

# Hugoton Geomod4 Build

The following is a detailed recap of the building of the Hugoton geomodel version 4 (Geomod 4). Provided in this preliminary version are all the gory details.

## Contents and Approximate slide numbers:

Structural Grid Models	1-18
Lithofacies Models	19-64
Porosity Models	65-73
Other Property Models	77-81
Workflow to make small model	82-108
Upscale 3X4 Hoobler sim mod	109-121

# Prepare GM3

1. Six sub-models: Delete properties and fluid contacts
2. Delete well headers in each folder by folder (very slow process) and import new well headers. Rename files with correct numbers (eg Cgrv\_ONLY\_las-295 becomes ...-295, Chase 218 – Chase. Did not delete the wells from the other folders. Takes too long. Some or all folders may need re-linking.

Core 28 duplicates wells in other folders. Delete from these folders.

Attribute	Column	Use	Comments
Name	1		The well name should be unique
Unique well id	2	<input checked="" type="checkbox"/>	
X-coordinate	3		
Y-coordinate	4		
Kelly bushing (KB)	7	<input checked="" type="checkbox"/>	If not given, KB = 0
Well symbol	8	<input checked="" type="checkbox"/>	Do not use space !
Top depth (MD)	5	<input checked="" type="checkbox"/>	
Bottom depth (MD)	6	<input checked="" type="checkbox"/>	

Conversions

Convert to project units

Units of input data: XY:  Z:

Header info (first 30 lines):

Line	WELL_NAME	UWI/API SURFV	SURFY	TOP_DEPTH	BOTTOM_DEPTH	DATUM	SYM
Line 1:	WELL_NAME	UWI/API SURFV	SURFY	TOP_DEPTH	BOTTOM_DEPTH	DATUM	SYM
Line 2:	15067203380000	15067203380000	1228041.7	378031.5	2000	3150	3100
Line 3:	15075202010000	15075202010000	1109267.1	444602.4	2000	3000	3335
Line 4:	35139207330000	35139207330000	1049343.6	5764.2	2000	3500	3237, Key-
Line 5:	15129212450000	15129212450000	1060986.9	193206	2000	2775	3328, Key-
Line 6:	15189206570000	15189206570000	1216318.4	188065.1	2000	3200	3025
Line 7:	15055206160000	15055206160000	1280556.1	412618	2000	3200	2950, Key-

# Well tops import


1. Create 4 new tops folders (Framework, Chase and Cgrv tops, plus set for the 28 core wells)
2. Delete old well tops folders

Import Petrel Well Tops: 1306 Chase LAS tops.TXT

Column #	1	2	3	4	5	6	7
Attribute	X	Y	Z	Type	Surface	Well	MD
Attribute name	X	Y	Z	Type	Surface	Well	MD
Attribute type	DOUBLE	DOUBLE	DOUBLE	VOID	KIDTAG	KIDTAG	DOUBLE
Unit	feet	feet	feet				feet

Connect to welltrace

Well name  Undefined value

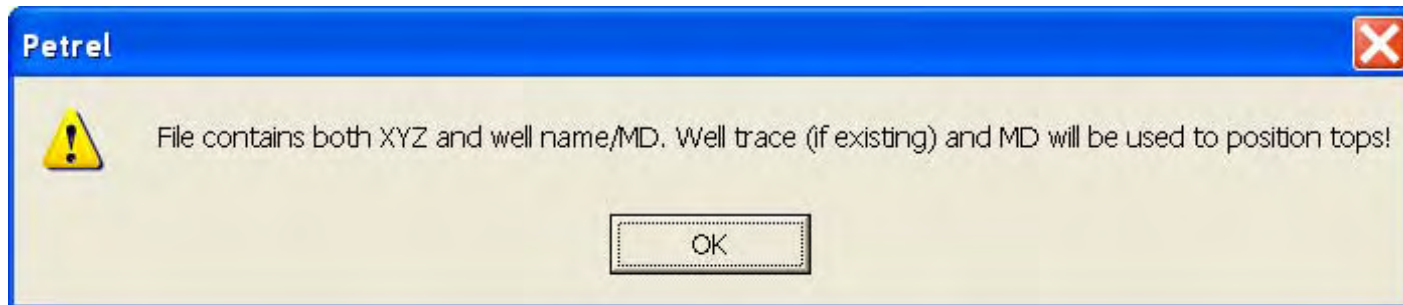
Negate Z-values   Sub-sea Z values must be negative!

Negate Time-values

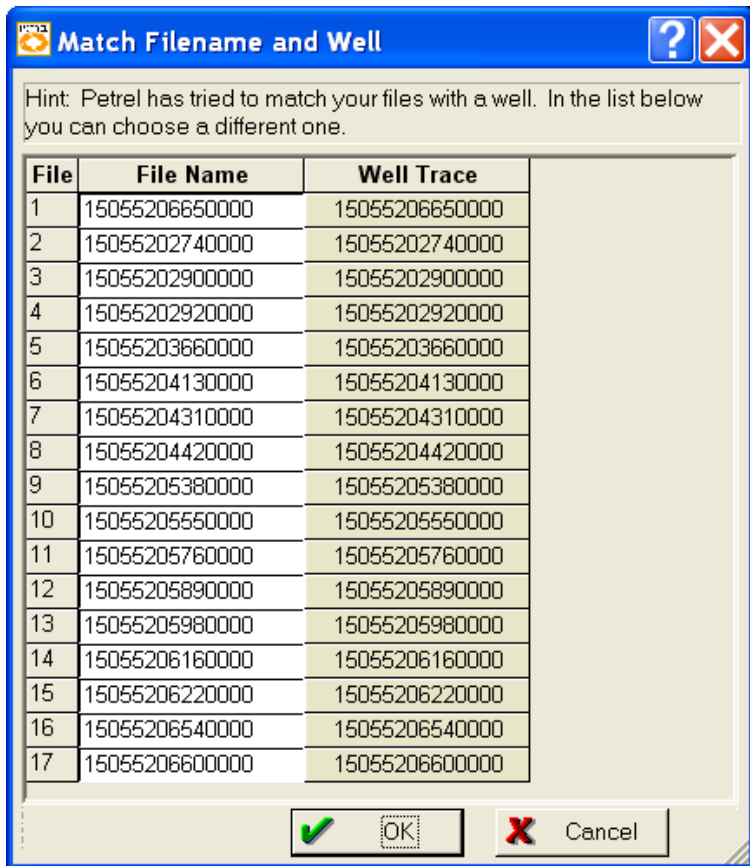
Header info (first 30 lines):

```
Line 1: #Petrel Well Tops
Line 2: VERSION 1
Line 3: BEGIN HEADER
Line 4: REAL X
```

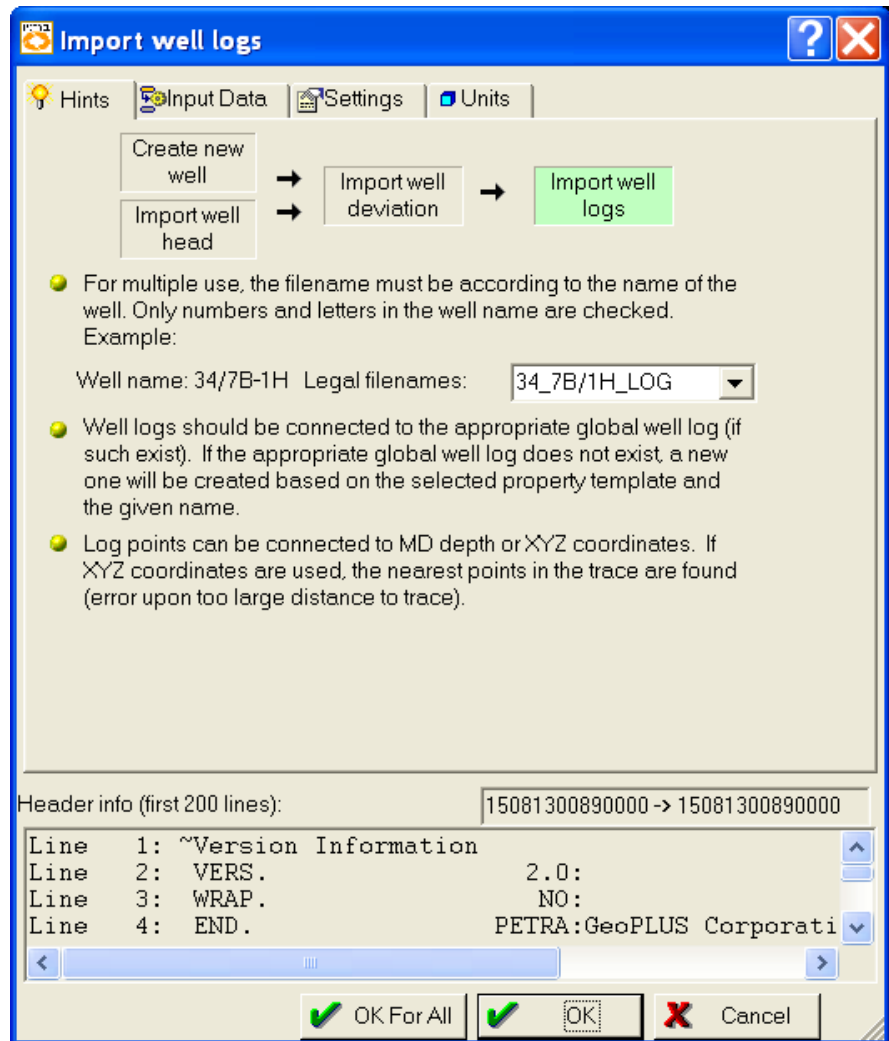
OK For All  OK  Cancel



# Import new LAS files

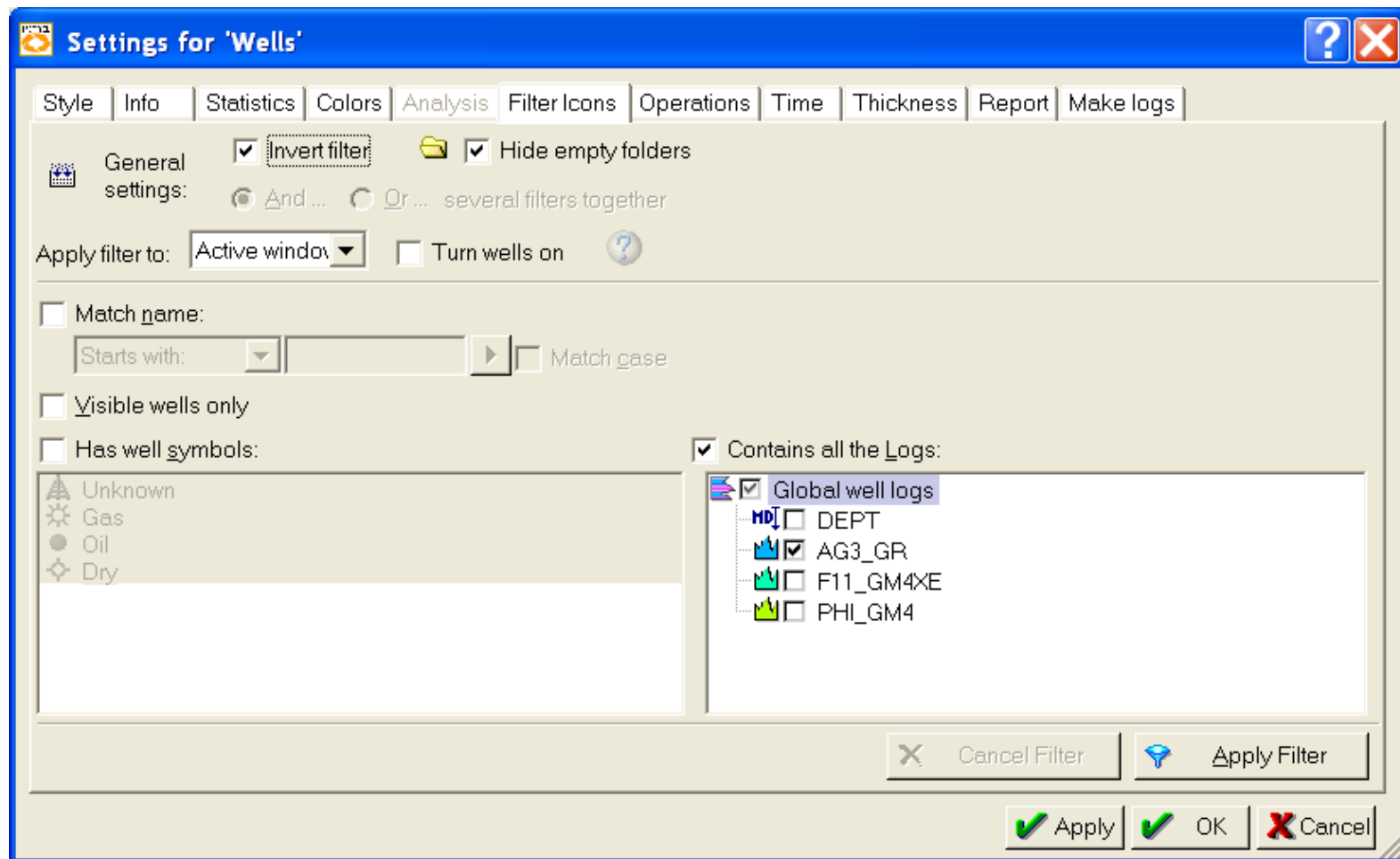


NO MORE THAN 200 AT A TIME!!

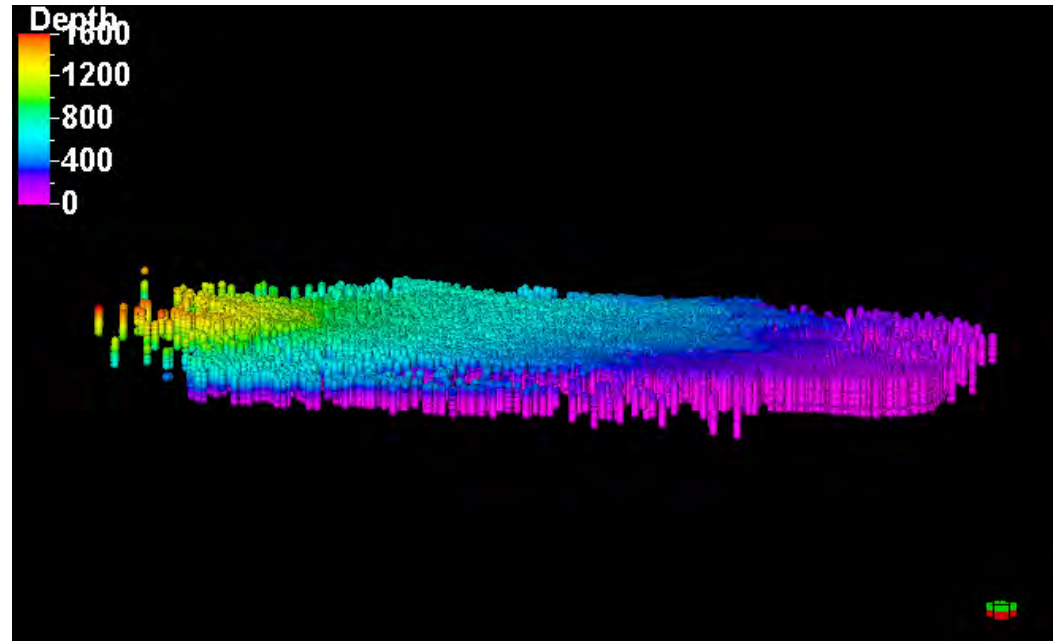
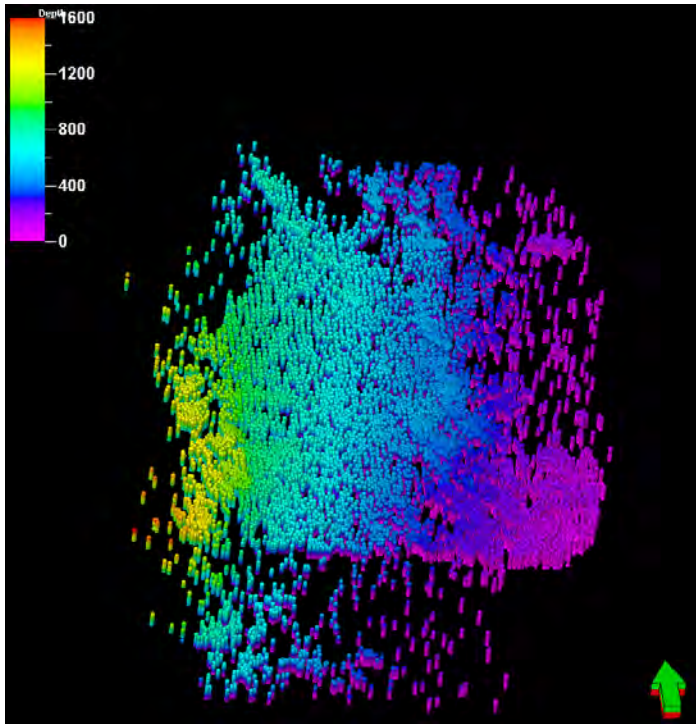


Mash OK for all

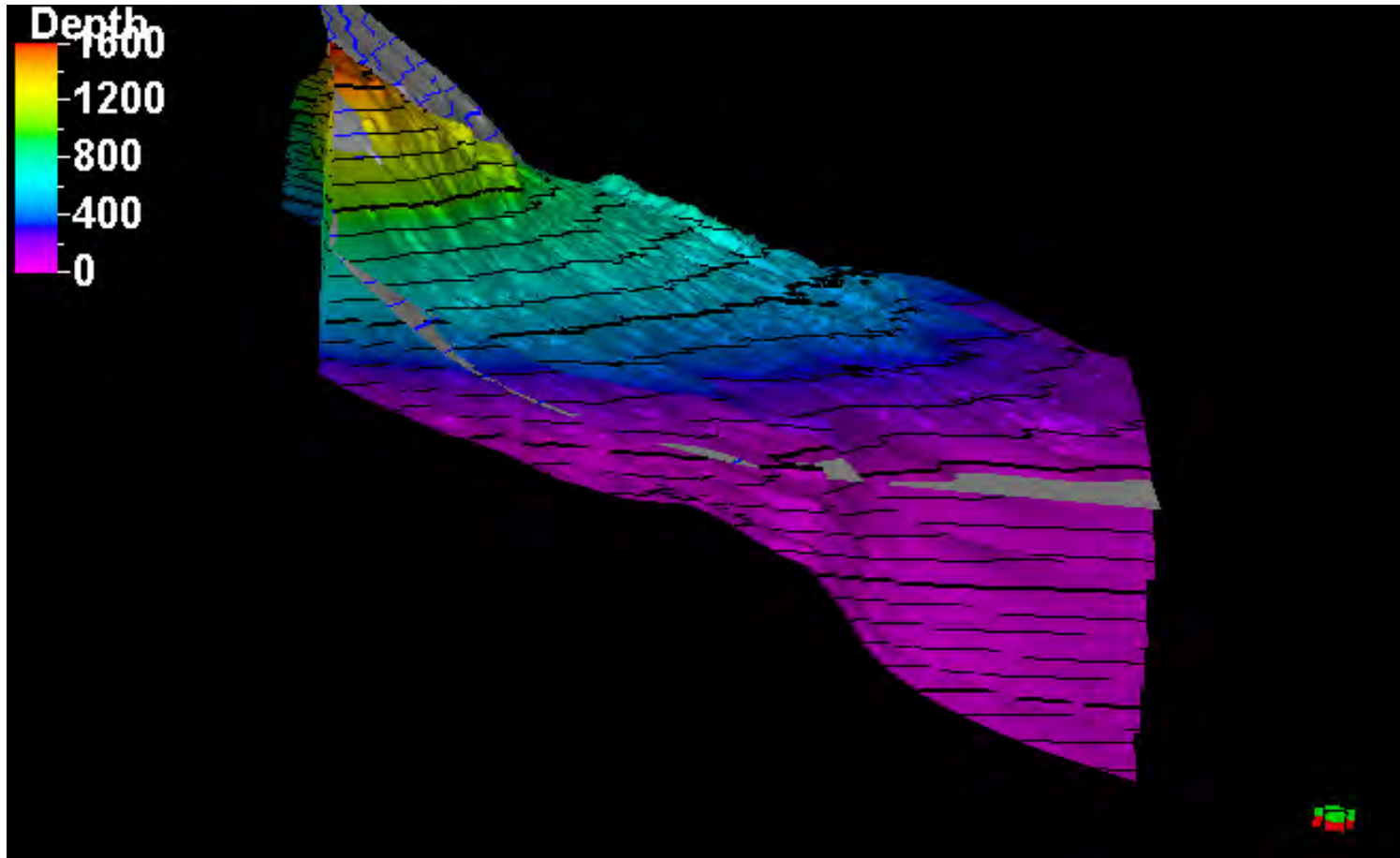
Verify there are curves for all wells:  
Wells>Filter>



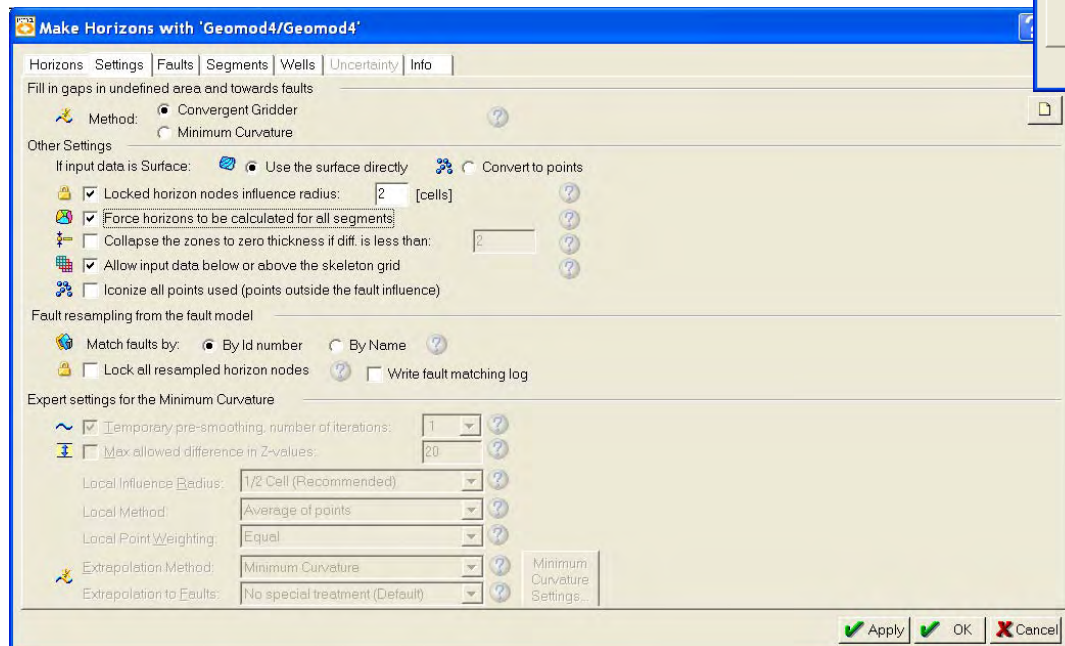
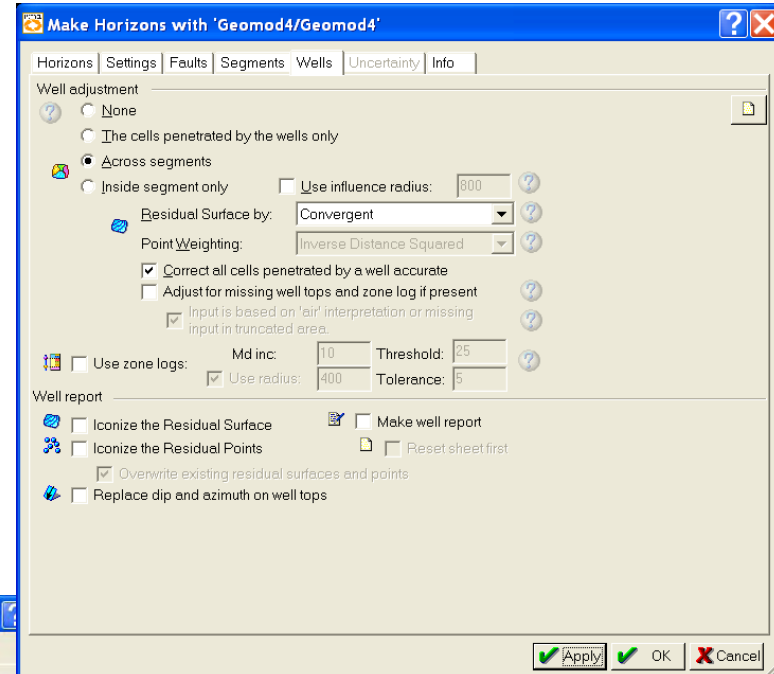
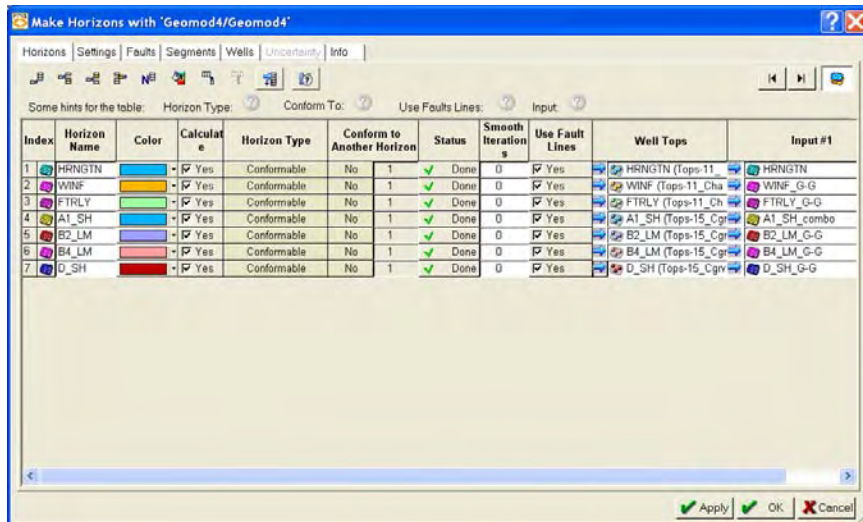
# QC tops



# Import surfaces



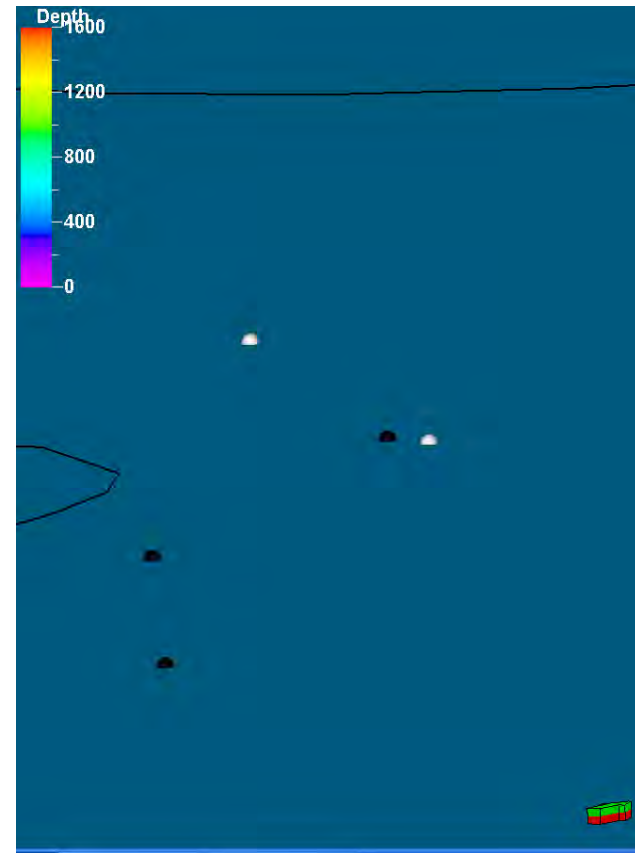
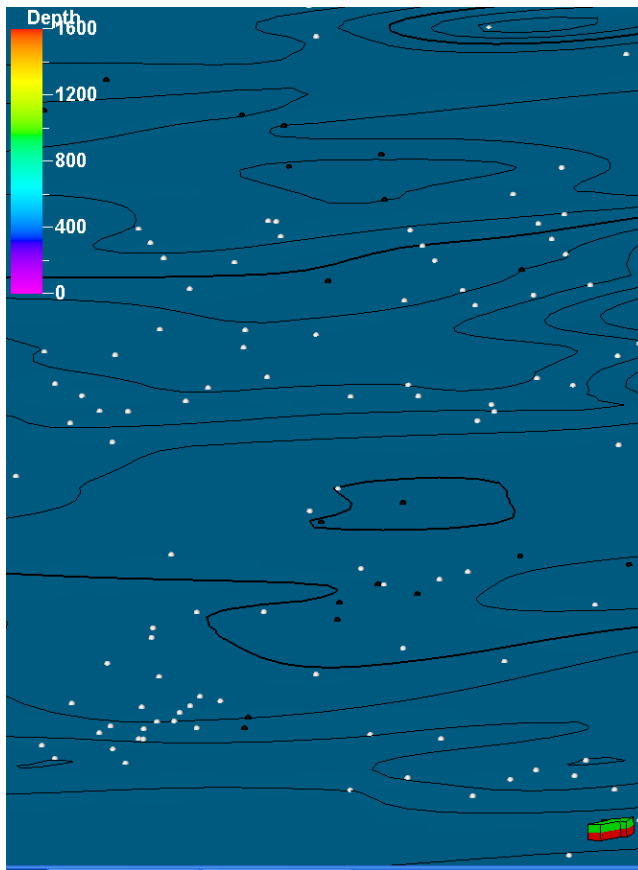
# Build Horizons conditioned on well tops for facies wells



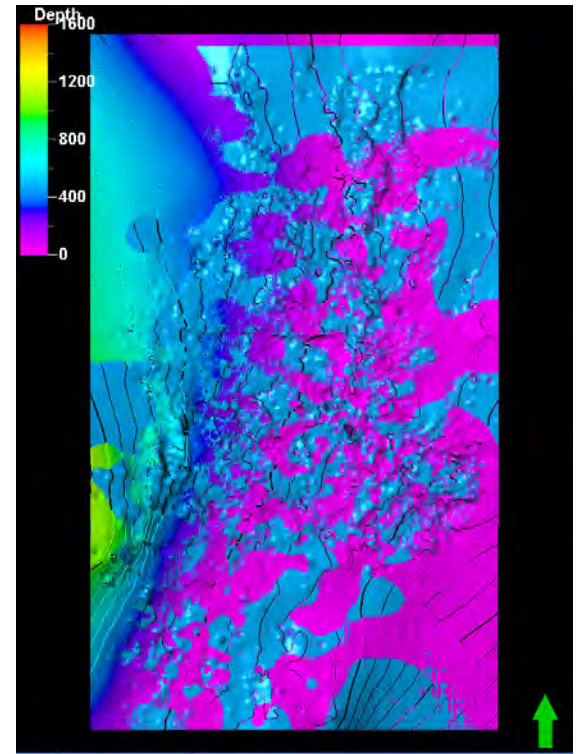
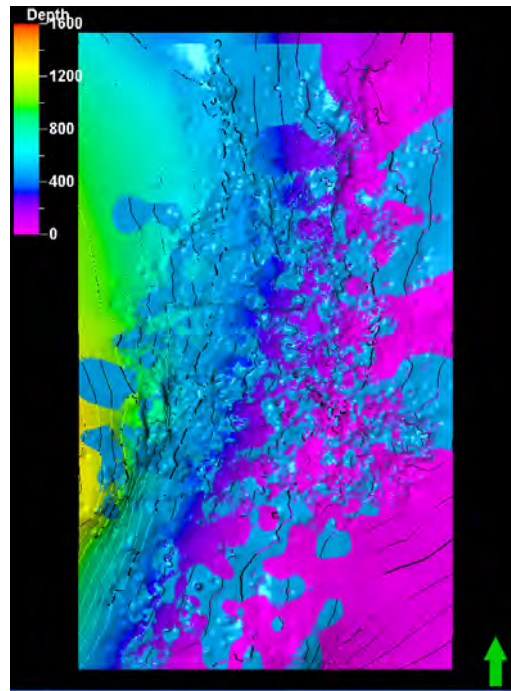
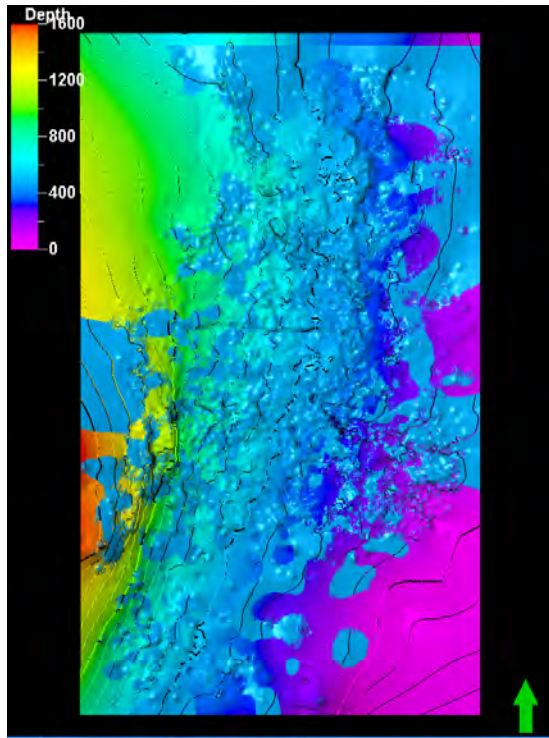


# Well ties A1\_Sh

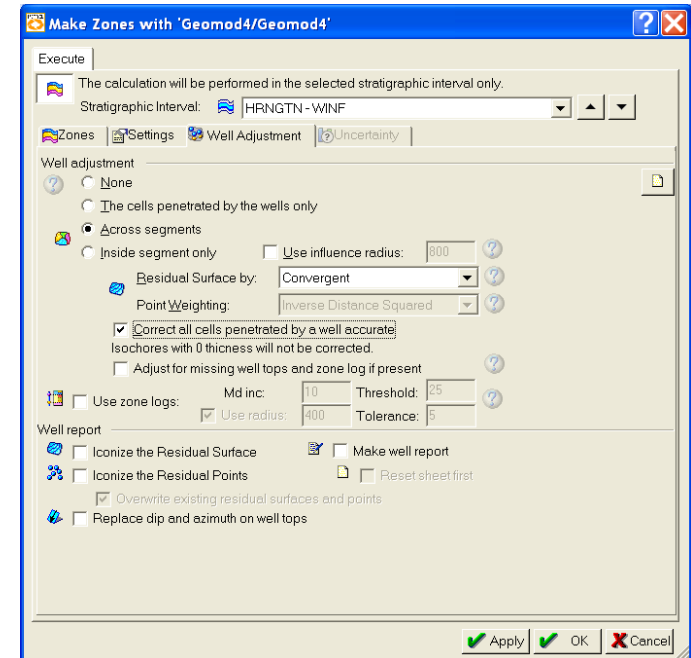
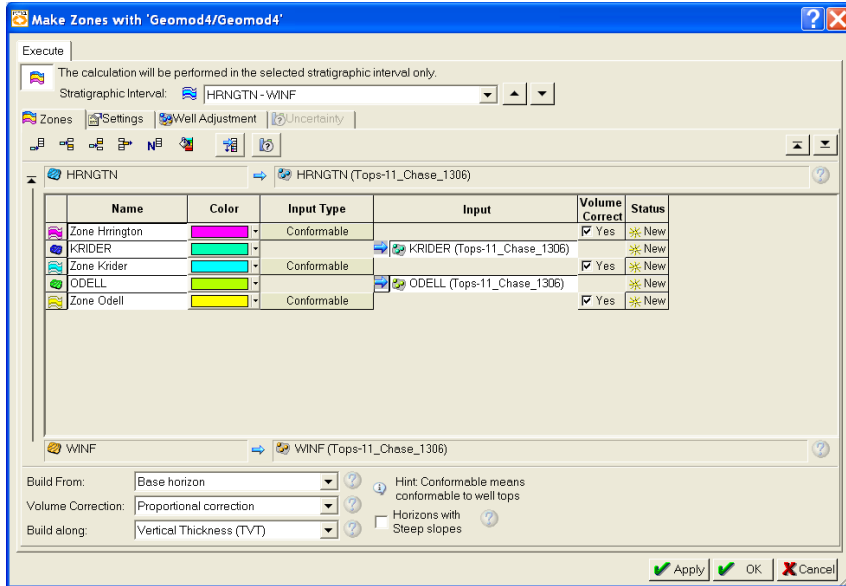
Black – wells with LAS files  
White – “framework” wells



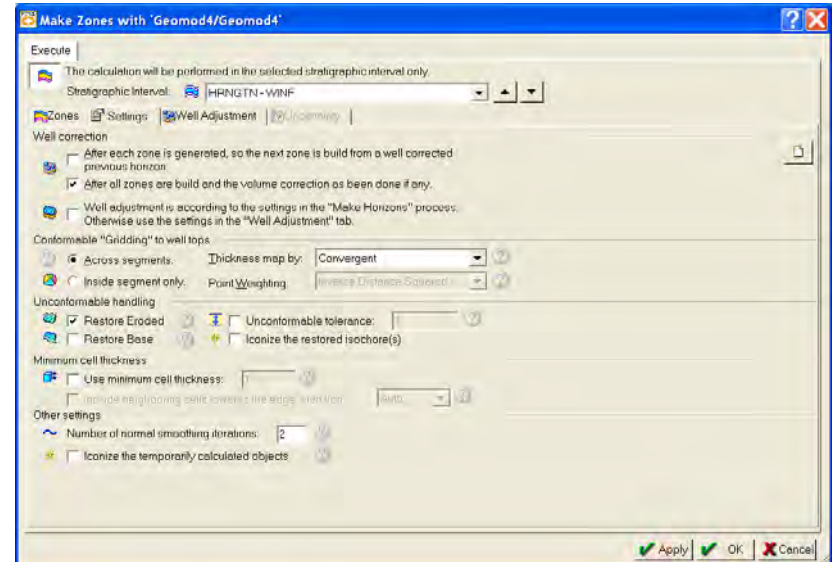
# Map ties: Grid in color, horizons in blue



# Make zones using Dave Hamilton's method (see Geomod 3 notes)



All default settings, except well adjustment: uncheck "Adjust for missing well tops"



# Rest of the Zones

Make Zones with 'Geomod4/Geomod4'

Execute

The calculation will be performed in the selected stratigraphic interval only.

Stratigraphic Interval: WNF - FTFLY

Zones: Settings Well Adjustment

WNF

Name	Color	Input Type	Input	Volume Correct	Status
Zone Wreford	Red	Conformable		<input checked="" type="checkbox"/> Yes	New
GAGE	Purple		GAGE (Tops-11_Chase_130)	<input checked="" type="checkbox"/> Yes	New
Zone Gage	Purple	Conformable		<input checked="" type="checkbox"/> Yes	New
TWNO	Blue		TWNO (Tops-11_Chase_130)	<input checked="" type="checkbox"/> Yes	New
Zone Towanda	Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
BTWNO	Green		BTWNO (Tops-11_Chase_13)	<input checked="" type="checkbox"/> Yes	New
Zone BTowanda	Green	Conformable		<input checked="" type="checkbox"/> Yes	New

FTFLY

Build From: Base horizon Hint: Conformable means conformable to well tops

Volume Correction: Proportional correction

Build along: Vertical Thickness (TVT) Horizons with Steep slopes

Apply OK Cancel

Make Zones with 'Geomod4/Geomod4'

Execute

The calculation will be performed in the selected stratigraphic interval only.

Stratigraphic Interval: FTFLY - A1\_SH

Zones: Settings Well Adjustment

FTFLY

Name	Color	Input Type	Input	Volume Correct	Status
Zone FTFLY	Purple	Conformable		<input checked="" type="checkbox"/> Yes	New
MATFIELD	Green		MATFIELD (Tops-11_Chase_130)	<input checked="" type="checkbox"/> Yes	New
Zone Matfield	Green	Conformable		<input checked="" type="checkbox"/> Yes	New
WREFORD	Purple		WREFORD (Tops-11_Chase_130)	<input checked="" type="checkbox"/> Yes	New
Zone Wreford	Purple	Conformable		<input checked="" type="checkbox"/> Yes	New

A1\_SH

Build From: Base horizon Hint: Conformable means conformable to well tops

Volume Correction: Proportional correction

Build along: Vertical Thickness (TVT) Horizons with Steep slopes

Apply OK Cancel

Make Zones with 'Geomod4/Geomod4'

Execute

The calculation will be performed in the selected stratigraphic interval only.

Stratigraphic Interval: B2\_LM - B4\_LM

Zones: Settings Well Adjustment

B2\_LM

Name	Color	Input Type	Input	Volume Correct	Status
Zone B2_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
B3_SH	Yellow		B3_SH (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B3_SH	Yellow	Conformable		<input checked="" type="checkbox"/> Yes	New
B3_LM	Light Blue		B3_LM (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B3_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
B4_SH	Purple		B4_SH (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B4_SH	Purple	Conformable		<input checked="" type="checkbox"/> Yes	New

B4\_LM

Build From: Base horizon Hint: Conformable means conformable to well tops

Volume Correction: Proportional correction

Build along: Vertical Thickness (TVT) Horizons with Steep slopes

Apply OK Cancel

Make Zones with 'Geomod4/Geomod4'

Execute

The calculation will be performed in the selected stratigraphic interval only.

Stratigraphic Interval: A1\_SH - B2\_LM

Zones: Settings Well Adjustment

A1\_SH

Name	Color	Input Type	Input	Volume Correct	Status
Zone A1_SH	Purple	Conformable		<input checked="" type="checkbox"/> Yes	New
A1_LM	Light Blue		A1_LM (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone A1_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
B1_SH	Green		B1_SH (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B1_SH	Green	Conformable		<input checked="" type="checkbox"/> Yes	New
B1_LM	Light Blue		B1_LM (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B1_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
B2_SH	Purple		B2_SH (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B2_SH	Purple	Conformable		<input checked="" type="checkbox"/> Yes	New

B2\_LM

Build From: Base horizon Hint: Conformable means conformable to well tops

Volume Correction: Proportional correction

Build along: Vertical Thickness (TVT) Horizons with Steep slopes

Apply OK Cancel

Make Zones with 'Geomod4/Geomod4'

Execute

The calculation will be performed in the selected stratigraphic interval only.

Stratigraphic Interval: B4\_LM - D\_SH

Zones: Settings Well Adjustment

B4\_LM

Name	Color	Input Type	Input	Volume Correct	Status
Zone B4_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
B5_SH	Yellow		B5_SH (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B5_SH	Yellow	Conformable		<input checked="" type="checkbox"/> Yes	New
B5_LM	Light Blue		B5_LM (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone B5_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New
C_SH	Green		C_SH (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone C_SH	Green	Conformable		<input checked="" type="checkbox"/> Yes	New
C_LM	Light Blue		C_LM (Tops-15_Cgrv_1248)	<input checked="" type="checkbox"/> Yes	New
Zone C_LM	Light Blue	Conformable		<input checked="" type="checkbox"/> Yes	New

D\_SH

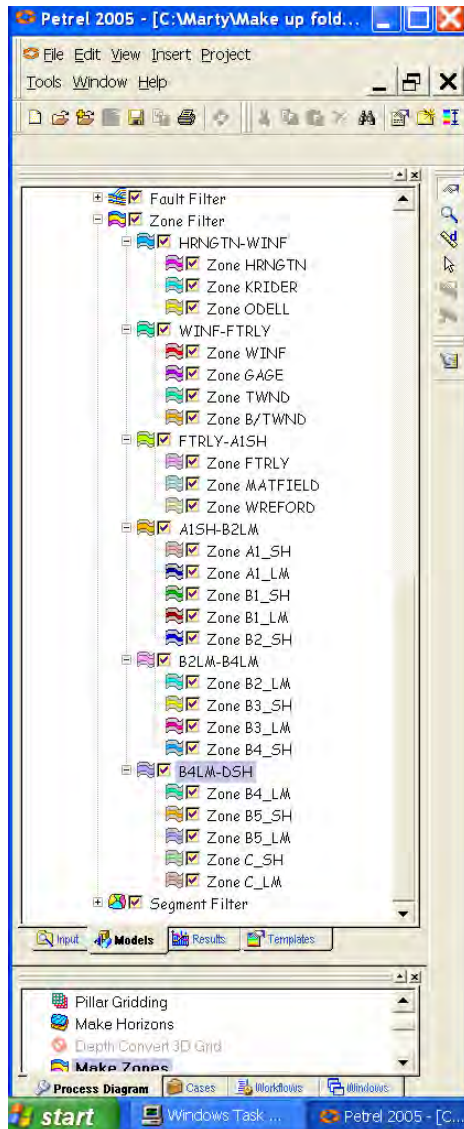
Build From: Base horizon Hint: Conformable means conformable to well tops

Volume Correction: Proportional correction

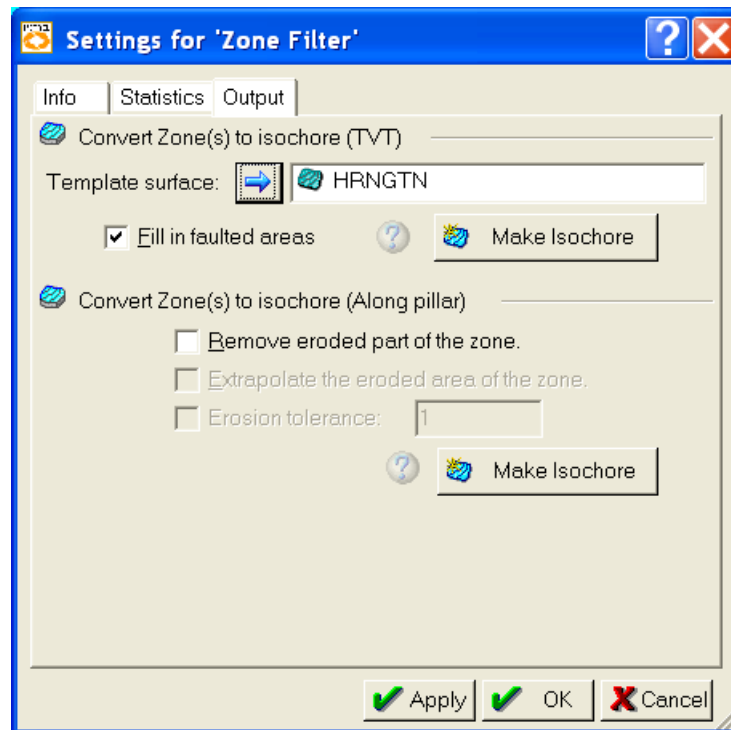
Build along: Vertical Thickness (TVT) Horizons with Steep slopes

Apply OK Cancel

# Zones made



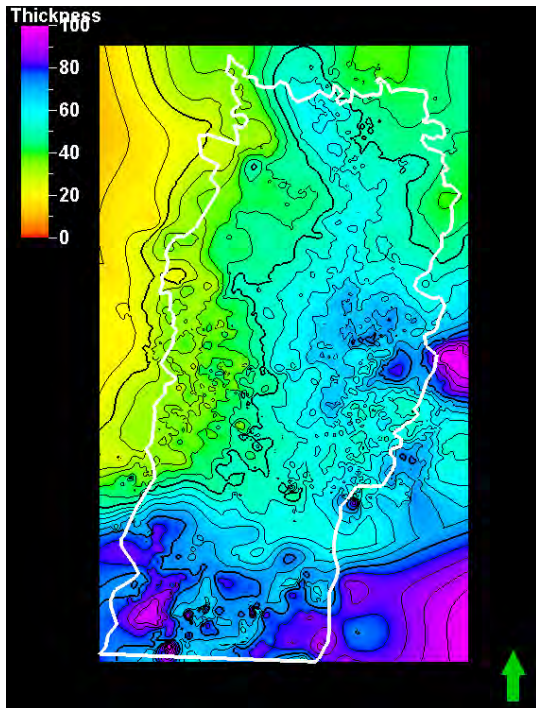
Make isochores for all zones: Click on zone filter folder>output tab>insert a grid (from the input tab) >apply



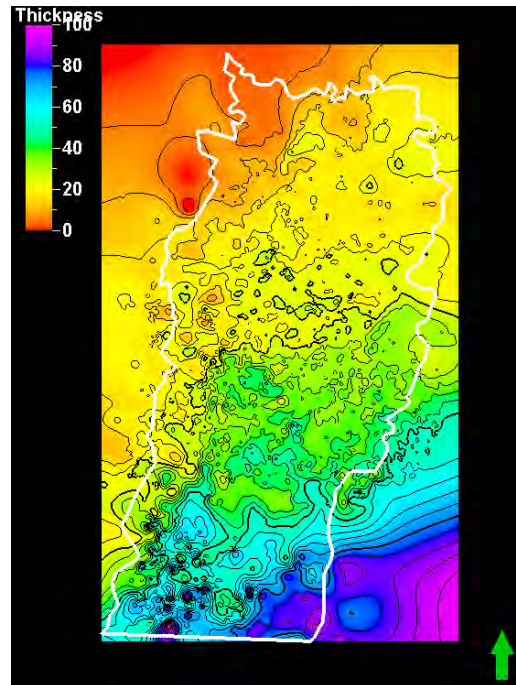
# Selected Zone Isochores

Evaluated all zone isochores and compared with Geomod 3. All look very similar and are satisfactory.

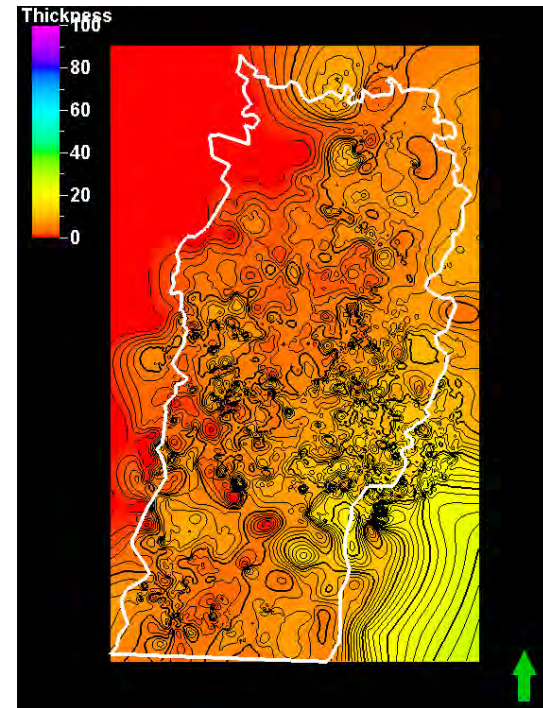
Krider



A1LM



B3LM



# Proportional Layering

Layering with 'Geomod4/Geomod4'

Zones

Process for making the layering for each zone

Common Settings

Build along: Along the Pillars  Horizons with Steep slopes

Use minimum cell thickness: 1  Include Proportional/Fractions, start From: Top

Settings for each Zone

Zone Division: Reference Surface: Restore Eroded: Restore Base:

Name	Color	Calculate	Zone Division		Reference Surface	Restore Eroded	Restore Base	Status
Zone HRNGTN		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 9		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone KRIDER		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 12		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone ODELL		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 4		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone WINF		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 11		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone GAGE		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 6		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone TWND		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 14		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B/TWND		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 4		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone FTRLY		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 14		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone MATFIELD		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 5		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone WREFORD		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 8		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone A1_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 4		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone A1_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 14		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B1_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 4		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B1_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 8		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B2_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 2		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B2_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 6		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B3_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 3		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B3_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 3		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B4_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 2		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B4_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 4		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B5_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 2		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone B5_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 10		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone C_SH		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 6		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New
Zone C_LM		<input checked="" type="checkbox"/> Yes	Proportional	Number of layers: 14		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	New

Apply OK Cancel

# Model Dimensions

**Settings for 'Geomod4'**

Info Statistics Operations Output

Axis	Min	Max	Delta
X	987000.00	1396860.00	409860.00
Y	-50000.00	635740.00	685740.00
Depth	-1342.19	1626.28	2968.47

Description	Value
Is depth converted ?	No
Is upscaled ?	No
Is stairstepped ?	No
Number of iconized horizons:	25
Number of iconized zones:	6
Number of faults:	0
Number of segments:	1
Number of properties:	0

Cells (nl x nJ x nK)	621 x 1039 x 169
Nodes (nl x nJ x nK)	622 x 1040 x 170
Total number of 3D cells:	109042011
Total number of 3D nodes:	109969600

Number of real horizons:	170
Number of real layers:	169

Total number of 2D cells:	645219
Total number of 2D nodes:	646880
Total number of defined 2D nodes:	646880

Average Xinc:	660.00000000
Average Yinc:	660.00000000
Average Zinc (along pillar)	3.35575878
Rotation angle:	0.00000000

Number of top truncated pillars:	0
Number of base truncated pillars:	0

Number of unfaulted pillars:	646880
Number of faulted pillars:	0
Number of end of fault pillars:	0

Number of unique horizon sequences:	646880
-------------------------------------	--------

Geometry overview:

Vertical pillars:	100.00%
Linear pillars:	0.00%
Listric pillars:	0.00%
Curved pillars:	0.00%

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

**Petrel 2005 - [C:\Marty\Make ...]**

File Edit View Insert Project Tools Window Help

Horizons

- HRNGTN-WINF
  - Zone HRNGTN
  - Zone KRIDER
  - Zone ODELL
- WINF-FTRLY
  - Zone WINF
  - Zone GAGE
  - Zone TWND
  - Zone B/TWND
- FTRLY-A1SH
  - Zone FTRLY
  - Zone MATFIELD
  - Zone WREFORD
- A1SH-B2LM
  - Zone A1\_SH
  - Zone A1\_LM
  - Zone B1\_SH
  - Zone B1\_LM
  - Zone B2\_SH
  - Zone B2\_LM
- B2LM-B4LM
  - Zone B2\_LM
  - Zone B3\_SH
  - Zone B3\_LM
  - Zone B4\_SH
- B4LM-DSH
  - Zone B4\_LM
  - Zone B5\_SH
  - Zone B5\_LM
  - Zone C\_SH
  - Zone C\_LM

Segment Filter

Input Models Results Templates

Process Diagram Cases Workflows Windows

Ready

**Petrel 2005 - [C:\Marty\Make ...]**

File Edit View Insert Project Tools Window Help

Horizons

- HRNGTN
- KRIDER
- ODELL
- WINF
- GAGE
- TWND
- B/TWND
- FTRLY
- MATFIELD
- WREFORD
- A1\_SH
- A1\_LM
- B1\_SH
- B1\_LM
- B2\_SH
- B2\_LM
- B3\_SH
- B3\_LM
- B4\_SH
- B4\_LM
- B5\_SH
- B5\_LM
- C\_SH
- C\_LM
- D\_SH

Edges

Input Models Results Templates

Pillar Gridding  
Make Horizons  
Depth Convert 3D Grid  
Make Zones

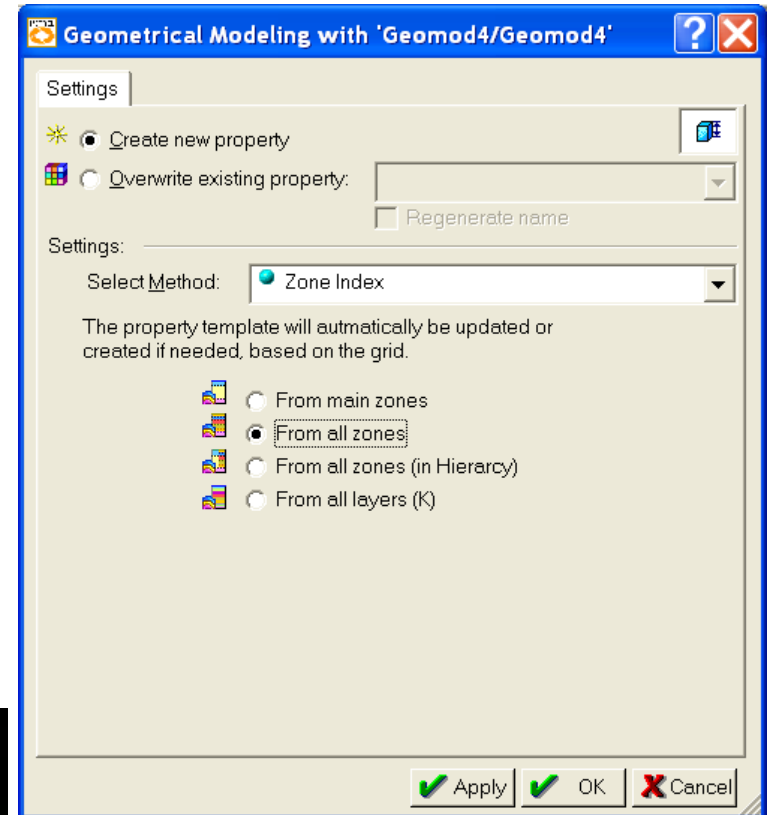
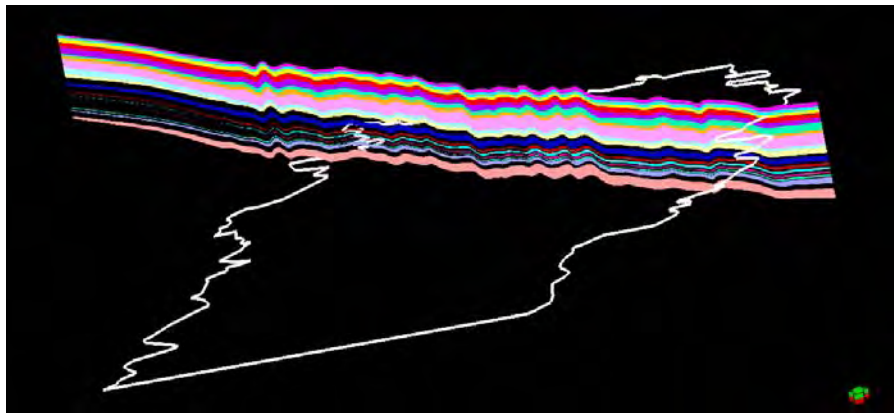
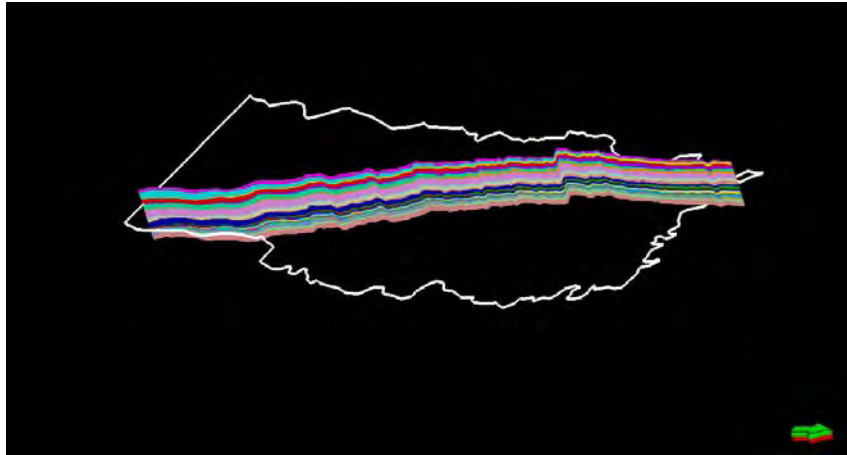
Process Diagram Cases Workflows Windows

Ready



# Evaluate Layering

Check out the layering and gridding: Property Modeling > Geometric modeling > Select Zone Index and From all zones, to create a property to display



Cgrv shales not displayed

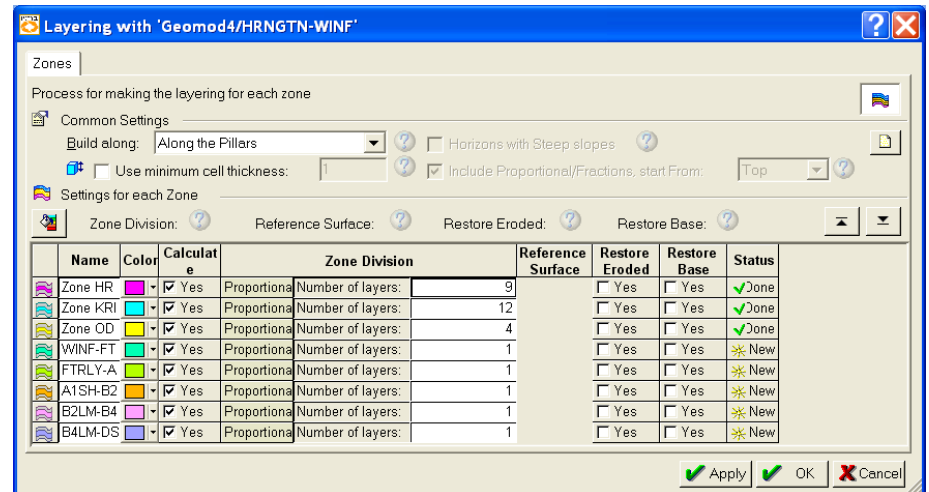
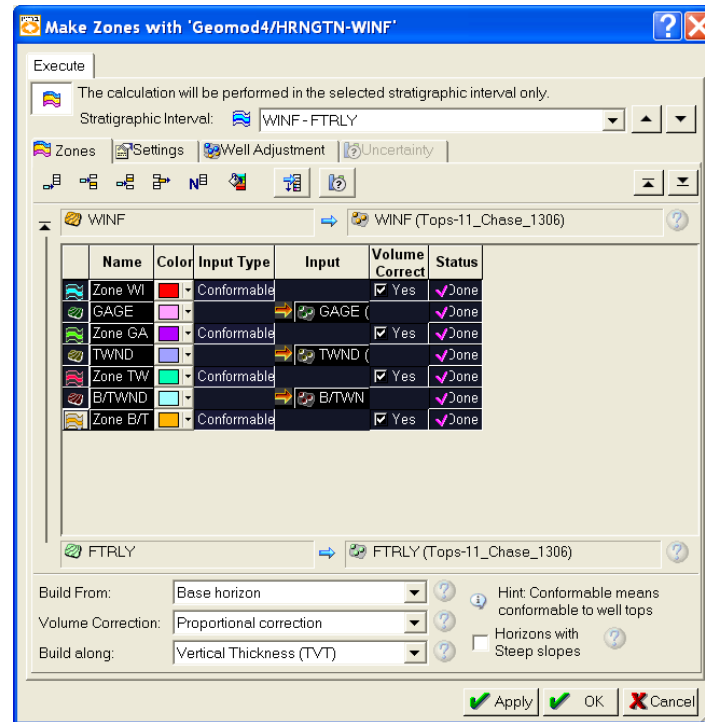
# Build six sub models

Make 6 copies of the full model.

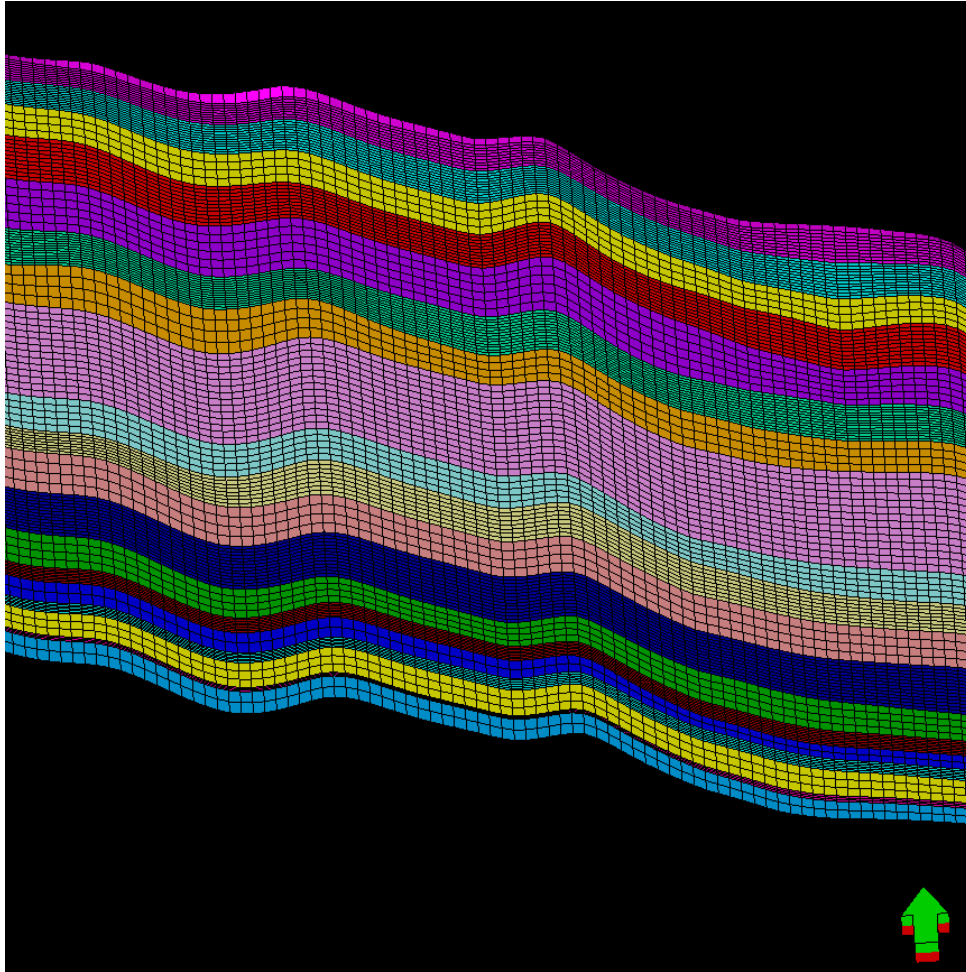
Re-layer so that the “placeholder” zones are one cell thick.

Delete unwanted zones:

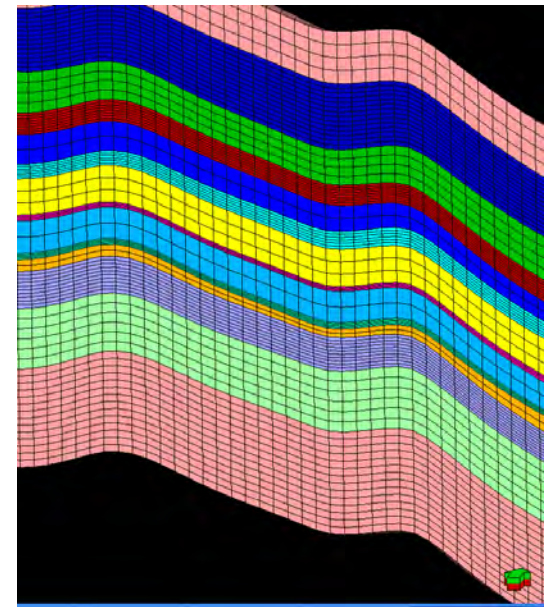
1. Make model active
2. Make zones in Structural modeling
3. Highlight zones to be deleted
4. Delete by mashing the delete icon and then “Apply.” Clear memory.
5. Continue through the model. And SAVE.
6. Check out the layering by opening the Layering tool



# HRNGTN-B4LM

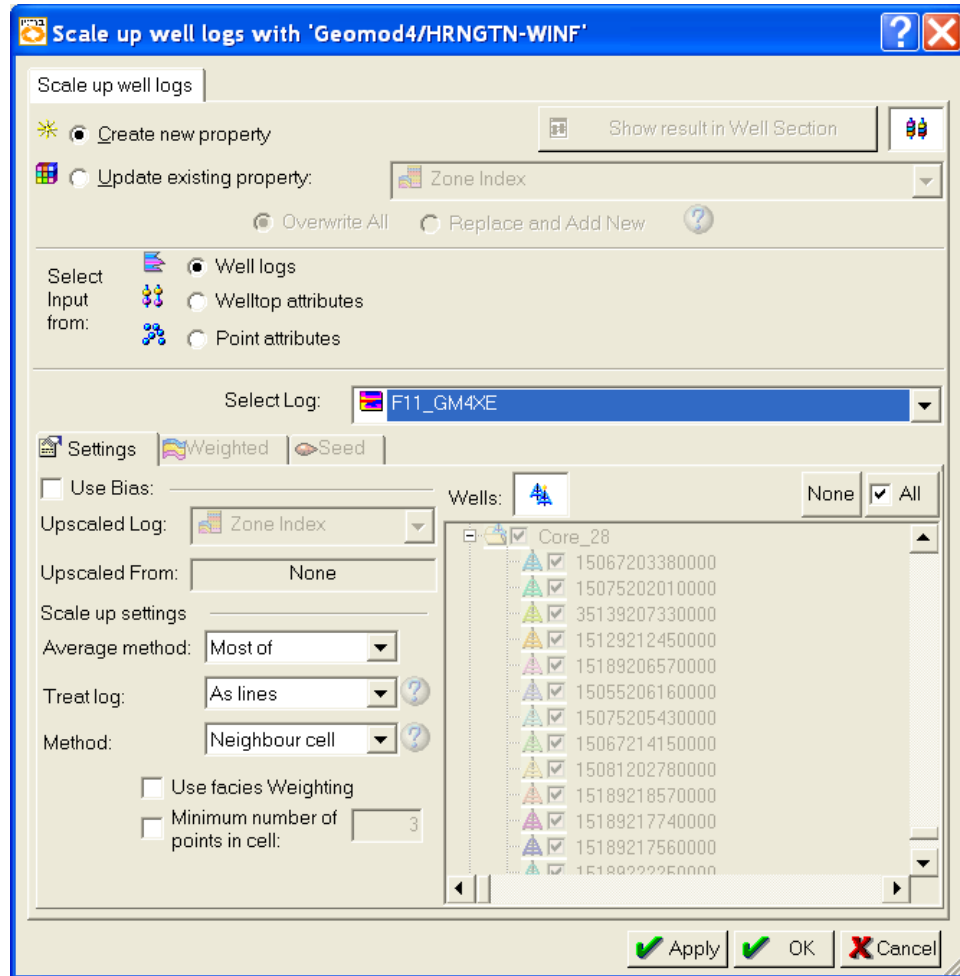


# A1SH-DSH (Cgrv)

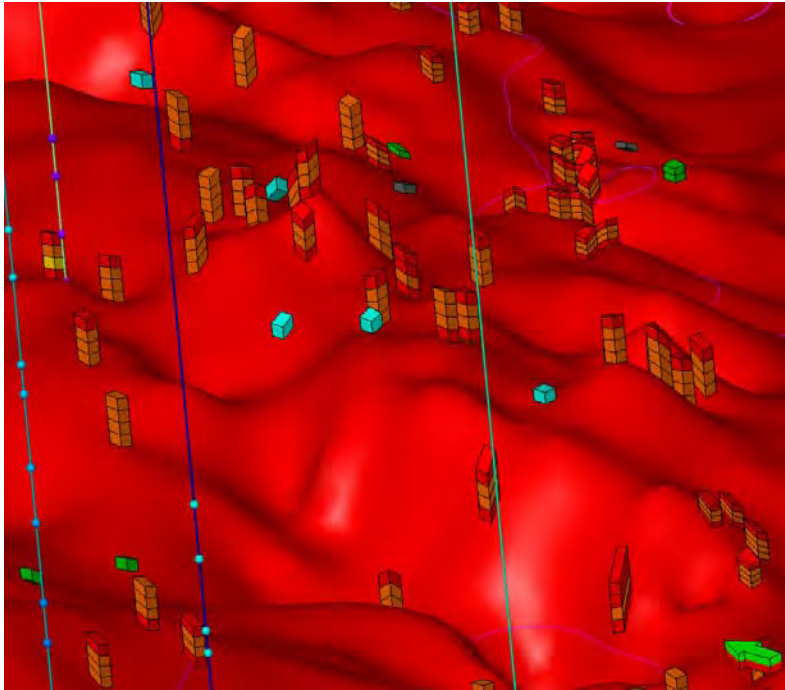


# Block facies to wells

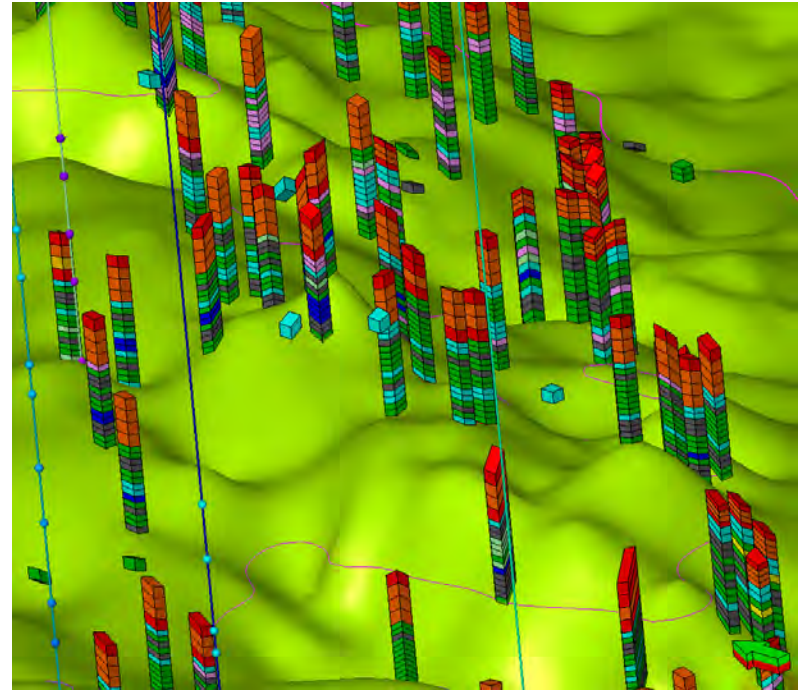
*Note: Did not assign templates while importing wells so had to do this before starting the process.*



# QC upscale facies at wells



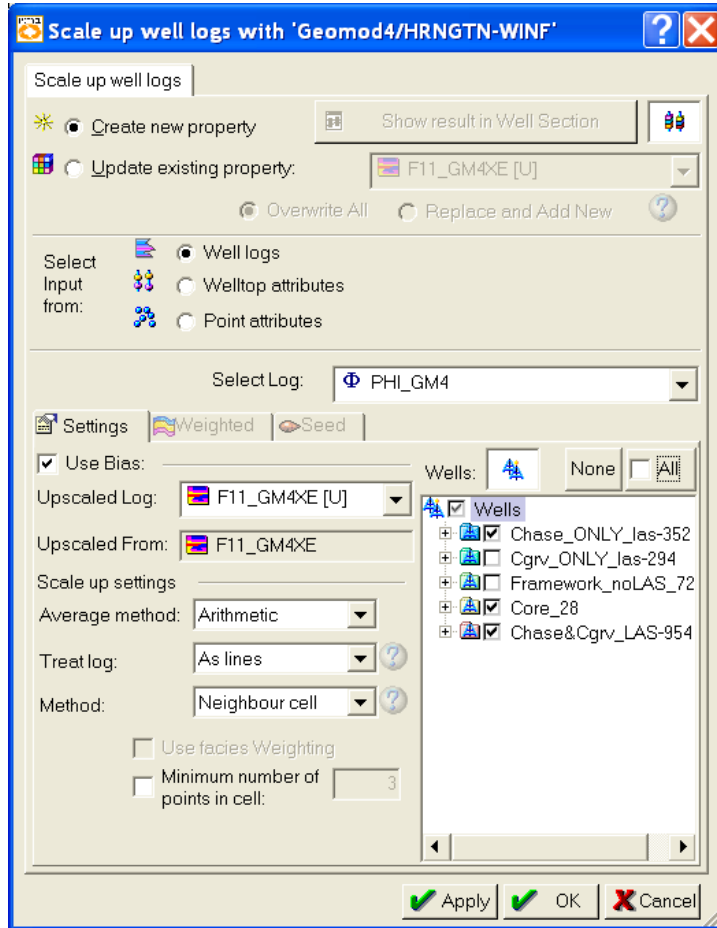
Blocked facies at wells with A1LM horizon (red)  
Blue and green cells are from Chase only wells  
where Cgrv AS1Sh was not part of conditioning  
set of tops data. Consider not modeling these  
facies in the modeling process.



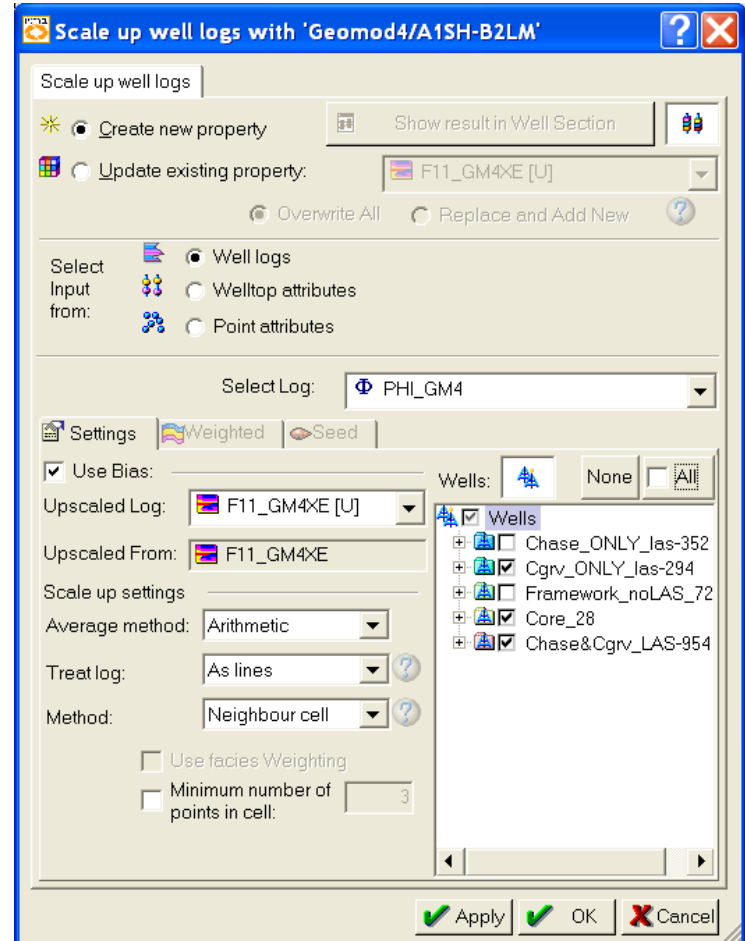
Blocked facies at wells with B1SH horizon  
(green) Blue and green cells are probably  
slop at the horizon. Consider not modeling  
these facies in the modeling process.

# Upscale porosity to wells

## Chase models

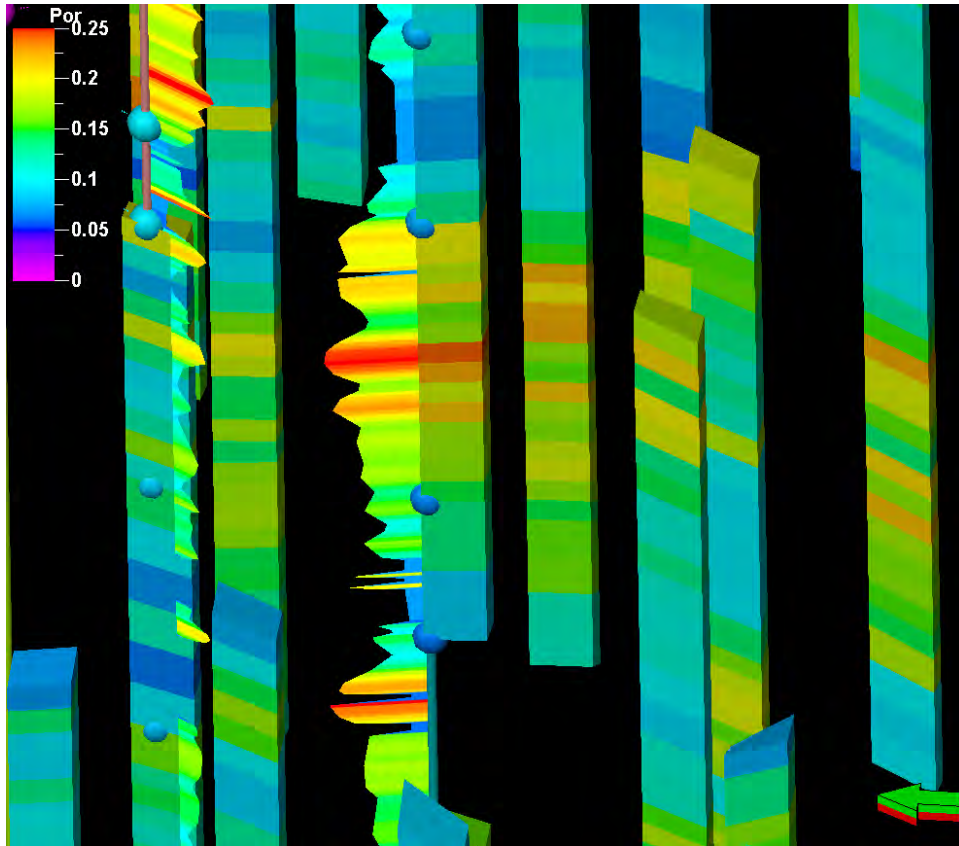


## Council Grove models

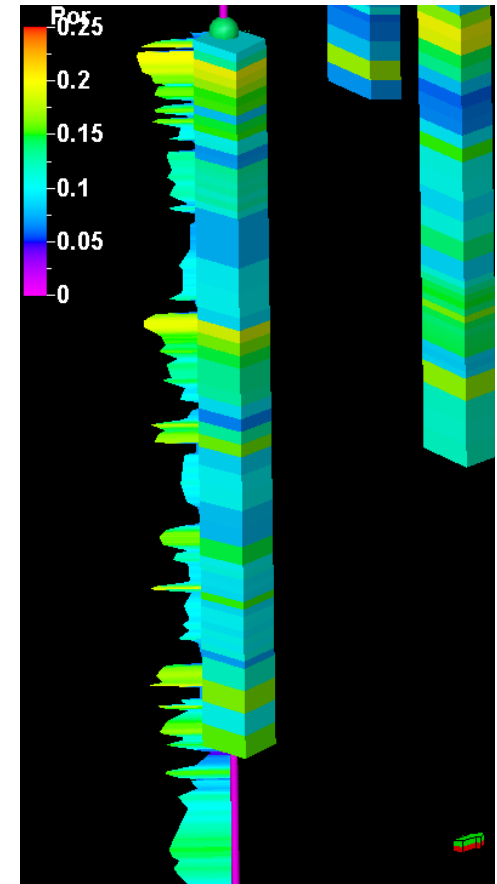


Turned off groups of wells without the curves over the interval being upscaled

# Upscaled vs. Log Phi



Winf-FtRly

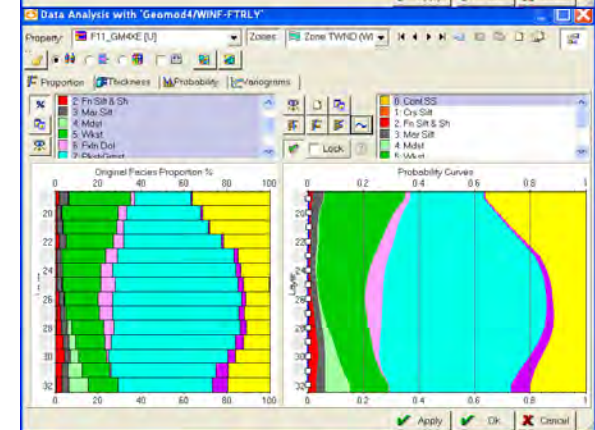
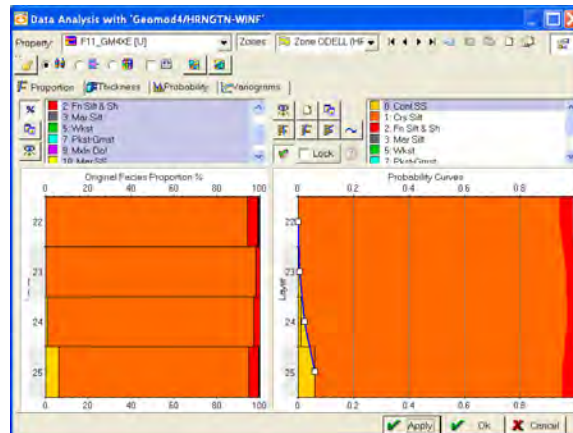
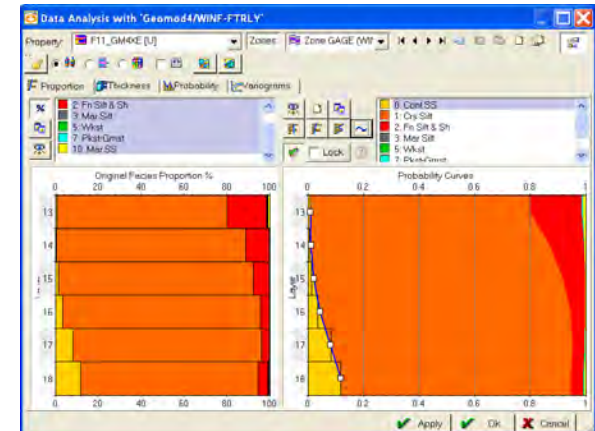
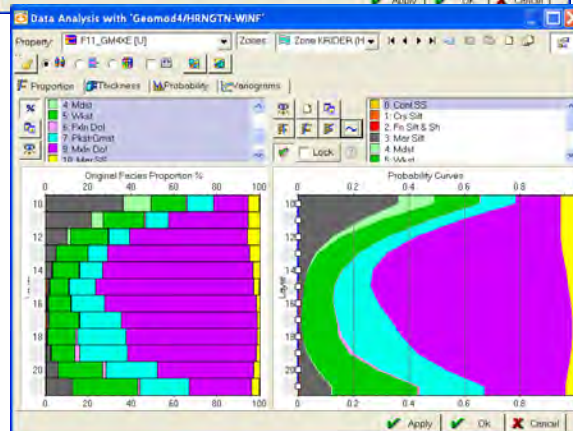
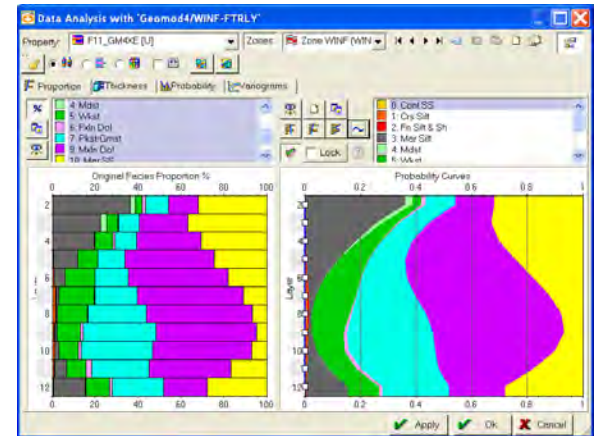
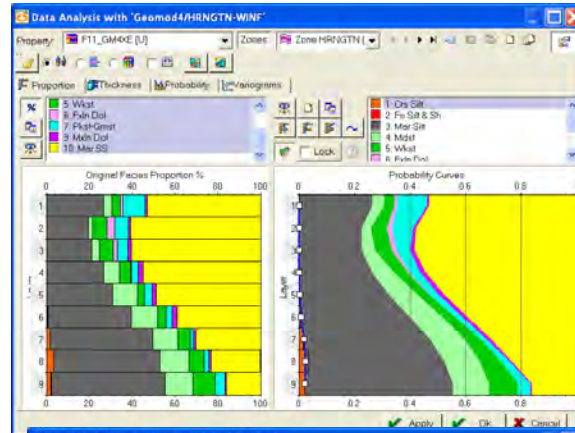


Hrngtn- Krider &  
Winf-FtRly

# Facies data analysis

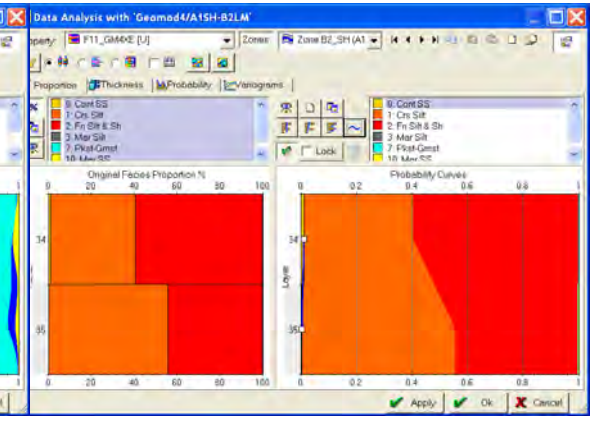
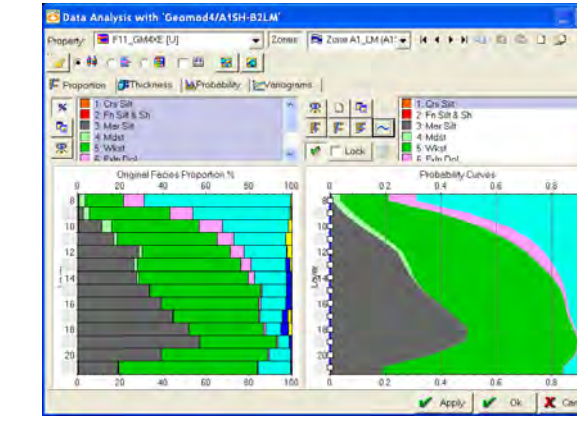
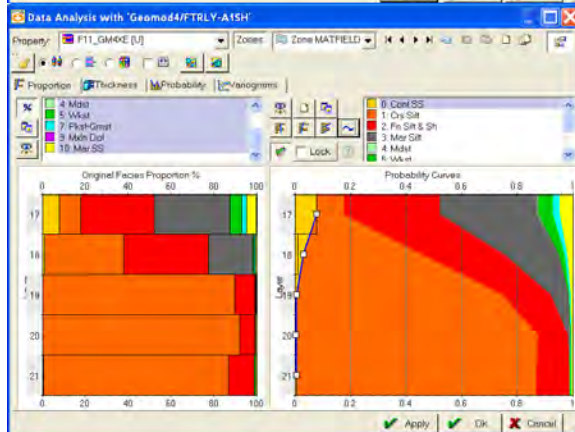
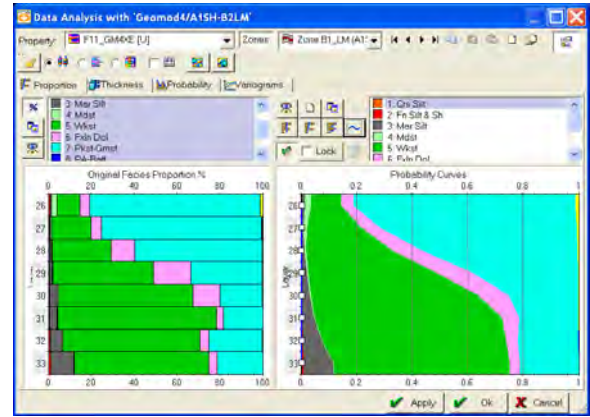
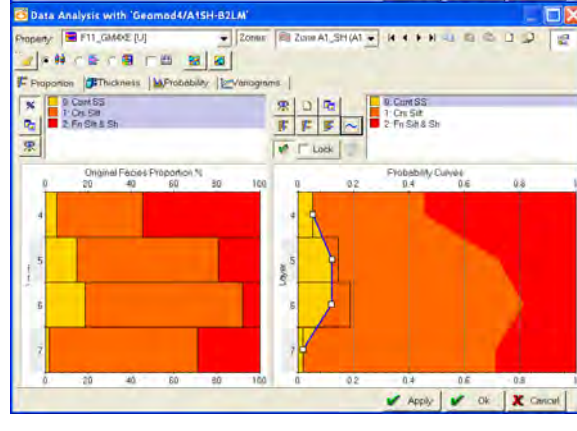
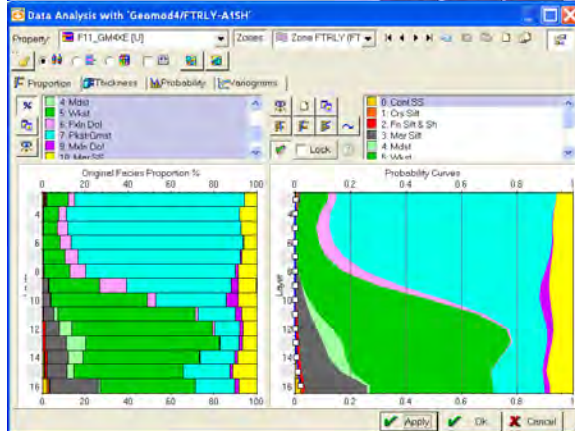
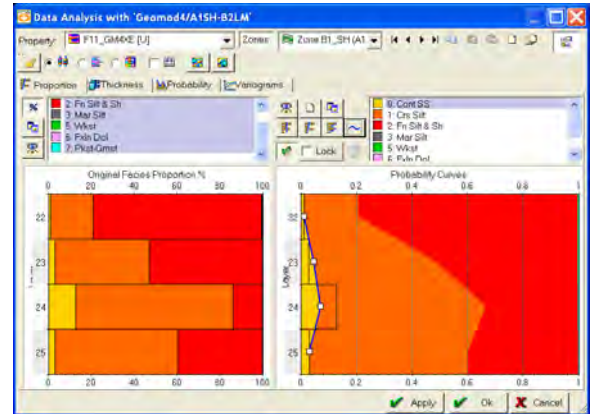
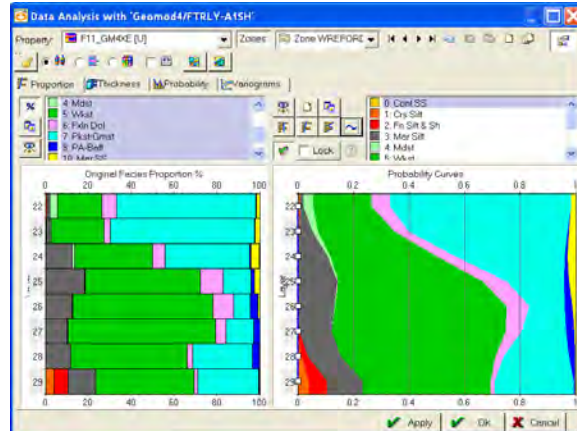
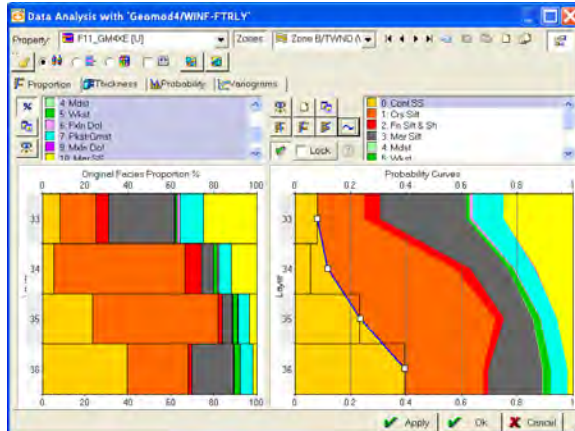
Go to Data Analysis

1. Unlock the zone
2. Punch "Fit Active/all curves to histogram" button
3. Smooth to satisfaction (2x)
4. Hit "Apply" to save

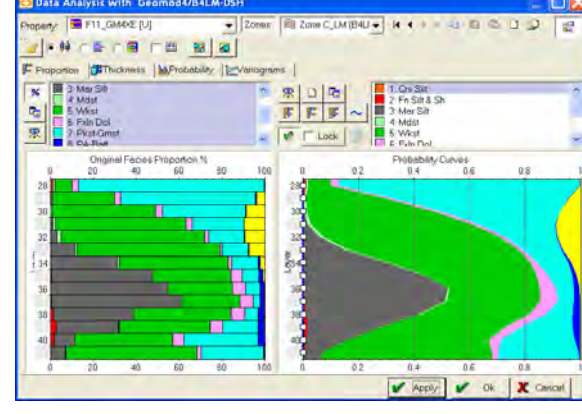
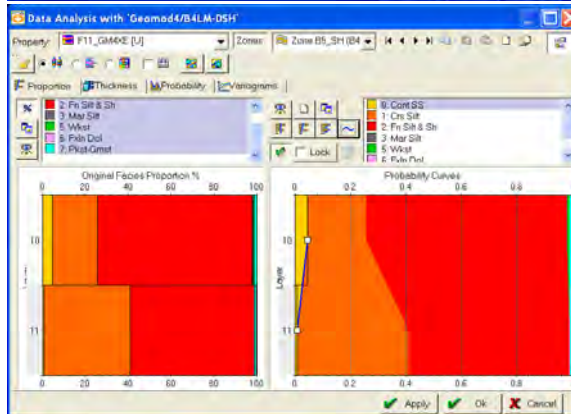
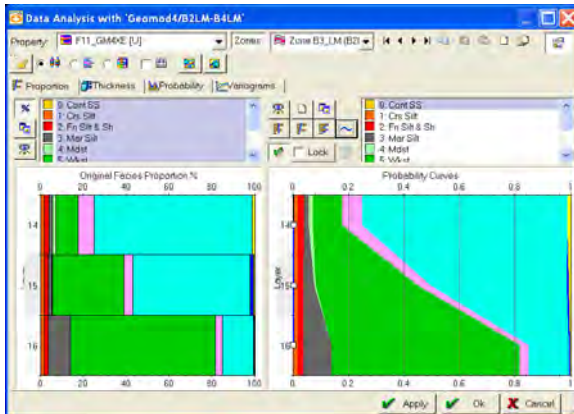
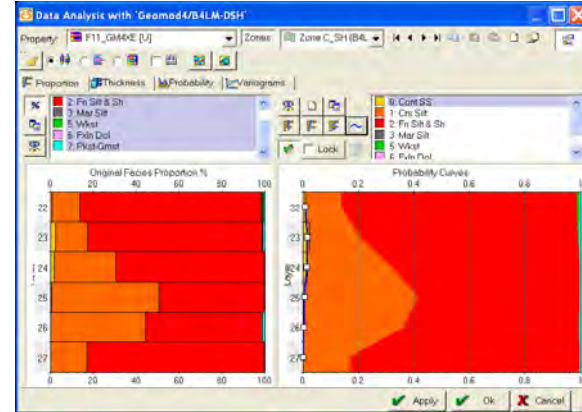
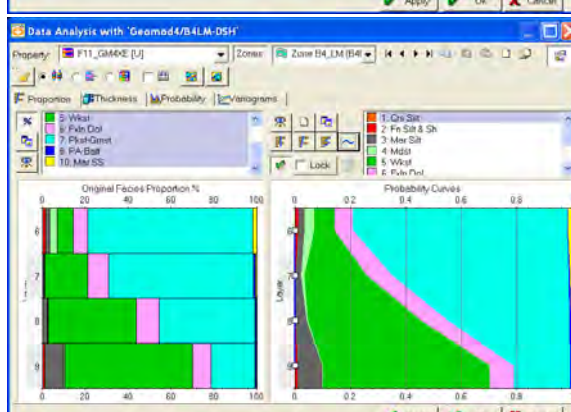
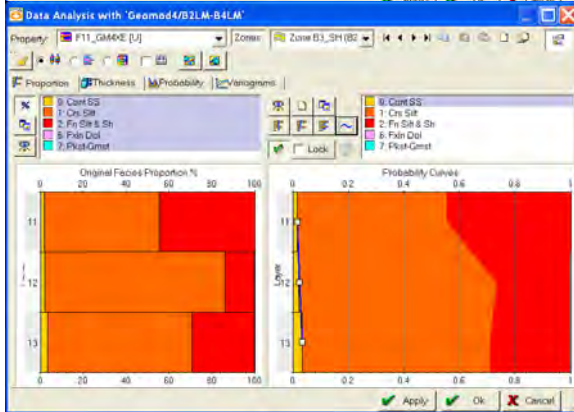
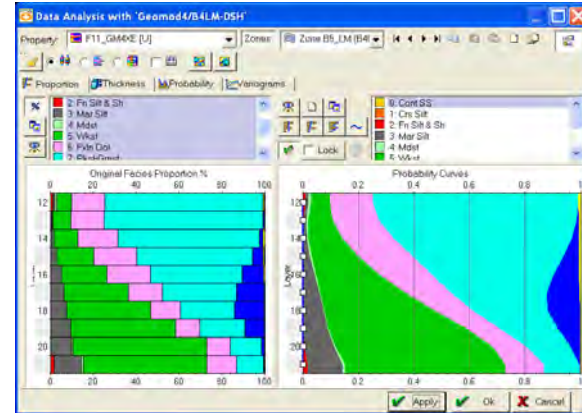
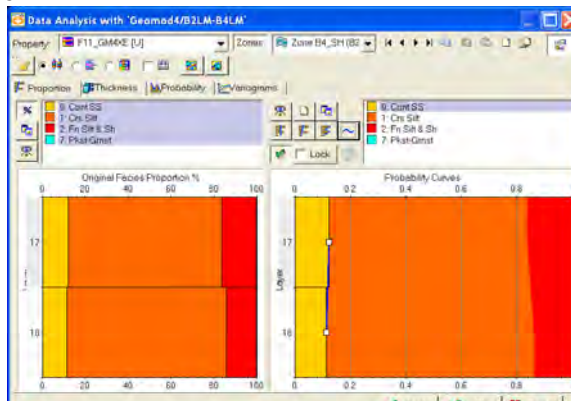
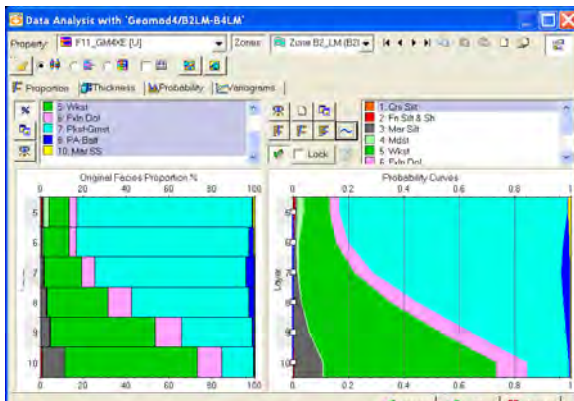




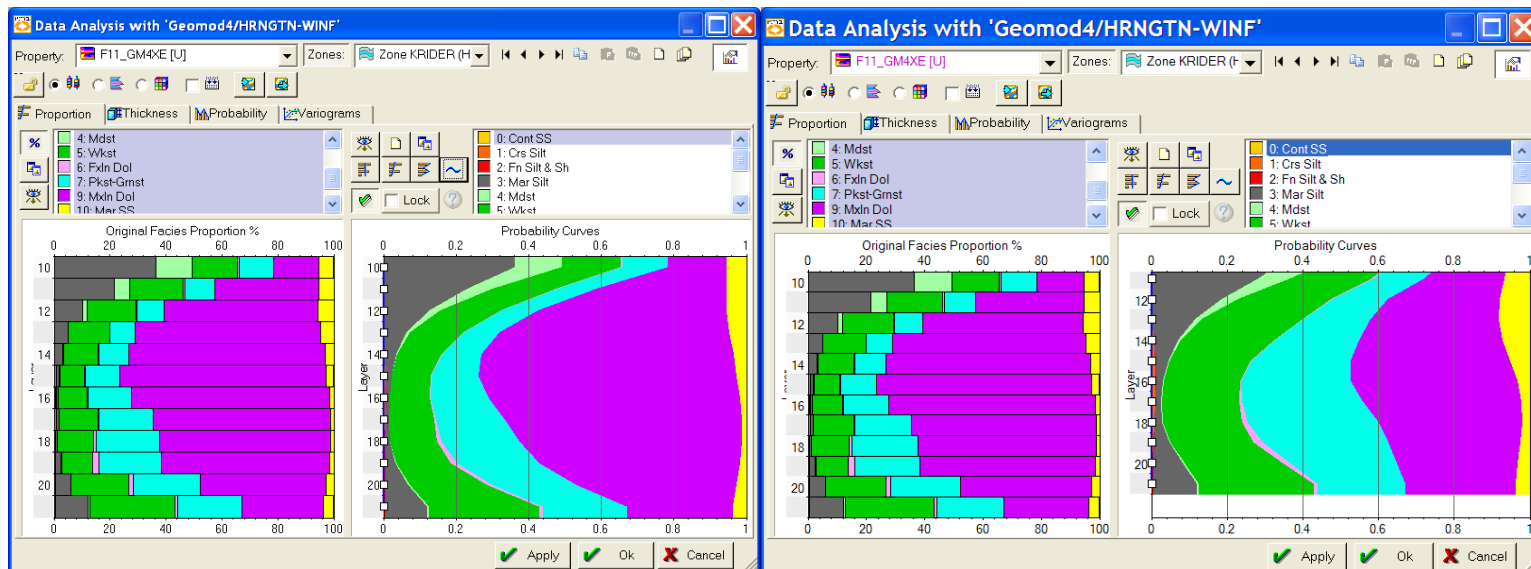
# More facies analysis



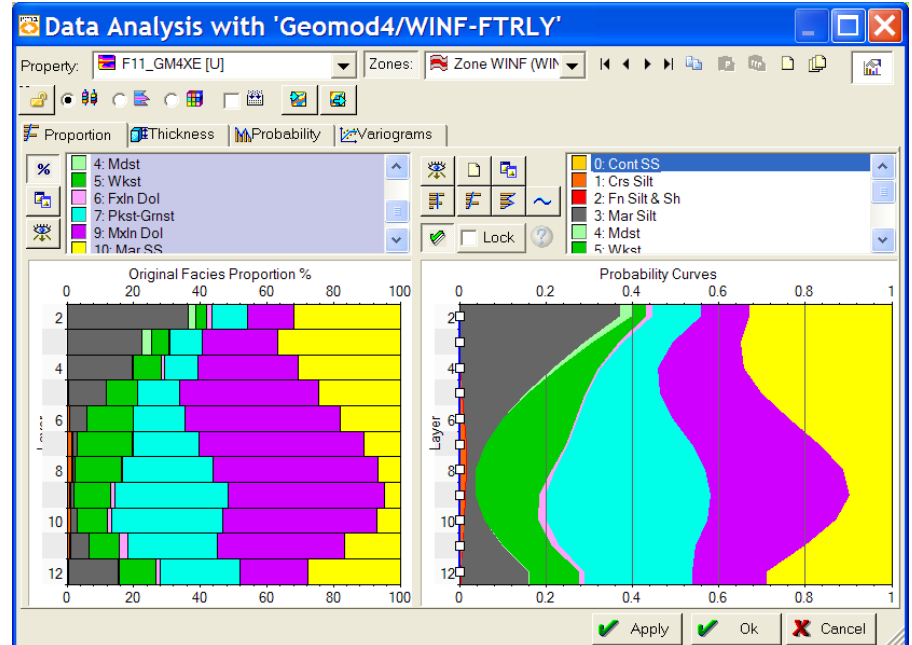
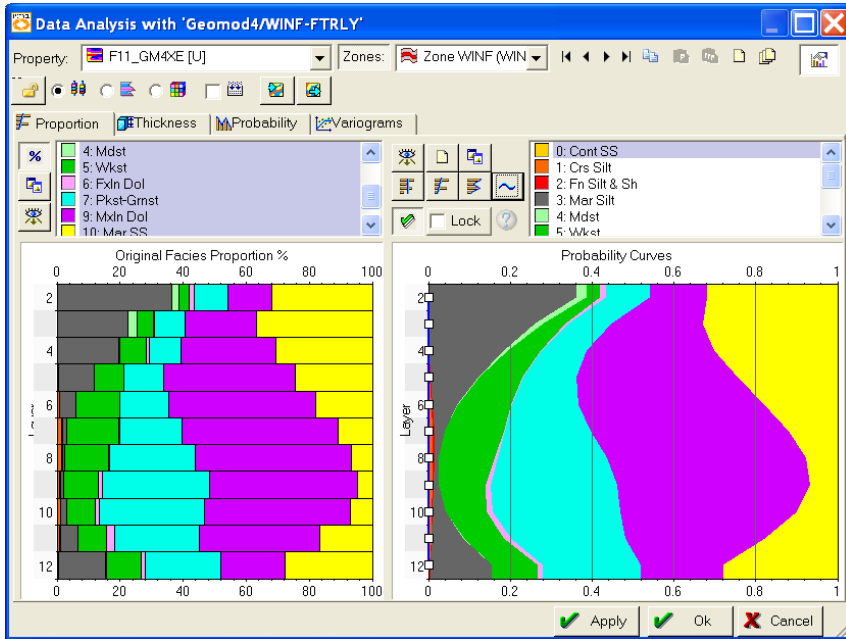
# More facies analysis



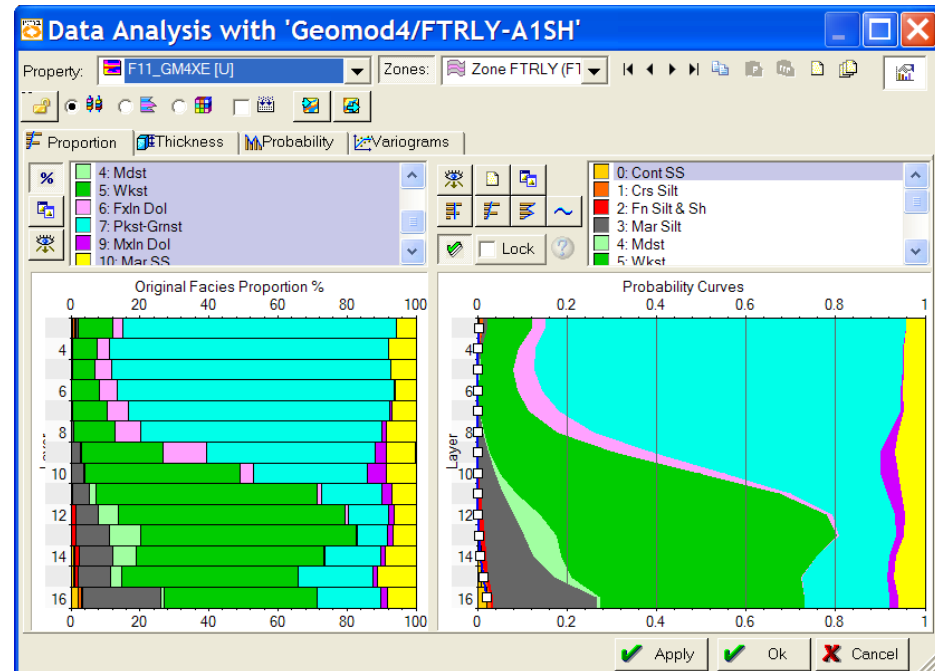
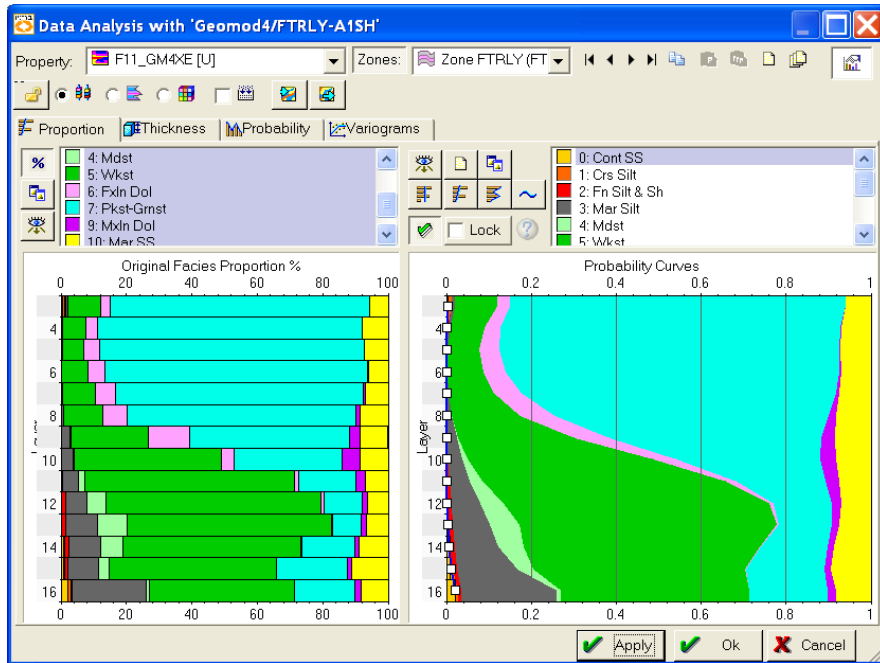
# Adjust relative proportions F9 for Krider



# Adjust relative proportions F9 for Winfield



# Adjust relative proportions F10 for FtRiley



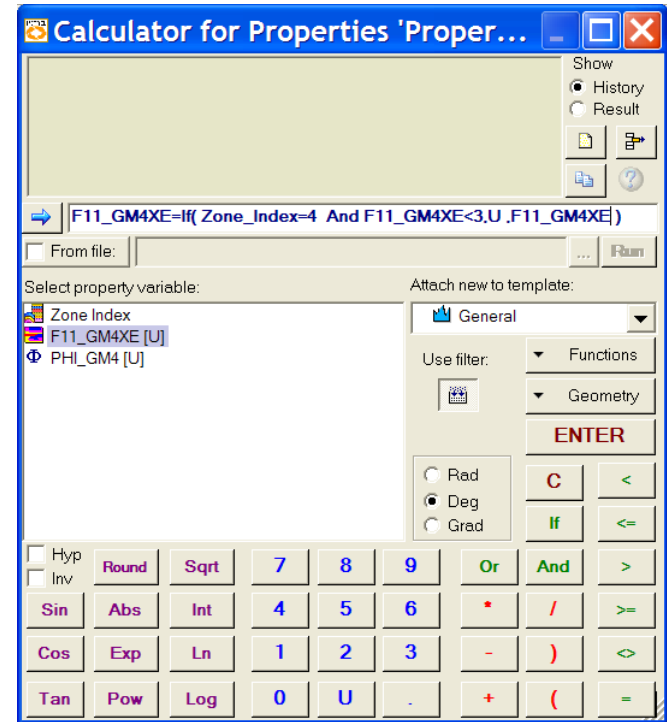
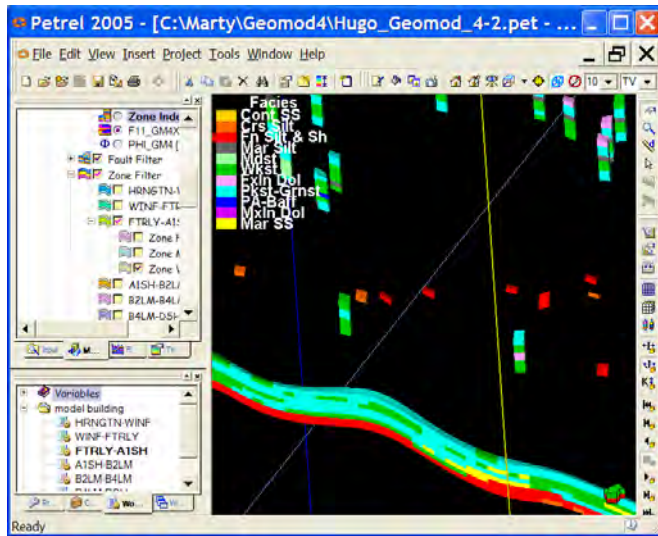
Reduced Mar ss by ~ 1/3

# Zap lithofacies except F0,1,2 in A1SH

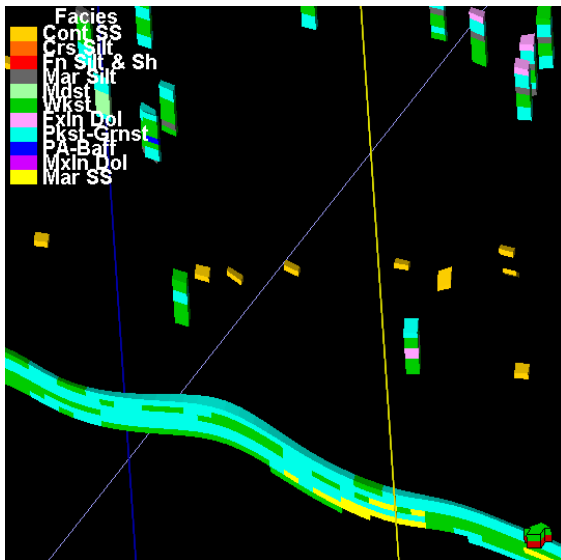
Determine zone index  
In Property calculator use equation to zap all  $F > 2$  (remember that the top dummy zone Hrngtn-Winf is zone 0)



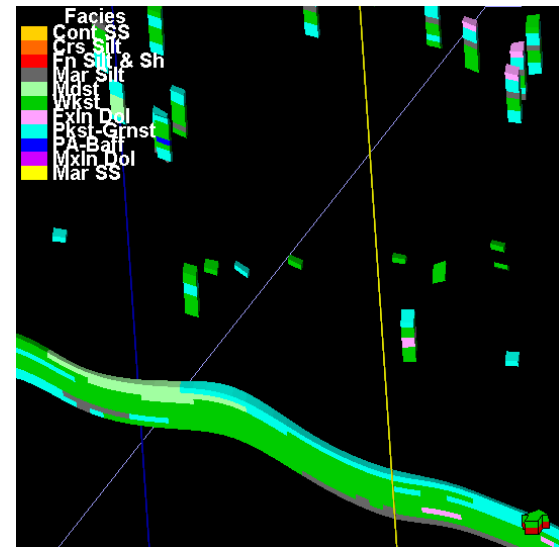
# Zap Wreford artifacts (F012)



F012 artifacts caused by the way the structural horizon was constructed



Something squirly about this, made them golden?? Artifact from the way the horizons were made, putting a little of A1sh up in the wreford for Cgrv only wells



# Rerun model with Geomod3 variogram parameters

1. Make copy of GM4XE
2. Insert Geomod3 variogram parameters through workflow
3. Re-run



# Odell Stats

**Settings for 'F11\_GM4XE [U]'**

Style | Info | **Statistics** | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: **Zone ODELL (HRNGTN-WINF)**

Min, mean, max and std values are for the interval height  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Co...	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	2.66	68690	62994	0.1 (1)	4.8 (1.09)	23.8 (3)	2.991
1	Crs Silt	92.38	2384213	688296	0.1 (1)	16.4 (3....)	49.5 (4)	8.377
2	Fn Silt & Sh	4.67	120645	108198	0.1 (1)	5.2 (1.12)	33.6 (4)	3.372
3	Mar Silt	0.04	1148	1148	0.7 (1)	3.2 (1)	7.2 (1)	2.067
5	Wkst	0.04	1054	1054	3.6 (1)	4.3 (1)	5.3 (1)	0.412
7	Pkst-Grnst	0.02	604	604	1.5 (1)	4.6 (1)	7.8 (1)	1.206
9	Mxln Dol	0.03	696	696	0.5 (1)	2.9 (1)	6.1 (1)	1.005
10	Mar SS	0.15	3826	3727	0.8 (1)	3.5 (1.03)	6.7 (2)	1.343

Statistics for the upscaled cells of the zone:

Co...	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	1.87	97	89	1.0 (1)	4.9 (1.09)	15.0 (2)	2.774
1	Crs Silt	94.37	4890	1330	1.5 (1)	15.5 (3....)	41.9 (4)	6.362
2	Fn Silt & Sh	3.47	180	154	1.2 (1)	4.3 (1.17)	24.7 (4)	3.102
3	Mar Silt	0.06	3	3	1.5 (1)	1.8 (1)	2.5 (1)	0.4798
5	Wkst	0.02	1	1	4.0 (1)	4.0 (1)	4.0 (1)	0
7	Pkst-Grnst	0.04	2	2	4.0 (1)	5.9 (1)	7.8 (1)	1.887
9	Mxln Dol	0.08	4	4	0.7 (1)	2.6 (1)	3.5 (1)	1.152
10	Mar SS	0.10	5	5	1.5 (1)	2.8 (1)	3.8 (1)	0.7989

Copy to output sheet:  List1  List2  Reset

Apply OK Cancel

**Settings for 'Copy of F11\_GM4XE [U]'**

Style | Info | **Statistics** | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: **Zone ODELL (HRNGTN-WINF)**

Min, mean, max and std values are for the interval height  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	4.05	104575	80135	0.1 (1)	6.3 (1.3)	42.7 (4)	4.908
1	Crs Silt	90.54	23366...	695386	0.1 (1)	15.9 (3....)	49.5 (4)	8.56
2	Fn Silt & Sh	4.98	128409	99496	0.3 (1)	5.6 (1.29)	32.0 (4)	4.207
3	Mar Silt	0.03	662	662	0.1 (1)	2.1 (1)	6.2 (1)	1.308
5	Wkst	0.04	919	919	3.7 (1)	4.6 (1)	5.7 (1)	0.434
7	Pkst-Grnst	0.02	450	440	3.3 (1)	4.6 (1.02)	7.9 (2)	1.352
9	Mxln Dol	0.06	1528	1286	0.5 (1)	3.8 (1.19)	12.0 (3)	1.953
10	Mar SS	0.30	7723	6172	0.1 (1)	2.6 (1.25)	14.0 (3)	1.951

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	1.87	97	89	1.0 (1)	4.9 (1.09)	15.0 (2)	2.774
1	Crs Silt	94.37	4890	1330	1.5 (1)	15.5 (3....)	41.9 (4)	6.362
2	Fn Silt & Sh	3.47	180	154	1.2 (1)	4.3 (1.17)	24.7 (4)	3.102
3	Mar Silt	0.06	3	3	1.5 (1)	1.8 (1)	2.5 (1)	0.4798
5	Wkst	0.02	1	1	4.0 (1)	4.0 (1)	4.0 (1)	0
7	Pkst-Grnst	0.04	2	2	4.0 (1)	5.9 (1)	7.8 (1)	1.887
9	Mxln Dol	0.08	4	4	0.7 (1)	2.6 (1)	3.5 (1)	1.152
10	Mar SS	0.10	5	5	1.5 (1)	2.8 (1)	3.8 (1)	0.7989

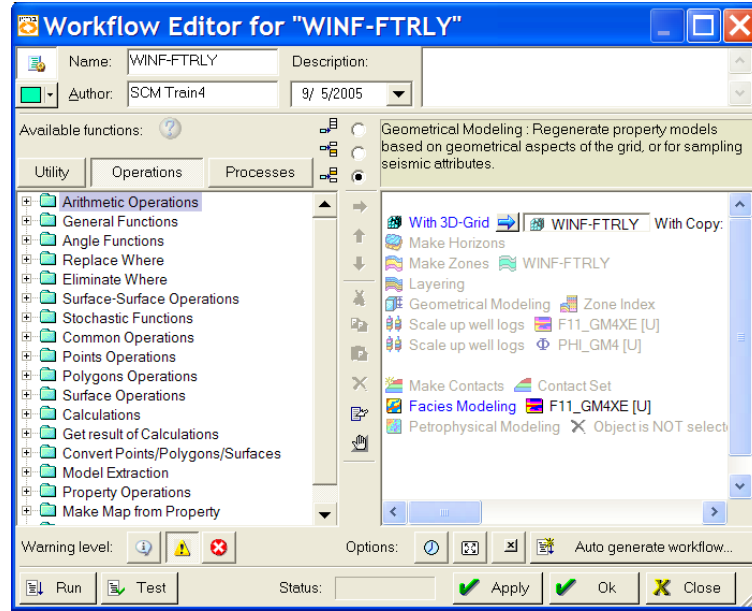
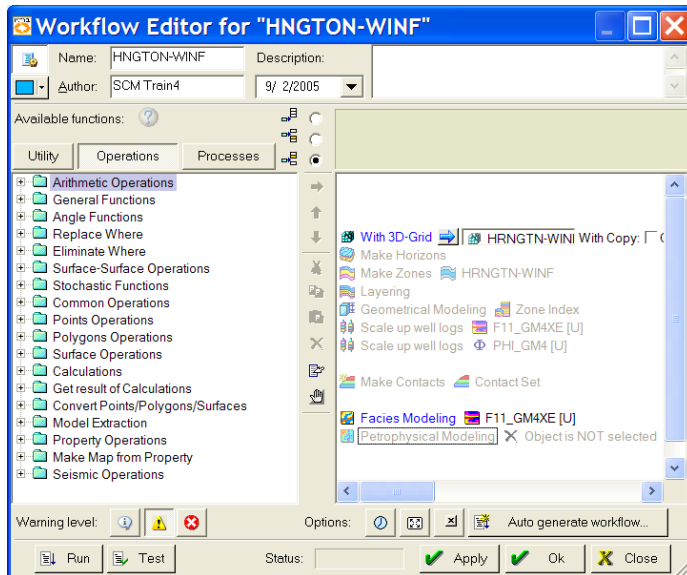
Copy to output sheet:  List1  List2  Reset

Apply OK Cancel

Model facies stats  
Zone ODELL resulting  
facies fractions:

-----  
-----  
Cont SS: 0.00 %  
Fine Silt & Sh: 97.62 %  
Crs Silt: 0.91 %  
Mar Silt: 1.19 %  
Mdst: 0.00 %  
Wkst: 0.00 %  
Fxl Dol: 0.00 %  
Pkst: 0.00 %  
Grnst: 0.00 %  
Cxln Dol: 0.00 %  
Mar SS: 0.28 %

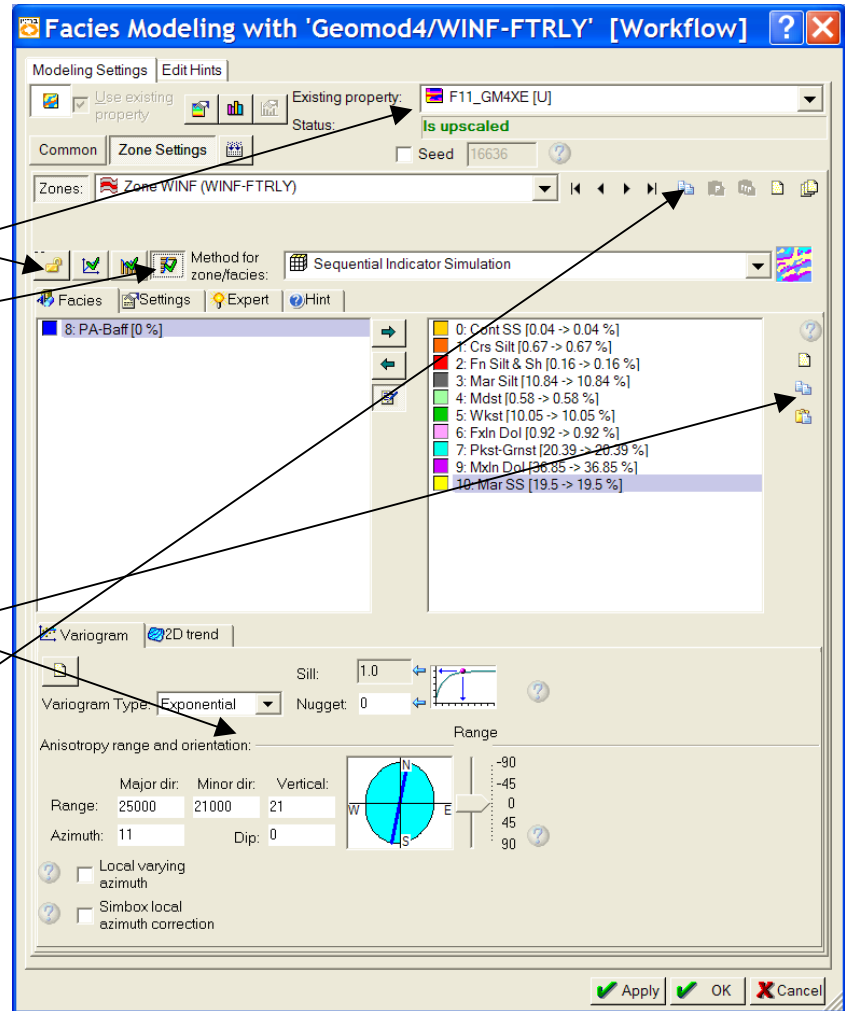
# Workflows



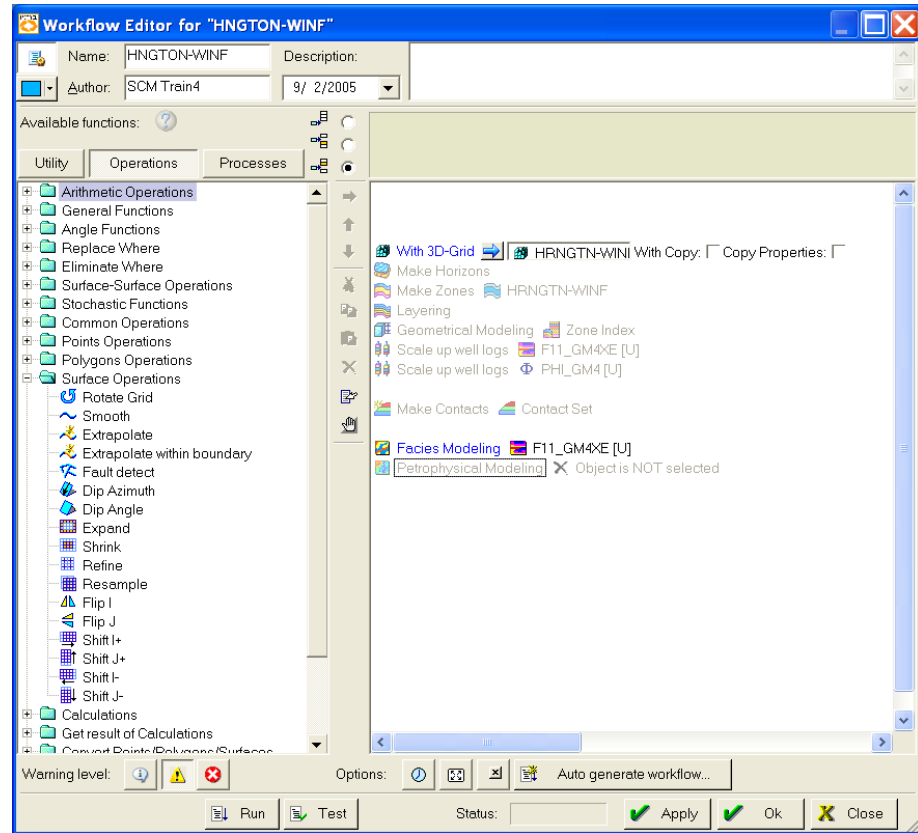
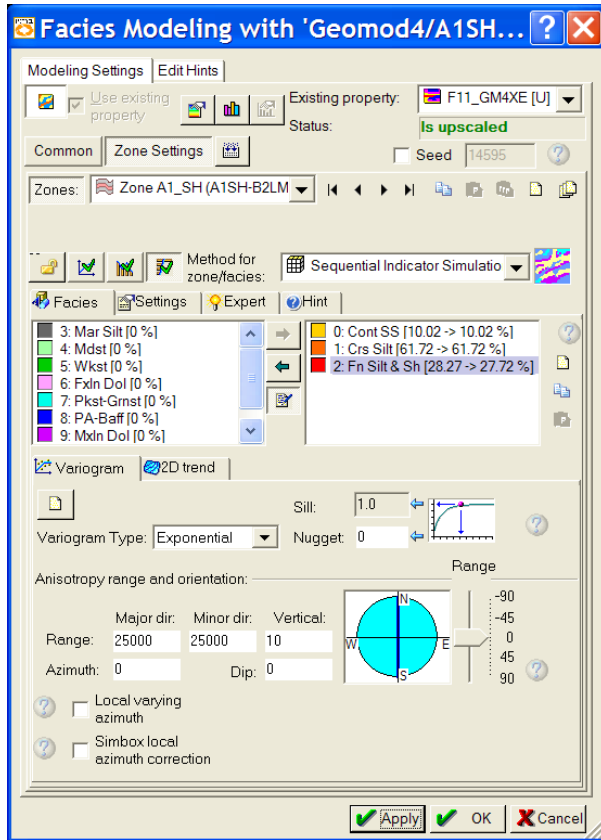
1. Open workflow for the model
2. Insert the appropriate 3D model. This automatically adds the associated make Horizons, make zones and layering workflow. Check these out to make sure they are okay.
3. Rearrange like to template
4. Set up the geometric model point to zone index
5. Make contact in process window>structural model
6. Set facies modeling parameters by double clicking the "Facies Modeling" to open the dialog box.
7. Turn off all except what you want run. Apply. Save in the Petrel tools tab. Apply > test >Run. Be patient. It takes 1 to 1-½ hours to run a model.

# Facies Modeling Parameters

1. Double click the “Facies Modeling” to open the dialog box
2. Unlock the zone to be modeled
3. Select the facies property
4. Mash the vertical proportions method icon
5. Move all facies over to the modeling side (even those with 0 occurrences)
6. Assign variogram parameters for all (use copy and paste where possible)
7. Copy all and apply to all zones to be modeled (by unlocking and pasting)
8. Remove facies without values
9. Leave zones not modeled as locked
10. Apply and Save in the main Petrel window



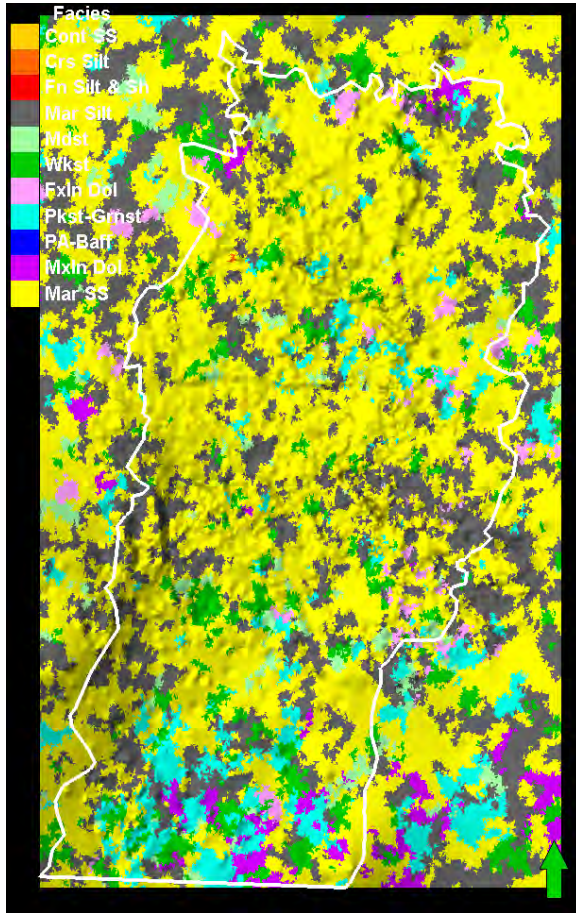
# Saving tips



To save without running hit in the modeling box and then apply in the workflows and save button in Petrel to save.  
Do Not Hit Close without first saving.

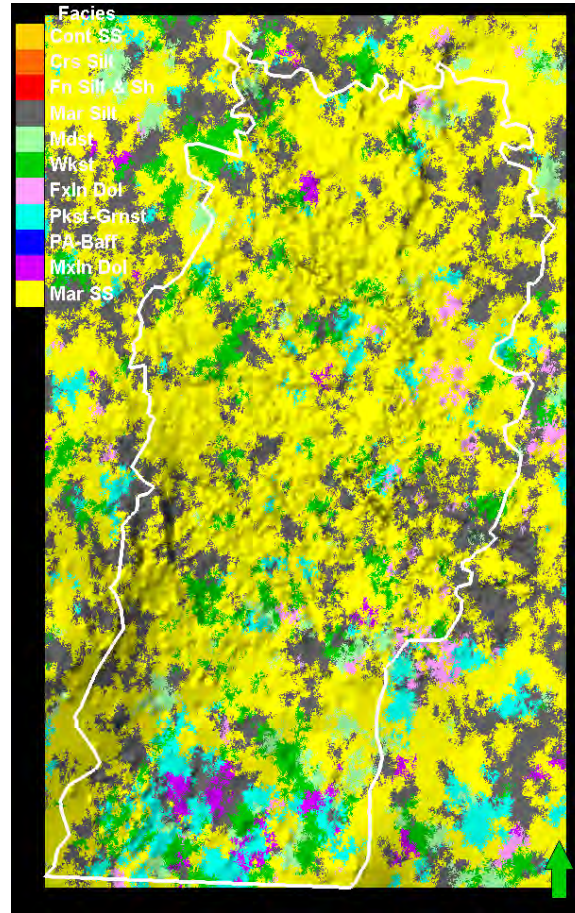
# Herington

GM4 Gf-Variograms  
(27/23-11, h=16)



Herington k=2  
(2<sup>nd</sup> layer down-of 9)

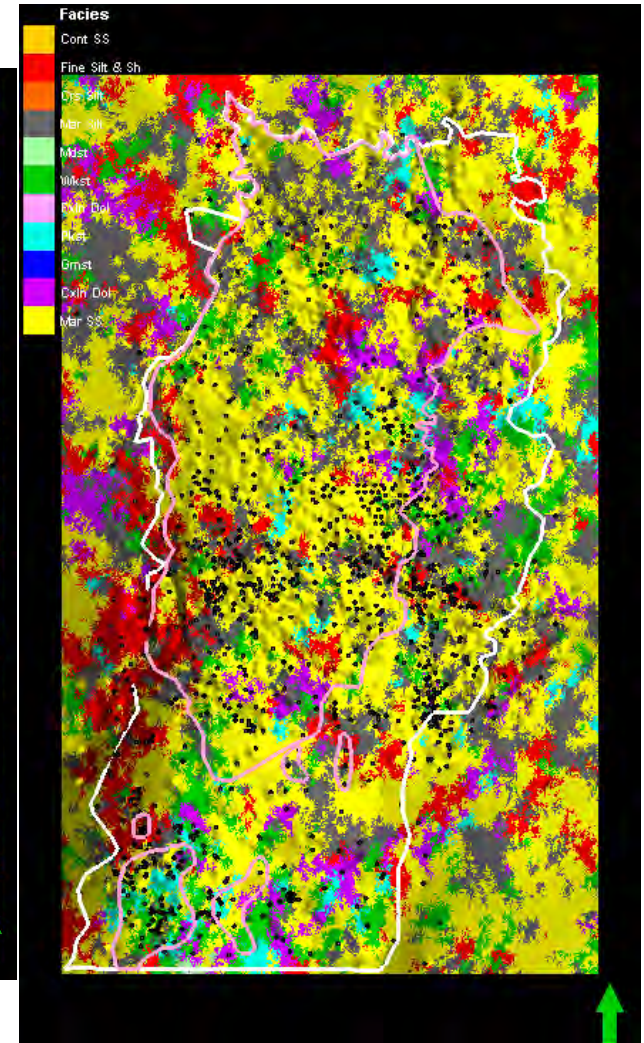
GM4 GM3-Variograms  
(30/25-11, h=7)



Herington k=2  
(2<sup>nd</sup> layer down-of 9)

Cont silt is now marine silt (more appropriate)

GM3GM3-Variograms  
(30/25-11, h=7)



Herington k=2  
(2<sup>nd</sup> layer down-of 9)

# Herington Stats

**Settings for 'Copy of F11\_GM4XE [U]'**

Style Info **Statistics** Disc. Stat Histogram Colors Operations Variogram

For zone: Zone HRNGTN (HRNGTN-WINF)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	1.12	64809	42636	0.4 (1)	2.6 (1.52)	16.8 (7)	1.73
2	Fn Silt & Sh	0.16	9436	7094	0.6 (1)	2.9 (1.33)	15.6 (5)	2.533
3	Mar Silt	35.94	20869...	998066	0.0 (1)	5.4 (2.09)	61.9 (9)	5.198
4	Mdst	9.72	564568	371476	0.0 (1)	4.1 (1.52)	42.9 (9)	3.491
5	Wkst	7.10	412105	297367	0.0 (1)	3.7 (1.39)	46.4 (9)	2.872
6	Fxln Dol	0.76	44161	30147	0.7 (1)	3.7 (1.46)	27.6 (8)	2.59
7	Pkst-Grnst	4.61	267804	175050	0.1 (1)	4.8 (1.53)	39.8 (7)	3.829
9	Mxln Dol	2.10	122118	73544	0.0 (1)	5.7 (1.66)	46.0 (8)	4.692
10	Mar SS	38.49	22350...	913896	0.1 (1)	5.8 (2.45)	56.4 (9)	4.841

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.87	100	72	0.4 (1)	2.8 (1.39)	16.8 (5)	2.085
2	Fn Silt & Sh	0.07	8	6	0.8 (1)	2.1 (1.33)	3.1 (2)	0.8744
3	Mar Silt	35.03	4041	1740	0.9 (1)	6.6 (2.32)	34.3 (9)	5.056
4	Mdst	8.82	1017	578	1.2 (1)	6.1 (1.76)	26.9 (8)	4.854
5	Wkst	5.88	678	451	1.2 (1)	4.7 (1.5)	21.6 (6)	2.966
6	Fxln Dol	0.75	86	68	1.8 (1)	4.4 (1.26)	12.9 (4)	1.959
7	Pkst-Grnst	4.40	508	354	1.2 (1)	4.6 (1.44)	14.6 (5)	2.671
9	Mxln Dol	1.40	162	82	2.0 (1)	6.8 (1.98)	31.7 (6)	5.525
10	Mar SS	42.79	4937	1558	0.4 (1)	8.1 (3.17)	32.0 (9)	5.663

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

**Settings for 'F11\_GM4XE [U]'**

Style Info **Statistics** Disc. Stat Histogram Colors Operations Variogram

For zone: Zone HRNGTN (HRNGTN-WINF)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Co...	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.98	57050	49459	0.4 (1)	2.3 (1.15)	16.8 (5)	1.452
2	Fn Silt & Sh	0.15	8483	7513	0.6 (1)	2.6 (1.13)	13.8 (5)	2.134
3	Mar Silt	35.17	2042239	1192974	0.0 (1)	4.4 (1.71)	51.7 (9)	3.739
4	Mdst	8.64	501704	385148	0.0 (1)	3.9 (1.3)	49.6 (8)	3.194
5	Wkst	5.92	343517	290834	0.0 (1)	3.1 (1.18)	21.6 (7)	1.926
6	Fxln Dol	0.50	29023	26109	0.6 (1)	3.2 (1.11)	13.7 (4)	1.744
7	Pkst-Grnst	4.39	255191	216585	0.0 (1)	3.5 (1.18)	31.7 (6)	2.381
9	Mxln Dol	1.76	102462	80397	0.0 (1)	4.0 (1.27)	36.1 (7)	2.615
10	Mar SS	42.49	2467302	1183515	0.0 (1)	5.0 (2.08)	55.4 (9)	4.295

Statistics for the upscaled cells of the zone:

Co...	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.87	100	72	0.4 (1)	2.8 (1.39)	16.8 (5)	2.085
2	Fn Silt & Sh	0.07	8	6	0.8 (1)	2.1 (1.33)	3.1 (2)	0.8744
3	Mar Silt	35.03	4041	1740	0.9 (1)	6.6 (2.32)	34.3 (9)	5.056
4	Mdst	8.82	1017	578	1.2 (1)	6.1 (1.76)	26.9 (8)	4.854
5	Wkst	5.88	678	451	1.2 (1)	4.7 (1.5)	21.6 (6)	2.966
6	Fxln Dol	0.75	86	68	1.8 (1)	4.4 (1.26)	12.9 (4)	1.959
7	Pkst-Grnst	4.40	508	354	1.2 (1)	4.6 (1.44)	14.6 (5)	2.671
9	Mxln Dol	1.40	162	82	2.0 (1)	6.8 (1.98)	31.7 (6)	5.525
10	Mar SS	42.79	4937	1558	0.4 (1)	8.1 (3.17)	32.0 (9)	5.663

Copy to output sheet:  List 1  List 2  Reset

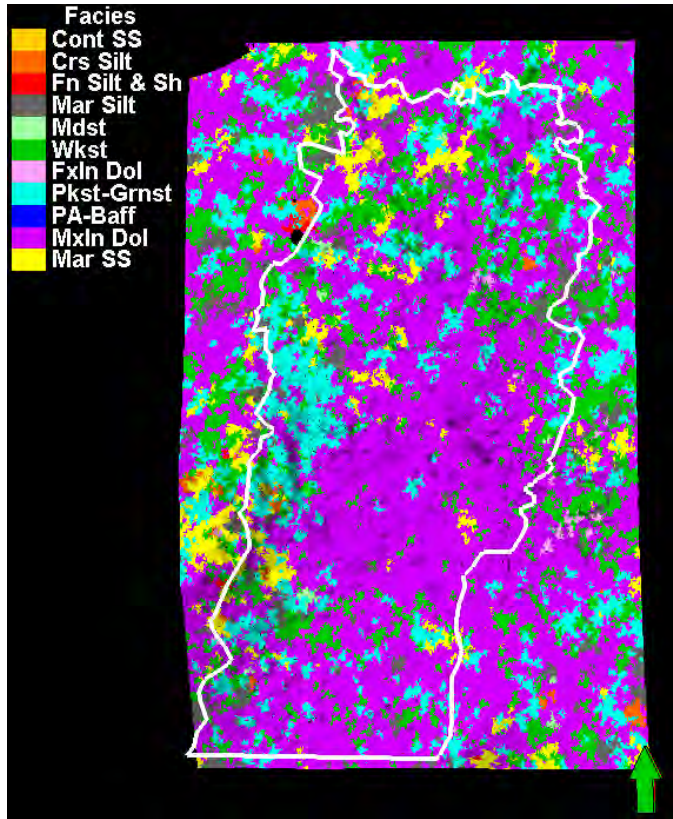
Apply OK Cancel

**Geomod3 Model facies**  
stats  
zone HRNGTN resulting  
facies fractions:

-----  
-----  
Cont SS: 0.00 %  
Fine Silt & Sh: 16.30 %  
Crs Silt: 0.06 %  
Mar Silt: 29.97 %  
Mdst: 3.13 %  
Wkst: 5.20 %  
Fxln Dol: 0.00 %  
Pkst: 1.97 %  
Grnst: 0.00 %  
Cxln Dol: 5.14 %  
Mar SS: 38.22 %

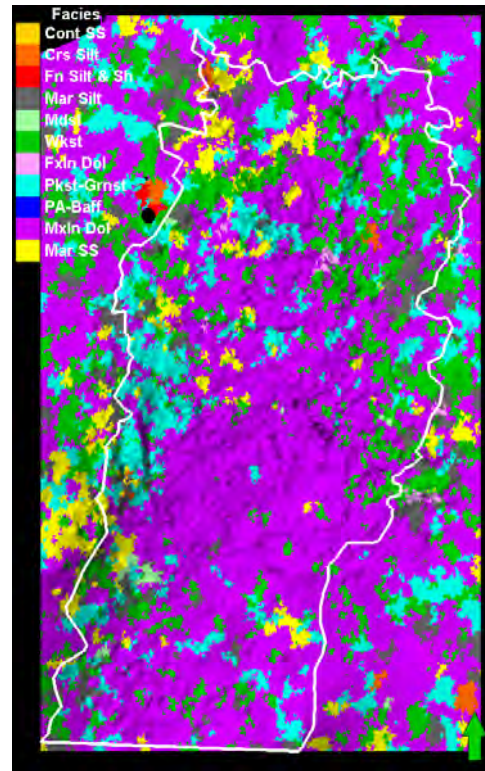
# Krider with varying parameters

GM4 Gf-Variograms  
(27/23-11, h=16)



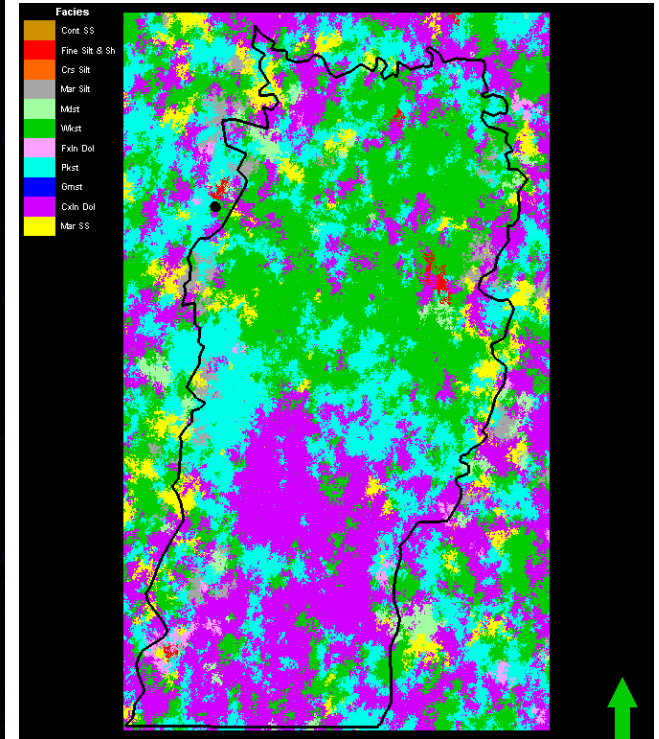
Krider k=14  
(5<sup>th</sup> layer down-of 12)

GM4 GM3-Variograms  
(30/25-11, h=7)



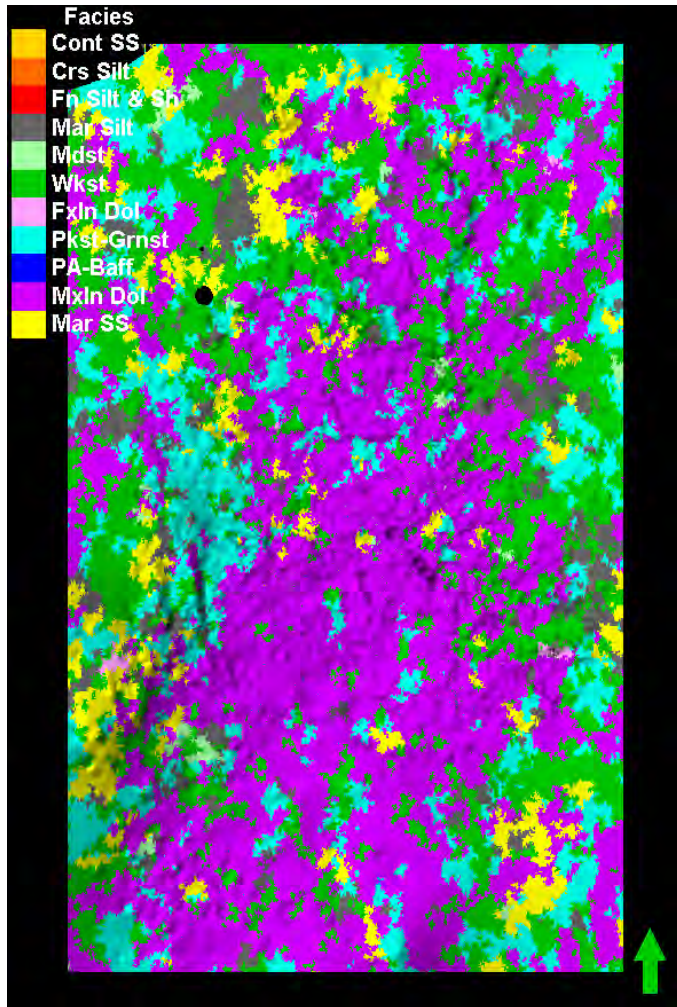
Krider k=14  
(5<sup>th</sup> layer down-of 12)

GM3GM3-Variograms  
(30/25-11, h=7)



Krider k=14  
(5<sup>th</sup> layer down-of 12)

# Modified Krider (the one used)



**Settings for 'F11\_GM4XE [U]'**

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone KRIDER (HRNGTN-WINF)

Min, mean, max and std values are for the interval height  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.00	4	3	1.7 (1)	2.1 (1.33)	3.0 (2)	0.5987
1	Crs Silt	0.00	52	35	0.7 (1)	2.2 (1.49)	5.2 (6)	1.102
2	Fn Silt & Sh	0.00	11	6	1.0 (1)	1.6 (1.83)	2.0 (6)	0.4104
3	Mar Silt	11.60	893833	568380	0.0 (1)	3.7 (1.57)	46.3 (12)	3.598
4	Mdst	2.55	196653	152772	0.0 (1)	3.4 (1.29)	33.8 (7)	3.144
5	Wkst	23.62	1819558	1068976	0.0 (1)	4.1 (1.7)	73.1 (12)	4.462
6	Fxln Dol	0.79	60956	43317	0.0 (1)	4.0 (1.41)	29.7 (6)	3.47
7	Pkst-Grnst	20.74	1597899	840864	0.0 (1)	4.9 (1.9)	82.1 (12)	5.616
9	Mxln Dol	35.90	2765390	1128680	0.0 (1)	7.4 (2.45)	84.7 (12)	8.961
10	Mar SS	4.79	368635	220892	0.0 (1)	3.6 (1.67)	56.7 (12)	4.305

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.03	4	3	1.7 (1)	2.1 (1.33)	3.0 (2)	0.5987
1	Crs Silt	0.33	52	35	0.7 (1)	2.2 (1.49)	5.2 (6)	1.102
2	Fn Silt & Sh	0.07	11	6	1.0 (1)	1.6 (1.83)	2.0 (6)	0.4104
3	Mar Silt	8.10	1260	794	0.3 (1)	3.7 (1.59)	21.3 (12)	2.472
4	Mdst	1.85	288	232	0.5 (1)	3.2 (1.24)	8.5 (4)	1.555
5	Wkst	15.66	2435	1305	0.5 (1)	4.4 (1.87)	31.9 (11)	3.171
6	Fxln Dol	0.68	105	75	1.3 (1)	4.4 (1.4)	14.5 (4)	2.903
7	Pkst-Grnst	16.01	2489	1052	0.7 (1)	6.1 (2.37)	45.0 (12)	5.417
9	Mxln Dol	54.09	8411	1775	0.8 (1)	14.4 (4...)	81.9 (12)	13.58
10	Mar SS	3.19	496	249	0.3 (1)	3.7 (1.99)	13.8 (9)	2.753

Copy to output sheet:  List1  List2  Reset

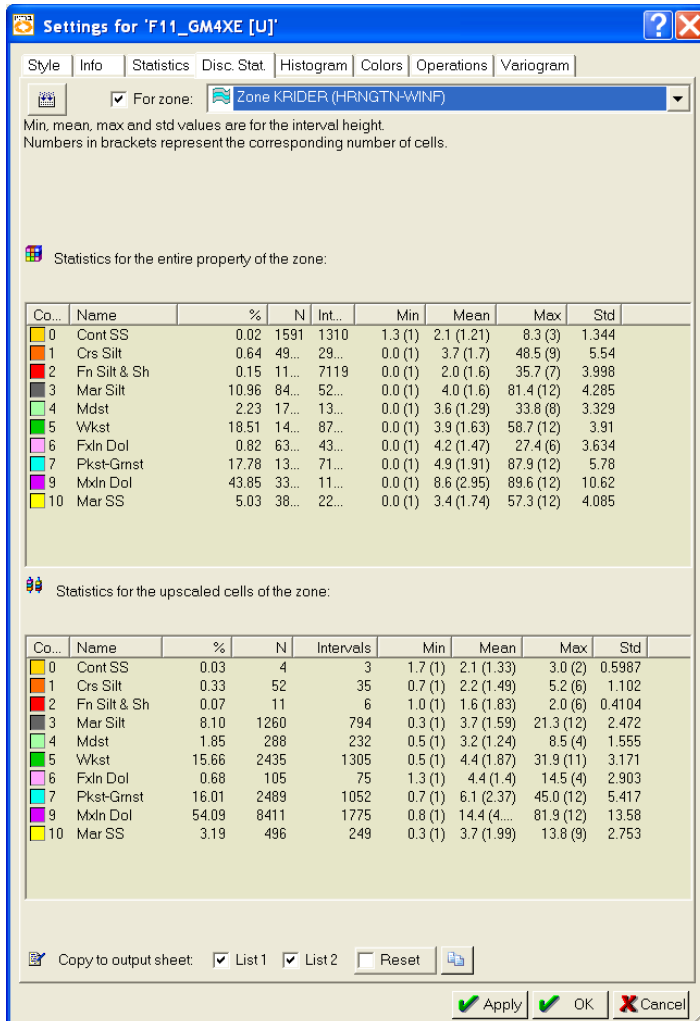
Apply OK Cancel

Krider L5 With very long ranges (50-42), looks much better



# Krider

## GM4 Gf-Variograms (27/23-11, h=16)

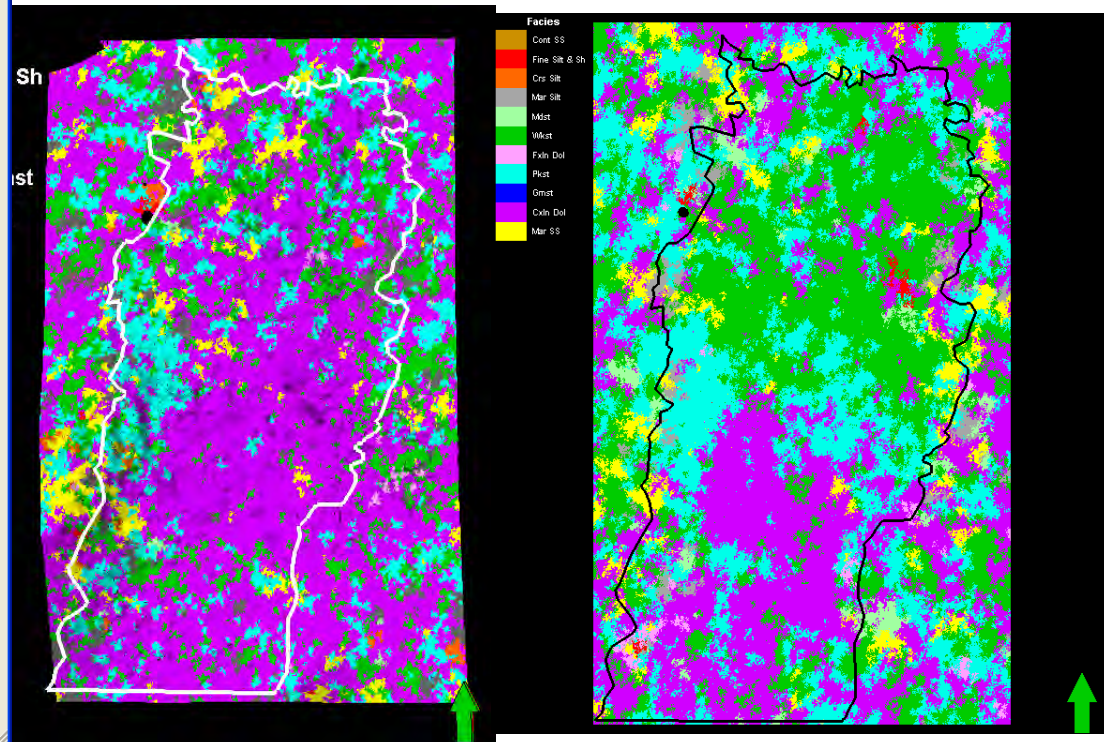


Geomod3  
Zone KRIDER resulting facies fractions:

-----

Cont SS: 0.00 %  
 Fine Silt & Sh: 0.60 %  
 Crs Silt: 0.16 %  
 Mar Silt: 1.17 %  
 Mdst: 8.97 %  
 Wkst: 27.96 %  
 Fxln Dol: 0.41 %  
 Pkst: 28.89 %  
 Grnst: 0.00 %  
 Cxln Dol: 26.62 %  
 Mar SS: 5.22 %

-----



# Krider Stats

GM4 Gf-Variograms  
(27/23-11, h=16)

Settings for 'Copy of F11\_GM4XE [U]'

For zone: Zone KRIDER (HRNGTN-WINF)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.02	1591	1310	1.3 (1)	2.1 (1.21)	8.3 (3)	1.344
1	Crs Silt	0.64	49550	29163	0.0 (1)	3.7 (1.7)	48.5 (9)	5.54
2	Fn Silt & Sh	0.15	11355	7119	0.0 (1)	2.0 (1.6)	35.7 (7)	3.998
3	Mar Silt	10.96	844578	527640	0.0 (1)	4.0 (1.6)	81.4 (12)	4.285
4	Mdst	2.23	172036	133000	0.0 (1)	3.6 (1.29)	33.8 (8)	3.329
5	Wkst	18.51	14261...	875123	0.0 (1)	3.9 (1.63)	58.7 (12)	3.91
6	Fxln Dol	0.82	63365	43145	0.0 (1)	4.2 (1.47)	27.4 (6)	3.634
7	Pkst-Grnst	17.78	13695...	716406	0.0 (1)	4.9 (1.91)	87.9 (12)	5.78
9	Mxln Dol	43.85	33776...	1143135	0.0 (1)	8.6 (2.95)	89.6 (12)	10.62
10	Mar SS	5.03	387143	222504	0.0 (1)	3.4 (1.74)	57.3 (12)	4.085

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.03	4	3	1.7 (1)	2.1 (1.33)	3.0 (2)	0.5987
1	Crs Silt	0.33	52	35	0.7 (1)	2.2 (1.49)	5.2 (6)	1.102
2	Fn Silt & Sh	0.07	11	6	1.0 (1)	1.6 (1.83)	2.0 (6)	0.4104
3	Mar Silt	8.10	1260	794	0.3 (1)	3.7 (1.59)	21.3 (12)	2.472
4	Mdst	1.85	288	232	0.5 (1)	3.2 (1.24)	8.5 (4)	1.555
5	Wkst	15.66	2435	1305	0.5 (1)	4.4 (1.87)	31.9 (11)	3.171
6	Fxln Dol	0.68	105	75	1.3 (1)	4.4 (1.4)	14.5 (4)	2.903
7	Pkst-Grnst	16.01	2489	1052	0.7 (1)	6.1 (2.37)	45.0 (12)	5.417
9	Mxln Dol	54.09	8411	1775	0.8 (1)	14.4 (4....)	81.9 (12)	13.58
10	Mar SS	3.19	496	249	0.3 (1)	3.7 (1.99)	13.8 (9)	2.753

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

GM4 GM3-Variograms  
(30/25-11, h=7)

Settings for 'F11\_GM4XE [U]'

For zone: Zone KRIDER (HRNGTN-WINF)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Co...	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.07	5720	4748	0.1 (1)	1.0 (1.2)	6.0 (4)	0.8166
1	Crs Silt	0.56	42973	33870	0.0 (1)	1.5 (1.27)	15.7 (8)	1.548
2	Fn Silt & Sh	0.12	9245	7254	0.0 (1)	0.8 (1.27)	6.9 (7)	0.8603
3	Mar Silt	9.92	764405	574302	0.0 (1)	3.2 (1.33)	37.8 (12)	2.807
4	Mdst	1.89	145716	124774	0.0 (1)	3.1 (1.17)	28.0 (4)	2.664
5	Wkst	16.84	1297410	932118	0.0 (1)	3.2 (1.39)	48.8 (12)	2.92
6	Fxln Dol	0.62	48017	42842	0.0 (1)	3.2 (1.12)	24.3 (4)	2.665
7	Pkst-Grnst	16.21	1248953	869167	0.0 (1)	3.8 (1.44)	52.5 (12)	3.762
9	Mxln Dol	49.56	3817492	1450744	0.0 (1)	7.7 (2.63)	90.7 (12)	9.906
10	Mar SS	4.19	323060	258309	0.0 (1)	2.4 (1.25)	32.8 (12)	2.238

Statistics for the upscaled cells of the zone:

Co...	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.03	4	3	1.7 (1)	2.1 (1.33)	3.0 (2)	0.5987
1	Crs Silt	0.33	52	35	0.7 (1)	2.2 (1.49)	5.2 (6)	1.102
2	Fn Silt & Sh	0.07	11	6	1.0 (1)	1.6 (1.83)	2.0 (6)	0.4104
3	Mar Silt	8.10	1260	794	0.3 (1)	3.7 (1.59)	21.3 (12)	2.472
4	Mdst	1.85	288	232	0.5 (1)	3.2 (1.24)	8.5 (4)	1.555
5	Wkst	15.66	2435	1305	0.5 (1)	4.4 (1.87)	31.9 (11)	3.171
6	Fxln Dol	0.68	105	75	1.3 (1)	4.4 (1.4)	14.5 (4)	2.903
7	Pkst-Grnst	16.01	2489	1052	0.7 (1)	6.1 (2.37)	45.0 (12)	5.417
9	Mxln Dol	54.09	8411	1775	0.8 (1)	14.4 (4....)	81.9 (12)	13.58
10	Mar SS	3.19	496	249	0.3 (1)	3.7 (1.99)	13.8 (9)	2.753

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

**Geomod3** Model facies  
stats  
Zone KRIDER resulting  
facies fractions:  
-----  
-----  
Cont SS: 0.00 %  
Fine Silt & Sh: 0.00 %  
Crs Silt: 0.00 %  
Mar Silt: 1.19 %  
Mdst: 8.61 %  
Wkst: 27.96 %  
Fxln Dol: 0.40 %  
Pkst: 29.33 %  
Grnst: 0.00 %  
Cxln Dol: 27.31 %  
Mar SS: 5.19 %

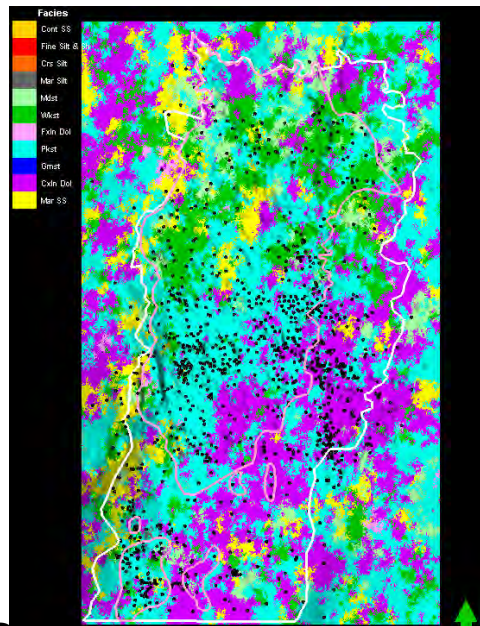
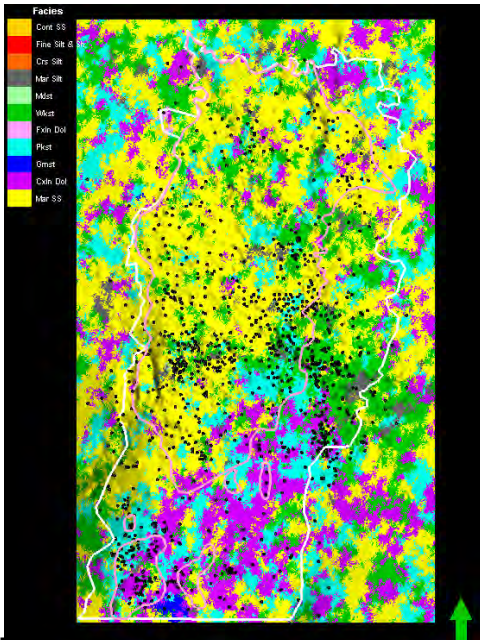
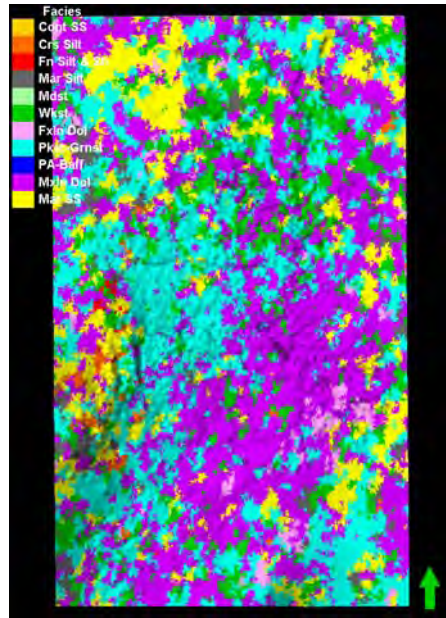
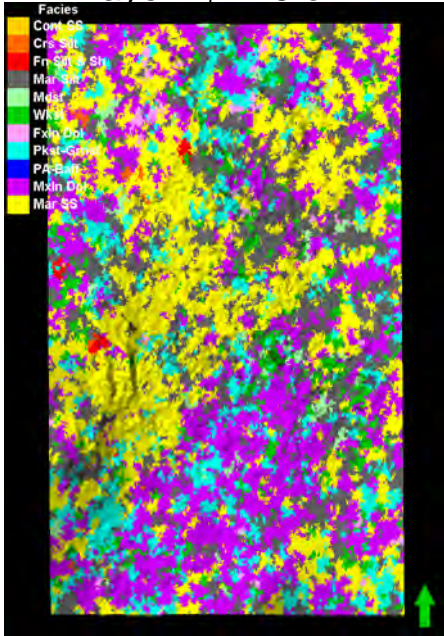
# GM4

# Winfield

# GM4

Winf layer 2, K=3 of Winf-FtRly

Winf layer 8, K=9 of Winf-FtRly



Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone WINF (WINF-FTRLy)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.05	3218	3214	0.9 (1)	3.0 (1)	10.4 (2)	1.178
1	Crs Silt	0.74	52437	39336	0.8 (1)	3.6 (1.33)	24.5 (6)	2.123
2	Fn Silt & Sh	0.27	19399	13838	1.0 (1)	3.7 (1.4)	20.0 (7)	2.105
3	Mar Silt	10.92	775192	529798	0.7 (1)	4.2 (1.46)	48.4 (11)	3.045
4	Mdst	0.49	35117	30585	0.8 (1)	3.2 (1.15)	19.8 (4)	1.905
5	Wkst	10.01	710690	515431	0.7 (1)	3.9 (1.38)	46.6 (9)	2.618
6	Fxln Dol	1.40	99187	70648	0.8 (1)	4.3 (1.4)	31.7 (7)	3.159
7	Pkst-Gmst	20.14	1429641	799133	0.7 (1)	5.5 (1.79)	67.6 (11)	4.813
9	Mxln Dol	32.38	2297925	1015994	0.7 (1)	6.9 (2.26)	67.4 (11)	6.811
10	Mar SS	23.59	1674603	878035	0.7 (1)	5.4 (1.91)	53.1 (11)	4.641

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.04	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.67	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.16	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	10.84	1547	1055	0.9 (1)	4.1 (1.47)	15.3 (6)	2.203
4	Mdst	0.58	83	76	1.5 (1)	3.3 (1.09)	6.9 (2)	1.092
5	Wkst	10.05	1434	882	0.9 (1)	4.5 (1.63)	20.3 (9)	2.67
6	Fxln Dol	0.92	132	99	1.3 (1)	4.1 (1.33)	21.4 (5)	3.019
7	Pkst-Gmst	20.39	2910	1221	1.3 (1)	7.2 (2.38)	34.4 (11)	5.709
9	Mxln Dol	36.85	5260	1465	1.3 (1)	11.5 (3...)	51.7 (11)	10.05
10	Mar SS	19.50	2784	1217	1.0 (1)	6.9 (2.29)	40.1 (9)	5.213

Copy to output sheet | List 1 | List 2 | Reset

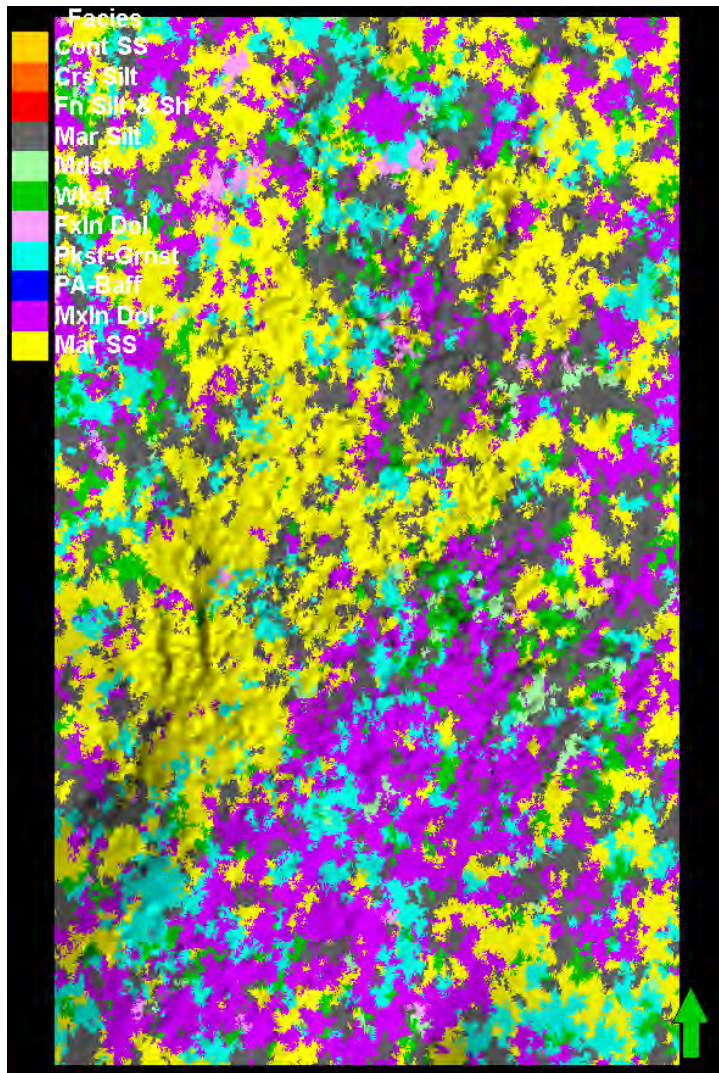
Apply | OK | Cancel

## Geomod3 Model facies stats

Zone WINF resulting facies fractions:

- Cont SS: 0.00 %
- Fine Silt & Sh: 0.00 %
- Crs Silt: 0.00 %
- Mar Silt: 1.56 %
- Mdst: 5.95 %
- Wkst: 14.24 %
- Fxln Dol: 0.20 %
- Pkst: 28.74 %
- Gmst: 0.03 %
- Cxln Dol: 21.65 %
- Mar SS: 27.62 %

# Modified Winfield (version 1 (after proportions, before ranges adjustment))



**Settings for 'F11\_GM4XE [U]'**

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: **Zone WINF (WINF-FTRLY)**

Min, mean, max and std values are for the interval height  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.00	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.00	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.00	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	11.61	824194	558758	0.7 (1)	4.2 (1.48)	47.3 (11)	3.02
4	Mdst	0.46	32608	29367	0.8 (1)	3.6 (1.11)	19.8 (4)	2.039
5	Wkst	11.10	787836	560763	0.7 (1)	4.0 (1.4)	38.8 (10)	2.729
6	Fxln Dol	1.37	96971	69480	0.8 (1)	4.1 (1.4)	31.7 (7)	3.004
7	Pkst-Grnst	20.96	1487876	828454	0.7 (1)	5.5 (1.8)	67.9 (11)	4.886
9	Mxln Dol	29.45	2089981	956648	0.7 (1)	6.7 (2.18)	67.3 (11)	6.545
10	Mar SS	25.05	1777819	914134	0.7 (1)	5.6 (1.94)	57.9 (11)	4.809

Statistics for the upscaled cells of the zone:

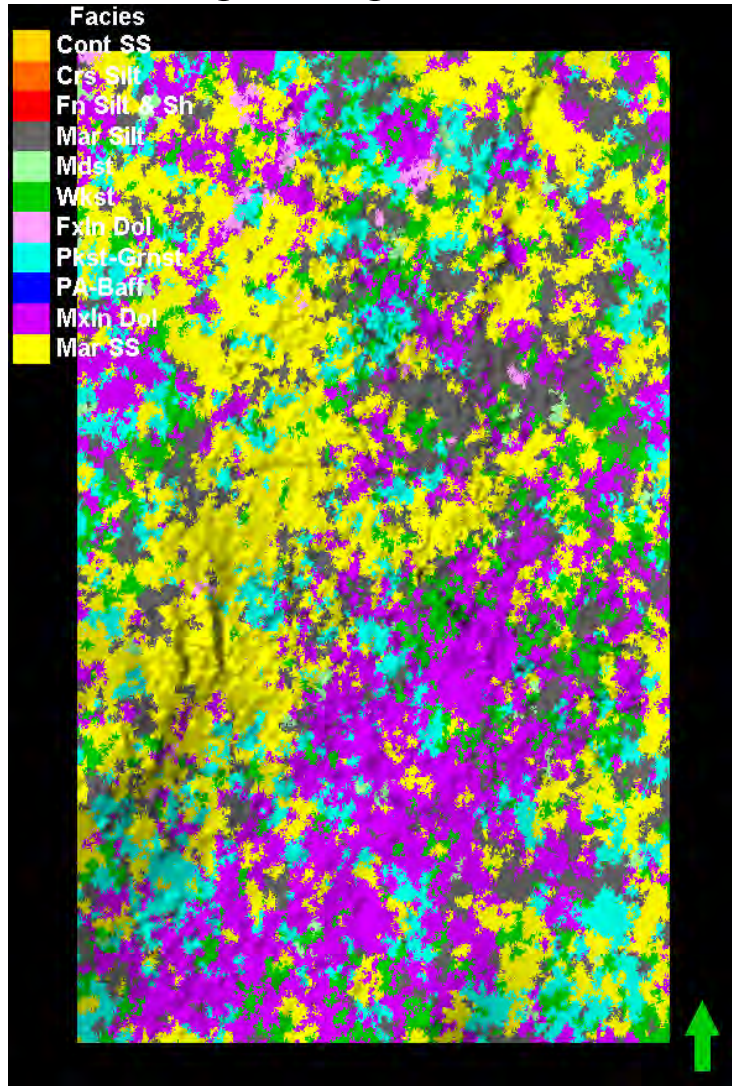
Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.04	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.67	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.16	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	10.84	1547	1055	0.9 (1)	4.1 (1.47)	15.3 (6)	2.203
4	Mdst	0.58	83	76	1.5 (1)	3.3 (1.09)	6.9 (2)	1.092
5	Wkst	10.05	1434	882	0.9 (1)	4.5 (1.63)	20.3 (9)	2.67
6	Fxln Dol	0.92	132	99	1.3 (1)	4.1 (1.33)	21.4 (5)	3.019
7	Pkst-Grnst	20.39	2910	1221	1.3 (1)	7.2 (2.38)	34.4 (11)	5.709
9	Mxln Dol	36.85	5260	1465	1.3 (1)	11.5 (3....)	51.7 (11)	10.05
10	Mar SS	19.50	2784	1217	1.0 (1)	6.9 (2.29)	40.1 (9)	5.213

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

Not much different. Reduce more

Winfield next try better (more proportion adjustment), but need to change ranges like in Krider



**Settings for 'F11\_GM4XE [U]'**

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: **Zone WINF (WINF-FTRLY)**

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.00	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.00	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.00	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	11.86	841906	570855	0.7 (1)	4.2 (1.47)	47.3 (11)	3.077
4	Mdst	0.47	33467	29729	0.8 (1)	3.2 (1.13)	19.8 (4)	1.566
5	Wkst	11.55	820092	579706	0.7 (1)	4.0 (1.41)	41.4 (10)	2.798
6	Fxln Dol	1.21	85769	61981	0.8 (1)	4.3 (1.38)	31.7 (7)	3.149
7	Pkst-Grnst	21.86	1551524	853009	0.7 (1)	5.5 (1.82)	67.8 (11)	4.984
9	Mxln Dol	27.42	1946081	897632	0.7 (1)	6.7 (2.17)	64.0 (11)	6.535
10	Mar SS	25.62	1818446	930891	0.7 (1)	5.6 (1.95)	60.1 (11)	4.806

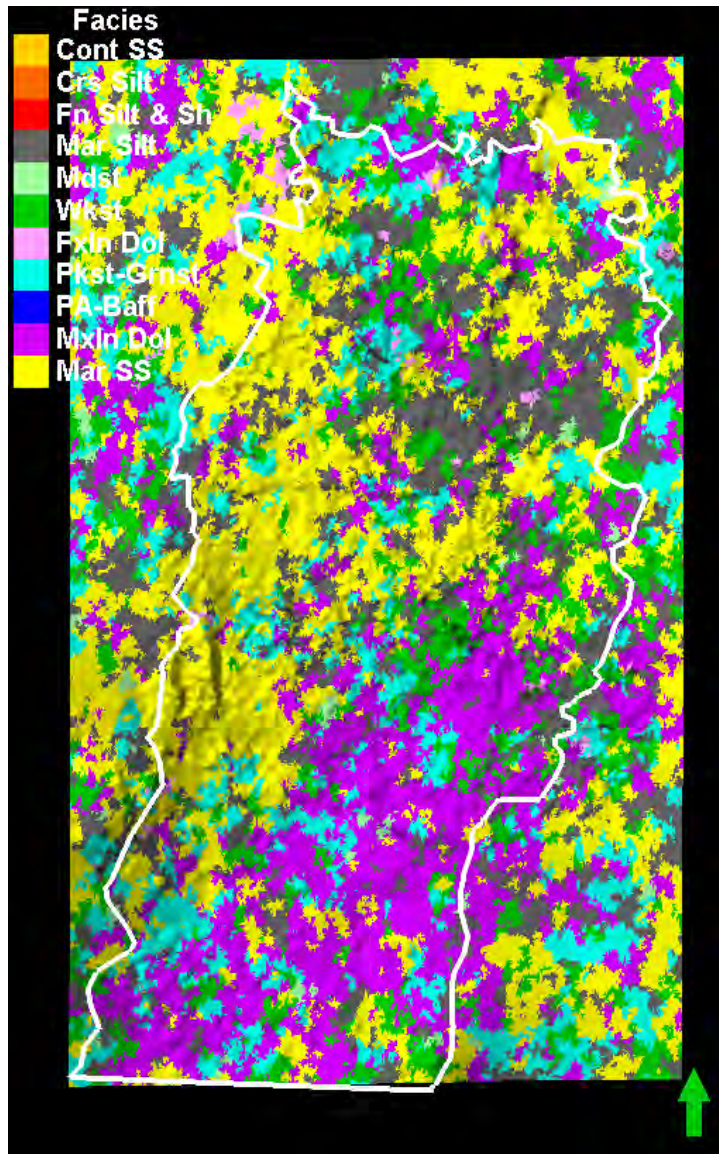
Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.04	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.67	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.16	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	10.84	1547	1055	0.9 (1)	4.1 (1.47)	15.3 (6)	2.203
4	Mdst	0.58	83	76	1.5 (1)	3.3 (1.09)	6.9 (2)	1.092
5	Wkst	10.05	1434	882	0.9 (1)	4.5 (1.63)	20.3 (9)	2.67
6	Fxln Dol	0.92	132	99	1.3 (1)	4.1 (1.33)	21.4 (5)	3.019
7	Pkst-Grnst	20.39	2910	1221	1.3 (1)	7.2 (2.38)	34.4 (11)	5.709
9	Mxln Dol	36.85	5260	1465	1.3 (1)	11.5 (3...)	51.7 (11)	10.05
10	Mar SS	19.50	2784	1217	1.0 (1)	6.9 (2.29)	40.1 (9)	5.213

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

# Winfield with new proportions and new "Krider" ranges (used this one)



Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone WINF (WINF-FTRLY)

Min, mean, max and std values are for the interval height  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.00	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.00	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.00	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	13.80	979425	639956	0.7 (1)	4.4 (1.53)	57.2 (11)	3.2
4	Mdst	0.69	48919	41747	0.8 (1)	3.2 (1.17)	19.8 (5)	1.673
5	Wkst	13.12	930873	641206	0.7 (1)	4.1 (1.45)	42.6 (11)	2.84
6	Fxln Dol	1.26	89345	63985	0.8 (1)	4.4 (1.4)	34.8 (9)	3.167
7	Pkst-Grnst	21.49	1525423	831375	0.7 (1)	5.6 (1.83)	66.0 (11)	5.014
9	Mxln Dol	24.56	1743158	855236	0.7 (1)	6.4 (2.04)	57.2 (11)	6.141
10	Mar SS	25.08	1780142	904282	0.7 (1)	5.6 (1.97)	53.0 (11)	4.744

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.04	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.67	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.16	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	10.84	1547	1055	0.9 (1)	4.1 (1.47)	15.3 (6)	2.203
4	Mdst	0.58	83	76	1.5 (1)	3.3 (1.09)	6.9 (2)	1.092
5	Wkst	10.05	1434	882	0.9 (1)	4.5 (1.63)	20.3 (9)	2.67
6	Fxln Dol	0.92	132	99	1.3 (1)	4.1 (1.33)	21.4 (5)	3.019
7	Pkst-Grnst	20.39	2910	1221	1.3 (1)	7.2 (2.38)	34.4 (11)	5.709
9	Mxln Dol	36.85	5260	1465	1.3 (1)	11.5 (3...)	51.7 (11)	10.05
10	Mar SS	19.50	2784	1217	1.0 (1)	6.9 (2.29)	40.1 (9)	5.213

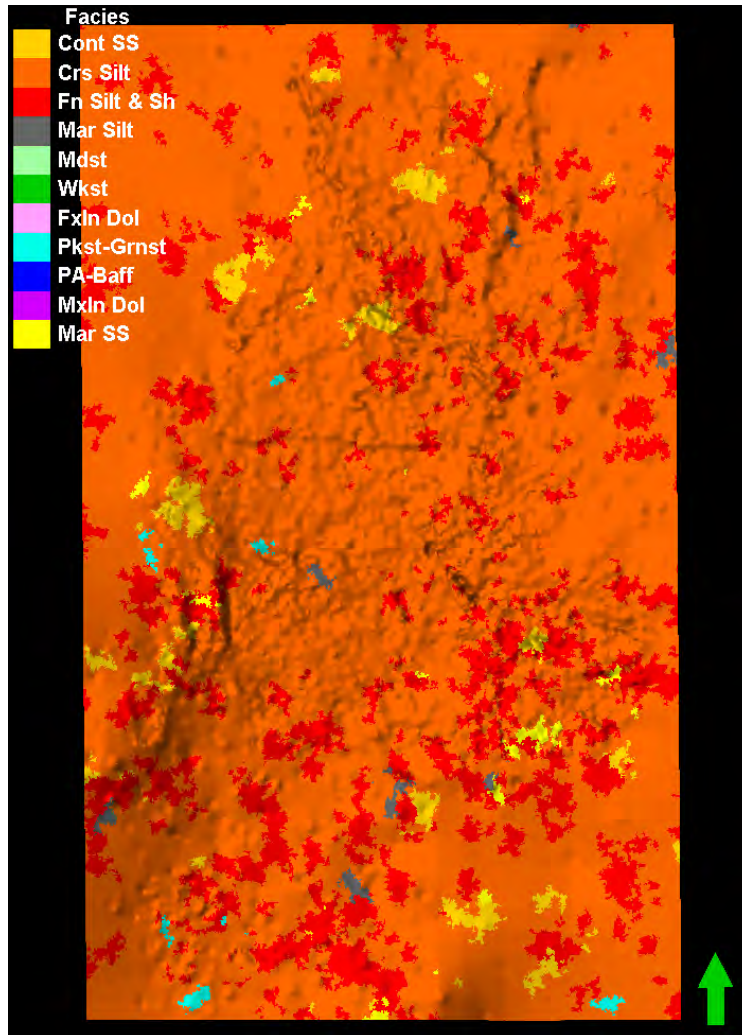
Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

Better overall stats. Maybe a little too much F10 I like it.

# Gage

GM4



Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone GAGE (WINF-FTRLY)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	7.05	272757	192972	0.7 (1)	7.4 (1.41)	50.3 (6)	5.202
1	Crs Silt	84.34	3264990	824582	0.1 (1)	19.5 (3...)	65.8 (6)	12.97
2	Fn Silt & Sh	8.06	312137	229695	0.1 (1)	5.7 (1.36)	42.3 (6)	3.926
3	Mar Silt	0.10	3951	3649	1.2 (1)	5.2 (1.08)	20.5 (3)	3.383
5	Wkst	0.05	1885	1701	2.2 (1)	5.3 (1.11)	16.0 (2)	2.218
7	Pkst-Grnst	0.10	3935	3585	0.9 (1)	4.6 (1.1)	14.0 (3)	2.498
10	Mar SS	0.30	11659	9595	1.3 (1)	5.1 (1.22)	29.7 (6)	3.301

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	4.42	344	259	1.5 (1)	6.8 (1.33)	28.5 (4)	4.321
1	Crs Silt	86.83	6752	1517	0.6 (1)	20.2 (4...)	60.0 (6)	11.46
2	Fn Silt & Sh	8.26	642	441	0.6 (1)	4.4 (1.46)	13.8 (6)	2.115
3	Mar Silt	0.09	7	7	2.5 (1)	4.3 (1)	6.8 (1)	1.599
5	Wkst	0.05	4	2	5.7 (2)	5.7 (2)	5.7 (2)	3.81...
7	Pkst-Grnst	0.14	11	10	1.3 (1)	4.8 (1.1)	10.3 (2)	2.593
10	Mar SS	0.21	16	16	1.5 (1)	4.5 (1)	7.9 (1)	2.162

Copy to output sheet | List 1 | List 2 | Reset

Apply | OK | Cancel

## Geomod3 Model facies stats

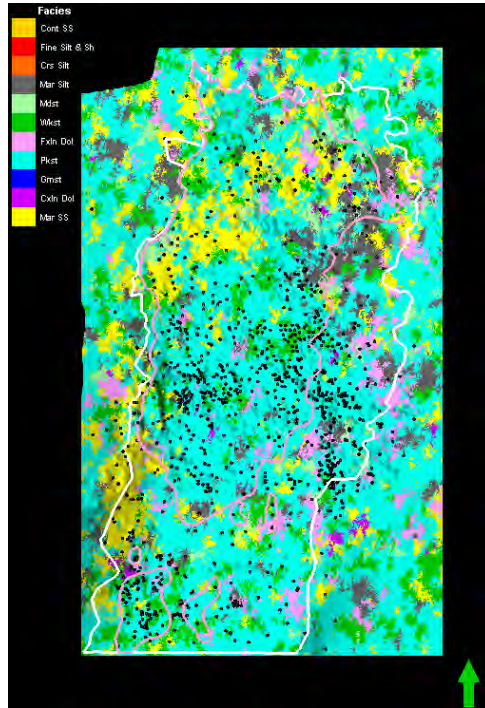
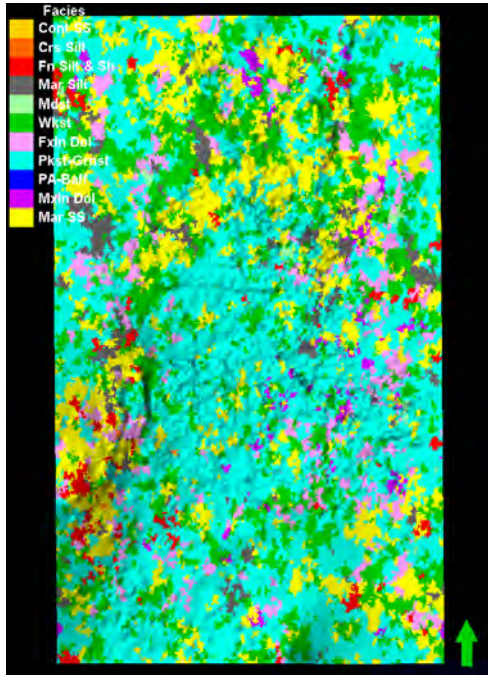
Zone GAGE resulting facies fractions:

-----

Cont SS: 0.11 %  
 Fine Silt & Sh: 98.33 %  
 Crs Silt: 0.68 %  
 Mar Silt: 0.39 %  
 Mdst: 0.00 %  
 Wkst: 0.00 %  
 Fxln Dol: 0.00 %  
 Pkst: 0.00 %  
 Grnst: 0.00 %  
 Cxln Dol: 0.00 %  
 Mar SS: 0.49 %

# Towanda GM3

GM4



Twnd 6, K=24 of Winf-FtRly

Twnd 6, K=24 of Winf-FtRly

Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone TWND (WINF-FTRLY)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.20	18429	12077	0.1 (1)	4.1 (1.53)	24.3 (7)	3.613
1	Crs Silt	0.09	8291	6369	0.5 (1)	2.5 (1.3)	16.6 (5)	1.833
2	Fn Silt & Sh	2.37	214350	140350	0.0 (1)	3.3 (1.53)	38.8 (10)	3.066
3	Mar Silt	3.88	350718	239345	0.0 (1)	3.3 (1.47)	37.4 (9)	2.945
4	Mdst	2.48	223820	168265	0.0 (1)	3.4 (1.33)	29.2 (7)	2.493
5	Wkst	20.89	1886729	1100283	0.0 (1)	4.3 (1.71)	53.8 (14)	4.05
6	Fxln Dol	4.36	393620	243723	0.0 (1)	4.3 (1.62)	36.9 (11)	3.705
7	Pkst-Grnst	43.12	3894606	1430107	0.0 (1)	7.5 (2.72)	72.1 (14)	8.23
9	Mxln Dol	2.91	263265	173639	0.0 (1)	4.4 (1.52)	38.6 (11)	3.382
10	Mar SS	19.70	1779151	913074	0.0 (1)	4.6 (1.95)	75.4 (14)	4.313

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.15	28	23	0.7 (1)	3.1 (1.22)	8.7 (2)	1.862
1	Crs Silt	0.12	22	18	0.7 (1)	2.6 (1.22)	4.1 (2)	1.006
2	Fn Silt & Sh	1.80	326	229	0.6 (1)	3.7 (1.42)	22.6 (6)	2.743
3	Mar Silt	2.57	465	370	0.6 (1)	2.8 (1.26)	10.0 (7)	1.461
4	Mdst	1.96	356	269	0.6 (1)	3.8 (1.32)	16.5 (5)	2.502
5	Wkst	18.40	3335	1696	0.4 (1)	5.4 (1.97)	42.8 (14)	4.703
6	Fxln Dol	3.88	703	424	0.7 (1)	5.0 (1.66)	29.7 (8)	3.865
7	Pkst-Grnst	49.97	9056	2105	0.4 (1)	12.8 (4.3)	57.9 (14)	11.25
9	Mxln Dol	2.69	488	308	2.0 (1)	5.6 (1.58)	37.6 (11)	3.817
10	Mar SS	18.45	3344	1373	0.6 (1)	6.2 (2.44)	32.6 (14)	4.595

Copy to output sheet | List 1 | List 2 | Reset

Apply | OK | Cancel

### Geomod3 Model facies stats

Zone TWND resulting facies fractions:

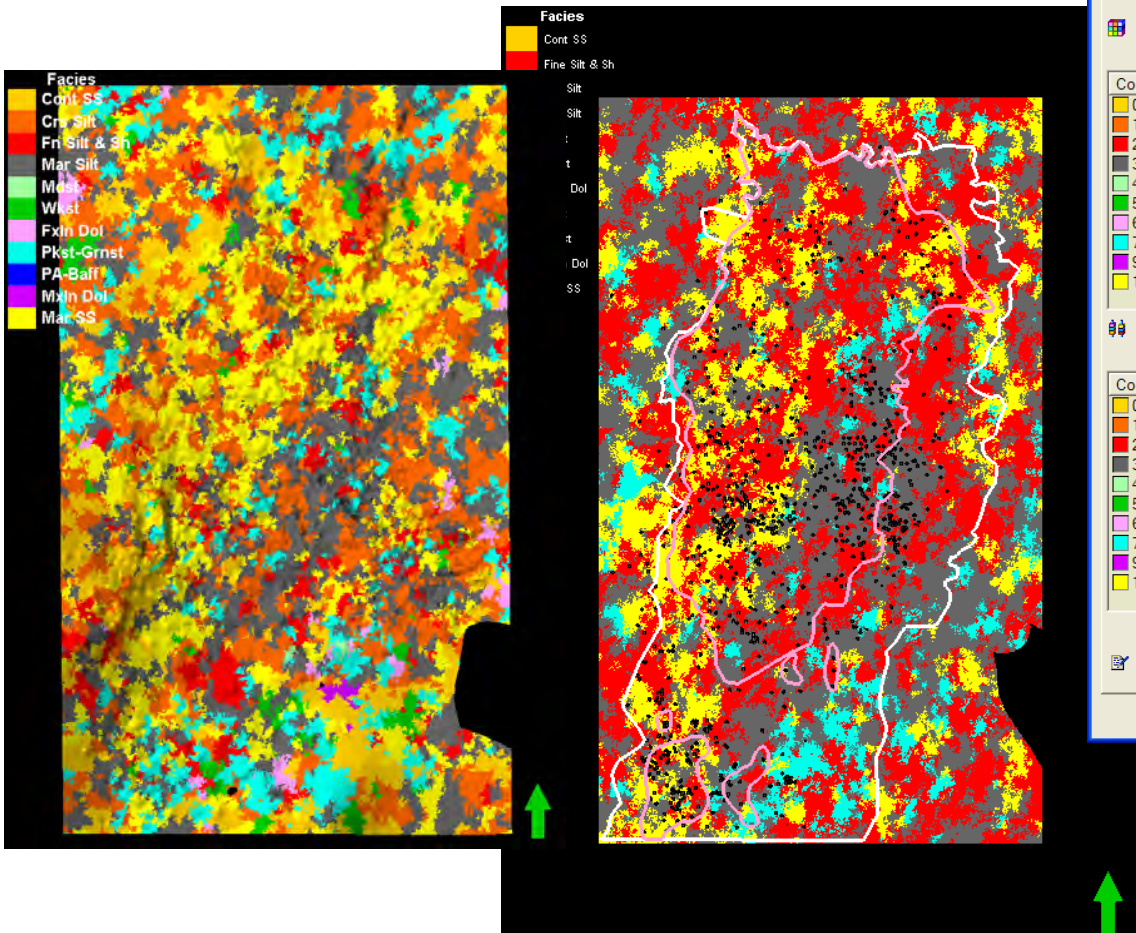
-----  
 Cont SS: 0.00 %  
 Fine Silt & Sh: 0.00 %  
 Crs Silt: 0.00 %  
 Mar Silt: 10.98 %  
 Mdst: 8.56 %  
 Wkst: 12.14 %  
 Fxln Dol: 4.35 %  
 Pkst: 46.91 %  
 Grnst: 0.00 %  
 Cxln Dol: 0.88 %  
 Mar SS: 16.18 %



# B/Twnd

GM4

GM3



**Settings for 'F11\_GM4XE [U]'**

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: **Zone B/TWND (WINF-FTRLY)**

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	25.70	651268	436232	0.0 (1)	7.1 (1.49)	55.3 (4)	5.613
1	Crs Silt	34.74	880191	530169	0.0 (1)	7.9 (1.66)	57.3 (4)	6.278
2	Fn Silt & Sh	3.71	94053	80237	0.0 (1)	5.1 (1.17)	28.0 (4)	3.631
3	Mar Silt	16.22	410935	330890	0.0 (1)	5.3 (1.24)	48.7 (4)	4.133
4	Mdst	0.26	6673	6160	0.2 (1)	4.4 (1.08)	18.6 (2)	3.664
5	Wkst	2.88	73090	64577	0.0 (1)	3.9 (1.13)	31.7 (4)	2.952
6	Fxln Dol	0.45	11482	10434	0.0 (1)	3.0 (1.1)	10.0 (3)	2.099
7	Pkst-Grnst	7.03	178082	142199	0.0 (1)	4.6 (1.25)	48.6 (4)	3.377
9	Mxdn Dol	0.14	3557	2771	0.0 (1)	1.6 (1.28)	6.5 (3)	1.008
10	Mar SS	8.87	224680	182686	0.0 (1)	6.3 (1.23)	38.7 (4)	4.169

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	19.16	989	753	0.3 (1)	6.0 (1.31)	32.5 (4)	3.601
1	Crs Silt	41.29	2131	1162	0.3 (1)	7.8 (1.83)	41.4 (4)	5.276
2	Fn Silt & Sh	4.22	218	196	0.4 (1)	4.3 (1.11)	18.8 (3)	2.707
3	Mar Silt	15.07	778	696	0.3 (1)	3.9 (1.12)	19.5 (4)	2.379
4	Mdst	0.17	9	7	1.0 (1)	2.8 (1.29)	7.0 (2)	2.034
5	Wkst	2.09	108	87	0.7 (1)	3.9 (1.24)	11.5 (4)	2.687
6	Fxln Dol	0.50	26	25	0.6 (1)	2.5 (1.04)	7.2 (2)	1.42
7	Pkst-Grnst	6.96	359	246	0.7 (1)	3.9 (1.46)	15.9 (4)	2.298
9	Mxdn Dol	0.10	5	3	1.2 (1)	2.4 (1.67)	4.5 (3)	1.491
10	Mar SS	10.42	538	440	0.3 (1)	6.3 (1.22)	37.8 (4)	3.861

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

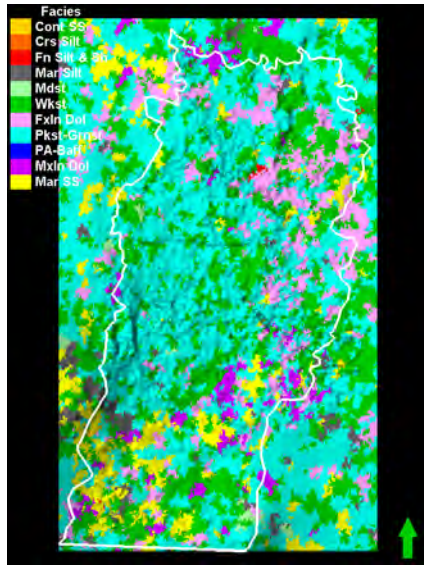
**Geomod3 Model facies stats**  
 Zone B/TWND resulting facies fractions:

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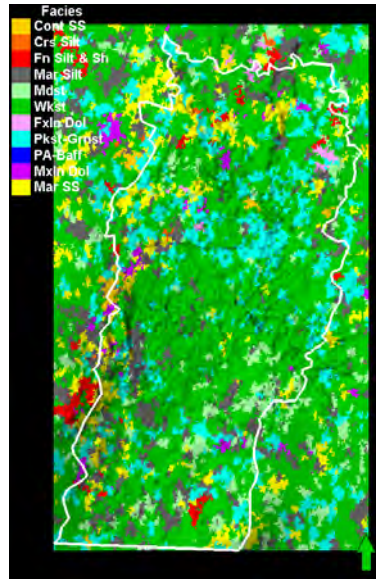
Cont SS: 0.18 %  
 Fine Silt & Sh: 65.33 %  
 Crs Silt: 0.00 %  
 Mar Silt: 14.88 %  
 Mdst: 0.00 %  
 Wkst: 0.00 %  
 Fxln Dol: 0.00 %  
 Pkst: 6.11 %  
 Grnst: 0.00 %  
 Cxln Dol: 0.00 %  
 Mar SS: 13.50 %

# FtRiley

GM4



GM4



Ftrly 7, K=9 of FtRly-A1sh

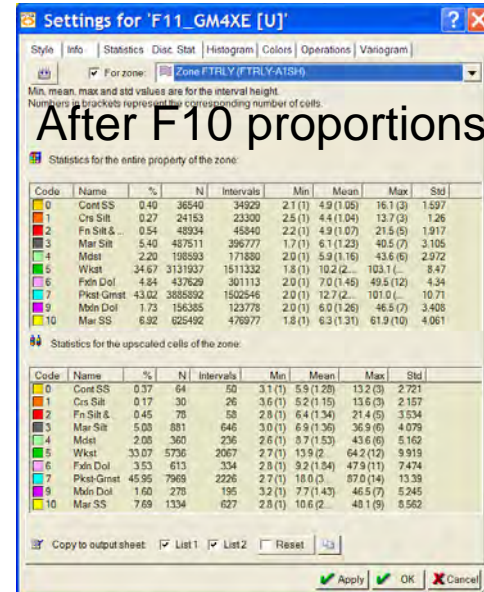
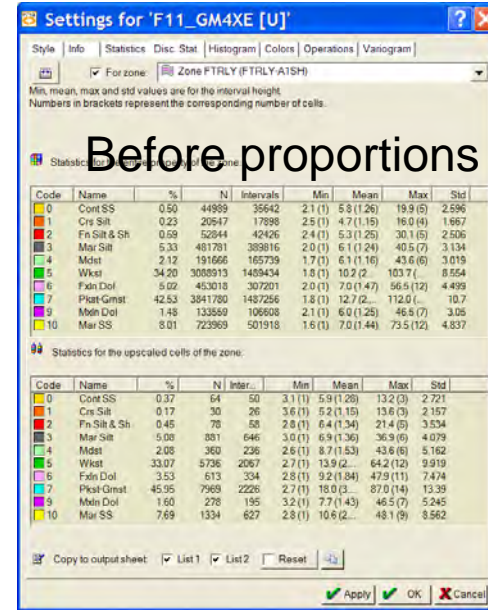
Ftrly 12, K=14 of FtRly-A1sh

Ftrly improved overall w/ more wkst in lower part. Reduced ss proportions slightly and re ran. Not much changed, but slightly better

## Geomod3 Model facies stats

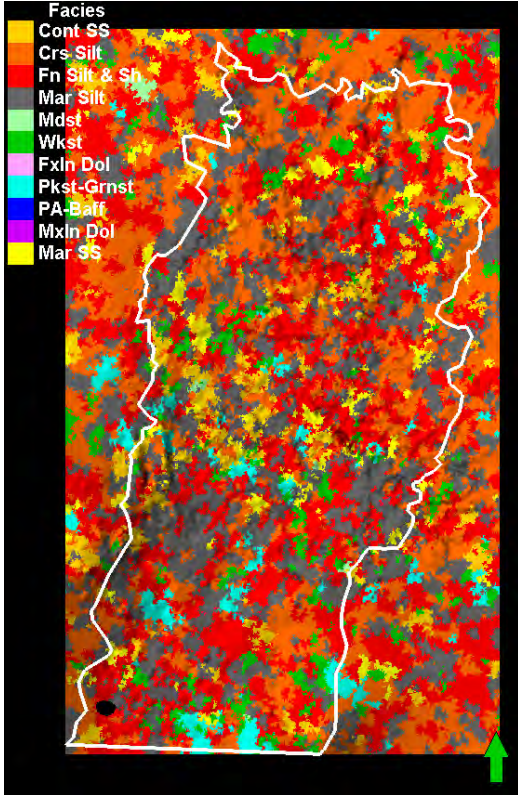
Zone FTRLY resulting facies fractions:

- Cont SS: 0.00 %
- Fine Silt & Sh: 0.00 %
- Crs Silt: 0.00 %
- Mar Silt: 7.09 %
- Mdst: 14.26 %
- Wkst: 11.62 %
- Fxln Dol: 6.04 %
- Pkst: 49.57 %
- Grnst: 0.01 %
- Cxln Dol: 0.39 %
- Mar SS: 11.02 %



# Matfield

GM4



**Geomod3 Model facies stats**  
 Zone MATFIELD resulting facies fractions:

---

Cont SS: 0.00 %  
 Fine Silt & Sh: 84.95 %  
 Crs Silt: 1.90 %  
 Mar Silt: 12.12 %  
 MdSt: 0.00 %  
 Wkst: 0.00 %  
 FxIn Dol: 0.00 %  
 Pkst: 0.00 %  
 Grnst: 0.00 %  
 CxIn Dol: 0.00 %  
 Mar SS: 1.04 %

Top Layer looks same

**Settings for 'F11\_GM4XE [U]'**

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone MATFIELD (FTRLY-A1SH)

Min, mean, max and std values are for the interval height.  
 Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	1.93	62220	52417	1.2 (1)	5.4 (1.19)	28.0 (4)	2.94
1	Crs Silt	63.63	2051194	766057	0.0 (1)	10.8 (2...)	42.0 (5)	6.689
2	Fn Silt & Sh	19.92	642103	427841	0.0 (1)	5.7 (1.5)	34.4 (5)	3.682
3	Mar Silt	10.17	327916	253814	0.0 (1)	5.3 (1.29)	29.3 (4)	2.867
4	MdSt	0.11	3569	3070	1.8 (1)	5.2 (1.16)	11.6 (2)	2.468
5	Wkst	1.68	54163	50026	0.9 (1)	4.2 (1.08)	17.1 (4)	1.861
7	Pkst-Grnst	1.22	39441	31849	0.9 (1)	4.2 (1.24)	22.6 (4)	2.127
9	MxIn Dol	0.02	765	556	1.6 (1)	3.8 (1.38)	11.6 (4)	2.079
10	Mar SS	1.31	42294	35191	1.3 (1)	4.7 (1.2)	31.8 (4)	2.441

Statistics for the upscaled cells of the zone:

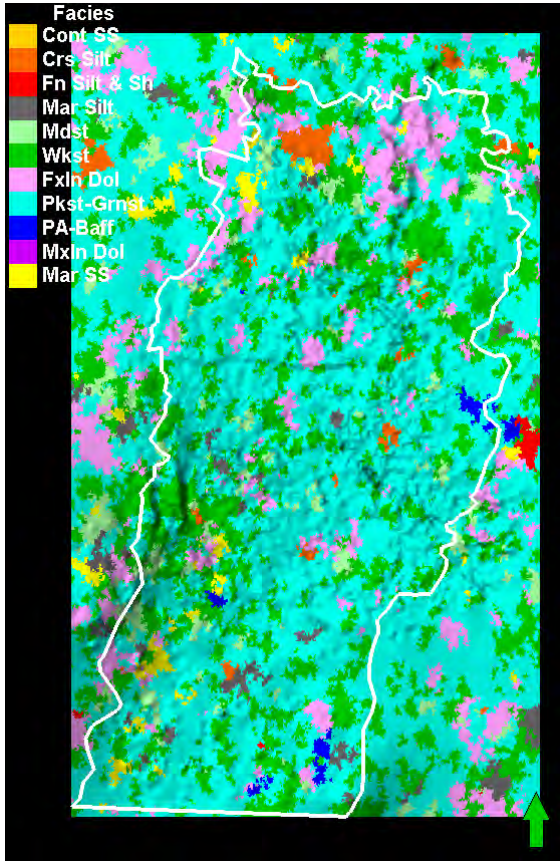
Code	Name	%	N	Inter...	Min	Mean	Max	Std
0	Cont SS	1.97	118	112	1.8 (1)	4.9 (1.05)	13.3 (2)	1.588
1	Crs Silt	62.78	3751	1236	1.4 (1)	12.0 (3...)	33.9 (5)	5.251
2	Fn Silt & Sh	20.59	1230	840	1.4 (1)	5.3 (1.46)	22.1 (5)	2.88
3	Mar Silt	11.30	675	550	1.5 (1)	4.9 (1.23)	14.4 (2)	2.161
4	MdSt	0.05	3	3	2.8 (1)	3.4 (1)	3.9 (1)	0.454
5	Wkst	1.29	77	75	1.6 (1)	3.4 (1.03)	7.6 (2)	1.004
7	Pkst-Grnst	0.72	43	40	1.4 (1)	3.7 (1.08)	6.4 (2)	1.168
9	MxIn Dol	0.05	3	1	7.2 (3)	7.2 (3)	7.2 (3)	0
10	Mar SS	1.26	75	68	2.0 (1)	4.6 (1.1)	23.3 (3)	2.739

Copy to output sheet  List 1  List 2  Reset

Apply  OK  Cancel

# Wreford

GM4



Layer looks similar.  
May want to eliminate  
F1-2

Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone WREFORD (FTRL-A1SH)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.03	1477	984	2.1 (1)	3.8 (1.5)	12.6 (5)	2.424
1	Crs Silt	1.44	74336	52282	0.3 (1)	3.9 (1.42)	24.1 (7)	2.553
2	Fn Silt & Sh	1.44	74110	54774	0.2 (1)	3.7 (1.35)	26.8 (7)	2.545
3	Mar Silt	9.95	513343	355234	0.1 (1)	4.0 (1.45)	37.8 (8)	2.931
4	Mdst	1.10	56529	46565	0.1 (1)	3.1 (1.21)	15.7 (4)	1.803
5	Wkst	46.14	2381839	1033552	0.1 (1)	6.3 (2.3)	46.7 (8)	5.232
6	Fxln Dol	7.10	366266	239590	0.1 (1)	4.1 (1.53)	29.8 (8)	2.881
7	Pkst-Grnst	30.30	1563885	870040	0.1 (1)	5.0 (1.8)	42.1 (8)	3.827
8	PA-Baff	1.43	74009	53438	0.3 (1)	4.4 (1.38)	37.5 (8)	3.11
10	Mar SS	1.08	55958	39944	0.1 (1)	3.7 (1.4)	26.2 (6)	2.423

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Inter...	Min	Mean	Max	Std
0	Cont SS	0.02	2	2	2.4 (1)	3.3 (1)	4.1 (1)	0.8486
1	Crs Silt	0.72	69	62	1.1 (1)	3.0 (1.11)	8.9 (3)	1.246
2	Fn Silt & Sh	0.91	87	87	1.3 (1)	2.6 (1)	4.5 (1)	0.6682
3	Mar Silt	10.07	960	673	0.7 (1)	4.0 (1.43)	17.3 (6)	2.138
4	Mdst	0.85	81	72	0.7 (1)	2.8 (1.13)	10.5 (4)	1.641
5	Wkst	46.15	4398	1741	1.0 (1)	7.1 (2.53)	29.8 (8)	5.089
6	Fxln Dol	5.57	531	311	1.0 (1)	5.0 (1.71)	21.1 (8)	3.462
7	Pkst-Grnst	32.72	3118	1608	1.0 (1)	5.6 (1.94)	29.1 (6)	3.077
8	PA-Baff	1.56	149	113	1.7 (1)	4.0 (1.32)	11.0 (4)	1.826
10	Mar SS	1.41	134	106	0.7 (1)	3.8 (1.26)	10.9 (4)	1.755

Copy to output sheet:  List1  List2  Reset

Apply OK Cancel

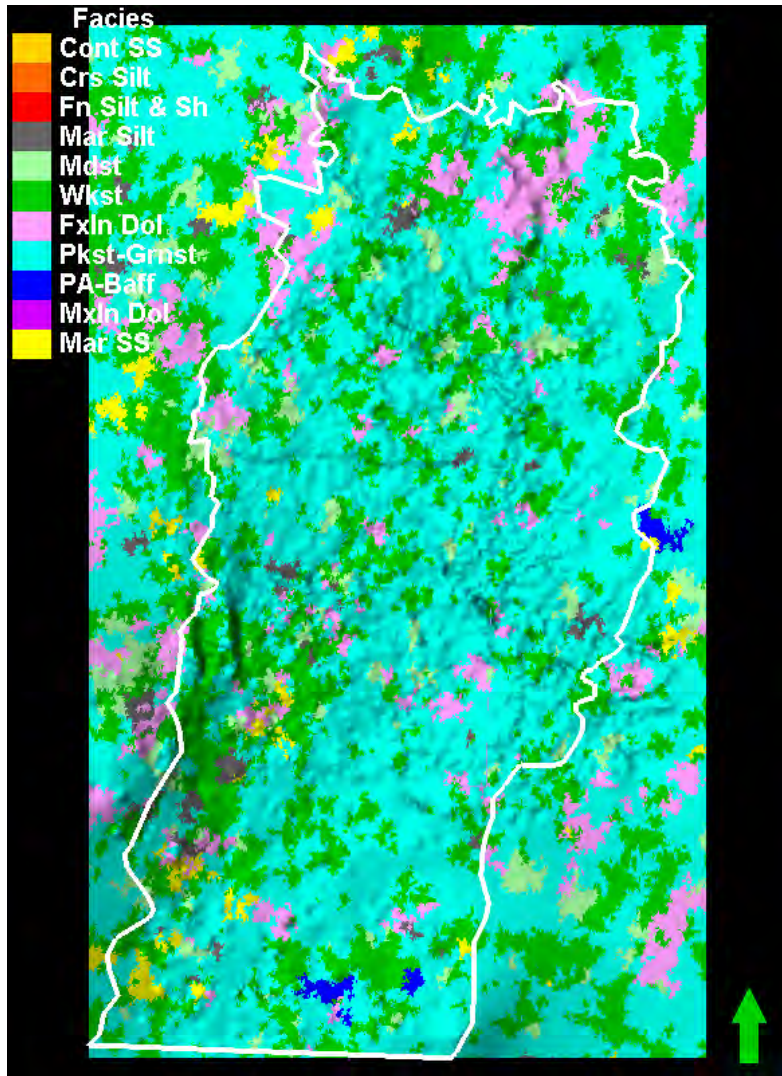
### Geomod3 Model facies stats

Zone WREFORD resulting facies fractions:

-----

Cont SS: 0.00 %  
 Fine Silt & Sh: 0.00 %  
 Crs Silt: 0.00 %  
 Mar Silt: 8.68 %  
 Mdst: 14.72 %  
 Wkst: 18.15 %  
 Fxln Dol: 1.83 %  
 Pkst: 50.88 %  
 Grnst: 0.00 %  
 Cxln Dol: 0.44 %  
 Mar SS: 5.29 %

# New Wreford, after zapping F0-2



### Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone WREFORD (FTRLY-A1SH)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
3	Mar Silt	10.01	516555	359675	0.1 (1)	4.0 (1.44)	32.7 (8)	2.746
4	Mdst	1.40	72341	58110	0.1 (1)	3.2 (1.24)	17.7 (5)	2.082
5	Wkst	48.51	2503873	1045772	0.1 (1)	6.5 (2.39)	44.2 (8)	5.366
6	Fxln Dol	6.41	331123	215817	0.1 (1)	4.3 (1.53)	30.9 (8)	3.189
7	Pkst-Grnst	30.95	1597333	879900	0.1 (1)	5.1 (1.82)	40.3 (8)	3.763
8	PA-Baff	1.39	71568	51992	0.5 (1)	4.4 (1.38)	33.4 (6)	2.762
10	Mar SS	1.34	68959	47750	0.1 (1)	3.7 (1.44)	28.0 (6)	2.565

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
3	Mar Silt	10.33	984	697	0.7 (1)	3.9 (1.41)	17.3 (6)	2.12
4	Mdst	0.85	81	72	0.7 (1)	2.8 (1.13)	10.5 (4)	1.641
5	Wkst	46.99	4478	1817	1.0 (1)	7.0 (2.46)	29.8 (8)	5.062
6	Fxln Dol	5.61	535	315	1.0 (1)	4.9 (1.7)	21.1 (8)	3.453
7	Pkst-Grnst	33.25	3168	1658	1.0 (1)	5.5 (1.91)	29.1 (8)	3.075
8	PA-Baff	1.56	149	113	1.7 (1)	4.0 (1.32)	11.0 (4)	1.826
10	Mar SS	1.41	134	106	0.7 (1)	3.8 (1.26)	10.9 (4)	1.755

Copy to output sheet:  List 1  List 2  Reset

Apply OK Cancel

# A1sh

F0 is way under represented using the low HZ ranges. Much better restoring long ranges. May still be short relative to actual and that in training set.

## Geomod3 Zone A1\_SH resulting

facies fractions:

-----  
 --  
 Cont SS: 15.66 %  
 Fine Silt & Sh: 50.54 %  
 Crs Silt: 32.58 %  
 Mar Silt: 0.52 %  
 Mdst: 0.70 %  
 Wkst: 0.00 %  
 Fxln Dol: 0.00 %  
 Pkst: 0.00 %  
 Grnst: 0.00 %  
 Cxln Dol: 0.00 %  
 Mar SS: 0.00 %  
 -----  
 --

Settings for 'F11\_GM4XE\_Run1 [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone A1\_SH (A1SH-B2LM)

Min, mean, max and std values are for the interval height.  
 Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	5.83	145427	125333	0.0 (1)	6.7 (1.16)	48.9 (4)	4.452
1	Crs Silt	60.58	1510529	753280	0.0 (1)	10.3 (2.15)	60.3 (4)	8.795
2	Fn Silt & Sh	33.58	837289	621694	0.0 (1)	6.9 (1.35)	59.6 (4)	5.619

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	10.02	510	343	0.7 (1)	9.3 (1.49)	42.0 (4)	5.998
1	Crs Silt	61.72	3142	1462	0.0 (1)	9.2 (2.15)	34.0 (4)	5.259
2	Fn Silt & Sh	28.27	1439	1182	0.0 (1)	5.2 (1.22)	28.4 (4)	2.878

Copy to output sheet:  List 1  List 2  Reset

Apply  OK  Cancel

Settings for 'F11\_GM4XE [U]'

Style | Info | Statistics | Disc. Stat | Histogram | Colors | Operations | Variogram

For zone: Zone A1\_SH (A1SH-B2LM)

Min, mean, max and std values are for the interval height.  
 Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	10.18	253716	194535	0.0 (1)	8.7 (1.3)	46.0 (4)	5.446
1	Crs Silt	59.75	1489772	745203	0.0 (1)	10.1 (2)	60.2 (4)	8.232
2	Fn Silt & Sh	30.07	749757	579064	0.0 (1)	6.4 (1.29)	59.3 (4)	5.231

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	10.02	510	343	0.7 (1)	9.3 (1.49)	42.0 (4)	5.998
1	Crs Silt	61.72	3142	1462	0.0 (1)	9.2 (2.15)	34.0 (4)	5.259
2	Fn Silt & Sh	28.27	1439	1182	0.0 (1)	5.2 (1.22)	28.4 (4)	2.878

Copy to output sheet:  List 1  List 2  Reset

Apply  OK  Cancel

# A1Lm

Run 1 not bad, but vertical distribution is off for the continental redbeds. Next run looks same statistically

**Settings for 'F11\_GM4XE\_Run1 [U]'**

Style Info Statistics Disc. Stat Histogram Colors Operations Variogram

For zone: Zone A1\_LM (A1SH-B2LM)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.01	477	456	0.7 (1)	2.7 (1.05)	6.0 (2)	0.8522
2	Fn Silt & Sh	0.20	18396	16787	0.4 (1)	3.2 (1.1)	22.8 (4)	2.042
3	Mar Silt	23.10	2087059	1119667	0.1 (1)	5.3 (1.86)	95.0 (14)	5.064
4	Mdst	1.30	117466	96936	0.2 (1)	3.3 (1.21)	30.1 (5)	2.294
5	Wkst	47.23	4266039	1881675	0.1 (1)	6.2 (2.27)	100.2 (...)	6.066
6	Fxln Dol	4.24	382835	266225	0.2 (1)	3.6 (1.44)	35.8 (8)	2.645
7	Pkst-Grnst	21.76	1965610	1216230	0.1 (1)	4.6 (1.62)	69.6 (14)	4.252
8	PA-Baff	1.48	133633	101663	0.1 (1)	3.9 (1.31)	32.7 (7)	3.042
10	Mar SS	0.68	61551	44078	0.4 (1)	5.5 (1.4)	59.9 (8)	4.658

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.01	1	1	2.1 (1)	2.1 (1)	2.1 (1)	0
2	Fn Silt & Sh	0.14	24	24	1.9 (1)	3.2 (1)	4.6 (1)	0.6651
3	Mar Silt	28.41	4950	2144	1.4 (1)	6.7 (2.31)	36.1 (12)	5.842
4	Mdst	1.21	210	182	0.8 (1)	3.4 (1.15)	10.9 (4)	1.346
5	Wkst	43.23	7534	3474	0.8 (1)	6.5 (2.17)	43.6 (13)	5.208
6	Fxln Dol	4.19	731	445	1.1 (1)	4.7 (1.64)	17.5 (7)	2.721
7	Pkst-Grnst	20.65	3598	1886	1.4 (1)	6.1 (1.91)	47.9 (14)	4.961
8	PA-Baff	1.26	220	137	1.9 (1)	5.5 (1.61)	21.2 (5)	3.112
10	Mar SS	0.91	158	119	1.8 (1)	5.1 (1.33)	13.1 (3)	2.478

Copy to output sheet  List1  List2  Reset

Apply OK Cancel

**Settings for 'F11\_GM4XE [U]'**

Style Info Statistics Disc. Stat Histogram Colors Operations Variogram

For zone: Zone A1\_LM (A1SH-B2LM)

Min, mean, max and std values are for the interval height.  
Numbers in brackets represent the corresponding number of cells.

Statistics for the entire property of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.01	529	529	1.5 (1)	2.2 (1)	3.6 (1)	0.6941
2	Fn Silt & Sh	0.14	12634	11850	0.4 (1)	3.0 (1.07)	13.2 (3)	1.563
3	Mar Silt	23.53	2125660	1199666	0.1 (1)	5.0 (1.77)	78.6 (13)	4.713
4	Mdst	1.30	117869	97884	0.3 (1)	3.6 (1.2)	31.1 (5)	2.76
5	Wkst	46.57	4206863	1940508	0.1 (1)	6.0 (2.17)	99.7 (14)	5.622
6	Fxln Dol	4.36	393668	292431	0.2 (1)	3.4 (1.35)	36.1 (8)	2.549
7	Pkst-Grnst	21.81	1970341	1228564	0.1 (1)	4.6 (1.6)	69.6 (14)	4.19
8	PA-Baff	1.43	129491	100173	0.1 (1)	4.0 (1.29)	28.1 (6)	2.985
10	Mar SS	0.84	76011	63504	0.4 (1)	4.0 (1.2)	34.4 (6)	2.987

Statistics for the upscaled cells of the zone:

Code	Name	%	N	Intervals	Min	Mean	Max	Std
1	Crs Silt	0.01	1	1	2.1 (1)	2.1 (1)	2.1 (1)	0
2	Fn Silt & Sh	0.14	24	24	1.9 (1)	3.2 (1)	4.6 (1)	0.6651
3	Mar Silt	28.41	4950	2144	1.4 (1)	6.7 (2.31)	36.1 (12)	5.842
4	Mdst	1.21	210	182	0.8 (1)	3.4 (1.15)	10.9 (4)	1.346
5	Wkst	43.23	7534	3474	0.8 (1)	6.5 (2.17)	43.6 (13)	5.208
6	Fxln Dol	4.19	731	445	1.1 (1)	4.7 (1.64)	17.5 (7)	2.721
7	Pkst-Grnst	20.65	3598	1886	1.4 (1)	6.1 (1.91)	47.9 (14)	4.961
8	PA-Baff	1.26	220	137	1.9 (1)	5.5 (1.61)	21.2 (5)	3.112
10	Mar SS	0.91	158	119	1.8 (1)	5.1 (1.33)	13.1 (3)	2.478

Copy to output sheet  List1  List2  Reset

Apply OK Cancel

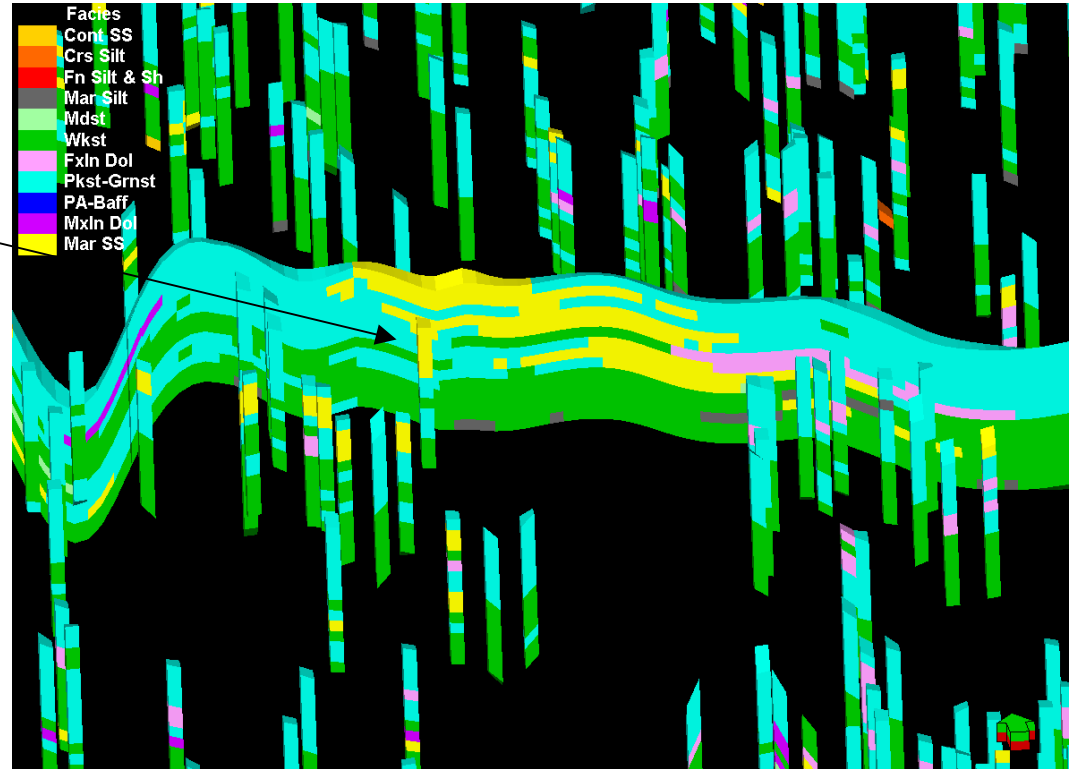
**Geomod3** Model stats  
Zone A1\_LM resulting facies fractions:

-----  
 Cont SS: 0.15 %  
 Fine Silt & Sh: 0.01 %  
 Crs Silt: 0.03 %  
 Mar Silt: 24.52 %  
 Mdst: 0.21 %  
 Wkst: 50.50 %  
 Fxln Dol: 6.22 %  
 Pkst: 18.06 %  
 Grnst: 0.30 %  
 -----

# FtRiley QC

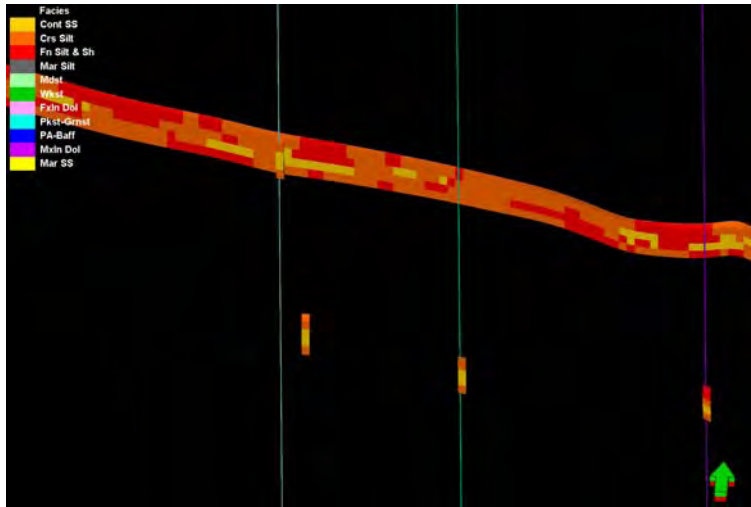
Sand has undue influence:

1. Consider reducing F10 in Ftrly
2. Too much being placed in areas w/o well control
3. V Rge too high. SS distributed way too low in section around this one well.

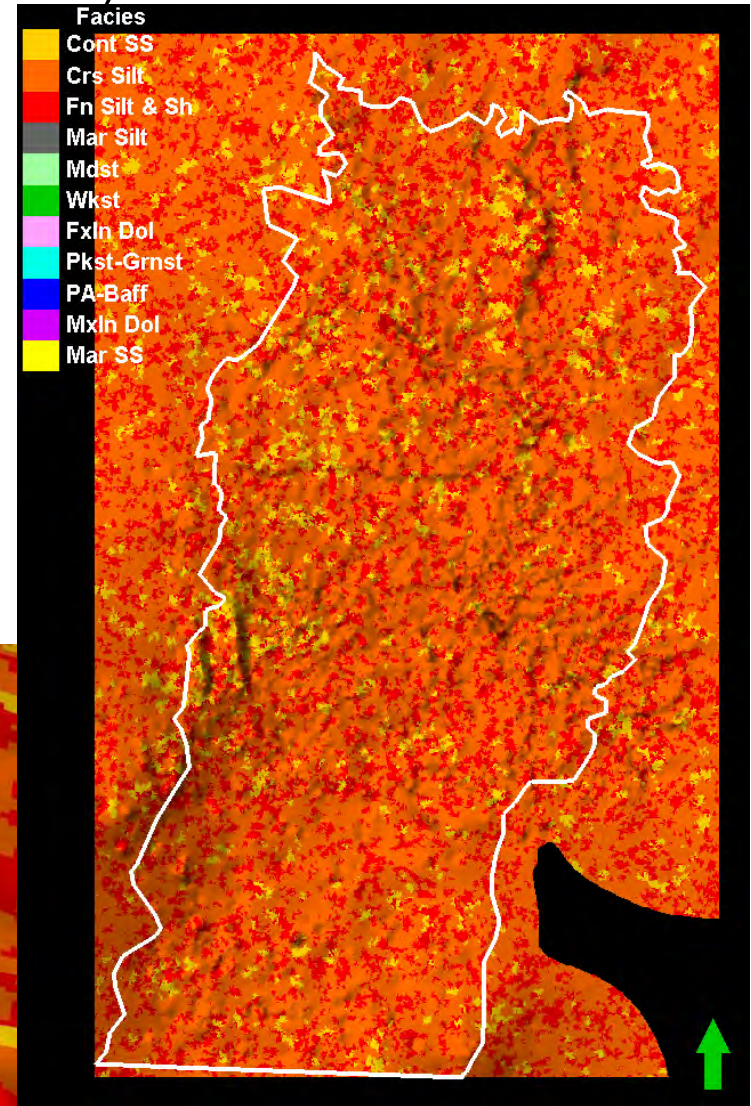
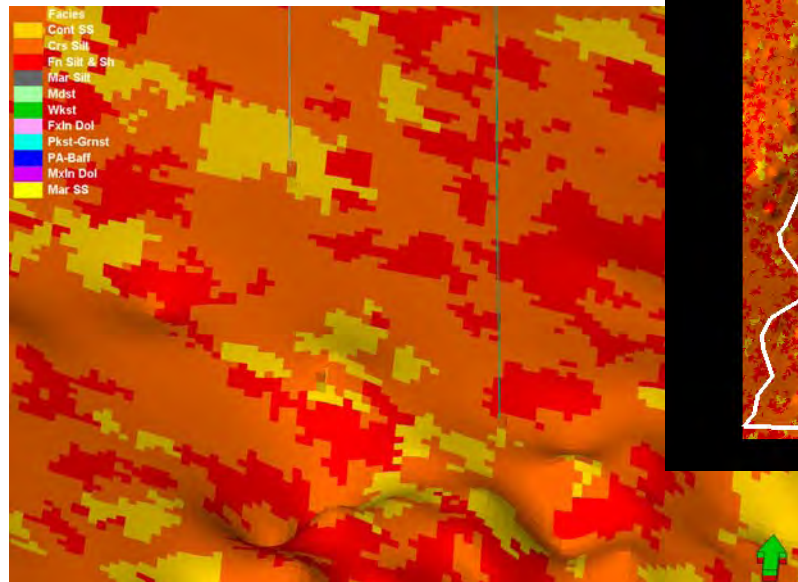




# A1Sh with short Hz ranges (F0-10, F1-5, F2-5)

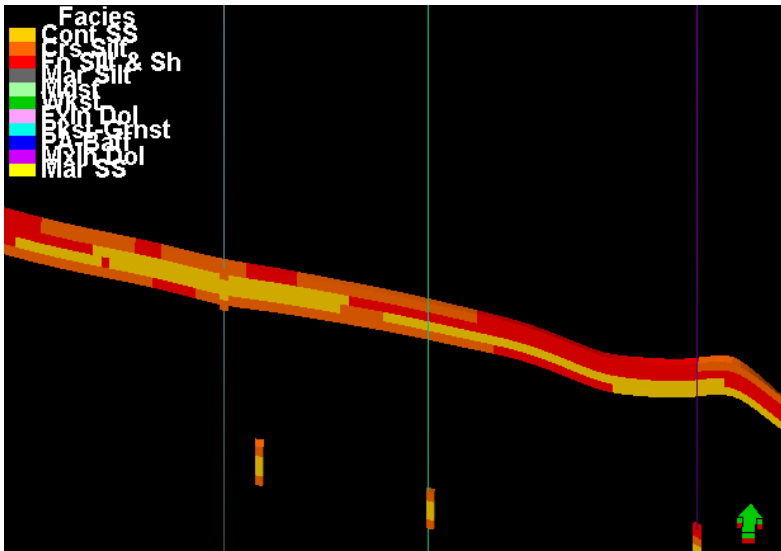


Sand is not continuous but should be due to short ranges. West well is Cross H Cattle.

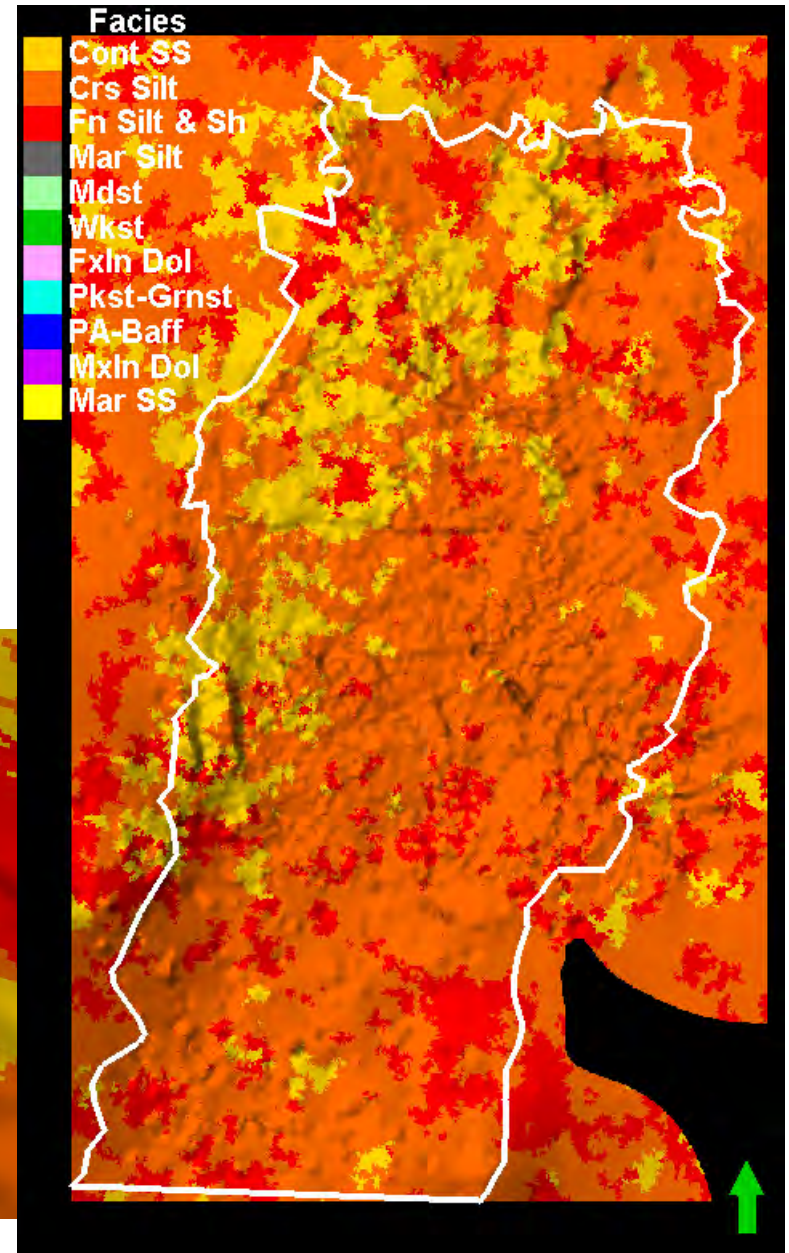
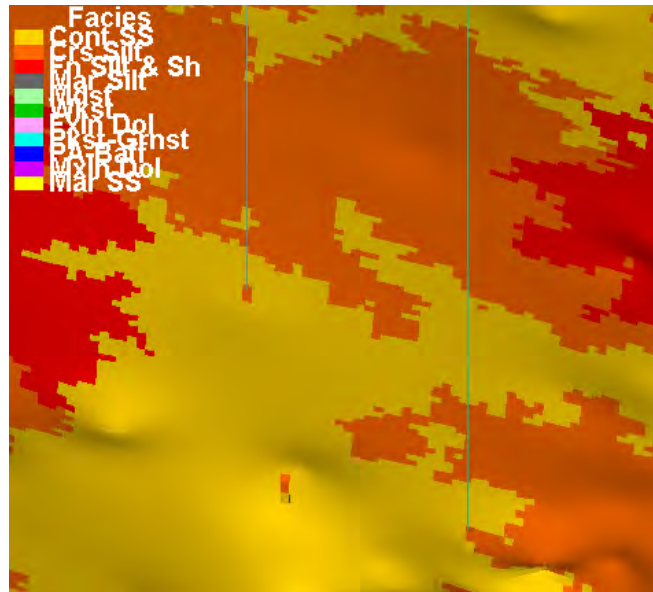


Layer 3 of 4

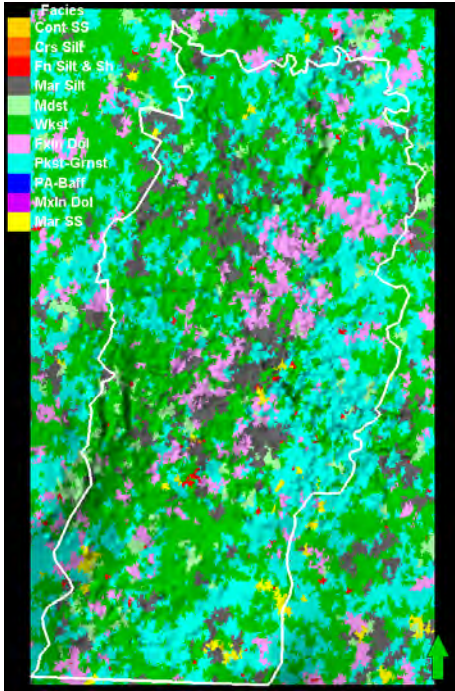
# Run 2 F0-40, F1-25, F2-25



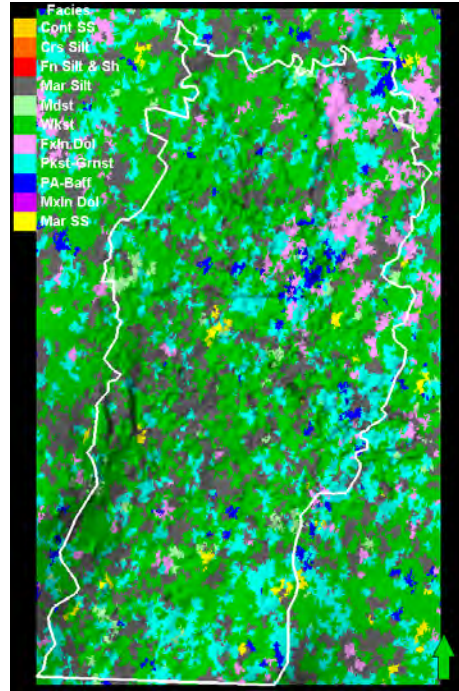
Longer Hz ranges and shorter V is much better



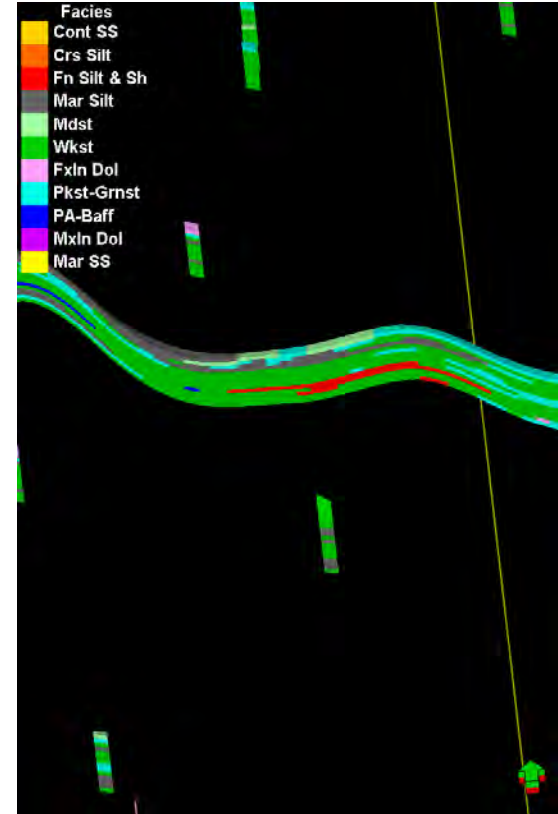
# A1LM



Layer 2 looks about same

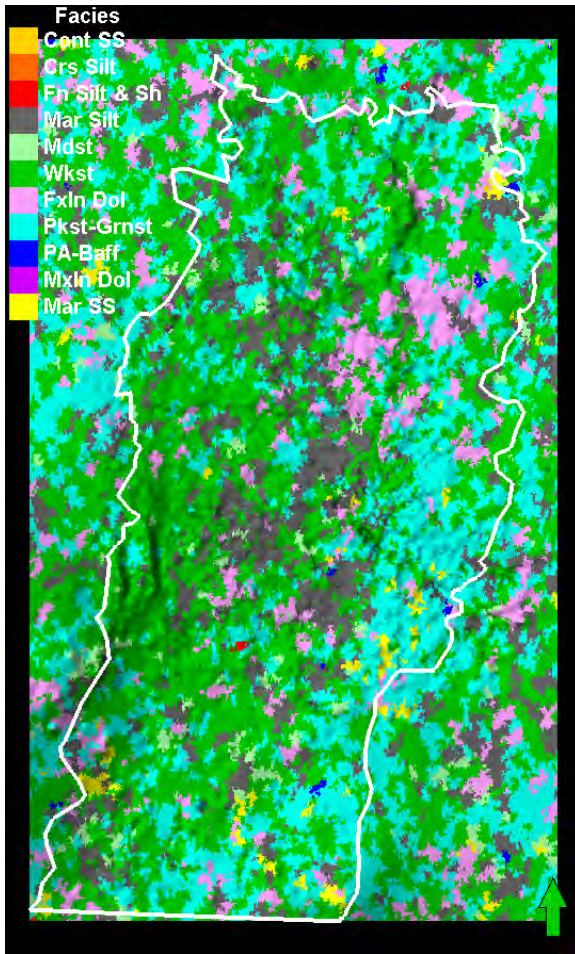


As does layer 5

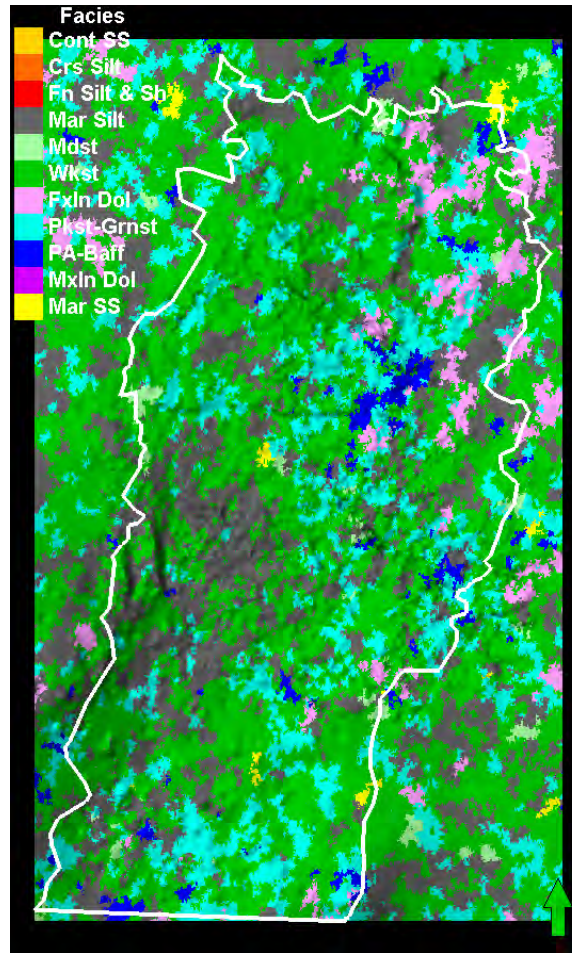


But redbeds show up in the oddest places (due to vertical range)

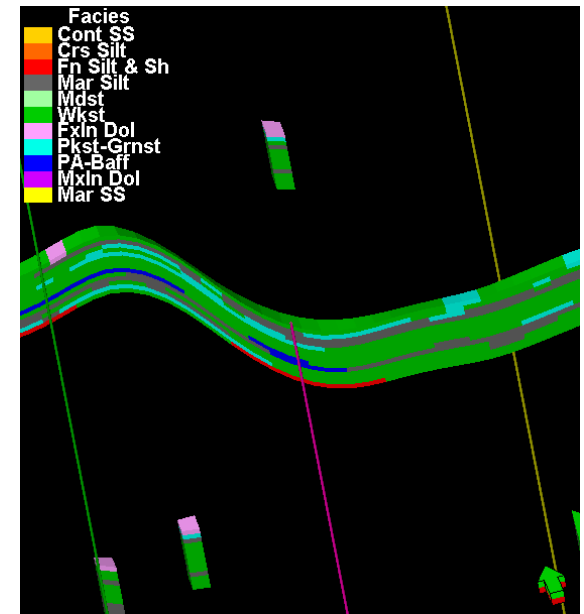
# Views from 2<sup>nd</sup> run



Layer 2 looks about same

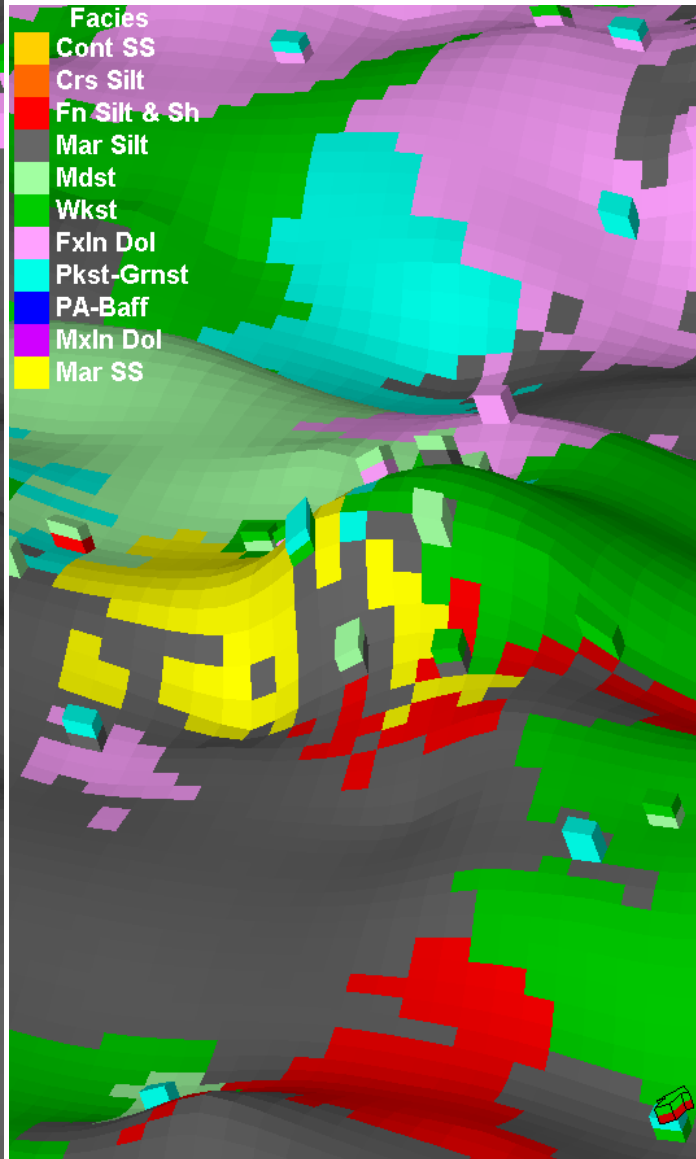
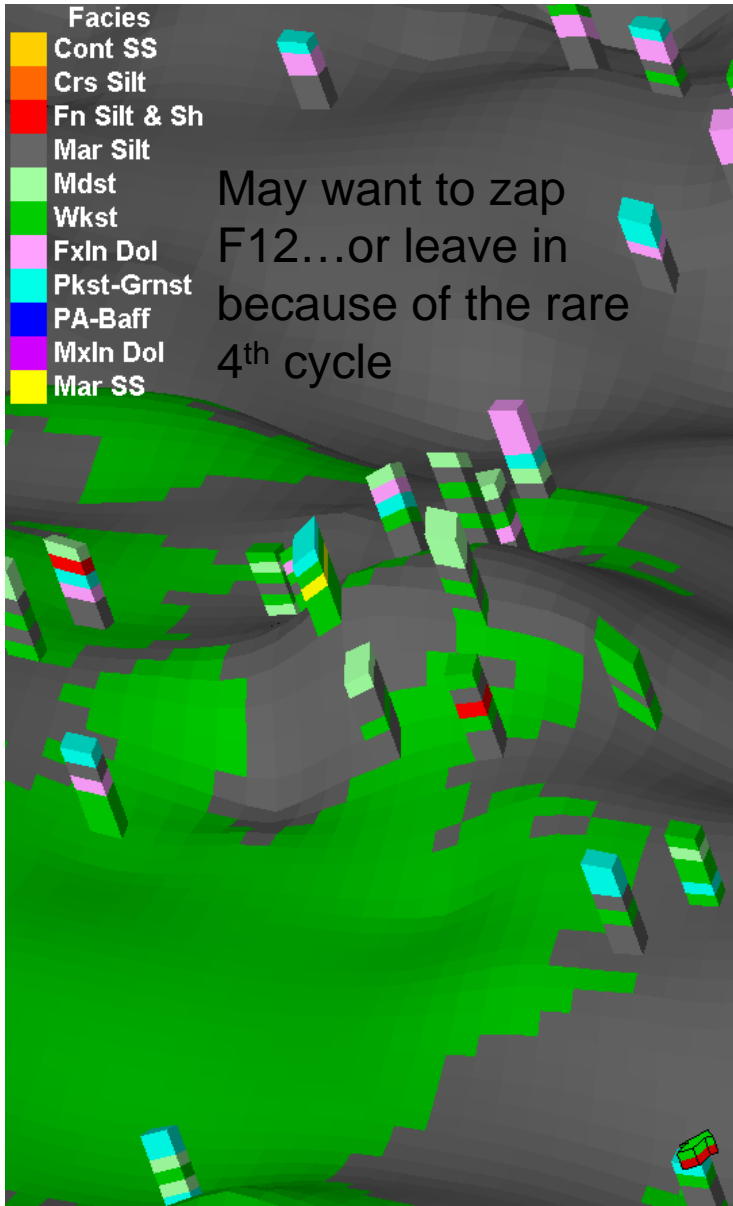


As does layer 5

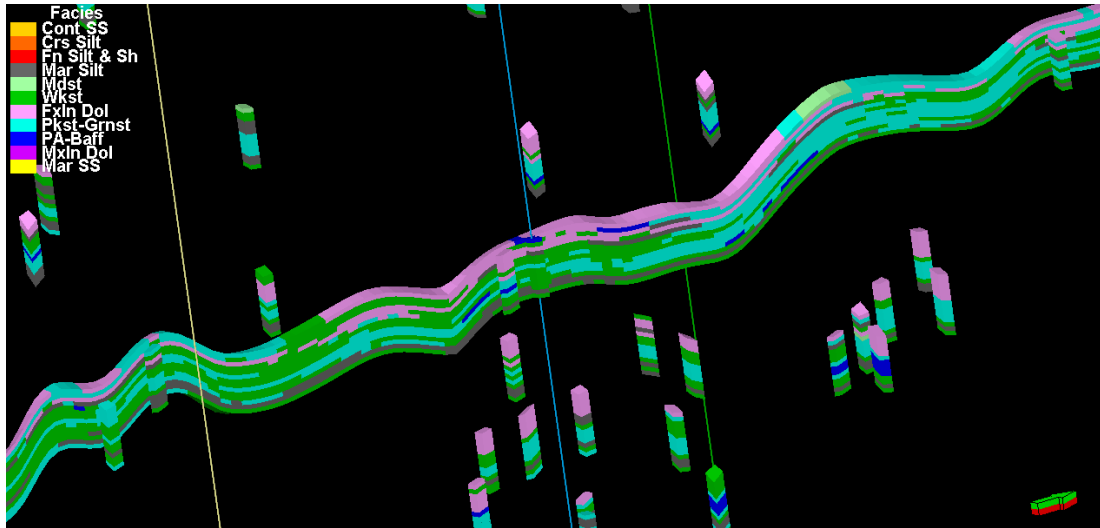


But redbeds are better constrained to where they belong

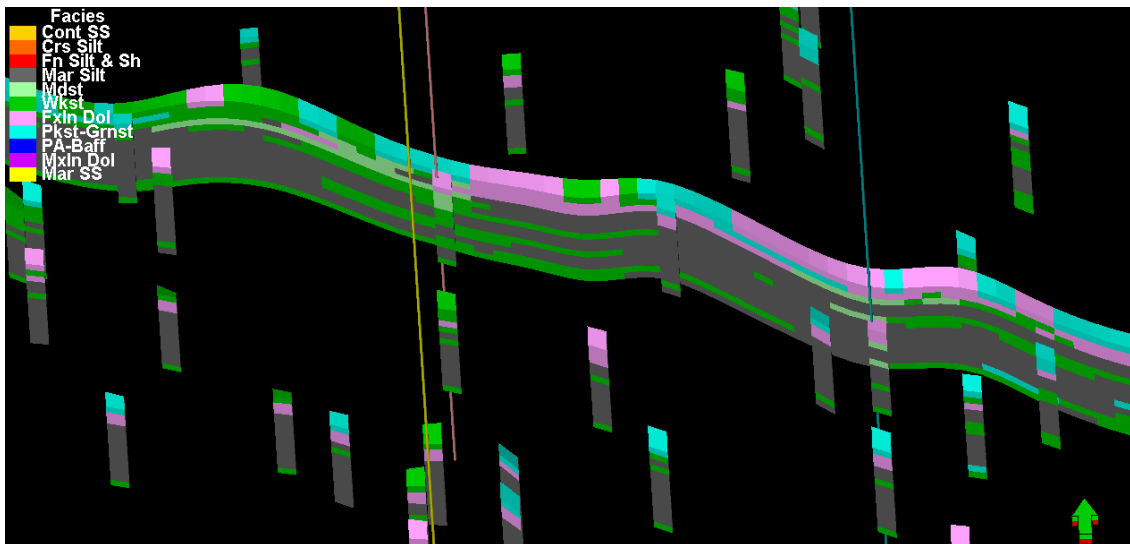
# A1LM with longer range for F12, shorter vertical range



# A1 Lm and core well ties



Alexander D2



Flower & Newby.  
Offset wells have  
more silt

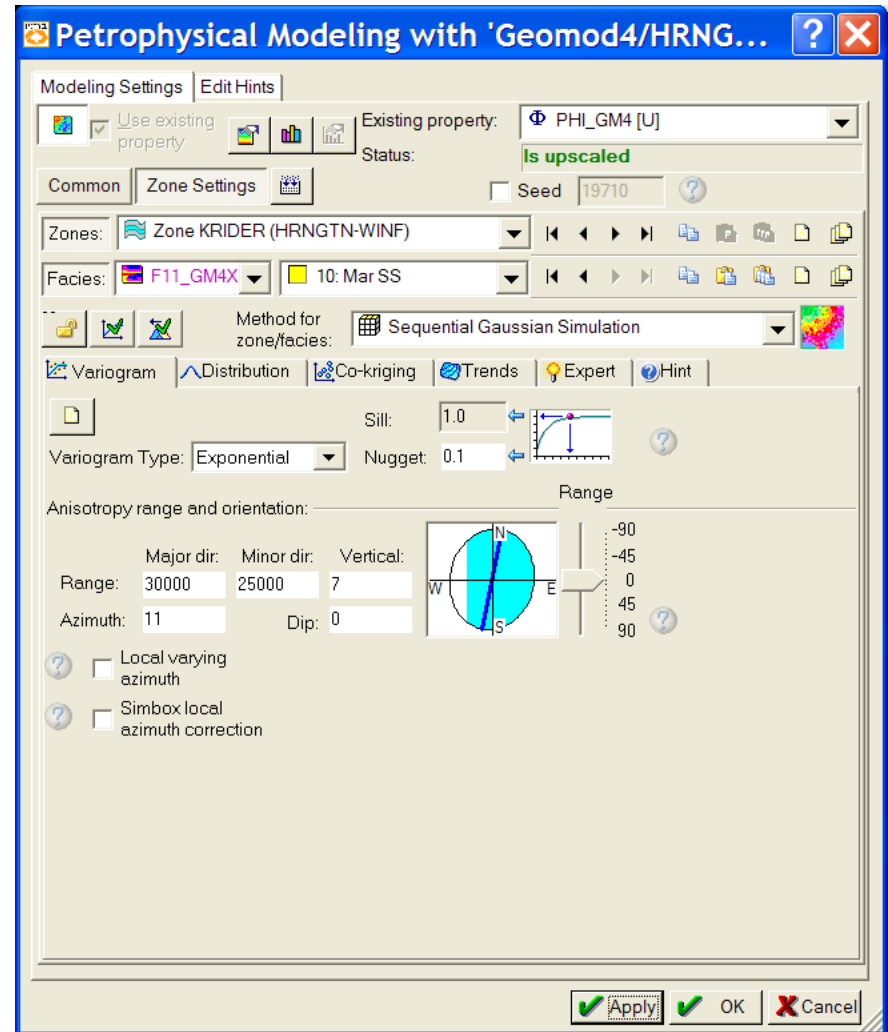
# Facies model modifications

1. Krider: reduced vertical proportions significantly for F9 and changed ranges 50/42/10
2. Winfield: reduced vertical proportions significantly for F9 and changed ranges 50/42/10
3. FtRiley: reduced vertical proportions slightly for F10 and changed vertical range from 21 to 8
4. Wreford: zapped all F0-1-2 in property calculator (made =U) and reduced vertical range for F10 to 8
5. Did not model  $F > 2$  in A1sh through B5sh (did not zap, just excluded from modeling), but did model in Csh
6. Did not model  $F < 3$  in B1 and B5 LM, but did in the rest. A1 and C have additional 5<sup>th</sup> order cycles in places and the B2-3-4LMs are very thin in places (may actually be continental).

(5 and 6 above, cancel each other)

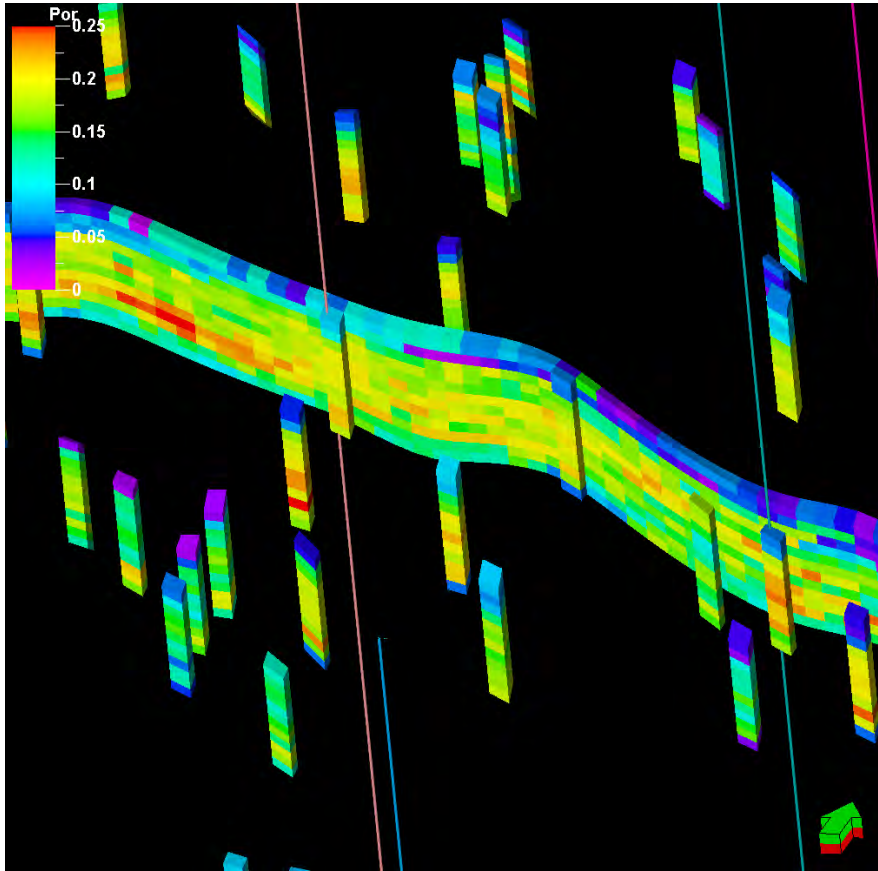
# Porosity modeling

1. In workflows, double click on property modeling
2. Select zone to be modeled and unlock
3. Mash the condition on facies button
4. Mash the “use transformations made in data analysis” button
5. Input variogram parameters by facies
6. Select SGS for simulation

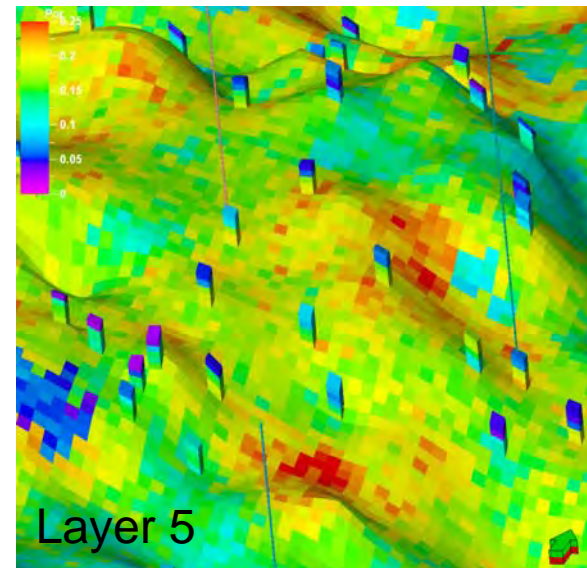
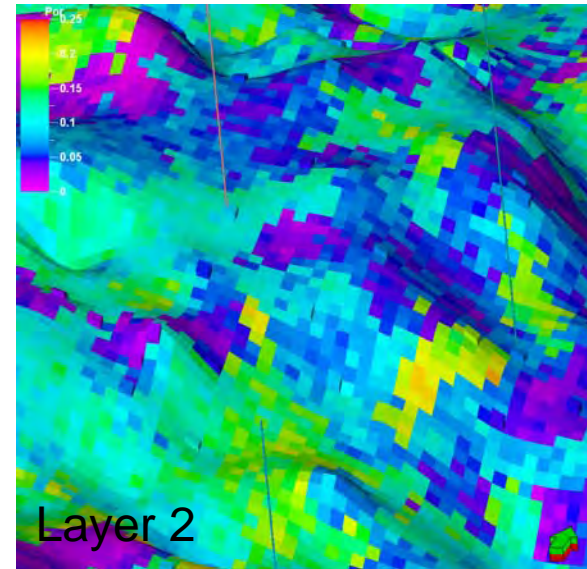




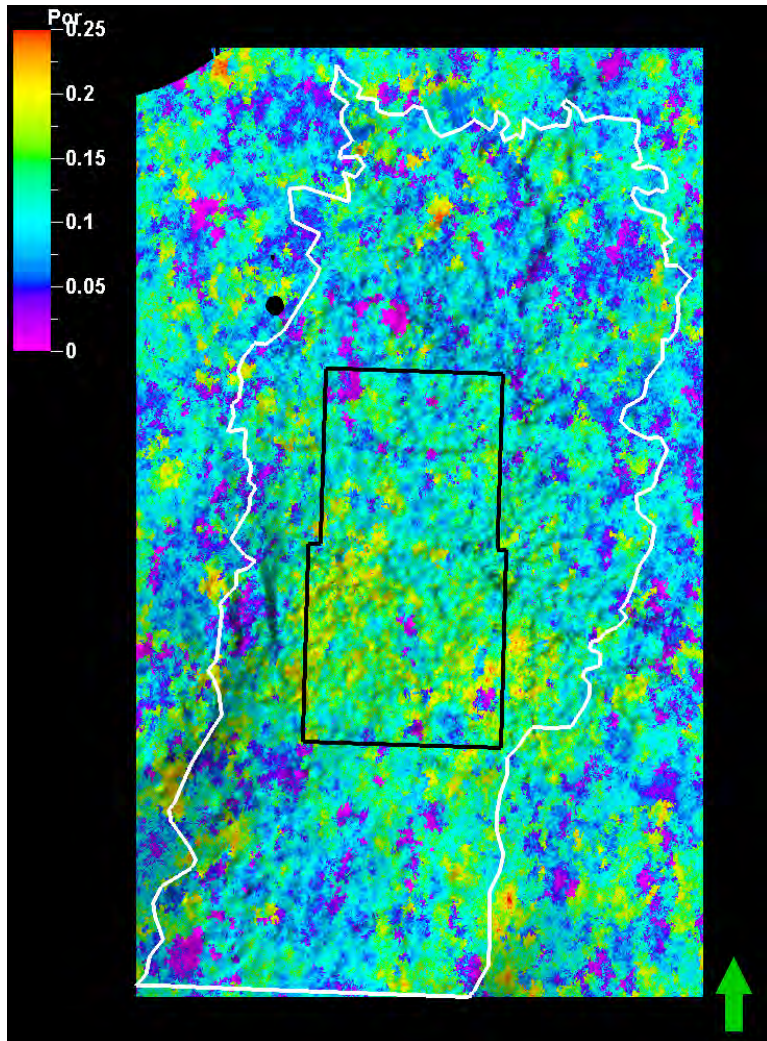
# Compare Phi models for Krider using Gmod3 variograms



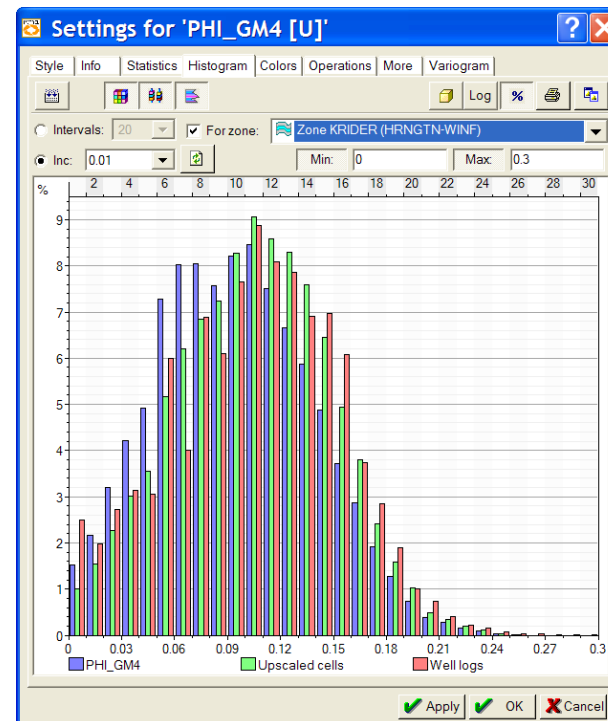
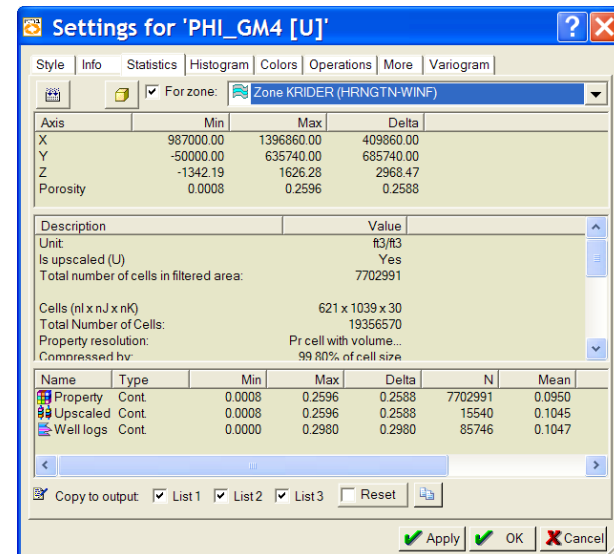
Geomod 4, Flower & Newby area,  
same 30/25/7 as in Geomod3



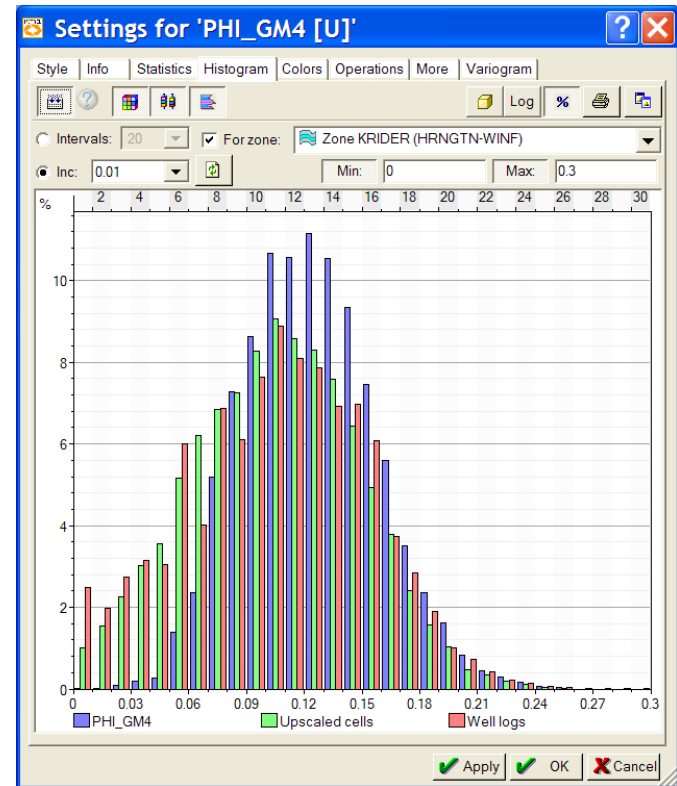
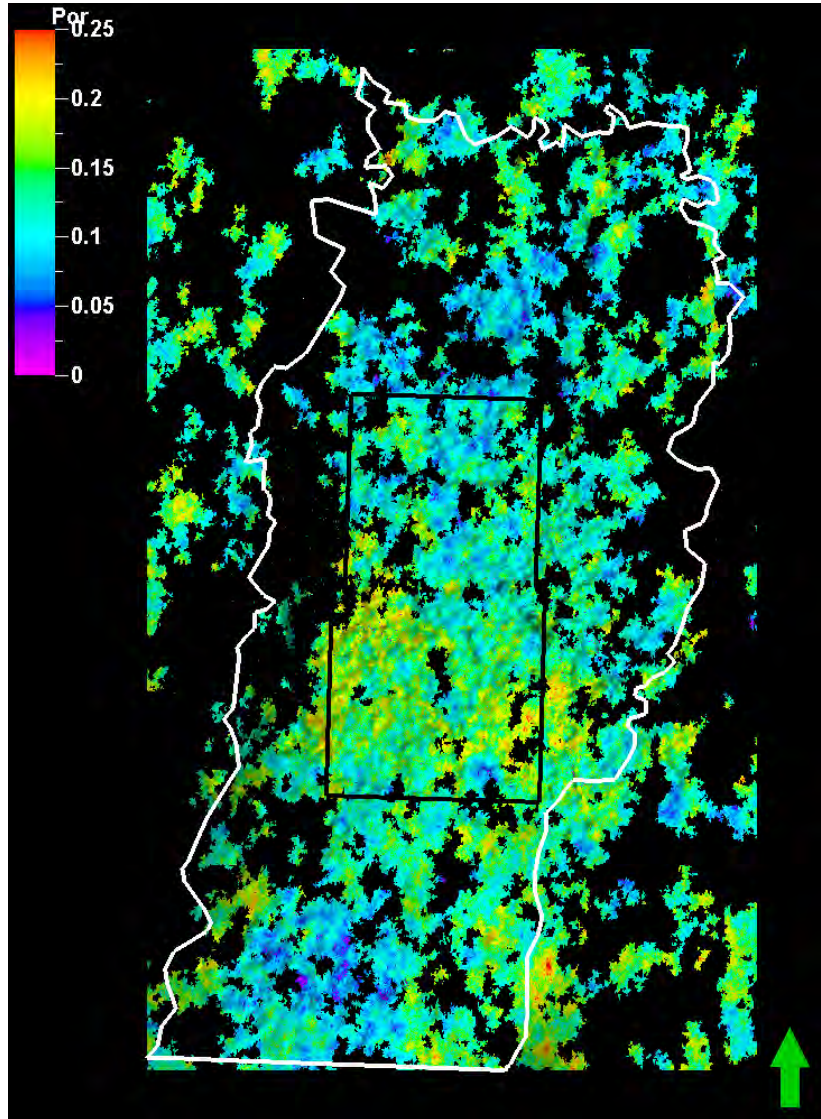
# Krider Geomod4 with GM3 variograms



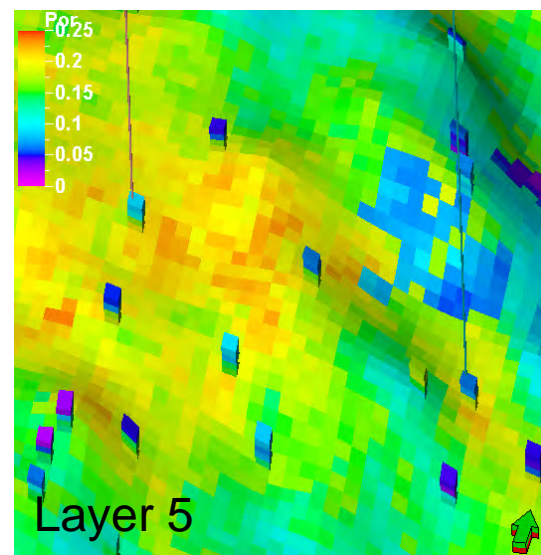
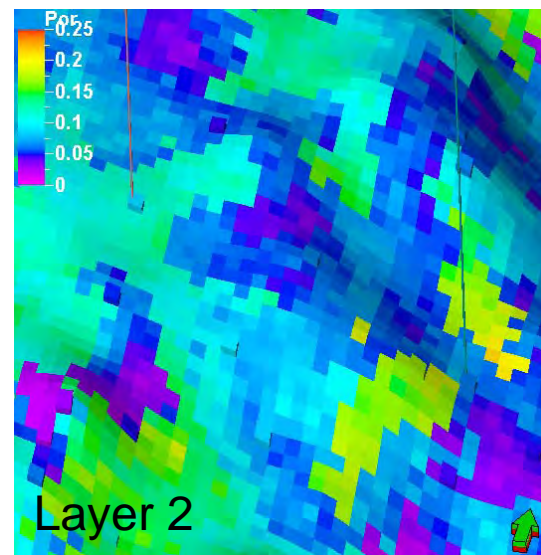
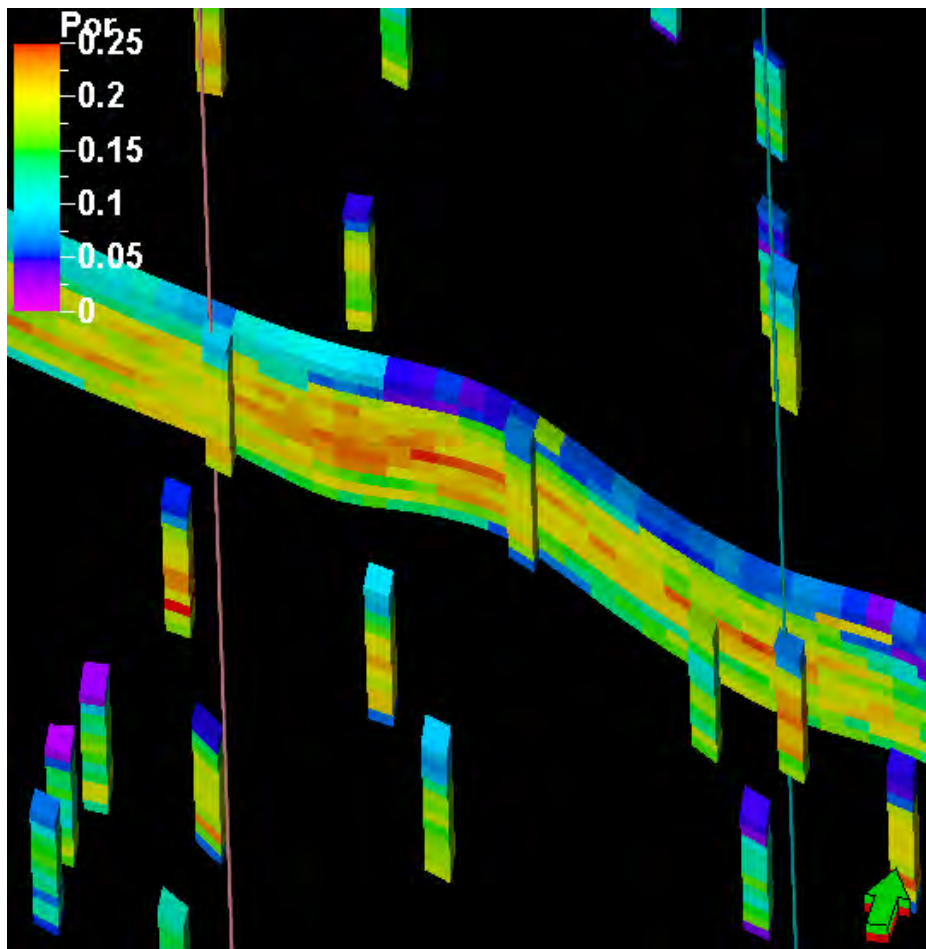
Layer 5, geomod4 30/25/7



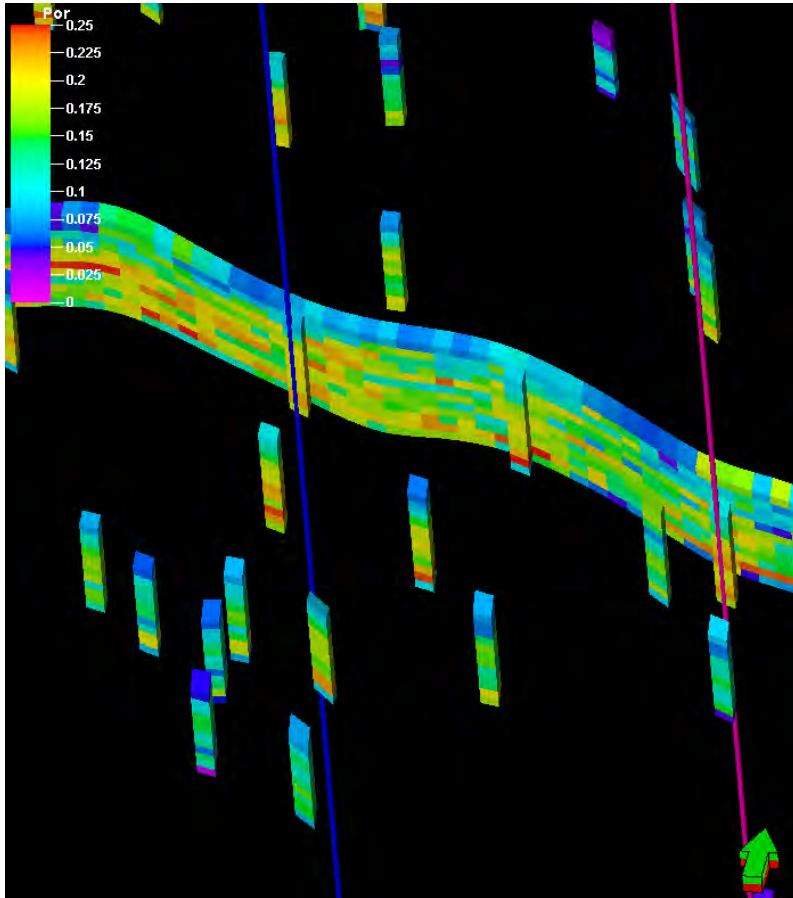
# Krider Geomod4, F9 only, with GM3 variograms



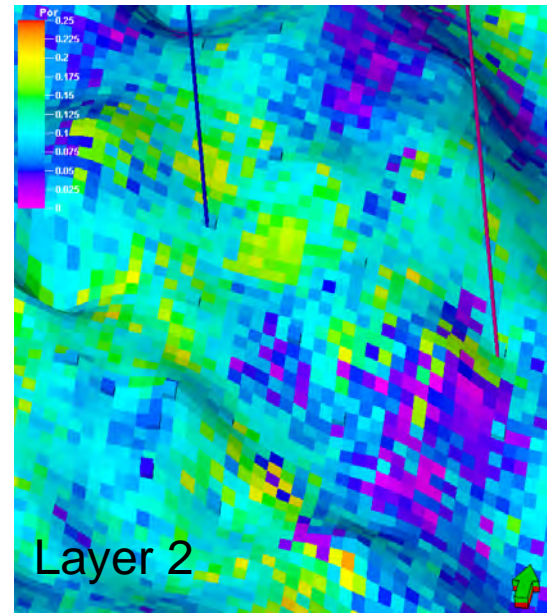
# Krider phi Gmod4 (new variograms)



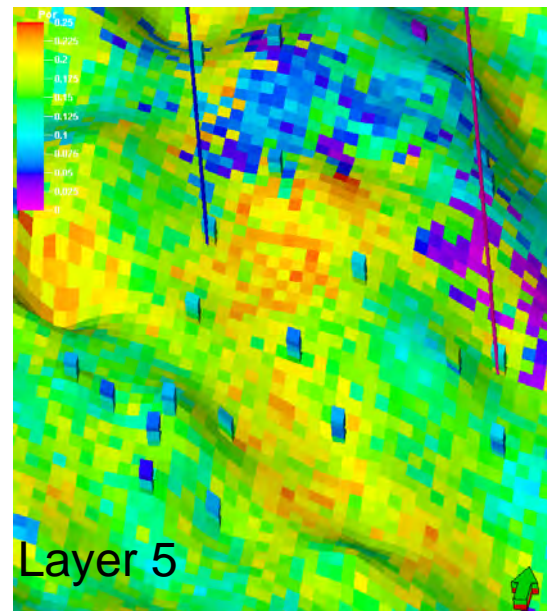
# Krider, Geomd 3



Flower & Newby area

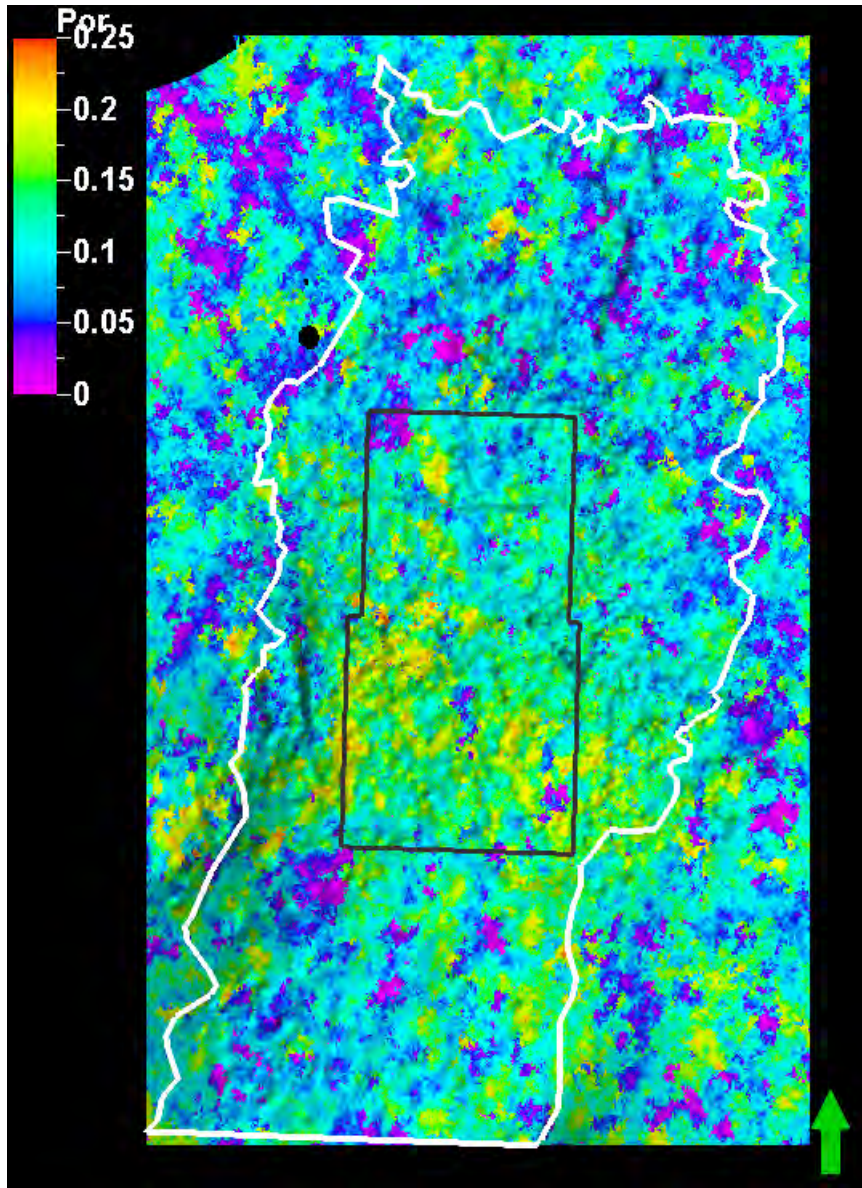


Layer 2

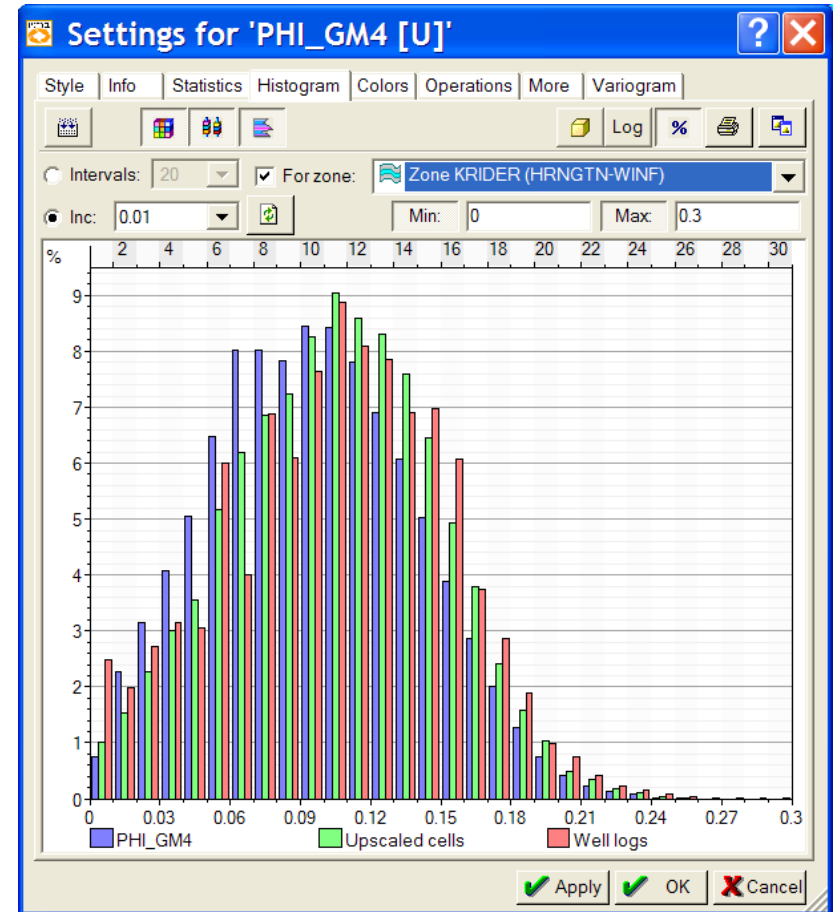


Layer 5

# Krider phi Gmod4

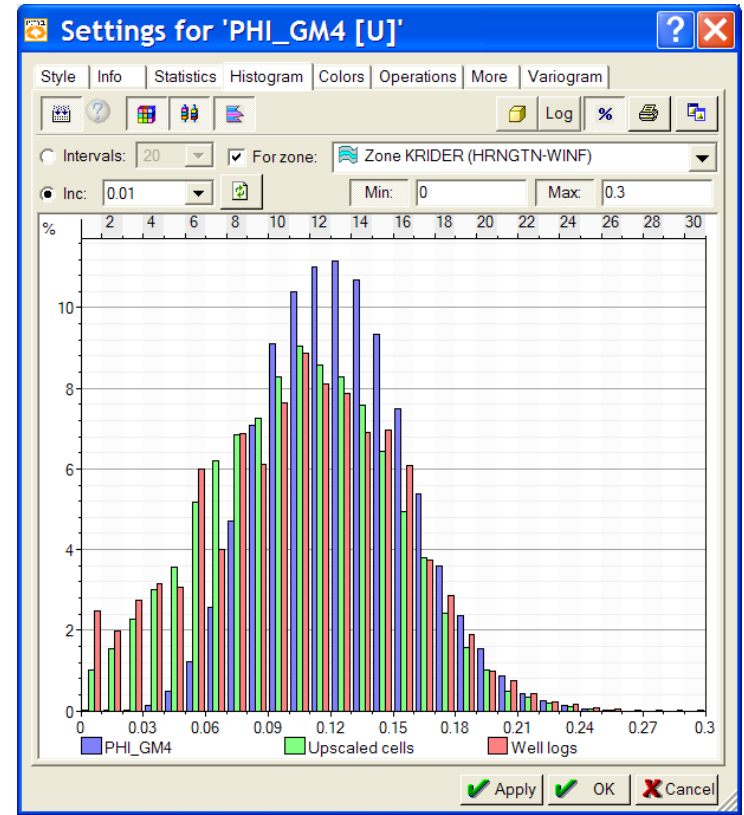
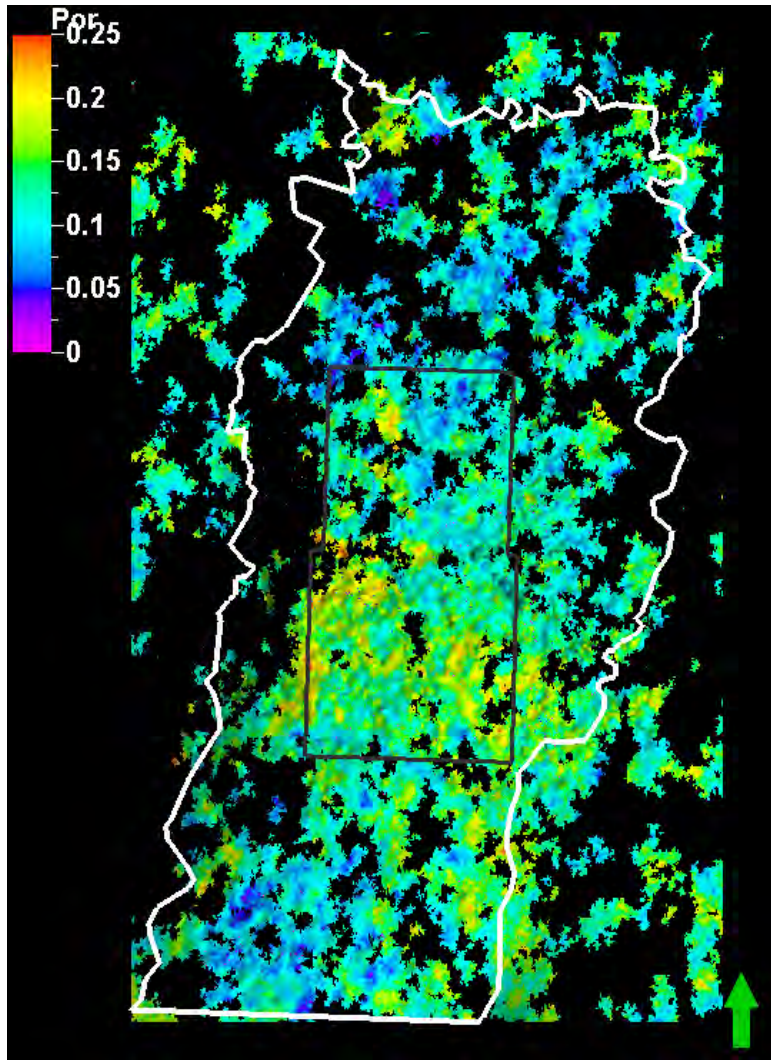


Krider Geomd4 phi, layer 5



Krider Geomd4 phi, all facies

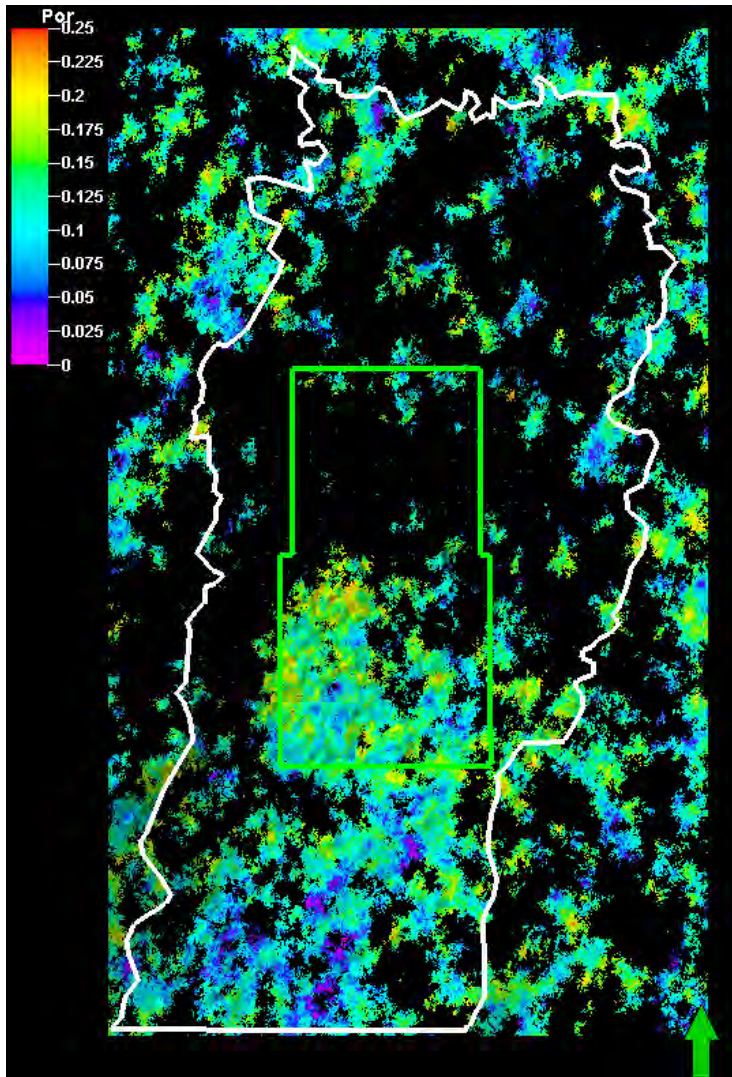
# Krider F9



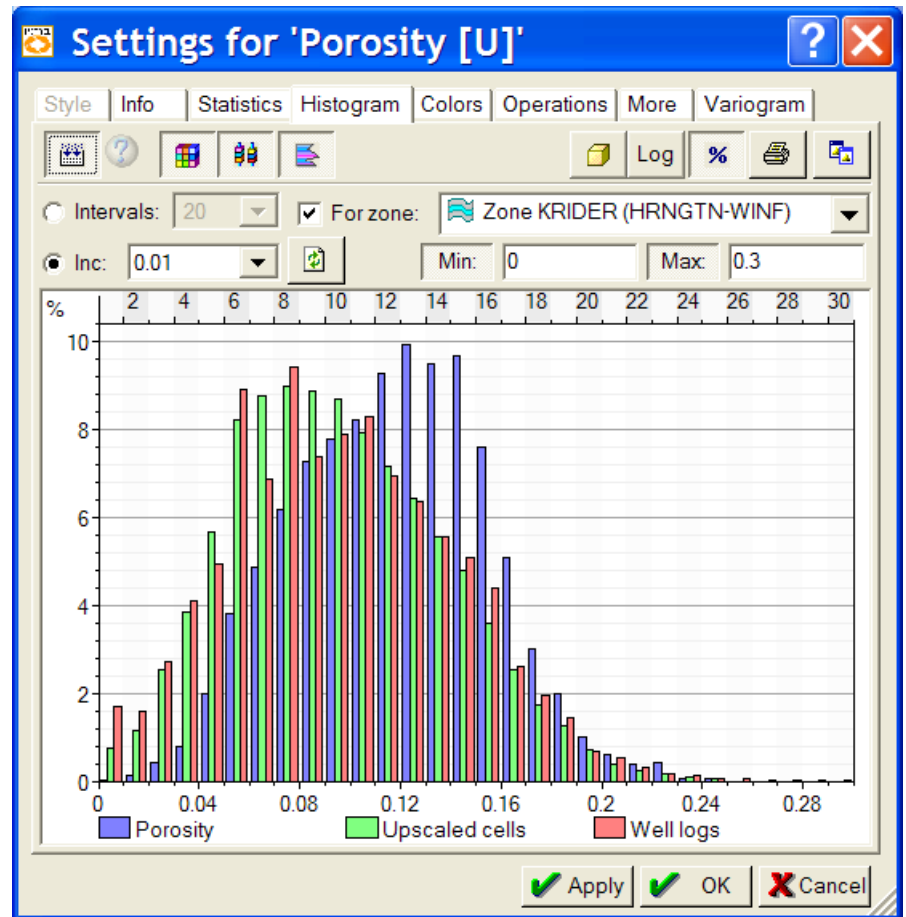
Krider Geomod4 phi, F9 only layer 5

Krider Geomod4 phi, F9 only

# Krider Geomod3, F9 only



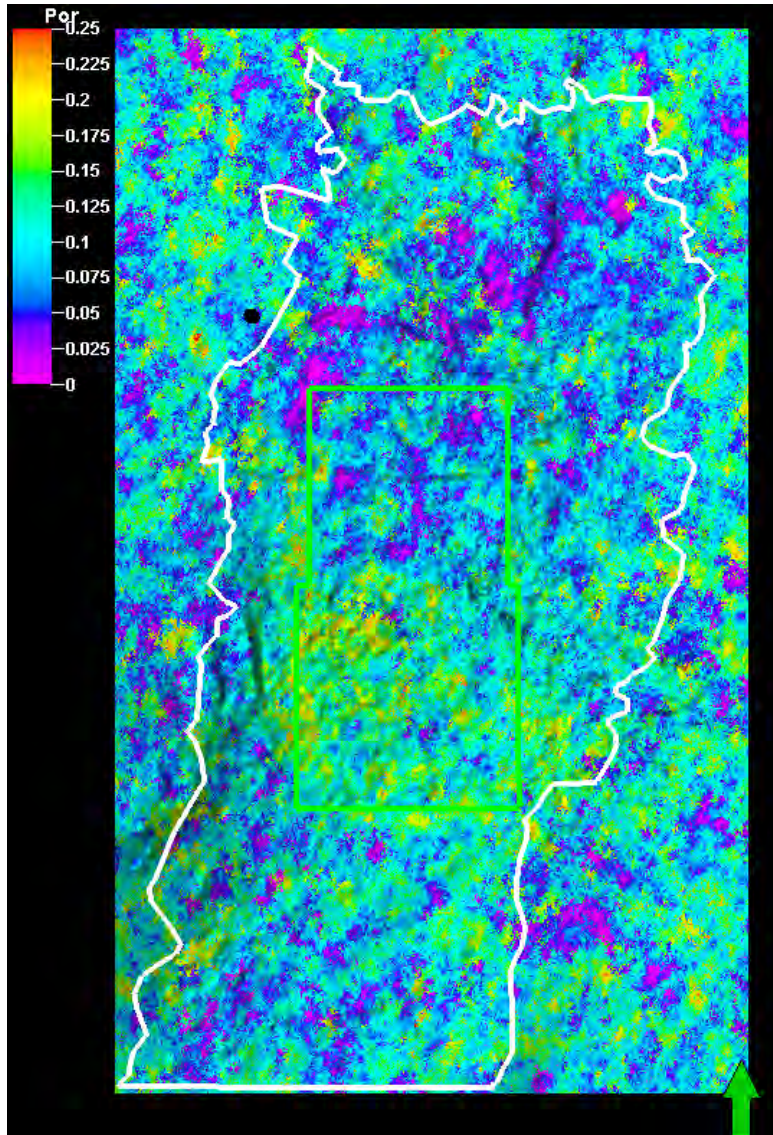
Krider Geomod3 phi, F9 only layer 5



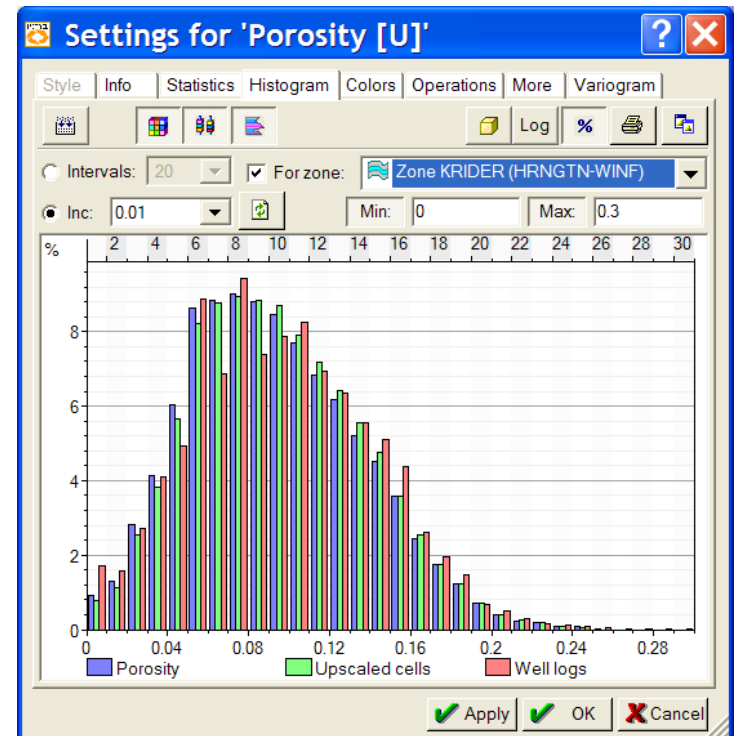
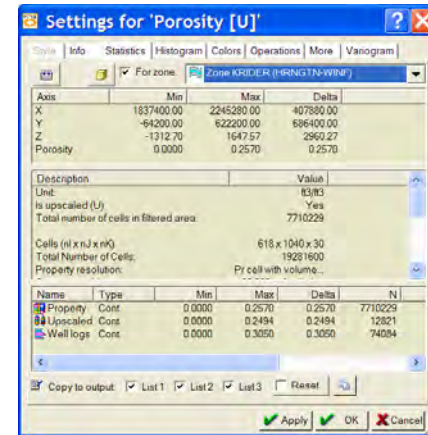
Krider Geomod3 phi, F9 only



# Krider, Geomd 3

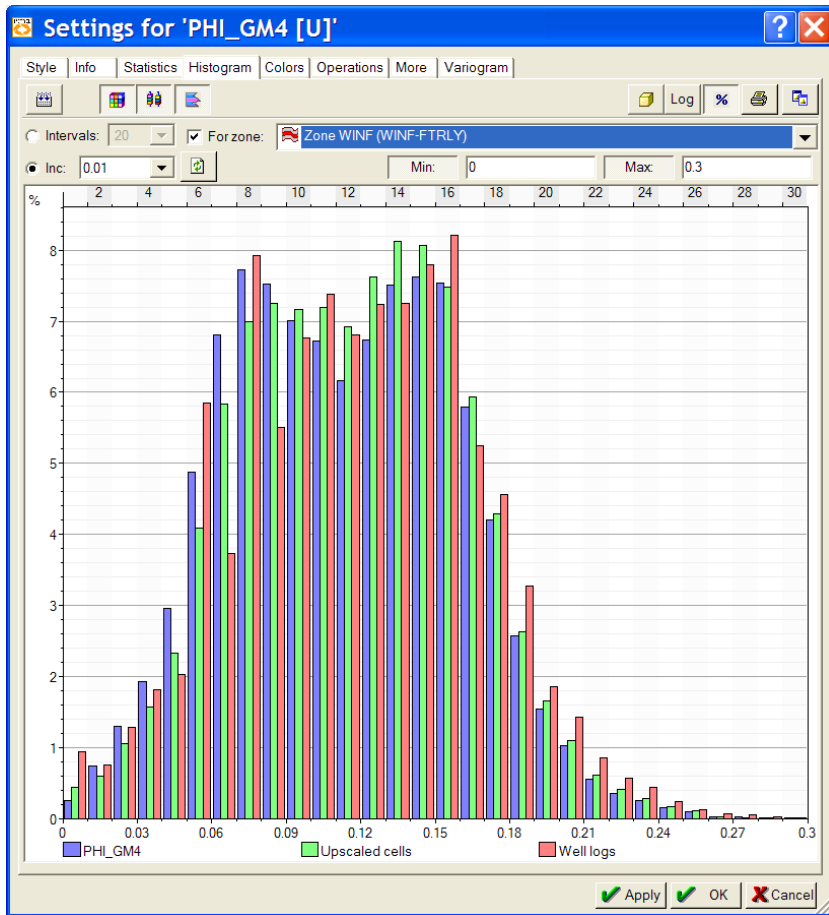


Krider Geomod3 phi, layer 5

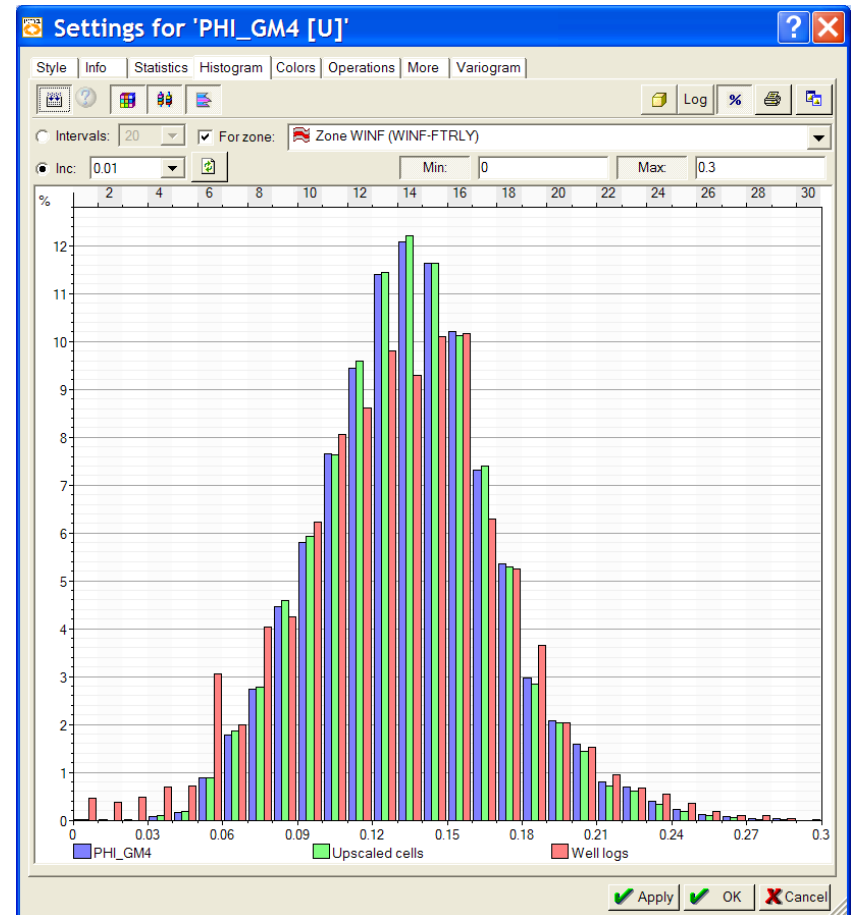


Krider Geomod3 phi, all facies

# Winfield Phi distribution



all



F9 only

## Potential error introduced in volumetric calculations by missed lithofacies prediction

1. Porosity corrections are a function of lithofacies
2. Porosity may increase or decrease when error in lithofacies prediction is made
3. If/when error is known, modifications in porosity may be appropriate
4. In Geomod4, F9 is estimated to be over represented in Krider by 7.3% and in Winfield by 12.1%. Probably not enough to make a significant difference. When 3X the Phi difference was subtracted from the Winfield F9 there was a change of <3% in OGIP

LithCode	Gmod4	Gmod3	Comments	% Change (at 18%)	
0	0.165	0.180	moderately lower at high end	-8.4%	
1	0.170	0.170	no change		
2	0.170	0.170	no change		
3	0.138	0.138	no change		
4	0.138	0.138	no change		
5	0.181	0.177	slightly higher	1.9%	
6	0.198	0.192	slightly higher	3.5%	
7	0.181	0.177	slightly higher	1.9%	
8	0.181	0.177	slightly higher	1.9%	
9	0.198	0.192	slightly higher	3.5%	
10	0.165	0.165	slightly higher	-0.1%	
	Difference	% Change in volume			
	0.021	12%		Increase in volume for F7 now F9	
	F7-F9				

## Winfield example for F9 porosity

1. F9 appears to be over represented by ~32% in the model, as well as in earlier steps in the process.

2. Training set – 25%

Predicted by NNet – 35% (39% high)

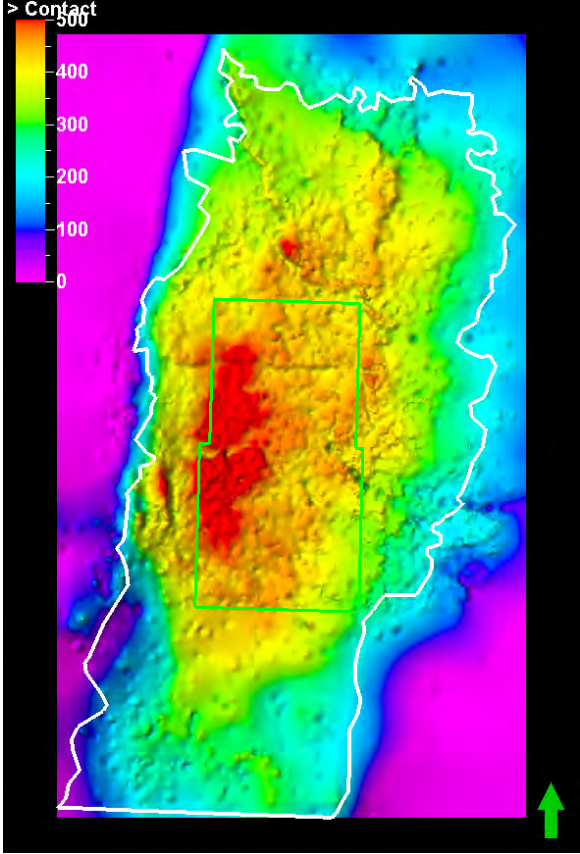
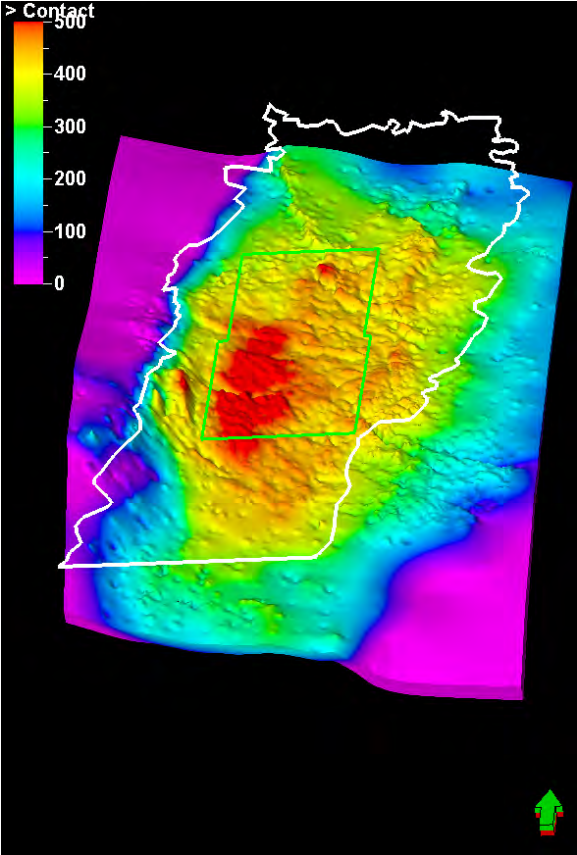
Petra grid from N/GR – 30%

$\text{PHI\_GM4} = \text{If}(\text{ZID}=3, \text{If}(\text{F11\_GM4XE}=9, \text{PHI\_GM4}-.01, \text{PHI\_GM4}), \text{PHI\_GM4})$

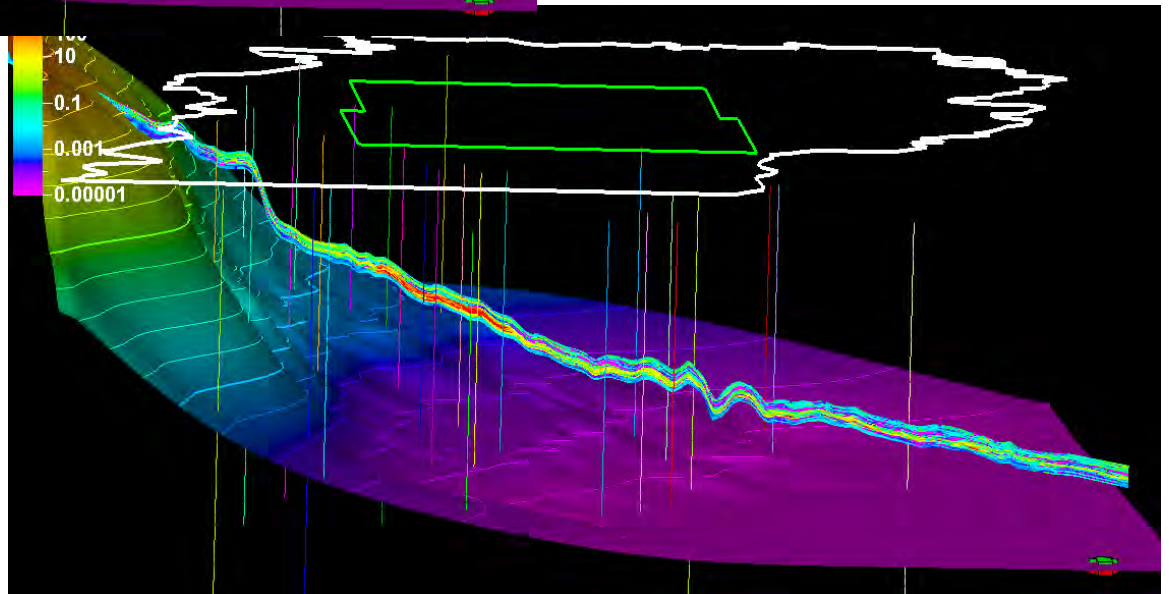
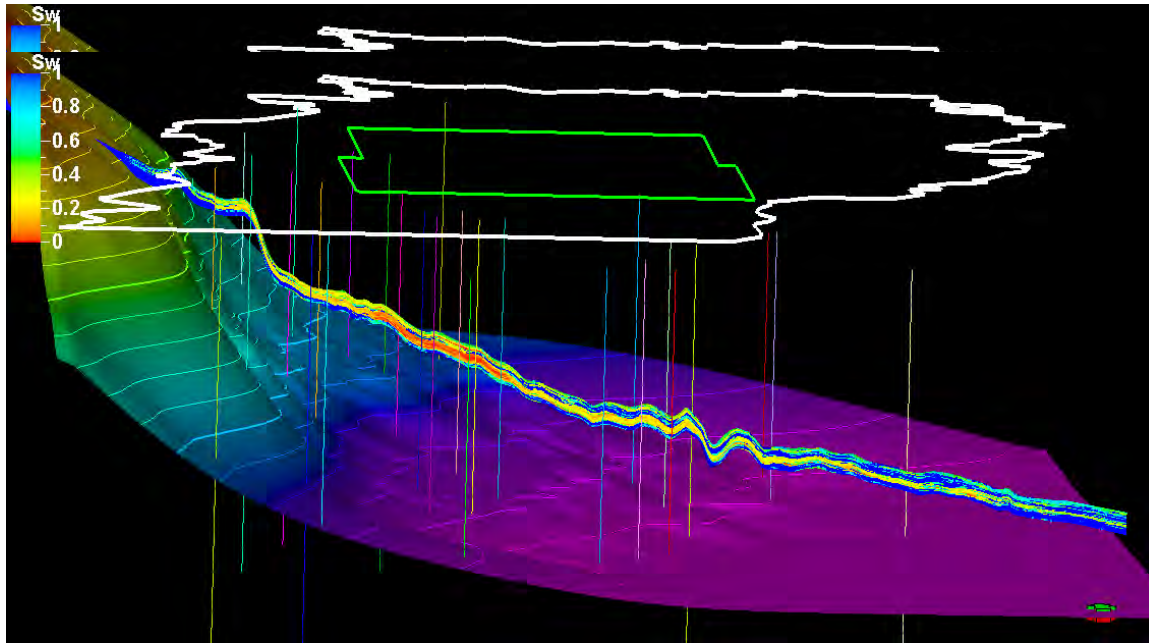
Reduced Winfield OGIP by 3%

# Step through Dave's workflow for properties

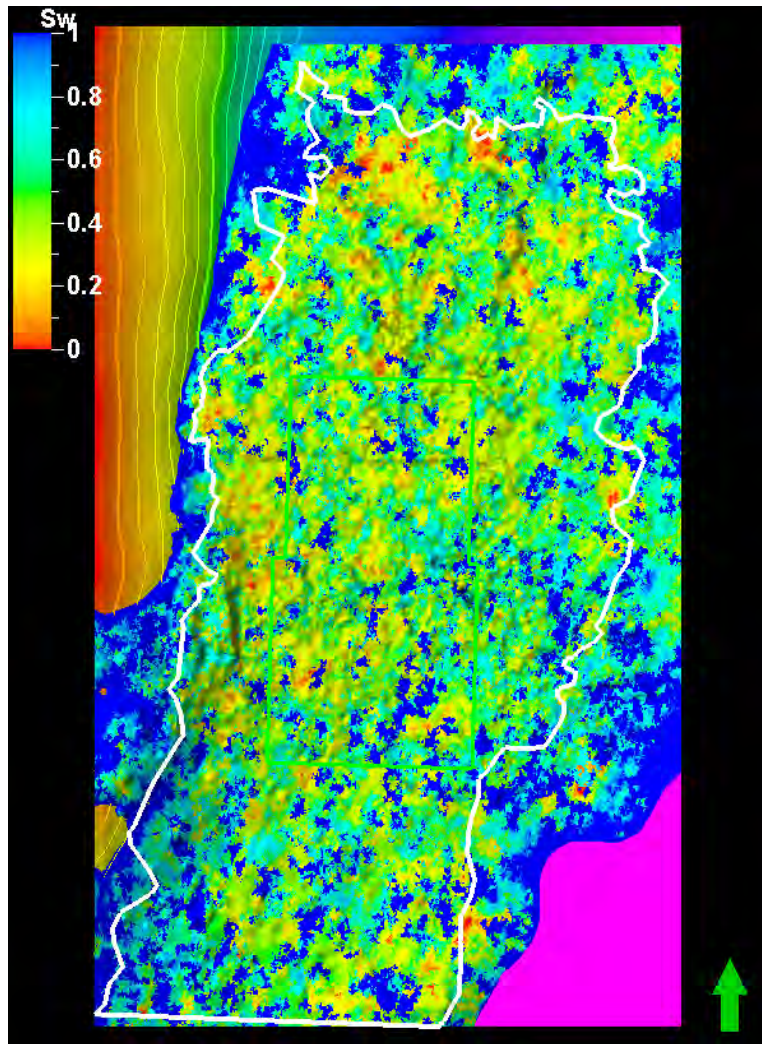
## HFWL70 for Hrngtn-Winf



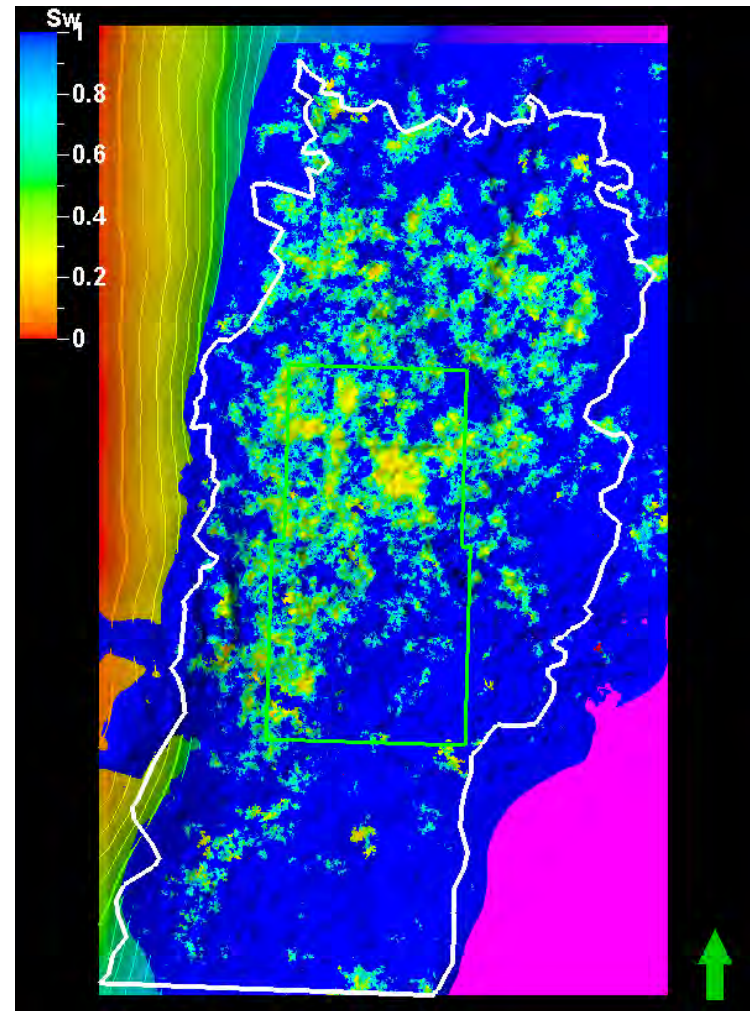
# Herington-Krider Sw and Kxy through the Flower-Newby



# Sw and FWL



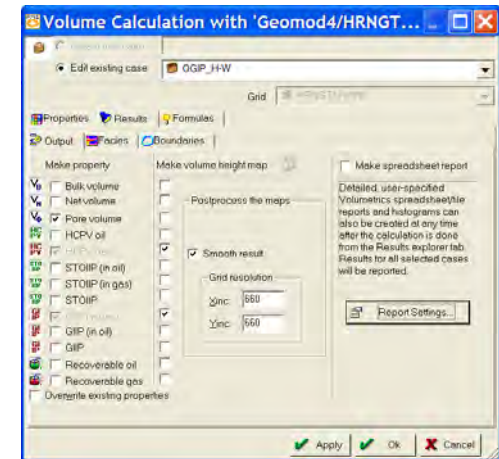
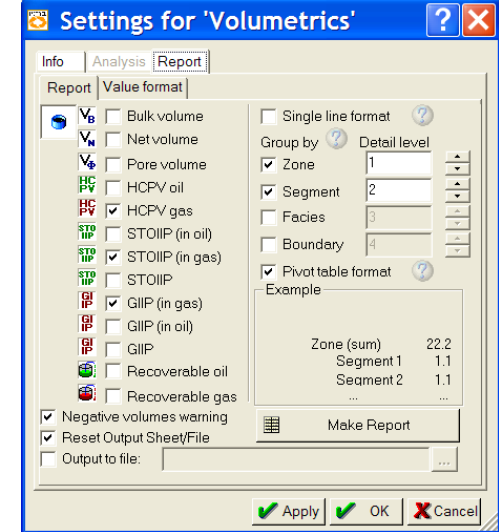
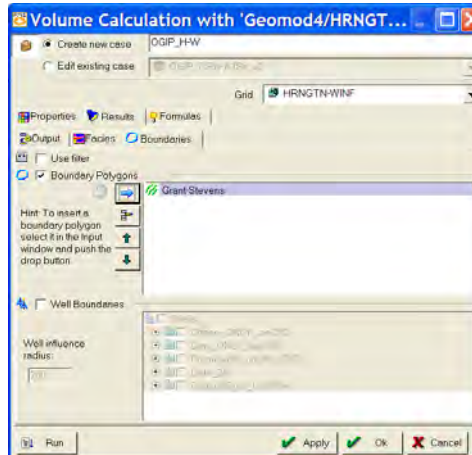
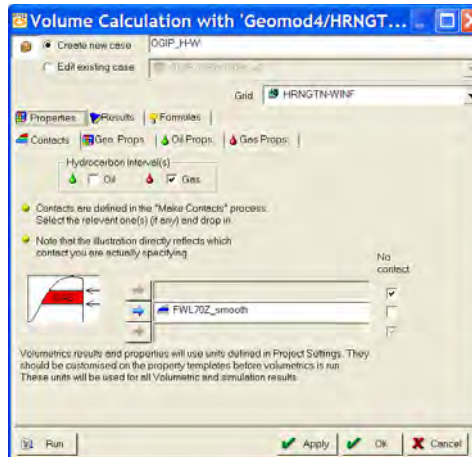
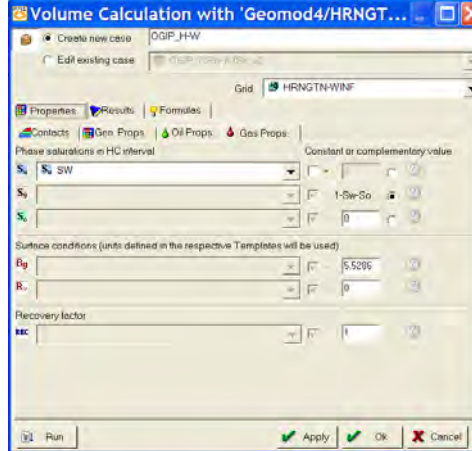
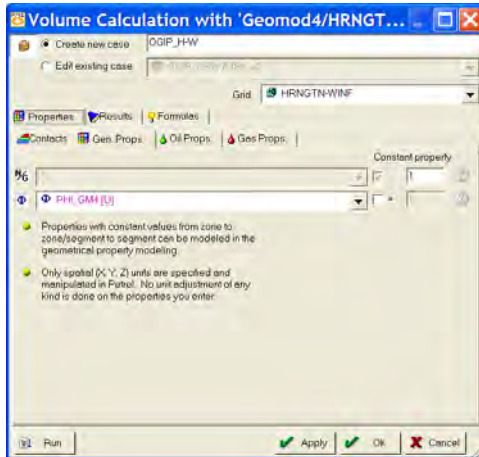
Herington



Bottom layer in Odell

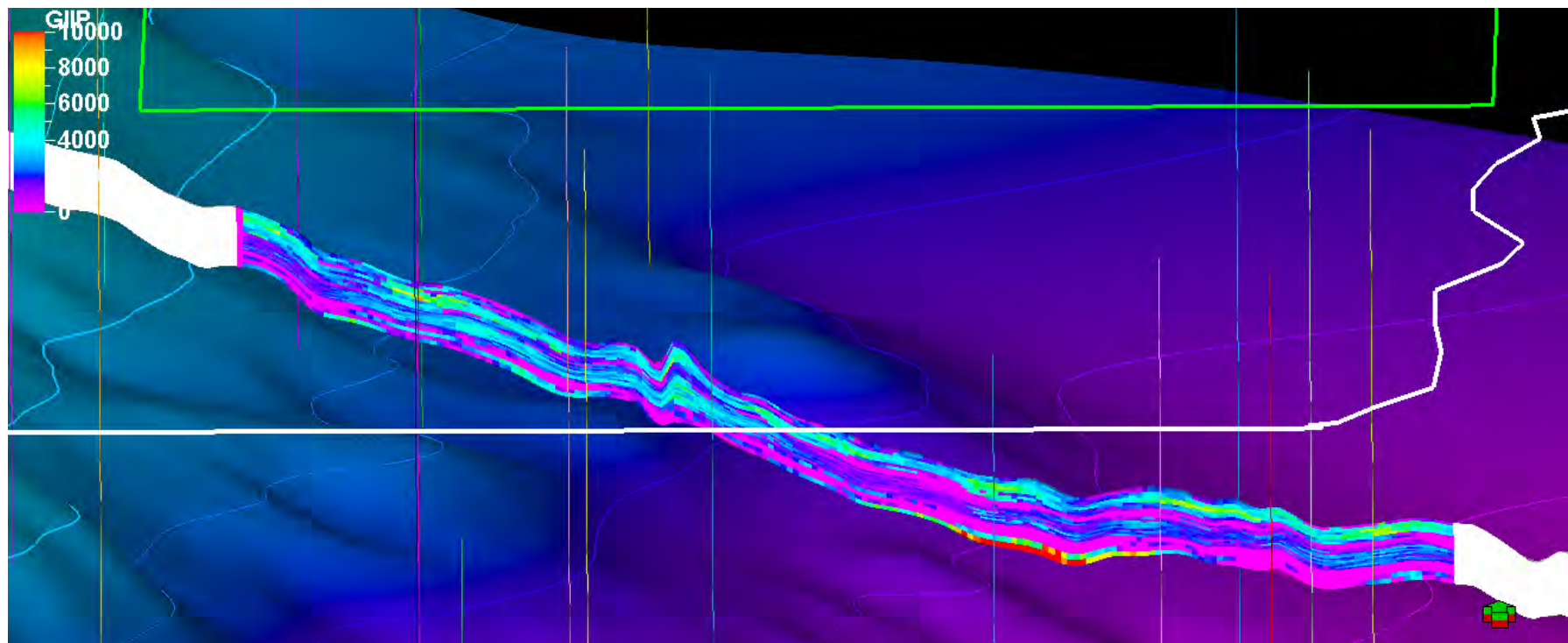
# OGIP calc

1. Open volume calculation
2. Insert FWL contact
3. Make  $S_w = S_w$  and leave  $S_g = 1 - S_w - S_o$ ,  $B_g = 5.5286$
4. Phi and N/G as shown
5. Select Grant-Stevens
6. Select what to report
7. Apply and Run

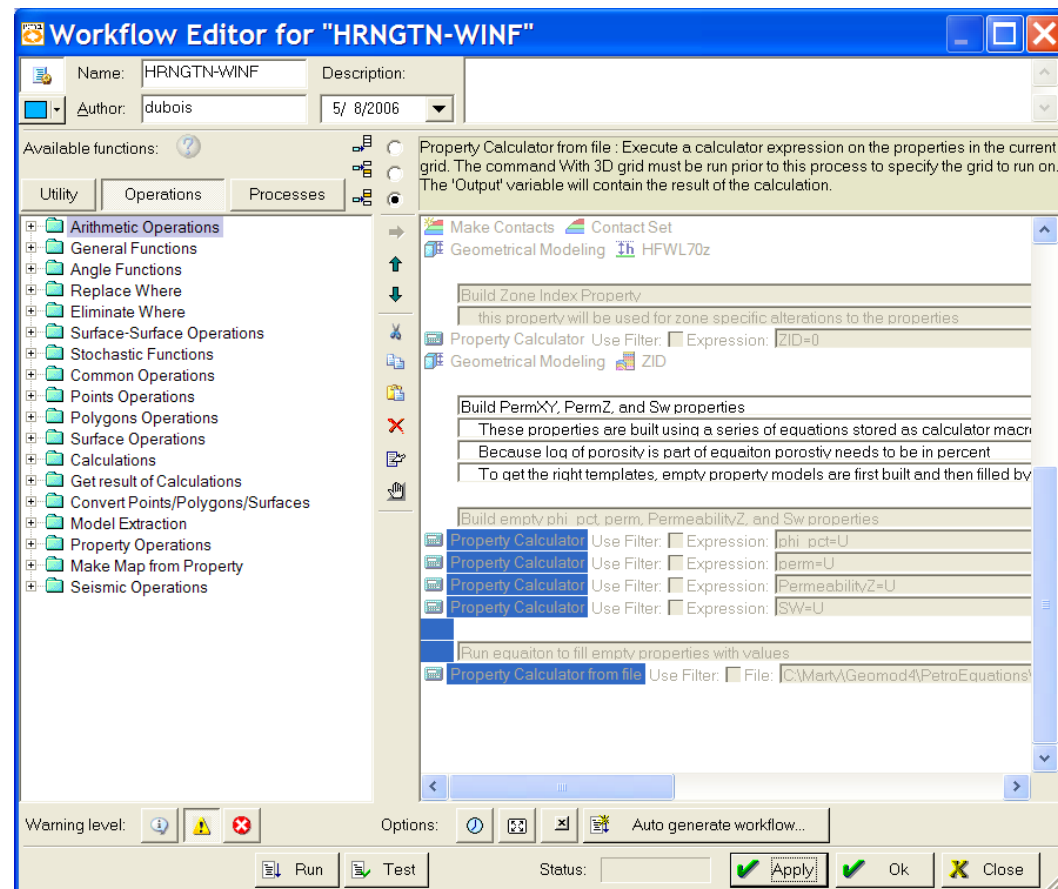
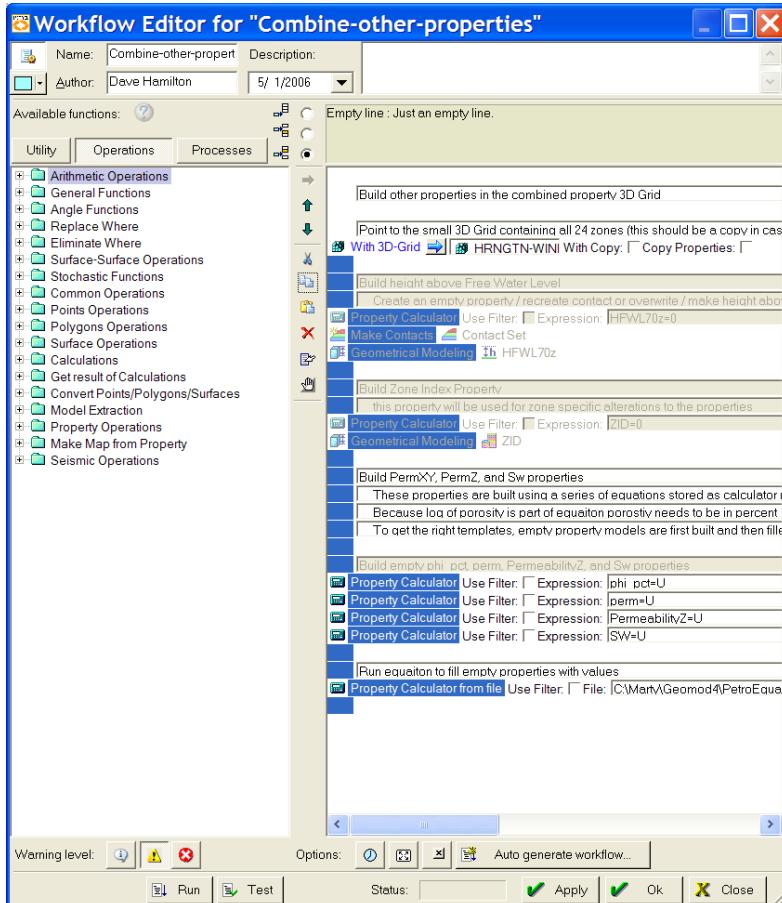




# H-Kr-O OGIP Flower-Newby area

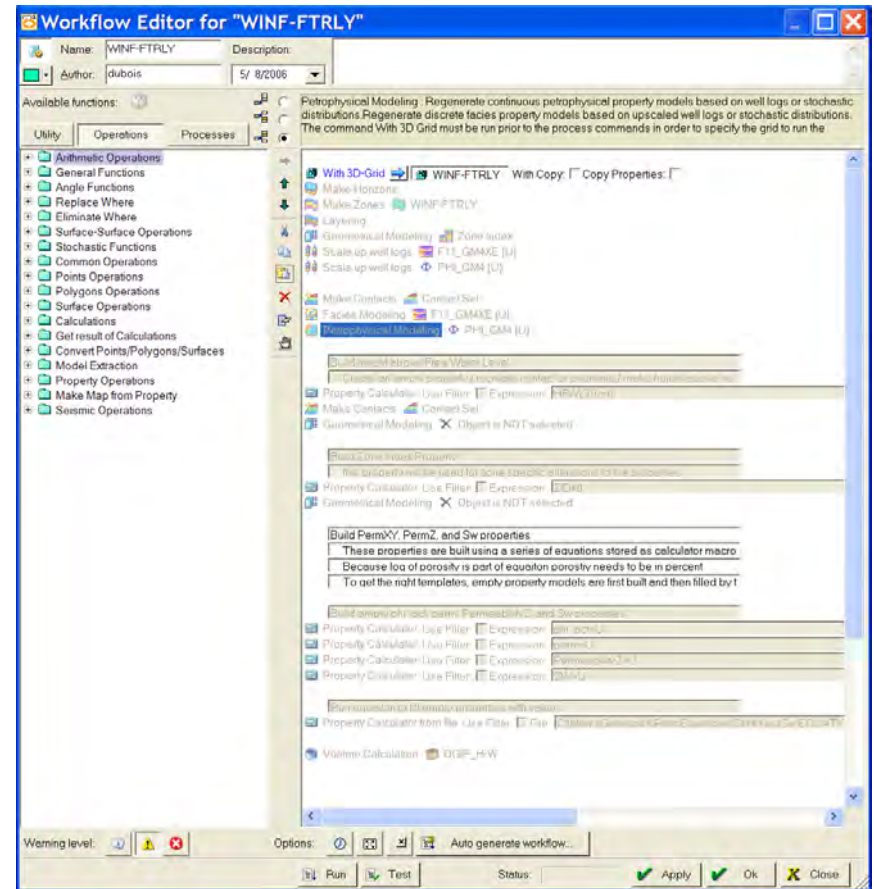
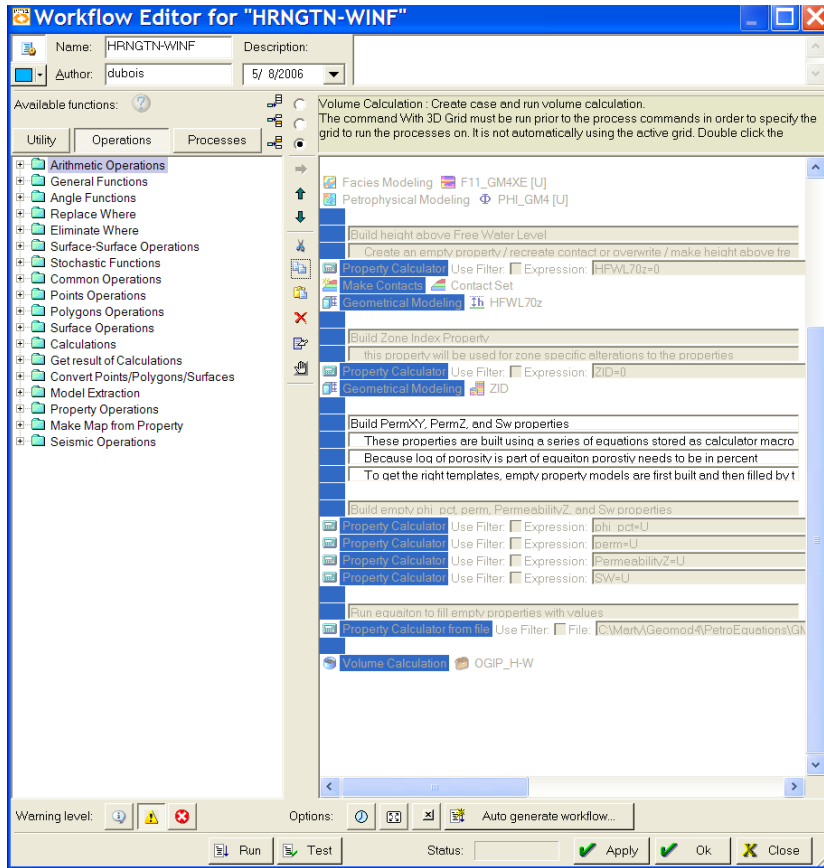


# Workflow work



Ran this from original location.  
The decided to copy it into the  
workflow for the zone

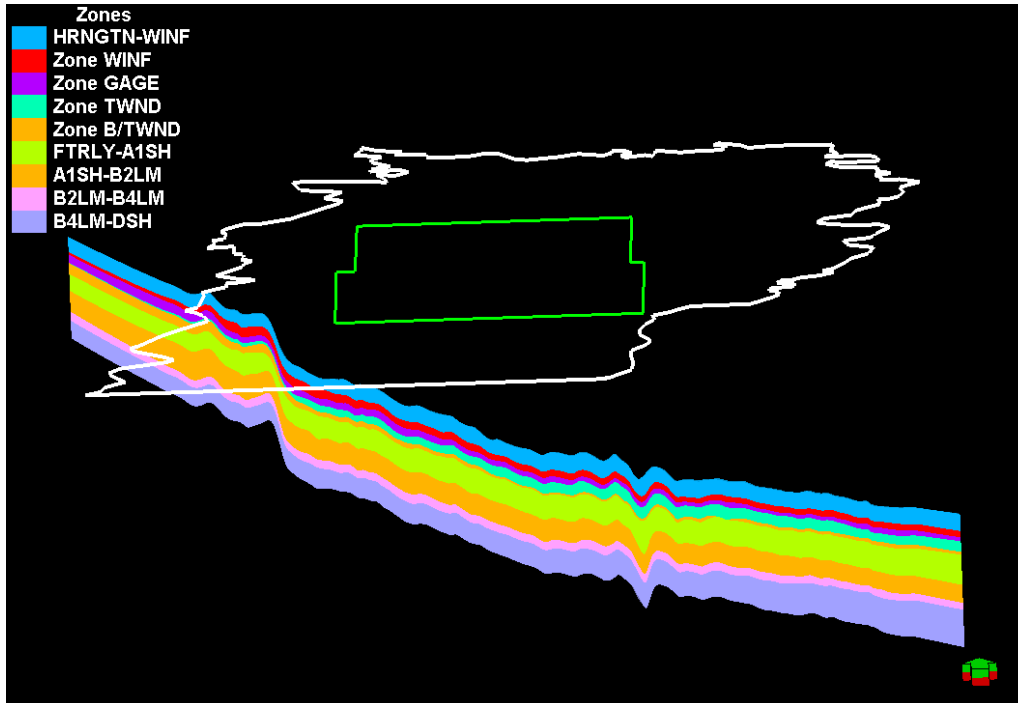
# More building workflow



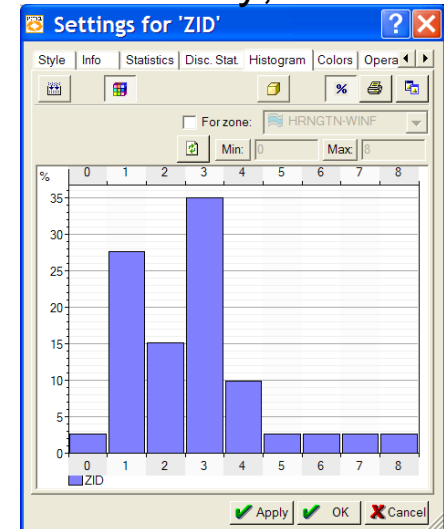
Added a working volume calculator and then copied to all other models

Go back to all workflows that are not an object and set up..for each zone

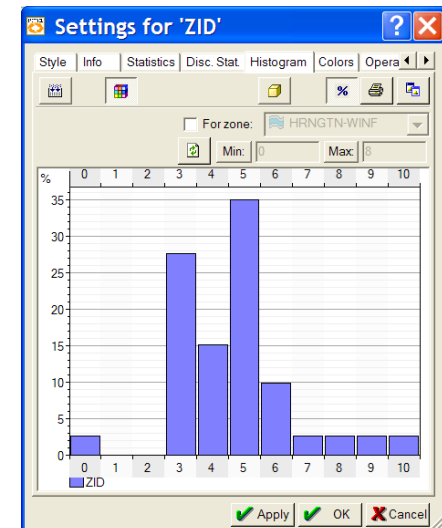
# More Building workflows – Change ZID for 3D grids below Hrntn-Winf



Winf-Ftrly, before



Winf-Ftrly, after



Winf-Ftrly  
 Ftrly-A1sh  
 A1sh-B2LM  
 B2LM-B4LM  
 B4LM-Dsh

ZID=If( ZID>0, ZID+2, ZID)  
 ZID=If( ZID>1, ZID+5, ZID)  
 ZID=If( ZID>2, ZID+7, ZID)  
 ZID=If( ZID>3, ZID+11, ZID)  
 ZID=If( ZID>4, ZID+14, ZID)

## Other tips

Many of the operations, especially the calculators need to be run interactively before the next can be executed. The next step relies on manually inputting the newly created variable. For example, Sw that goes in the Volumetrics has to be generated before it can be inserted.

The screenshot displays the 'Workflow Editor for "WINF-FTRLY"' interface. At the top, the workflow name is 'WINF-FTRLY', the author is 'dubois', and the date is '5/ 8/2006'. The left sidebar lists available functions under categories like 'Arithmetic Operations', 'General Functions', 'Replace Where', 'Eliminate Where', 'Surface-Surface Operations', 'Stochastic Functions', 'Common Operations', 'Points Operations', 'Polygons Operations', 'Surface Operations', 'Calculations', 'Get result of Calculations', 'Convert Points/Polygons/Surfaces', 'Model Extraction', 'Property Operations', 'Make Map from Property', and 'Seismic Operations'. The main workspace shows a sequence of operations:

- With 3D-Grid**: WINF-FTRLY. Includes options for 'With Copy' and 'Copy Properties'.
- Make Horizons**
- Make Zones**: WINF-FTRLY
- Layering**
- Geometrical Modeling**: Zone Index
- Scale up well logs**: F11\_GM4XE [U]
- Scale up well logs**: PHI\_GM4 [U]
- Make Contacts**: Contact Set
- Facies Modeling**: F11\_GM4XE [U]
- Petrophysical Modeling**: PHI\_GM4 [U]

Below the operations, there are several text boxes and calculator steps:

- Build height above Free Water Level**: Create an empty property / recreate contact or overwrite / make height above fre
- Property Calculator**: Use Filter: [ ] Expression: HFWL70z=0
- Make Contacts**: Contact Set
- Geometrical Modeling**: Object is NOT selected
- Build Zone Index Property**: this property will be used for zone specific alterations to the properties
- Property Calculator**: Use Filter: [ ] Expression: ZID=0
- Geometrical Modeling**: Object is NOT selected
- Build PermXY, PermZ, and Sw properties**: These properties are built using a series of equations stored as calculator macro. Because log of porosity is part of equation porosity needs to be in percent. To get the right templates, empty property models are first built and then filled by t
- Build empty phi, pct, perm, PermeabilityZ, and Sw properties**
- Property Calculator**: Use Filter: [ ] Expression: phi\_pct=U
- Property Calculator**: Use Filter: [ ] Expression: perm=U
- Property Calculator**: Use Filter: [ ] Expression: PermeabilityZ=U
- Property Calculator**: Use Filter: [ ] Expression: SW=U
- Run equation to fill empty properties with values**
- Property Calculator from file**: Use Filter: [ ] File: C:\Martv\Geomod4\PetroEquations\GM4 KxzSw EQUATIK
- Volume Calculation**: OGIP\_H-W

The bottom of the window shows a 'Warning level' section with icons for information, warning, and error. The 'Options' section includes 'Auto generate workflow...'. At the very bottom, there are buttons for 'Run', 'Test', 'Status', 'Apply', 'Ok', and 'Close'.

# Inserting Text comments and Free memory

The screenshot shows the 'Workflow Editor for "HRNGTN-WINF"' interface. At the top, the window title is 'Workflow Editor for "HRNGTN-WINF"'. Below the title bar, there are fields for 'Name: HRNGTN-WINF', 'Description:', 'Author: dubois', and a date '5/ 8/2006'. The main interface is divided into three main sections: a left-hand tree view, a top toolbar, and a large central workspace.

**Tree View (Left):** This section contains a hierarchical list of functions and folders. The 'Folder administration' folder is expanded, showing sub-items like 'Delete', 'Remove content', 'Copy', 'Move', 'New folder', 'Set reference', 'Set reference list', 'Save Project', 'Export Output Sheet', 'Load Output Sheet', 'Export Graphic', 'Free Memory', 'Set name & active', 'Visibility & Plotting', and 'Surface Filter & Calculator'. The 'Free Memory' and 'Comments' items are circled in red.

**Top Toolbar:** This section contains buttons for 'Utility', 'Operations', and 'Processes'. There are also icons for 'Available functions' and a 'Hint' box that reads: 'Hint: Select one of the operations in the tree, and execute it by the Execute button. The action can be undone.'

**Central Workspace (Right):** This section displays a sequence of workflow steps. The steps include: 'With 3D-Grid', 'Make Horizons', 'Make Zones', 'Layering', 'Geometrical Modeling', 'Scale up well logs', 'Make Contacts', 'Facies Modeling', and 'Petrophysical Modeling'. Each step has associated icons and text. For example, the 'Build height above Free Water Level' step includes the text: 'Create an empty property / recreate contact or overwrite / make height above'. The 'Build Zone Index Property' step includes: 'this property will be used for zone specific alterations to the properties'. The 'Build PermXY, PermZ, and Sw properties' step includes: 'These properties are built using a series of equations stored as calculator... Because log of porosity is part of equation porosity needs to be in percent... To get the right templates, empty property models are first built and then filled'. The 'Build empty phi, pct, perm, PermeabilityZ, and Sw properties' step includes: 'Property Calculator Use Filter: Expression: phi\_pct=U', 'Property Calculator Use Filter: Expression: perm=U', 'Property Calculator Use Filter: Expression: PermeabilityZ=U', and 'Property Calculator Use Filter: Expression: SW=U'. The 'Run equation to fill empty properties with values' step includes: 'Property Calculator from file Use Filter: File: C:\Mart\Geomod4\PetroEqua' and 'Property Calculator Use Filter: Expression: SW=if(Zone\_Index>2, 1, SW)'. The 'Volume Calculation' step includes the icon 'OGIP\_H-W'.

**Bottom Panel:** This section contains a 'Warning level:' indicator with icons for information, warning, and error. There are also buttons for 'Options:', 'Auto generate workflow...', 'Run', 'Test', 'Status:', 'Apply', 'Ok', and 'Close'.

# Clear Sw property in dummy zones

Insert after the property calculators, before volumetric calculations

Hrngtn-Winf            SW=If( ZID>2, 1, SW)

Winf-Ftrly            SW=If( ZID<3, 1, SW)  
                         SW=If( ZID>6, 1, SW)

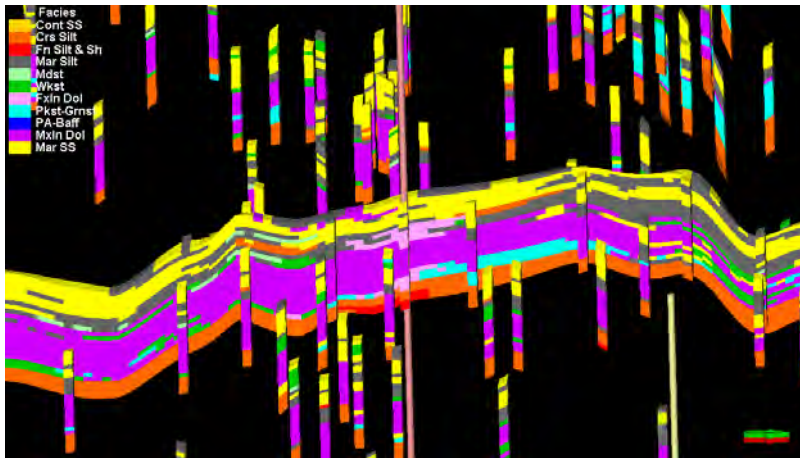
Ftrly-A1sh            SW=If( ZID<7, 1, SW)  
                         SW=If( ZID>9, 1, SW)

A1sh-B2LM            SW=If( ZID<10, 1, SW)  
                         SW=If( ZID>14, 1, SW)

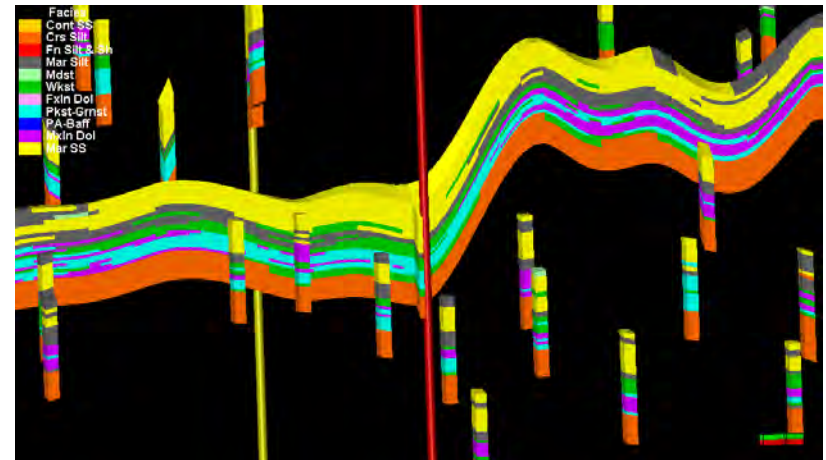
B2LM-B4LM            SW=If( ZID<15, 1, SW)  
                         SW=If( ZID>18, 1, SW)

B4LM-Dsh            SW=If( ZID<19, 1, SW)

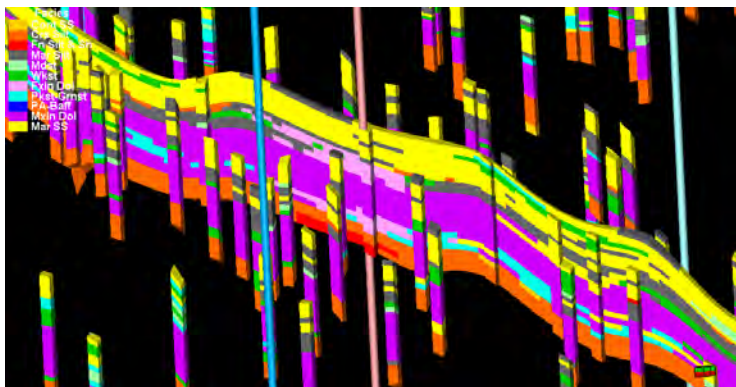
# Herington-Krider-Odell core ties



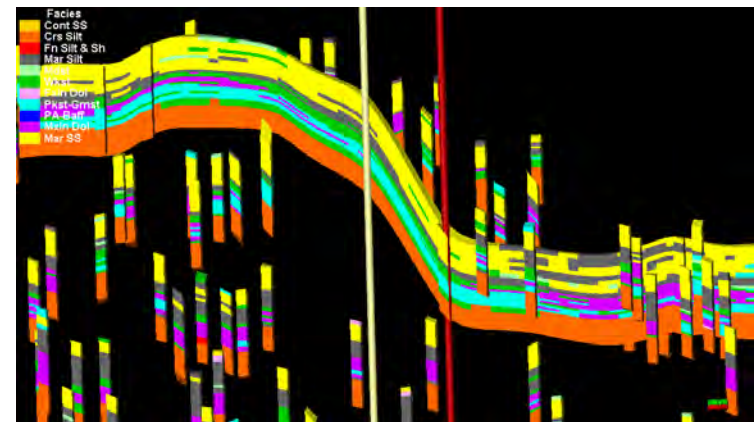
Flower I -direction (S-N)



Shrimplin I-direction (S-N)



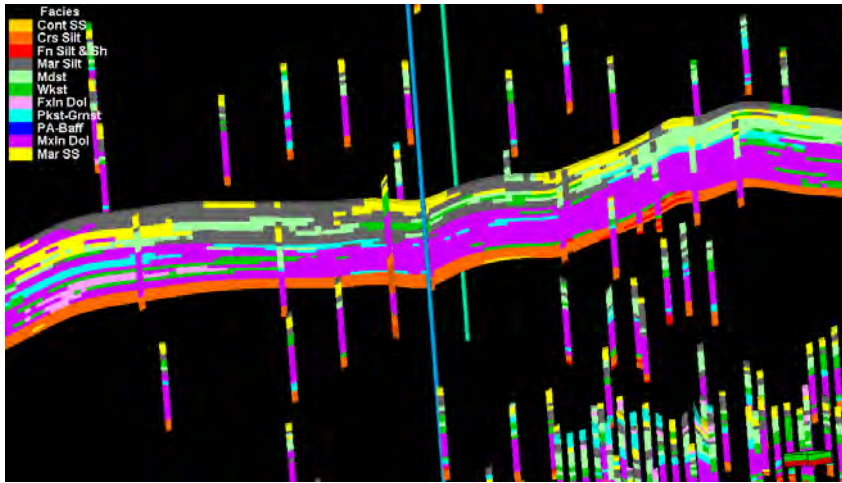
Flower J-direction (W-E)



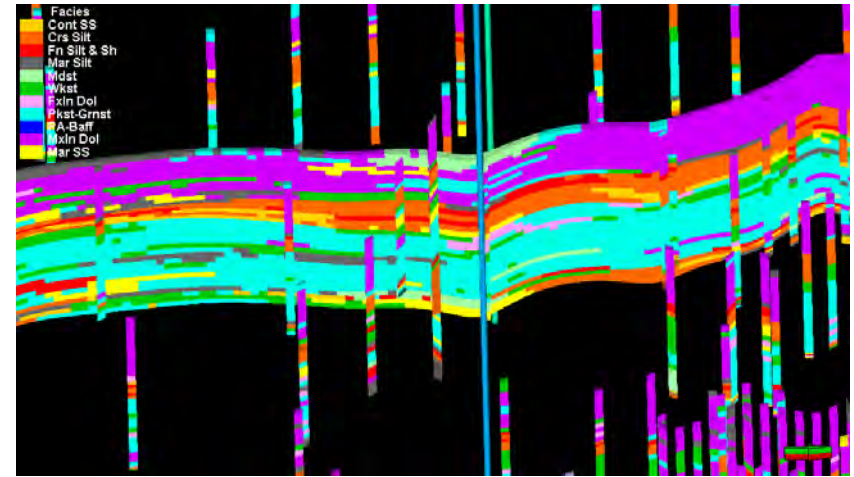
Shrimplin J-direction (W-E)



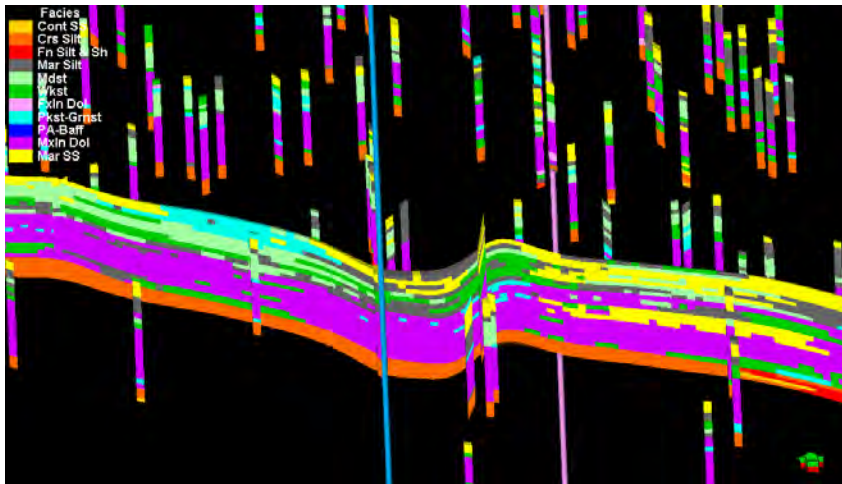
# Herington-Krider-Odell and Winfield-Gage-Towanda-B/Towanda core ties



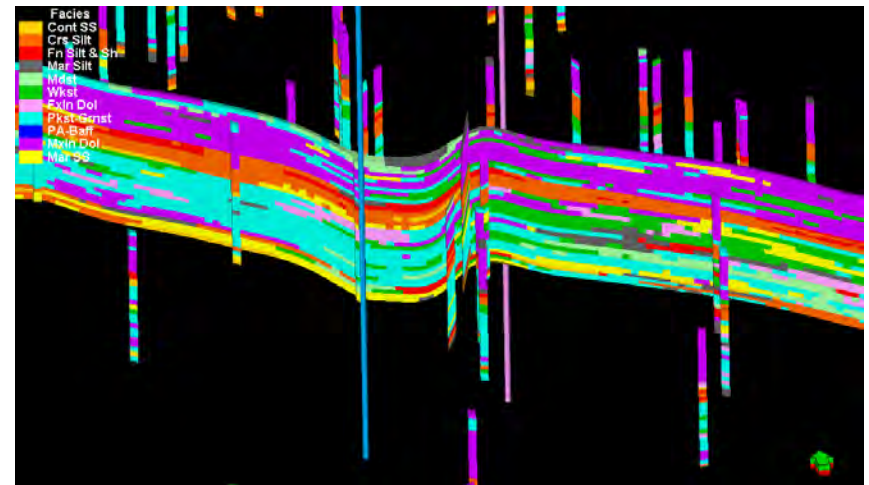
Hoobler I -direction (S-N)



Hoobler I -direction (S-N)

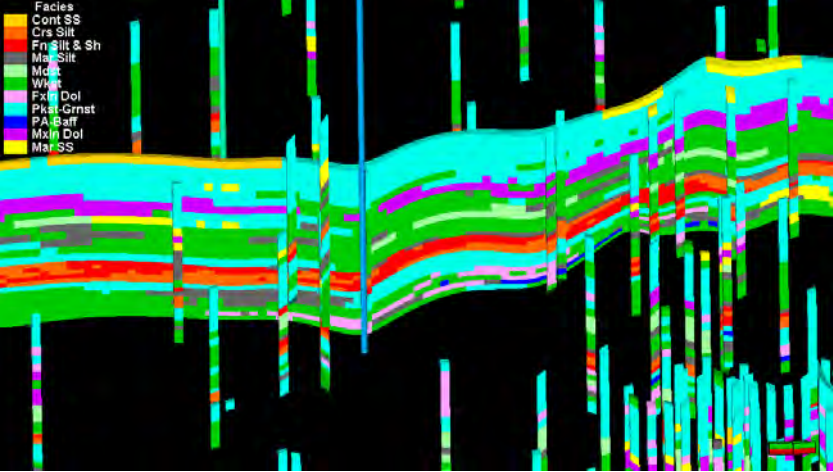


Hoobler J-direction (W-E)

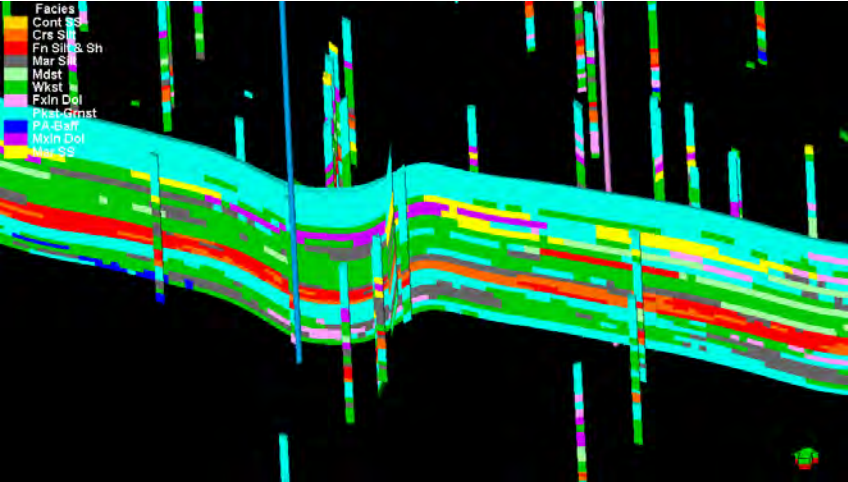


Hoobler J-direction (W-E)

# More Hoobler FtRiley-Matfield-Wreford

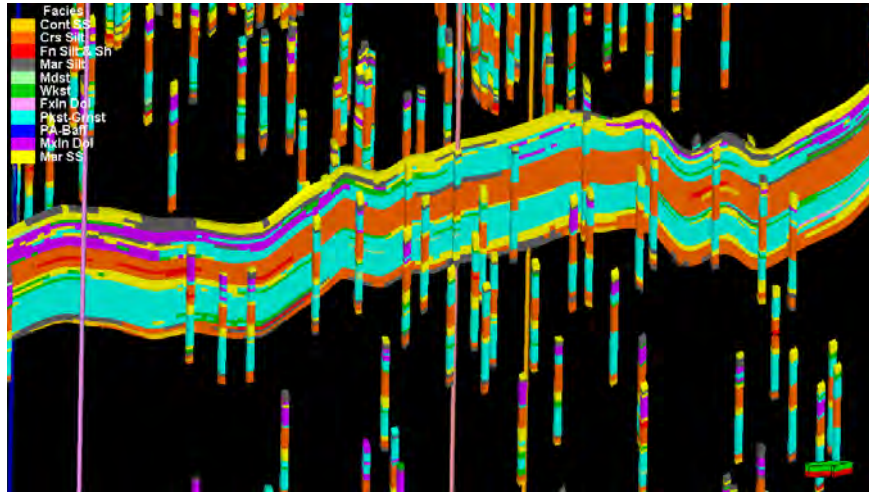


Hoobler I -direction (S-N)

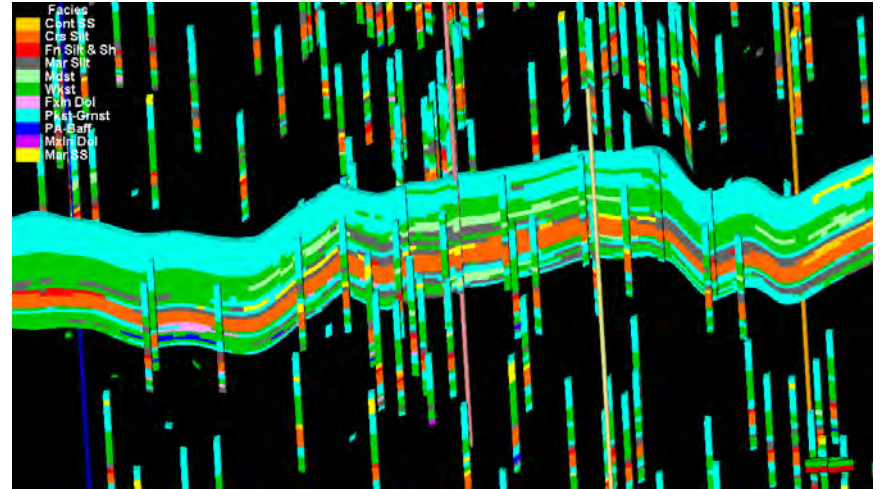


Hoobler J-direction (W-E)

# Flower Winfield-B/Twnd & FtRly-Wreford



Flower I-direction (S-N)

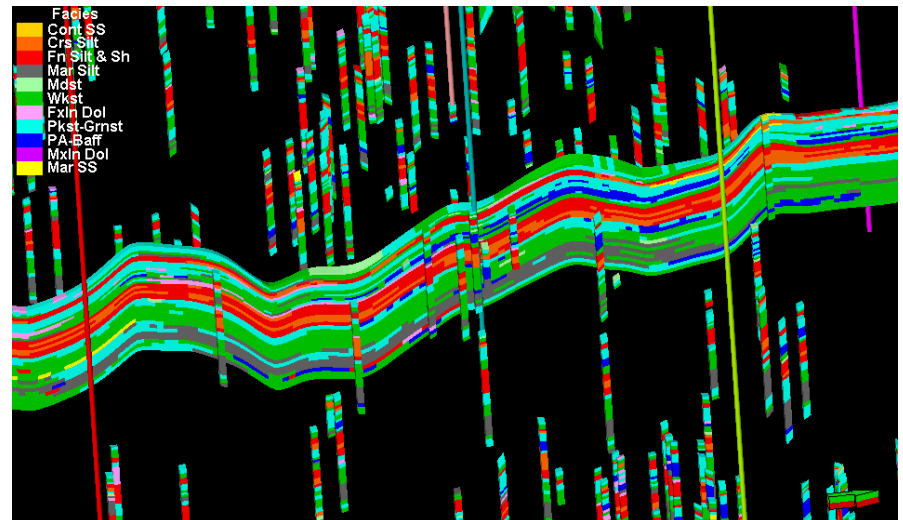
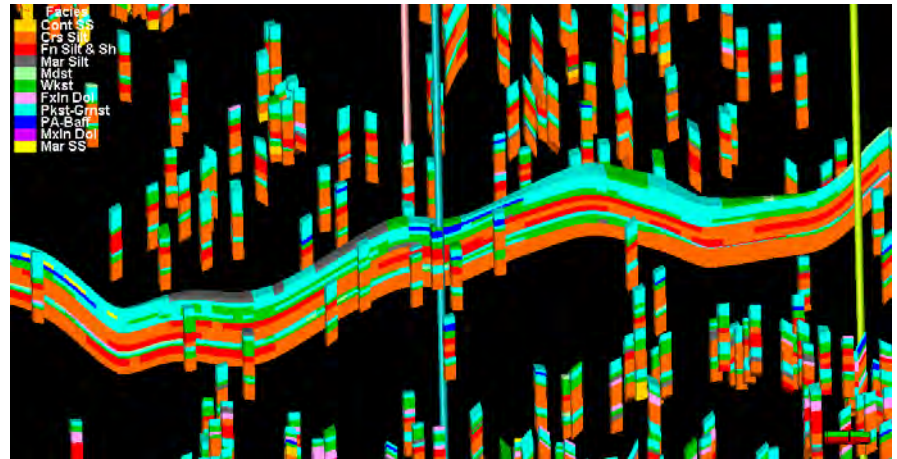
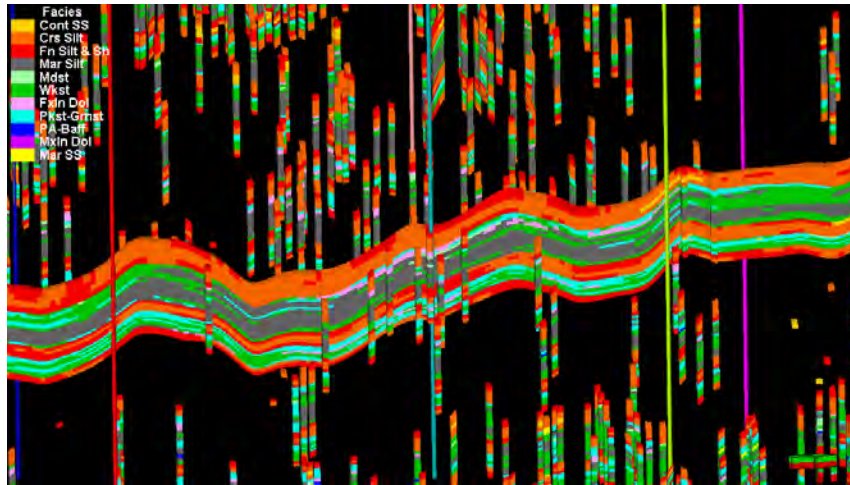


Flower I-direction (S-N)

Newby area S-N  
(I-direction)  
Council Grove

B2LM-B4LM

A1SH-B2LM



B4LM-DSH

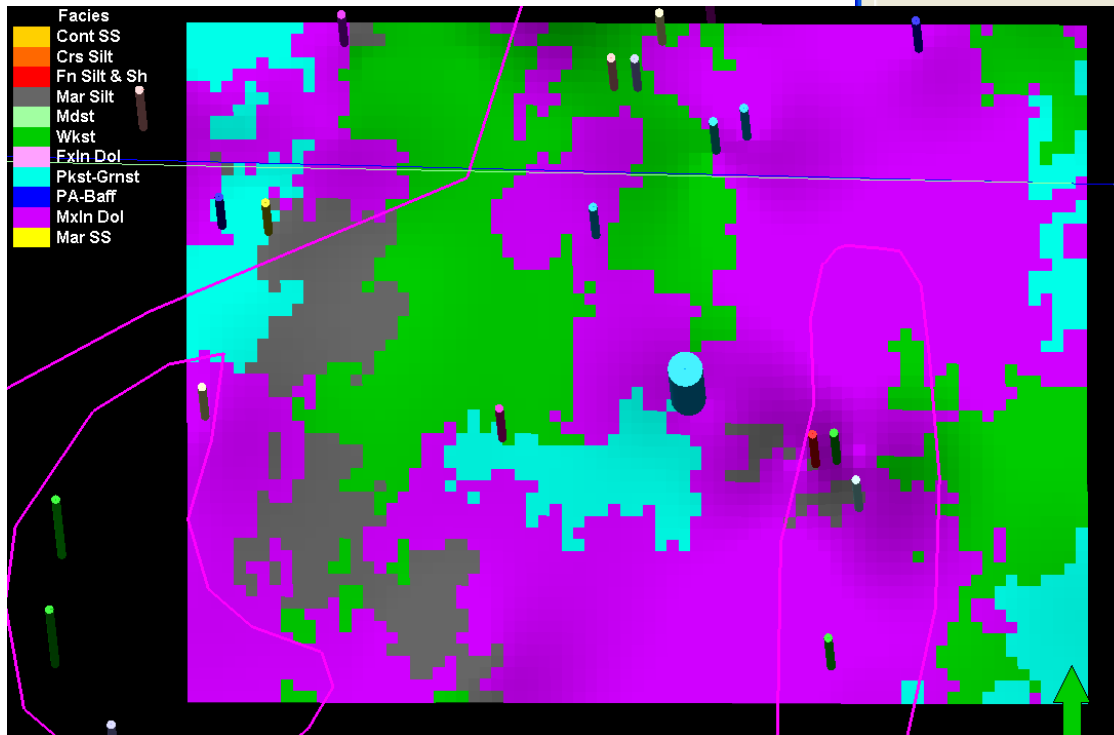
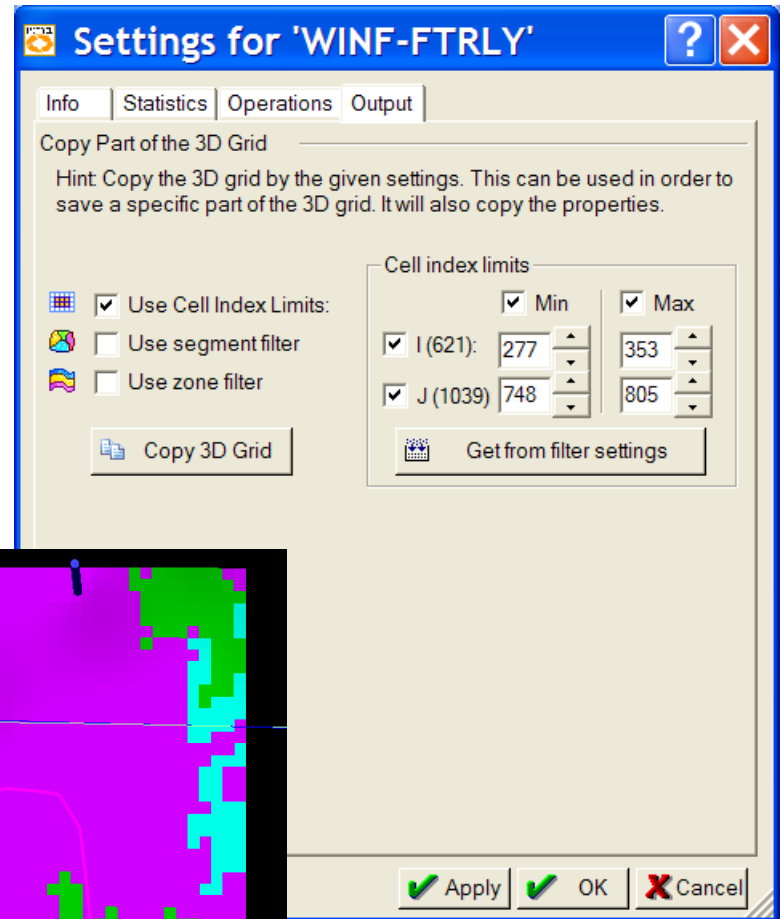
# Hoobler area IJ

Min I 277

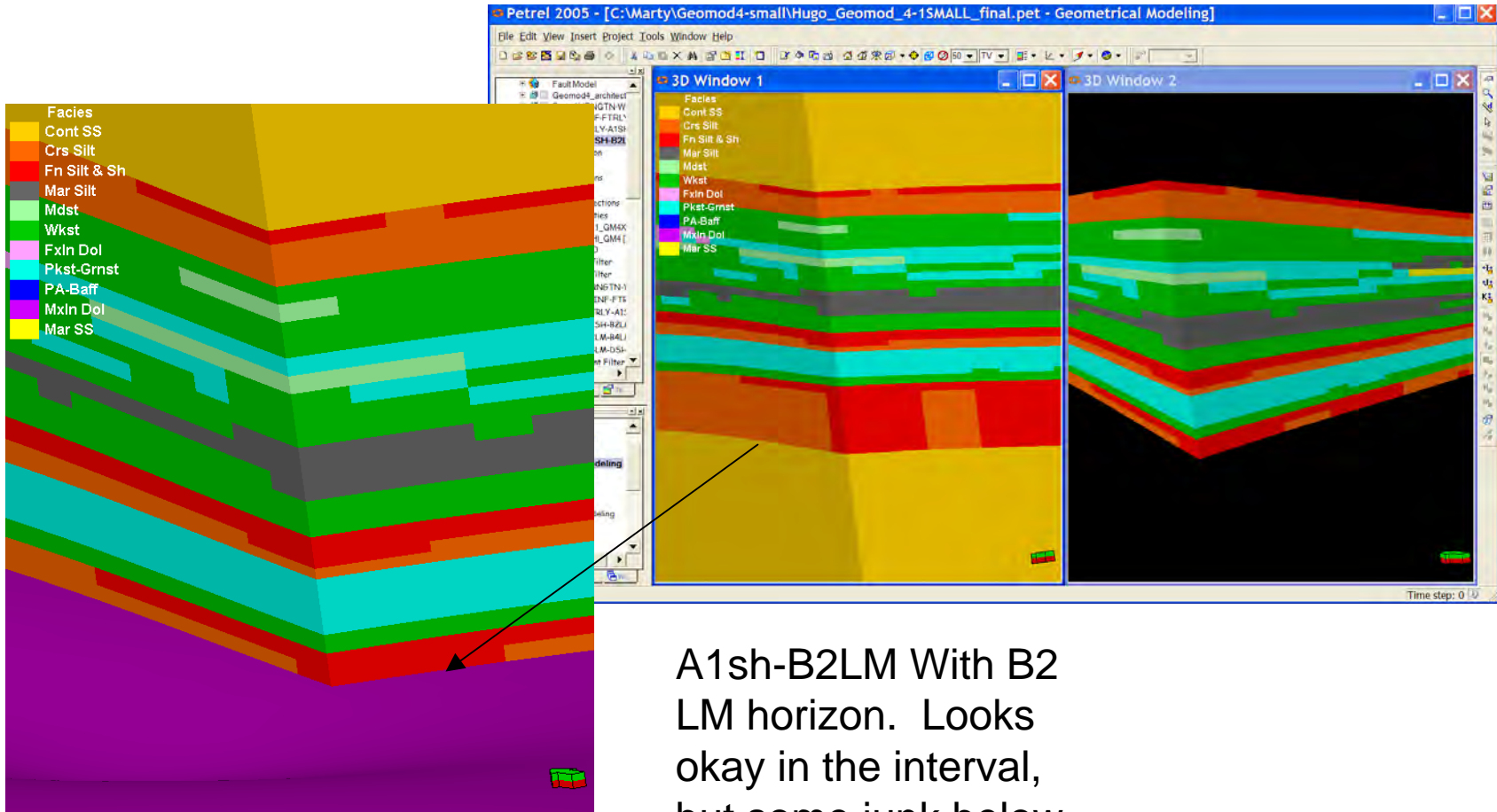
Max I 353

Min J 748

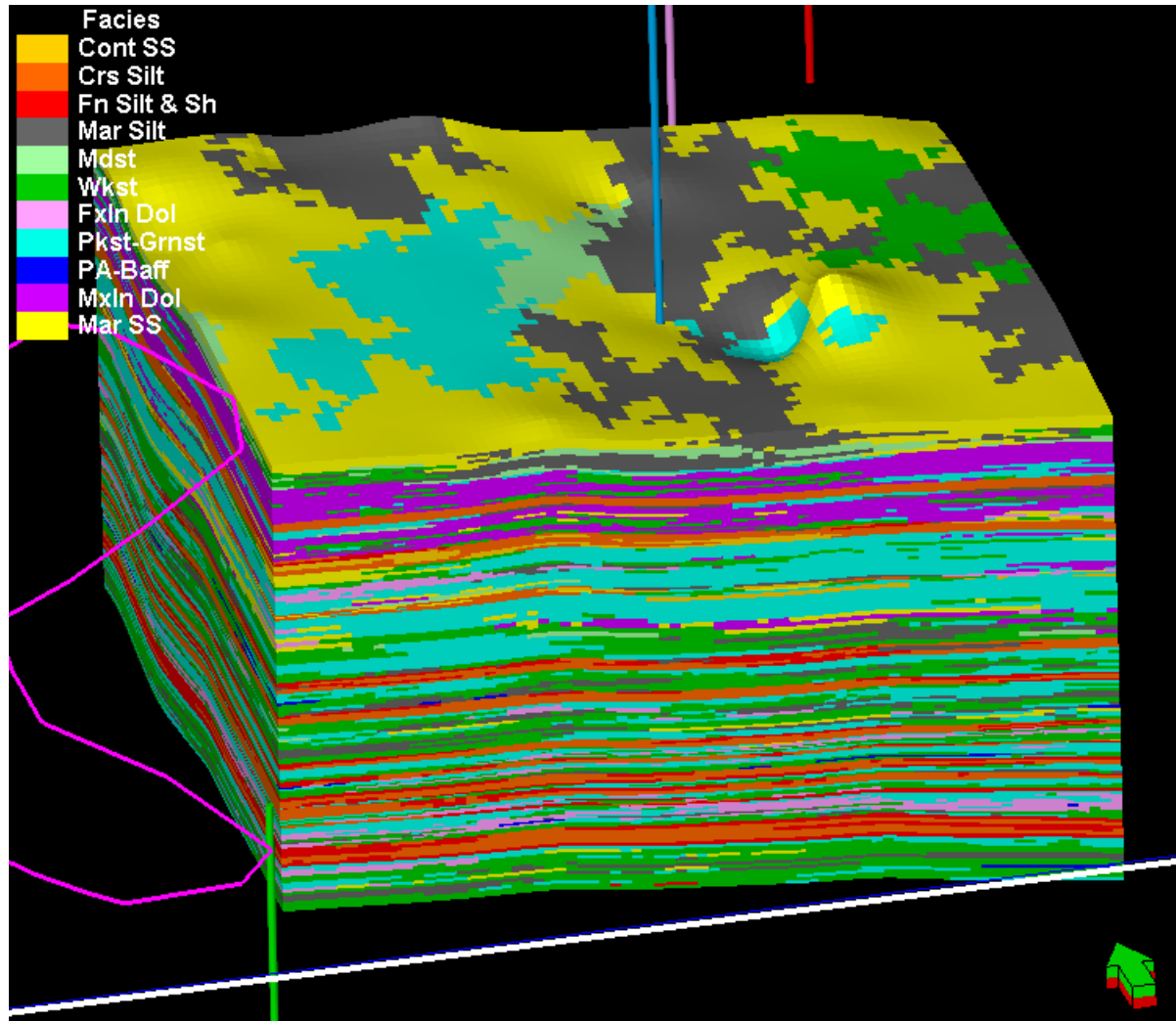
Max J 805



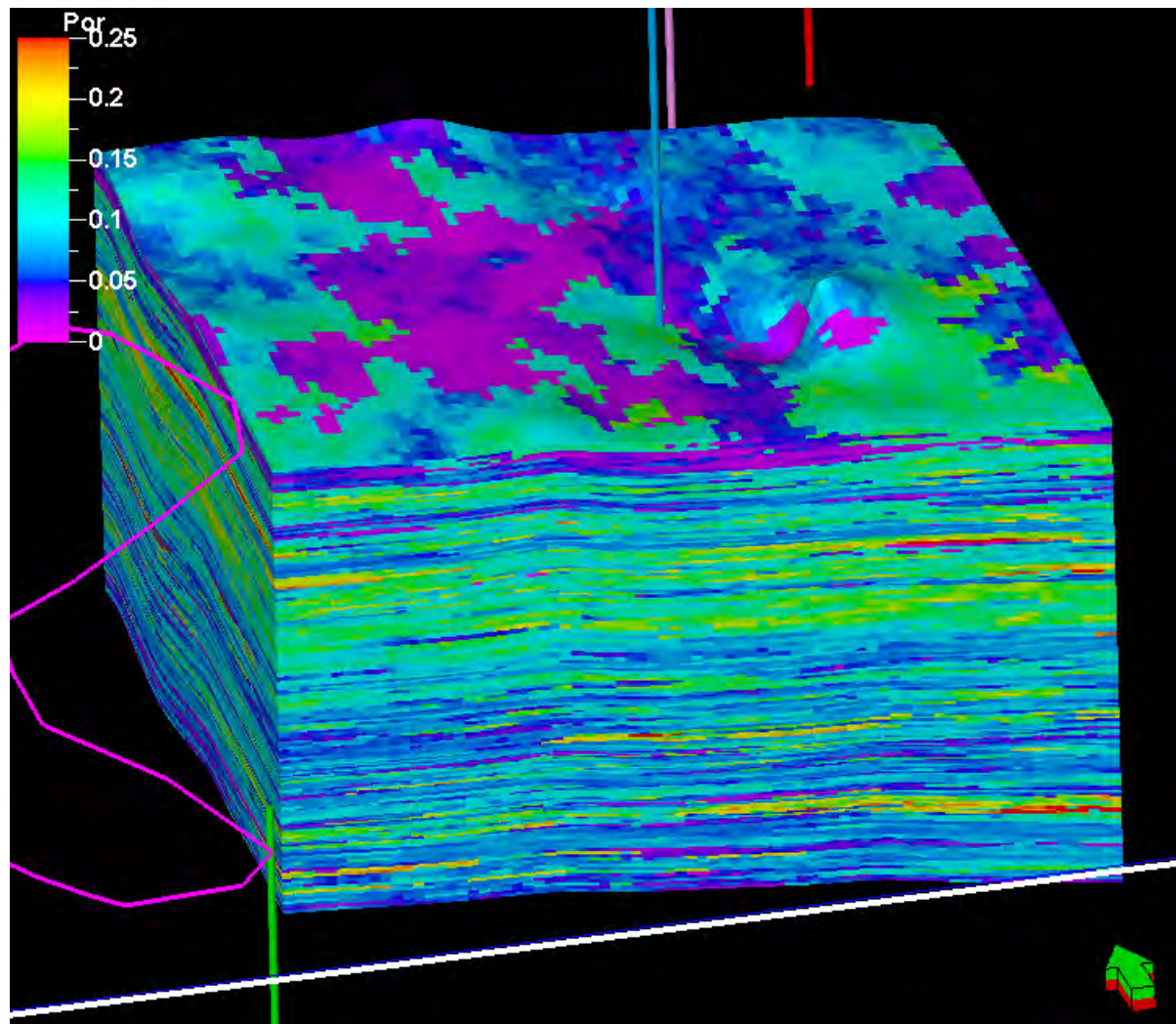
# Combine facies models p 14



# Hoobler combined Facies

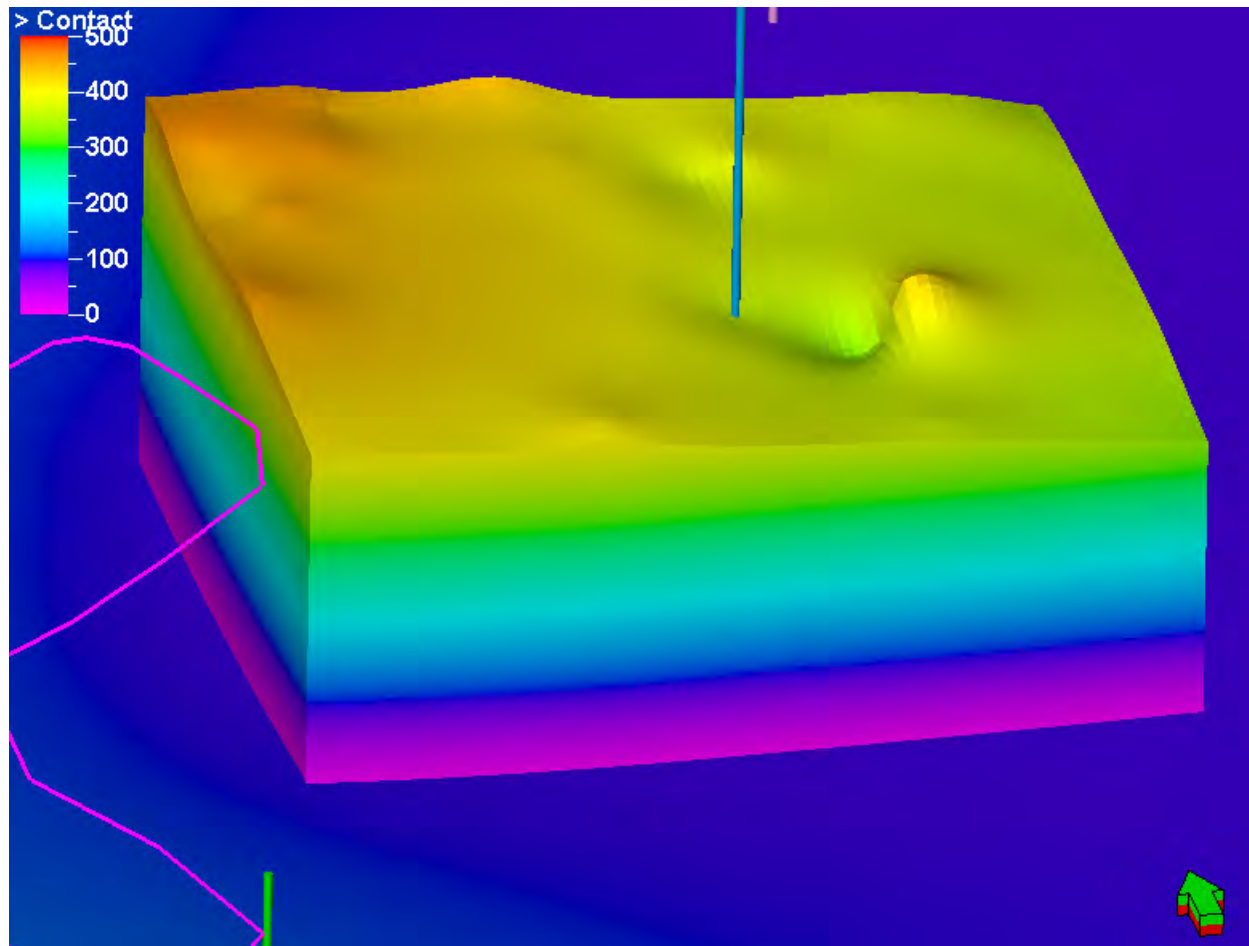


# Hoobler combined Porosity



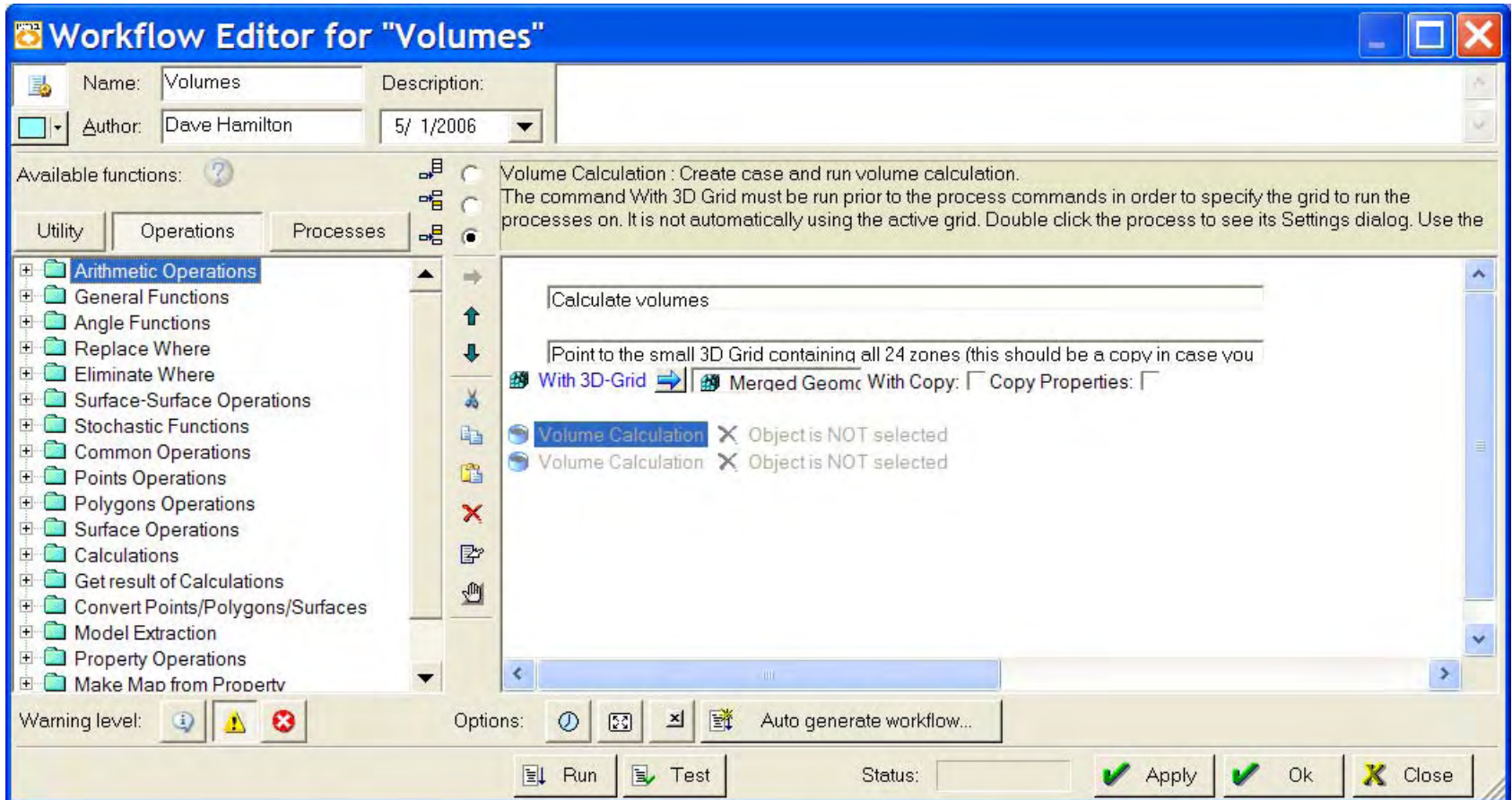


# Hoobler HaFWL

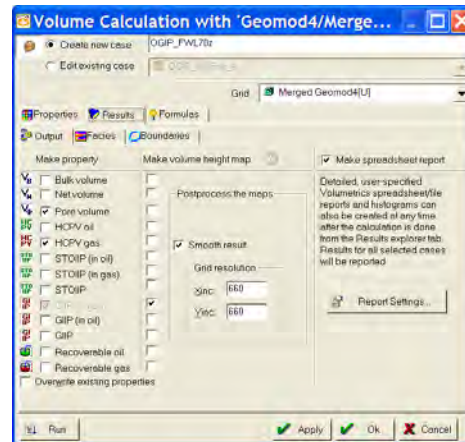
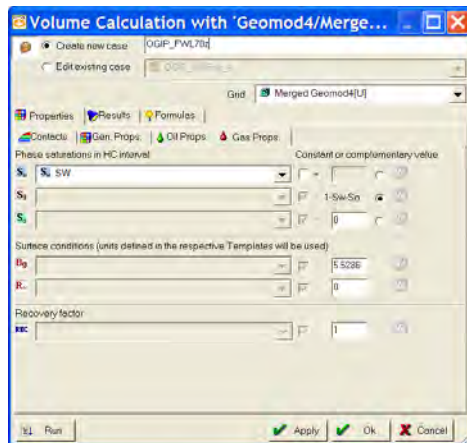
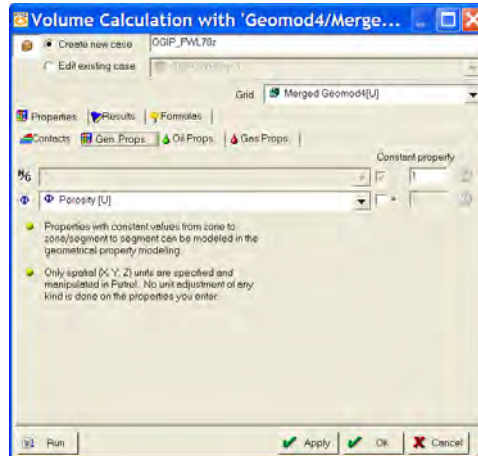
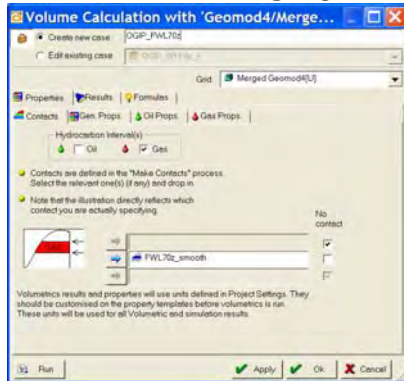


FWL ~ -30 feet

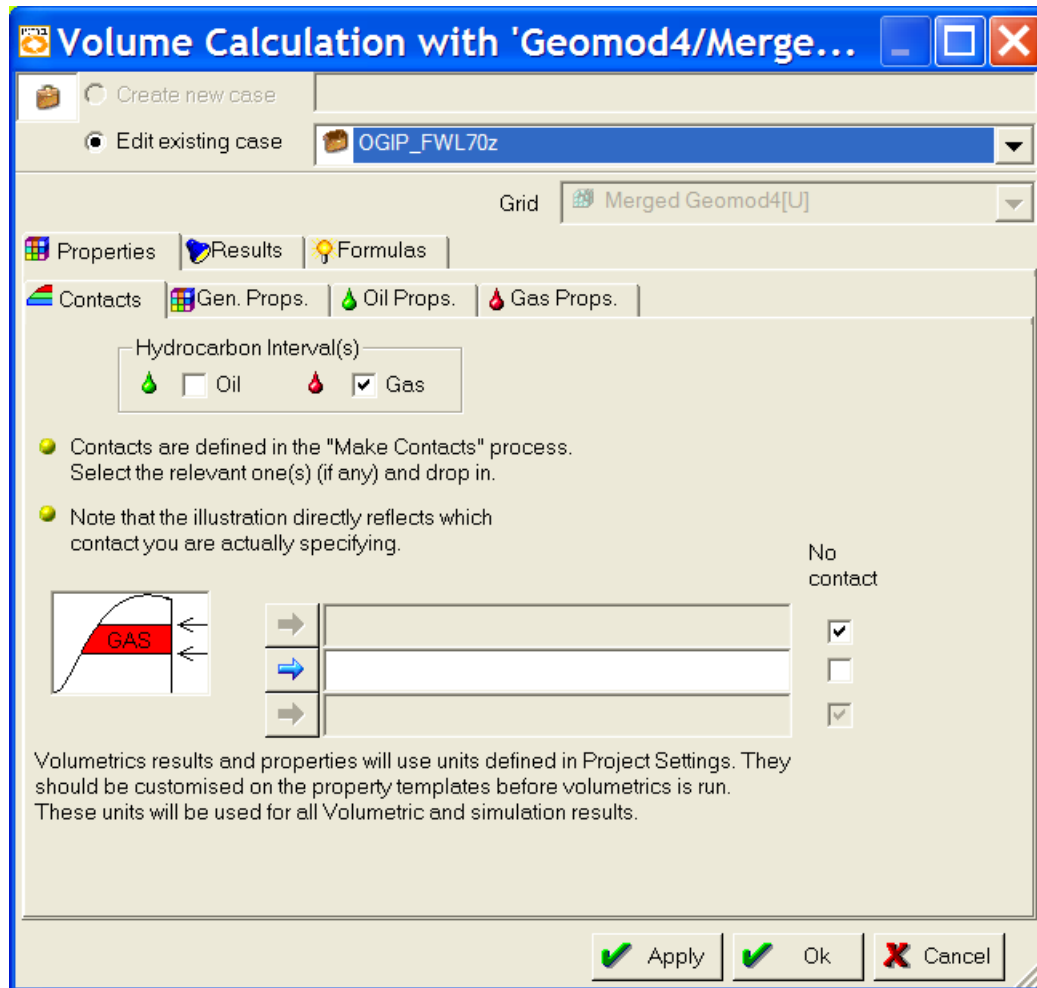
# Volumetrics



# Volumetrics



# Volumetrics



# Hoobler Vol Reports

Petrel 2005 - [C:\Marty\Geomod4-small\Hugo\_Geomod\_4-1SMALL\_final.pet - Volume Calculation] ...

File Edit View Insert Project Tools Window Help

H\_W\_facies  
 W\_F\_facies  
 F\_A\_facies  
 A\_B2\_facies  
 B2\_B4\_facies  
 B4\_D\_facies  
 main\_zone\_index  
 Facies [U]  
 H\_W\_porosity  
 W\_F\_porosity  
 F\_A\_porosity  
 A\_B2\_porosity  
 B2\_B4\_porosity  
 B4\_D\_porosity  
 Porosity [U]  
 HFWL70z  
 ZID  
 phi\_pct  
 perm  
 PermeabilityZ  
 SW  
 Pore volume (OGIP\_FWL70z\_1)  
 HCPV gas (OGIP\_FWL70z\_1)  
 GIIP (in gas) (OGIP\_FWL70z\_1)

Fault Filter  
 Zone Filter  
 Segment Filter  
 Fluid Contacts  
 Contact Set  
 FWL70z\_smooth  
 Copy of Part of Merged Geomod4  
 Part of Geomod4\_architecture

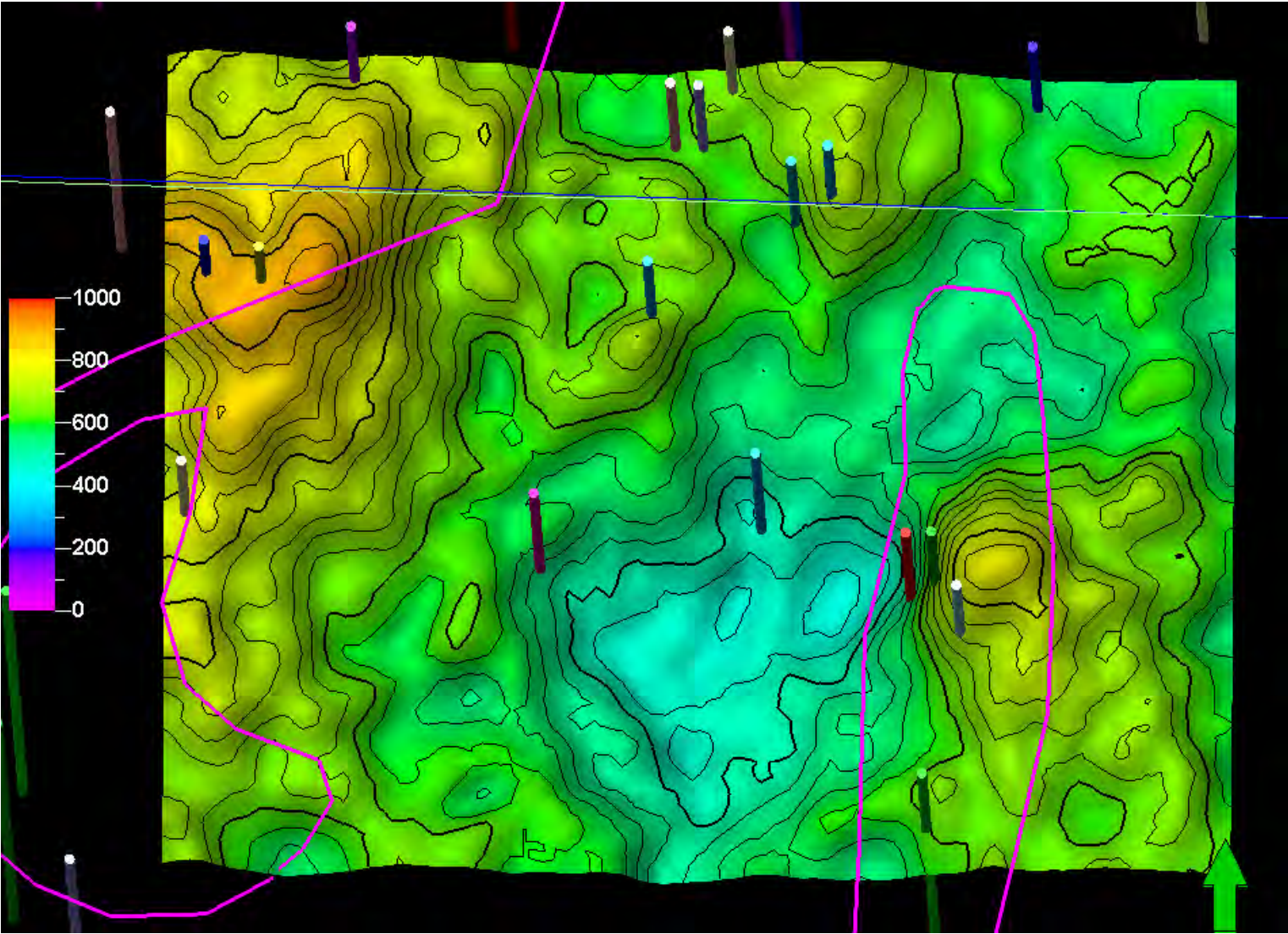
Variables  
 model building  
 model subseting  
 Combine-Facies  
 Combine-Porosities  
 Combine-other-properties  
 Volumes

1	Petrel 2005	Schlumberger Information Solutions		
2	User name	mdubois		
3	Date	Monday, May 15 2006 01:17:25		
4	Project	Hugo_Geomod_4-1SMALL_final.pet		
5				
6	Model	Geomod4		
7	Grid	Merged Geomod4		
8	Input XY unit	ft		
9	Input Z unit	ft		
10				
11	HC phase intervals	Includes gas interval only.		
12	Lower gas contact:	FWL70z_smooth		
13				
14	General properties			
15	Porosity:	Porosity		
16	Net gross:	1.00000000		
17				
18	Properties in gas interval:			
19	Sat. water:	SW		
20	Sat. gas:	1-Sw-So		
21	Sat. oil:	0.00000000		
22	Bg (formation vol. factor):	5.52860000 [RB/MSCF]		
23	Rv (vaporized oil/gas ratio):	0.00000000 [STB/MSCF]		
24				
25	Properties in oil interval:			
26	Bo (formation vol. factor):	1.00000000 [RB/STB]		
27	Rs (solution gas/oil ratio):	0.00000000 [MSCF/STB]		
28				
29	Case	HCPV gas[*10^6 RB]	STOIIIP (in gas)[*10^6 STB]	GIIP (in gas)[*10^6 MSCF]
30	OGIP_FWL70z_1	6784	0	1227
31				
32				
33	Totals all result types			
34	Zones			
35	Zone HRNGTN	205	0	37
36	Zone KRIDER	1264	0	229
37	Zone ODELL	5	0	1
38	Zone WINF	1047	0	189
39	Zone GAGE	46	0	8
40	Zone TWND	1766	0	319
41	Zone B/TWND	165	0	30
42	Zone FTRLY	1664	0	301
43	Zone MATFIELD	9	0	2
44	Zone WREFORD	440	0	80
45	Zone A1_SH	3	0	1
46	Zone A1_LM	155	0	28
47	Zone B1_SH	0	0	0
48	Zone B1_LM	11	0	2
49	Zone B2_SH	1	0	0
50	Zone B2_LM	2	0	0

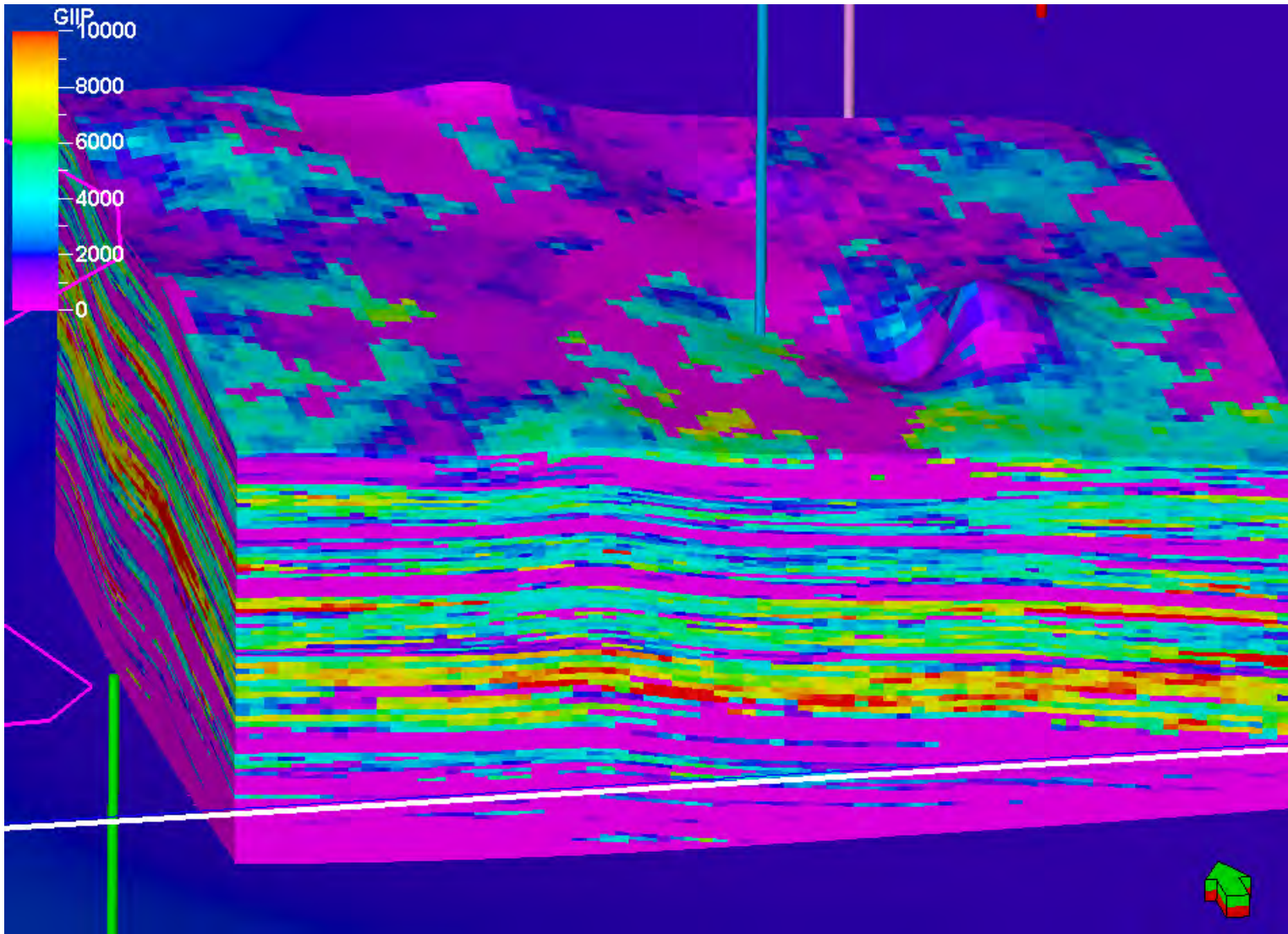
Well report | Volumes | Depth conv | W |

Ready

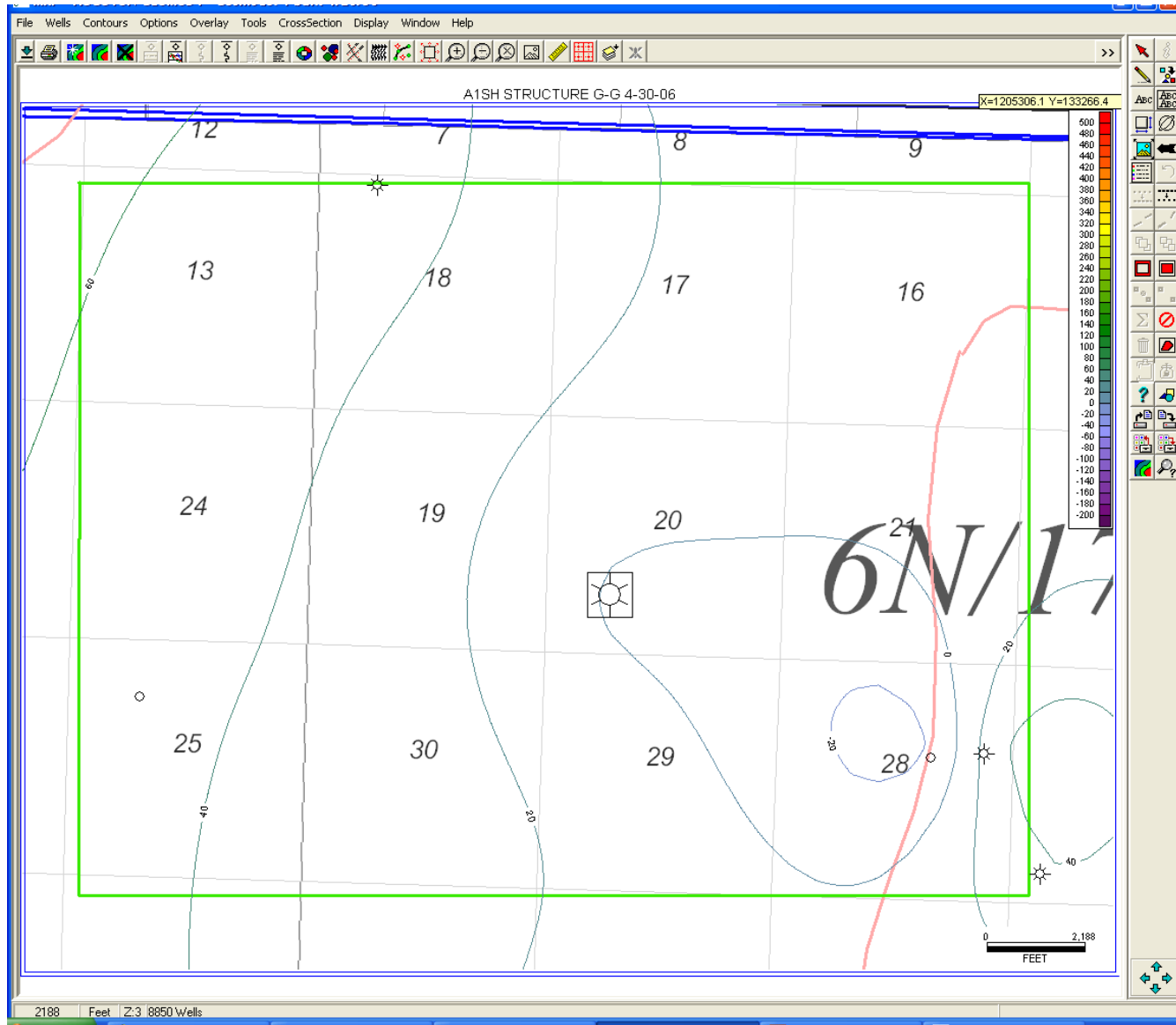
# Hoobler HCH (OGIP) map



# Hoobler OGIP cube



# Hoobler small 3X4 model

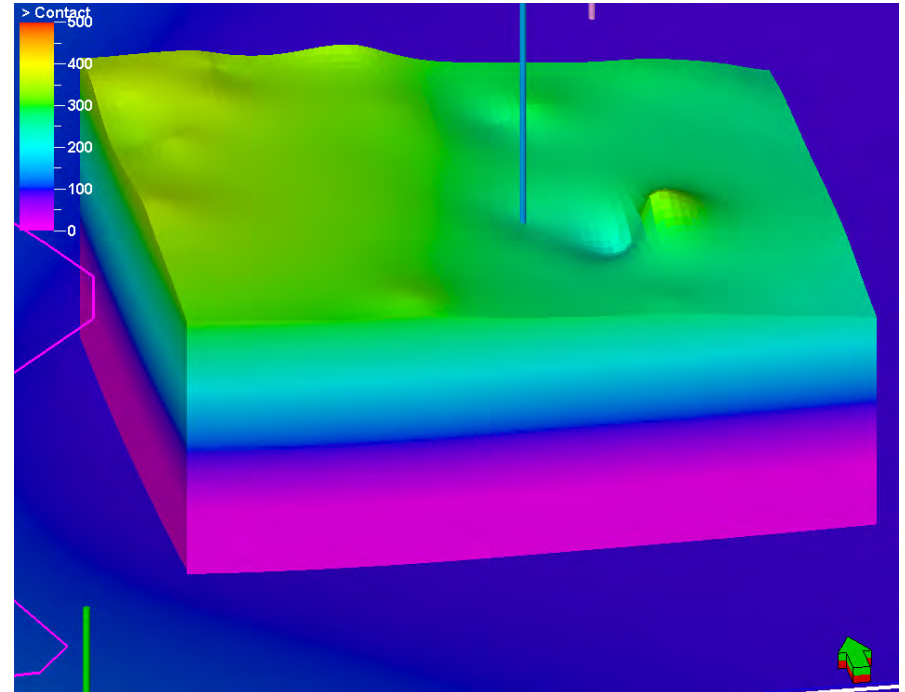
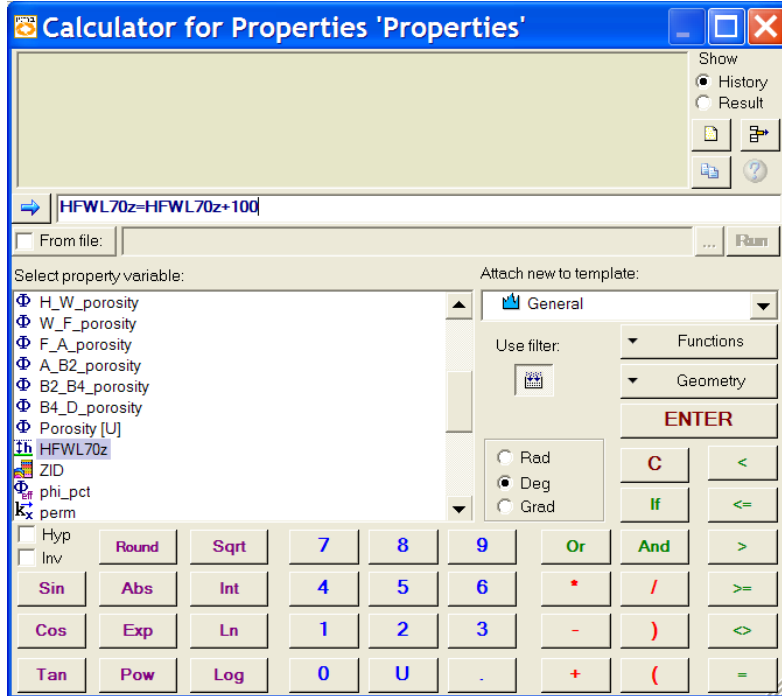




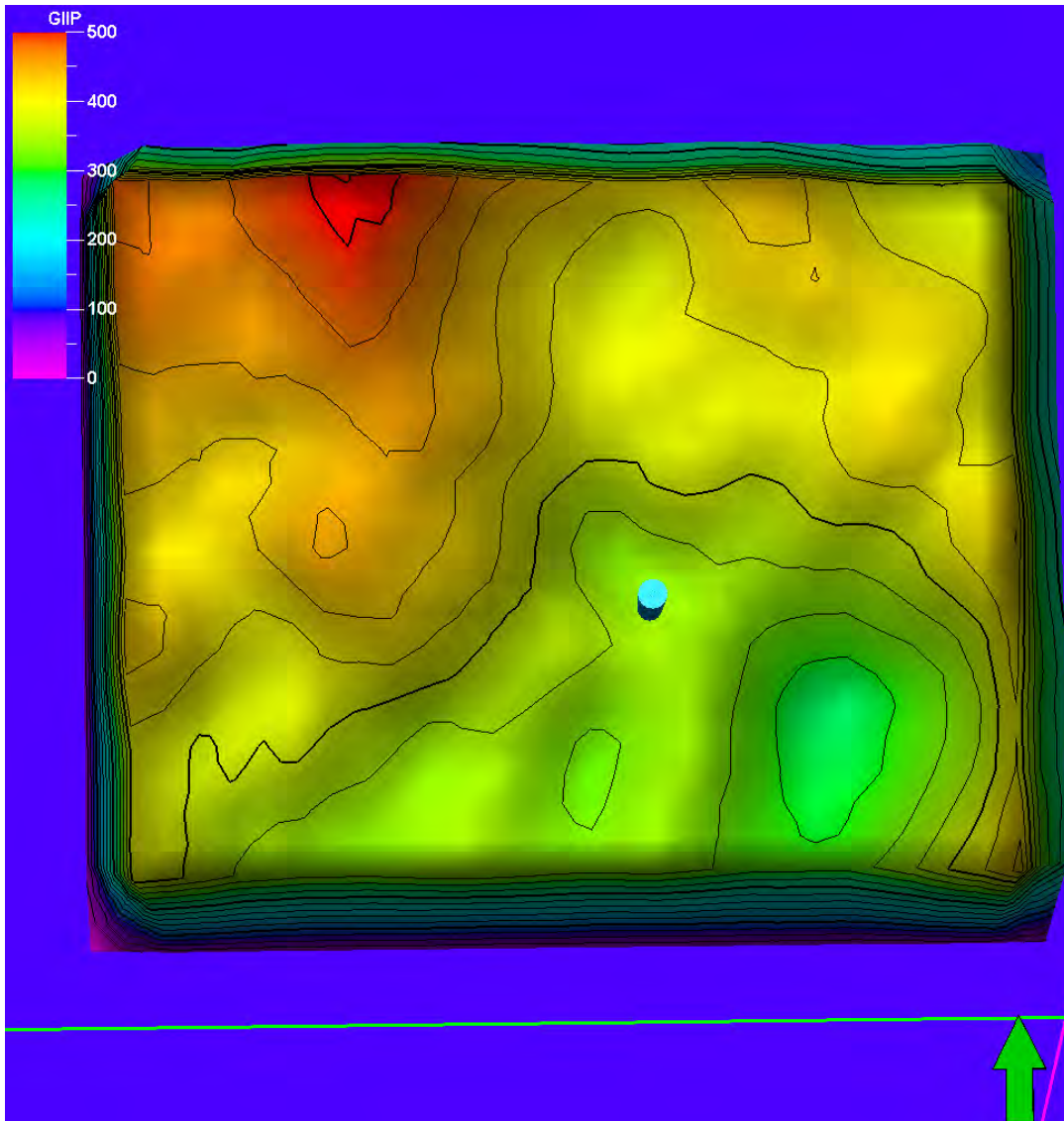
# Hoobler Model Area Cum. Gas

API	OPER	Hoobler Area	WE	SPUD	PROD	SYM	SI	TC	RA	YYMM	CUM_GAS
35139015660000	REPUBLIC NAT	DANIELS	1	1/1/1946	CHSE	GAS	17	6N	17E	200504	8,356,932
35139015670000	REPUBLIC NAT	CUSTER	1	1/1/1947	CHSE	GAS	18	6N	17E	200504	6,020,519
35139015680000	REPUBLIC NAT	TOWNER	1	1/1/1946	CHSE	GAS	19	6N	17E	200504	4,532,704
35139015690000	REPUBLIC NAT	HOBBLER	1	1/1/1947	CHSE	GAS	20	6N	17E	200504	4,426,176
35139015700000	REPUBLIC NAT	WILSON	2	1/1/1946	CHSE	GAS	21	6N	17E	200504	4,138,028
35139015740000	REPUBLIC NAT	BLACKMER-28	3	1/1/1947	CHSE	GAS	28	6N	17E	200504	3,731,024
35139015750000	REPUBLIC NAT	WILLIAMS	1	1/1/1947	CHSE	GAS	29	6N	17E	200504	4,021,503
35139017500000	REPUBLIC NAT	HAMPSTON	1	3/19/1940	CHSE	GAS	13	6N	16E	200504	9,230,934
35139017550000	REPUBLIC NAT	EBERSOLE	1	5/21/1940	CHSE	GAS	24	6N	16E	198205	5,229,040
35139017560000	REPUBLIC NAT	BLACKMER-25	2	7/25/1946	CHSE	GAS	25	6N	16E	200504	6,321,500
35139017610000	REPUBLIC NAT	SCHMELZEL	1	10/26/1946	CHSE	GAS	16	6N	17E	200504	7,345,449
35139017660000	REPUBLIC NAT	MULLER	2	8/22/1946	CHSE	GAS	30	6N	17E	200504	5,539,541
35139216580000	MOBIL OIL COR	EBR SOL/RNG 92	2	5/29/1982	CHSE	GAS	24	6N	16E	199207	271,689
35139221040000	MOBIL OIL COR	CUSTER UNIT	2	5/17/1986	CGRV	GAS	18	6N	17E	200207	507,472
35139224410000	MOBIL OIL COR	EBERSOLE UNIT	3	9/11/1992	CHSE	GAS	24	6N	16E	200504	903,085
35139230470000	ANADARKO PE	HJ V MCADAM `B	1	7/16/1999	CGRV	GAS	28	6N	17E	200206	604,068
35139230590000	ANADARKO PE	H J V WILSON `A	1	9/21/1999	CGRV	GAS	28	6N	17E	200205	191,836
35139230620000	ANADARKO PE	H J V BRIGGEMA	1	9/16/1999	CGRV	GAS	21	6N	17E	200205	287,162
35139230710000	ANADARKO PE	HJ V J AVUREK `A	1	11/9/1999	CGRV	GAS	21	6N	17E	200205	212,813
									<b>Count</b>	<b>Interval</b>	
									<b>14</b>	<b>Chase</b>	<b>70,068,124</b>
									<b>5</b>	<b>Cgrv</b>	<b>1,803,351</b>
									<b>19</b>	<b>Wolfcamp</b>	<b>71,871,475</b>

# Modify FWL in steps



# OGIP in HCH



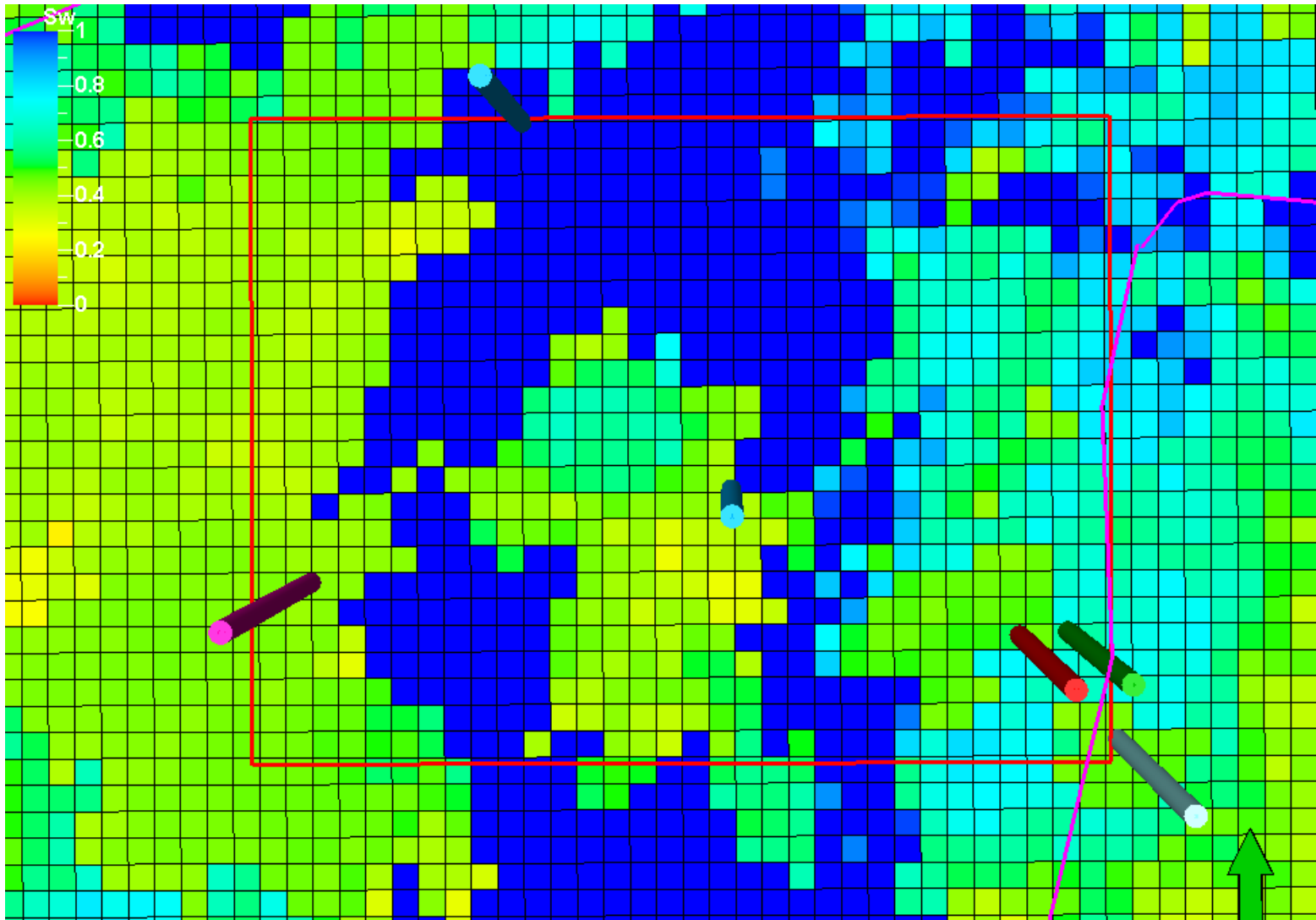
# Hoobler Change in OGIP with 100' change in FWL

	FWL70z			FWL70z -100		
	HCPV	GIIP		HCPV	GIIP	
	*10 <sup>6</sup> RB	10 <sup>6</sup> MSCF		*10 <sup>6</sup> RB	10 <sup>6</sup> MSCF	
HRNGTN	26	5		22	4	
KRIDER	171	31		161	29	
ODELL	0	0		0	0	
WINF	135	24		123	22	
GAGE	16	3		10	2	
TWND	264	48		222	40	
B/TWND	26	5		17	3	
FTRLY	232	42		133	24	
MATFIELD	1	0		0	0	
WREFOR	59	11		0	0	
A1_SH	0	0		0	0	
A1_LM	24	4	<b>173</b>	0	0	<b>124</b>

# Upscale 3X4 section Hoobler simulation model

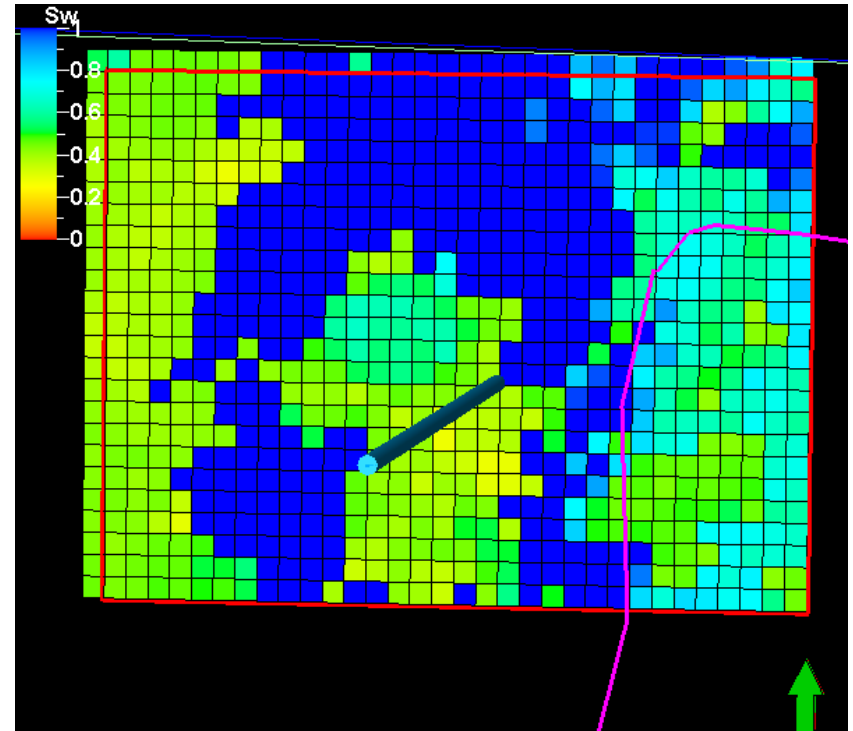
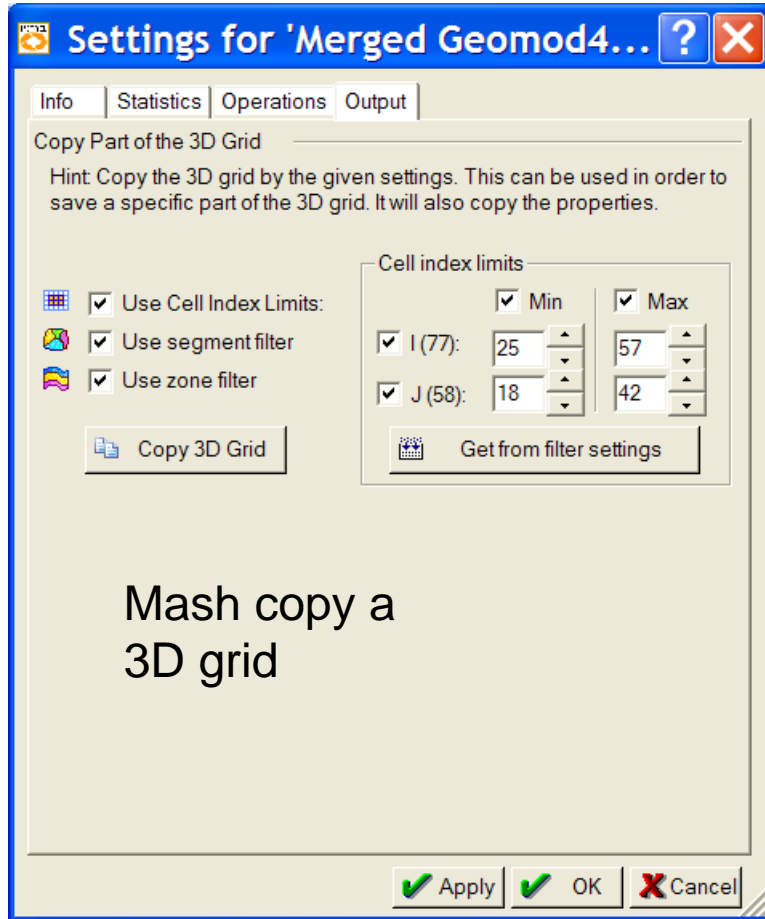
# Hoobler simulation coordinates

(57,18)  
(57,19)



(26,42)  
(25,42)

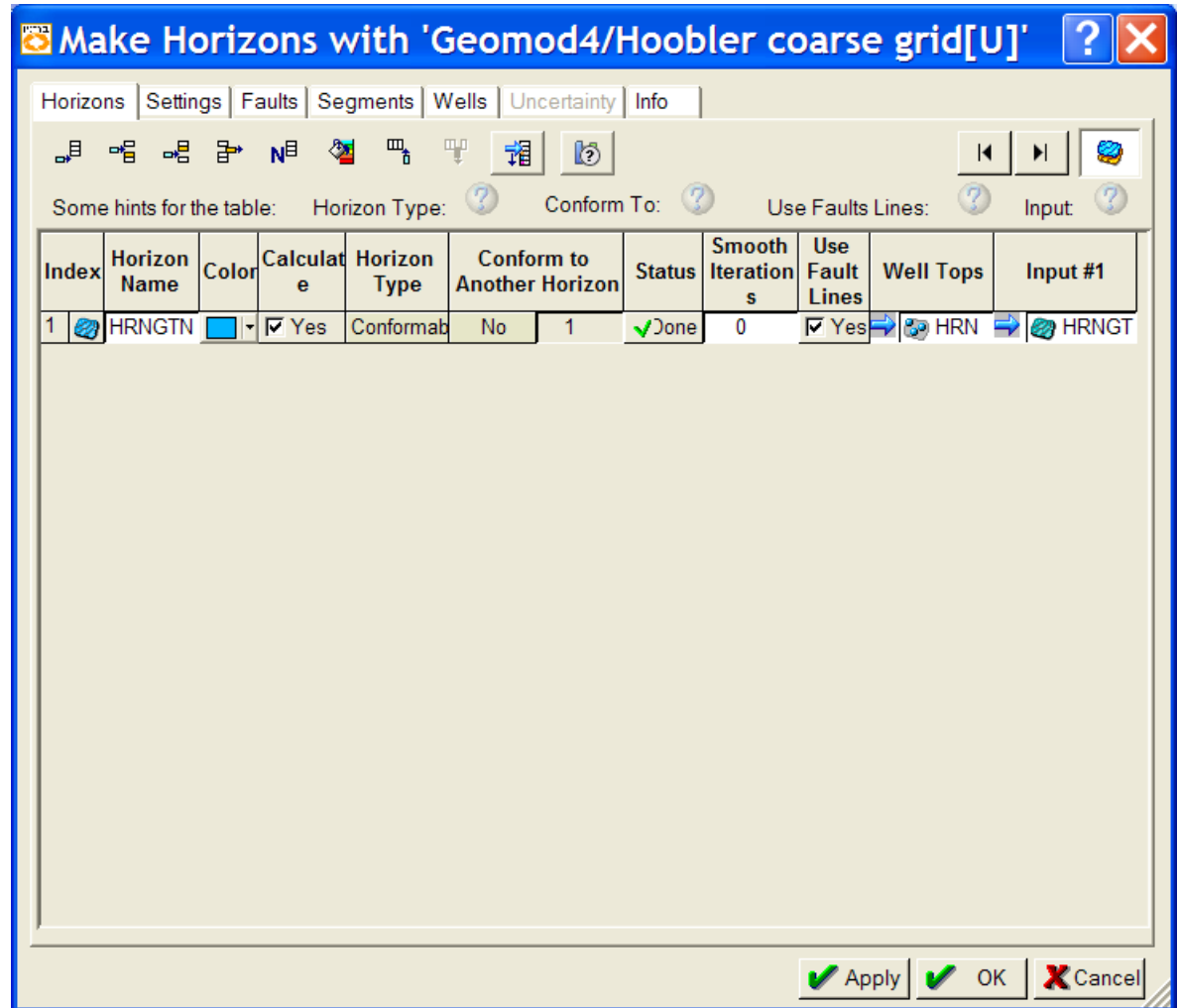
Make copy of part of small model to  
be simulated and rename it  
Hoobler fine grid



And delete properties not needed

Make a copy for the coarse grid  
and rename it Hoobler coarse grid

1. Delete all the properties
2. Make Horizons (new Hrngtn Horizon)





# Make new zones and re-layer to one each

Execute

The calculation will be performed in the selected stratigraphic interval only.  
Stratigraphic Interval: **Below HRNGTN**

Zones | Settings | Well Adjustment | Uncertainty

HRNGTN | HRNGTN (Tops-11\_Chase\_1306)

Name	Color	Input Type	Input	Volume Correct	Status
HRNGTN		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
KRIDER		Conformable	KRIDE	<input checked="" type="checkbox"/> Yes	✔ Zone
KRIDER		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
ODELL		Conformable	ODELL	<input checked="" type="checkbox"/> Yes	✔ Zone
ODELL		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
WINF		Conformable	WINF	<input checked="" type="checkbox"/> Yes	✔ Zone
WINF		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
GAGE		Conformable	GAGE	<input checked="" type="checkbox"/> Yes	✔ Zone
GAGE		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
TWND		Conformable	TWND	<input checked="" type="checkbox"/> Yes	✔ Zone
TWND		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B/TWND		Conformable	B/TWND	<input checked="" type="checkbox"/> Yes	✔ Zone
B/TWND		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
FTRLY		Conformable	FTRLY	<input checked="" type="checkbox"/> Yes	✔ Zone
FTRLY		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
MATFIEL		Conformable	MATFI	<input checked="" type="checkbox"/> Yes	✔ Zone
MATFIEL		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
WREFO		Conformable	WREF	<input checked="" type="checkbox"/> Yes	✔ Zone
WREFO		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
A1_SH		Conformable	A1_SH	<input checked="" type="checkbox"/> Yes	✔ Zone
A1_SH		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
A1_LM		Conformable	A1_LM	<input checked="" type="checkbox"/> Yes	✔ Zone
A1_LM		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B1_SH		Conformable	B1_SH	<input checked="" type="checkbox"/> Yes	✔ Zone
B1_SH		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B1_LM		Conformable	B1_LM	<input checked="" type="checkbox"/> Yes	✔ Zone
B1_LM		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B2_SH		Conformable	B2_SH	<input checked="" type="checkbox"/> Yes	✔ Zone
B2_SH		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B2_LM		Conformable	B2_LM	<input checked="" type="checkbox"/> Yes	✔ Zone
B2_LM		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B3_SH		Conformable	B3_SH	<input checked="" type="checkbox"/> Yes	✔ Zone
B3_SH		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B3_LM		Conformable	B3_LM	<input checked="" type="checkbox"/> Yes	✔ Zone
B3_LM		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone
B4_SH		Conformable	B4_SH	<input checked="" type="checkbox"/> Yes	✔ Zone
B4_SH		Conformable		<input checked="" type="checkbox"/> Yes	✔ Zone

Build From: Top horizon  
Volume Correction: None correction  
Build along: Vertical Thickness (TVT)

Hint: Conformable means conformable to well tops  
Horizons with Steep slopes

Apply OK Cancel

After the fact

Layering with 'Geomod4/Hoobler coarse grid[U]'

Zones

Process for making the layering for each zone

Common Settings

Build along: Along the Pillars  
Horizons with Steep slopes  
Use minimum cell thickness: 1  
Include Proportional/Fractions, start From: Top

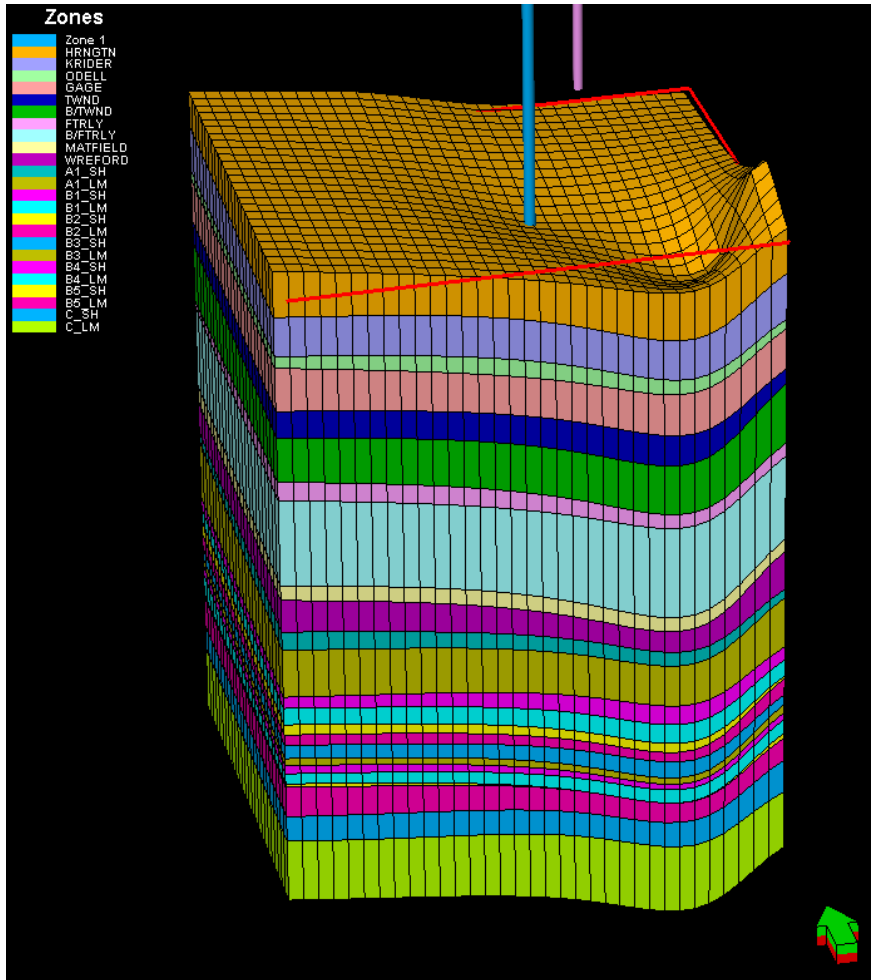
Settings for each Zone

Zone Division: Reference Surface: Restore Eroded: Restore Base:

Name	Color	Calculate	Zone Division	Reference Surface	Restore Eroded	Restore Base	Status
HRNGTN		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
KRIDER		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
ODELL		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
GAGE		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
TWND		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B/TWND		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
FTRLY		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B/FTRLY		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
MATFIELD		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
WREFORD		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
A1_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
A1_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B1_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B1_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B2_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B2_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B3_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B3_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B4_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B4_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B5_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
B5_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
C_SH		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New
C_LM		<input checked="" type="checkbox"/> Yes	Proportional Number of lay 1		<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	✳ New

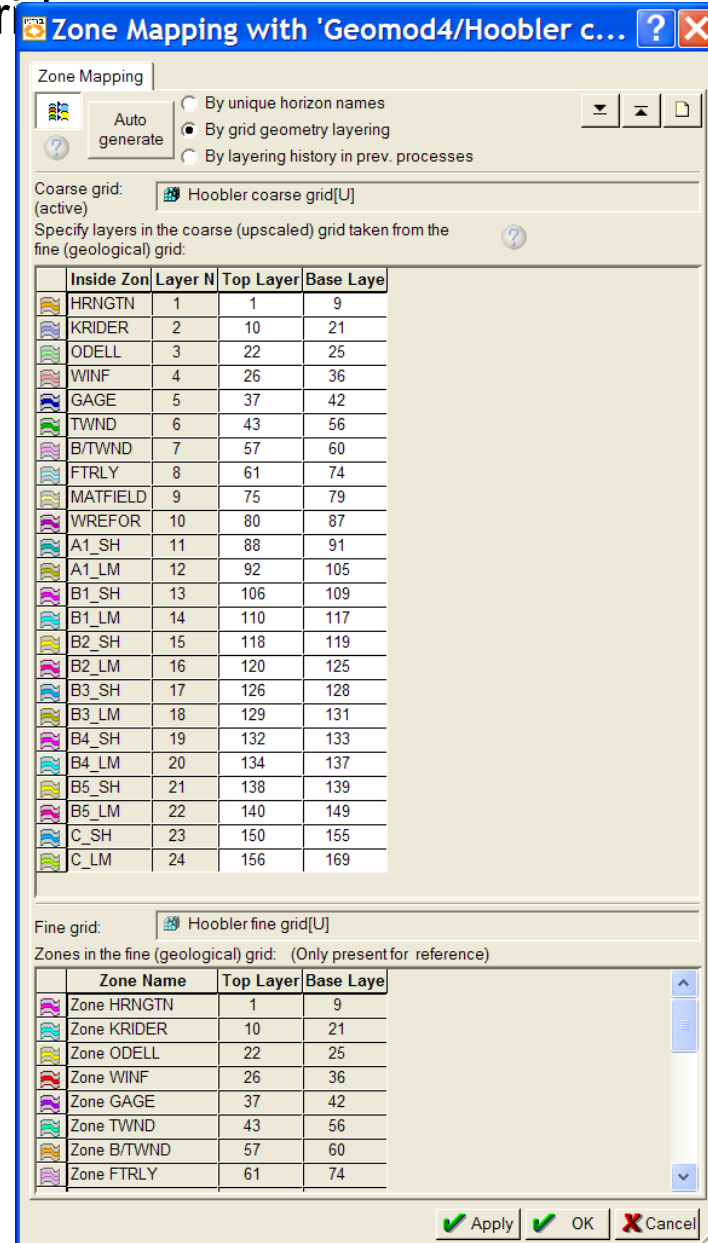
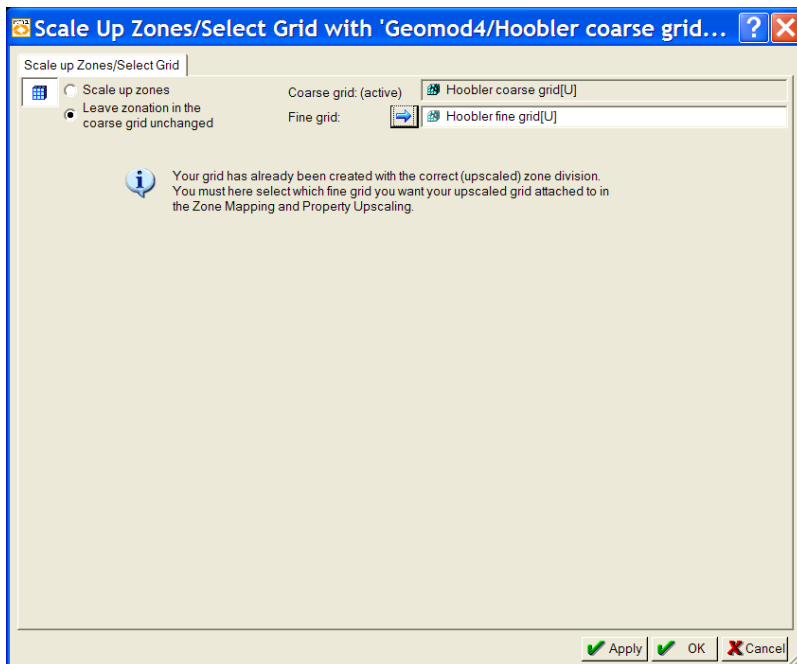
Apply OK Cancel

# Check after creating zone index



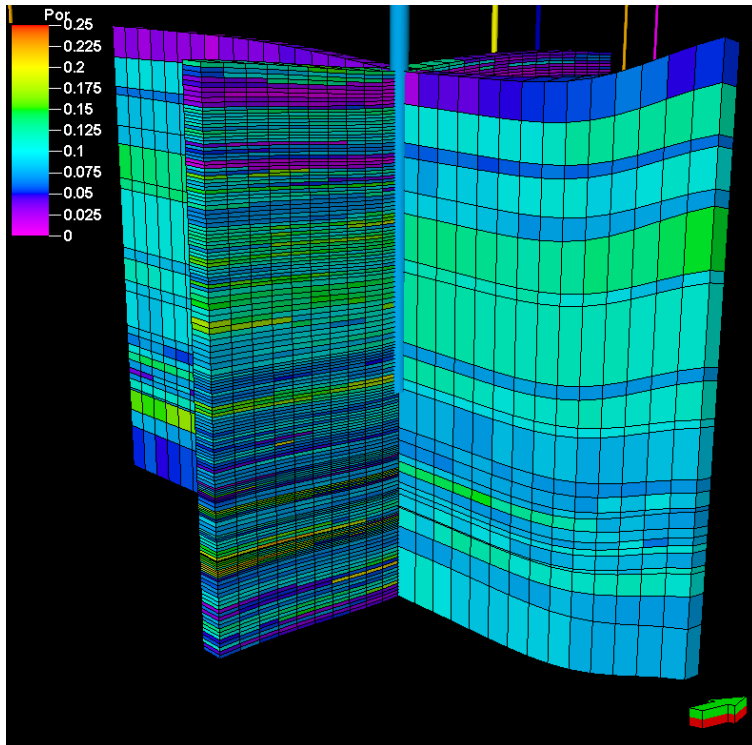
# Scale up properties from Fine Grid to Coarse Grid: Map fine to coarse grid

1. Activate coarse grid
2. Link the fine grid to the coarse grid. Open “Scale UP Zones” in Upscaling. OK.
3. Map the zones from one model to the other. Open Zone Mapping and check to ensure it is correct. Should be. OK.



# Scale up properties from Fine Grid to Coarse Grid: Porosity

1. Activate “Scale up Properties” and select porosity.
2. Make settings as in dialog box to right



**Scale Up Properties**

Execute

Overwrite existing property:  $\Phi$  Porosity In Coarse Grid

Property to upscale:  $\Phi$  Porosity [U] In Fine Grid

The fine grid: Hoobler fine grid[U]

Name of new property: Porosity

Sampling method

Layered sampling

Upscale by matching geometry

Downscale by matching geometry

Settings

Ensure value in all cells

Use property filter

Average Tensor

Accuracy

Simplified (fast)  Exact intersection (slow)

Average Method

Arithmetic

Weighting

Select properties from the fine (geological grid):

Properties

- H\_W\_facies
- W\_F\_facies
- F\_A\_facies
- A\_B2\_facies
- B2\_B4\_facies
- B4\_D\_facies
- main\_zone\_index
- Facies [U]

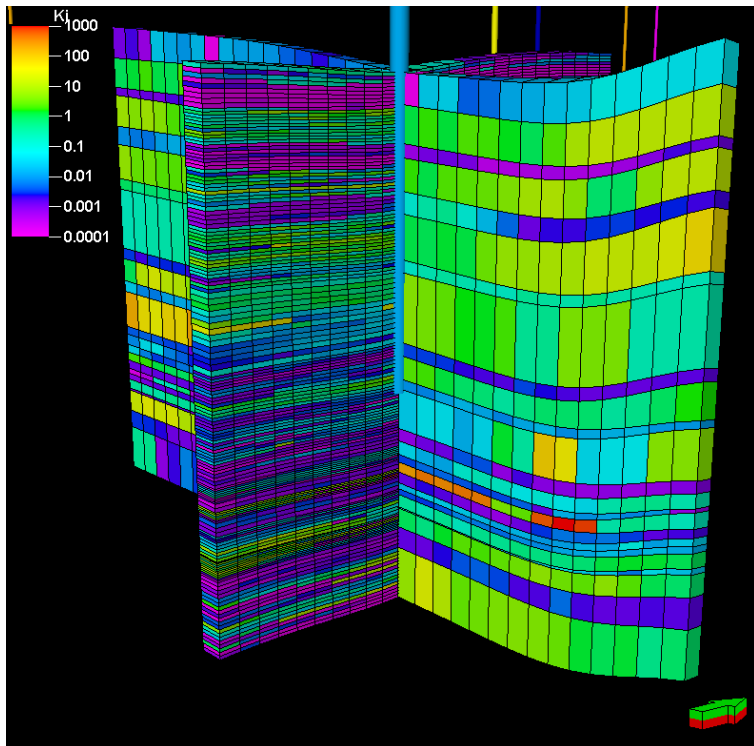
Use volume weighting

Hint: The algorithm will weight with the product of all the properties you select here.

Apply OK Cancel

# Scale up properties from Fine Grid to Coarse Grid: Perm XY

1. Activate “Scale up Properties” and select Kxy.
2. Make settings as in dialog box to right



### Scale Up Properties

**Execute**

Overwrite existing property: Zones In Coarse Grid

Property to upscale:  $k_x$  perm In Fine Grid

The fine grid: Hoobler fine grid[U]

Name of new property: perm

**Sampling method**

Layered sampling ?

Upscale by matching geometry ?

Downscale by matching geometry ?

**Settings**

Ensure value in all cells ?

Use property filter ?

**Average** | **Tensor**

**Algorithm**

PSK-solver ?

Finite difference ?

Full tensor ?

**Result format**

XYZ permeabilities ?

IJK permeabilities ?

**Skin zone**

Add skin zone ?

Additional cells ?

Min no cells

Number of cells I: 1 J: 1 K: 1

Velocity average skin cells ?

Let the Skin go outside the zone mapping

**Boundary Condition**

Open ?

Closed ?

Closed K ?

**Input properties**

$k_x$   $k_x$  perm ?

$k_x$   $k_x$  perm ?

$k_x$   $k_x$  perm ?

$\nabla G$  ?

$\Phi$   $\Phi$  H\_W\_porosity ?

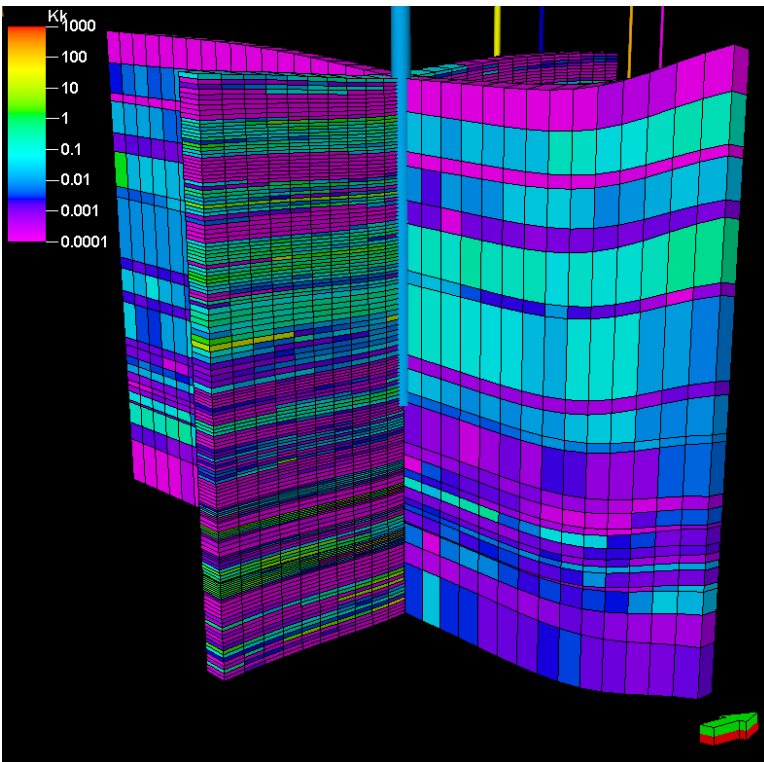
Upscaled  $\nabla G$  ?

Upscaled  $\Phi$   $\Phi$  Porosity ?

Apply  OK  Cancel

# Scale up properties from Fine Grid to Coarse Grid: Perm Z

1. Activate “Scale up Properties” and select Kz.
2. Make settings as in dialog box to right



**Scale Up Properties**

Execute

Overwrite existing property: Zones In Coarse Grid

Property to upscale:  $k_z$  PermeabilityZ In Fine Grid

The fine grid: Hoobler fine grid[U]

Name of new property: PermeabilityZ

Sampling method

Layered sampling

Upscale by matching geometry

Downscale by matching geometry

Settings

Ensure value in all cells

Use property filter

Average Tensor

Algorithm

PSK-solver

Finite difference

Full tensor

Result format

XYZ permeabilities

IJK permeabilities

Skin zone

Add skin zone

Additional cells

Min no cells

Number of cells I: 1 J: 1 K: 1

Velocity average skin cells

Let the Skin go outside the zone mapping

Boundary Condition

Open

Closed

Closed K

Input properties

$k_x$   $k_x$  perm

$k_y$   $k_y$  perm

$k_z$   $k_z$  perm

$\mu$

$\Phi$  H\_W\_porosity

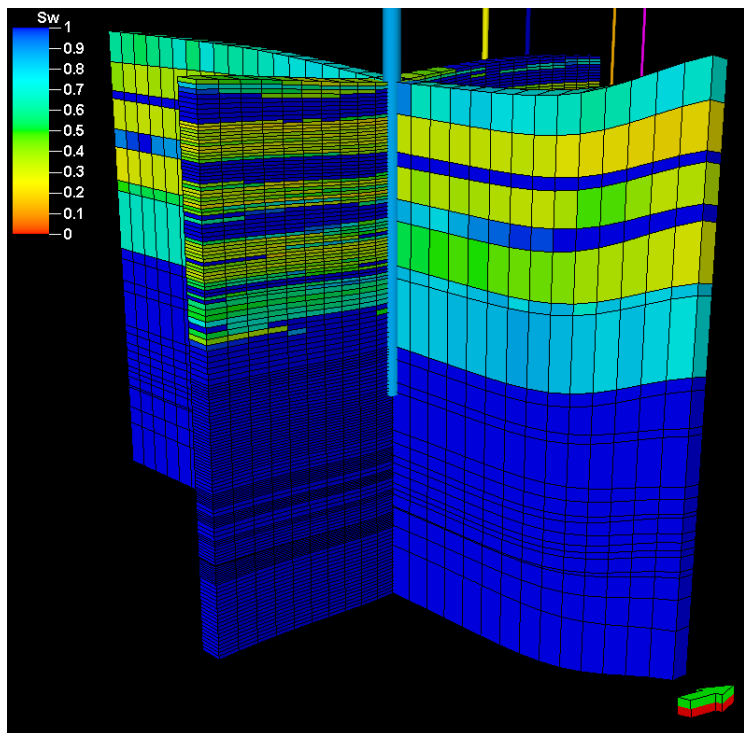
Upscaled  $\mu$

Upscaled  $\Phi$  Porosity

Apply OK Cancel

# Scale up properties from Fine Grid to Coarse Grid: Sw

1. Activate “Scale up Properties” and select Sw.
2. Make settings as in dialog box to right, phi weighted



**Scale Up Properties**

Execute

Overwrite existing property: Zones In Coarse Grid

Property to upscale: **Sw** In Fine Grid

The fine grid: Hoobler fine grid[U]

Name of new property: SW

Sampling method

Layered sampling

Upscale by matching geometry

Downscale by matching geometry

Settings

Ensure value in all cells

Use property filter

Average Tensor

Accuracy

Simplified (fast)  Exact intersection (slow)

Average Method

Arithmetic

Weighting

Select properties from the fine (geological grid):

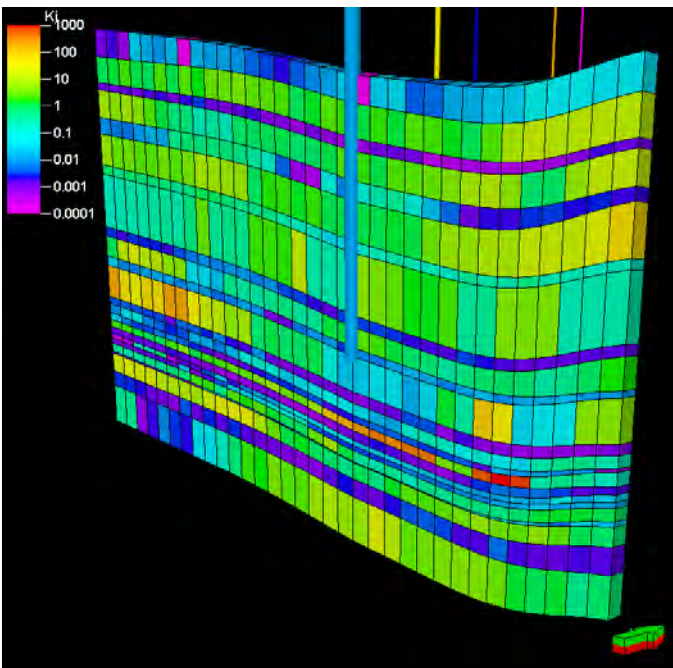
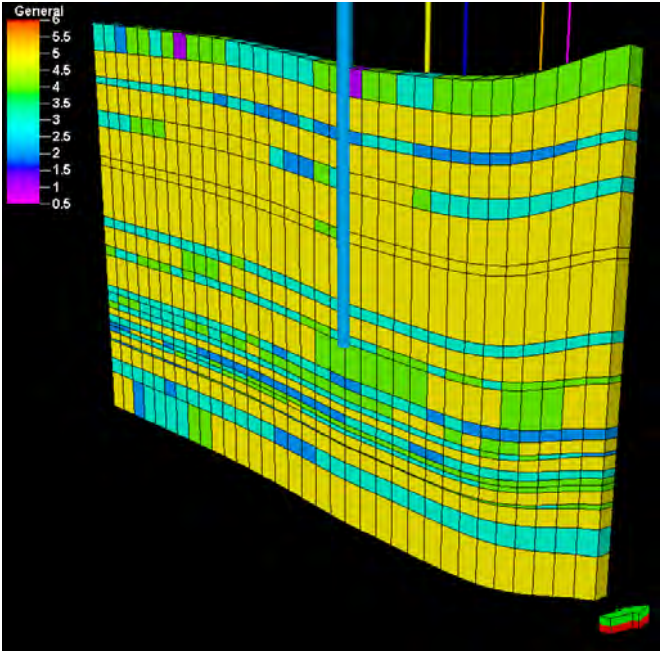
- F\_A\_porosity
- A\_B2\_porosity
- B2\_B4\_porosity
- B4\_D\_porosity
- Porosity [U]
- HFWL70z
- ZID
- phi\_pct
- perm
- PermeabilityZ
- Sw**

Use volume weighting

Hint: The algorithm will weight with the product of all the properties you select here.

Apply OK Cancel

# Calculate Rock Type for Relative Perm



Calculator for Properties 'Properties'

Show  
 History  
 Result

RTYPE=U  
 RTYPE=If(perm\_k<=0.0001, 1, RTYPE)  
 RTYPE=If(perm\_>0.0001, 2, RTYPE)  
 RTYPE=If(perm\_>0.001, 3, RTYPE)  
 RTYPE=If(perm\_>0.01, 4, RTYPE)  
 RTYPE=If(perm\_>0.1, 5, RTYPE)

From file: ... Run

Select property variable:

- Zones
- Porosity
- perm\_I
- perm\_J
- perm\_K
- Permeability\_Z\_I
- Permeability\_Z\_J
- Permeability\_Z\_K
- SW
- RTYPE**

Attach new to template: General

Use filter: Functions  
Geometry

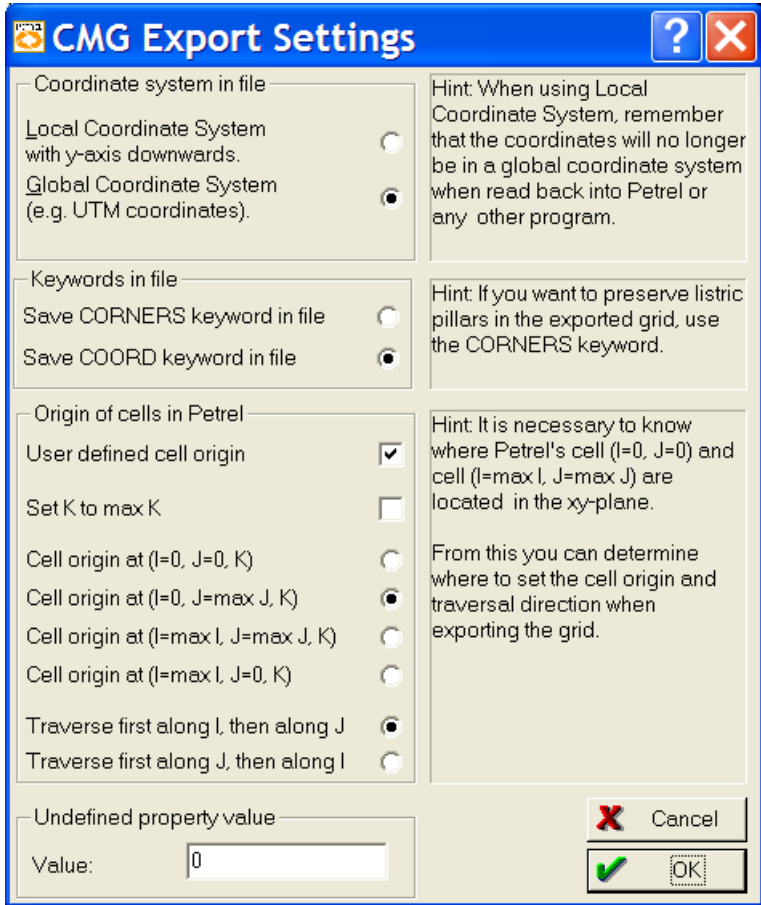
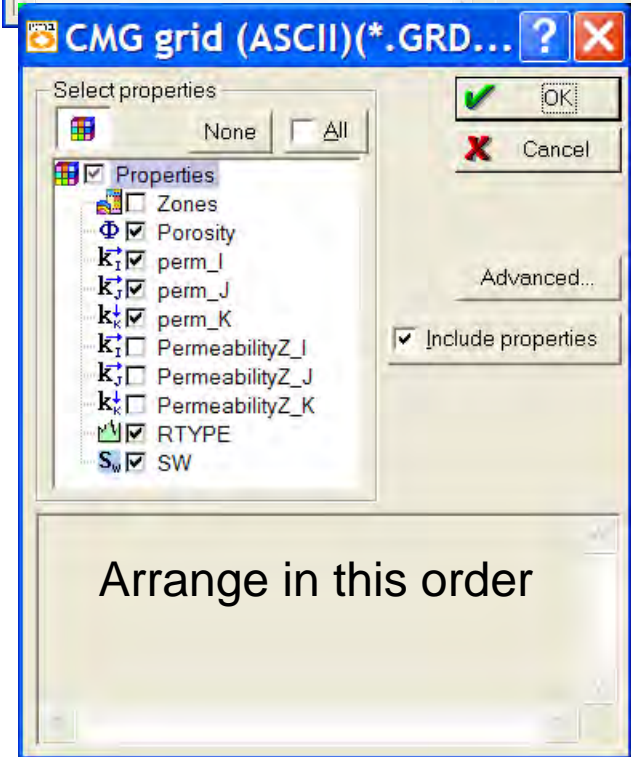
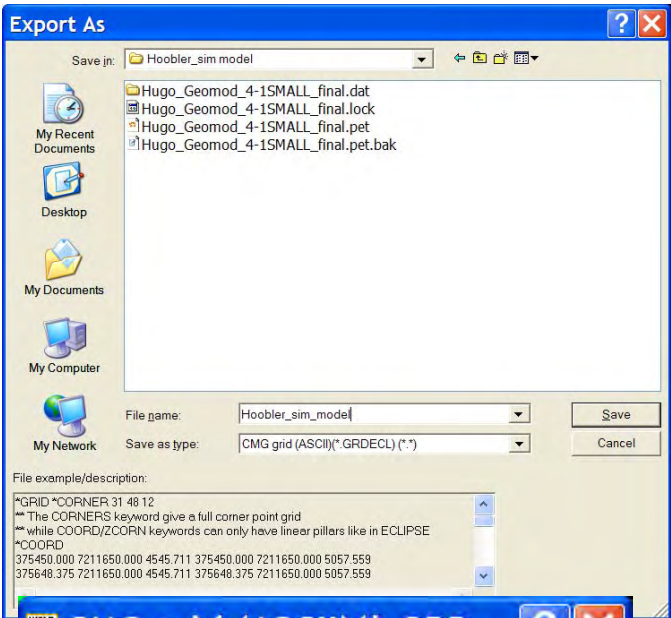
ENTER

Rad  
 Deg  
 Grad

<input type="checkbox"/> Hyp	Round	Sqrt	7	8	9	Or	And	>
<input type="checkbox"/> Inv	Sin	Abs	4	5	6	*	/	>=
	Cos	Exp	1	2	3	-	)	<>
	Tan	Pow	0	U	.	+	(	=



# Export properties and grid for simulation (CMG format)



Punch all the correct buttons

END