



# GUEMES ISLAND FERRY REPLACEMENT

## Engineer's Cost Estimate

<b>PREPARED FOR:</b>  <b>Skagit County Public Works</b> <b>Mount Vernon, Washington</b>		<b>BY:</b> Jeffrey M. Rider, PE PROJECT ENGINEER	
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<b>DOC:</b> 17079-043-01	<b>REV:</b> -	<b>FILE:</b> 17097.01	<b>DATE:</b> 30 November 2017

## References

1. *Guemes Island Ferry Replacement, Concept Design Report*, Glosten Inc., Report No. 17097-053-01.
2. *Guemes Island Ferry Replacement, General Arrangement*, Glosten Inc., Drawing No. 17097-070-01.
3. *Guemes Island Ferry Replacement, Structural Midship Section*, Glosten Inc., Drawing No. 17097-100-01.
4. *Guemes Island Ferry Replacement, Transportation System Assessment*, Glosten Inc., Report No. 17097-000-02.
5. *Bureau of Labor Statistics*, <https://www.bls.gov>, 16 November 2017.

## Summary

An engineer's cost estimate has been developed for the Guemes Island Ferry Replacement Project, as defined in References 1 through 4. Table 1 represents the anticipated capital cost breakdown of the vessel, shore-side infrastructure, and terminal upgrades. The estimated shipyard contract cost ranges from \$12.8 to \$15.9 million, and the total estimated program costs range from \$15.8 to \$25.7 million (depending on propulsion system choice and related infrastructure improvements anticipated).

The following metrics were used to develop the shipyard contract cost estimates:

- \$70/hr shipyard labor rate – representing a national average
- 70 hrs/LT production rate for steel
- 300 hrs/LT production rate for aluminum
- 20% plate wastage
- 10% shape wastage
- 12.5% material markup – to cover associated material shipping, storage, handling
- 20% estimating allowance
- 2% builders risk insurance and bonding
- 0% taxes for the vessel

The following metrics were used to develop the program cost estimate:

- 20% estimating allowance
- 5% remaining design costs for vessel
- 10% design costs for terminal improvements
- 4% construction management

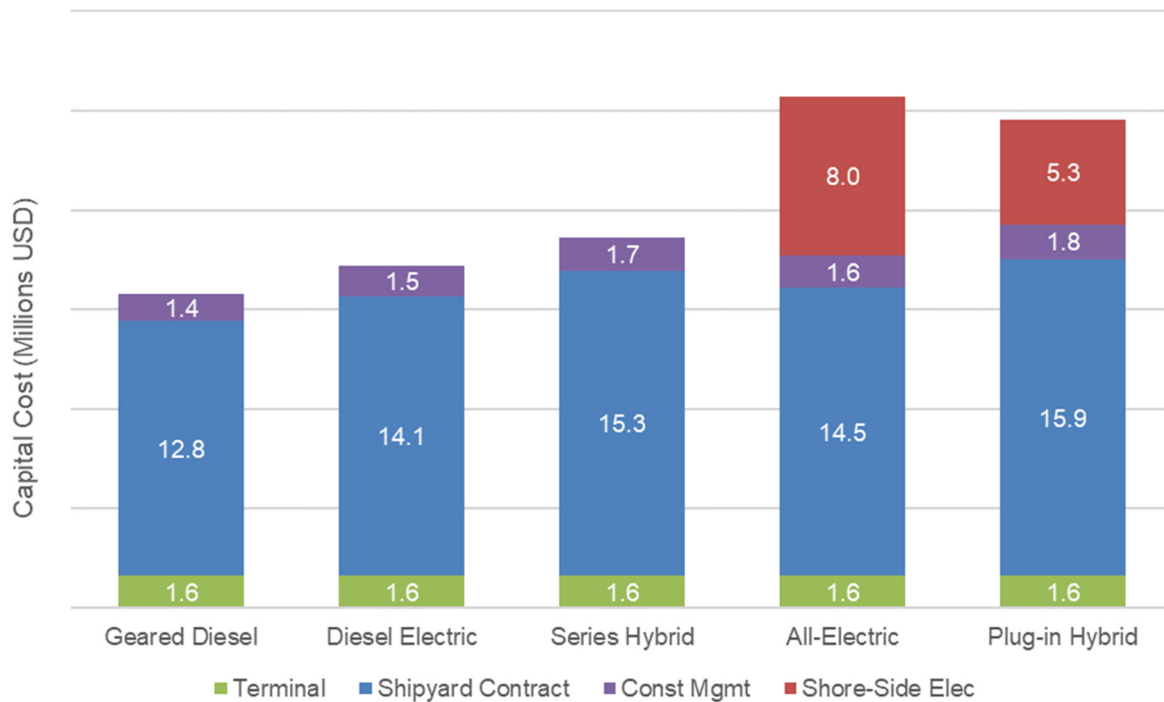
- 2% county oversight and contracting
- 1% permitting fees where appropriate
- 8.5% tax on all shore-side improvements

The shore-side electrical equipment is custom for charging a vessel of this size. Uncertainties in technology are represented by conservatism in equipment, design, and installation costs.

**Table 1** Engineers cost estimate for the Guemes Island ferry replacement project, cost x \$1,000

Description	Geared Diesel	Diesel Electric	Series Hybrid	All Electric	Plug-in Hybrid
<b>Total Replacement Cost</b>	<b>15,832</b>	<b>17,217</b>	<b>18,652</b>	<b>25,723</b>	<b>24,589</b>
<b>Vessel Total</b>	<b>14,212</b>	<b>15,596</b>	<b>17,031</b>	<b>16,111</b>	<b>17,685</b>
County Oversight and Contracting	256	281	307	290	319
Vessel Design	640	703	767	726	797
Construction Management	512	562	614	581	637
Shipyard Contract	12,803	14,050	15,343	14,514	15,932
Bonding and Risk Insurance	251	275	301	285	308
Material Markup	551	627	721	684	753
Estimating Allowance	2,000	2,191	2,387	2,258	2,440
Shipyard Engineering & Services	1,795	1,869	1,940	1,886	1,958
Structure	2,799	2,799	2,799	2,799	2,799
Propulsion	1,616	1,148	1,298	1,298	1,298
Electric Plant	576	1,905	2,374	2,223	2,609
Command and Surveillance	554	663	959	772	975
Auxiliary Systems	1,159	1,070	1,060	806	1,055
Outfit & Furnishings	1,503	1,503	1,503	1,503	1,503
Emergency Services Generator					234
<b>Shore-Side Electrical Total</b>				<b>7,991</b>	<b>5,284</b>
Utility Connection				260	217
County Oversight and Contracting				140	89
Permitting				70	44
Shore-Side Design				500	500
Shore-Side Electrical Subtotal				7,020	4,434
Infrastructure				3,099	2,638
Charging Apparatus				3,592	1,796
Emergency Services Generator				329	
<b>Terminal Improvements Total</b>	<b>1,621</b>	<b>1,621</b>	<b>1,621</b>	<b>1,621</b>	<b>1,621</b>
County Oversight and Contracting	29	29	29	29	29
Terminal Design	145	145	145	145	145
Terminal Improvements Subtotal	1,447	1,447	1,447	1,447	1,447
Apron Modifications	345	345	345	345	345
Dolphin Upgrades	1,102	1,102	1,102	1,102	1,102

A shipyard contract cost summary for each propulsion system can be found in Appendix A. The major categories of Table 1 are graphically shown in Figure 1.

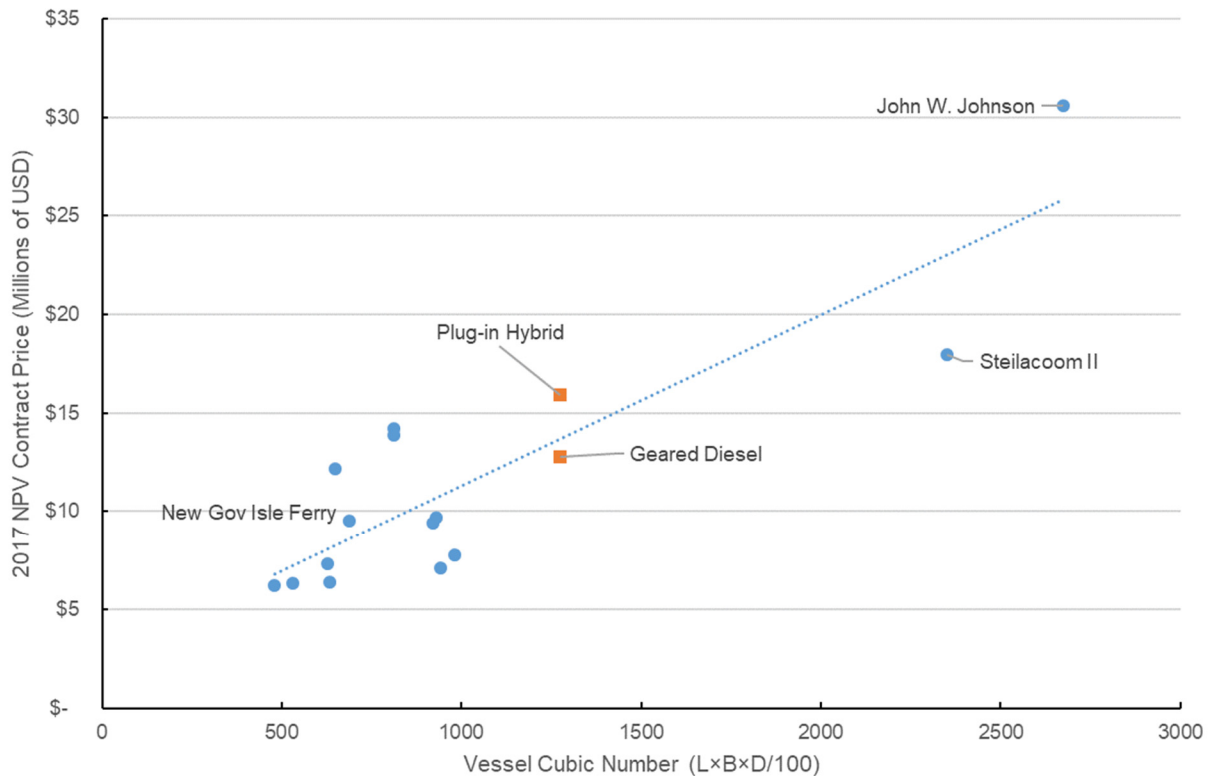


**Figure 1 Program capital cost estimate by propulsion system type**

The range of shipyard contract costs is shown on Figure 2, plotted against a database of ferry construction contract prices. Each vessel is a steel, double-ended monohull, with diesel propulsion systems. Most of the vessels are open-top ferries, all less than 260 feet in length. The contract price is shown in 2017 dollars, adjusted for inflation by the Producer Price Index (PPI) specific to non-military self propelled vessels, under the ship building and repairing category (Reference 5).

Several vessels are noted in Figure 2 due to significance or relevance. The Governors Island Ferry is a smaller passenger-only ferry, but was just contracted this year. The Steilacoom II ferry is owned by Pierce county and is familiar to many. The John W. Johnson is the largest open-top ferry in the database. Costs vary considerably due to many factors other than size, e.g. installed power, propulsor type, structural requirements, outfit.

A linear trendline is applied to the data points to show the general trend of increasing cost with increasing vessel size. While the geared diesel replacement vessel lies slightly below this trend line, it is well within the general range of data points.



**Figure 2** Vehicle ferry cost data with the replacement vessel plotted (steel, double-ended, diesel ferries)

## Restrictions

This engineer's cost estimate has been developed consistent with a 30% complete vessel design. Further phases of design will permit a more comprehensive cost estimate to be developed, where allowances and estimating contingencies could be reduced. We recommend that the estimated costs be used to establish a project budget, while recognizing that bids provided by prospective contractors may vary significantly due to unpredictable market forces.

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## Appendix A     Cost Tables for All Propulsion Systems

**Guemes Island Ferry Replacement - Engineer's Capital Cost Estimate, x \$1,000**

Description	Geared Diesel	Diesel Electric	Series Hybrid	All Electric	Plug-in Hybrid
<b>Total Replacement Cost</b>	<b>15,832</b>	<b>17,217</b>	<b>18,652</b>	<b>25,723</b>	<b>24,589</b>
<b>Vessel Total</b>	<b>14,212</b>	<b>15,596</b>	<b>17,031</b>	<b>16,111</b>	<b>17,685</b>
County Oversight and Contracting	256	281	307	290	319
Vessel Design	640	703	767	726	797
Construction Management	512	562	614	581	637
Shipyard Contract	12,803	14,050	15,343	14,514	15,932
Bonding and Risk Insurance	251	275	301	285	308
Material Markup	551	627	721	684	753
Estimating Allowance	2,000	2,191	2,387	2,258	2,440
Shipyard Engineering & Services	1,795	1,869	1,940	1,886	1,958
Structure	2,799	2,799	2,799	2,799	2,799
Propulsion	1,616	1,148	1,298	1,298	1,298
Electric Plant	576	1,905	2,374	2,223	2,609
Command and Surveillance	554	663	959	772	975
Auxiliary Systems	1,159	1,070	1,060	806	1,055
Outfit & Furnishings	1,503	1,503	1,503	1,503	1,503
Emergency Services Generator					234
<b>Shore-Side Electrical Total</b>				<b>7,991</b>	<b>5,284</b>
Utility Connection				260	217
County Oversight and Contracting				140	89
Permitting				70	44
Shore-Side Design				500	500
Shore-Side Electrical Subtotal				7,020	4,434
Infrastructure				3,099	2,638
Charging Apparatus				3,592	1,796
Emergency Services Generator				329	
<b>Terminal Improvements Total</b>	<b>1,621</b>	<b>1,621</b>	<b>1,621</b>	<b>1,621</b>	<b>1,621</b>
County Oversight and Contracting	29	29	29	29	29
Terminal Design	145	145	145	145	145
Terminal Improvements Subtotal	1,447	1,447	1,447	1,447	1,447
Apron Modifications	345	345	345	345	345
Dolphin Upgrades	1,102	1,102	1,102	1,102	1,102

**Skagit County Ro/Pax Ferry - Engineer's Cost Estimate**  
**Geared Diesel**

Description	Labor (hours)	Materials (\$1000)	Subtotal (\$1000)	Percent of Total
<b>Shipyard Contract Total</b>			<b>12,803</b>	
Labor rate per hour	\$70			
Bonding and Risk Insurance	2%		251	
Material Markup (% of Materials)	12.5%		551	
Estimating Allowance (% of Subtotal)	20%		2,000	
<b>Shipyard Contract Subtotal</b>	79,905	4,408	10,001	
Shipyard Engineering & Services	17,513	569	1,795	17.7%
Structure	28,601	797	2,799	27.5%
Propulsion	2,680	1,428	1,616	17.0%
Electric Plant	5,298	205	576	5.7%
Command and Surveillance	2,840	355	554	5.7%
Auxiliary Systems	8,896	536	1,159	11.6%
Outfit & Furnishings	14,077	518	1,503	14.9%

**Skagit County Ro/Pax Ferry - Engineer's Cost Estimate**  
***Diesel Electric***

<b>Description</b>	<b>Labor (hours)</b>	<b>Materials (\$1000)</b>	<b>Subtotal (\$1000)</b>	<b>Percent of Total</b>
<b>Shipyard Contract Total</b>			<b>14,050</b>	
Labor rate per hour	\$70			
Bonding and Risk Insurance	2%		275	
Material Markup (% of Materials)	12.5%		627	
Estimating Allowance (% of Subtotal)	20%		2,191	
<b>Shipyard Contract Subtotal</b>	<b>84,872</b>	<b>5,016</b>	<b>10,957</b>	
Shipyard Engineering & Services	18,005	608	1,869	16.8%
Structure	28,601	797	2,799	25.0%
Propulsion	2,140	998	1,148	11.0%
Electric Plant	10,473	1,172	1,905	17.7%
Command and Surveillance	3,400	425	663	6.2%
Auxiliary Systems	8,176	497	1,070	9.8%
Outfit & Furnishings	14,077	518	1,503	13.5%



**Skagit County Ro/Pax Ferry - Engineer's Cost Estimate**  
**Series Hybrid**

Description	Labor (hours)	Materials (\$1000)	Subtotal (\$1000)	Percent of Total
<b>Shipyard Contract Total</b>			<b>15,343</b>	
Labor rate per hour	\$70			
Bonding and Risk Insurance	2%		301	
Material Markup (% of Materials)	12.5%		721	
Estimating Allowance (% of Subtotal)	20%		2,387	
<b>Shipyard Contract Subtotal</b>	88,065	5,770	11,934	
Shipyard Engineering & Services	18,322	658	1,940	16.0%
Structure	28,601	797	2,799	22.9%
Propulsion	2,140	1,148	1,298	11.4%
Electric Plant	12,068	1,529	2,374	20.3%
Command and Surveillance	4,920	615	959	8.2%
Auxiliary Systems	7,938	505	1,060	8.9%
Outfit & Furnishings	14,077	518	1,503	12.4%

**Skagit County Ro/Pax Ferry - Engineer's Cost Estimate**  
**All Electric**

Description	Labor (hours)	Materials (\$1000)	Subtotal (\$1000)	Percent of Total
<b>Shipyard Contract Total</b>			<b>14,514</b>	
Labor rate per hour	\$70			
Bonding and Risk Insurance	2%		285	
Material Markup (% of Materials)	12.5%		684	
Estimating Allowance (% of Subtotal)	20%		2,258	
<b>Shipyard Contract Subtotal</b>	83,031	5,475	11,288	
Shipyard Engineering & Services	17,823	639	1,886	16.4%
Structure	28,601	797	2,799	24.2%
Propulsion	2,140	1,148	1,298	12.0%
Electric Plant	10,973	1,455	2,223	20.1%
Command and Surveillance	3,960	495	772	7.0%
Auxiliary Systems	5,457	424	806	7.2%
Outfit & Furnishings	14,077	518	1,503	13.1%

**Skagit County Ro/Pax Ferry - Engineer's Cost Estimate**  
**Plug-in Hybrid**

Description	Labor (hours)	Materials (\$1000)	Subtotal (\$1000)	Percent of Total
<b>Shipyard Contract Total</b>			<b>15,698</b>	
Labor rate per hour	\$70			
Bonding and Risk Insurance	2%		308	
Material Markup (% of Materials)	12.5%		753	
Estimating Allowance (% of Subtotal)	20%		2,440	
<b>Shipyard Contract Subtotal</b>	<b>88,198</b>	<b>6,024</b>	<b>12,198</b>	
Shipyard Engineering & Services	18,335	674	1,958	15.8%
Structure	28,601	797	2,799	22.4%
Propulsion	2,140	1,148	1,298	11.1%
Electric Plant	12,423	1,740	2,609	21.8%
Command and Surveillance	5,000	625	975	8.1%
Auxiliary Systems	7,623	522	1,055	8.7%
Outfit & Furnishings	14,077	518	1,503	12.1%