**Introduction:** Green, sustainable, and eco-friendly have become popular buzz-words and consumers are willing to pay more for products with these terms in their descriptions. Mining has more often been associated with undesirable qualities such as environmental degradation and toxic waste, so the industry might benefit from improving the public image of mining as employing “green” practices. In this vein, Canada’s mining industry is trying very hard to turn mining’s image around and the government’s Natural Resources Department launched a “Green Mining Initiative” in 2009.

Travelling around California visiting mining operations, we see a lot of examples of green mining practices that promote sustainability and exemplify good environmental stewardship. The topics and examples in this presentation show innovative ways of doing business that go beyond the minimum requirements imposed by laws and regulations. They may require thinking outside the box or going the extra mile, but they can result in improving the bottom line and enhancing public image.

**SMARA and Mine Reclamation:**

**Reclamation** – At the heart of SMARA is a sustainable and balanced approach to resource management. The requirements for reclamation plans, financial assurances, the backfilling of metallic mines, and the reclamation of mined lands to a beneficial condition all ensure that the environmental impacts of mining are minimized, hazards to public health and safety are eliminated, and that we are not left with more of the residual problems of historic abandoned mines. Mine reclamation is a core concept of green mining.

**Reusing Legacy Mine Waste** – Making use of legacy mining waste is perhaps the best type of true reclamation, where a left-over resource is used and the environment is cleaned up. The Yuba Gold Fields provides a prime example, as the piles of dredger tailings left behind from dredger mining for gold is now mined as a valuable source of rock for aggregate. Other examples include the reprocessing of former waste piles at several historic iron mines and at Molycorp’s Mountain Pass Mine as new technologies allow for more efficient recovery of valuable minerals.

**Creating Habitat** - Mine sites are often reclaimed to an end use of open space and wildlife habitat, which may be even better than what existed before mining. This reduces or even reverses the environmental impacts of mining and maintains open space that might otherwise be developed. Valuable ecosystems are restored, often providing habitat for threatened and endangered species. Certification programs administered by the Wildlife Habitat Council and the National Wildlife Federation are available to recognize the beneficial creation and preservation of habitat. The resulting community involvement, environmental education, and public access can all generate local goodwill. Examples will showcase mines that have been reclaimed to vernal pools, pit lakes, and riparian corridors.
Turning land over to land trusts, conservancies, and parks - To preserve the property's conservation values, there are several tools available for landowners that can assist with managing the land while offering a range of tax benefits, such as conservation easements, land trusts, conservancies, and donations. Examples include Lakeside River Park, Sequoia Riverlands Trust, and Vulcan's Rank Island.

Controlling Invasive Species – The spread of invasive species is a major problem and expensive battle in California. Under SMARA, mines are required to control noxious weeds and revegetate using desirable species. To help control the spread of weeds in imported aggregate, a Weed-free Aggregate Certification Program has been developed by the U.S. Forest Service and the National Park Service to ensure that all aggregate products used for projects in the Lake Tahoe Basin and Yosemite Park are certified weed-free to help maintain the scenic and biological values of these special places. The program is planned to expand across the Sierra region.

Green Energy and Cutting Greenhouse Gas Emissions:

Local Production of Materials – Construction projects depend on large quantities of aggregate materials that are mined, processed, and transported to job sites by trucks. Reducing the distances these trucks travel is a key to reducing greenhouse gases and the state's carbon footprint. Transporting these materials from shorter distances protects the environment, reduces traffic, and saves money. Local production by locally permitted mines is greener than importing. CALCIMA created DistanceMatters.org in support of reducing carbon emissions by thinking globally and acting locally.

Solar and Wind Energy – Several California mines are turning to alternative forms of renewable energy to provide all or part of the power for their operations. Examples include Teichert's Vernalis Plant (wind), Granite's Indio and Coalinga Mines (solar), and BoDean's Mark West Quarry, the first 100% solar-powered quarry. The Environmental Protection Agency (EPA) and the Bureau of Land Management (BLM) are also interested in locating utility-scale solar and wind farms on closed out or abandoned mined lands.

Using Conveyors instead of trucking – Aggregate mines typically use conveyors to move materials short distances but at some mine operations, conveyors play a larger role across greater distances in the place of trucks and heavy equipment. When used in this manner, conveyors save energy while reducing greenhouse gas emissions and traffic. For example, Teichert's Aspen 8 Mine utilizes over 2 miles of conveyors! Conveyors are also a viable alternative to consider during the design phase of a new mine operation. In some circumstances, haul roads can be more expensive to build and create more significant visual, air quality, and traffic impacts compared to utilizing a conveyor system.
Recycling:

Recycling water – While recycling water used for washing aggregate is cost-effective and mandated by water quality regulations, some mines go beyond the basics. Sediment ponds can be reclaimed after mining, as are the ones at Teichert’s Aspen 4 Mine. The fines that settle out can be used as a growth media for revegetation. But when you’re drastically limited on space and water supply, you may consider doing what Dean Soiland did at his Mark West Quarry in Sonoma County. He imported a machine from Italy used in the wine industry to press all the water out of the slurry left from washing aggregates. Once the clean water is recovered, the “cake” that’s left behind can be used in reclamation or for making pottery.

Recycling Asphalt and Concrete - Many California mine operators help keep construction and demolition (C & D) materials out of landfills by crushing millions of tons of used concrete and asphalt salvaged from demolished infrastructure (roads, parking lots, buildings, etc.) to create recycled aggregates. When recycling asphalt, materials from other sources - such as rubber from used tires, asphalt roofing shingles, and blast furnace slag – are routinely recycled into the pavement mix. This recycled aggregate is in high demand for a variety of applications. Recycling asphalt and concrete has additional benefits. Using recycled aggregates instead of mining new materials conserves the reserves of natural materials already known to be inadequate to meet the future demands of our growing population, helping to make mining into the future more sustainable. Using locally recycled material cuts down on transportation costs plus reduces the associated greenhouse gas emissions and wear and tear on roads.

 Burning Used Tires in Cement Kilns - Over 50 million used tires are consumed as fuel in cement kilns in the U.S. each year, keeping scrap tires out of landfills. Tire-Derived Fuels (TDF) offer an efficient energy alternative, producing the same amount of energy as oil and 25% more than coal. Between 10-20% of the energy needs of cement kilns can be met by TDFs. Examples include Lehigh’s Mountain Gate Quarry in Shasta County and Mitsubishi’s Cushenbury Mine in San Bernardino County.

Mining and Green Technologies:

Rare Earth Elements – It would be impossible to talk about green technologies without mentioning the vital role of rare earth elements (REEs) necessary in everything from CFL lightbulbs to hybrid cars and wind turbines. Molycorp’s Mountain Pass Mine is back in full production as America’s only rare earth mine, helping to supply a growing demand, which has tripled since 2000, and to reduce dependence on Chinese exports.
The Future:

**Green, Sustainable Mining** is gaining momentum worldwide. Canada and Finland already have Green Mining Initiatives in place. Australia has issued a 2011 report to guide their mineral industry toward a sustainable future called “Vision 2040 – Mining, Minerals, and Innovation”. Conferences have been held on this topic in Africa and Australia and India, and a book titled “Sustainable Mining Practices” was published in 2005. Here in California, “Green Mining Solutions” has been the topic of the Sierra Fund annual conferences in Nevada City for the past 2 years. One of the topics of discussion introduced there was the idea of a Green Mine Certification Program.

**A Green Mine Certification Program** - Certification provides a credible way for businesses to tell potential customers about their sustainability efforts and to gain a marketing advantage. Could California implement a third party “Green Mine” certification program, similar to programs already in place for organically grown produce, sustainably harvested timber and seafood products, fair trade coffee, eco-tourism, etc.? Could it be beneficial for the California mining industry?