COMPLICATIONS ASSOCIATED WITH MAINTAINING AUTHORIZED CHANNEL DIMENSIONS DURING LOW WATER PERIODS

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INTRODUCTION

The St. Louis District is responsible for maintaining a safe and dependable navigation channel on 300 miles of the Mississippi River between Saverton, Missouri and Cairo, Illinois. The southernmost 195 mile section of the Mississippi River in the St. Louis District, located between the confluences of the Missouri River and the Ohio River, is referred to as the Middle Mississippi River (MMR). The MMR is a vital artery in the inland navigation system and vital to the nation's safety and economy. There are two locations (Grand Tower, Illinois river miles 80-79 and Thebes, Illinois river miles 46-38) on the MMR where the river crosses a sedimentary rock outcrop. Previous attempts to remove portions of the rock outcrop were successful (as recent as the late 1980s); but, remnants of the rock outcrop still exist and pose a hazard to commercial river navigation at low river stages. These remnants are termed "pinnacles" due to their shape and size. The task of maintaining authorized channel dimension for commercial navigation on the MMR is a highly visible, politically sensitive, and extremely complex endeavor. While always a challenge, maintaining a safe and dependable navigation channel was made far more challenging during the summer, fall and winter of 2012 – 2103 due to extreme low water conditions on the MMR.

PROJECT DESCRIPTION

The drought of 2012 was equal to or exceeded any drought or low water period experienced on the MMR within the past five decades. Water levels in the MMR reached record lows, which posed a significant risk to commercial navigation traffic due to shallow channel crossings, reduced channel widths, and the rock pinnacles located along the channel bottom at Grand Tower and Thebes Illinois. The St. Louis District (MVS) was required to operate in an environment of competing demands for scarce water resources including; agriculture, recreation, environmental programs, energy production, and commercial navigation. MVS relied heavily upon diverse USACE core competencies and resources. Additionally, unique expertise was sought from other federal agencies (United States Coast Guard (USCG), United States Fish & Wildlife Service (USFWS), United States Department of Agriculture (USDA), Federal (Department of Transportation (DOT)) as this mission crossed organizational boundaries.

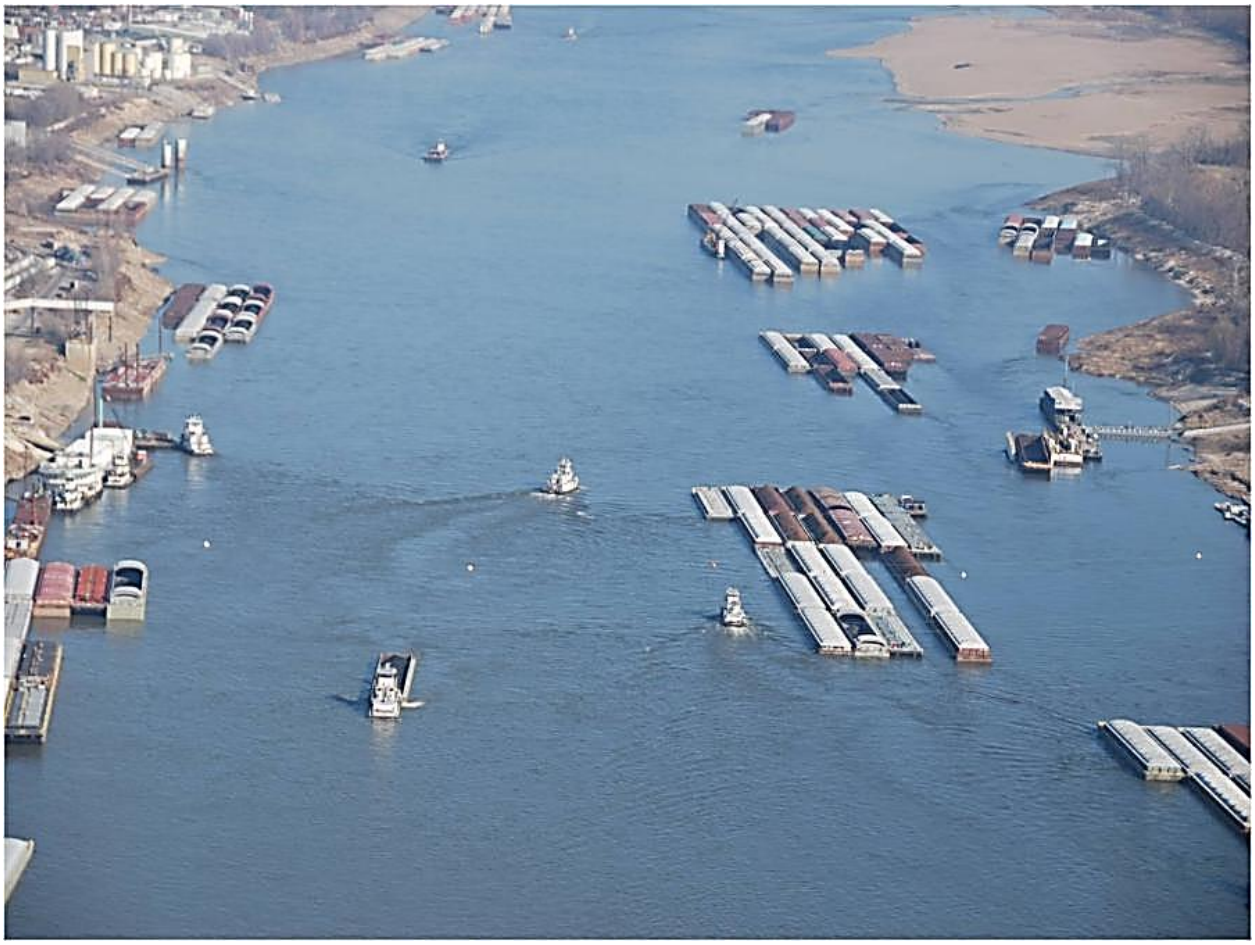

Figure 1: Low water conditions within St. Louis Harbor meant that space for fleeting is limited

The St. Louis District is responsible for planning and overseeing all aspects of providing a safe and dependable navigation channel at these record low river stages. This included (1) identifying critical specialties and disciplines required for the mission while balancing against competing demands; (2) determining and resourcing the needs of the team while maintaining cost, time, and quality assurance objectives; (3) extensive coordination with project stakeholders including (but not limited to) the River Industry Action Committee (RIAC), the River Industry Executive Task Force (RIETF), the United States Coast Guard (USCG), and the United States Fish and Wildlife Service (USFWS); (4) compliance with all relevant environmental regulations (National Environmental Policy Act (NEPA) and Fish and Wildlife Coordination Act (FWCA)); (5) managing pool and reservoir elevations; (6) forecasting river levels; (7) removing underwater rock pinnacles; (8) dredging shoals; (9) providing and utilizing a nearly continuous flow of channel and rock pinnacle surveys. Water management PDT members constantly collected water data, monitoring a number of hydrological and meteorological factors to forecast river conditions the rest of the Nation relied upon. Additionally, extensive coordination with the Kansas City District of the Northwest Division was a daily occurrence as the Missouri River releases were closely monitored. The complexity and significance of the rock removal component of the mission cannot be overstated. This work required integrated and coordinated management along with the application of innovative technology and tools / removal methodologies. Risks associated with barge tow collisions with rock pinnacles were high from a fiscal perspective as well as from an environmental perspective. Current and future river construction contract needs were adjusted in order to fund the rock removal project. River engineering projects were reprioritized to allow for detailed plans and specifications to be

produced to accommodate a tight project schedule. Removal of the pinnacles involved advanced surveying techniques coupled with innovative removal methodologies. Work locations within the rock removal areas were prioritized to get the most dangerous (highest elevation) rock removed first, with a secondary focus on providing optimal channel widths. The Project Management Plan (PMP) for the Regulating Works Project on the Middle Mississippi River includes a cost estimate, the project schedule, and all performance objectives and key assumptions. MVS was able to not only meet, but exceed the requirements outlined in the PMP through effective partnering and collaboration. During this low water event, due to the exhaustive efforts of MVS and partnering agencies, there were no accidents, groundings or unplanned closures of the Middle Mississippi River. This performance is unprecedented given that a similar drought in the late 1980's featured numerous groundings, accidents, channel closures, restrictions and a generally unreliable channel. With all eyes on the Middle Mississippi River – the White House, Congress, River Industry, and the US and international media – MVS efficiently and effectively coordinated all phases of the mission, exceeded expectations, and delivered what was promised.

Figure 2: A 20 barge tow transits upbound through the Thebes, Illinois rock removal reach

PROJECT RESULTS

Prior to the drought conditions reaching critical levels, MVS was carefully planning and preparing for strategic low water operations by identifying key problematic locations and putting into place the designs and resources to act when called upon. This foresight enabled the MVS to act quickly once critical levels were imminent and allowed USACE to provide authorized navigation channel dimensions during periods of extremely low water. The project consisted of maintaining the authorized channel dimensions in the Middle Mississippi River from St. Louis to Cairo, IL from July 2012 through February 2013 while monitoring 195 miles of river bed obstructions and moving river sediments that would have otherwise impeded navigation.

Highly specialized survey crews used the latest multi-beam technology to differentiate between sand and rock, enabling them to identify small but hazardous rock pinnacles in the navigation channel. As water levels continued to fall, the river bed material was transported and additional critical rock pinnacles were identified for removal. Expedited rock removal was required in several areas containing dense limestone to safely allow barge traffic to continue without groundings or accidents. This was accomplished using unique drilling and blasting as well as mechanical (hydro hammer) techniques. The minimum authorized channel dimensions were achieved in 30 days (approximately 30 days ahead of schedule) from award of the contracts with minimal channel closures that were coordinated with contractors, the USCG, and navigation industry. Contracts needs were adapted in order to fulfill the most critical low water needs as the drought progressed. The composition of the team responsible for the success of this project consists of many members including specialists such as engineers, technicians, project managers, construction and dredging specialists, skilled laborers, surveyors, GIS specialists, construction contractors, public affairs, barge industry representatives (port captains), towboat pilots, biologists, contracting officers, safety officers, meteorologists, and the U.S. Coast Guard. Several Corps elements throughout the U.S. provided team members in these fields. The contractual mechanisms and logistics plan were implemented as part of the strategic first step. Implementing an effective communication plan within MVS assisted project coordination and increased the efficiency of handling stakeholder concerns locally, regionally, and nationally. The effective and detailed project communication overall stakeholder collaboration nullified many coordination complexities. Dredge surveys and channel patrols surveys were posted to the district's website. Navigation channel status reports were sent out weekly. Rock pinnacle information (electronic chart overlays, surveys, rock locations, slides, etc.) were posted to a dedicated webpage. The successful completion of the Urgent and Compelling Rock Removal Project of 2012 has help restore America's faith in USACE and has established lifelong partnerships across Federal, State and Local agencies.

Figure 3: Mike Rodgers Project Manager for the Rock Removal Project departs survey vessels with Senator Durbin Representative Enyart and USACE Major General Peabody in Thebes, Illinois, January 7, 2013.

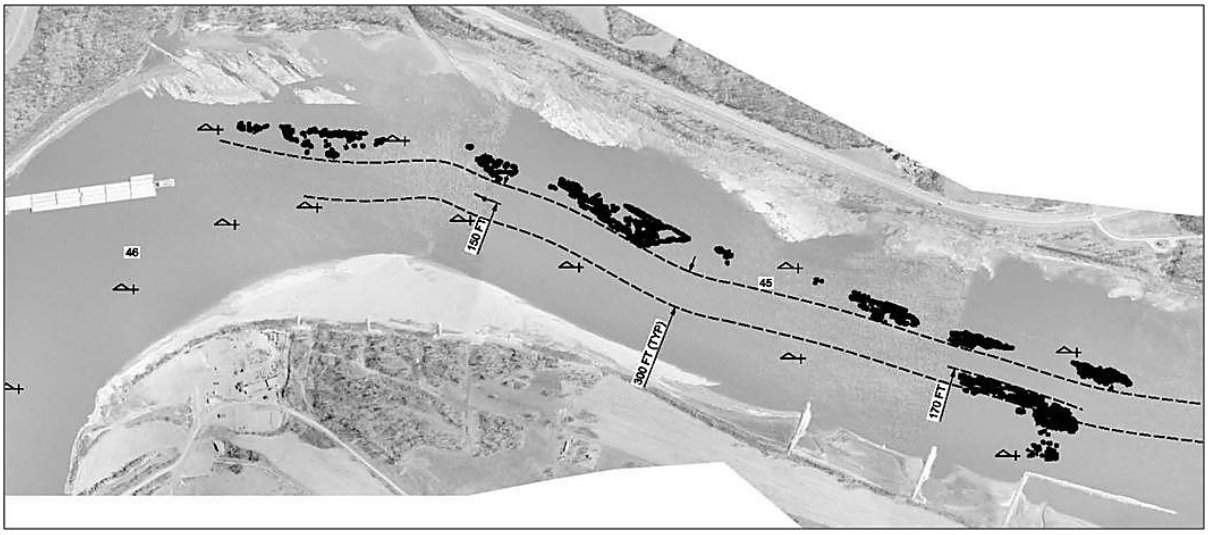

Figure 4: The plan view illustrates the pinnacle rock locations and how the encroach upon the 300' (hatch line) minimally authorized channel width from river miles 46 to 44 near Thebes, Illinois

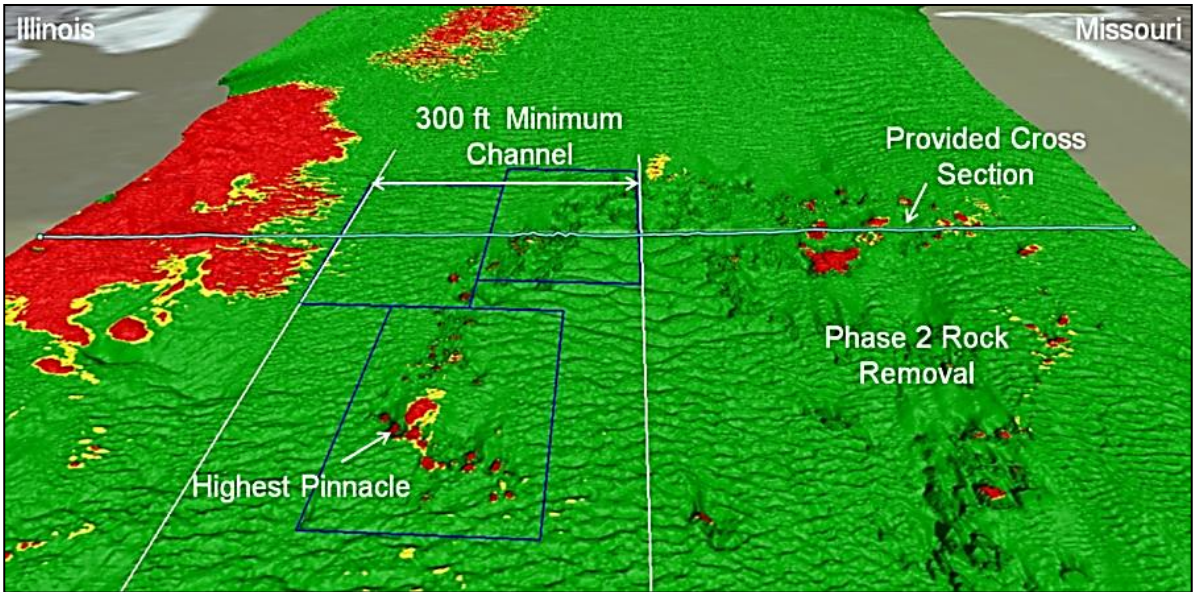

Figure 5: Prior to rock removal, a high density multi-beam survey of the river bed at Thebes (river mile 38.5) shows hazardous rock outcroppings (red) intermixed with large sandwaves (green)

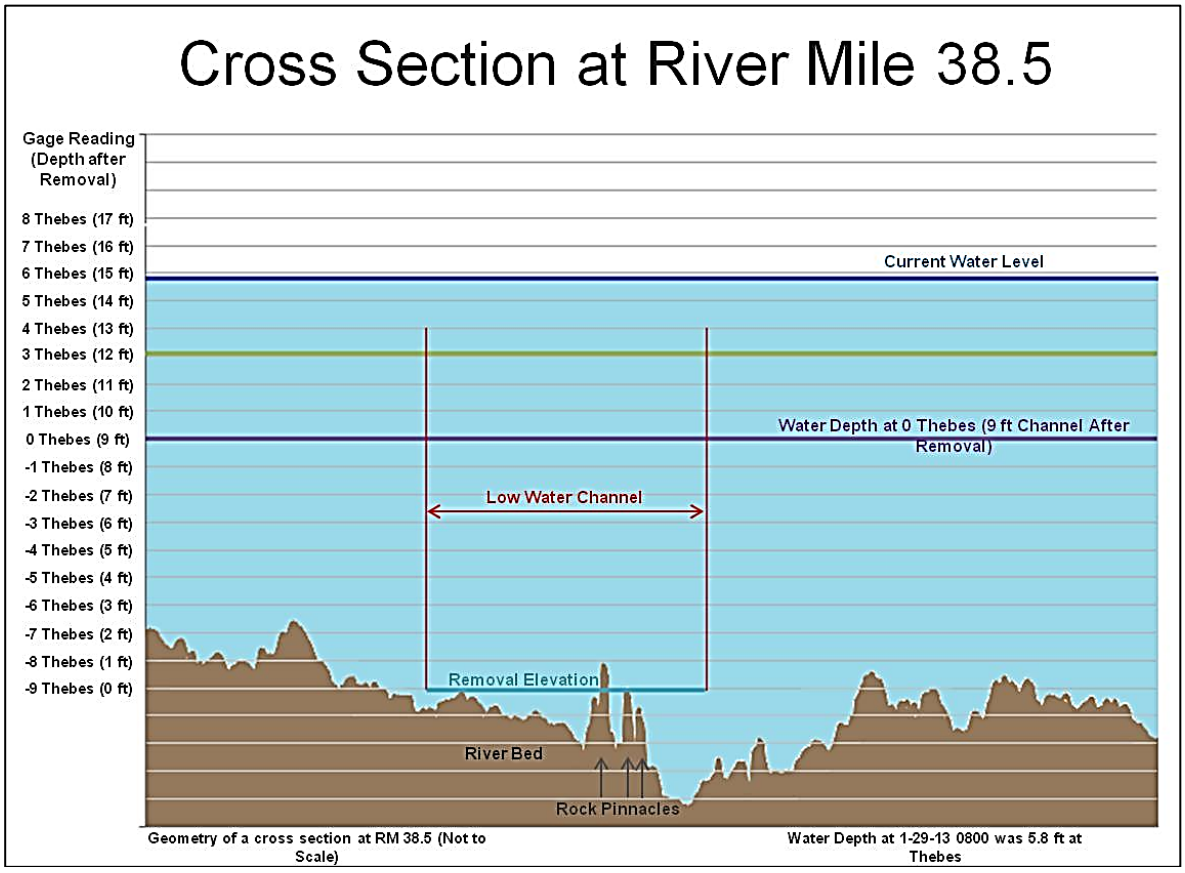

Figure 6: A cross section at river mile 38.5 identifies the low water channel and rock pinnacles needing to be removed

Figure 7: Rock was removed from the navigation channel using various means such as hydro-hammering excavating grappling and blasting