



McClellan-Kerr Arkansas River Navigation System (MKARNS) Mooring Modernization Project

*Rebuilding American Infrastructure with Sustainability and
Equity Discretionary Grant Application*

Applicant: Oklahoma Department of
Transportation (ODOT)

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**Supporting information can be found
at:**

<https://oklahoma.gov/odot/progress-and-performance/federal-grant-awards/raise-grants/mkarns-mooring-modernization-project-2022.html>

RAISE Request Amount: \$15,500,000 (75.6%)

Local Match: \$5,000,000 (24.4%)

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Table of Contents

1	Project Description.....	1
	Challenges & Opportunities.....	2
	Limited capacity at existing ports	3
	Safety risks during flooding events.....	3
	State of good repair	4
	Project Overview	4
	Funding Request	6
	Project Partners	6
2	Project Location.....	7
3	Grant Funds, Sources, and Uses.....	8
4	Merit criteria	9
	Safety	9
	Improved Safety Conditions	9
	Continue to Support Safe Movement of Freight.....	10
	Improved Worker Safety.....	11
	Existing Vandalism and Safety Concerns.....	11
	Environmental Sustainability.....	12
	Efficient Goods Movement with Reduced Emissions	12
	Flood Protection.....	13
	riverbank stability	13
	Clean Energy.....	14
	Mobility and Community Connectivity	14
	Supply Chain Improvements.....	14
	Oversized, Overweight Loads.....	15
	Quality of Life.....	15
	Jobs and Local Rural Vitality.....	15
	Improved transportation for individuals.....	16
	Racial equity	16
	Access to Clean Energy	17
	Efficient Movement of Goods with Reduced Costs.....	17
	Economic Competitiveness.....	17
	Regional Significance	18

Flood impacts on economy	19
Efficiencies in Doing Business	19
Local Economy	19
Forecasted Growth	20
State of Good Repair.....	21
Partnership and Collaboration.....	22
ODOT’s Commitment to Waterways	23
Innovation	24
Innovative technologies	24
Innovative Project Delivery	24
Innovative Financing	25
5 Environmental Risk Review	25
Project Schedule.....	25
Approvals.....	26
Technical Feasibility	26
Assessment of Project Risks and mitigation strategies	27
6 Benefit Cost Analysis	28
7 Appendices.....	29

LIST OF FIGURES

Figure 1: Oklahoma Ports	5
Figure 2: Primary Project Partners.....	6
Figure 3: Project Location	7
Figure 4: Installation on the shoreline vs. within the River	13
Figure 5: Port Partner Waterway Commerce – 2021	20
Figure 6: Project Schedule	25

LIST OF TABLES

Table 1: Project Funding.....	6
Table 2: Mooring Infrastructure Cost	8
Table 3: Project Cost.....	8
Table 4: Project Funding.....	8
Table 5: Project Partners	22
Table 6: Project Risks and Mitigation Strategies	27

1 PROJECT DESCRIPTION

The McClellan-Kerr Arkansas River Navigation System (MKARNS) plays a vital role to the regional, state, and national economy. It serves as the primary navigable waterway in the State of Oklahoma. The MKARNS waterway originates in northeastern Oklahoma and flows southeast to the Mississippi River. The **MKARNS Mooring Modernization Project** (the Project) will construct new mooring structures in the waterway that will **replace existing obsolete** anchors at the Tulsa Port of Catoosa, the Port of Muskogee and Oakley’s Terminal Muskogee (an extension of Oakley’s Port 33). **The modernized mooring infrastructure** will enable safe harbor for mariners, increase reliability of structures in the event of a flood, and ensure the Oklahoma segment of the MKARNS **can continue to support the over 22,000 full and part-time jobs it provides.**¹

The primary goal of the Project is to **implement reliable mooring infrastructure to ensure safe and efficient freight movement, protect Oklahoma’s roads and bridges, and promote long-term vitality of the waterway.**



Oklahoma's Marine Highway
MKARNS
M-40

The Project will replace existing barge tie-down structures that were not designed for the type of major flood events experienced in the region in recent years. It will enhance harbor safety by greatly reducing the risk of a barge becoming loose, which could result in damage to infrastructure in the waterway. These new mooring structures will also prepare ports for the forecasted increases in freight demand through the MKARNS segment in Oklahoma.

New mooring infrastructure will be an investment in long-term strength, security, and resiliency and will allow Oklahoma to continue as a major contributor to the U.S. and global markets. The MKARNS waterway links Oklahoma to a 12-state service area with various domestic ports along the U.S. inland waterways system and connects to foreign ports by way of New Orleans and the Gulf Intracoastal Waterway.

Freight movement by waterway in Oklahoma is forecasted to grow by 35 percent through 2045 and reach 8.5 million tons in 2045.¹

In 2021, Oklahoma’s waterborne commerce on the MKARNS totaled 4.9 million tons with a value of \$2.3 billion dollars. In addition, more than 10.6 million tons traversed the entire MKARNS waterway with **a value of more than \$3.6 billion dollars.** It is important to note that shipping cargo by water is the most energy efficient and the most economically competitive form of freight transportation.²

The Port of Muskogee, Tulsa Port of Catoosa, and Oakley’s Port 33 combined 3,100 acres of industrial park **employ nearly 9,000 workers** and **serve 86 percent of the tonnage** inland of Webbers Falls Lock and Dam on the MKARNS Oklahoma segment.³

¹ [Oklahoma Transportation 2021 Annual Report](#)

² [MKARNS 2022 Inland Waterway Fact Sheet](#)

³ Tonnage information was informed by each port location associated with this Project.

The improvements to be provided at Oakley’s Terminal Muskogee directly support the tonnage processed by Oakley’s Port 33, as they are both owned and operated by Bruce Oakley, Incorporated.⁴ The Port of Muskogee, Tulsa Port of Catoosa, Oakley’s Terminal Muskogee, and Oakley’s Port 33 are important economic engines for the State of Oklahoma, making them key components of the regional and national freight transportation system. The Project will invest in necessary mooring technologies to preserve the waterway’s economic vitality and prepare for future freight traffic demand within the larger U.S. economy. Since the official opening of the MKARNS in 1971, the Port Authorities and State of Oklahoma have made strategic infrastructure investments to maintain ports and channel infrastructure in a state of good repair, promote the development of jobs, and improve transportation land access to ports.



The Infrastructure Investment and Jobs Act (IIJA) of 2021 designated a portion of US-412 in Arkansas and Oklahoma as a future interstate on the National Highway System. US-412 directly serves the Tulsa Port of Catoosa and Oakley’s Port 33 on the MKARNS. This designation will help attract new businesses, improve safety, enhance freight mobility, and better connect rural and urban communities.⁵ Furthermore, the Army Corps of Engineers released their plans to utilize funding from the IIJA to deepen the MKARNS channel from 9 feet to 12 feet. A deeper channel will allow for increased barge capacity up to 400 tons per barge. Additionally, the Port of Inola, located on the Oklahoma segment of the MKARNS, just recently completed the Sofidel America Manufacturing facility, a \$360 million dollar investment employing over 400 people with direct access to barge transportation.⁶

Infrastructure investments like the US-412 interstate designation, the deepening of the MKARNS channel, the Port of Inola manufacturing facility, and the MKARNS Mooring Modernization Project, will help continue to protect and support the growth of the MKARNS waterway system in Oklahoma.

CHALLENGES & OPPORTUNITIES

The Oklahoma Department of Transportation (ODOT) and the Port Partners all agree that this project is a top priority for the MKARNS Oklahoma Segment. The Project will:

- Provide mooring replacement structures that will better support forecasted freight demands;
- Reduce safety risks by replacing obsolete anchorage systems;
- Reduce fuel consumption and carbon emissions;
- Protect Oklahoma’s infrastructure and economy during flooding events; and
- Better maintain a state of good repair in the waterway by minimizing operations and maintenance costs.

⁴ [Bruce Oakley, Incorporated](#)

⁵ [U.S. 412 Interstate Designation \(2021\)](#)

⁶ [Tulsa Port of Inola](#)



LIMITED CAPACITY AT EXISTING PORTS

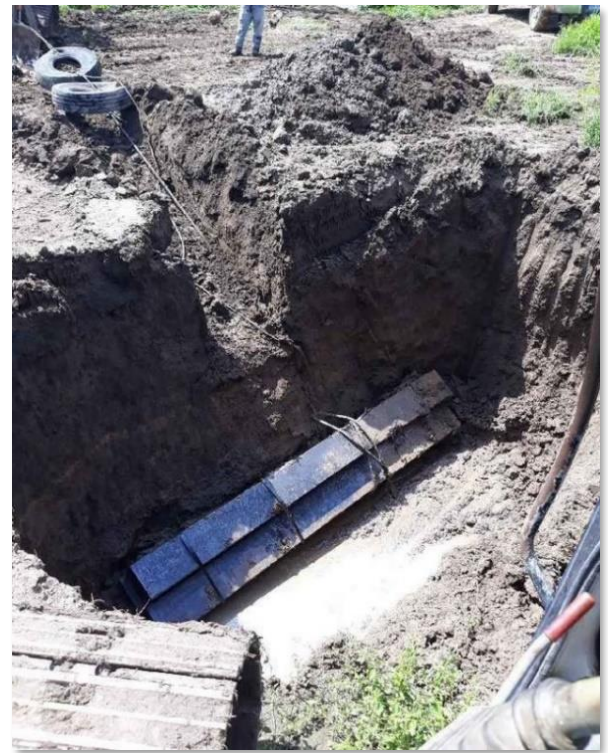
The Project will replace existing obsolete anchors at the Tulsa Port of Catoosa, Port of Muskogee, and Oakley’s Terminal Muskogee, which will provide safer and more reliable structures to tie down barges. Existing anchorage structures at these port terminals are limited and cannot support the incoming growth of barges and vessels that move freight. Because capacity is limited, some vessels today are deadman⁷ anchored along the banks of the waterway creating congestion. The Tulsa and Little Rock Districts of the Army Corps of Engineers have identified a Critical backlog of maintenance needs on the MKARNS. Any one of these anchors has a 50 percent probability of failure within the next 5 years, and a failure of any sort will affect or shut down the entire MKARNS.⁸



June 2021: Mooring Infrastructure – Tulsa Port of Catoosa

SAFETY RISKS DURING FLOODING EVENTS

Historic flooding in 2019 was devastating for ports and industries along the MKARNS segment of Oklahoma and Arkansas. Prior to 2019, all events were compared to the 1986 flood on the MKARNS which yielded water flows of 375,000 cubic feet per second (cfs), a standard measurement of the volumetric flow rate of water. However, the 2019 flood flows **nearly doubled the 1986 flood reaching flows more than 675,000 cfs**, which led to infrastructure damage.⁹ The Federal Emergency and Management Agency (FEMA) declared the flood event as a disaster on May 25, 2019.¹⁰



Deadman anchor at Oakley’s Terminal Muskogee

The current anchorage system has not changed since the inception of the ports 50 years ago and the existing structures were not designed for major flood events that will potentially increase in severity and frequency due to climate change.¹¹

During the barrage of floodwater flow in 2019, two barges broke loose and floated downstream, striking a dam structure before they sank. While the dam structure properly maintained its integrity, the barges

⁷ An object, such as an anchor, piling, or concrete block, buried on shore that contains a tie to secure barges.

⁸ [The McClellan-Kerr Navigation System is in Danger](#)

⁹ [National Waterways Conference \(2019\) - Page 8](#)

¹⁰ [FEMA Disaster Declaration](#)

¹¹ [Peak Streamflow and Stages at Selected Stream Stages on the Arkansas River in Oklahoma \(2019\)](#)

were tied down to obsolete anchoring structures which poses a risk to waterway infrastructure such as dams and bridges during flooding events. Subsequently, the MKARNS system was closed for 2.5 months because of high water flooding, unsafe water flows and dredging needs. Once the water flow normalized, the system remained closed for an additional 1.5 months while the excavation and salvage of the barges occurred.¹² The flood event resulted in an immense time delay for the system and highlighted the need for new infrastructure able to withstand future flood events.

In 2002, a barge struck an I-40 bridge pier, causing the bridge to collapse and resulted in **14 deaths, 11 injuries,¹³ and \$27 million dollars in bridge reconstruction costs.¹⁴** While this situation did not arise from failed anchoring, loose barges during flooding events can result in catastrophic events such as this. Investments in mooring construction will provide a safe and reliable tie down method that is designed to accommodate extreme conditions during significant flooding events. Proper tie down infrastructure will prepare the MKARNS in Oklahoma to handle potential future flooding events and to support continuous growth on the “marine highway”.

STATE OF GOOD REPAIR

While the MKARNS currently offers strong performance and high reliability, it faces a significant maintenance backlog. The Army Corps of Engineers lacks a sufficient budget to maintain the infrastructure of the inland waterway system. The current cost of the **Critical backlog of maintenance needs on the MKARNS alone is now approaching \$160.4 million dollars on the Oklahoma segment.** Modernized mooring structures provided by the Project will reduce and **nearly eliminate the ongoing operating and maintenance costs** of existing structures at the associated Port locations.

¹² Cleaning process that takes place to remove debris, mud, weeds or other materials from the riverbed.

¹³ I-40 Bridge Disaster

¹⁴ I-40 Bridge Expenses Exceed Original Estimate



PROJECT OVERVIEW

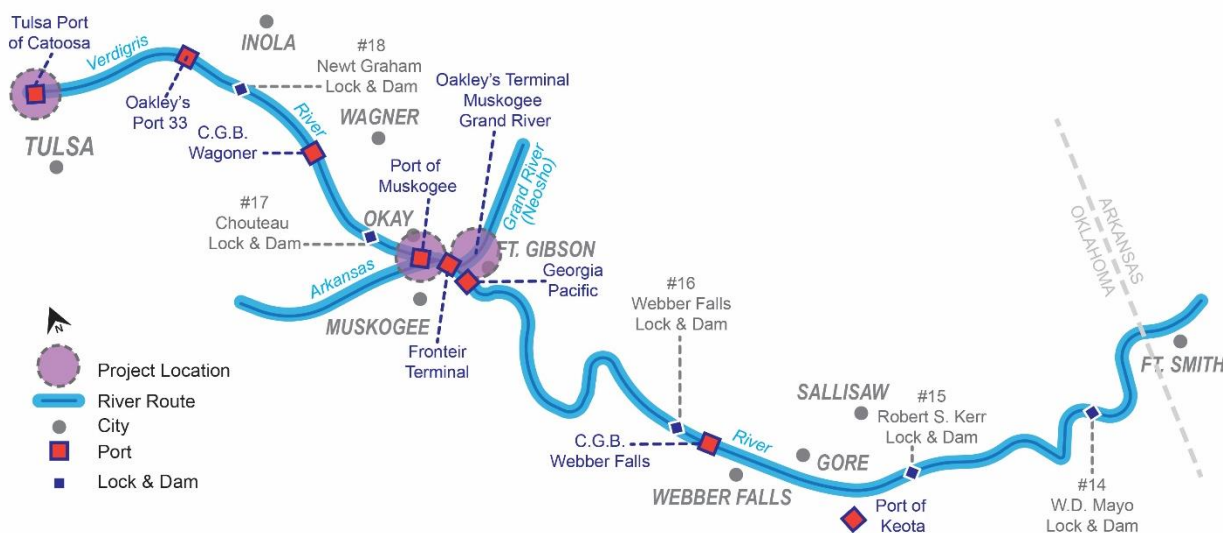
Requested RAISE funding will be used to construct modernized mooring structures at three locations: the Tulsa Port of Catoosa, the Port of Muskogee, and Oakley’s Terminal Muskogee. Oakley’s Terminal Muskogee is strategically located at the confluence of the Arkansas, Grand, and Verdigris Rivers in the Port of Muskogee. Oakley’s Terminal Muskogee is an extension of Oakley’s Port 33, located upstream just south of the Port of Catoosa. The existing anchoring structures at the three locations vary between deadman anchors and dolphin moorings. Deadman anchors (located at Oakley’s Terminal Muskogee in the Grand River) consist of lines connected to buried timbers or bridge beams which are installed on dry land and buried to make use of earth pressure to resist pull forces. Dolphin moorings in the waterway today (located at the Tulsa Port of Catoosa and Port of Muskogee) consist of a combination of vertical and horizontal “batter” wood piles.

The Project includes the following improvements:

- Tulsa Port of Catoosa – The Project will remove and replace 6 dolphin structures with new mooring structures with associated gangway¹⁵ and platforms.
- Port of Muskogee – The Project will remove and replace 20 dolphin structures with new mooring structures with associated gangway and platforms.
- Oakley’s Terminal Muskogee – The Project will remove and replace 6 deadman anchors with new mooring structures with associated gangway and platforms.

Figure 1 below highlights the three Project locations.

FIGURE 1: OKLAHOMA PORTS



¹⁵ Merriam-Webster defines a gangway as a passageway or walkway.

FUNDING REQUEST

The RAISE grant funding request for the Project is \$15.5 million dollars. Because the MKARNS is a unique and economically vital commercial transportation corridor in Oklahoma, ODOT is committed to leverage \$5 million dollars in additional funding (a 24.4 percent local match) for this Project. Because this Project is not in the ODOT 8-year work plan and does not have a dedicated revenue source outside of the \$5 million-dollar commitment, the Project cannot be completed in its entirety without the additional \$15.5 million dollar RAISE funding. The funds will enable the construction of 32 modernized mooring structures with associated gangway and platforms, including 6 at the Tulsa Port of Catoosa, 20 at the Port of Muskogee, and 6 at Oakley’s Terminal Muskogee.

TABLE 1: PROJECT FUNDING

Funding Source	\$ Amount (%)
ODOT	\$5,000,000 (24.4%)
U.S. DOT RAISE	\$15,500,000 (75.6%)
Total Project Cost	\$20,500,000 (100%)

There have been approximately \$1.4 million dollars in previously incurred costs for this project as of 2022. These costs were used for the ODOT contract with CONSOR, a construction engineering company, who developed the infrastructure cost estimate for this Project as well as costs associated with environmental analysis (EA). The RAISE funding request of \$15.5 million dollars would be strictly allocated for construction of the Project.

PROJECT PARTNERS

The Project boasts numerous supporters including State and Federal Congressional delegation, industry representatives, local business owners, tribal leaders, and other stakeholders. These partners understand the importance of leveraging the “marine highway” as a solution to the congested National Highway Freight Network (NHFN) corridors. Project supporters understand the importance of the Project to the long-term vitality of the MKARNS.

A snapshot of Project partners is shown below in Figure 2 and a complete list of project supporters is provided in the Partnership section of the application.

FIGURE 2: PRIMARY PROJECT PARTNERS

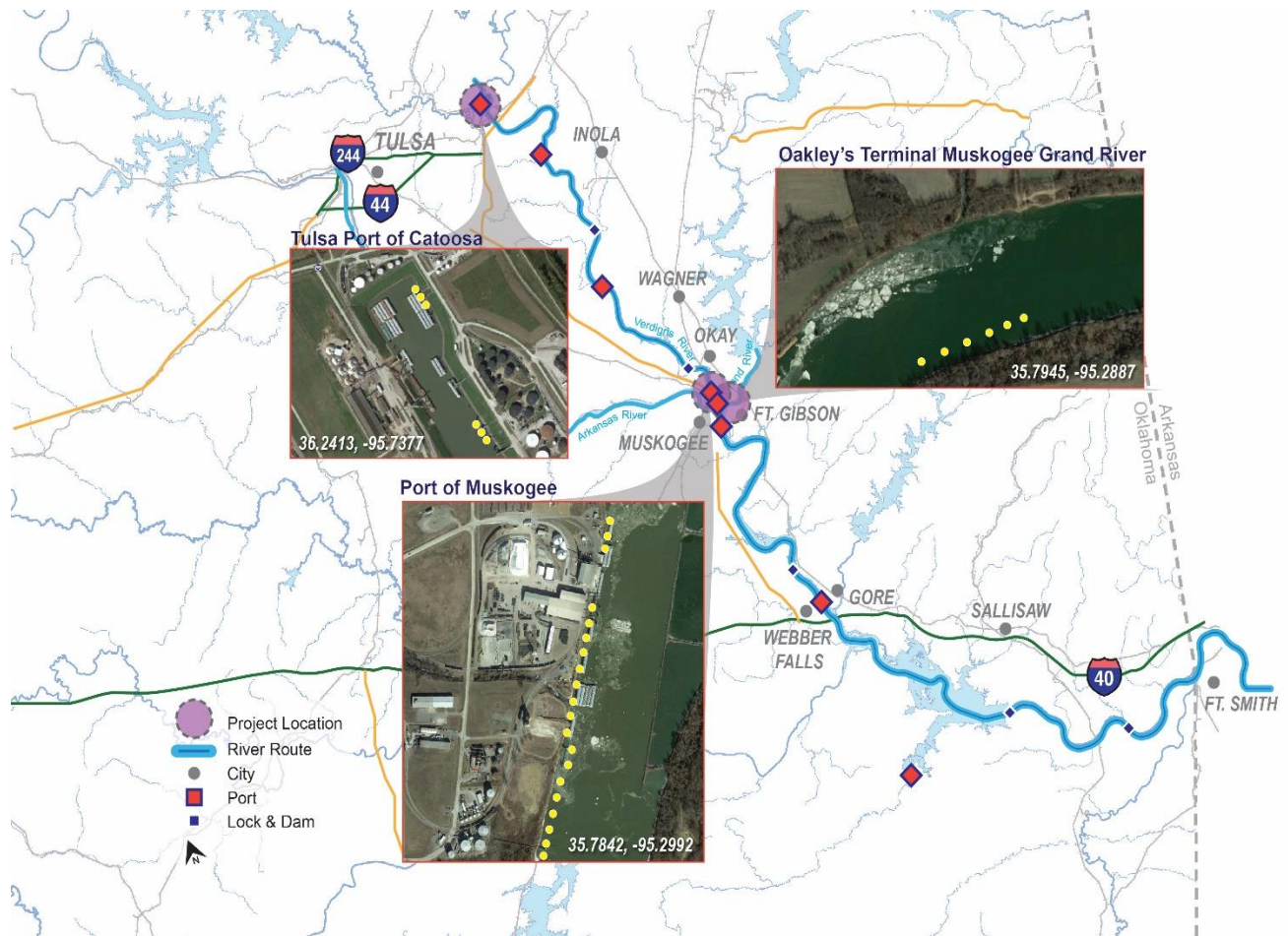


2 PROJECT LOCATION

The MKARNS is 445-mile-long marine highway which consists of the Verdigris, Arkansas, and White Rivers. The MKARNS serves a 12-state region and is the most westerly inland ice-free waterway system in the Country. As such, the waterway provides access to port terminals to transfer freight from barge to either rail or truck. The MKARNS is synonymous with the Arkansas River in Oklahoma from the Port of Muskogee downstream to the State of Arkansas border. Upstream from the Port of Muskogee, MKARNS leaves the Arkansas River to join the Verdigris River and terminates at Tulsa Port of Catoosa.

The Project will construct 32 mooring structures at the Tulsa Port of Catoosa, Port of Muskogee and at Oakley’s Terminal Muskogee, all of which are located in Northeast Oklahoma’s 2nd Congressional District. These three locations include the two largest public ports (Tulsa Port of Catoosa and Port of Muskogee), and Oakley’s Terminal Muskogee is an extension of the largest private port (Oakley’s Port 33) along the MKARNS waterway in Oklahoma. The specific geospatial coordinates of proposed mooring structures are provided in Figure 3 below.

FIGURE 3: PROJECT LOCATION



The three port locations that will benefit from this Project are all considered rural.¹⁶ The Port of Muskogee (Muskogee County, Tract 4) is designated as an Area of Persistent Poverty (APP) and a Historically Disadvantaged Community (HDC). Oakley’s Terminal Muskogee (Muskogee County, Tract 14) and the Port of Catoosa (Rogers County, Census Tract 504.08) are both categorized as Historically Disadvantaged Communities (HDC).¹⁷

3 GRANT FUNDS, SOURCES, AND USES

The cost of the project is \$20.5 million dollars. ODOT is committed to leverage federal dollars with local investment. Table 2 shows a complete cost breakdown for each mooring structure and Table 3 shows the total project budget including mobilization and de-mobilization. All obligated RAISE funds would be used for project construction and construction contingency. Table 4 provides a breakdown of sources and uses of funds for each project component. In total, ODOT requests \$15.5 million dollars in RAISE funding, 75.6 percent of total project costs. ODOT’s 24.4 percent local match will be dedicated from annual state appropriations.

TABLE 2: MOORING INFRASTRUCTURE COST

Item	Quantity	Unit Cost	Total
5 ft Diameter Monopile	80 FT	\$3,765	\$301,200
Pile Tremie Concrete Cubic Yards	55 CY	\$500	\$27,500
Grout and Misc. Outfitting	Lump Sum	\$70,000	\$70,000
Rock Anchors / Rock Socket	Lump Sum	\$32,250	\$32,250
Sub Total			\$430,950
30% Construction Contingency			\$130,000
Total Cost Per Structure			\$560,950

TABLE 3: PROJECT COST

Item	Quantity	Unit Cost	Total
Mooring Structures	32 structures	\$560,950	\$17,950,400
Mobilization and De-mobilization	Lump Sum	\$1,912,600	\$1,912,600
Demolition	26 structures	\$24,500	\$637,000
Total Cost Per Structure			\$20,500,000

TABLE 4: PROJECT FUNDING

Funding Source	\$ Amount (%)
ODOT	\$5,000,000 (24.4%)
U.S. DOT RAISE	\$15,500,000 (75.6%)
Total Project Cost	\$20,500,000 (100%)

¹⁶ Federal Register Notice of Funding – Page 16

¹⁷ Areas of Persistent Poverty and Historically Disadvantaged Community Status Tool

4 MERIT CRITERIA

SAFETY

IMPROVED SAFETY CONDITIONS

The MKARNS opened as an official navigable waterway over 50 years ago. Ports constructed around this time included mooring technology that is now outdated and in need of significant upgrades to remain operational. The Project will replace existing obsolete anchorage structures and enhance harbor safety by greatly reducing risk during extreme weather conditions.

Existing infrastructure was unable to safely anchor barges during the recent Oklahoma flood event in 2019. This event was devastating for ports and industries along the MKARNS segment of Oklahoma and Arkansas. The waterway reached river stages, elevations, and flows never previously experienced during the lifetime of the MKARNS, with flows reaching more than 675,000 cubic feet per second (cfs). Under normal conditions at the Port of Muskogee, flows average 8,000 cfs.¹⁸ The existing anchorage system, unchanged since its inception in the early 1970s, is not designed to support these recently experienced flows or water elevations.

During the barrage of floodwater flow in 2019, two barges broke loose from the Port of Muskogee and floated downstream. After catching the barges and re-securing the vessels to trees along the soggy riverbank, they broke free again and struck a dam structure at the Webbers Falls Lock and Dam before they sank. The waterway was closed for 104 days to recover these barges and provide waterway repairs. Fortunately, the dam maintained its integrity, but obsolete anchoring structures pose a risk to waterway infrastructure. Hundreds of barges were at-risk during this flood event because the deadman anchors and other fixed mooring structures were up to ten feet below the water's surface.

In total, the damages to the dam structure cost more than \$310,000 in repairs, however, the damage could have been much worse. In 2002, the Oklahoma community experienced more extensive damage to infrastructure and devastating safety risks when a barge struck an I-40 bridge pier. While this situation did not arise from failed anchoring, it illustrates the potential devastating effects that may result from failed mooring structures. In total, this event resulted in 14 deaths, 11 injuries, \$24 million dollars in bridge reconstruction, a 64-day closure of the waterway, and major impacts on freight commerce and travel.¹⁹



May 2019 flooding near Muskogee
Source: Tulsa World



MKARNS dam near Webbers Falls
Source: The Waterways Journal

¹⁸ [National Waterways Conference \(2019\) - Page 8](#)

¹⁹ [I-40 Bridge Collapse Kills 14](#)

The existing structures were not designed to withstand flood flows yielded by the 2019 flood event. Existing conditions create potential safety risks if no alternative tie-down solutions are constructed. Currently, there is risk for future collisions with infrastructure, flood damage to port infrastructure, and potential loss of product to market. Because much of the bulk commodity transported along the MKARNS system includes chemical fertilizer, there is also a risk of environmental hazards to the waterway system, water supply, and to fish and other wildlife inhabiting these rivers.



Port of Muskogee in normal conditions

Investments in mooring construction will provide a safe, reliable tie-down method designed to accommodate increased extreme flooding conditions. The design solution also considers detail by the Army Corps of Engineers (USACE) for proper tie down infrastructure on navigable rivers and includes detail to properly secure both loaded and unloaded barges. Modern tie down infrastructure will prepare the MKARNS in Oklahoma to handle potential future extreme flooding events and to support continuous growth on the “marine highway”.



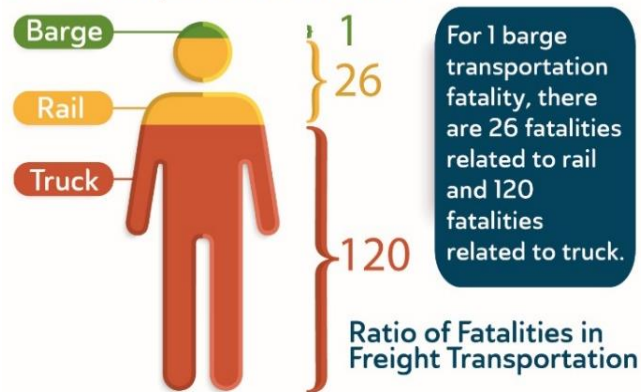
Port of Muskogee in 2019 flood event

CONTINUE TO SUPPORT SAFE MOVEMENT OF FREIGHT

The MKARNS is an integral part of the regional and national movement of freight and goods. By safely moving America’s cargo at the lowest cost, barge transportation plays a vital role in not only the nation’s economy, but in limiting truck traffic congestion and reducing safety risks on our nation’s roads.²⁰

Inland waterway transportation has a low fatality and injury record compared to rail or truck freight movement. For each barge-related fatality, there are 26 rail-related fatalities and 120 truck-related fatalities.²¹ For each barge-related injury, there are 96 rail-related injuries and 1,145 truck-related injuries.²² Inland waterways are one of the safest ways to move freight in our nation.

Inland Waterways Transport has the **Lowest Fatality Record** Compared to Rail or Truck



National Waterways Foundation

²⁰ [Inland Marine Highway](#)

²¹ [National Waterways Foundation \(2022\)](#)

²² [National Waterways Foundation \(2022\)](#)

IMPROVED WORKER SAFETY

Modernized moorings will improve worker safety and minimize risk during mooring tie-down procedures. Mooring infrastructure provided by this Project requires less skill and physical force by captains and deckhands as they are securing barges. Securing a deadman anchor requires the captain to maneuver the barge towards the riverbank as the deckhand uses a long (approximately 20 ft) pike pole to retrieve a floating cell connected to the deadman anchor cable. The deckhand then must physically pull the cable to the deck to secure the barge. The process to secure a barge using a deadman anchor is physically strenuous for both the captain and deckhand. During the securing process, the deckhands' eyes are in front of the barge which can also be strenuous on the eyes during the night, high wind conditions, or pouring rain. The modernized mooring infrastructure proposed by the Project (either monopile or dolphin mooring) would allow captains to maneuver a barge alongside the mooring structure as the deckhand throws a line around the pipe to secure the barge, which is an easier and safer process than what is required to secure to a deadman anchor.



Existing Dolphin at the Port of Muskogee



Existing Deadman Anchor wire at Oakley's Terminal Muskogee

EXISTING VANDALISM AND SAFETY CONCERNS

The general public has access to the MKARNS waterway and riverbanks as it is a recreational asset for the community. While many use the waterway for recreation such as boating and fishing, the ports do encounter vandalism, particularly to the deadman anchors which are set on the dry shore. Oakley's Terminal Muskogee has encountered destructive, reoccurring vandalism including burning tires, cutting cables, or shooting floating cells. Acts of vandalism cost the ports money and pose a risk to the integrity of the moorings. The updated moorings will be constructed in the water, which will greatly improve the safety and minimize the existing risk posed by deadman anchors on the shore.

ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability is a priority and key asset of goods movement by waterway. Maintaining air quality standards, investing in infrastructure to reduce the risk of loss of goods and improving congestion related emissions at each port will further improve the quality of life for regional economies. The Project provides improvements to ensure the long-term vitality of the waterway, ports, and mooring system. Proper tie down infrastructure will create a more reliable method to secure barges in the waterway to better support current and future demands of freight movement. Freight movement by waterway produces significantly less emissions than other modes of transport (truck and rail), which ultimately reduces climate change impacts.

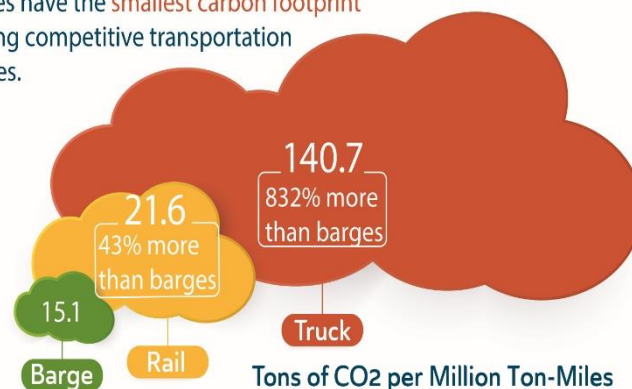
EFFICIENT GOODS MOVEMENT WITH REDUCED EMISSIONS

Agricultural commodities accounted for 73 percent of the total product moved on the Oklahoma segment of the MKARNS in 2015.²³ Use of waterway freight movement is the most energy efficient and least damaging mode of transportation for the environment.

- **More energy efficiency per gallon of fuel.** Transporting freight by water is the most energy efficient choice. Barges can move one ton of cargo 675 ton-miles per gallon of fuel when compared to only 472 ton-miles for rail and 151 ton-miles for trucks. Ton-miles per gallon are a measure of how far each ton of cargo is carried by a single gallon of fuel.²⁴
- **Better for the environment** Barges have the smallest carbon footprint among other modes including rail and truck. To move an identical amount of cargo by rail generates 43 percent more carbon dioxide than by barge, and trucks generate over 800 percent more emissions.²⁵
- **Fewer vessels or vehicles required.** One full barge load of wheat is more than enough to provide a one-pound loaf of bread for every man, woman, and child living in Oklahoma in 2019.²⁶

The Project will replace and update obsolete anchorage, which will be an investment that will continue to allow freight movement by barge in Oklahoma. This investment will encourage use of barges for the transport of goods and contribute to sustainable outcomes including reduced fuel consumption, reduced carbon emissions and pollutants, and improved air quality.

Barges have the **smallest carbon footprint** among competitive transportation modes.



National Waterways Foundation

²³ [MKARNS Update \(2020\)](#)

²⁴ [National Waterways Foundation \(2022\)](#)

²⁵ [National Waterways Foundation \(2022\)](#)

²⁶ [National Waterways Foundation \(2022\)](#)

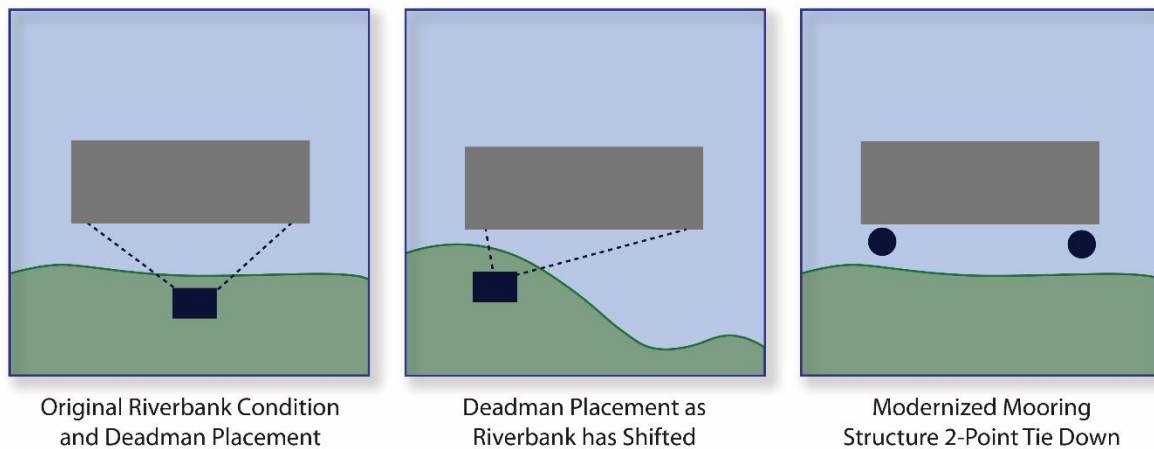
FLOOD PROTECTION

The MKARNS is a multi-beneficiary system that includes water supply, navigation, fish and wildlife, recreation, hydropower generation, and flood control. The MKARNS is part of the Arkansas River Basin which includes upstream reservoirs that control when and how water flows. From the time of its inception to the year 2021, it is estimated that flood damages prevented by the Arkansas River Basin (under control of the U.S. Army Corps of Engineers Tulsa District) totaled roughly \$644 million dollars. Cumulative damages prevented through 2021 equate to an estimated \$9.3 billion dollars.²⁷ Ensuring safe mooring for vessels will minimize risks to infrastructure, such as bridge piers, along the waterway.

RIVERBANK STABILITY

The Project will improve the riverbank stability by removing the deadman anchors at Oakley’s Terminal Muskogee and replacing them with modernized mooring structures. Deadman anchor construction (and repair) requires digging holes along the riverbank to place buried steel beams and timbers. Cables are attached to the foundations which are used as ties for barges and vessels. Continual repair, maintenance, and replacement of deadman anchors can lead to riverbank erosion as cables dig into the shore soil and as tension shifts or vibrates the anchor over time, which is illustrated in Figure 4 below. In addition, there are several endangered species within the Project area that include, but are not limited to, the American Burying Beetle, Piping Plover, and Whooping Cranes. The mooring infrastructure implemented for this Project will be constructed in the river, minimizing further disturbance to habitats at Oakley’s Terminal. The Project will eliminate anchor-related disturbances to the shoreline and riverbank during routine maintenance, repair, or replacement.

FIGURE 4: INSTALLATION ON THE SHORELINE VS. WITHIN THE RIVER



²⁷[Oklahoma Transportation 2021 Annual Report](#)

CLEAN ENERGY

There are two hydropower plants on the MKARNS in Oklahoma that include 7 power generating units. These units provide clean energy to approximately 700,000 end users.²⁸ If the MKARNS were to become inoperable, as it was for 104 days in 2019, the hydropower plants would have to be supplemented by other means of power generation, such as natural gas. A study completed in 2015 describes the potential impacts if the MKARNS segment in Oklahoma were to become inoperable:

- Sales would decrease by \$72 million dollars;
- Nearly 470 full time and part time jobs would be lost;
- Business tax incomes would decrease by \$3 million dollars and;
- Oklahoma (GDP) would decrease by nearly \$38 million dollars.

These impacts highlight the importance of investing in infrastructure to ensure the MKARNS segment in Oklahoma remains in a state of good repair.²⁹ Minimizing risk to infrastructure in the waterway, including hydropower facilities, is a key benefit that the Project investment will provide.



MOBILITY AND COMMUNITY CONNECTIVITY

SUPPLY CHAIN IMPROVEMENTS

The MKARNS is a 12-state navigable waterway capable of handling barges which traverse the entire inland waterway system from New Orleans and Houston to Pittsburgh and Minneapolis. Shipping by water is the most cost competitive form of freight transportation, and just about any type of cargo can be shipped by barge if there is large enough volume to move.³⁰



June 2021: Tulsa Port of Catoosa

From September 2019 to December 2021, the average door-to-door shipping time for waterway freight doubled from 40 to 80 days.³¹ Increased shipping demands have contributed to record-breaking supply chain issues resulting in out-of-stock products for stores, dealerships, grocery stores, and more. Another supply chain issue is the ability for companies to make their freight movement greener as demands continue to skyrocket. Freight movement by barge is already the greenest forms of freight transportation, and future

²⁸ [Oklahoma Transportation 2021 Annual Report](#)

²⁹ [MBTC Final Research Report – Page 24](#)

³⁰ [Shipping on the Waterway](#)

³¹ [Door to Door Average Shipping Time for Ocean Freight Shanghai-Los Angeles](#)

shipping demands, and policy changes may require companies to consider different methods of shipping methods that lower their carbon footprint.³²

Modernized mooring structures will allow the Tulsa Port of Catoosa, Muskogee, and Oakley’s Terminal Muskogee to continue to provide a reliable and efficient method to ship bulk commodities through these locations. As the shipping industry continues to adjust to increased demands, new infrastructure will also help these locations to maintain good relationships with the businesses who already rely on them to support this increasing freight demand and create the opportunity for new connections with businesses in the future.

OVERSIZED, OVERWEIGHT LOADS

In 2021, the MKARNS transported 1,010,204 tons of iron and steel and 32,064 tons of equipment and machinery.³³ These products and commodities are usually overweight and/or oversized and require a permit if transported by truck. Transporting these goods and commodities by barge provides greater efficiencies and cost-savings by eliminating the need for a permit and allowing greater tonnages to be transported in each load. New tie down structures will help the Project locations to continue to accommodate oversized and overweight loads safely and further reduce oversized loads on the highway to ensure a more balanced transportation network.

QUALITY OF LIFE

JOBS AND LOCAL RURAL VITALITY

The waterway is an important contributor to jobs in the surrounding rural areas. In total, the Oklahoma MKARNS segment and ports support more than 11,000 jobs and directly contribute \$1.6 billion dollars to Oklahoma’s economy each year.³⁴ The Project will improve the quality of life in the region by supporting the ports’ ability to continue to provide jobs, encourage outside markets to use Oklahoma ports for trade, and provide a safer way for workers to secure barges in the waterway.

Ports in Oklahoma process more than **6 million tons of cargo** each year, support **more than 11,000 jobs** and directly **contribute \$1.6 billion to the state’s economy**.⁴²

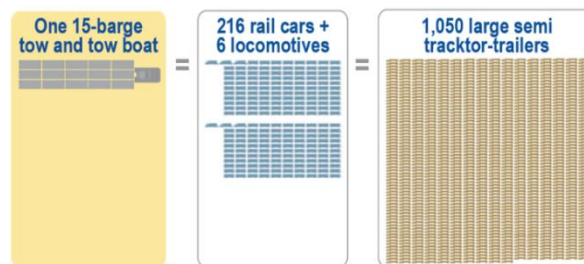
³² [National Waterways Foundation \(2022\)](#)

³³ [MKARNS 2022 Inland Waterway Fact Sheet](#)

³⁴ [MKARNS 50th Anniversary](#)

IMPROVED TRANSPORTATION FOR INDIVIDUALS

Waterway is an efficient way to move large amounts of freight. It would take the equivalent of 15 jumbo rail cars or 60 large semi-trucks to carry the amount that could be supported by 1 barge.³⁵ Efficiencies in waterway travel on the MKARNS allow lower shipment prices (approximately 15 percent), and thus identifies waterway freight movement as the preferred method over rail or truck.



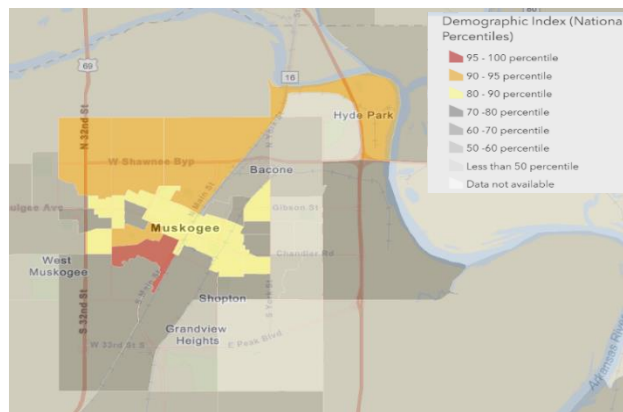
Source: National Waterway Foundation

If Oklahoma’s 4.9 million tons of waterborne commerce were transported by an alternative method it would require 195,847 trucks to carry such a load.³⁶ This would not only require more energy and generate more emissions, but it would also vastly change the local roadway transportation network for residents in the surrounding rural areas and Tulsa metropolitan area. Fuel use and CO₂ emissions are reduced by 40 percent when waterway shipment is compared to rail and are reduced by 270 percent when comparing this method of freight movement to truck.

Investments in the Project will enhance mooring structure capabilities in the waterway to ensure that tie-down structures can continue to support this competitive system in Oklahoma and continue support of freight movement by waterway.

RACIAL EQUITY

The Project is strongly supported by the nearby Indian Nations. The Port of Muskogee is located within the historic tribal boundaries of the Cherokee and Muscogee Nations. Letters of Support for this Project have been provided by each of these Indian Nations and are available on the [Project website](#).



Source: Environmental Justice Demographic Index Map (2022) – Muskogee County

The Project is predominately located in Muskogee County, Oklahoma which has an estimated population of 66,146 according to the United States Census Bureau. Of this population, 44.5 percent are nonwhite, and 18.2 percent are persons in poverty.³⁷ The United States Census Bureau uses the Demographic Index as a combined calculation of both low income and people of color. The Environmental Justice Screening Map Displayed to the right shows the Demographic Index percentile for the Project Census Tract and surrounding Census Tracts located within Muskogee County.³⁸ These populations as well as the surrounding community will benefit from the successful construction of this Project because it will continue to provide current and future jobs with local businesses that utilize the waterway to ship commodities.

³⁵ [MKARNS 2022 Inland Waterway Fact Sheet](#)

³⁶ [MKARNS 2022 Inland Waterway Fact Sheet](#)

³⁷ [United States Census Bureau Muskogee, Oklahoma QuickFacts 2021](#)

³⁸ [Environmental Justice Screening and Mapping Tool, 2022](#)

ACCESS TO CLEAN ENERGY

The MKARNS in Oklahoma provides benefits to approximately 700,000 end users by supplying them with clean hydropower energy. There are two hydropower plants in Oklahoma that include a total of seven power generating units.³⁹ Hydroelectricity qualifies as clean energy because it uses running water to produce electricity. Hydroelectricity is a key contributor to residents and businesses located in the Project area because it provides efficient, low-cost electricity to users. Operability of the MKARNS system is vital for Oklahoma’s hydroelectric plants to continue to provide energy for local users that rely on these plants for their work, homes, and other needs.

EFFICIENT MOVEMENT OF GOODS WITH REDUCED COSTS

Communities cannot thrive without effective movement of goods. Waterways provide significant cargo capacity and move freight more safely and efficiently than truck or rail. This generates valuable cost savings for businesses, farmers, consumers, and shippers.⁴⁰ The Project will implement new tie down structures to improve efficiency and further support investment in the waterway which will help keep costs low for energy, manufactured goods, and food for everyday U.S. consumers. The Project will aid in continuation of the state’s economic growth and ability to compete within the national market.

ECONOMIC COMPETITIVENESS

The primary goal of the Project is to ensure safe and efficient freight movement and to provide long-term vitality of the waterway. Modernized mooring structures will replace obsolete anchors and ensure the Oklahoma segment of the waterway is prepared for flooding events, today’s freight demand, and future projected increases in demand for large and heavy vessels.

ODOT is committed to ensuring compliance with domestic preference laws, promoting the hiring of local contractors, and facilitating participation by socially and economically disadvantaged businesses. ODOT will not be pursuing a waiver for relevant domestic preference laws. Programs like ODOT’s [On-Boarding Program](#) provide resources to DBE’s, Small Businesses, and Women Owned Businesses, for the purpose of development into viable, self-sufficient businesses capable of competing for and performing on, federally assisted highway projects. Area contractors are well experienced in construction techniques required for the Project.

This Project directly aligns with **Executive Order 14008, Tackling the Climate Crisis at Home and Abroad (86 FR 7619)**, by delivering modern and sustainable infrastructure that promotes the use of the marine highway that can deliver goods in a reduced carbon footprint compared to freight-truck or rail. Additionally, given the volume of goods that pass through the MKARNS, **an average of 11 million tons of cargo or \$4 billion dollars each year**⁴¹, this presents an opportunity for good ‘paying jobs’ for those working the boats, docks, and nearby facilities. Overall, this MKARNS Oklahoma segment supports over 22,000 full and part-time jobs⁴².

³⁹ [Oklahoma Transportation 2021 Annual Report](#)

⁴⁰ [Regional Economic Impact Study \(2015\)](#)

⁴¹ [MKARNS Update \(2020\)](#)

⁴² [Oklahoma Transportation 2021 Annual Report](#)

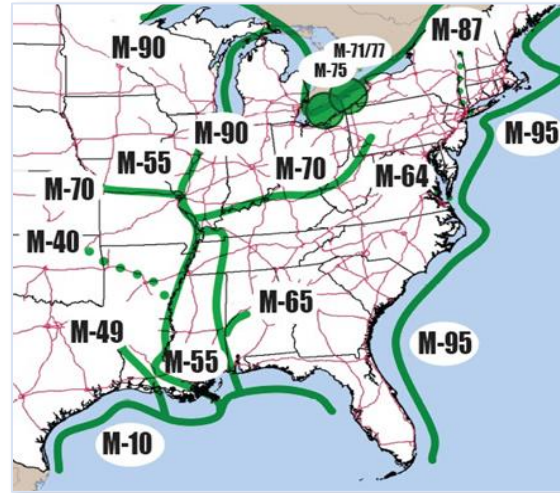
REGIONAL SIGNIFICANCE

There are three Foreign Trade Zones on the MKARNS at the ports of Little Rock, Muskogee, and Catoosa and at least 42 countries have commercial transactions via the MKARNS. In 2015, the waterway changed from a “moderate” to a “high-use” designated waterway which upgraded the “Marine Highway M40” from a “Connector” to a “Corridor” due to its five-year average of more than 3.3 billion-ton-miles traveled.⁴³ As of 2021, the MKARNS waterborne commerce totaled 4.9 million tons.

Oklahoma supplies agricultural products throughout the U.S. and internationally. In total, Oklahoma shipped \$5.4 billion dollars’ worth of goods around the globe in 2020.⁴⁴

The MKARNS and Oklahoma ports provide an efficient flow of goods from production to the U.S. and foreign markets. In addition to Oklahoma-produced goods, surrounding great plain states bring products to the MKARNS for shipment because it is an economical and efficient way to bring goods to market. In 2017, approximately half of the tonnage traversing Oklahoma ports was directly related to Kansas shipments (approximately 2.9 million tons).⁴⁵ Top commodities traded on the MKARNS include, but are not limited to, iron, steel, chemical fertilizer, and soybeans.⁴⁶

Current maintenance has not kept up with the growing freight demand. Investment in the Project is key for Oklahoma’s future waterway growth and economic vitality in the global and national trade market.



Eastern U.S. Marine Highways



MKARNS Marks 50th Anniversary

⁴³ [MKARNS 2022 Inland Waterway Fact Sheet](#)

⁴⁴ [World's Top Exports, Oklahoma's Top 10 Exports](#)

⁴⁵ [MKARNS Presentation](#)

⁴⁶ [MKARNS 2022 Inland Waterway Fact Sheet](#)

FLOOD IMPACTS ON ECONOMY

The flood event of 2019 brought record water levels along the MKARNS in Oklahoma. The event required a four-month closure of the waterway, ultimately costing Oklahoma businesses and industry a total of \$20 million in state gross domestic product (GDP).⁴⁷ That event was categorized by the USGS to have an Annual Exceedance probability (AEP) of 0.6 percent, which defines the probability of another occurrence of an event with this magnitude in a given year. As climate patterns continue to change, the 100-year flood of yesterday may not equate to the 100-year flood of today.⁴⁸ The Project will replace mooring structures which have a combined probability of failure in a 100-year flood of approximately 1 percent. The new mooring structures are expected to reduce this risk of a barge breaking loose to a combined 0.01 percent during a similar flood. These improvements are vital for the MKARNS to be more resilient and sustainable long term as flood events become more regular overtime.

EFFICIENCIES IN DOING BUSINESS

Waterways provide great cargo capacity and move freight more safely and efficiently than truck or rail. This generates valuable cost savings for businesses, farmers, and consumers.⁴⁹ Waterway transportation in Oklahoma helps to save money for farmers, manufactures and consumers which encourages future growth and trade.⁵⁰ As of 2021, the Port of Catoosa, Muskogee, and Oakley’s Terminal Muskogee serviced 86 percent of the total tonnage shipped inland of the Webbers Falls Lock and Dam on the MKARNS Oklahoma segment⁵¹. Infrastructure improvements at these port locations are vital for cargo to continue to be shipped efficiently.

The Project will implement new tie down structures to improve efficiency and reduce wait times, which will save time and money for businesses that trade along the MKARNS system. Improved mooring structures will sustain a lowered risk factor during extreme weather conditions and allow vessels to remain secured. Overall, investments in modernized mooring structures will create long-term strength and security for Oklahoma’s economy and preparation for the U.S. to remain competitive in the global goods movement market.⁵²

LOCAL ECONOMY

Local industries along the MKARNS manufacture bulk commodities that provide direct access to global markets. Oklahoma is a major energy and agriculture producer, as well as a producer of manufactured goods. Northeast Oklahoma is home to the largest Maintenance, Repair, and Operation (MRO) facility in the world and is used to maintain American Airline airplanes. The facility alone employs more than 6,000 employees while the aerospace and defense industries in Oklahoma employ more than 120,000 employees statewide.⁵³ The aerospace industry is growing in Oklahoma and many of the manufactured goods needed to maintain this industry are shipped on the MKARNS.

⁴⁷ [Webbers Falls \(2019\)](#)

⁴⁸ [Floods and Recurrence Intervals](#)

⁴⁹ [Regional Economic Impact Study \(2015\)](#)

⁵⁰ [MKARNS 2022 Inland Waterway Fact Sheet](#)

⁵¹ Tonnage information was informed by ODOT and each Port location associated with this Project

⁵² [MKARNS 2022 Inland Waterway Fact Sheet](#)

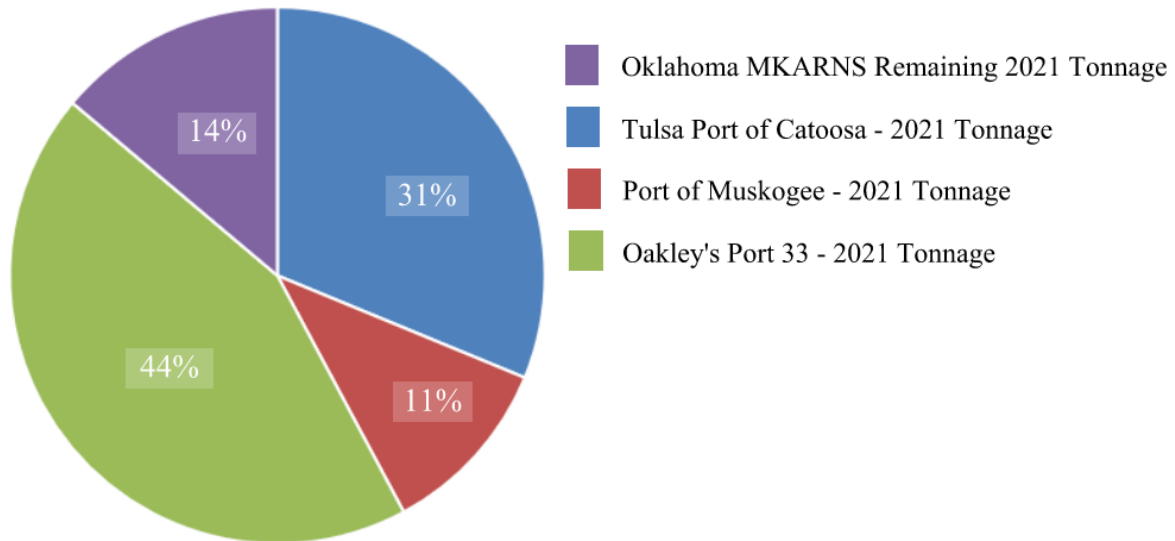
⁵³ [Aerospace and Industrial](#)

FORECASTED GROWTH

The Project’s mooring infrastructure design will allow for storage of empty or full barges at any elevation, including the extreme conditions and elevations experienced in the 2019 flood event. The Project will replace retiring anchorage systems and construct 32 new moorings designed to be more stable in terms of the number of barges each structure can hold during flood events and high congestion times on the waterway.

The three Port locations that will receive mooring modernization from this Project support the bulk of the total tonnage shipped on the Oklahoma MKARNS segment. In 2021, these locations totaled 86 percent of the total tons of cargo shipped inland of Webbers Falls Lock and Dam.⁵⁴ Freight movement by waterway is expected to grow by 35 percent by 2045, making mooring structure improvements at these port locations vital for the Oklahoma system to continue to operate efficiently and support future growth.⁵⁵ The 2021 proportional breakdown of waterway commerce along the MKARNS segment in Oklahoma by the Project Port Partners is shown below in Figure 5.

FIGURE 5: PORT PARTNER WATERWAY COMMERCE – 2021



Tonnage information was informed by ODOT and each Port location associated with this Project
[Oklahoma Freight Transportation Plan \(2018-2023\)](#)

STATE OF GOOD REPAIR

Each Project port has its own individual needs, but there is an overwhelming agreement that the most important priority is to preserve the safe, reliable, and productive operation of the MKARNS system. While the MKARNS currently offers strong performance and high reliability, it faces significant maintenance backlog. Critical maintenance needs are now approaching \$230 million dollars. Critical maintenance is described by the U.S. Army Corps of Engineers (USACE) as having a 50 percent chance of failure during the next five years.⁵⁶

Oklahoma freight traffic along the system has fluctuated between 3.8 and 6.2 million tons annually.⁵⁷ In current conditions, barges are moored to either monopile or dolphin moorings with ropes that are secured to kevels or bitts on the barge. Deadman anchors are also used to tie down barges with a wire cable. The existing structures do not accommodate current capacity needs, are obsolete during extreme flooding events, and require substantial maintenance and repair in their current condition.

The Tulsa Port of Catoosa completed a replacement study in 2019 which found that **all the evaluated dolphin structures showed signs of deterioration, with some in need of immediate repair or decommissioning.**⁵⁸

The existing structures do not meet the standards defined to measure the state of good repair for capital assets as defined in 49 CFR § 625.41. Existing structures are no longer able to perform their designed function and no longer support water flows, elevations, and freight capacities experienced in the waterway today. The use of the existing structures poses an identified safety risk to the waterway, its infrastructure, and its users. During flood events, hundreds of barges will be at risk due to failing mooring structures. In addition to extreme events, the existing conditions also cost the ports significant annual maintenance costs.

On an average year without extreme flooding and weather events, ports incur approximately \$9,750 in the annual maintenance of the current mooring systems. However, these structures will be deemed obsolete as of 2025, which will leave the system without means to operate. The Ports are experiencing critical failures that will continue to lower capacity if no updated infrastructure is provided. Placing newly designed mooring structures at each designated project location will greatly reduce and nearly eliminate ongoing operations and maintenance costs associated with existing infrastructure repairs yielding a reduction of \$6,550 in annual savings. The new mooring structures will have a lifespan of 75 years, thus providing an investment in a long-term solution.



Tower dolphin structure in disrepair at Tulsa Port of Catoosa



Tulsa Port of Catoosa – Platform Critical Failure

⁵⁶ [MKARNS Non-Routine Maintenance Items](#)

⁵⁷ [MKARNS Update \(2020\)](#)

⁵⁸ [Mooring Dolphin Report \(2019\)](#)

PARTNERSHIP AND COLLABORATION

ODOT, together with the Port Partners involved in this project include the Tulsa Port of Catoosa, Port of Muskogee, and Oakley’s Terminal Muskogee (an extension of Oakley’s Port 33), are committed to improving infrastructure conditions along the MKARNS to increase safety, reduce maintenance costs, and ensure operability of the waterway. ODOT has and will continue coordinating with the U.S. Army Corps of Engineers as their involvement and input will be key in successful delivery of this Project. The Tulsa District of the U.S. Army Corps of Engineers has provided a letter in support of the Project which identifies that the Project directly aligns with and maintains their mission to support and improve commercial navigation on the MKARNS.

ODOT and the Port Partners work closely with regional organizations and local municipalities, businesses, and freight stakeholders. More than a dozen entities have shown their support for the project by providing letters of support. This includes the regional planning agency, Oklahoma Chamber of Commerce, USACE, local municipalities, and various industry stakeholders. The Project is also strongly supported by the nearby Indian Nations. The Port of Muskogee is located within the historic tribal boundaries of the Cherokee and Muscogee Nations. The Cherokee Nation, in fact, owns the bed and banks of the Waterway at the Port of Muskogee and in 1985, the Port entered a riverbed use agreement which authorized use of the riverbed property. Letters of Support can be found in the Letters of Support section on the [Project website](#).

TABLE 5: PROJECT PARTNERS

Project Partners						
						
Oklahoma Department of Transportation	Tulsa Port of Catoosa	Port of Muskogee	Oakley’s Terminal Muskogee & Oakley’s Port 33			
Congressional Delegation						
						
U.S. Senator Jim Inhofe	U.S. Senator James Lankford	U.S. Representative Frank Lucas	U.S. Representative Tom Cole	U.S. Representative Kevin Hern	U.S. Representative Markwayne Mullin	U.S. Representative Stephanie Bice
Indian Nations						
Creek Nation • Cherokee Nation • Chickasaw Nation						

To take best advantage of economies of scale, ODOT will coordinate and let the project for all three port locations. ODOT will enter into contractual agreements with each of the Port Partners. Upon completion of construction, each respective Port Partner will take over operations and maintenance of the new mooring structures in perpetuity.

ODOT'S COMMITMENT TO WATERWAYS

The importance of the MKARNS to Oklahoma's economy is undeniable. ODOT and the Arkansas Waterways Commission worked jointly on a Regional Economic Impact Study that was conducted by the University of Arkansas Little Rock, Oklahoma State University, and the University of Arkansas Mack-Blackwell Rural Transportation Center in Fayetteville. The study illustrates the estimated economic impact of the MKARNS to not only Oklahoma's and Arkansas' economies, but also the nation.

Because of ODOT's commitment to support the ports and the freight and shipping opportunities that they provide for the state, numerous transportation system improvement projects have been completed or are scheduled in the ports' vicinities. Since 2000, ODOT has awarded 186 contracts, including right-of-way and utility relocation efforts, totaling more than \$621.4 million within a 10-mile radius of the Port of Catoosa and Oakley's Terminal Muskogee. Further, within that same area, an additional 40 projects totaling nearly \$266 million are scheduled for award in FFY 2019 through 2026, of which \$240.3 million are included in the 8-Year Construction Work Plan. Similarly, since 2000, the Department has awarded 53 contracts, including right-of-way and utility relocation efforts, totaling almost \$100.7 million within a 10-mile radius of the Port of Muskogee. An additional 22 projects totaling over \$147.3 million are scheduled for award in FFY 2019 through 2026, of which \$125.1million are included in the 8 Year Construction Work Plan for that same area.

Port of Catoosa & Oakley's Terminal Muskogee



Awarded Projects (since 2000)

\$701,689,672

Port of Catoosa & Oakley's Terminal Muskogee



Active Projects (between 2021 and 2028)

\$247,245,251

Port of Muskogee



Awarded Projects (since 2000)

\$116,719,585

Port of Muskogee



Active Projects (between 2019 and 2026)

\$127,471,698

INNOVATION

Maintenance needs along the waterway system in Oklahoma have continued to grow in value as infrastructure becomes obsolete or nears the end its design life. The Project will include innovative technologies for corrosion protection and berthing⁵⁹ load design which will reduce maintenance costs and increase safety. Funding from the National Highway Freight Program (NHFP) will be utilized as an innovative financing component if this project is funded. The uses of these innovative methods are highlighted below.

INNOVATIVE TECHNOLOGIES

Corrosion Protection Systems

The Verdigris River and The Arkansas River intersect southeast of the Port of Muskogee. The Arkansas River flows are stronger than that of the Verdigris River and can speed up the deterioration process of infrastructure. To achieve a 50-year design life, corrosion protection systems for the mooring structures will be considered during preliminary design to counteract damage that could be caused by each river’s chemistry. Corrosion protection coatings that will be considered include polypropylene cladding along with active and passive anode protection.

Berthing Load Design

There are two methods to determine the load imparted on the mooring structure from the barge tow berthing. The first method uses dynamic analysis while the second uses a static analysis. The dynamic method balances the kinetic energy of the barge tow with the structure’s ability to absorb and dissipate energy. Using this method, the structure dissipates energy through elastic deformation; therefore, the dynamic method is best for flexible structures. For rigid structures, empirical data collected by the US Army Corps of Engineers is used to determine the reactions of a barge tow to the structure.

INNOVATIVE PROJECT DELIVERY

Demolition

Discussions with local representatives were conducted to develop the Mooring Dolphin Repair and Replacement Study for the Tulsa Port of Catoosa.⁶⁰ These representatives shared innovative methods that could be utilized for demolition of the existing deteriorating dolphin structures.

Removal of the existing dolphins consists of dismantling the steel truss structure above the platform, saw cutting and removing the concrete platform, and removal of the piers. The innovations listed in the Mooring Dolphin Repair report will be considered for this Project to determine the best option for removal of existing dolphins at the Tulsa Port of Catoosa and Muskogee. Ultimately, determining the most cost effective and least disturbing method of demolition will be important to protect the vitality of the waterway.

⁵⁹ Maritime definition for the location at which a barge or ship docks.

⁶⁰ [Mooring Dolphin Report \(2019\)](#)

INNOVATIVE FINANCING

This will be the first waterway project that ODOT will utilize funding from the National Highway Freight Program (NHFP). According to section 23 USC 167(i)(5)(B), up to 10 percent of NHFP funds may be obligated for freight intermodal projects.⁶¹ ODOT recognizes that any projects that utilize NHFP funds under this designation would need to be identified in ODOT’s Freight Transportation Plan and ODOT’s Statewide Transportation Improvement Plan. Those plans will be updated to include this project if this project is awarded funding.

5 ENVIRONMENTAL RISK REVIEW

PROJECT SCHEDULE

A detailed project schedule that includes all major project milestones has been prepared anticipating RAISE funding.

FIGURE 6: PROJECT SCHEDULE



The Environmental and Permitting (NEPA) process began in Quarter 2 of 2021. The Executive Agreement (EA) process followed a similar time frame beginning in the latter half of Quarter 2 of 2021 and ending at the end of Quarter 4 in 2022. An EA is required for this project because ODOT’s programmatic language for categorical exclusion does not include a provision for this Project type. Construction will occur in the waterway, which will require coordination with the Federal Highway Administration (FHWA). ODOT has confirmed that National Highway Freight Program funds will be eligible for this project and ODOT will be proceeding in coordination with FHWA in compiling an EA for the project. Project adoption within the State Transportation

⁶¹ [National Highway Freight Program \(2022\)](#)

Improvement Program (STIP) and Transportation Improvement Program (TIP) will start at the end of Quarter 2 in 2022 and end in Quarter 4 of 2022.

The schedule includes sufficient time to complete all reviews and approvals for RAISE funds to be obligated by the statutory deadline (September 30, 2024). Additionally, the schedule allows for construction to begin quickly upon obligation of funding with funds expended well in advance of the September 30, 2024 deadline. The effort to update the Oklahoma Freight plan has begun, and if the project were to receive federal funding, it would be incorporated into the next Oklahoma Freight Transportation Plan. The project schedule will sufficiently accommodate all environmental reviews and permitting, state and local planning approvals, final design, and construction.

APPROVALS

Over the past year, ODOT has had extensive work sessions with the Maritime Administration (MARAD) and FHWA to discuss the approach on how to proceed with the EA and who would be the lead agency. With these discussions, ODOT has made strides to better understand the NEPA process while balancing the relationship to utilize FHWA Surface Transportation funds and having MARAD as a concurring agency on an FHWA Executive Agreement. ODOT has confirmed that National Highway Freight Program funds will be eligible for this project and ODOT will be proceeding in coordination with FHWA in compiling an EA for the project. The EA is expected to be completed by the end of 2022.

TECHNICAL FEASIBILITY

ODOT and its partners have extensive experience in the MKARNS waterway. The technical feasibility of the monopile design is evidenced by decades of use on navigable rivers in the United States for mooring barges near bridges, locks, and dams. Monopiles have reliably performed under high flow conditions and flood conditions at sites across the nation. Design of the monopiles will be in conformance to USACE engineering standards for navigation and flood risk reduction structures. The standards for design from the USACE include provisions and standards for safe design of the line hooks and check posts, corrosion protection, and the uncertainty of hydraulic loads. USACE has guidance in the form of Engineering Manuals (EM's) that will be used for foundation design and reinforced concrete design of the monopiles. The engineering standards for design will include USACE publication EM 1110-2-2906 Design of Pile Foundations, EM 1110-2-2104 Design of Hydraulic Concrete Structures, and EM 1110-2-1604 Hydraulic Design of Navigation Locks.

ASSESSMENT OF PROJECT RISKS AND MITIGATION STRATEGIES

ODOT and the MKARNS Port Partners have carefully assessed and documented the potential Project risks and identified mitigation strategies for each:

TABLE 6: PROJECT RISKS AND MITIGATION STRATEGIES

Project Risk	Mitigation Strategy	Risk Category
Financial risk related to commitment of local match	ODOT and the Port partners have committed sufficient funds for the local Project match. Historically, ODOT has met every funding obligation for pervious grant applications. It is important to note that no additional reviews or approvals are needed from State legislature once note of the award has been granted.	Low
USACE Coordination	ODOT and the Port partners have closely coordinated with USACE and will continue to throughout the design and construction process. Permits for the Project will be obtained through the Army Corps of Engineers.	Low
Critical Maintenance	The Tulsa and Little Rock Districts of the Army Corps of Engineers have identified a Critical backlog of maintenance needs on the MKARNS. This value increased to \$160.4 million dollars for the Oklahoma segment in 2021 demonstrating the need for improvements.	Medium
Environmental Risk	ODOT has selected a consultant to complete the NEPA documentation and requirements and final design plans. As a port improvement project, an environmental assessment (EA) is required; however, there are minimal environmental risks and/or resource impacts because the project includes replacement of older existing mooring infrastructure in the same sites. The Project would also require State Historic Preservation Office (SHPO) review and concurrence with the adjacent Indian Nations.	Medium
Cost of Materials	The Russian invasion of Ukraine has created an increase to the cost of construction and materials. Historical construction cost tables demonstrate changes in costs. Completing this Project in a timely fashion will ensure the least amount of impact to costs over time.	Medium
Schedule	The Project has an aggressive schedule to receive necessary approvals and permits before obligation of funding can be provided, which result in the construction of the Project.	Low

6 BENEFIT COST ANALYSIS

The Project boasts a strong benefit-cost ratio (BCR) of **11.01** and an **internal rate of return of 36.10 percent**. At this rate, the proposed **total capital project cost of \$20.5 million (2020\$)** will produce a **positive net user benefit of about \$142.7 million dollars net present value (NPV)** over 20 years.

The Benefit Cost Analysis (BCA) shows that the Project will significantly improve safety in the event of a flood, reduce operations and maintenance (O&M) costs over time, and provide loss of use savings. The categories that demonstrate these savings are defined as follows:

Operations & Maintenance: Accounts for the duties and labor associated with yearly operations and repairs of the existing structures at each port location compared to the savings that would occur once the modernized mooring infrastructure is constructed.

Flood Damage Savings: Includes analysis and probability of the risk of flood or damage from a barge breaking loose in a flood event, the environmental impacts associated with the diversion of waterway cargo to rail or truck, and travel time impacts of a detour route if the waterway were inoperable due to a flood event.

Loss of Use Savings: The savings calculated for this category of the BCA include analysis of savings associated with total loss of use of the waterway. This accounts for the impacts to safety, environment, and the local economy.

Over the life of the Project, investment will produce the following benefits:

- **Operations & Maintenance** **\$214,904 (NPV)**
- **Flood Damage Savings** **\$23,055 (NPV)**
- **Loss of Use Savings** **\$156,708,097 (NPV)**

If the Project is not constructed, the MKARNS risks a loss of barge capacity due to degraded mooring structures. Under this assumption, that many of the anchors will be unusable by 2025. Additionally, if tonnage had to be diverted due to closure of this segment of the MKARNS, it was assumed that 25 percent of the goods would not be moved while the remaining 75 percent would be diverted to rail and 25 percent would be diverted to trucks.

The BCA was prepared in accordance with the U.S. Department of Transportation (USDOT) 2022 Benefit Cost Analysis Guidance (revised version). The BCA dollar amounts were discounted by 7 percent to reflect the time value of money. Additional detail on the BCA methodology and results is located on the [Project website in the BCA Technical Memorandum](#).

7 APPENDICES

Additional Project resources are included on the project website at:

<https://oklahoma.gov/odot/progress-and-performance/federal-grant-awards/raise-grants/mkarns-mooring-modernization-project-2022.html>

Specific items referenced in the application and uploaded onto the project website include:

Benefit Cost Analysis Guidance 2022 (Revised)

I-40 Bridge Collapse Kills 14

MBTC Final Research Report – Page 24

MKARNS 2022 Inland Waterways Fact Sheet

MKARNS Update (2020)

Mooring Dolphin Report (2019)

Non-Routine Maintenance Items