

M.L. 2015 Project Abstract

For the Period Ending June 30, 2018

PROJECT TITLE: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste

PROJECT MANAGER: Steve Thomas

AFFILIATION: The NetWork for Better Futures

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FUNDING SOURCE: Environment and Natural Resources Trust Fund

LEGAL CITATION: M.L. 2015, Chp. 76, Sec. 2, Subd. 07c as extended M.L. 2017, Chapter 96, Section 2, Subdivision 18

APPROPRIATION AMOUNT: \$845,000

AMOUNT SPENT: \$836,123

AMOUNT REMAINING: \$8,877

Overall Project Outcome and Results

This project promoted building deconstruction as an alternative to demolition. The project also developed viable techniques for reducing greenhouse gas emissions and diverting significant amounts of reusable and recyclable building materials from landfills. Construction and demolition debris is the second largest component of our waste stream; only 20-30 percent is recycled. Deconstruction is the systematic disassembly of a building, with the purpose of recovering materials for reuse or manufacturing into new products. Overall, material reuse reduces the industry's consumption of virgin materials, helps preserve natural resources, and protects the environment from pollution related to extraction, processing, and disposal of raw materials.

The partners exceeded nearly all the expectations related to this project:

1. 29 LCCMR-eligible properties were deconstructed.
2. 303 unemployed people were trained and/or employed. 18 FTE positions were created.
3. The partners compiled environmental impact data for the projects. Over 2,600 tons of building material was diverted from landfills. For projects in the Twin Cities, more than 85% of the waste was diverted and 5% of the materials were reused. It was difficult to achieve these diversion rates in Greater Minnesota due to the lack of building material recycling facilities.
4. The environmental benefits generated by deconstruction compared to traditional demolition are significant. The practice of dumping a building into a landfill emits, on average, 248 metric tons of CO₂ for each property demolished. Better Futures' deconstruction work emitted on average just 51 metric tons of CO₂.
5. This project averted the emission of 5,288 metric tons of CO₂. This decrease in CO₂ emissions is equivalent to taking 1,114 cars off the road for one year. The social cost of this carbon offset is \$190,548.

These activities and accomplishments confirmed the multiple benefits of building deconstruction. This approach for building removal reduces the release of harmful toxins and gasses to our air, water and land. Deconstruction also creates meaningful employment with opportunities for advancement in

numerous industries. This process also preserves a wide range of fixtures and other materials that are in demand for reuse or repurposing.

But significant challenges hinder the financial viability of deconstruction since the current cost of demolition is artificially low. The existing price for demolition does not reflect the true environmental, health, economic, and social cost of burying material in landfills. The solution, based on the testing, work, and research completed under this grant is to adopt building material stewardship policies statewide.

Project Results Use and Dissemination

Throughout the grant period, the partners were consistently engaged in promoting the practice of deconstruction and material reuse. Over time, the visibility of workers taking a part a building generated the most publicity and heightened the level of interest among the public. The actual work helped to highlight the futility and wastefulness of demolition and showcased a practical way to significantly reduce trips to a landfill. Homeowners emerged as the prime drivers for deconstruction of privately owned buildings. Accordingly, the partner's revised its messages and materials to address a homeowners' demands and concerns about demolition. An added advantage is homeowners secure a tax deduction for the materials donated to the partners. This tax benefit helps with making the case for deconstruction.



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2015 Work Plan Final Report

Date of Report: 8-10-18

Final Report

Date of Work Plan Approval: 6-11-15

Project Completion Date: 6-30-18

PROJECT TITLE: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste

Project Manager: Steve Thomas

Organization: The NetWork for Better Futures

Mailing Address: 2620 Minnehaha Avenue

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Location: Twin Cities Metropolitan Area and North Central Minnesota

Total ENRTF Project Budget:

ENRTF Appropriation: \$845,000

Amount Spent: \$836,123

Balance: \$ 8,877

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 07c

M.L. 2017, Chapter 96, Section 2, Subdivision 18

Appropriation Language:

\$845,000 the first year is from the trust fund to the commissioner of natural resources for an agreement with Better Futures Minnesota in cooperation with the Northwest Indian Opportunities Industrialization Center and \$155,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota - Duluth for the Natural Resources Research Institute to develop and test a model for implementing building deconstruction and material reuse as a competitive alternative to demolition for the purpose of reducing greenhouse gas emissions, reducing landfill waste, and providing job training.

Carryforward (a) The availability of the appropriations for the following projects are extended to June 30, 2018: (7) Laws 2015, chapter 76, section 2, subdivision 7, paragraph (c), Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste.

I. PROJECT TITLE: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste

II. PROJECT STATEMENT:

This project will establish deconstruction as an alternative to demolition and develop viable techniques for reducing greenhouse gas emissions and the amount of reusable building materials buried in landfills. The U.S. EPA estimates that construction and demolition debris is the second largest

component of our waste stream, just behind municipal solid waste. Only 20-30 percent of this waste is recycled. One goal for this project is to deconstruct at least 30 buildings over a two year period. We estimate that the environmental impact of this effort is projected to: reduce carbon dioxide (CO₂) emissions by 900 metric tons, reduce the emission of methane gas (CH₄) by 45 tons, conserve the equivalent of 6,400 MMBTUs of energy, and divert 2,600 tons of building material from landfills.

As summarized by The Institute for Local Self-Reliance, deconstruction is the systematic disassembly of a building, with the purpose of recovering valuable materials for reuse or manufacturing into new products. By reducing waste, deconstruction also reduces greenhouse gas emissions and abates the need for new landfills and incinerators. It helps to steer the construction and demolition industry towards sustainability and reuse. It reduces the industry's consumption of virgin materials, helps preserve natural resources, and protects the environment from pollution related to extraction, processing, and disposal of raw materials.

The goals for this project are to: (1) Test and fully develop effective techniques and incentives for deconstructing buildings; (2) Develop and build value-added products and sustainable markets for the range of reusable materials recovered; and, (3) Document the environmental, social, and economic benefits of deconstruction, including reduced greenhouse gas emissions, reduced landfill use, and the reuse of natural resources. These goals will be achieved by: (1) Developing efficient techniques for deconstructing buildings safely; (2) Promoting deconstruction as alternative to demolition and establishing a marketplace for reclaimed materials; (3) Creating and manufacturing products made from reclaimed materials; (4) Calculating the environmental impact of this project and deconstruction work.

This endeavor is a partnership between Better Futures Minnesota (Minneapolis), the Northwest Indian OIC (Bemidji), and the Natural Resources Research Institute (NRRI) at the University of Minnesota Duluth. To advance this project and achieve the outcomes outlined in the work plan, the partners intend to meet monthly via conference call and hold face to face meetings each quarter.

Better Futures will: serve as the project manager; take the lead on testing and refining efficient techniques for taking apart buildings; take the lead on educating Tribal, local, county and State government agencies about the practice and benefits of deconstruction and work with these entities to implement incentives, policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition; deconstruct up to 20 uninhabitable properties in various states of condition; and, work with the NRRI to develop and test products that can be manufactured from reclaimed materials. \$503,397 of the ENRTF appropriation is allocated to cover Better Futures' projected expenses.

The Northwest Indian OIC will: help test and inform the development of efficient techniques for taking apart buildings in North Central Minnesota; hire, train, and supervise NW OIC crew chief and workers; work with Tribal, State, county, and local agencies to implement incentives, policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition; and, deconstruct up to 10 uninhabitable properties in various states of condition. \$341,603 of the ENRTF appropriation is allocated to cover Northwest Indian OIC's projected expenses.

The Natural Resources Research Institute (NRRI) at the University of Minnesota Duluth will: inform the development of techniques that maximize the quality and quantity of materials harvested from

buildings that are in various states of condition and assess the value, quality, and quantity of materials harvested; identify or develop a tool for calculating the yield and environmental impact of materials harvested from buildings, including reduced greenhouse gas emissions, energy savings, reduced landfill use, and the reuse of natural resources; and build prototypes and test products that can be manufactured from reclaimed materials. \$155,000 of the ENRTF appropriation is being appropriated directly to NRRI to cover its projected expenses.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of December 31, 2015:

The partners meet monthly to advance all the activities outlined in this work plan. Since July 2015, Better Futures deconstructed 4 publically-owned buildings and 5 additional publically-owned buildings are in the process of being deconstructed. The NWIOIC deconstructed 3 mobile homes for tribal agencies. 36 different Better Futures employees worked 2,217 hours on the 4 buildings that were deconstructed. Twenty eight (28) Better Futures workers participated in 6 hours of training on deconstruction techniques and packaging of materials for reuse; 16 of these workers completed OSHA-10 safety training while 17 completed forklift training. Five (5) NWIOIC workers completed OSHA 10 safety training.

Better Futures and NWIOIC began testing various techniques for dismantling buildings in an effort to reduce the amount of materials sent to landfills. The diversion rates for an initial set of buildings deconstructed by Better Futures since July varies from 55% to 83%. The data and analysis being produced by NRRI will help the partners refine and improve on-site work processes to increase and maintain high diversion rates, with a priority on increasing the reclamation rate of materials.

Presentations regarding the benefits of deconstruction were made before a commission in Edina, at the State Fair, at the architect's State convention, and at the Recycling Association of MN convention. The major challenges to date are: demolition is an established, low cost option; deconstruction is an under-developed, under-valued practice; public policy and current practices hinder the development of deconstruction as a viable alternative; the true cost of demolition compared to the benefits of deconstruction needs to be assessed more fully.

Amendment Approved by LCCMR 5-19-2016:

On behalf of its partners, Better Futures is requesting three amendments to our work plan:

- 1) We would like to change the deadlines for submitting status reports from December 31 to January 31 and from June 30 to July 31. The reason is that Better Futures' accounting system is not able to produce accurate payroll, expense, and revenue data until the books are closed for the month. This typically occurs two to three weeks later in the following month. For example, June data will not be ready until the second or third week of July.
- 2) We would like to shift a portion of the Project Manager's time and funding to cover work related to Activity Four. The reason for this shift is that a portion of the Project Manager's time is being invested in helping gather and then analyze the environmental impact data being produced by NRRI. In addition, the Project Manager is helping to package the environmental data for education and outreach efforts described in Activity Two.
- 3) We would like to amend the work plan and budget to contract with Tim Roman of Ecotone Partners as a Sole Source Vendor. Better Futures will retain Roman to assist with completing these tasks outlined in our work plan:

- ✓ Assist with developing tools for estimating time and cost to complete a project and the projected value of materials.
- ✓ Create a spreadsheet that calculates labor hours and projected product values once the type and amount of materials from a project are entered into this tool.

Working with Better Futures' business manager and accountants, Mr. Roman will build the database needed to support the labor costs used for this spreadsheet. In addition, Mr. Roman is currently under contract with Better Futures to develop and launch a warehouse inventory system for used materials and an on-line store. His expertise with these new systems will enable him to integrate the list of materials and values from the inventory with the formulas to be used in this new calculation tool.

Moreover, (under a contract outlined in NRRI's companion Work Plan) Roman is currently the only person using the materials lists, recycling reports, and landfill reports from every project completed by Better Futures and NWIOIC to produce the environmental impact statements outlined in Activity Four. This experience developed by Roman over the past year is a valuable asset as the Partners move to create the estimating tool described above. Roman's knowledge of the value, weight, and type of materials being reused recycled, or land filled is essential for creating the estimating tool.

Overall, the Partners agree that Roman's firm is the only, one entity reasonably able to meet the objectives outlined in Activity One. He has been working with NRRI since the inception of this grant and he is the developer and producer of the environmental impact statements for this grant. To our knowledge, no other firm or individual has created or is producing the type of impact statements produced under this grant project. This distinctive skill, along with an intimate knowledge of the range of materials collected during the deconstruction process, makes Roman uniquely qualified to help the Partners develop the estimating tool cited in Activity One.

In addition, Roman's research and practical experience with deconstruction techniques and the sale of used materials enables him to apply this knowledge in developing a practical tool for estimating job hours and material values. His unique, practical understanding of the deconstruction work processes, his survey of the national marketplace for material sales, and his detailed understanding of the value and environmental impact of all the materials generated during the deconstruction process, positions him to be uniquely qualified for this assignment.

As noted, Roman has been working with Better Futures for several years and with NRRI more recently. The initial engagement between Better Futures and Roman was not established through a competitive bid process but was developed in consultation with staff at Hennepin County's Environmental Services agency. Back then, we were in the early stages of figuring out how to measure the environmental impact and benefits of recycling and reusing used building materials. Roman was an ideal candidate since he had served on the Board of the Green Institute's Reuse Store (now closed) and was beginning to tackle this issue. Roman's role, value and expertise emerged as we all learned and developed this line of work more fully.

As to rates, Roman proposes to charge the same rate he charged three years ago, \$62.50 an hour. From our research, this rate is well below market. By comparison, for other clients, Roman charges \$150 an hour. Our colleagues at NRRI estimate that a talent who performs the type of work offered by Roman typically charges \$200 an hour. Based on advice from NRRI and experience with consultants

from other fields, we are confident that the proposed rate is below market and of good value for the project.

Project Status as of July 31, 2016:

A range of key activities were completed during the first half of 2016. Better Futures work crews deconstructed four (4) eligible properties and partially deconstructed a fifth property. NWICDC deconstructed one property. Since the inception of this project, the two partners have deconstructed 13 eligible properties. Chronically unemployed people were trained and hired to work on these projects. They were employed for a total of 4,432 hours (3,830 for Better Futures workers and 602 hours for NWICDC workers). Thirty four (34) different men participated in trainings and worked on the projects (Better Futures employed 26 different men and NWICDC employed 8 different men).

Efforts to promote the innovative practice of deconstruction and promote the reuse of reclaimed materials intensified and blossomed during the first half of 2016. Better Futures drafted a “model” building deconstruction and material reuse policy and presented the policy to officials at Hennepin County and the City of Minneapolis. Both entities are considering adoption of this proposed policy. The goal under the new policy would be to reuse at least 5% of the materials from a building targeted for removal and to recycle an additional 70% of the materials. The partners estimate that, at these rates, the CO2 emissions from a project would be at least “net zero”; meaning that the net emissions of CO2 gas would be zero or less.

Significant progress was made in constructing higher value goods (park benches) from reclaimed materials. In addition, an environmental impact analysis of the LCCMR-eligible jobs completed by Better Futures under this grant is impressive: On average, 87% of all building material from 8 projects was diverted from the landfill. More important, deconstruction generated 70% less CO2 emissions than simply recycling some of the materials; and, deconstruction generated 91% less CO2 emissions than the current, predominate practice of throwing away the building and burying it in a landfill.

Amendment Approved by LCCMR 11/3/2016:

On behalf of its partners, Better Futures is requesting two amendments to its work plan and budget:

- 1) Better Futures would like to shift \$12,416 in personnel funding from Activity One to Activity Three. This will enable Better Futures to train workers and build about 100 “Leopold” park benches. The benches will be made from lumber reclaimed from the buildings deconstructed under Activity One in this Work Plan. As mentioned in the July 31, 2016 Status Report, the NRRI helped the partner identify these benches as a viable option for manufacturing new products from reclaimed materials. The benches are relatively easy to build and just a few tools are needed. This manufacturing effort is also a great training opportunity for the partner’s workers. Along with safety training, this endeavor will train workers on how to use basic woodworking tools and reinforce core production habits related to consistency and quality control. The workers will also help develop a budget and production schedule for this effort reinforcing the need to be safe and efficient while staying within budget.

The plan is to use the benches to help promote the value and benefits of reuse. This effort also advances one of the objectives of creating higher value products from reclaimed materials. In addition, the benches will help build an additional line of work for the partners and create additional employment slots.

The NWICDC would like to shift \$43,056 from Activity One to Activity Two. This reallocation of funding will enable the NWICDC to hire a full time staff person to receive and inventory reclaimed materials, promote the reuse of reclaimed materials in the community, and operate a reuse warehouse. The need for this position is needed to help create a demand and marketplace for reclaimed materials in North Central Minnesota. In addition to promoting the value of reuse and building a customer base, the manager is needed to establish protocols and systems to manage inventory and customer fulfillment.

This position will advance a critical goal for this LCCMR grant; namely, promote deconstruction as alternative to demolition and establish a marketplace for reclaimed materials. This new position and the reuse warehouse are critical elements for promotion and for creating a marketplace for reclaimed materials. The intent is to establish this warehouse as a destination and source for reused building materials in North Central Minnesota. The one-time infusion of LCCMR funds for this staff position will help develop this strategy into a sustainable endeavor. The NWIOIC is funding the warehouse cost and other related overhead expenses. Projected revenue from sales of materials is expected to cover these operating costs in the future.

The partners do not expect this shift in funding to affect their ability to achieve the original goals for this grant. LCCMR funds coupled with other sources of revenue are expected to enable the partners to complete 30 deconstruction projects.

Project Status as of January 31, 2017:

Better Futures and its partners made steady progress in advancing this distinctive effort to reduce greenhouse gasses and solid waste. Better Futures work crews deconstructed an additional four (4) eligible properties and NWICDC deconstructed three (3) additional properties. Since the inception of this project, the two partners have deconstructed 19 eligible properties. Chronically unemployed people were trained and hired to work on these projects. They were employed for a total of 4,621 hours (822 for Better Futures workers and 3,799 hours for NWICDC workers). During this six month period, 40 different people participated in trainings and worked on the projects (Better Futures employed 26 different men and NWICDC employed 14 different men).

Efforts to establish alternative policies and practices at the county and municipal levels moved forward, but at a very slow pace. As noted in the last update, even though building material reuse and recycling reduces greenhouse gas emissions and landfill waste significantly, policy and practices must be reformed at all levels of government to establish deconstruction and reuse as an alternative to dumping. The impact data generated throughout this project documents that “net zero” emissions (meaning the net emissions of CO₂ gas would be zero or less) would occur if a requirement to reuse at least 5% of the materials from a building targeted for removal and to recycle an additional 70% of the materials was implemented. Along with achieving significant environmental and health benefits, a new policy will generate more jobs statewide.

Both Better Futures and NWICDC crews built dozens of benches and other types of seating with reclaimed wood. The NRRRI provided design ideas along with building patterns, work flow advice, and step by step building directions. On average, 86% of all building material from the four Better Futures projects during this six month period was diverted from the landfill. More important, as the partners collect more impact data, the dramatic environmental benefits are becoming more apparent: during this six month period, deconstruction generated 81% less CO₂ emissions than simply recycling some of the materials; and, deconstruction generated 150% less CO₂ emissions than the current, predominate

practice of throwing away the building and burying it in a landfill. This growing amount of impact data is helping to inform public education campaigns. For example, the data was used to produce a graphic/poster entitled “Why Throw Away A House?” (see Attachment B).

Amendment Approved by LCCMR (3-22-17):

On behalf of its partners, Better Futures Minnesota is requesting an amendment to its LCCMR work plan and budget to maximize the impact of the LCCMR grant and develop deconstruction into a sustainable line of work. This request focuses on realigning a portion of the existing funds while staying on track to meet all the goals outlined in the original work plan. With this amended work plan and budget, the partners will also achieve additional outcomes as noted below.

Funds are available for reallocation since the actual costs related to deconstructing properties are lower than originally projected. The partner’s techniques have improved and become more efficient thus requiring fewer days on a job site. In addition, the partners have experimented with the size of work crews and settled on an efficient level of staffing for a deconstruction crew.

The specific requested changes are as follows:

- 1) Decrease the Activity One “Personnel” budget by \$49,664 to a revised budget of \$488,266.
- 2) Increase the Activity Three “Personnel” budget by \$49,664 to a revised budget of \$128,517.
This shift of existing funds will support one Better Futures and one NWICDC furniture-building work crew for three months. We project the three months of funding will be expended by 9-30-17. This proposed use of funding will enable the partners to build and sell 75 more benches and other types of furniture. In addition, more workers than originally projected will be employed. The partners estimate that 8 FTE job slots will be funded during this three month period. Any net revenue from the sale of the furniture will be used to support the program activities sponsored by each partner.
- 3) Reallocate \$113,756 of Personnel funds within Activity One to cover a portion of the salary and benefit expenses for two existing Better Futures staff people. We are proposing to spend less on work crews for deconstruction work and reallocate some of those funds to cover these two additional positions for 8 months. The requested reallocation of LCCMR funds will cover 60% of the Deconstruction Managers’ position for eight months and 50% of the Business Coordinator’s position for eight months retroactive to 2-1-17. The amount of the retroactive funding requested is \$14,220. Better Futures’ deconstruction line of work has grown considerably over the past year (a measure of success for the LCCMR grant). Last February 2016, the partner’s work crews were idle; this February, Better Futures had three full crews working on deconstruction projects. This increased workload created the need to train and supervise more workers, assess prospective jobs and prepare bids, manage a greater number of customers and projects, and transport an increasing amount of reclaimed materials. Moreover, together with the LCCMR Program Manager, the Deconstruction Manager will assist with the final drafting of the deconstruction operations manual, the safety manual, and a cost estimating tool. These are deliverables for the LCCMR grant. The Deconstruction Manager is also attending a growing number of trade shows and community events to help promote the practice deconstruction. The Business Coordinator is focused on managing the logistics related to an increasing pipeline of deconstruction work, including customer relations, ordering equipment, managing subcontractors, invoicing, collecting cost and impact data, and transportation.
- 4) Extend funding for the NWICDC Project Manager, the NWICDC Warehouse Manager, and the Better Futures Project Manager for an additional three months (July, August, and September

2017). The expense related to the additional three months is \$125,681. We expect to spend less on work crews for deconstruction work thus creating an opportunity to reallocate some of these work crew funds to cover these three existing positions for an additional 3 months. This increase in time will enable these individuals to close out this project, continue adding projects to the deconstruction pipeline, continue promoting changes in policy and practice, (including making presentations at community meetings and the State Fair), and continue building momentum for material sales at the NWICDC sales warehouse.

- 5) Shift \$5,000 in Personnel Funds in Activity One to increase training funds in Activity One from \$10,000 to \$15,000. This increase in funding will cover the cost of Deconstruction certification training. The plan is to engage a certified trainer to train Better Futures and NWICDC crew chiefs and deconstruction managers. By completing this training, the partner's supervisory staff will earn a nationally-recognized certification in deconstruction project management and techniques. With this certification, the partners will be positioned to compete for more work. In addition, Hennepin County officials have indicated a desire to require that companies be certified to complete deconstruction projects in their jurisdiction.
- 6) Use a portion of the work crew personnel funds in Activity Two to support the employment of two existing Better Futures job slots for eight months focused on the promotion and sales of reclaimed materials. We also request that reimbursement for this expense be approved retroactive to 2-1-17. The expense related to retroactive funding is \$2,826. These are full time positions and the men receive training related to customer service and processing sales transactions. More men than originally projected will be employed by this shift in LCCMR funding. As noted earlier, the lower work crew cost for deconstruction permits us to dedicate a portion of the work crew personnel funding in Activity Two for this purpose.

Amendment Approved by LCCMR (July 31, 2017)

In light of the one-year extension to spend the funds appropriated for this project, the partners request that all project end dates be changed from June 30, 2017 to January 31, 2018.

Project Status as of July 31, 2017:

Better Futures and its partners continued to make important strides toward making deconstruction and building material reuse a sustainable alternative to demolition. Although Better Futures work crews deconstructed one LCCMR-eligible property during this reporting period, both Better Futures and the NWICDC crews were kept very busy by deconstructing properties for private and government customers. Better Futures completed the deconstruction of five, privately-owned properties during this reporting period and was in the process of completing two additional projects on July 31st (one for a private owner and one LCCMR-eligible project). In addition, the NWICDC deconstructed three private or government-owned properties during the first six months of 2017.

Since the inception of this project, the two partners have deconstructed 22 LCCMR- eligible properties. We have a sufficient number of potential LCCMR-eligible projects in the pipeline to meet the goal of 30 projects by the end of 2017. The main strategy for reaching this goal is a deconstruction pilot with St Louis County. The County planning staff are excited to demonstrate the multiple benefits of deconstruction and reuse in the Northeast part of Minnesota and they have initially identified seven properties that may be good candidates for deconstruction. Better Futures and the NWICDC are in the process of assessing each property. Deconstruction work on some of these sites is expected to begin in the early Fall 2017.

Chronically unemployed people were trained and hired to work on these projects. During this six month reporting period, 85 different people participated in trainings and worked on the projects (Better Futures employed 75 different men and NWICDC employed 10 different men). The non-LCCMR work created the highest number of people consistently employed since the inception of this project. Better Futures also earned a record level of revenue from the sale of reclaimed materials. Total sales revenue for this six month reporting period totaled \$140,325.

Better Futures and its partners increased its outreach and education efforts during the past six months. Multiple presentations at trade shows and conferences helped to increase the visibility of our work and promote its value. In May, Better Futures was honored with the Sustainable Business Award during Environmental Initiatives 25th Anniversary celebration.

Both Better Futures and NWICDC crews continued to build dozens of benches and other types of seating with reclaimed wood. In addition, the NRRRI worked with a supply of drywall gathered by the NWICDC to develop an array of possible alternate uses for this material. The possibilities include animal bedding, a soil supplement, and chalk for lining sports fields.

The environmental impact from this project remains impressive. On average, 87% of all building material from the partner's deconstruction projects was diverted from the landfill. To date, this project has collected over 2,500 tons of building material, 2000 tons of this material was recycled and more than 100 tons was reused. Overall, the project so far has averted the emission of 4,224 metric tons of CO₂. This amount of CO₂ reduction is equivalent to taking 106 cars off the road for a year.

Amendment Approved: (2/22/2018)

Given the delay in implementing the St Louis County Deconstruction Pilot, the partners request that all project end dates be changed from January 31, 2018 to June 30, 2018.

Project Status as of January 31, 2018:

Along with deconstructing a mix of LCCMR-eligible and privately-owned properties, Better Futures made significant progress in drafting and advancing policies to replace demolition with deconstruction in several local communities. In addition, both the State MPCA and Hennepin County highlighted the need to focus on and divert construction and demolition waste from landfills. This is the first time C and D waste has been elevated to this level of urgency in these public agency's solid waste plans.

Better Futures work crews completed the deconstruction of one LCCMR-eligible property in Ramsey County. This job received coverage in local newspapers and helped to increase Better Futures' presence in the County. The NWICDC deconstructed three more government-owned properties during the last six months of 2017. Since the inception of this project, the two partners have deconstructed 25 LCCMR- eligible properties. See Attachment B for a listing of all LCCMR-eligible properties fully deconstructed since July 2015.

Better Futures has negotiated a contract with St Louis County to implement a deconstruction pilot initiative funded in part with the remaining portion of the LCCMR funds. This project was expected to be completed last fall but the partner's workload prevented them from diverting labor and managers to the County. The plan now is to complete this Pilot as soon as weather permits in 2018.

Chronically unemployed people continued to be trained and hired to work on these projects. During this six-month reporting period, 93 different people participated in trainings and worked on the projects (Better Futures employed and trained 80 different men; NWICDC employed and trained 13 different workers). Better Futures more than doubled the amount of annual revenue earned from the sale of used materials. In 2016, Better Futures earned \$116,000; in 2017, the agency earned \$266,000. This dramatic growth in sales revenue indicates a growing demand for used building materials and progress in building a marketplace for these materials.

Per our agreement with the previous LCCMR Director, all net proceeds from generated revenue has been reinvested in this project.

The environmental impact from this project remains impressive. Moreover, the partners are generating data for each project that helps the customer and policymakers understand the benefits of deconstruction and the harmful effects of demolition. On average, 87% of all building material from the partner's deconstruction projects was diverted from the landfill. To date, this project has collected over 2,620 tons of building material, 2300 tons of this material was recycled or reused. Overall, the project so far has averted the emission of 5,172 metric tons of CO₂. The partners' deconstruction work is close to achieving "net zero" emissions of CO₂ gas.

Overall Project Outcomes and Results:

This project promoted building deconstruction as an alternative to demolition. The project also developed viable techniques for reducing greenhouse gas emissions and diverting significant amounts of reusable and recyclable building materials from landfills. Construction and demolition debris is the second largest component of our waste stream; only 20-30 percent is recycled. Deconstruction is the systematic disassembly of a building, with the purpose of recovering materials for reuse or manufacturing into new products. Overall, material reuse reduces the industry's consumption of virgin materials, helps preserve natural resources, and protects the environment from pollution related to extraction, processing, and disposal of raw materials.

The partners exceeded nearly all the expectations related to this project:

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5. This project averted the emission of 5,288 metric tons of CO₂. This decrease in CO₂ emissions is equivalent to taking 1,114 cars off the road for one year. The social cost of this carbon offset is \$190,548.

These activities and accomplishments confirmed the multiple benefits of building deconstruction. This approach for building removal reduces the release of harmful toxins and gasses to our air, water and land. Deconstruction also creates meaningful employment with opportunities for advancement in

numerous industries. This process also preserves a wide range of fixtures and other materials that are in demand for reuse or repurposing.

But significant challenges hinder the financial viability of deconstruction since the current cost of demolition is artificially low. The existing price for demolition does not reflect the true environmental, health, economic, and social cost of burying material in landfills. The solution, based on the testing, work, and research completed under this grant is to adopt building material stewardship policies statewide.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Develop efficient techniques for deconstructing tribal, publically-owned, or uninhabitable buildings safely

Description:

One key strategy for making deconstruction a cost-effective alternative to demolition is demonstrating viable, safe techniques for dismantling a building. In addition, as proponents of deconstruction, the partners must document the yield, value, and quality of the materials diverted. Accordingly, the tasks and outcomes in this area of activity are aimed at testing and refining techniques for maximizing the yield, quality, and value of material diverted from landfills either through recycling or reuse. The objective of maximizing yield and value of material diverted must be balanced with the cost of time and labor required to meet this objective.

Diverting the maximum amount of building materials from landfills generates significant environmental benefits. For example, the deconstruction of a 2000 square foot house in 2014 produced the following benefits: 82%, or 88 tons of the building was recycled or reused and this effort averted the emission of 33 metric tons of carbon dioxide and 1.5 metric tons of methane gas. This reduction in emissions is equivalent to conserving 211 MMBTUs of energy.

Better Futures and the NWIOIC will take apart in a methodical manner at least 30 Tribal, publically-owned, or uninhabitable buildings that are in various stages of condition (i.e. fully intact to partially damaged). These projects will be used to continuously refine deconstruction and material processing techniques during the course of this project. Better Futures and NWIOIC will also use the practical experience from these projects to develop and refine protocols that help workers maximize the yield, quality, and value of material harvested from each building. A related task is that partners will test a range of techniques for processing the material harvested to achieve the greatest value from recycling or reuse. NRRI (as outlined in their work plan) will be helping Better Futures and NWIOIC with assessing the value, quality and quantity of materials harvested.

This in-the-field, project experience will enable Better Futures and the NWIOIC to update and finalize an operating manual and safety protocols. In addition, all workers will receive training with credentialing related to safety, product identification, and harvesting techniques to maximize yield, value, and quality during the deconstruction process. As with the operating manual and safety protocols, this training regimen will be refined and finalized during the course of the project.

Summary Budget Information for Activity 1:

ENRTF Budget:	\$551,939
Amount Spent:	\$543,062

Balance: \$ 8,877

Outcome	Completion Date
1. At least 30 tribal, publically-owned, or uninhabitable buildings, in various stages of condition (i.e. fully intact to partially damaged) are deconstructed. Of the projected 30 buildings, 20 are expected to be located in the Twin Cities Area and 10 in North Central MN.	June 2018
2. At least 40 different at-risk adults and two supervisors are hired and trained for deconstruction work. LCCMR funding supports 29,000 hours of training and labor for the 30 projects.	June 2018
3. On average, 75% of the materials from each building (estimated total weight of 2,600 tons) are reused or recycled and diverted from landfills.	June 2018
4. A final report summarizing the following information is produced: the amount of material recycled or reused and diverted from each building; the type of materials recycled and reused from each building; and the quality and estimated value of the materials recycled and reused.	June 2018
5. A final operating manual and safety protocol for building deconstruction is produced. The manual will contain guidelines for maximizing the yield, value, and quality of material harvested from buildings. The manual will also offer guidelines for assessing the viability of deconstructing a building based on its age and condition.	June 2018

Activity Status as of December 31, 2015:

The partners are focused on developing and testing techniques for safely taking apart buildings while controlling costs. Offering a financially attractive alternative to demolition is one of this project’s objectives. Several approaches are being used to develop these safe and efficient techniques: Deconstruction companies and practitioners in other cities are being consulted; Training manuals and videos obtained from these practitioners and from a professor at Catholic University are being used; and, Practical experience gained from actual work on the job site is being documented and analyzed. The work on actual jobs provides the most valuable information. This on-site work also enables the partners to test, assess, regroup, and adjust. The information and experience gained from these sources is being used to routinely update the deconstruction and safety training regimen.

Along with testing various techniques, the partners are tackling a major operational issue related to the optimal number of workers required and the number of experienced workers needed on a crew. The partners are testing various scenarios while dealing with the tensions inherent in their workforce development model. Namely, a job can be completed in less time with higher paid, more experienced workers; yet, the partner’s mission is to create as many jobs as possible. Moreover, labor is the single biggest cost factor in deconstruction. More jobs over the year ahead will help the partners analyze staffing assumptions more thoroughly and come closer to establishing an efficient, sustainable staffing model.

A more thorough average project cost analysis will be presented in the next status report. From an initial review of expense data for the first set of projects for two private customers, it appears that earned revenue covered most of the direct cost of deconstruction. The rates earned to date from private customers have not, however, covered all overhead costs. In addition, the partners struggle with finding demolition companies (who are needed to remove the foundation and prepare the lot for

its new use) willing to provide their services at a significantly lower cost. We expect much lower final demolition costs since a good portion of the material has already been removed through the deconstruction process.

Of course, a steady pipeline of buildings is needed to advance this project and good amount of staff time and effort has been invested in securing tribal and publically-owned properties for deconstruction. NWIOIC has initially targeted its outreach to tribal agencies, counties, cities, MNDOT (Northern MN), the State DNR, and the National Forest Service. Better Futures has introduced this concept and its services to MNDOT, Hennepin and Ramsey counties, and several cities in Hennepin County.

The NWIOIC was able to complete work for a tribal agency (the deconstruction of 3 mobile homes). Better Futures deconstructed 4 houses owned by Hennepin County and the County offered 3 more houses which are in the process of being deconstructed. The City of Minneapolis adopted a deconstruction pilot and has initially offered 2 houses for deconstruction. All 9 of the properties were slated to be demolished. In addition, Better Futures completed full deconstruction work for two private customers.

Along with deconstructing these properties in a safe and efficient manner, the partner's objectives over the past six months has been to: reduce the amount of time spent working at a site; increase the amount and quality of materials harvested for reuse (as opposed to recycling and landfill); and, move closer to settling on the ideal staffing level and mix of staff experience.

Another development which advanced learning and kept at-risk men employed, occurred in November when Better Futures invited NWIOIC's Deconstruction Director to supervise a crew and work on two of the buildings offered by Hennepin County. The NWIOIC's workload slowed down in the fall and Better Futures needed an extra crew to meet the project timeline set by Hennepin County. This creative arrangement has the partners working side-by-side on a daily basis which expedites testing and the development of practical experience.

Here is a summary of the partner's efforts compared to the outcomes established for Activity 1:

1. A total of 12 tribal or publically-owned buildings were deconstructed or were in the process of being deconstructed during the first six months of this project. NWIOIC deconstructed 3 of the properties and Better Futures deconstructed 4 County-owned houses; 3 more County-owned houses are in the process of being deconstructed and 2 houses owned by the City of Minneapolis are being deconstructed.
2. 36 Better Futures workers, including three crew chiefs, worked a total of 2,217 hours deconstructing the four houses owned by Hennepin County.
3. Twenty eight (28) Better Futures workers participated in 6 hours of training on deconstruction techniques and packaging of materials for reuse; 16 of these workers completed OSHA-10 safety training while 17 completed forklift training. Five (5) NWIOIC workers completed OSHA 10 safety training. A total of 274 training hours were offered.
4. The diversion rates for an initial set of buildings deconstructed by Better Futures since July varies from 55% to 83%. The data and analysis being produced by NRRI will help the partners refine and improve on-site work processes to increase and maintain high diversion rates, with a priority on increasing the reclamation rate of materials.

Activity Status as of July 31, 2016:

During the first six months of 2016, the partners focused on refining deconstruction techniques and developing a sustainable cost model.

The diverse and steady flow of work has enabled the partners to learn a great deal about the main drivers of the deconstruction cost model. These include: staffing mix and size; the efficient deployment of staff and effective project management; final demolition expenses; and the age, quality, and size of building. The partners have been vigilant about testing operating assumptions, assessing performance after each job, and adjusting the operating model when necessary. This process of performing, learning, and adjusting is allowing Better Futures and the NWICDC improve continuously and progress toward establishing a sustainable business model.

Initially, the partners assumed the best staffing model was one crew chief, 4 full time workers, and 2 trainees. Based on the data and experience of working on the 13 LCCMR-funded projects since June 2015, the partners are now adjusting this model to consist of one crew chief (with a richer mix of supervisory and training skills plus a higher starting salary), 5 full time workers (with higher performance expectations and perhaps an increase in the hourly rate), and one FTE which will cover the deployment of two trainees at each job.

Overall, this adjustment in staffing is needed to ensure the partners provide a quality service at a competitive price. This includes increasing the skill set, performance expectations, and pay for the full-time staff. Turnover of the full-time staff undermines the enterprises' ability to provide a consistent, disciplined, and cost-effective service. And yet, many full-time workers leave for higher paying jobs in the private sector. This transition is an on-going tension and management challenge: stable, well-prepared workers are needed to ensure a high performing enterprise but the overall goal is to move workers into better paying jobs in the community.

A similar tension is related to the deployment of trainees on the work site. The deconstruction work for trainees advances the goal of creating work opportunities for chronically unemployed, at-risk people. But this strategy also burdens the crew chief with additional supervision responsibilities and distracts the chief from focusing on project management objectives.

The newest version of the full deconstruction staffing model will be tested and fine-tuned over the remaining months of 2016. Based on past experience and initial feedback from companies in other parts of the country, the one crew chief, 5 workers, and two trainees model appears to be best option.

Next to staffing, the ability to plan for and execute a full deconstruction project on time and within budget is mission-critical. LCCMR grant-funded work has helped the partners further develop this skill and the habits necessary for effective project management.

One insight is that more careful planning must be completed on the front end of a project, starting with the initial inspection. Staff are learning about the essential need to understand the age, quality, and condition of a building. This includes gaining deeper insights into how a structure was built. For example, a house at 6601-04 Girard in Richfield appeared to be a typical mid-century suburban home. Yet, the crew discovered the house took more time than planned to disassemble since the "bones" of the building were larger and better "connected" than usual. The type and application of insulation throughout a house also affects time and costs.

More time must also be invested in preparing for a project, including starting with daily production goals and then adjusting these goals after a day's work is completed. Also, a key task under this grant -- study performance and environmental data to prioritize the type and amount of materials to harvest from a house -- will help with the allocation of staff time. There is a point of diminishing returns and this analysis will help create decision rules and craft a labor deployment plan that yields the highest returns in terms of materials and environmental impact.

The age, quality, size, and composition of a building play a critical role in determining the schedule and cost of deconstruction. Again, more analysis is needed but it appears that a decision matrix (depicted below) needs to be created to help guide the planning and project management process.

High quality and high value Building built before 1950 3000 sq ft or larger An appraisal of \$30K or more is likely Old barns	Medium quality and value The older the home the better 1500-2000 sq ft Marginal need for an appraisal	Low quality, low value but high value for structural lumber if older building
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Although cost is a prime factor, customers have additional factors to consider and the partners must continue its efforts to address these factors in a compelling manner. For example, private owners have been willing to pay a higher cost for deconstruction since the tax deduction for the value of the materials donated to Better Futures and the NWICDC offsets some of this higher cost. A public owner, however, will value the positive return of creating jobs for chronically unemployed men. Public owners will also typically value the significant increases of recycling and reuse produced by the deconstruction process. Finally, a major goal for the last half of 2016 is to assemble more demolition partners in an effort to reduce the cost of their service, and thus the overall cost of full deconstruction.

Here is a summary of the partner's efforts to advance the outcomes established for Activity 1 during the first six months of 2016:

1. Better Futures work crews deconstructed four (4) eligible properties and partially deconstructed a fifth property. NWICDC deconstructed one property in the past six months. Since the inception of this project, the two partners have deconstructed 13 eligible properties.
2. Chronically unemployed people were trained and hired to work on the 5 deconstruction projects and the building of park benches during the first six months of 2016. They were employed for a total of 4,432 hours (3,830 for Better Futures workers and 602 hours for NWICDC workers) during this reporting period. This includes 79 hours of training for the workers. Thirty-four (34) different men participated in trainings and worked on the projects. Better Futures employed 26 different men and NWICDC employed 8 different men. Since the beginning of the LCCMR grant, 70 different men have been trained and/or employed and these men have worked a total of 6,649 hours.
3. The partners have compiled environmental impact data for 8 of the 13 LCCMR-funded projects completed since June 2015 (additional data is still being collected for the remaining projects). On average, 87% of all building material from the 8 projects was diverted from the landfill.

Activity Status as of January 31, 2017:

A summary of the partner's efforts to advance the outcomes established for Activity 1 during the last six months of 2016 are presented below.

1. Better Futures work crews deconstructed four (4) eligible properties and the NWICDC deconstructed three properties. Since the inception of this project, the two partners have deconstructed 19 eligible properties.
2. Along with working on LCCMR-eligible properties, Better Futures also deconstructed 6 private properties and partially deconstructed another 4 properties for private customers. The work for private customers is typically a profitable job and the growth in this type of work is a critical element for making deconstruction a financially sustainable enterprise.
3. Chronically unemployed people were trained and hired to work on the 7 deconstruction projects and the building of park benches during the last six months of 2016. They were employed for a total of 4,621 hours (822 for Better Futures workers and 3,799 hours for NWICDC workers). During this six month period, 40 different people participated in trainings and worked on the projects (Better Futures employed 26 different men and NWICDC employed 14 different men). Since the beginning of the LCCMR grant, 110 different people have been trained and/or employed and these individuals have worked a total of 11,270 hours.
4. The partners have compiled environmental impact data for 15 of the 19 LCCMR-funded projects completed since June 2015. A major constraint for the NWICDC is the lack of building material recycling facilities in Greater Minnesota. Consequently, the CDC's ability to achieve high diversion rates is nearly impossible. For Better Futures projects, however, an average of 86% of all building material for 11 of its 13 projects was diverted from the landfill; nearly 5% of this material was reused.

During the first six months of 2017, a final draft of a deconstruction and safety operating manual will be prepared. One version of this manual will be developed for the training of new workers. A second version will be crafted for use on the job site. The manuals will include coaching points and guidelines for: assessing the value of materials; estimating worker hours for a job; and, protocols outlining efficient methods for processing materials safely. These resources are needed to support a stable, predictable and cost-effective deconstruction operation over the long term.

Project Status as of July 31, 2017:

During the first six months of 2017, Better Futures and its partners accomplished the following tasks in relation to Activity One:

1. Better Futures work crews deconstructed one (1) LCCMR-eligible property. Since the inception of this project, the two partners have deconstructed 22 eligible properties.
2. Along with working on LCCMR-eligible properties, Better Futures also deconstructed 6 private properties. One private project (a 24,000-square foot house) employed about 16 men for three months. The NWICDC also deconstructed two properties owned by a private and a government customer. The growth in this type of work is a critical element for making deconstruction a financially sustainable enterprise.
3. Eighty-seven (87) different, chronically unemployed people were trained and hired to work on 9 deconstruction projects and the building of benches. Since the beginning of the LCCMR grant, 198 different people have been trained and/or employed.
4. The partners have compiled environmental impact data for 15 of the 22 LCCMR-funded projects completed since June 2015. As noted in the last update, a major constraint for the NWICDC is the lack of building material recycling facilities in Greater Minnesota. Consequently, the CDC's ability to achieve high diversion rates is nearly impossible.

5. Better Futures is now typically achieving net zero emissions of CO₂ with each project. The environmental benefits of this outcome are significant; the common practice of dumping a building into a landfill emits, on average, 228 metric tons of CO₂ per project.

Given the extension for this project's appropriation, the partners adjusted their work plan and now intend to produce a final draft of a deconstruction and safety operating manuals during the last part of 2017.

Project Status as of January 31, 2018:

During the last six months of 2017, Better Futures and its partners accomplished the following tasks in relation to Activity One:

1. Better Futures work crews completed the full deconstruction of one (1) LCCMR-eligible property. The NWICDC deconstructed 3 properties. Since the inception of this project, the two partners have deconstructed 25 eligible properties.
2. 93 different, chronically unemployed people were trained and hired to work on 4 deconstruction projects. Since the beginning of the LCCMR grant, 291 different people have been trained and/or employed.
3. The partners have compiled environmental impact data for 25 LCCMR-funded projects completed since June 2015. As noted in the last update, a major constraint for the NWICDC is the lack of building material recycling facilities in Greater Minnesota. Consequently, the CDC's ability to achieve high diversion rates is nearly impossible.
4. Better Futures is now typically achieving net zero emissions of CO₂ with each project. The environmental benefits of this outcome are significant; the common practice of dumping a building into a landfill emits, on average, 228 metric tons of CO₂ per project.

Given the delay in implementing the St Louis County Deconstruction Pilot, the partners adjusted their work plan and now intend to produce a final draft of a deconstruction and safety operating manuals by June 2018. This effort includes organizing a six-day deconstruction training program for managers, crew chiefs, workers, and building inspectors. This training will lead to some of the staff becoming certified as deconstruction experts.

Final Report Summary:

Better Futures and its partners exceeded nearly all the expectations and outcomes outlined in Activity One:

1. Better Futures work crews and NWICDC deconstructed 29 LCCMR-eligible property against a goal of 30 properties. We were not able to fully deconstruct 2 of the 29 properties due to budget and time restraints.
2. 303 different, chronically unemployed people were trained and/or employed for Better Futures and NWICDC deconstruction projects. Overall, 18 FTE positions for chronically unemployed people were supported during the LCCMR grant period. This exceeded the original goal of 15.2 FTE
3. The partners compiled environmental impact data for all 29 LCCMR-funded projects completed. Over 2,600 tons of building material was diverted from landfills. A major constraint for the NWICDC and our St Louis County Deconstruction Pilot was the lack of building material recycling facilities in Greater Minnesota. Consequently, the ability to achieve high diversion rates outside the Twin Cities is currently nearly impossible. In the Twin Cities, however, Better

Futures diverted more than 85% of the waste from LCCMR-funded projects. By the end of this project, Better Futures was reusing over 5% of the materials from each building deconstructed.

4. Better Futures will use a portion of its 2018 LCCMR grant award to develop and implement techniques to significantly increase reuse, recycling, and waste diversion in select Greater Minnesota counties.
5. Another key outcome is that 8 people (5 Better Futures employees, 2 NRRI employees and 1 NWICDC employee) successfully completed a four day, nationally recognized deconstruction skills training. The training was funded in part with LCCMR grant funds. Five of these individuals also passed a test for the certification of deconstruction technician. These trainings are sponsored by the Building Materials Reuse Association which offers the “gold standard” in deconstruction training.
6. Better Futures and its partner the NRRI, assembled handbooks and materials for training deconstruction workers on techniques, safety and protocols for preserving the value of harvested materials. To compile these materials, the partners discovered existing resources (manuals, study guides and videos) that served as sources for the final materials developed under this grant. Better Futures harvested from these sources and also prepared customized handouts and presentations for use during regular training sessions. Another valuable source was the training handbook published by the Building Materials Reuse Association. All project managers and crew chiefs used this handbook during a certification training session funded in part with LCCMR grant dollars.

These activities and accomplishments confirmed the multiple value of building deconstruction. This approach for building removal reduces the release of harmful toxins and gasses to our air, water and land. Deconstruction also creates meaningful employment with opportunities for advancement in numerous industries. In addition, the methodical process of taking apart a building preserves valuable natural resources such as lumber and wood flooring. This process also preserves a wide range of fixtures and other materials that are in demand for reuse or repurposing.

But significant challenges hinder the financial viability of deconstruction. Quite simply, the current cost of demolition is artificially low. The existing price for demolition does not reflect the true environmental, health, economic, and social cost of burying and holding waste in landfills; the current cost for demolition does not capture the negative effects of transporting waste to landfills, and the impact of manufacturing new products from virgin material.

Moreover, existing practices and infrastructure are designed to support demolition not deconstruction. The lack of sufficient C and D waste recycling facilities along with the lack of expertise, specialized equipment and tools, and training all affect the further development of deconstruction.

The solution, based on the testing, work, and research completed under this grant is to adopt building material stewardship policies statewide. Similar stewardship laws, i.e. for electronics, appliances, household waste, paint, etc. resulted in these toxic products being reused and/or recycled. Building material waste poses health and environment threats to the community; more than 85% of this waste can and should be diverted from landfills. And unlike many of the products currently regulated, buildings contain a significant amount of material that can be reused and repurposed into higher value goods.

ACTIVITY 2: Promote deconstruction as a sustainable alternative to demolition and establish a marketplace for reusing materials harvested from projects

Description:

Another key strategy for making deconstruction a viable alternative to demolition is to introduce the value and benefits of deconstruction to a range of people in the community: homeowners, contractors, demolition companies, architects, Tribal, local, county and state government officials, and consumers. This effort to educate the community and public officials will consist of two objectives: promote the practice of deconstruction as a viable, cost effective alternative to demolition; and, increase awareness about the value and uses for materials harvested from buildings. A combination of information, promotion, and practical demonstrations are expected to generate a trend toward making deconstruction a common practice. In addition, these efforts are expected to increase the amount and types of materials being recycled and reused by consumers, contractors, architects, and government agencies.

The key activities in this area will consist of studying strategies and incentives used by public agencies across the country to promote the practice of deconstruction. In addition, we will study the practices of deconstruction and reuse organizations nationwide to determine their methods for promoting deconstruction and fostering a demand for reclaimed building materials.

This scan of practices nationwide will help inform the partner's efforts in Minnesota. Specifically, Better Futures and the NWIOIC will develop briefing materials outlining the "why, what and how" of deconstruction, including a primer on the environmental benefits of this practice compared to demolition. A strategy for promoting deconstruction within key sectors (homeowners, contractors, architects, demolition companies, and public agency officials) will be developed and implemented. Briefing materials will be tailored for each of these audiences. Outreach tactics will include making presentations at home improvement shows and conventions sponsored by architects and builders. We will also host seminars and offer presentations for local, county, tribal, and State government officials, focusing on those officials with responsibility for issuing demolition permits and increasing waste recycling rates. The goal of this education and promotion effort is to increase the practice of building deconstruction statewide. In addition, we will work with local, county and State officials to adopt incentives for deconstruction such as reduced permit fees and/or diversion goals for projects.

Another set of activities will be focused on increasing Better Futures' and the NWIOIC's expertise for valuing and creating a demand for materials reclaimed during the deconstruction process. This effort to foster a demand and marketplace for reclaimed materials is critical since our preliminary data indicates that using reclaimed materials generates a dramatically higher environmental benefit than recycling. For example, in 2014 Better Futures diverted 175 tons of building material from the landfill. 74% of this material was recycled and 26% was reused. Material reuse, however, accounted for 80% of the carbon emissions averted. 180 metric tons of CO₂ emissions were avoided by reusing materials compared to only 46 metric tons of CO₂ prevented by recycling materials.

A set of activities to increase demand for and promote the reuse of materials will be advanced during this project. Information about the environmental benefits and range of potential uses for reclaimed materials will be prepared. This information will be promoted and accessible via each partner's website. We will also promote reuse ideas at trade shows and remodeling fairs which target homeowners and crafts people. Social media will also be used to promote ideas for reuse and the

range of materials available. A key tactic will consist of building and launching an on-line store to promote the availability and sale of reclaimed materials.

Summary Budget Information for Activity 2:

ENRTF Budget: \$150,485

Amount Spent: \$150,485

Balance: \$ 0

Outcome	Completion Date
1. The practice of deconstruction and information regarding its environmental benefits is widely promoted by: Meeting with Tribal, local, county, and State officials who issue demolition permits, demolish public buildings, and are responsible for increasing recycling rates; Hosting information booths and seminars at home improvement shows, and trade conventions for architects, contractors, and demolition companies.	June 2018
2. At least six continuing education sessions regarding the practice and benefits of deconstruction and the reuse of materials are hosted by the partners. Architects and contractors are the prime audience for these sessions.	June 2018
3. At least one Tribal government and three cities or counties or State agencies adopt incentives and/or material recycling and reuse goals for buildings targeted for demolition.	June 2018
4. Demand for reclaimed materials increases by 30% over the course of the project (as measured by Better Futures and NWIOIC revenue from the sale of material from January 2016 through December 2017)	June 2018
5. Tribal, local, county, and State agencies begin using reclaimed materials for tables and other types of basic office furniture.	June 2018

Activity Status as of December 31, 2015:

A major task and challenge for this project is changing the established practice for removing buildings. The partners are committed to making an effective case for replacing the wasteful practice of demolition but they are confronting some significant hurdles. These include:

- ✓ The cost of demolition is low compared to the initial cost of deconstruction. In addition, the deconstruction process takes more time. The challenge for the partners is to build a case for why the true cost of demolition is in fact higher when one accounts for the environmental and social impact of demolition compared to deconstruction.
- ✓ The partners are also learning how public policy hinders the development of deconstruction into a sustainable practice. For example, counties in Minnesota must report on their recycling rates for household waste and financial incentives are tied to these rates. In contrast, counties are not required to track or report on the recycling and diversion rates of construction and demolition waste.
- ✓ Deconstruction as a practice is a relatively unknown and underdeveloped service in Minnesota. Consequently, the partners must rely on “early adapters”, an initial group of customers (public and private) who are willing to help the partners learn and test their trade.

- ✓ The partners are working to build a steady of pipeline of year-round work. Deconstruction requires a core group of trained and experienced workers and these workers move on to other jobs if the work is intermittent and unpredictable.

Activity 2 is focused on dealing with these challenges. An initial set of briefing handouts were prepared and are being used to educate public officials and private customers. NWIOIC reached out to officials at tribal agencies throughout Northern MN, MNDOT, the State DNR, several counties and cities in Northern MN, and the National Forest Service. Better Futures advanced a deconstruction demonstration effort with Hennepin County and launched a deconstruction pilot with the City of Minneapolis. Better Futures also introduced the concept to cities in the metropolitan area along with architects, contractors, and homeowners. A marketing plan developed by the partners is guiding this education and outreach effort.

The partners also relied on several gatherings to promote the practice and benefits of deconstruction. Better Futures met with the City of Edina Recycling Solid Waste Working Group in August and presented at the MPCA's eco-booth at the State Fair. The partners also shared a booth with MN Green Star at the AIA (architects) State convention in November. The partners' work and services were also highlighted at the Recycling Association of MN convention in October. This included a tour of two deconstruction job sites for convention participants.

A related effort is the redesign of Better futures' website to promote the practice and benefits of deconstruction. The new website is expected to be operational in March 2016. Along with information about deconstruction, the website will include an on-line store for viewing and buying reclaimed building materials. This online store is expected to be an outlet for selling materials harvested by both Better Futures and NWIOIC.

A key element of Activity 2 is establishing a demand and outlets for the materials harvested from deconstruction sites. During the first six months of this project, the partners focused on increasing its sales efforts. This consisted of Better Futures hiring a new, full time sales manager and hosting several warehouse sales events which were promoted through various social media outlets. In addition, the Better Futures warehouse is open daily and has attracted an increasing number of steady customers. The demand for reused materials is expected to increase significantly when Better Futures opens its new warehouse in January 2016. This new site is conveniently and prominently located in South Minneapolis near a set of other retail outlets selling used goods.

The results of these efforts are beginning to yield good outcomes. Better Futures revenue from the sales of materials for the first 11 months of 2015 was \$49,000; \$13,000 of this revenue was earned from a large sale in July. Sales revenue is projected to total \$150,000 in 2016.

Activity Status as of July 31, 2016:

The partners made significant progress in promoting deconstruction as an alternative to demolition and to creating a marketplace for reclaimed materials.

Educational materials were updated to reflect customer feedback and to incorporate data about the significant environmental benefits of deconstruction. The partners are also refining a "side by side" analysis which compares the cost of traditional demolition to the net cost of deconstruction (factoring

in the cash value of a customer's tax deduction. The partners also discovered an additional appraiser with deep experience in valuing used building materials.

The sale of building materials is a proven strategy for creating a demand and marketplace for reclaimed materials. In addition, sale of materials can generate income to support of the overall mission of the partner's enterprises. Success in this marketplace is dependent, however, on consistent effort and exceptional sales management practices. To that end, the partners implemented the following improvements over the past six months:

1. Opened a new warehouse in South Minneapolis at the northern end of Minneapolis' "Reuse Mile" and in a prime location for shoppers.
2. Implemented a high-performing inventory management and point of sale system which will support the operation of an on-line store.
3. Launched an on-line store. And Better Futures is working with the NWICDC to develop a way to provide access to the on-line store for the sale of materials harvested by the NWICDC.
4. Both partners are using social media (primarily Craig's List and Face book) to generate interest in and demand for reclaimed materials.
5. Better Futures established a partnership agreement with the Twin Cities Builder's Association. This partnership is expected to increase significantly the amount of used building materials donated to Better Futures.
6. In an effort to create a marketplace in North Central Minnesota, the NWICDC has started selling used building materials at a warehouse near Bemidji.

Better Futures earned \$50,000 in revenue from the sale of used building materials in the first six months of 2016.

Efforts to promote the innovative practice of deconstruction as an alternative to demolition intensified and blossomed during the first half of 2016. Better Futures drafted a "model" building deconstruction and material reuse policy and presented the policy to officials at Hennepin County and the City of Minneapolis. Both entities are considering adoption of this proposed policy. For the County, this policy would apply to all County-funded renovation and demolition projects. The City may apply the policy to all renovation and demolition projects in Minneapolis, both public and private projects. The goal under the new policy would be to reuse at least 5% of the materials from a project and to recycle an additional 70% of the materials. The partners estimate that at these rates, the CO2 emissions from a project would be at least "net zero".

The partners were also invited to present the case for deconstruction to public works and recycling officials with St Louis Park. The model policy was discussed and ways to introduce deconstruction to private developers and incorporate deconstruction in City-funded projects were reviewed.

Activity Status as of January 31, 2017:

A major effort was made during this reporting period to develop a more robust marketplace for the sale of reused building materials. The results from this focused effort were significant and very promising. The NWICDC secured new warehouse space and hired a full time person to promote the sale of reused materials. Better Futures intensified its use of social media outlets and hired a new sales person in September. These two actions generated substantial results for Better Futures: Gross revenue from sales of materials was \$112,798 in 2016. More significant, the average monthly sales

revenue for the first 8 months of 2016 was \$5,390 but the average monthly total for the last four months was \$17,419; monthly sales revenue more than tripled during the last four months of 2016.

Better Futures and the NWICDC are becoming known more widely as a source for used building materials and a small but loyal group of repeat customers now exists. Many of these customers send pictures of their renovation jobs or furniture made with reclaimed material purchased at the Better Futures warehouse.

As noted earlier, Better Futures experienced an increase in the number deconstruction jobs completed for private customers. This type of work typically generates a greater amount of high value materials (compared to LCCMR-eligible uninhabitable sites) and this work creates a steady pipeline of work for employees. This increase in private customers is due in part to the hiring of a part time marketing agent. The partners still need, however, to improve their marketing materials, including offering an easy to understand explanation for how the tax benefits from donating materials to one of the partners typically makes deconstruction less expensive than demolition.

Modest progress was made in convincing county and municipal governments to reform existing demolition policies. The partners continue to promote a model policy for increasing the reuse and recycling of materials but public officials are slow to respond. As noted throughout this report, public policy and practices must change to help make deconstruction a sustainable alternative to demolition.

The partners continued to connect with trade and community groups to promote the value and practice of deconstruction. Better Futures hosted a booth at the AIA convention in November and Better Futures staff made a presentation at the annual meeting for Association of Recycling Managers and Counties and Cities Involved in Source Reduction and Recycling in December.

In October 2016, the partners submitted comments to Assistant Commissioner Kirk Koudelka at the MPCA in an effort to inform changes in the handling of building waste and the management of landfills statewide. Below is an excerpt from that letter:

“Thank you for inviting us to submit recommendations for reducing pollutants and for reducing the amount of building material thrown away and buried in landfills throughout the State.

As summarized in our last status report to the State’s Legislative-Citizen Commission on Minnesota Resources (LCCMR), the U.S. EPA estimates that construction and demolition debris is the second largest component of our waste stream, just behind municipal solid waste. The MPCA estimates that only 20-30 percent of this waste is recycled. Just as significant, our work to reuse and not throw away building material is highlighting the substantial amount of pollutants emitted by dumping building materials in landfills.

Our environmental impact analysis for 8 projects revealed the following: 87% of all building material from the 8 projects was diverted from the landfill. We are able to consistently achieve this rate of diversion by using proven, “deconstruction” methods, an approach that entails taking apart a building in a methodical manner and preserving the maximum amount of material for reuse. Our deconstruction work generated 70% less CO2 emissions than simply recycling some of the materials; and, deconstruction generated 91% less CO2 emissions than the current, predominate practice of throwing away the building and burying it in a landfill. Over the next few months, we plan on providing

additional data on the amount and type of toxic chemicals that leech from buried building waste into the surrounding land and groundwater.

Overall, our work is documenting that current policies and practices for processing used building materials emits a significant level of greenhouse gasses along with pollutants that seep into our land and water. As our status report indicates, a substantial portion of these “waste” materials can be recycled and, most important, reused which creates jobs, new businesses, and helps improve the quality of our State’s air, land, and water.

Our evidence is compelling and our approach (which is growing and well-established in many communities throughout the country) is a much-preferred alternative to current building waste management practices in Minnesota. But as noted in our LCCMR status report, we are encountering significant barriers as we try to develop our building deconstruction and reuse endeavor into a sustainable enterprise. Quite simply, State solid waste policies and current management practices seriously undermine efforts to establish alternatives that generate significant environmental, social, and economic benefits. For example:

- ✓ The cost of demolition is *artificially* low compared to the cost of deconstruction. The real cost of demolition is much higher than what the market is currently paying because the impact associated with GHG emissions and other toxic effects of land filling are not accounted for. In contrast, deconstruction does indeed add costs as an alternative to landfill. But in doing so, we are closer to capturing the REAL COSTS of pollution in the price.
- ✓ Public policy in Minnesota hinders the development of deconstruction into a sustainable practice. For example, counties in Minnesota must report on their recycling rates for household waste and financial incentives are tied to these rates. In contrast, counties are not required to track or report on the reuse, recycling, and diversion rates of construction and demolition waste.

In light of these barriers, and given the substantial, emerging evidence of the multiple benefits of reusing and recycling building materials, we encourage the MPCA to consider and advance these recommendations:

- 1) The State must establish a comprehensive policy for reducing significantly the amount of building materials currently buried in landfills. There are an array of model policies nationwide. We suggest that the State promote a policy that requires a demolition project to achieve a recycling rate of 70% and a reuse of material rate of at least 5%. At a minimum, these reuse and recycling rates should be expected from all State-funded projects.
- 2) The price of throwing away building materials should be increased to reflect the true cost of burying the waste. The State’s low tip fees encourage a “throw away” mentality and, perhaps more significant, leaves the additional cost of pollution and future clean up to an entity other than the owner of the material. Deconstruction and material reuse is a flourishing practice in areas where the per ton cost of dumping is \$100 or higher.
- 3) The new policy for processing used building materials should also include grants and financial incentives for reusing or recycling building materials. As noted in our report, the reuse of materials generates by far the most significant environment and economic benefits. Funding tied to recycling and especially reuse rates will begin to change practices and behaviors.
- 4) The State’s new policy should outline specific goals and the overriding goal should be a net zero emissions goal for each “demolition” or major renovation project. As our data indicates, net zero emissions from processing used building materials can only be achieved when a portion of

the material is reused. Tracking diversion rates alone will not necessarily result in a net zero emissions from a project.

- 5) This new policy, its related goals and its financial incentives should be complemented by grants to help educate local officials, contractors, and the public.
- 6) Grant funds should also be offered to support the development of deconstruction and building material reuse services statewide.

Clearly, these are ambitious proposals but they are absolutely necessary. And our interaction with public officials and citizens throughout the State underscores the need and desire to adopt a new course of action. Just as important, the current policies and practices for managing used building materials are not sustainable. There is a growing and urgent need to adopt a much more enlightened and beneficial approach; an approach that can be supported by compelling environmental, economic, and social benefits data.

Thank you for the opportunity to help inform your policy agenda. We are committed to working with you as you advance efforts to improve and protect our State's land, water and air. Please let me know how we can help you and your colleagues work toward the goal of net zero emissions from processing used building materials."

Project Status as of July 31, 2107:

The main area of success within Activity Two has been the dramatic increase in the sale of materials reclaimed from deconstructed buildings. Better Futures' sales revenue totaled \$140,325. This amount for the first six months of 2017 is more than double total sales revenue for all of 2016.

No progress was made in implementing policy reforms at the county or local levels. But Better Futures and NRRI did have several opportunities to promote the benefits of deconstruction and reuse before several important audiences. In March, Better Futures presented before a gathering of solid waste officials from the seven-county metro area. This presentation led to a call from officials in the city of Roseville who contracted with Better Futures to deconstruct a foreclosed city-owned property. In addition, officials from Ramsey County initiated conversations with Better Futures about deconstructing some county-owned properties.

Another encouraging development is the commitment of officials in St Louis County to sponsor a deconstruction pilot in that county. Seven county-owned properties have been identified as candidates for deconstruction. Work on some of these sites is expected to begin sometime in September 2017.

Better Futures and the NRRI also made a presentation on deconstruction and material reuse at the Transportation Research Board's sustainability conference. This was a good networking opportunity. Finally, Environmental Initiatives honored Better Futures with its Sustainable Business Award at its annual dinner in May. The LCCMR was noted as one of Better Futures' key partners.

Project Status as of January 31, 2018:

As mentioned earlier, the St Louis Pilot was delayed until this Spring. In addition, the partners connected with officials in Clearwater and Otter Tail counties about potential deconstruction work later this year.

The two significant accomplishments in this area over the past six months were: 1) Better Futures sales revenue for 2017 more than doubled for a total of \$266,000. 2) City council members in Minneapolis are working with Better Futures to draft a model deconstruction ordinance. The goal is to adopt this ordinance by July 1, 2018. The new code will mandate the deconstruction of all residential properties instead of demolishing the buildings. Also, Hennepin County and the State MPCA are making the diversion of building material waste a priority in their newly drafted solid waste management plans. To support these policy reform efforts, Better Futures assembled model ordinances from around the country and prepared briefing sheets to support the adoption of these policies.

Final Report Summary:

The partners made presentations before a wide array of audiences about the benefits and impact of building material reuse and repurposing. These events included annual talks at the State Fair, meeting with elected officials across the State, serving as panelists at recycling conferences and gatherings sponsored by Twin Cities metro area counties. The partners also hosted booths at home improvement and builders' conventions, at architect conventions, and in one on one meetings with more than 100 contractors and homeowners.

The partner's websites were updated to promote building material reuse and deconstruction. Better Futures' sales warehouse was updated to include promotions about the multiple benefits of building material reuse. A copy of a poster from the warehouse is included with this final report. Sales of products at this warehouse totaled more than \$500,000 over the LCCMR grant period, further demonstrating the demand for reclaimed goods and materials. All net proceeds from these sales were reinvested into the project.

Efforts to promote material reuse included a deconstruction pilot initiative in St Louis County. This initiative, funded primarily with LCCMR grant dollars created 2 months of full time work for 9 local residents. Four tax forfeited properties were deconstructed (3 in Duluth and 1 in Chisholm). This work provide exposure to the value and benefits of deconstruction. A small press conference was held at one of the sites in Duluth. Flyers to neighbors were used to promote the practice of deconstruction and social media was used to promote the sale of materials. About \$3,000 of the harvested material was sold at the job sites; the remaining material (4 truckloads) was transported back to Better Futures' warehouse. This effort also generated a handful of calls from local contractors and homeowners interested in working with the partners' work crews.

One of the most significant accomplishments in this activity area is the introduction of building material reuse policies for Hennepin County and the City of Minneapolis. As of this report date, the County is in the process of reviewing a proposal to require material reuse and recycling in all projects sponsored by the County. The County is also paying Better Futures to deconstruct any County-owned property slated for demolition.

In addition, a Minneapolis City Council committee is about to approve a building material reuse ordinance. Specifically, the new law would require all buildings built before 1950 to achieve a reuse rate of at least 5% and a recycling rate of at least 75%. The committee is expected to recommend the ordinance for approval by the full City Council some time in October.

The activity related to sponsoring six continuing education sessions was not achieved. Over the grant period, the partners did make presentations before nearly a dozen trade and professional associations

(architects, contractors, public officials, environmental protection agencies, and recycling associations) but none of the presentations qualified as formal continuing education sessions.

ACTIVITY: 3 Create and test higher value uses for reclaimed materials; develop markets for products made from reclaimed building materials

Description:

The Natural Resources Research Institute at the University of Minnesota Duluth will identify and test potential products that can be manufactured from reclaimed materials. Please see their work plan for a project description and budget.

NRRI will also train Better Futures and Northwest OIC staff on manufacturing processes, standards, specifications, and equipment needed to build products. The NRRI will also offer advice to Better Futures and Northwest OIC staff as they prepare for and begin manufacturing products. As noted below, a small portion of the budget will be used to support this area of activity.

Summary Budget Information for Activity 3:	ENRTF Budget:	\$128,671
	Amount Spent:	\$128,671
	Balance:	\$ 0

Outcome	Completion Date
1. Better Futures and the NWIOIC use reclaimed materials to create at least three new products such as end tables, conference tables, and counter tops.	June 2018

Activity Status as of December 31, 2015:

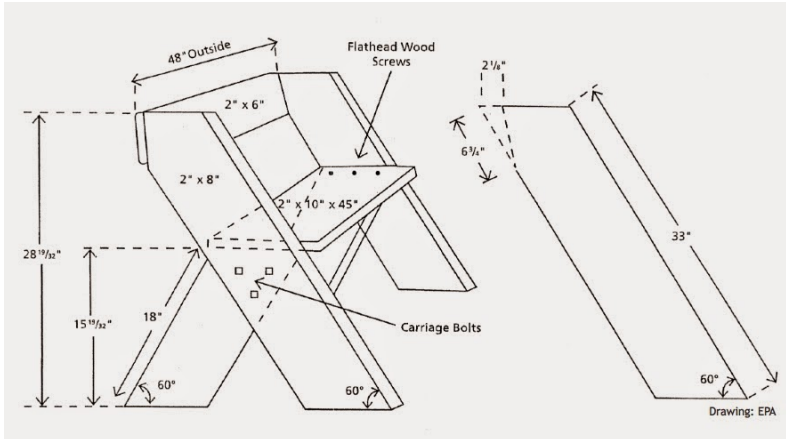
The NRRI is taking the lead on this Activity and Better Futures and NWIOIC are working closely with the agency to develop higher uses for some of the materials reclaimed during the deconstruction process. In May 2015, the NRRI produced three small tables from wood reclaimed from deconstruction projects. These prototype tables are being used to introduce potential customers to the idea of building furniture from reclaimed wood. For example, Hennepin County is assessing the cost and value of using tables made from reclaimed lumber in several renovated libraries. A business plan and financial model for developing the capacity, expertise, and demand for furniture will be developed during the first half of 2016.

In addition, the NRRI staff toured several deconstruction job sites in December and the partners in an effort to identify materials that could be reused or recycled rather than sent to the landfill. The partners decided to experiment with developing alternative uses for three materials in particular: porcelain, drywall, and insulation. The NRRI will test these materials and experiment with possible uses. The partners will also scan the country to determine if and how these materials are being reused and recycled elsewhere.

Activity Status as of July 31, 2016:

Workers for Better Futures and NWICDC completed a pilot initiative of building benches designed by Aldo Leopold. This is the first “higher use” product made from the wood harvested from LCCMR-funded deconstruction projects. The NRRI assisted with producing plans for building the benches and they constructed several prototypes to inform the training of workers and to develop building

instructions. The NRRI also provided training and advice for both NWICDC and Better Futures as their supervisors and workers built nearly a dozen benches. NRRI is also providing advice on marketing the benches.



The partners agree that this product is an ideal item to produce on a much larger scale. It's fairly simple to build and requires just three sizes of reclaimed wood. Only one type of saw is required and a minimal amount of hardware is used. Finally, the final touches such as sanding and staining are easy tasks to teach.

At present, Better Futures lacks the type and size of work space required for building and storing the benches. But over the next few months, the partners intend to develop a production schedule, including a plan to address Better Futures' production space needs. A marketing plan and quality control protocol will also be developed. The partners expect to build 100 or more benches during the upcoming winter months and have them ready for sale early next spring. The benches will be promoted through Better Futures' on-line store and Craig's List. Select garden centers may also be a potential sales outlet. Each bench will have the partner's logo branded on the back rail and a small card outlining the "transformation story" about the wood and the people who built the bench will be attached.

Activity Status as of January 31, 2017:

With design plans, prototypes and building instructions from the NRRI, Better Futures and the NWICDC assigned work crews to begin producing the "Aldo Leopold" benches mentioned in the past update. This project offers additional training for some workers and provides a higher value use for the much of the lumber reclaimed from job sites. An interior designer is serving as a volunteer and is offering advice on the finer points related to different types of finishes and stains and sales strategies. Another benefit of this emerging line of work is that is expected to create year-round work for at least one crew.

The bench project has ignited the workers' imaginations. They along with NRRI staff are developing more styles of benches, stools and tables.

Project Status as of July 31, 2017:

Bench building activities were limited during the first half of this year since most workers were needed to handle the high volume of deconstruction work.

Project Status as of January 31, 2018:

The NRRI will provide an update on activities in this area in their six-month report. The partners overall success and efforts in the is activity area will be summarized in the final report.

Final Report Summary:

The partners work in this area confirmed the value and potential of repurposing reclaimed material (especially lumber) into higher value goods. Several challenges were encountered in an attempt to develop repurposing into a consistent and sustainable enterprise.

First, proper space and appropriate tools are needed to build products, both the NWICDC and BFM lacked access to these assets. Second, workers must invest time in learning the finer skills related to using specialized tools and building quality products. The turnover in the workforce and the lack of steady work in this area prevented the partners from taking time to invest in this amount of training. Third, a steady level of year round work in this area must be available to support the investment of time and money into this line of business.

Nevertheless, the experience gained during this grant period established repurposing as a line business that should be developed. As the partner’s current enterprises mature and become healthier financially, building new products from reclaimed materials will likely become the next source of income and employment opportunities.

ACTIVITY 4: Calculate the environmental impact of this project and deconstruction work.

Description:

The Natural Resources Research Institute at the University of Minnesota Duluth will develop a formula for calculating the environmental impact of this project. Please see their work plan for a project description and budget.

In addition, Better Futures will help gather and then analyze the environmental impact data being produced by NRRI. Better Futures’ Project Manager will also package the environmental data for the education and outreach efforts described in Activity Two.

Summary Budget Information for Activity 4:

ENRTF Budget:	\$13,905
Amount Spent:	\$13,905
Balance:	\$ 0

Outcome	Completion Date
1. Better Futures and NWIOIC use impact data to inform efforts to promote the practice of deconstruction and to promote the reuse of reclaimed materials.	June 2018

Activity Status as of December 31, 2015:

Please see NRRI’s status report for a complete summary of the partner’s work in Activity 4. A major challenge for Better Futures is finding haulers, landfill operators, and building waste recyclers who understand and value the alternative practice we are trying to develop. The current systems do not routinely generate the data needed to complete quality impact statements, such as the composition of dumpster loads and weights for each type of material processed. These issues are solvable but it will take time to educate and help landfills and recyclers adopt processes that meet the partner’s data needs.

Activity Status as of July 31, 2016:

Another critical task related to education and marketing is documenting the environmental, social and economic benefits of building deconstruction. The environmental impact data generated by the partners to date is unprecedented. As far as the partners know, this project is the only deconstruction initiative in the nation attempting to provide an environmental and social impact statement for every job completed. This emerging data will help inform improvements in the management and completion of a job and support efforts to implement new policies and practices. The partners will continue to refine their impact model by consulting with County and State environmental staff and with experts nationwide. In addition, this impact data must be analyzed much more thoroughly to identify correlations and to refine the impact model.

There are several key findings. First, the State does not require counties or municipalities to track the amount of construction and demolition debris generated in their localities. Nor are there any financial incentives to divert this waste from landfills. State policy places emphasis on and directs financial incentives toward the recycling of household waste. The partners believe this policy and practice must change. At present, Minnesotans can throw away buildings (even though more than 85% of the buildings can be reused or recycled) with no consequences or incentive to change this practice.

Second, although most focus on the amount of Building material diverted from landfills, the key measurement is the amount of that waste reused and recycled. As noted in the path-breaking data produced under this grant, reuse of building materials generates a significant environmental benefit, a much greater benefit than simply recycling a portion of the material. The partners' data points to the need to begin tracking the portion of material reused and recycled from a project, not just the amount of material diverted.

Table One of the Attachment accompanying this Status Report presents environmental impact data for 8 of the 13 buildings deconstructed with LCCMR grant funds. The key results include:

- ✓ When compared to demolition, the deconstruction of these 8 buildings avoided the emissions of nearly 2,100 metric tons of CO₂, the largest component of greenhouse gasses.
- ✓ The average diversion rate was 87%.
- ✓ Three of the 8 projects resulted in no net emission of CO₂! This occurs when the reuse of materials rate typically equals or exceeds 5%. The impact from this project is revealing that the reuse of materials has a significant, positive benefit for the environment, much more beneficial than recycling.
- ✓ Overall, deconstruction generates 91% less CO₂ emissions than demolition, and 70% less CO₂ emissions than recycling some of the materials off-site.

Activity Status as of January 31, 2017:

Attachment A, accompanying this Status Report, presents environmental impact data for 3 of the 4 buildings deconstructed by Better Futures with LCCMR grant funds during this reporting period. This table also presents a summary of the environmental impact for 11 of the 13 LCCMR eligible projects deconstructed by Better Futures since the start of the LACCMR grant in July 2015. The key results include:

- ✓ When compared to demolition, the deconstruction 11 buildings to date avoided the emissions of 3,435 metric tons of CO₂, the largest component of greenhouse gasses.
- ✓ The average diversion rate was 86%.
- ✓ The average reuse of material rate for the 11 projects is nearly 5%. A 5% reuse rate combined with a recycling rate of 70% or higher typically results in "net zero" emissions.

- ✓ Overall, the growing amount of impact data from this project shows that deconstruction generates 81% less CO2 emissions than simply recycling some of the materials; and, deconstruction generates 150% less CO2 emissions than the current, predominate practice of throwing away the building and burying it in a landfill.

Project Status as of July 31, 2017:

Please review Attachment A which summarizes the environmental impact of 12 LCCMR-eligible projects deconstructed by Better Futures since the inception of this project.

Project Status as of January 31, 2018:

Please review Attachment A which summarizes the environmental impact of 15 LCCMR-eligible projects fully deconstructed by Better Futures since the inception of this project along with the 10 projects deconstructed by the NWICDC. In addition, Attachment B lists the address and location of every LCCMR-eligible project deconstructed by Better Futures and the NWICDC.

Final Report Summary:

By the end of the grant period, Better Futures was typically achieving net zero emissions of CO2 from each deconstruction project. The environmental benefits generated by deconstruction compared to traditional demolition are significant. The common practice of dumping a building into a landfill emits, on average, 248 metric tons of CO2 for each property demolished. In contrast, Better Futures' deconstruction work on LCCMR-funded projects generated on average just 51 metric tons of CO2.

Overall, the work under this LCCMR project averted the emission of 5,288 metric tons of CO2 (against an original goal of 900 metric tons). This decrease in CO2 emissions is equivalent to taking 1,114 cars off the road for one year and the social cost of this carbon offset is \$190,548.

V. DISSEMINATION:

Description:

As noted in the work plan, the partners intend to prepare marketing materials that promote the practice and multiple benefits of building deconstruction. These materials will focus on informing homeowners, architects, contractors, tribal governments, and government agencies (with a focus on North Central Minnesota and the Twin Cities). The partners also intend to identify key gatherings such as trade shows, industry conventions, and the State Fair to promote the practice of deconstruction and the reuse of used materials.

Better Futures will also provide regular updates about the purpose and status of this project through its Face book page and website (www.betterfuturesminnesota.com). Better Futures' newsletter is another outlet for providing updates and promoting deconstruction. This newsletter is distributed via e mail every other month. Finally, the partners intend to use an on-line store to promote the reuse of materials and products made from reclaimed materials. This store will provide an additional outlet for promoting the practice of deconstruction and the reuse of used building materials.

Status as of December 31, 2015:

As noted under Activity 2, the partners worked to promote the concept and practice of deconstruction through multiple venues. A presentation was developed and will be improved as additional cost/multiple benefits data is gathered from an increasing number of deconstruction projects. Updated

education and marketing handouts targeted to four key sectors--government, contractors, architects and homeowners—must still be drafted. These four new handouts will replace an existing handout.

The partners will continue to identify and attend trade shows and home improvement fairs. Better Futures joined the Builder's Association of the Twin Cities and the MN chapter of the National Remodelers Association. These memberships are intended to connect the partners with potential customers for both deconstruction services and used building materials. The partners' presence on social media is established and the use of these various outlets should increase significantly once the Better futures sales manager is settled in the new warehouse. And the launch of the online store in the spring of 2016 is expected to increase the demand for reused materials.

Status as of July 31, 2016:

The partners are routinely using various outlets to promote their work and the information being generated under this project. Newsletters and Blog posts are regular venues for sharing project updates and highlighting the environmental impact data. Better Futures' on-line store was launched and is serving as an outlet for promoting and selling reclaimed materials. Policy proposals being developed with both the City of Minneapolis and Hennepin County is helping to promote (and perhaps even mandate) deconstruction as an alternative to demolition.

Status as of January 31, 2017:

As noted earlier, social media and partner websites are routinely used to promote the practice of deconstruction and the reuse of reclaimed building materials. In the fall of 2016, Better Futures, its consultant Ecotone, and a team of graphic design students produced a compelling poster depicting the environmental benefits of taking a part and reusing or recycling pieces of a house. The poster is entitled "Why Throw Away A House" and a copy of the graphic is presented in Attachment B.

Project Status as of July 31, 2017:

Better Futures and its partners continued to attend conferences and home improvements shows in an effort to promote the practice and benefits of deconstruction. Better Futures also used social media to promote its award from Environmental Initiatives and related press coverage.

Project Status as of January 31, 2018:

Better Futures and its partners continued to attend conferences and home improvements shows. in an effort to promote the practice and benefits of deconstruction. Better Futures also hosted a design contest using reclaimed materials. Winners submitted their designs and work products; the most creative designers were awarded gift certificates for use at the Better Futures warehouse.

Final Report Summary:

Throughout the grant period, the partners were consistently engaged in promoting the practice of deconstruction and material reuse. Over time, the visibility of the partner's workers taking a part a building generated the most publicity and heightened the level of interest among the public. The actual work helped to highlight the futility and wastefulness of demolition and the work showcased a practical way to significantly reduce trips to a landfill.

Homeowners also emerged as the prime drivers for deconstruction of privately owned buildings. Accordingly, the partner's revised it's messages and materials to address a homeowners demands and

concerns about demolition. An added advantage is that homeowners secure a tax deduction for the materials donated to the partners. This tax benefit helps with making the case for deconstruction.

VI. Project Budget SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 761,675	Better Futures Project Manager: NWIOIC Deconstruction Director: NWIOIC Work Crew: BFM Work Crew: BFM Crew Chief:
Professional/Technical/Service Contracts:	\$30,000	Tim Roman of Ecotone Partners to assist with developing tools for estimating time and cost to complete a project and the projected value of materials. Roman will help create a "spreadsheet" that lists all the types of materials targeted for harvest in a building and be programmed to calculate labor hours and projected product values once the type and amount of materials are entered into this tool. Roman will also gather data and build the database needed to support the costs and values used in this spreadsheet.
Equipment/Tools/Supplies:	\$ 18,245	
Travel Expenses in MN:	\$ 11,203	
Other:	\$15,000	Estimated cost of safety training and training related to proper use of tools;
TOTAL ENRTF BUDGET:	\$836,123	

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 18

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: .25

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
To be determined	\$65,000	\$ 0	Box truck, pickup truck, trailer
To be determined	\$20,000	\$ 0	Out of state travel
Earned Revenue and Foundations	\$210,000	\$500,000	Administrative overhead and operating support for the LCCMR project
Hennepin County Environment and Energy	\$0	\$435,000	Marketing support and subsidies for deconstruction projects in the County

TOTAL OTHER FUNDS:	\$295,000	\$ 935,000	
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VII. PROJECT STRATEGY:

A. Project Partners:

This endeavor is a partnership between Better Futures Minnesota (Minneapolis) and the Northwest Indian OIC (Bemidji). Better Futures will serve as the project manager. Both agencies are committed to supporting at risk adults who are committed to changing their lives and lifestyles. Job creation and employment are core activities for both. For the past four years, Better Futures has been working with counties, contractors, and the MPCA to promote the practice of building deconstruction and develop markets and alternative uses for construction waste diverted from landfills. Their experience informs the proposal outlined in this work plan. Better Futures is partnering with the Northwest OIC to help build their capacity to provide this service in North Central Minnesota. The University of Minnesota Duluth’s Natural Resources Research Institute (NRRI) recently began working with Better Futures to identify, prototype and assess uses for reclaimed materials. This grant will enable NRRI to increase their level of research and assistance for both Better Futures and the Northwest Indian OIC.

The following is a summary of each partner’s role and responsibilities during this project. To advance this plan and achieve the outcomes outlined in the plan, the partners intend to meet monthly via conference call and hold face to face meetings each quarter.

Better Futures Minnesota:

1. Serve as Project Manager with overall responsibility for:
 - A. Preparing LCCMR work plan and budget and submitting status and final reports to the LCCMR
 - B. Organizing and shepherding the partnership, including managing contracts, establishing and monitoring work plans with each partner, and hosting monthly video meetings and quarterly face-to-face meetings with partners.
2. Take the lead on testing and refining efficient techniques for taking apart buildings
3. Develop, disseminate and update as needed operating manuals and protocols to maximize the amount of material recovered from deconstruction properties and diverted from landfills;
4. Develop, disseminate, and update as needed a training regimen related to safety, product identification, and harvesting techniques to maximize the yield, value and quality of materials from deconstruction properties
5. Hire, train, and supervise Better Futures crew chiefs and workers
6. Assist NRRI with assessing the quality, quantity, and value of materials harvested during the deconstruction process
7. Assist NRRI with developing strategies that maximize quality and quantity of materials harvested from buildings in various states of condition
8. With advice and assistance from NRRI and the Northwest Indian OIC, develop marketing handouts and implement a statewide promotion strategy targeting homeowners, architects, contractors and government agencies
9. With advice and assistance from NRRI and the Northwest Indian OIC, develop expertise for valuing and selling materials using on-line stores and auctions
10. Take the lead on recommending strategies for sustaining the practice of deconstruction statewide
11. With the NRRI and the Northwest Indian OIC, promote deconstruction services and materials, and the environmental benefits of this approach through relations with trade groups, trade shows, social media, and web pages

12. Assist NRRI with studying model deconstruction/diversion policies from across the country; take the lead on drafting model policy and practice options for Tribal, local, county and State government agencies to consider
13. Work with Tribal, State, county, and local agencies to implement public policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition
14. Deconstruct up to 20 properties in various states of condition
15. Work with the NRRI to develop and test products that can be manufactured from reclaimed materials
16. Prepare an operating and financial plan to launch the manufacture of at least three products from deconstruction reclaimed materials. This plan may result in products being made by Better Futures or NW OIC independently or in cooperation with each other.

Natural Resources Research Institute at the University of Minnesota Duluth:

1. Assess the quality, quantity, type, and value of materials harvested during the deconstruction process
2. Develop strategies that maximize the quality and quantity of materials harvested from buildings that are in various states of condition and assess the value, quality, and quantity of materials harvested
3. Identify or develop a tool for calculating the yield and environmental impact of materials harvested from buildings, including reduced greenhouse gas emissions, energy savings, reduced landfill use, and the reuse of natural resources
4. Study and benchmark this venture against similar endeavors across the nation (i.e. their techniques, products, and the policies that support these techniques and products) with an emphasis on integrating the values and traditions of the Native American and African American cultures
5. Build prototypes and test products that can be manufactured from reclaimed materials
6. Review and test prototypes with potential customers; identify viable products
7. Develop manufacturing plan, identify equipment, and provide technical support, product specifications and quality assurance for each viable product in cooperation with Better Futures MN and NW Indian OIC

Northwest Indian OIC

1. Help test and inform the development of efficient techniques for taking apart buildings
2. Contribute to the drafting and updates of operating manuals and protocols related to material recovery and waste diversion;
3. Assist with drafting and training regimens related to safety, product identification, and harvesting techniques
4. Hire, train, and supervise NW OIC crew chief and workers
5. Assist NRRI with assessing the quality, quantity, and value of materials harvested during the deconstruction process
6. Assist NRRI with developing techniques that maximize quality and quantity of materials harvested from buildings in various states of condition
7. Assist with drafting a business and financial plan for sustaining this enterprise when start up funding, including the LCCMR funding ends
8. Assist NRRI with studying model deconstruction/diversion policies from across the country; take the lead on drafting model policy and practice options for Tribal, local, county and State government agencies to consider

9. Work with Tribal, State, county, and local agencies to implement public policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition
10. Deconstruct up to 10 properties in various states of condition
11. Work with the Natural Resources Research Institute to develop and test products that can be manufactured from reclaimed materials
12. Assist Better Futures with preparing an operating and financial plan to launch the manufacture of at least three products from deconstruction reclaimed materials. This plan may result in products being made by Better Futures or NW OIC independently or in cooperation with each other.

B. Project Impact and Long-term Strategy:

By adopting deconstruction on a broad-scale, Minnesota can achieve significant reductions in greenhouse gas emissions, reduce the amount of waste buried in landfills, and increase the amount of materials reused. There are, however, a set of challenges that hinder the development of deconstruction into a standard practice statewide. These include:

1. At present, there is no economic model to support this line of work. The cost of dumping in Minnesota is much cheaper than recycling and reuse and there are no established marketplaces for selling reclaimed materials. A new economic model must be developed and changes in public policy and practice are the main drivers for helping to foster this new model.
2. Local and State government is presently focused on the lowest bid to remove buildings and there is no current policy or incentives to take into account the additional jobs and environmental benefits that would be achieved from deconstruction.
3. Launching a new line of business and reaching a level of stability takes time (at least five years) and sufficient startup capital.
4. The State is an under-developed market for deconstruction, meaning that no one is offering this service, there is no prominent marketplace for selling used or reclaimed materials, and current public policy undermines attempts to develop the market more fully. This is both a challenge and an opportunity.
5. At present, there is only one appraiser who is willing to provide private owners with an appraisal for the goods donated to Better Futures. And this appraiser has very limited experience with the method for appraising harvested materials and complying with IRS policies.

This project is focused on addressing these challenges. The four activities being funded over the two year grant period: (1) Developing efficient techniques for deconstructing buildings safely; (2) Marketing deconstruction and establishing a marketplace for selling reclaimed materials; (3) Creating, manufacturing, and marketing products made from reclaimed materials; (4) Calculating the environmental impact of this project and deconstruction work; are formulated to demonstrate the economic, social and economic value of deconstruction. In addition, the partner’s experience gained and data generated will help inform the development of policies and practices to support deconstruction as an alternative to demolition. These new policies and practices will also help foster a marketplace for the reuse and reclamation of used building reused materials. And the experience and data will help inform strategies to support deconstruction as a financially viable practice statewide. Long term, deconstruction can become a financially sustainable line of business once the level of work generates adequate revenue from dismantling buildings, selling used materials, and selling products manufactured from reclaimed materials.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
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MN Pollution Control Agency	11/15/12-6/30/14	\$18,833
MN Department of Employment and Economic Development	7/1/14-6/30/15	\$237,500


IX. VISUAL COMPONENT or MAP(S):

Please see attached poster, "Why Throwaway a House?"

X. RESEARCH ADDENDUM:

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than: December 31, 2015; July 31, 2016; January 31, 2017; July 31, 2017, and January 31, 2018. A final report and associated products will be submitted no later than August 31, 2018.

Environment and Natural Resources Trust Fund															
															
Project Title: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste															
Legal Citation: M. L. 2015, Chp 76, Sec. 2, Subd. 07c and M.L. 2017, Chapter 96, Section 2, Subd. 07c															
Project Manager: Steve Thomas															
Organization: The NetWork for Better Futures															
M.L. 2015 ENRTF Appropriation: \$845,000															
Project Length and Completion Date: 3 Years, June 30, 2018															
Date of Final Report 08-10-2018															
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	Activity 4 Budget	Amount Spent	Activity 4 Balance	CURRENT BUDGET	Amount Spent	TOTAL BALANCE
Personnel (Wages and Benefits)	\$484,354	\$484,267	\$87	\$134,986	\$134,986	\$0	\$128,517	\$128,517	\$0	\$13,905	\$13,905	\$0	\$761,762	\$761,675	\$87
Project Manager: (77% wages, 23% benefits); .6 FTE each year for 2.50 years at \$182,023															
BFM Work Crew: \$188,950 (62% wages, 38% benefits); 2.7 FTE each year for 2 years															
BFM Crew Chief: \$115,661 (69% wages, 31% benefits); 1 FTE each year for 2 years															
BFM Business and Marketing Coordinator \$19,425 (50% Wages, 23% benefits) 1 FTE															
BFM Business and Deconstruction Manager \$48,300 (60% Wages, 38% benefits) 1 FTE															
NWIOIC Deconstruction Director: \$162,021 (71% wages, 29% benefits); 1 FTE each year for 2 years															
NWIOIC Sales of Materials Coordinator \$43,056 (62% Wages, 38% benefits) 1 FTE															
NWIOIC Work Crew: \$120,703 \$163,579 (62% wages, 38% benefits); 2.3 FTE each year for 2 years															
Professional/Technical/Service Contracts	\$15,000	\$15,000	\$0	\$15,000	\$15,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$30,000	\$30,000	\$0
Tim Roman, Ecotone Analytics: Consultant to develop template and formula for cost estimating and assist with identifying and valuing materials. The consultant(s) will help create a "spreadsheet" that lists all the types of materials targeted for harvest in a building and be programmed to calculate labor hours and projected product values once the type and amount of materials are entered into this tool. The consultant(s) will also gather data and build the database needed to support the costs and values used in this spreadsheet.															
Equipment/Tools/Supplies	\$20,794	\$18,245	\$2,549	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$20,794	\$18,245	\$2,549
Rental of containers to collect and temporarily store recyclable and reusable materials at up to 6 sites; 3 containers @ \$400 per container for a total of \$1200 per job (\$7,200) Rental of a JLG Lift for up to 3 days to remove high pitched roof on building in Chisholm (\$1500) Purchase of plastic safety fencing for perimeter of job sites and purchase of replacement blades for saws, and safety equipment for workers (\$400) Rental of chemi jons for six jobs x \$150 a site (as required by code)=(\$900). Total \$10,000															
Hand and power tools and personnel safety equipment: tool belts for workers, starter supply of power and hand tools for NW OIC workers, replacement small tools for both agencies; hard hats, vests, eye protection, gloves, and steel inserts for boots. Specific costs and exact items to be determined.															
General woodworking supplies, saw blades, adhesives, wood finishes, cutting bits, stains, hardware,															
Travel expenses in Minnesota	\$16,791	\$11,203	\$6,241	\$499	\$499	\$0	\$154	\$154	\$0	\$0	\$0	\$0	\$17,444	\$11,203	\$6,241
Up to 40 days of actual costs for food and lodging for one crew chief and one on-site supervisor (DNR grant guidelines regarding reimbursement for these costs will be followed) = \$8,800. Reimbursement for mileage related to St Louis County Pilot: crew chief and Pilot supervisor travel back and forth to home on weekends, 2 people x 7 weekends x 250 miles roundtrip = \$3,500 + 6 trips to Duluth by BFM staff, 250 x 6 = \$1,500. Total costs \$13,800															
Travel to Duluth, Minneapolis and Bemidji areas for project activities associated with deconstruction of buildings. Mileage: \$4,492 (10 trips to MSP, 5 to Duluth, 5 to Bemidji); Lodging: \$1,860 (30 nights); and Meals: \$1,440 (30 days)															
Other	\$15,000	\$15,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$15,000	\$15,000	\$0
Estimated cost of safety training and training related to proper use of tools; exact cost and provider(s) of training to be determined															
Shipping of samples and prototypes															
Laboratory testing of energy content of wood samples															
Grinding of wood materials that are not usable in sold form by a commercial wood grinding company															
COLUMN TOTAL	\$551,939	\$543,062	\$8,877	\$150,485	\$150,485	\$0	\$128,671	\$128,671	\$0	\$13,905	\$13,905	\$0	\$845,000	\$836,123	\$8,877