



## **Environmental Compliance: Acquisition, Storage, and Analysis of Waste Oil Data**

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# **User Manual**

This guide is intended to be used in conjunction with the data transmission system and database developed by WPI students for the storage and analysis of shipboard waste data.

### **Developed For:**

United States Coast Guard

Office of Vessel Activities (COMDT CG-543), in conjunction with the  
Office of Investigations and Casualty Analysis (COMDT CG-545)

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# Table of Contents

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Table of Figures.....	ii
Tables of Tables.....	<b>Error! Bookmark not defined.</b>
1 Parsing Program.....	3
2 Database .....	4
2.1 Importing Data .....	4
2.2 Main Menu.....	6
2.3 Data Entry and Modification.....	7
2.3.1 New Vessel .....	7
2.3.2 Add SWOMS Data.....	8
2.3.3 Add Sounding Book Data.....	10
2.3.4 Modify Tanks Data .....	12
2.3.5 Vessel Details.....	13
2.3.6 Delete Records.....	13
2.4 Data Viewing .....	14
2.4.1 Vessel List .....	14
2.4.2 SWOMS Data .....	15
2.4.3 Sounding Book Data .....	16
2.5 Generating Reports.....	16
2.5.1 Quick Reports Using the Main Menu .....	16
2.5.2 Detail Reports .....	17
2.5.3 SWOMS Anomaly Report.....	19
2.5.4 Sounding Anomaly Report.....	20
2.5.5 Combined Report.....	20
2.5.6 Printing or Exporting Reports.....	21
3 Parsing Program Maintenance .....	22
3.1 Rebuild swomsparser Executable from Source Code .....	22
3.1.1 Create Project.....	22
3.1.2 Set Up Project.....	24
3.1.3 Modify and Build Code .....	26
4 Access Database Maintenance .....	27

# Table of Figures

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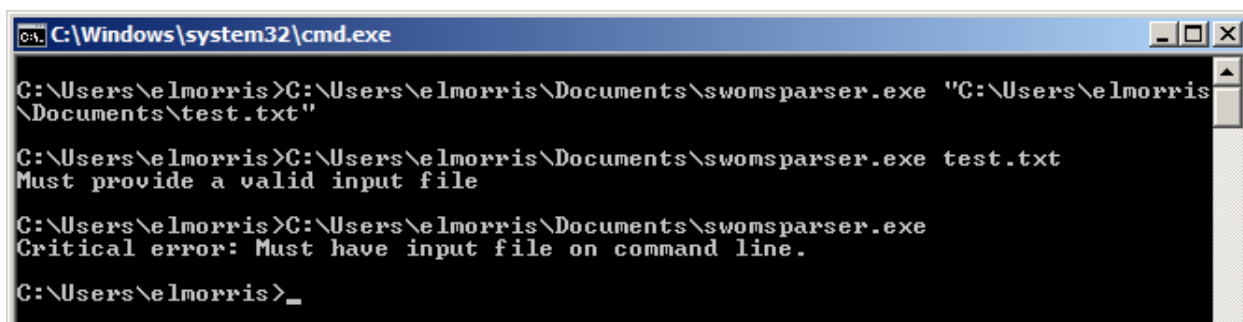
Figure 1: Run swomsparser.exe Via cmd.exe.....	3
Figure 2: Run swomsparser.exe Via the Run Dialogue .....	4
Figure 3: Access Toolbar to Import Data .....	4
Figure 4: Text File Import Source and Destination .....	5
Figure 5: Import Data Delimiter Options.....	6
Figure 6: Main Menu.....	6
Figure 7: New Vessel form.....	8
Figure 8: Add SWOMS Data form – Basic Info tab.....	9
Figure 9: Add SWOMS Data form - Tanks tab .....	10
Figure 10: Add Sounding Book Data form.....	11
Figure 11: Tanks Data form.....	12
Figure 12: Vessel Details form .....	13
Figure 13: Delete Records form.....	14
Figure 14: Delete Records Dialog.....	14
Figure 15: Vessel List table.....	15
Figure 16: SWOMS Data table.....	15
Figure 17: Sounding Book Data form .....	16
Figure 18: Detail Reports form .....	18
Figure 19: New Project dialog.....	23
Figure 20: Application Settings.....	24
Figure 21: Solution Explorer.....	24
Figure 22: Solution Explorer Including Files .....	25
Figure 23: Project Properties .....	26
Figure 24: Build Output .....	27

# 1 Parsing Program

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The parsing program “swomsparser” runs automatically after a combination of Outlook rules and VBA code is run on the incoming SWOMS email. The program should run without any user interaction. As subject-line IMO number retrieval has not implemented, the program uses dummy IMO numbers. The program first finds the vessel name within the automatically generated SWOMS email, and then looks for a vessel-specific CSV file named with the vessel name. If this file does not exist, the program will generate a new file, the first line of which will contain a dummy IMO number (“0000000”) and the vessel’s name, and then it will append the single record containing the data parsed from the email into that file. Otherwise, the program will append a single record containing the data parsed from the email to vessel-specific table, copying the IMO number contained in the first line. If that IMO number is verified to be an actual IMO number (i.e. not “0000000”), the program will proceed to add that same record to a master table containing SWOMS data (SWOMS\_Table.csv) which is automatically monitored by the database.

In the case that the user desires to manually run the program on a specific file, there are two methods that can be used. The first is to use the Windows Command Prompt (see Figure 1). This method is preferable because it will display any relevant error messages in the case that the command is incorrectly typed.

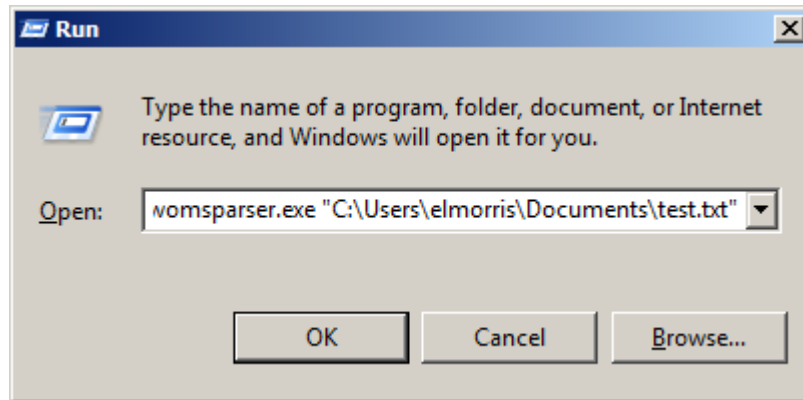


```
C:\Windows\system32\cmd.exe
C:\Users\elmorris>C:\Users\elmorris\Documents\swomsparser.exe "C:\Users\elmorris\Documents\test.txt"
C:\Users\elmorris>C:\Users\elmorris\Documents\swomsparser.exe test.txt
Must provide a valid input file
C:\Users\elmorris>C:\Users\elmorris\Documents\swomsparser.exe
Critical error: Must have input file on command line.
C:\Users\elmorris>_
```

Figure 1: Run swomsparser.exe Via cmd.exe

In order to open the command prompt, go to the Start Menu, select “Run,” type in “cmd,” and then click “OK.” In the command prompt, type the path to the executable (e.g. “C:\Users\elmorris\Documents\swomsparser.exe” not including the quotes) followed by a space and then the path to the text file to be processed (e.g. “C:\Users\elmorris\Documents\textfile.txt” which may or may not include quotes). If this is entered correctly, the program should run without issue, and the program will not print any text in response, giving a fresh prompt. If the file that is referenced does not exist, or is not in the location indicated, the program will print the error message “Must provide a valid input file.” If no argument is given after the path to the executable, the program will print the error message “Critical error: Must have input file on command line.” If no error messages are shown, then the only way for the user to ensure that the file was parsed is to open the vessel-specific CSV file, which is created in the same directory as the input file.

The second method is to use the same command inputs as before, but to enter them directly into the “Run” dialogue box (see Figure 2) rather than the Windows Command Prompt.



**Figure 2: Run swomsparser.exe Via the Run Dialogue**

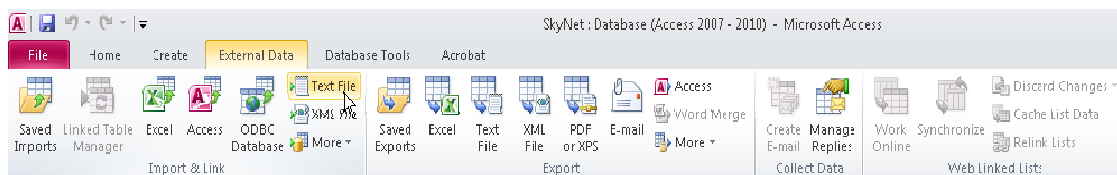
This is a less helpful method because any error messages will only briefly flash on the screen before the window exits. Just as with system functions like “ping”, the program will close its command interpreter window as soon as it has completed processing. This will not give the user enough time to read any error messages that are displayed.

## 2 Database

This section of the user manual details the navigation and use of the database. The database has a combination of dropdown menus, text entry boxes, buttons, and check boxes for navigation. In addition to clicking on each of these items in order to select them, the database also has the capability to use keyboard shortcuts for navigation. Tab-navigation is enabled, which means that pressing the Tab key will select the next clickable element on each page. The buttons on some of the pages have a single letter underlined. If that key is pressed at the same time as the Alt key, it will perform the equivalent of clicking on that button. In order to open the database, simply navigate to the folder location where the database is saved, and open the Access database file just like any other file, it has the .accdb file extension.

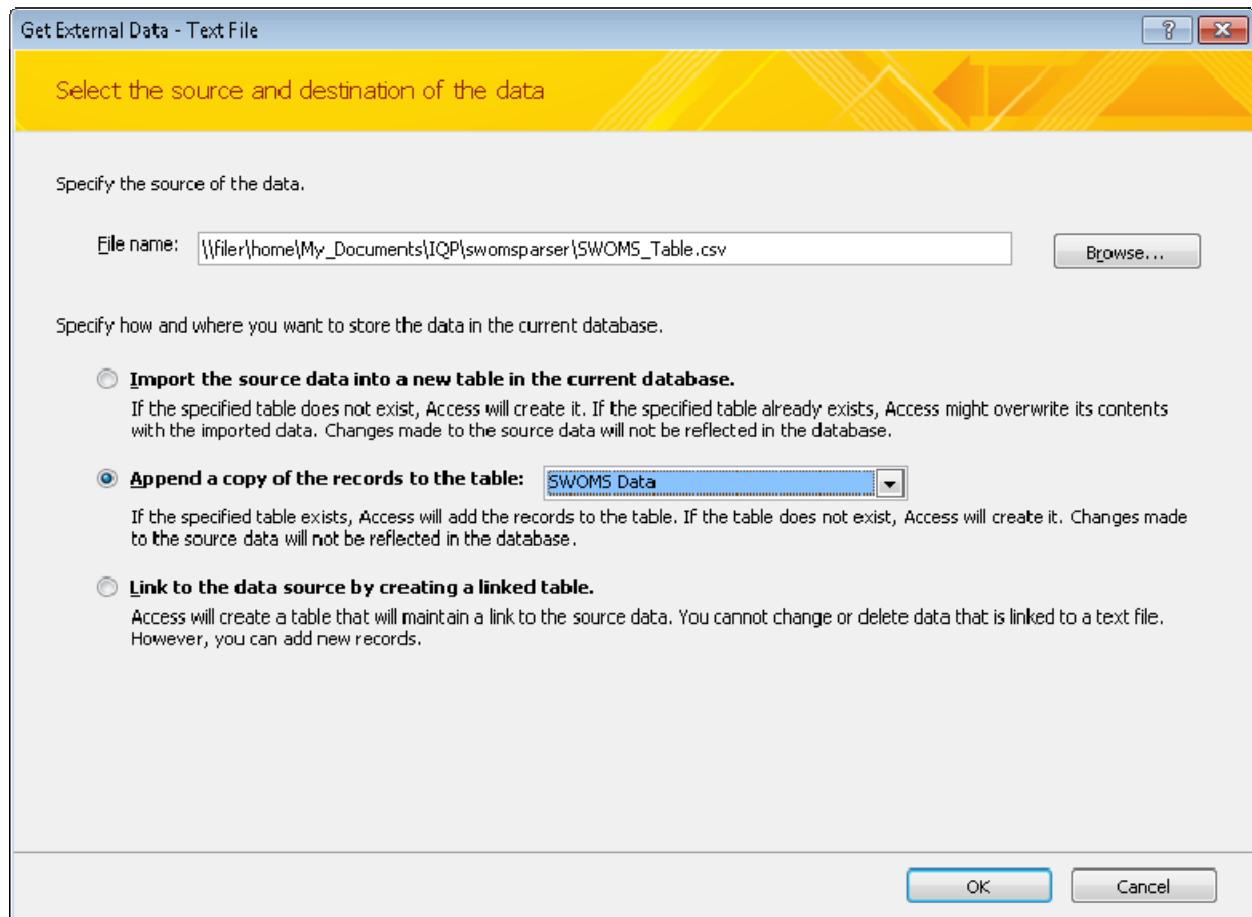
### 2.1 Importing Data

In order to add a new spreadsheet already containing data to the database, the user will have to use the Access tools for importing data. In order to import data, click the External Data tab in the Access toolbar and select the Text File option contained within the Import & Link section (see Figure 3).



**Figure 3: Access Toolbar to Import Data**

In the window that opens hit browse to select the file to import. Select “Append a copy of the records to the table” and then either “SWOMS data” or “SoundingBook Data” depending on what is being imported. Finally, click OK (see Figure 4).



**Figure 4: Text File Import Source and Destination**

The Import Text Wizard will then open, on the first screen make sure Delimited is selected, and then click next. On the next screen, make sure that Comma is selected and that the “first Row Contains Field Names” box is checked, then click finish (see Figure 5). This will have to be done for all new data being added to the database.

What delimiter separates your fields? Select the appropriate delimiter and see how your text is affected in the preview below.

Choose the delimiter that separates your fields:

☐ Tab
 ☐ Semicolon
 ☒ Comma
 ☐ Space
 ☐ Other:

☒ First Row Contains Field Names
 Text Qualifier: {none}

IMO Number	Date (dd/mm/yyyy)	Time (UTC; 00:00:00)	Latitude	Longitude	Bilge Pump F
1234	04/25/2011	00:00:00	31 51.127' N	34 38.735' E	0
5678	04/29/2011	00:00:00	42 43.105' N	15 39.557' E	2

Advanced... Cancel < Back Next > Finish

Figure 5: Import Data Delimiter Options

## 2.2 Main Menu

Upon opening the database, the user is brought to the Main Menu (see Figure 6). This screen can be accessed by clicking the “Home” button located on most screens. It contains several buttons giving several different options. Nearly every aspect of the database can be directly accessed from this menu.

**Main Menu**

**Quick Reports:**

IMO Number: 9999999

Start Date: 11/9/2011 End Date: 12/9/2011

SWOMS Anomaly Report    Sounding Anomaly Report    SWOMS:Sounding Comparison  
 Print SWOMS Report    Print Sounding Report    Print Combined Report

**Manage Data:**

New Vessel  
 New SWOMS Data  
 New Sounding Book Data  
 Edit Tanks  
 Delete Records

**Links:**

Detail Reports  
 Vessel List  
 SWOMS Data  
 Sounding Book Data

Figure 6: Main Menu

From within the leftmost section titled “Quick Reports”, the user can generate quick reports for an individual vessel based on a date range (see Section 2.5.1).

From within the center section titled “Manage Data”, the user can access the following data entry forms which are used to enter new data into the database:

- “New Vessel”, which brings up the New Vessel form (see section 2.3.1);
- “New SWOMS Data”, which brings up the Add SWOMS Data form (see section 2.3.2);
- “New Sounding Book Data”, which brings up the Add Sounding Book Data form (see section 2.3.3);
- “Edit Tanks,” which brings up a window that allows the user to edit the tanks for a specific vessel (see section 2.3.4); and
- “Delete Records,” which brings up a window that allow the user to delete SWOMS or sounding book records (see section 2.3.6)

From within the rightmost section titled “Links,” the following options are accessible:

- “Detail Reports,” which allows the user to generate detailed reports, which are more selective in the data displayed (see section 2.5.2);
- “Vessel List,” which displays a table with a list of the vessels in the database along with some other relevant information (see section 2.4.1);
- “SWOMS Data,” which links to the table containing the raw SWOMS data (see section 2.4.2); and
- “Sounding Book Data,” which links to the table containing the raw sounding book data (see section 2.4.3).

## 2.3 Data Entry and Modification

### 2.3.1 New Vessel

The “New Vessel” form (see Figure 7), which is accessible through the Main Menu, is used to enter a new vessel. The form should appear as a pop-up window. This form must be filled out for each new vessel before any other data for that vessel can be added (including tank data, SWOMS data, and sounding data).



**Figure 7: New Vessel form**

This form provides spaces to enter the IMO Ship ID (the IMO Number), the Vessel Name, the Shipping Company, the Flag Nation, and the Vessel Type (e.g. Oil Tanker). Upon completion of the form, the user must click the “Submit” button at the lower right-hand corner in order to enter the information into the Vessel List in the database. This button will be disabled except for when the user hits tab from the Vessel Type text box. This is in order to prevent vessel data from being incorrectly uploaded to the tables. In addition, if the user tabs through to the submit button without filling in all fields, a message will pop up telling them to fill them in as all fields are required. In order to cancel the entry, simply close the window.

Clicking “Submit” should bring up the Tanks Data form (see Section 2.3.4), which allows the user to add tanks to a vessel. This form should be filled out by a knowledgeable Coast Guard employee based on the order of the tanks in the SWOMS emails.

### 2.3.2 Add SWOMS Data

The “Add SWOMS Data” form, which can be accessed by selecting the “New SWOMS Data” button on the Main Screen, is used to submit a new entry of SWOMS data. It should appear as a pop-up window. At the top of this window is a drop-down menu that allows the user to select the relevant IMO number. This form has two tabbed sections:

- The first tabbed section (titled “Basic Info”, see Figure 8) allows the user to enter basic information, including the date, time, location, and any shipboard system information.
- The second tabbed section (titled “Tanks”, see Figure 9) allows the user to enter the instantaneous tank levels and volumes that relate to the date and time on the Basic

Info tab. The tanks are referred to by their numerical assignments, as is set up in the Tanks Data form (see Section 2.3.4).

The screenshot shows a web application window titled "Add SWOMS Data". The window has a blue header bar with the title and an "IMO Number:" dropdown menu. Below the header, there are two tabs: "Basic Info" (selected) and "Tanks". The "Basic Info" tab contains a form with various input fields for recording SWOMS data. The fields are organized into two columns. The left column includes: "Date:" (with a calendar icon), "Time:", "Latitude:", "Longitude:", "Bilge Pump Runs:", "Bilge Pump Run Time:", "OWS Runs:", "OWS Run Time:", and "Overboard Opened:". The right column includes: "Overboard Open Time:", "PPM Alarms:", "Average PPM Overboard:", "OCM Fresh Water Valve Opened:", "Oil Purge Valve Opened:", "Oil Purge Valve Open Time:", "Incinerator Runs:", and "Incinerator Run Time:". At the bottom of the form area, there are two buttons: "Submit and New" and "Submit and Done". Below the form area, there is a footer bar with a record count "Record: 1 of 1", a filter status "No Filter", and a search bar.

Add SWOMS Data	
IMO Number: <input type="text"/>	
<b>Basic Info</b> <b>Tanks</b>	
Date: <input type="text"/>	Overboard Open Time: <input type="text"/>
Time: <input type="text"/>	PPM Alarms: <input type="text"/>
Latitude: <input type="text"/>	Average PPM Overboard: <input type="text"/>
Longitude: <input type="text"/>	OCM Fresh Water Valve Opened: <input type="text"/>
Bilge Pump Runs: <input type="text"/>	Oil Purge Valve Opened: <input type="text"/>
Bilge Pump Run Time: <input type="text"/>	Oil Purge Valve Open Time: <input type="text"/>
OWS Runs: <input type="text"/>	Incinerator Runs: <input type="text"/>
OWS Run Time: <input type="text"/>	Incinerator Run Time: <input type="text"/>
Overboard Opened: <input type="text"/>	
<input type="button" value="Submit and New"/> <input type="button" value="Submit and Done"/>	
Record: 1 of 1   No Filter   Search	

Figure 8: Add SWOMS Data form – Basic Info tab

**Add SWOMS Data**

IMO Number:

**Basic Info** **Tanks**

	Level:	Volume:		Level:	Volume:
Tank 1:	<input type="text"/>	<input type="text"/>	Tank 9:	<input type="text"/>	<input type="text"/>
Tank 2:	<input type="text"/>	<input type="text"/>	Tank 10:	<input type="text"/>	<input type="text"/>
Tank 3:	<input type="text"/>	<input type="text"/>	Tank 11:	<input type="text"/>	<input type="text"/>
Tank 4:	<input type="text"/>	<input type="text"/>	Tank 12:	<input type="text"/>	<input type="text"/>
Tank 5:	<input type="text"/>	<input type="text"/>	Tank 13:	<input type="text"/>	<input type="text"/>
Tank 6:	<input type="text"/>	<input type="text"/>	Tank 14:	<input type="text"/>	<input type="text"/>
Tank 7:	<input type="text"/>	<input type="text"/>	Tank 15:	<input type="text"/>	<input type="text"/>
Tank 8:	<input type="text"/>	<input type="text"/>	Tank 16:	<input type="text"/>	<input type="text"/>

**Submit and New** **Submit and Done**

Record: 1 of 1 | No Filter | Search

**Figure 9: Add SWOMS Data form - Tanks tab**

In order to enter the information upon completion of the form, the user may click the “Submit and New” button or the “Submit and Done” button, both of which are located in the lower right-hand corner. The “Submit and New” button will submit the data and then reset (clear) the form, allowing a new entry to be filled out, whereas the “Submit and Done” button will submit the data and then close the window.

### 2.3.3 Add Sounding Book Data

The “Add Sounding Book Data” form (see Figure 10), which can be accessed by clicking the “New Sounding Book Data” button on the Main Screen, is used to submit a new entry of sounding book data. It should appear as a pop-up window.

The screenshot shows a web application window titled "SoundingBook Data1". The main heading is "Add Sounding Book Data". Below the heading is a form with the following elements:

- IMO Number:** A dropdown menu.
- Date:** A text input field.
- Time:** A text input field.
- Tank Data:** A grid of input fields for 16 tanks. Each tank has two columns: "Level:" and "Volume:". The tanks are labeled "Tank 1" through "Tank 16".
- Buttons:** Two buttons at the bottom right: "Submit and New" and "Submit and Done".
- Status Bar:** At the bottom, it shows "Record: 1 of 1", "No Filter", and a "Search" field.

**Figure 10: Add Sounding Book Data form**

At the top of this window is a drop-down menu that allows the user to select the desired IMO number. This form contains spaces where the user can enter the date, time, and the instantaneous tank levels and volumes.

In order to enter the information upon completion of the form, the user may click the "Submit and New" button or the "Submit and Done" button, both of which are located in the lower right-hand corner. The "Submit and New" button will submit the data and then reset (clear) the form, allowing a new entry to be filled out, whereas the "Submit and Done" button will submit the data and then close the window.

## 2.3.4 Modify Tanks Data

The “Tanks Data” form (see Figure 11), which can be accessed by clicking the “Edit Tanks” button on the Main Screen, is used to add or edit the list of tanks for each vessel.

The screenshot shows the 'Tanks Data' form. The title bar is 'Tanks Data'. The header section has a Coast Guard logo, 'IMO Number:' dropdown, and 'Unit Type: Cubic Meters' dropdown. Below the header are two tabs: 'Tanks 1-8' and 'Tanks 9-16'. The 'Tanks 1-8' tab is active, showing a grid of input fields for 8 tanks. Each tank has fields for 'Type:', 'Description:', and 'Capacity:'. At the bottom right are 'Update and Close' and 'Cancel' buttons. At the bottom left is a status bar with 'Record: 1 of 1', 'No Filter', and a 'Search' field.

Figure 11: Tanks Data form

At the top of the form is a dropdown menu to select the IMO number of the desired vessel. There is also a dropdown menu that allows the user to choose what units (cubic meters or gallons) to use for the capacity of the tank. This form also includes spaces to enter the Type (Bilge or Sludge), Description (the tank name, e.g. “WO Service” or “Starboard Bilge”), and Capacity for up to 16 tanks (note the tabbed entry on the top of the form allowing access to Tanks 9-16). This form should be filled out by a knowledgeable Coast Guard employee in the same order that the tanks appear in the SWOMS emails.

Upon completion of this form, the user should click the “Update and Close” button, which will automatically enter the data into the database. Alternatively, click “Cancel” in order to close the form. This will lose any changes entered into the form.

### 2.3.5 Vessel Details

The “Vessel Details” form (see Figure 12), which can be accessed through the “Detail Reports” form (see Section 2.5.2), as well as the “SWOMS Data and “Sounding Book Data” forms, is used to view and edit the existing vessel information. In order to open this form from the Detail Reports, simply select the desired IMO number from the dropdown button, and then click the “Vessel Details” button. This form is almost identical to the “New Vessel” form (see Section 2.3.1). It contains spaces to view the IMO Number and to view or modify the Vessel Name, the Shipping Company, the Flag Nation, and the Vessel Type.

The screenshot shows a web application window titled "Vessel Details". The window has a dark blue header bar with a logo on the left and a "View and Edit Tanks" button on the right. Below the header, the form contains five labeled input fields: "IMO Number:" with the value "9999999", "Vessel Name:" with the value "M/T ECP", "Shipping Company:" with the value "Compliance Management", "Flag Nation:" with the value "USA", and "Vessel Type:" with the value "Oil / Chemical Tanker". At the bottom right of the form is a blue button labeled "Update and Close". At the very bottom of the window is a footer bar with the text "Record: 1 of 1", a "No Filter" button, and a "Search" button.

Figure 12: Vessel Details form

Once the user is satisfied with the information, click the “Update and Close” button at the bottom of the screen. This will submit the information to the database, replacing the previous information. Alternatively, the user can click the “View and Edit Tanks” button at the top of the screen in order to bring up the “Tanks Data” form (see Section 2.3.4).

### 2.3.6 Delete Records

The “Delete Records” form (see Figure 13), which can be accessed through the Main Menu, is used to delete SWOMS or sounding book data records contained in the database. This form

includes a dropdown menu to choose the IMO Number, spaces to fill out a date range, and buttons to “Delete SWOMS data”, “Delete Sounding Data”, and to “Cancel.”

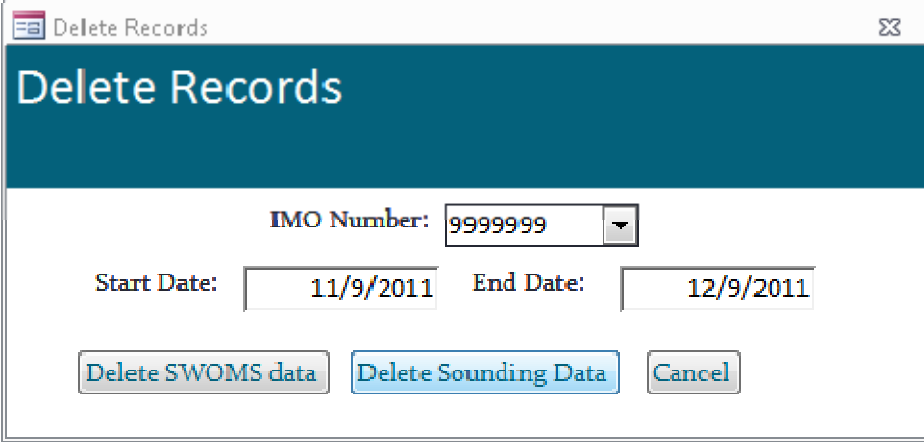
A screenshot of a web-based form titled "Delete Records". The form has a dark blue header with the title in white. Below the header, there is a label "IMO Number:" followed by a text input field containing "9999999" and a dropdown arrow. Below this, there are two date input fields: "Start Date:" with "11/9/2011" and "End Date:" with "12/9/2011". At the bottom, there are three buttons: "Delete SWOMS data" (light blue), "Delete Sounding Data" (light blue), and "Cancel" (light gray).

Figure 13: Delete Records form

Clicking “Delete SWOMS Data” will delete all of the SWOMS data for the selected IMO Number within the specified date range. Clicking “Delete Sounding Data” will delete all of the Sounding Data for the selected date range. Clicking either of these will bring up a dialog window asking if the user is sure about deleting the records (see Figure 14).

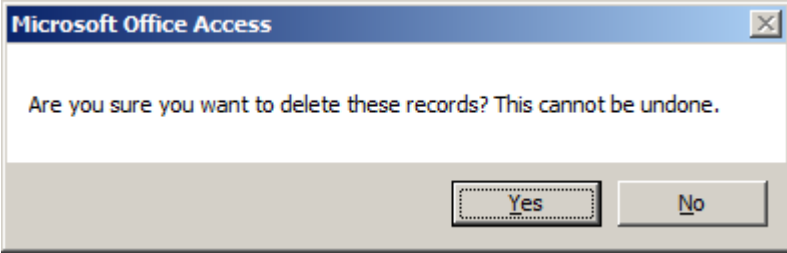
A screenshot of a Microsoft Office Access dialog box. The title bar says "Microsoft Office Access". The main text area contains the message: "Are you sure you want to delete these records? This cannot be undone." At the bottom right, there are two buttons: "Yes" and "No".

Figure 14: Delete Records Warning

Clicking “Yes” will delete the data and “No” will cancel the operation. This data deletion is permanent and cannot be undone.

## 2.4 Data Viewing

### 2.4.1 Vessel List

The “Vessel List” table (see Figure 15), which can be accessed by clicking the “Vessel List” button on the Main Screen, is used to view the list of vessels included in the database. The table includes columns for the IMO number, the Vessel Name, the Shipping Company, the Flag Nation, and the Vessel Type.


DetailReports Vessel Identification				
 <b>Vessel List</b> <span>Add Vessel</span> <span>Home</span>				
IMO Number	Vessel Name	Shipping Company	Flag Nation	Vessel Type
9999984	Vessel1	Company1	Nation1	Oil/Chemical Tanker
9999985	Vessel2	Company1	Nation1	Oil Products Tanker
9999986	Vessel3	Company1	Nation1	Oil/Chemical Tanker
9999987	Vessel4	Company2	Nation1	Oil Products Tanker
9999988	Vessel5	Company3	Nation2	Oil/Chemical Tanker
9999989	Vessel6	Company3	Nation2	Oil Products Tanker
9999990	Vessel7	Company3	Nation2	Oil/Chemical Tanker
9999991	Vessel8	Company3	Nation2	Oil/Chemical Tanker
9999992	Vessel9	Company4	Nation3	Oil Products Tanker
9999993	Vessel10	Company4	Nation3	Oil Products Tanker
9999994	Vessel11	Company5	Nation4	Oil Products Tanker
9999995	Vessel12	Company6	Nation5	Oil/Chemical Tanker
9999996	Vessel13	Company6	Nation5	Oil/Chemical Tanker
9999997	Vessel14	Company7	Nation5	Chemical Tanker
9999998	Vessel15	Company7	Nation5	Oil/Chemical Tanker
9999999	Vessel16	Company8	Nation6	Oil/Chemical Tanker
*				

Figure 15: Vessel List table

The “Add Vessel” button in the top-right corner of the screen goes to the “New Vessel” form (see Section 2.3.1). The “Home” button in the top-right-hand corner of the screen returns to the Main Menu. Double-clicking on any ship in this list will bring up the Vessel Details form for that vessel (see Section 2.3.5), allowing the user to directly edit the information displayed in the table.

## 2.4.2 SWOMS Data

The “SWOMS Data” form (see Figure 16 for a portion), which can be accessed by clicking the “SWOMS Data” button on the Main Screen, shows the SWOMS data included in the database. The form includes the date, time, location, any shipboard system information (e.g. OWS runs), and the instantaneous tank levels and volumes.


SWOMS Data										
 <b>SWOMS Data</b> <span>IMO Number: 9999999</span> <span>Vessel Details</span> <span>Start Date: 4/1/2011 End Date: 4/6/2011</span> <span>Add Data</span> <span>Home</span>										
Date	Time	Latitude	Longitude	Bilge Pump Runs	Bilge Pump Run Time	OWS Runs	OWS Run Time	Overboard Opened	Overboi	
4/1/2011	12:00:00 AM	57 51.588' N	10 28.804' E	3	145	24	24.17	41		9.67
4/2/2011	12:00:00 AM	55 45.900' N	16 33.988' E	3	27.83	6	9.83	28		7.67
4/3/2011	12:00:00 AM	57 31.111' N	21 22.916' E	2	11.5	0	0	0		0
4/4/2011	12:00:00 AM	57 24.164' N	21 32.865' E	4	47.67	2	0.33	3		1.33
4/5/2011	12:00:00 AM	57 24.163' N	21 32.864' E	1	6	0	0	0		0
4/6/2011	12:00:00 AM	56 30.053' N	18 58.394' E	3	31.17	0	0	0		0
*										

Figure 16: SWOMS Data table

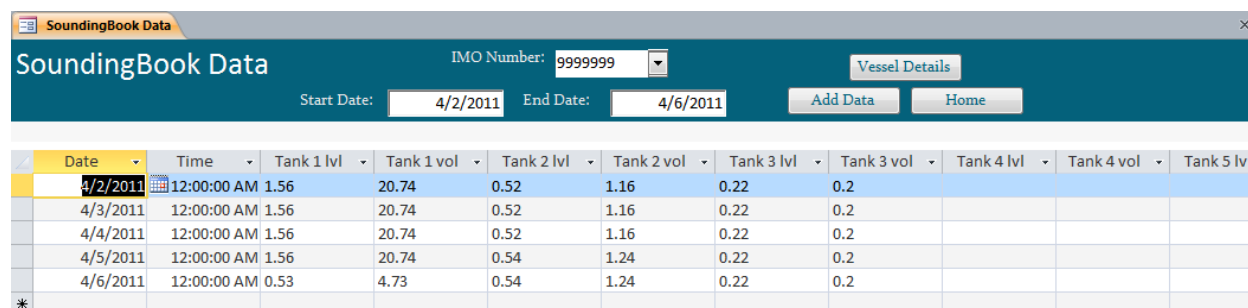


Upon opening the form, no data appears. In order to populate the table with data, select an IMO number from the dropdown menu at the top of the screen and enter the desired date range by filling in the Start and End Dates just below that dropdown menu.

The “Vessel Details” button in the top-right-hand corner of the screen brings up the “Vessel Details” form (see Section 2.3.5), which can be used to modify the details of the vessel, and also gives a link to view and edit the tank data (see Section 2.3.4). The “Add Data” button in the top-right-hand corner of the screen brings up the “Add SWOMS Data” form (see Section 2.3.2) to manually add SWOMS data. The “Home” button in the top-right-hand corner of the screen returns to the Main Menu.

### 2.4.3 Sounding Book Data

The “SoundingBook Data” form (see Figure 17 for a portion), which can be accessed by clicking the “Sounding Book Data” button on the Main Screen, shows the sounding data included in the database. The table includes the date, time, location, and instantaneous tank levels and volumes.



Date	Time	Tank 1 lvl	Tank 1 vol	Tank 2 lvl	Tank 2 vol	Tank 3 lvl	Tank 3 vol	Tank 4 lvl	Tank 4 vol	Tank 5 lvl
4/2/2011	12:00:00 AM	1.56	20.74	0.52	1.16	0.22	0.2			
4/3/2011	12:00:00 AM	1.56	20.74	0.52	1.16	0.22	0.2			
4/4/2011	12:00:00 AM	1.56	20.74	0.52	1.16	0.22	0.2			
4/5/2011	12:00:00 AM	1.56	20.74	0.54	1.24	0.22	0.2			
4/6/2011	12:00:00 AM	0.53	4.73	0.54	1.24	0.22	0.2			

Figure 17: Sounding Book Data form

Upon opening the form, no data appears. In order to populate the form with data, select an IMO number from the dropdown menu at the top of the screen, and enter the desired date range by filling in the Start and End Dates in the spaces just below that dropdown menu.

The “Vessel Details” button in the top-right-hand corner of the screen brings up the “Vessel Details” form (see Section 2.3.5), which can be used to modify the details of the vessel, and also gives a link to view and edit the tank data (see Section 2.3.4). The “Add Data” button in the top-right-hand corner of the screen brings up the “Add Sounding Book Data” form (see Section 2.3.2) to manually add sounding data. The “Home” button in the top-right-hand corner of the screen returns to the Main Menu.

## 2.5 Generating Reports

### 2.5.1 Quick Reports Using the Main Menu

The Main Menu gives the option to generate reports solely based on the IMO number and a date range. The ability to do this is contained in the Quick Reports, which is the left-most section of the Main Menu (see Figure 6, p.6). In order to do this, select the IMO number from the dropdown

menu, and then enter the desired date range in the Start and End Date spaces. The following reports can then be generated or printed:

- SWOMS Anomaly Report, which looks within the SWOMS data for anomalies (see Section 2.5.3);
- SWOMS: Sounding Comparison, which compares the SWOMS data to the sounding data, looking for anomalies (see Section 2.5.4); and
- Sounding Anomaly Report, which looks within the sounding data for anomalies (see Section 2.5.4).

Note that Access will be unable to generate a report if a report of the same type is already open. Also while reports generate all the necessary data sometimes information gets cut off while reviewing the report in Access. Therefore it is recommended for most analysis to print the reports or export them as PDFs as discussed in section 2.5.6.

## **2.5.2 Detail Reports**

More detailed reports can be generated or printed using the “Detail Reports” form (see Figure 18), which can be accessed through the Main Menu.

**DetailReports**

**Detail Reports**

IMO Number: 9232369

Vessel Details Home

Start Date: 11/9/2011

End Date: 12/9/2011

**Tanks to highlight:**

- Clean BHT
- FO Sludge Tank
- Oily Bilge
- Starboard Bilge
- Port Bilge
- Aft Bilge
- Incinerator Sludge
- W.O. Service

**Check all to highlight:**

- ☐ OWS Usage
- ☐ Incinerator Usage
- ☐ PPM
- ☐ OCM
- ☐ Overboard
- ☐ Bilge Pump
- ☐ Oil Purge

**Report Options:**

Generate SWOMS Report Generate Sounding Report Generate Combined Report

Print SWOMS Report Print Sounding Report Print Combined Report

Figure 18: Detail Reports form

The following types of reports can be generated:

- SWOMS Anomaly Report, which looks within the SWOMS data for anomalies (see Section 2.5.3);
- Sounding Anomaly Report, which looks within the sounding data for anomalies (see Section 2.5.4); and
- Combined Report, which compares the SWOMS data to the sounding data, looking for anomalies (see Section 2.5.5).

Note that Access will be unable to generate a report if a report of the same type is already open.

These detailed reports are essentially the same as the quick reports, except that they give the user the opportunity to exclude unwanted information, giving the user the ability to select which tanks and what SWOMS system information is included.

Once on the “Detail Reports” form, select the IMO number for the vessel from the dropdown menu at the top of the screen, and then enter the desired date range in the Start and End Date spaces. To select which tanks to generate data for, highlight the desired tank descriptions from the list of tanks. To select or deselect a tank, simply click on its name in the list. In order to select which shipboard environmental system information is included, check the items in the list to the right of the tanks list (i.e. OWS Usage, Incinerator Usage, PPM, OCM, Overboard, Bilge Pump, and Oil Purge). The checked items will be included.

### 2.5.3 SWOMS Anomaly Report

The SWOMS Anomaly Report (see Figure 20), which can be generated using Quick Reports (see Section 2.5.1) or Detail Reports (see Section 2.5.2), looks for anomalies within the SWOMS data.

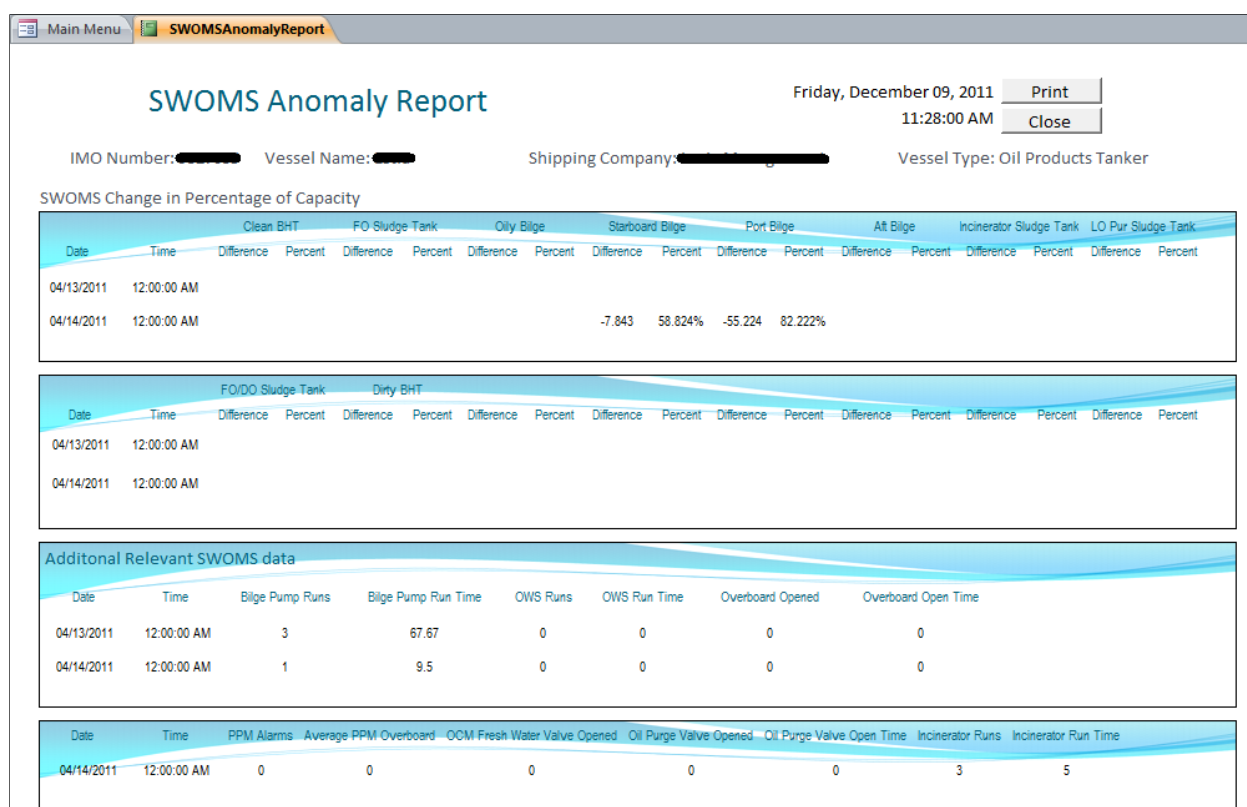


Figure 19: SWOMS Report for Two Days of Data

Contained within the header for this report is the date and time that the report is generated, as well as information taken from the Vessel Tanks table (see Section 2.4.1) including the IMO Number, Vessel name, Company, and Vessel Type. Located in the upper right-hand corner is a button that will allow the user to print the report as well as one for closing it. Printing the report in this method will not give the user any preview of what will be printed.

Located below the header, the upper portion of this report, entitled “SWOMS Change,” focuses on finding the anomalies within the SWOMS data. This finds the days where the tank volume decreases by over 30% of the total tank capacity and prints the volumetric difference as well as the percentage difference as compared to the previous day for each of these days. It is divided up into two sections, one above the other, which look at 8 tanks at a time to prevent the report from being too wide.

The lower portion, entitled “Additional Relevant SWOMS data” looks through the basic shipboard SWOMS data in order to find when the on-board systems were run, such as the OWS (Oil Water Separator) or bilge pump, to facilitate quick interpretation of the data. This portion is also divided into two sections, one above the other.

#### **2.5.4 Sounding Anomaly Report**

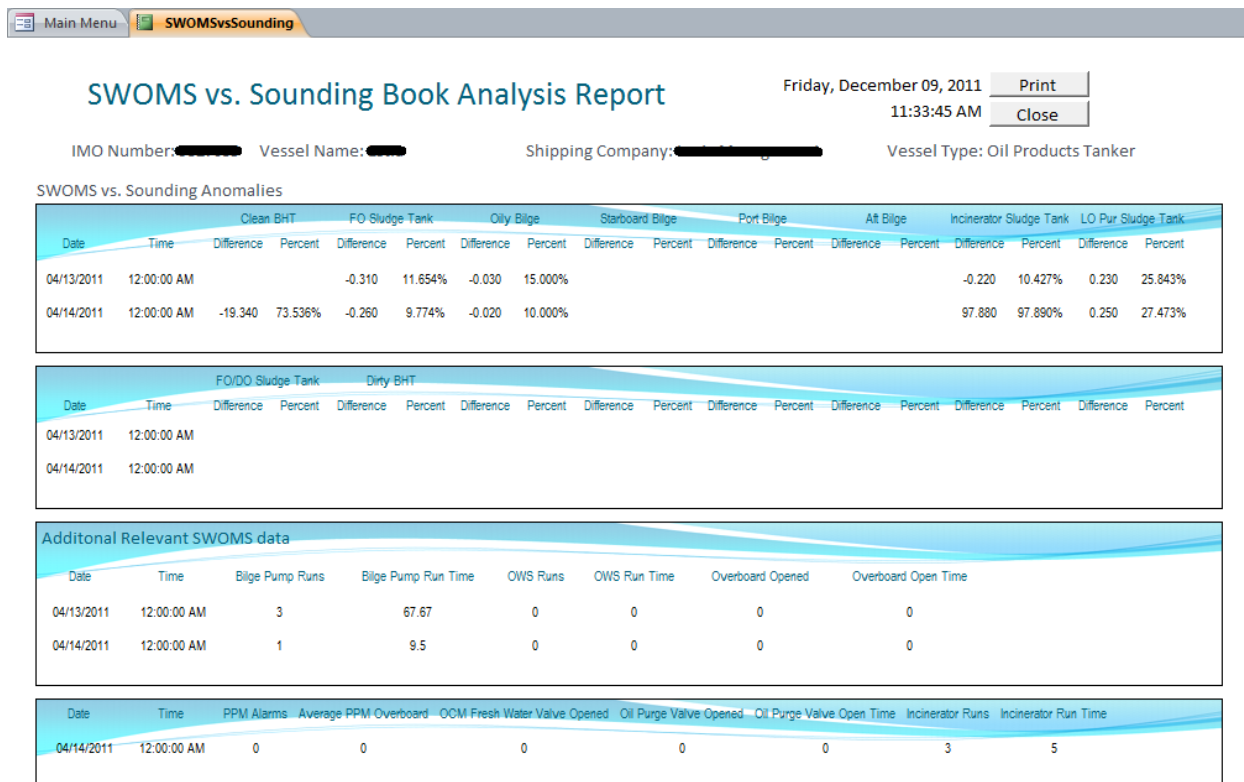
The Sounding Book Anomaly Report, which can be generated using Quick Reports (see Section 2.5.1) or Detail Reports (see Section 2.5.2), looks for anomalies within the sounding data. This report has the same format as the SWOMS report (see Figure 20). Contained within the header for this report is the date and time that the report is generated, as well as information taken from the Vessel Tanks table (see Section 2.4.1) including the IMO Number, Vessel name, Company, and Vessel Type. Located in the upper right-hand corner is a button that will allow the user to print the report and another for closing it.

Located below the header, the upper portion of this report, entitled “Sounding Book Change Subreport,” focuses on finding the anomalies within the Sounding data. This finds the days where the tank volume decreases by greater than 30% of the total tank capacity and prints the volumetric difference as well as the percentage difference as compared to the previous day for each of these days. It is divided up into two sections, one above the other, which look at 8 tanks at a time to prevent the report from being too wide.

The lower section, entitled “Additional Relevant SWOMS data” looks through the basic shipboard SWOMS data in order to find when the on-board systems were run, such as the OWS (Oil Water Separator) or bilge pump, to facilitate quick interpretation of the data. This portion is also divided into two sections, one above the other.

#### **2.5.5 Combined Report**

The Combined Report (see Figure 21), which can be generated using Quick Reports (see Section 2.5.1) or Detail Reports (see Section 2.5.2), looks for substantial differences between the SWOMS and sounding data.



**Figure 20: Combined Report for Two Days of Data**

Contained within the header for this report is the date and time that the report is generated, as well as information taken from the Vessel Tanks table (see Section 2.4.1) including the IMO Number, Vessel name, Company, and Vessel Type.

Located in the upper right-hand corner is a button that will allow the user to print the report and another for closing it. Located below the header, the top section of this report, entitled “SWOMS vs. Sounding Anomalies,” focuses on comparing the SWOMS and sounding book data and looking for anomalies. This finds the days where the tank volume from SWOMS is off by more than five percent from the sounding book.

The lower section, entitled “Additional Relevant SWOMS data” looks through the basic shipboard SWOMS data in order to find when the on-board systems were run, such as the OWS (Oil Water Separator) or bilge pump, to facilitate quick interpretation of the data.

## 2.5.6 Printing or Exporting Reports

There are several ways to print these reports. If the user would like to print them without first viewing them they can simply click the print report button for any of the three reports on either the Main Menu or the Detail Reports form (see Section 2.5.2). On the Main Menu these buttons are located in the quick reports section underneath their respective generate report button. On the Detail Reports form, they are located in the report options underneath the generate report buttons. If the user would like to review a report before printing they can use the generate report buttons to

generate a report, and then print it from the button on the report (this will not print the command buttons).

In order to export the report to a PDF, simply select the Acrobat tab in the Access toolbar when a report is open and click create PDF (see figure). Access will prompt the user for a save location and name for the file and then when save is pressed, will create and save a pdf of the report in the specified location.

## **3 Parsing Program Maintenance**

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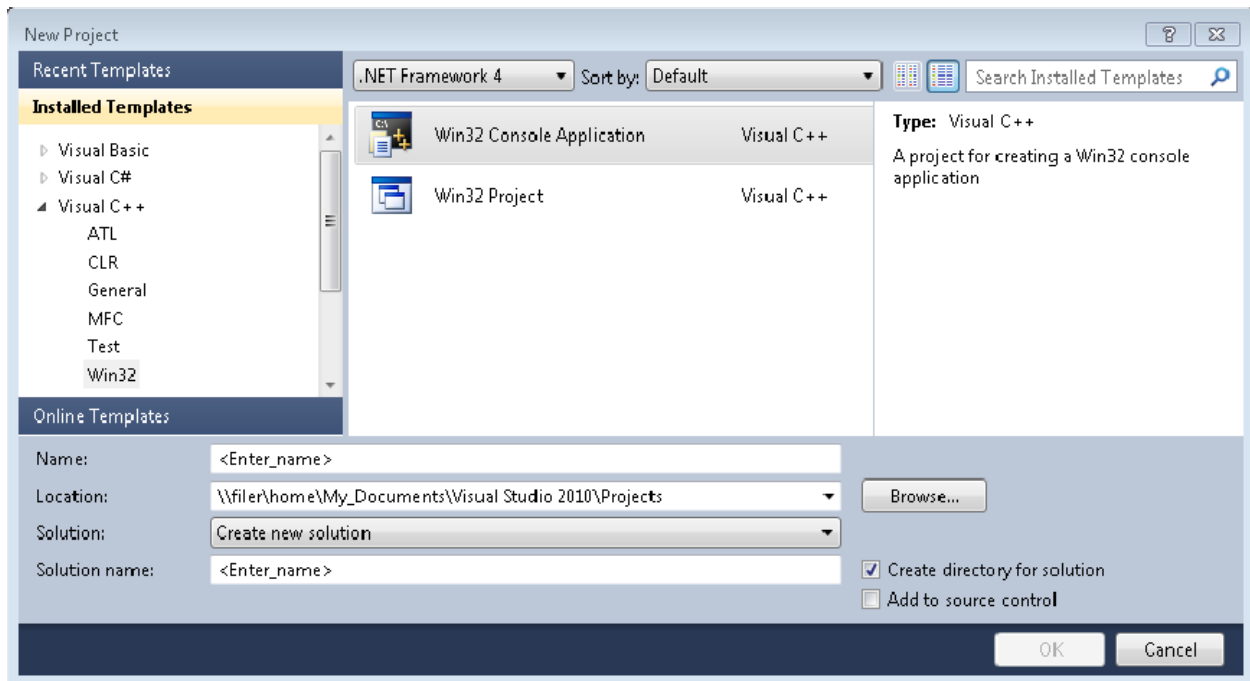
The parsing program will need to be updated to match any future design templates or the addition of more command line arguments. The program was finally compiled using Microsoft Visual C++ (VC++), a component of Microsoft Visual Studio 2010. If changes are made to the source code, it is recommended that the program get recompiled using the same compiler to avoid issues. However, the program is written entirely in C. By removing dependency on windows.h and replacing that with stdlib.h, the program should properly compile from a Linux shell. The code used to create this program is well-commented and should be easily understood and modified by a programmer.

### **3.1 Rebuild swomsparser Executable from Source Code**

This section details how to recompile the parsing program “swomsparser.exe” from its source code using Microsoft Visual Studio 2010. This process requires the files “targetver.h” and “swomsparser.cpp”. Any code modification should be implemented by someone familiar with the coding language C++.

#### **3.1.1 Create Project**

The first step towards recompiling this program is to create a new project within Visual Studio. This can be done by using the keyboard shortcut Ctrl-Shift-N, or by clicking on File > New > Project. This brings up a window allowing the user to make specifications for the project (see Figure 19).

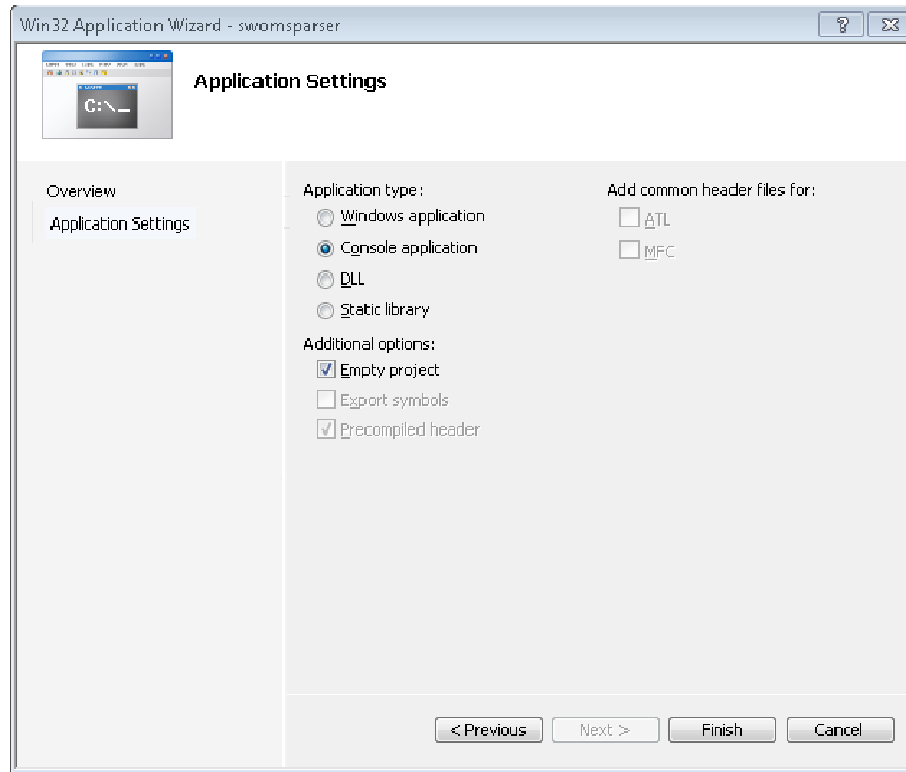


**Figure 21: New Project dialog**

The type of project is a Win32 Console Application coded in Visual C++. In order to select this option, click on Visual C++ > Win32 in the Installed Templates section of the window. Ensure that Win32 Console Application is selected in the main section of the window. Next, enter a name for the project. “Create directory for solution” should be checked and “Add to source control” should be unchecked.

Once satisfied, click OK, which should bring up the Application Wizard. Click Next to advance to the Application Settings section (see Figure 20).



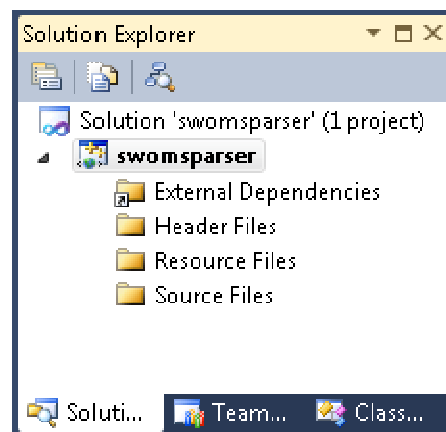


**Figure 22: Application Settings**

In the Application Settings, set the Application type to Console Application and check Empty Project under Additional Options. Click Finish to complete the creation of the project.

### 3.1.2 Set Up Project

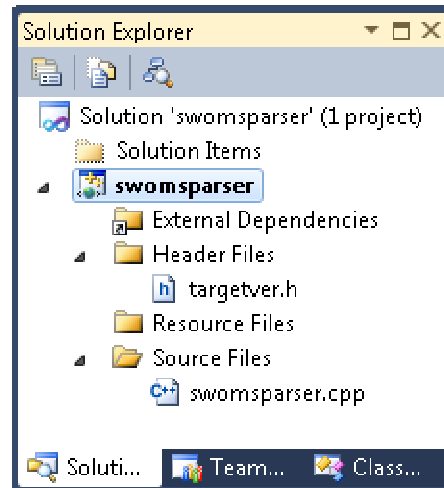
The Solution Explorer (see Figure 21) is an interface for viewing and managing the code contained in the projects. If the Solution Explorer interface is not automatically visible, use keyboard shortcut Ctrl-Alt-L or click on View > Solution Explorer.



**Figure 23: Solution Explorer**

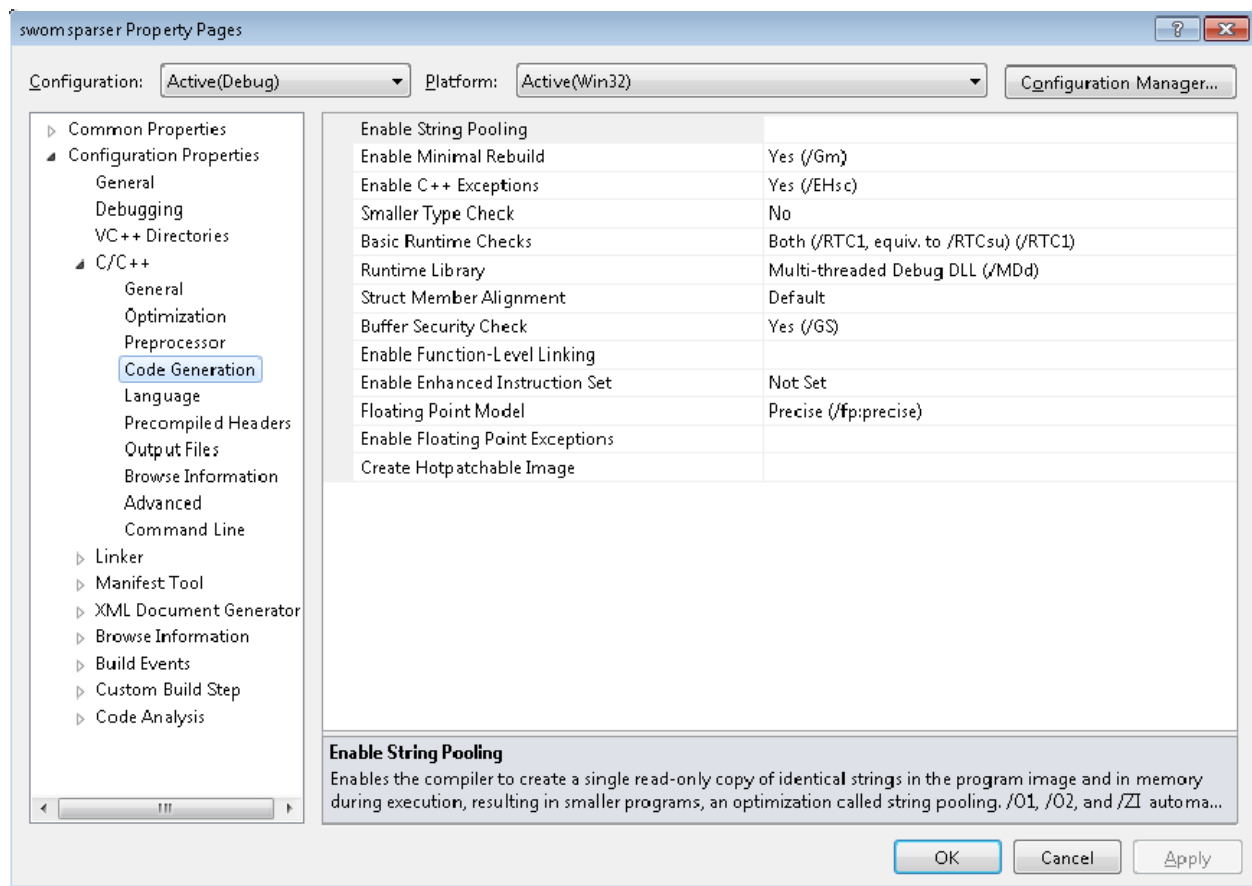
Right click on the project name in the Solution Explorer interface and click on “Open Folder in Windows Explorer”. Once the folder is open, copy the code files “targetver.h” and “swomsparser.cpp” into that folder. Once this is complete, the folder can be closed.

The Solution Explorer can then be used to add the files to the project. To add the header file “targetver.h”, right click on Header Files, then click on Add > Existing Item. Select “targetver.h” and then click Add. To add the source code “swomsparser.cpp”, right click on Source Files, then click on Add > Existing Item. Select “swomsparser.cpp” and then click Add. At this point, the Explorer should look like Figure 22.



**Figure 24: Solution Explorer Including Files**

In order to set the properties for the project, right click on the project name in the Solution Explorer and click on Properties (see Figure 23).



**Figure 25: Project Properties**

Under Configuration Properties > C/C++ > Code Generation, set the Runtime Library property to “Multi-threaded (/MT)”. Under Configuration Properties > C/C++ > Preprocessor, add “;\_CRT\_SECURE\_NO\_WARNINGS” to the end of the pre-existent list of Preprocessor Definitions. Then, click “OK”. After these changes are made, save the project using keyboard shortcut Ctrl-S or by clicking on File > Save.

### 3.1.3 Modify and Build Code

To open the code, double-click on “swomsparser.cpp” from under the Source Files in the Solution Explorer. This should bring up the code in a window that will allow editing. After making any changes, build the code using Ctrl-Shift-B or by clicking on Build > Build Solution. The output of the build should show up within its own interface with the results of the build and any warnings. Figure 24 below shows a successful build output.

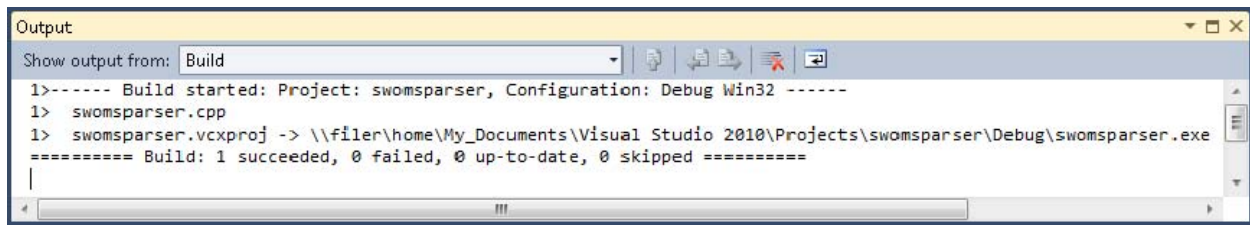


Figure 26: Build Output

## 4 Access Database Maintenance

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The database will need to be updated for any future expansions and modifications of the environmental compliance programs. Additionally if there are ever any problems or errors with the current database, a user familiar with Access will have to look at the code to make the necessary changes or fixes. The visual basic code, which is used for basic form functionality as well as the basics of some of the data updating and report generation, is fully documented and commented within the code. If there are any errors with this code, a user can look to the comments for a full explanation of how the various functions work, and therefore they will not be explained here. What follows are descriptions of all of the Access queries and the relevant SQL code, so that if future modifications are necessary it should be simple to understand what the queries currently do.

Capacity Query:

The capacity query simply takes all the tank capacities from the tank data table, and compiles them based on the user selected IMO number from the detail reports form.

Delete SWOMS and Delete Sounding:

The delete SWOMS query selects all the records from the SWOMS data table based on an IMO number and date range on the delete records form, and deletes those records. The Delete Sounding query does the same.

SWOMS Analysis and Sounding Analysis:

The SWOMS analysis query simply gathers all the data from the SWOMS table required for analysis for a user selected IMO number and date range so that this information can be easily used by the other queries. The Sounding Analysis query does the same for the sounding book data.

Sorted Query and Sorted Query 2:

The two sorted queries gather the fields from the SWOMS Analysis that are not related to the tank volumes. These are gathered separately so they can be easily used to generate data for the two Sorted Data subreports.

SWOMS % CAP and Sounding % CAP:

This query calculates the percentage of the total tank capacity each tank is at for every record in SWOMS Analysis. It takes the tank capacity from the capacity query and calculates the percent capacity using this formula:

```
IIf(Nz([Capacity Query].[Tank01 Cap])=0,Null,((Nz([SWOMS Analysis].[Tank01 VOL])/Nz([Capacity Query].[Tank01 Cap])))
```

This ensures that Access does not divide by zero and accounts for possible null values with the Nz() method. The query has a field for each of these calculations, one for each tank. This query also collects all the tank volumes because in order for SWOMS change to work properly it needs to gather all its data from a single query. The Sounding query does the same but for Sounding Analysis data.

SWOMS Change and Sounding Change:

The SWOMS Change query takes the calculated capacities as well as the volumes from the SWOMS % CAP query, and does further calculations with this data. It first calculates the change in percentage between two records using this formula:

```
([SWOMS % CAP].[Tank 1]-(SELECT TOP 1 [Tank 1] FROM [SWOMS % CAP] AS Q WHERE (DateDiff("d", [SWOMS % CAP].[Date (dd/mm/yyyy)], Q.[Date (dd/mm/yyyy)]) = -1) AND ([SWOMS % CAP].[Date (dd/mm/yyyy)] > Q.[Date (dd/mm/yyyy)]) AND (([SWOMS % CAP].[Tank 1]-Q.[Tank 1])<-.3)))
```

This formula selects the current record, as well as using "SELECT TOP 1" to select the previous record, and checks whether the date is for the previous day. It then checks that the difference between the two percentages is greater than 30%, which is the threshold for anomalies that should be highlighted. The query then calculates the difference between the tank volume for the same two records, if the dates are concurrent and the percentage change is greater than 30% using this formula:

```
([SWOMS % CAP].[Tank01 VOL]-(SELECT TOP 1 [Tank01 VOL] FROM [SWOMS % CAP] AS Q WHERE (DateDiff("d", [SWOMS % CAP].[Date (dd/mm/yyyy)], Q.[Date (dd/mm/yyyy)]) = -1) AND ([SWOMS % CAP].[Date (dd/mm/yyyy)] > Q.[Date (dd/mm/yyyy)]) AND ([SWOMS % CAP].[Tank 1]-(SELECT TOP 1 [Tank 1] FROM [SWOMS % CAP] AS Q WHERE (DateDiff("d", [SWOMS % CAP].[Date (dd/mm/yyyy)], Q.[Date (dd/mm/yyyy)]) = -1) AND ([SWOMS % CAP].[Date (dd/mm/yyyy)] > Q.[Date (dd/mm/yyyy)]) AND (([SWOMS % CAP].[Tank 1]-Q.[Tank 1])<-.3))))
```

Both of these are then repeated for all 16 tanks and Sounding Change does the same.

SWOMS Data Query and SoundingBook Data Query:

These two queries simply gather the data from their respective tables, based on an IMO number and date range on the SWOMSData and SoundingBook data forms respectively, so that this data can be properly displayed on the forms.

## SWOMS VS Sounding:

This query takes the data from the SWOMS Analysis and Sounding Analysis queries and calculates the difference between these values. Using this formula, the query calculates the difference in volume from the two queries:

```
[SWOMS Analysis].[Tank01 VOL]-(SELECT TOP 1 [Tank01 VOL] FROM [Sounding Analysis] WHERE  
DateDiff("d", [SWOMS Analysis].[Date (dd/mm/yyyy)], [Sounding Analysis].[Date (dd/mm/yyyy)])  
= 0 AND [SWOMS Analysis].[Time (UTC; 00:00:00)] = [Sounding Analysis].[Time (UTC; 00:00:00)]  
AND ((([SWOMS Analysis].[Tank01 VOL]-[Sounding Analysis].[Tank01 VOL])/[SWOMS  
Analysis].[Tank01 VOL]) >.05 OR (([Sounding Analysis].[Tank01 VOL]-[SWOMS Analysis].[Tank01  
VOL])/[Sounding Analysis].[Tank01 VOL]) >.05))
```

Then using the values from this first formula, the query calculates whether this difference is greater than five percent with this formula:

```
IIf([Diff]>0,([Tank01 VOL]-([Tank01 VOL]-[Diff]))/[Tank01 VOL],([Tank01 VOL]+(-1*[Diff]))-  
[Tank01 VOL])/([Tank01 VOL]+(-1*[Diff])))
```

This formula check whether the difference is greater than zero or not and calculates the percent difference accordingly. The query then does the same for all 16 tanks.