

THE CULTURAL ADVENTURES OF SIERRA LEONE, MINING, AND BEYOND

BY:

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MINING ENGINEER

UNITED STATES FOREST SERVICE



BIOGRAPHY

- Born in Freetown, Sierra Leone
 - Came to United States at age 12
- Middle and High School education in Maryland, USA
- BSc. in Mining Engineering from Virginia Tech
 - Minor in Women's Studies Leadership
- Miss Sierra Leone USA 2012
- Miss Earth Maryland 2015



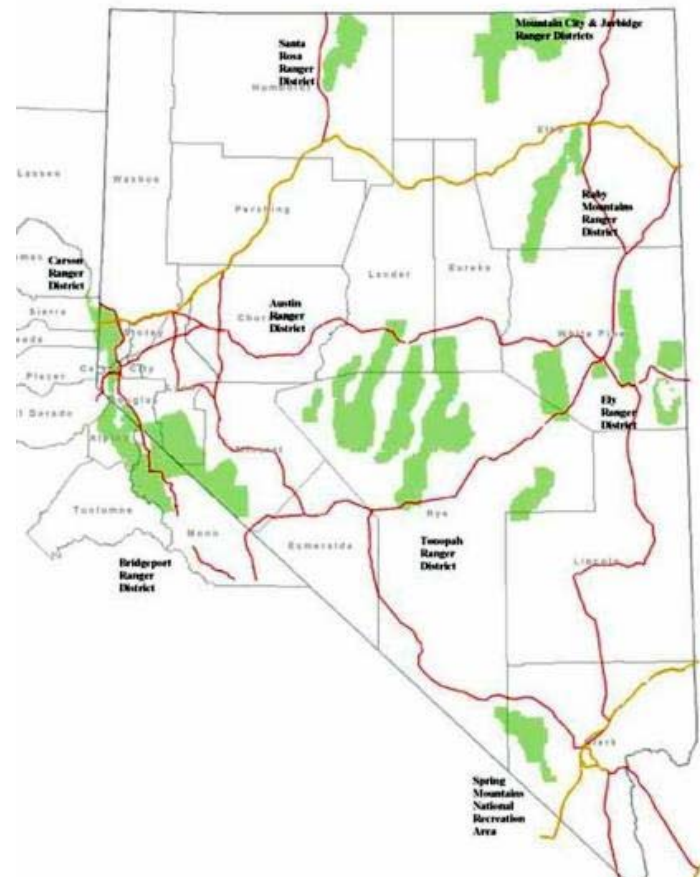
MISS EARTH MARYLAND 2015

- Personal Platform
 - Bridging The Gap: Miners and Environmentalists Must Work Together for Mother Earth!
- Fox 45 Morning News
<http://foxbaltimore.com/morning/miss-earth-maryland-2015>
- Winner of “Beauties for a Cause” award at national Miss Earth USA 2015 pageant



USDA FOREST SERVICE

- Caring for the Land and Serving People
- Hired under USFS recent graduate program
- Humboldt-Toiyabe National Forest
 - Largest national forest in the lower 48 states with 6.3 million acres
 - Duty station: Elko, Nevada



MINERALS AND GEOLOGY MANAGEMENT

- Manages energy and mineral resources into development, production, and reclamation
- Categories of minerals
 - Locatable: gold, silver, barite
 - Leasable: oil, gas, coal, geothermal
 - Mineral materials/salable: sand, gravel
- Abandoned mine lands
 - In 1995, USFS using Bureau of Mines data determined 38,991 total abandoned mine sites
 - 34%: arsenic, cadmium, copper, lead, mercury, and zinc
 - Human and environmental impacts
- Cave and karst resources
 - Over 2,200 caves on NFS lands
 - Protect and maintain biologic, geologic, mineralogical, paleontological, hydrologic, cultural, educational, scientific, and recreational values
- Groundwater
 - Responsibility to water resource on National Forests and Grasslands
 - Sustaining groundwater-dependent ecosystems to support biodiversity



PROJECTS

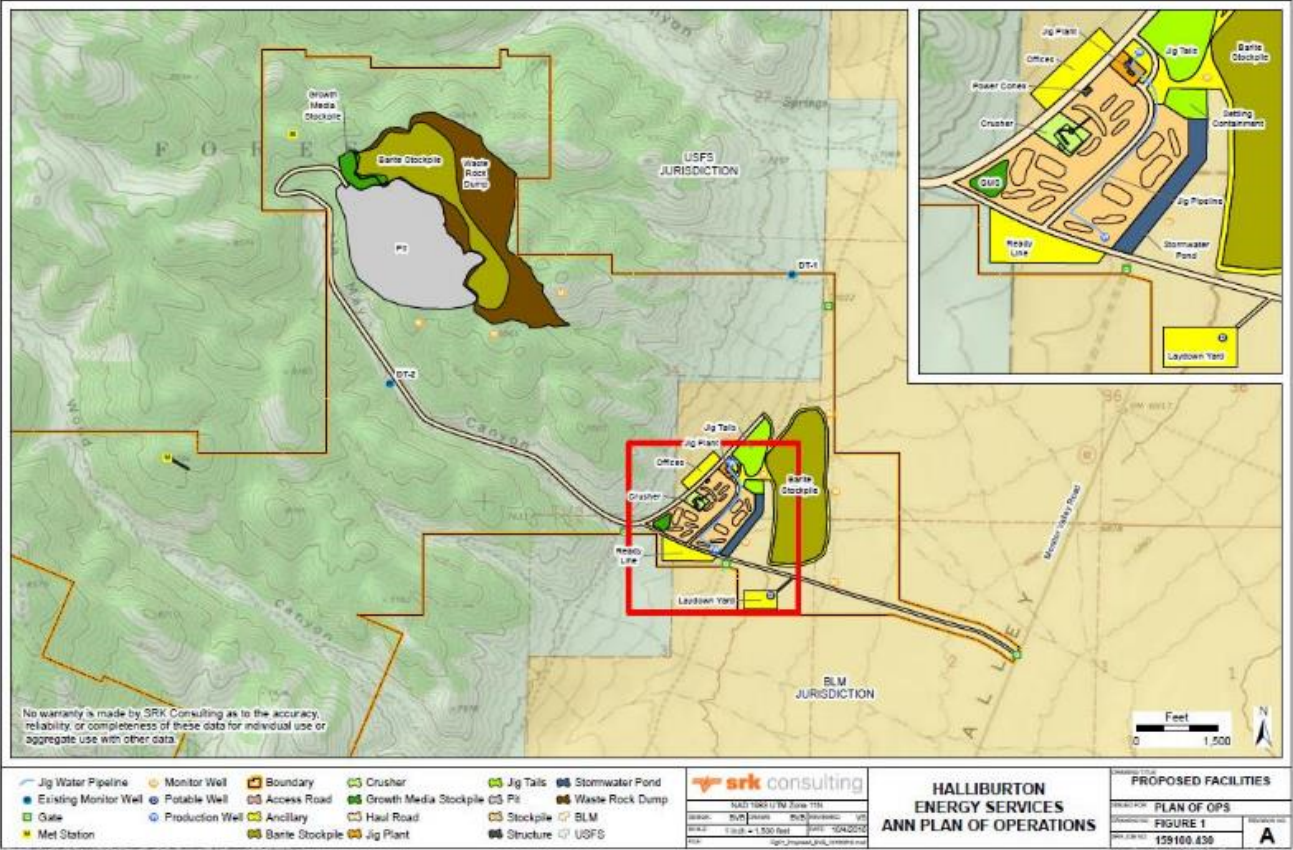
- Revegetation bond release for Jerritt Canyon mine, the largest gold mine in the U.S. on National Forest Service lands
- Big Springs gold mine
- Halliburton's Ann Barite mine
- Experience with locatable minerals, leasable minerals, and minerals materials
- Bond reviews for exploration projects and large mines in Nevada and Idaho



JERRITT CANYON GOLD MINE: SSX-STEER MINE AND EXPLORATION ROADS RECLAMATION

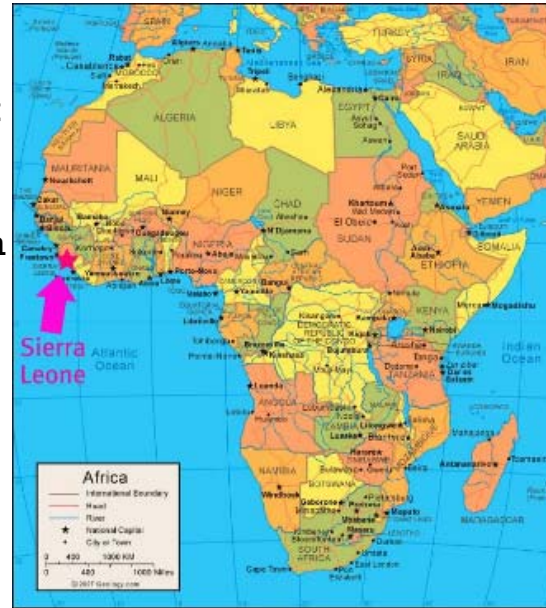


HALLIBURTON'S ANN BARITE MINE



SIERRA LEONE

- Democratic nation in West Africa
- Capital City: Freetown
- Situated on the Man Craton of the Southern West African Shield
- The Archean granitic shield contains elements of early sedimentary and mafic formations and a group of supracrustal greenstone belts with banded ironstone and detrital sediments
- Top 10 diamond-producing nation
- Other minerals
 - World's largest deposits of rutile
 - Bauxite, iron ore, gold
- Annual diamond production: \$250 million-\$300 million
- Kono District, Eastern Province
 - Koidu Town is the 4th largest city; ~275 miles from Freetown
 - Recent discovery of 706-carat diamond in Kono District



MISS SIERRA LEONE USA 2012



CROWN FOR A CAUSE

- Personal Platform
 - Advocate for recruitment and retention of girls/women in science, technology, engineering, and mathematics (STEM) fields in Sierra Leone and United States
- Blogging



KOIDU LIMITED

- Formerly Koidu Holdings S.A.
- Diamond mining project
 - Hard rock kimberlite operations
- Privately owned by BSG Resources Limited (BSGR) through its subsidiary OCTÉA Limited.
- 2 projects: Koidu Kimberlite Project (KKP) and Tonguma (Tongo) Project
 - Kimberlite clusters of pipes and dyke zones
- 25-year mining lease signed in 1995
 - 1,211 acres
 - 2 small kimberlite pipes
 - No. 1 Pipe ("K1"); No. 2 Pipe ("K2")
 - 4 kimberlite dyke zones
 - 4 small blows were discovered



WHAT IS KIMBERLITE?

- Type of igneous rock that sometimes contains diamond
- Named after the town of Kimberley in South Africa
 - Kimberlite was first recognized in the late 1800s as a primary source of diamond
- Relatively rare and occur in continental areas as small intrusions (dykes, sills and plugs) and as volcanic pipes
- Range in age from about 45 million to in excess of 2 billion years
- Depending on its mode of formation, kimberlites can be highly variable in appearance and mineral content
- Usually dark rocks that contain high concentrations of olivine and an unusual suite of minerals that are very important for their exploration and evaluation
- Commonly, diamonds are liberated from their original host rock and dispersed within the kimberlite
 - Sometimes occurs as inclusions contained within fragments of mantle rocks in the kimberlite

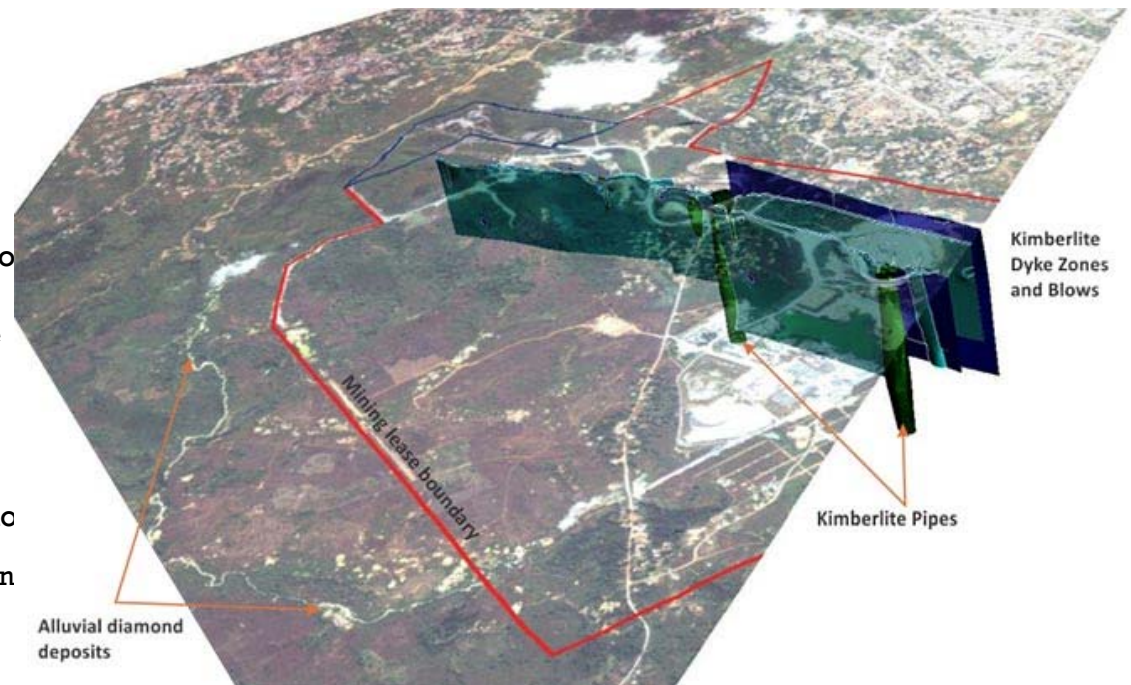


Photo: Koidu Limited



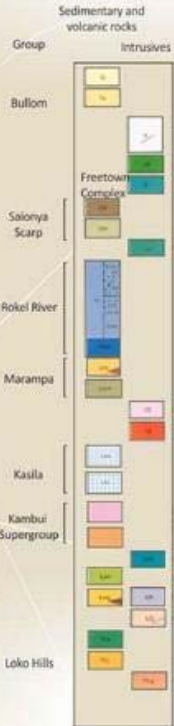


Geological Map of Sierra Leone

Showing the location of the Koidu Kimberlite Project

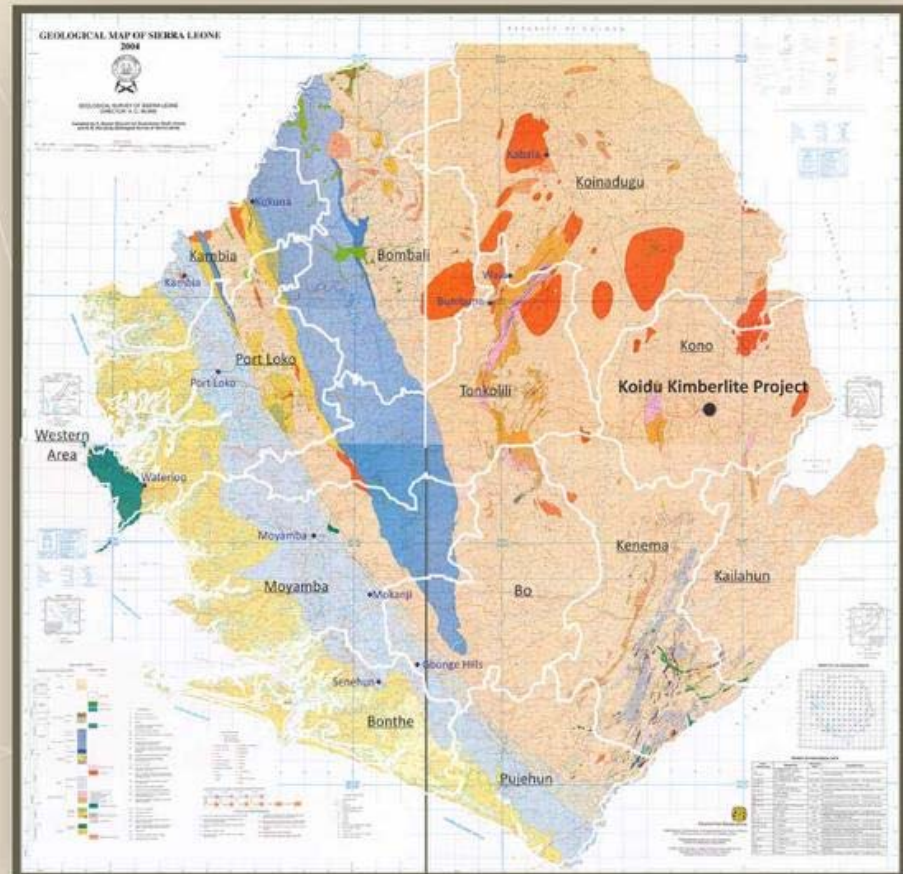


Stratigraphy



Legend

- Q Alluvium, beach sand etc.
- Tb Sand, Clay, lignite etc.
- K Kimberlite dyke
- Jd Dolerite dyke
- Jf Dunite gabbro, troctolite, olivine gabbro, leucogabbro, anorthosite
- Dw Laminated argillite with rhyolite
- Om Shale, arkosic sandstone, sandstone, conglomerate
- EB Basic intrusives
- Erm Variegated shale, laminated siltstone, orthoquartzite, arkose
- Ert Grey mudstone and shale, siltstone, laminated silty shale
- Erk Andesitic lava, splittic basalt, dacite, dacitic tuff
- Erte Purple and grey shale with interbedded quartzwacke bands
- Prtm Grey shale interbedded with quartzite, arkose, conglomerate
- Lmr Metasediments, haematite, quartzite and specularite schist, banded ironstone
- Lmm Massive and banded meta-andesite, ultrabasic lava, pillow lava
- Lb Bagbe Alkalic Complex - Nepheline Syenite, syenite, granite
- Lg Liberian Granite - Biotite granite, porphyroblastic granite, granitoid
- Lkm Quartzo-feldspathic gneiss, coarse amphibolite, garnetiferous gneiss lava
- Lkt Hypersthene gneiss with feldspathic bands, olivine-bearing metagabbro
- Kambui Supergroup - Greenstone belts (Sula Mountains, Kargaa Hills, Kambui Hills, Nimini Hills, Gori Hills)
- Lan Anorthosite metagabbro
- Lam Amphibolite coronite
- Lmg Mafic granulite, ferruginous quartzite, banded ironstone
- Lq Porphyroblastic banded gneiss, pyroxene augen gneiss, mylonite
- PLa Amphibolite
- PLi Amphibolite, quartzite, banded ironstone
- PLg Migmatitic gneiss and granitoid



Locations of Mining Leases held by Koidu Holdings

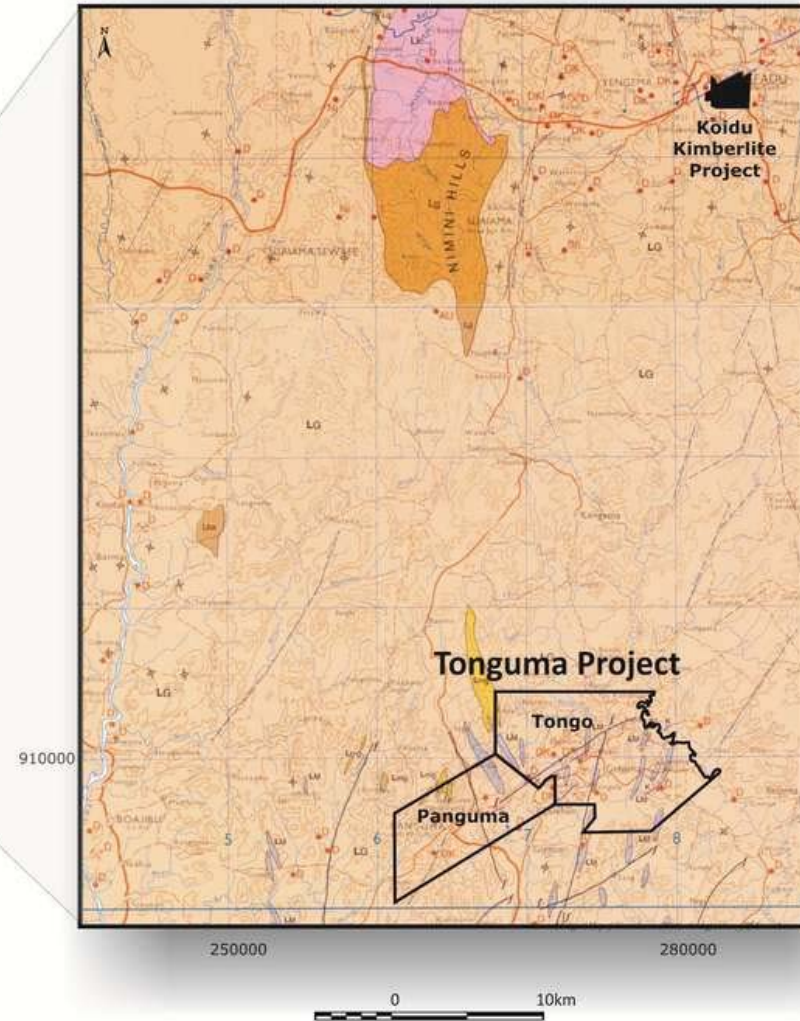
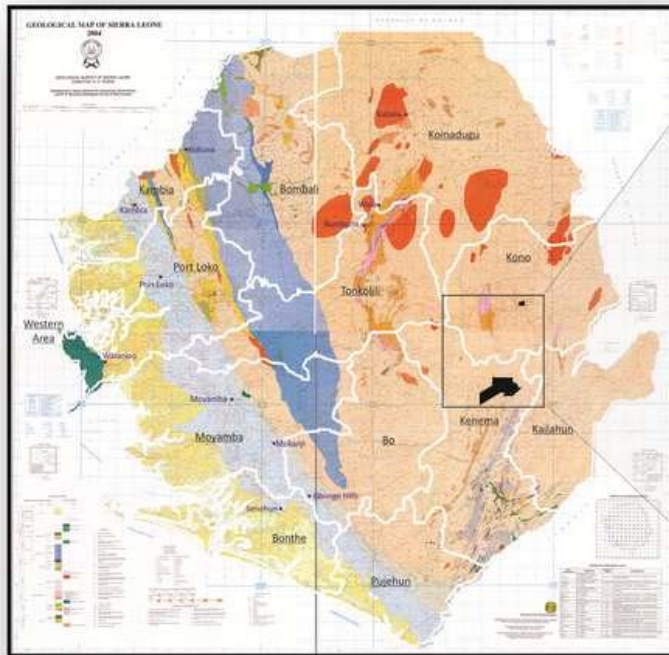


Photo: Koidu Limited



KOIDU LIMITED

- **Environmental and Social Impact Assessment (“ESIA”) completed by Digby Wells**
 - Identified certain areas that would be affected by the relatively small-scale operation envisaged at the time
 - Over the 7 years following the completion of the initial ESIA and commencement of the resettlement program, the mine experienced various difficulties in managing the impacts of the operation on these communities
 - Compounded by the need to accommodate a national road that passes between the 2 kimberlite pipes, while at the same time maintaining security, access control and a safe working environment in line with international norms for the diamond industry
- **EIA License issued by the Environment Protection Department prior to commencement of operations in 2003.**



THE INTERNSHIP

- 8-hour work day
- Mine planning and development meetings
- Worked in various departments
 - Surveying
 - Drilling and blasting (conducted blasts twice a week)
 - Load/haul
 - Dewatering
 - Community development
- Safety practices



THE INTERNSHIP

- 983 permanent employees
 - 91.4% are Sierra Leoneans
- Worked with several expatriate employees
- First woman to work in the mine on the site
- Poor road conditions



IN THE COMMUNITY

- Clinic visits
- Engaging with the Community
- Community leaders



IN THE COMMUNITY

- The People of Kono
- Food and Lifestyle
- Culture and Pastimes



QUESTIONS???

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