Hugoton Geomod4 Build

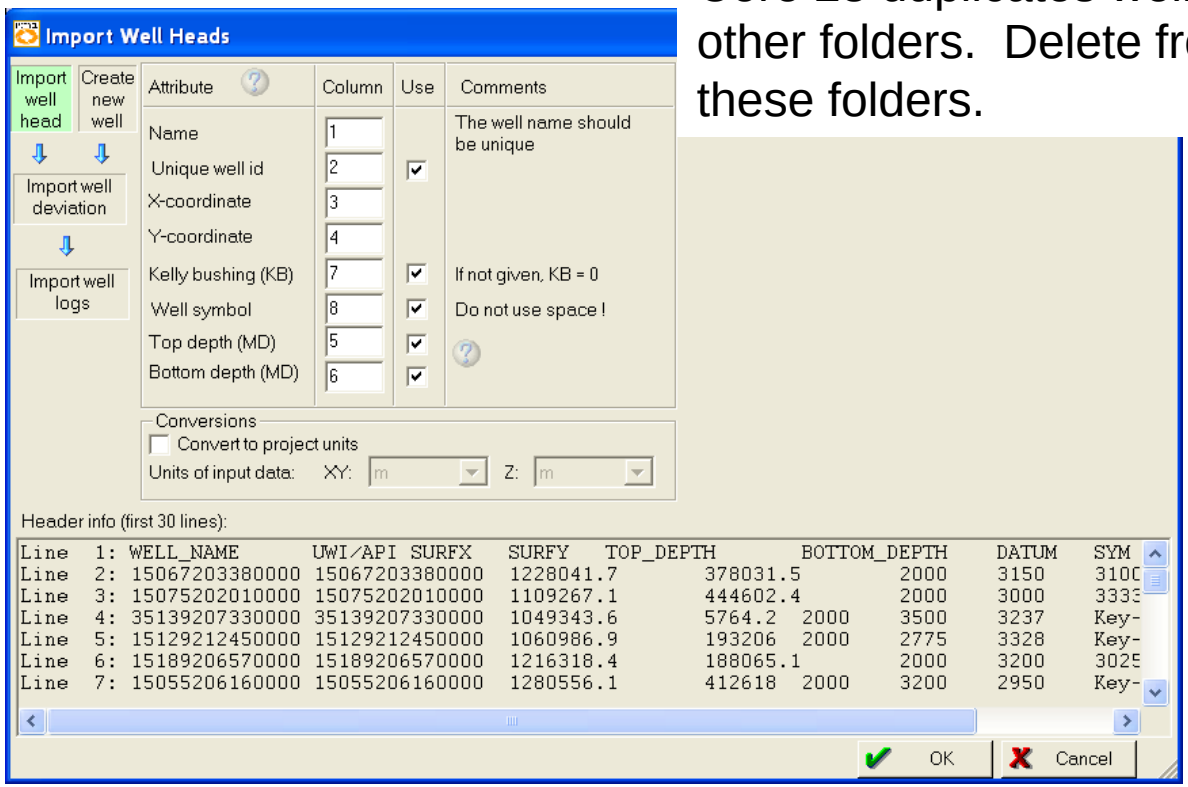
The following is a detailed recap of the building of the Hugoton geomodel version 4 (Geomod 4). Provided in this preliminary version are all the gory details.

Contents and Approximate slide numbers:

Prepare GM3

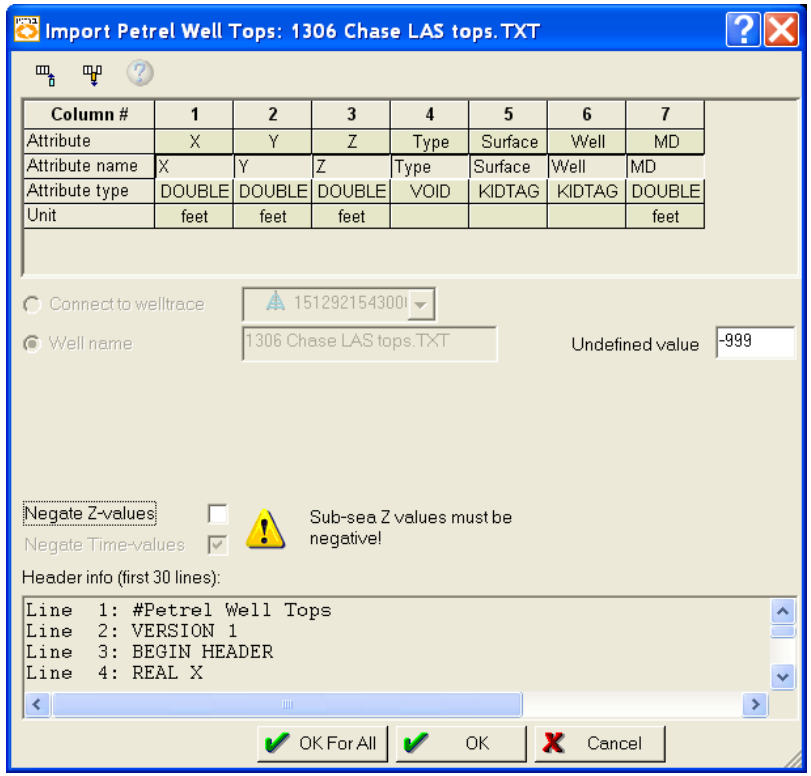
1. Six sub-models: Delete properties and fluid contacts
2. Delete well headers in each folder by folder (very slow process) and import new well headers. Rename files with correct numbers (eg Cgrv_ONLY_las-295 becomes …-295, Chase 218 – Chase. Did not delete the wells from the other folders. Takes too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

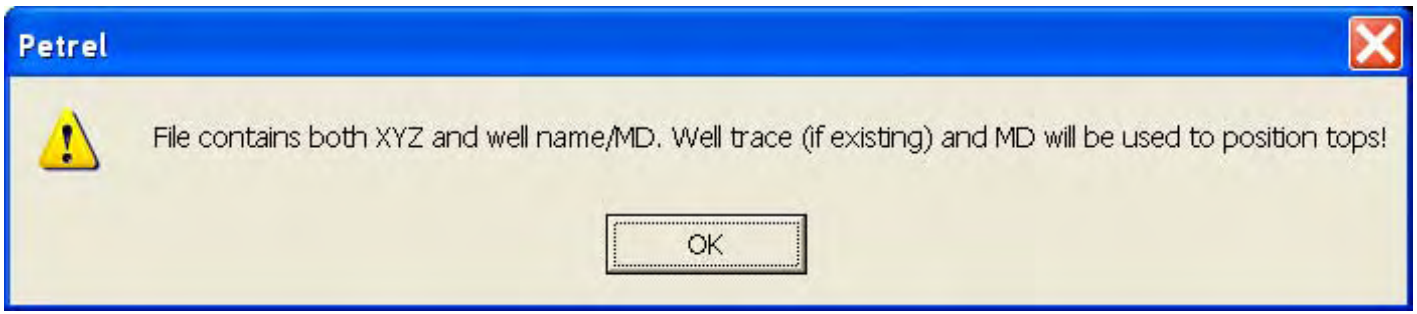
Core 28 duplicates wells in other folders. Delete from these folders.



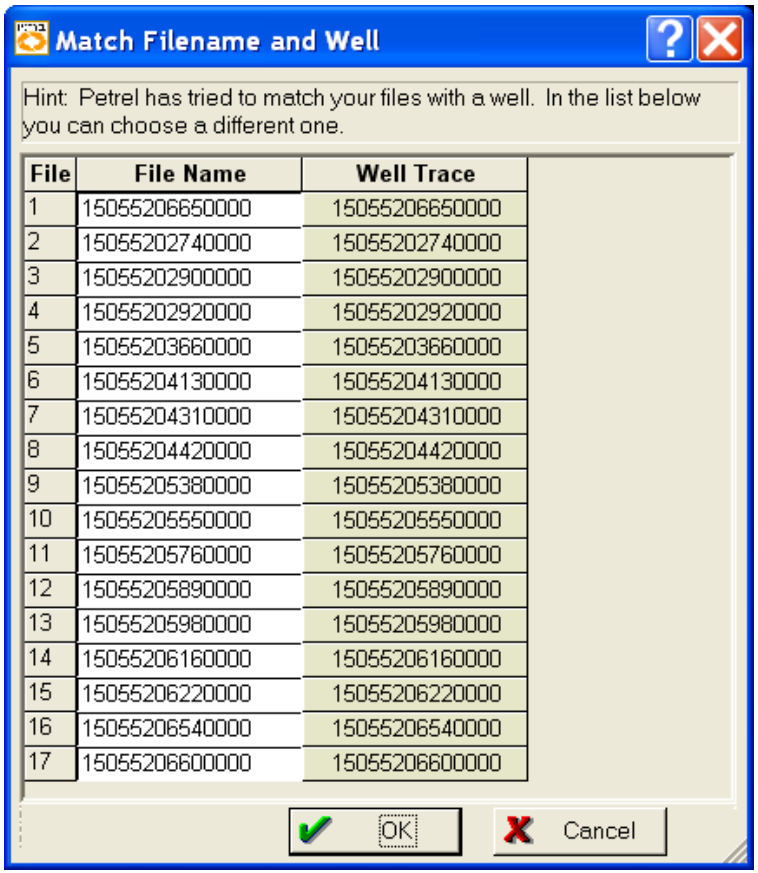
Well tops import

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



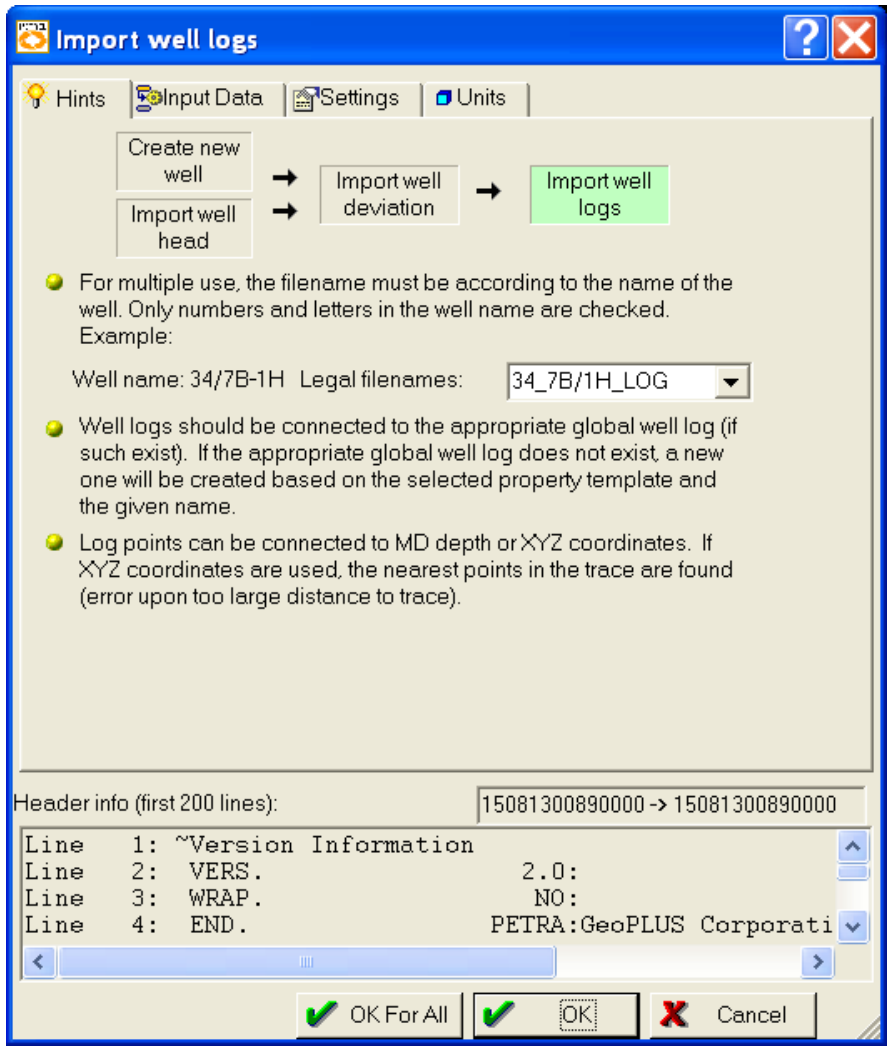


Import new LAS files



File	File Name	Well Trace
1	15055206650000	15055206650000
2	15055202740000	15055202740000
3	15055202900000	15055202900000
4	15055202920000	15055202920000
5	15055203660000	15055203660000
6	15055204130000	15055204130000
7	15055204310000	15055204310000
8	15055204420000	15055204420000
9	15055205380000	15055205380000
10	15055205550000	15055205550000
11	15055205760000	15055205760000
12	15055205890000	15055205890000
13	15055205980000	15055205980000
14	15055206160000	15055206160000
15	15055206220000	15055206220000
16	15055206540000	15055206540000
17	15055206600000	15055206600000

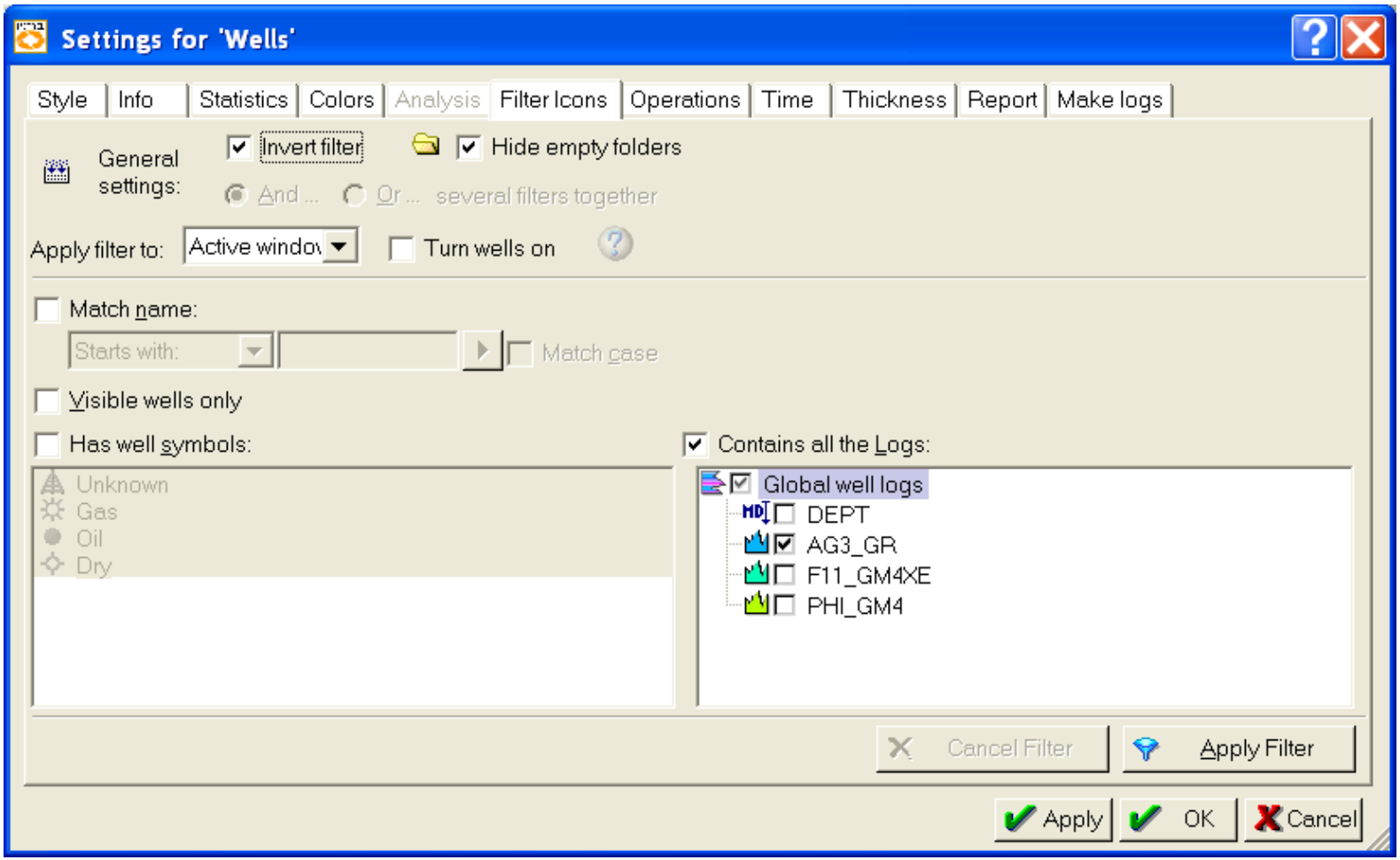
NO MORE THAN 200 AT A TIME!!



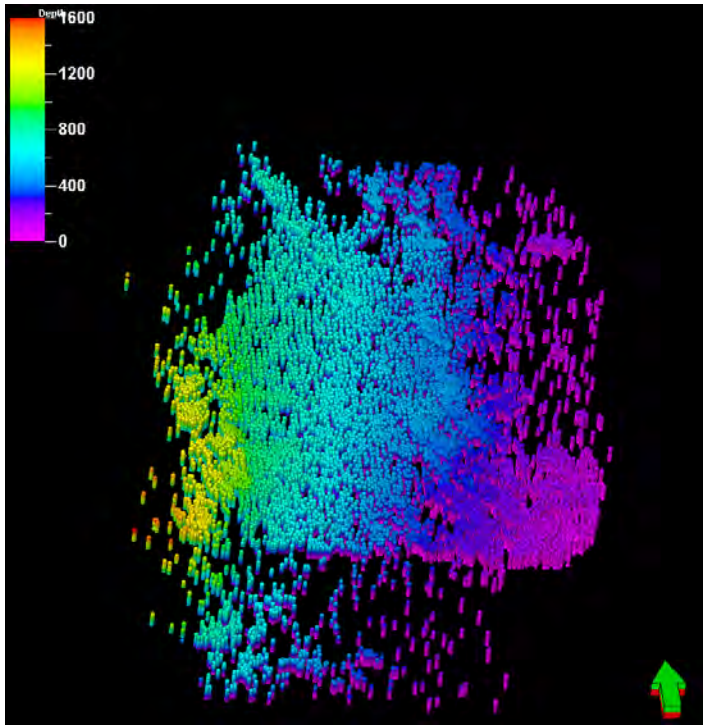
Mash OK for all

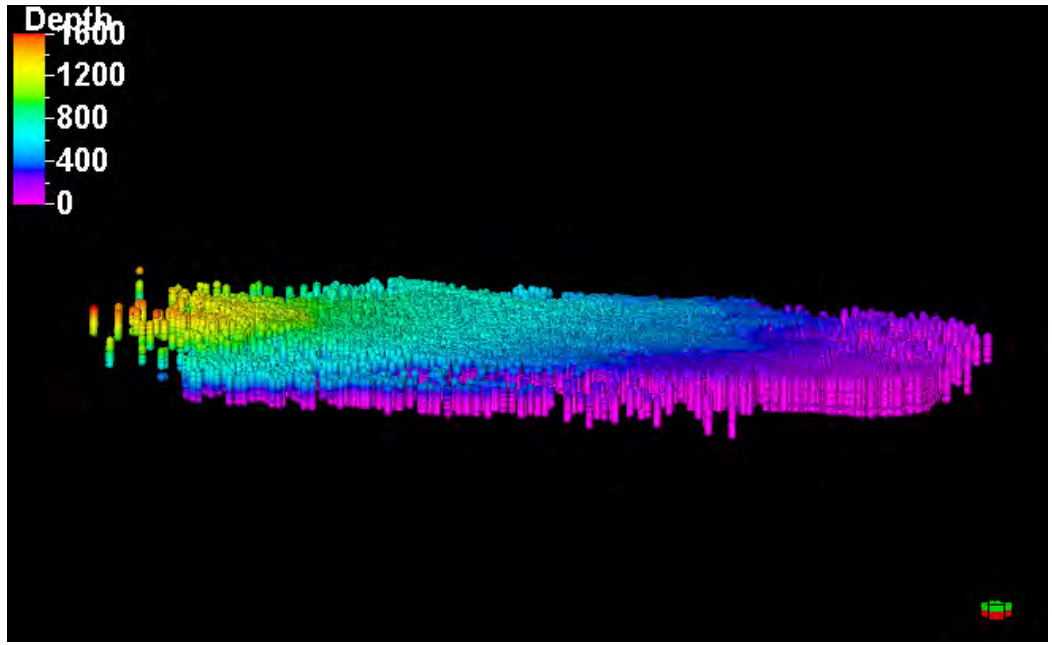
Verify there are curves for all wells:

Wells>Filter>

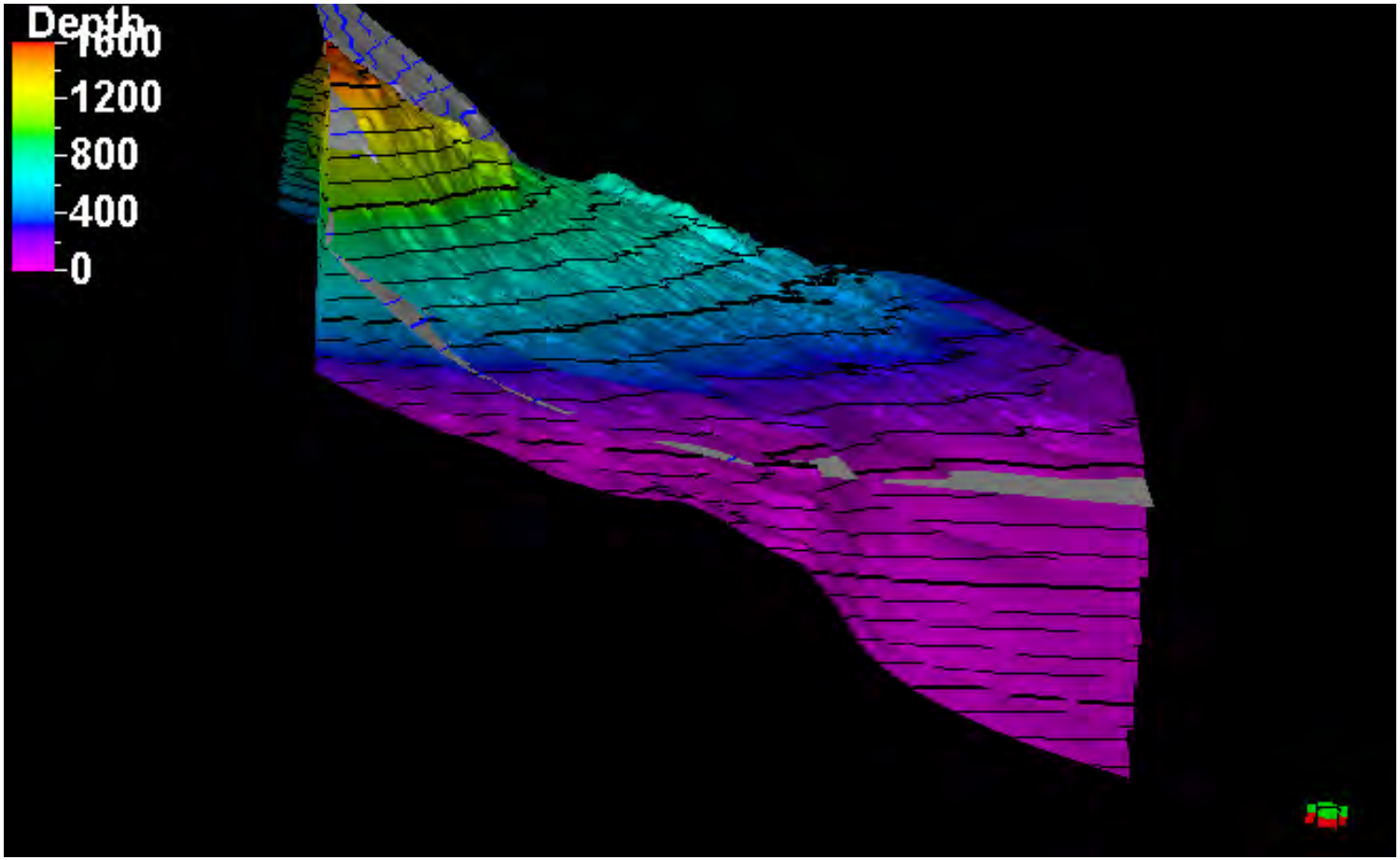


QC tops

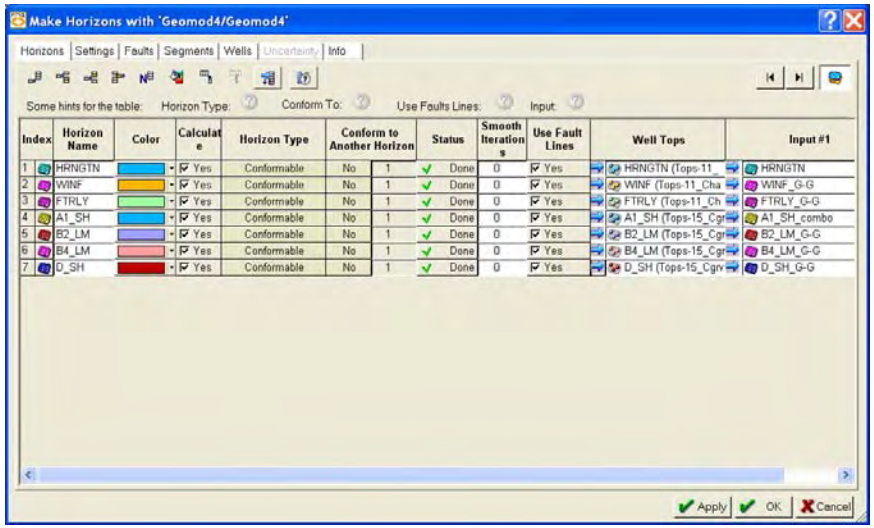


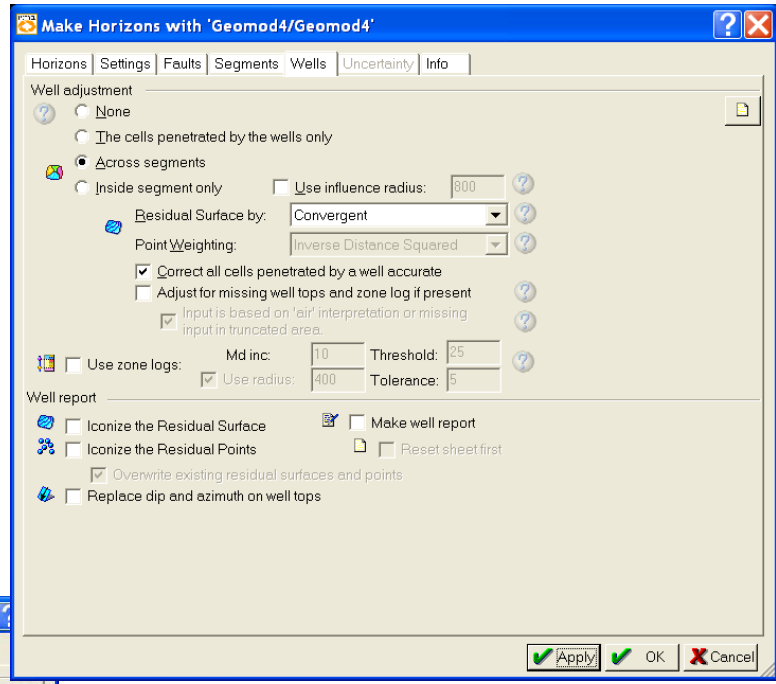


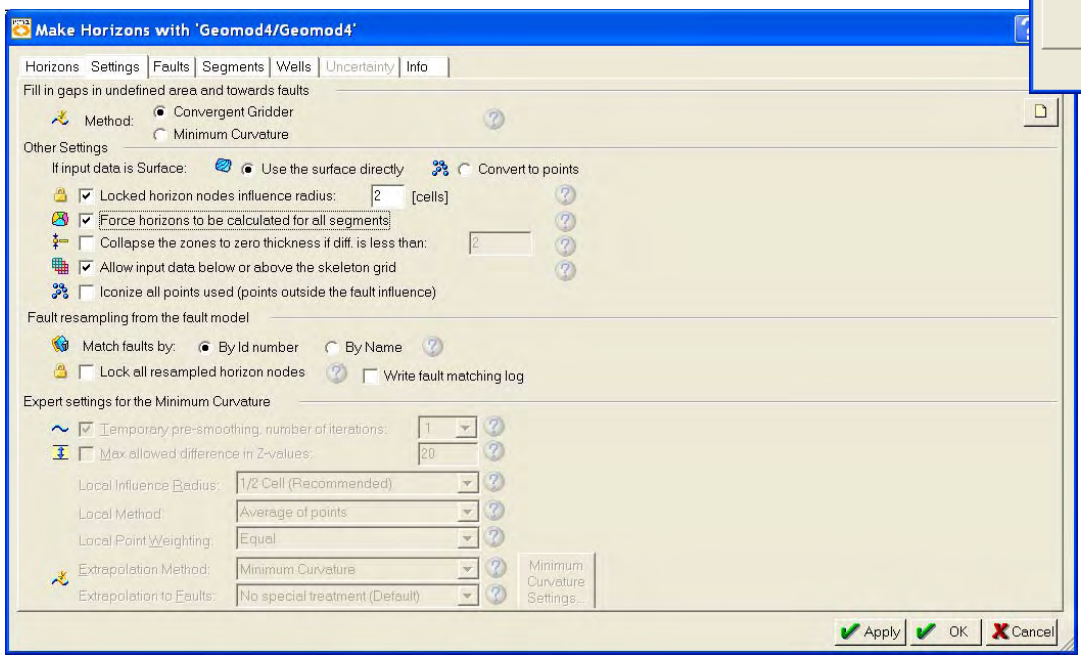
Import surfaces



Build Horizons conditioned on well tops for facies wells

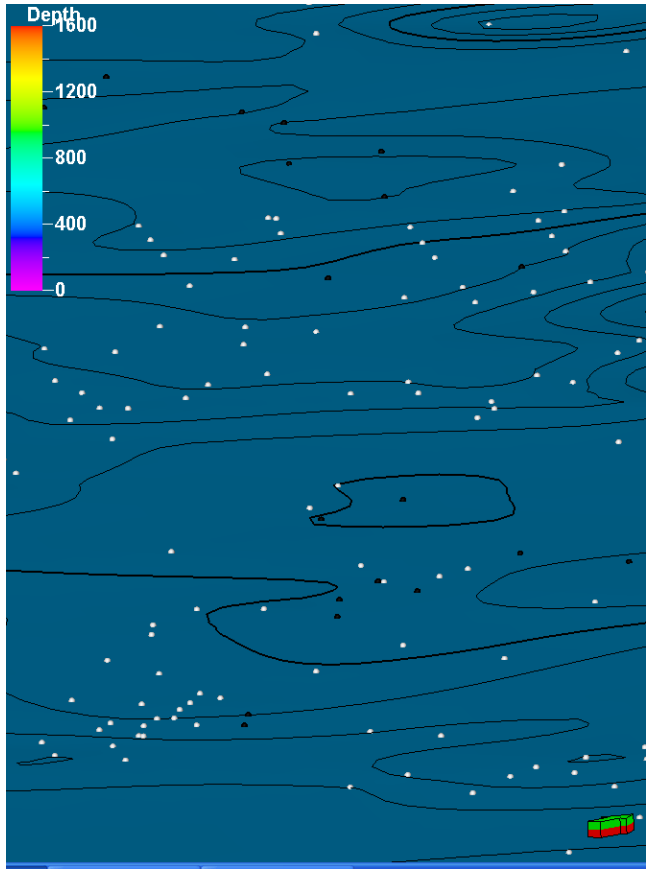


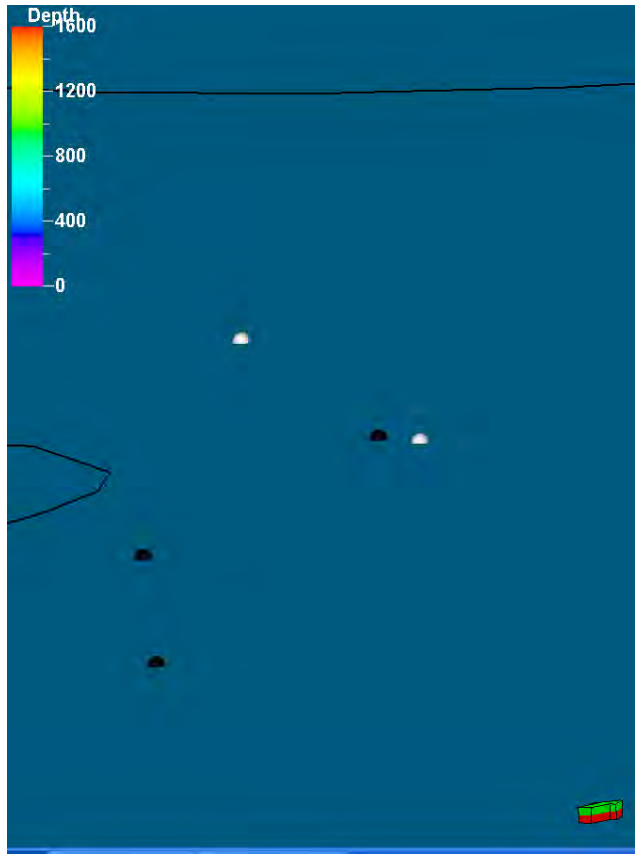




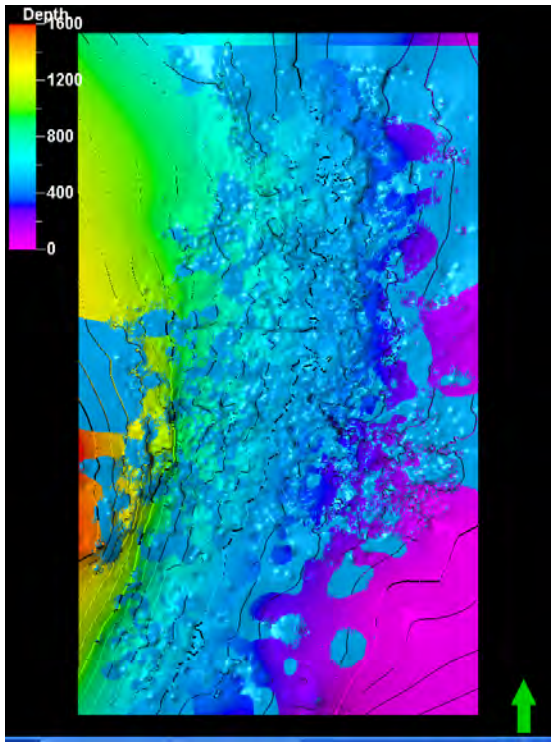
Well ties A1_Sh

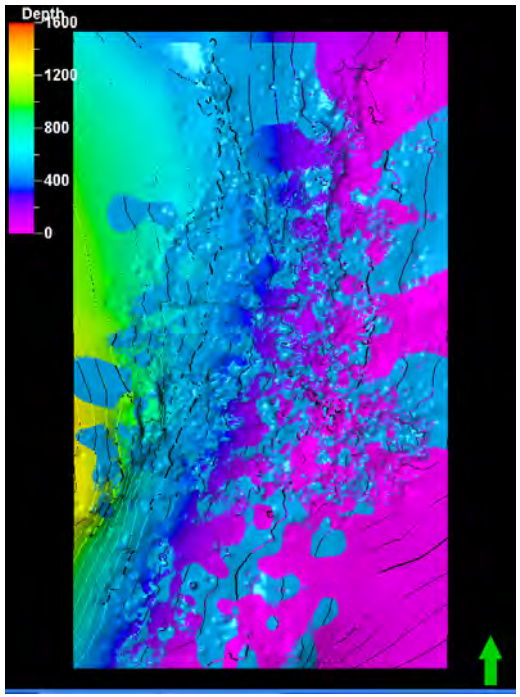
Black – wells with LAS files
White – “framework” wells

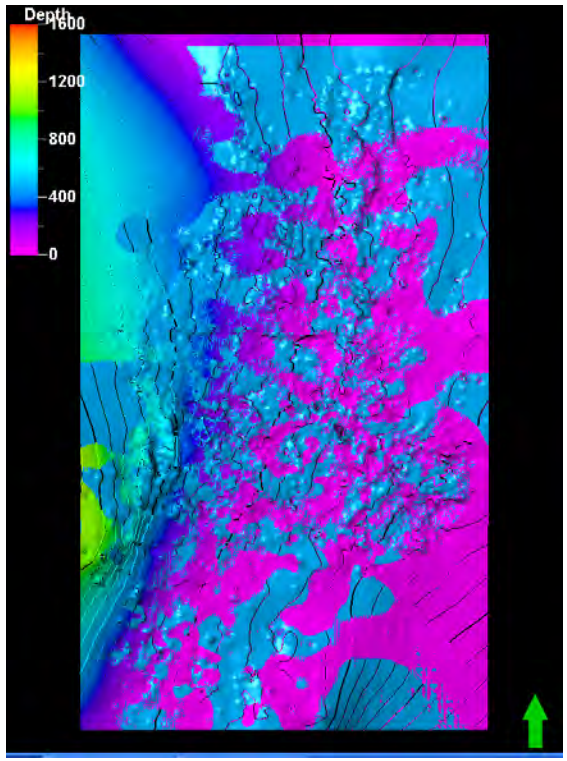




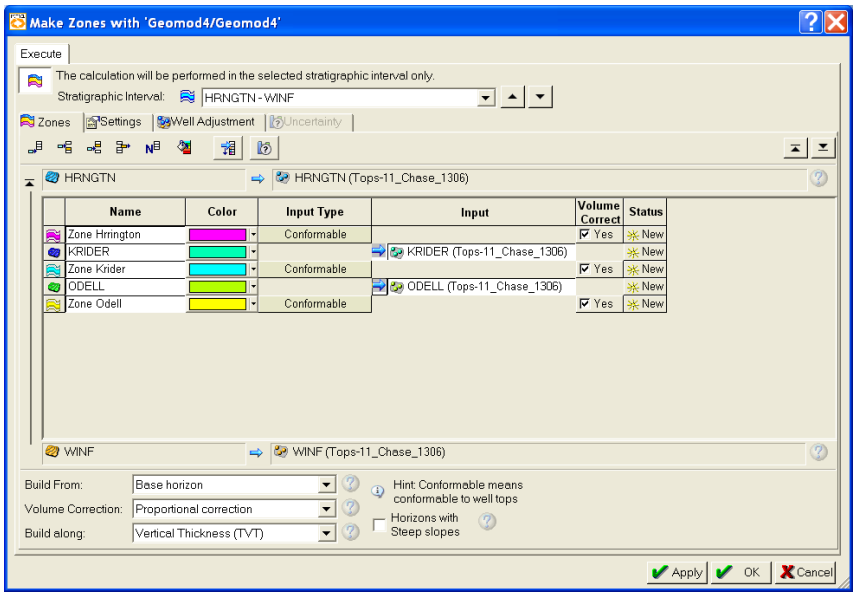
Map ties: Grid in color, horizons in blue

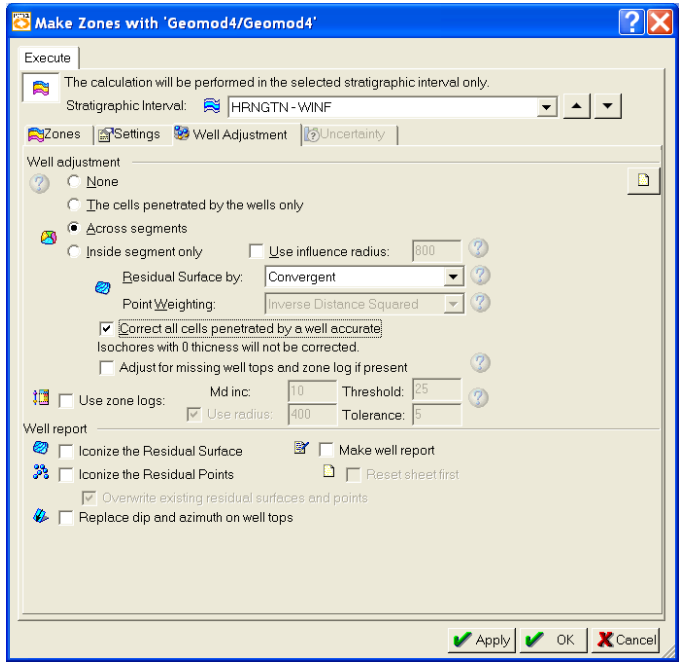




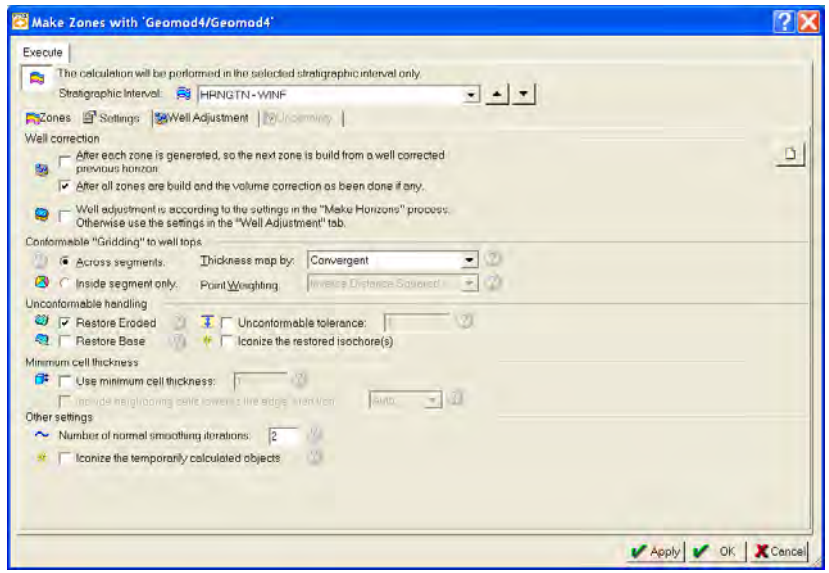


Make zones using Dave Hamilton's method (see Geomod 3 notes)

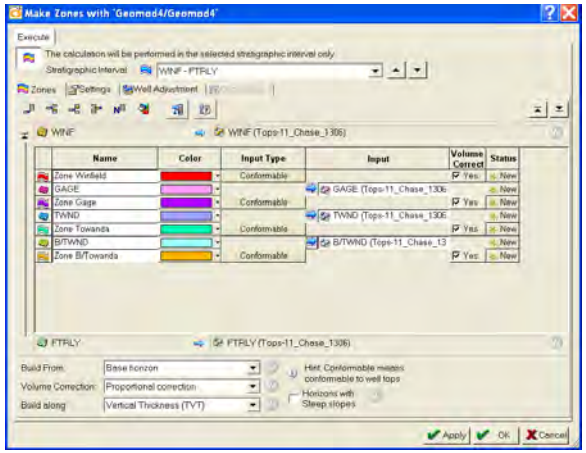


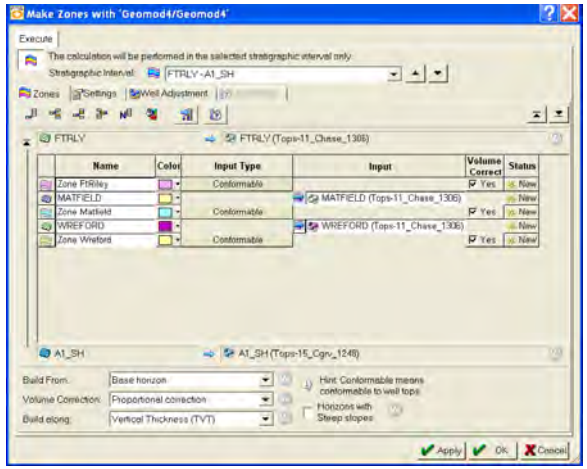


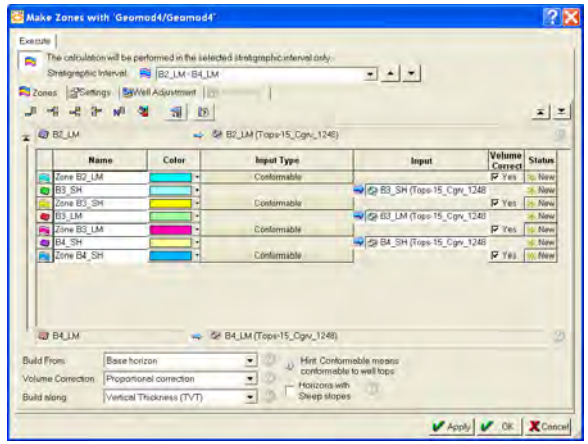
All default settings, except well adjustment: uncheck "Adjust for missing well tops"

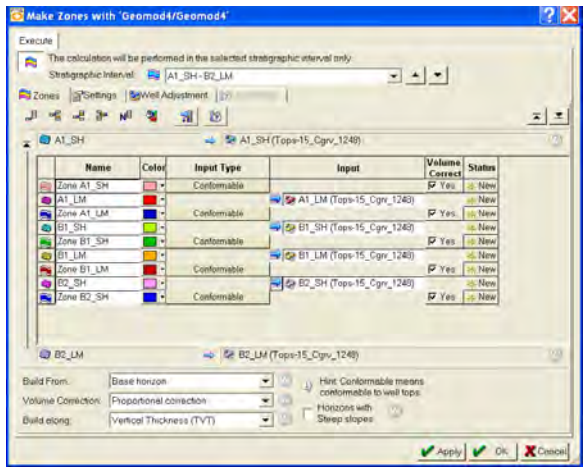


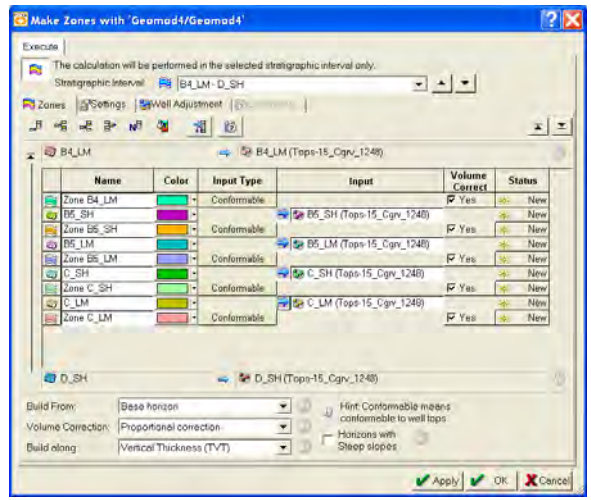
Rest of the Zones



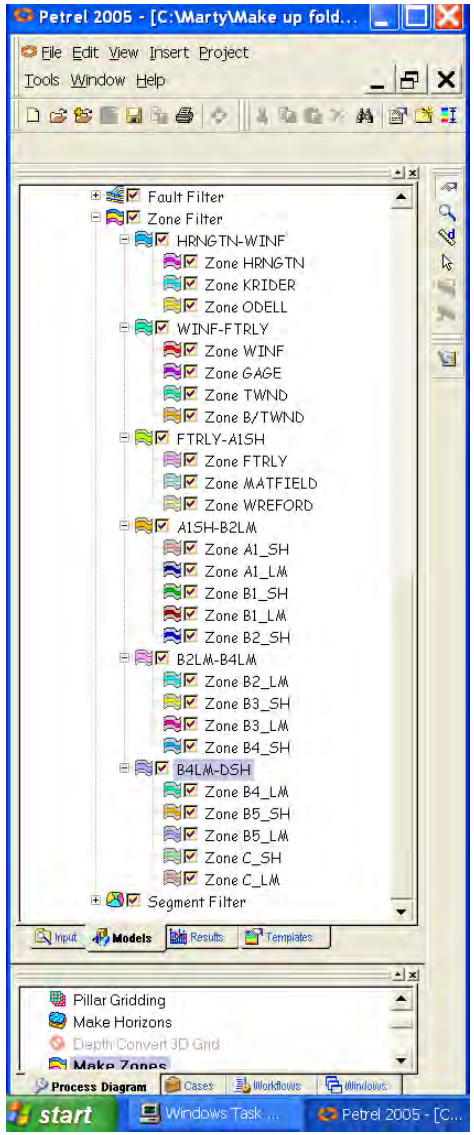




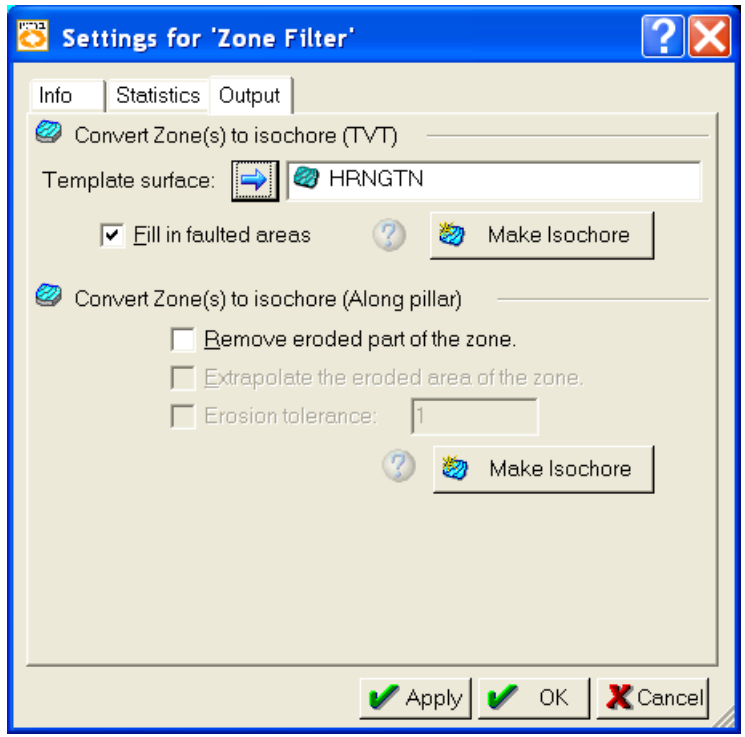




Zones made



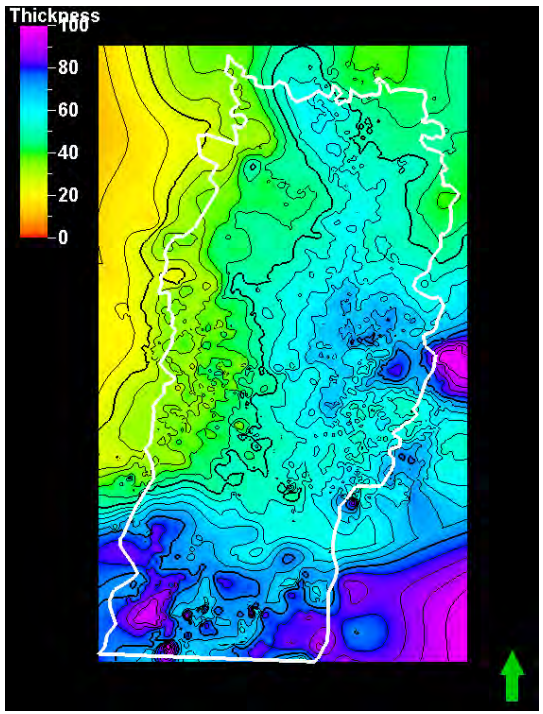
Make isochores for all zones: Click on zone filter folder>output tab>insert a grid (from the input tab) >apply



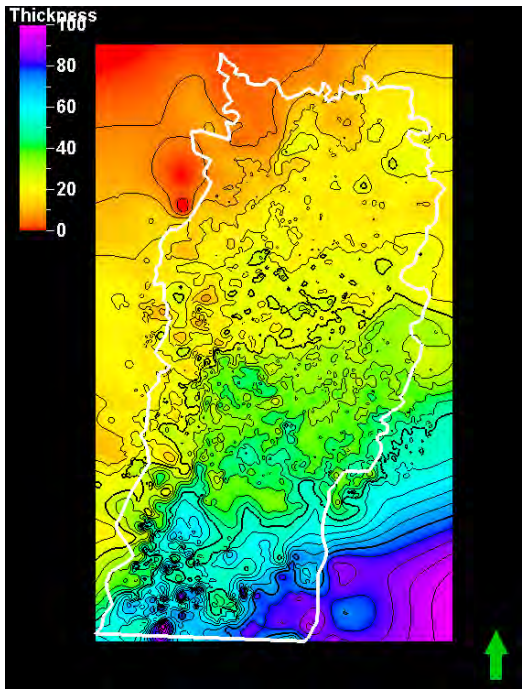
Selected Zone Isochores

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

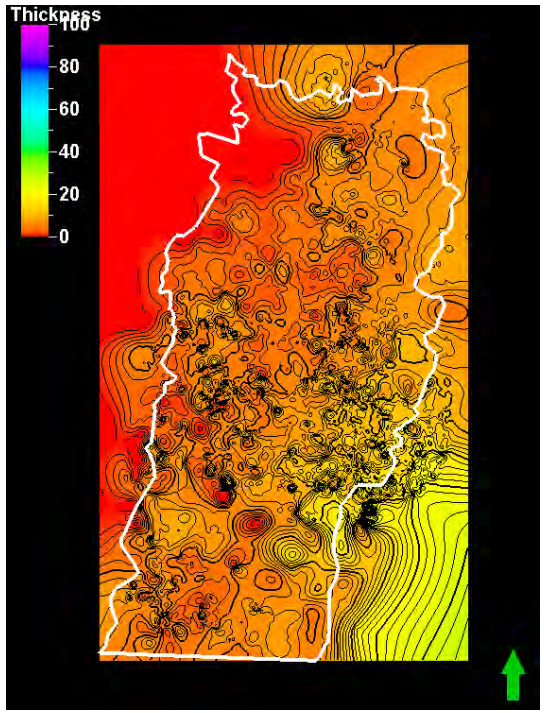
Krider



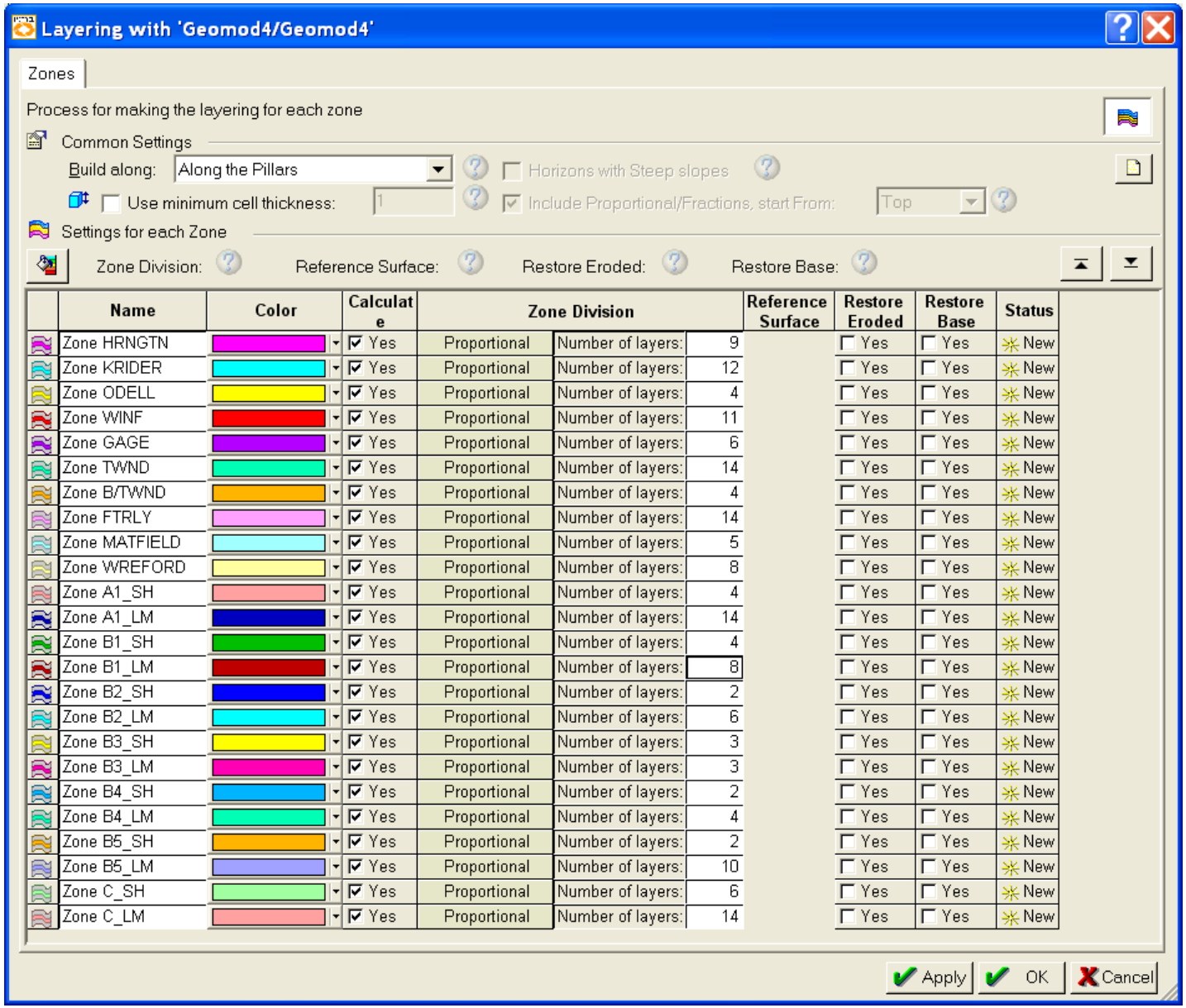
A1LM



B3LM

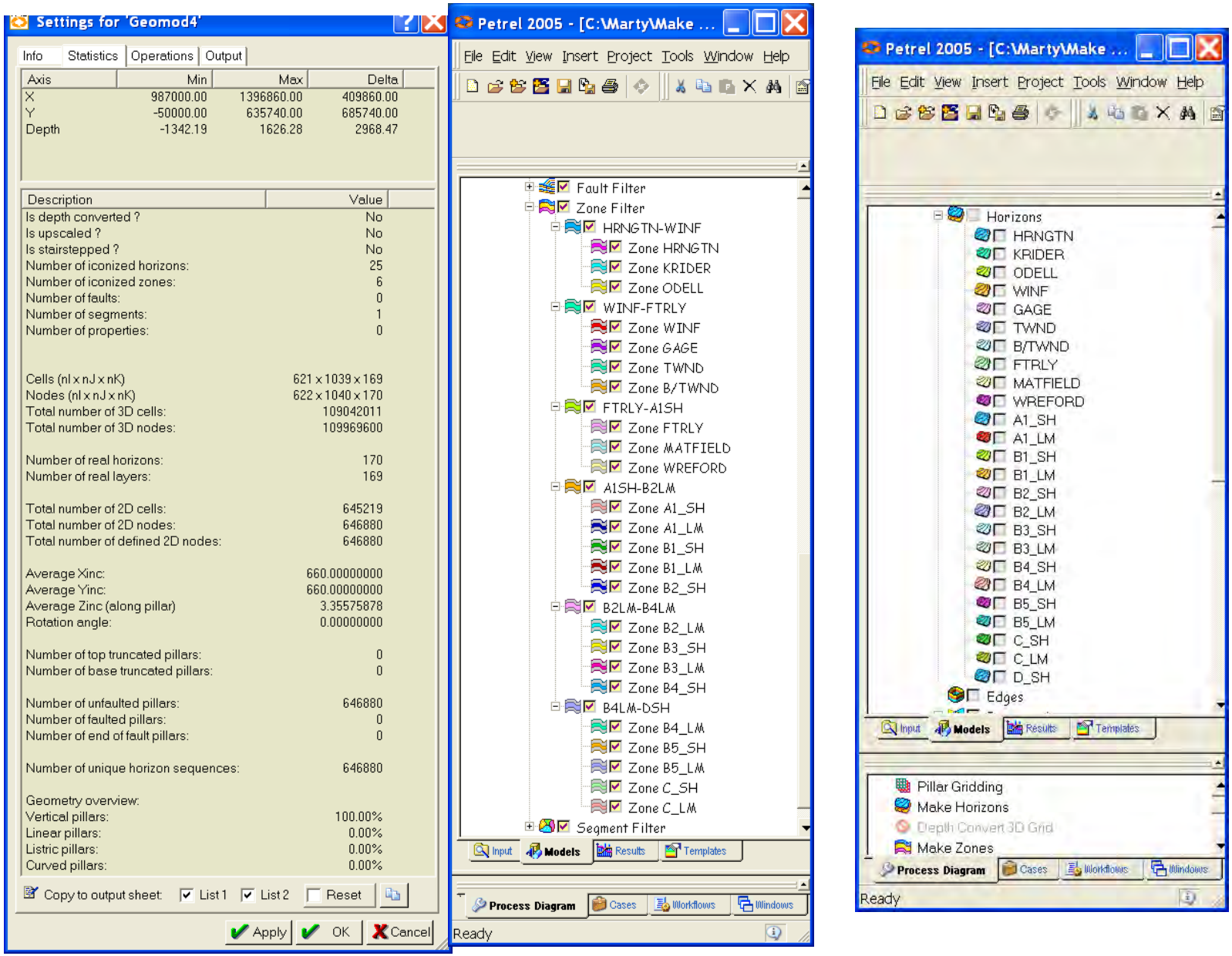


Proportional Layering



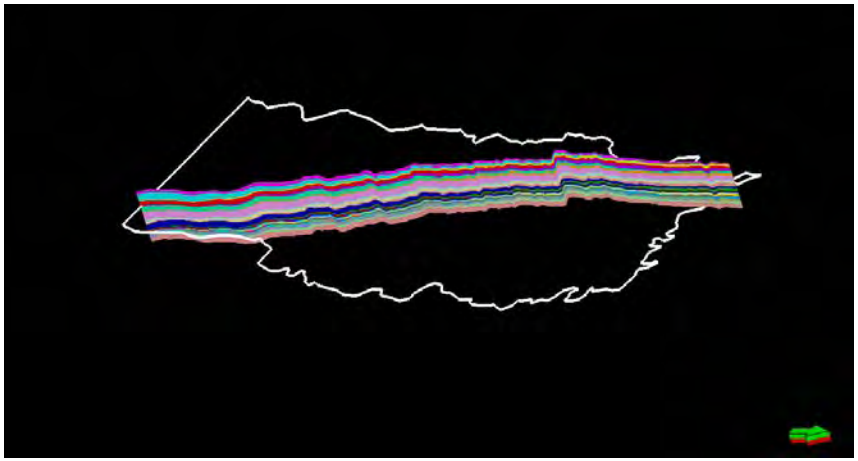
Name	Color	Calculate	Zone Division			Reference Surface	Restore Eroded	Restore Base	Status
Zone HRNGTN		Yes	Proportional	Number of layers:	9		Yes	Yes	New
Zone KRIDER		Yes	Proportional	Number of layers:	12		Yes	Yes	New
Zone ODELL		Yes	Proportional	Number of layers:	4		Yes	Yes	New
Zone WINF		Yes	Proportional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

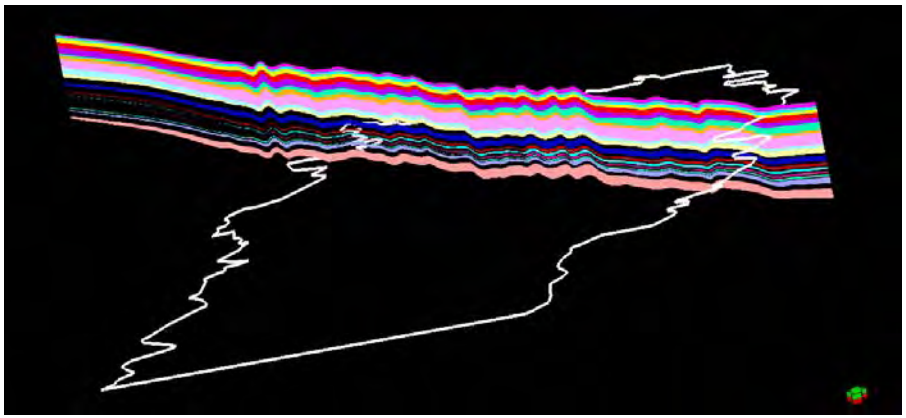
Model Dimensions

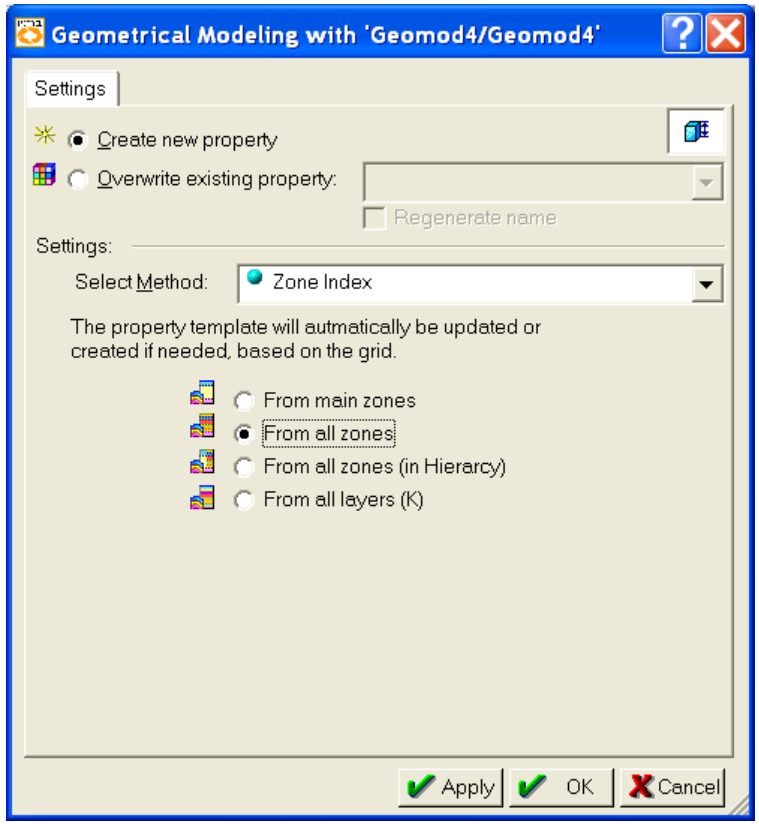


Evaluate Layering

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

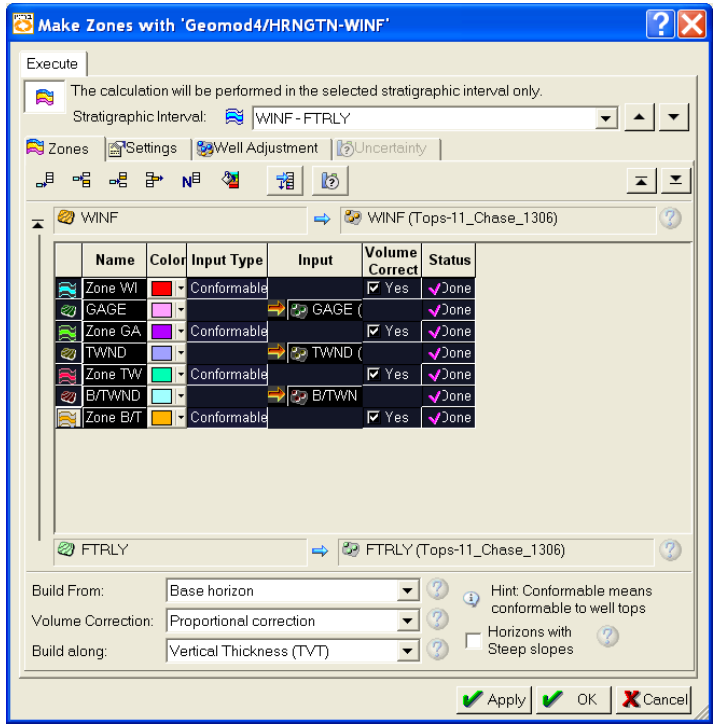
Build six sub models

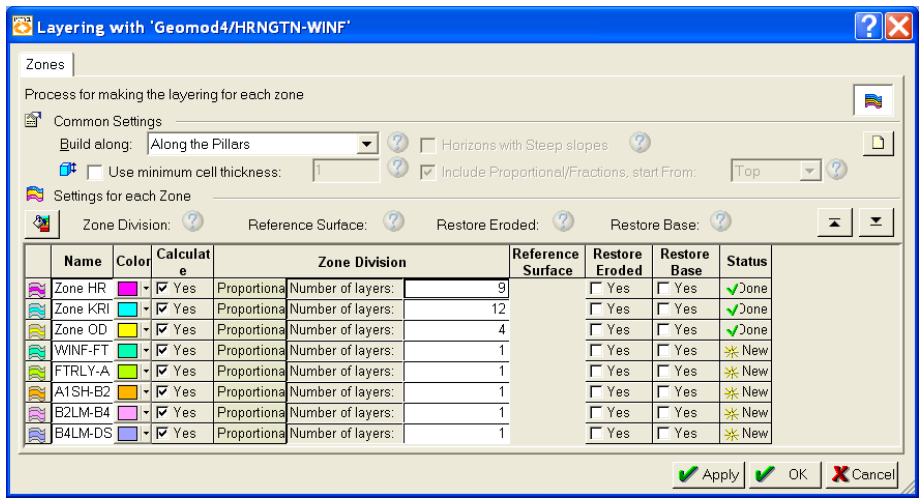
Make 6 copies of the full model.

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

Delete unwanted zones:

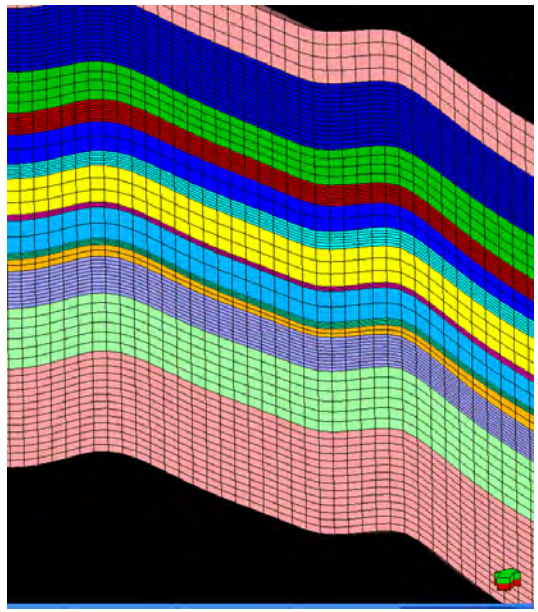
1. Make model active
2. Make zones in Structural modeling
3. Highlight zones to be deleted
4. Delete by mashing the delete icon and then “Apply.” Clear memory.
5. Continue through the model. And SAVE.
6. Check out the layering by opening the Layering tool





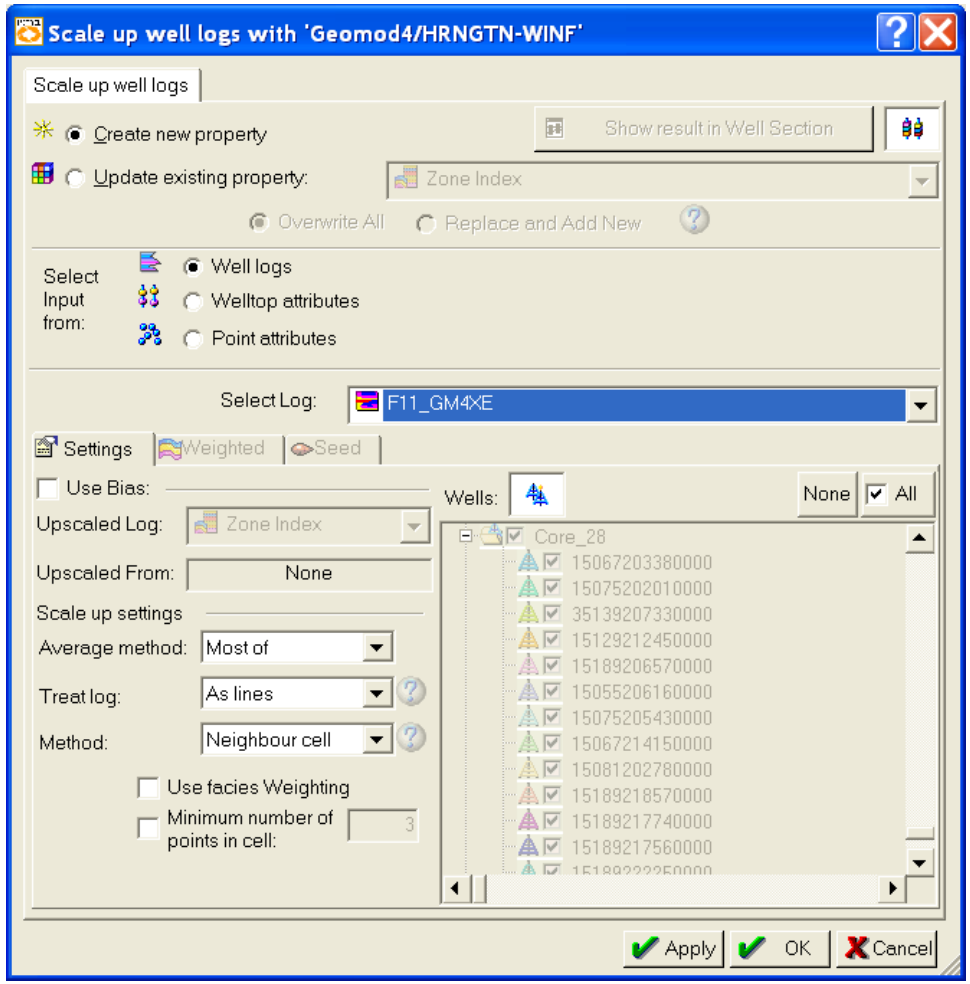
HRNGTN-B4LM

A1SH-DSH (Cgrv)

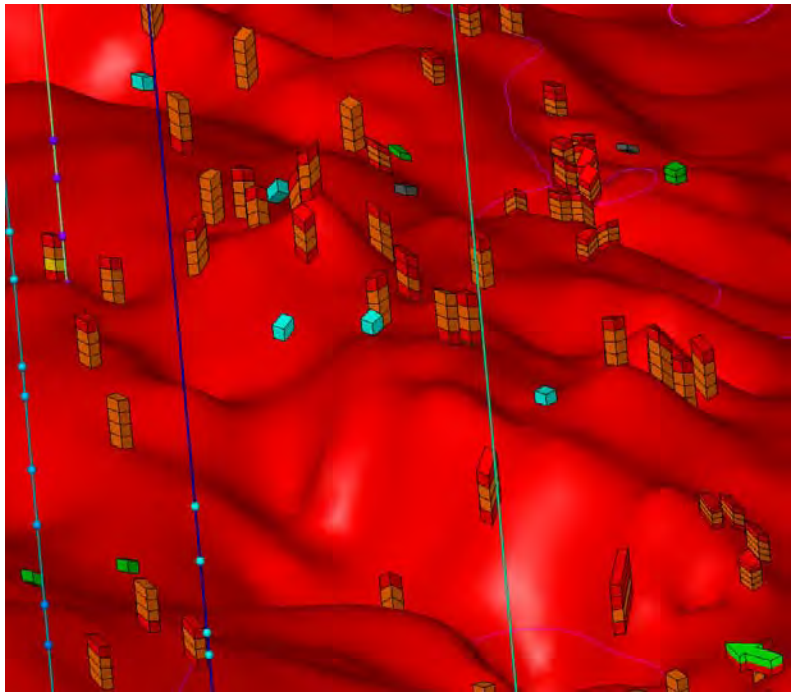


Block facies to wells

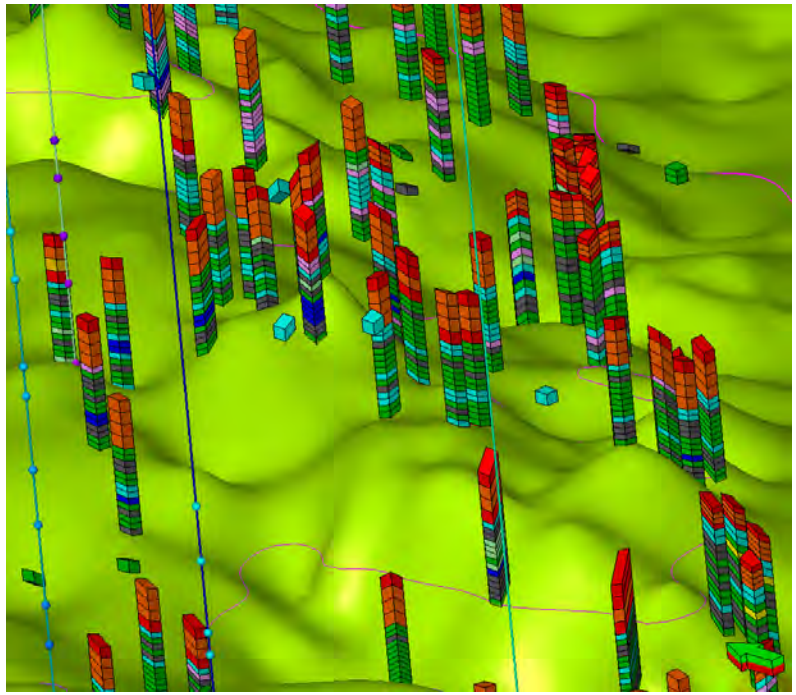
Note: Did not assign templates while importing wells so had to do this before starting the process.



QC upscale facies at wells



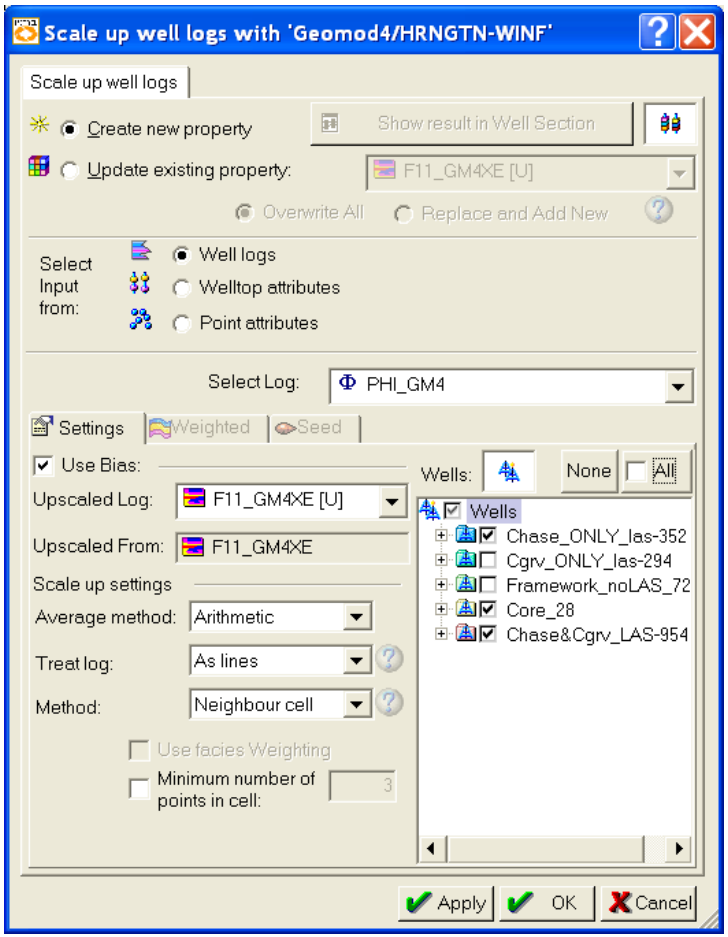
Blocked facies at wells with A1LM horizon (red) Blue and green cells are from Chase only wells where Cgrv AS1Sh was not part of conditioning set of tops data. Consider not modeling these facies in the modeling process.



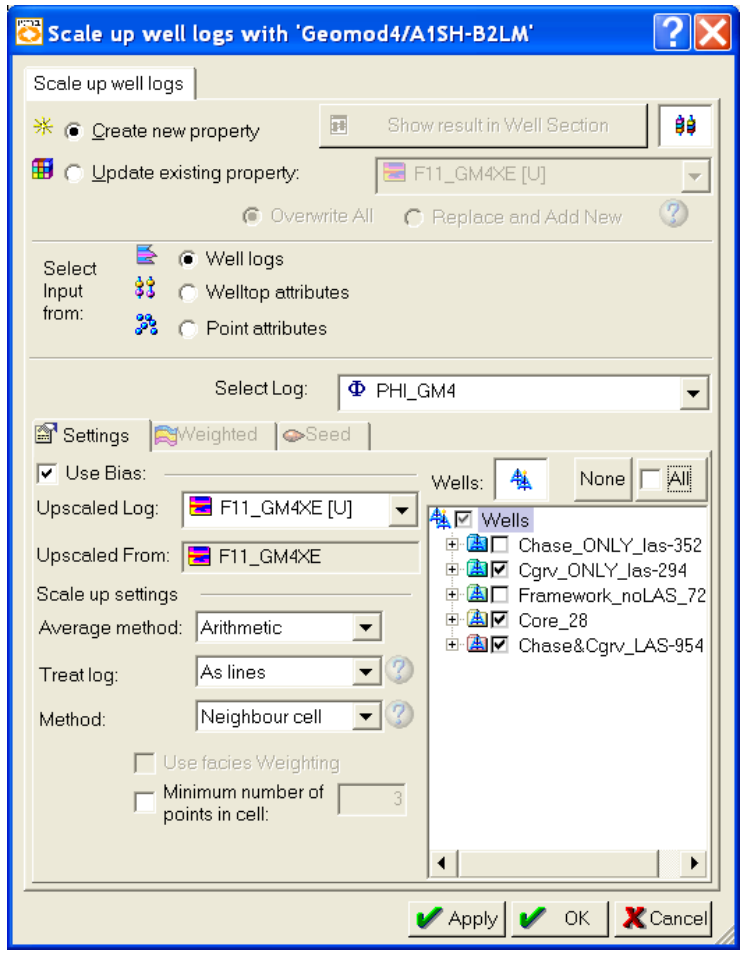
Blocked facies at wells with B1SH horizon (green) Blue and green cells are probably slop at the horizon. Consider not modeling these facies in the modeling process.

Upscale porosity to wells

Chase models

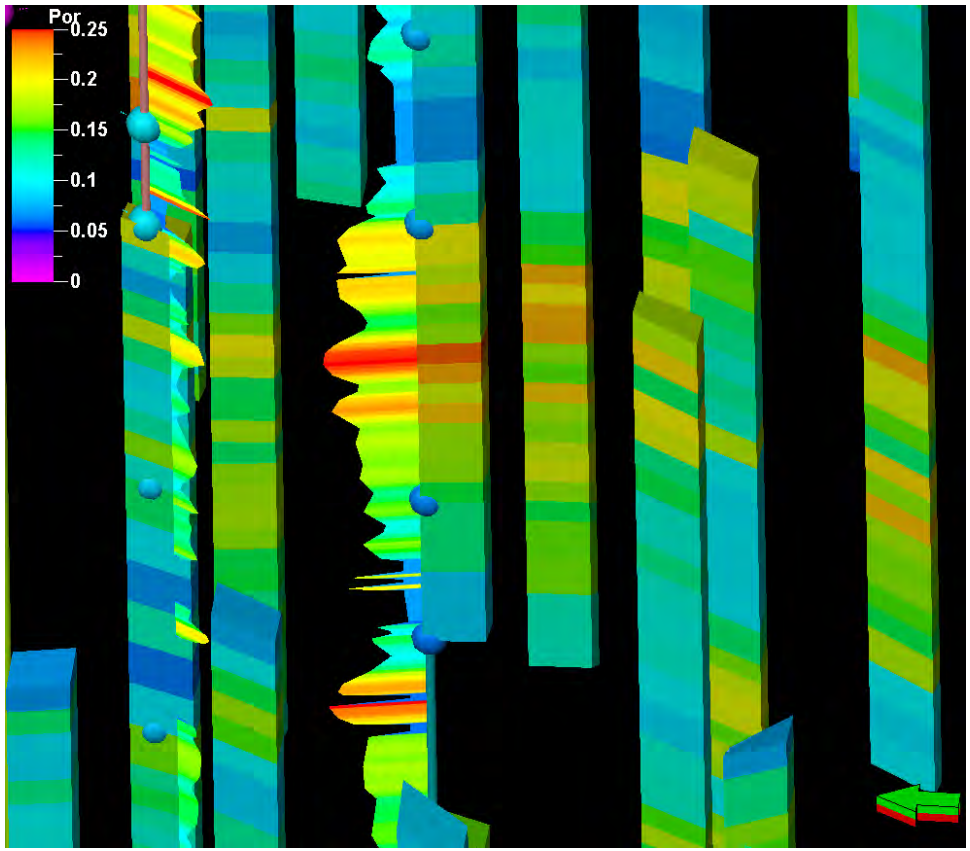


Council Grove models

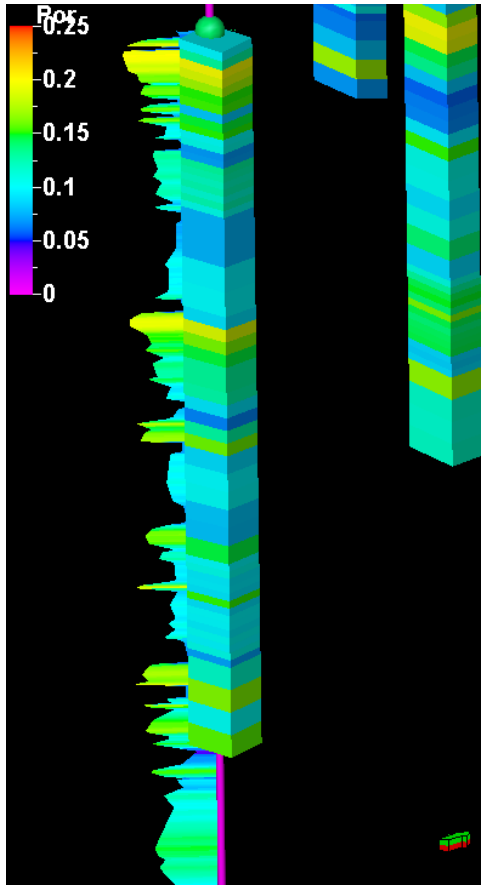


Turned off groups of wells without the curves over the interval being upscaled

Upscaled vs. Log Phi



Winf-FtRly

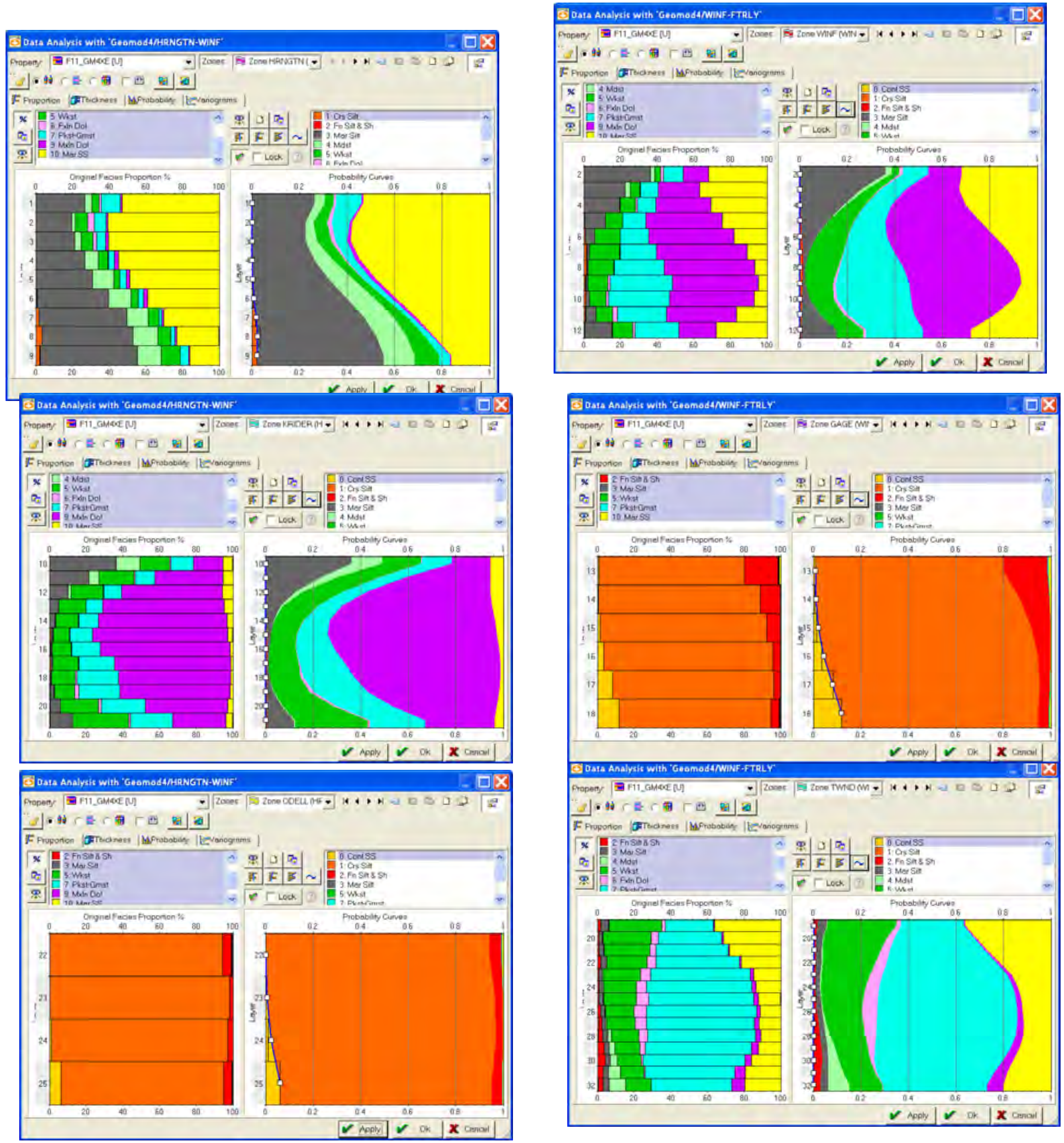


Hrngtn- Krider &
Winf-FtRly

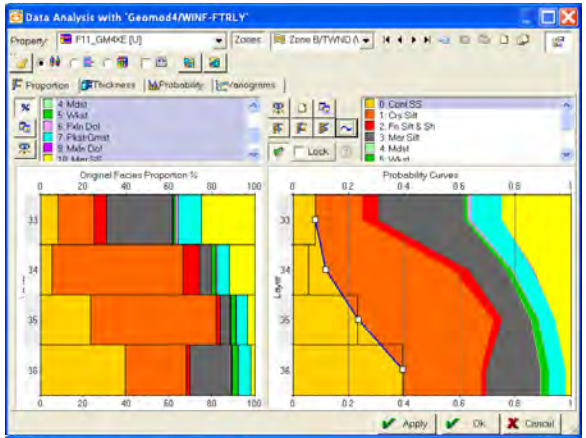
Facies data analysis

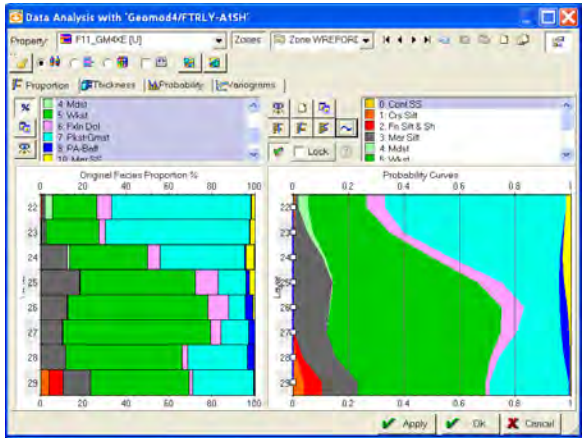
Go to Data Analysis

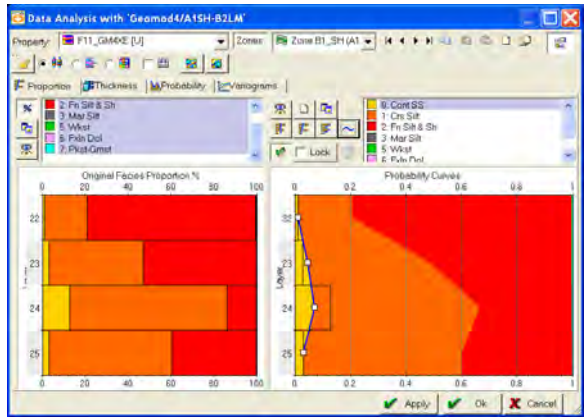
1. Unlock the zone
2. Punch “Fit Active/all curves to histogram” button
3. Smooth to satisfaction (2x)
4. Hit “Apply” to save

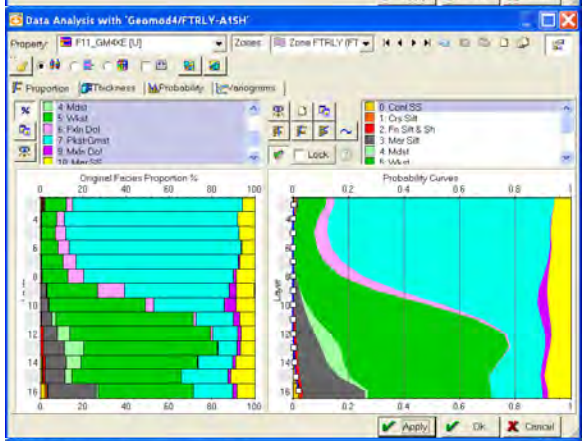


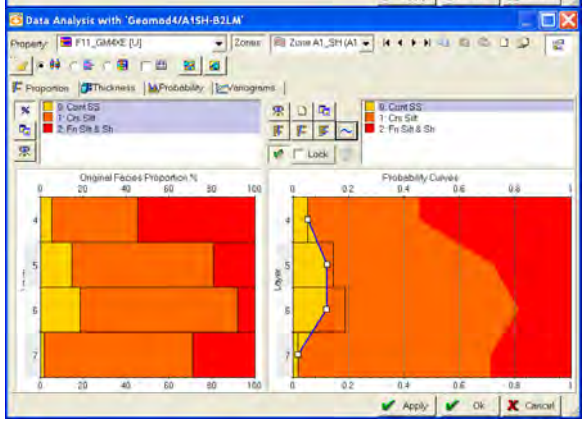
More facies analysis

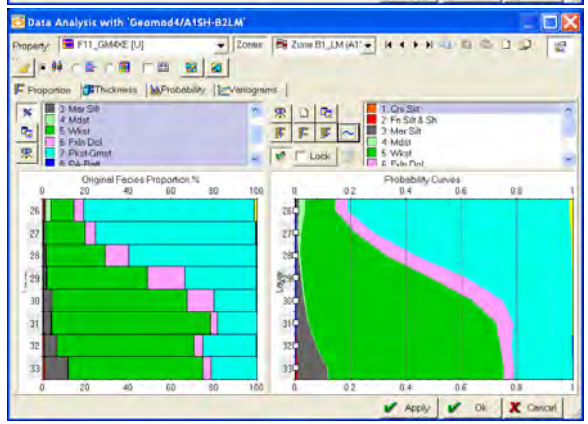


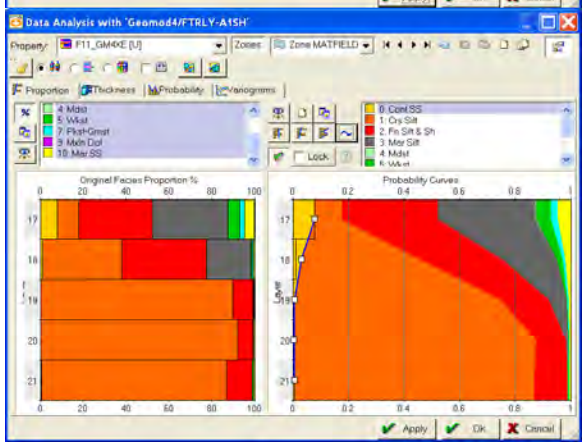


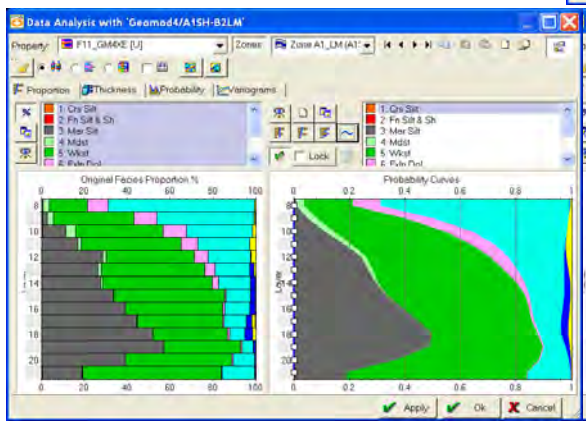


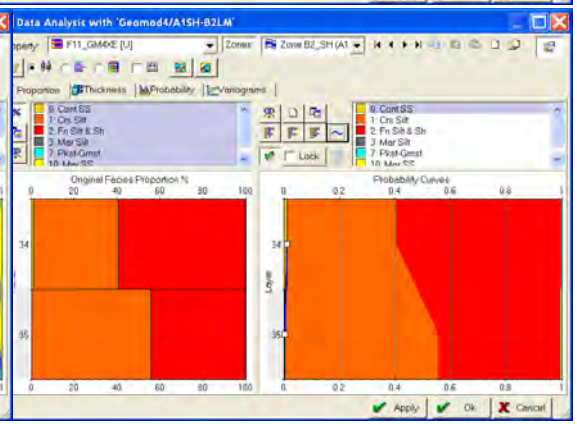




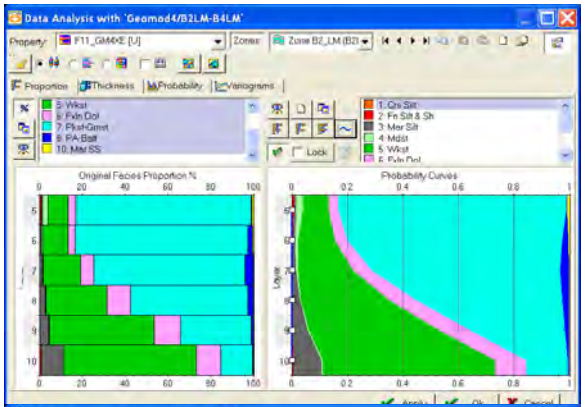


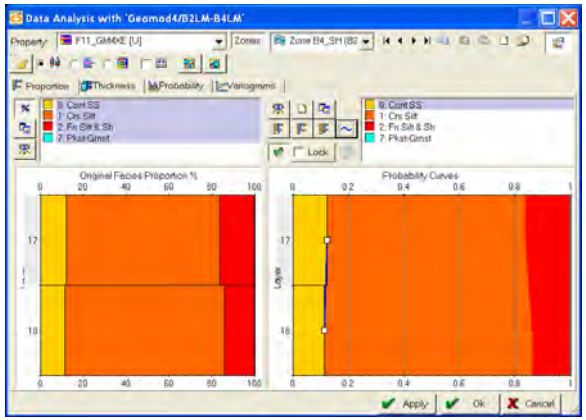


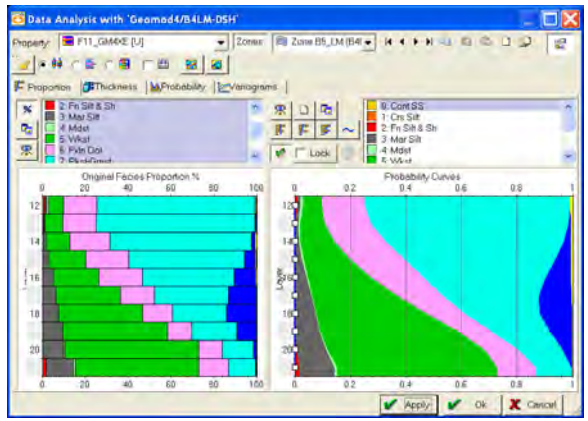


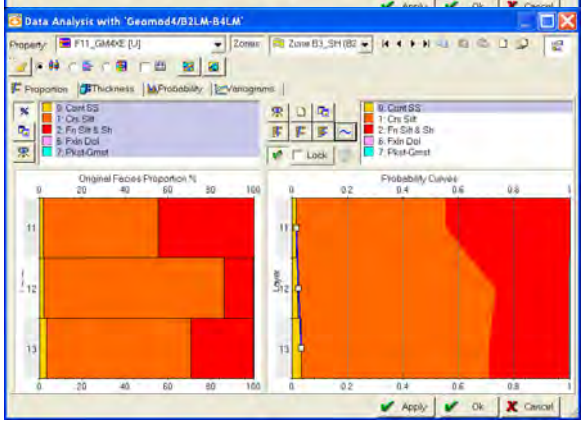


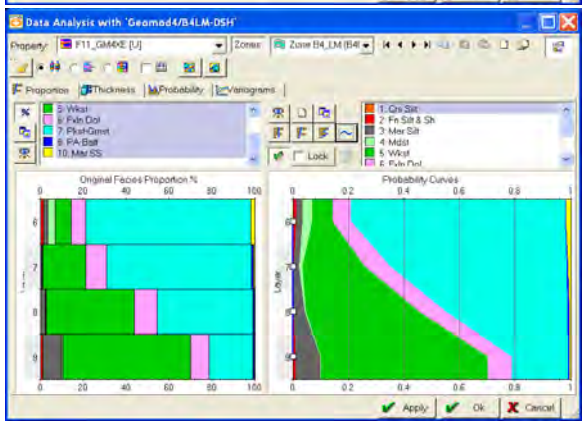
More facies analysis

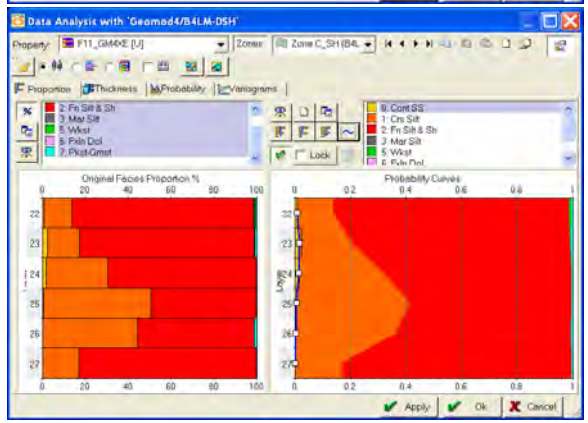


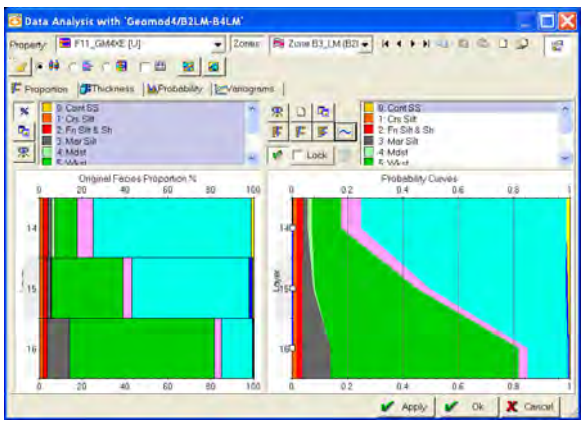


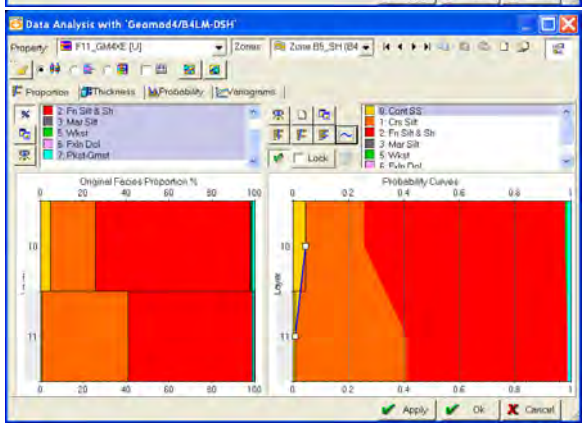


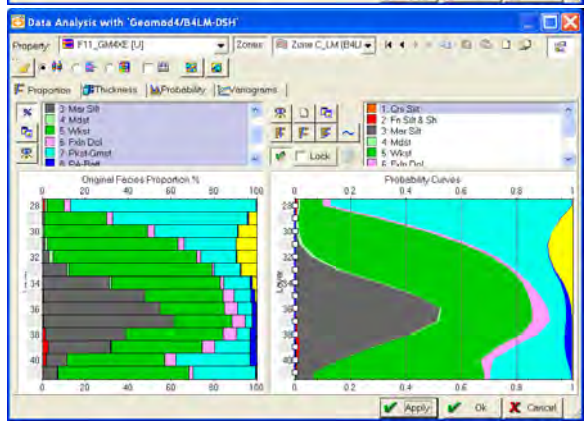




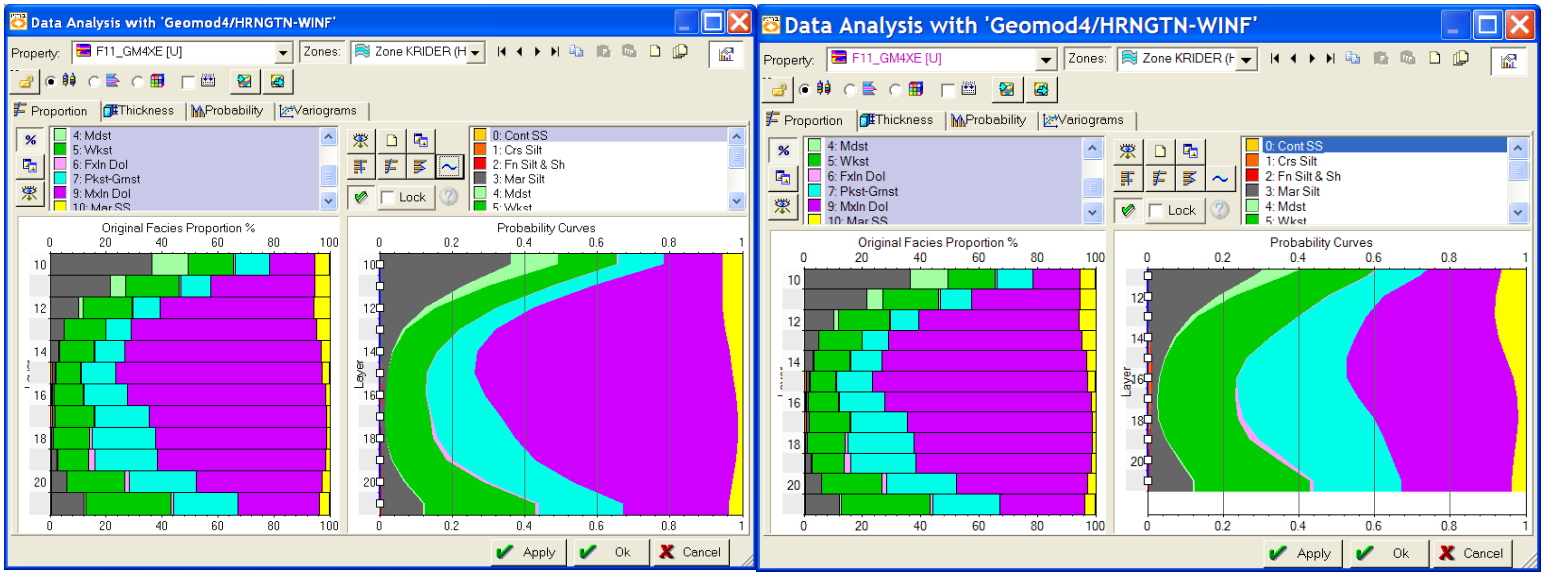




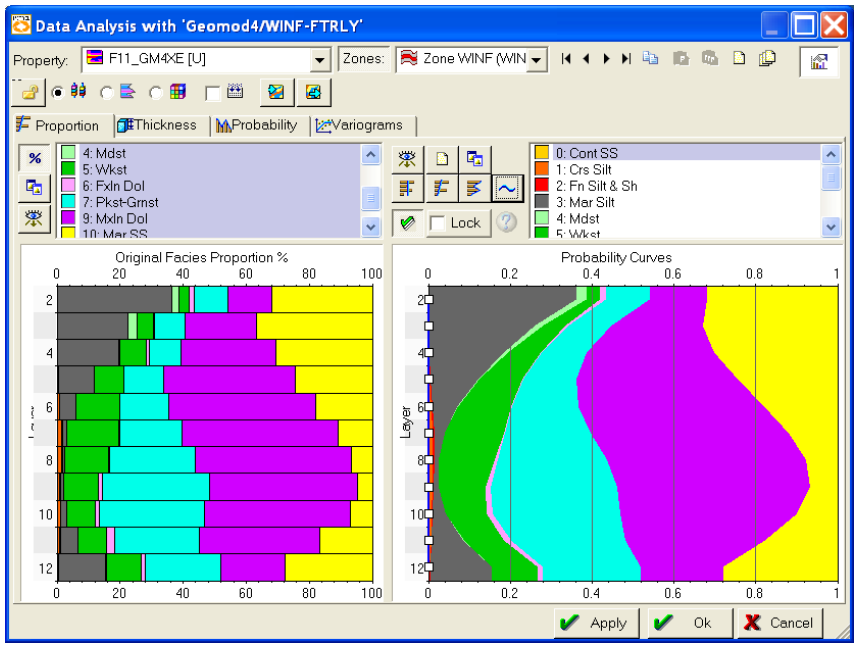


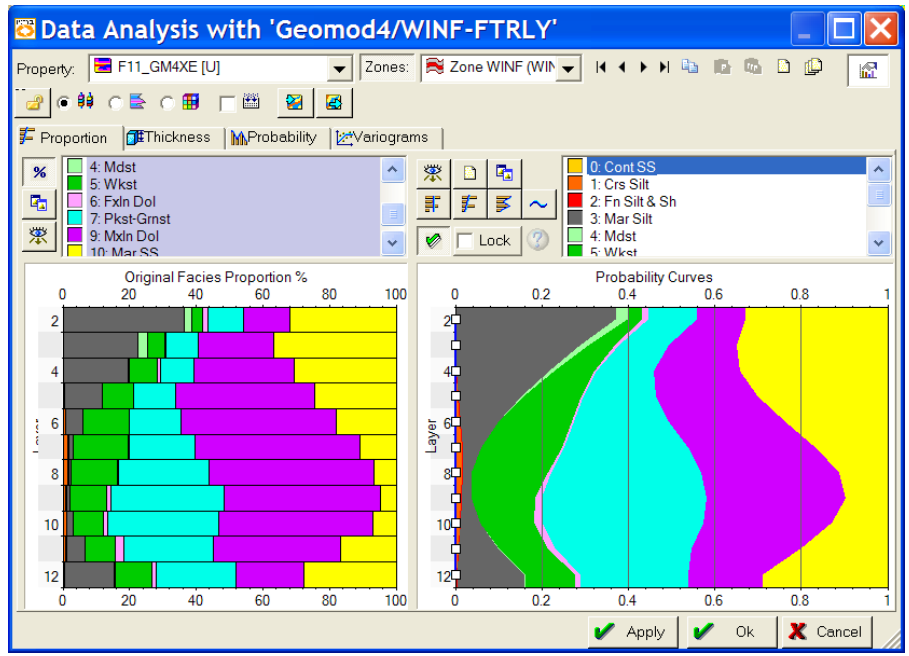


Adjust relative proportions F9 for Krider

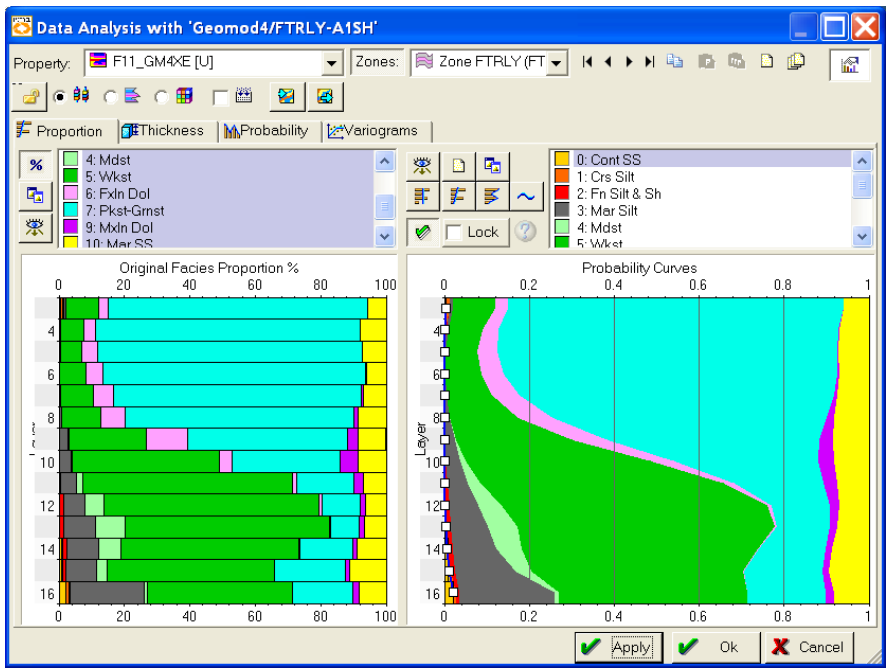


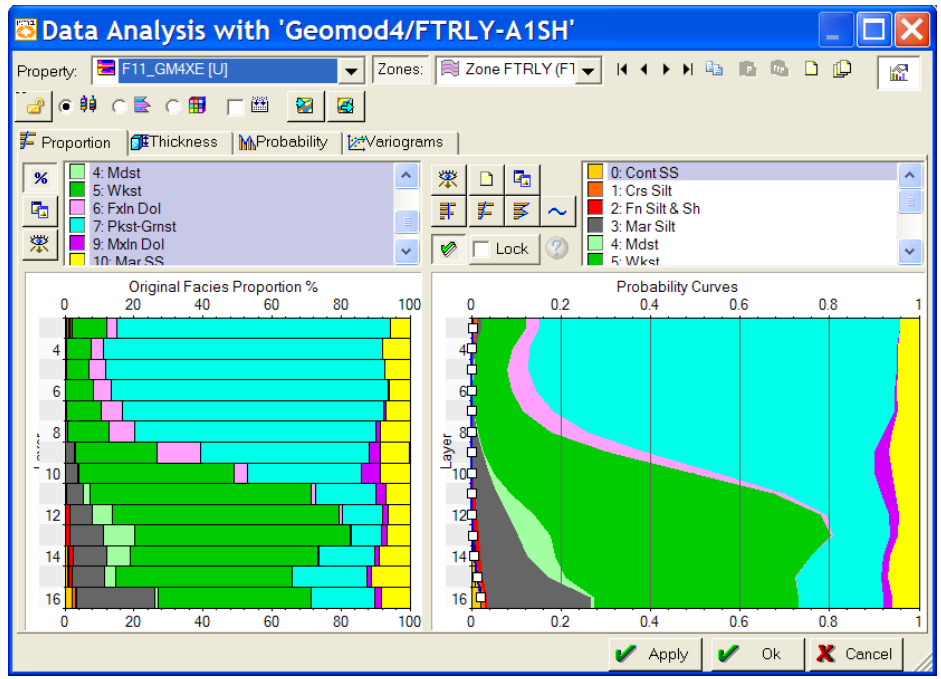
Adjust relative proportions F9 for Winfield





Adjust relative proportions F10 for FtRiley

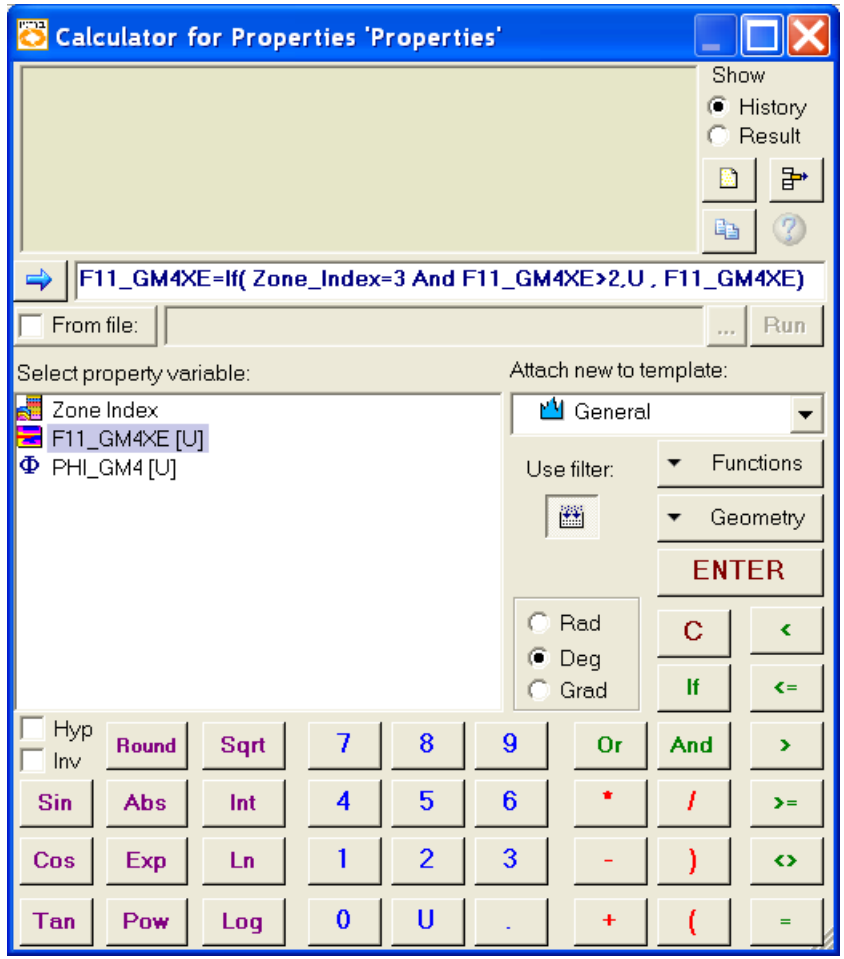




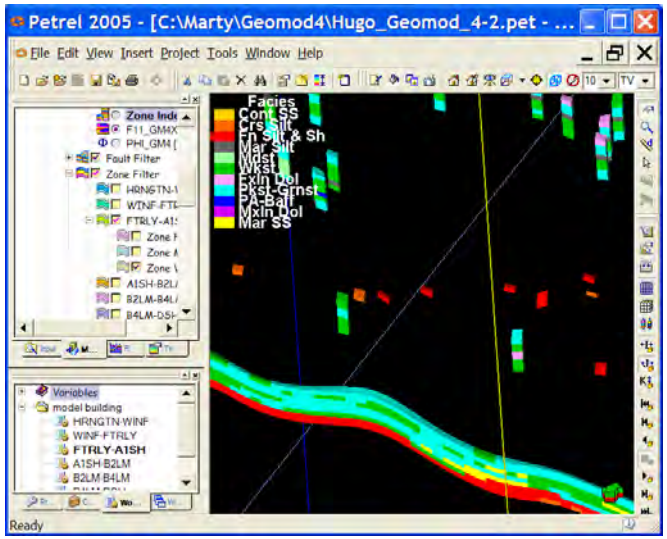
Reduced Mar ss by ~ 1/3

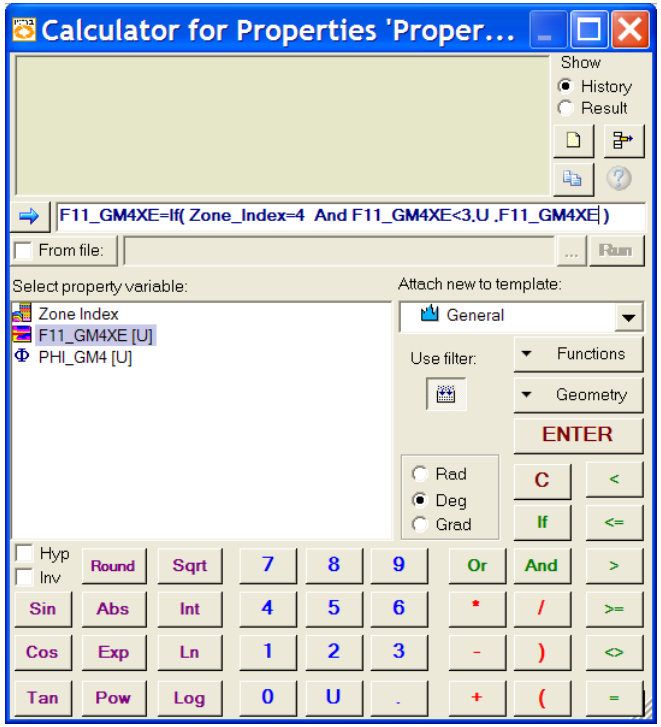
Zap lithofacies except F0,1,2 in A1SH

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

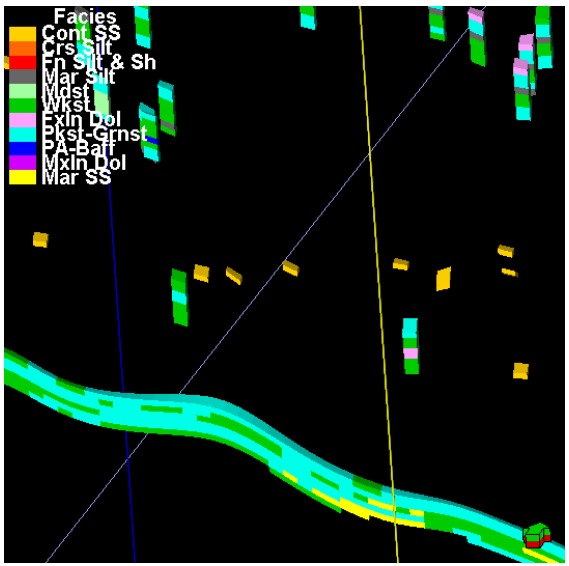


Zap Wreford artifacts (F012)

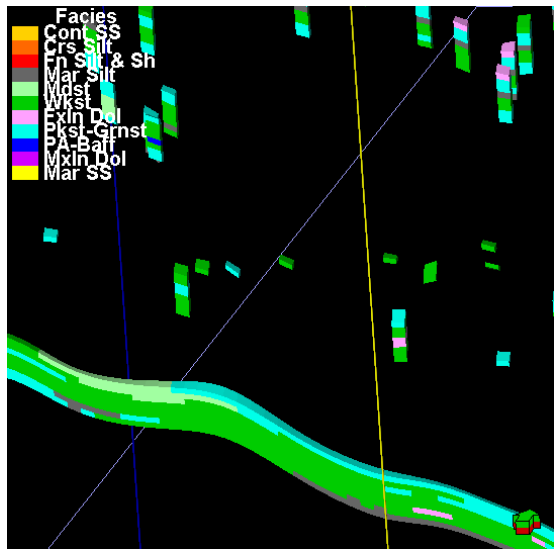




F012 artifacts caused by the way the structural horizon was constructed



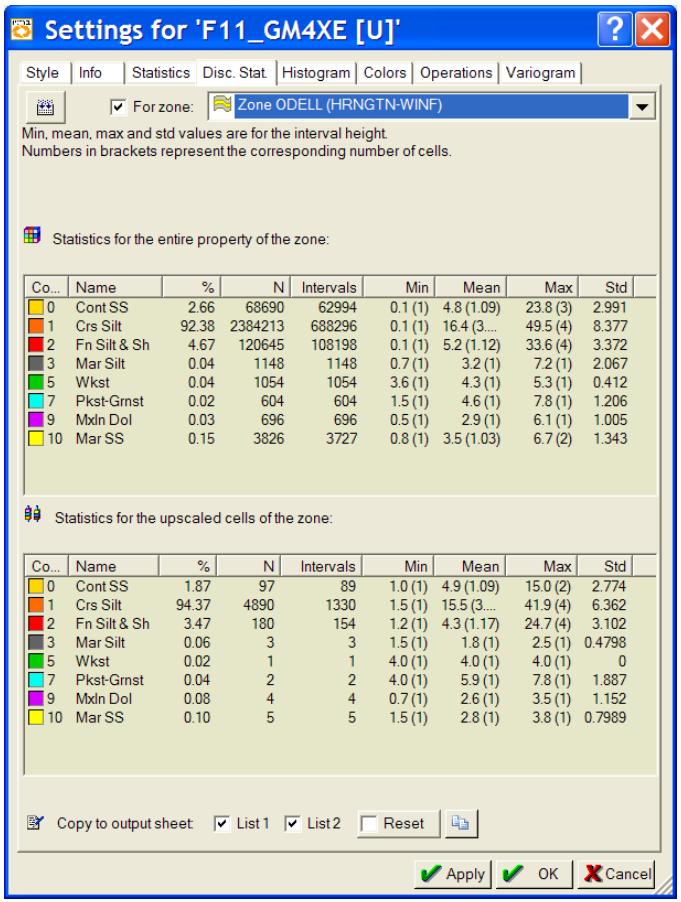
Something squirly about this, made them golden?? Artifact from the way the horizons were made, putting a little of A1sh up in the wreford for Cgrv only wells

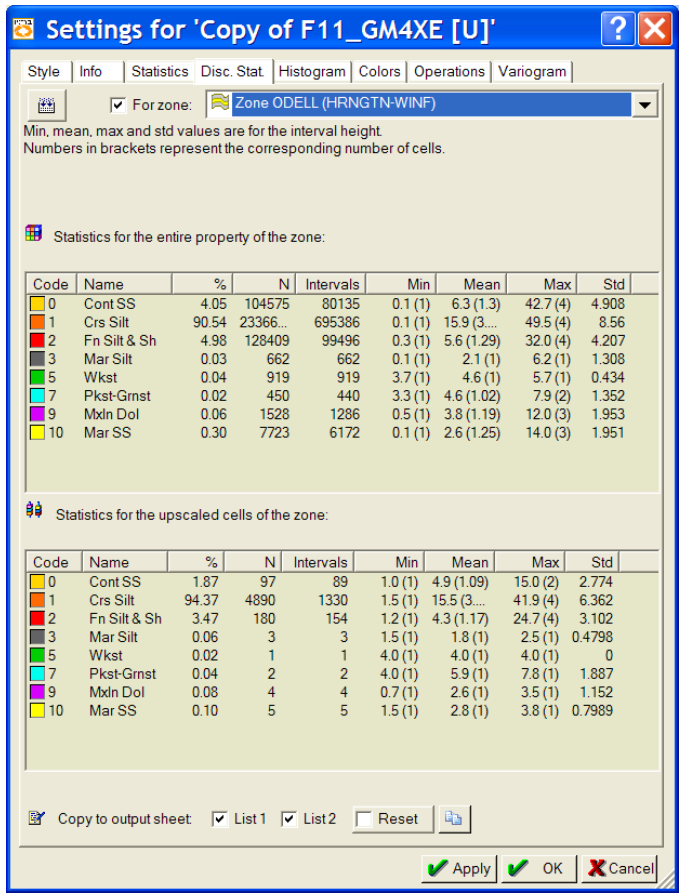


Rerun model with Geomod3 variogram parameters

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

Odell Stats

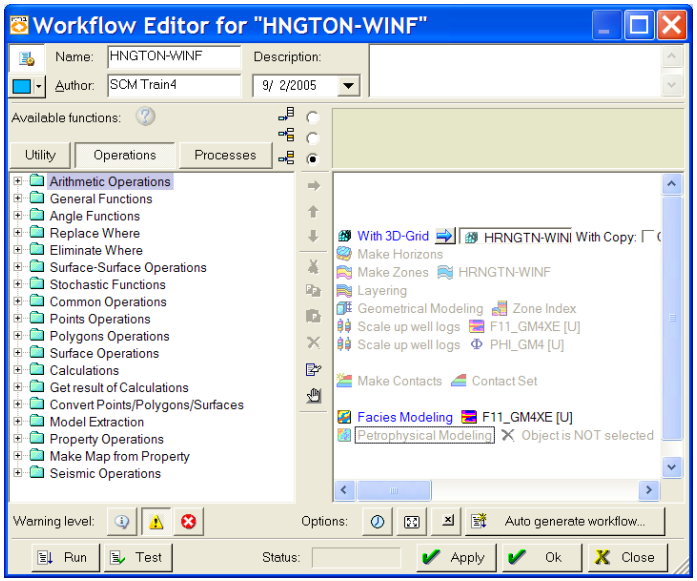


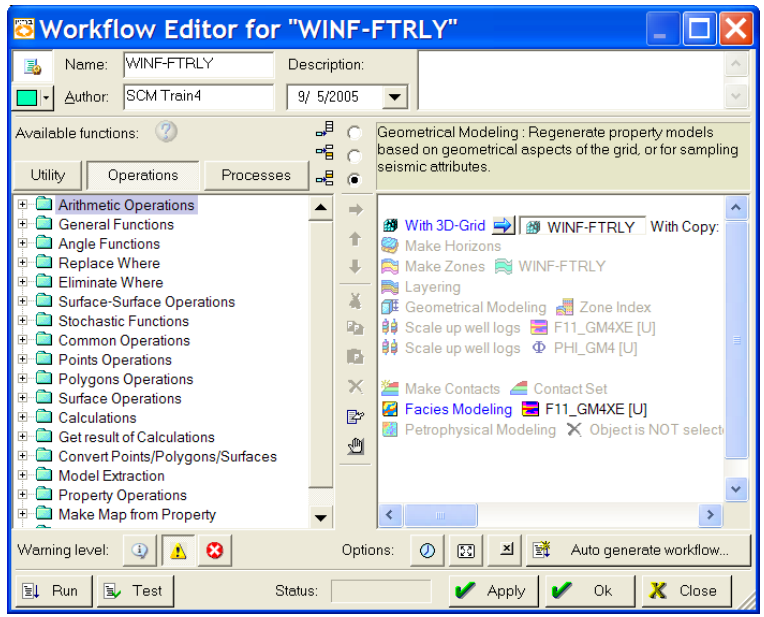


Model facies stats
Zone ODELL resulting facies fractions:

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

Workflows

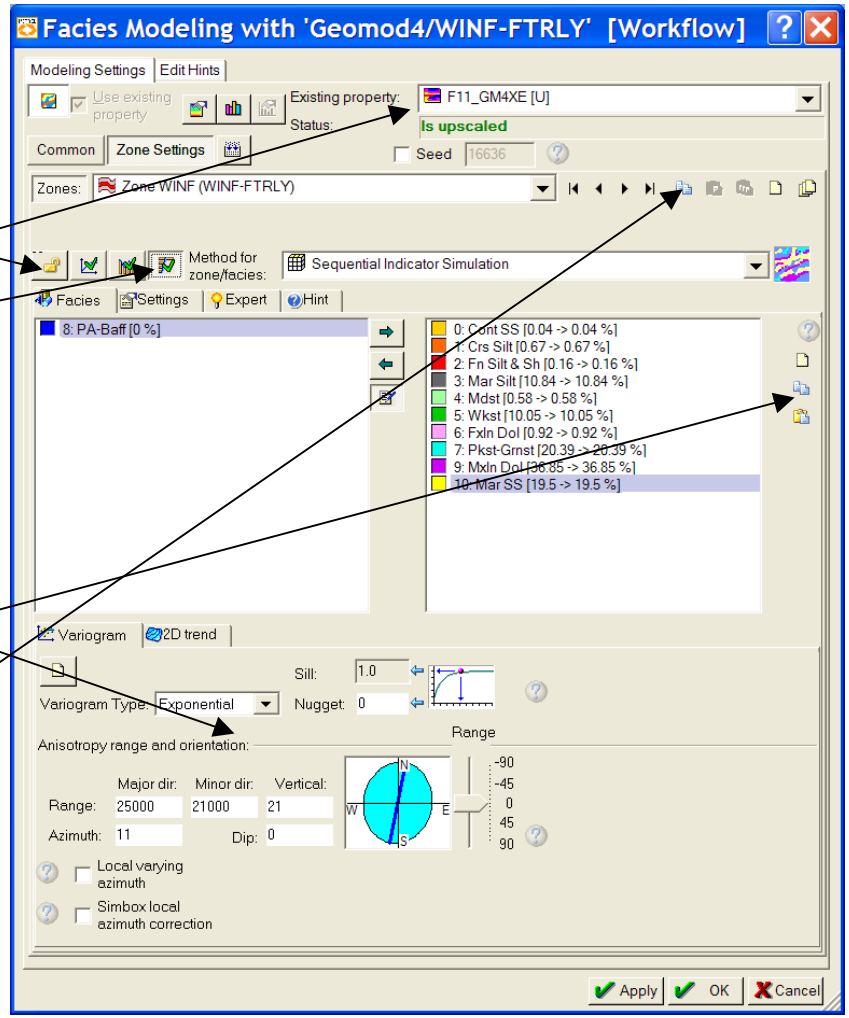




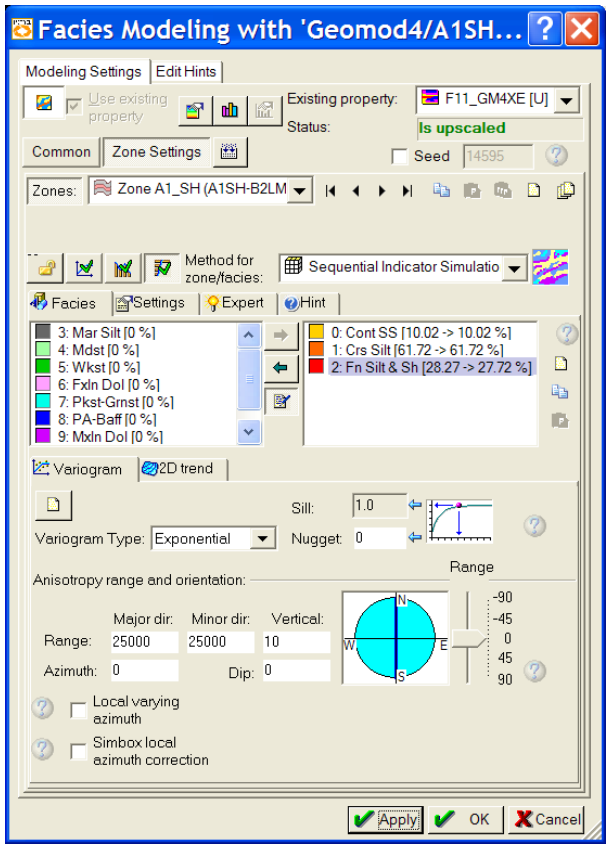
1. Open workflow for the model
2. Insert the appropriate 3D model. This automatically adds the associated make Horizons, make zones and layering workflow. Check these out to make sure they are okay.
3. Rearrange like to template
4. Set up the geometric model point to zone index
5. Make contact in process 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.

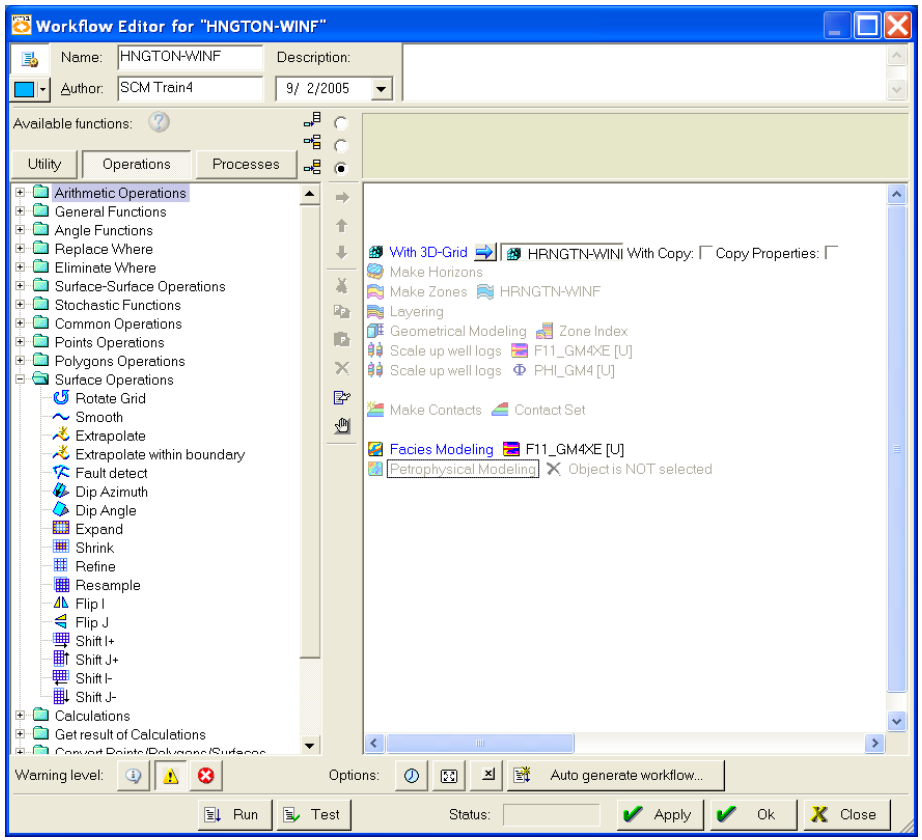
Facies Modeling Parameters

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 parmeters for all (use copy and paste where possible)
7. Copy all and apply to all zones to be modeled (by uinlocking 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

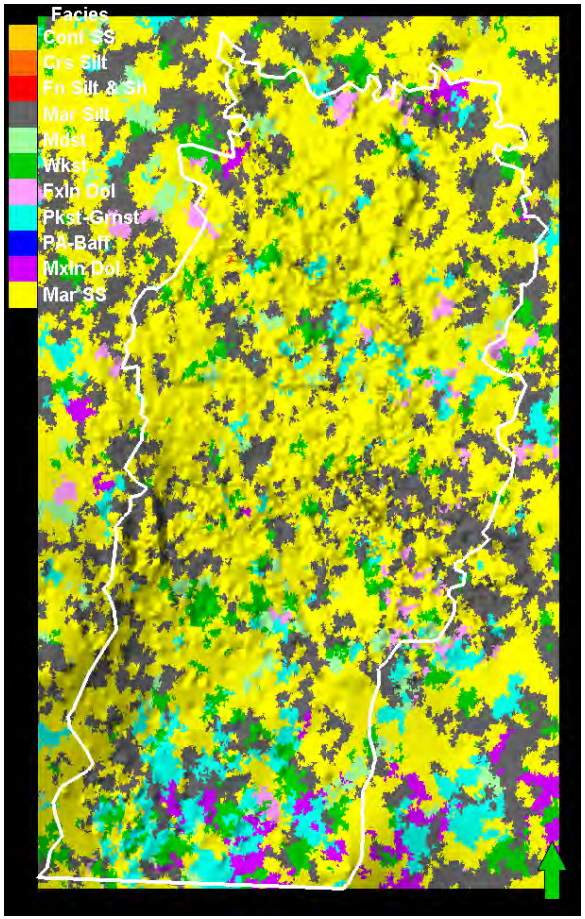




To save without running hit in the modeling box and then apply in the workflows and save button in Petrel to save.
<u>Do Not Hit Close without first saving.</u>

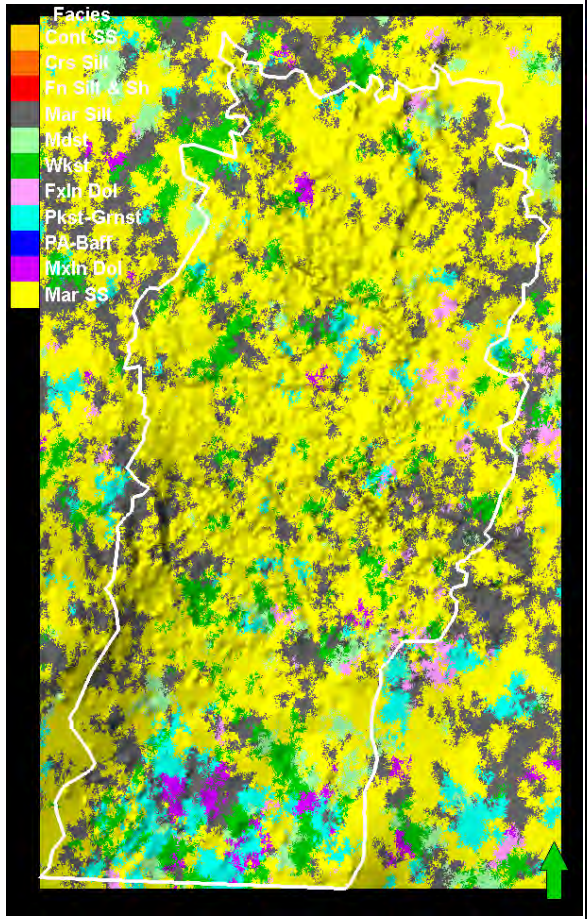
Herington

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



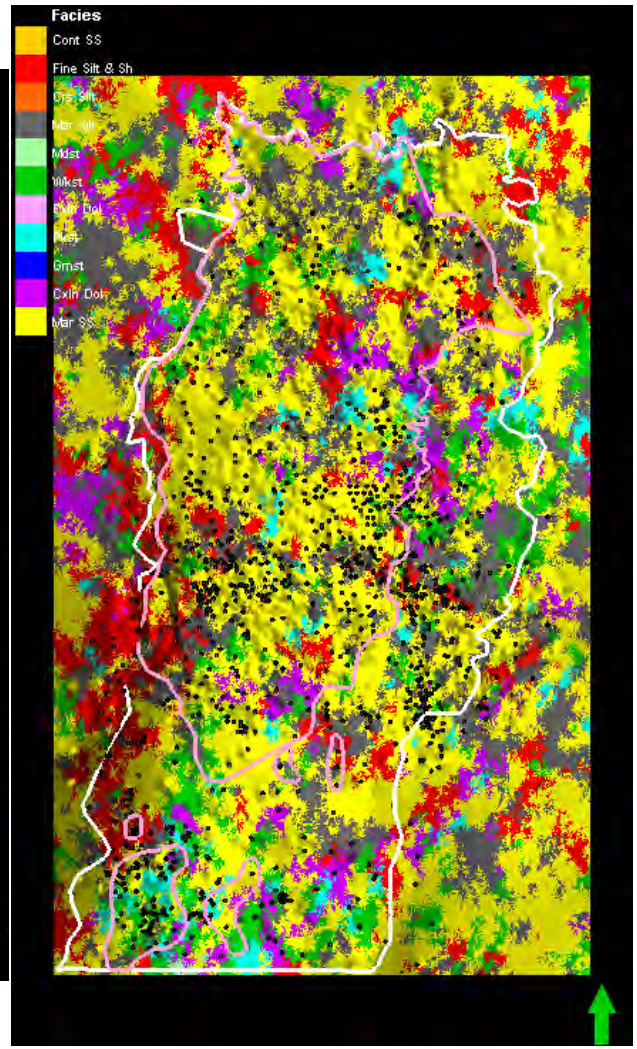
Herington k=2
(2nd layer down-of 9)

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



Herington k=2
(2nd layer down-of 9)

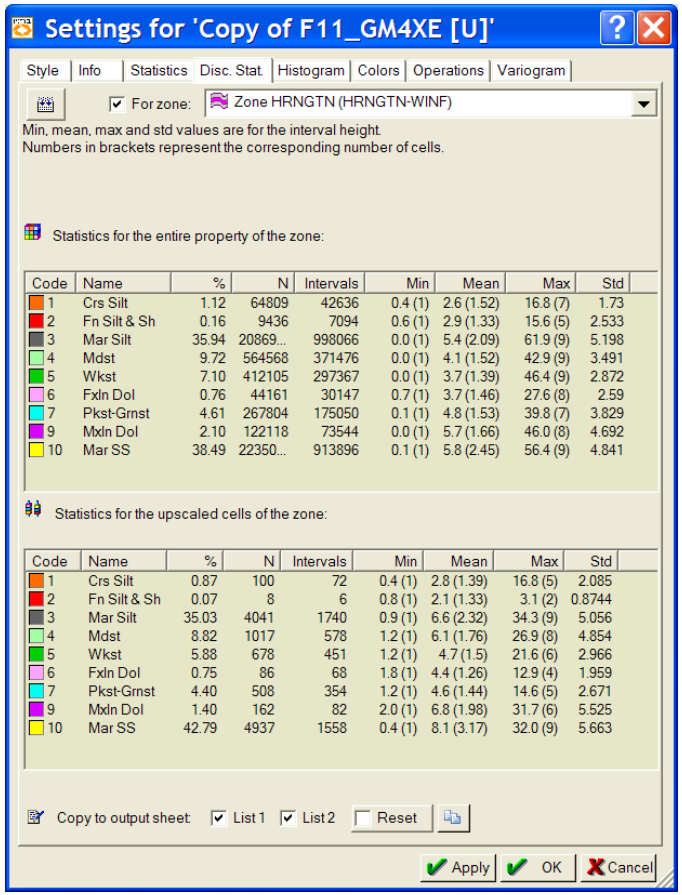
GM3GM3-Variograms
(30/25-11, h=7)

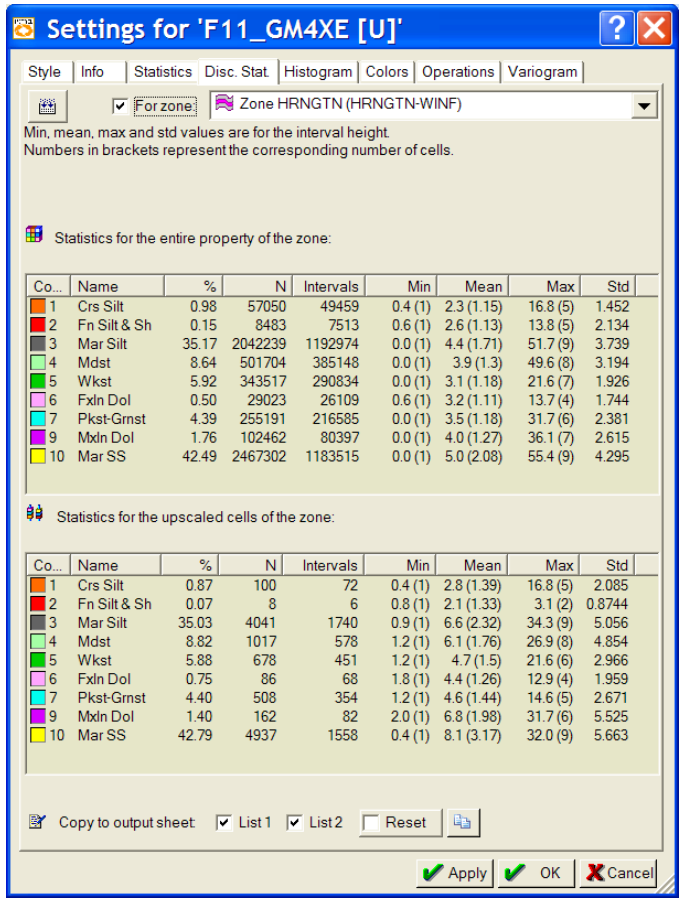


Herington k=2
(2nd layer down-of 9)

Cont silt is now marine silt (more appropriate)

Herington Stats



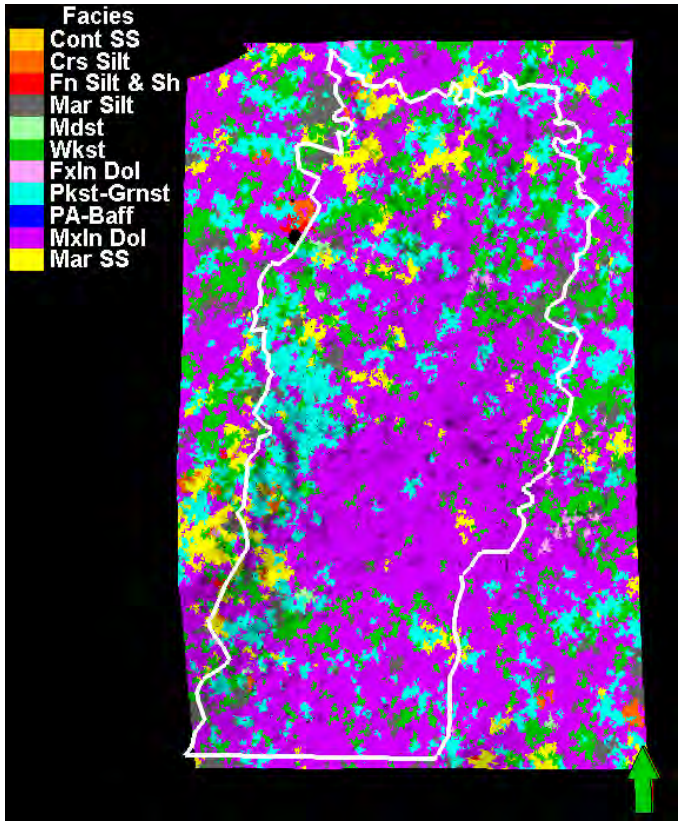


Geomod3 Model facies stats
Zone HRNGTN resulting facies fractions:

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 %

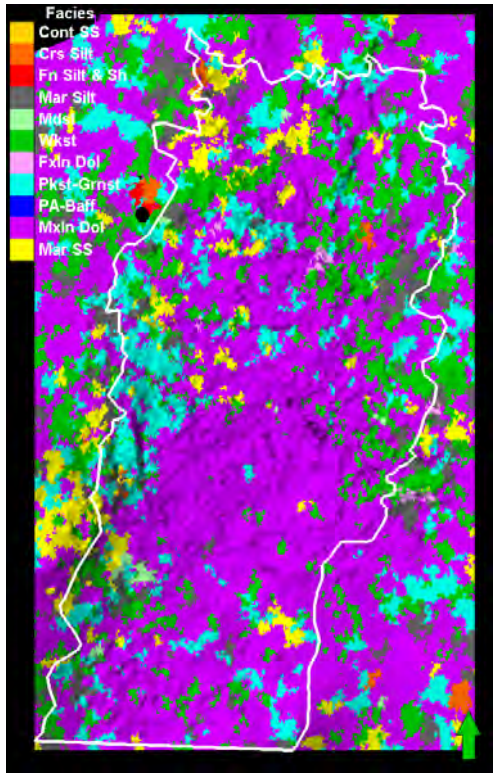
Krider with varying parameters

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



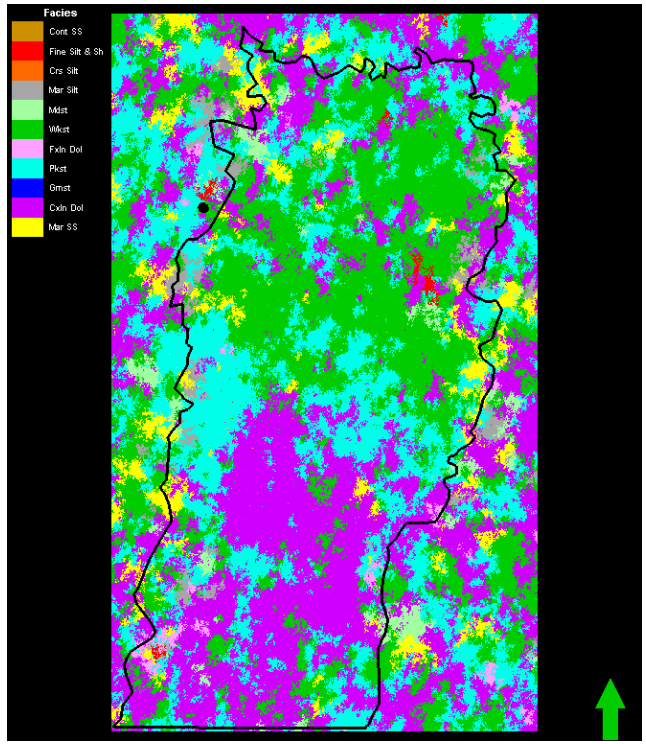
Krider k=14
(5th layer down-of 12)

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



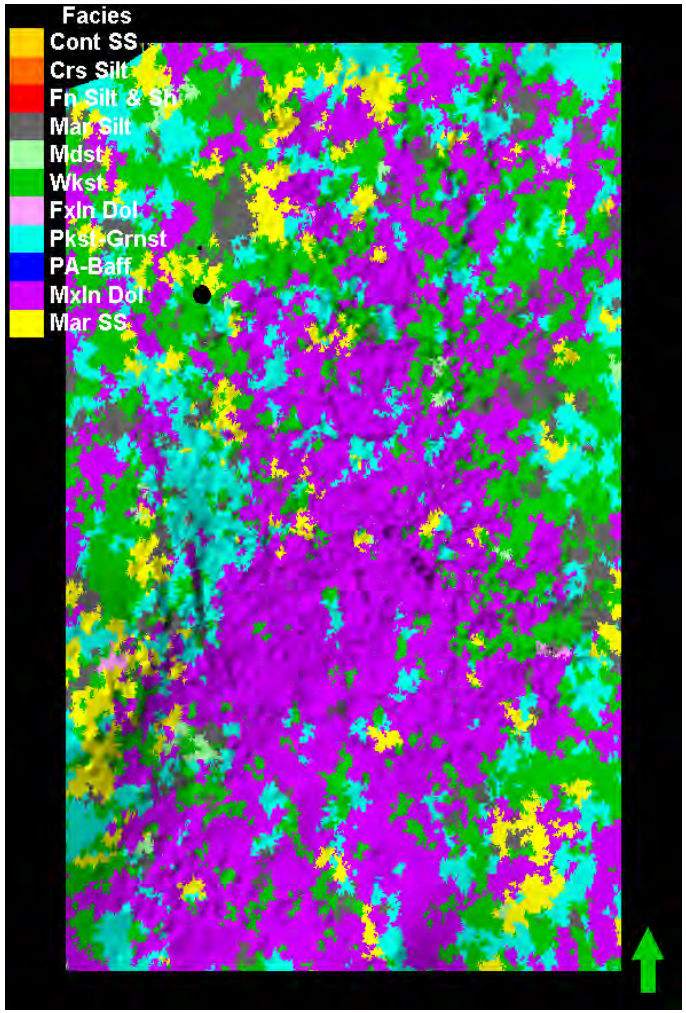
Krider k=14
(5th layer down-of 12)

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



Krider k=14
(5th 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

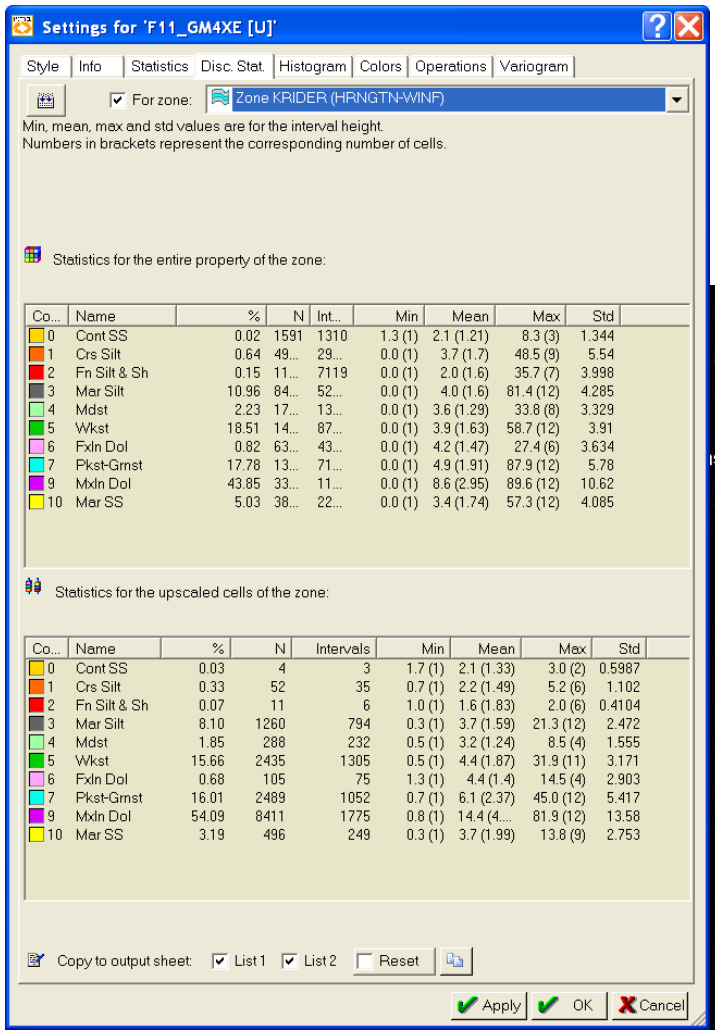
Copy to output sheet: List 1 List 2 Reset

Apply OK Cancel

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

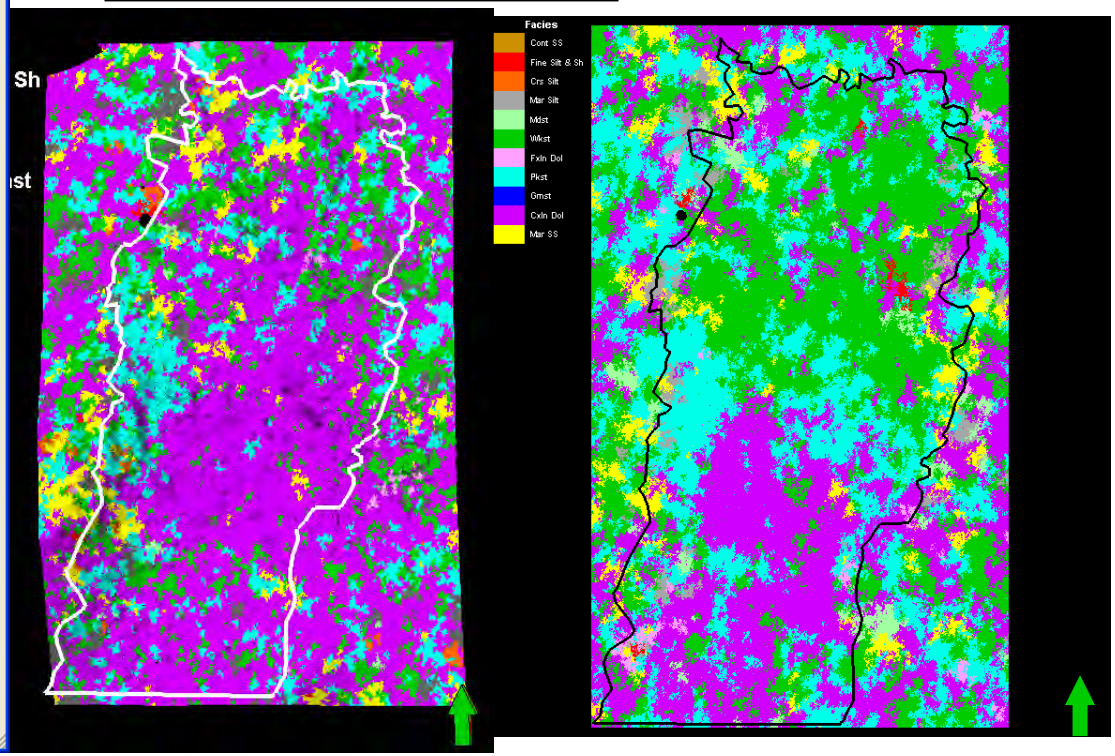
Krider

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



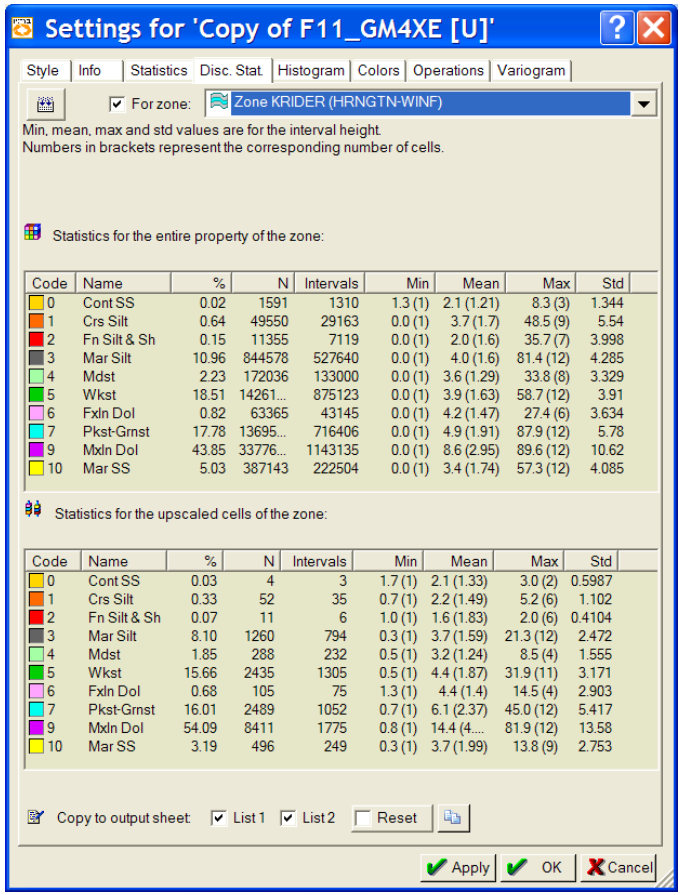
Geomod3
Zone KRIDER resulting facies fractions:

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 %

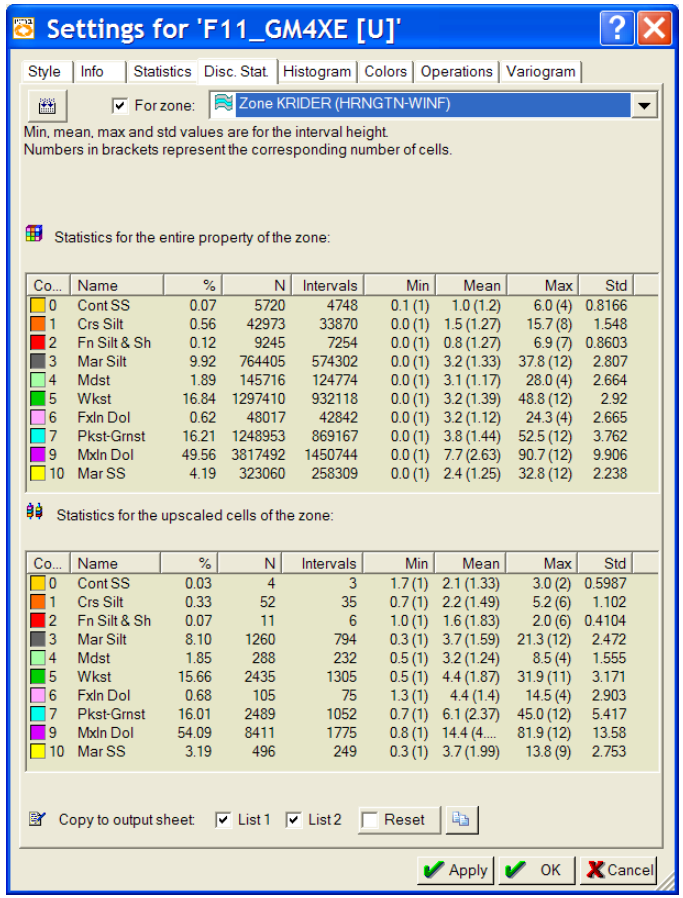


Krider Stats

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



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

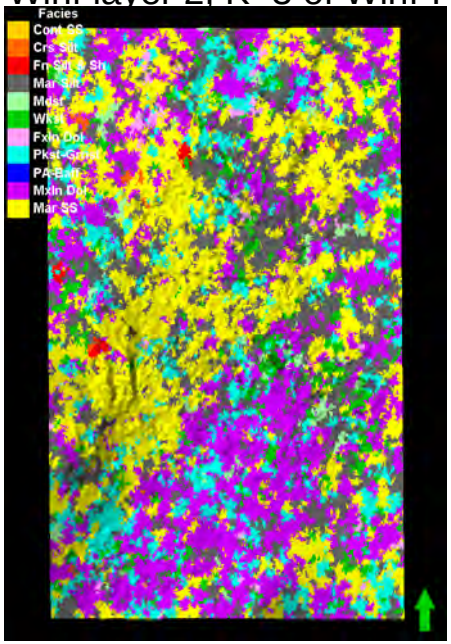


Geomod3 Model facies stats
Zone KRIDER resulting facies fractions:

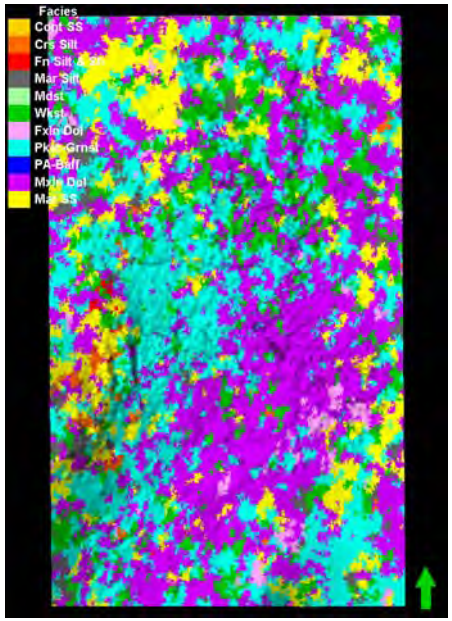
Cont SS: 0.00 %
Fine Silt & Sh: 0.00 %
Crs Silt: 0.00 %
Mar Silt: 1.19 %
Mdst: 8.61 %
Wkst: 27.96 %
Fxln Dol: 0.40 %
Pkst: 29.33 %
Grnst: 0.00 %
Cxln Dol: 27.31 %
Mar SS: 5.19 %

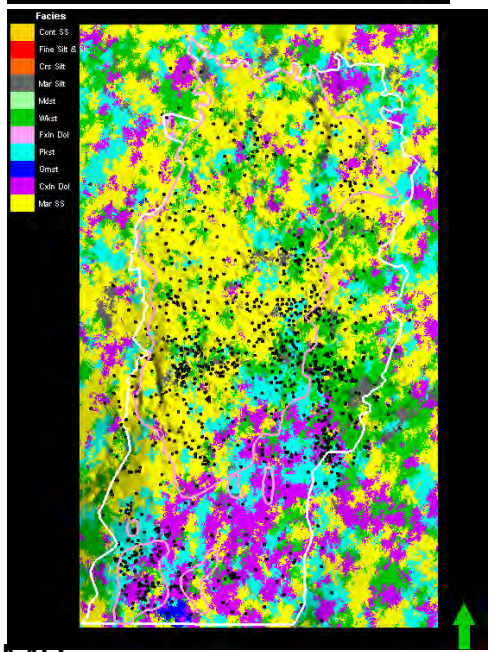
GM4 Winfield GM4

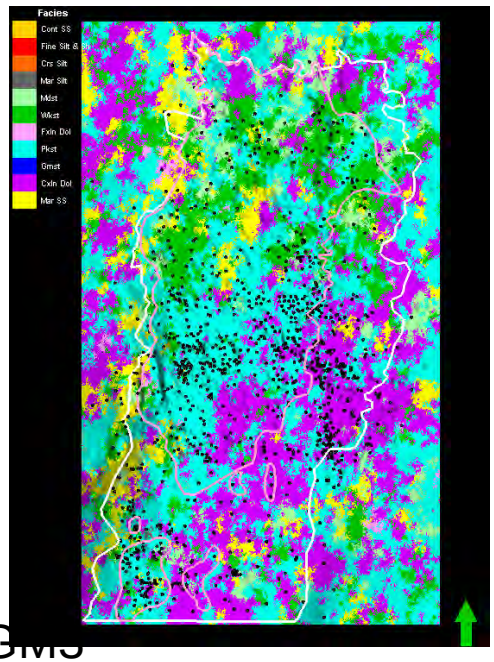
Winf layer 2, K=3 of Winf-FtRly



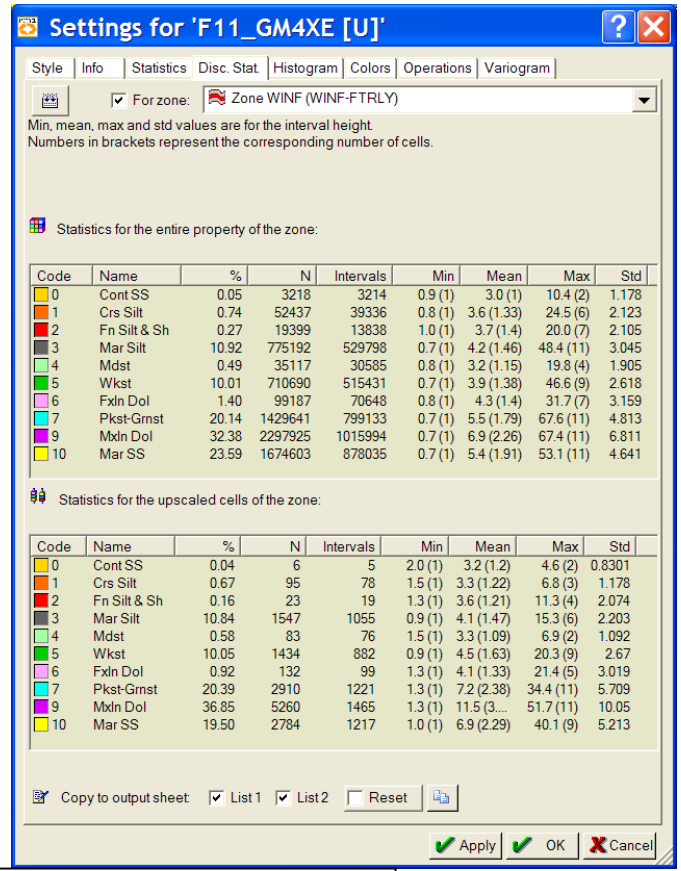
Winf layer 8, K=9 of Winf-FtRly







GM3 GM3

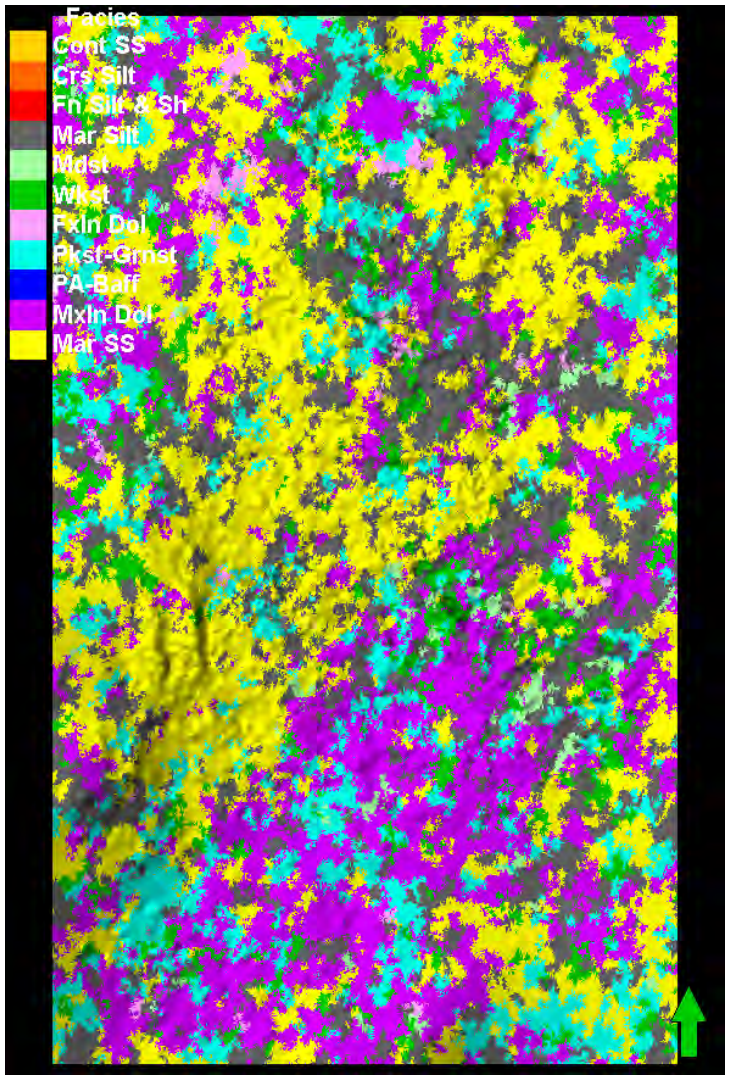


Geomod3 Model facies stats

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 %
Grnst: 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:

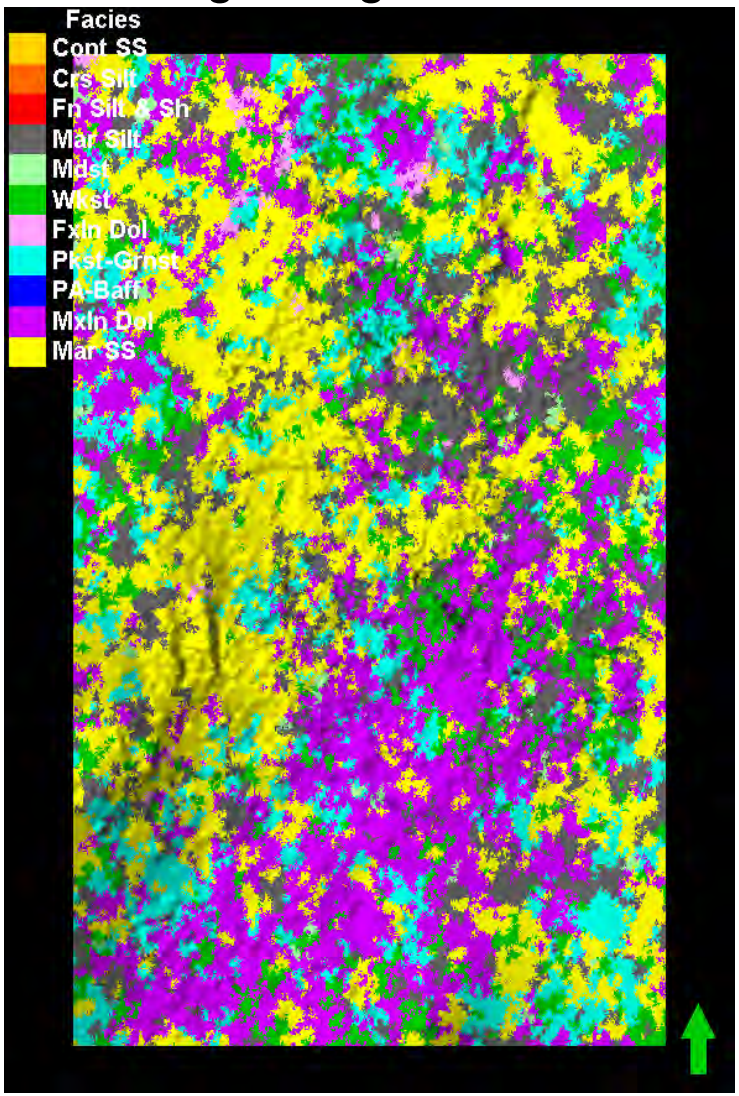
Code	Name	%	N	Intervals	Min	Mean	Max	Std
0	Cont SS	0.04	6	5	2.0 (1)	3.2 (1.2)	4.6 (2)	0.8301
1	Crs Silt	0.67	95	78	1.5 (1)	3.3 (1.22)	6.8 (3)	1.178
2	Fn Silt & Sh	0.16	23	19	1.3 (1)	3.6 (1.21)	11.3 (4)	2.074
3	Mar Silt	10.84	1547	1055	0.9 (1)	4.1 (1.47)	15.3 (6)	2.203
4	Mdst	0.58	83	76	1.5 (1)	3.3 (1.09)	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

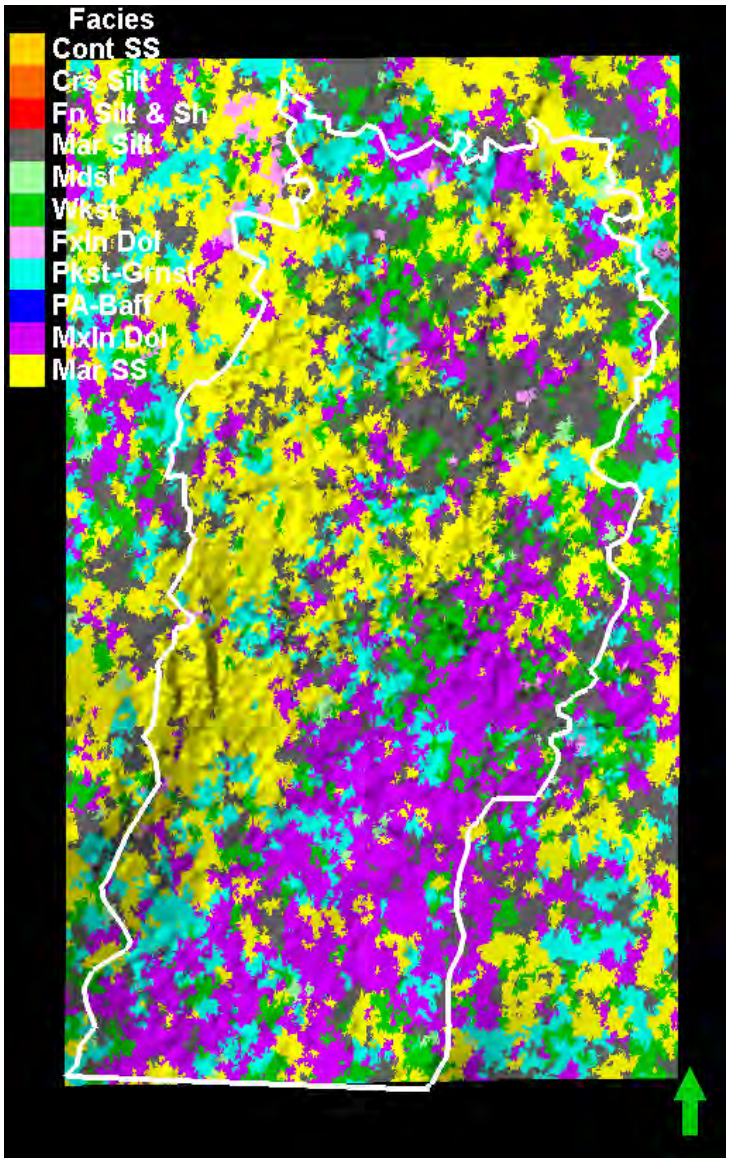
Statistics for the upscaled cells of the zone:

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

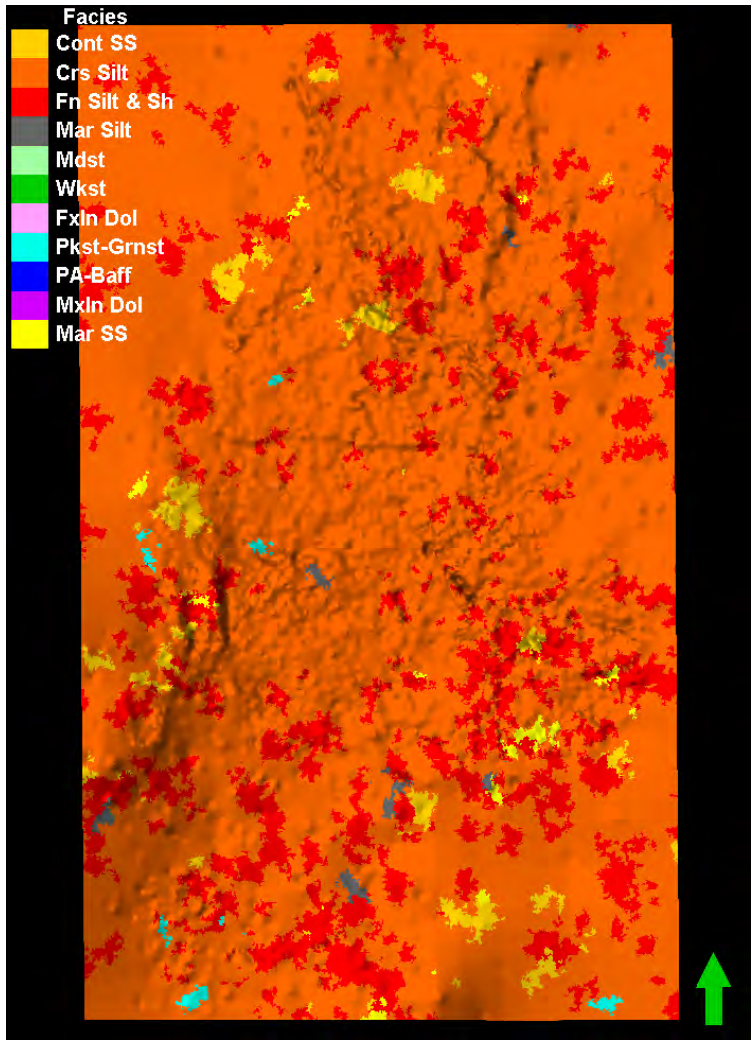
Copy to output sheet: List 1 List 2 Reset

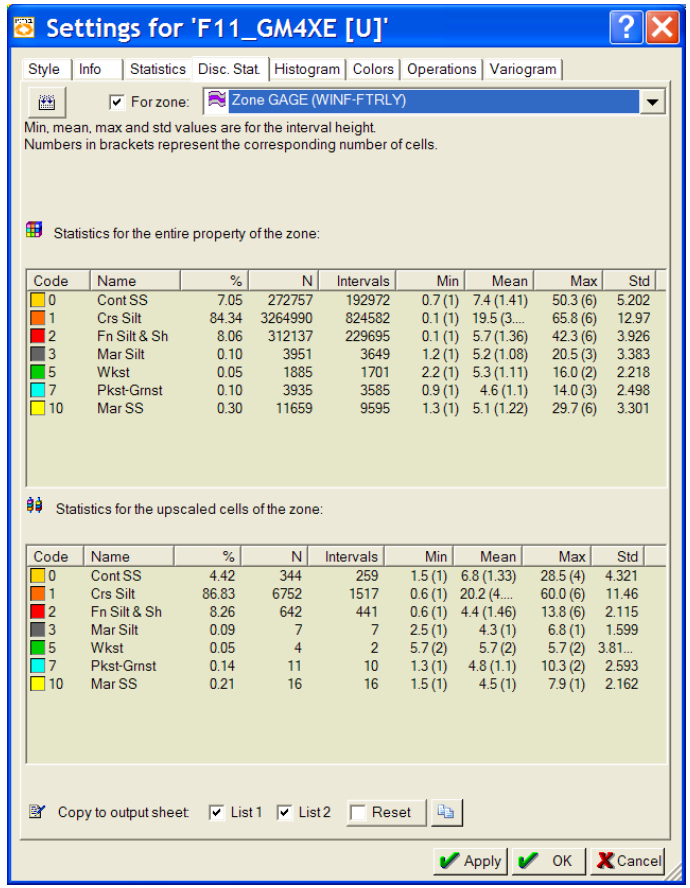
Apply OK Cancel

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

Gage

GM4





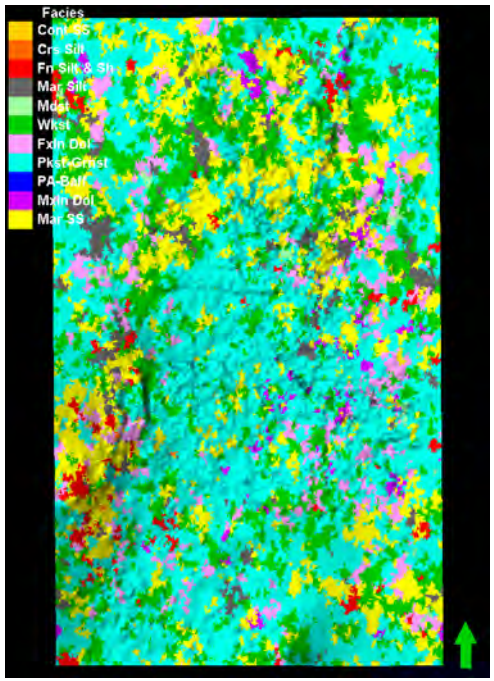
Geomod3 Model facies stats

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 %

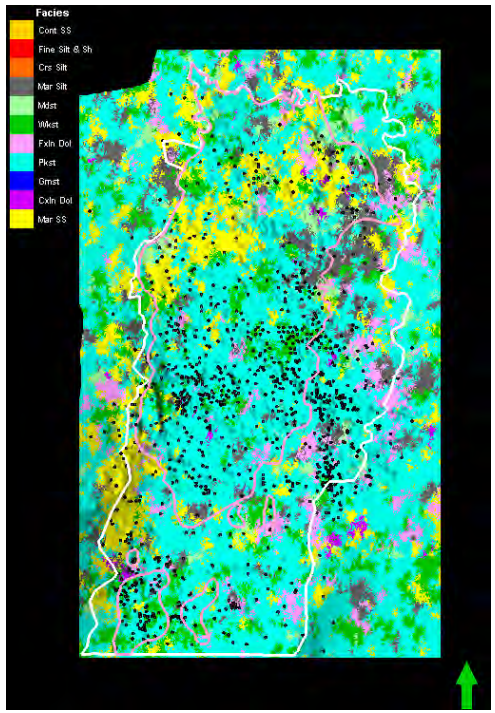
Towanda

GM4

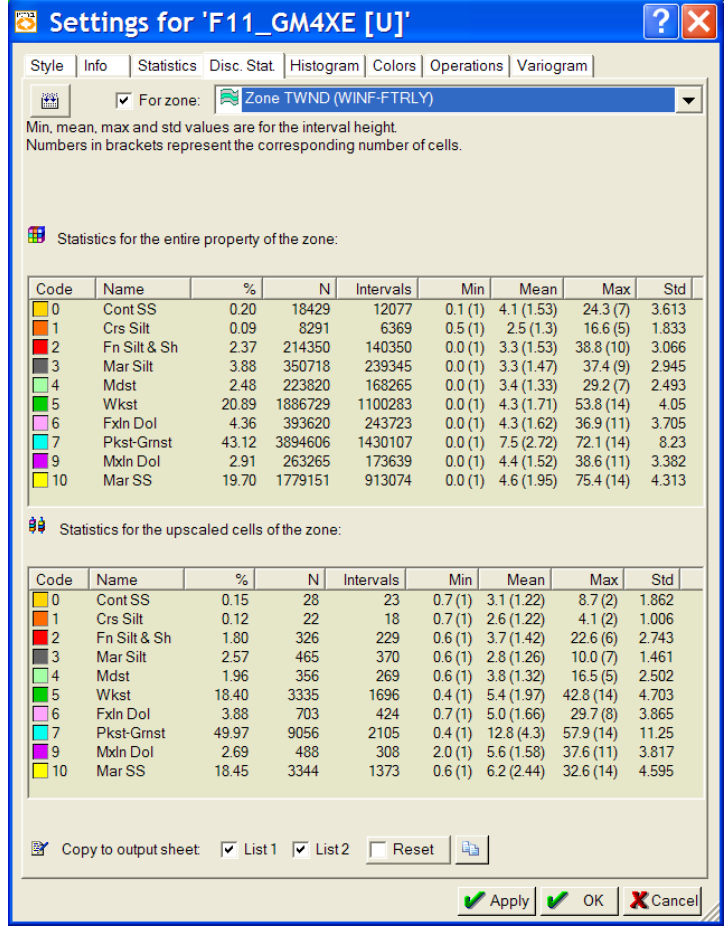


Twnd 6, K=24 of Winf-FtRly

GM3



Twnd 6, K=24 of Winf-FtRly



Geomod3 Model facies stats

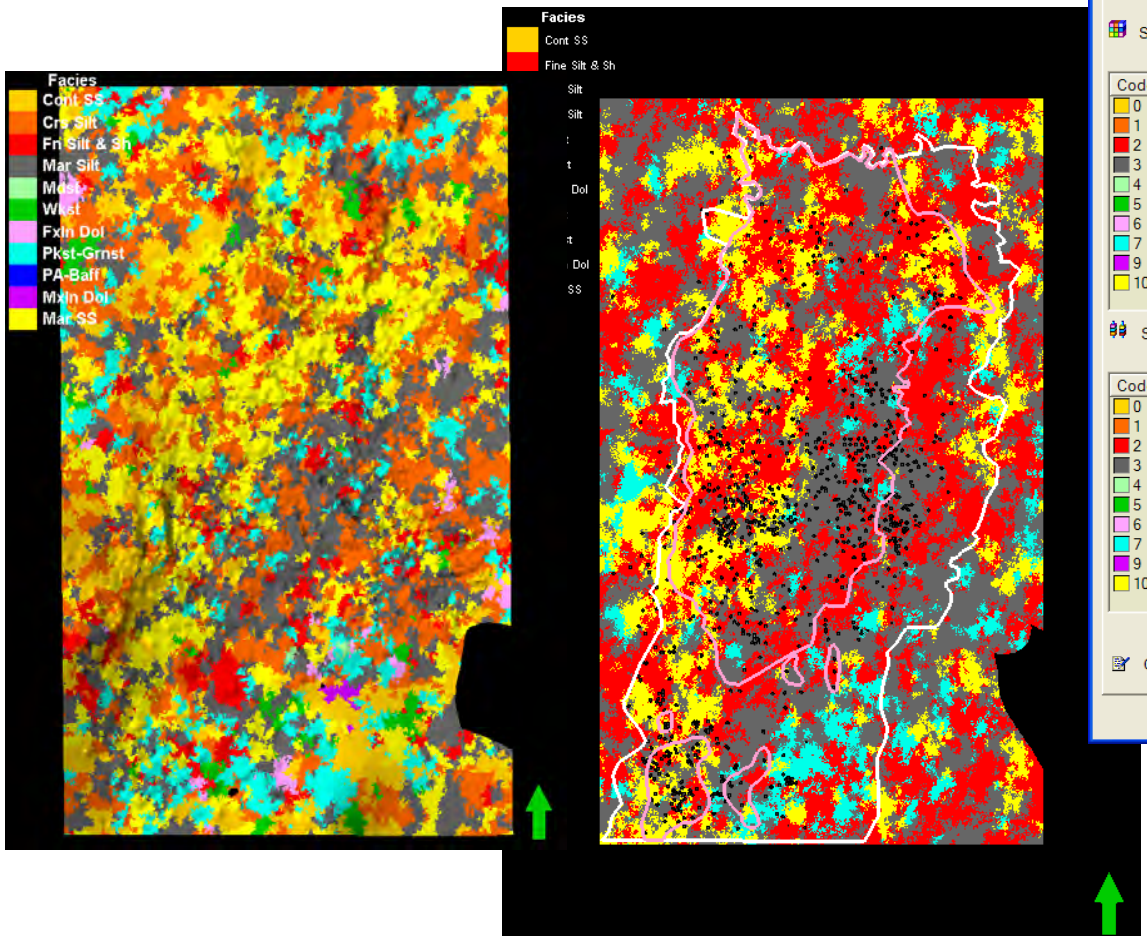
Zone TWND resulting facies fractions:

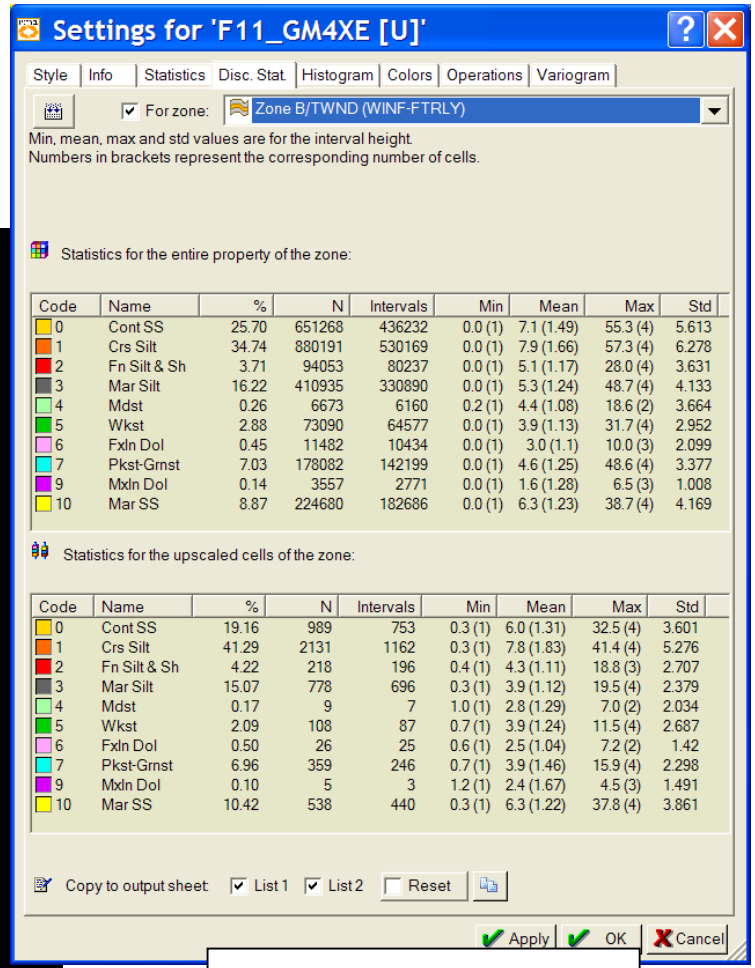
Cont SS: 0.00 %
Fine Silt & Sh: 0.00 %
Crs Silt: 0.00 %
Mar Silt: 10.98 %
Mdst: 8.56 %
Wkst: 12.14 %
Fxln Dol: 4.35 %
Pkst: 46.91 %
Grnst: 0.00 %
Cxln Dol: 0.88 %
Mar SS: 16.18 %

B/Twnd

GM4

GM3





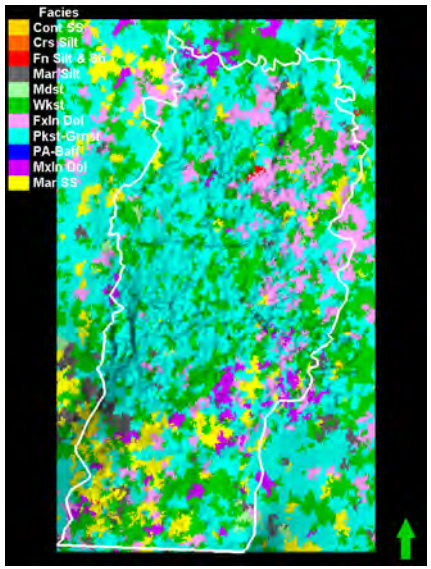
Geomod3 Model facies stats

Zone B/TWND resulting facies fractions:

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 %

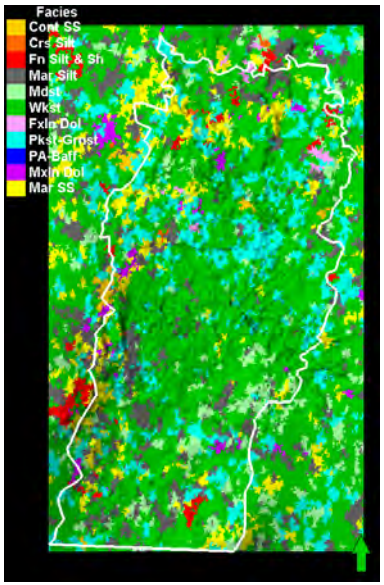
FtRiley

GM4



Ftrly 7, K=9 of FtRly-A1sh

GM4



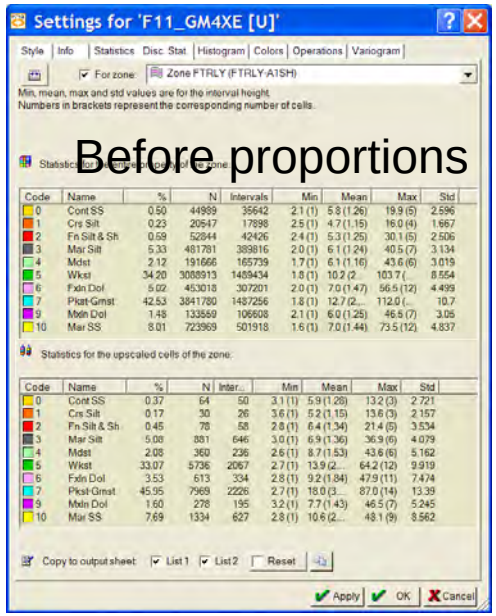
Ftrly 12, K=14 of FtRly-A1sh

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

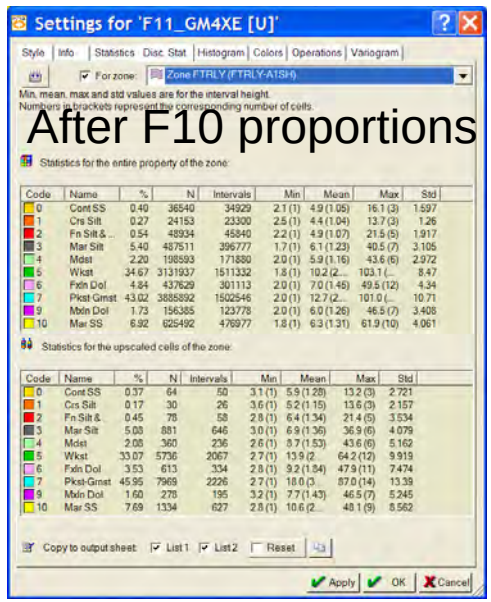
Geomod3 Model facies stats

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 %



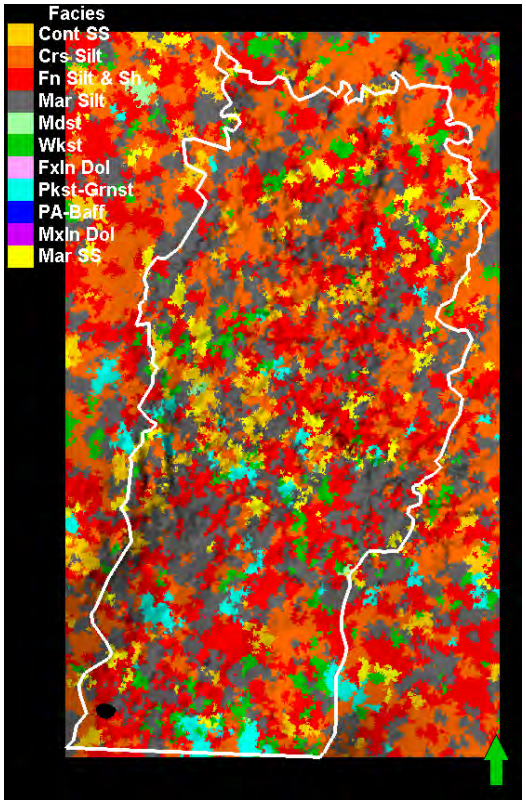
Before proportions



After F10 proportions

Matfield

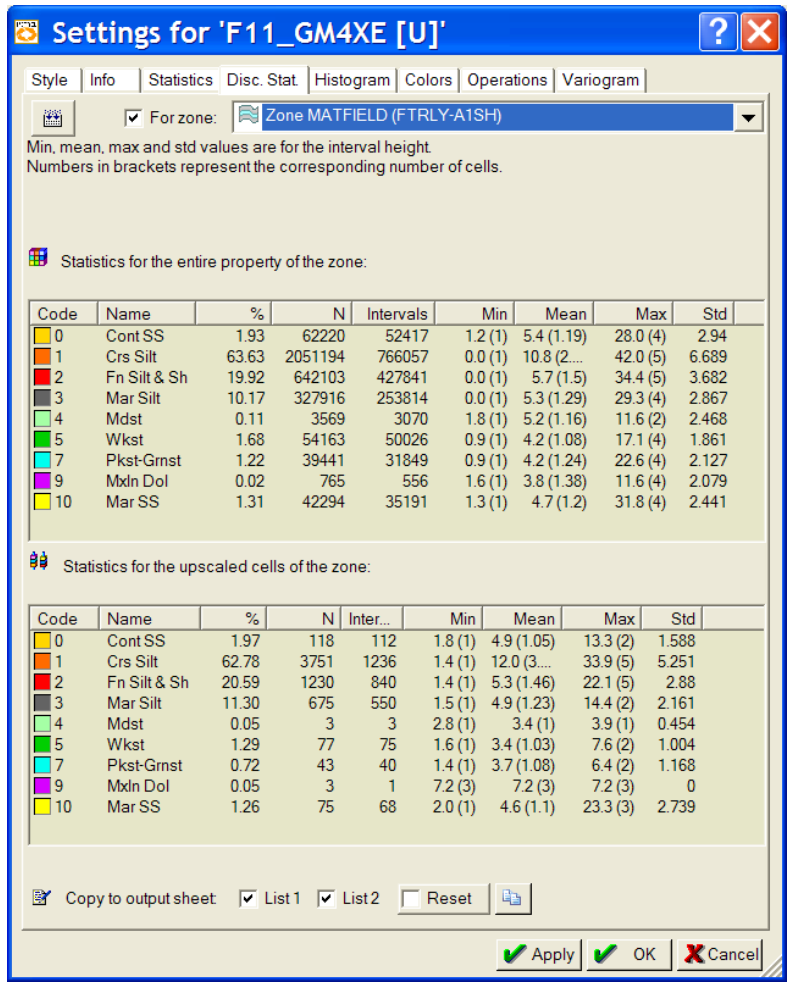
GM4



Geomod3 Model facies stats
Zone MATFIELD resulting facies fractions:

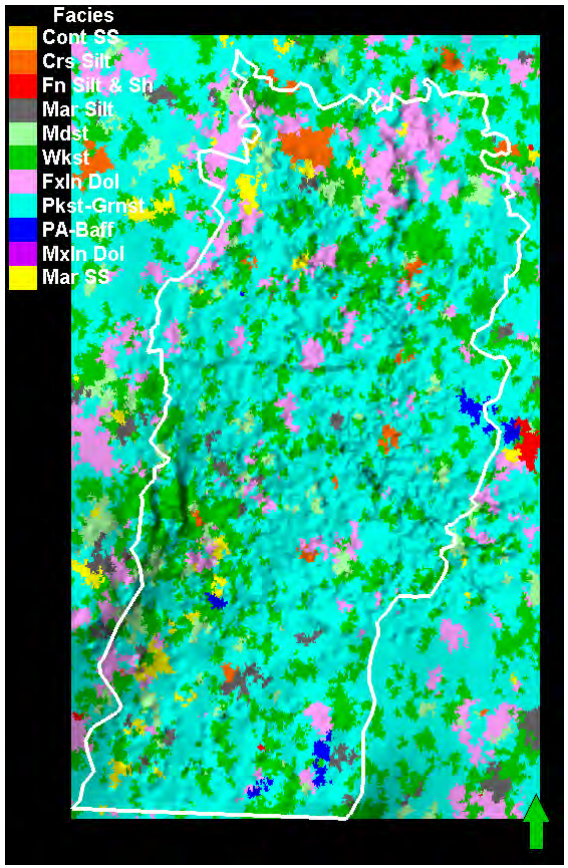
Cont SS: 0.00 %
Fine Silt & Sh: 84.95 %
Crs Silt: 1.90 %
Mar Silt: 12.12 %
Mdst: 0.00 %
Wkst: 0.00 %
Fxln Dol: 0.00 %
Pkst: 0.00 %
Grnst: 0.00 %
Cxln Dol: 0.00 %
Mar SS: 1.04 %

Top Layer looks same

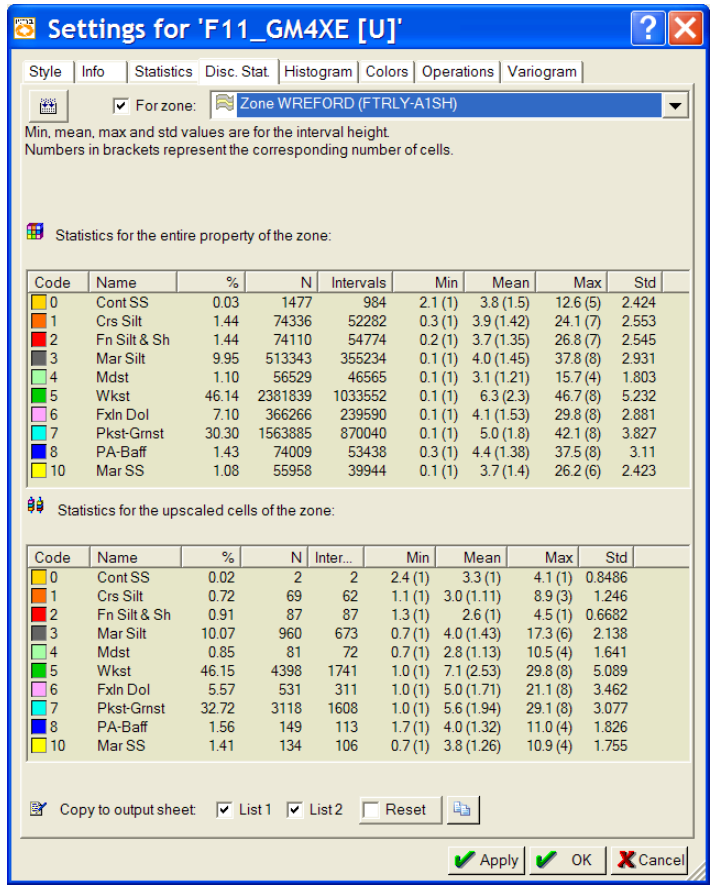


Wreford

GM4



Layer looks similar.
May want to eliminate F1-2



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:

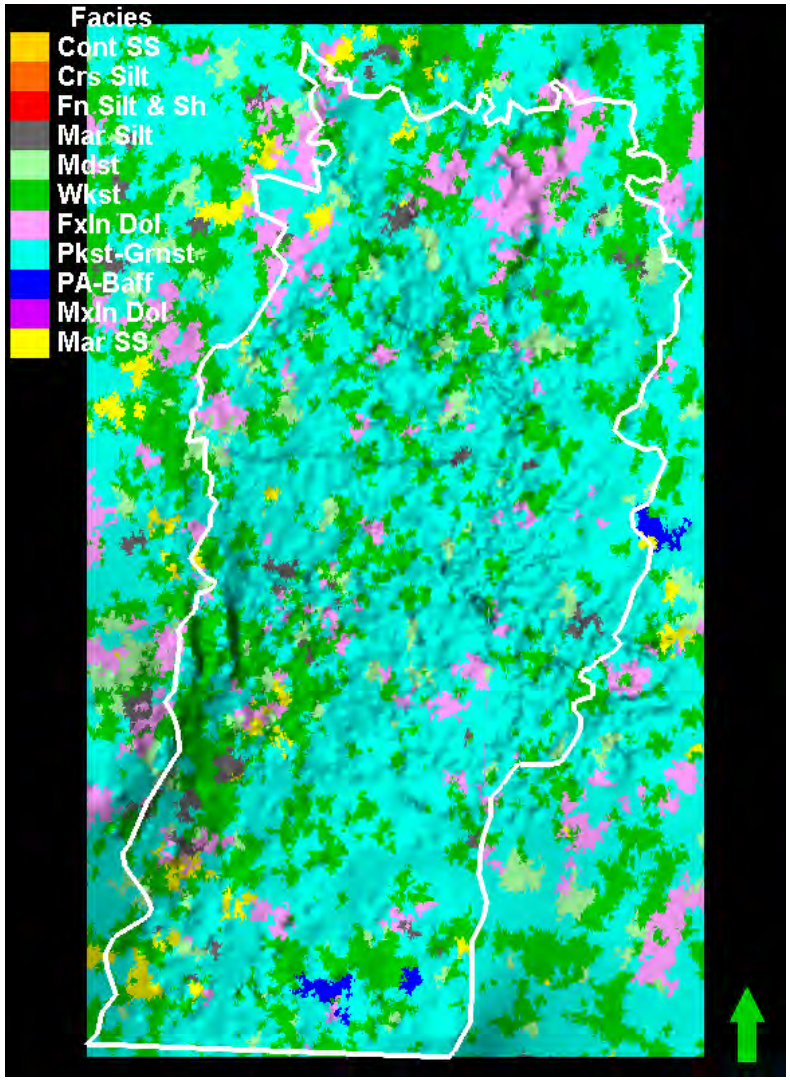
Code	Name	%	N	Inter...	Min	Mean	Max	Std
0	Cont SS	0.02	2	2	2.4 (1)	3.3 (1)	4.1 (1)	0.8486
1	Crs Silt	0.72	69	62	1.1 (1)	3.0 (1.11)	8.9 (3)	1.246
2	Fn Silt & Sh	0.91	87	87	1.3 (1)	2.6 (1)	4.5 (1)	0.6682
3	Mar Silt	10.07	960	673	0.7 (1)	4.0 (1.43)	17.3 (6)	2.138
4	Mdst	0.85	81	72	0.7 (1)	2.8 (1.13)	10.5 (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 (8)	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

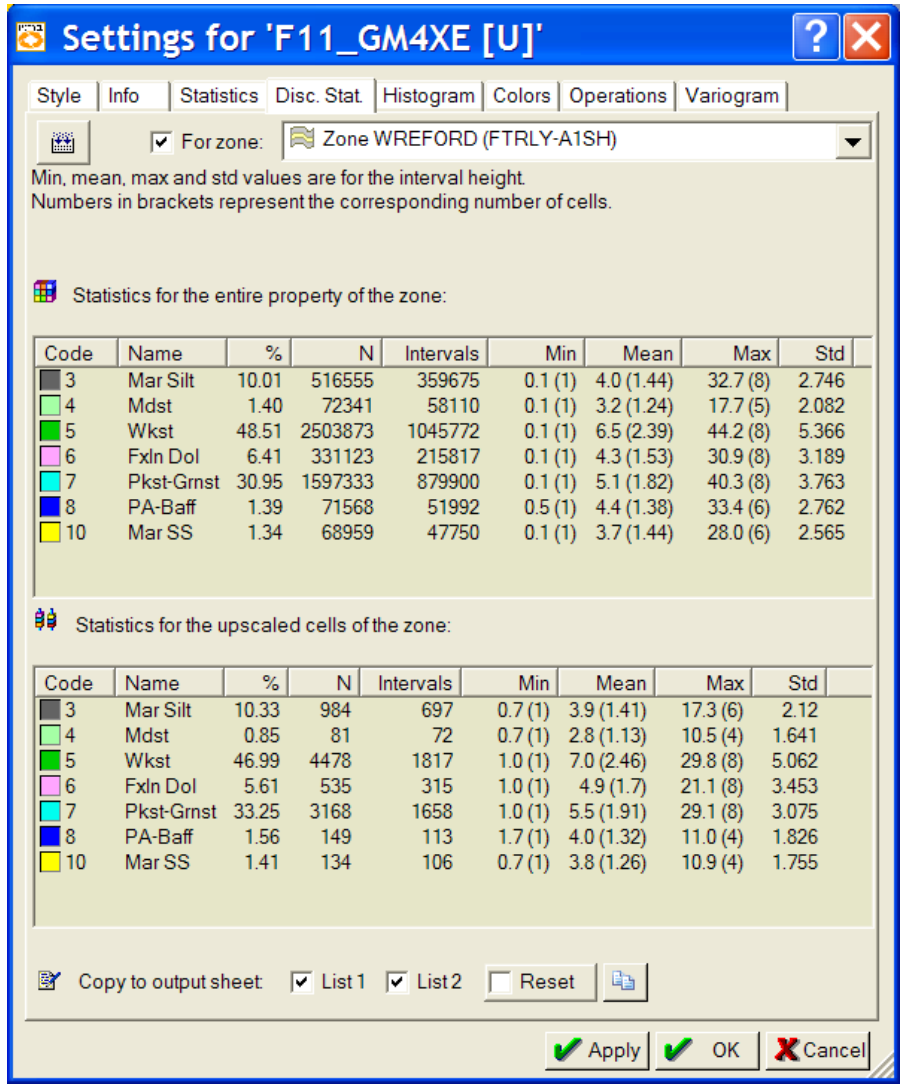
Geomod3 Model facies stats

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





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 %

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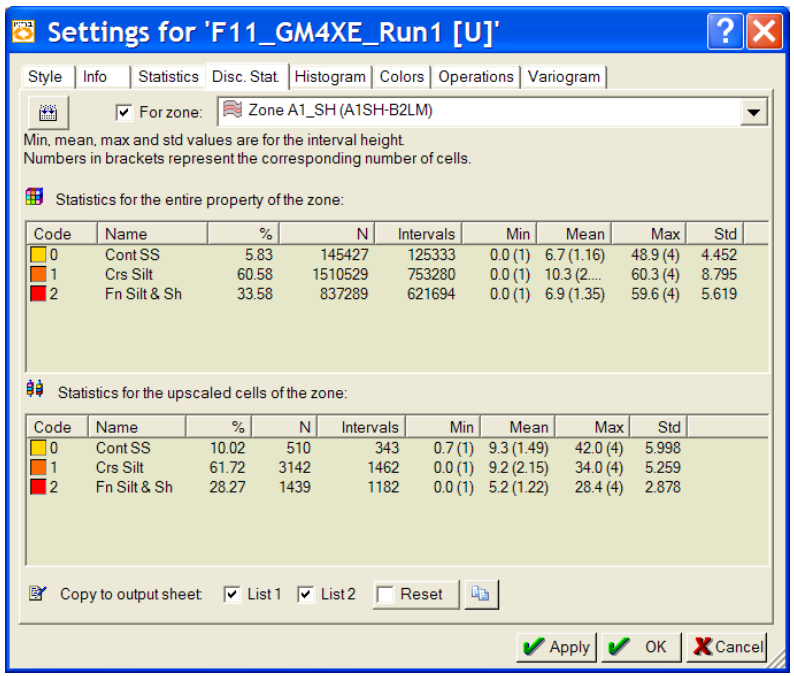
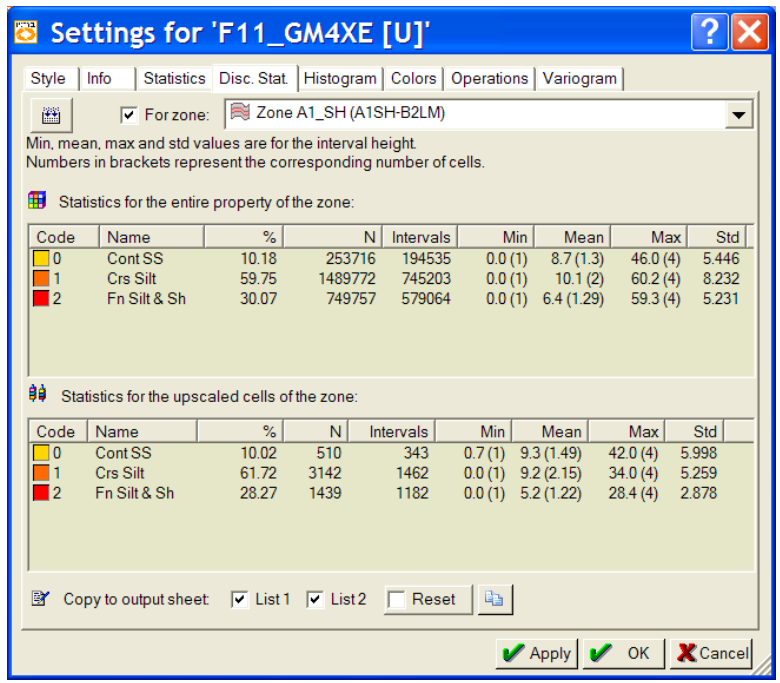
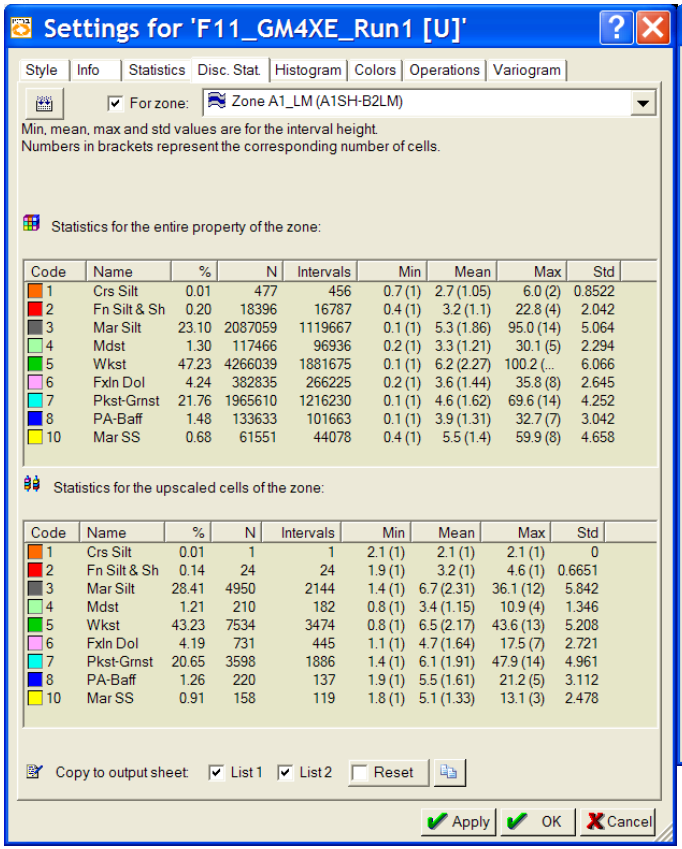
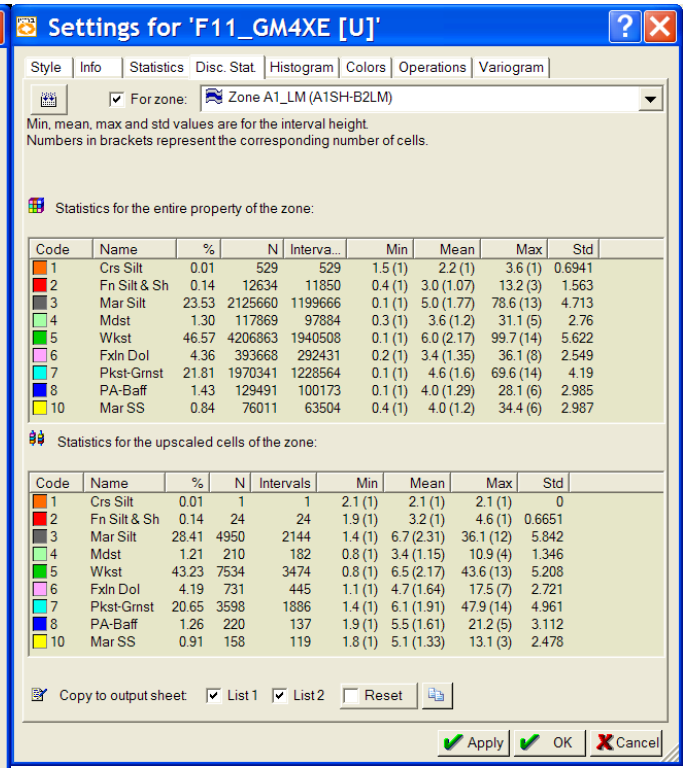




A1Lm

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





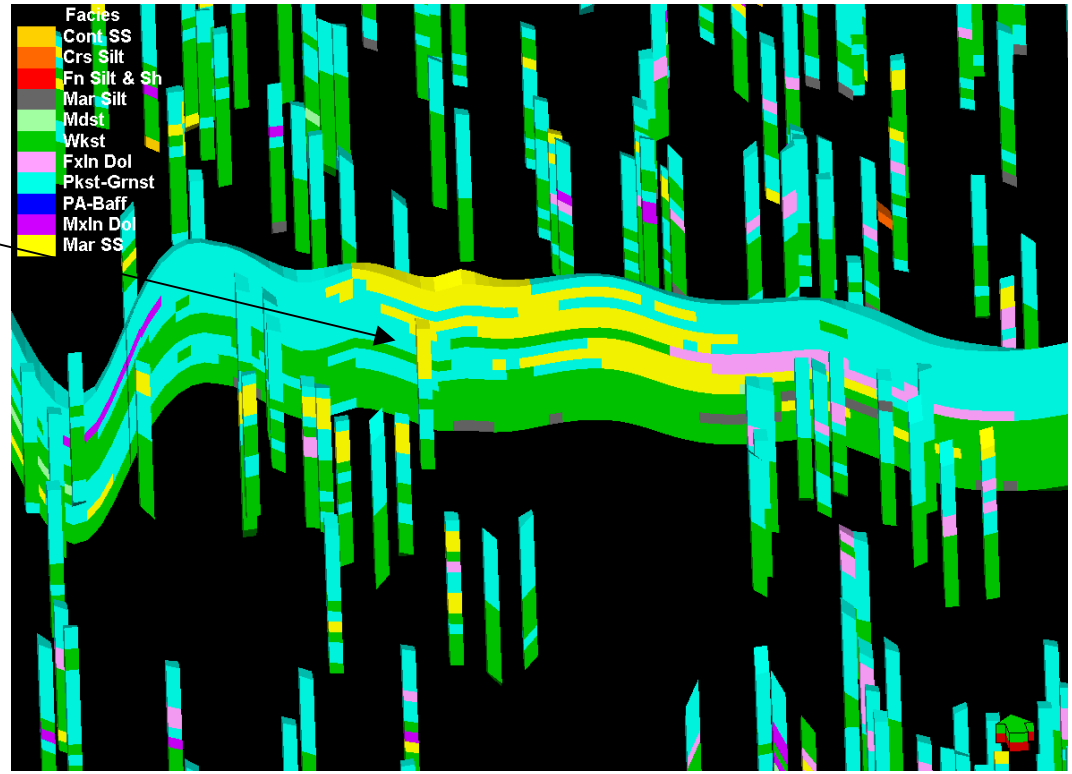
Geomod3 Model stats
Zone A1_LM resulting facies fractions:

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 %

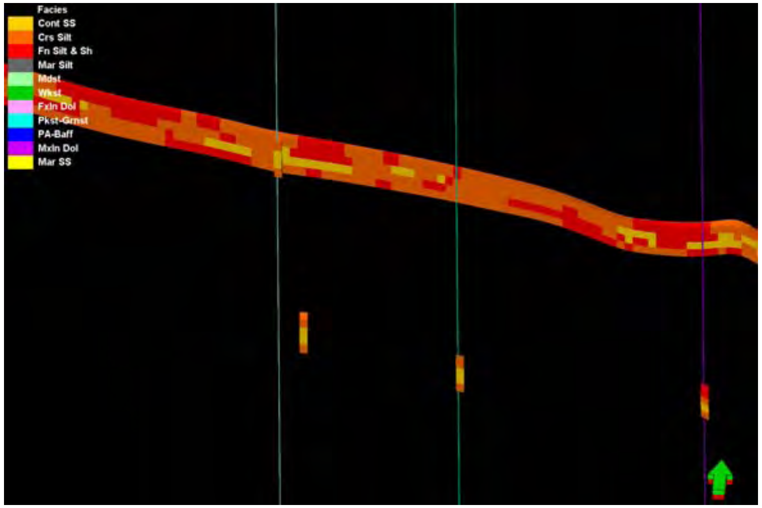
FtRiley QC

Sand has undue influence:

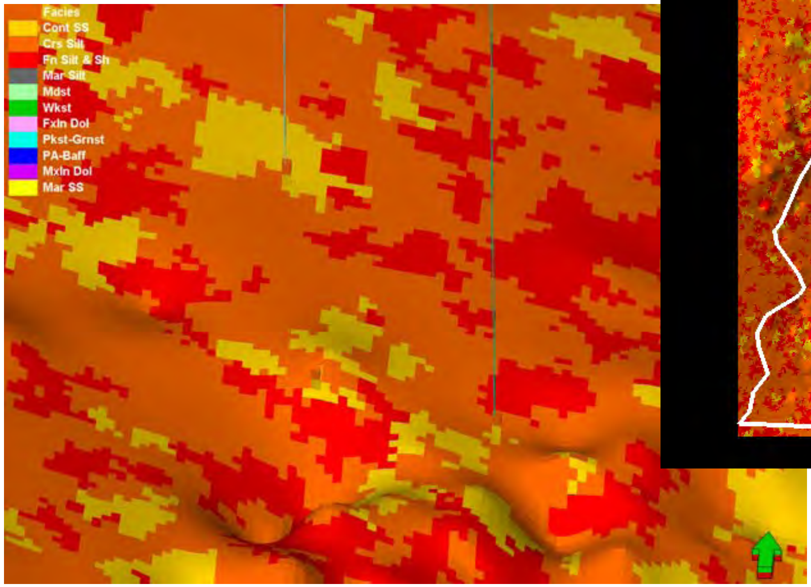
1. Consider reducing F10 in Ftrly
2. Too much being placed in areas w/o well control
3. V Rge too high. SS distributed way too low in section around this one well.

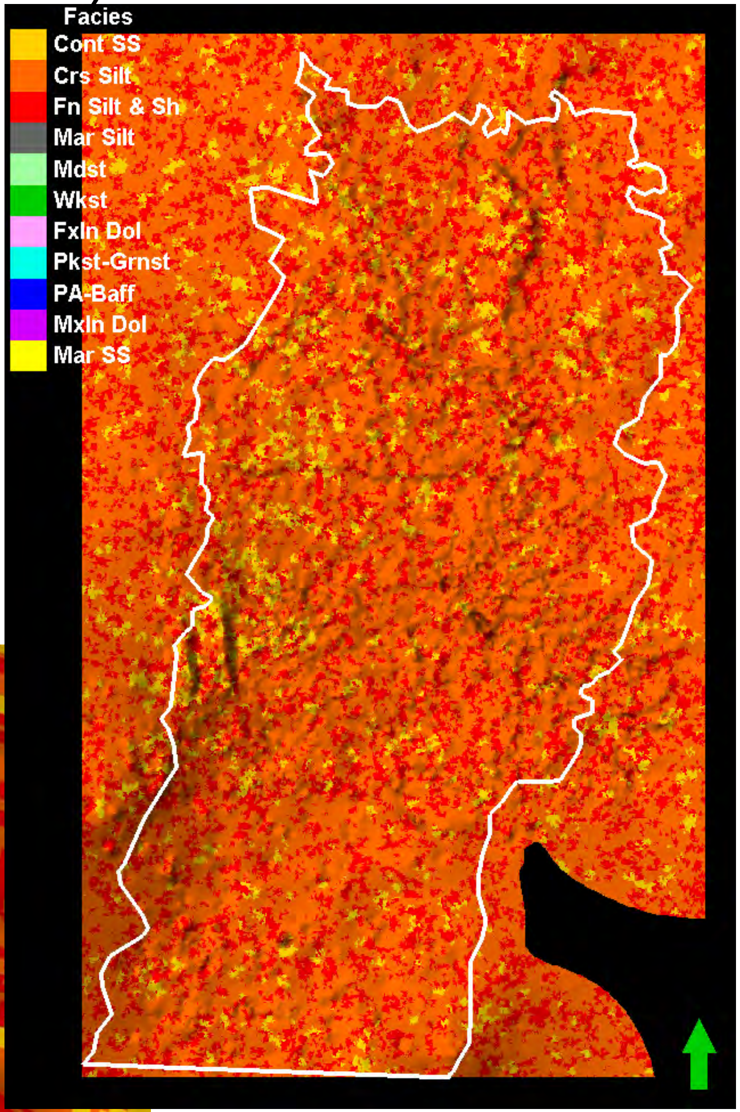


A1Sh with short Hz ranges (F0-10, F1-5, F2-5)



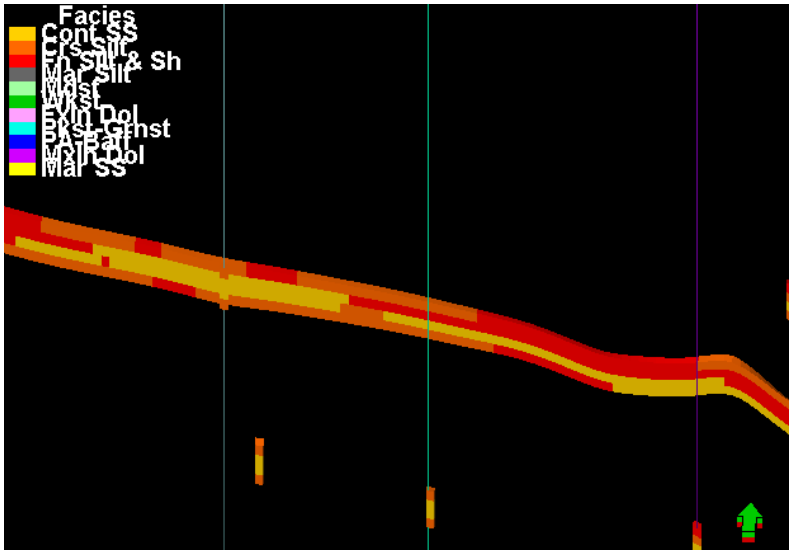
Sand is not continuous but should be due to short ranges. West well is Cross H Cattle.

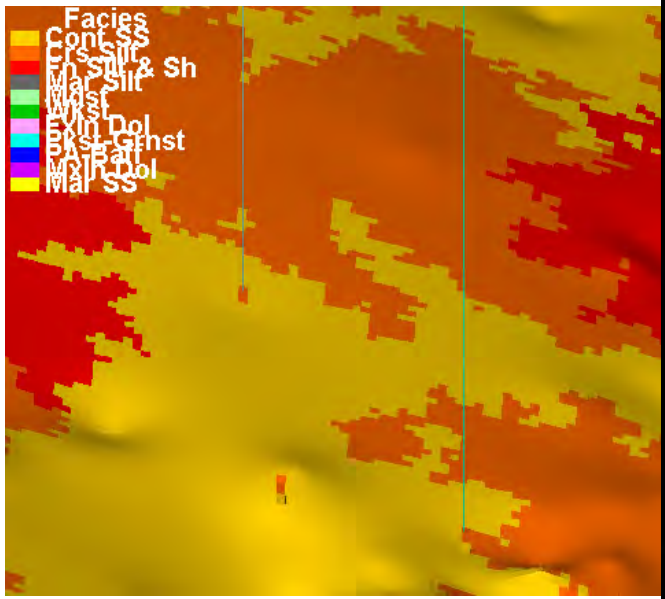




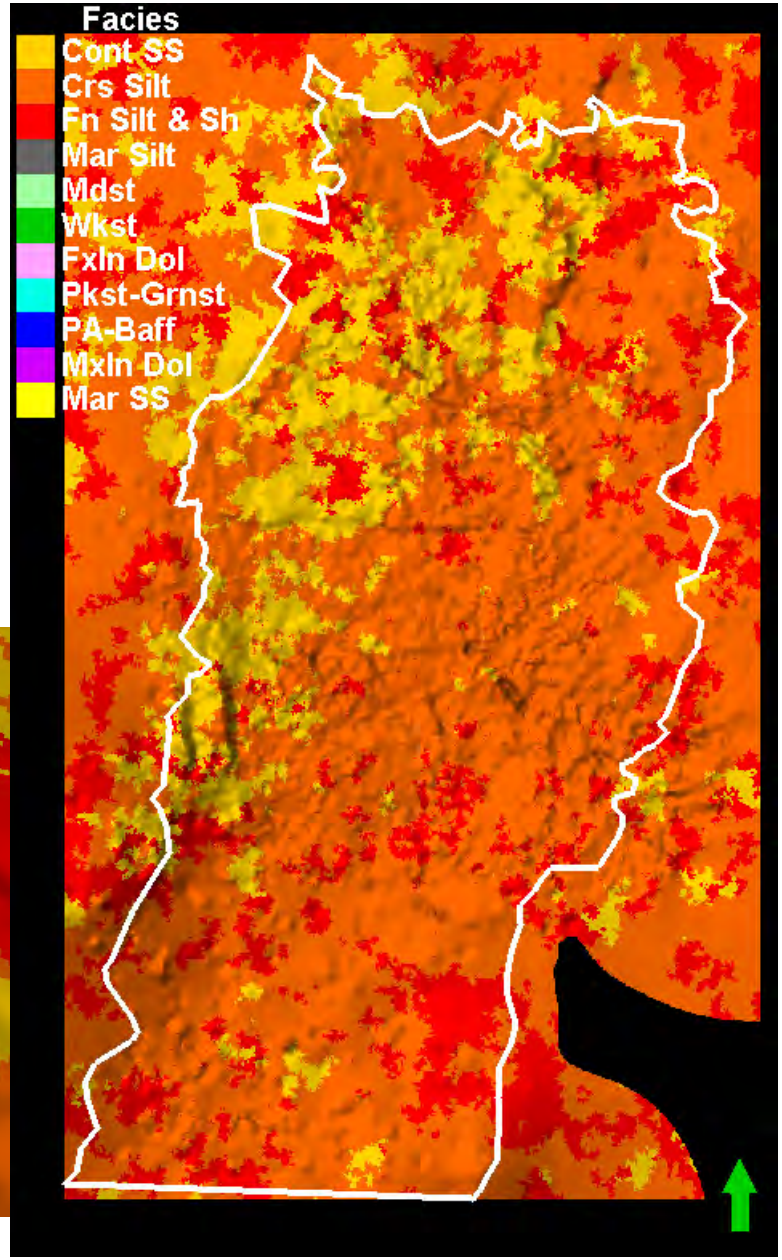
Layer 3 of 4

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

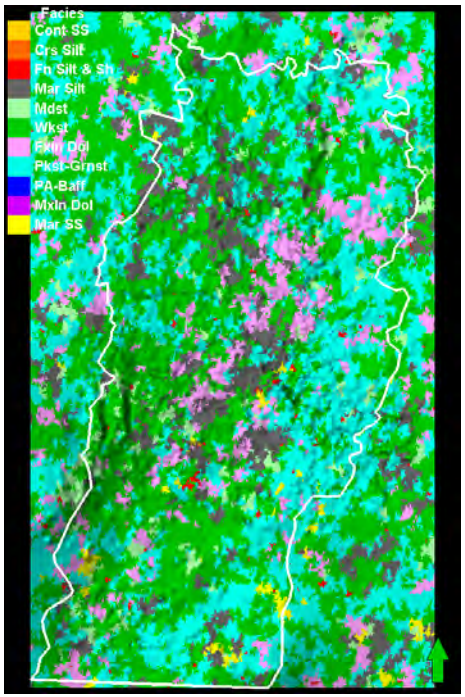




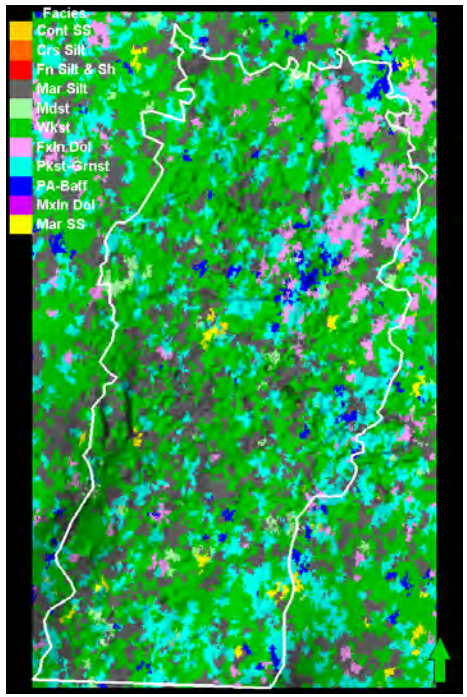
Longer Hz ranges and shorter V is much better



A1LM



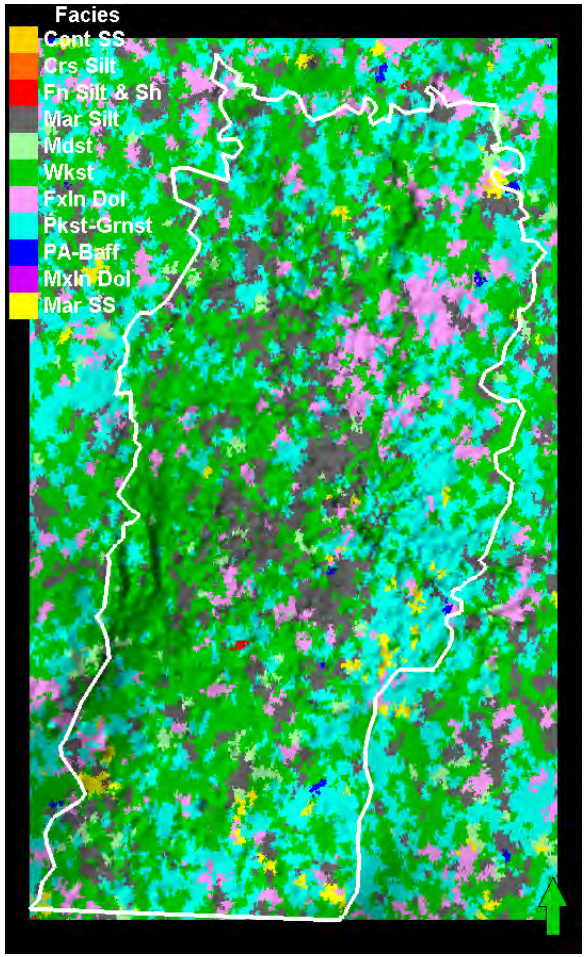
Layer 2 looks about same



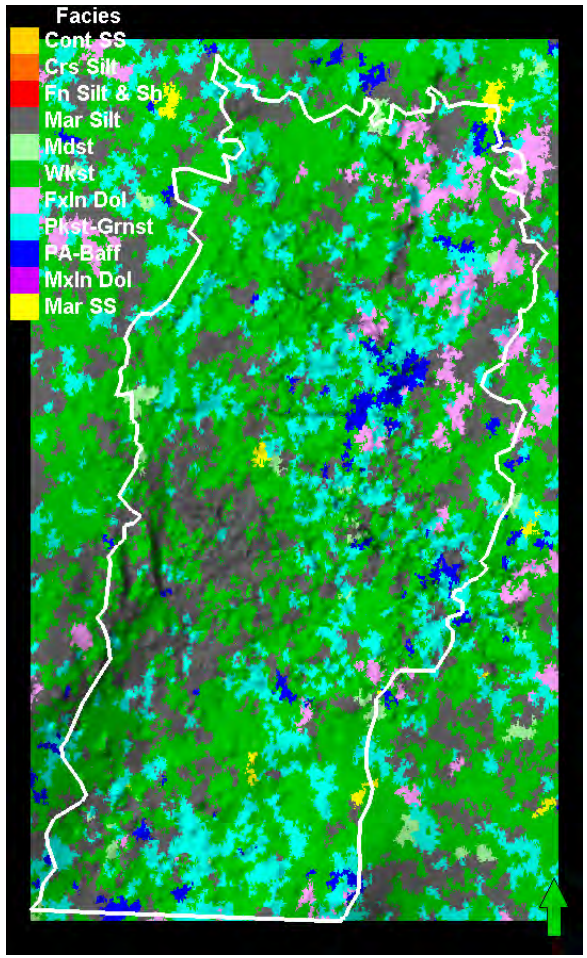
As does layer 5

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

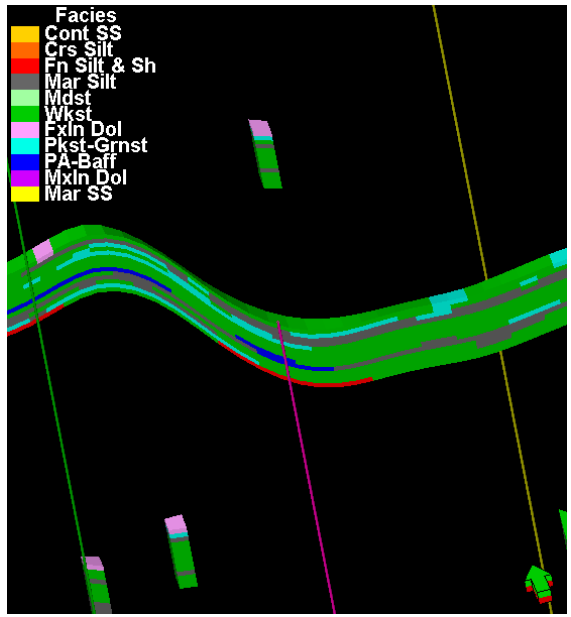
Views from 2nd run



Layer 2 looks about same

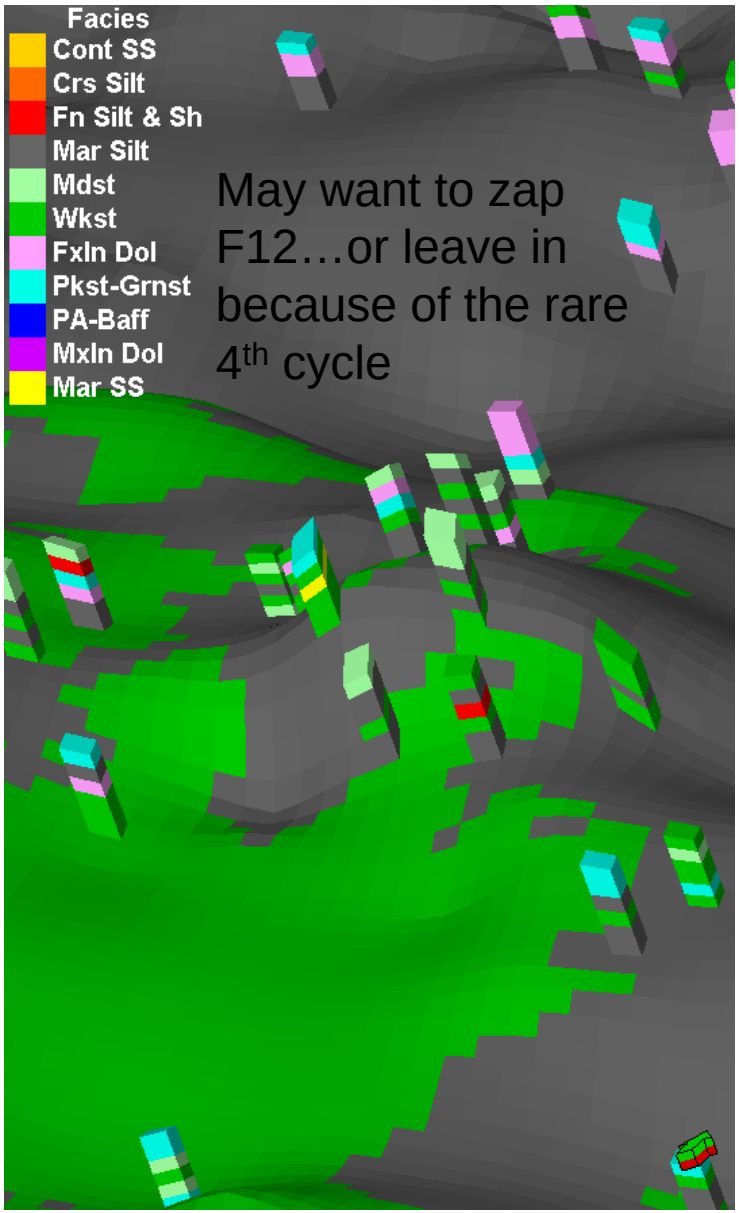


As does layer 5

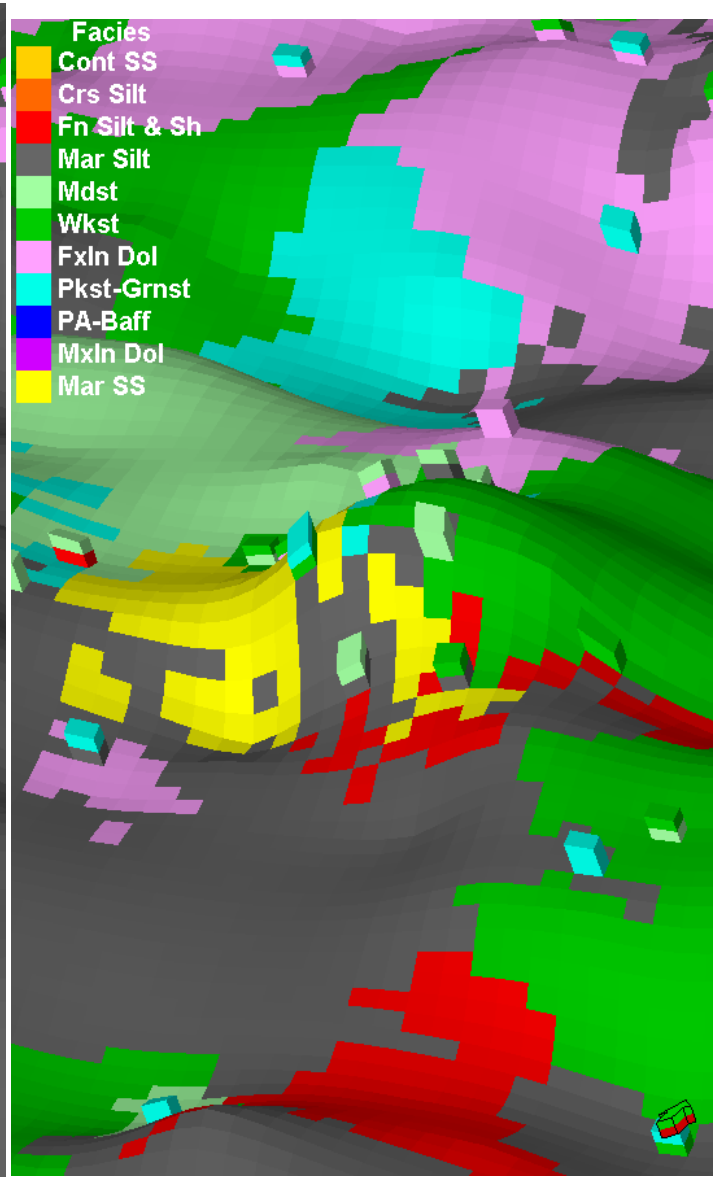


But redbeds are better constrained to where they belong

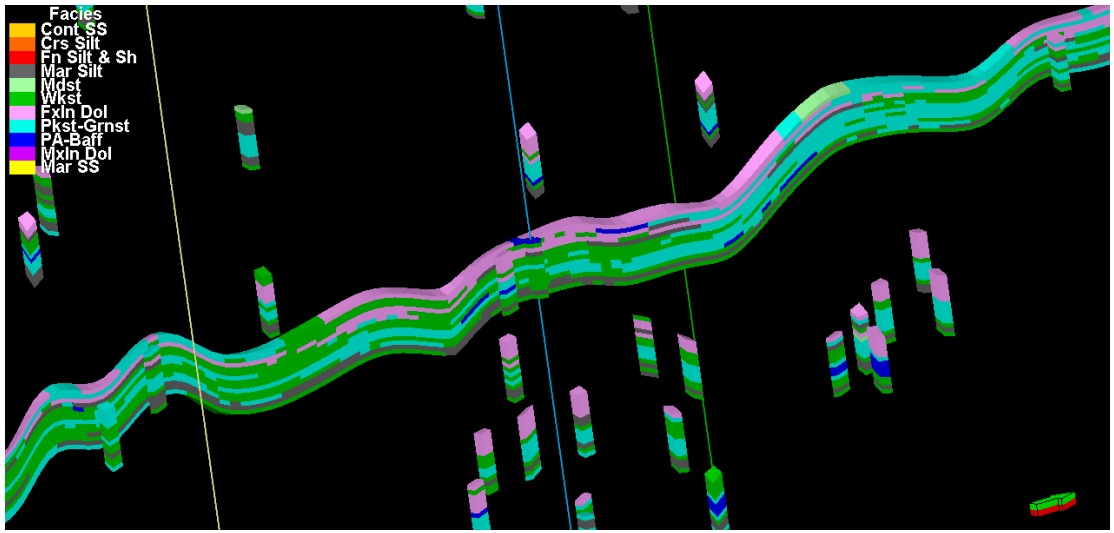
A1LM with longer range for F12, shorter vertical range



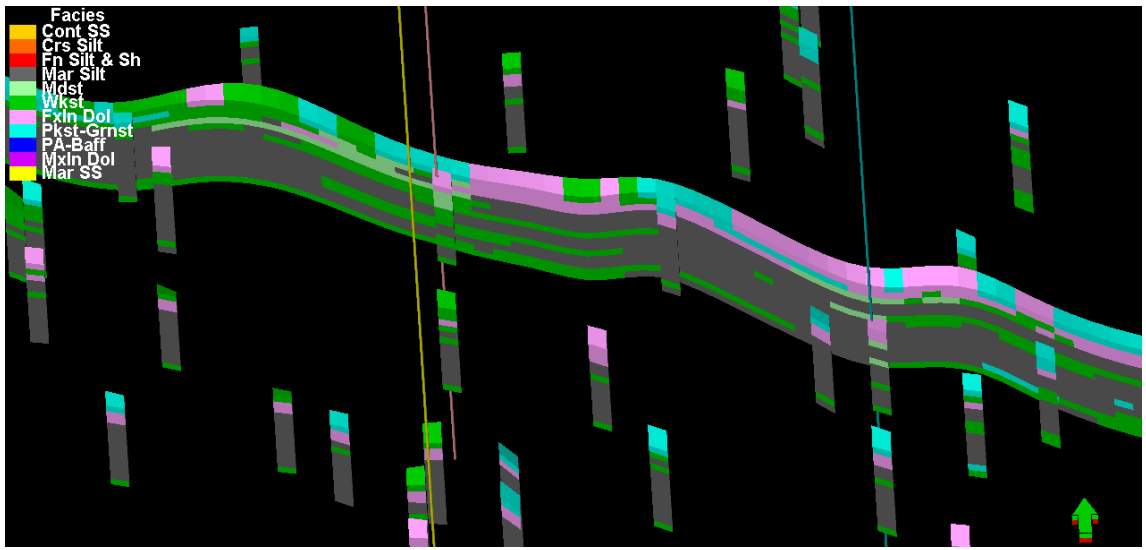
May want to zap F12…or leave in because of the rare 4th cycle



A1 Lm and core well ties



Alexander D2



Flower & Newby. Offset wells have more silt

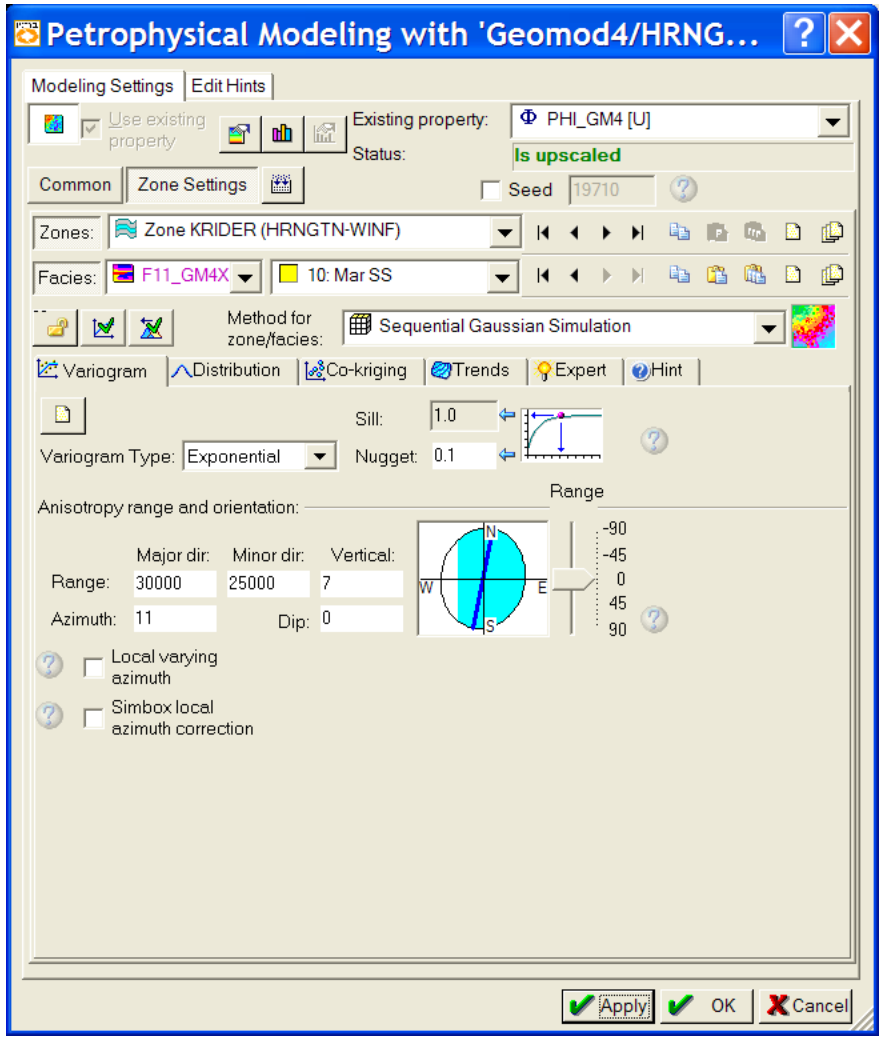
Facies model modifications

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 5th order cycles in places and the B2-3-4LMs are very thin in places (may actually be continental).

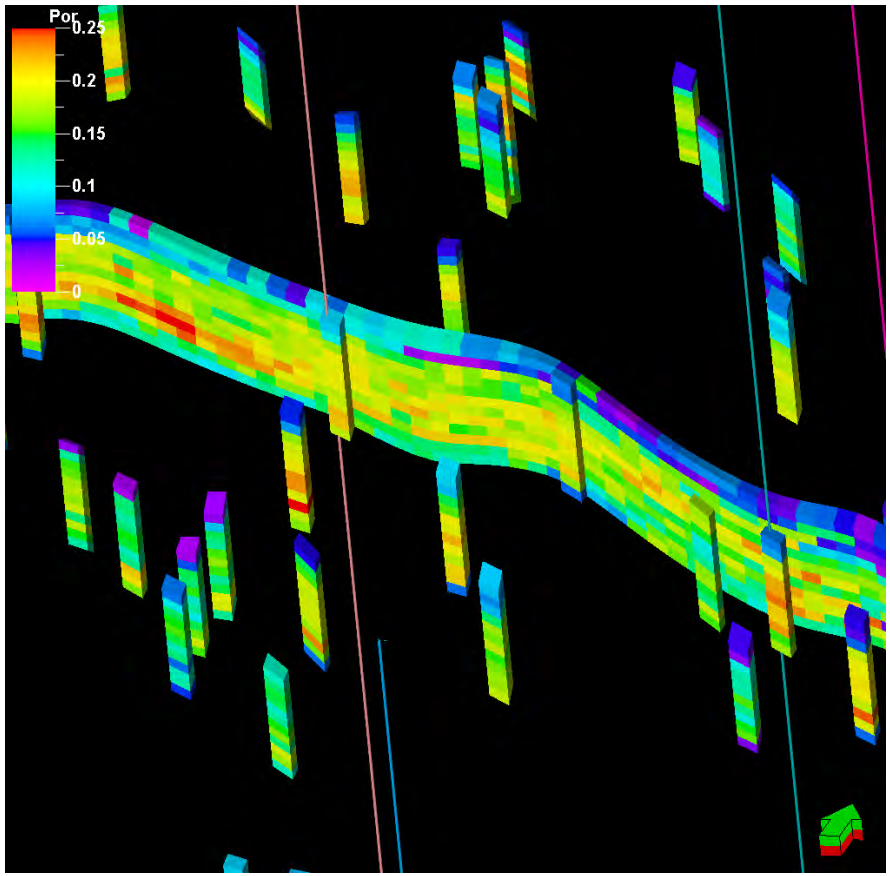
(5 and 6 above, cancel each other)

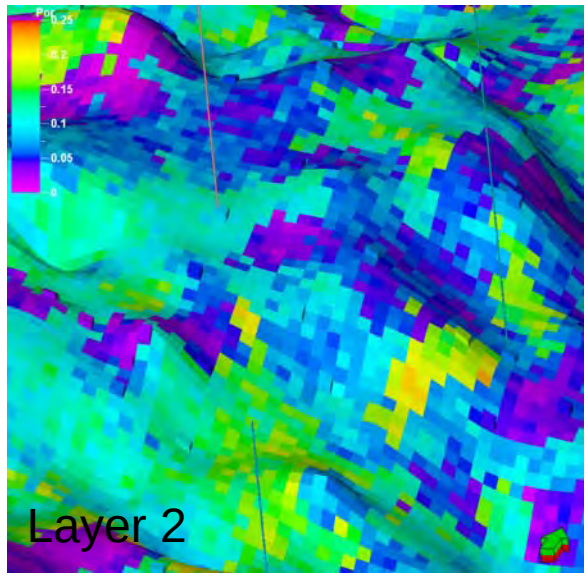
Porosity modeling

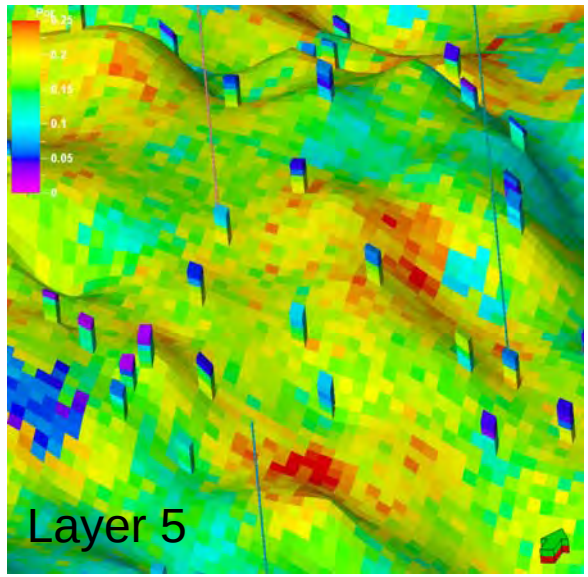
1. In workflows, double click on property modeling
2. Select zone to be modeled and unlock
3. Mash the condition on facies button
4. Mash the “use transformations made in data analysis” button
5. Input variogram parameters by facies
6. Select SGS for simulation



Compare Phi models for Krider using Gmod3 variograms

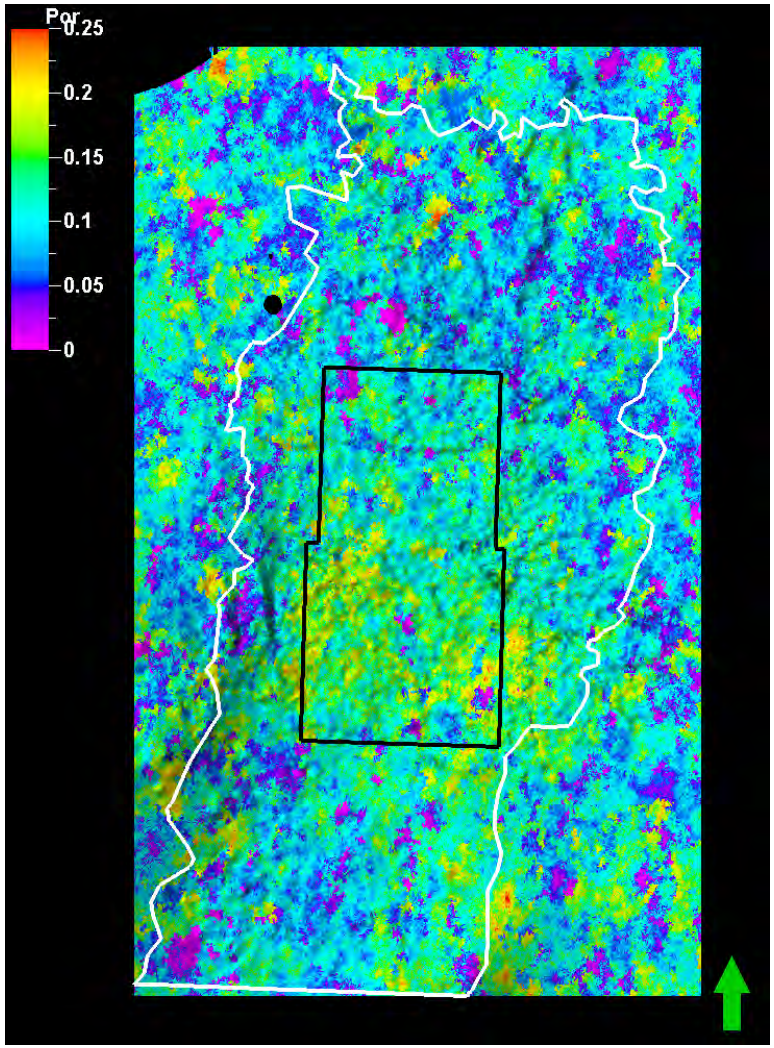




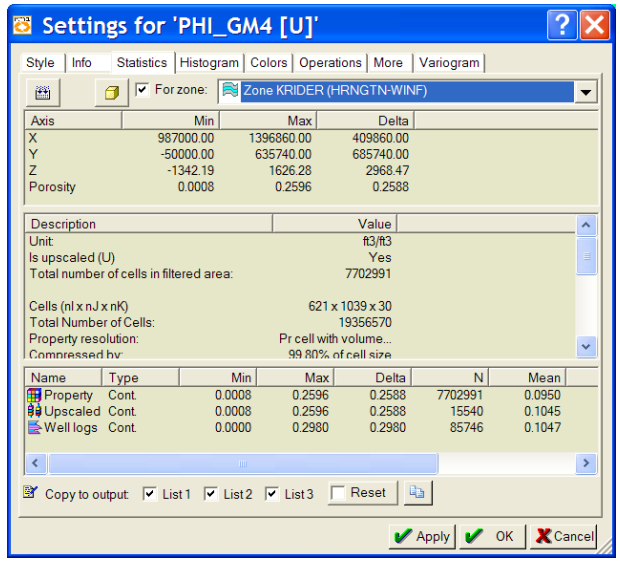


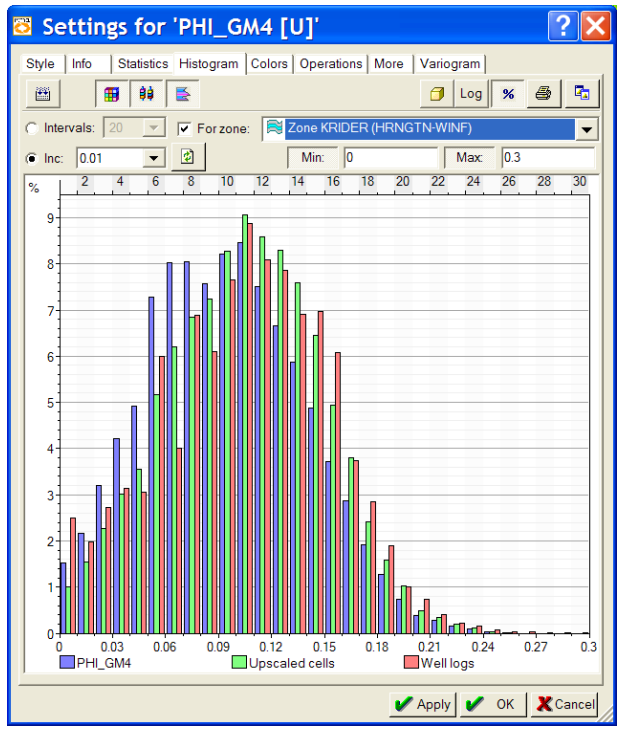
Geomod 4, Flower & Newby area, same 30/25/7 as in Geomod3

Krider Geomod4 with GM3 variograms

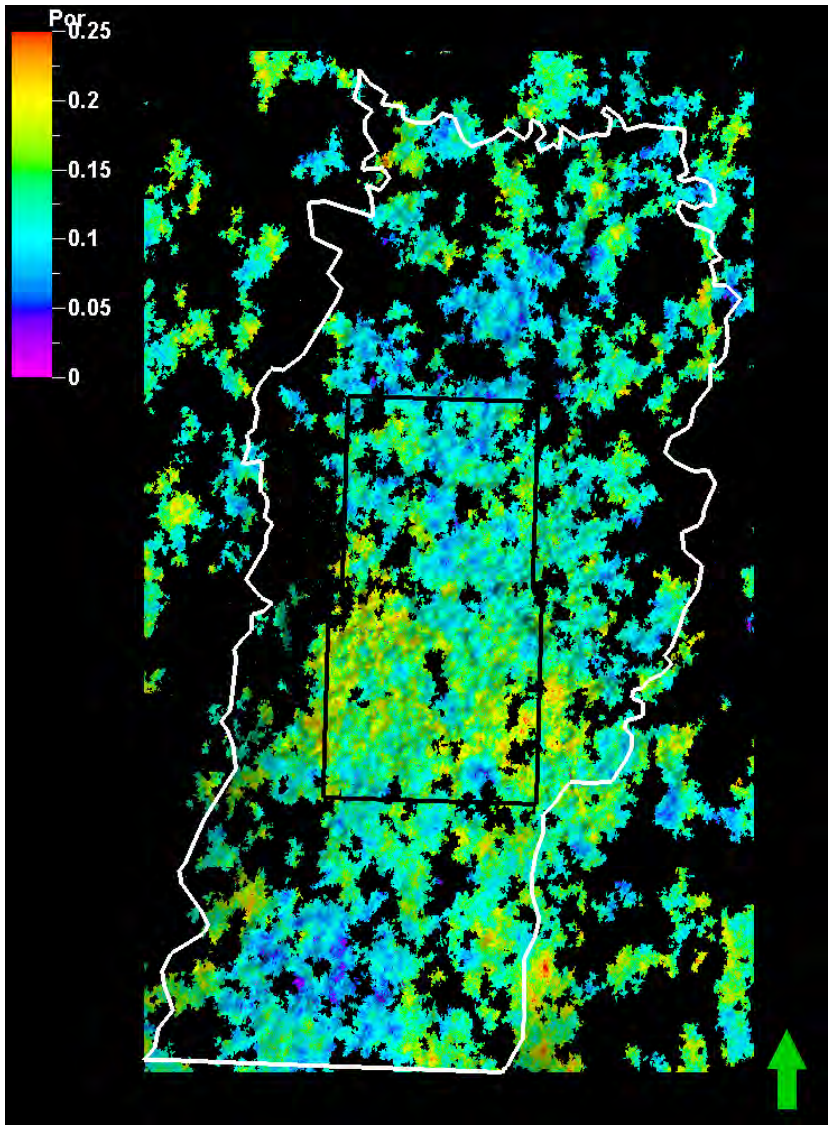


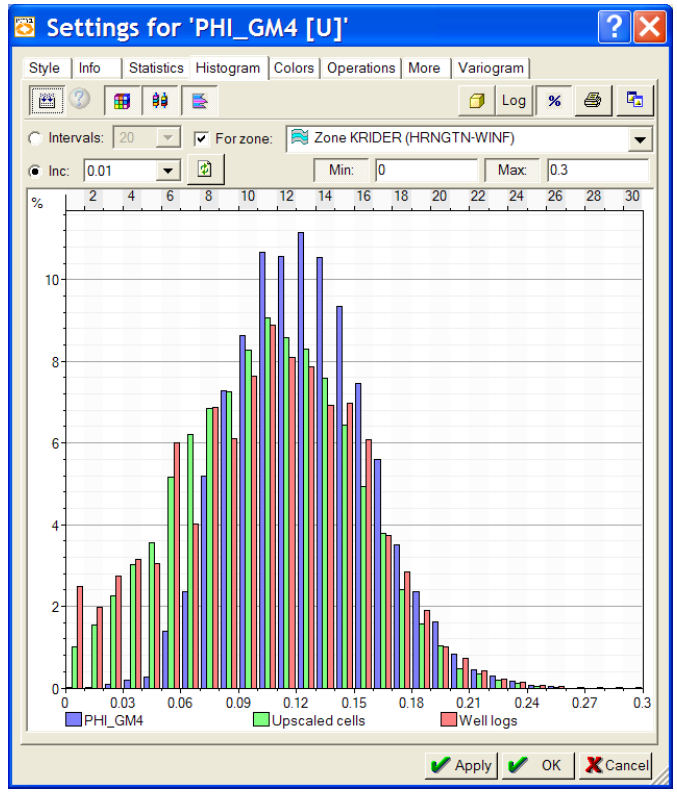
Layer 5, geomod4 30/25/7



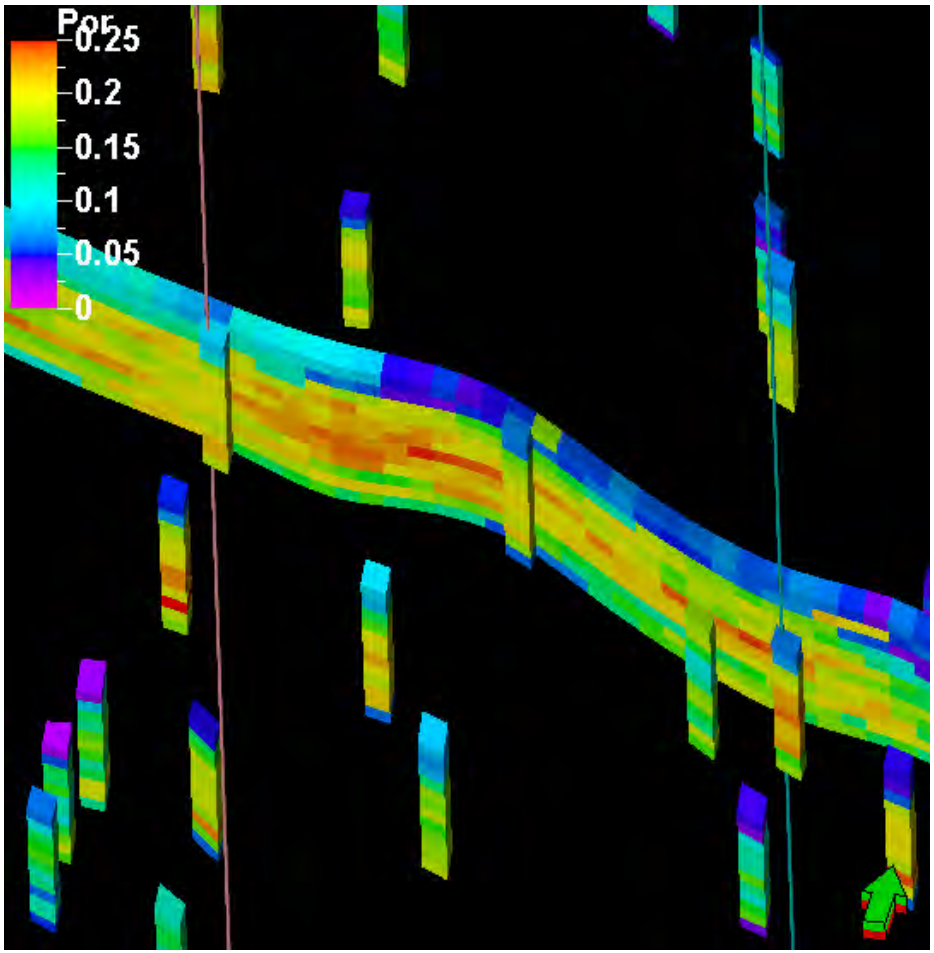


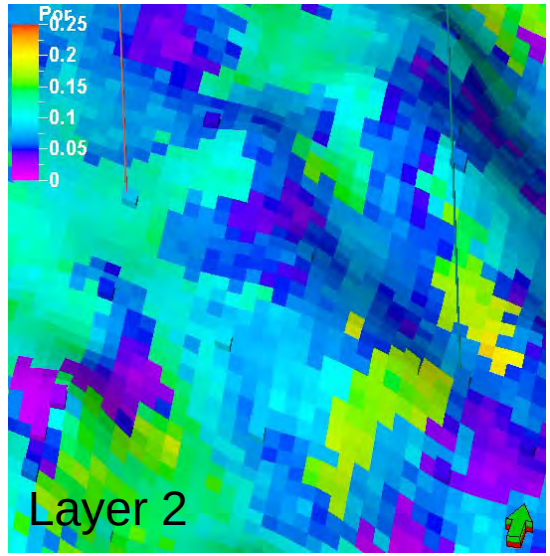
Krider Geomod4, F9 only, with GM3 variograms

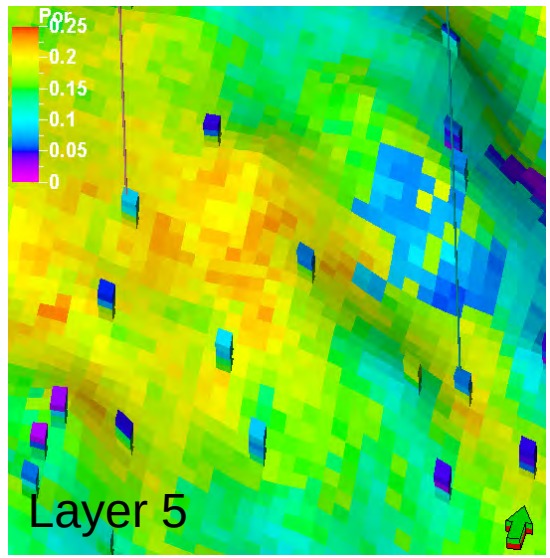




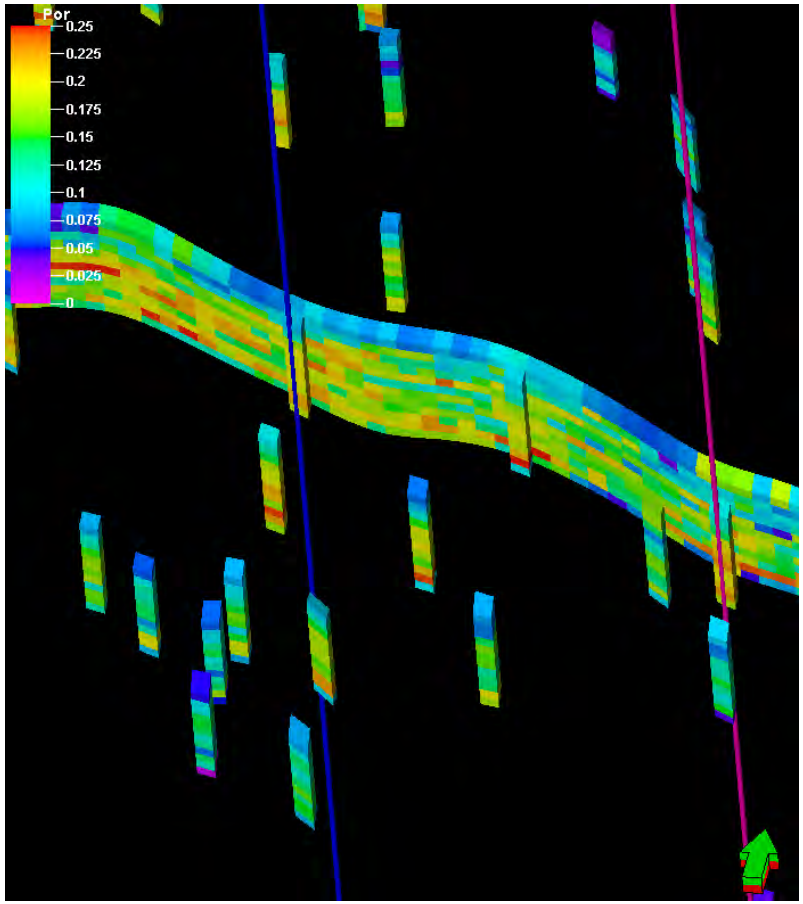
Krider phi Gmod4 (new variograms)



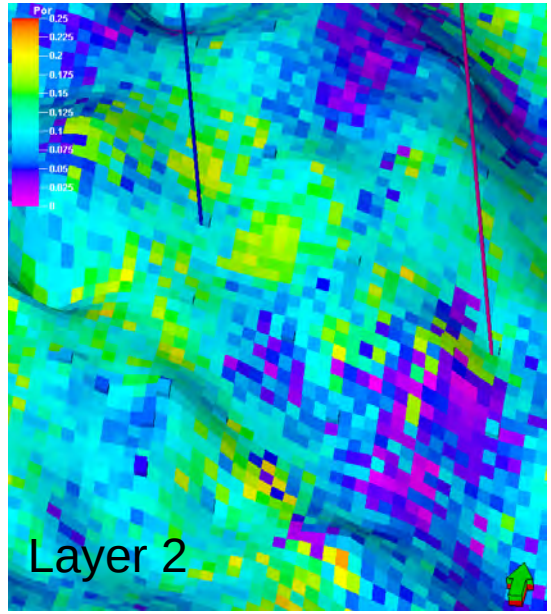


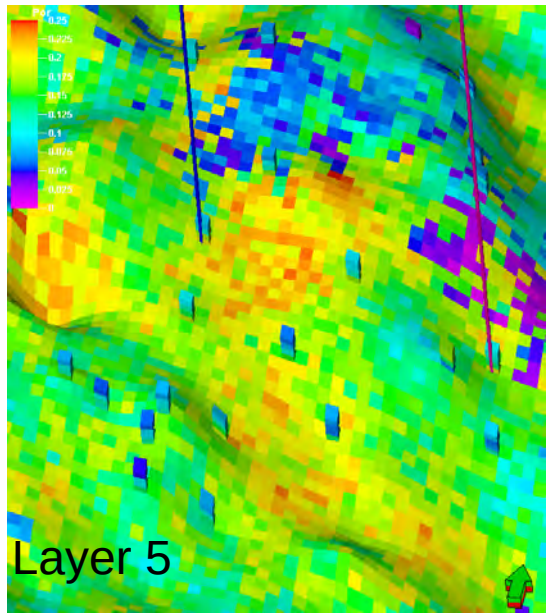


Krider, Geomd 3

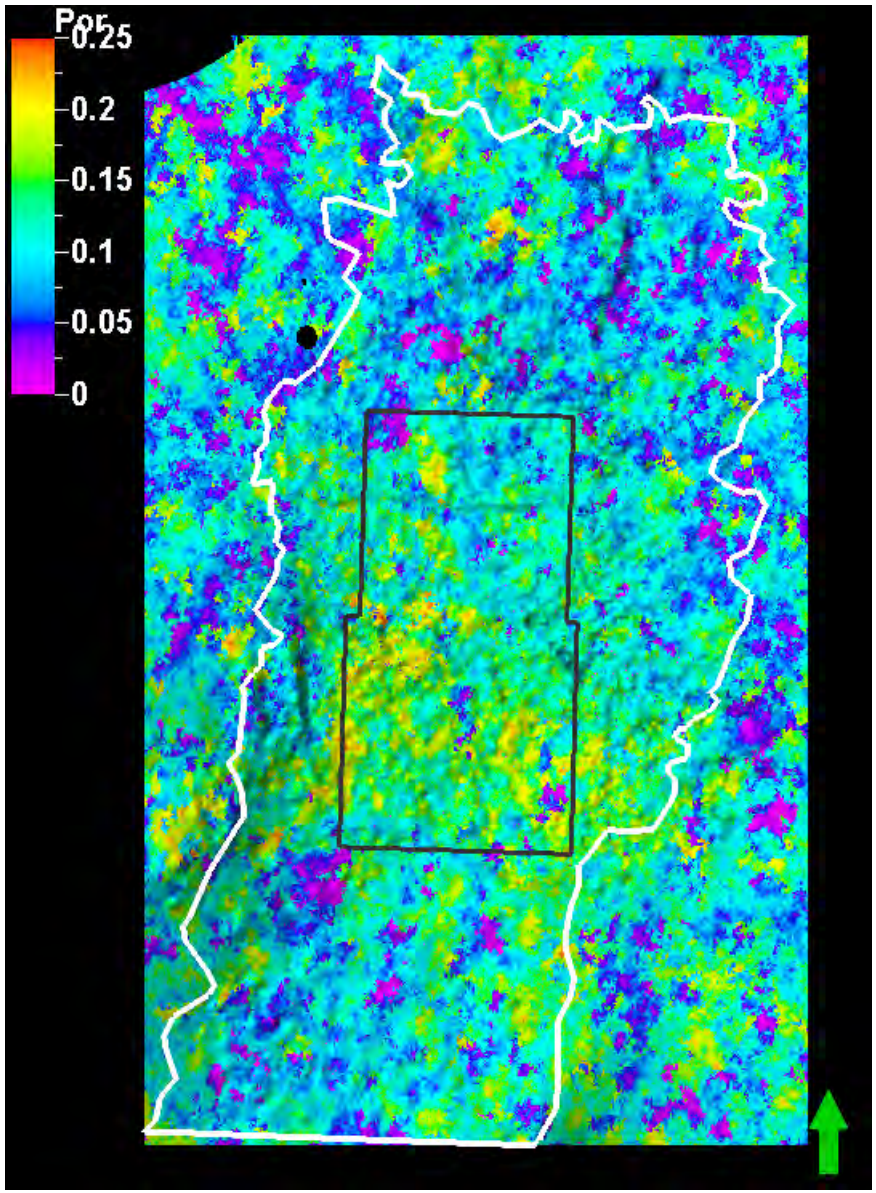


Flower & Newby area

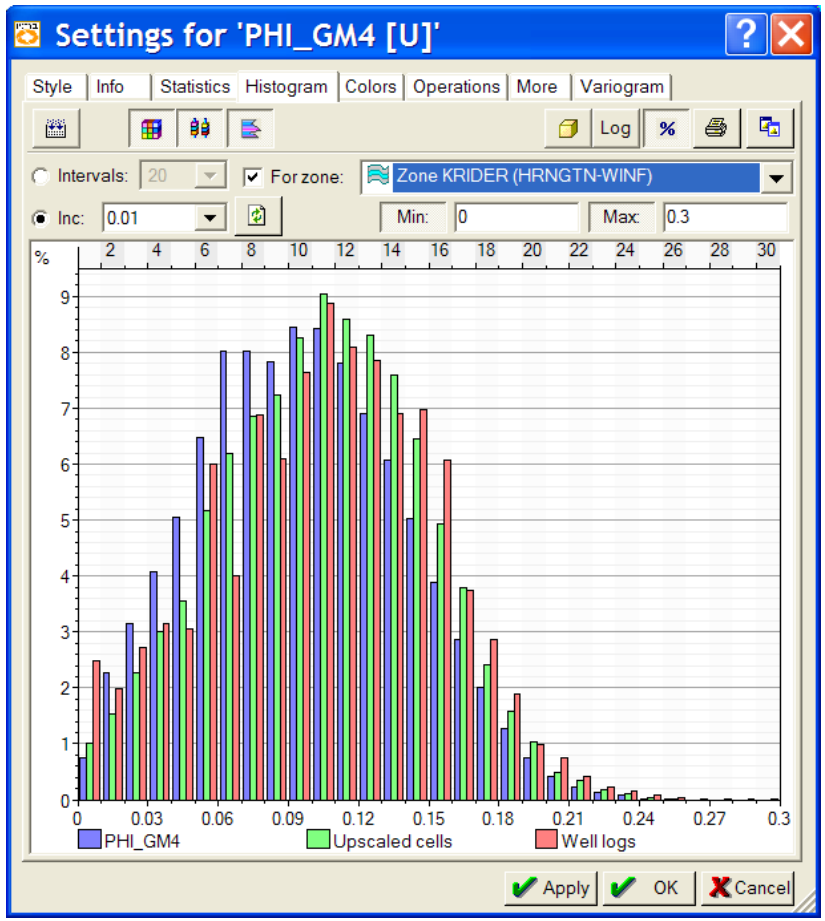




Krider phi Gmod4

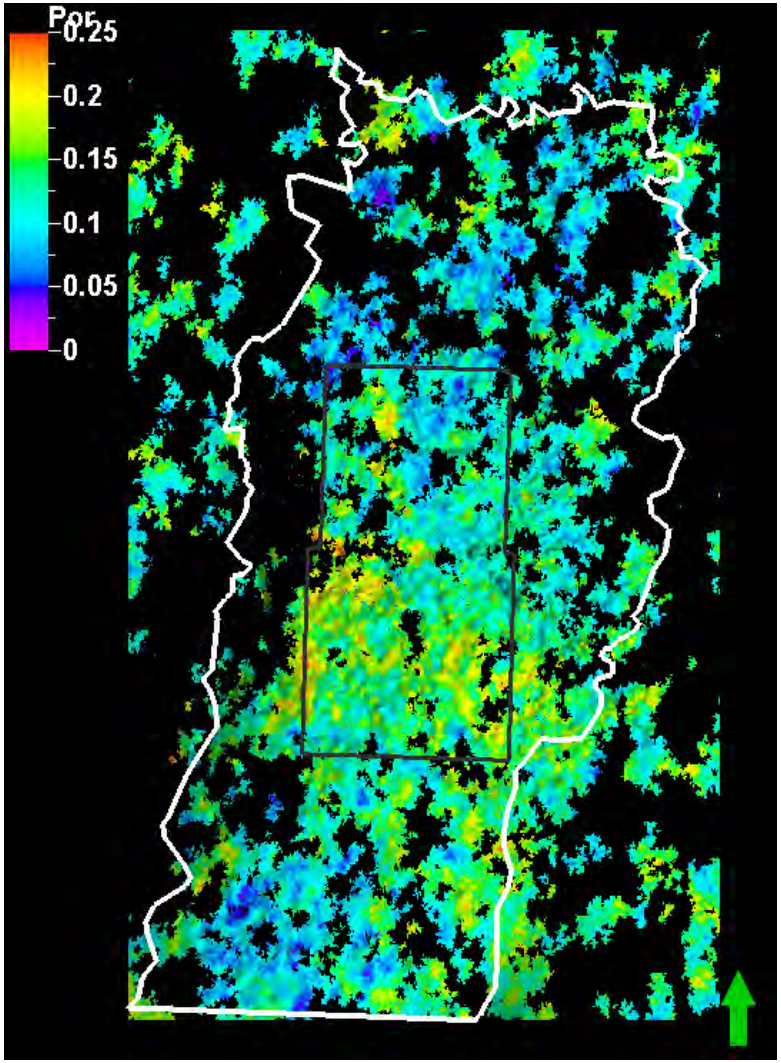


Krider Geomd4 phi, layer 5

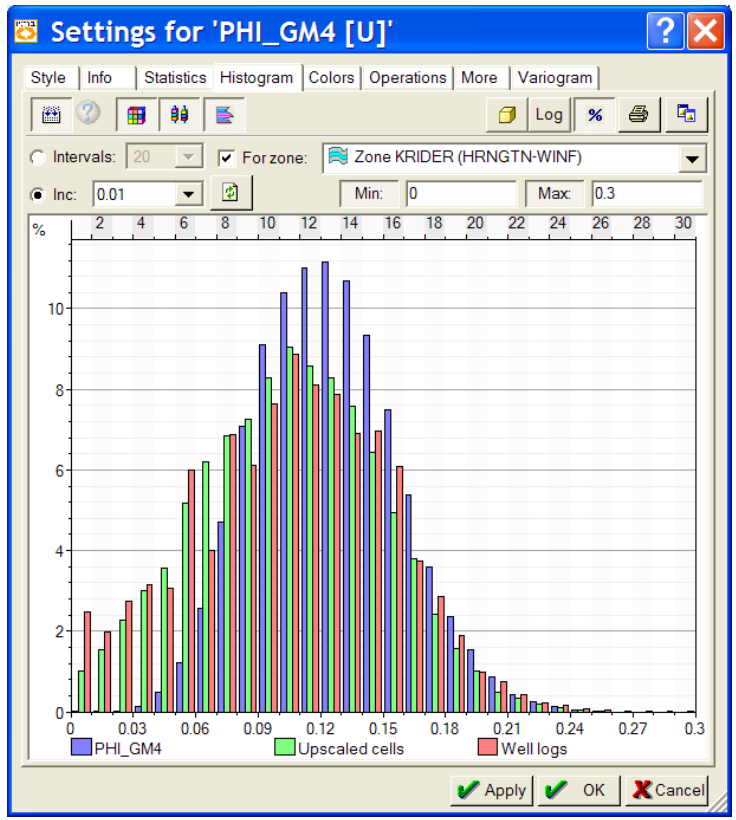


Krider Geomd4 phi, all facies

Krider F9

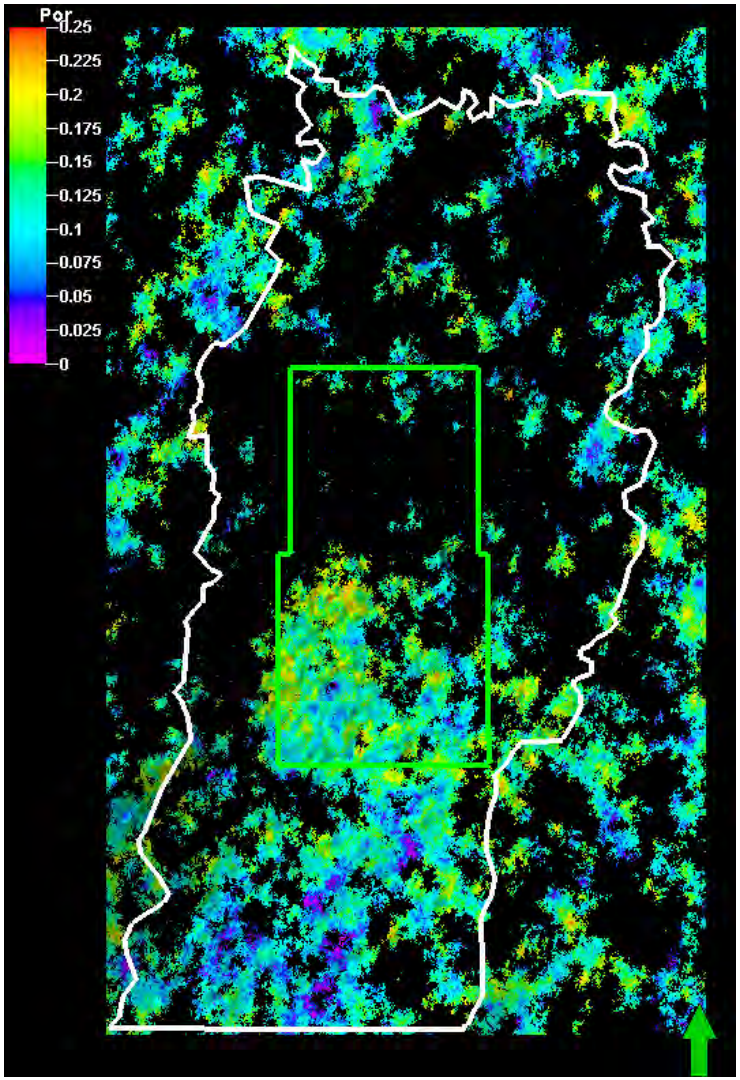


Krider Geomod4 phi, F9 only layer 5

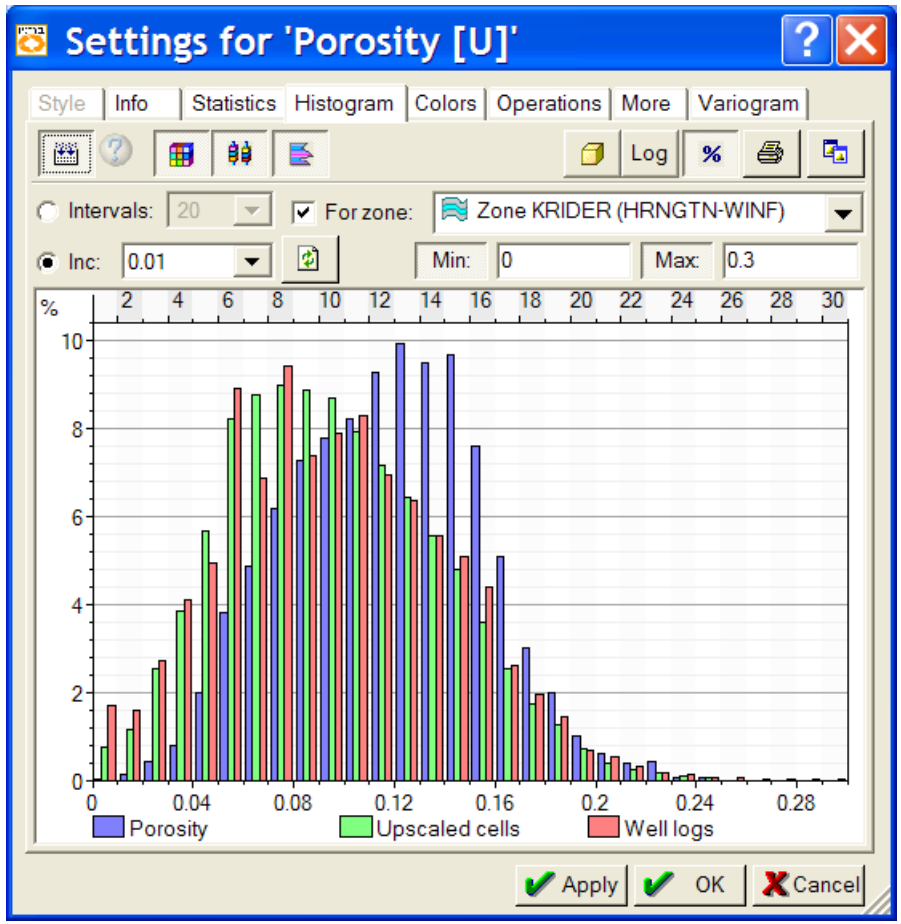


Krider Geomod4 phi, F9 only

Krider Geomod3, F9 only

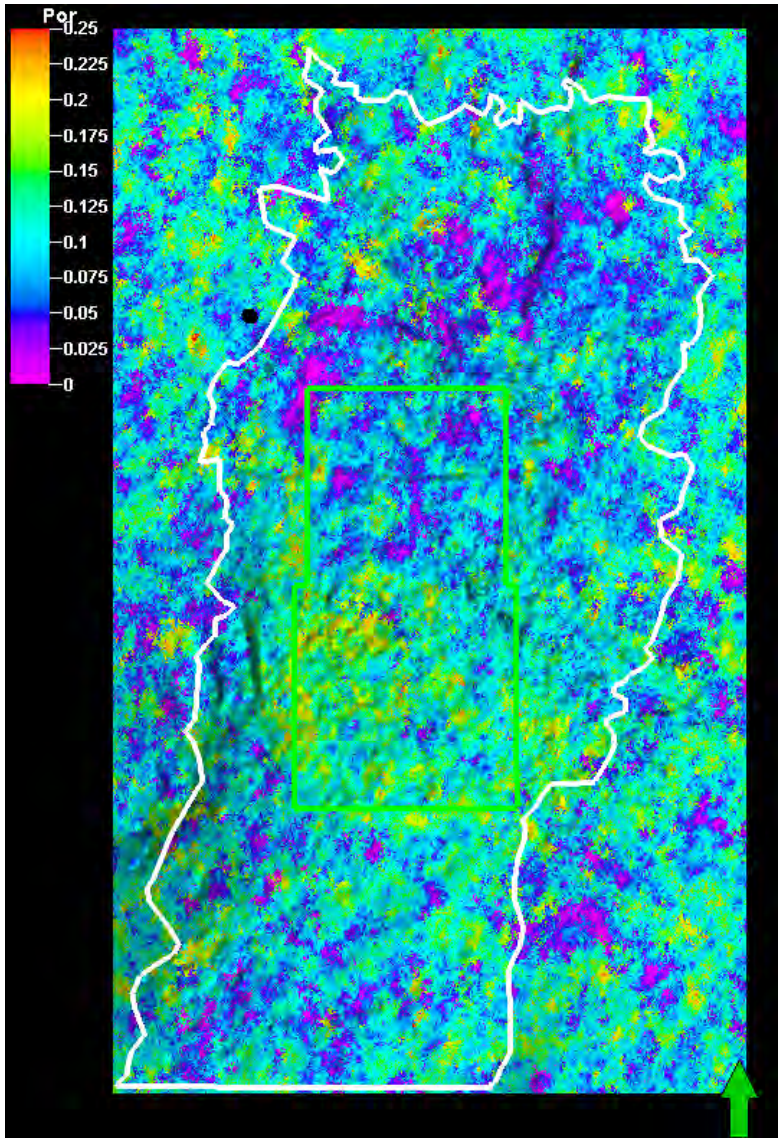


Krider Geomd3 phi, F9 only layer 5

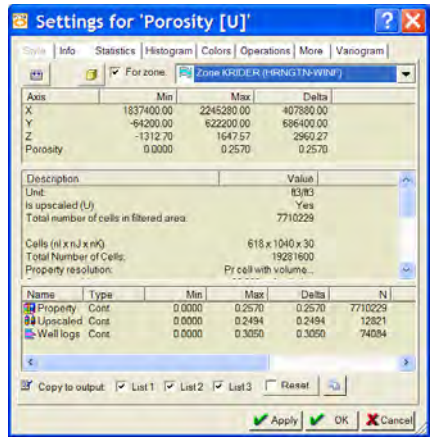


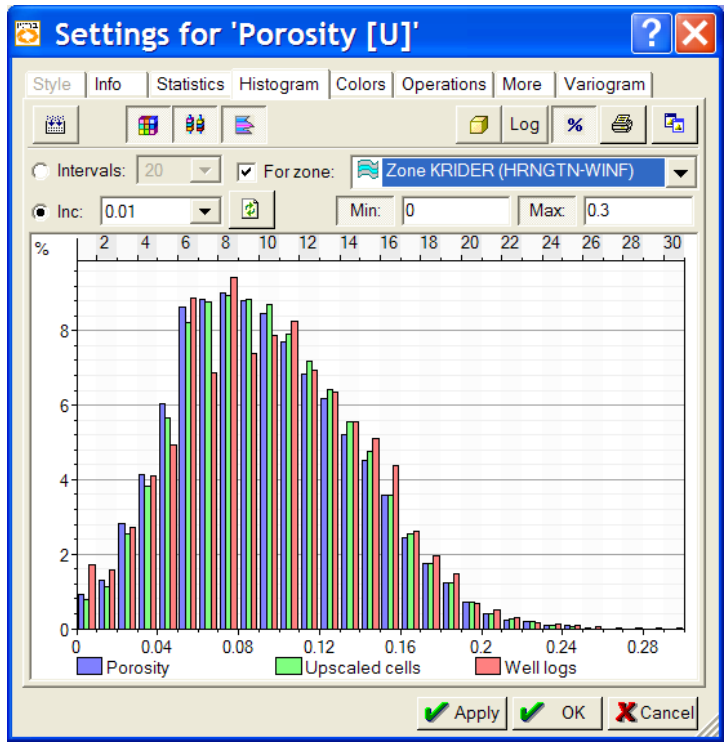
Krider Geomd3 phi, F9 only

Krider, Geomd 3



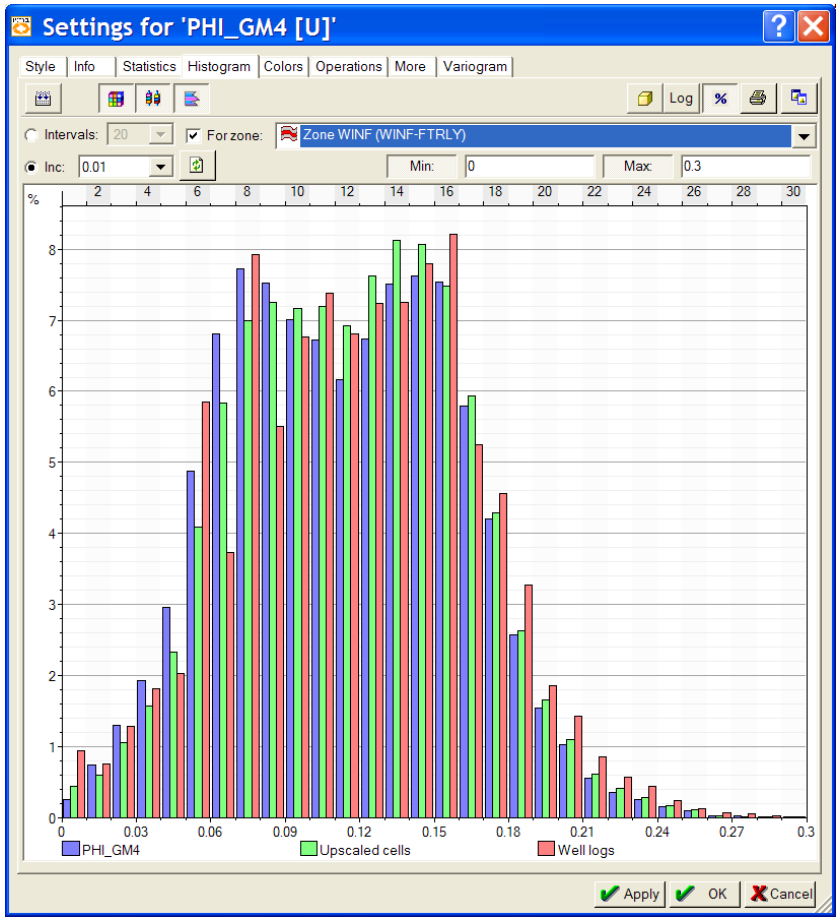
Krider Geomod3 phi, layer 5



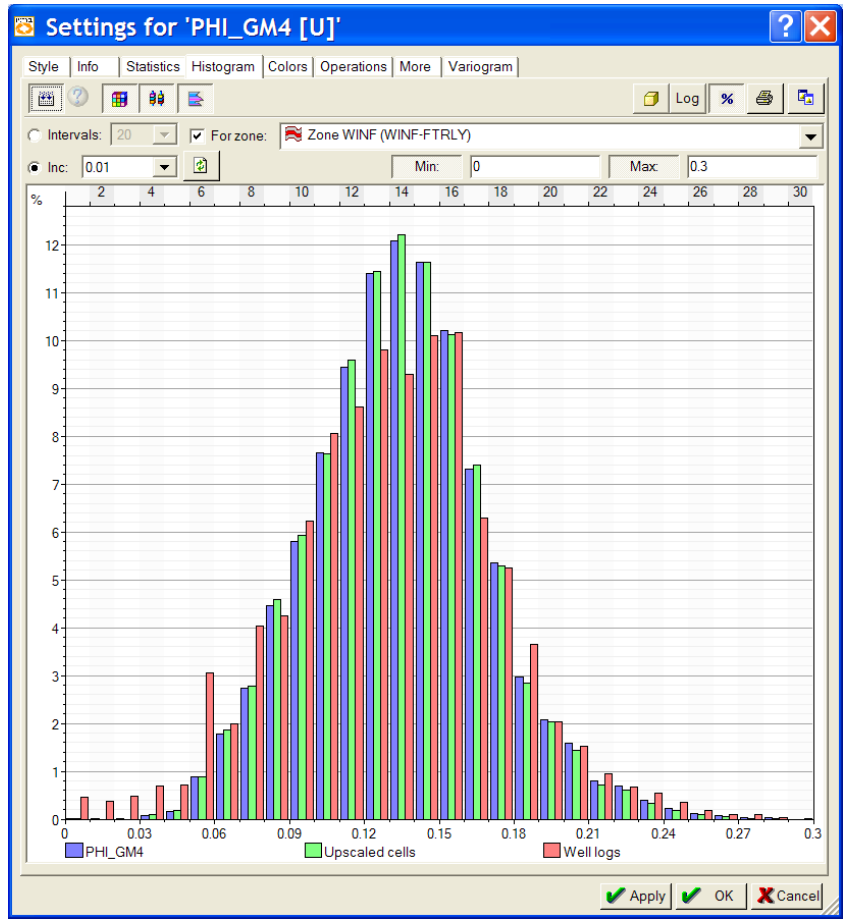


Krider Geomod3 phi, all facies

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%

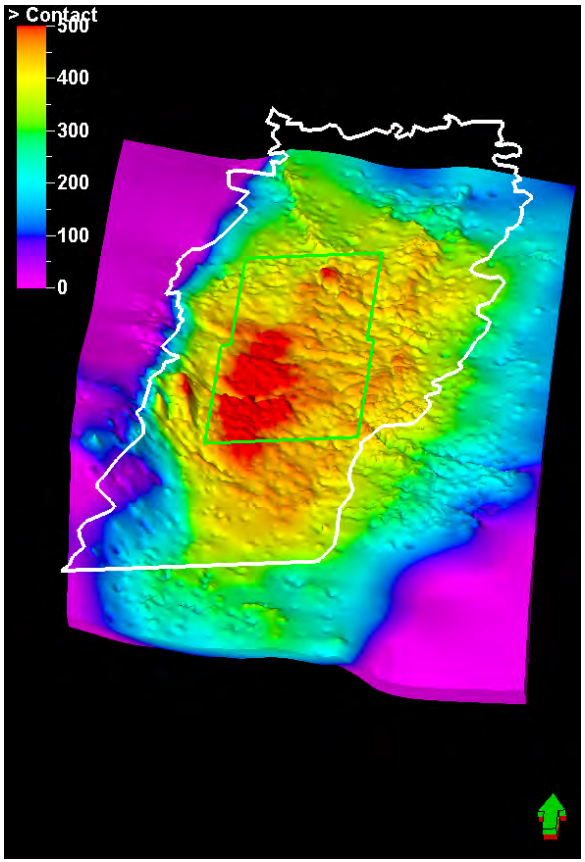
   Predicted by NNet – 35% (39% high)

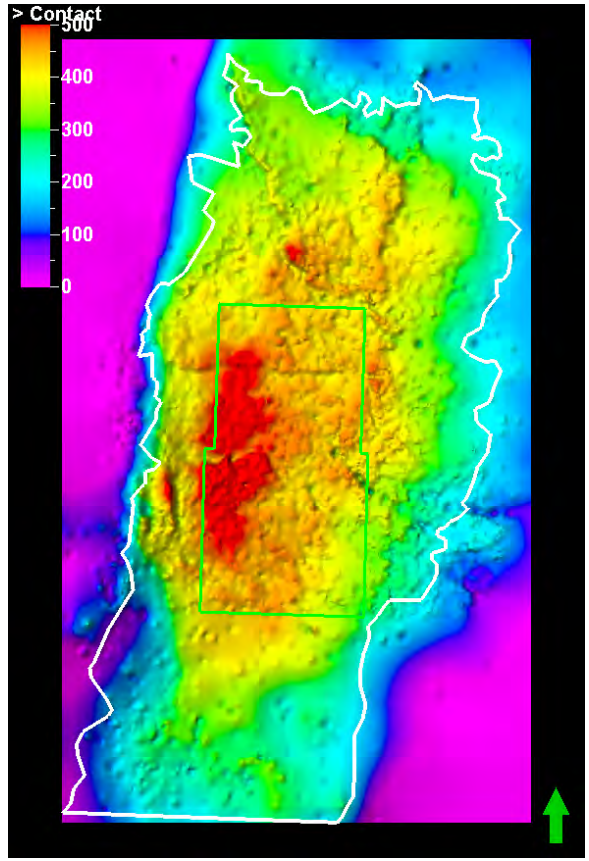
   Petra grid from N/GR – 30%

PHI_GM4=If(ZID=3, If(F11_GM4XE=9,PHI_GM4-.01 , PHI_GM4), PHI_GM4)
Reduced Winfield OGIP by 3%

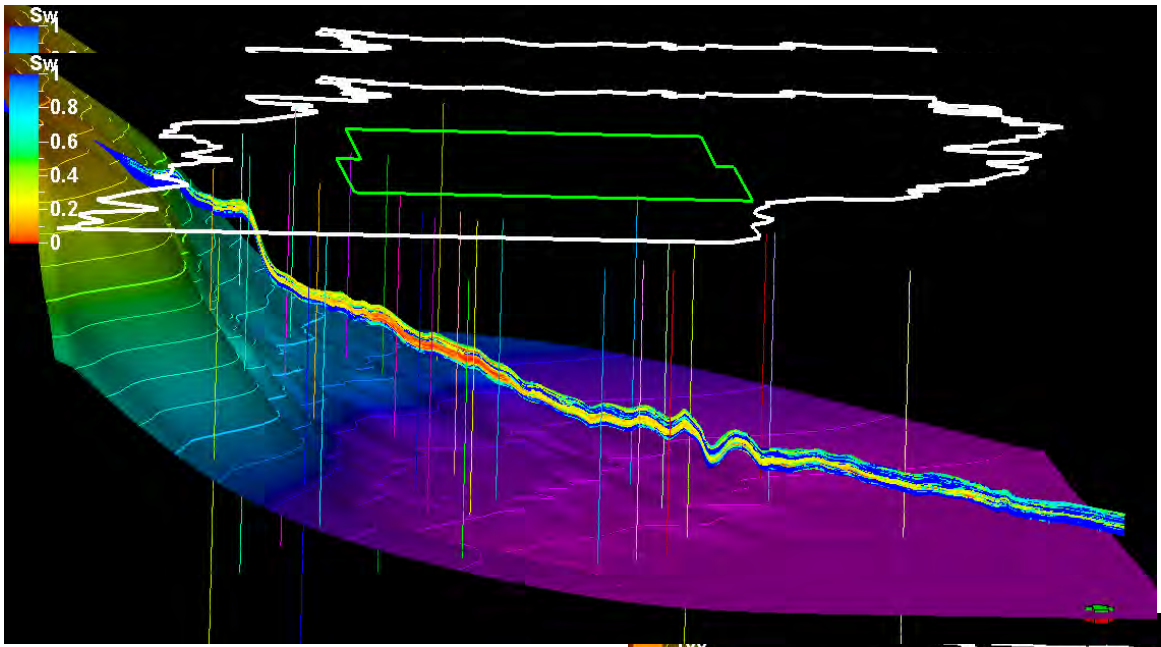
Step through Dave's workflow for properties

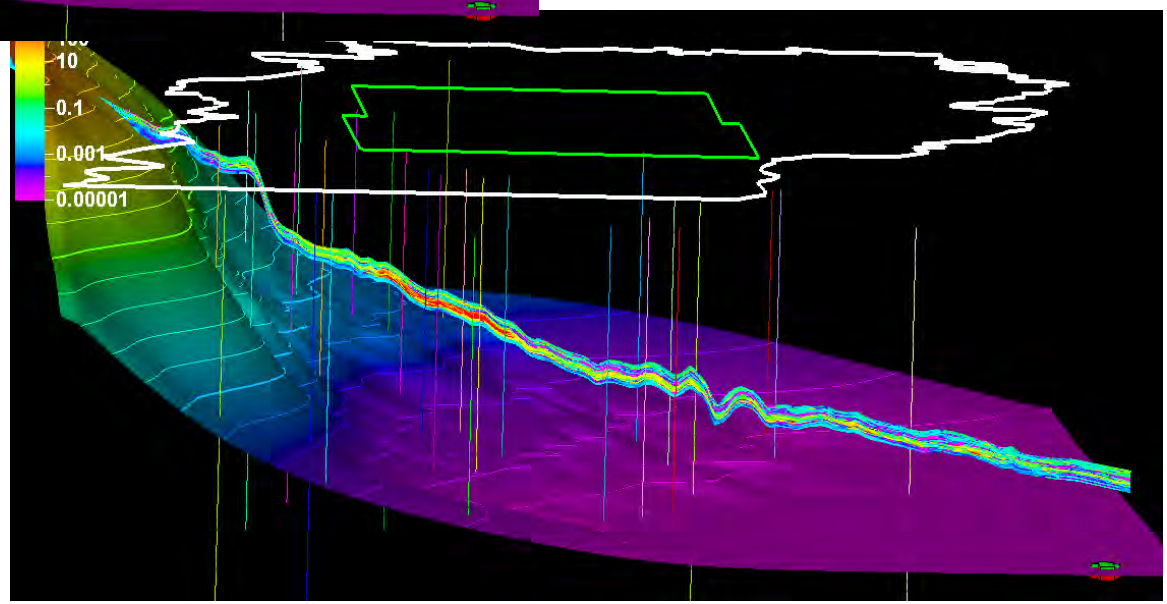
HFWL70 for Hrngtn-Winf



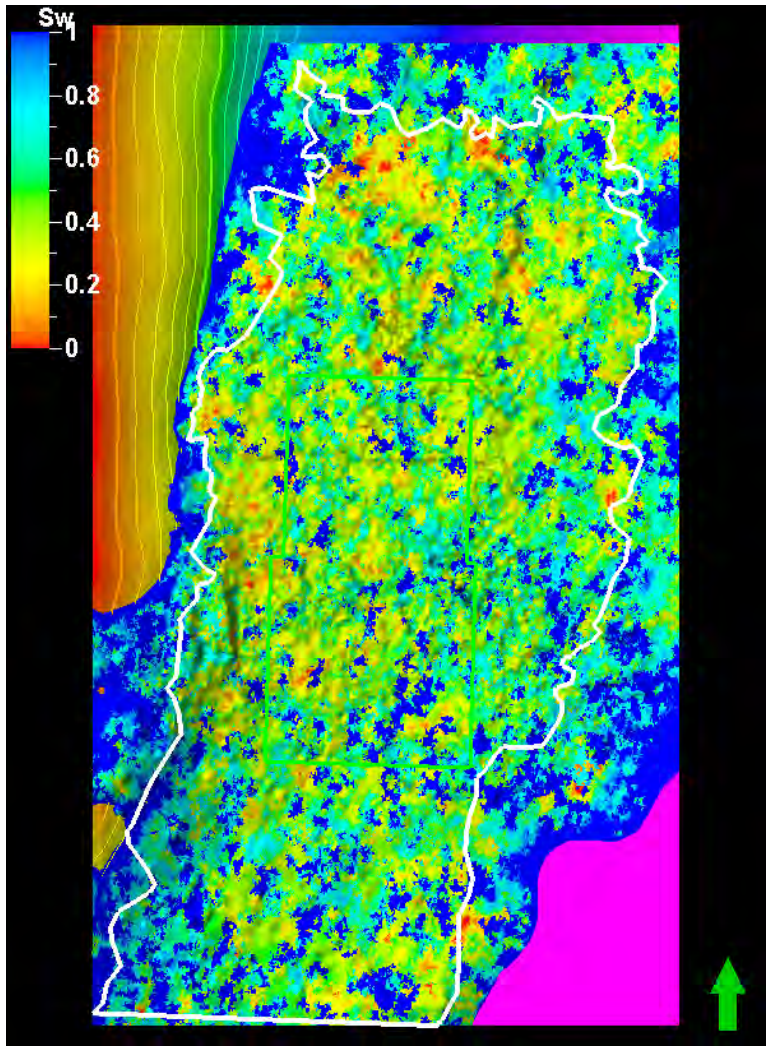


Herington-Krider Sw and Kxy through the Flower-Newby

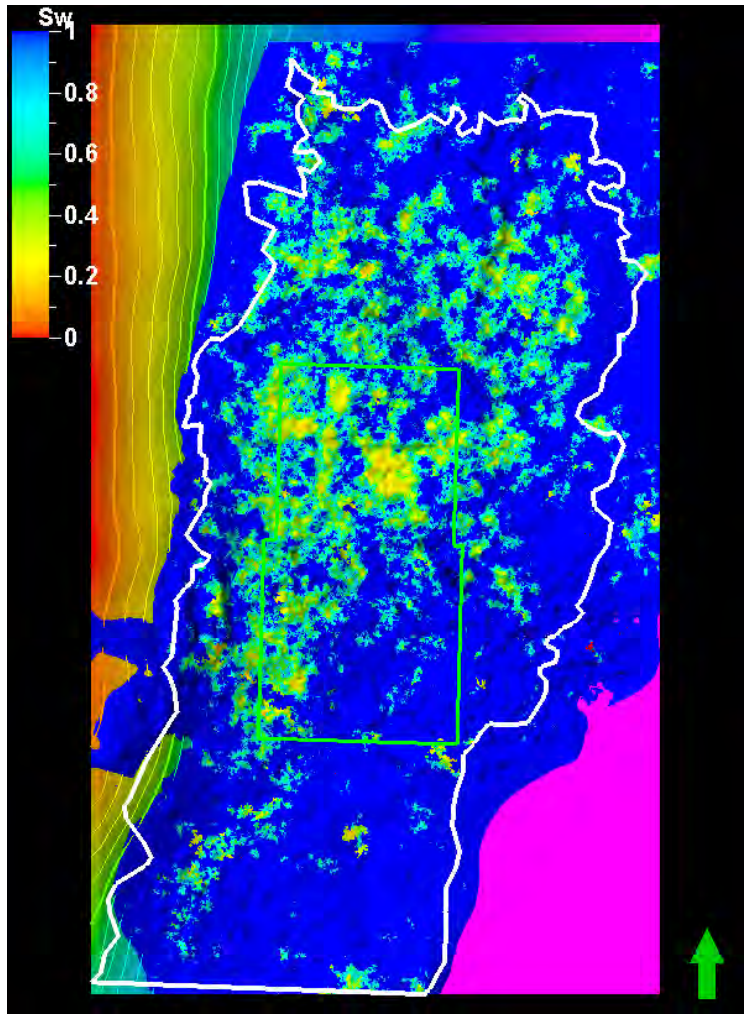




Sw and FWL



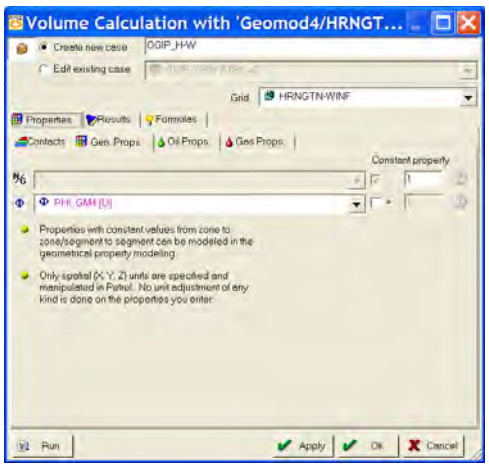
Herington

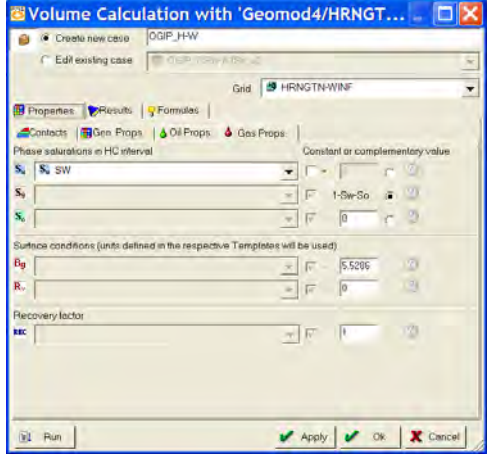


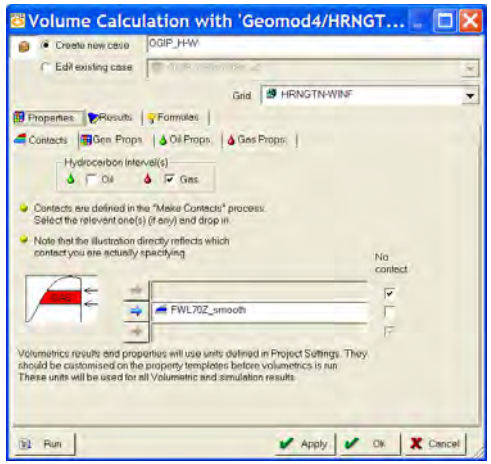
Bottom layer in Odell

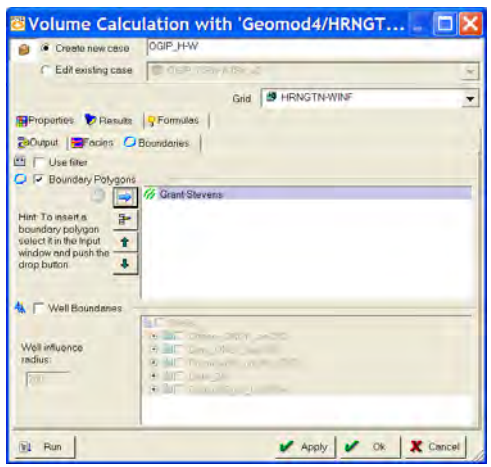
OGIP calc

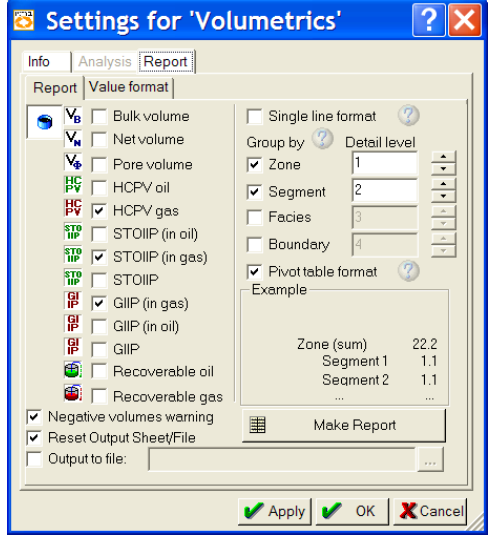
1. Open volume calculation
2. Insert FWL contact
3. Make Sw= Sw and leave Sg=1-Sw-So, Bg = 5.5286
4. Phi and N/G as shown
5. Select Grant-Stevens
6. Select what to report
7. Apply and Run

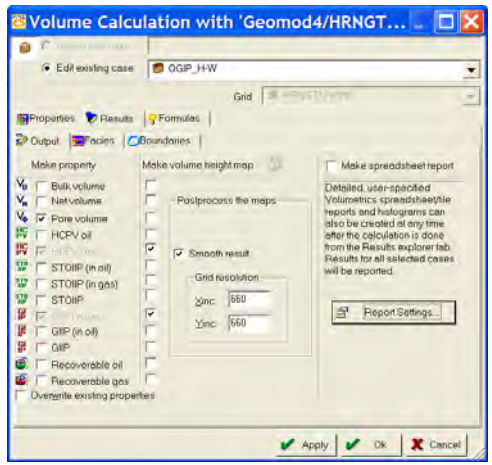




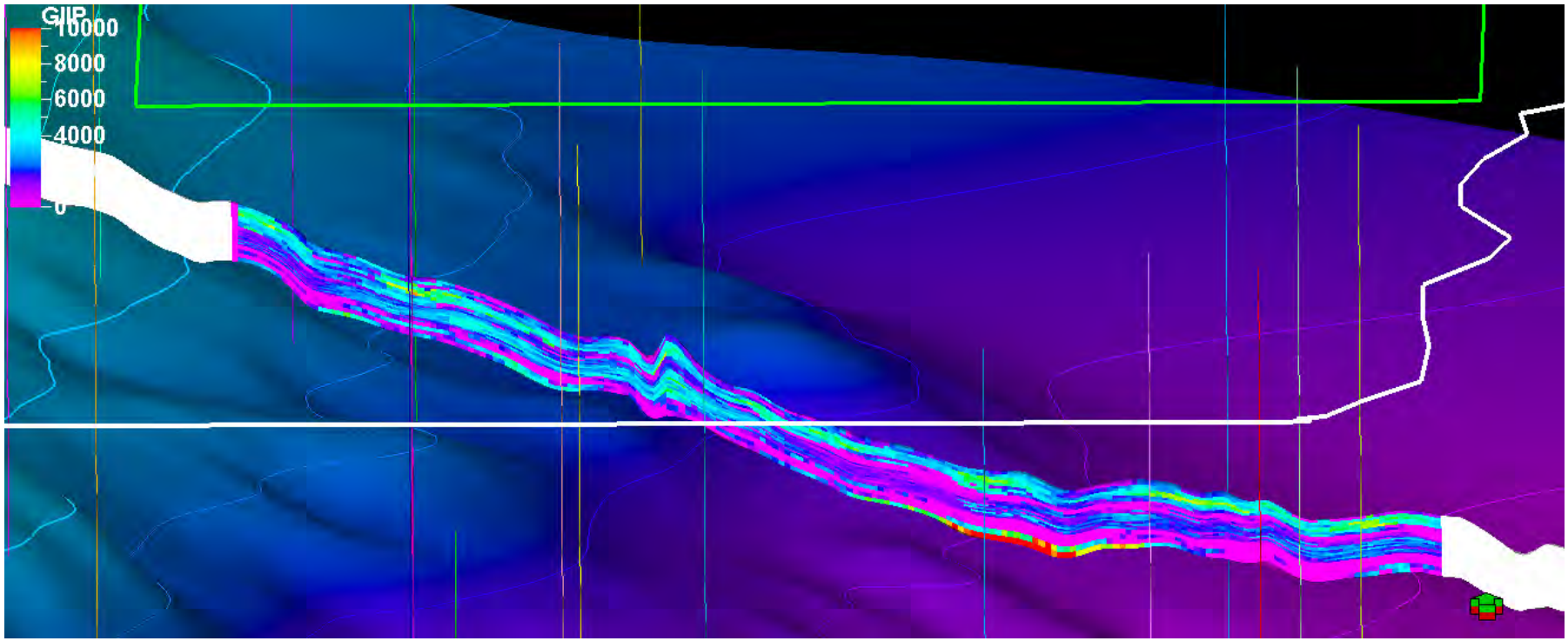




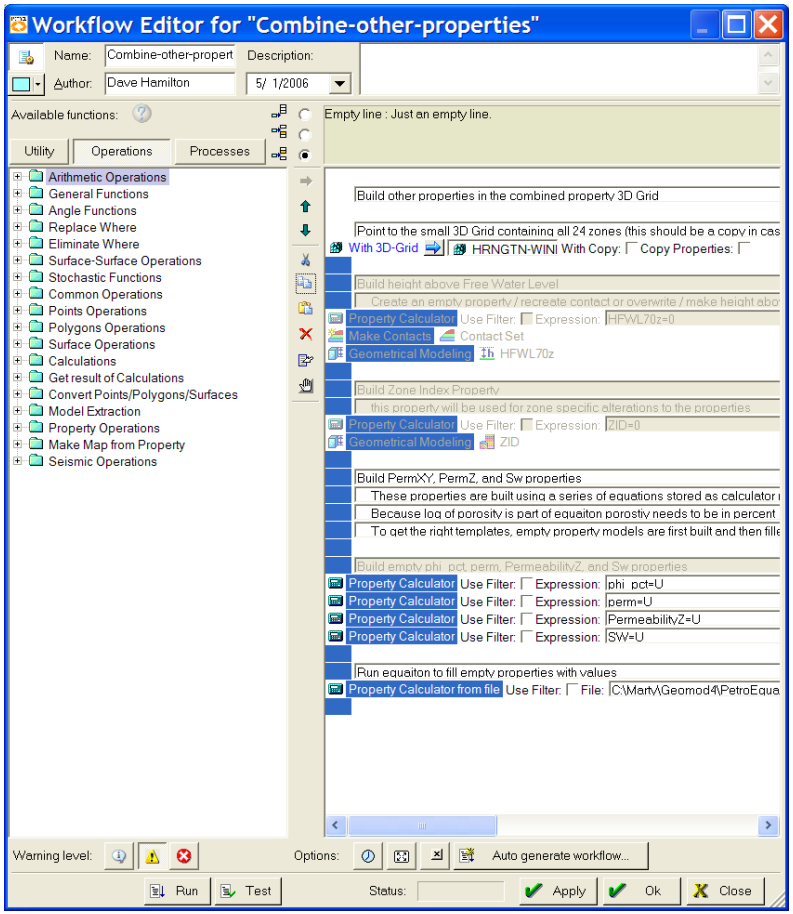


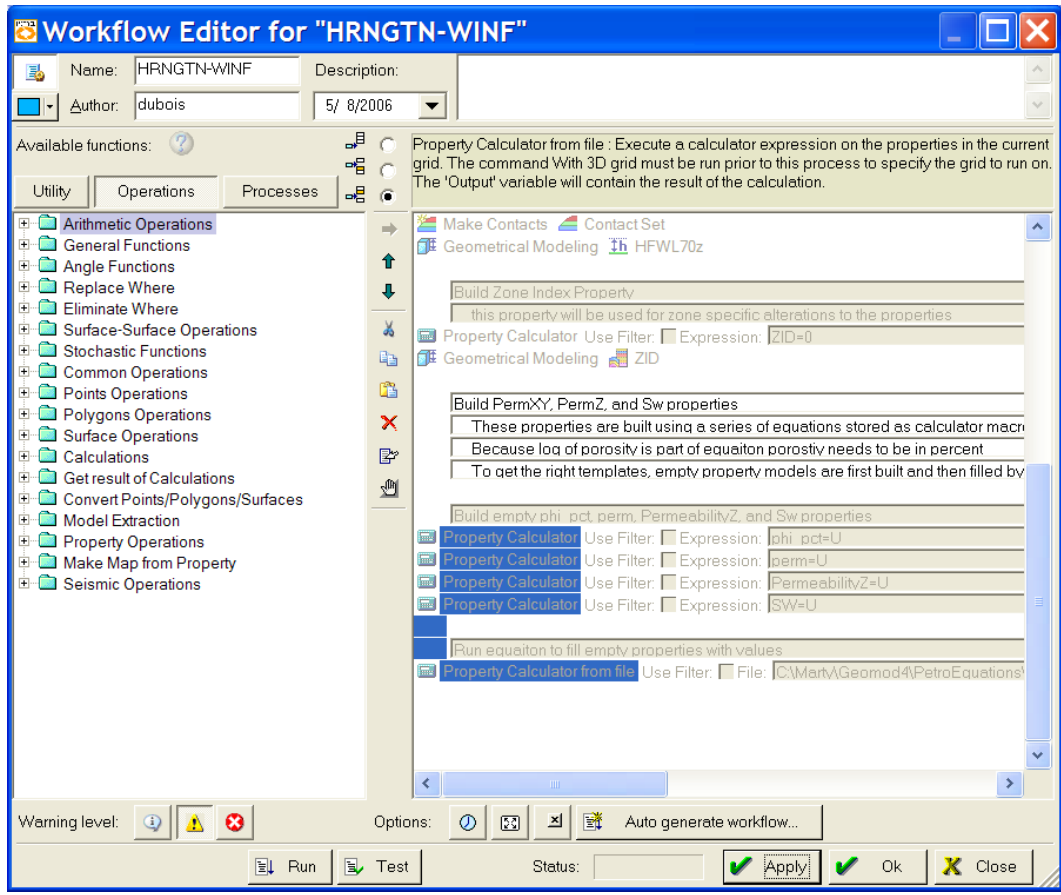


H-Kr-O OGIP Flower-Newby area



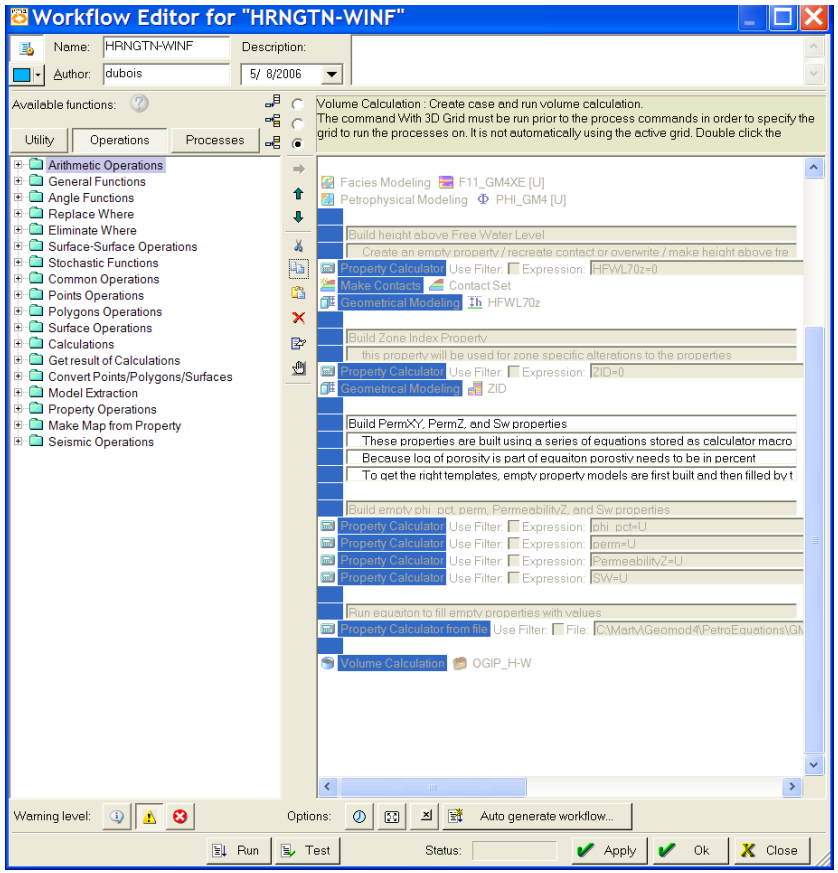
Workflow work

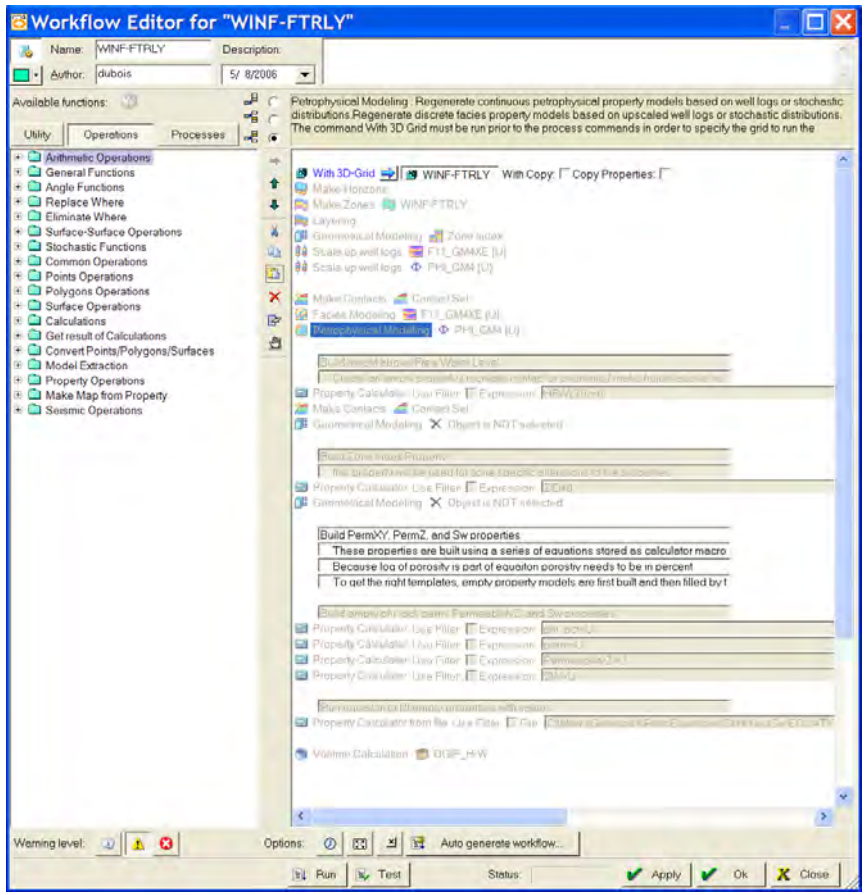




Ran this from original location. The decided to copy it into the workflow for the zone

More building workflow

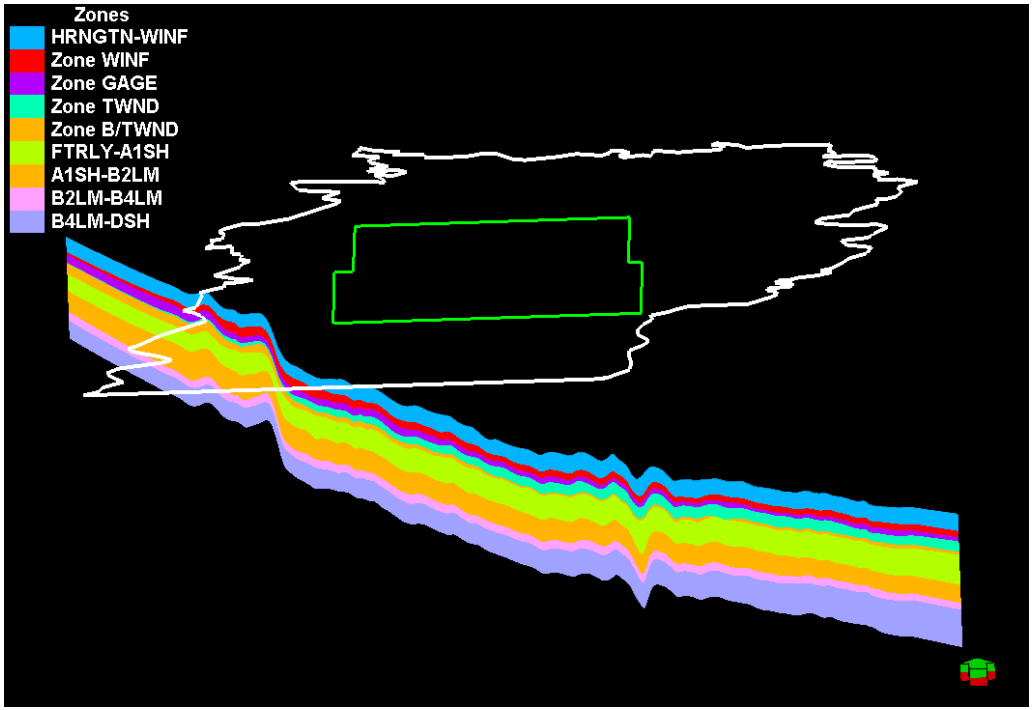




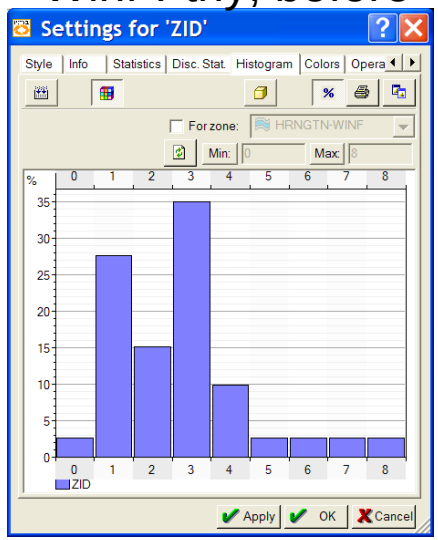
Added a working volume calculator and then copied to all other models

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

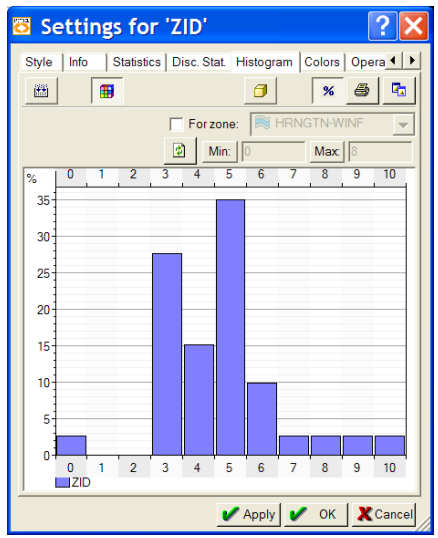
More Building workflows – Change ZID for 3D grids below Hrntn-Winf



Winf-Ftrly, before



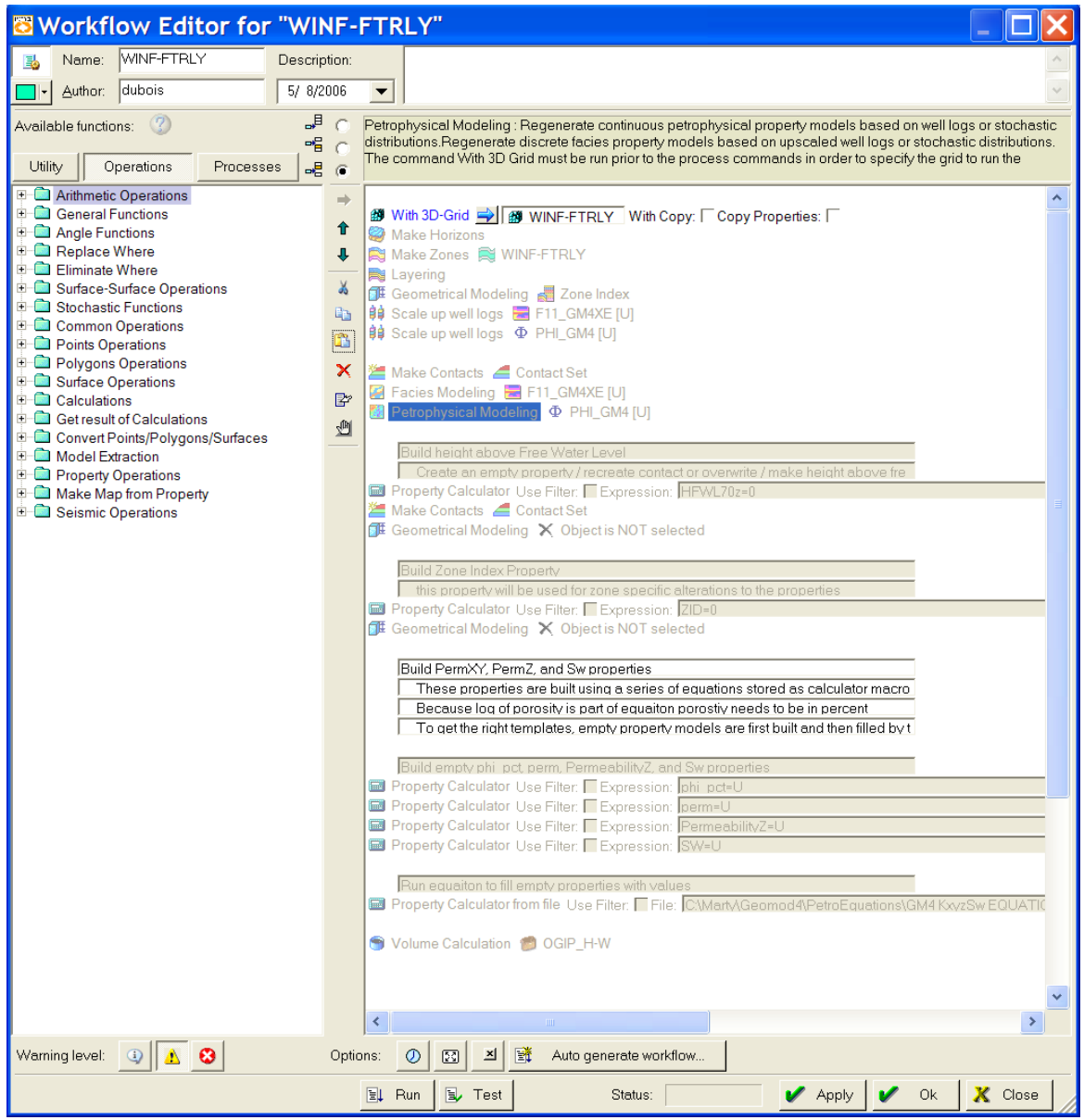
Winf-Ftrly, after



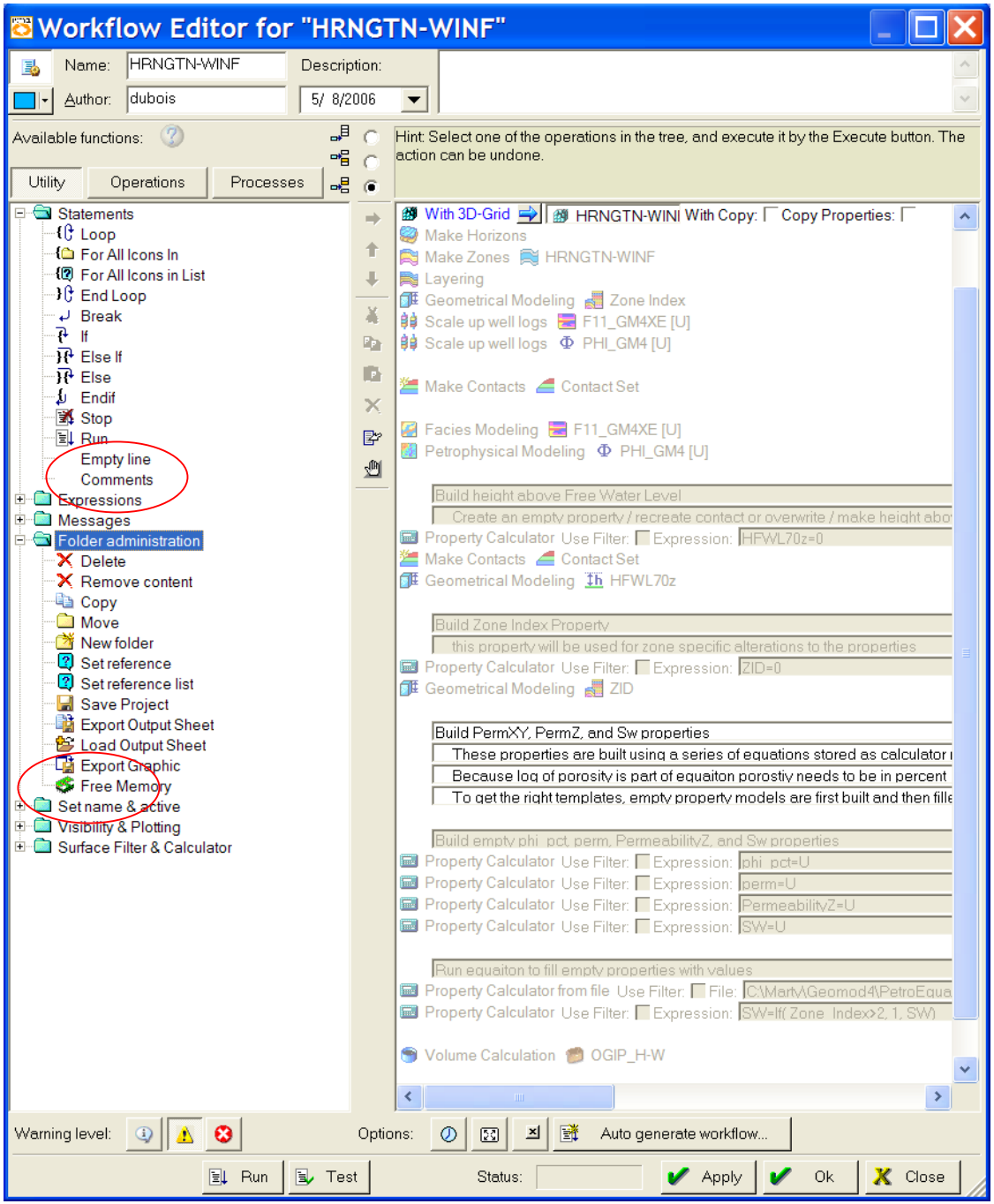
Winf-Ftrly	ZID=If(ZID>0, ZID+2, ZID)
Ftrly-A1sh	ZID=If(ZID>1, ZID+5, ZID)
A1sh-B2LM	ZID=If(ZID>2, ZID+7, ZID)
B2LM-B4LM	ZID=If(ZID>3, ZID+11, ZID)
B4LM-Dsh	ZID=If(ZID>4, ZID+14, ZID)

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.



Inserting Text comments and Free memory

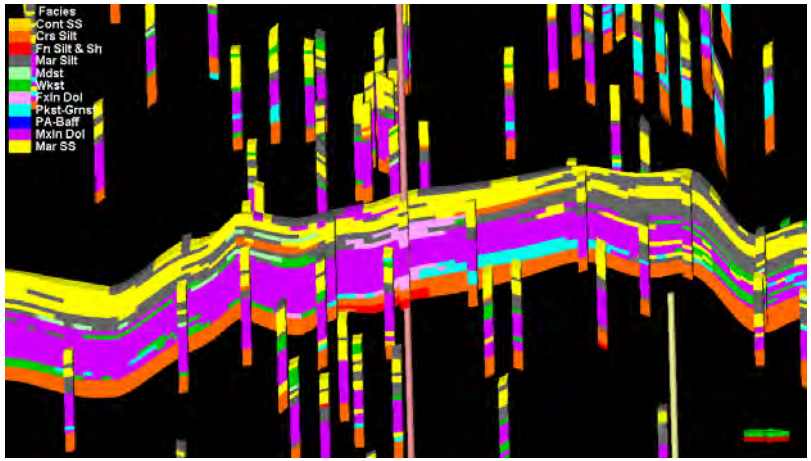


Clear Sw property in dummy zones

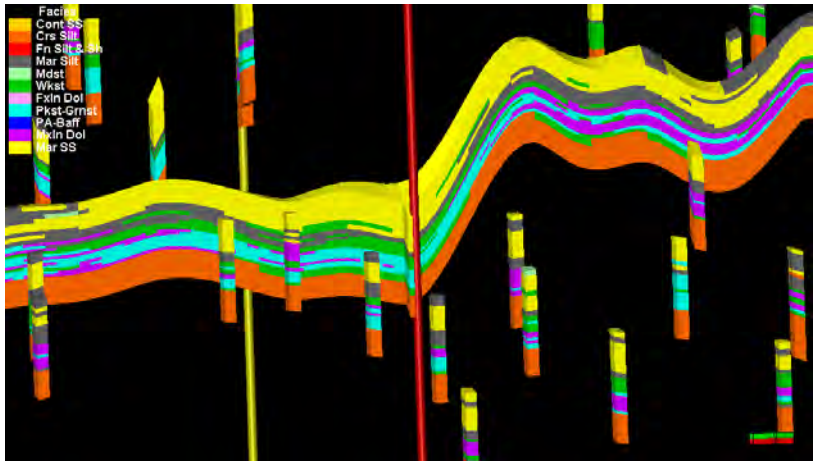
Insert after the property calculators, before volumetric calculations

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)

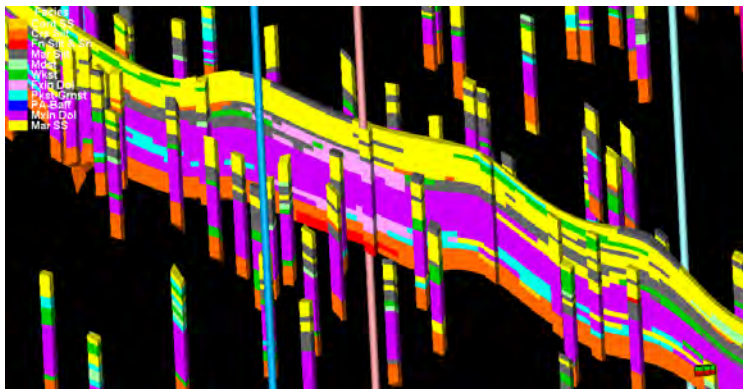
Herington-Krider-Odell core ties



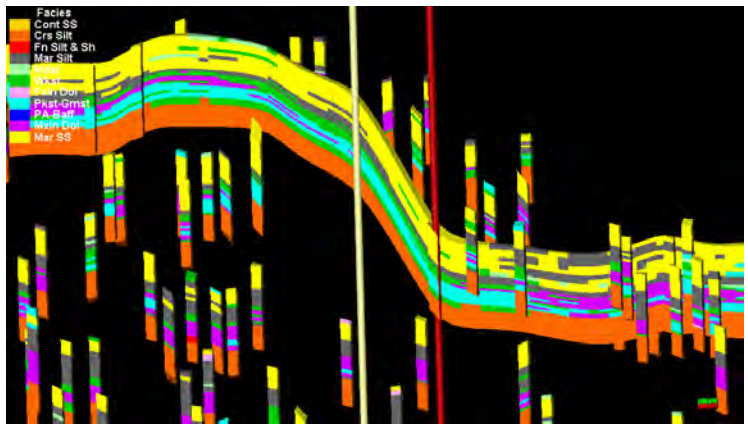
Flower I -direction (S-N)



Shrimplin I-direction (S-N)

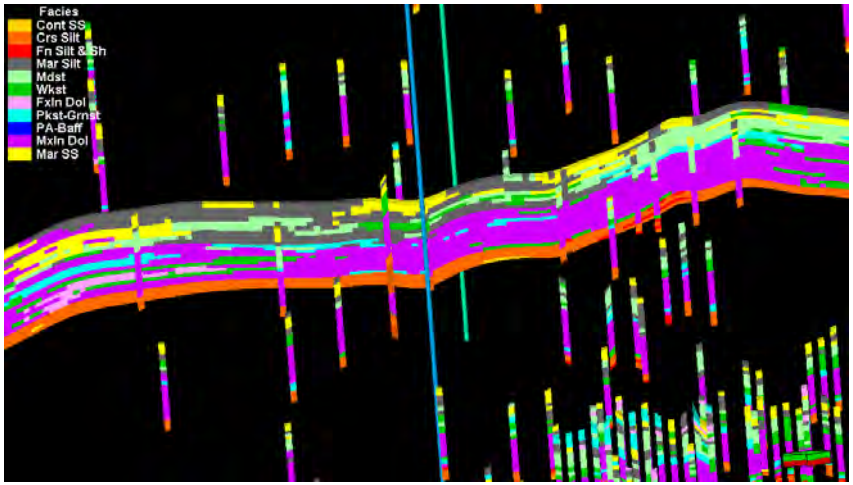


Flower J-direction (W-E)

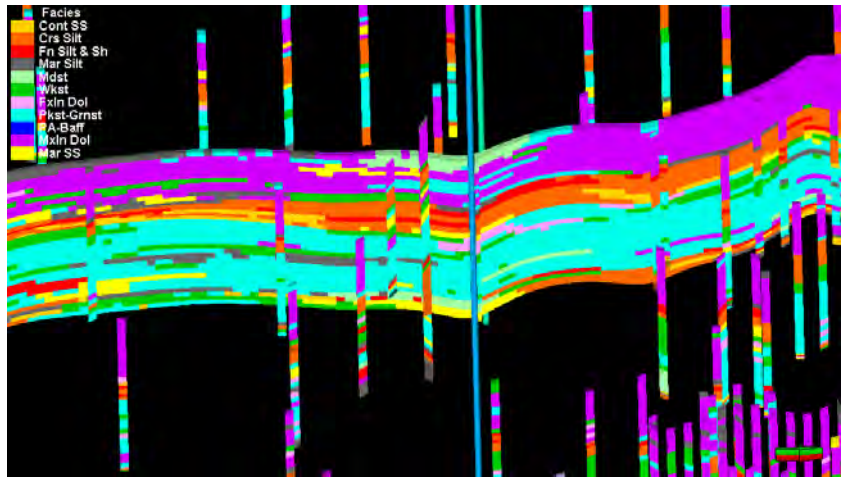


Shrimplin J-direction (W-E)

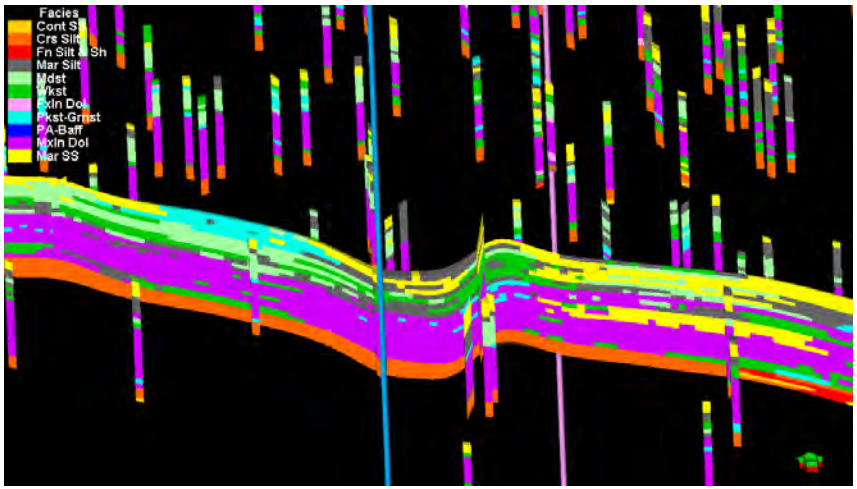
Herington-Krider-Odell and Winfield-Gage-Towanda-B/Towanda core ties



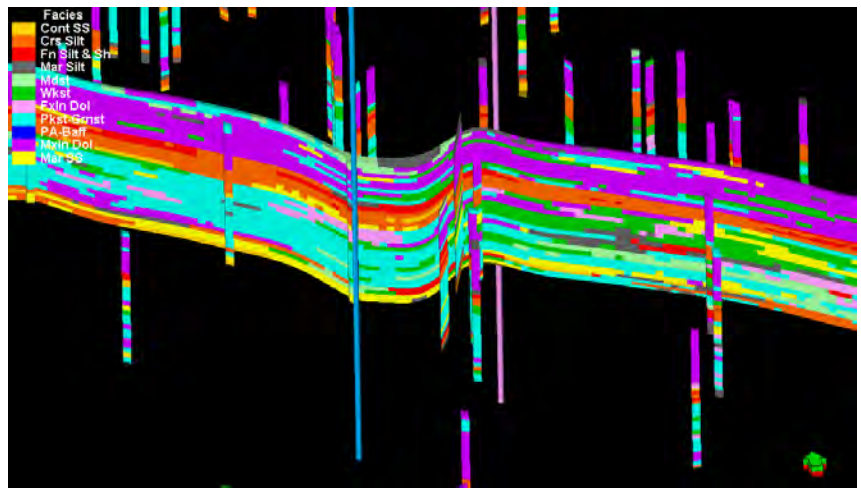
Hoobler I -direction (S-N)



Hoobler I -direction (S-N)

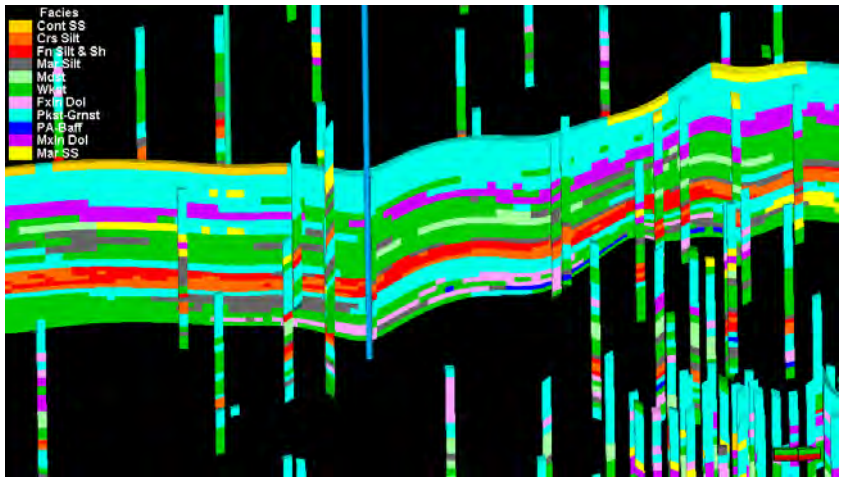


Hoobler J-direction (W-E)

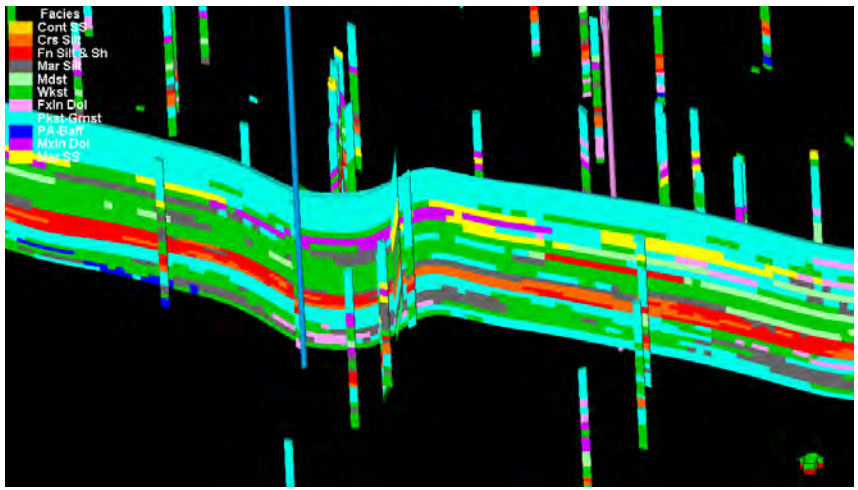


Hoobler J-direction (W-E)

More Hoobler FtRiley-Matfield-Wreford

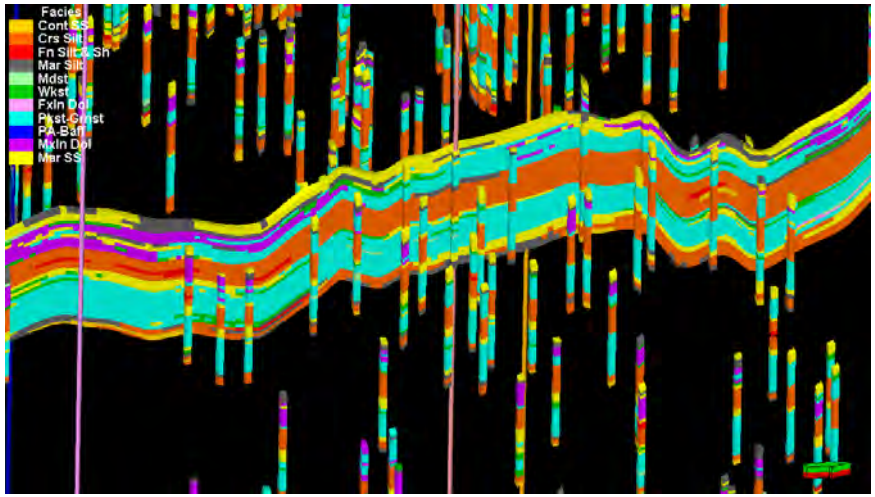


Hoobler I -direction (S-N)

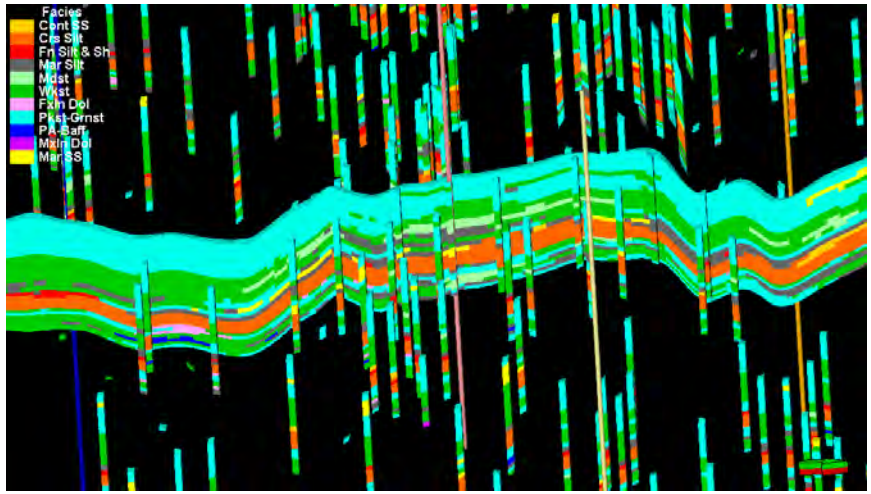


Hoobler J-direction (W-E)

Flower Winfield-B/Twnd & FtRly-Wreford



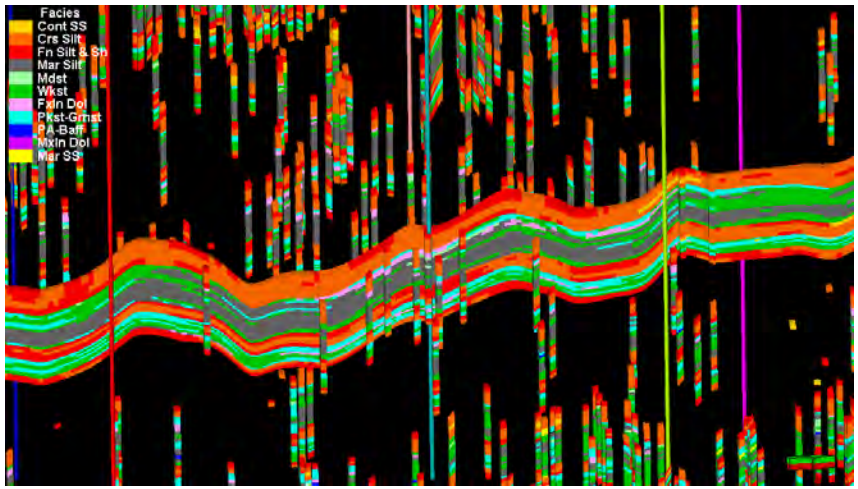
Flower I-direction (S-N)



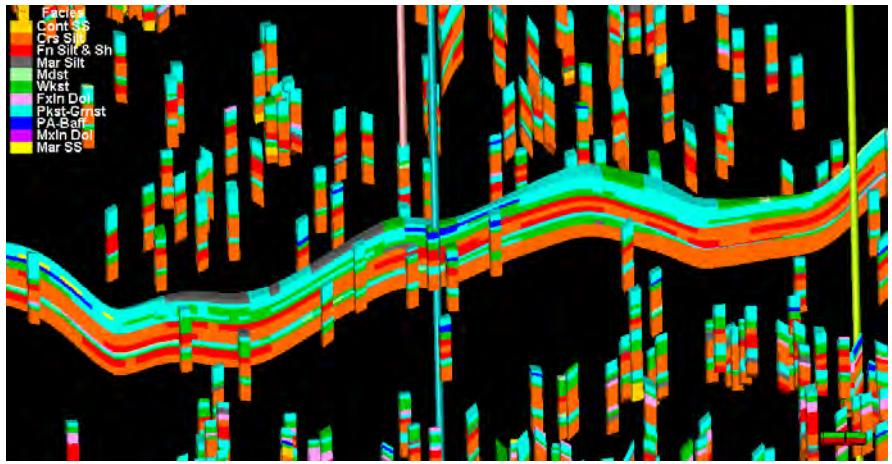
Flower I-direction (S-N)

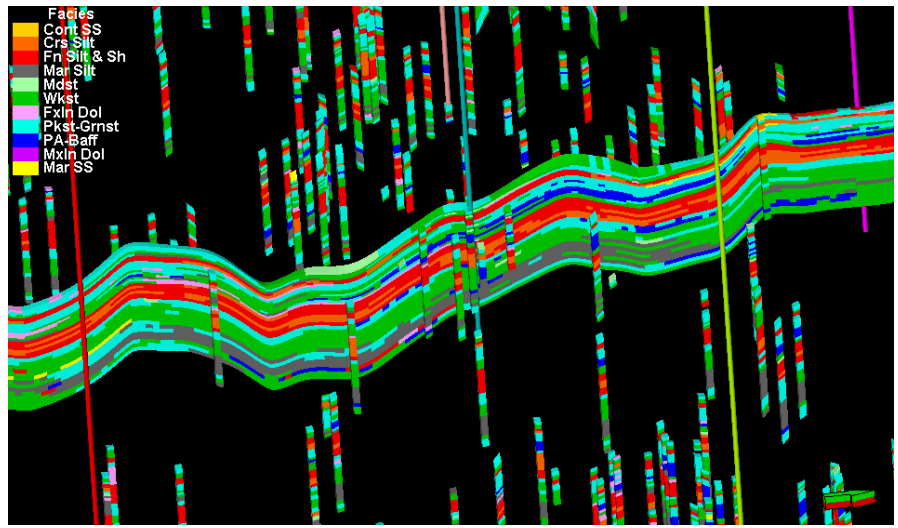
Newby area S-N
(I-direction)
Council Grove

A1SH-B2LM



B2LM-B4LM

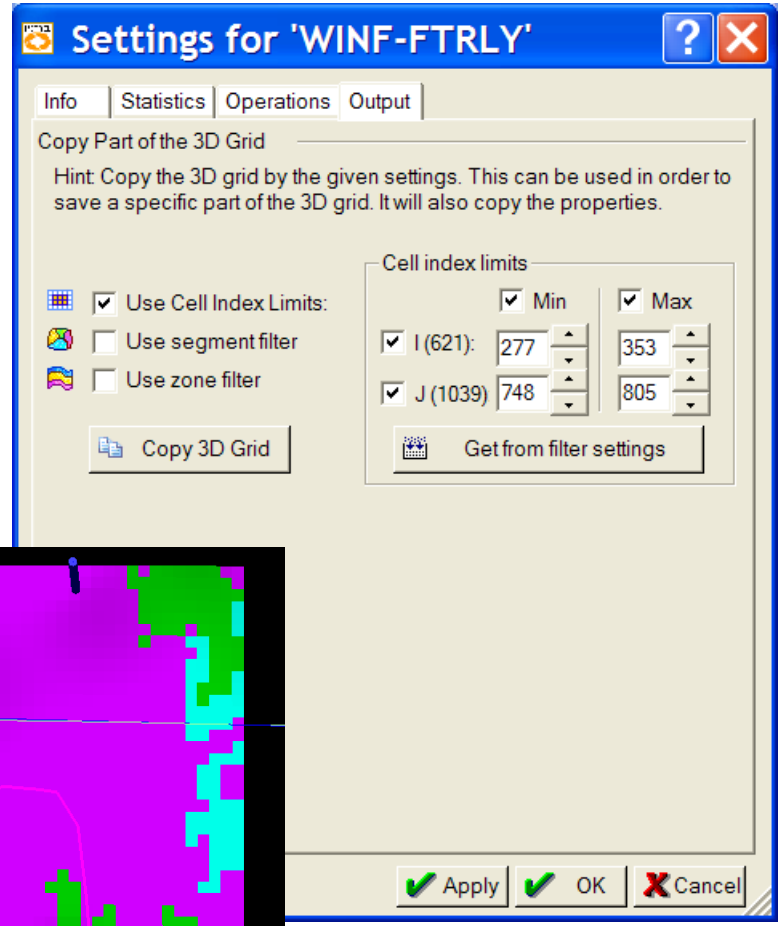


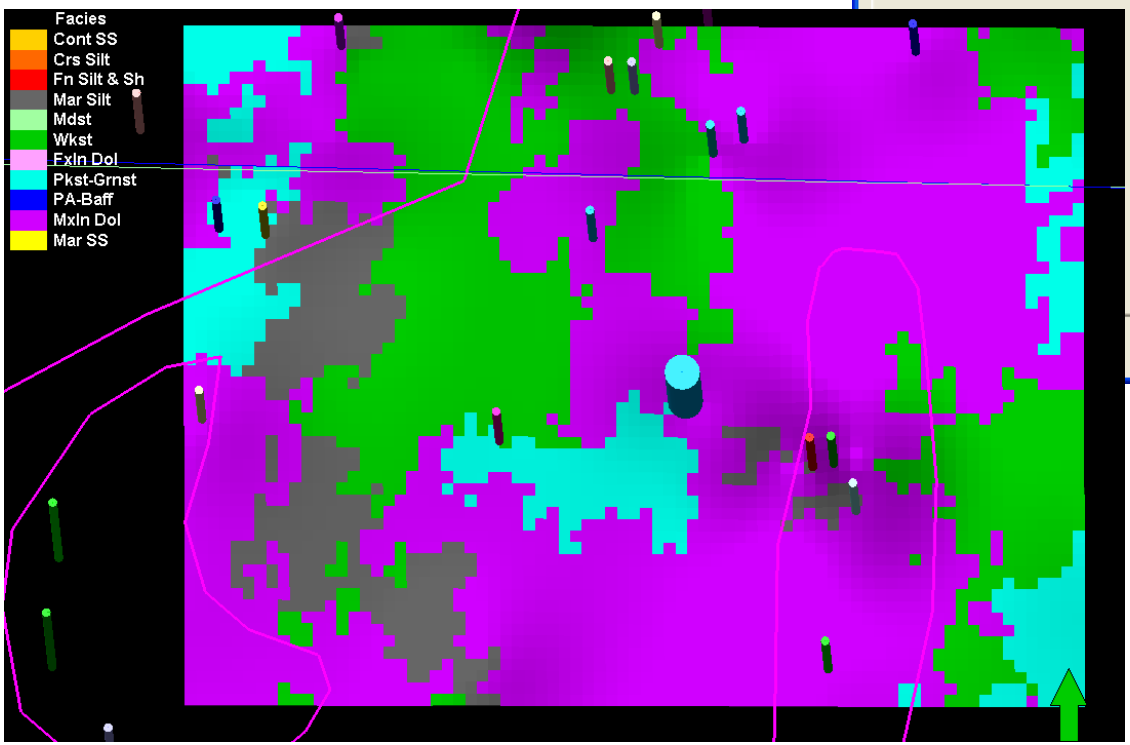


B4LM-DSH

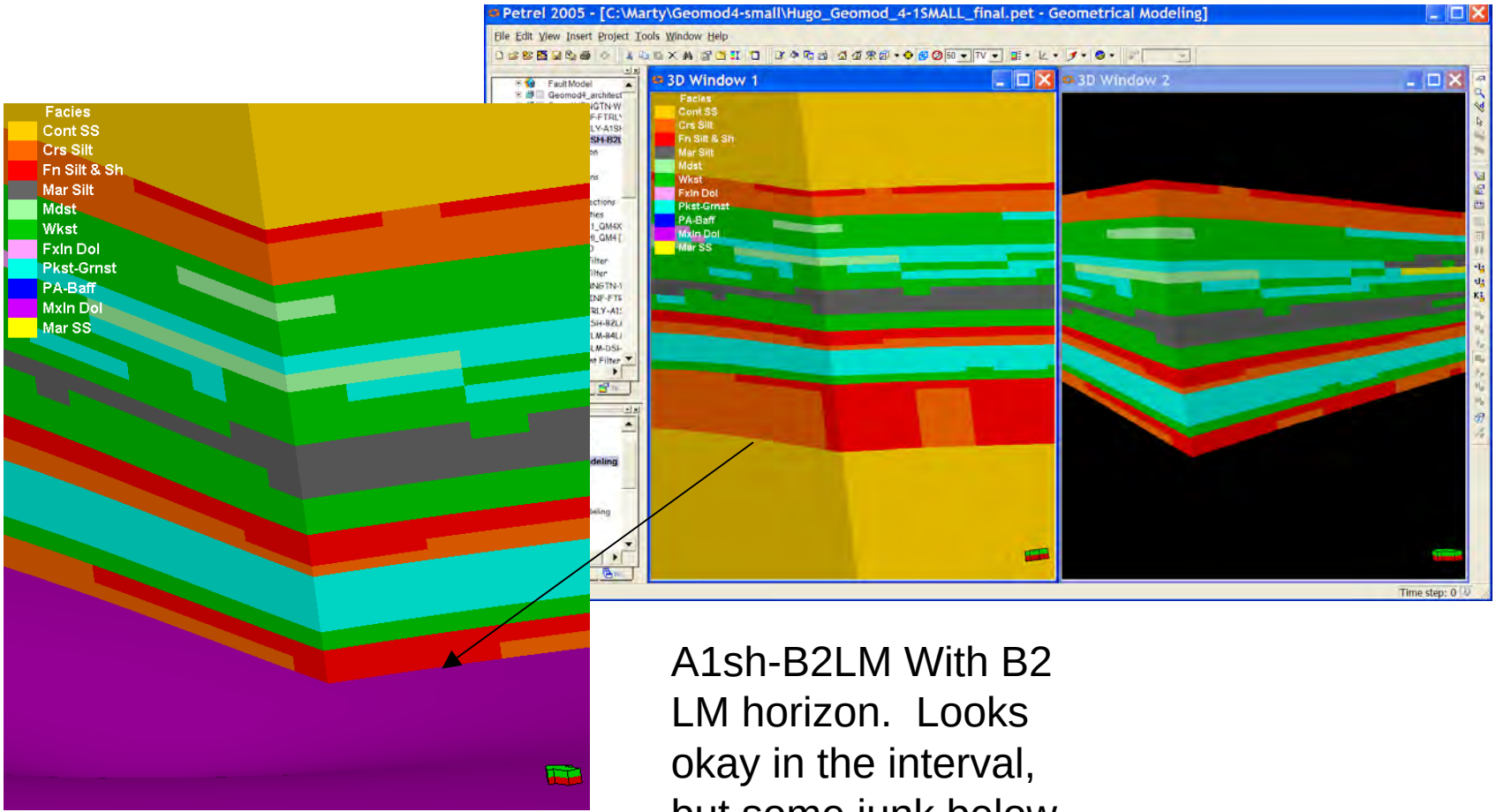
Hoobler area IJ

Min I	277
Max I	353
Min J	748
Max J	805



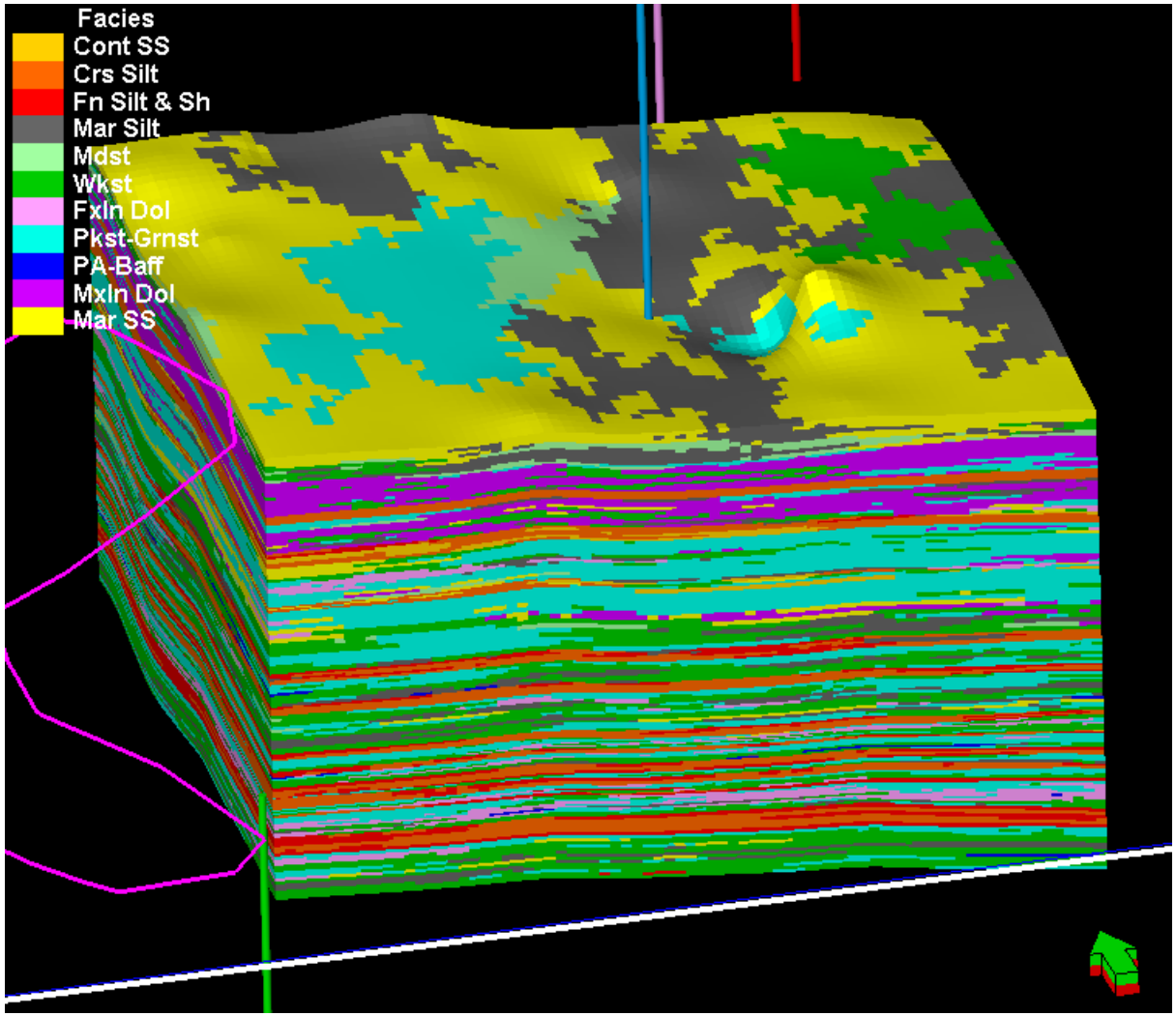


Combine facies models p 14

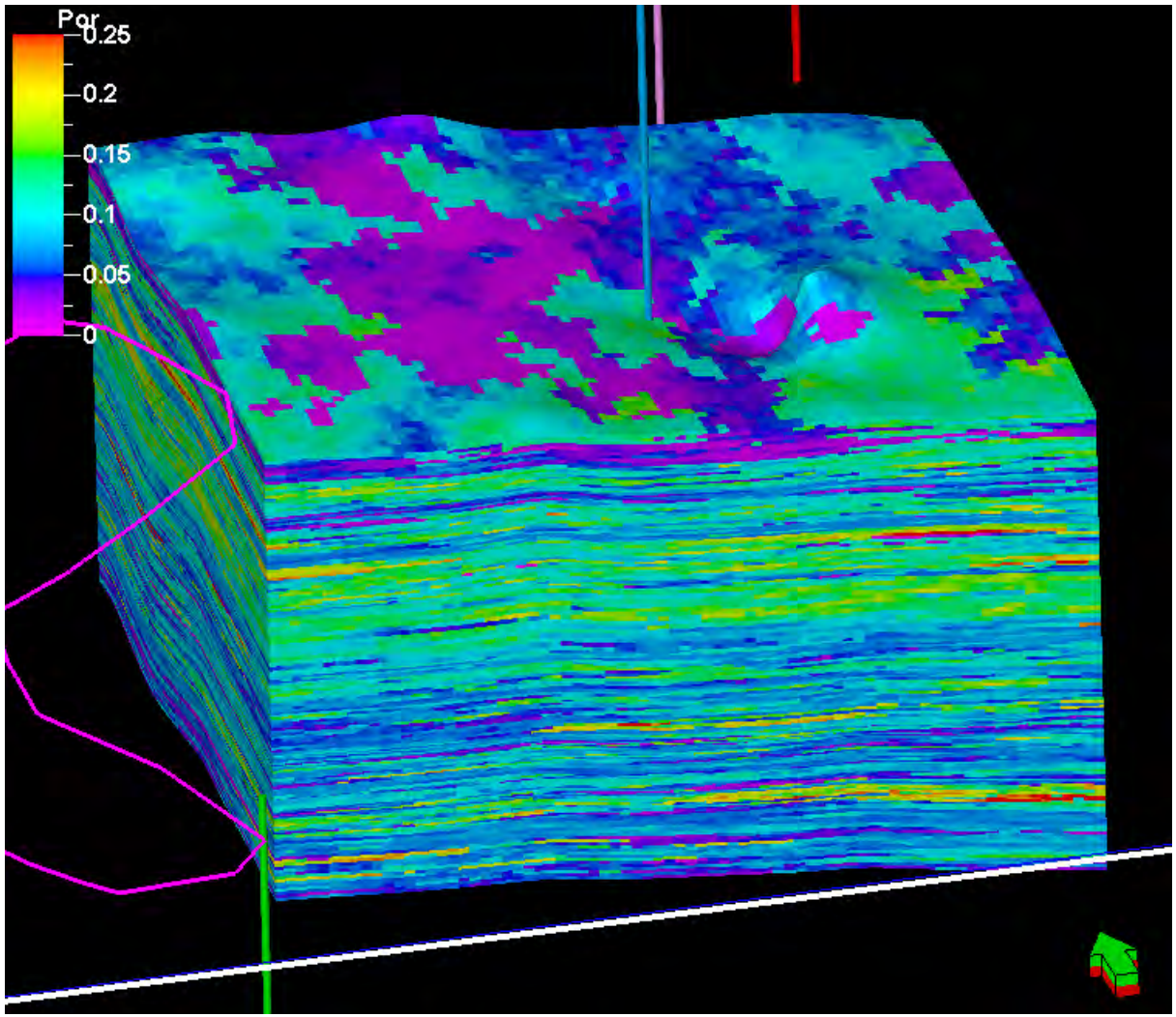


A1sh-B2LM With B2 LM horizon. Looks okay in the interval, but some junk below.

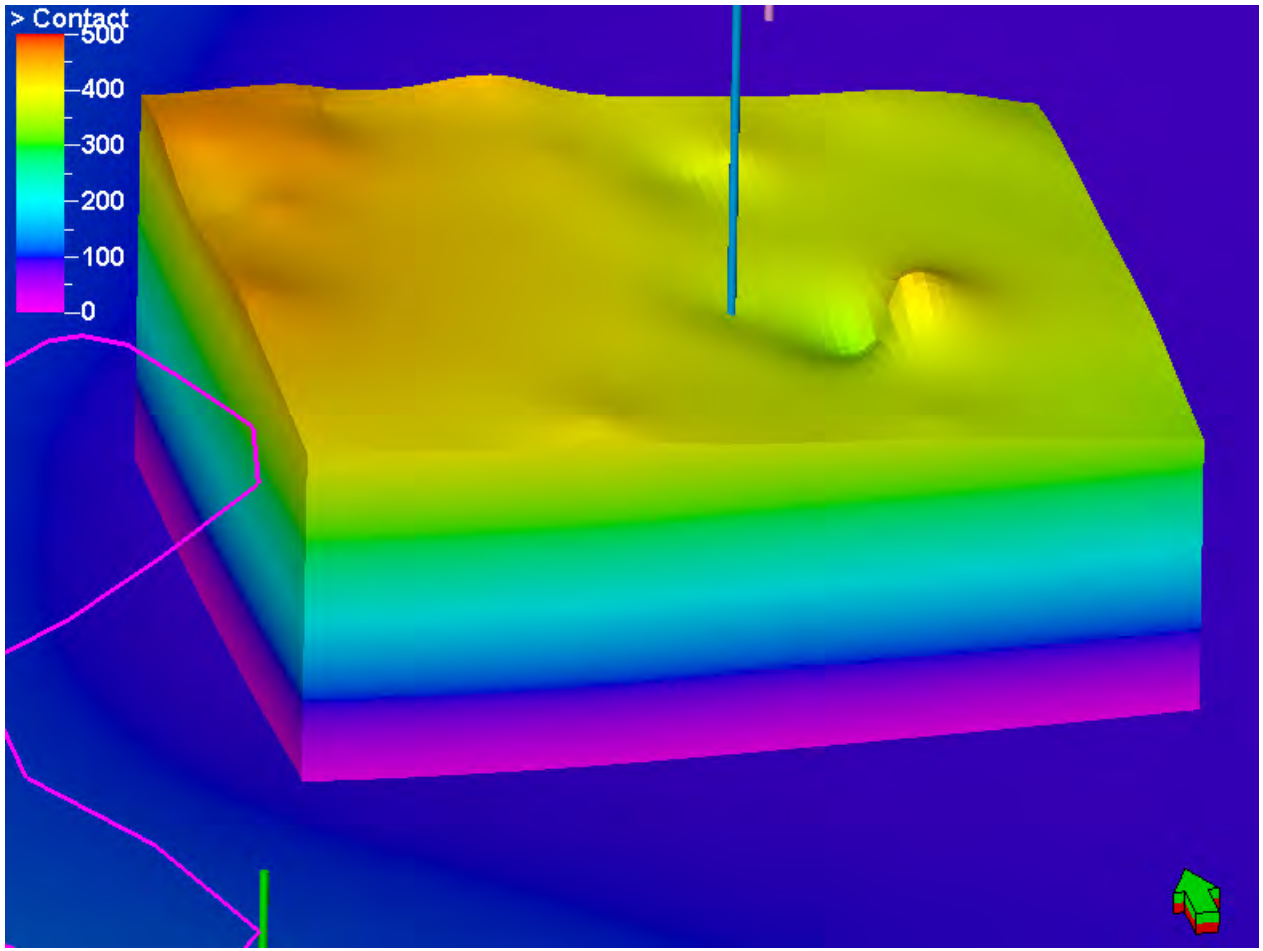
Hoobler combined Facies



Hoobler combined Porosity

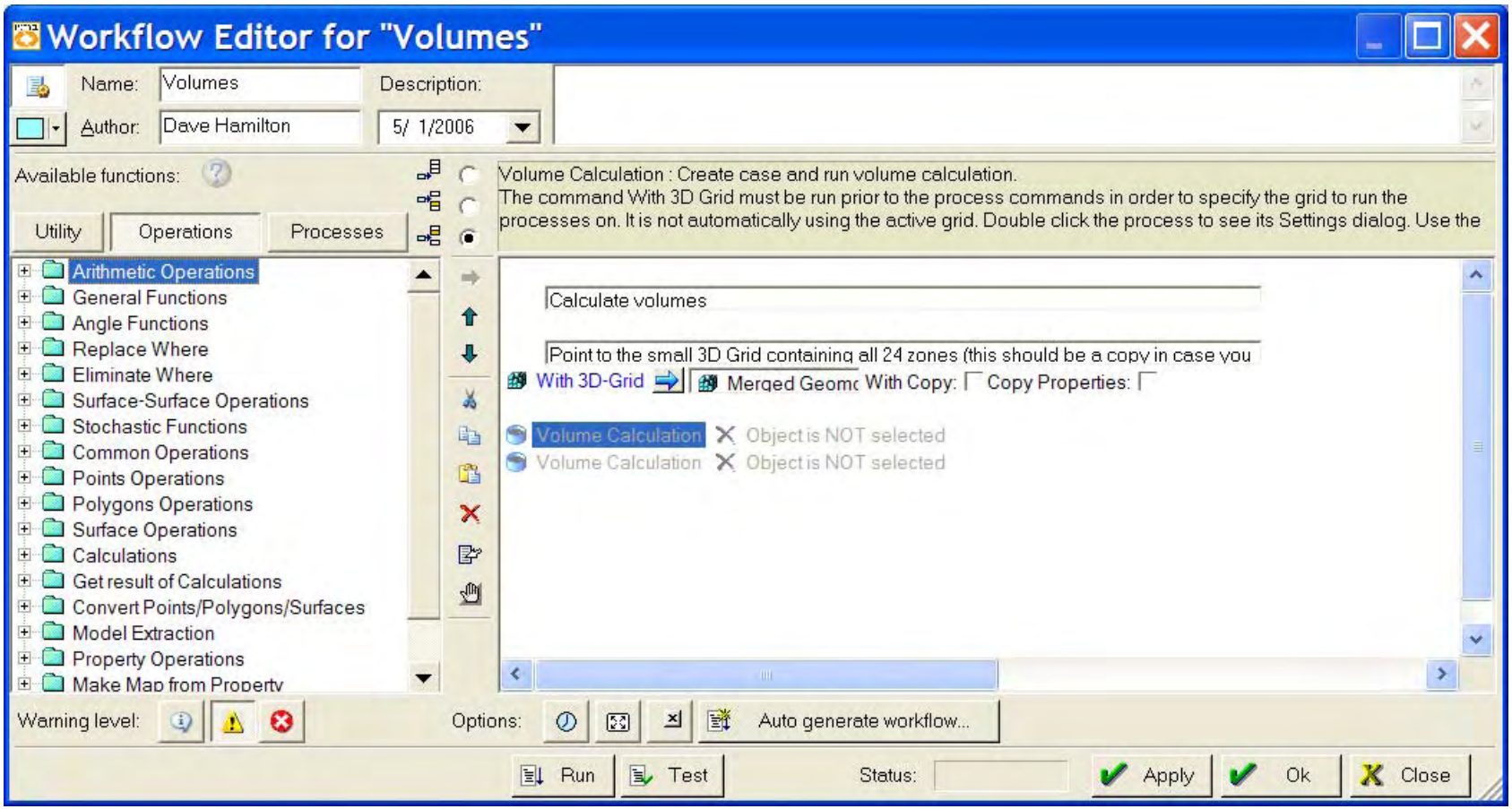


Hoobler HaFWL

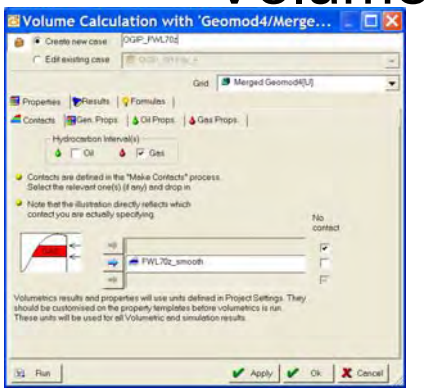


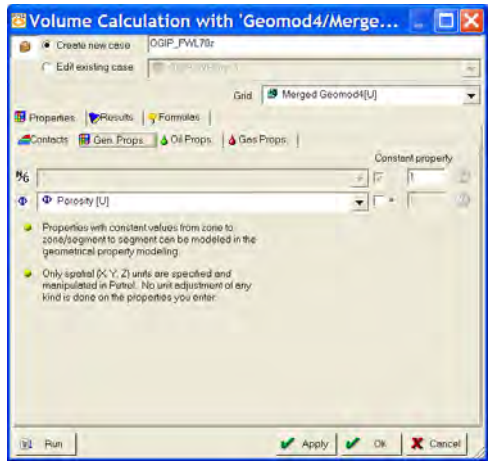
FWL ~ -30 feet

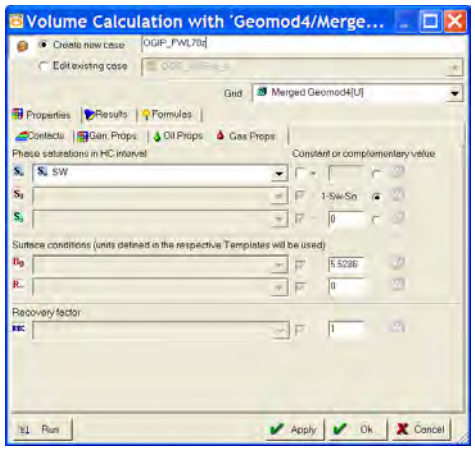
Volumetrics

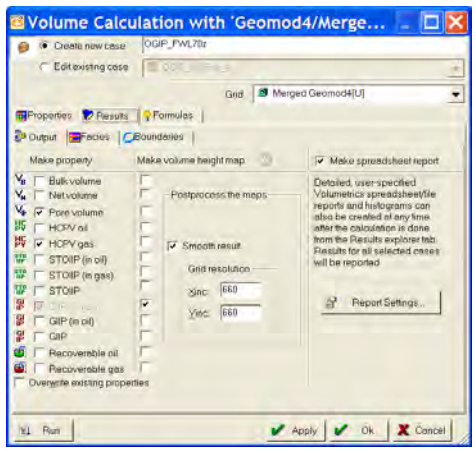


Volumetrics

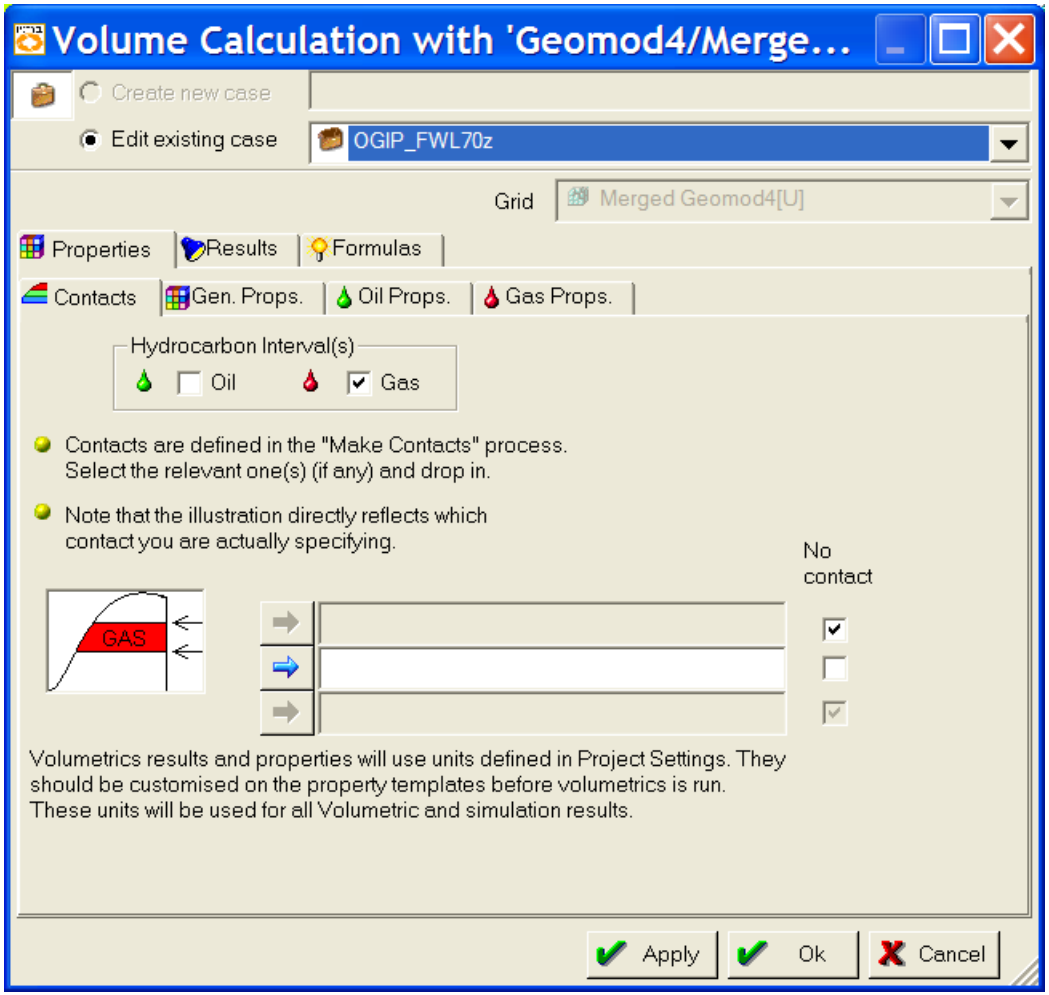




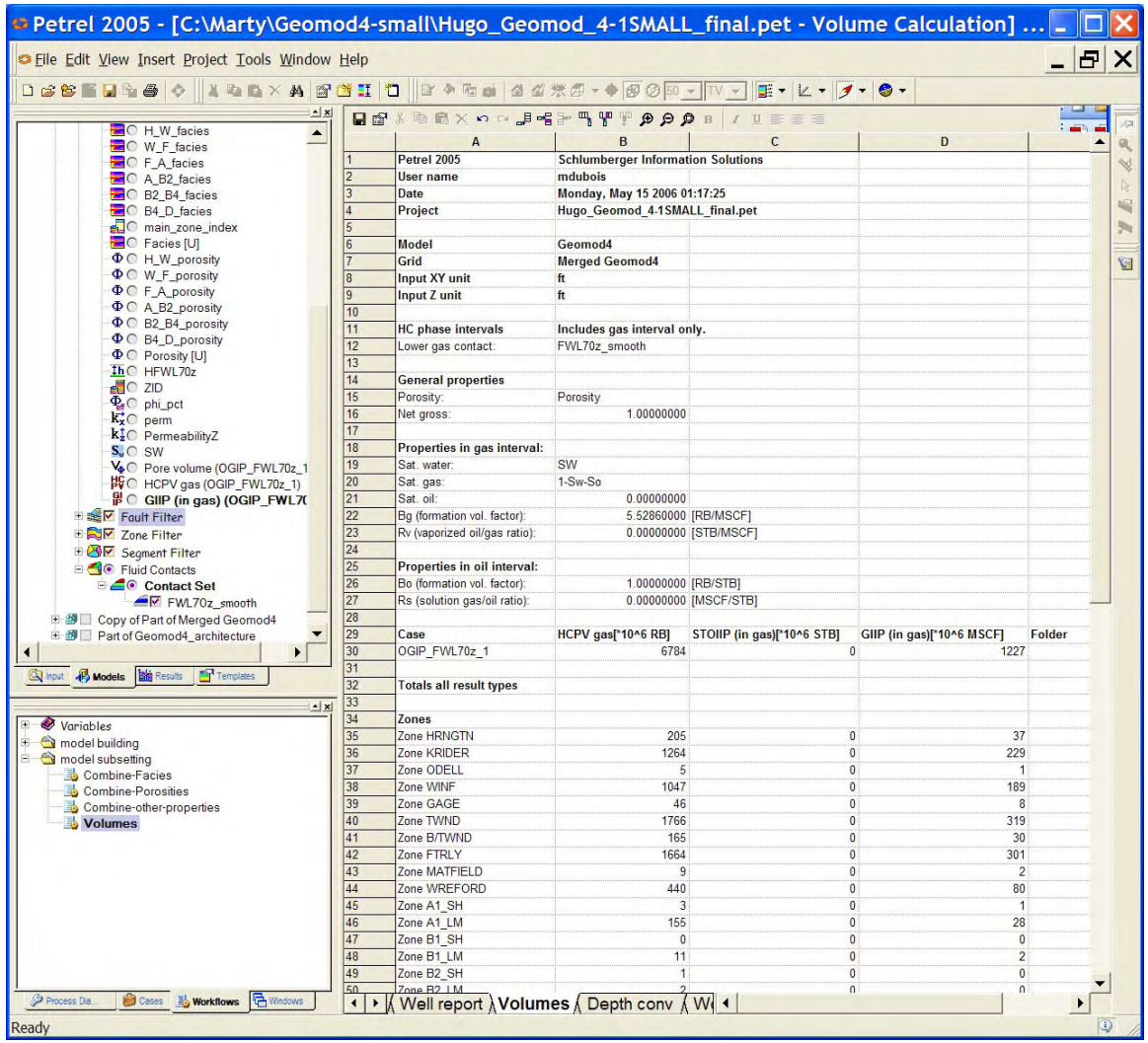




Volumetrics

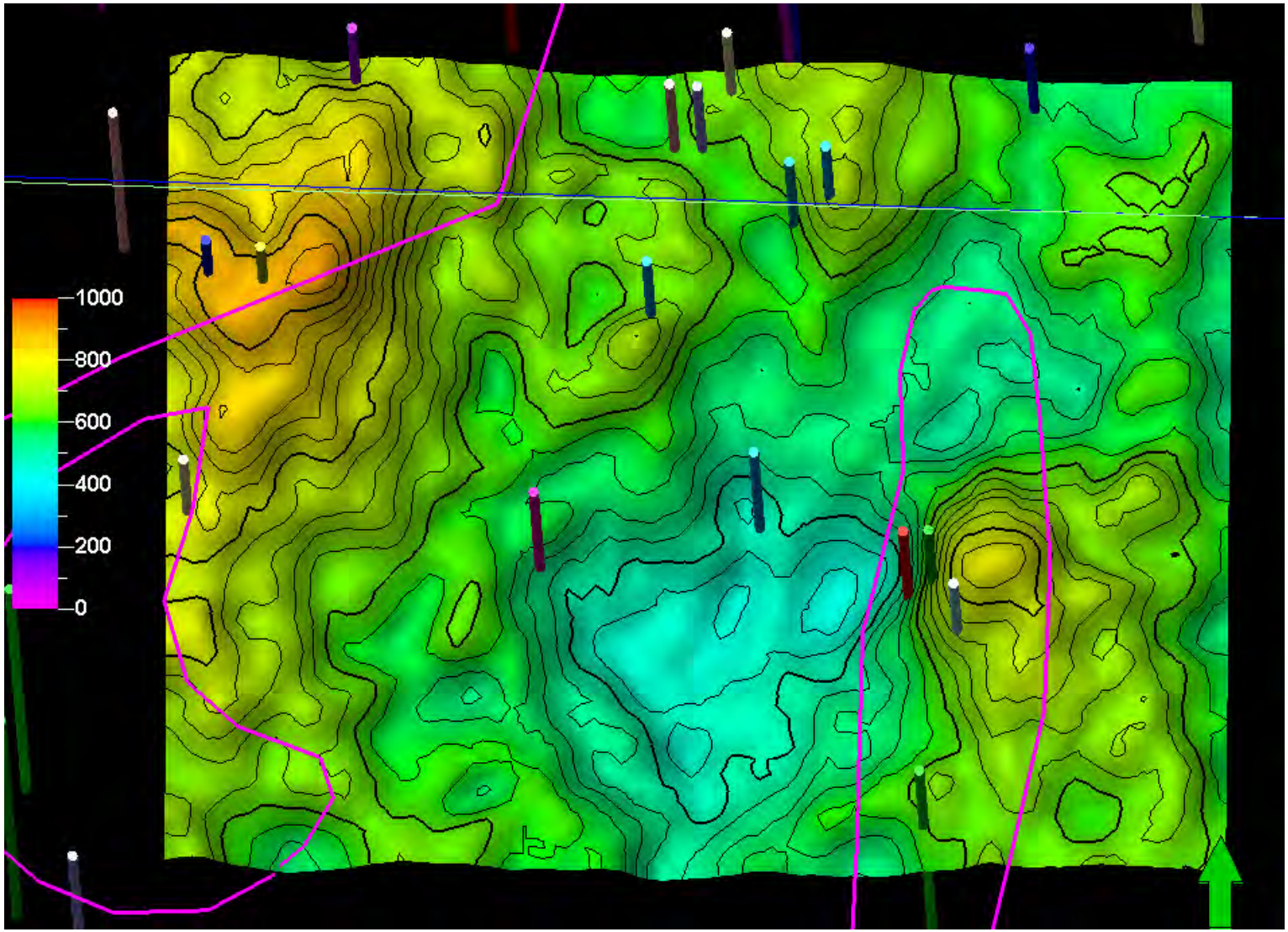


Hoobler Vol Reports

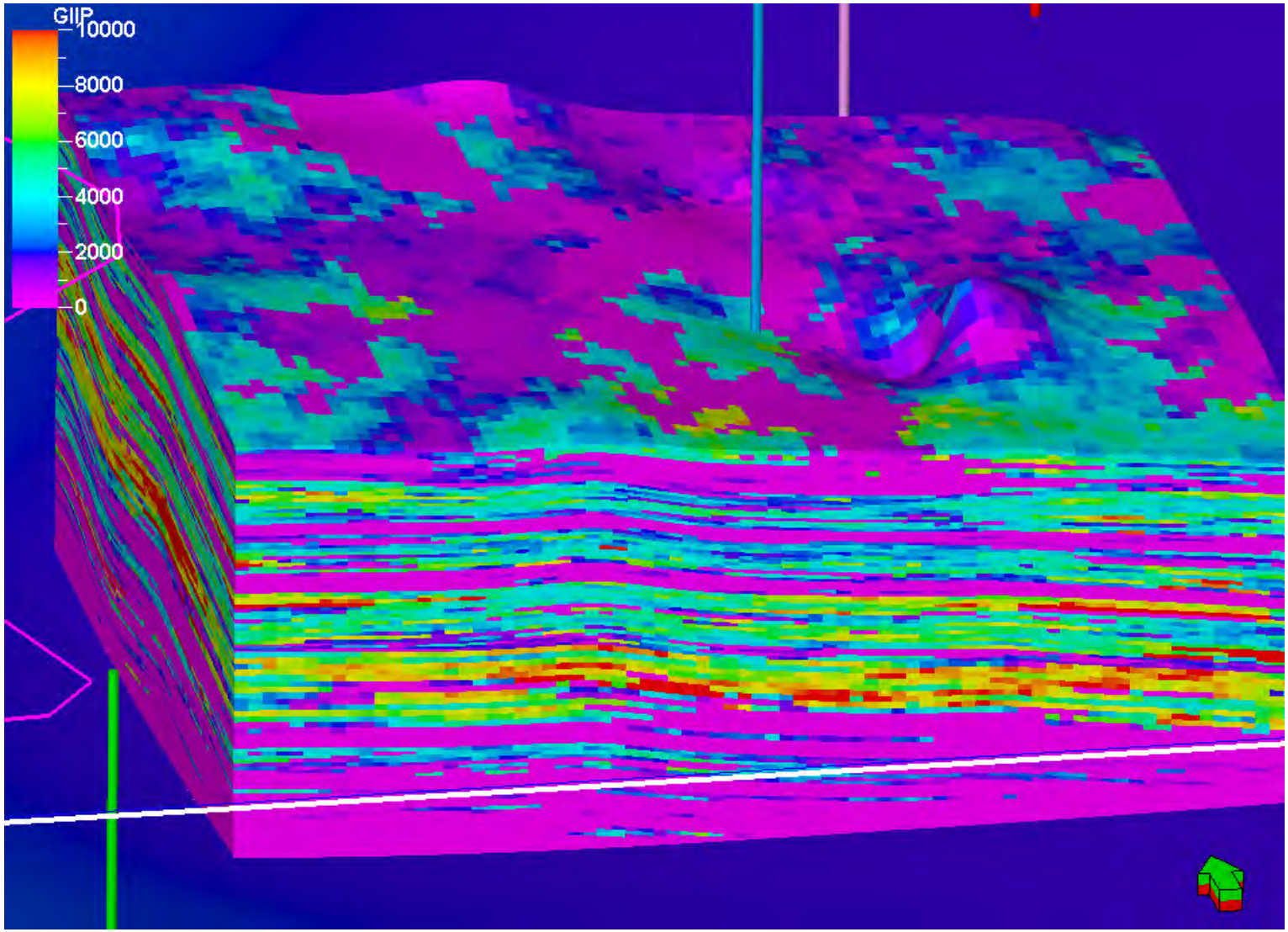


	A	B	C	D	
1	**Petrel 2005**	**Schlumberger Information Solutions**			
2	**User name**	**mdubois**			
3	**Date**	**Monday, May 15 2006 01:17:25**			
4	**Project**	**Hugo_Geomod_4-1SMALL_final.pet**			
5					
6	**Model**	**Geomod4**			
7	**Grid**	**Merged Geomod4**			
8	**Input XY unit**	**ft**			
9	**Input 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]**	**STOIIP (in gas)[*10^6 STB]**	**GIIP (in gas)[*10^6 MSCF]**	**Folder**
30	OGIP_FWL70z_1	6784	0	1227	
31					
32	**Totals all result types**				
33					
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	

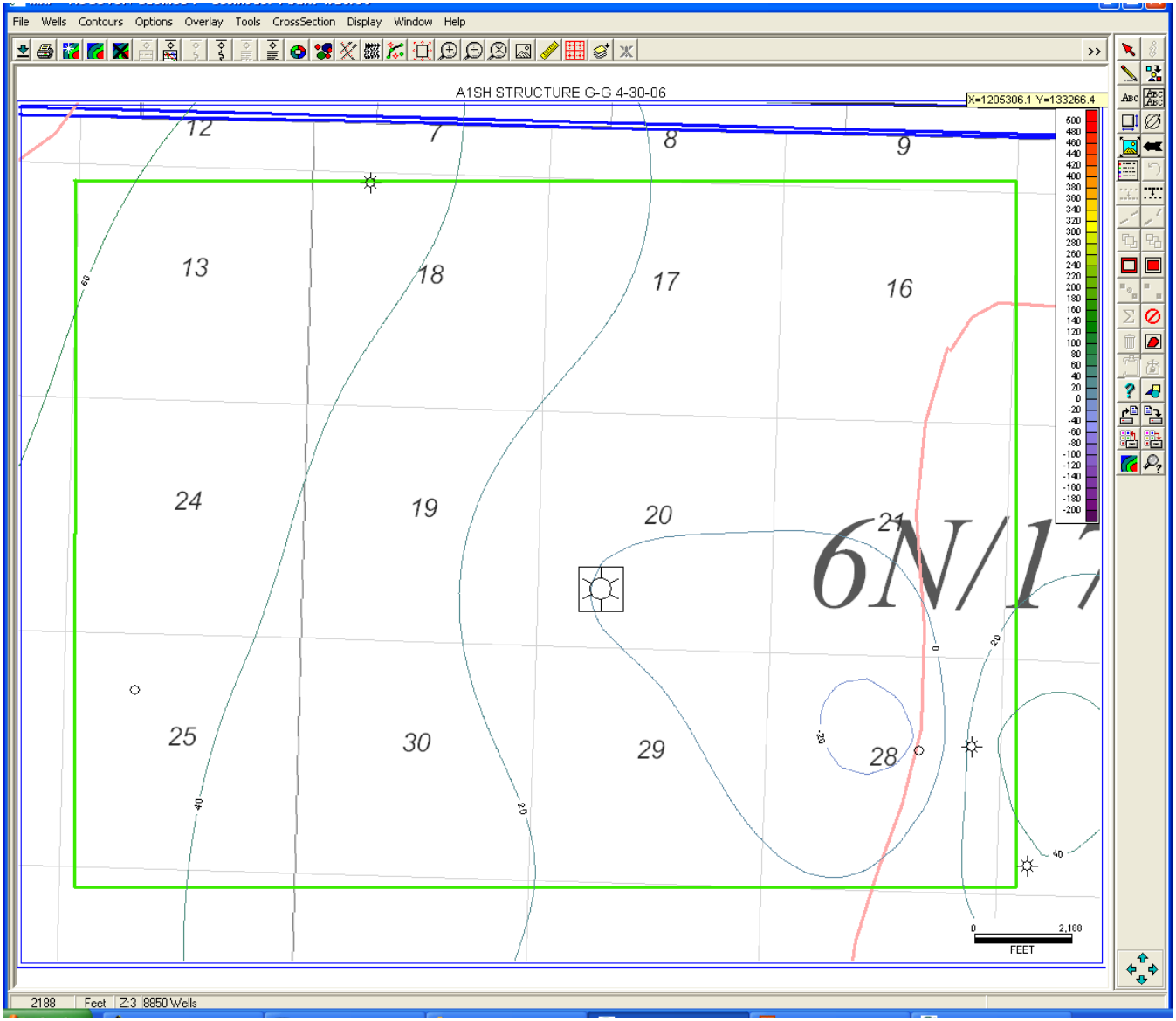
Hoobler HCH (OGIP) map



Hoobler OGIP cube



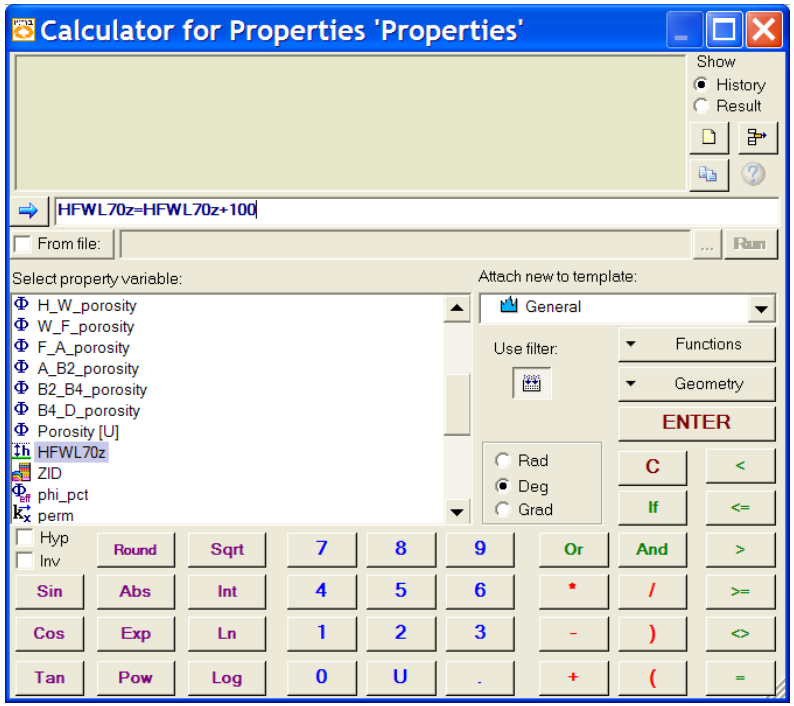
Hoobler small 3X4 model

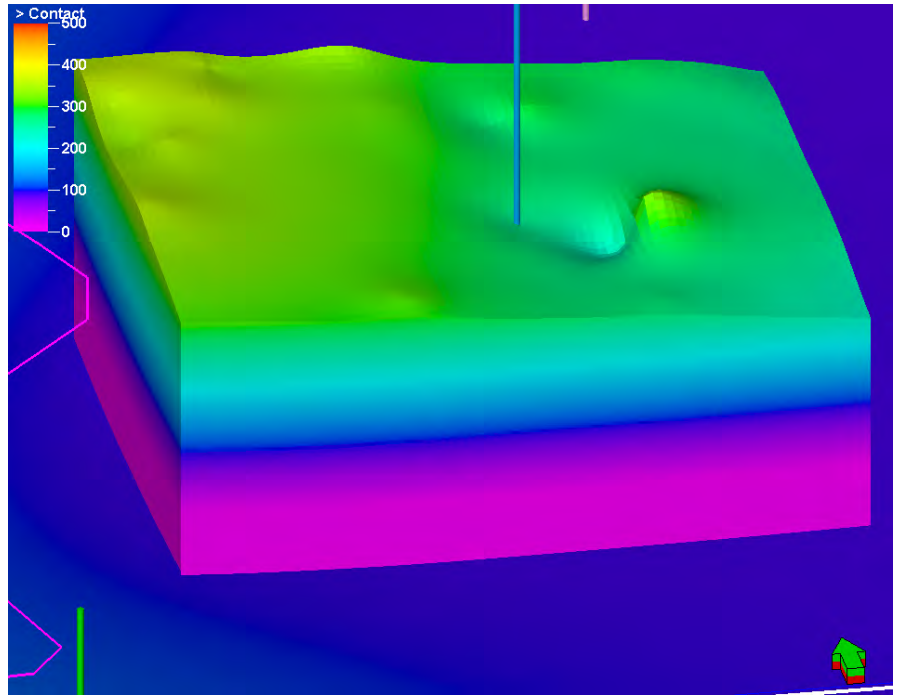


Hoobler Model Area Cum. Gas

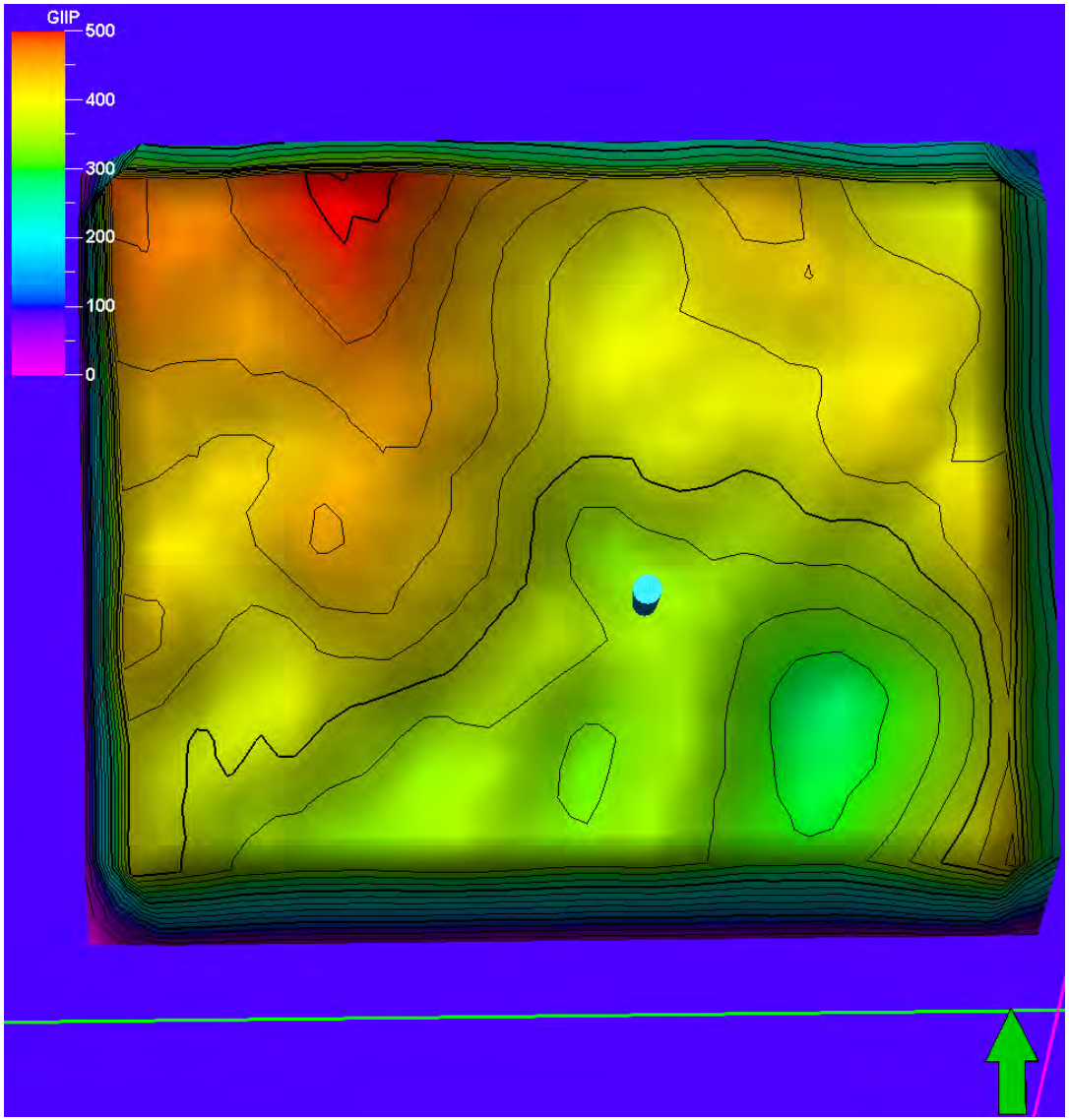
API	OPER	HooblerArea	WE	SPUD_	PROD	SYM	SE	TO	RA	YYYYMM	CUM_GAS
35139015660000	REPUBLIC NAT	DANIELS	1	1/1/1946	CHSE	GAS	17	6N	17E	200504	8,356,932
35139015670000	REPUBLIC NAT	CUSTER	1	1/1/1947	CHSE	GAS	18	6N	17E	200504	6,020,519
35139015680000	REPUBLIC NAT	TOWNER	1	1/1/1946	CHSE	GAS	19	6N	17E	200504	4,532,704
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	EBRSOL/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 UNI	3	9/11/1992	CHSE	GAS	24	6N	16E	200504	903,085
35139230470000	ANADARKO PE	HJV 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	HJV JAVUREK `A	1	11/9/1999	CGRV	GAS	21	6N	17E	200205	212,813
									Count	**Interval**	
									14	**Chase**	**70,068,124**
									5	**Cgrv**	**1,803,351**
									19	**Wolfcamp**	**71,871,475**

Modify FWL in steps





OGIP in HCH



Hoobler Change in OGIP with 100’ change in FWL

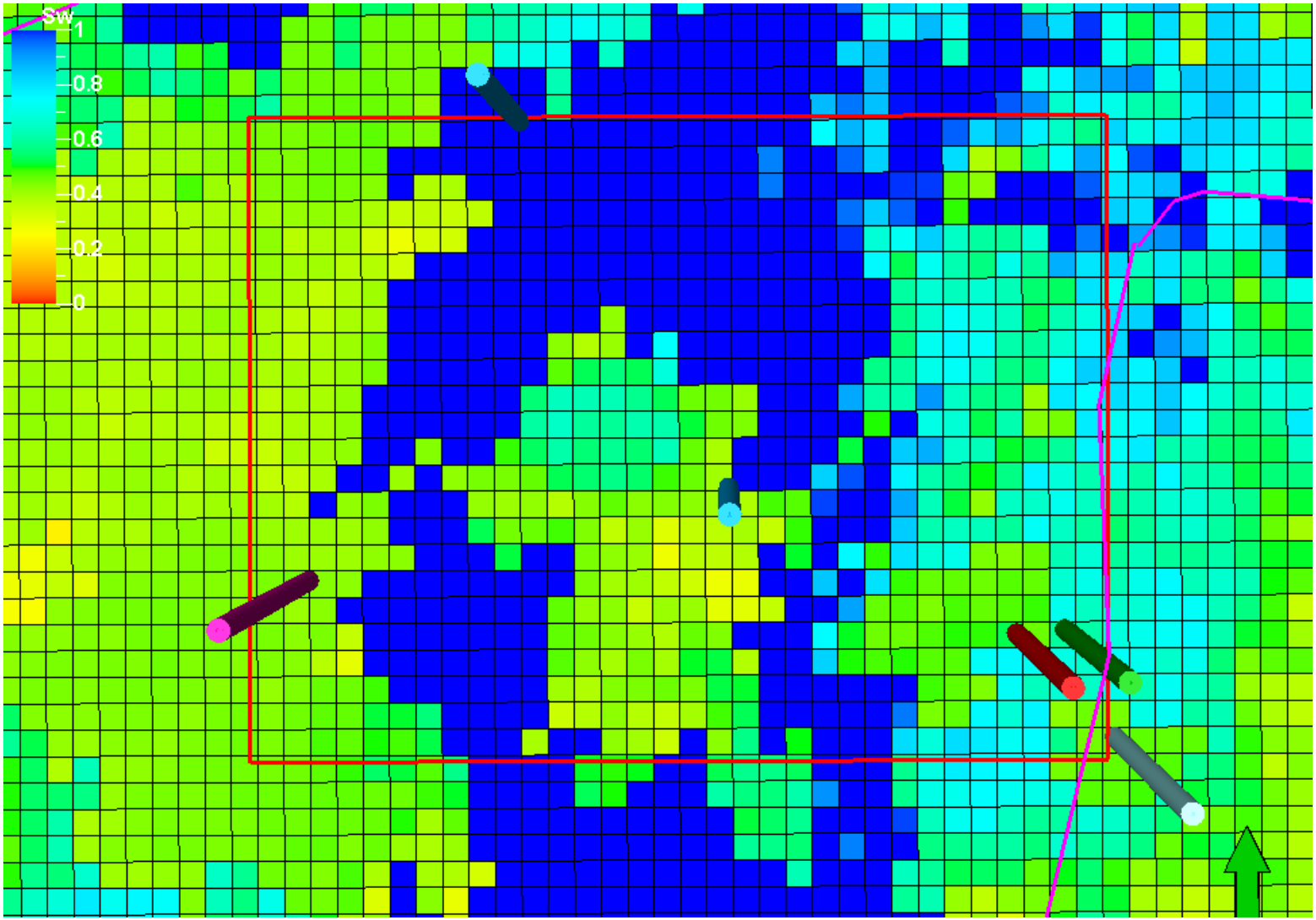
	FWL70z			FWL70z -100		
	HCPV	GIIP		HCPV	GIIP	
	*10^6 RB	0^6 MSCF		*10^6 RB	0^6 MSCF	
HRNGTN	26	5		22	4	
KRIDER	171	31		161	29	
ODELL	0	0		0	0	
WINF	135	24		123	22	
GAGE	16	3		10	2	
TWND	264	48		222	40	
B/TWND	26	5		17	3	
FTRLY	232	42		133	24	
MATFIELD	1	0		0	0	
WREFOR	59	11		0	0	
A1_SH	0	0		0	0	
A1_LM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

Upscale 3X4 section Hoobler simulation model

Hoobler simulation coordinates

(57,18)

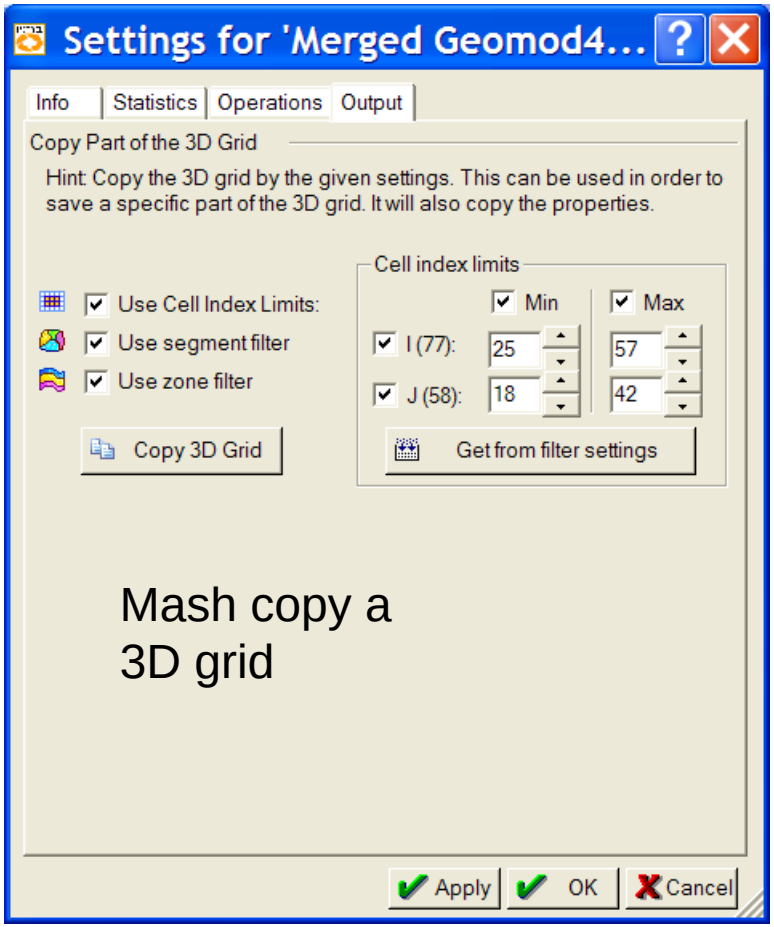
(57,19)



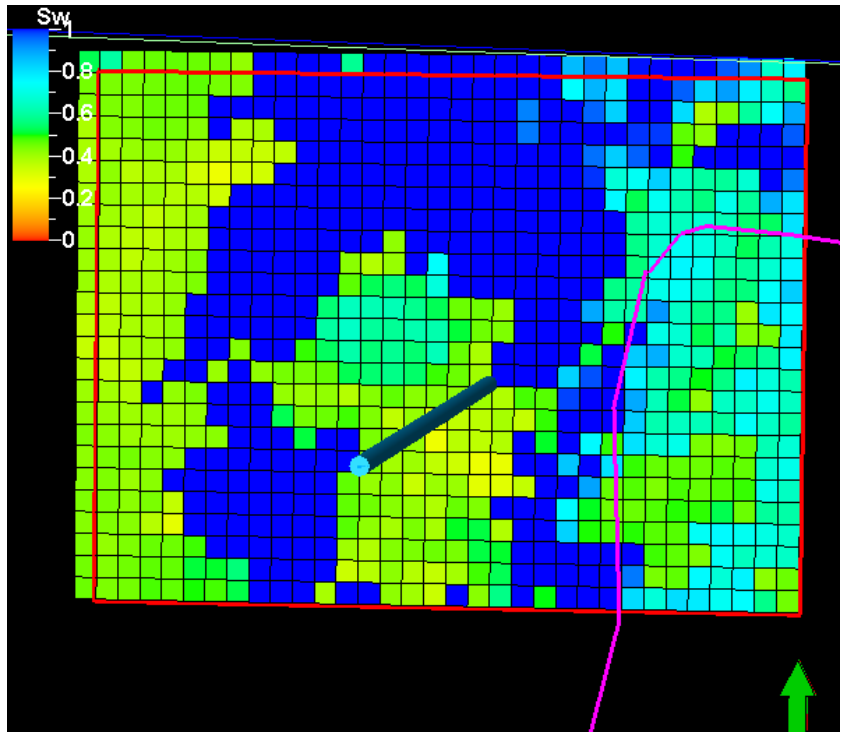
(26,42)

(25,42)

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



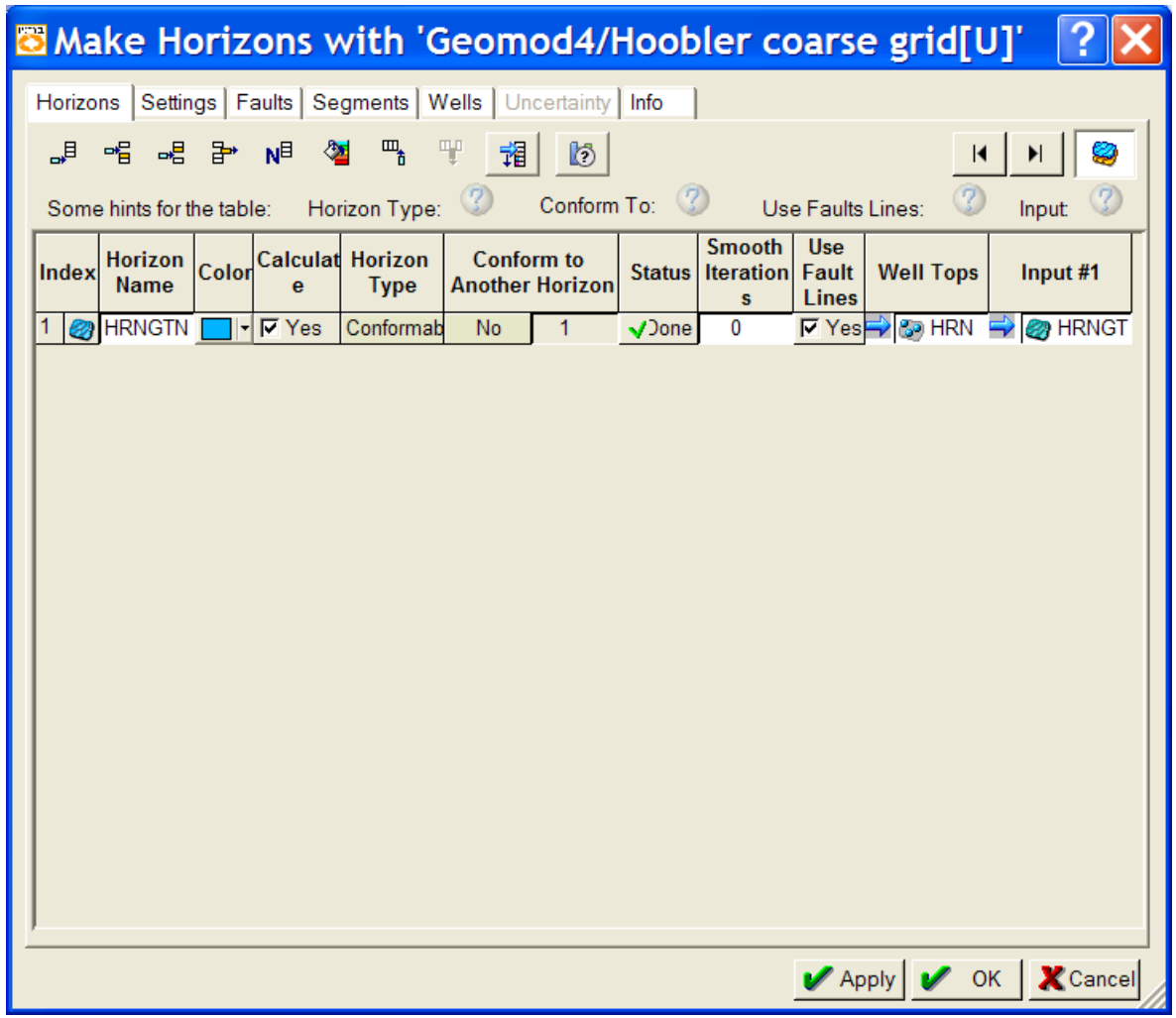
Mash copy a 3D grid



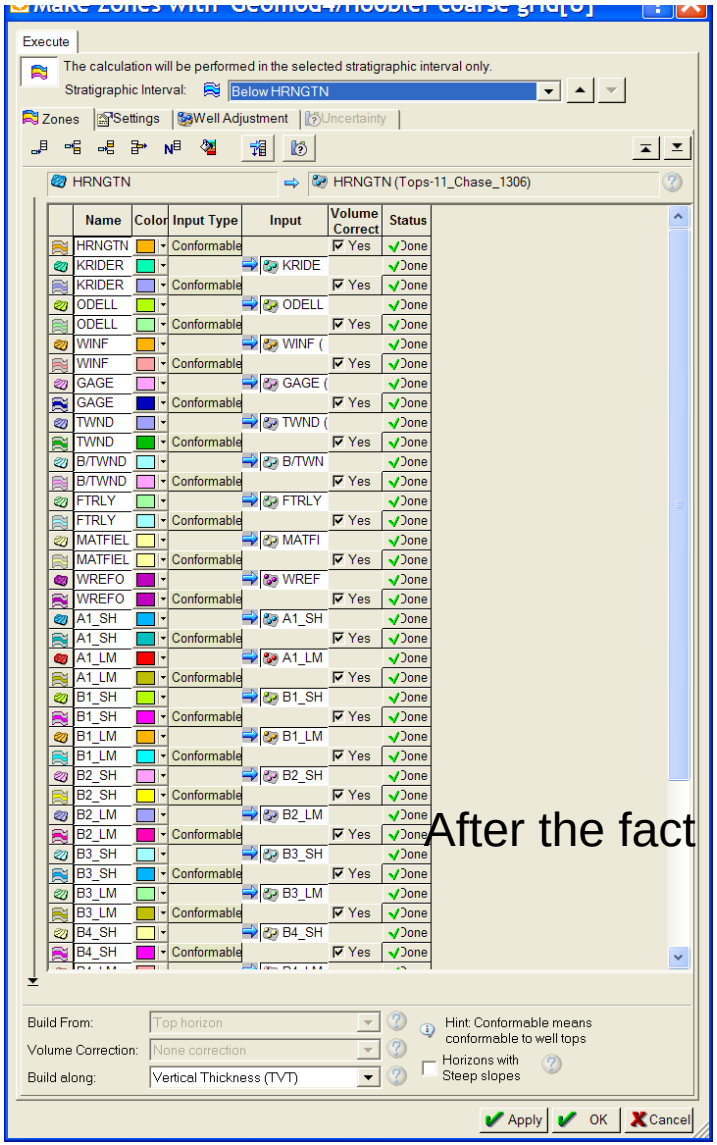
And delete properties not needed

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

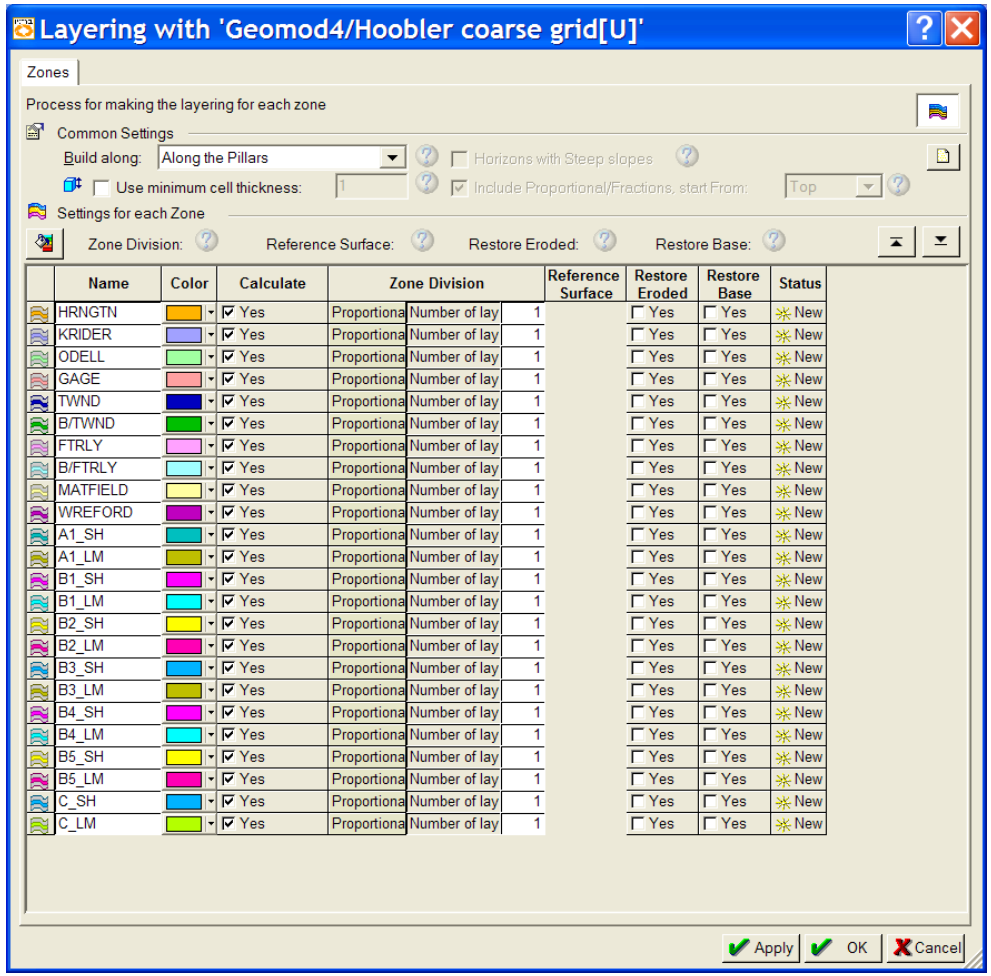
1. Delete all the properties
2. Make Horizons (new Hrngtn Horizon)



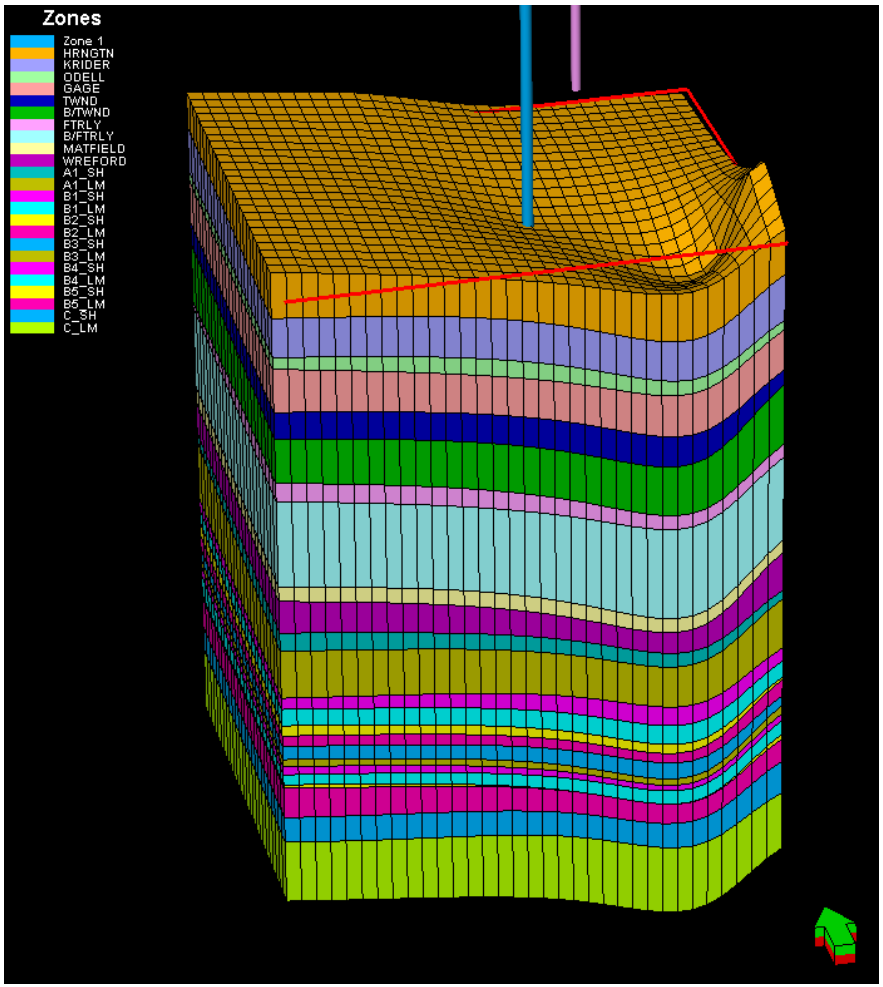
Make new zones and re-layer to one each



After the fact

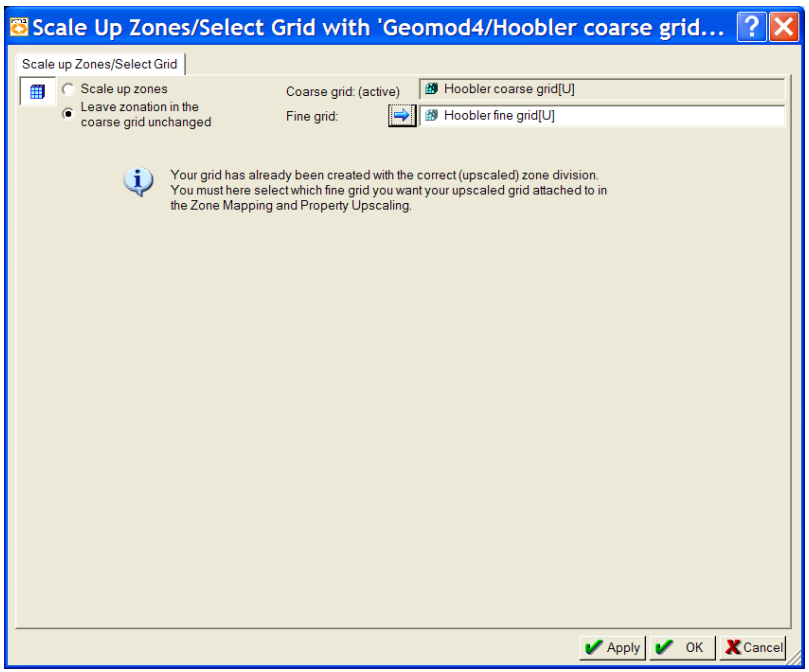


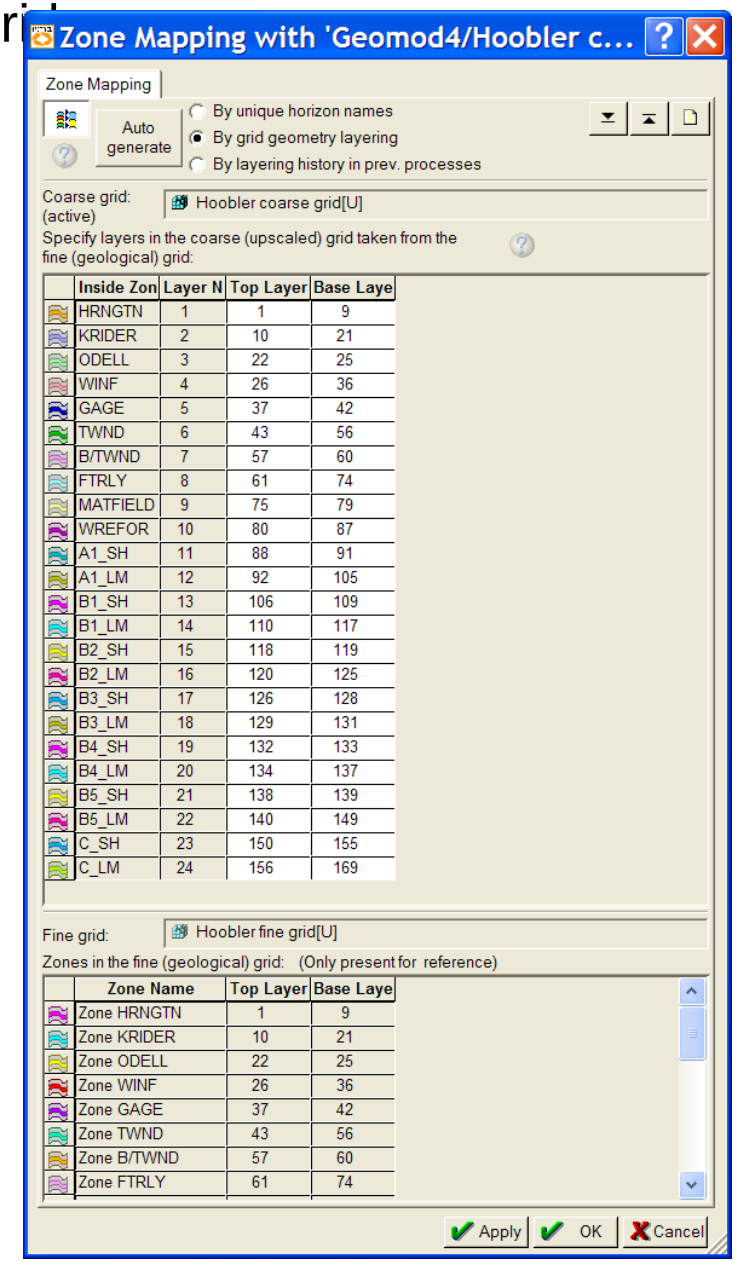
Check after creating zone index



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

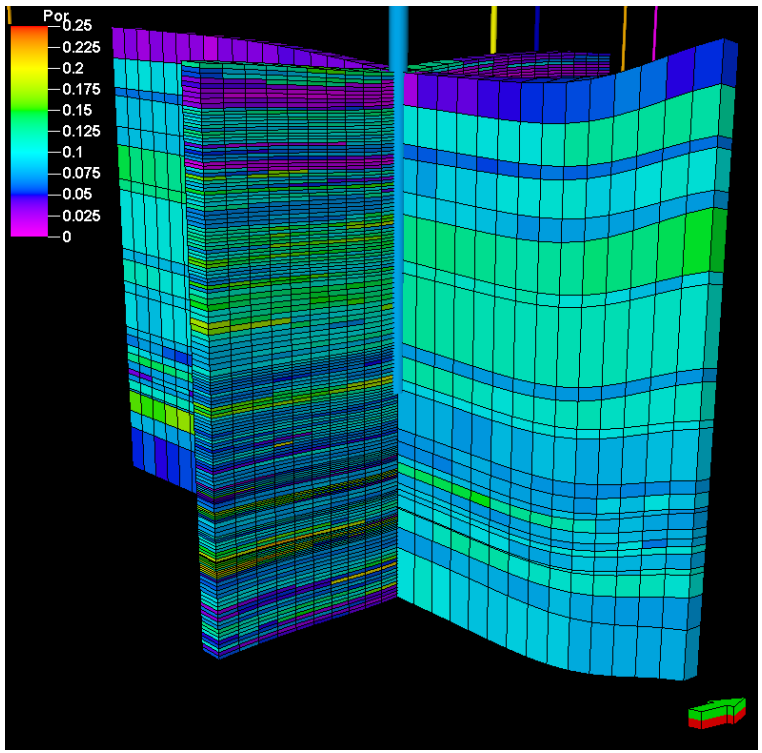
1. Activate coarse grid
2. Link the fine grid to the coarse grid. Open “Scale UP Zones” in Upscaling. OK.
3. Map the zones from one model to the other. Open Zone Mapping and check to ensure it is correct. Should be. OK.

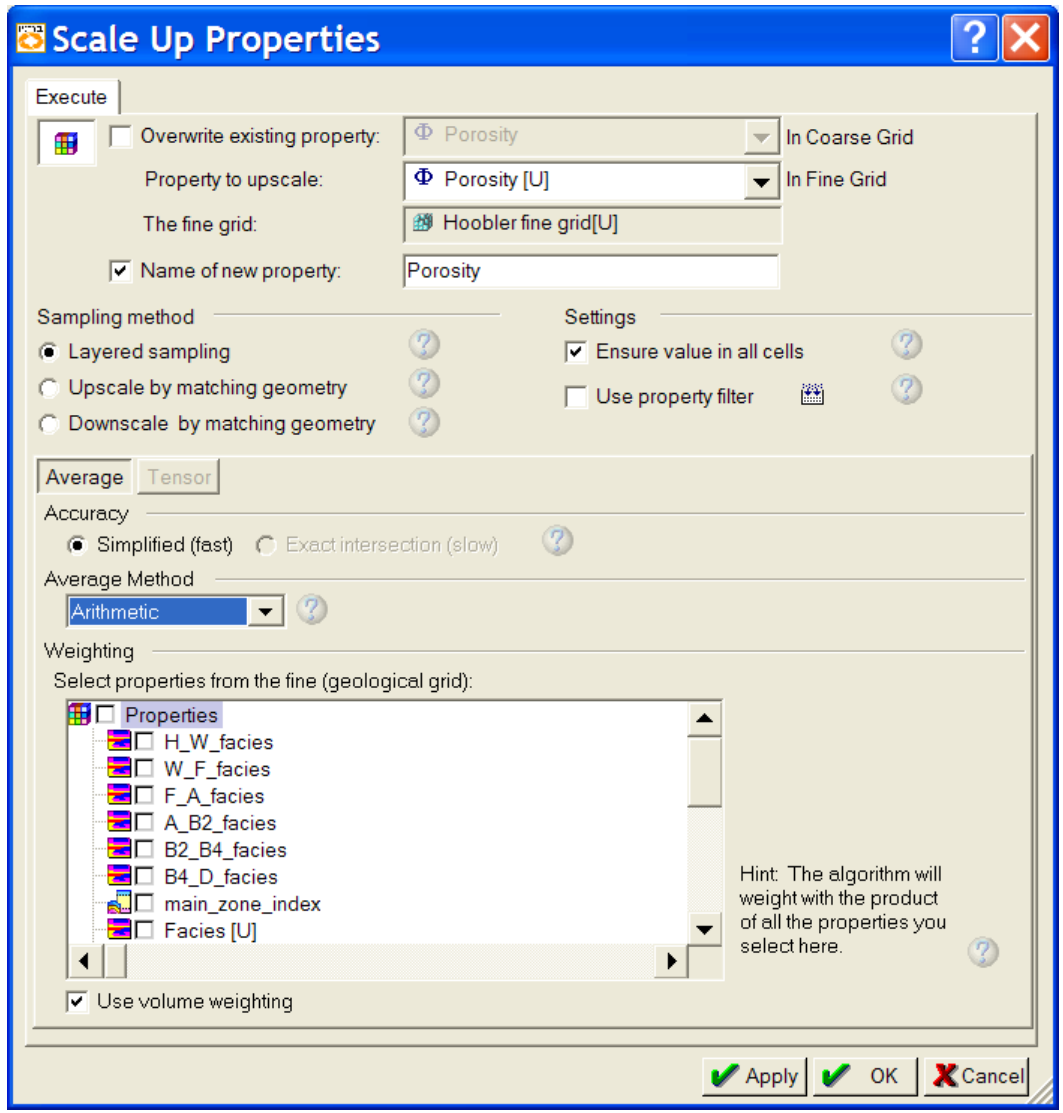




Scale up properties from Fine Grid to Coarse Grid: Porosity

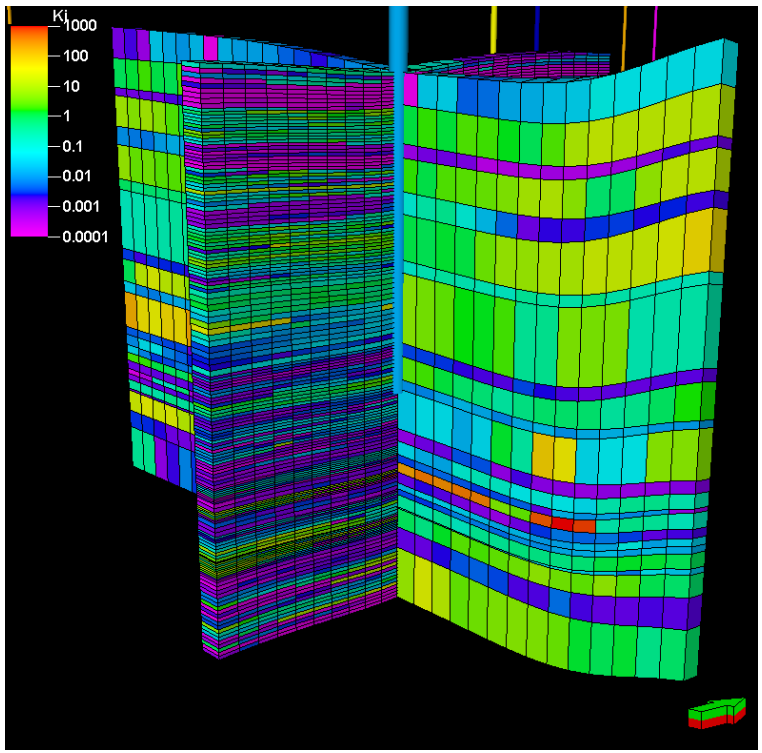
1. Activate “Scale up Properties” and select porosity.
2. Make settings as in dialog box to right

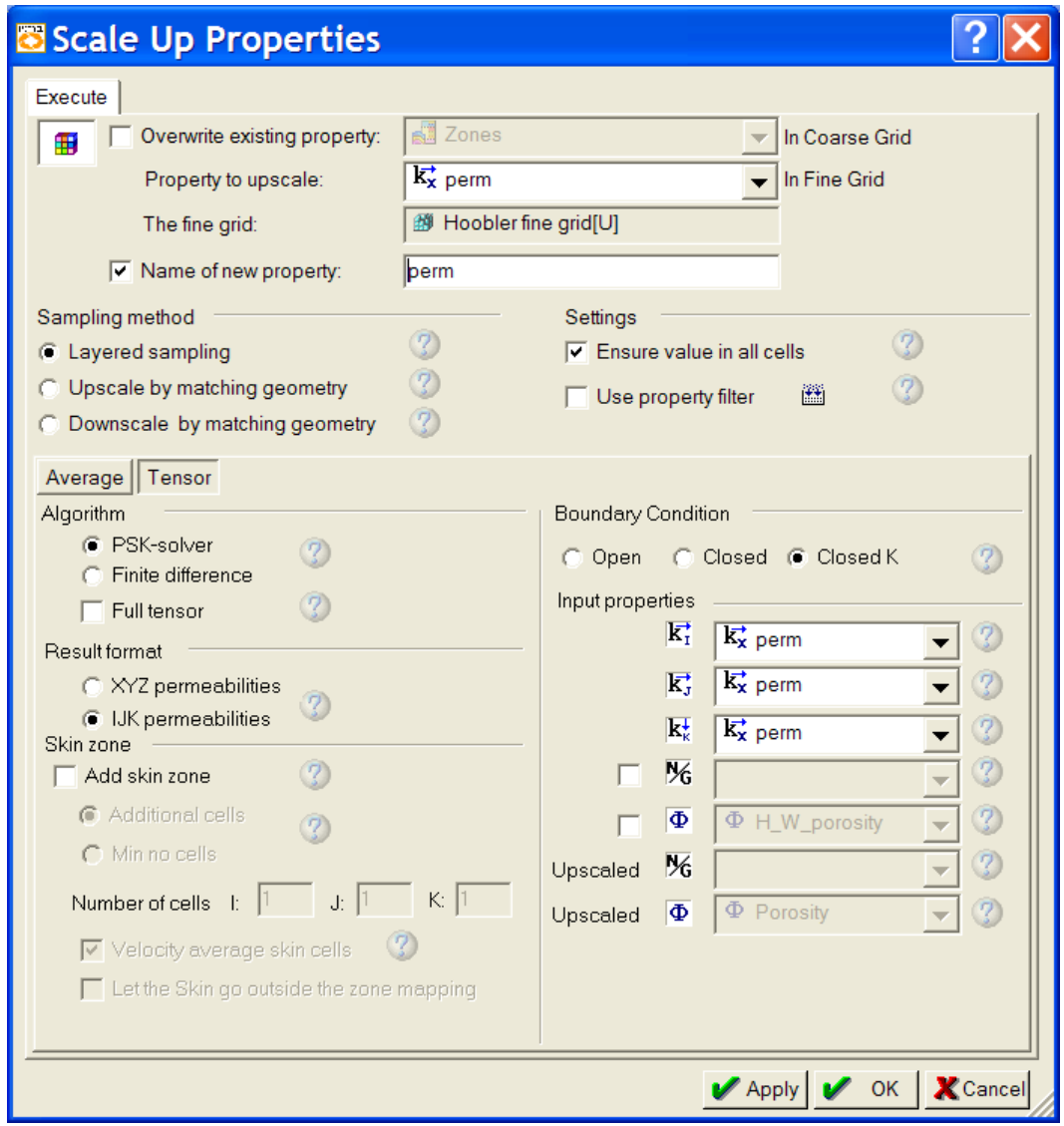




Scale up properties from Fine Grid to Coarse Grid: Perm XY

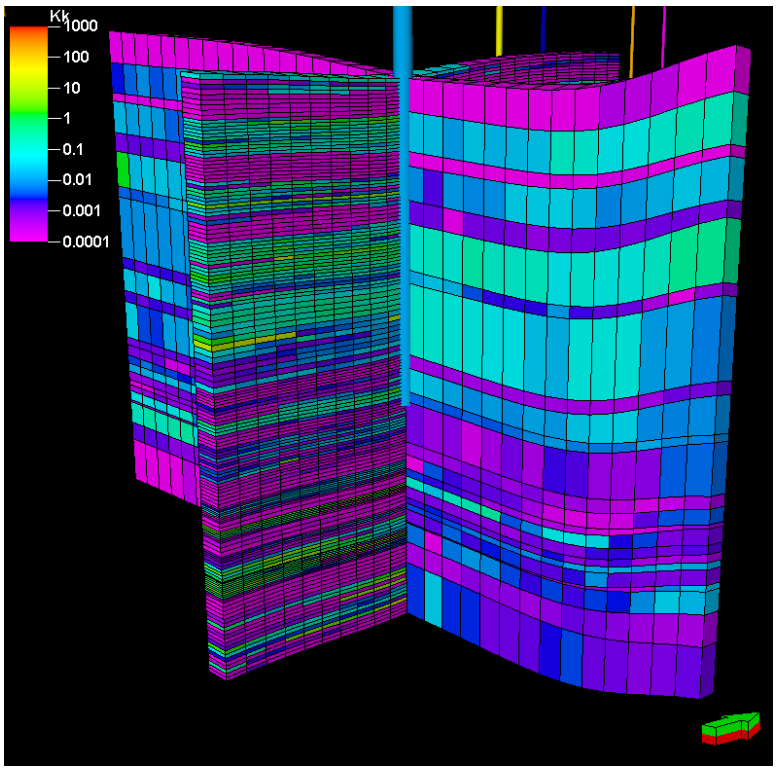
1. Activate “Scale up Properties” and select Kxy.
2. Make settings as in dialog box to right

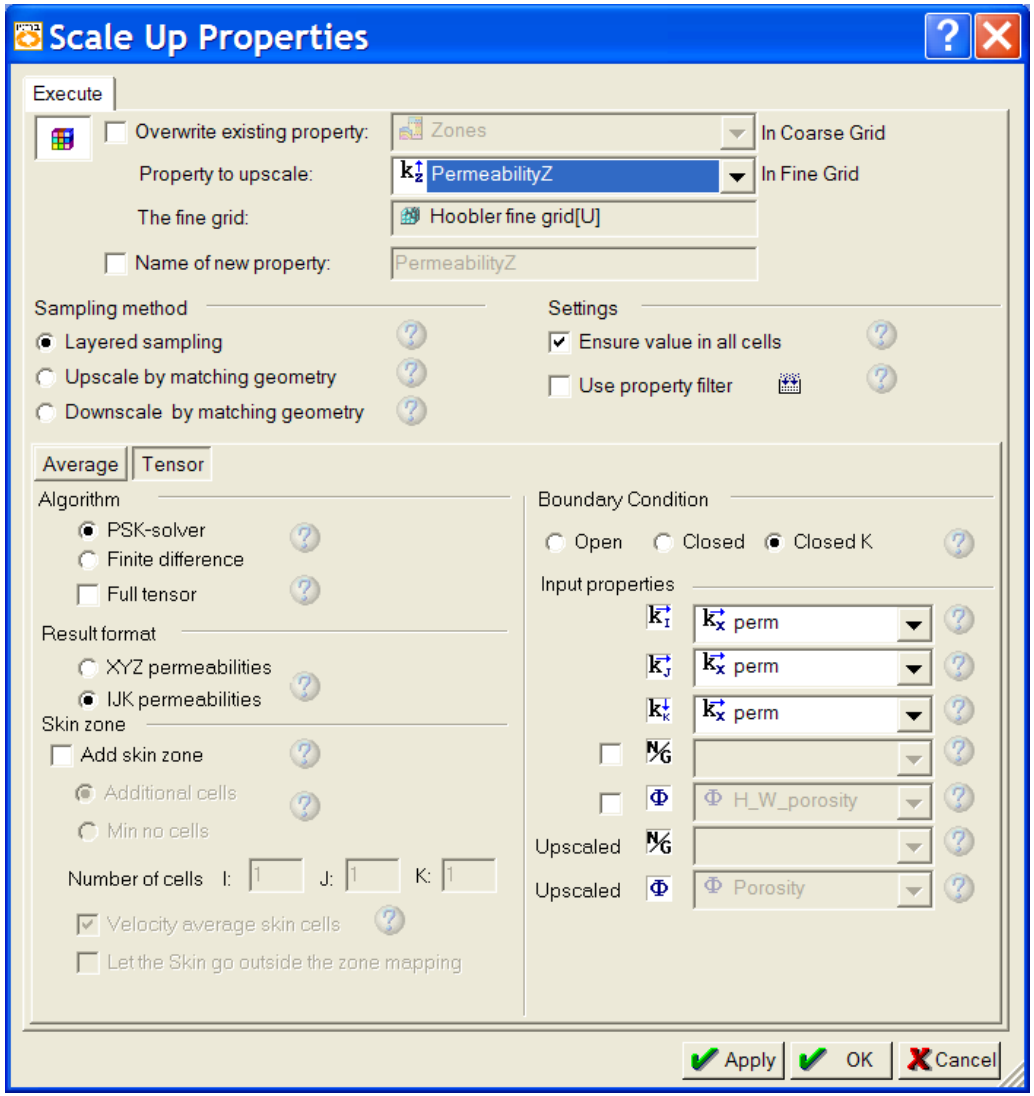




Scale up properties from Fine Grid to Coarse Grid: Perm Z

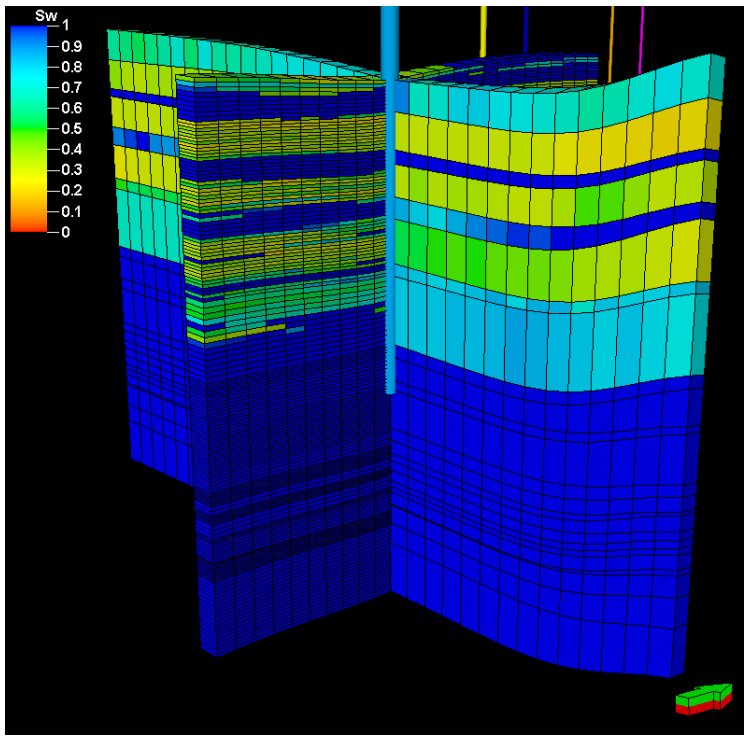
1. Activate “Scale up Properties” and select Kz.
2. Make settings as in dialog box to right

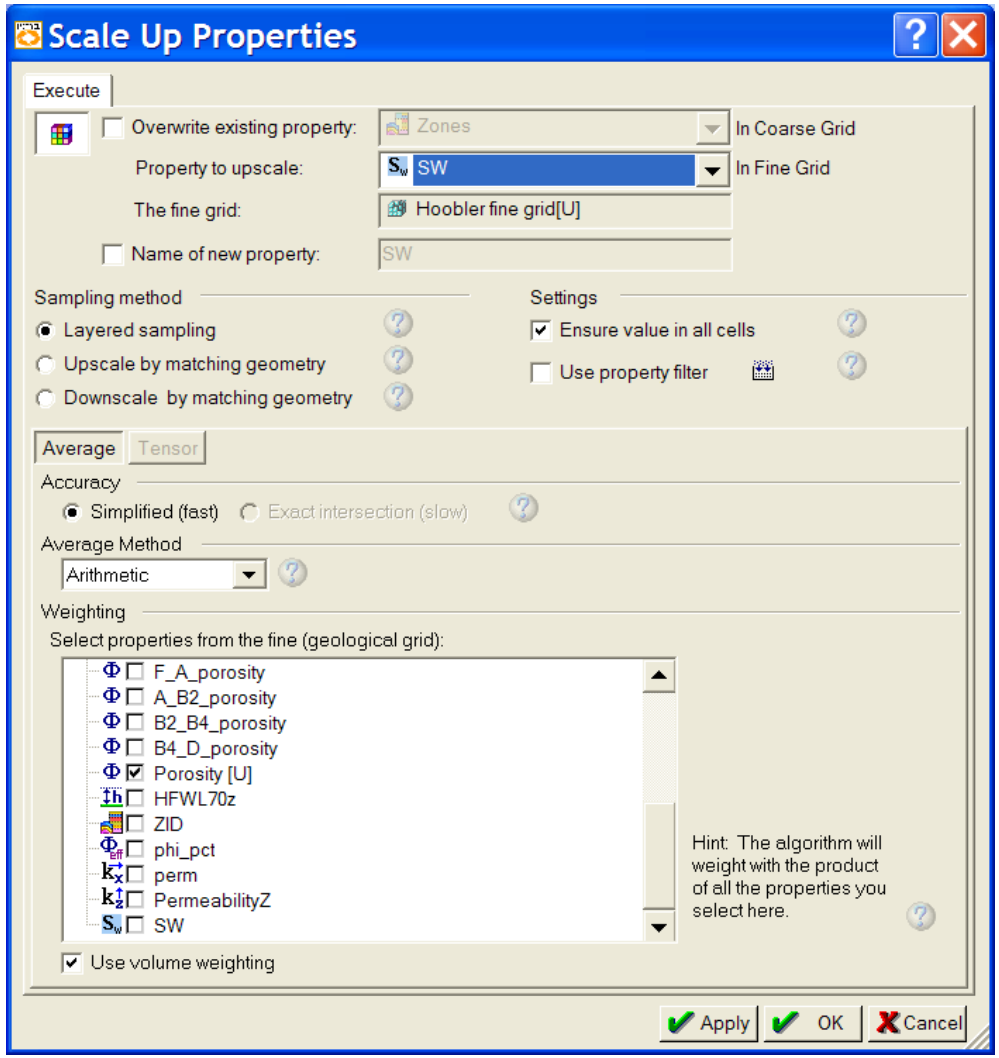




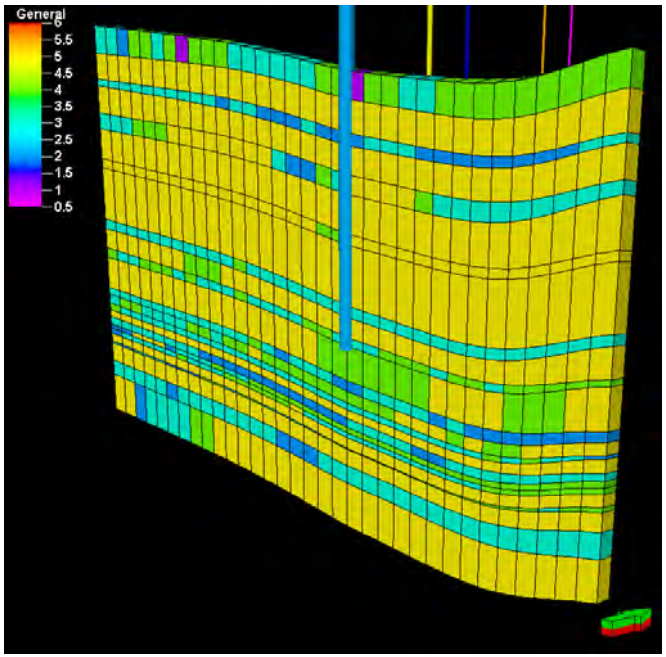
Scale up properties from Fine Grid to Coarse Grid: Sw

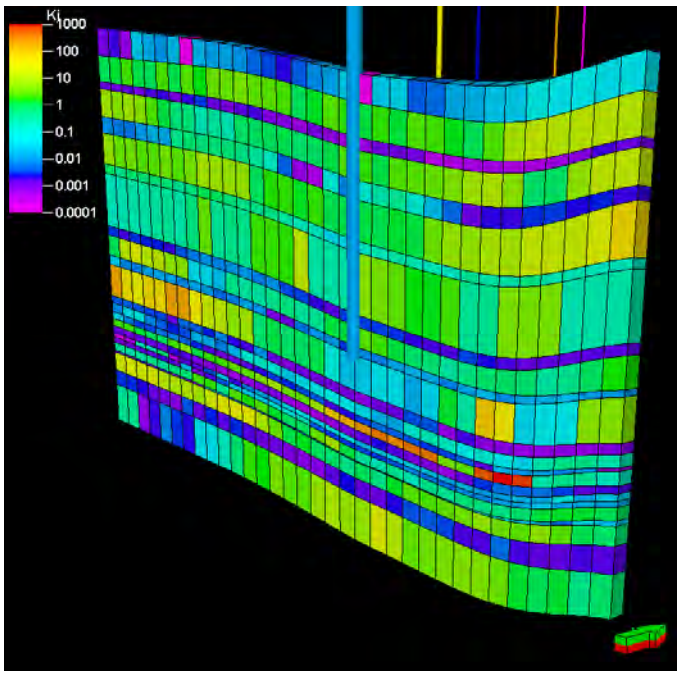
1. Activate “Scale up Properties” and select Sw.
2. Make settings as in dialog box to right, phi weighted

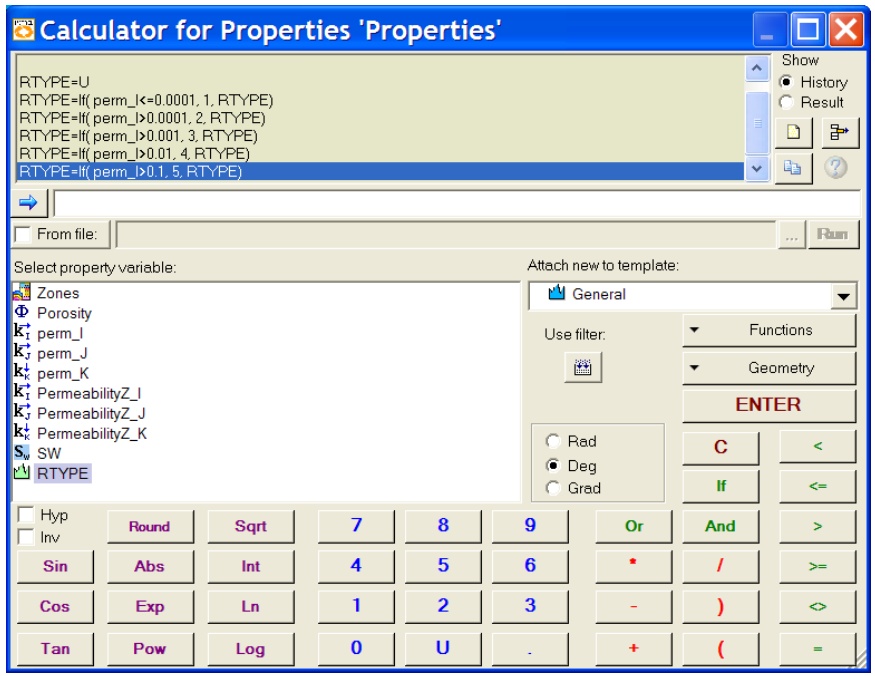




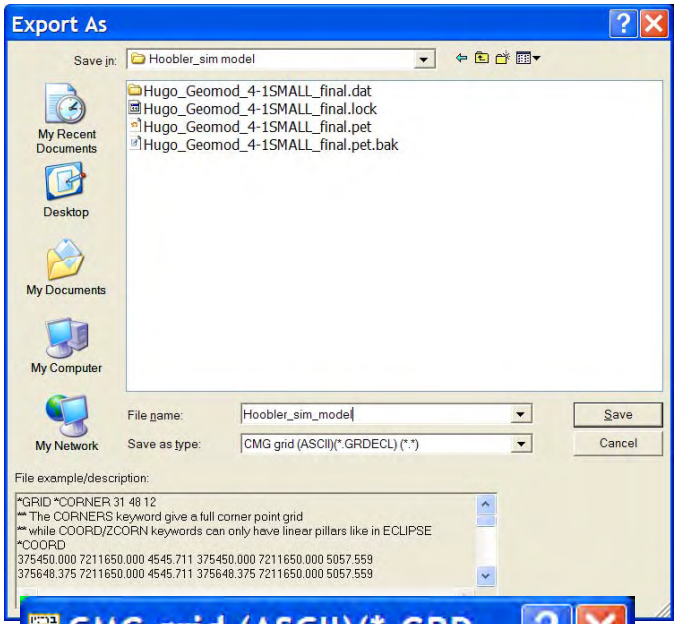
Calculate Rock Type for Relative Perm

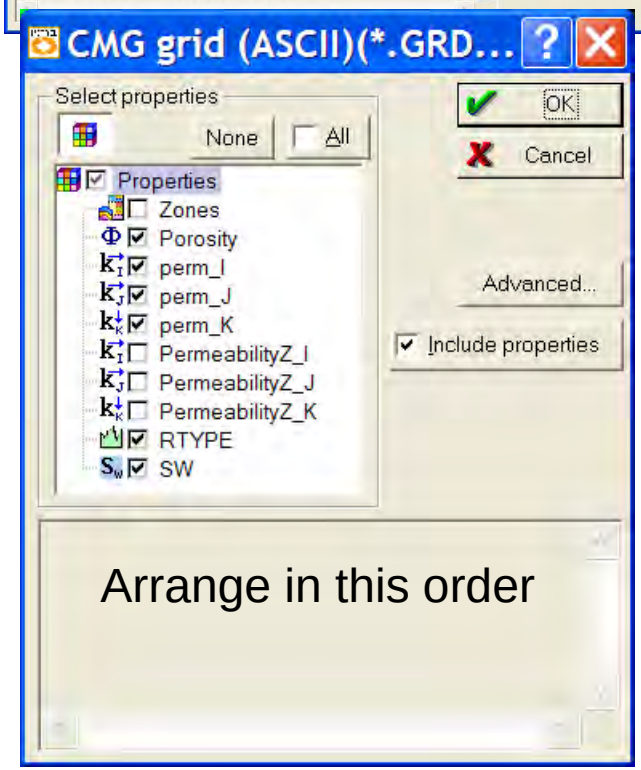


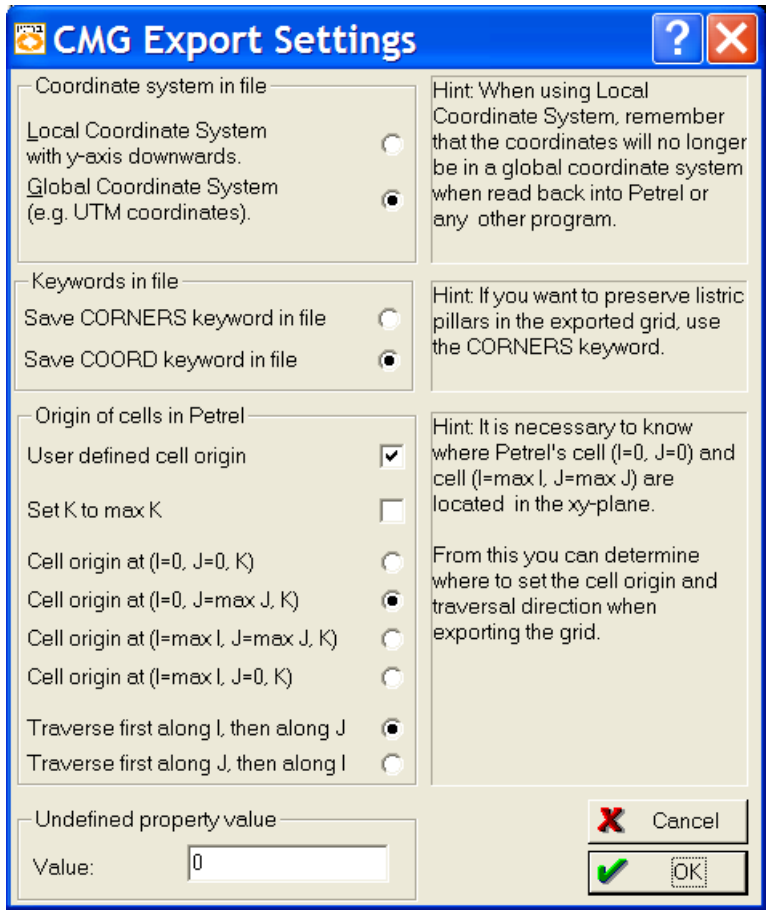




Export properties and grid for simulation (CMG format)







Punch all the correct buttons

END