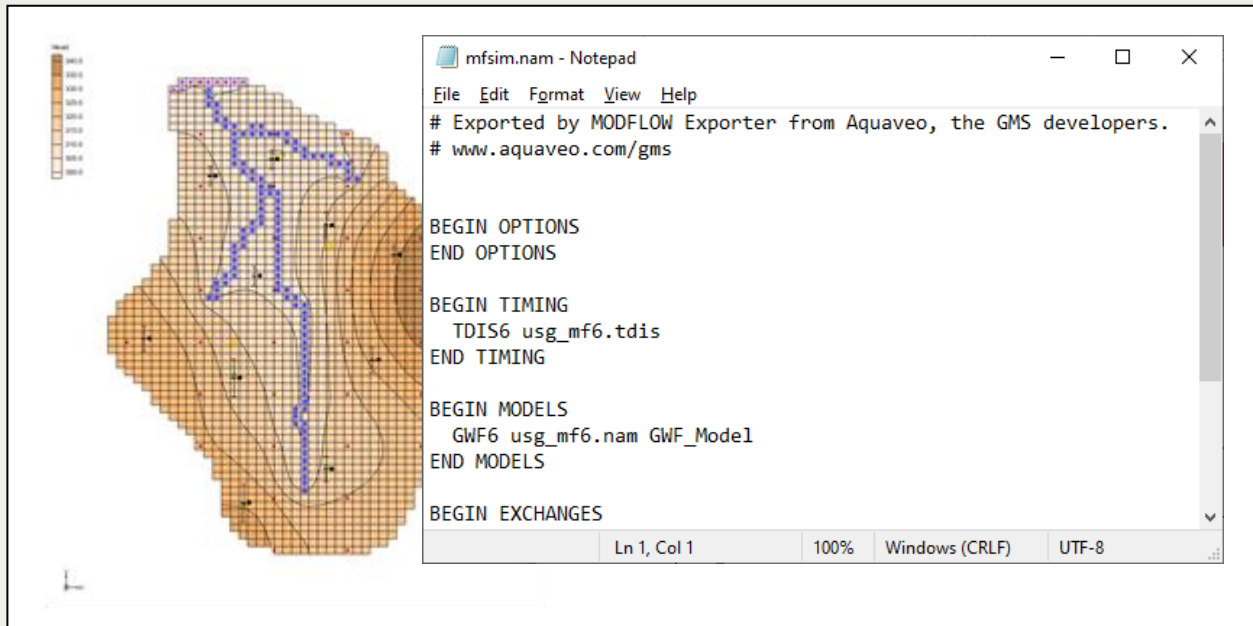




GMS 10.9 Tutorial

MODFLOW – Saving MODFLOW 6

Save a MODFLOW 6 Simulation in Native Text Format



Objectives

This tutorial explains how to save MODFLOW simulations in MODFLOW 6 native text format.

Prerequisite Tutorials

- MODFLOW – Saving Native Text

Required Components

- GMS Core
- MODFLOW Interface
- Geostatistics
- Text Editor Software

Time

- 25–40 minutes

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1 Introduction

MODFLOW 6 requires that older MODFLOW project files be converted into the file format it uses. GMS allows saving MODFLOW project files into the MODFLOW 6 file format. This feature is similar to the process used to save native text files.

Currently, GMS does not convert MODFLOW-LGR files to MODFLOW 6. Also, not all MODFLOW packages are supported in MODFLOW 6.

This tutorial will demonstrate:

- Exporting a MODFLOW 2000 simulation to MODFLOW 6
- Exporting a MODFLOW simulation with unsupported features or parameters to MODFLOW 6
- Exporting a MODFLOW-USG simulation to MODFLOW 6


1.1 Getting Started

Do the following to get started:

1. If necessary, launch GMS.
2. If GMS is already running, select *File* | **New** to ensure that the program settings are restored to their default state.

2 Exporting a MODFLOW Simulation

Start with importing a MODFLOW simulation. This simulation is one of the example files that ships with the USGS MODFLOW source code.

1. Click **Open**  to bring up the *Open* dialog.
2. Select “MODFLOW Name Files (*.mfn;*.nam)” from the *Files of type* drop-down.
3. Browse to the *modflow6\modflow6\modfgrid* directory and select “modfgrid.mfn”.
4. Click **Open** to close the *Open* dialog and bring up the *MODFLOW Translator* dialog.

This dialog appears when importing MODFLOW native text files. The MODFLOW translator allows valid MODFLOW simulations to be imported into GMS.

5. Select *MODFLOW 2000* (the default option).
6. Click **OK** to initiate the translator.

The *MODFLOW Translator* dialog will disappear briefly then reappear to show the progress of the translation.

MODFLOW will run and export a new set of files, including an HDF5 file. GMS will work with these files, preserving the original native text model files.

7. When the file conversion is complete, click **Done** to close the *MODFLOW Translator* dialog.

A MODFLOW model similar to Figure 1 should appear.

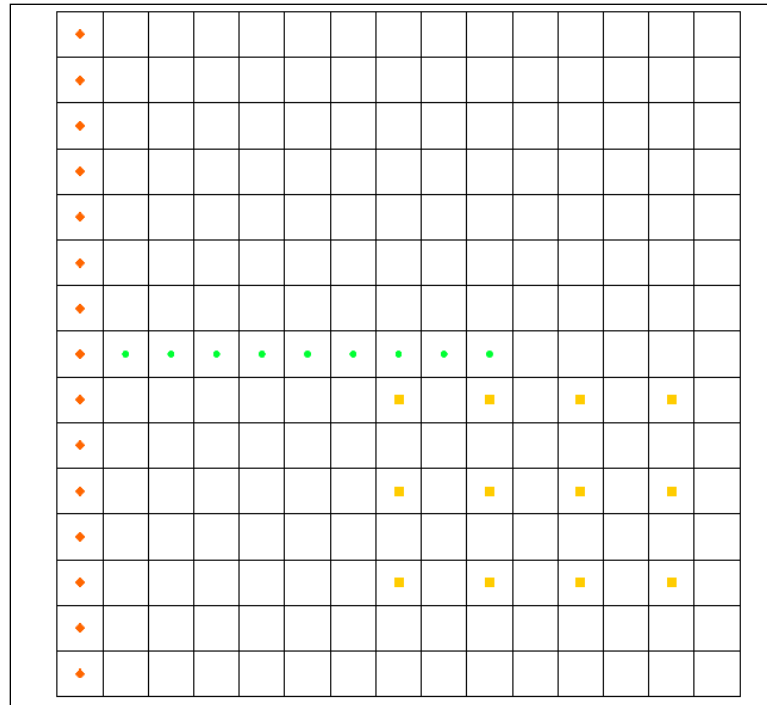


Figure 1 Imported MODFLOW model

2.1 Saving the Project

Now it is possible to save the project as if MODFLOW were going to be run.

1. Select *File* | **Save As...** to bring up the *Save As* dialog.
2. Browse to the *modflow6\modflow6* directory.
3. Select "Project Files (*.gpr)" from the *Save as type* drop-down.
4. Enter "modfgrid.gpr" as the *File name*.
5. Click **Save** to save the project and close the *Save As* dialog.

When a project is saved in GMS, a GPR file is created. The GPR file contains GMS-specific data. If a MODFLOW simulation is in the current project, then a folder is created that contains all of the MODFLOW inputs. The new folder name will use the name of the current project name with "_MODFLOW" added to the end. In this project, a new folder called "modfgrid_MODFLOW" was created.

2.2 Exporting MODFLOW 6 from GMS


Now to export the simulation into the MODFLOW 6 native text format:

1. Select **MODFLOW | Global Options...** to bring up the *MODFLOW Global/Basic Package* dialog.
2. In the *MODFLOW version* section, turn on *Save MODFLOW 6 copy*.
3. Click **OK** to exit the *MODFLOW Global/Basic Package* dialog.
4. Select **File | Save** to save the project.

By turning on the *Save MODFLOW 6 copy* option, an additional set of MODFLOW input files are saved in the MODFLOW 6 text format.

2.3 Viewing the MODFLOW 6 Text Files

The next step is to go look at the MODFLOW 6 text files that were just saved.

1. In the Project Explorer, Right-click on “ MODFLOW” and select **Open Containing Folder...** to bring up a new window in Windows Explorer.
2. Browse to the *modflow6\modflow6\modfgrid_MODFLOW_mf6* directory to bring up the MODFLOW 6 text files (Figure 2).














Name	Date modified	Type
 mfsim.nam	9/25/2024 5:02 PM	NAM File
 modfgrid.chd	9/25/2024 5:02 PM	CHD File
 modfgrid.dis	9/25/2024 5:02 PM	DIS File
 modfgrid.drn	9/25/2024 5:02 PM	DRN File
 modfgrid.ic	9/25/2024 5:02 PM	IC File
 modfgrid.ims	9/25/2024 5:02 PM	IMS File
 modfgrid.mfn	9/25/2024 5:02 PM	Text Document
 modfgrid.nam	9/25/2024 5:02 PM	NAM File
 modfgrid.npf	9/25/2024 5:02 PM	NPF File
 modfgrid.oc	9/25/2024 5:02 PM	OC File
 modfgrid.rch	9/25/2024 5:02 PM	RCH File
 modfgrid.tdis	9/25/2024 5:02 PM	TDIS File
 modfgrid.wel	9/25/2024 5:02 PM	WEL File

Figure 2 Native text MODFLOW 6 files saved From GMS

3. Using a text editor, open the “modfgrid.mfn” file.

This file is created as the model is saved in MODFLOW 6 format. Near the bottom of the file you can see that some “NOTES” are printed. The BAS6 and LPF packages are not directly supported in MODFLOW 6. The information in these packages is contained in the IC, DIS, NPF, and STO packages. The SIP solver is also not supported in MODFLOW 6; it is replaced by the IMS package (similar to the SMS solver in MODFLOW-USG). In this case the MODFLOW 6 simulation supports all of the features of the MODFLOW 2000 model but there are other cases where certain features and packages are not supported.

4. Using a text editor, open the “mfsim.nam” file (Figure 3).

```
File Edit Format View Help
# Exported by MODFLOW Exporter from Aquaveo, the GMS developers.
# www.aquaveo.com/gms

BEGIN OPTIONS
END OPTIONS

BEGIN TIMING
  TDIS6 modfgrid.tdis
END TIMING

BEGIN MODELS
  GWF6 modfgrid.nam GWF_Model
END MODELS

BEGIN EXCHANGES
END EXCHANGES

BEGIN SOLUTIONGROUP 1
  MXITER 1
  IMS6 modfgrid.ims GWF_Model
END SOLUTIONGROUP
```

Figure 3 MODFLOW 6 mfsim.nam text file from GMS

This file is required for all MODFLOW 6 simulations. The file must be named “mfsim.nam” and should not be renamed. Notice that the other files have the prefix modfgrid. This file has MODFLOW 6 inputs for time discretization (TDIS), groundwater models (GWF6), and the solver (IMS).

5. Using a text editor, open the “modfgrid.nam” name file (Figure 4).

```
File Edit Format View Help
# Exported by MODFLOW Exporter from Aquaveo, the GMS developers.
# www.aquaveo.com/gms

BEGIN OPTIONS
  LIST modfgrid.out
  PRINT_INPUT
  PRINT_FLOWS
  SAVE_FLOWS
END OPTIONS


BEGIN PACKAGES
  DIS6 modfgrid.dis
  OC6 modfgrid.oc
  RCH6 modfgrid.rch
  WEL6 modfgrid.wel
  DRN6 modfgrid.drn
  NPF6 modfgrid.npf
  IC6 modfgrid.ic
  CHD6 modfgrid.chd
END PACKAGES
```

Figure 4 MODFLOW 6 name file

This file is similar to the MODFLOW name file from previous versions. Notice the different packages that are included under the BEGIN PACKAGES section.

3 MODFLOW Simulations with Unsupported Features

Now to open a simulation with features which are not supported in MODFLOW 6.

1. Select *File* | **New** to clear the current project and start a new one.
2. Click **Open**  to bring up the *Open* dialog.
3. Select “MODFLOW Name Files (*.mfn;*.nam)” from the *Files of type* drop-down.
4. Browse to the *modflow6\modflow6\mnw1* directory and select “mnw1.nam”.
5. Click **Open** to close the *Open* dialog and bring up the *MODFLOW Translator* dialog.
6. Select *MODFLOW 2000*.
7. Click **OK** to initiate the translator.

The *MODFLOW Translator* dialog will disappear briefly then reappear to show the progress of the translation.

8. When the file conversion is complete, click **Done** to close the *MODFLOW Translator* dialog.

A MODFLOW model similar to Figure 5 should appear.

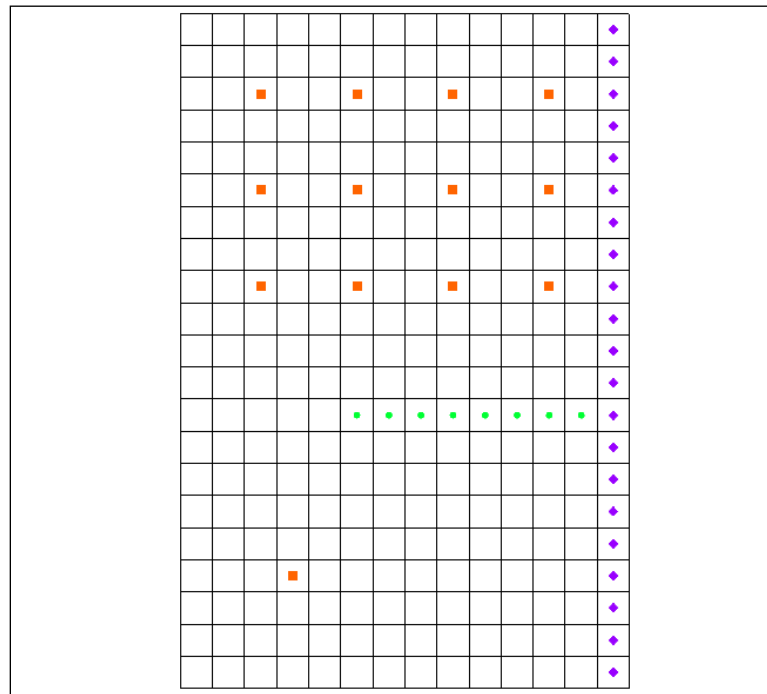


Figure 5 Imported MODFLOW model

3.1 Saving the Project with MODFLOW 6

Now it is possible to save the project as if MODFLOW 6 were going to be run.

1. Select *MODFLOW* | **Global Options...** to bring up the *MODFLOW Global/Basic Package* dialog.
2. In the *MODFLOW version* section, turn on *Save MODFLOW 6 copy*.

3. Click **OK** to exit the *MODFLOW Global/Basic Package* dialog.
4. Select *File* | **Save As...** to bring up the *Save As* dialog.
5. Browse to the *modflow6\modflow6* directory.
6. Select “Project Files (*.gpr)” from the *Save as type* drop-down.
7. Enter “mnw1.gpr” as the *File name*.
8. Click **Save** to save the project and close the *Save As* dialog.

When this model is saved in MODFLOW 6 format some errors are reported and the *MODFLOW 6 Export* dialog appears.


9. Scroll to the bottom of the text window in the *MODFLOW 6 Export* dialog.

Notice that the BCF package is not supported by MODFLOW 6. The BCF package cannot be converted to the NPF and STO packages. Since these packages are required for a MODFLOW 6 model, an error is reported, and the export is aborted.

10. Click **OK** to close the *MODFLOW 6 Export* dialog.

4 MODFLOW Simulations with Unsupported Parameters

Now to open a simulation with parameters not supported by MODFLOW 6:

1. Select *File* | **New** to clear the current project and start a new one.
2. Click **Open**  to bring up the *Open* dialog.
3. Select “MODFLOW Name Files (*.mfn;*.nam)” from the *Files of type* drop-down.
4. Browse to the *\modflow6\modflow6\etsdrt* directory and select “etsdrt.nam”.
5. Click **Open** to close the *Open* dialog and bring up the *MODFLOW Translator* dialog.
6. Select *MODFLOW 2005* (the default option).
7. Click **OK** to initiate the translator.

The *MODFLOW Translator* dialog will disappear briefly, then reappear to show the progress of the translation.

8. When the file conversion is complete, click **Done** to close the *MODFLOW Translator* dialog.

A MODFLOW model similar to Figure 6 should appear.

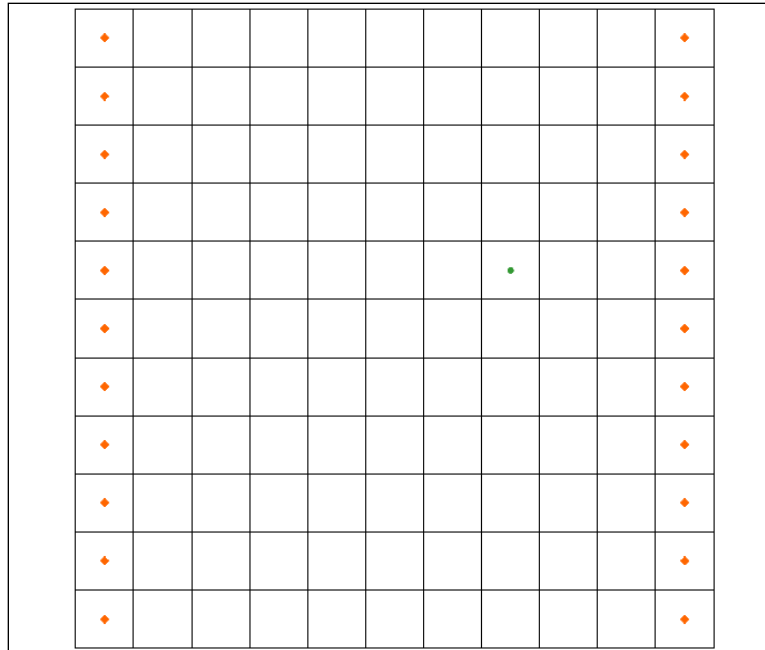


Figure 6 Imported MODFLOW model

4.1 Saving the Project with MODFLOW 6

Now it is possible to save the project as if MODFLOW were going to be run.

1. Select *MODFLOW* | **Global Options...** to bring up the *MODFLOW Global/Basic Package* dialog.
2. In the *MODFLOW version* section, turn on *Save MODFLOW 6 copy*.
3. Click **OK** to exit the *MODFLOW Global/Basic Package* dialog.
4. Select *File* | **Save As...** to bring up the *Save As* dialog.
5. Browse to the *modflow6\modflow6* directory.
6. Select "Project Files (*.gpr)" from the *Save as type* drop-down.
7. Enter "etsdrt.gpr" as the *File name*.
8. Click **Save** to save the project and close the *Save As* dialog.

When this model is saved in MODFLOW 6 format some errors are reported and the *MODFLOW 6 Export* dialog is shown.


9. Scroll to the bottom of the text window in the *MODFLOW 6 Export* dialog.

Notice that "parameters" are not supported by MODFLOW 6. Thus, an error is reported and the export is aborted.

10. Click **OK** to close the *MODFLOW 6 Export* dialog.

5 Importing a MODFLOW-USG Simulation

Now to read in a MODFLOW-USG simulation:

1. Select **File | New** to clear the current project and start a new one.
2. Click **Open**  to bring up the *Open* dialog.
3. Select “Project Files (*.gpr)” from the *Files of type* drop-down.
4. Browse to the `modflow6\modflow6\usg` directory and select “usg.gpr”.
5. Click **Open** to import the file and close the *Open* dialog.

A model similar to Figure 7 should appear.

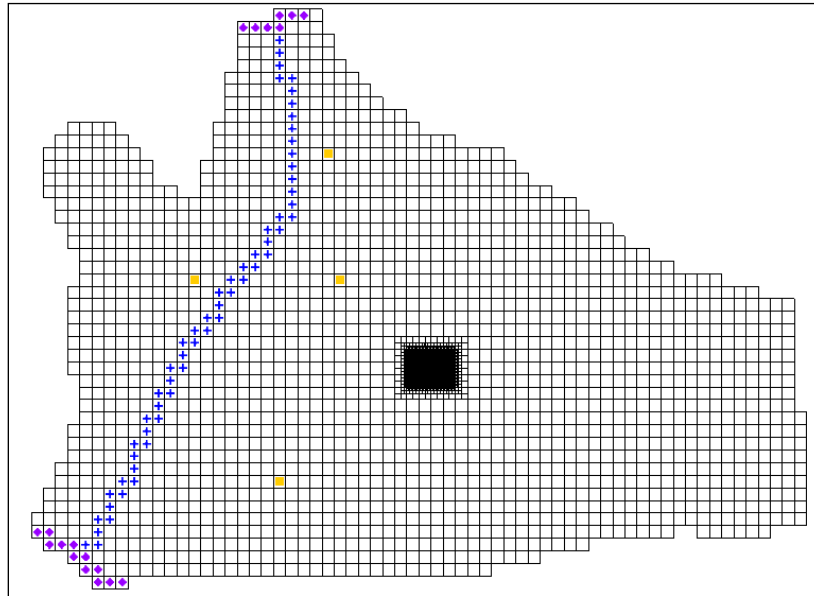


Figure 7 MODFLOW-USG model with pilot points

5.1 Saving the Project with MODFLOW 6

Now it is possible to save the project as if MODFLOW were going to be run.

1. Select **MODFLOW | Global Options...** to bring up the *MODFLOW Global/Basic Package* dialog.
2. In the *MODFLOW version* section, turn on *Save MODFLOW 6 copy*.
3. Click **OK** to exit the *MODFLOW Global/Basic Package* dialog.
4. Select **File | Save As...** to bring up the *Save As* dialog.
5. Browse to the `modflow6\modflow6` directory.
6. Select “Project Files (*.gpr)” from the *Save as type* drop-down.
7. Enter “usg_mf6.gpr” as the *File name*.
8. Click **Save** to save the project and close the *Save As* dialog.

This simulation saves without any errors or warnings because MODFLOW 6 supports all of the packages in this model. Further, this type of grid can be represented by the DISV package in MODFLOW 6.

6 Conclusion

This concludes the “MODFLOW – Saving MODFLOW 6” tutorial. The following topics were discussed and demonstrated:

- MODFLOW 2000, 2005, NWT, USG can be saved to MODFLOW 6.
- Not all MODFLOW 2000, 2005, NWT, USG packages are supported by MODFLOW 6.