Diving in a war zone

USACE oversees multi-national team complete Mosul Dam dive mission

By Rick Benoit
USACE, North Atlantic Division

Lake Dahuk, Ninawa Governorate, Iraq – Each day started as would any day at dive stations around the world; team arrived at job site, equipment and clearances were checked, safety meeting held, work began.

However, for the Drafinsub-Nautilus Joint Venture (DNJV) dive team working Mosul Dam, most days also included watching war planes, copters and drones buzz overhead, rockets being launched from nearby hills, hearing distant explosions and seeing billowing black smoke framing battles ragging between Iraqi-led forces and the Islamic State (ISIS) in nearby Mosul City.

"The daily reminder of war, the sights and sounds of nearby battles certainly grabbed our attention. We can see, smell and hear war just about every day," said Drafinsub Diving Project Manager Marco Vacchieri. "It's hard not to notice when you have helicopters flying near our dive station with their gunners test firing 50 caliber machine guns into the lake. There were a couple of times when we all hit the deck and ducked for cover."

Nearly coinciding with coalition military efforts to expel ISIS from this Kurdish-administered region of northern Iraq, planning for Drafinsub-Nautilus JV's mission at Mosul Dam began in December 2015. Underwater work, including sonar and video surveys started in September 2016; full-time diving was executed January thru July 2017, a time which paralleled the push by Iraqi and Kurdish forces to complete its purge of Islamic State fighters from nearby Mosul City.

During 19 months of planning and execution, the Mosul Dam Bottom Outlet Rehabilitation Project was a collaborative effort between four Italian-based international companies; Drafinsub of Genoa and its Venetian joint-venture partner Nautilus, Seli Overseas of Rome and prime contractor Trevi Group of Cesena. Additionally, contractors worked with the United States Army Corps of Engineers (USACE) who served as Project Engineer, as well as Mosul Dam stakeholders the Ministry of Water Resources (MWR), Ministry of Electricity (MOE) and Iraq's national government owner of the facility.

For all in-water operations, Mosul Dam Task Force utilized USACE lone personnel specially trained in saturation diving, deep diving and underwater construction inspection techniques; Todd Manny of Portland District and Rick Benoit of Transatlantic Division – Afghanistan, to provide both remote as well as on-site submittal review, diving, clearance / lock-out, tag-out, safety and quality assurance oversight.

“There were many kinds of challenging aspects to this job; one of the biggest challenges for me was the size of this project and working with so many different entities,” said Vacchieri, who holds degrees in Naval Architect, Marine Engineer and a Master’s in Nautical Engineering from University of Genova. “But most importantly, this project was being watched by three, if not four governments: Iraqi, Italian, American as well as the Kurds. And because of the urgency and critical need for repairs, it was like the whole world was watching our progress as we worked with a war going on around us.”

Drafinsub CEO Gianluca Passeri echoed the sentiments of his Diving Project Manager saying that a “special” aspect of the Mosul Dam Project has been the professionalism and positive relationships between contractors, project managers and government officials.

“For this mission I cannot say enough how well everyone worked together,” said Passeri, whose family-owned firm opened in 1977 as a small, shallow-water dive company. “It was due to the professionalism of Trevi, Seli, USACE and my team that made this mission’s success possible and allowed us to work safety in a very dangerous area such as Mosul.”

Mosul Dam, formally named Saddam Dam after Iraq’s disposed President Saddam Hussein is the largest dam in Iraq providing flood control for the upper Tigris River, irrigation and hydropower electricity. At a height of 371 feet and nearly two miles long, the earth and concrete facility includes a powerhouse with four Francis turbines and a five-gate spillway. The dam also serves as a constant reminder of the area’s violence and volatility showing battle scars from fire-fights between U.S. forces and Saddam Hussein’s expelled government as well as from combat between ISIS, Kurdish and Iraqi forces.

Now an international community of engineers, scientists and government officials believe the dam’s most critical battle is being fought as Iraq’s government with its consortium of nations and contractors battle to repair and save what’s often been called “the most dangerous dam in the world.”

Commissioned in 1986, geologically Mosul Dam sits on a karst foundation of soluble rocks such as limestone, dolomite, and gypsum. What concerns the international community most is that according to a 2007 U.S. government report, approximately 1.5 million people in the downriver cities of Mosul, Tikrit, Samarra and Baghdad would be imperiled if the dam failed. Additionally, according to that same U.S. report produced by USACE and the Special Inspector General for Iraqi Reconstruction (SIGIR), if the dam collapsed failure models predict that within hours of the breach, Mosul City could be swamped by up to 70 feet of water.

Although Iraqi efforts to stabilize the dam’s foundation had been ongoing since the 1980’s, several incidents including worker deaths, downstream sinkholes and seepage led Iraq’s government to concede international help was needed. In February 2016, Iraq signed a renewable 18-month contract with Trevi for a reported $296 million to keep its dam from collapsing.

Besides drilling and injecting grout to strengthen Mosul Dam's geologic foundation, Trevi's contract also called for an underwater inspection, repairs and rehabilitation of the facility's massive bottom outlet structure which houses two 2,500 feet long and 40 foot high by-pass tunnels, associated bulkheads, gates, mechanical and electronic controls as well as downstream plunge pool.

Drafinsub-Nautilus completed its assigned work on schedule while planned drilling and grouting efforts both atop the dam and within its gallery section are ongoing. USACE also executed additional work engaging the U.S. Army's 569th Engineering Dive Detachment of Ft. Eustis, VA during July and August 2017 to provide follow up underwater plunge pool and powerhouse inspections.

Along with an extensive mobilization and de-mobilization, the Drafinsub-Nautilus JV team was required to provide a multi-beam sonar profiles and remotely operated vehicle (ROV) video surveys of the dam's forebay as well as its downstream plunge pool, inspection and repair, removal and installation of four 40 x 20 foot, 70 ton bulkheads, installation of four 10-ton mooring blocks as well as location and positional buoy systems.

During operations, DNJB worked 12-hour days, seven days per week aboard the 110 x 90 foot flexi-float barge Adriano which also served as a platform for the team's saturation system Raffaella. Most diving in this northern Iraqi reservoir was accomplished using surface-supplied air with Kirby Morgan 37's. About 10 dives were executed utilizing a two-person diving bell when depths approached 200 feet. All dives, which took place in the shadow of Turkey's snowcapped Mardin Mountain Range, required high altitude adjustments.

The Drafinsub-Nautilus joint venture team, which rotated its dive team roster of 25 about every 45 days, included Christian and Muslim from Italy, Egypt, Romania, Turkey, Iraq, Kurdistan and the United States each speaking either their native language or English with various degrees of fluency. Adding to the mission's social complexity were the various dive and work regulations DNJV needed to follow including those of the U.S. Army Corps of Engineers (EM 385), International Marine Contractor's Association (IMCA), Royal Institution of Naval Architects (RINA) as well as Italian labor laws and applicable on-site contractor safe practice manuals.

However, unlike other jobs experienced by the crew, work was completed under the constant watch of nearly 500 Italian soldiers (Esercito Italiano) sitting behind 50 caliber machine guns mounted atop Iveco Defense Vehicles (IDV's). Briefly controlled by ISIS in July 2014, Mosul Dam is located in Iraqi's autonomous region of Kurdistan and also protected by AK-47-carrying Kurdish Peshmerger security forces.

Despite the challenges of living and working in a war zone, blending a multi-cultural team and operating according to sometimes unfamiliar regulations, the DNJV team executed its mission without accident or incident for 11 months accumulating 3,492 work hours supporting 328 dives and 293 hours of diving.

“This was the most challenging aspect of our job; maintaining personnel safety for all of our people,” said Passeri, whose 40-year old company specializes in deep-water and saturation diving for oil and gas companies. “This was also one of the more satisfying aspects of our job; the team’s excellence and professionalism allowing us to work in a very dangerous environment without any accidents.”

In addition to daily reminders of noise and sights produced by the bloody urban war being fought 30 miles south in Mosul City, dive team members also battled temperatures up to 120 degrees, poisonous vipers, insects and austere living conditions. Daily, dive team members passed through multiple sand-bagged check points guarded by Kurdish and Italian soldiers traveling four miles round-trip by bus between Lake Dahuk and their base camp where life was lived behind a ring of 20-foot high concrete T-walls below armed guard towers and strings of barbed wire.

And although there was no “official” opportunity to be “outside the wire” except when working, some members of the dive team clandestinely traveled into the barren, dust-choked hills surrounding Mosul Dam bringing food, water and children’s toys to displaced families and refugees escaping the fight in Mosul City.

“It all was extremely interesting work but humbling work in a very strange environment surrounded by war and soldiers with guns to protect us from ISIS. In the beginning, it was quite unsettling and uncomfortable,” said Vacchieri, a 33-year old father of three. “But, like anything else, after a while you get use to where you are. Most importantly, being here made going home to my family, to Genoa; which by the way is the most beautiful city in the world, very, very special.”

EDITOR’S NOTE: The author Mr. Rick Benoit, served as the United States Corps of Engineers Mosul Dam Task Force Dive Safety Officer in Iraq overseeing dive operations from November 2016 thru June 2017. A commercial diver, dive supervisor and instructor, Mr. Benoit, who has also deployed to Afghanistan with USACE, currently works for the Corps of Engineers North Atlantic Division.

-30-