

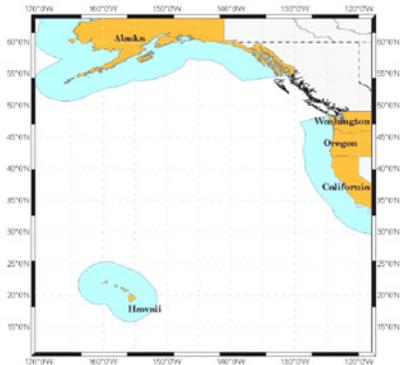
Project Experience | Glosten, Seattle WA

**SBIR Ballast Water Monitoring System prototype**

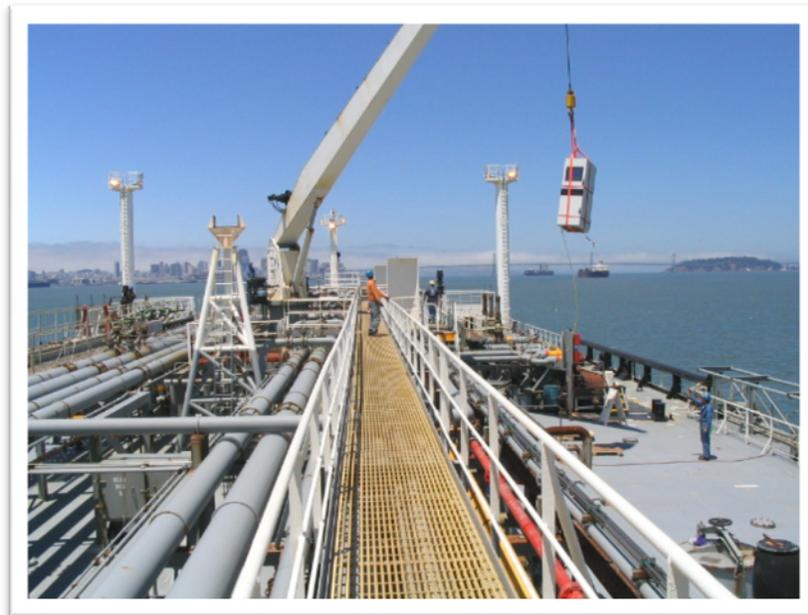
**Earnest Development** began working with **Glosten**, a marine engineering firm, in August, 2003 under a contract funded by the US Coast Guard (USDOD). The project addressed compliance with pending federal and regional legislation aimed at minimizing marine contamination due to release of ballast water from one ecological region to another by large oceangoing vessels.

The prototype proved and demonstrated a solution for determining when and where a vessel is permitted to discharge ballast, and to provide documentation of compliance.

This was an intriguing and complex project that we worked on with Glosten's engineering team for almost 2 years.



*United States Federal Regulations,  
Washington - Waters of the State*



*The prototype console being loaded onto the preliminary test vessel  
"Seabulk Pride", anchored in San Francisco Bay, October. 2004*

## Project

Design and Development  
Components:

### Database:

(Shipboard server)

1. Import raw data from sensors (PLC)
2. Pre-process raw data and feed to Pipeflow
3. Import and store data from Pipeflow.
4. Integrate GPS and Regions data
5. Process data and feed to Desktop application.

### Desktop application:

(Shipboard console)

1. Interface for configuration and system administration
2. Graphical interface for end-users.
3. Reports

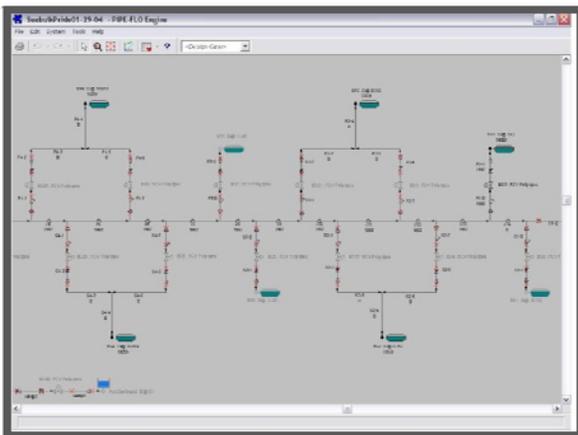
### Platform:

SQL Server (back-end)  
VB Script (data processing)  
C# / vb.net (interface)  
Crystal Reports (reports)

**Modeling:** MS Access

## Scope of Work:

- A. System definition & discovery:
  1. Understand PLC data output;
  2. Understand Pipeflow software specifics & data output;
  3. Understand GPS and regions data output;
  4. Prepare prelim. database schema
  5. Prepare outline of data processing routines;
  6. Prepare definition of interface components;
  7. Define output/report requirements;
  8. Prepare performance specifications document.
  9. Review and approval
    - a. Review session & follow up
    - b. Reconcile scope, fee estimate & schedule, adjust if necessary.
- B. Mockup & preliminary coding:
  1. Build database and tables
  2. Create sample data
  3. Code data import/export and processing routines
  4. Mockup admin, configuration and end-user screens.
  5. Review and approval
    - a. Review session & follow up
    - b. Reconcile scope, fee estimate & schedule – adjust if necessary.
- C. Coding
  1. Data import / export routines
  2. Data normalization / processing routines
  3. Error trapping
  4. Interface graphics
  5. Interface functionality
  6. Reports
- D. Simulation and testing
  1. Configure simulated demonstration and testing environment
  2. Testing & debugging
- E. Final coding
- F. Implementation



*Pipeline diagram*



### Ballast Monitoring System (SBIR Program)

PRELIMINARY MOCKUP

The Glosten Associates, Inc.  
600 Mutual Life Building  
605 First Avenue  
Seattle Washington 98104-2224  
USA  
206.6247850  
www.glosten.com

Mockup software development supplied by  
Earnest Development  
1411 Fourth Avenue, Suite 812  
Seattle, Washington 98101  
USA  
206.622.1950  
www.earnestdevelopment.com

copyright 2003 all rights reserved

[BEGIN]

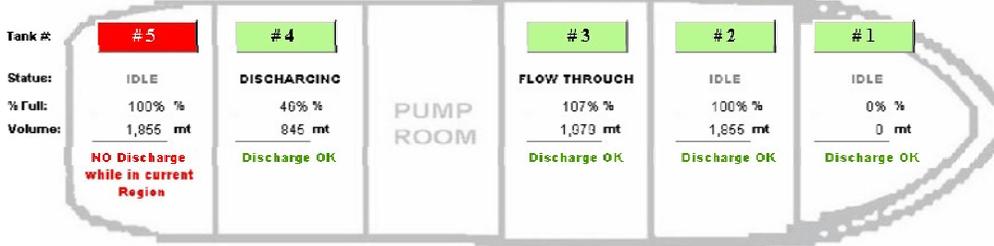
#### Current Status

M/V Blue Traveler

Owner: Interocean Transport  
IMO Number: 398883  
Call Sign: TWZF  
Gross Tonnage: 40,000 mt  
Total Ballast Capacity: 9,275 mt

Geographic Region: Kaohsiung  
Current Position: 22:37.01 N 120:16:07 E  
Vessel Course: 120  
Vessel Speed: 12 knots  
Vessel Trim: 1m by Stern  
Total Ballast On Board: 6,534 mt 70%  
Pump Status: RUNNING  
Last Data Update: 4/26/2003 10:16:46 PM

M/V Blue Traveler



[Plan Ballast Discharge] [Reports] [System Display] [Configuration] [Help] [EXIT]

### # 5 Tank Detail

**Discharge OK at current position?** NO

Baseline Elev:	0 m	Current Status:	IDLE
Sensor Height:	15 m	Flow Rate:	0 m <sup>3</sup> /hr.
Tank Capacity:	1,855 m <sup>3</sup>	Tank Volume:	1,855 m <sup>3</sup>
Max. Level:	15 m	Tank Level:	15 m
		% of Capacity:	100%

**Ballast Water History:**

Date	Type	Region	Volume	Ending Volume
4/1/2003	Fill	Puget Sound	1,200	2,400
2/18/2003	Fill	Kaohsiung	1,200	1,200
2/15/2003	Discharge	Kaohsiung	2,400	0
2/10/2003	Flow Through	Mid-Ocean	2,400	2,400
2/3/2003	Fill	Kaohsiung	2,400	2,400
2/2/2003	Discharge	Kaohsiung	1,000	0
2/1/2003	Fill	Kaohsiung	1,000	1,000
1/31/2003	Discharge	Mid-Ocean	2,400	0
1/30/2003	Flow Through	Mid-Ocean	2,400	2,400

**GLOSTEN**  
The Glosten Associates, Incorporated

Main Screen

System Display

HELP

**Kaohsiung** 50%

**Puget Sound** 50%

**Mid-Ocean** 0%

Glosten SBIR Ballast Monitoring System - Discharge Scenarios

## Plan Ballast Water Discharge

Proposed Discharge Region: Puget Sound

	<b>IDLE</b>			<b>IDLE</b>	<b>IDLE</b>
	1,855 mt	845 mt	1,979 mt	1,855 mt	0 mt
	100%	46%	107%	100%	0%

**NO Discharge**

**Discharge OK**

Main Screen



February 24, 2004  
**Glosten Phase II, Discussion Items**

1. Redicate Regions
  - a. The system and BW discharge rules will no longer be based on Regions.
  - b. Glosten will incorporate ArcView software to model Jurisdictional Common Waters data.
  - c. System is to track BW intake in increments measured to a distance = one nautical mile; using Lat/Long rounded to the nearest minute.
  - d. Impact: Coding for "Events Processing" was substantially completed and most of that code will need re-writing. Effect to display minimal. No effect on completed code for pre-processing, simulator system.
  - e. Est. Hrs:
    - Arc View integration: 20-40 hrs.
    - Rework Events Processing code: 70-90 hrs.
    - Modify Display & reporting: 5-10 hrs.
2. Change database platform to SQL Server?
  - a. Is SQL Server db desirable for commercial version?
  - b. Opportunity to change platforms in conjunction with re-write Processing:
    - Adds approx. 100 hrs to item #1 if done at this point in time.
    - After phase II is complete, much more duplicated effort.
    - Is cost of conversion to SQL Server budgeted in "Phase II"?
3. Add -XML to SERC via Email
  - a. Need to see xml schema
  - b. What is the Email protocol?
  - c. E.U. can provide cost est. after review of schema.
4. Tamper and Fraud Prevention
  - a. Should tamper/fraud alerts be incorporated into report to U.S. Coast Guard?
  - b. If tampering/fraud is detected, how should it be reported?
  - c. Should tamper/fraud alerts create any special Emails or auto reports?
  - d. How would a Log report be utilized?
  - e. E.D. can provide cost est. after Scope of work is discussed.

(continued)

**Tamper and Fraud Prevention**

	Log	Display Alert	Send Alert
<b>Access</b>			
Password Protect access to the DB			
Password Protect access to system processing start/stop.			
Password Protect access to Windows user interface			
<b>Sensors</b>			
Skarp - detect No Signal (3 <sup>rd</sup> instance)	x	x	
PLC - detect No Signal (3 <sup>rd</sup> instance)	x	x	
GPS - detect No Signal (3 <sup>rd</sup> instance)	x	x	
GPS - receive No triangulate signal (3 <sup>rd</sup> instance)	x	x	
<b>Data Integrity</b>			
Detect start/stop of system processes		x	
Detect continuity gaps (max interval between reads)		x	x
Compare Skarp reading to /PLC Valve settings		x	x
<b>Prevent Loss of Data</b>			
Mirror system (RAID)			
Fully automated backup of data			

Condition	Solution
Shut down processes	need password
Disconnect power	Continuity gap is detected.
Stolen / damaged sensor	No Signal is detected.
Skarp / PLC	Inconsistent data is detected.
Failure to the CPU	Switch to mirror system (RAID) -or- restore data from backup.
System Error	Switch to mirror system (RAID) -or- restore data from backup.

2 Earnest Development, Project status as of February 26, 2004										
3 Potential cost overrun is \$40,000.										
4 Increase in cost is driven by expansion scope of work and changes to complete work.										
5 Plan A: \$26,000 over budget. Borrow hours from existing contracts scope to cover about half of "necessary" new work.										
6 Plan B: Meet budget. Substitute hours from existing contracts scope to cover all "necessary" new work.										
7 In both plans, hours are recovered by eliminate Documentation, Commissioning, AWP Peak Tank special processing, xml/Email and fraud/tamper detection.										
8 Plan B additionally reduce scope of display and reporting features, and (40) hours held carried to Phase III.										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										
<b>TASKS</b>		<b>HOURS</b>		<b>EST. HOURS TO COMPLETE</b>			<b>Budget</b>	<b>PLAN A</b>	<b>PLAN B</b>	
		<b>BUDGETED</b>	<b>TO DATE</b>	<b>CONTRACT</b>	<b>ADDITIONAL</b>	<b>TOTAL</b>	<b>\$</b>	<b>STATUS</b>	<b>STATUS</b>	
13	More contract	0	120	0	0	120				(40)
14	Discovery	0	0	0	0	0				
15	Planning & Presentation	0	0	0	0	0				
16	Core Processing (Concept Events)	250	240	240	0	240				
17	Core Processor - Events	94	94	0	0	94				
18	Display and Reporting	250	202	120	0	220				(40)
19	<b>Subtotal</b>	<b>594</b>	<b>766</b>	<b>480</b>	<b>0</b>	<b>480</b>	<b>\$</b>	<b>51,288</b>		<b>(40)</b>
20	Eliminate Documentation	40	0	40	0	40				(40)
21	Pre-commission testing / debugging	50	0	50	0	50				(40)
22	Commissioning	95	0	95	0	95				(95)
23	<b>Subtotal</b>	<b>185</b>	<b>0</b>	<b>185</b>	<b>0</b>	<b>185</b>	<b>\$</b>	<b>47,571</b>		
24	<b>2 Addition of services</b>									
25	More meetings & presentations	0	0	0	40	40				
26	Hardware cost / config	0	0	0	5	5				
27	Add Parts / Location	0	13	0	10	23				(10)
28	New BW Report - USCG version	0	11.5	0	30	41.5				(20)
29	Add Operator Training	0	10	0	10	20				(20)
30	Add AWP Peak Tank - special processing	0	0	0	25	25				(25)
31	Add report for simulator	0	10	0	5	15				(10)
32	Add Arc Visualization	0	0	0	20	20				
33	<b>Subtotal</b>	<b>0</b>	<b>54.5</b>	<b>0</b>	<b>110</b>	<b>164.5</b>	<b>\$</b>	<b>98,658</b>		
34	<b>3 Revisions to completed work - Eliminate Regions:</b>									
35	Discovery	0	24	0	0	24				
36	Event Processing	0	0	0	60	60				(60)
37	Display & Reporting	0	0	0	60	60				(60)
38	<b>Subtotal</b>	<b>0</b>	<b>24</b>	<b>0</b>	<b>120</b>	<b>144</b>	<b>\$</b>	<b>56,551</b>		
39	<b>4 Enhancements (pending)</b>									
40	Email and/or Browsable	0	0	0	40	40				(40)
41	Fraud/Tamper Detection	0	0	0	40	40				(40)
42	<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>80</b>	<b>80</b>	<b>\$</b>	<b>7,088</b>		
43	<b>5</b>									
44	<b>TOTALS</b>	<b>1,143</b>	<b>872</b>	<b>354</b>	<b>365</b>	<b>1,579</b>	<b>\$</b>	<b>543,938</b>		
45	<b>Percent of Budget</b>		<b>761</b>	<b>302</b>	<b>382</b>	<b>1372</b>		<b>1372</b>		
46	<b>Potential Overrun (savings)</b>					<b>426</b>	<b>\$</b>	<b>48,421</b>	<b>(249)</b>	<b>(426)</b>

Client: The Glosten Associates, Inc., 1201 Western Avenue, Suite 200, Seattle WA 98101-2921  
 Kevin Reynolds, Sr. Engineer and Project Manager