The Impact of Mining on Water Quality  
and Water Quantity in the DR/GR

A summation of Mining in Lee County Benefits & Impacts, a white paper by Thomas M. Missimer, Ph.D., P.G. and Robert G. Maliva, Ph.D., P.G. Missimer Groundwater Science, a Schlumberger company. The complete signed and sealed report is available by calling Briggs & Rogers, LLC at 239-278-3900.

About the DR/GR

The Density Reduction/Groundwater Resource (DR/GR) incorporates about 83,000 acres in south Lee County. It was created in 1989 in a compromise agreement between the Florida Department of Community Affairs and Lee County government to meet state growth management laws.

A common misperception to those who are not familiar with the area is that the DR/GR is a pristine landscape of environmentally protected land, when, in fact, the land has undergone considerable alteration from agriculture operations, road construction, residential construction, mining, and other development. Some of the land has been well-preserved, and about one third of it is currently in public ownership.

About Quality Aggregate Materials

Deposits of construction-quality limerock, called coarse aggregate, are available in only a few areas of the state, including the DR/GR area. The aggregate resources of Florida are considered to be a “finite natural resource” (Strategic Aggregates Review Task Force, 2008). The availability of a reliable supply of rock helps keep the cost of construction and road building down, an issue critically important to taxpayers. Mining is important economically, contributing more than $1 billion each year to the Florida economy.

Impact of Mining

As Lee County studies the DR/GR and contemplates changes to the land uses allowed in the area, it is critically important that analysis of environmental impacts be scientifically based and separated from perceived impacts, particularly in relation to mining and its impact on water resources. This paper addresses five potential environmental impacts from mining:

(1) Evaporation from mine lakes and its impact on wetlands and water resources,
(2) Drainage and wetlands,
(3) Groundwater quality,
(4) Public drinking water supplies, and
(5) The community and environment.

Each of these issues is addressed in this discussion, and additional support references and data are included within the Appendix of this report.

It is also important to differentiate between temporary and permanent impacts and to recognize that there are solutions to overcome real impacts. Changes in land use associated with what will be a temporary activity, such as mining, offer the opportunity to correct for previous alterations of natural water drainage necessitated for farming and eventually, for the further creation of environmental and recreational resources, which would benefit residents from all over Southwest Florida.

**Evaporation from Mine Lakes and its Impact on Wetlands and Water Resources**

*Mining creates lakes that increase water storage, which is beneficial to the aquifer and wetlands in the dry season.*

One perceived issue that has been raised is that mine lakes could cause an increase in the evapotranspiration (ET) rates that would lower water levels and thus adversely impact sensitive environments such as wetlands. Such a concern is unfounded, and in fact, the reverse is true. Mine lakes will have a beneficial impact on natural environments by providing additional storage of water. There is significant scientific data that shows some vegetation types have greater ET rates than surface water bodies, such as lakes, while other types have lesser rates. Lakes appear to have a somewhat greater ET rate than pine flatwoods and lesser rates than some agricultural uses and exotic vegetation such as Melaleuca.

The major benefit of mine lakes is that they provide additional storage of water. A given volume of surface water contains much more water than the same volume of aquifer because most of the aquifer volume consists of solid rock or sediment. Mine lakes store water during the summer rainy season and release it to the aquifer during the subsequent dry periods, helping to maintain higher groundwater levels. The storage provided by lakes also reduces drawdowns on the water table from wellfield...
pumpage, which is also beneficial to nearby wetlands. The beneficial impacts of the additional storage dwarf any possible impacts due to differences in ET rates.

**Impacts of Mine Lakes on Drainage and Wetlands**

*Best management practices in mining can manage drainage issues and prevent impacts to wetlands.*

Another perceived impact that has been raised is the potential impacts of mining on drainage of wetlands adjacent to mining lakes. The concern is that large mine lakes excavated across topographic contours will drain adjacent lands on the uphill side of the lake and flood downhill areas. The design of mines address this issue by not constructing mining lakes across topographic and groundwater contours and by segmenting the lakes to add buffers between them. This is a best management practice used in mining operations today, and advanced surface-water management solutions are continuing to be explored.

**Impacts of Mining on Groundwater Quality**

*Pathogenic micro-organisms are quickly filtered out and die off in the groundwater environment. Lee County rock mines and wellfields have co-existed for more than 20 years without any impacts to the water supply.*

Another perceived concern related to rock mining and groundwater quality is that lakes excavated into aquifer rock could allow for easier entry of pollutants or contaminants into the aquifer and ultimately, into the water supply. Public water supply wells are located a minimum of 500 feet from rock mines or mine lakes near both the Lee County Corkscrew Wellfield and Green Meadows Wellfield (right).

The transport processes of contaminants and pathogenic organisms from surface-water bodies into and through aquifers has been intensely studied and well documented in the scientific literature. Communities worldwide have taken advantage of the storage provided by surface-water bodies and the natural filtration provided by bed and aquifer sediment to provide potable (drinking) water for over 100 years. In fact, the drinking water supply on Marco Island is a former mining lake, and Naples depended on a mining lake for its drinking supply for many years. Abundant scientific data on the inability of pathogenic micro-organisms to survive in the groundwater environment and the actual historic experience of Lee County rock mines and wellfields co-existing for
more than 20 years without any impacts to the water supply indicate that additional mining in the DR/GR area will not impact groundwater quality or the public water supply.

Public Drinking Water Supplies

Agricultural operations use large quantities of freshwater to irrigate crops. Lee County residents would benefit by converting agricultural uses to mining, which uses much less water.

Lee County is facing tough concerns about freshwater resources for some of its citizens. The growing population in Lehigh Acres is particularly troublesome as the Sandstone Aquifer, which supplies their drinking water, will not be able to meet the needs of the projected community at build-out if it continues to remain dependent on private wells. Water utilities in Lee County are being forced to develop and expand expensive reverse-osmosis desalination facilities to meet current and expected future demands.

Meanwhile, agricultural operations within the DR/GR area use as much as 14.5 billion gallons of fresh groundwater per year for crop irrigation. As more and more agricultural operations cease farming operations, that water could become available for public consumption. Additional wellfields could be constructed after mining is completed, providing Lee County with a large and valuable source of inexpensive freshwater that would not otherwise be available.

Converting agriculture lands to mining will increase the amount of drinking water available, but current restrictions on mining and other land uses in the DR/GR leave landowners with few practical alternatives other than to maintain water-intensive agricultural operations.

Mining as an Asset to the Community

Mine properties and lakes can be restored into wonderful recreation areas that benefit residents of the entire region.

Mine lakes can be a benefit to the environment and to the community when planned and incorporated into environmental restoration projects, flow-ways, parks, and even public water supplies. Land uses currently approved in the DR/GR offer few options for public use of the area, but a great opportunity exists. When mining operations are completed, infrastructure can be removed, the land reclaimed and restored into a series of lakes. With some vision, the mine properties could be transformed into a major recreational and environmental asset to the community for the enjoyment of our children and grandchildren.
A regional park could be developed that would provide opportunities for hiking, bicycling, boating, fishing, equestrian activities, bird and nature observation, picnicking, and many other activities. Former mine staging and processing areas could be converted to soccer and baseball fields, campgrounds, and other public uses. The lakes could be engineered to restore natural surface-water flow-ways.

The conversion of former mine properties to recreation facilities has been successful previously in Lee County when it purchased, in 1978, a former mine site and created Lakes Regional Park, which is now considered the crown jewel of Lee County Parks & Recreation Department. Florida Gulf Coast University embraced a former mine lake and created The Waterfront, a popular recreational area for students that offers opportunities such as boating, swimming, fishing, windsurfing, and relaxing on the beach with friends.

Vision for the Future of the DR/GR Land

Lee County has an unprecedented opportunity to transform the DR/GR through private-public partnerships and cooperation into a resource that balances the needs of all of the region’s stakeholders in a way that will benefit not only Lee County but all of Southwest Florida. The key issue is to employ sound science and best management practices to allow for the recovery of critical limestone resources, while at the same time, enhancing the environment, the water resources of Lee County, and the recreational opportunities for all citizens and visitors.