REQUEST FOR INFORMATION – PROPULSION DRIVES

GUEMES ISLAND FERRY REPLACEMENT

000 GENERAL REQUIREMENTS

000.1 Objective

This Request for Information describes the requirements for two approximately 700-kW azimuthing thruster units to be installed aboard the Guemes Island Ferry Replacement (GIFR) vessel, a 160-ft double ended car ferry. One thruster will be installed on each end, both on the centerline of the vessel. We are requesting information including drawings, 3D models, specifications, and rough order of magnitude (ROM) pricing for this equipment to progress the design of the vessel.

The information provided will not be used as a basis for selection of a vendor or equipment for the vessel propulsors.

Responses are requested by 30 June. Please note all information does not need to be provided at one time and early information submittal is encouraged.

000.2 Acronyms

Acronyms used throughout this document are as follows:

ASCS	Automatic Shore Connection System
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
GIFR	Guemes Island Ferry Replacement
RFI	Request for Information
ROM	Rough Order of Magnitude
SES	Shoreside Electrical System
VES	Vessel Electrical System
URN	Underwater Radiated Noise

000.3 Requested Data

The following drawings and data are requested:

- Dimensional drawings of all components, including 3D models if available.
    - Thrusters, including maintenance envelopes and installation details.
    - Control cabinets, panels, misc. equipment.
    - Thruster control heads and panels.
- Weight estimate of all components.
- Electrical equipment description, ratings, and drawings.
- Auxiliary system requirements (air cooling, water cooling, hydraulics, lube oil, etc.)
- Technical description of equipment and its operation. The description shall list all components that are to be delivered. If drawings of minor components cannot be

provided at this time, a clear description with overall dimensions and weights shall be provided.

- Overall electrical and mechanical efficiency of units.
- Open water propeller characteristics, incorporating nozzles.
- Motor power and torque curves as a function of motor speed.
- ROM cost estimate for equipment, with itemized commissioning services. Cost estimates should not include costs for shipping equipment.
- Information outlining vendor support and warrantee of equipment throughout vessel's operational life.

All information does not need to be delivered at one time.

000.4 Project Information

000.4.1 Procurement and Support

Table 1 Estimated project timeline

Preliminary design complete	September 2020
Contract design complete	March 2021
Shipyard period	November 2021 to July 2023
Terminal modification period	November 2022 to April 2023
Vessel in service	September 2023

Table 1 provides an estimated timeline for major milestones for the GIFR project. Preliminary propulsion drive information from vendors is expected ahead of the completion of the preliminary design.

000.4.2 Multiple GIFR RFIs

Glosten will issue separate RFIs for the automatic shoreside connection system (ASCS), vessel electrical system (VES), and shoreside electrical system (SES). Vendors may elect to respond to any of the RFIs on an individual basis. In cases where a cost savings may be obtained by selection of a single vendor for multiple scope items, this should be explicitly stated and costs savings broken out.

000.4.3 Vessel

The double ended ferry will have one thruster mounted on each end. It is assumed two 700 kW L-drive propulsion units will be installed, one on each end. The propulsors will provide an estimated 70/30 thrust split (pushing/pulling) under typical transit operations. Full power simultaneously to each thruster will be required when docking in severe weather.

Table 2 Vessel particulars

Length, Overall	160'-0"
Beam	53'-0"

Draft, Design	7'-6"
Car Capacity	28
Displacement, Design	530 LT
Speed, Cruise at Full Load	11.5 knots
Hull Material	Steel
Ice Capability	None
Main Deck Height at Centerline	13'-5"
Hull Height at Thruster	5'-6"
Main Deck Structure Above Thruster Well	5'-0"

It is estimated that the vessel will operate 365 days per year, with an average of 24 round-trip crossing per operating day. Figure 1 depicts the timeline of a typical roundtrip crossing, which takes 30 minutes.

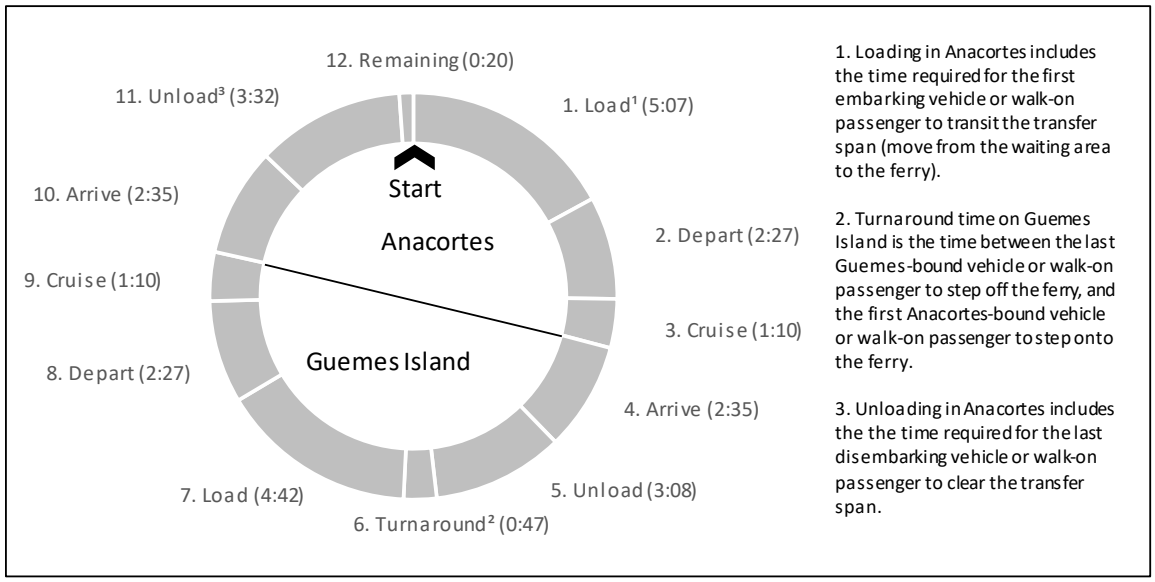

Figure 1 Typical round-trip transit

The vessel electrical system (VES) will consist of a common DC bus with two independent propulsion battery banks, which serve as the primary sources of power. Power for the propulsion motors will be taken directly from the DC bus and converted to 600-690VAC, 3-phase. Other consumers can be powered by 480VAC or 208Y-120VAC, 3 phase, 60 Hz. A 550 ekW onboard standby diesel generator will provide supplementary power for propulsion, ship loads, and battery charging during abnormal operations (e.g. bad weather, transit offsite).

The VES outlined above is outside the scope of this RFI, see Section 000.4.2.

000.4.4 Regulatory

The vessel will be required to satisfy the rules for a USCG Inspected Small Passenger Vessel under US CFR Title 46, Subchapter T.

001 AZIMUTHING THRUSTERS

001.1 Underwater Radiated Noise

Underwater radiated noise (URN) is a growing concern and vendors are encouraged to propose "quiet" propeller and gear designs or other means to help reduce URN of the thrusters.

001.2 Propeller Wake and Thrust Deduction

The Wake Fraction and Thrust Deduction for a standard case were determined through CFD analysis. The values were then estimated for a transverse (thrusting sideways) case. These values are reported below.

Wake fraction (w)

- Standard
  - Aft: -0.046
  - Fwd: 0.055
- Transverse
  - Aft/Fwd: 0.030

Thrust deduction (t)

- Standard
  - Aft: 0.033
  - Fwd: 0.125
- Transverse
  - Aft/Fwd: 0.030

001.3 Vessel Resistance

Figure 2 below provides calculated resistance curves at three (3) different operating conditions of the vessel. The operating speed is 11.5 knots in transit and 4.5 knots when maneuvering under side current. The vendor is expected to calculate required power and torque numbers to size the recommended thruster and motor. Sizing shall incorporate a 15% additional power margin for the transit case, and a 5% power margin when maneuvering under side current.

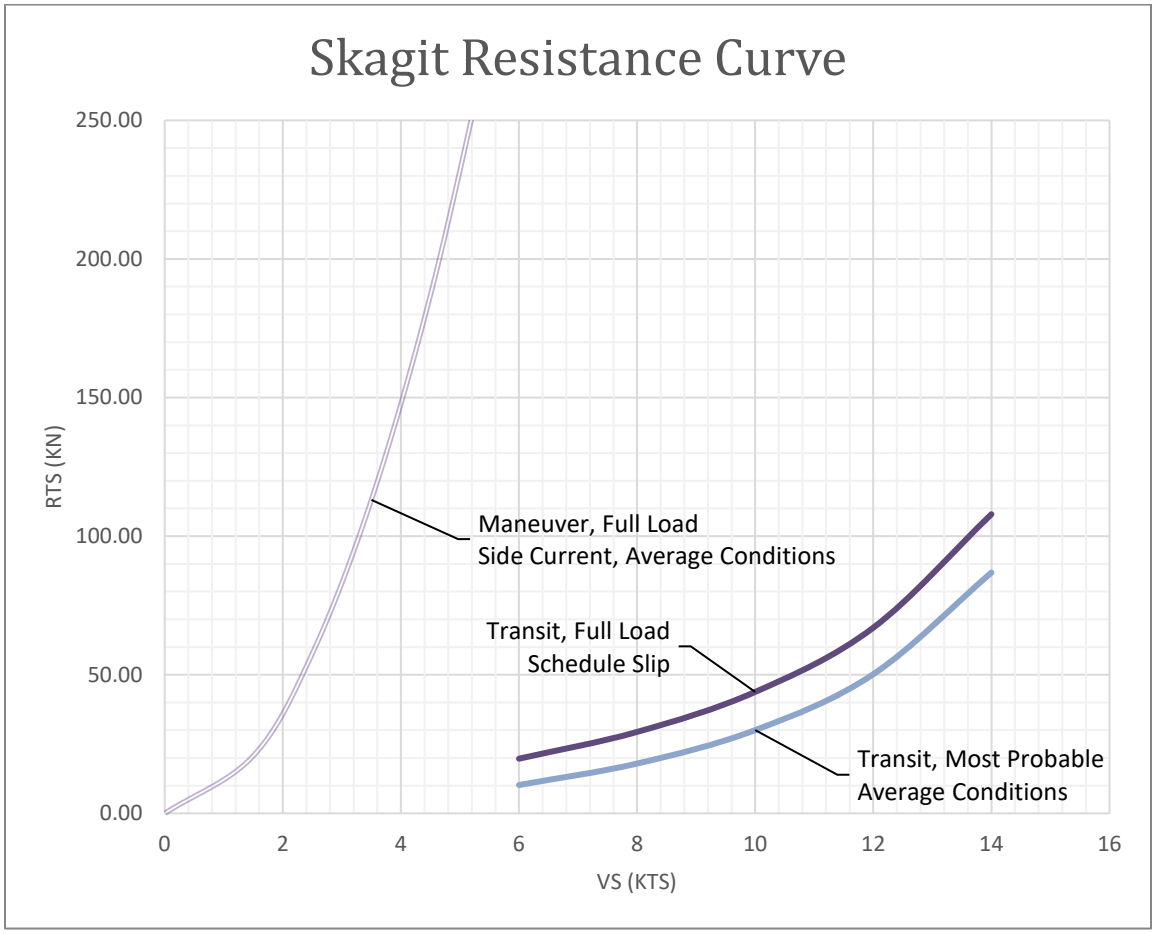

Figure 2 Resistance curves at various operating points

Table 3 is provided as an example input power estimate, with no margins added. In this example, input power represents power delivered by the motor. This value includes an estimated 3% loss for mechanical inefficiencies. It is anticipated the vendor will provide refined estimates based on their specific equipment characteristics. The limiting design case appears to be maneuvering in 4.5 knots of side current during average weather conditions. It is expected the thruster sizing will be driven by this condition, and as stated above, a 5% power margin is required in this condition.

Table 3 Input power estimates for GIFR at various operating points

Description	Environmental Condition	Speed	Input Power (aft)	Input Power (fwd)
Transit, Most Probable	Average conditions	11.5 knots	370 kW	170 kW
Transit, Full Load	Schedule slip[1]	11.5 knots	490 kW	220 kW
Maneuver, Full Load	Side current, average conditions	4.5 knots	630 kW	630 kW

1. Schedule slip begins to happen at 20 knots of wind and 3 knots of current. This is the maximum expected thruster output for transit across the channel.

001.4 Thruster Requirements

Two azimuthing thrusters shall be provided, each meeting the following requirements:

- Well mounted for extraction through the main deck while the vessel is floating.
- L-drive configuration preferred.
- Permanent magnet motors are preferred due to an increased efficiency and overhead clearance limitation when in L-drive configuration.
- Must maintain a 5% power margin during 4.5 knots of side current. The motor power and torque shall be determined by the vendor based on the efficiency of the unit proposed and the vessel resistance points provided.
- High efficiency nozzles are preferred to increase the overall performance and efficiency of the thruster.
- It is acceptable for the propeller and nozzle to extend below baseline by 1'-6" as the vessel draft is limited to 9'-0".
- The total height of the propulsion unit, including motor and nozzle, shall be no greater than 14'.

002 CONTROL STATIONS

The double-ended ferry will be equipped with two primary control stations, one on either end of the pilothouse. A third control station, mounted on the exterior deck, is required for person-overboard operations.