MOUNTAIN HIGH

Erosion control holds the slopes of the 2014 Winter Olympics in place

By Adam Dibble

For this erosion control and vegetative establishment project, it is not a stretch to say the world was watching.

A television audience of more than 3 billion from around the globe tuned in to the 2014 Winter Olympics in Sochi, Russia. In addition to skiers, biathletes and ski jumpers, viewers saw the finished results of the largest infrastructure project the world likely has ever seen.

The infrastructure work conducted throughout Sochi in the years prior to the Olympic torch reaching the city was estimated at $50 billion, including $1.5 billion for Olympic sport objects. The improvements to the Olympic site included a colossal erosion control and vegetative establishment project led by Russia-based ECTM Ltd. in fellowship with Profile Products. Profile, a Chicago-based manufacturer, consulted on the project to determine the specific solution that eventually shaped an area of mountainous terrain into the smooth, winding slopes that later allowed the world's best athletes to show off their skills to a global audience.

Project Challenges

From an erosion control and vegetation establishment standpoint, the soil and slopes in Sochi presented the hardest challenge for Profile Products, ECTM (the project's erosion control supervisor and supplier) and Rosengineering (the contractor).

"There were a lot of site-specific conditions in Sochi that created a lot of high-level risks to controlling erosion and establishing vegetation," said Steve Zwilling, market development manager for Profile Products. "Agronomic factors that would influence seed germination were in play, while the location and topography of the site itself was conducive to erosion risks. There were project management issues to navigate through, too."

The soil was poor in every way imaginable. It was rocky and compacted, with little organic value. Soil compaction led to poor water infiltration. Low cation exchange capacity and nutrient values resulted in unfavorable conditions for plant establishment. The underground water breaching cut slopes created additional risk of erosion in rainfall events. These conditions, combined with the steepness of the slopes, created accelerated sheet flows, so erosion was a major issue throughout the project.

The sheer magnitude of the project also made it difficult to manage. Specifications and schedules were revised often, which made it more challenging for the supplier and the contractor to meet deadlines.

High altitudes (3,000 to 7,000 ft) and alpine terrain ranked high on the list of the Sochi project's challenges. Getting water to the site and securing equipment was an endeavor, requiring skill and sometimes daring. Time constraints meant seeding needed to take place during both the wet winter months and the hottest, driest summer months to finish on schedule.

"It's never an ideal situation to attempt to establish vegetation in winter temperatures or summer months that lack precipitation," said Mikhail Teterin of ECTM. "But we only had a finite amount of time to complete the project, so we had to work year-round regardless of the season."

Seeding was carried out in the rain, snow, sun and fog. The altitude of the mountain range and vast distances of the

steep slopes meant a lot of hose work, often with a harness for the applicator to ensure safety. The distance from the staging area and a hydroseeder to the application area often required more than 1,300 ft of hose.

"For even the easiest erosion control and vegetation establishment projects, you need a lot of things to go in your favor," said Yelena Ponomaryova, market development manager for Profile Products. "While this project had hurdle after hurdle, we were fortunate to have a tailored solution specific to the Sochi site's challenges in place to overcome the obstacles."

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A Tailored Solution

Several site visits and soil tests helped determine the makeup of the solution, which ultimately comprised a combination of two soil amendments and two erosion control solutions.

The soil was amended at a rate of 40 lb per acre to address the low organic matter and encourage germination with a pair of biostimulants: JumpStart 5 and BioPrime. The two soil amendments are part of Profile's ProPlus Prescriptive Agronomic Formulations.

JumpStart 5 includes five active ingredients that work together to improve long-term plant establishment and resistance to stress. The end result is faster, more complete germination. The product increased water-holding capacity to reduce drought stress and improved root penetration on the Sochi site by breaking up compacted soil.

BioPrime is designed to address issues affecting long-term plant vitality. Its

proprietary formula, containing slow-release nitrogen, is ideally suited for the revegetation of bare soils like those found on Sochi's slopes.

When the soil conditions were addressed and made more conducive to plant survival, the next task was to protect the surface and the seeds until germination. Flexterra High Performance Flexible Growth Medium (HP-FGM) was chosen because of the project site's high erosion potential, slope length, and gradient and functional longevity needs, because the seeds would need protection for an extended period of time.

Flexterra HP-FGM offers 99% erosion control effectiveness, with a functional longevity of up to 18 months. Its matrix bonds directly to soil immediately upon application.

The erosion control project team paid special attention to seed selection. With extreme climate conditions and timing constraints in mind, the grass species were required to have versatile characteristics, such as drought resistance and shade tolerance, high rate of winter survival, quick germination, an extended root system and the ability to grow in extremely poor soils. The final seed mixture met the project requirements and delivered excellent results.

Many areas of the project required a different erosion control solution: areas of concentrated water flow, water diversion channels and extreme slopes. To ensure vegetation establishment in those areas, the GreenArmor System was installed. The system is a cost-effective green solution for protecting high-discharge waterways and extreme slopes. Where the slopes were unstable, the system was armored by rockfall protection (double-twisted steel mesh and percussion-driven earth anchors), creating one multilevel soil stabilization system.

The GreenArmor System combines the erosion control and functional longevity of Flexterra HP-FGM with the permanent reinforcement capabilities of a turf reinforcement mat (TRM). The TRM was installed on the slope and provided a lofty and open matrix, which then was hydraulically infilled with Flexterra HP-FGM to bond soil and seeds while accelerating growth.

Let the Games Begin

In all, 82 acres were covered with 19,000 bales of Flexterra HP-FGM at a rate of 4,000 lb per acre. Some of the area was covered twice to ensure the soil would hold and vegetation would take root along the slopes.

"When all was said and done, this was an absolutely incredible undertaking by all parties involved," said Pavel Greskov of ECTM. "From the research done ahead of time by ECTM and Profile Products to prescribe the best solution for the Sochi environment, to the distributor delivering the needed materials, to the contractor's ability to wrangle a large crew in extreme conditions and get the job done, it took a herculean effort to pull off what everyone should be proud of." SWS

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