Natural Stone Council

Sustainability Benchmark Survey

January 2008

UT CENTER FOR CLEAN PRODUCTS

Natural Stone Council

The United Voice of the Natural Stone Industry

NSC Sustainability Project Overview

DATE: January 28, 2008
TO: Members of the Natural Stone Industry
FROM: John Mattke, on behalf of the
Natural Stone Council's Sustainability Committee
RE: **Industry Environmental Benchmarking Survey**

As reported to you previously, the Natural Stone Council, as part of its Sustainability Initiative for our industry, has contracted with the Center for Clean Products at The University of Tennessee (UT) to evaluate—and ultimately improve—the environmental performance of our industry. The UT/NSC research plan includes a life-cycle analysis of the environmental impacts of certain stone products, the development of strategic sustainability goals for the industry, and a plan for outreach to the environmental and Green Building communities.

We now need your assistance and participation in this important research effort. We've attached a data collection survey to gather information from as many stone quarries and fabricators as possible. The survey information is critical to the effort as we identify and quantify the processes and impacts associated with current industry practices and inform the development of management and operational strategies to promote overall improvement. This information will become the foundation for establishing the baseline environmental footprint of the stone industry and form the building blocks for creating life-cycle data and assessments of stone compared to other building materials. Without it, we will not be able to move forward.

We recognize that the survey asks for information about your business' activities, some of which you may consider sensitive. *The survey response process has been designed to keep your responses confidential*. While the survey is being sent from your primary industry association, the responses will be returned to UT. UT will not provide individual company information back to the NSC, any individual association or any other individual or company. The data will be aggregated so that individual responses and company information are unobtainable. Further, UT researchers may call on you to follow-up on data gaps or questions related to your survey response, but again, any information gained from these conversations will remain confidential.

As we all know, the green building movement is gaining momentum, and we all want to ensure that the natural stone industry and our products are properly positioned in this market. Your response to this survey request is critical to helping gather the data necessary for this to happen. It will take some time and thought to complete it. We have provided a help line through UT that is available should you need or want it.

Thank you in advance, for your participation in this important effort and for your prompt response to this survey.

Co-Chair Natural Stone Council
NSC Sustainability Committee Chair

NSC Sustainability Project Overview

How the Data will be used
UT will collect inventory data and tally the inputs and outputs associated with quarrying and stone processing operations. Information gathered by this form will be used to develop environmental profiles based on inputs and outputs for the various types of stone products. The profiles will be used to form life-cycle inventory data sets that will be distributed by the NSC and made publicly available.

Results of the Project
The benchmarking process and associated data sets will enable professionals in the green building movement to accurately evaluate and compare stone products to other products, and will facilitate analyses that fully articulate the abundant advantages inherent to the selection and use of natural stone products. In addition, results will help identify areas for product and process improvement related to risk and environmental impact (e.g., identifying material use inefficiencies) throughout the stone quarrying and manufacturing processes. Data provided will be used to assess the overall sustainability of the natural stone industry through the identification of best practices, drivers of environmental impact, and metrics against which to measure future improvement.

Confidentiality of Data
All data provided on this form should be submitted directly to the University of Tennessee Center for Clean Products. UT will aggregate data and ensure that data associated with particular companies remains anonymous to the NSC, the public, and other participating companies. UT has entered into a confidentiality agreement with the Natural Stone Council to cover data obtained through project activities and can enter into confidentiality agreements with individual companies if required. Please understand that accurate and representative information from you is critical for this project's success.

Instructions

1. Please be sure to read the introductory text in each section prior to filling out the form.
2. The final three pages of this packet include flow diagrams to help you understand the processes on which this survey was based. Please refer to these for context as you complete the survey.
3. This document is divided into two sections: Part 1 is for Quarrying Operations data, while part 2 is for Processing Operations data. The data you supply in the tables should represent inputs and outputs associated only with the quarrying OR processing component, depending on the section on which you are working. If quantities provided are not specific to the indicated component, please explain how they differ in the comments section at the bottom of the appropriate table.
4. Where supporting information is available as independent documents, reports, or calculations, please provide them as attachments with reference to the associated table(s) in this form.
5. If there is inadequate room on a page to supply your data (including comments), please copy the appropriate page and attach it to this packet.
6. If you have more than one quarry, please copy and complete a separate survey for each quarry. If more than one stone is quarried at a particular site, please complete a separate survey for each stone quarried. Similarly, if you operate more than one processing facility, please complete a separate survey for each processing facility. This survey can be printed from: **http://isse.utk.edu/ccp/projects/naturalstone.html**. Click "Resources for Survey Respondents".
7. **Please mail this document to UT in the provided envelope postmarked no later than <u>February 20, 2008</u>.**

IF YOU HAVE QUESTIONS, PLEASE CONTACT:

Amanda McKenna Phone: 865-974-4583 Email: cleanproducts@utk.edu

OR VISIT: http://isse.utk.edu/ccp/projects/naturalstone.html

Company & Contact Information

Date: _____

Table 1.

COMPANY INFORMATION	CONTACT INFORMATION
1. Company name: _____	1. Prepared by: _____
2. Facility name: _____	2. Title/Position: _____
3. Facility address: _____	3. Phone number: _____
_____	4. Fax number: _____
_____	5. Email address: _____

Stone Type(s) Quarried and Sold: _____
(Please list ALL general stone types you quarry/sell at ALL quarries/processing facilities.)

Type(s) of Stone Products Produced: _____
(Please list ALL general types of products produced)

Types of Building Products Produced (if any): _____

Percent of finished product sold:

Regionally: _____% Nationally: _____% Internationally _____%

If you do business regionally, please define region in general terms (e.g., within five-state area; within 500 miles; only in California):

_____

_____

Volume of Stone Products Sold in 2006: _____ ft^3 or tons

(THIS PAGE INTENTIONALLY LEFT BLANK)

PART 1: Quarry Operations

Directions: Complete the following questions specific to your **quarry site**. If you have more than one quarry site, please duplicate Part 1 for each quarry on which you are reporting data for this survey. Similarly, if you quarry more than one stone at your quarry, please duplicate Part 1 for each stone type. Data should reflect only processes shown in Figure 1 located at the end of this packet.

Table 2.

1. Name of quarry: _____
2. Location of quarry (closest town and state): _____
3. Type of quarry (e.g., drive-in, derrick, etc.): _____
4. Type of stone quarried:
   Note: If more than one stone type is quarried, please provide a separate set of forms for each type.

   ☐ Granite ☐ Oolitic Limestone ☐ Travertine ☐ Sandstone

   ☐ Marble ☐ Dolomitic Limestone ☐ Slate ☐ Other_____
5. Main application for stone quarried:

   ☐ Building Stone ☐ Crushed Stone ☐ Aggregate ☐ Other_____
6. Gross quarry production[1] in 2006 (e.g., tons, ft^3): _____
7. Net amount of stone moved from the quarry[2] in 2006 (e.g., tons, ft^3): _____
8. Years quarry has been open: _____ yrs
9. Total years of active quarry operations to-date[3]: _____ yrs
10. Total stone extracted since quarry opened (e.g., tons, ft^3)[3]: _____
11. Size of quarry site (e.g., acres)[3]: _____
    Note: this includes scrap piles, quarry roads, buildings, etc.
12. Estimated hours of operation annually: _____ hrs

[1]Gross quarry production = the total amount of stone quarried, including waste
[2]Net amount of stone moved from the quarry = the total amount of quarried stone able to be used for product
[3]Estimate is acceptable.

1.1 Stone Extraction Techniques

Indicate the method(s) used to extract stone from your **quarry site** (referenced in Table 2 above) by checking whether it is the primary or an occasional technique implemented:

	Primary	Occasional		Primary	Occasional
Explosives	☐	☐	Thermal burner	☐	☐
Slot drill	☐	☐	High-pressure water	☐	☐
Circular blade saw	☐	☐	Hydraulic splitter	☐	☐
Chain saw	☐	☐			
Diamond wire saw	☐	☐	Other _____	☐	☐

1.2 Equipment Use

Please indicate all equipment that is used in the **stone quarrying process** (as shown in Figure 1 at the end of this packet) by filling in the following column data. Use the blank row to add machinery that is not listed. *Please list only tools and not materials* (i.e., diamond wire saw but NOT diamond wire).

Table 3.

Equipment Type	*Type of Energy Used*[1]	*Number Operating Each Day*	*Hours Each Operate per Day (hr/day)*
Chain Saw			
Circular Blade Saw			
Derrick Crane			
Drill			
Dump Truck			
Excavator			
Fork Lift			
Front-end Loader			
High-Pressure Water Jet			
Hydraulic Splitter			
Thermal Burner			
Wire Saw			
Generator			

[1]Examples: diesel fuel, electricity, generator powered by diesel fuel, etc.

1.3 Material Inputs and Outputs

Please list all of the material inputs or outputs associated with your **stone quarrying process** (as shown in Figure 1 at the end of this packet). For each material, report the quantity of the material either consumed or generated. Please include all materials needed for your quarrying practices, including maintenance items.

Material Inputs

Material Ex. *TNT explosive compound* Annual Qty *200* Units *ft/yr*

Material Ex. *diamond wire #1029* Annual Qty *3,000* Units *ft/yr*

Material #1 _____ Annual Qty _____ Units _____

Material #2 _____ Annual Qty _____ Units _____

Material #3 _____ Annual Qty _____ Units _____

Material #4 _____ Annual Qty _____ Units _____

Material #5 _____ Annual Qty _____ Units _____

Material Outputs

Material Ex. *scrap rock* Annual Qty *3,000* Units *ft^3/yr*

Material Ex. *spent diamond wire #1029* Annual Qty *3,000* Units *ft/yr*

Material #1 _____ Annual Qty _____ Units _____

Material #2 _____ Annual Qty _____ Units _____

Material #3 _____ Annual Qty _____ Units _____

Material #4 _____ Annual Qty _____ Units _____

Material #5 _____ Annual Qty _____ Units _____

1.4 Utility Inputs

Please provide the quantity of each utility used in your **stone quarrying process** (as shown in Figure 1 at the end of this packet). Include consumption by all equipment you have listed in section 1.2 above, plus that used by all infrastructure *needed to run the quarry*, such as HVAC systems and lighting. If possible, please exclude nonquarry-related consumption. If this is not possible, please include a comment that nonquarry-related consumption is included. If *annual* quantities are not available, provide applicable units (e.g., gal/1000ft^3 of product). Use the blank spaces to add energy sources used by the quarry that are not listed.

Table 4.

Utility	Consumption in 2006[1]	Unit
1. Electricity		MJ
2. Natural gas / propane		MCF[2]
3. Diesel fuel		gal
4. Gasoline		gal
5. Water (gals per day)		gal
6.		
7.		
Comments:		

[1]Consumption in 2006 = amount of each utility consumed in 2006.

[2]If you choose to use units other than MCF (million cubic feet), please utilize only units of energy content or volume (e.g., mmBTU, therm, CCF, liters).

Does your quarry purchase green energy credits? ☐ YES ☐ NO

Does your quarry have any on-site renewable energy sources, such as solar power? ☐ YES ☐ NO

1.5 Environmental Management

In this section, please provide information regarding the environmental management of your **stone quarrying process** (as shown in Figure 1 at the end of this packet).

1.5.1 Environmental Regulation

Does your facility have a National Pollutant Discharge Elimination System (NPDES) permit? ☐ YES ☐ NO

Does any groundwater or surface water monitoring take place on your quarry site? ☐ YES ☐ NO

If YES, please list the parameters being monitored: _____

_____

Does a post-closure plan for your quarry exist? ☐ YES ☐ NO

1.5.2 Wastewater Management

If you do NOT use water in the **quarrying process**, please check here ☐ and skip this section.

Please indicate how your **quarry** obtains clean water by providing the percentage of clean water that comes from each source:

Groundwater (e.g., pumping well) _____% Water treatment plant (i.e., "city water") _____%

Surface water (e.g., nearby lake or river) _____% Other_____ _____%

What percentage of wastewater generated by your **quarry** is:

Discharged off-site _____% Recirculated through your quarry_____%

Is **quarry** wastewater treated on-site? ☐ YES ☐ NO

If YES, please describe the treatment process below:

_____

_____

Do you de-water your sludge? ☐ YES ☐ NO If YES, to what water content? _____%

Amount of sludge collected _____ lbs/year

How is your sludge disposed? _____

1.5.3 Solid Waste Management

Please indicate the fate of the scrap rock generated by your **stone quarrying process** by providing the percentages of scrap that goes to each final destination:

On-site scrap piles _____% Quarry refill _____%

Crushing facility _____% Other _____%

1.5.4 Environmental Initiatives

Please describe any environmental initiatives of your facility (e.g., scrap rock uses, inactive quarry site reclamation, etc.). Use additional paper if needed.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR TIME!

Please Postmark by <u>February 20, 2008</u> and send to:

UT Center for Clean Products
311 Conference Center Bldg
Knoxville, TN 37996

Or e-mail/fax to: **Amanda McKenna**
cleanproducts@utk.edu
Fax: (865) 974-1838

PART 2: Stone Processing Operations

Directions: Complete the following questions specific to your **stone processing operation**. If you have more than one stone processing facility, please duplicate and complete Part 2 for each facility on which you are reporting data for this survey. When completing this form, please **exclude any processes that are not specifically used in part to manufacture products for building applications**, such as engraving processes for monuments. Data should reflect only processes shown in Figures 2a and 2b on the final pages of this packet.

Table 5.

1. Name of processing facility: _____
2. Location of processing facility: _____
   (Please list nearest town & state. If not in U.S., please include country)
3. Please indicate the primary types of stone processed in this facility by providing the annual percentage of each stone type being processed (i.e., If I process 3000ft^3 of stone per year, and 1500ft^3 of that is granite, I would indicate "Granite 50%"):

   Granite _____% Oolitic Limestone _____% Sandstone _____%

   Marble _____% Dolomitic Limestone _____% Travertine _____%

   Slate _____% Other _____ _____%

4. Total amount of quarried stone that entered the processing facility in 2006 (e.g., tons, ft^3): _____
   (Please include semi-fabricated stone purchased from other domestic or international vendors)
5. Total amount of product produced by processing facility in 2006 (e.g., tons, ft^3): _____

2.1 Primary Sawing/Processing Techniques

Indicate the technique(s) used in your primary sawing of stone products in your **stone processing operations** (as shown in Figures 2a and 2b on the final pages of this packet) by providing the percentage of total product produced by each process.

Diamond wire saw	_____%	Steel-Shot-Blade	_____%
Circular blade saw	_____%	Splitter	_____%
Other _____	_____%		

2.2 Transportation to Processing Facility

Indicate how stone is transported to your processing facility by listing the source(s) of stone, mode of transport, and distance traveled by each mode. Also provide the amount of stone that travels to your facility from each source. The data in this section should reflect the transport from the source of the stone (e.g., quarry, vendor) to the *first* processing step. For example, if you purchase stone from a vendor located in the U.S., and that vendor imports stone from overseas and stores it at their facility in the U.S., only provide information for the shipment between the U.S. vendor storage location and your processing facility. If you purchase stone from a U.S. quarry, ship it overseas for pre-processing, and ship it back to the U.S. for finishing, only report data for the transport from the source to the pre-processing (overseas) location. If you purchase stone directly from overseas, please provide data for the shipment from the overseas source to your processing facility.

Table 6.

Vendor	Vendor Location[1]	Distance Transported (mi)			Total Amount of Stone Purchased in 2006 (tons or ft^3)
		By Truck	By Rail	By Boat	

[1]Vendor location = city and state (or city and country if not in U.S.) from which stone was shipped to your processing facility

2.3 Stone Finishing Steps

Indicate the method(s) used in applying a final finish to stone products in your **stone processing operations** (as shown in Figures 2a and 2b on the final pages of this packet) by providing the percentage of total product produced by each process. If you do not apply a finish to your product, check here ☐ and skip this section.

Thermal or flamed _____% Hammered _____% Other _____ _____%

Polished or honed _____% Water Blasted _____% Other _____ _____%

Machine ground _____% Sand Blasted _____% Other _____ _____%

2.4 Secondary Sawing/Product Shaping Techniques

Indicate the technique(s) used in the secondary sawing/product shaping of stone products in your **stone processing operations** (as shown in Figures 2a and 2b on the final pages of this packet) by providing the percentage of total production passing through each process. If you do not perform any secondary sawing/ processing, check here ☐ and skip this section.

Diamond-tipped wire saw _____% Other _____ _____%

Circular blade saw _____% Other _____ _____%

High-pressure water jet _____% Other _____ _____%

2.5 Material Inputs and Outputs

Please list all the material inputs or outputs associated with your **primary stone processing operations** (as shown in Figures 2a and 2b on the final pages of this packet). For each material, report the quantity of the material either consumed or generated per year. Materials include all items needed to operate and maintain equipment used in processing operations, such as lubricants and saw blades. Use the back of this page for additional space.

Material Inputs

Material Ex. *diamond wire* #1029 Annual Qty *5,000* Units *ft/yr*

Material Ex. *lubricating oil* Annual Qty *50* Units *gal/yr*

Material #1 _____ Annual Qty _____ Units _____

Material #2 _____ Annual Qty _____ Units _____

Material #3 _____ Annual Qty _____ Units _____

Material #4 _____ Annual Qty _____ Units _____

Material Outputs

Material Ex. *spent diamond wire* #1029 Annual Qty *3,000* Units *ft/yr*

Material Ex. *spent 36-inch tires* Annual Qty *27* Units *tires/yr*

Material #1 _____ Annual Qty _____ Units _____

Material #2 _____ Annual Qty _____ Units _____

Material #3 _____ Annual Qty _____ Units _____

Material #4 _____ Annual Qty _____ Units _____

2.6 Utility Inputs

Please provide the quantity of each utility used in **stone processing operations** (as shown in Figures 2a and 2b on the final pages of this packet). Include consumption by all equipment and by all infrastructure *needed to run the processing facility*, such as HVAC systems and lighting. Also include consumption required for transportation between process steps (e.g., forklift). If annual quantities are not available, provide applicable units (e.g., gal/1000ft^3 of product).

Table 7.

Utility	Consumption in 2006[1]	Unit
1. Electricity		MJ
2. Natural gas / propane		MCF[2]
3. Diesel fuel		gal
4. Gasoline		gal
5. Water (gals per day)		gal
6. Propane		
7.		

Comments:

[1]Consumption in 2006 = amount of each utility consumed in 2006.

[2] If you choose to use units other than MCF (million cubic feet), please utilize only units of energy content or volume (e.g., mmBTU, therm, CCF, liters).

Does your **processing facility** purchase green energy credits? ☐ YES ☐ NO

If YES, are these credits the same credits purchased for your **quarry operations?** ☐ YES ☐ NO

Does your **processing facility** have any on-site renewable energy sources, such as solar power? ☐ YES ☐ NO

2.7 Environmental Management

In this section, please provide information regarding the environmental management of your **stone processing operation** (as shown in Figures 2a and 2b on the final pages of this packet).

2.7.1 Environmental Regulation

Does your facility have a National Pollutant Discharge Elimination System (NPDES) permit? ☐ YES ☐ NO

Does any groundwater or surface water monitoring take place at your processing facility? ☐ YES ☐ NO

If YES, please list the parameters being monitored: _____

_____

2.7.2 Wastewater Management

If you do NOT use water in your **stone processing operation**, please check here ☐ and skip this section.

If water and wastewater in your **processing facility** is combined with water and wastewater in your **quarry** such that you will answer the following questions *exactly* how you have answered the questions in section 1.5.2, please check here ☐ and skip this section. In other words, if water and wastewater quantities are not tracked separately for your quarry and processing facility, do not fill in this section.

Please indicate how your **processing facility** obtains clean water by providing the percentage of clean water that comes from each source:

Groundwater (e.g., pumping well) _____% Water treatment plant (i.e., "city water") _____%

Surface water (e.g., nearby lake or river) _____% Other_____ _____%

Is the *majority* of wastewater generated by your **stone processing facility** DISCHARGED off-site or RECIRCULATED through your facility? (Circle one.)

Is **stone processing** wastewater treated on-site? ☐ YES ☐ NO

If YES, please describe the treatment process below:

_____

_____

Do you de-water your sludge? ☐ YES ☐ NO If YES, to what water content? _____%

Amount of sludge collected _____ lbs/year

How is your sludge disposed? _____

2.7.3 Solid Waste Management

Please indicate the fate of the scrap rock generated by your **stone processing facility** by providing the percentages of scrap that goes to each final destination:

On-site scrap piles _____% Quarry refill _____%

Crushing facility _____% Other _____%

2.7.4 Environmental Initiatives

Please describe any environmental initiatives of your **stone processing facility** (e.g., scrap rock uses, inactive quarry site reclamation, etc.). Use additional paper if needed.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR TIME!

Please Postmark by <u>February 20, 2008</u> and send to:

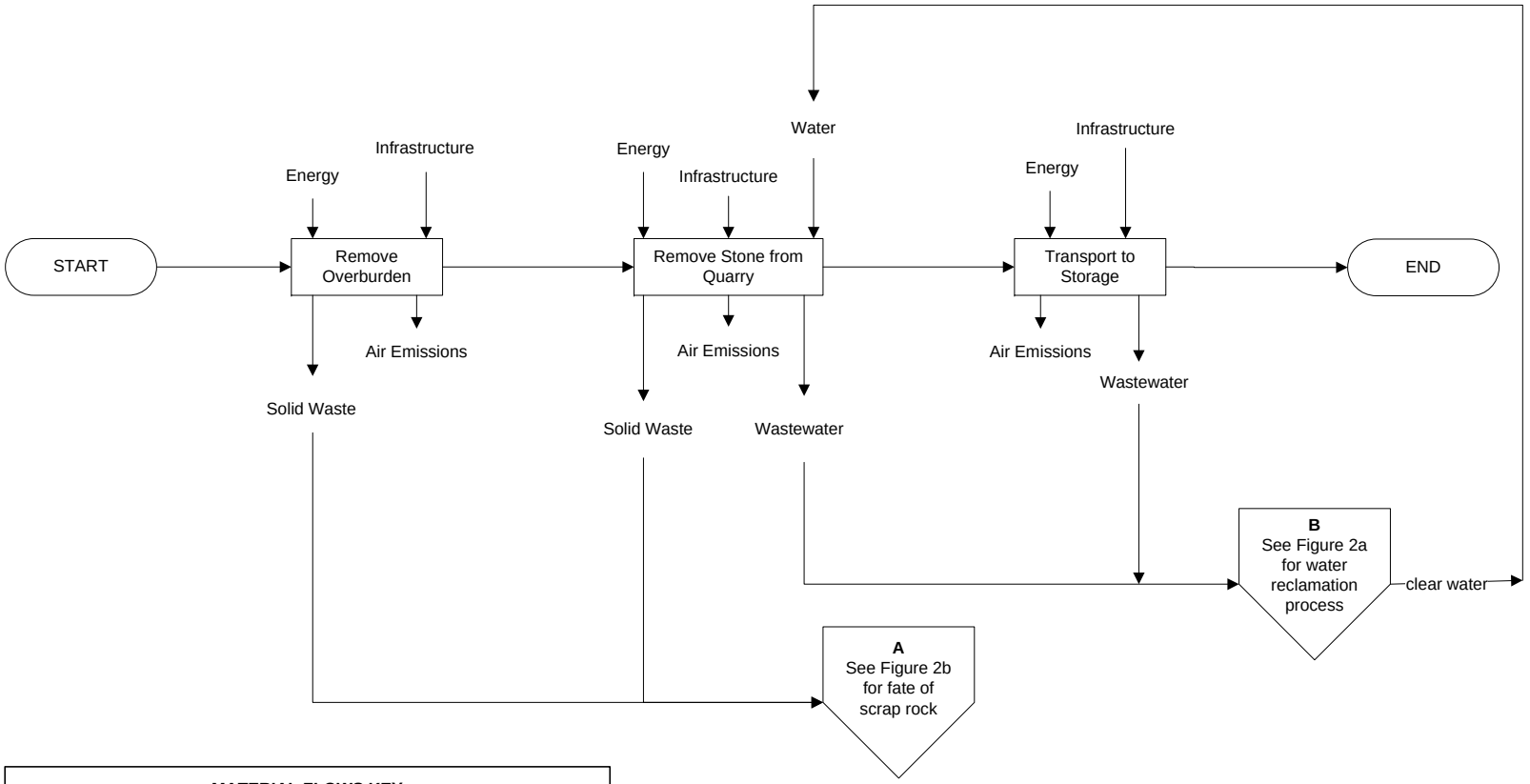
UT Center for Clean Products
311 Conference Center Bldg.
Knoxville, TN 37996

Or e-mail/fax to: **Amanda McKenna**
cleanproducts@utk.edu
Fax: (865) 974-1838

Reference Diagrams

The following three pages provide flow diagrams for quarrying practices and stone processing operations. Please make notes on the figures to indicate any significant differences between the identified process steps and your own.

Figure 1. Quarry Operations Flow Diagram



MATERIAL FLOWS KEY

Energy: diesel fuel, electricity, natural gas, etc.

Infrastructure: vehicles, machinery, hand tools, etc.

Water: potable or gray water

Solid Waste: scrap stone, sludge, scrap packaging, etc.

Air Emissions: vehicle exhaust, silicates, fugitive dust, etc.

Wastewater: spent process water, road runoff (suspended solids, oil, gas, etc.)

Figure 2a. Stone Processing Flow Diagram--page 1

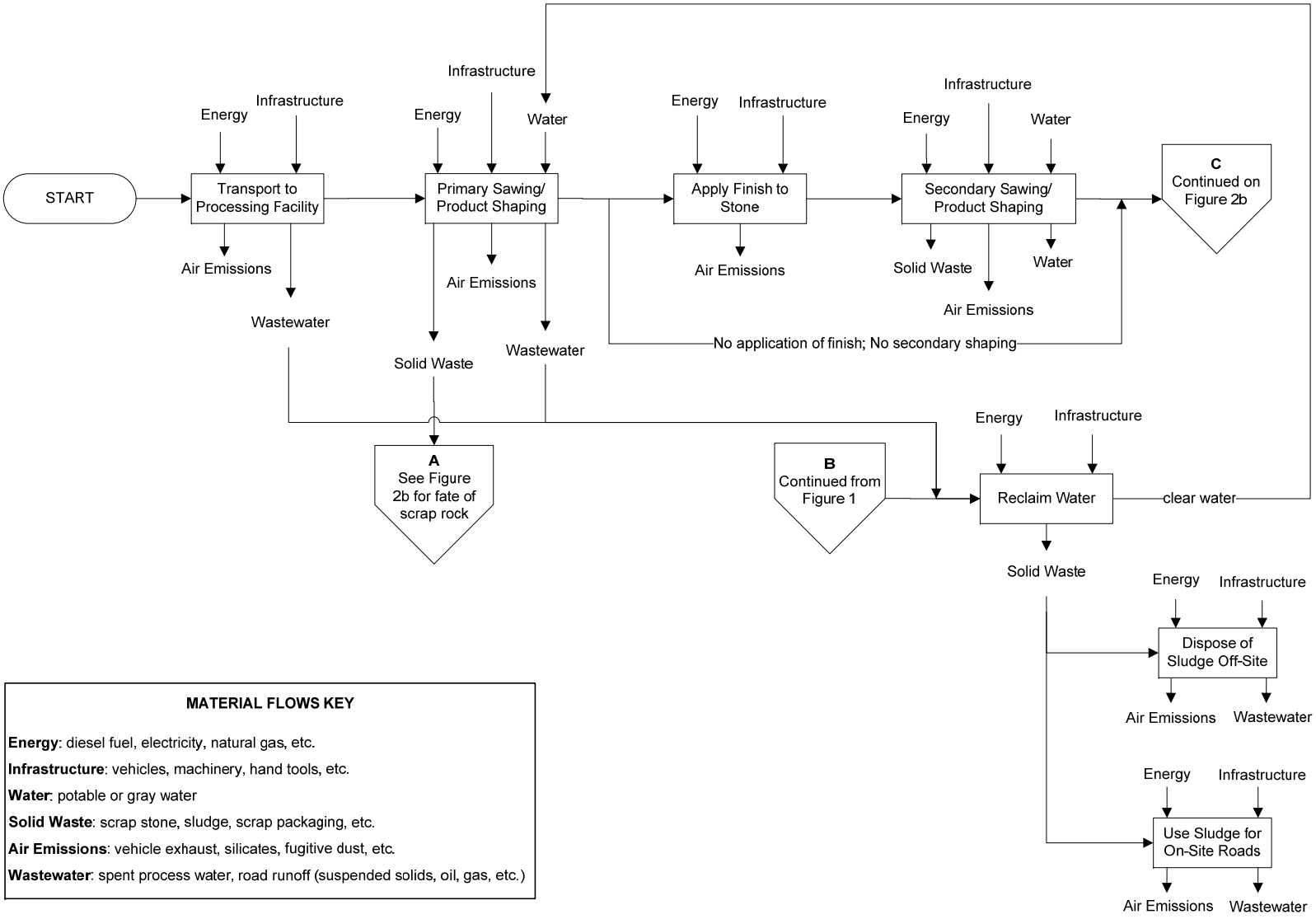


Figure 2b. Stone Processing Flow Diagram--page 2