

Drillingsoftware Mud Engineer User Manual

1. Introduction

This program provides the engineer with all the mud engineering inputs and calculations required for both Water Based Mud (WBM) and Oil Based Mud (OBM). Figures and flow charts are used to aid the engineer to navigate through the program. As the data is entered in the various dialog boxes, the data bases, reports and the charts are updated

2. Operation

A. Main Menu

The Main Menu is the entry point to all functions of the program. For all Main Menu button functions refer to Figure 2.



Figure 1 Main Menu

Figure 2 shows all the mud engineering button functions and references to where the relevant information is to be found.

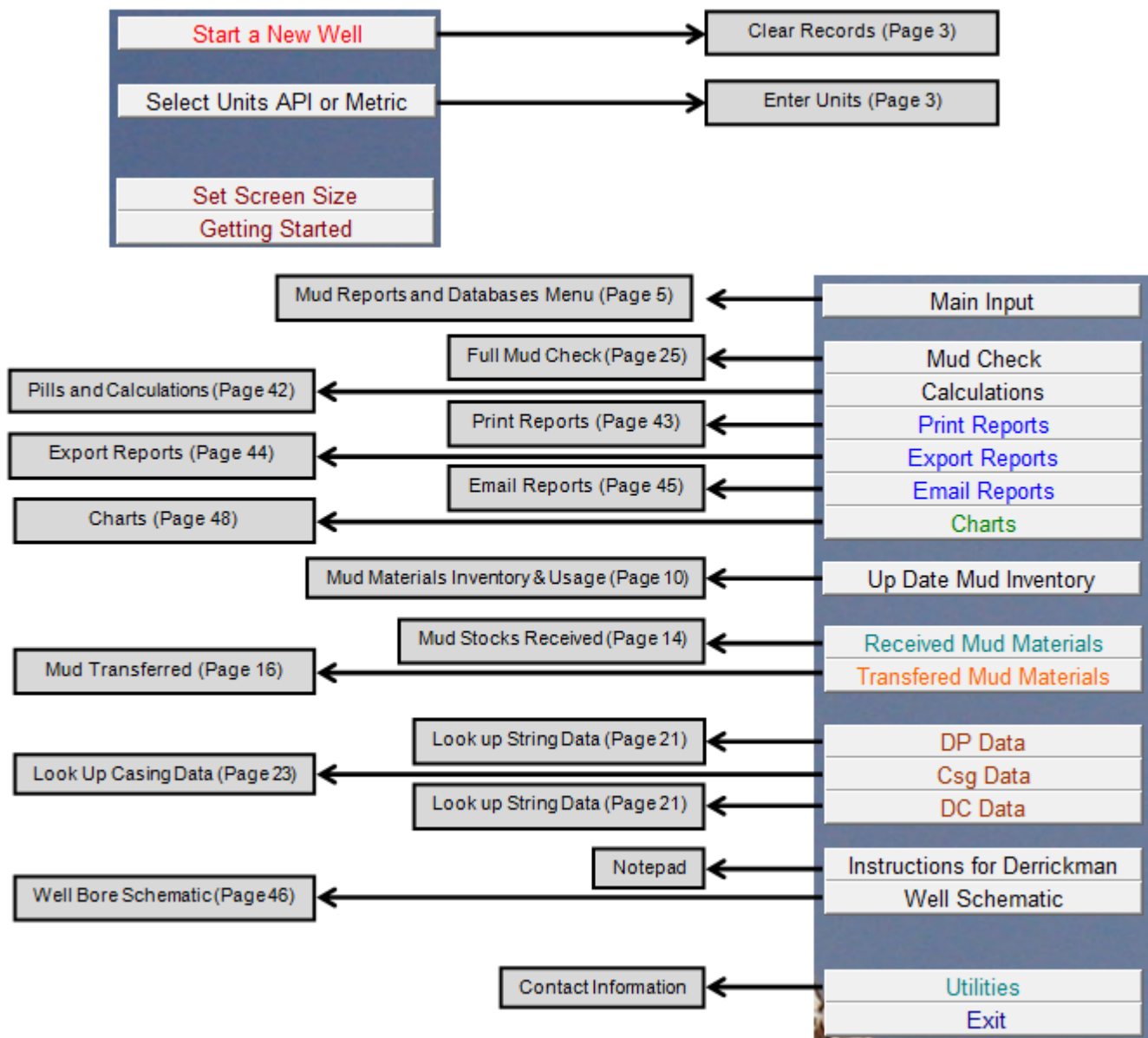


Figure 2 Main Menu Button Functions

B. Starting a New Well

Before starting a new well it is necessary to clear all the previously entered data and enter the units to be used throughout the program. These can be either API or Metric or a combination of both.

(1) Clear Records

On the Main Menu page, select **Start a New Well** (Ref. Figure 1). The Clear Records Page is shown (Ref. Figure 3).



Figure 3 Clear Records

Select **Clear the DataBase and start a new well**. After approximately 10 seconds a message box is shown indicating that these databases have been deleted:

- Mud Received
- Mud Check Report
- Mud Materials Inventory.

Select **OK**. The program returns to the Main Menu (Ref. Figure 1).

(2) Enter Units

On the Main Menu page, select **Select Units API or Metric**. A warning is shown. This informs the operator that the selected units will be used throughout the entire program.

Select **OK**. The Select Units dialog box is shown (Ref. Figure 4).

Select Units

For Your Reference - Units Selected

- Hole Size ins
- Depth ft
- Pipe Weight ppf
- Volume bbls
- AV ft/min
- Nozzles 32nds
- Jet Velocity ft/sec
- PV cp
- Temp F°
- Cake 1/32
- YP lbs/100ft²
- Pump Output bpm
- Pressure psi
- Density ppg
- Produce Concentration lb/bbl
- K-Factor lb.sⁿ/100ft
- WOB lbs
- Linier Volume bbl/ft
- Force/Torque Ft/lbs
- Power HP
- Trip Tank Volume bbls/in
- Trip Tank measurement mtrs
- Mud sack weight Lb/sack
- Pails/buckets US Gals
- Pump Liners & Strokes ins

Hole/Pipe Size
☐ Ins ☐ mm ☐ cm

Length - Depth
☐ Feet ☐ Mtrs

Pipe Weight
☐ Lb/Ft ☐ Kg/Mtr

Volume
☐ Bbls ☐ Ltrs ☐ M³

Trip Tank Volume
☐ Bbls/in ☐ M³/cm

Trip Tank Measurement
☐ Feet ☐ Meters

Annular Velocity
☐ Ft/Min ☐ m/min

Bit-Nozzle size
☐ 1/32nd ☐ mm

Pressure
☐ psi ☐ kPa

Jet Velocity
☐ Ft/Sec ☐ m/sec

Plastic Viscosity
☐ cP ☐ mPa.s

Temperature
☐ F° ☐ C°

Filter Cake Thickness
☐ 1/32 ins ☐ mm

Pump Liner ID x Stroke Length
☐ Ins ☐ mm ☐ cm

Yield Point / Gels
☐ Lbs/100ft² ☐ Pa

Linier Volume
☐ Bbls/Ft ☐ M³/Mtr

Pump Output/Flow Rate
☐ BPM ☐ GPM ☐ M³/Min

Product Concentration
☐ Lb/Bbl ☐ Kg/M³

Mud Sack Weight
☐ Lbs/Sack ☐ Kg/Sack

Liquid Chemical Buckets/Pails
☐ US Gals ☐ Liters

Force
☐ Ft/Lbs ☐ Mtr/Kg

K-Factor
☐ Lb.sⁿ/100ft ☐ Pa.sⁿ

Funnel Velocity
☐ cc/30 min ☐ ml/30 min

WOB
☐ lbs ☐ Knewton ☐ daN

Power
☐ HP ☐ KW

Density
☐ ppg ☐ S.G ☐ Kg/M³ ☐ lb/ft³

Mud Pressure Gradient
☐ psi/Ft ☐ S.G/M ☐ kPa/M

Continue

Figure 4 Select Units

On the left margin of the Select Units dialog box, all previously selected units are shown. This is for reference only. These units can be changed using the appropriate entry field.

When all the required data has been entered, select **Continue**. The program returns to the Main Menu (Ref. Figure 1).

C. Mud Reports and Databases Menu

On the Main Menu page, select **Main Input**. The Mud Reports and Databases Menu is shown (Ref. Figure 5).

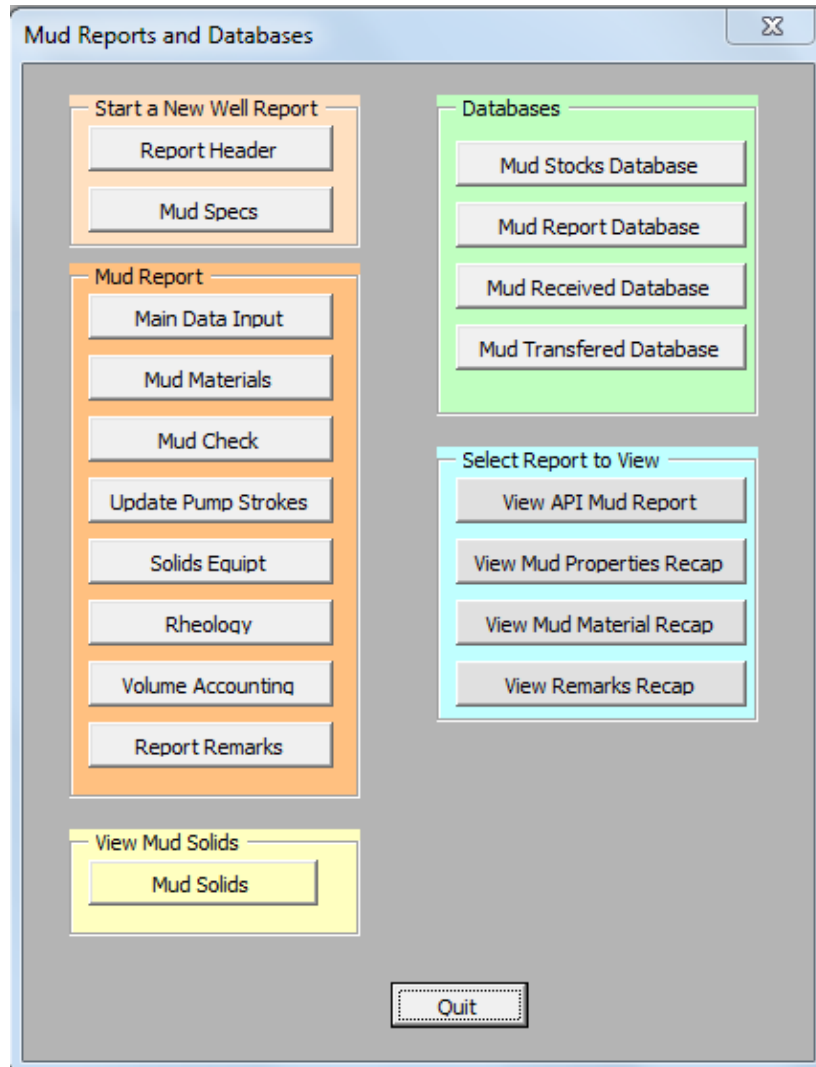


Figure 5 Mud Reports and Databases Menu

The Mud Reports and Databases Menu is the entry point for all the mud engineering parameters. Figure 6 shows each button function. References to figures, flow charts and page numbers are a guide to where that particular information is to be found.

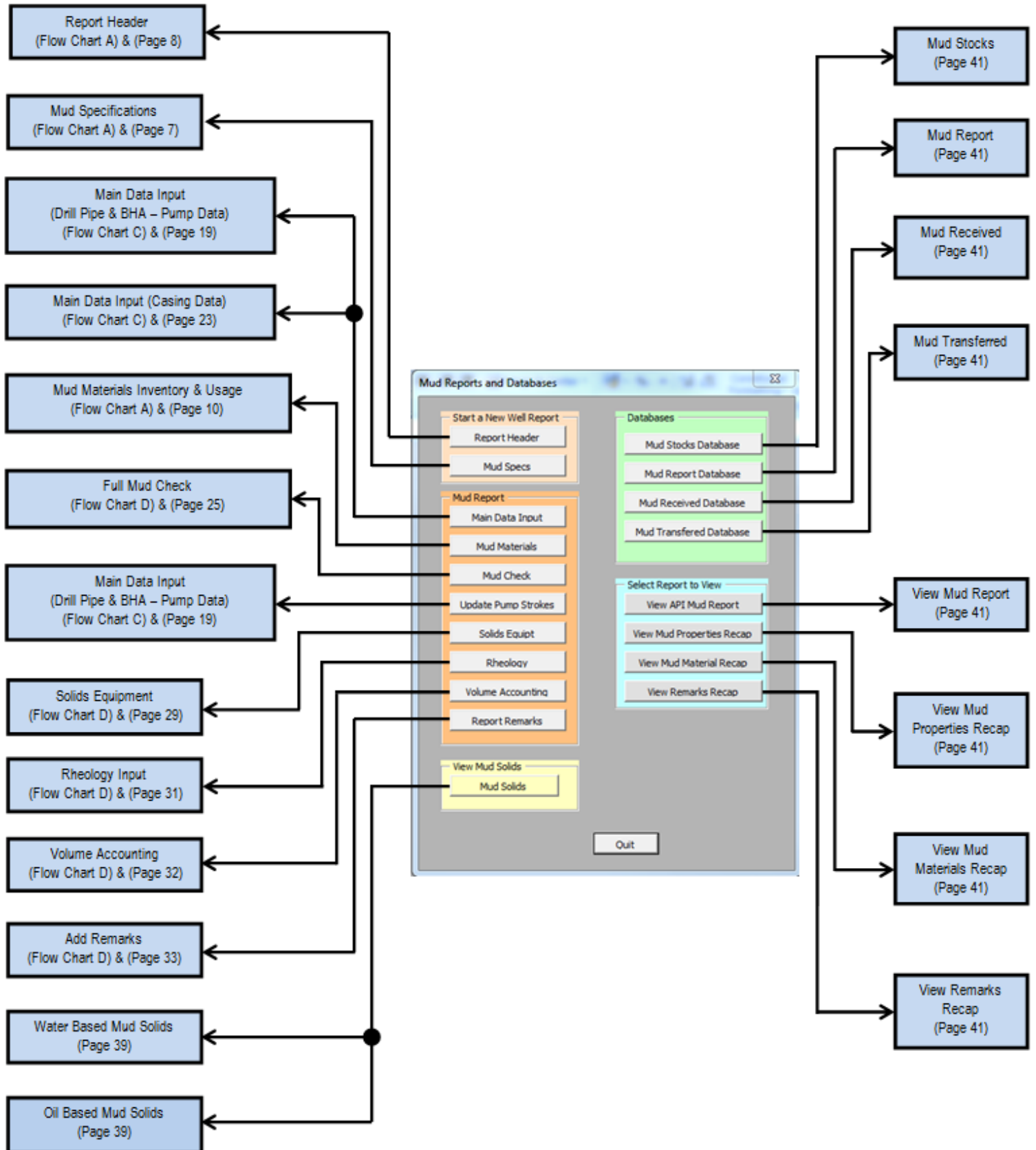
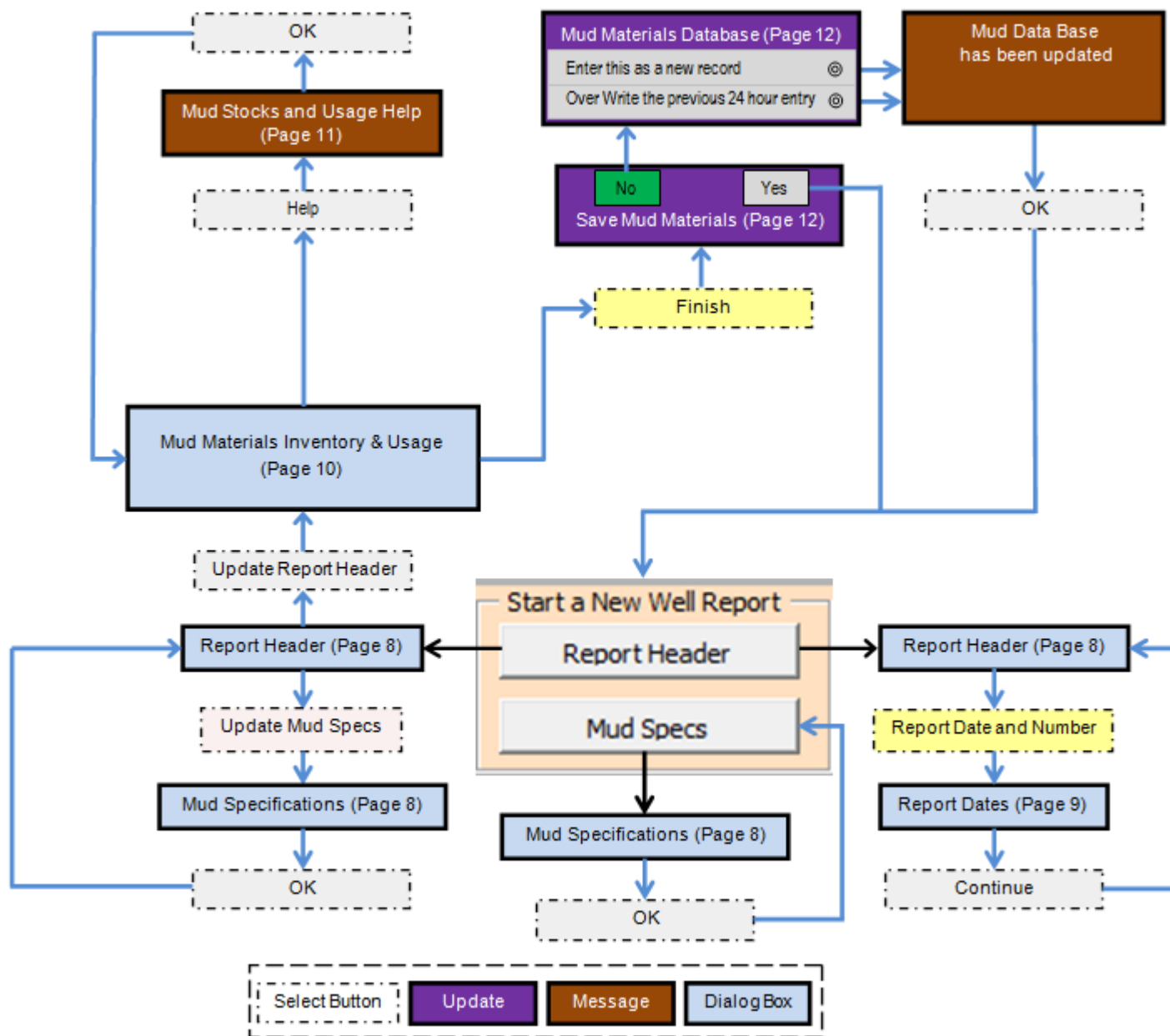


Figure 6 Mud Reports and Databases Menu Button Functions

(1) Start a New Well Report.

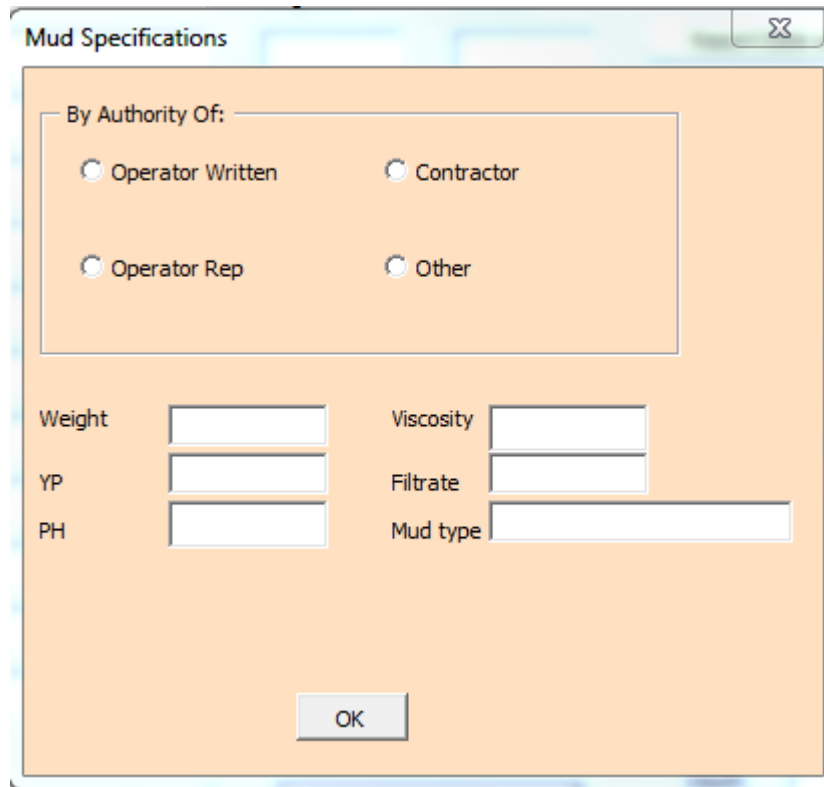
In this section of the Mud Reports and Databases Menu, the Report Header and the Mud Specs dialog boxes are accessed. Flow Chart A and Flow Chart B (Start a New Well Report) are to help the mud engineer navigate this section of the program.



Flow Chart A: Start a New Well Report

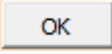
(a) Mud Specs

On the Mud Reports and Databases Menu, select . The Mud Specifications dialog box is shown (Ref. Figure 7).

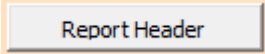


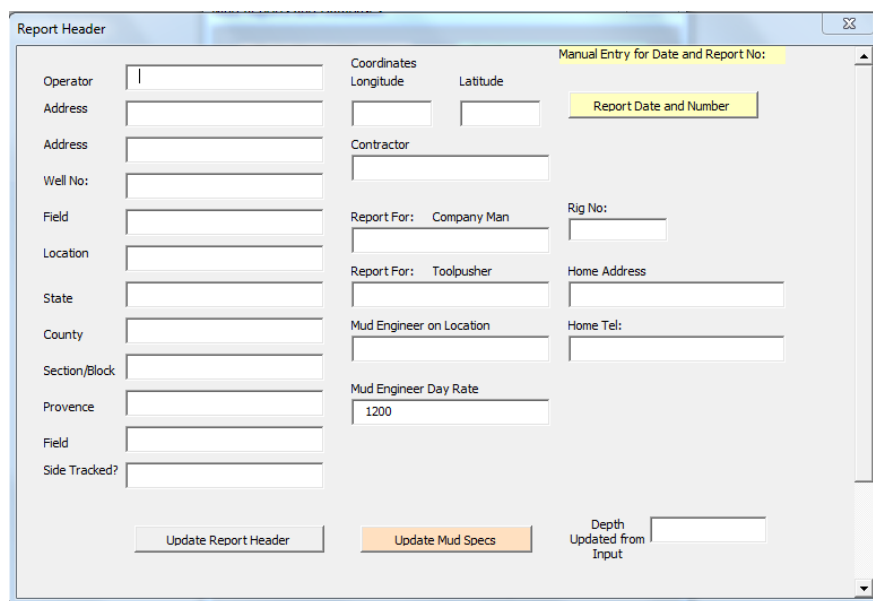
The image shows a software dialog box titled "Mud Specifications". It has a standard Windows-style title bar with a close button (X) in the top right corner. The main area of the dialog is light orange. At the top, there is a section labeled "By Authority Of:" containing four radio button options arranged in a 2x2 grid: "Operator Written", "Contractor", "Operator Rep", and "Other". Below this section, there are several input fields: "Weight" (a small rectangular box), "Viscosity" (a small rectangular box), "YP" (a small rectangular box), "Filtrate" (a small rectangular box), "PH" (a small rectangular box), and "Mud type" (a longer rectangular box). At the bottom center of the dialog is a single "OK" button.

Figure 7 Mud Specifications

Selecting , after entering the appropriate data, returns the program to the Mud Reports and Databases Menu.

(b) Report Header

On the Mud Reports and Databases Menu, select . The Report Header dialog box is shown (Ref. Figure 8).




The 'Report Header' dialog box contains the following fields and controls:

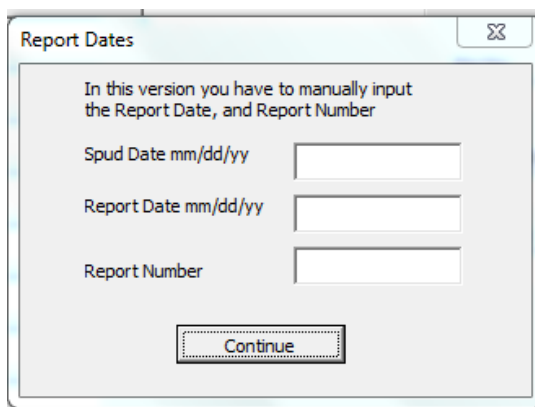
- Operator:** Text input field.
- Address:** Two stacked text input fields.
- Well No.:** Text input field.
- Field:** Text input field.
- Location:** Text input field.
- State:** Text input field.
- County:** Text input field.
- Section/Block:** Text input field.
- Province:** Text input field.
- Field:** Text input field.
- Side Tracked?:** Text input field.
- Coordinates:** Sub-section with 'Longitude' and 'Latitude' text input fields.
- Contractor:** Text input field.
- Report For:** Two radio buttons labeled 'Company Man' and 'Toolpusher'.
- Mud Engineer on Location:** Text input field.
- Mud Engineer Day Rate:** Text input field with '1200' entered.
- Manual Entry for Date and Report No.:** Sub-section with a 'Report Date and Number' button.
- Rig No.:** Text input field.
- Home Address:** Text input field.
- Home Tel.:** Text input field.
- Depth Updated from Input:** Text input field.
- Buttons:** 'Update Report Header' (grey), 'Update Mud Specs' (orange), and 'Continue' (dashed border).

Figure 8 Report Header

All the information relating to the well is entered on the Report Header data input form.

1. Report Dates

On the Report Header dialog box, select . The Report Dates dialog box is shown (Ref. Figure 9).



The 'Report Dates' dialog box contains the following fields and controls:


- Text:** 'In this version you have to manually input the Report Date, and Report Number'.
- Spud Date mm/dd/yy:** Text input field.
- Report Date mm/dd/yy:** Text input field.
- Report Number:** Text input field.
- Continue:** Button with a dashed border.

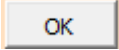
Figure 9 Report Dates

The Spud Date, Report Date and Report Number are entered manually.


When  is selected, the program returns to the Report Header dialog box.

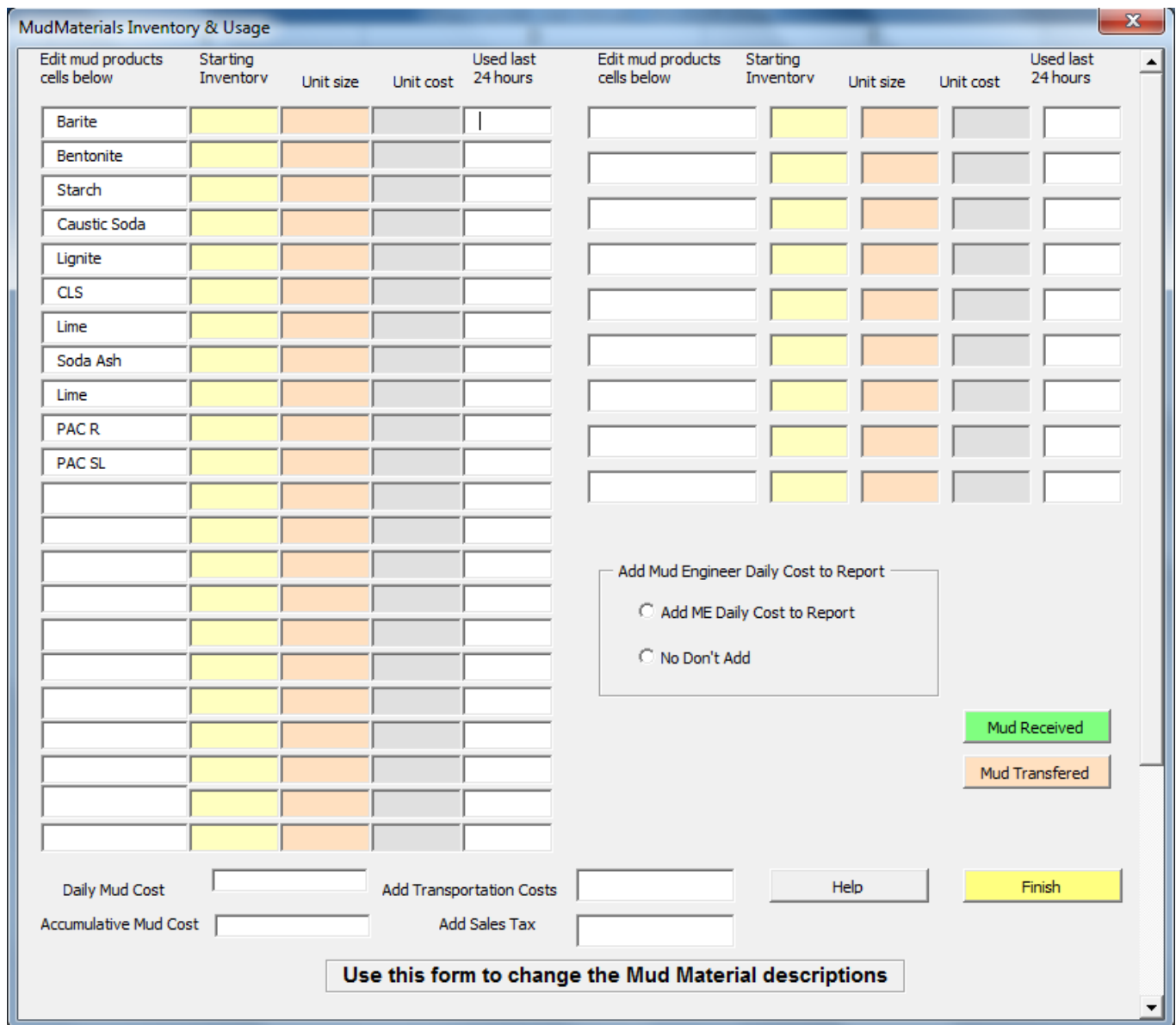
2. Update Mud Specs

On the Report Header dialog box, select . The Mud Specifications dialog box is shown (Ref. Figure 7).

After the appropriate data has been entered or edited, selecting  returns the program to the Report Header dialog box (Ref. Figure 8).

3. Mud Materials Inventory & Usage

On the Report Header dialog box, select . The Mud Materials & Usage dialog box is shown (Ref. Figure10).

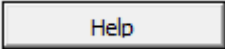


Edit mud products cells below	Starting Inventory	Unit size	Unit cost	Used last 24 hours
Barite				
Bentonite				
Starch				
Caustic Soda				
Lignite				
CLS				
Lime				
Soda Ash				
Lime				
PAC R				
PAC SL				

Figure 10 Mud Materials Inventory & Usage

The Mud Materials Inventory & Usage dialog box is used to input all the mud materials, their costs, quantities and daily usage.

a. Help

Selecting  on the Mud Materials Inventory & Usage dialog box shows the Mud Stocks and Usage Help page (Ref. Figure 11)

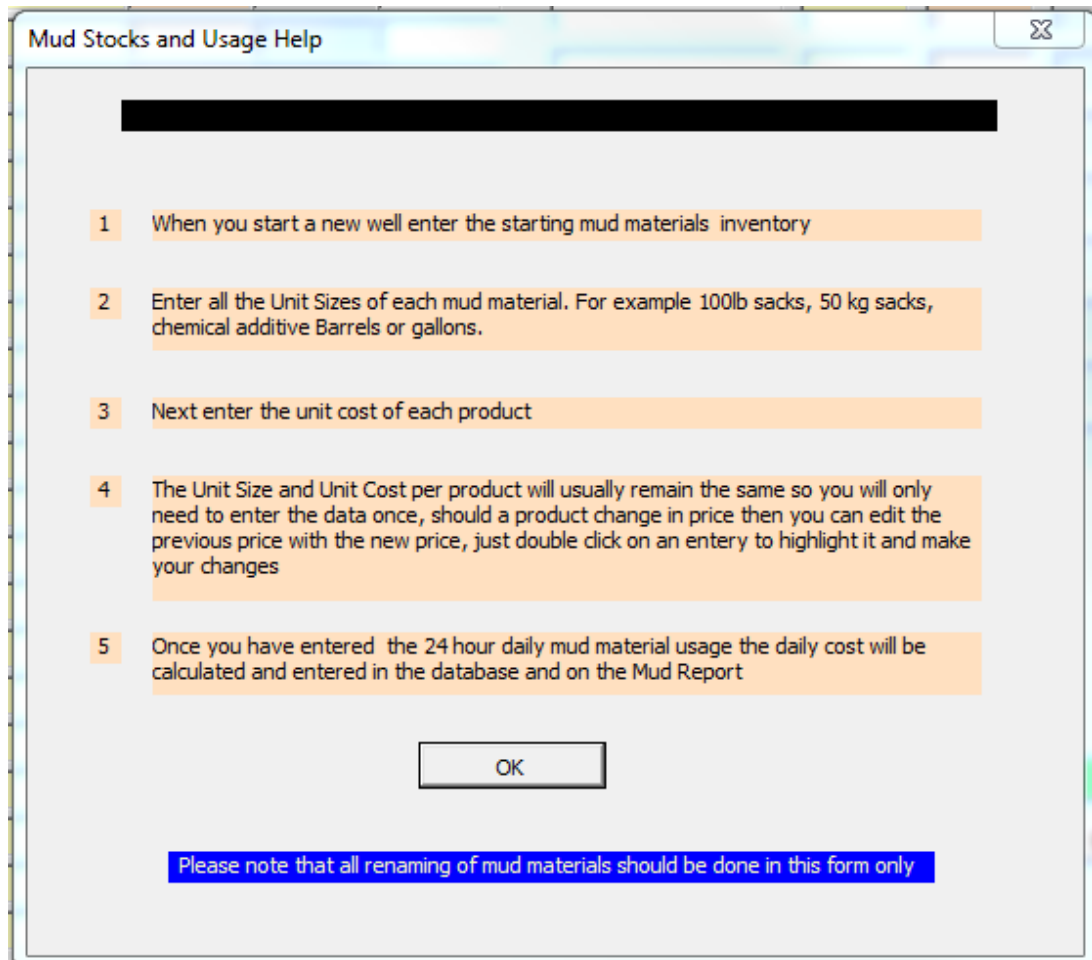
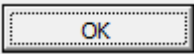


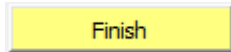
Figure 11 Mud Stocks and Usage Help

This page provides a guide on how to utilize the Mud Materials & Usage dialog box.

Select . The program returns to the Mud Materials Inventory & Usage dialog box.

b. Database Update

After entering/editing the data on Mud Materials Inventory & Usage dialog box, select



. The Save Mud Materials Update box is shown (Ref. Figure 12).

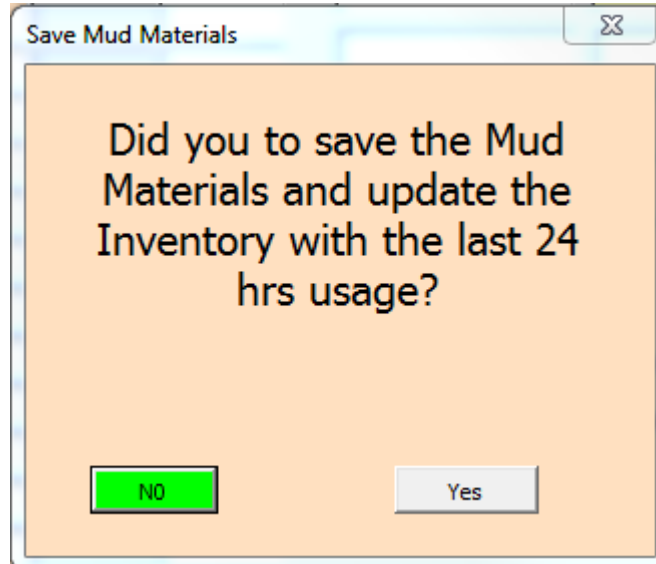
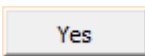
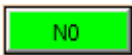


Figure 12 Save Mud Materials Update

Selecting  in the update box returns the program to the Mud Reports and Databases Menu (Ref. Figure 5).

Selecting  in the update box shows the Mud Materials DataBase update box (Ref. Figure 13).

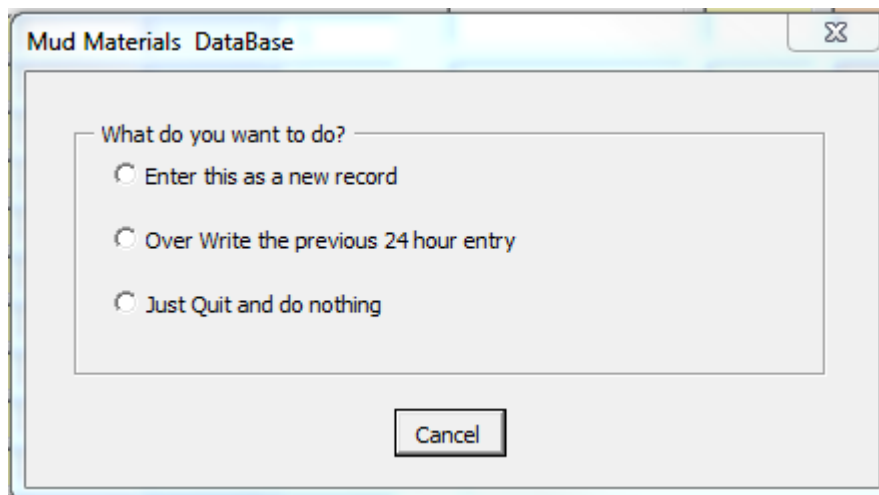
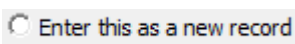


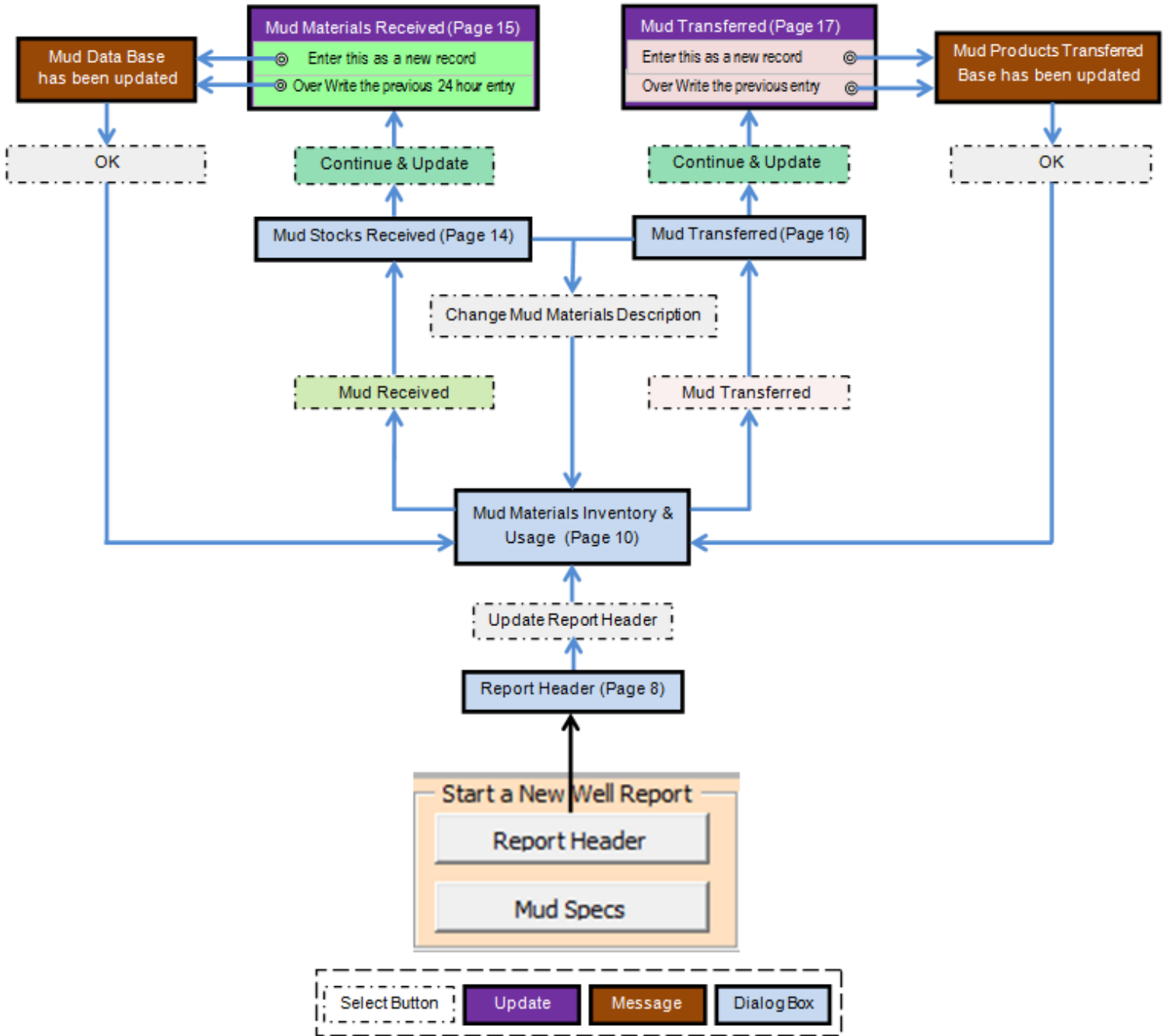
Figure 13 Mud Materials Database Update

Selecting  updates the mud materials database with the previously entered data. A message is shown indicating that the mud materials data base has been updated.

Selecting , in this message box, returns the program to the Mud Reports and Databases Menu (Ref. Figure 5).

Selecting ☐ Over Write the previous 24 hour entry up dates and overwrites the previous 24 hour entry. A message is shown indicating that the mud materials data base has been updated.

Selecting , in this message box, returns the program to the Mud Reports and Databases Menu (Ref. Figure 5).



Flow Chart B: Start a New Well Report

c. Mud Stocks Received

On the Mud Materials Inventory & Usage dialog box (Ref. Figure 10), selecting

Mud Received

shows the Mud Stocks Received dialog box (Ref. Figure 14).

Figure 14 Mud Stocks Received

This dialog box is used to update the mud stock inventory.

Selecting **Cancel/Clear All** clears all the existing data.

If new mud materials are to be added, selecting **Change Mud Material descriptions** shows the Mud Materials Inventory & Usage dialog box (Ref. Figure 10). In this dialog box, new mud materials can be added, or existing mud materials can be edited.

Select **Mud Received** in the Mud Materials Inventory & Usage dialog box. The program returns to the Mud Stocks Received dialog box with the new or edited mud materials added to the Mud Stocks Received dialog box.

After entering any new data, select **Continue & Update**. The Mud Materials Received update box is shown (Ref. Figure 15).

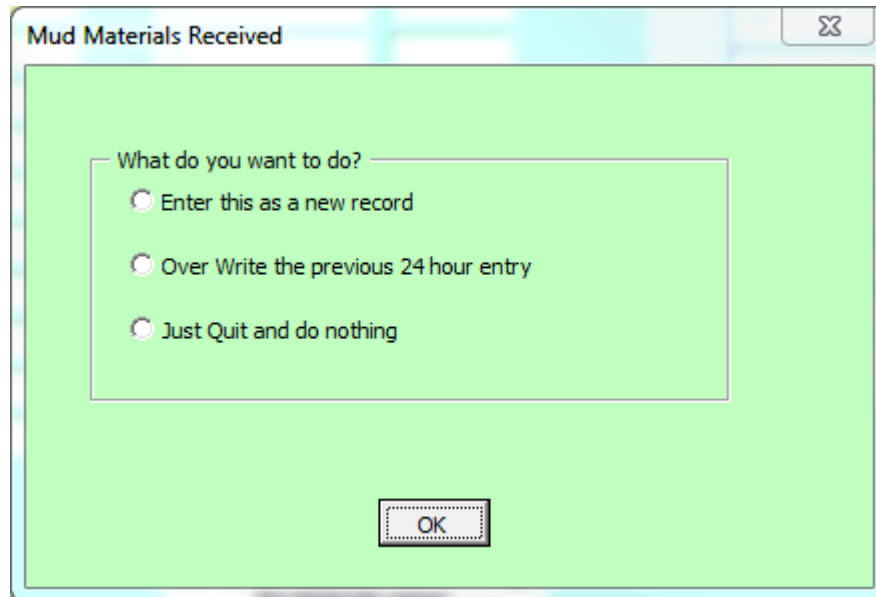


Figure 15 Mud Materials Received Update

Selecting ☐ Enter this as a new record updates the mud materials received data base. A message is shown indicating the mud materials received data base has been updated.

Selecting ☐ OK, in this message box, returns the program to the Mud Materials Inventory & Usage dialog box (Ref. Figure 10).

Selecting ☐ Over Write the previous 24 hour entry overwrites and updates the previous 24 hour entry. A message is shown indicating that the mud materials received data base has been updated.

Selecting ☐ OK, in this message box, returns the program to the Mud Materials Inventory & Usage dialog box (Ref. Figure 10).

d. Mud Stocks Transferred

Selecting **Mud Transferred** on the Mud Materials Inventory & Usage dialog box (Ref. Figure 10) shows the Mud Transferred dialog box (Ref. Figure 16).

Figure 16 Mud Transferred

This dialog box is used to update the mud stocks transferred inventory.

Selecting **Cancel/Clear All** clears all the existing data.

When new mud materials are to be added, selecting **Change Mud Material descriptions** shows the Mud Materials Inventory & Usage dialog box (Ref. Figure 10). On this dialog box, new mud materials can be inserted, or existing mud materials can be edited.

Select **Mud Transferred** on the Mud Materials Inventory & Usage dialog box. The program returns to the Mud Transferred dialog box with the new or edited mud materials added to the Mud Transferred dialog box.

After the new data has been entered, select **Continue & Update**. The Mud Products Transferred Database update box is shown (Ref. Figure 17).

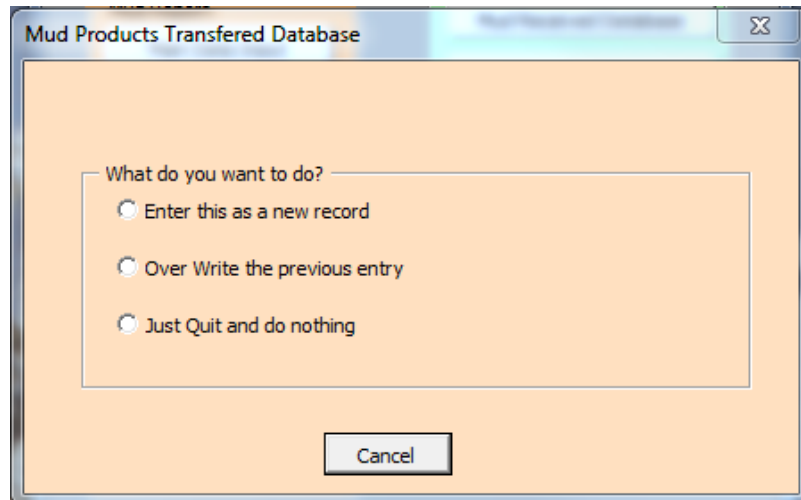


Figure 17 Mud Products Transferred Database Update

Selecting ☒ Enter this as a new record updates the mud products transferred data base. A message is shown indicating that the mud products transferred data base has been updated.

Selecting ☐ OK, in this message box, returns the program to the Mud Materials Inventory & Usage dialog box (Ref. Figure 10).

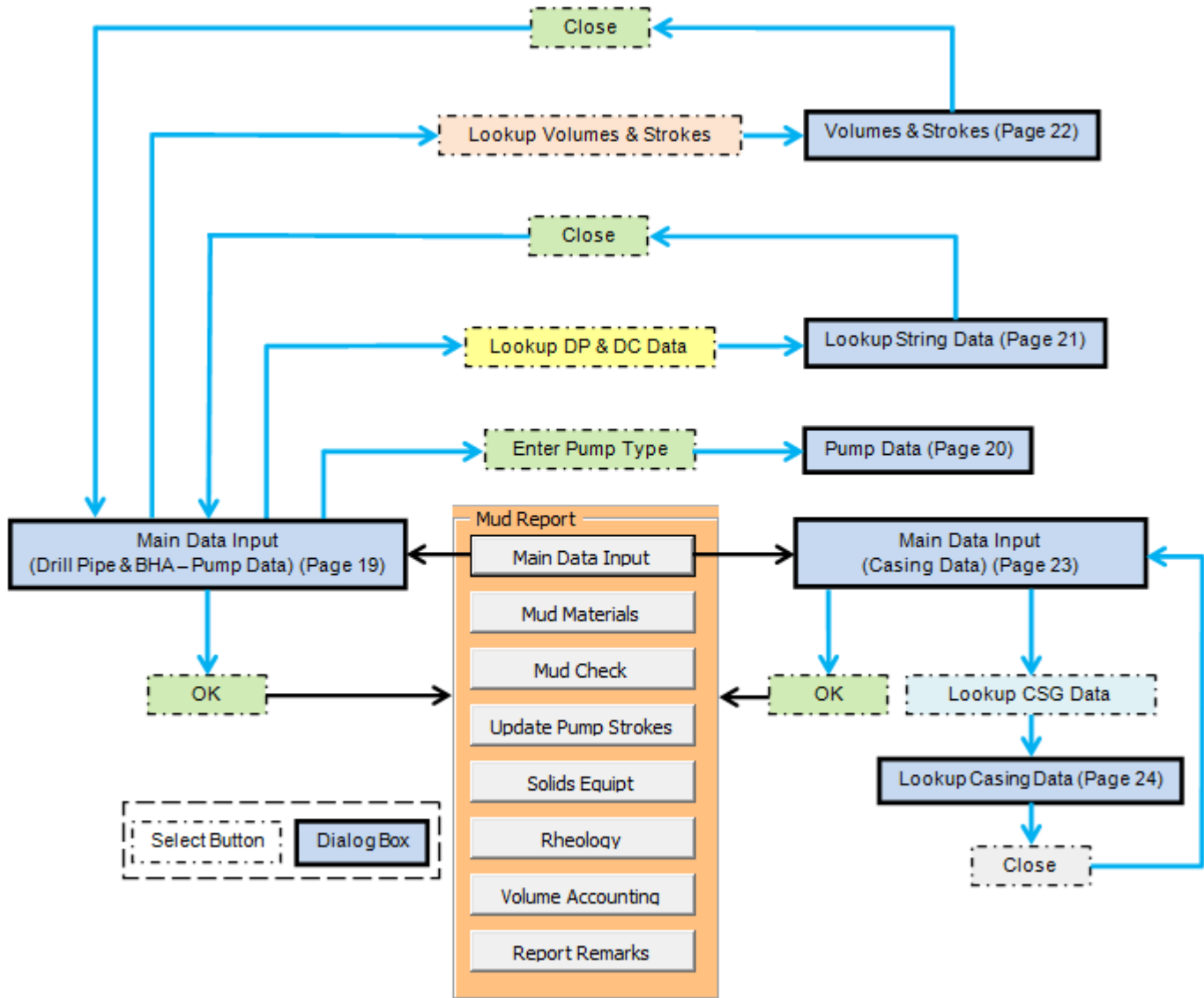
Selecting ☒ Over Write the previous entry overwrites and updates the previous 24 hour entry. A message is shown indicating that the mud products transferred data base has been updated.

Selecting ☐ OK, in this message box, returns the program to the Mud Materials Inventory & Usage dialog box (Ref. Figure 10).

(2) Mud Report

(a) Main Data Input

In this section of the Mud Reports and Databases Menu, the Main Dialog box is accessed. Flow Chart C (Main Data Input) is to help the mud engineer navigate this section of the program.



Flow Chart C: Main Data Input

On the Main Menu, select **Main Data Input**. The Main Data Input dialog box is shown with the Drill Pipe & BHA – Pump Data tab activated (Ref. Figure 18).

Data Input

Drill Pipe & BHA - Pump Data

Drill Pipe

Type	OD	ID	Weight	Length
G-105	5.5	4.6	29.02	7800
G-105	5.5	4.6	29.3	500

DC's

OD	ID	Weight	Length
8	7.5	149.4	200
9	8	150	500

Pump Data

	Stroke	Liner size	SPM
Pump #1	12	6.5	60
Pump #2	12	6.5	60
Pump #3	15	15	
Efficiency	0.95	Max Pressure	3000
Pump Manufacturer	CE F1000		

Enter Pump Type Duplex

Block Weight

	bbls/min	gals/min	M ³ /min
Pump # 1	7.02	294.94	1.116465604
Pump # 2	7.02	294.94	1.116465604
Pump # 3	0.00	0.00	0
Total	14.04	589.89	2.232931207

Lookup DP and DC Data **Lookup Volumes and Strokes**

OK

Figure 18 Main Data Input (Drill Pipe & BHA - Pump Data)

1. Drill Pipe & BHA – Pump Data

Data is entered in these dialog boxes

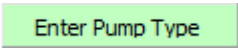
- a. Drill Pipe:
 - Type
 - Outside Diameter (OD)
 - Inside Diameter (ID)
 - Weight
 - Length.
- b. DC's:
 - Outside Diameter (OD)
 - Inside Diameter (ID)
 - Weight
 - Length.

- c. Pump Data:
- Stroke
 - Liner Size
 - SPM
 - Pump Manufacturer.

- d. Block Weight.

The pump outputs are shown in the panel to the right of the Pump Data.

- e. Pump Type

Selecting  shows the Pump Data selection dialog box (Ref. Figure 19)

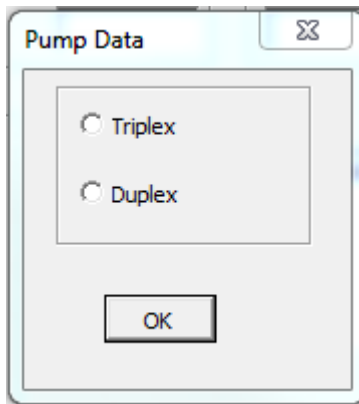
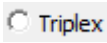


Figure 19 Pump Data Selection

Selecting  returns the program to the Main Data Input (Drill Pipe & BHA – Pump Data) dialog box.

Selecting  shows the Duplex Rod Size dialog box (Ref. Figure 20).

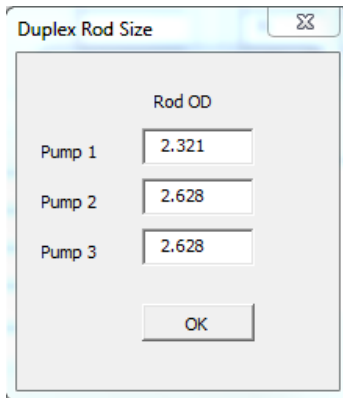
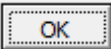


Figure 20 Duplex Rod Size

The rod Outside Diameter (OD) for each pump is entered on this dialog box.

Select  after entering the data, the program returns to the Data Input (Drill Pipe & BHA – Pump Data) dialog box.

f. Look up String Data

Selecting **Lookup DP and DC Data** shows the Look up String data page (Ref. Figure 21). This page is for information only.

Look up String data									
Drill Pipe									
Pipe OD ins	Pipe Weight ppf	Pipe Material Grade	Upset Style	Conn Size	Conn Type	Drift Dia ins	Displacement bbl/ft	Capacity bbl/ft	
2.375	6.65	E-75	EU	API	NC 26	1.625	0.002568	0.003200	
	6.65	X-95	EU	API	NC 26	1.625	0.002601	0.003200	
	6.65	G-105	EU	API	NC 26	1.625	0.002601	0.003200	
	6.65	S-135	EU	API	NC 26	1.625	0.002601	0.003200	
2.875	10.40	E-75	EU	API	NC 31	1.963	0.003989	0.004495	
	10.40	X-95	EU	API	NC 31	1.875	0.004058	0.004495	
	10.40	G-105	EU	API	NC 31	1.875	0.004058	0.004495	
	10.40	S-135	EU	API	PAIC	1.375	0.003781	0.004495	
3.5	10.40	S-135	EU	API	NC 31	1.5	0.004237	0.004495	
	13.30	E-75	EU	API	NC 38	2.457	0.005107	0.007421	
	13.30	X-95	EU	API	NC 38	2.438	0.005217	0.007421	
Heavy Weight Drill Pipe									
Pipe OD ins	Pipe Weight ppf	Pipe Material Grade	Pipe ID ins	Approx Actual Weig	Wall Thickness ins	Drift Dia ins	Displacement bbl/ft	Capacity bbl/ft	
3.5	25.3	NC389	2.1875	25.33333333	0.719		0.009297333	0.004648491	
4	29.7	NC40	2.6875	29.66666667	0.719		0.010887667	0.007016375	
4.5	39.9	NC46	2.875	59.83333333	0.875		0.021958833	0.008029556	
5	48.5	NC50	3.0625	72.66666667	1		0.026668667	0.009111042	
5.875	49.385	XT57	4	57.42	0.361		0.02107314	0.015543035	
5.68	47.23	FH Modified		47.23			0.01733341	0	
6.625	88.98	FH					0.031903226	0.016322581	
6.625	91.06	FH					0.032516611	0.016237542	
Drill Collars									
OD ins	Calculated Weight	Material Grade	ID ins	Conn Size ins	Conn Type	Drift Dia. ins	Open End Displacm	Closed End Displac	Capacity bbl/ft
12	368.0		2.5			0.135056	0	0	0.006071498
12	363.0		2.8125			0.133221	0	0	0.00768424
12	361.0		3			0.132487	0	0	0.008742957
12	356.0		3.25			0.130652	0	0	0.010260832
11.75	352.0		2.5			0.129184	0	0	0.006071498
11.75	347.0		2.8125			0.127349	0	0	0.00768424
11.75	345.0		3			0.126615	0	0	0.008742957
11.75	340.0		3.25			0.12478	0	0	0.010260832
11.5	336.0		2.5			0.123312	0	0	0.006071498
11.5	332.0		2.8125			0.121844	0	0	0.00768424
11.5	329.0		3			0.120743	0	0	0.008742957
Close									

Figure 21 Lookup String Data

Selecting **Close** returns the program to the Main Data Input (Drill Pipe & BHA - Pump Data) dialog box.

g. Volumes and Strokes

Selecting **Lookup Volumes and Strokes** in the Main Data Input (Drill Pipe & BHA - Pump Data) dialog box shows the Volumes and Strokes page (Ref. Figure 22).

	bbls/min	gals/min	M ³ /min
Pump # 1	7.02	294.94	1.12
Pump # 2	7.02	294.94	1.12
Pump # 3	0.00	0.00	0.00
Total	14.04	589.89	2.23

Open Hole Volume	bbls	Drill String Capacity	bbls	bbls
Annulus Volume	341.52	Drill String Disp.	185.00	Hole volume w/drill string
	29.58		126.94	214.58

Weight of drill string lbs	345886	Weight in air	345886	Weight in Mud	345886	Weight in Mud+block	370886
----------------------------	--------	---------------	--------	---------------	--------	---------------------	--------

Strokes	Pump #1	Pump #2	Pump #3	All Pumps	Minutes
Surface to Bit	1581	1581	297	1581	13
Bit to Surface	253	253	47	253	2
Total Circulation	1833	1833	344	1833	15

Calculate Hole Washout of bbls

Strokes	Pump #1	Pump #2	Pump #3
Surface to Bit	1666	1666	313
Bit to Surface	338	338	64
Total Circulation	2004	2004	376

Close

Figure 22 Volumes and Strokes

This page is mainly an information page. The hole washout calculation can be entered manually.

Selecting **Close** returns the program to the Main Data Input (Drill Pipe & BHA - Pump Data) dialog box.

Selecting **OK** on the Main Data Input (Drill Pipe & BHA - Pump Data) dialog box updates the applicable data base and returns the program to the Mud Reports and Databases Menu (Ref. Figure 5)

2. Casing Data

Selecting the **Casing Data** tab on the Main Data Input (Drill Pipe & BHA - Pump Data) dialog box shows the Main Data Input (Casing Data) dialog box (Ref. Figure 23)

Data Input

Casing Data | Drill Pipe & BHA - Pump Data

Casing Data Input

ins ft bbl/ft

	OD	ID	Weight	Top	Bottom	In@	CAP
Conductor	16	15	152	0	120	120	0.218573927
Surface	9.625	8.75	54.5	0	3000	3000	0.07437585
Liner 1	7	6.366	26	2900	7200	7200	0.039368521
Liner 2							
Liner 3							
Production csg							

Clear Casing Data

Lookup CSG Data

OK

Figure 23 Main Data Input (Casing Data)

a. Clear Casing Data

Selecting **Clear Casing Data** clears any existing casing data.

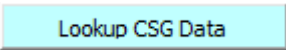
Any data relating to:

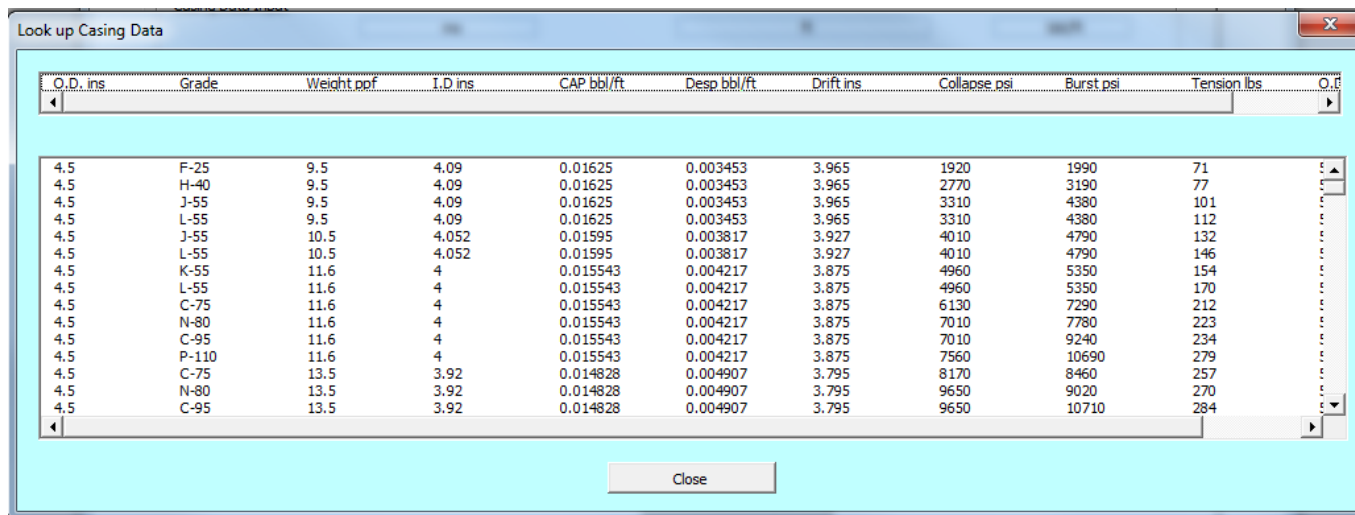
- Conductor
- Surface
- Liner 1
- Liner 2
- Liner 3
- Production csg

is entered in the applicable dialog box.

Selecting **OK** updates the data base and returns the program to the Mud Reports and Databases Menu (Ref. Figure 5).

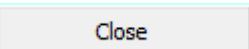
b. Lookup CSG Data

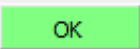
Selecting  an information page, with the casing data, is shown (Ref. Figure 24).



O.D. ins	Grade	Weight ppf	I.D. ins	CAP bbl/ft	Desp bbl/ft	Drift ins	Collapse psi	Burst psi	Tension lbs
4.5	F-25	9.5	4.09	0.01625	0.003453	3.965	1920	1990	71
4.5	H-40	9.5	4.09	0.01625	0.003453	3.965	2770	3190	77
4.5	J-55	9.5	4.09	0.01625	0.003453	3.965	3310	4380	101
4.5	L-55	9.5	4.09	0.01625	0.003453	3.965	3310	4380	112
4.5	J-55	10.5	4.052	0.01595	0.003817	3.927	4010	4790	132
4.5	L-55	10.5	4.052	0.01595	0.003817	3.927	4010	4790	146
4.5	K-55	11.6	4	0.015543	0.004217	3.875	4960	5350	154
4.5	L-55	11.6	4	0.015543	0.004217	3.875	4960	5350	170
4.5	C-75	11.6	4	0.015543	0.004217	3.875	6130	7290	212
4.5	N-80	11.6	4	0.015543	0.004217	3.875	7010	7780	223
4.5	C-95	11.6	4	0.015543	0.004217	3.875	7010	9240	234
4.5	P-110	11.6	4	0.015543	0.004217	3.875	7560	10690	279
4.5	C-75	13.5	3.92	0.014828	0.004907	3.795	8170	8460	257
4.5	N-80	13.5	3.92	0.014828	0.004907	3.795	9650	9020	270
4.5	C-95	13.5	3.92	0.014828	0.004907	3.795	9650	10710	284

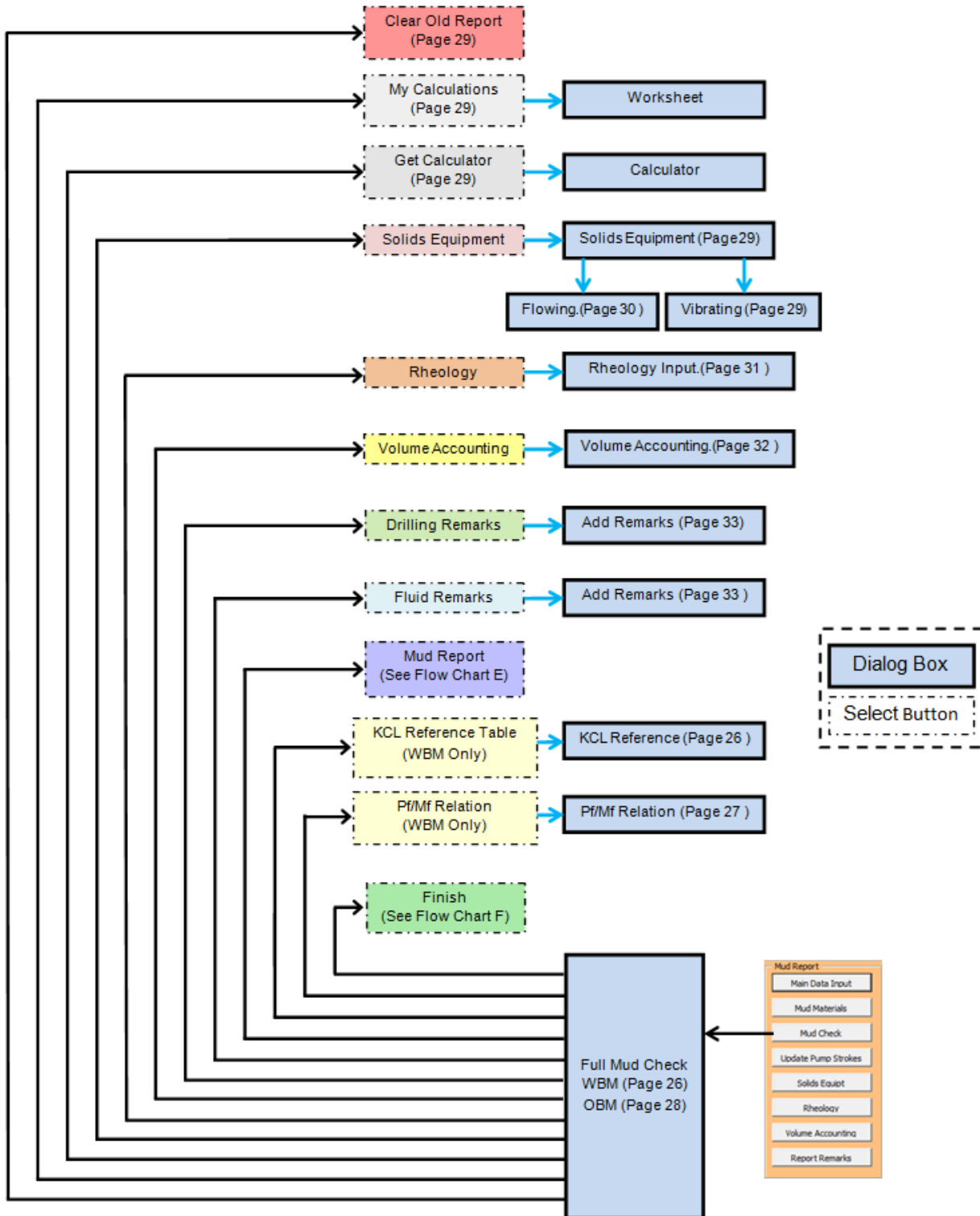
Figure 24 Casing Data

Selecting  returns the program to the Main Data Input (Casing Data) dialog box.

Selecting  updates the applicable data base and returns the program to the Mud Reports and Databases Menu (Ref. Figure 5).

(b) Mud Check

In this section of the Mud Reports and Databases Menu, the Full Mud Check dialog box is accessed. Flow Chart D (Full Mud Check) is to help the mud engineer navigate this section of the program.



Flow Chart D: Full Mud Check

On the Mud Reports and Databases Menu (Ref. Figure 5), select **Mud Check**. The Full Mud Check dialog box is shown with the Water Base Mud tab activated (Ref. Figure 25).

Full Mud Check

Water Base Mud | Oil Base Mud - Depths and Report time

Sample Taken: Flow Line, Suction

Temp: 22

Time (00:00): 11.11

TVD:

MTD:

Weight:

Viscosity:

10 Sec Gels:

10 Min Gels:

30 Min Gels: test

HTHP 200 deg:

HTHP 250 deg:

HTHP 300 deg:

Fluid Loss ml/30 min:

Sand %:

Cake:

Alkalinity (PH):

Pm:

Pf:

Mf:

Retort Solids%:

Retort Oil %:

Retort Water%:

mL,AgNo3:

MBT:

LCM:

Calcium:

KCL Polymer Weighted ? ☐ YES ☒ NO

KCL Reference Table | Pf / Mf Relation

HTHP FL (35mPax150°C):

HTHP Cake mm:

Bicarbonates mg/l:

Carbonates mg/l:

Hydroxil mg/l:

Chlorides mg/l:

Total Hardness mg/l:

Calcium Ion mg/l:

Magnesium mg/l:

MgO mg/l:

Potassium Ion mg/l:

KCL calculated % v/v:

Oil % v/v:

Water % v/v:

Solids Content % v/v:

Total Drill Solids:

Corrected LGS % v/v:

HGS % v/v:

Sand Suction % v/v:

Bentonite as Gel kg/m³:

Mud Density kpa/m:

Mud Density S.G:

Nozzles

1: 12

2: 12

3: 12

4: 12

5:

6:

7:

8:

9:

10:

11:

12:

Bit size: 6.25

Bit #:

Type:

Manuf:

Clear Old Report

My Calculations

Get Calculator

Solids Equipment

Rheology

Volume Accounting

Drilling Remarks

Fluids Remarks

Mud Report

Present Operation:

Present Depth:

Pit Volume:

Finish

Figure 25 Full Mud Check (Water Base Mud)

1. Water Base Mud

All factors relating to the water base mud are entered in this dialog box.


a. KCL Reference

Selecting **KCL Reference Table** shows the KCL Reference table (Ref. Figure 26).


% KCl	Density (kg/m ³)	KCl (kg/m ³)	KCl (mg/L)	K ⁺ (mg/L)	Cl ⁻ (mg/L)	Final Volume Factor	Freezing Point (° C)
1	1006	11.4	10050	5271	4779	1.004	0
2	1013	20.0	20220	10605	9615	1.008	-1
4	1026	39.9	40960	21482	19478	1.016	-2
6	1039	62.8	62210	32627	29583	1.024	-3
8	1052	82.8	84000	44056	39945	1.033	-4
10	1065	105.6	106300	55752	50548	1.043	-5
12	1079	128.4	129200	67762	61439	1.053	-6
14	1093	154.1	152700	80087	72613	1.064	-7
16	1106	176.9	176700	92674	84026	1.076	-8
18	1120	202.6	201300	105576	95724	1.088	-9
20	1135	225.4	226600	118845	107755	1.102	-10
22	1149	251.1	252400	132376	120024	1.115	0
24	1160	279.6	279000	146327	132673	1.028	13

OK

Figure 26 KCL Reference Table

Selecting  returns the program to the Full Mud Check (Water Base Mud) dialog box.

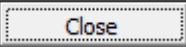
b. Pf/Mf Relation

Selecting  shows the Pf/Mf Relation Chart (Ref. Figure 27).

Pf / Mf Relation			
Use the following table to estimate the Carbonate (CO ₃), Bicarbonate (HCO ₃), or Hydroxyl (OH) alkalinity present in the mud system.			
Pf / Mf Relation	Bicarbonate (mg/L HCO ₃)	Carbonate (mg/L CO ₃)	Hydroxyl (mg/L OH)
Pf = 0	1220 X Mf	0	0
Pf = Mf	0	0	340 X Mf
2Pf = Mf	0	1200 X Pf	0
2Pf > Mf	0	1200 (Mf - Pf)	340 (2Pf - Mf)
2Pf < Mf	1200 (Mf - 2Pf)	1200 X Pf	0

Close

Figure 27 Pf/Mf Relation

Selecting  returns the program to the Full Mud Check (Water Base Mud) dialog box.

2. Oil Base Mud

Selecting the **Oil Base Mud - Depths and Report time** tab on the Full Mud Check (Water Base Mud) shows the Full Mud Check (Oil Base Mud) dialog box (Ref. Figure 28).

Full Mud Check

Water Base Mud | **Oil Base Mud - Depths and Report time**

Sample Taken	Flow Line	Suction	Sample Taken	Flow Line	Suction
Temp	22		API WL		
Time (00:00)	11.11		HTHP 300 deg		
TVD			Cake		
MTD			Solids %		
Weight			Oil		
Viscosity			Water		
Alkalinity (PH)			Alkalinity ml, N-10		
10 Sec Gels			E.S.		
10 Min Gels			ml, .282 Ag		
			Calcium		
			Nad lb/bbl		
			% wt Sodium Chloride		
			Water Phase Salinity Volts		
			EDTA ml		
			Total Hardness		

O/W Ratio IN: O/W Ratio OUT:

Excess Lime ppb:

Nozzles

Nozzle	Size
1	12
2	12
3	12
4	12
5	
6	
7	
8	
9	
10	
11	
12	

Bit size: 6.25
Bit #:
Type:
Manuf:

Present Operation:
Present Depth:
Pit Volume:

Buttons: Clear Old Report, My Calculations, Get Calculator, Solids Equipment, Rheology, Volume Accounting, Drilling Remarks, Fluids Remarks, Mud Report, Finish

Figure 28 Full Mud Check (Oil Base Mud)

All factors relating to the water base mud are entered in this dialog box.

3. Water Base Mud and Oil Based Mud

The following functions are common to both the Water Base Mud and the Oil Base Mud dialog boxes.

a. Clear Old Report

Selecting **Clear Old Report** deletes the existing data.

b. Calculations

Selecting **My Calculations** shows a blank worksheet. Any personal calculations can be entered on this worksheet. Selecting **Get Calculator** on either the worksheet or the Full Mud Check dialog box shows a calculator.

Selecting **Mud Check** on the worksheet returns the program to the Full Mud Check dialog box.

c. Solids Equipment

Selecting **Solids Equipment** shows the Solids Equipment dialog box with the **Vibrating** tab activated (Ref. Figure 29).

Solids Equipment

Vibrating | Flowing

	Top Screen	MID Screen	Btm Screen	Flow Over	Flow Under	Hours Run
Shaker #1	175	175	175			
Shaker #2	175	175	174			
Shaker #3	175	177	180			
Shaker #4	180	190	200			
M/Cleaner #1	200	210	250			
M/Cleaner #2	200	225	250			

Clear Old Report **Close**

Debris Equipment

	Location	Hours Used
Centrifuge Low solids		
Centrifuge High Solids		
Debris Transporter		
Debris container		

Figure 29 Solids Equipment (Vibrating)

Selecting **Clear Old Report** deletes the existing data. New data relating to the vibrating solids can now be entered.

Selecting **Close** saves the data and returns the program to the Full Mud Check dialog box.

Selecting the **Flowing** tab shows the flowing solids dialog box (Ref. Figure 30)

	Wt In	Wt Out	Hours Run
Centrifuge			
Desander			
Desilter			
Degaser	11	3	

Clear Old Report **Close**

	Location	Hours Used
Centrifuge Low solids		
Centrifuge High Solids		
Debris Transporter		
Debris container		

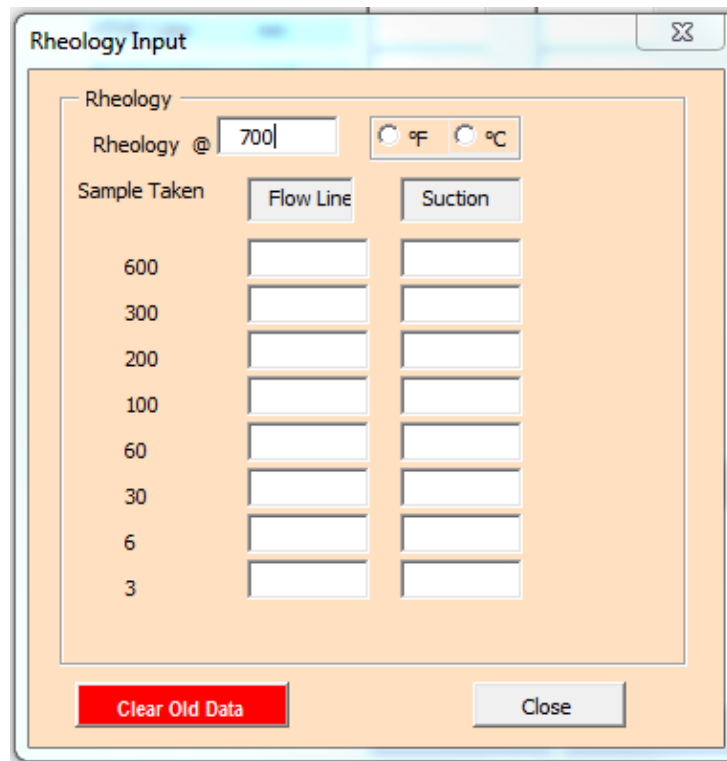
Figure 30 Solids Equipment (Flowing)

Selecting **Clear Old Report** deletes the existing data. New data relating to the flowing solids can now be entered.

Selecting **Close** saves the data and returns the program to the Full Mud Check dialog box.

d. Rheology

Selecting **Rheology** shows the Rheology Input dialog box (Ref. Figure 31).



The Rheology Input dialog box is a window with a title bar that says "Rheology Input". Inside the window, there is a section labeled "Rheology" with a sub-label "Rheology @" followed by a text input field containing "700". To the right of this field are two radio buttons labeled "°F" and "°C". Below this, there are two buttons labeled "Flow Line" and "Suction". Underneath these buttons is a table with two columns, "Flow Line" and "Suction", and eight rows corresponding to sample depths: 600, 300, 200, 100, 60, 30, 6, and 3. Each cell in the table is an empty text input field. At the bottom of the dialog box, there are two buttons: "Clear Old Data" (highlighted in red) and "Close".

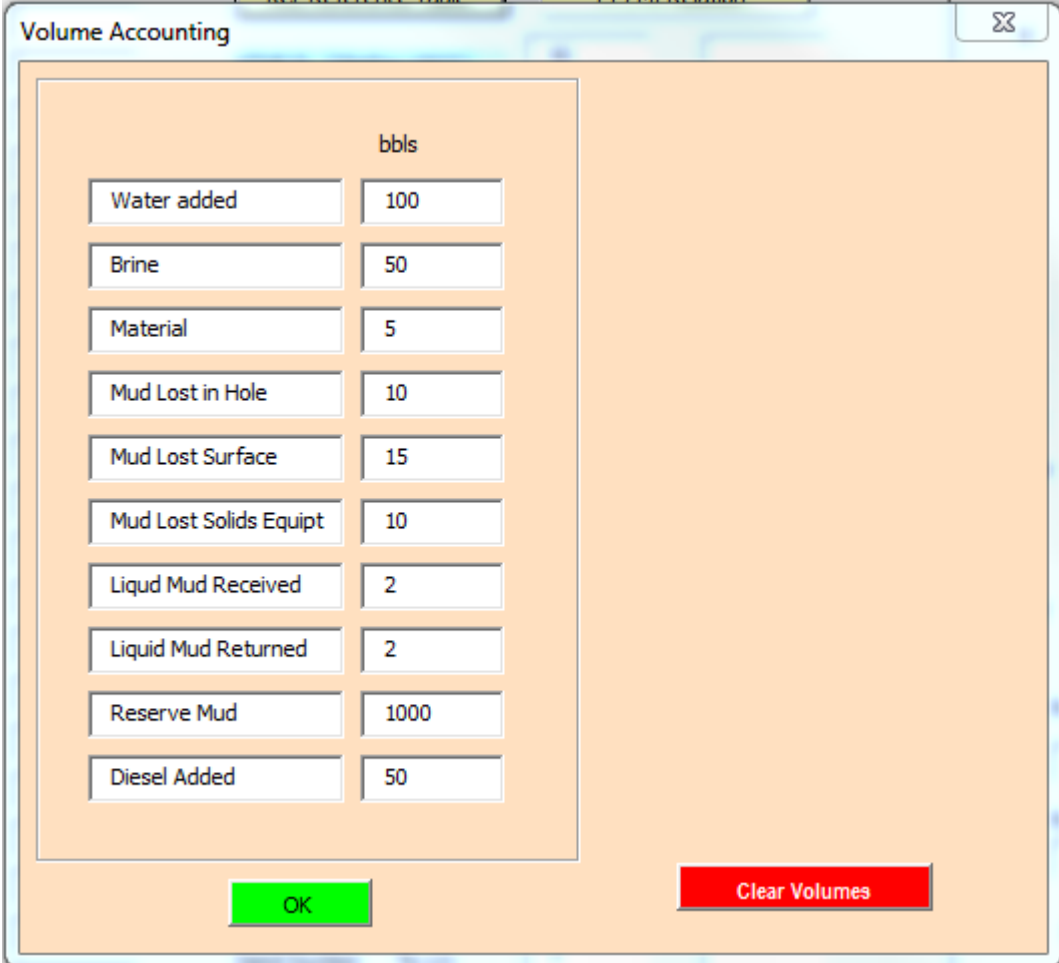
Figure 31 Rheology Input

Selecting **Clear Old Report** deletes the existing data. New data relating to the rheology can now be entered.

Selecting **Close** saves the data and returns the program to the Full Mud Check dialog box.

e. Volume Accounting

Selecting **Volume Accounting** shows the Volume Accounting dialog box (Ref. Figure 32).



The dialog box is titled "Volume Accounting" and contains a table with the following data:

	bbls
Water added	100
Brine	50
Material	5
Mud Lost in Hole	10
Mud Lost Surface	15
Mud Lost Solids Equipt	10
Liquid Mud Received	2
Liquid Mud Returned	2
Reserve Mud	1000
Diesel Added	50

At the bottom of the dialog box, there are two buttons: **OK** (green) and **Clear Volumes** (red).

Figure 32 Volume Accounting

Selecting **Clear Volumes** deletes the existing data. New data relating to the volume accounting can now be entered.

Selecting **OK** saves the data and returns the program to the Full Mud Check dialog box.

f. Drilling Remarks

Selecting **Drilling Remarks** shows the Add Remarks to the API Report Form (Drilling) dialog box (Ref. Figure 33).

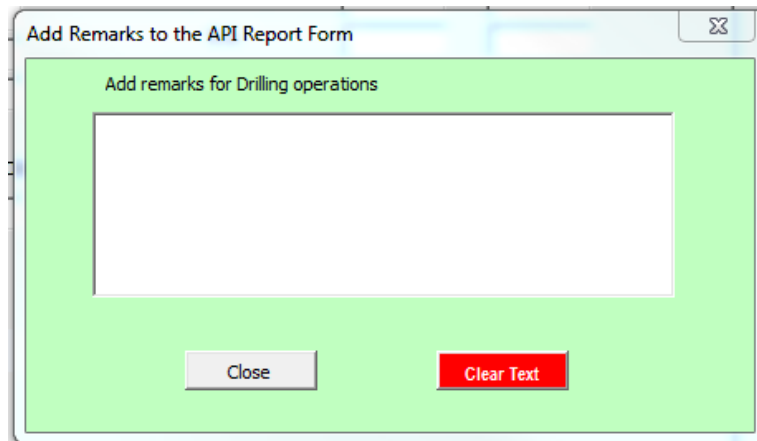


Figure 33 Drilling Remarks

Selecting **Clear Text** deletes the existing text. New text can now be entered.

Selecting **Close** saves the text and returns the program to the Full Mud Check dialog box.

g. Fluids Remarks

Selecting **Fluids Remarks** shows the Add Remarks to the API Report Form (Fluids) dialog box (Ref. Figure 34).

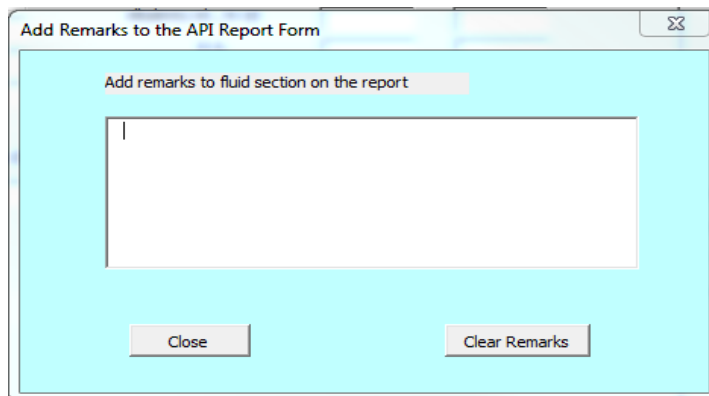


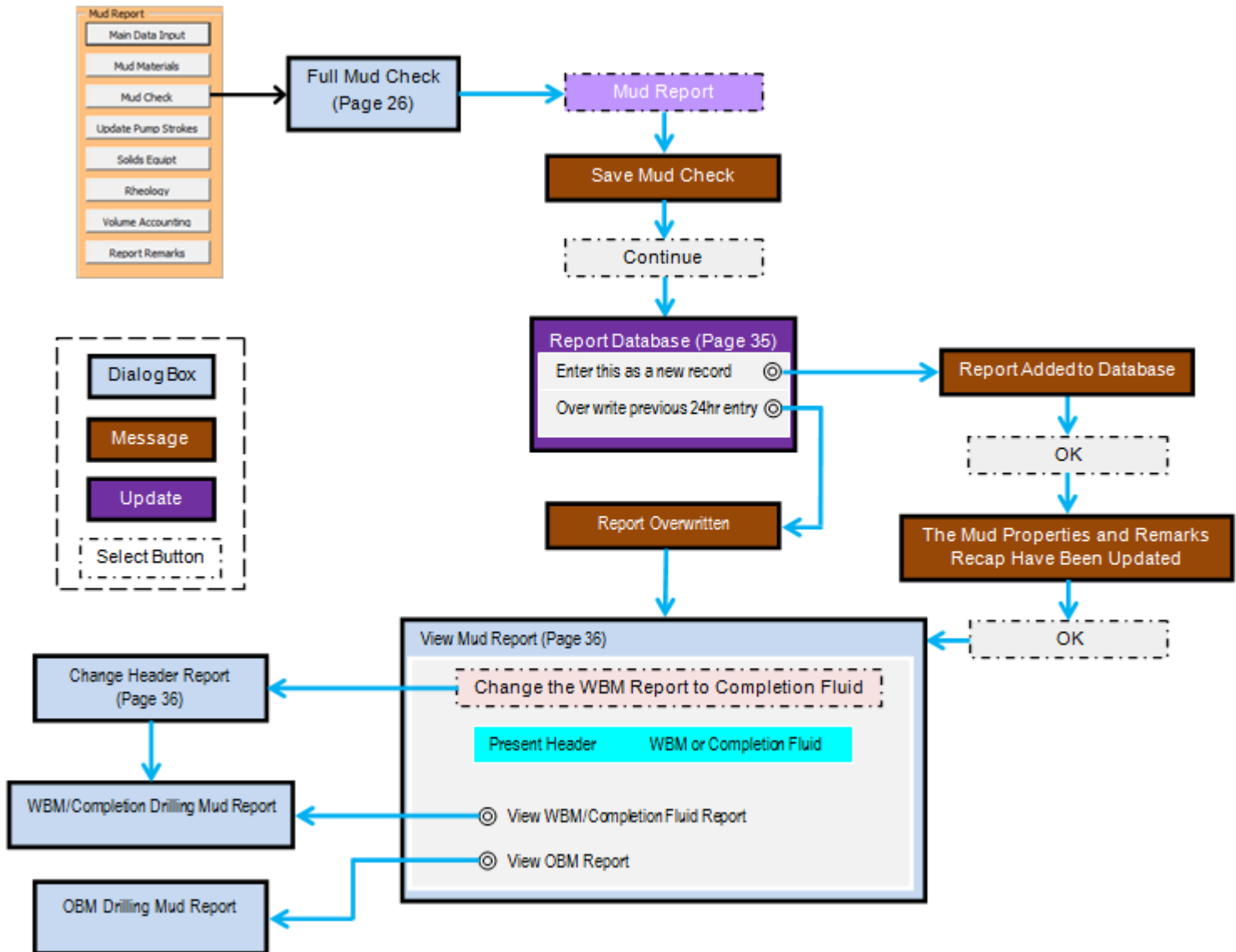
Figure 34 Fluids Remarks

Selecting **Clear Remarks** deletes the existing text. New text can now be entered.


Selecting **Close** saves the text and returns the program to the Full Mud Check dialog box.

h. Mud Report

The mud report saves all the Mud Check data and displays the selected mud report (WBM/Completion Fluid or OBM). Flow Chart F (Full Mud Check - Mud Report) is to help the mud engineer navigate this section of the program.



Flow Chart E: Full Mud Check - Mud Report

In the Full Mud Check dialog box (Ref. Figure 25), selecting  shows the Save Mud Check message box (Ref. Figure 35).

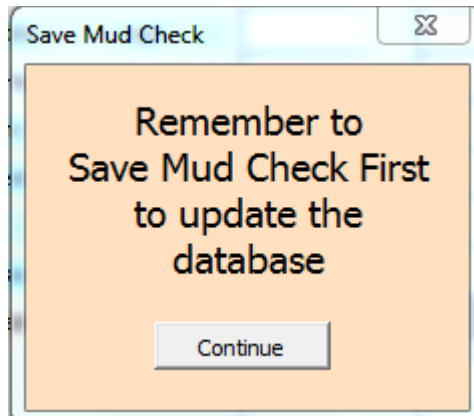
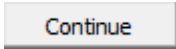


Figure 35 Save Mud Check

Selecting  shows the Report Database update box (Ref. Figure 36).

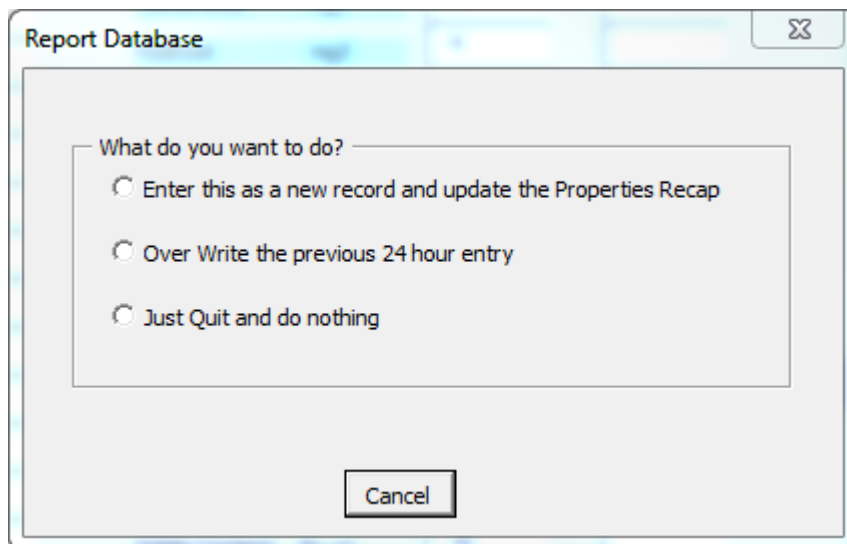

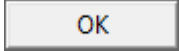
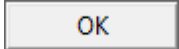



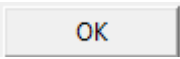
Figure 36 Report Database Update

Selecting  updates the mud report data base. A message is shown indicating that the mud report data base has been updated.

Selecting  in this message box, updates the mud properties recap and remarks recap. A message is shown indicating that the mud properties recap and remarks recap have been updated.

Selecting  in this message box, shows the View Mud Report dialog box (Ref. Figure 37).

Selecting  in the Reports Database dialog box, overwrites and updates the previous 24 hour entry. A message box is shown indicating that the mud report data base has been updated.

Selecting  in this message box ,shows the View Mud Report dialog box (Ref. Figure 37).

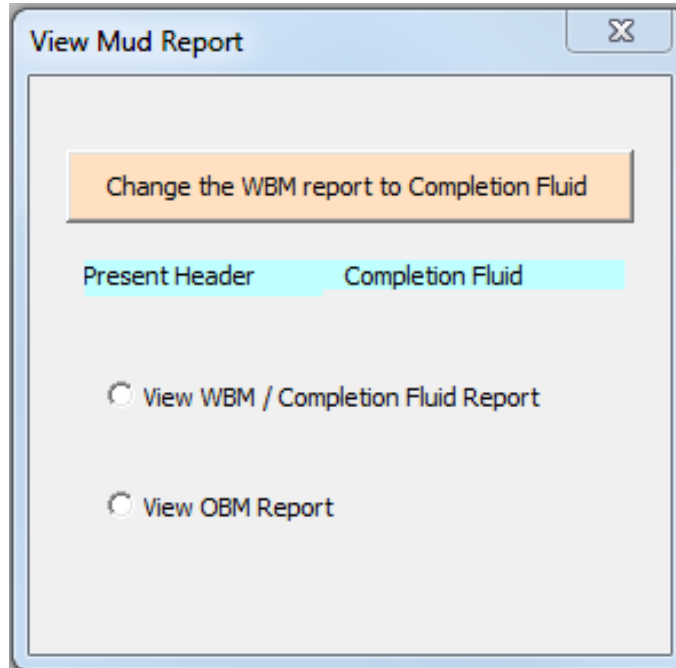

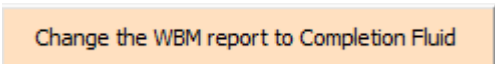


Figure 37 View Mud Report

A message is shown indicating which of the reports is presently selected (WBM or Completion Fluid).

Select  **View WBM / Completion Fluid Report** to view the currently selected WBM/Completion Fluid report.

Select  **View OBM Report** to view the OBM report

Select  to change the report header from the currently selected header to the alternative header (WBM or Completion Fluid). The Change Report Header WBM-Completion Fluid dialog box is shown (Ref. Figure 38).

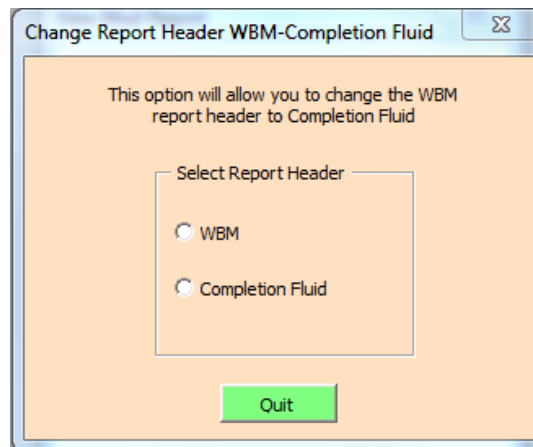


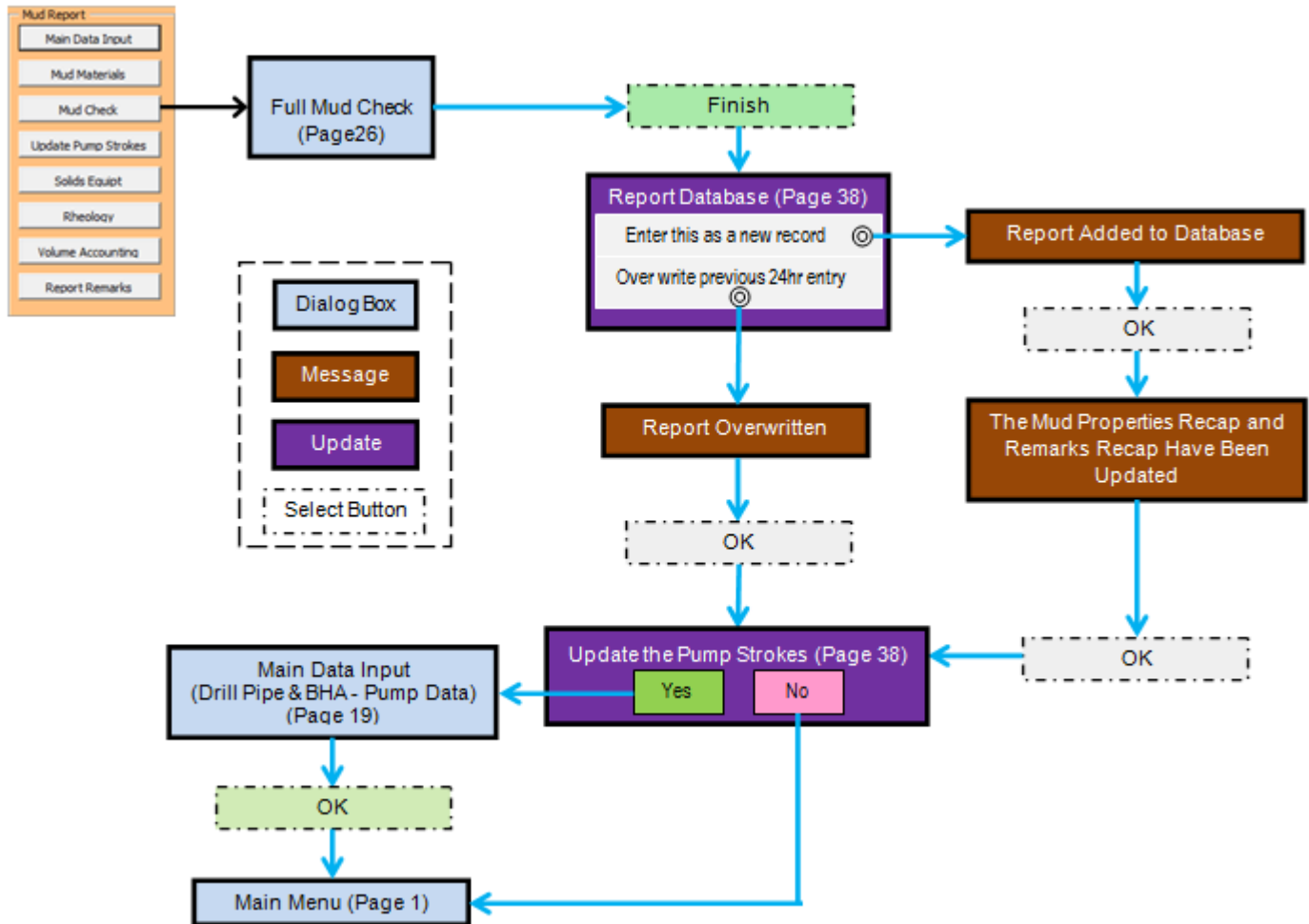
Figure 38 Change Report Header

Select the preferred report header (WBM or Completion Fluid). The selected report is shown.

To return to the Main Menu (Ref. Figure 1) select the **Menu** tab on the displayed report.

i. Finish

The finish function saves all the previously entered Mud Check data to the appropriate databases, reports and charts. Flow Chart F (Full Mud Check - Finish) is to help the mud engineer navigate this section of the program.



Flow Chart F: Full Mud Check – Finish

Selecting **Finish** on the Full Mud Check dialog box (Ref. Figures 15 & 16) shows the Report Data Base update box (Ref. Figure 39).

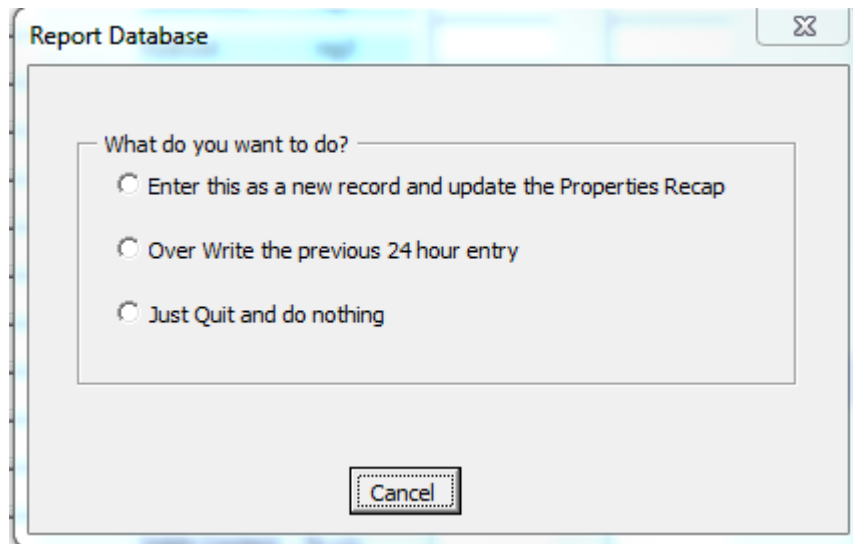


Figure 39 Reports Database Update

Selecting ☐ Enter this as a new record and update the Properties Recap , in the Report Database update box, updates the mud report data base. A message is shown indicating that the mud report data base has been updated.

Selecting , in this message box, updates the mud properties recap and remarks recap. A message is shown indicating that the mud properties recap and remarks recap have been updated.

Selecting , in this message box, shows the Update the Pump Strokes update box (Ref. Figure 40).

Selecting ☐ Over Write the previous 24 hour entry , in the reports Database dialog box, overwrites and updates the previous 24 hour entry. A message is shown indicating that the mud report data base has been updated.

Selecting , in this message box, shows the Update the Pump Strokes update box (Ref. Figure 40).

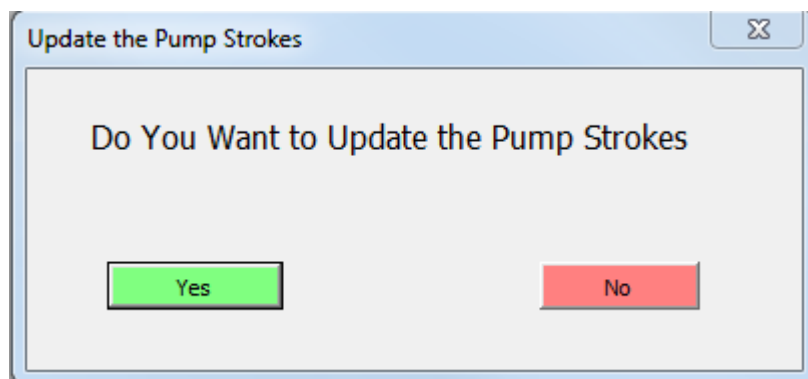
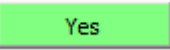



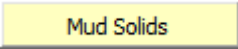
Figure 40 Update the Pump Strokes

Selecting returns the program to the Main Menu (Ref. Figure 1).

Selecting  shows the Data Input (Drill Pipe & BHA - Pump Data) dialog box (Ref. Figure 18). The pump strokes are updated in the Pump Data section of the Data Input dialog box.

Selecting , in the Data Input dialog box, returns the program to the Main Menu (Ref. Figure 1).

(c) Mud Solids

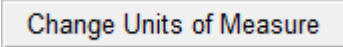
Selecting  on the Mud Reports and Databases Menu (Ref. Figure 5) shows all the water mud solids and all the oil mud solids/chlorides (Ref Figure 41 and Figure 41A).

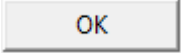
WATER MUD SOLIDS				
	Flow Line	CORR.	Suction	CORR
Mud weight ppg	8.60	8.60	0.00	0.00
Retort % Solids	10.00	9.69	0.00	100.00
Retort % Water	85.00	85.31	0.00	0.00
Retort % Oil	5.00	5.00	0.00	0.00
MBT equiv lb/bbl	16.00	16.00	0.00	0.00
ml of AgNO3, .0282/.282	6.00	6.00	0.00	0.00
S.G. of Oil	0.80	0.80	0.80	0.80
Low gravity solids %	17.16	16.55	257.58	257.58
Low gravity solids lb/bbl	156.12	150.64	2343.94	2343.94
High gravity solids %	-7.16	-6.86	-257.58	-157.58
High gravity solids lb/bbl	-106.63	-102.21	-3837.88	-2347.88
Bentonite %	-0.14	-0.07	-32.20	-32.20
Bentonite lb/bbl	-1.32	-0.63	-292.99	-292.99
Drilled Solids %	17.30	16.62	289.77	289.77
Drilled Solids lb/bbl	157.44	151.27	2636.93	2636.93
A.S.G.	1.46	1.43	-4.25	0.00
Corrected % Solids	9.69	9.69	100.00	100.00
KCL Polymer Mud		Flow Line	Suction	Weighted No
KCL	% v/v	0.0	0.0	
Potassium Ion	mg/l	6	0	
Corrected LGS	% v/v	16.55	257.58	
Density	S.G	1.03	0.00	
Density	Kg/M³	1030.51	0.00	
Pressure Gradient	psi/ft	0.45	0.00	
Change Units of Measure				

Figure 41 Water Mud Solids

OIL MUD SOLIDS/CHLORIDES				
	IN	CORR	OUT	CORR
Mud weight ppg	8.60	8.60	0.00	0.00
Retort % Solids	10.00	10.00	0.00	0.00
Retort % Water	85.00	85.00	0.00	100.00
Retort % Oil	5.00	5.00	0.00	0.00
MBT equiv lb/bbl	0.00	N-10	0.00	N-10
ml of AgNO3, .0282/.282	0.00	0.00	0.00	0.00
S.G. of Oil	0.80	0.80	0.80	0.80
Low gravity solids %	23.39	29.57	181.82	198.01
Low gravity solids lb/bbl	212.89	269.12	1654.55	1801.85
High gravity solids %	-13.39	-19.57	-181.82	-198.01
High gravity solids lb/bbl	-199.58	-287.74	-2709.09	-2910.68
Bentonite %	-0.14	-0.07	-32.20	-32.20
Bentonite lb/bbl	-1.32	-0.63	-292.99	-292.99
Drilled Solids %	22.39	28.57	180.82	197.01
Drilled Solids lb/bbl	203.79	260.02	1645.45	1792.75
A.S.G.	0.39	-0.63	#DIV/0!	#DIV/0!
Corrected % Solids	10.00	10.00	0.00	0.00
Sodium Chloride IN	0.00	0.00	#DIV/0!	0.00
EXCESS LIME lb/bbl	0.00	0.00	0.00	0.00
OIL RATIO	5.56	0.00	#DIV/0!	0.00
WATER RATIO	94.44	0.00	#DIV/0!	0.00
CaCl2 % lb/bbl	0.00	0.00	0.00	0.00
Cacl2 %by Wt	0.00	0.00	#DIV/0!	0.00
CL-om, mg/L	0.00	0.00	0.00	0.00
CL-,mg/L(of water)	0.00	0.00	#DIV/0!	0.00
Ca -om	0.00	0.00	#DIV/0!	0.00
CaCl2mg/l(H2O)	0.00	0.00	#DIV/0!	0.00
Cacl2 , ppm, (H2O)	0.00	0.00	#DIV/0!	0.00
Brine Density	1.00	0.00	1.00	0.00
CaCl2 (OM) , mg/L	0.00	0.00	0.00	0.00

Figure 41A Oil Mud Solids/Chlorides

Selecting  shows a message box indicating that changing the units will be universal throughout the program.

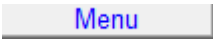
Selecting , in this message box, shows the Select Units dialog box (Ref. Figure 4). The units of measurement are changed in this dialog box.

Selecting  returns the program to the Main Menu

(d) Databases

In the Databases panel, on the Mud Reports and Databases Menu (Ref. Figure 5), the various databases can be quickly viewed. The databases are:

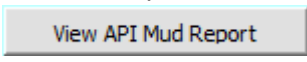
- Mud Stocks Database
- Mud Report Database
- Mud Received Database
- Mud Transferred Database.

Selecting  on any of the databases returns the program to the Main Menu.

(e) View Reports

In the Select Report to View panel, on the Mud Reports and Databases Menu (Ref. Figure 5), The various reports can be quickly viewed. These reports are:

- View API Mud Report
- View Mud Properties Recap
- View Mud Materials Recap
- View Remarks Recap.

Selecting  shows the View Mud Report dialog box (Ref. Figure 37).

Selecting  on any of the reports returns the program to the Main Menu.

(f) Pills and Calculations

Selecting **Calculations** from the Main Menu (Ref. Figure 1) shows the Pills and Calculations dialog page (Ref. Figure 42).

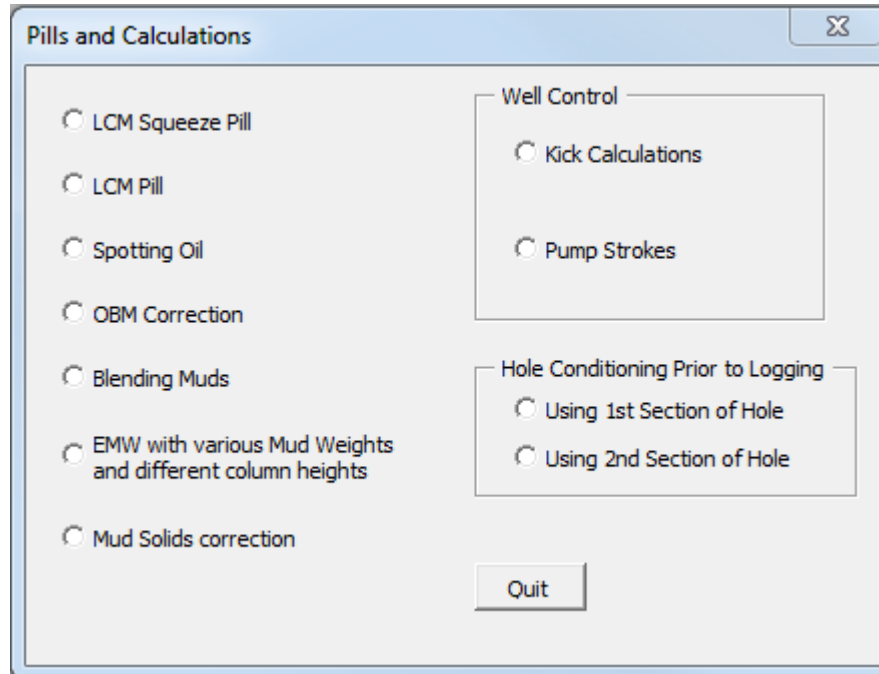


Figure 42 Pills and Calculations

From this dialog box, the following are accessed:

- LCM Water Squeeze Pill dialog box
- LCM Pills dialog box
- Spotting Oils dialog box
- OBM Corrections dialog box
- Blending
- Blending and Weighing-up Mud dialog box
- The EMW with different mud columns calculation dialog box
- Mud Solids Correction:
 - Water Mud Solids dialog box
 - Oil Mud Solids/Chlorides dialog box
- Well Control
 - Well Control (Kick) Program dialog box
 - Pump Strokes Calculations dialog box
- Hole Conditioning Prior to Logging
 - Using 1st Section of Hole dialog box
 - Using 2nd Section of Hole dialog box.

The relevant data is entered into the appropriate data boxes. All calculations are done automatically.

(g) Reports

1. Print Reports

Selecting [Print Reports](#) on the Main Menu (Ref Figure 1) shows the Print Central dialog box (Ref. Figure 43). The selected report is automatically printed.

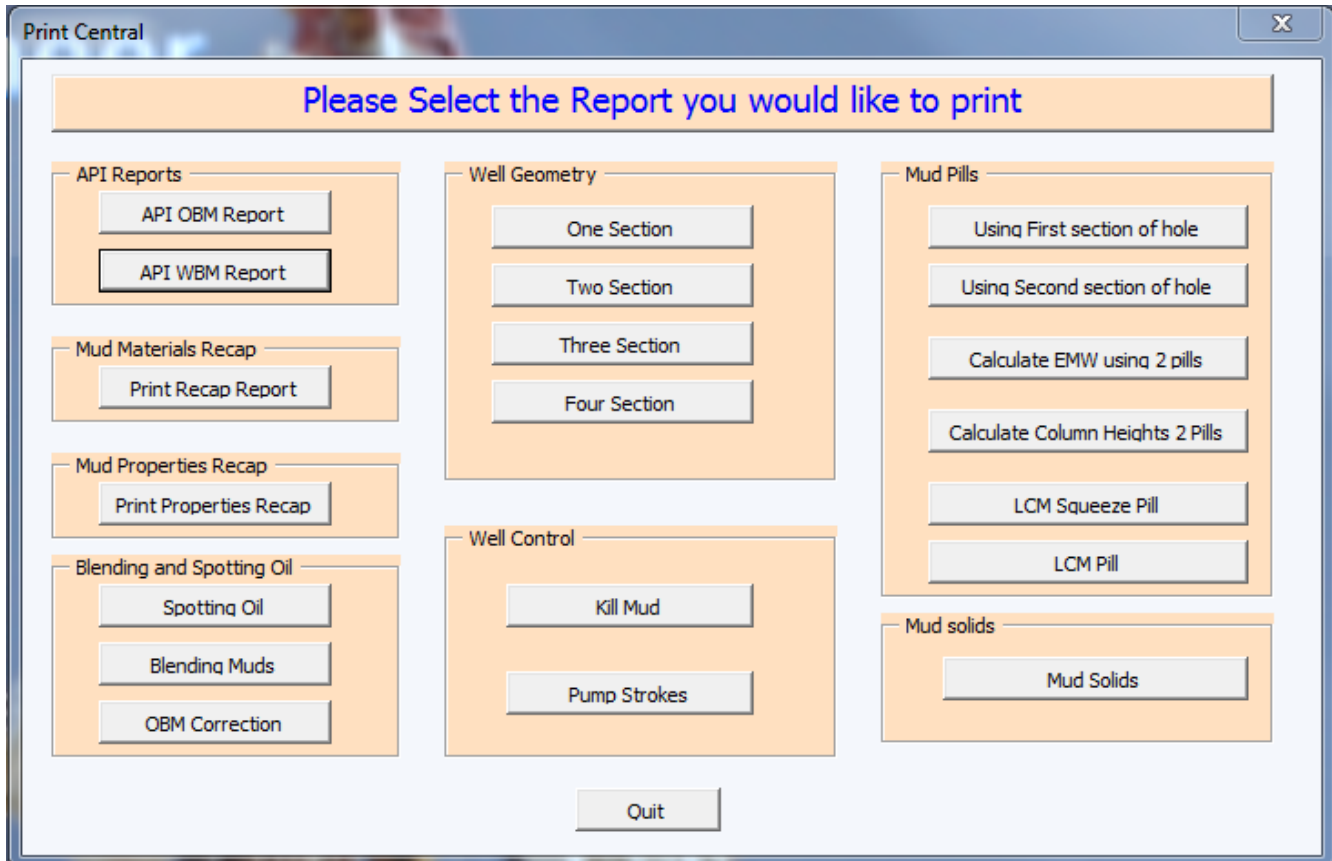


Figure 43 Print Central

2. Export Reports

Selecting **Export Reports** on the Main Menu (Ref Figure 1) shows the Export Reports dialog box (Ref. Figure 44).

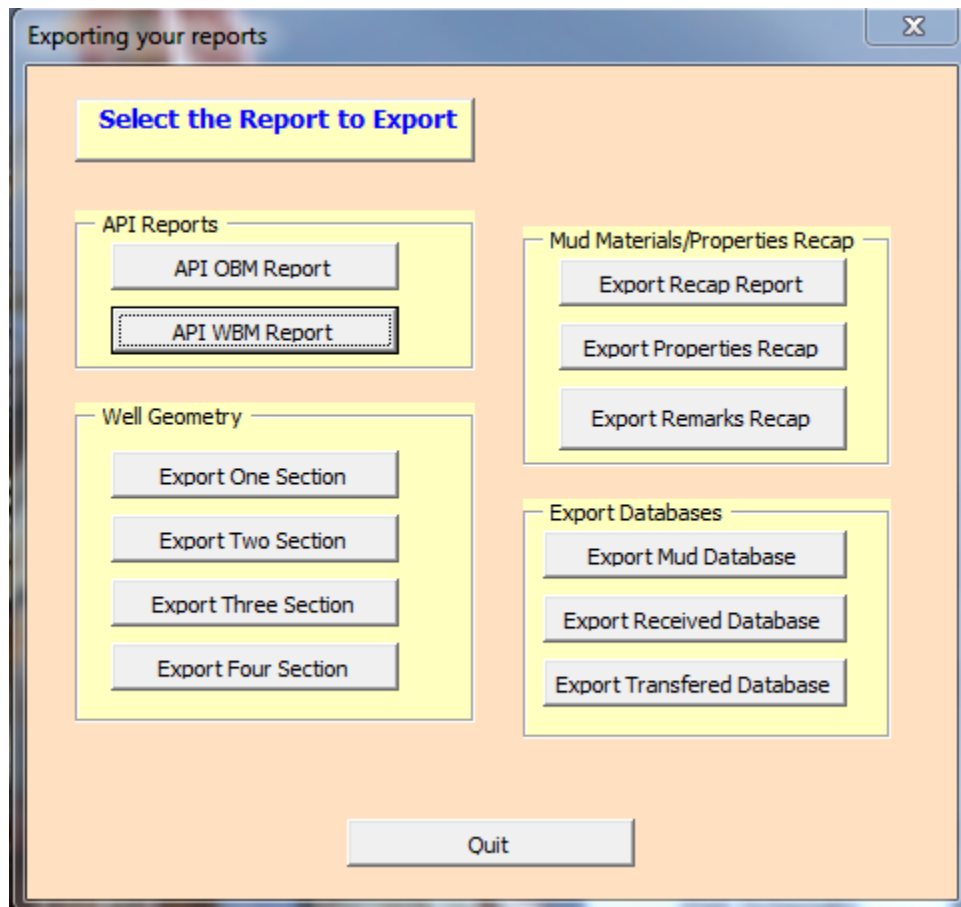


Figure 44 Export Reports

When selecting a report for export, a message box is shown indicating that the report will be exported to a selected folder.

Selecting **OK**, in this message box, gives the option of which folder to export the file to. After saving the file a message box indicating the file has been saved is shown.

Selecting **OK**, in this message box, returns the program to the Main Menu.

3. Email Reports

Selecting **Email Reports** on the Main Menu (Ref Figure 1) shows the Email Reports dialog box (Ref. Figure 45).

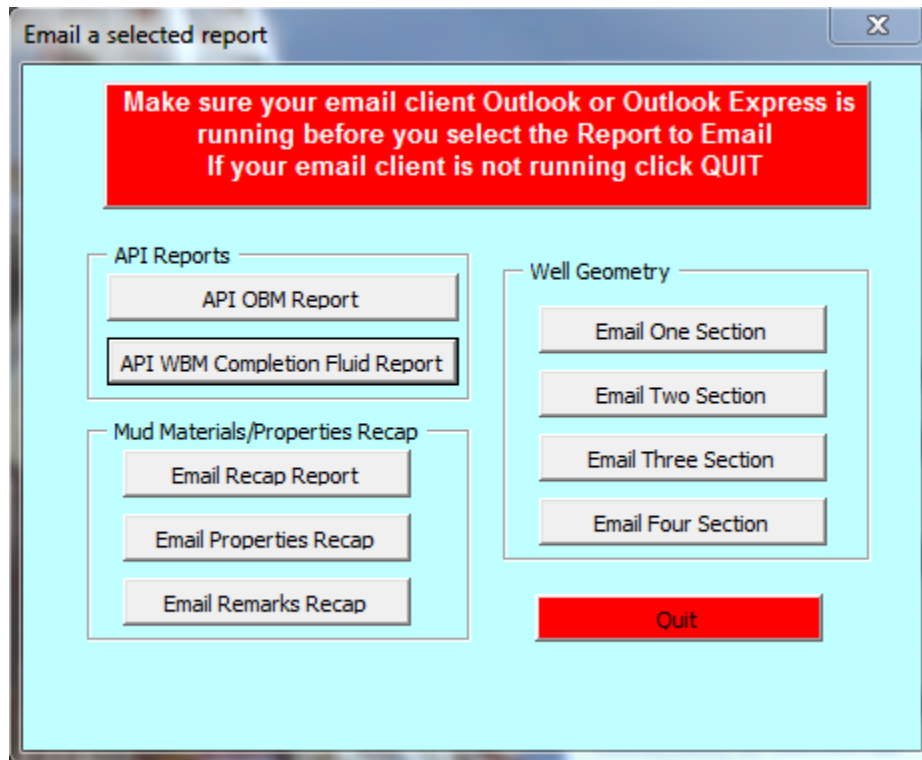


Figure 45 Email Reports

The Email Reports dialog box shows a warning to select an Email program

After selecting a report for Emailing, a message box is shown indicating that the report will be exported to a selected folder.

Selecting **OK**, in this message box, gives the option of which folder to export the file to. After saving the file a message box indicating the file has been saved is shown.

Selecting **OK**, in this message box, opens the selected Email program. The selected report is automatically attached to the Email. The recipients Email address must be inserted before sending the report.

(h) Well Schematics

Selecting **Well Schematic** on the Main Menu (Ref. Figure 1) shows the Well Bore Schematic dialog box (Ref. Figure 46).

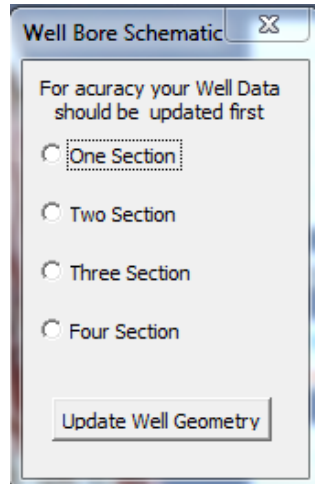


Figure 46 Well Bore Schematic

Up to four casing sections can be selected. Figure 47 these casing sections

To update the well geometry, select **Update Well Geometry** on the Well Bore Schematic dialog box. The Main Data Input (Drill Pipe & BHA – Pump Data) dialog box is shown (Ref. Figure 18).

The DP and the DC parameters are entered/edited in this dialog box.

Selecting the **Casing Data** tab on the Data Input (Drill Pipe & BHA – Pump Data) dialog box shows the Main Data Input (Casing Data) dialog box (Ref Figure 23). The liner parameters are entered or edited in this dialog box.

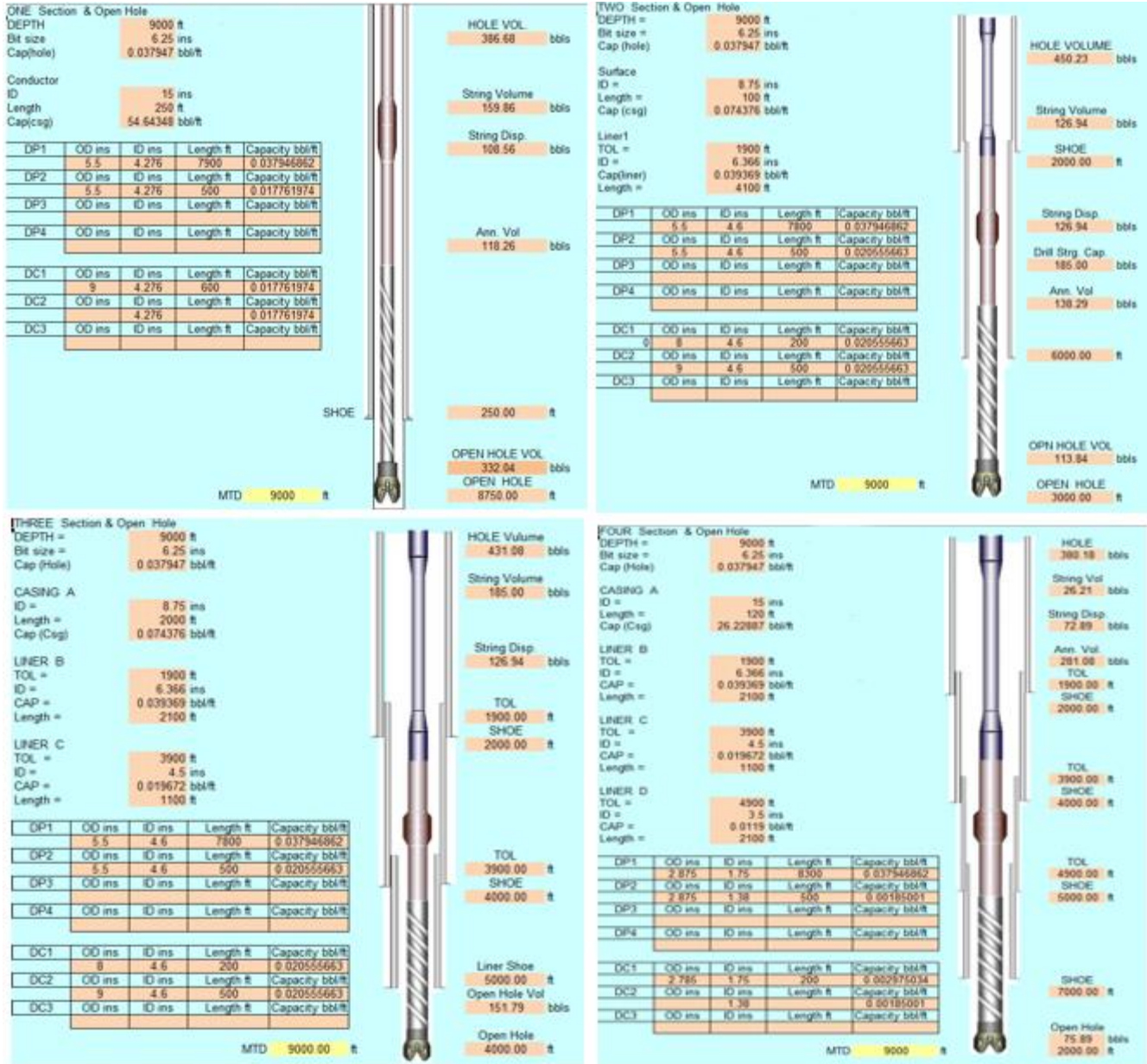


Figure 47 Well Schematic Sections

(i) Charts

Selecting on the Main Menu shows a message box, indicating that the charts will be developed as the databases are updated. Figure 47 shows the Chemicals Used chart

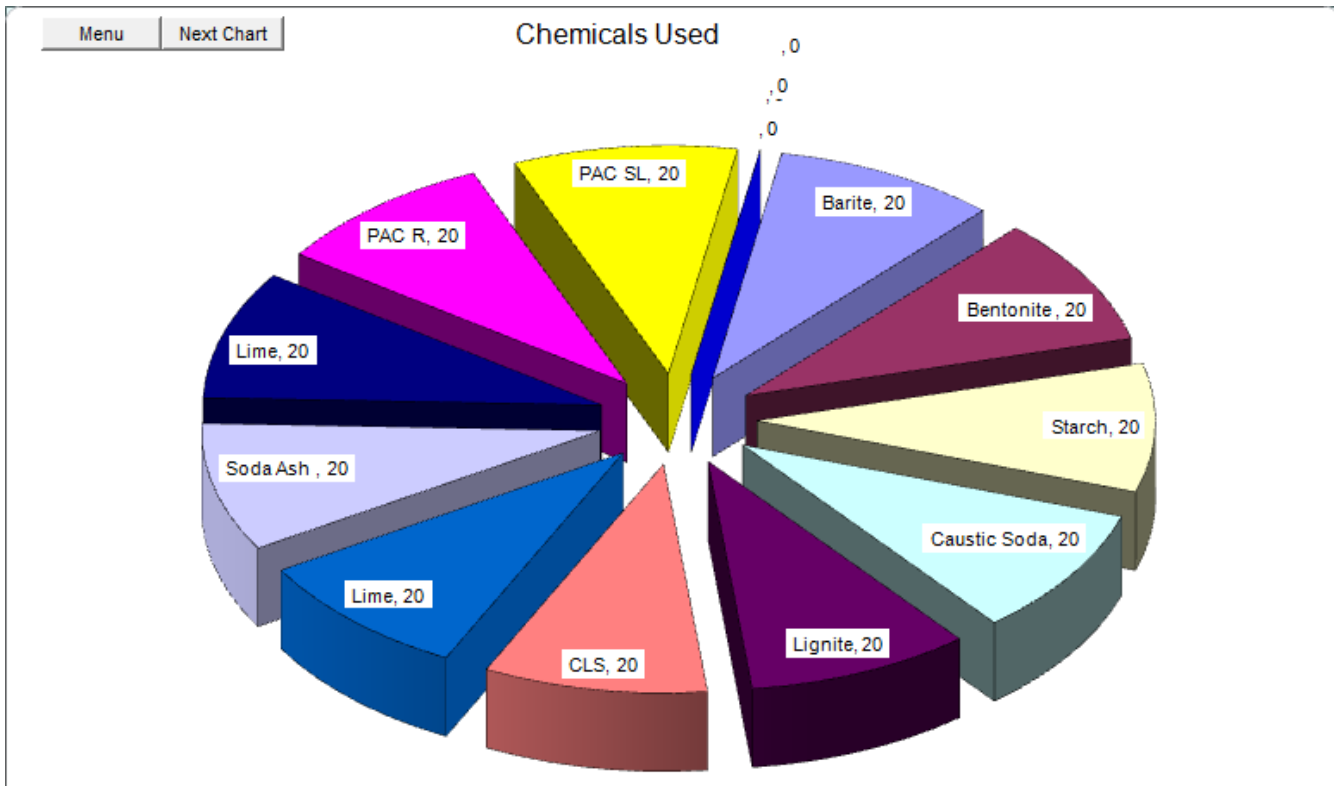


Figure 5 Chemicals Used Chart

Selecting shows these charts in sequence:

- Chemicals Used and Cost
- Depth v Mud Cost
- Total Volumes
- Depth v Days
- Depth v Mud Weight

Selecting returns the program to the Main Menu.