



Teaming Up for Environmental Action

The following activity was developed for the poster project "Geoscape Toronto".

1. Distribute copies of the handout *How Aggregate Gets to You* (see below), which provides background information on how aggregate is extracted and processed.
2. Write the following categories in columns on the board: land, water, air, wildlife and people.
3. After students have read the background information, facilitate a brainstorming session about how the environment may be affected by the extraction and processing of aggregates. Invite students to record their answers under the appropriate headings.
4. Distribute one *Teaming Up for Action* card (see below) to each student. There are three types of cards:
 - **Aggregate Activity:** describes different activities conducted by the aggregate industry.
 - **A Concern:** discusses the environmental impact of a specific aggregate activity.
 - **A Possible Solution:** highlights one way that the aggregate industry has attempted to reduce its impact on the environment.
5. Review the concepts covered on the *Teaming Up for Action* cards, to ensure student comprehension and make sure each problem has a matching concern and solution.
6. Instruct students with an **Aggregate Activity** card to try and find the two students with the matching **Concern** and **Solution** cards.
7. Once the students find their matches, give the groups time to discuss their cards. Can they think of related concerns or possible solutions not listed on their cards?
8. To summarize the activity, allow students to share their cards with the class.

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How Aggregate Gets to You

When you go into a building or walk on the sidewalk, do you ever think about how aggregate products are created? Included below are some of the steps involved in finding, producing and processing aggregate products before they are ready for people to use.

Exploration

The sources of aggregate - sand, gravel, and rock for crushed stone - were formed by geologic processes long ago. When an aggregate supply is required, geological investigations can determine the location, distribution, and nature of potential aggregate in an area. Some areas have abundant aggregate resources; other areas have little or no resources. The location, shape and character of rock materials used for aggregate in southern Ontario were formed by seas, glaciers, rivers and lakes over millions of years. The gravel used today was deposited thousands of years ago by glacial meltwaters and rivers. Hard, dense limestone, dolostone, sandstone, and shale were deposited in or near an ancient sea hundreds of millions of years ago.

Extraction

Once the aggregate is found, there are different methods of extraction, depending on the geology of the deposit, the processing available and local demand for the products. One method creates pits—holes in the ground dug by front-end loaders—primarily for loose material such as sand and gravel. Another method is called a quarry, which is a hole created by controlled drilling and blasting. These operations are primarily for the excavation of solid rock.

Processing

Aggregate is processed on-site. The materials are put into a jawcrusher. This machine crushes the aggregate into the desired size, which is then washed with water. This water is recycled, to eliminate any threat to the local water supply. The aggregates are then put through a series of vibrating screens, to sort the material by size. Sometimes aggregates are treated with colour on-site. Also, some operations may mix the aggregate with different materials or chemicals, to produce a desired product.

Transportation

Since transportation costs average 60% of the price of aggregate, it is important to have a supply of quality aggregate close to major markets. Most of the time, the aggregate is transported by trucks. Trucks typically use the existing road networks to deliver the material directly to the customer. Trucks are required to cover their load with tarps to prevent excessive dust and debris. Aggregates can also be transported by rail or barge.

Products

Aggregate, which is formed by crushed stone, sand and gravel, has hundreds of uses in modern society. Sand and gravel (or sand alone) are used for sand casting in foundry operations, glass manufacturing, abrasives, and filtration beds of water treatment facilities. Crushed stone is used as a source of calcium for fertilizers, in metal refining, and as the major component in the manufacture of cement and lime. Crushed stone may also be used in filtration systems, and in the manufacture of glass and ceramics. Crushed stone, sand and gravel are used abundantly in the construction industry, especially in cement and concrete for residential and

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commercial buildings, bridges and airports, as well as cement, concrete, and bituminous mixes (asphalt) for highway construction.

A large percentage of aggregate is used without a binder as road base, for road surfacing, and as railroad ballast. Aggregate is also used to provide drainage around house foundations, for septic system leach fields, for snow and ice control, and as fill in wet, swampy or low land.

Construction of 1 kilometre of a six-lane highway requires 51,800 tonnes of aggregate or 3,500 truckloads. Few homeowners realize that construction of an average brick house requires 440 tonnes of aggregate (30 truckloads), or that construction of one average-size hospital or school requires 13,000 tonnes (900 truckloads).

Rehabilitation

Rehabilitation of a mined-out area is highly important to communities near aggregate operations, because residents do not want a scarred landscape near their property. Rehabilitation is planned before the aggregate is extracted. In progressive rehabilitation, mined-out areas can be rehabilitated as extraction continues in other parts of the operation.

The primary goal of rehabilitation is to return the land to a beneficial next use. Residential developments are a popular use for reclaimed sites. The natural setting provided by rock outcrops and water fulfill a demand for scenic, lakefront property. Reclaimed pits or quarries have also been converted to industrial and commercial properties or to office parks, golf courses, parks and recreation areas, storm water management ponds, farmland, and landfills. Many sites eventually become public lands.

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Aggregate Activity	A Concern	A Possible Solution
As trucks transport the aggregates, this creates dust in the area.	Excessive dust can cause medical problems for people with lung conditions. It also may create problems with the surrounding wildlife.	Companies collect or control dust through the use of dust enclosures on processing equipment. They also spray water on the trucks and other equipment on-site.
Aggregate Activity	A Concern	A Possible Solution
Quarries use water to wash the aggregates.	The water that is used may potentially contaminate the water supply in local communities.	Companies recycle the water that is used. If any water is released, then the companies must comply with government regulations to return clean water.
Aggregate Activity	A Concern	A Possible Solution
Lots of noise can be created by the machinery and the trucks.	This can be an annoyance to people living near an operation. This may also scare away wildlife in the area.	Companies have started to use sound-deadening materials, such as rubber, on the equipment. They also make sure that the equipment is always well maintained.
Aggregate Activity	A Concern	A Possible Solution
Explosives to blast the rocks can cause vibrations.	Local residents could be concerned that their homes might crack due to the vibrations. Also, vibrations may scare away the wildlife.	Companies hire professionals who are trained to use explosives to blast the rock. They ensure that the noise and vibrations are within acceptable limits.

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Aggregate Activity	A Concern	A Possible Solution
<p>When a new area has been selected for aggregate extraction, roads are the first things that are planned. Trucks and other equipment need access to the site.</p>	<p>Building roads can cause habitat loss or fragmentation. Heavy trucks can also cause existing roads to deteriorate more quickly.</p>	<p>Companies try to plan the most direct routes and try to use the least number of roads possible. Operators pay additional fees to municipalities for road repair.</p>
Aggregate Activity	A Concern	A Possible Solution
<p>After the company is has completed the extraction of aggregates, the land has been altered.</p>	<p>This can cause stress on the wildlife in the area, because their habitat has been altered. Also, people are concerned they won't be able to use the area once extraction is complete.</p>	<p>Companies apply progressive rehabilitation where practical and/or during extraction. Companies rehabilitate an area as per original plan, when extraction is complete. Companies create housing developments, recreation areas, and fish habitats.</p>
Aggregate Activity	A Concern	A Possible Solution
<p>As companies begin to extract at a new site, they remove the topsoil from the environment. They pile it up in a large mound on the side.</p>	<p>This topsoil is needed for growth in the area. When it is in a pile, organisms have limited growth, and the soil is not being used to host plants.</p>	<p>As the companies are rehabilitating an area, they put the top-soil back on land to create a stable and productive environment.</p>
Aggregate Activity	A Concern	A Possible Solution
<p>Some of the larger pits tend to dig below the water table.</p>	<p>The local communities are concerned that there will be problems with the groundwater level. This change in level means that their wells may not be deep enough to get adequate amounts of water.</p>	<p>Most pits created by companies are above the water level; the few that are under the water level are specifically designed and controlled. They do not create any changes in the water levels.</p>

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