.20		
Total Recyclables	6842	526.69	\$34,063.04	\$47,992.92	\$15,785.08

This project avoided over \$15,000 in disposal costs by recycling. This clearly demonstrates that recycling was a cost effective strategy for managing the project's construction waste in addition to the many environmental benefits.

J. Publicize the project and its results to a number of audiences through a variety of newsletters, architectural and building association publications, a planned event to publicize results and public presentations to at least three relevant groups.

This project has been extensively publicized. Alliant Energy and WasteCap Wisconsin have collaborated to reach a wide audience through various media outlets. Listed below are some of the media results and public presentations.

Media/Presentations:

- Recognition at **Alliant Energy Headquarters Open House**. July, 2002.
- Presentation at the **National Environmental Protection Agency Jobs Through Recycling Annual Meeting**. June, 2002.
- Presentation at the **AIA Annual Convention**. May, 2002.
- Wisconsin State Journal **advertisement** on importance of recycling and energy efficiency. April, 2002.
- Presentation at the **Associated Recyclers of Wisconsin Conference**. March, 2002.
- **Fox 6 News**. March, 2002.
- Presentation at **ConExpo**, Las Vegas, NV. February, 2002.
- Presentation for the **State Department of Administration Project Manager's Training**. January, 2002.
- **Resource Recycling**. "Leading the Way to New C&D Recycling Markets" January, 2002. National, highly-respected recycling magazine.
- **Hard Hat News**. "Wood Recycling and Drywall Grinding" December 7, 2001.
- Presentation at the **Recycling Association of Minnesota Conference**. November, 2001.
- Presentation at **Iowa's Waste Matters Conference**. October, 2001.
- **Talk & Tour at Alliant Energy's worldwide headquarters** hosted by Alliant Energy, Opus North Corporation, Green Valley Disposal and WasteCap Wisconsin. October 9, 2001
- Presentation at the **Madison Chapter of the International Facility Manager's Association**. September, 2001
- Presentation at the **Great Lakes Regional Pollution Prevention Roundtable**. "Construction Waste Recycling at Alliant Energy Headquarters" July, 2001.
- **Letter from Governor Scott McCallum**. "The results stemming from such an innovative endeavor will undoubtedly result in a cleaner environment, which ultimately benefits all of the residents of the great state of Wisconsin." June 13, 2001.
- **Headquarters Headlines** "Presenters talk trash at Talk & Tour" Alliant Energy newsletter. November, 2001
- **Environmental Building News** "Earthworms and Type X Drywall" October, 2001. Highly-respected national environmental building newsletter. Full page article with photo.
- **Milwaukee Journal Sentinel** "WasteCap helps businesses with their dirty work" October 23, 2001. Front page of the Business section with large photos of the Alliant construction site.
- **WasteCap's Web Site**. Front page of WasteCap's web site in October and November
- **Channel 15 News**. Covered Talk & Tour at Alliant Energy's construction site on 10 pm news.
- **Capital Times**. October, 2001. Article inviting readers to Talk & Tour.
- **The Green Valley Hauler** "Construction Recycling!!!" October, 2001. Green Valley Disposal newsletter.
- **C&D Recycler** "Wisconsin Project Sets C&D Recycling Goals" July/August, 2001. National magazine.

- **BioCycle** “Wisconsin Companies Turn Wood Residuals Into Revenues” July, 2001. National magazine. Full page article with photo.
- **Recycling News** “Building a Future for Construction Debris – Innovative, Large-Scale Construction Waste Reduction and Recycling Program Makes an Impact” Summer, 2001. Wisconsin DNR’s statewide recycling newsletter. Full page article
- **The Green Valley Hauler** “Recycling on a Construction Site?” July, 2001. Green Valley Disposal newsletter.
- **Contractor’s Update** “Building A Future for Construction Debris – Innovative, Large-Scale Construction Waste Reduction and Recycling Program Makes an Impact” May/June, 2001. Newsletter of the Associated General Contractors.
- **Associated Recyclers of Wisconsin** “Building a Future for Construction Debris” June, 2001. Statewide newsletter. Full page article.
- **BioCycle** “Measuring the Results of C&D Debris Recycling” May, 2001.
- **Headquarters Headlines** “New headquarters contractors applauded for recycling efforts” May, 2001. Alliant Energy newsletter.
- **WasteCap’s Email Bulletin**. April, July, September, October and November articles about the efforts of the team and inviting recipients of the bulletin to the Talk & Tour
- **Waste News** “Project gauges C&D recycling efficiency” National newspaper. May 28, 2001.
- **The Daily Reporter** “Alliant, WasteCap recycle lessons, debris. \$57 million construction project to serve as role model for state” April, 2001. Construction newspaper.
- **In Business** “Wisconsin Companies Turn Wood Wastes Into Revenues” National magazine. Summer, 2001.

A Talk & Tour was held on October 9, 2001. Over 70 people registered for this event representing architects, contractors, engineers and other building professionals, recycling professionals, and others interested in waste reduction and recycling. Attendees also included an Environmental Protection Agency Region #5 representative and several representatives from the State of Wisconsin Department of Facilities Development. Through the state’s involvement, there is the potential that recycling will become a standard part of all state construction projects. This Talk & Tour helped encourage them to move in that direction. Also, as a direct result of the Talk & Tour, a Madison-area contractor decided to recycle on their job site.

Each attendee was given a packet of information so that they could take back the information presented at the event and consider similar efforts on their job sites.

Presentations at the Talk & Tour were given by:

- Susan Bangert, Director of the Bureau of Waste Management for the Wisconsin Department of Natural Resources, on behalf of Governor McCallum
- Pam Wegner, Alliant Energy
- Jenna Kunde, WasteCap Wisconsin, Inc.
- Heidi Rahn, Alliant Energy
- Pete Runhaar, Green Valley Disposal
- Josh Babiasz, Opus North Corporation
- Jim Shebesta, Project Manager for Alliant Energy
- Pete Zak, Zak Engineering (HVAC System)

K. Formulate a case study based on the results and create a "how to" education/training guide.

The case study is currently being developed and includes not only a "how to" education/training guide, but a series of fact sheets on various portions of this project. For example, there is a fact sheet on drywall, one on the economics of this project and one on the media received for this project. This case study will be posted on WasteCap Wisconsin's web site, published on their email bulletin, offered at Talk & Tours and other events, and given to members of Associated General Contractors and AIA of Wisconsin.

4. Final Recommendations and Discussion of Application of the Project Statewide

This project was a success by all measures –

- **Economic:** Over **\$15,000** was saved through avoided disposal costs.
- **Environmental:** 527 tons of solid waste were diverted from Wisconsin landfills. We far exceeded our goal of diverting 50% by **diverting 74% of the construction debris**. As just one example of the environmental impact, 72.24 tons of cardboard were recovered. 17 trees are saved for each ton of paper recovered, so **1,228 trees were saved** through these efforts.
- **Technical:** The contractor, subcontractors, owner, and the hauler agreed that **recycling was technically extremely successful and not at all difficult**. A few keys to our success included proper placement of recycling containers, clear signage, constant education (at every weekly meeting of the foremen, daily reinforcement by staff, education at several special events, etc.), check-ins with contractors and subcontractors to address questions and make adjustments, daily on-site monitoring, and recycling language in the specifications requiring compliance. In on-site interviews and follow up discussion, contractors and subcontractors reported that minimal extra time was needed to separate recyclables. Extra time is needed to educate crews, to properly document the amount and cost of collection of recyclables and trash, to find markets for unusual recyclables (e.g. drywall), and to create and place clear signs.
- **Social:** **This project is inspiring other projects around Wisconsin**. Thanks to the success of this recycling project and increased interest in construction waste recycling in general, more and more contractors are recycling including Findorff, Vogel Brothers Builders, The Jansen Group, Oscar J. Boldt, and Affiliated Construction Services. Several large Wisconsin commercial contractors would like to include recycling on all of their construction sites as a corporate policy. These actions were clearly inspired by the success at Alliant Energy and the contractors would most likely not be taking these steps without the strong example of recycling success at the Alliant Energy Worldwide Headquarters construction site.
 - Media/presentations: As a subset to the social impact of this project, this project attracted local, statewide and national media attention. **Conferences highlighting this project included: the annual convention for architects**, the AIA Annual Convention; **the annual convention for recyclers in Wisconsin and Minnesota**, the AROW and the RAM Conferences; and **the national annual convention for contractors**, ConExpo.
- **Political:** Governor McCallum recognized this project in a letter to WasteCap Wisconsin noting: "Such a plan could certainly change the way construction waste is handled statewide. The results stemming from such an innovative endeavor will undoubtedly result in a cleaner environment, which ultimately benefits all of the residents of the great state of Wisconsin."

Considerations that may hinder the implementation of these projects statewide:

Local Recycling Markets – In Dane County, we found recycling markets for all of the commodities we recycled. As noted in the economics section, some of the materials were less expensive than trash disposal and some were more expensive for a net savings by recycling. In other communities, recycling markets for some commodities may not be available or may be cost-prohibitive. In particular, the markets for wood and drywall (the two largest portions of the construction and demolition waste stream according to the 1995 Camp, Dresser and McKee report) need to be developed statewide.

Drywall Guidelines/Permit Requirements – Currently, the only market for drywall from a commercial site in Wisconsin is land application on farmers' fields. There are only three DNR permits that have been issued for land application of drywall in Wisconsin. The Alliant Energy project led to a study of the impact to the biological community of Type X drywall and an exemption from solid waste rules to land apply Type X drywall for this one project. However, it is unknown whether other projects that want to divert Type X drywall from their waste stream for land application will be able to do so. In addition, another Wisconsin-based project is working with WasteCap and the DNR to try to discover whether or not drywall can be ground and applied on a construction site. Also, WasteCap Wisconsin has recently received a grant from the U.S. EPA to test use of drywall in commercial fertilizer. Markets for drywall in Wisconsin and around the U.S. are new and, thanks in no small measure to the leadership of the Alliant Energy construction project, are currently being tested. Hopefully these studies will lead to the development of clear guidelines/permit requirements which business leaders who want to divert their drywall will be able to follow.

In Conclusion

Based on the economic, environmental, technical, social and political success of recycling at Alliant Energy, overall interest in the industry, and the potential to replicate Alliant Energy's success around Wisconsin, we see a clear direction around the state and the U.S. for substantial expansion of construction waste recycling. As Josh Babiasz of Opus North Corporation stated: "In 10 years, this [construction waste recycling] will just be normal practice on all construction sites." We are grateful to the Wisconsin Department of Natural Resources for providing a Demonstration Grant which helped make these results possible.

BUDGET

	<u>Projected</u>	<u>Actual</u>
Labor	Total \$78,714	\$76,088.97
Alliant Energy	22,635	12,719.21
Opus North	22,344	30,650.06
WasteCap WI	29,874	31,608.70
Green Valley Disposal	3,861	1,111.00
Supplies and Services	\$27,152	\$40,570.14
Alliant Energy		
Mileage	1,426	37.96
Printing	1,500	.00
Materials		70.75
Incentives		70.53
Opus North		
Signage	2,971	2,350.54
Materials/Equipment		1,093.95
Green Valley Disposal		
Recycling hauling and drop off	16,020	17,319.87
Containers	1,000	360.00
WoodCycle, Inc.		11,072.00
Peletteri		4,503.24
WasteCap		
Mileage	2,245	1,489.40
Postage	990	1,761.85
Participant Incentives	1,000	440.05
Total Costs	\$105,866	Actual \$116,659.11
		<u>X .50</u>
MAXIMUM GRANT AMOUNT	\$ 52,933	\$58,329.56

Referring to the budget line items, the differences between our predictions and our totals resulted from the following changes:

Consultant Costs:

- Alliant Energy's labor did not reach the projected cost; expenses were primarily for time spent on grant administration and outreach efforts. Costs predicted but not incurred include time spent on the final Case Study editing and designing as well as the cost of printing.
- Opus North labor surpassed expected costs based on the extensive amount of field labor used to separate materials successfully. There was not an easy way to assess the amount of time actually spent separating materials due to the recycling program vs. what would've been spent handling materials at a construction site where everything is combined and trashed.
- WasteCap Wisconsin's labor costs were more than projected due to extensive research and administration needed for the unexpected drywall study.
- Green Valley Disposal's labor costs were less than planned due to difficulty in tracking all the extensive customer service received on this site.

Supplies and Services:

- Alliant Energy mileage did not reach the projected total. We developed a great team, which allowed Alliant Energy to reduce the amount of on-site visits needed for compliance and program oversight.
- Alliant Energy printing costs were not incurred during the grant period as the final case study needs to be edited and designed yet by Alliant Energy staff.
- Alliant Energy purchased research reports and team incentives to enhance the program.
- Opus North signage totaled less than projected.
- Green Valley Disposal's projected recycling, hauling and drop off fees increased due to inaccurate prediction of the amount of waste which would be generated on site. The costs represented here are directly from the invoices and are slightly less than what we had tracked on our spreadsheet throughout the duration of the project. The spreadsheet numbers were used in the cost analysis of the program because we felt they were the most accurate representation of what we paid per yard/ton.
- Green Valley purchased 95 and 18-gallon bins to be used on the job site. 1½ yd. containers were not needed.
- WasteCap's mileage, postage and incentive costs are slightly less than the total projected costs for their supplies/services.