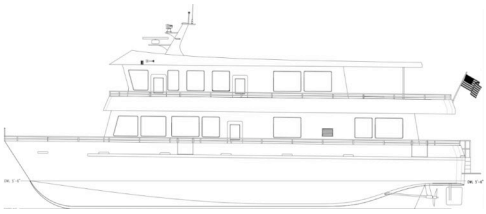
going green



PITTSBURGH VOYAGER

GREEN BOAT PROJECT
A Worldwide First

Pittsburgh Voyager's mission is to provide exceptional river-based experiential learning and adventure opportunities for students, teachers and the public.

Voyager is building one of the first green passenger boats in the world to serve as its flagship vessel for river-based science education and public programming. The 149-passenger, 90'x25' boat will serve over 10,000 students a year while reducing emissions to air and water, implementing innovative propulsion technology and alternative fuels. It will also serve as a practical model for sustainable boating technology worldwide. The following objectives have guided the Green Boat project from concept to reality:

- Serve as an **educational tool and real world example of sustainable design practices** for the students, teachers and the public that Voyager serves.
- **Minimize the impact of operations on the natural environment**.
- Showcase how **green building design** and environmentally friendly procedures can be utilized on a passenger vessel **while still maintaining operating efficiency and reliability**.
- Design and build a passenger vessel that implements the Leadership in Energy and Environmental Design (LEED™) process for all applicable systems.

Over **110 onboard systems** were investigated and the resulting vessel design demonstrates a number of technologies that are new to the marine industry. The following are examples of the innovative features of Voyager's Green Boat:

- Hybrid diesel-electric propulsion system and a power plant designed for the future addition of solar, wind or fuel cells.
- Large battery banks for zero emission operations - charged at dock or underway.
- Generator engine waste heat recovery.
- Excellent thermal insulation system.
- Low volatile organic coatings.
- Highly efficient interior and exterior lighting systems.
- Water efficiency and zero wastewater discharge.
- Energy management and control system.

Project Team:

THE HEINZ ENDOWMENTS

Carnegie Mellon

ALION SCIENCE AND TECHNOLOGY

Green Building Alliance
Smart solutions for the built environment

SIEMENS

PFAFFMANN+ASSOCIATES PC

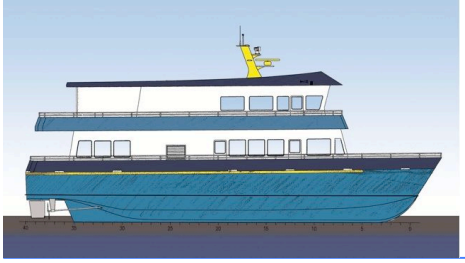
Perkins Eastman

SHERWIN WILLIAMS

MOSHIER STUDIO

FREEPORT SHIPBUILDING

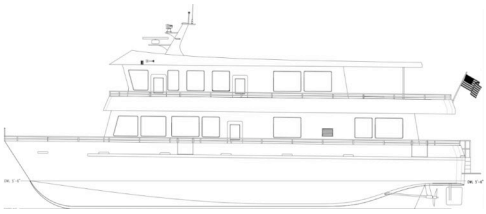
DeJong & Lebet, Inc.



TRACO
The Windows And Doors That Greet The World.

HILBISH McGEE LIGHTING DESIGN

going green



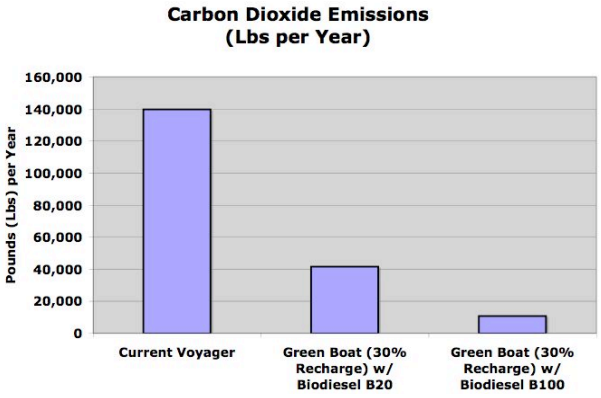
PITTSBURGH VOYAGER

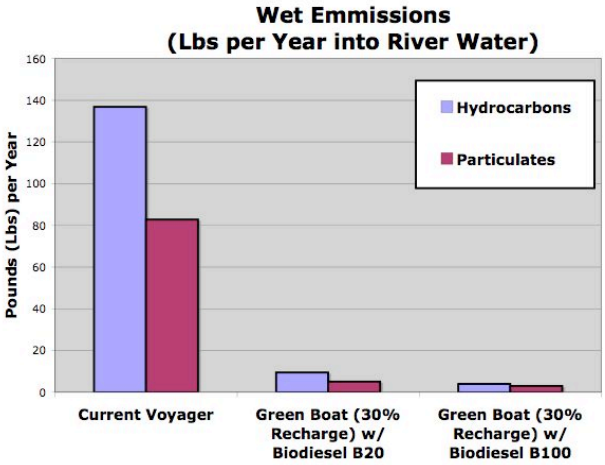
GREEN BOAT PROJECT
Air and Water Quality

Pittsburgh Voyager provides river-based environmental education and public programming to thousands of children and adults every year on the rivers of Western PA and beyond the region. In designing the Green Boat, we sought to significantly reduce our impact to the air and water as compared with our baseline fleet of traditional diesel powered vessels, *Voyager* and *Discovery*. The goals are to improve our environmental performance and demonstrate environmental stewardship to our students and customers.

In spite of our environmental mission, the limitations of our current aging fleet have hindered stewardship for the environment. The majority of inland coastal and ocean vessels burns marine diesel fuel which burns hundreds of times dirtier than US highway diesel.

Air emissions modeling in Allegheny County suggests that diesel emissions are amongst the worst in the US with human health risks over 500 times the US EPA acceptable levels. **Marine emissions from river commerce contribute as much as 30% of the overall diesel particulate matter in the region.**





The Green Boat will achieve significant reductions in both air and wet emissions, air emissions that are released underwater and captured by the river water, via:

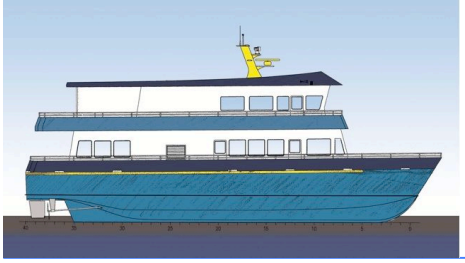
- Hybrid diesel-electric propulsion system with state-of-the-art diesel engine technology.
- Use of biodiesel blended fuel.
- Use of 100% renewable electric power from the local grid to charge the battery banks while at dock.
- Future fuel cell, photovoltaic and micro wind turbine implementation.

Air and Water Quality Team:

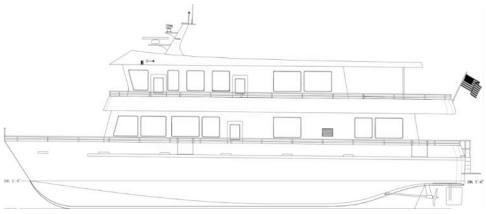
ALION SCIENCE AND TECHNOLOGY

Carnegie Mellon

CLEAN AIR TASK FORCE



going green



PITTSBURGH VOYAGER

GREEN BOAT PROJECT
Green Construction and LEED™ Processes

The Green Boat design team
thoroughly researched US and global standards for designing an environmentally friendly and sustainable vessel, but found none that were comprehensive enough for the goals of this project. One of the most mature and flexible green design standards within industry today is the US Green Building Council's (USGBC) Leadership in Energy and Environmental Design or LEED™ standard.

Pittsburgh, a leader in green buildings for over ten years, has amongst the largest number of square feet of LEED™ certified space than any other city in the world, including the first certified convention center, historic building, university residence hall and children's museum. Our team determined that applying the LEED™ process to the design of the Green Boat was the best approach to holistically evaluate the boat design using an objective standard.

We also think it appropriate that Pittsburgh continue to set new trends in environmental thinking and practice in keeping with our history of global innovation.

LEED LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Voyager's Green Boat is the first boat to apply the LEED™ process to its design and construction. Many boat subsystems such as HVAC, lighting, interior design and materials, plumbing and windows are practically identical to buildings.

The project has required a close team effort with considerable education of our contracted shipyard and contractors about green material selection and construction techniques.

Voyager is following the entire LEED™ process and we expect that USGBC will provide official recognition of our efforts.

The LEED™ process has significantly changed our boat design approach for:

- **Windows** – Energy efficient custom architectural windows will replace marine windows for the same price.
- **HVAC** – Energy modeling helped reduce chiller size requirements.
- **Insulation** – Thermal breaks added to wall construction.
- **Materials and Coatings** – Cabinetry will be made from renewable materials that are new to the contractors building the boat and the industry.

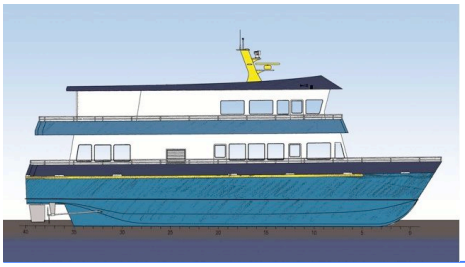
Green Construction Team:

MOSHIER STUDIO

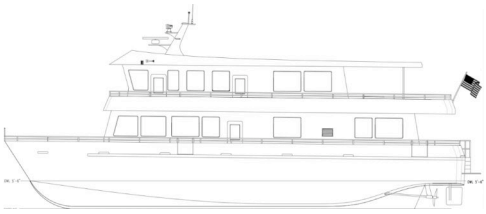
Perkins Eastman

HILBISH McGEE LIGHTING DESIGN

Green Building Alliance®
Smart solutions for the built environment



going green



PITTSBURGH VOYAGER

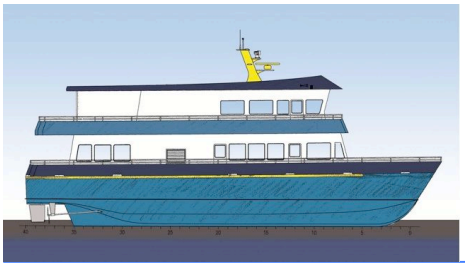
GREEN BOAT PROJECT
Hybrid Propulsion System and Alternative Fuels

The most innovative aspect of Voyager's Green Boat is the propulsion system. After a thorough evaluation of existing technology by the industry's leading alternative fuel marine engineers, Alion JJMA, the designers of the yet-to-be-built San Francisco Bay Area Water Transit Authority Fuel Cell Ferry, it was determined that a diesel-electric hybrid system was the best alternative. The flexibility and exceptional environmental performance of this design is coupled with high reliability and proven technology.

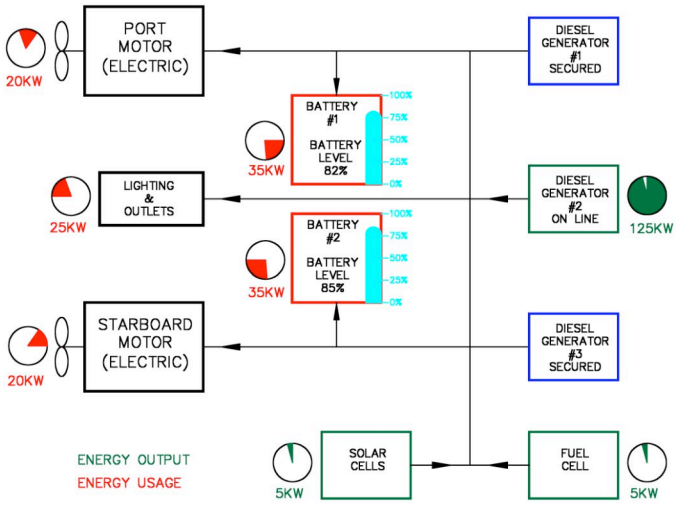
The Green Boat will be one of the first vessels in the world constructed with this propulsion system design.

The hybrid propulsion system being provided by Siemens Energy and Automation will combine the use of green power from shore with the world's most advanced diesel-electric power generation technology onboard. The engines will run on a biodiesel fuel blend and the system explicitly provides for the future addition of new power sources such as a fuel cell, solar panels and micro wind turbines. **The organization's reliance on imported oil will be significantly reduced through the use of domestic biodiesel.**

The Green Boat will reduce the total energy needed by the Voyager fleet to serve 10,000 students by over 35,000 kW-hrs per year or nearly 50%. Emissions of CO_2, SO_X and PM will be significantly reduced.



The design and construction of Voyager's **Green Boat represents a significant national and international step for green boat design** and the successful integration of energy and environmental goals within a defined operational marine context.



Propulsion System Team:

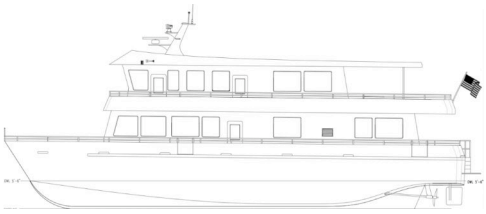
SIEMENS

ALION SCIENCE AND TECHNOLOGY

Carnegie Mellon

FREEPORT SHIPBUILDING

going green



PITTSBURGH VOYAGER

GREEN BOAT PROJECT
Environmental, Energy & Sustainability Education

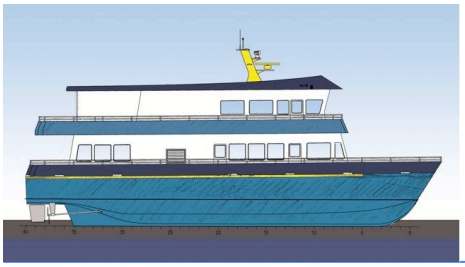
Voyager's core mission and competency is river-based science education. Voyager has been delivering award winning education programming for over 10-years. The Green Boat will provide a revolutionary new platform from which to teach both formal students from grade school through college and the public about the rivers, the environment and now also about energy and sustainability.

The Green Boat will become a powerful teaching tool for all who come on board, whether for educational or tour programs or for after-hours charters and special events, and the special ADA accessible features will make this a vessel truly capable of serving the entire community.

As part of the curriculum development related to the new vessel, Voyager and our partners and expert education consultants will develop energy and sustainability modules to add to both our current core programs:

- *Environmental Science on the 3 Rivers*
- *Boat Bridges and Water*

In addition we will be building a whole new series of **programming exclusively around green engineering, sustainability and energy that will complement the boat's interpretive signage** and hands-on learning opportunities. The Green Boat will also provide for significant program expansion due to increased capacity.

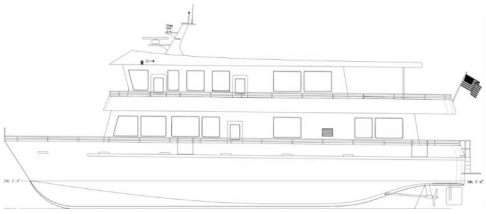


Education and Public Programming Team:

Carnegie Science Center — One of the four Carnegie Museums of Pittsburgh

Carnegie Mellon

PITTSBURGH — GREATER PITTSBURGH CONVENTION & VISITORS BUREAU



GREEN BOAT PROJECT
Technical Specifications

Dimensions

Length Overall:	90'-6"
Length on Deck:	89’-0”
Beam (molded):	26'-0"
Depth (molded hull):	10'-0"
Draft, Full Load:	5'-6"
Draft, Mean Normal Operating:	5’-0”
Maximum Air Draft:	40' above baseline
Gross Tonnage:	Less than 100

Passengers and Crew

Passengers:	150
Crew:	20

Certifications

Route:	Protected Waters
U.S. Coast Guard Classification:	Subchapter T

Capacities

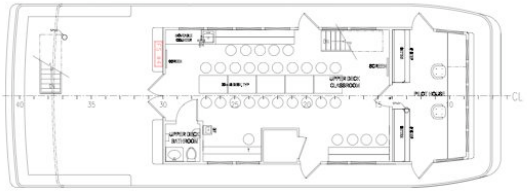
Fuel Storage Capacity:	2,000 Gallons
Potable Water Capacity:	1,800 Gallons
Black Water Capacity:	1,400 Gallons
Dirty Lube Oil Capacity:	200 Gallons

Materials

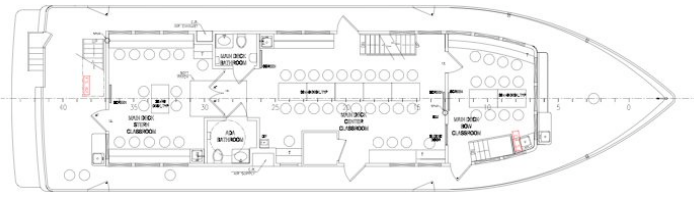
Hull:	100% recycled steel
Railing system:	Anodized aluminum
Custom cabinetry:	Wheat board

Major Systems

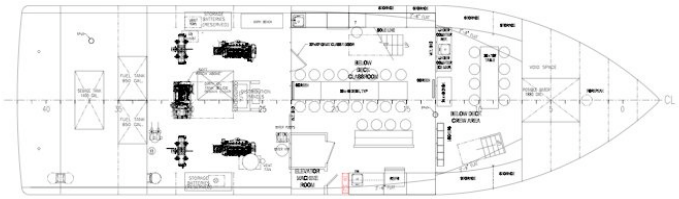
Propulsion System:	ELFA™, Siemens Hybrid Marine Propulsion System
Marine Paint System:	Sherwin Williams
Window System:	TRACO NX-200



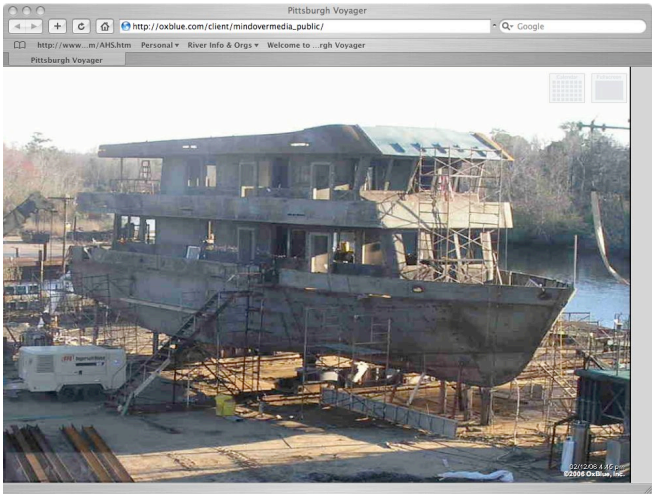
Second Deck Arrangement Plans



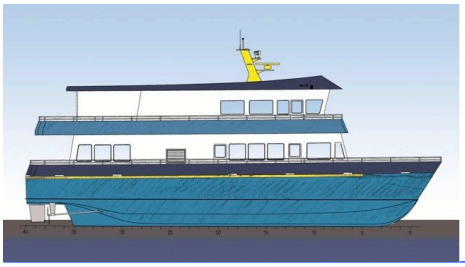
Main Deck Arrangement Plans



Below Deck Arrangements Plans



Web cam photograph of the boat under construction in Freeport, FL, February 12, 2006. (http://oxblue.com/client/mindovermedia_public/)



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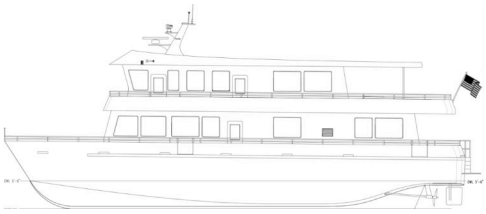


PITTSBURGH VOYAGER

GREEN BOAT PROJECT
Contributors

Financial:

- **Alcoa Corporation**
- **Eden Hall Foundation**
- **Equitable Resources Foundation**
- **The Fisher Fund of The Pittsburgh Foundation**
- **The Giant Eagle Foundation**
- **H.J. Heinz Company Foundation**
- **The Heinz Endowments**
- **Hillman Foundation**
- **Howard & Nell E. Miller Foundation**
- **McCune Foundation**
- **The Negley Flinn Charitable Foundation**
- **Pennsylvania Department of Environmental Protection**
- **Richard King Mellon Foundation**
- **Robert and Mary Weisbrod Foundation**

As of March 1, 2006, Voyager has raised a total of $1,500,000 towards a total Green Boat construction budget of $3,000,000.

Voyager gratefully acknowledges The Heinz Endowments for their leadership in philanthropic support of this project.

THE HEINZ ENDOWMENTS

In-Kind:

- **Alion JJMA**: *Propulsion system design and consulting.*
- **Carnegie Mellon University:** *Extensive planning, software development and technical consulting.*
- **Fiberstars, Inc.:** *Fiber optic exterior lighting system.*
- **HILBISH McGEE LIGHTING DESIGN:** *Interior and Exterior lighting design.*
- **Perkins Eastman:** *Interior design services.*
- **Sherwin Williams:** *Marine paint system.*
- **TRACO:** *Advanced window system.*

ALION SCIENCE AND TECHNOLOGY

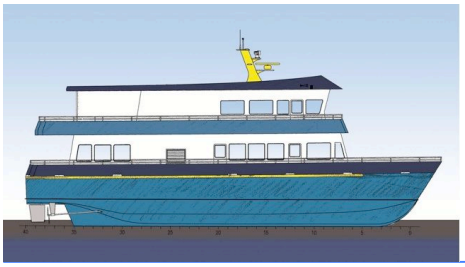
Carnegie Mellon

HILBISH McGEE LIGHTING DESIGN

Perkins Eastman

COVER THE EARTH
SHERWIN WILLIAMS

TRACO
The Windows And Doors That Greet The World.



Pittsburgh Voyager

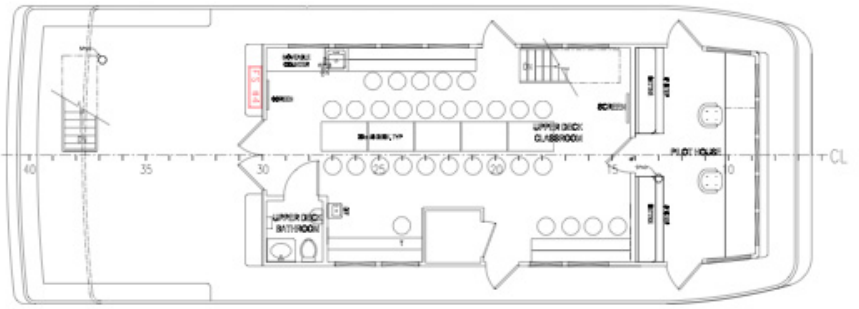
New “Green” Boat Floor Plans

School Programs

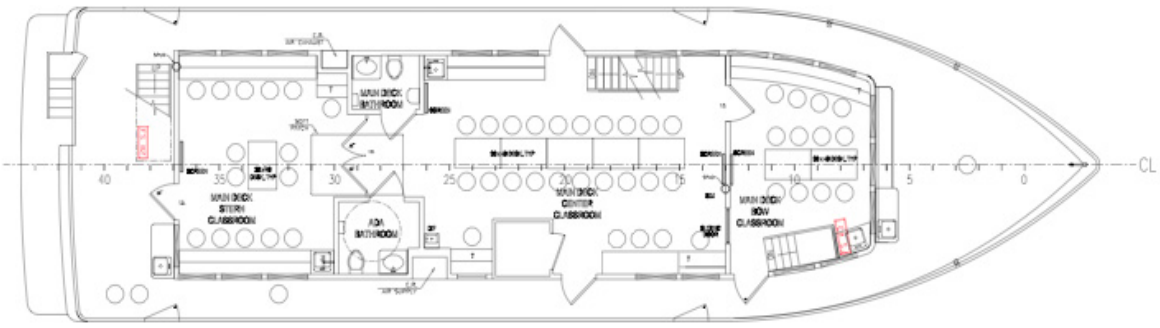
- Up to 90 Students
- Up to 9 School Teachers/Chaperones
- Up to 9 Voyager Education Staff
- 4 Boat Crew
- 9 Laboratory Areas

Public Education Programs & Private Charters

- Up to 149 Passengers
- Up to 20 Education Staff, Boat/Service Crew



Second Deck Arrangement Plans



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