CITY OF

NEWPORT BEACH

Harbor Commission Staff Report

November 13, 2024
Agenda Item No. 6.4

TO:	HARBOR COMMISSION
FROM:	Paul Blank, Harbormaster - (949) 270-8158, pblank@newportbeachca.gov
TITLE:	Report on Conversion to Helical Anchor System for Moorings

ABSTRACT:

The City currently has 16 moorings for which it is responsible for the semi-annual inspection and maintenance of the tackle. Interest has been expressed in potentially converting the ground tackle on these moorings from traditional weights and chains to more environmentally friendly helical anchor systems. This report will update the Commission on a pilot project to convert three City moorings in the C mooring field to the helical anchor system.

RECOMMENDATION:

a) Determine this action is exempt from the California Environmental Quality Act (CEQA) pursuant to Sections 15060(c)(2) and 15060(c)(3) of the CEQA Guidelines because this action will not result in a physical change to the environment, directly or indirectly;

AND

b) Receive and file

OR

c) Recommend the Harbor Department move forward with the pilot project to convert three moorings in the C Mooring field to the helical anchor system.

FUNDING REQUIREMENTS:

There is no fiscal impact related to this item as converting three moorings to the helical anchor system is within the current budget for the required, semi-annual inspection and maintenance of moorings for which the City is responsible.

DISCUSSION:

Mooring systems play a crucial role in securing vessels and ensuring their stability and preventing drift or displacement. Traditional mooring tackle, such as chains and weights, has long been the industry standard. However, advancements in marine technology have led to the development of alternative mooring solutions, including the helical anchor system. The City is interested in exploring the potential benefits of converting from a traditional mooring tackle to a helical anchor system.

Helical anchors, also known as screw anchors or helical piles, offer several advantages over traditional weight and chain mooring systems. According to several sources, helical anchors

provide a more secure and reliable mooring solution. Unlike weight and chain systems, which can be susceptible to dragging or shifting during severe weather conditions, helical anchors are designed to screw deeply into the seafloor, offering superior holding power and stability.

Furthermore, helical anchors have a significantly smaller footprint compared to weight and chain systems. That smaller footprint on the seafloor can be very beneficial in areas where environmental concerns, such as the presence of eelgrass need to be addressed. The installation process of helical anchors is also less disruptive to the seabed, reducing the potential impact on marine ecosystems. Helical anchor systems also reduce the risk of unsuitable materials leeching from the traditional weights into the water column.

Additionally, helical anchors are reportedly easier to install and require less maintenance than traditional weight and chain systems. This can lead to reduced operating and maintenance costs for the city of Newport Beach, making the overall mooring system more cost-effective in the long term.

Components of a Helical Anchor System

A helical anchor system is made up of the components in the table below. Also in the table are the traditional anchor system component equivalents.

Helical Anchor System Components	**Traditional Anchor System Components**
Mooring buoy	Mooring buoy
Thimbles	Thimbles
Elastic Mooring System	Light chain
Submerged floats	
Rope or cable	Heavy chain
Helical screw	Weight

The helical anchor system components are depicted in Attachment A – Mooring Pilot Project Design. The traditional anchor system components are depicted in Attachment B – Traditional Anchor System Components.

Improved Holding Power

Helical anchors are designed with a screw-like configuration that allows them to penetrate and grip the seafloor more effectively than traditional anchors. This increased holding power translates to greater stability and reduced risk of mooring failure, even in challenging seabed conditions such as soft or rocky substrates. Studies have shown that helical anchors can provide up to 40% more holding capacity compared to traditional anchor systems of the same size. The seabed in Newport Harbor has been sampled on several occasions and in several locations. Analysis of

those samples indicates conditions well suited to the use of the helical anchor system throughout the harbor.

Reduced Footprint and Scaring on Seafloor

The footprint on the seafloor of the helical anchor head, the only exposed portion of the system is significantly smaller than that of materials used as traditional anchors. The traditional anchors in use in Newport Harbor include steel wheels and gears, engine blocks, concrete blocks, concrete piles, and metal crankshafts.

The optimal hardware between the mooring float and the helical anchor in the proposed system is a cable including a group of elastic bands and submerged floats. The elasticity in the hardware means that no part of the connection between the mooring buoy and the helical anchor head will rest on the seafloor. The combination of light and heavy chains in use in the traditional anchor system means that some portion of the chain is resting on the seafloor most of the time providing the shock-absorbing capability required for shifts in tide, current, and forces acting on the mooring and moored vessel. The chain scars the seafloor as it is lifted and replaced as well as dragged laterally by the prevailing forces.

It is estimated that the ground tackle for an average mooring in the C field occupies 0.84 square meters of substrate. The proposed helical anchor tackle minimizes the substrate area occupied to an average of 0.01 square meters each. The total area of the substrate occupied by the three moorings would be reduced by 4.98 square meters through the implementation of the proposed pilot project.

Increased Versatility

Helical anchors can be designed to accommodate a wide range of seabed conditions and mooring requirements. They can be customized with different helix configurations, shaft lengths, and materials to optimize performance for specific applications, making them a versatile solution compared to traditional anchor types.

Reduced Maintenance Requirements

Unlike traditional anchor systems that can be susceptible to corrosion, wear, and damage, helical anchors have a more durable construction that often requires less frequent inspection and maintenance. This can lead to reduced operational costs and downtime associated with mooring system maintenance.

Traditional anchor systems are also prone to dragging in adverse conditions such as severe wind and waves. There have been a couple of notable examples of moorings dragging in recent severe weather conditions. These occurrences have resulted in significant damage to the vessel assigned to the mooring in Newport Harbor that dragged and nearby vessels. Even when damage does not result, repositioning of traditional mooring tackle can be costly, inconvenient, and dangerous. Helical anchor systems are not prone to drift or relocation in severe weather

conditions. A component of the proposed pilot project involves testing the implemented anchors for holding capacity with loads above those considered extreme.

Estimated Cost for Proposed Pilot Project

The engineer's estimate of probable cost for the three mooring pilot program in the C field is $43,037.50 and includes:

- Mobilization for the contractor
- Equipment including the anchor, elastic system, and floats
- Installation
- Pull tests on 50% of the anchors
- Contingency
- Contractor overhead

The estimated costs are higher than those for simply inspecting and replacing the existing mooring tackle with like-for-like equipment. However, the long-term maintenance costs are expected to be less and the commensurate benefits to the health of the harbor including improvements to the water quality and proliferation of eelgrass should be significant.

The adoption of a helical anchor system by the city of Newport Beach could offer improved mooring security, reduced environmental impact, and lower maintenance requirements making it a compelling alternative to the traditional weight and chain mooring ground tackle.

No action is currently required from the Harbor Commission. However, the Commissioners may wish to take an affirmative position that the Harbor Department move forward with the pilot program to convert three moorings in the C mooring field to the helical anchor system as part of the regular, required semi-annual inspection and maintenance of mooring tackle.

ENVIRONMENTAL REVIEW:

Staff recommends the Harbor Commission find this action is not subject to the California Environmental Quality Act (CEQA) pursuant to Sections 15060(c)(2) (the activity will not result in a direct or reasonably foreseeable indirect physical change in the environment) and 15060(c)(3) (the activity is not a project as defined in Section 15378) of the CEQA Guidelines, California Code of Regulations, Title 14, Division 6, Chapter 3, because it has no potential for resulting in physical change to the environment, directly or indirectly.

NOTICING:

The agenda item has been noticed according to the Brown Act (72 hours in advance of the meeting at which the Harbor Commission considers the item).

ATTACHMENTS:

Attachment A – Mooring Pilot Project Design
Attachment B – Traditional Anchor System Components