



Model created in COMSOL Multiphysics 6.4

Transient Response of a Shallow Foundation on Unsaturated Soil

Introduction

This example is an extension of the model [Shallow Foundation on Unsaturated Soil](#). In the referred example, sudden changes in suction occur due to changes in the underground water level. In this example, the deformation of the clay stratum due to footing pressure and pore suction is analyzed after time-dependent changes in the boundary conditions. Two distinct natural events — a few days of rainfall and a few days of evaporation — are considered, after which the soil is subjected to a footing pressure.

The model is inspired by the example presented in [Ref. 1](#). The Extended Barcelona Basic model (BBMx), which includes suction in its constitutive relationship, is used to demonstrate the behavior of a settlement on an unsaturated soil layer.

Model Definition

In this example, a 6 m wide and 3 m deep soil layer is studied. A 1 m wide footing is placed on top of the layer. The footing is modeled as a boundary load applied on the surface. The settlement analysis is carried out for an increasing footing pressure. Initially, in the first analysis, the ground water level is constant (3 m below the surface), and the footing pressure gradually increases to its final value. Once the final footing pressure is applied, a rainfall event with an infiltration rate of 10 cm/day is considered. The second scenario considers evaporation at a rate of 2 mm/day.

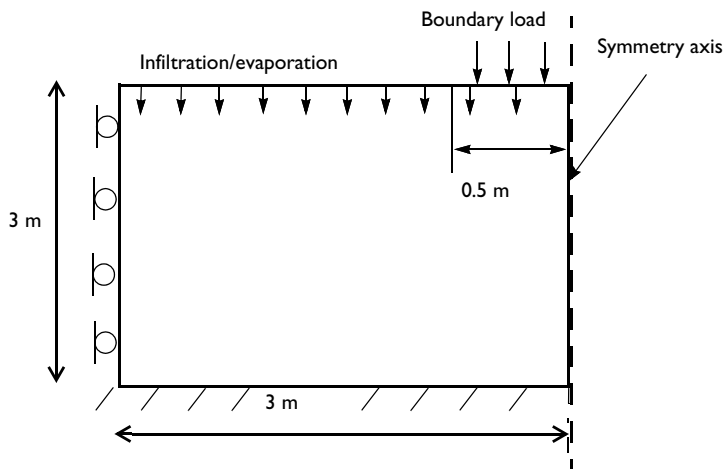


Figure 1: Dimensions, boundary conditions, pressure load, and flow rate for the unsaturated soil.

SOIL PROPERTIES

The properties of the soil are given in [Table 1](#).

TABLE 1: MATERIAL PROPERTIES

Property	Variable	Value
Poisson's ratio	ν	0.2
Soil density	ρ_s	1743 kg/m ³
Water density	ρ_w	1000 kg/m ³
Dynamic viscosity of water	μ_w	0.001 Pa.s
Swelling index	κ	0.006
Swelling index for changes in suction	κ_s	0.008
Compression index at saturation	λ	0.22
Compression index for changes in suction	λ_s	0.123
Slope of critical state line	M	1.24
Weight parameter	w	0.4
Soil stiffness parameter	m	60 kPa
Plastic potential smoothing parameter	b_s	10
Tension to suction ratio	k_s	0.6
Initial yield value for suction	s_y	100 kPa
Initial void ratio	e_0	0.666
Reference pressure	p_{ref}	10 kPa
Initial consolidation pressure	p_{c0}	50 kPa
Initial porosity	ϕ	0.4
Saturated hydraulic conductivity	k_{sat}	1 m/day
Fitting parameter	α	2 1/m
Residual degree of saturation	S_{res}	0.23
Degree of saturation at full saturation	S_{sat}	1

The Richards' Equation interface requires additional material properties, which are derived from [Table 1](#) and based on data from [Ref. 1](#).

CONSTRAINTS AND LOADS

- The soil layer is supported by a rigid and perfectly rough base. Apply a fixed constraint on the lower horizontal boundary.
- Use a roller boundary condition on the left vertical boundary, symmetry on the right.

- A hydraulic head of 0 m is initially assigned to the lower horizontal boundary in the Richards' Equation interface.
- The infiltration and evaporation rates are applied in the Richards' Equation interface using the **Precipitation** node. Infiltration is represented by a positive quantity in the **Precipitation** node, and evaporation by a negative quantity.
- The gravity load is applied using the **Gravity** node. The pore pressure in the saturated region of the layer is applied using an **External Stress** node.
- A boundary load is applied on top of the soil layer to model the weight of the footing, see [Figure 1](#).

Results and Discussion

[Figure 2](#) shows the pressure head in the clay stratum after five days of rainfall (left) and five days of evaporation (right). The pressure head after five days of rainfall shows less variation across the layer due to the high infiltration rate. In contrast, with a low evaporation rate, the pressure head is almost linear with layer position and changes slightly at the top surface.

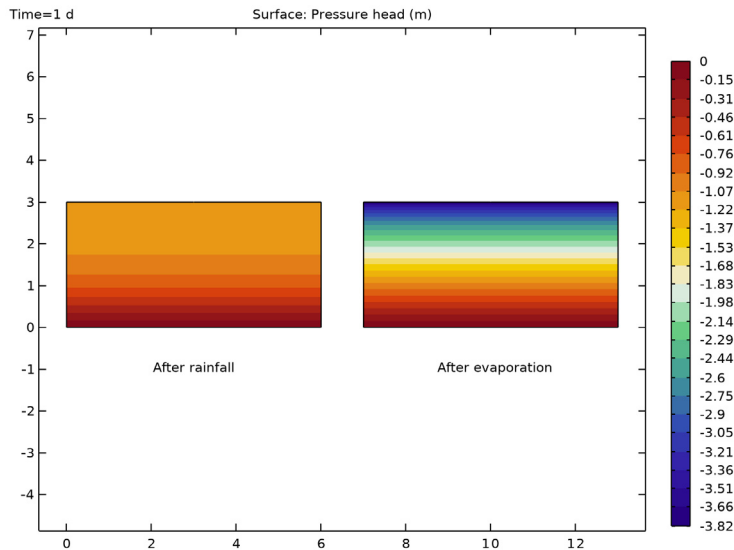


Figure 2: Pressure head after infiltration and evaporation.

The results presented in [Figure 2](#) are emphasized in [Figure 3](#) and [Figure 4](#). With a high infiltration rate ([Figure 3](#)), the pressure head after 5 days of rainfall is within the range of 0–1 m instead of the initial range of 0–3 m. The pressure head after five days of rainfall

matches the Gardener steady state solution quite well. [Figure 4](#) shows changes in the pressure head with a low evaporation rate, with the opposite trend as compared to [Figure 3](#). Evaporation decreases the water content, which lowers the pressure head. Due to the low evaporation rate, changes in the pressure head are much smaller as compared to the changes due to the rainfall event, and mostly affect the region near the top surface. Again, the pressure head after five days of evaporation matches the Gardener steady state solution.

The distribution of the von Mises stress due to footing pressure is shown in [Figure 5](#). Five days of rainfall reduces the suction and increases the pore pressure. The water in the pores can bear more load, which reduces the stresses in the soil skeleton, see [Figure 6](#). Vice versa, after five days of evaporation, the stress in the soil skeleton increases slightly due to the reduced amount of water in the pores, see [Figure 7](#).

The footing pressure versus settlement after the rainfall and evaporation events is shown in [Figure 8](#) and [Figure 9](#), respectively. The collapse of the soil under the footing is expected with increasing infiltration. Collapse also occurs after evaporation (although barely visible in the figure). The vertical displacement of the top layer due to rainfall and evaporation is different (see [Figure 10](#)); with rainfall there is a large collapse under the footing, whereas the collapse due to evaporation is not that drastic.

The changes in pore suction due to rainfall and evaporation is shown in [Figure 11](#). Pore suction decreases during rainfall event, which results in positive volumetric strains in the soil layer (expansion of pores). Pore suction increases when considering evaporation, which results in a negative volumetric strain in the soil (compression of pores).

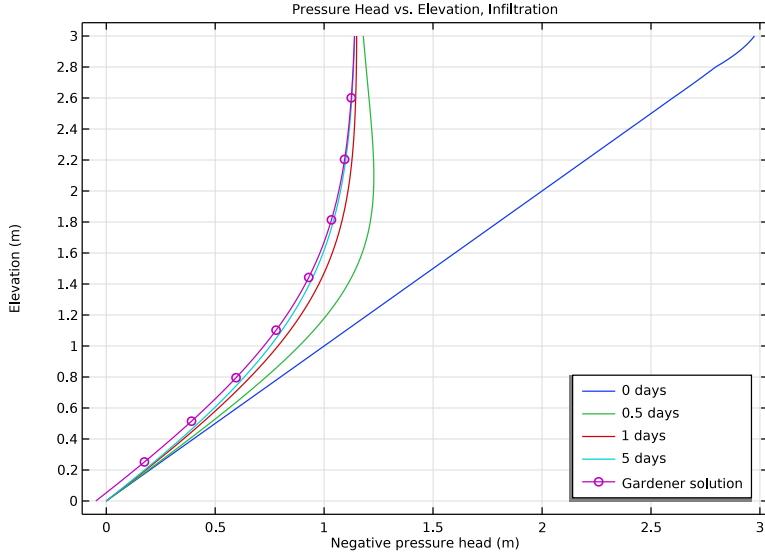


Figure 3: Pressure head versus elevation for rainfall event.

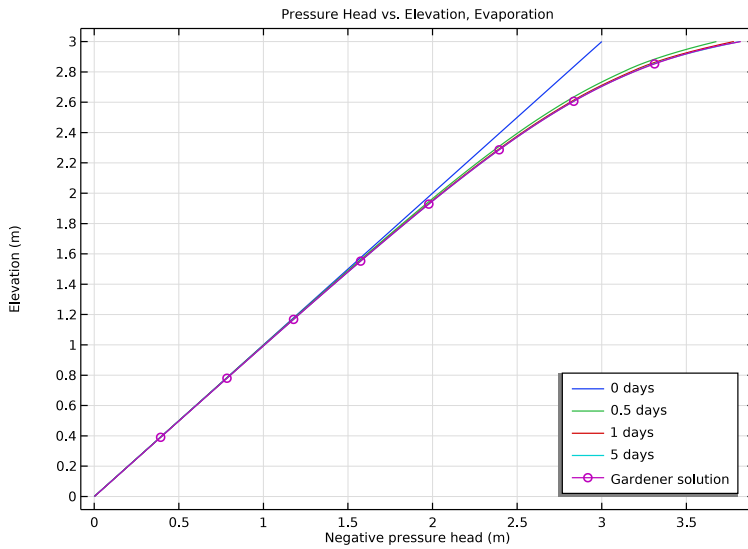


Figure 4: Pressure head versus elevation for evaporation event.

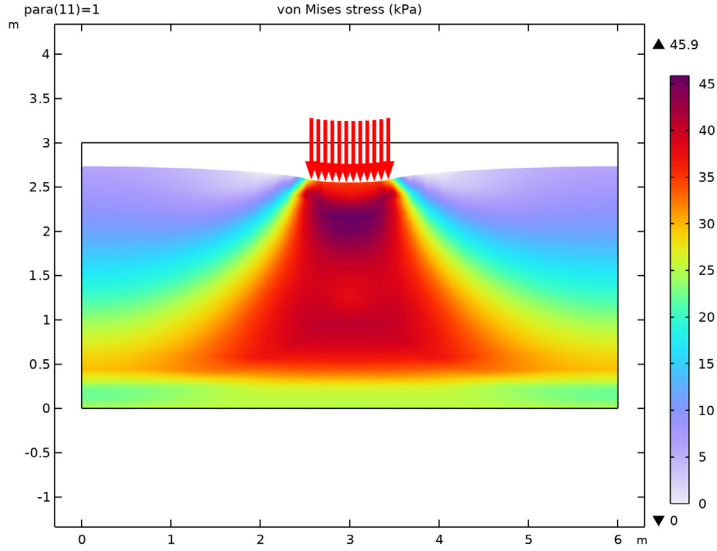


Figure 5: von Mises stress due to footing pressure.

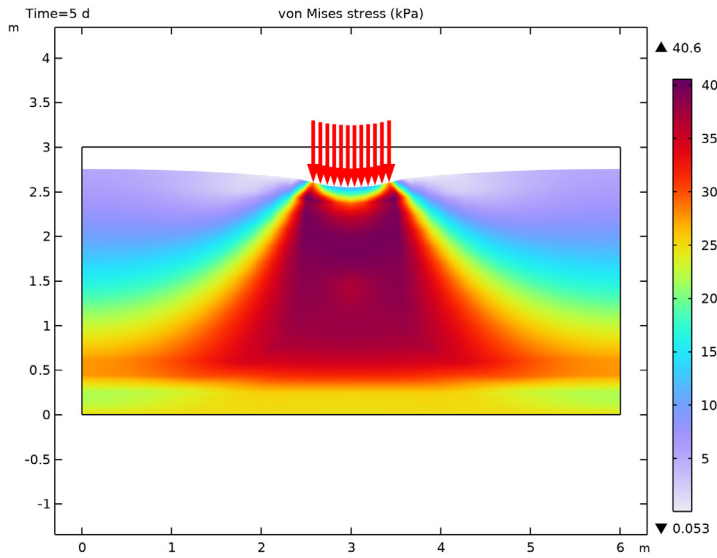


Figure 6: von Mises stress due to footing pressure after five days of rainfall.

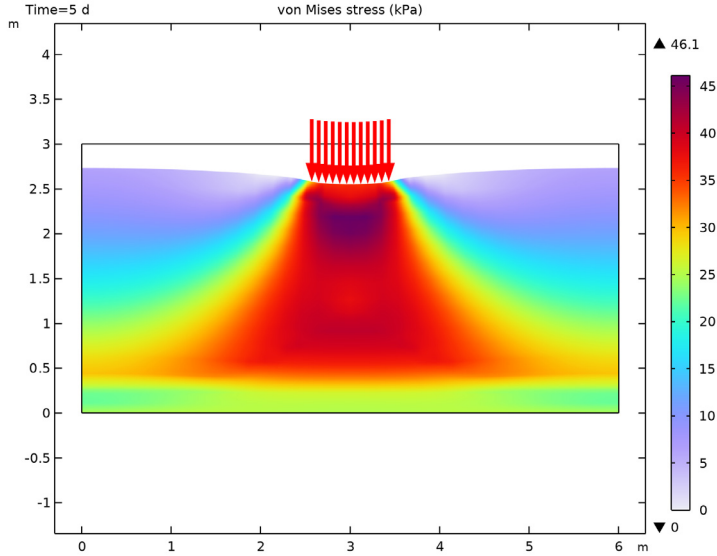


Figure 7: von Mises stress due to footing pressure after five days of evaporation.

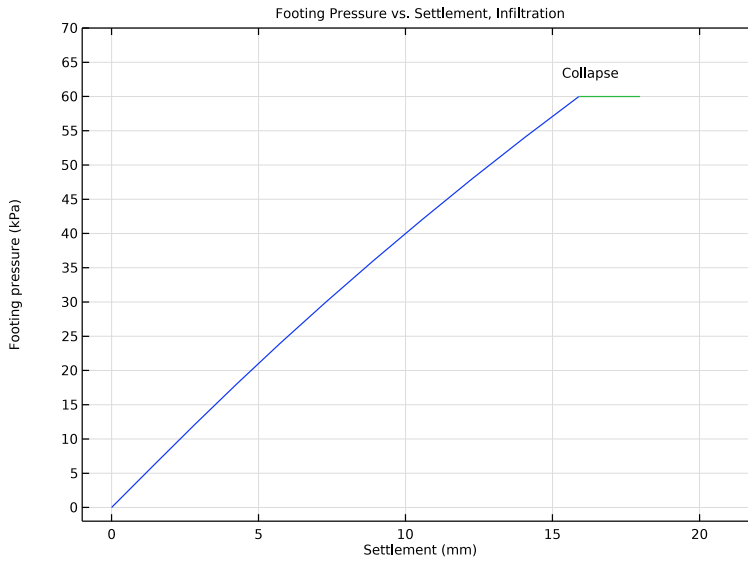


Figure 8: Footing pressure versus settlement after five days of rainfall.

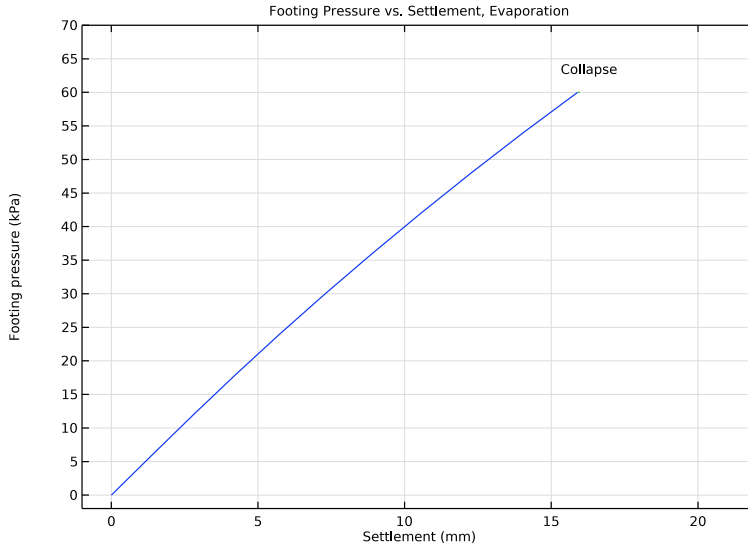


Figure 9: Footing pressure versus settlement after five days of evaporation.

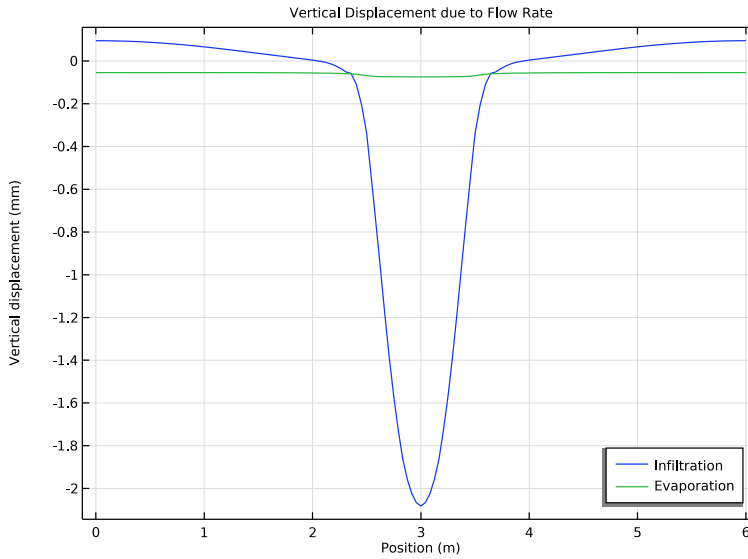


Figure 10: Vertical displacement of top layer of soil due to rainfall and evaporation.

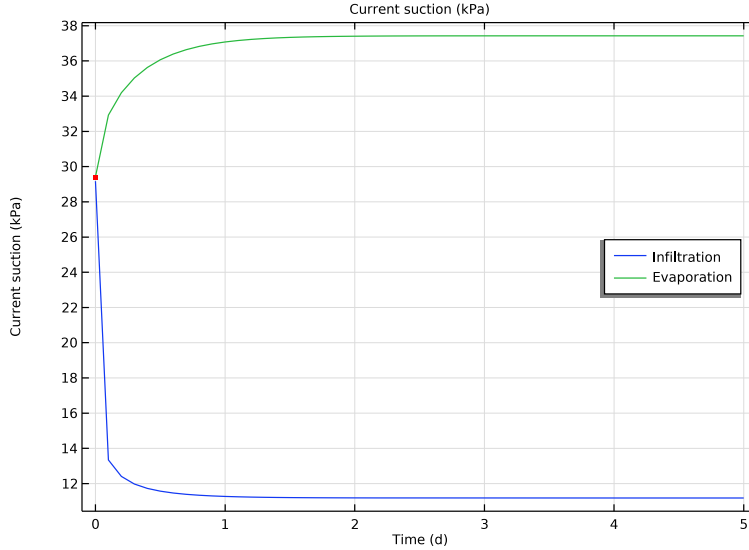


Figure 11: Changes in pore suction due to rainfall and evaporation.

Notes About the COMSOL Implementation

The model setup represents a unidirectional multiphysics coupling where changes in pore pressure affect the soil deformation, but changes in the deformation have no effect on the pore pressure.

The Cam-Clay family of soil models, like the MCC or BBMx models, do not define any stiffness at zero stress. To avoid numerical instabilities, prescribe an initial mean stress equal to the reference pressure at zero strain.

Reference


1. A.A. Abed and P.A. Vermeer, “Numerical Simulation of Unsaturated Soil Behavior,” *International Journal of Computer Applications in Technology*, vol. 34, no. 1, 2009.

Application Library path: Geomechanics_Module/Soil/
settlement_analysis_transient




Modeling Instructions

From the **File** menu, choose **New**.

NEW

In the **New** window, click  **Model Wizard**.

MODEL WIZARD


- 1 In the **Model Wizard** window, click  **2D**.
- 2 In the **Select Physics** tree, select **Fluid Flow > Porous Media and Subsurface Flow > Richards' Equation (dl)**.
- 3 Right-click and choose **Add Physics**.
- 4 In the **Select Physics** tree, select **Structural Mechanics > Solid Mechanics (solid)**.
- 5 Right-click and choose **Add Physics**.
- 6 Click  **Study**.
- 7 In the **Select Study** tree, select **General Studies > Stationary**.
- 8 Click  **Done**.

GEOMETRY I


Model parameters are available in the appended text file.

GLOBAL DEFINITIONS

Parameters I

- 1 In the **Model Builder** window, under **Global Definitions** click **Parameters I**.
- 2 In the **Settings** window for **Parameters**, locate the **Parameters** section.
- 3 Click  **Load from File**.
- 4 Browse to the model's Application Libraries folder and double-click the file `settlement_analysis_transient_parameters.txt`.

Footing Pressure

- 1 In the **Home** toolbar, click  **Functions** and choose **Global > Interpolation**.
- 2 In the **Settings** window for **Interpolation**, type Footing Pressure in the **Label** text field.
- 3 Locate the **Definition** section. In the **Function name** text field, type `F_P`.

4 In the table, enter the following settings:

t	f(t)
0	0
1	60

5 Locate the **Units** section. In the **Argument** table, enter the following settings:

Argument	Unit
t	1

6 In the **Function** table, enter the following settings:

Function	Unit
F_P	kPa

DEFINITIONS

Variables 1

1 In the **Model Builder** window, expand the **Component 1 (comp1) > Definitions** node.

2 Right-click **Definitions** and choose **Variables**.

Model variables are available in the appended text file.

3 In the **Settings** window for **Variables**, locate the **Variables** section.


4 Click  **Load from File**.

5 Browse to the model's Application Libraries folder and double-click the file `settlement_analysis_transient_variables.txt`.

Create half of the geometry by exploiting symmetry.

GEOMETRY 1

Rectangle 1 (r1)

1 In the **Geometry** toolbar, click  **Rectangle**.



2 In the **Settings** window for **Rectangle**, locate the **Size and Shape** section.

3 In the **Width** text field, type 3.

4 In the **Height** text field, type 3.

Add a line segment to represent the foundation.

Line Segment 1 (ls1)

- 1 In the **Geometry** toolbar, click  **More Primitives** and choose **Line Segment**.
- 2 In the **Settings** window for **Line Segment**, locate the **Starting Point** section.
- 3 From the **Specify** list, choose **Coordinates**.
- 4 In the **x** text field, type 2.5.
- 5 In the **y** text field, type 3.
- 6 Locate the **Endpoint** section. From the **Specify** list, choose **Coordinates**.
- 7 In the **x** text field, type 3.
- 8 In the **y** text field, type 3.
- 9 Click  **Build Selected**.

MATERIALS

Add a **Porous Material** that contains information about the fluid and porous matrix properties together with the structural properties.

Porous Material 1 (pmat1)

In the **Model Builder** window, under **Component 1 (comp1)** right-click **Materials** and choose **More Materials > Porous Material**.

Continue with setting up the physics. After that, the software automatically detects which material properties are required.

RICHARDS' EQUATION (DL)

Unsaturated Porous Medium 1

- 1 In the **Settings** window for **Unsaturated Porous Medium**, locate the **Porous Medium** section.
- 2 From the **Storage model** list, choose **User defined**.

Porous Matrix 1

- 1 In the **Model Builder** window, click **Porous Matrix 1**.
- 2 In the **Settings** window for **Porous Matrix**, locate the **Retention Model** section.
- 3 From the **Retention model** list, choose **User defined**. In the S_e text field, type S_e .
- 4 In the θ_l text field, type $S_{res} \cdot \phi_0 + S_e \cdot (\phi_0 - S_{res} \cdot \phi_0)$.
- 5 In the C_m text field, type C_m .
- 6 In the κ_r text field, type k_{rel} .
- 7 In the θ_r text field, type $S_{res} \cdot \phi_0$.

Initial Values 1

- 1 In the **Model Builder** window, under **Component 1 (comp1) > Richards' Equation (dl)** click **Initial Values 1**.
- 2 In the **Settings** window for **Initial Values**, locate the **Initial Values** section.
- 3 Click the **Hydraulic head** button.


Hydraulic Head 1

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Hydraulic Head**.
- 2 Select Boundary 2 only.

Symmetry 1

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Symmetry**.
- 2 Select Boundary 5 only.

Infiltration

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Precipitation**.
- 2 In the **Settings** window for **Precipitation**, type Infiltration in the **Label** text field.
- 3 Select Boundaries 3 and 4 only.
- 4 Locate the **Precipitation** section. In the P_0 text field, type U_{in} .

Evaporation


- 1 Right-click **Infiltration** and choose **Duplicate**.
- 2 In the **Settings** window for **Precipitation**, type Evaporation in the **Label** text field.
- 3 Locate the **Precipitation** section. In the P_0 text field, type $-U_{out}$.

Continue with setting up the **Solid Mechanics** interface.

SOLID MECHANICS (SOLID)


- 1 In the **Model Builder** window, under **Component 1 (comp1)** click **Solid Mechanics (solid)**.
- 2 In the **Settings** window for **Solid Mechanics**, locate the **Structural Transient Behavior** section.
- 3 From the list, choose **Quasistatic**.

Extended Barcelona Basic Model (BBMx)

- 1 In the **Physics** toolbar, click  **Domains** and choose **Elastoplastic Soil Material**.
- 2 In the **Settings** window for **Elastoplastic Soil Material**, type Extended Barcelona Basic Model (BBMx) in the **Label** text field.

- 3 Locate the **Elastoplastic Soil Material** section. From the **Material model** list, choose **Extended Barcelona basic**.
- 4 From the $\Gamma(\theta)$ list, choose **Matsuoka–Nakai**.
- 5 Find the **Parameters** subsection. From the M list, choose **From material**.
- 6 In the s_0 text field, type `InitSuction`.
- 7 In the s text field, type `Suction`.
- 8 In the p_{ref} text field, type `pref`.
- 9 In the p_{c0} text field, type `pc0`.
- 10 Select Domain 1 only.

External Stress I

- 1 In the **Physics** toolbar, click  **Attributes** and choose **External Stress**.
- 2 In the **Settings** window for **External Stress**, locate the **External Stress** section.
- 3 From the **Stress input** list, choose **Pore pressure**.
- 4 In the p_A text field, type `PorePressure`.
- 5 In the p_{ref} text field, type `0`.
- 6 From the α_B list, choose **User defined**. In the associated text field, type `1`.

Go to the material node and assign the required material properties.


MATERIALS

Porous Material I (pmatI)

- 1 In the **Model Builder** window, under **Component 1 (comp1) > Materials** click **Porous Material I (pmatI)**.
- 2 In the **Settings** window for **Porous Material**, locate the **Porosity** section.
- 3 In the ε_p text field, type `ph10`.
- 4 Locate the **Homogenized Properties** section. In the table, enter the following settings:

Property	Variable	Value	Unit	Property group
Plastic potential smoothing parameter	bb	bB	l	Barcelona Basic
Swelling index for changes in suction	kappaSwellingsu	kappa_s	l	Barcelona Basic
Density	rho	rhos	kg/m ³	Basic

Property	Variable	Value	Unit	Property group
Compression index at saturation	lambdaComp0	lambda	l	Barcelona Basic
Poisson's ratio	nu	Nu	l	Critical state model
Weight parameter	wb	wB	l	Barcelona Basic
Initial yield value for suction	sy0	syB0	Pa	Barcelona Basic
Slope of critical state line	M	MB	l	Critical state model
Soil stiffness parameter	mb	mB	Pa	Barcelona Basic
Initial void ratio	evoid0b	e0	l	Barcelona Basic
Swelling index at saturation	kappaSwelling0	kappa	l	Barcelona Basic
Tension to suction ratio	kb	kB	l	Barcelona Basic
Permeability	kappa_iso ; kappaii = kappa_iso, kappaij = 0	k	m ²	Basic
Compression index for changes in suction	lambdaCompsu	lambda_s	l	Barcelona Basic

5 Locate the **Phase-Specific Properties** section. Click  **Add Required Phase Nodes**.

Fluid 1 (pmat1.fluid1)

- 1 In the **Model Builder** window, click **Fluid 1 (pmat1.fluid1)**.
- 2 In the **Settings** window for **Fluid**, locate the **Material Contents** section.
- 3 In the table, enter the following settings:

Property	Variable	Value	Unit	Property group
Density	rho	rhov	kg/m ³	Basic
Dynamic viscosity	mu	muw	Pa·s	Basic
Porosity	epsilon	l	l	Porous model

SOLID MECHANICS (SOLID)


Gravity 1

In the **Physics** toolbar, click  **Global** and choose **Gravity**.

Fixed Constraint 1

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Fixed Constraint**.
- 2 Select Boundary 2 only.


Roller 1

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Roller**.
- 2 Select Boundary 1 only.

Symmetry 1

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Symmetry**.
- 2 Select Boundary 5 only.

Boundary Load 1

- 1 In the **Physics** toolbar, click  **Boundaries** and choose **Boundary Load**.
- 2 Select Boundary 4 only.
- 3 In the **Settings** window for **Boundary Load**, locate the **Force** section.
- 4 Specify the \mathbf{f}_A vector as

0	x
-F_P(para)	y

MESH 1

Mapped 1


- 1 In the **Mesh** toolbar, click  **Mapped**.
- 2 In the **Settings** window for **Mapped**, click  **Build All**.

STUDY: FOOTING PRESSURE


- 1 In the **Model Builder** window, click **Study 1**.
- 2 In the **Settings** window for **Study**, type Study: Footing Pressure in the **Label** text field.
- 3 Locate the **Study Settings** section. Clear the **Generate default plots** checkbox.

Step 1: Stationary



- 1 In the **Model Builder** window, under **Study: Footing Pressure** click **Step 1: Stationary**.

- 2 In the **Settings** window for **Stationary**, locate the **Physics and Variables Selection** section.
- 3 Select the **Modify model configuration for study step** checkbox.
- 4 In the tree, select **Component 1 (comp1) > Richards' Equation (dl) > Infiltration and Component 1 (comp1) > Richards' Equation (dl) > Evaporation**.
- 5 Right-click and choose **Disable**.
- 6 Click to expand the **Study Extensions** section. Select the **Auxiliary sweep** checkbox.
- 7 Click  **Add**.
- 8 In the table, enter the following settings:


Parameter name	Parameter value list	Parameter unit
para (Parameter)	range(0,0.1,1)	

- 9 In the **Study** toolbar, click  **Compute**.

RESULT TEMPLATES

- 1 In the **Results** toolbar, click  **Result Templates** to open the **Result Templates** window.
- 2 Go to the **Result Templates** window.
- 3 In the tree, select **Study: Footing Pressure/Solution 1 (sol1) > Richards' Equation > Pressure (dl)** and **Study: Footing Pressure/Solution 1 (sol1) > Richards' Equation > Effective Saturation (dl)**.
- 4 Click the **Add Result Template** button in the window toolbar.
- 5 In the tree, select **Study: Footing Pressure/Solution 1 (sol1) > Solid Mechanics > Stress (solid)**, **Study: Footing Pressure/Solution 1 (sol1) > Solid Mechanics > Volumetric Plastic Strain (solid)**, **Study: Footing Pressure/Solution 1 (sol1) > Solid Mechanics > Void Ratio (solid)**, and **Study: Footing Pressure/Solution 1 (sol1) > Solid Mechanics > Applied Loads (solid)**.
- 6 Click the **Add Result Template** button in the window toolbar.
- 7 In the **Results** toolbar, click  **Result Templates** to close the **Result Templates** window.

ADD STUDY

- 1 In the **Home** toolbar, click  **Add Study** to open the **Add Study** window.
- 2 Go to the **Add Study** window.
- 3 Find the **Studies** subsection. In the **Select Study** tree, select **General Studies > Time Dependent**.
- 4 Right-click and choose **Add Study**.

5 In the **Home** toolbar, click  **Add Study** to close the **Add Study** window.

STUDY: INFILTRATION

1 In the **Settings** window for **Study**, type **Study: Infiltration** in the **Label** text field.

2 Locate the **Study Settings** section. Clear the **Generate default plots** checkbox.

Step 1: Time Dependent

1 In the **Model Builder** window, under **Study: Infiltration** click **Step 1: Time Dependent**.

2 In the **Settings** window for **Time Dependent**, locate the **Study Settings** section.

3 From the **Time unit** list, choose **d**.

4 In the **Output times** text field, type range (0,0.1,5).

5 From the **Tolerance** list, choose **User controlled**.

6 In the **Relative tolerance** text field, type 0.0001.

7 Locate the **Physics and Variables Selection** section. Select the **Modify model configuration for study step** checkbox.

8 In the tree, select **Component 1 (comp1) > Richards' Equation (dl) > Evaporation**.

9 Right-click and choose **Disable**.

10 Click to expand the **Values of Dependent Variables** section. Find the **Initial values of variables solved for** subsection. From the **Settings** list, choose **User controlled**.

11 From the **Method** list, choose **Solution**.

12 From the **Study** list, choose **Study: Footing Pressure, Stationary**.

13 From the **Parameter value (para)** list, choose **Last**.

Solution 2 (sol2)

1 In the **Study** toolbar, click  **Show Default Solver**.

2 In the **Model Builder** window, expand the **Solution 2 (sol2)** node.



3 In the **Model Builder** window, expand the **Study: Infiltration > Solver Configurations > Solution 2 (sol2) > Time-Dependent Solver 1** node, then click **Fully Coupled 1**.

4 In the **Settings** window for **Fully Coupled**, click to expand the **Method and Termination** section.

5 From the **Nonlinear method** list, choose **Automatic (Newton)**.

6 In the **Study** toolbar, click  **Compute**.

ADD STUDY

- 1 In the **Home** toolbar, click  **Add Study** to open the **Add Study** window.
- 2 Go to the **Add Study** window.
- 3 Find the **Studies** subsection. In the **Select Study** tree, select **General Studies** > **Time Dependent**.
- 4 Right-click and choose **Add Study**.
- 5 In the **Home** toolbar, click  **Add Study** to close the **Add Study** window.


STUDY: EVAPORATION


- 1 In the **Settings** window for **Study**, type **Study: Evaporation** in the **Label** text field.
- 2 Locate the **Study Settings** section. Clear the **Generate default plots** checkbox.

Step 1: Time Dependent

- 1 In the **Model Builder** window, under **Study: Evaporation** click **Step 1: Time Dependent**.
- 2 In the **Settings** window for **Time Dependent**, locate the **Study Settings** section.
- 3 From the **Time unit** list, choose **d**.
- 4 In the **Output times** text field, type range (0, 0.1, 5).
- 5 From the **Tolerance** list, choose **User controlled**.
- 6 In the **Relative tolerance** text field, type 0.0001.
- 7 Locate the **Physics and Variables Selection** section. Select the **Modify model configuration for study step** checkbox.
- 8 In the tree, select **Component 1 (comp1)** > **Richards' Equation (dl)** > **Infiltration**.
- 9 Right-click and choose **Disable**.
- 10 Locate the **Values of Dependent Variables** section. Find the **Initial values of variables solved for** subsection. From the **Settings** list, choose **User controlled**.
- 11 From the **Method** list, choose **Solution**.
- 12 From the **Study** list, choose **Study: Footing Pressure, Stationary**.
- 13 From the **Parameter value (para)** list, choose **Last**.


Solution 3 (sol3)

- 1 In the **Study** toolbar, click  **Show Default Solver**.
- 2 In the **Model Builder** window, expand the **Solution 3 (sol3)** node.
- 3 In the **Model Builder** window, expand the **Study: Evaporation** > **Solver Configurations** > **Solution 3 (sol3)** > **Time-Dependent Solver 1** node, then click **Fully Coupled 1**.

- 4 In the **Settings** window for **Fully Coupled**, locate the **Method and Termination** section.
- 5 From the **Nonlinear method** list, choose **Automatic (Newton)**.
- 6 In the **Study** toolbar, click  **Compute**.

RESULTS

Mirror 2D 1

- 1 In the **Results** toolbar, click  **More Datasets** and choose **Mirror 2D**.
- 2 In the **Settings** window for **Mirror 2D**, locate the **Axis Data** section.
- 3 In row **Point 1**, set **X** to 3.
- 4 In row **Point 2**, set **X** to 3.
- 5 Click to expand the **Advanced** section. Find the **Space variables** subsection. Select the **Remove elements on the symmetry axis** checkbox.

Mirror 2D 2

- 1 Right-click **Mirror 2D 1** and choose **Duplicate**.
- 2 In the **Settings** window for **Mirror 2D**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Study: Infiltration/Solution 2 (sol2)**.

Mirror 2D 3

- 1 Right-click **Mirror 2D 2** and choose **Duplicate**.
- 2 In the **Settings** window for **Mirror 2D**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Study: Evaporation/Solution 3 (sol3)**.

Pressure Head

- 1 In the **Model Builder** window, under **Results** click **Pressure (d1)**.
- 2 In the **Settings** window for **2D Plot Group**, type Pressure Head in the **Label** text field.
- 3 Locate the **Data** section. From the **Dataset** list, choose **Mirror 2D 2**.

Surface


- 1 In the **Model Builder** window, expand the **Pressure Head** node, then click **Surface**.
- 2 In the **Settings** window for **Surface**, locate the **Expression** section.
- 3 In the **Expression** text field, type $d1.Hp$.

Surface 2

- 1 Right-click **Surface** and choose **Duplicate**.
- 2 In the **Settings** window for **Surface**, locate the **Data** section.

- 3 From the **Dataset** list, choose **Mirror 2D 3**.
- 4 Click to expand the **Title** section. From the **Title type** list, choose **None**.
- 5 Click to expand the **Inherit Style** section. From the **Plot** list, choose **Surface**.


Transformation 1

- 1 Right-click **Surface 2** and choose **Transformation**.
- 2 In the **Settings** window for **Transformation**, locate the **Transformation** section.
- 3 In the **x** text field, type 7.
- 4 In the **Pressure Head** toolbar, click  **Plot**.

Pressure Head

In the **Model Builder** window, under **Results** click **Pressure Head**.

Table Annotation 1

- 1 In the **Pressure Head** toolbar, click  **More Plots** and choose **Table Annotation**.
- 2 In the **Settings** window for **Table Annotation**, locate the **Data** section.
- 3 From the **Source** list, choose **Local table**.
- 4 Locate the **Coloring and Style** section. Clear the **Show point** checkbox.
- 5 Locate the **Data** section. Select the **LaTeX markup** checkbox.
- 6 In the table, enter the following settings:

x-coordinate	y-coordinate	Annotation
1.8	-0.7	After rainfall
8.5	-0.7	After evaporation

Degree of Saturation, Infiltration

- 1 In the **Model Builder** window, under **Results** click **Effective Saturation (dl)**.
- 2 In the **Settings** window for **2D Plot Group**, type Degree of Saturation, Infiltration in the **Label** text field.
- 3 Locate the **Data** section. From the **Dataset** list, choose **Mirror 2D 2**.
- 4 Click to expand the **Title** section. From the **Title type** list, choose **Manual**.
- 5 In the **Title** text area, type Degree of Saturation.

Surface 1


- 1 In the **Model Builder** window, expand the **Degree of Saturation, Infiltration** node, then click **Surface 1**.
- 2 In the **Settings** window for **Surface**, locate the **Data** section.

- 3 From the **Dataset** list, choose **Mirror 2D 2**.
- 4 From the **Time (d)** list, choose **0**.
- 5 Click **Replace Expression** in the upper-right corner of the **Expression** section. From the menu, choose **Component 1 (comp1) > Richards' Equation > Retention model > dl.Se - Effective saturation - 1**.

Surface 2

- 1 Right-click **Results > Degree of Saturation, Infiltration > Surface 1** and choose **Duplicate**.
- 2 In the **Settings** window for **Surface**, locate the **Data** section.
- 3 From the **Dataset** list, choose **From parent**.
- 4 Locate the **Inherit Style** section. From the **Plot** list, choose **Surface 1**.


Transformation 1

- 1 Right-click **Surface 2** and choose **Transformation**.
- 2 In the **Settings** window for **Transformation**, locate the **Transformation** section.
- 3 In the **x** text field, type 7.
- 4 In the **Degree of Saturation, Infiltration** toolbar, click  **Plot**.

Degree of Saturation, Infiltration


In the **Model Builder** window, under **Results** click **Degree of Saturation, Infiltration**.

Table Annotation 1

- 1 In the **Degree of Saturation, Infiltration** toolbar, click  **More Plots** and choose **Table Annotation**.
- 2 In the **Settings** window for **Table Annotation**, locate the **Coloring and Style** section.
- 3 Clear the **Show point** checkbox.
- 4 Locate the **Data** section. Select the **LaTeX markup** checkbox.
- 5 From the **Source** list, choose **Local table**.
- 6 In the table, enter the following settings:

x-coordinate	y-coordinate	Annotation
1.2	-0.7	Before rainfall
8.5	-0.7	After 5 days of \newline \$\sphericalangle\$ rainfall

Degree of Saturation, Infiltration

- 1 In the **Model Builder** window, click **Degree of Saturation, Infiltration**.
- 2 In the **Degree of Saturation, Infiltration** toolbar, click  **Plot**.

Degree of Saturation, Evaporation

- 1 Right-click **Degree of Saturation, Infiltration** and choose **Duplicate**.
- 2 Drag and drop **Degree of Saturation, Infiltration 1** below **Degree of Saturation, Infiltration**.
- 3 In the **Settings** window for **2D Plot Group**, type Degree of Saturation, Evaporation in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Mirror 2D 3**.

Surface 1


- 1 In the **Model Builder** window, expand the **Degree of Saturation, Evaporation** node, then click **Surface 1**.
- 2 In the **Settings** window for **Surface**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Mirror 2D 3**.
- 4 In the **Degree of Saturation, Evaporation** toolbar, click  **Plot**.

Table Annotation 1


- 1 In the **Model Builder** window, click **Table Annotation 1**.
- 2 In the **Settings** window for **Table Annotation**, locate the **Data** section.
- 3 In the table, enter the following settings:

x-coordinate	y-coordinate	Annotation
1.2	-0.7	Before evaporation
8.5	-0.7	After 5 days of \newline \$\\;\$ evaporation

- 4 In the **Degree of Saturation, Evaporation** toolbar, click  **Plot**.

Set default units for result presentation.

Preferred Units 1

- 1 In the **Results** toolbar, click  **Configurations** and choose **Preferred Units**.
- 2 In the **Settings** window for **Preferred Units**, locate the **Units** section.
- 3 Click **+ Add Physical Quantity**.
- 4 In the **Physical Quantity** dialog, select **Solid Mechanics > Stress tensor (N/m²)** in the tree.
- 5 Click **OK**.
- 6 In the **Settings** window for **Preferred Units**, locate the **Units** section.

7 In the table, enter the following settings:

Quantity	Unit	Preferred unit
Stress tensor	N/m ²	kPa

8 Select the **Apply conversions to expressions with the same dimensions** checkbox.

9 Click  **Apply**.

Stress, Footing Pressure

1 In the **Model Builder** window, under **Results** click **Stress (solid)**.

2 In the **Settings** window for **2D Plot Group**, type **Stress, Footing Pressure** in the **Label** text field.

3 Locate the **Data** section. From the **Dataset** list, choose **Mirror 2D 1**.

4 Locate the **Color Legend** section. Select the **Show maximum and minimum values** checkbox.

Surface 1

1 In the **Model Builder** window, expand the **Stress, Footing Pressure** node, then click **Surface 1**.

2 In the **Settings** window for **Surface**, click to expand the **Quality** section.

3 From the **Smoothing threshold** list, choose **None**.

Arrow Line 1

1 In the **Model Builder** window, right-click **Stress, Footing Pressure** and choose **Arrow Line**.

2 In the **Settings** window for **Arrow Line**, click **Replace Expression** in the upper-right corner of the **Expression** section. From the menu, choose **Component 1 (comp1) > Solid Mechanics > Load > solid.fax,solid.fay - Force per deformed area (spatial frame)**.

3 Click to expand the **Title** section. From the **Title type** list, choose **None**.

4 Locate the **Coloring and Style** section. From the **Arrow base** list, choose **Head**.

5 Click to expand the **Inherit Style** section. From the **Plot** list, choose **Surface 1**.

6 Clear the **Color** checkbox.

7 Clear the **Arrow scale factor** checkbox.

8 Clear the **Color and data range** checkbox.


Deformation 1

Right-click **Arrow Line 1** and choose **Deformation**.


Stress, Footing Pressure

In the **Stress, Footing Pressure** toolbar, click  **Plot**.

Stress, Infiltration

- 1 In the **Model Builder** window, right-click **Stress, Footing Pressure** and choose **Duplicate**.
- 2 Drag and drop **Stress, Footing Pressure 1** below **Stress, Footing Pressure**.
- 3 In the **Settings** window for **2D Plot Group**, type **Stress, Infiltration** in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Mirror 2D 2**.
- 5 Click  **Plot Last**.

Stress, Evaporation

- 1 Right-click **Stress, Infiltration** and choose **Duplicate**.
- 2 Drag and drop **Stress, Infiltration 1** below **Stress, Infiltration**.
- 3 In the **Settings** window for **2D Plot Group**, type **Stress, Evaporation** in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Mirror 2D 3**.
- 5 In the **Stress, Evaporation** toolbar, click  **Plot**.

Volumetric Plastic Strain (solid)

- 1 In the **Model Builder** window, click **Volumetric Plastic Strain (solid)**.
- 2 In the **Settings** window for **2D Plot Group**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Mirror 2D 2**.

Surface 2

- 1 In the **Model Builder** window, expand the **Volumetric Plastic Strain (solid)** node.
- 2 Right-click **Results > Volumetric Plastic Strain (solid) > Surface 1** and choose **Duplicate**.
- 3 In the **Settings** window for **Surface**, locate the **Data** section.
- 4 From the **Dataset** list, choose **Mirror 2D 3**.
- 5 Locate the **Title** section. From the **Title type** list, choose **None**.
- 6 Locate the **Inherit Style** section. From the **Plot** list, choose **Surface 1**.

Transformation 1

- 1 Right-click **Surface 2** and choose **Transformation**.
- 2 In the **Settings** window for **Transformation**, locate the **Transformation** section.
- 3 In the **x** text field, type 7.

Volumetric Plastic Strain (solid)



- 1 In the **Model Builder** window, under **Results** click **Volumetric Plastic Strain (solid)**.
- 2 In the **Volumetric Plastic Strain (solid)** toolbar, click  **Plot**.

Table Annotation 1

- 1 In the **Volumetric Plastic Strain (solid)** toolbar, click  **More Plots** and choose **Table Annotation**.
- 2 In the **Settings** window for **Table Annotation**, locate the **Data** section.
- 3 From the **Source** list, choose **Local table**.
- 4 Locate the **Coloring and Style** section. Clear the **Show point** checkbox.
- 5 Locate the **Data** section. Select the **LaTeX markup** checkbox.
- 6 In the table, enter the following settings:

x-coordinate	y-coordinate	Annotation
1.8	-0.7	After rainfall
8.5	-0.7	After evaporation


Void Ratio (solid)

- 1 In the **Model Builder** window, under **Results** click **Void Ratio (solid)**.
- 2 In the **Settings** window for **2D Plot Group**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Mirror 2D 2**.

Surface 2

- 1 In the **Model Builder** window, expand the **Void Ratio (solid)** node.
- 2 Right-click **Results > Void Ratio (solid) > Surface 1** and choose **Duplicate**.
- 3 In the **Settings** window for **Surface**, locate the **Data** section.
- 4 From the **Dataset** list, choose **Mirror 2D 3**.
- 5 Locate the **Title** section. From the **Title type** list, choose **None**.
- 6 Locate the **Inherit Style** section. From the **Plot** list, choose **Surface 1**.

Transformation 1

- 1 Right-click **Surface 2** and choose **Transformation**.
- 2 In the **Settings** window for **Transformation**, locate the **Transformation** section.
- 3 In the **x** text field, type 7.
- 4 In the **Void Ratio (solid)** toolbar, click  **Plot**.

Void Ratio (solid)




- 1 In the **Model Builder** window, under **Results** click **Void Ratio (solid)**.
- 2 Click  **Plot**.

Table Annotation 1

- 1 In the **Void Ratio (solid)** toolbar, click  **More Plots** and choose **Table Annotation**.
- 2 In the **Settings** window for **Table Annotation**, locate the **Data** section.
- 3 From the **Source** list, choose **Local table**.
- 4 Locate the **Coloring and Style** section. Clear the **Show point** checkbox.
- 5 Locate the **Data** section. Select the **LaTeX markup** checkbox.
- 6 In the table, enter the following settings:

x-coordinate	y-coordinate	Annotation
1.8	-0.7	After rainfall
8.5	-0.7	After evaporation

Suction Changes

- 1 In the **Results** toolbar, click  **ID Plot Group**.
- 2 Drag and drop below **Void Ratio (solid)**.
- 3 In the **Settings** window for **ID Plot Group**, type Suction Changes in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Study: Infiltration/ Solution 2 (sol2)**.
- 5 Locate the **Legend** section. From the **Position** list, choose **Middle right**.

Point Graph 1

- 1 Right-click **Suction Changes** and choose **Point Graph**.
- 2 Select Point 5 only.
- 3 In the **Settings** window for **Point Graph**, locate the **y-Axis Data** section.
- 4 In the **Expression** text field, type Suction.
- 5 Click to expand the **Legends** section. Select the **Show legends** checkbox.
- 6 From the **Legends** list, choose **Manual**.
- 7 In the table, enter the following settings:

Legends
Infiltration


Point Graph 2

- 1 Right-click **Point Graph 1** and choose **Duplicate**.
- 2 In the **Settings** window for **Point Graph**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Study: Evaporation/Solution 3 (sol3)**.
- 4 Click to expand the **Title** section. From the **Title type** list, choose **None**.
- 5 Locate the **Legends** section. In the table, enter the following settings:

Legends

Evaporation

Annotation 1

- 1 In the **Model Builder** window, right-click **Suction Changes** and choose **Annotation**.
- 2 In the **Settings** window for **Annotation**, locate the **Position** section.
- 3 In the **Y** text field, type 29.4.
- 4 Locate the **Coloring and Style** section. From the **Color** list, choose **Red**.
- 5 In the **Suction Changes** toolbar, click  **Plot**.

Volume Changes

- 1 Right-click **Suction Changes** and choose **Duplicate**.
- 2 Drag and drop **Suction Changes 1** below **Suction Changes**.
- 3 In the **Settings** window for **ID Plot Group**, type Volume Changes in the **Label** text field.


Point Graph 1

- 1 In the **Model Builder** window, expand the **Volume Changes** node, then click **Point Graph 1**.
- 2 In the **Settings** window for **Point Graph**, locate the **y-Axis Data** section.
- 3 In the **Expression** text field, type `solid.epm1.evols`.


Point Graph 2

- 1 In the **Model Builder** window, click **Point Graph 2**.
- 2 In the **Settings** window for **Point Graph**, locate the **y-Axis Data** section.
- 3 In the **Expression** text field, type `solid.epm1.evols`.

Annotation 1

- 1 In the **Model Builder** window, click **Annotation 1**.
- 2 In the **Settings** window for **Annotation**, locate the **Position** section.
- 3 In the **Y** text field, type 0.
- 4 In the **Volume Changes** toolbar, click  **Plot**.

Footing Pressure vs. Settlement, Infiltration

- 1 In the **Results** toolbar, click  **ID Plot Group**.
- 2 Drag and drop below **Volume Changes**.
- 3 In the **Settings** window for **ID Plot Group**, type Footing Pressure vs. Settlement, Infiltration in the **Label** text field.
- 4 Click to expand the **Title** section. From the **Title type** list, choose **Label**.
- 5 Locate the **Plot Settings** section.
- 6 Select the **x-axis label** checkbox. In the associated text field, type Settlement (mm).
- 7 Select the **y-axis label** checkbox. In the associated text field, type Footing pressure (kPa).
- 8 Locate the **Axis** section. Select the **Manual axis limits** checkbox.
- 9 In the **x maximum** text field, type 22.
- 10 In the **y minimum** text field, type -2.
- 11 In the **y maximum** text field, type 70.
- 12 Locate the **Legend** section. Clear the **Show legends** checkbox.

Point Graph 1


- 1 Right-click **Footing Pressure vs. Settlement, Infiltration** and choose **Point Graph**.
- 2 Select Point 5 only.
- 3 In the **Settings** window for **Point Graph**, locate the **y-Axis Data** section.
- 4 In the **Expression** text field, type F_P(para).
- 5 Locate the **x-Axis Data** section. From the **Parameter** list, choose **Expression**.
- 6 In the **Expression** text field, type $\text{abs}(v-\text{withsol}('sol1',v,\text{setval}(\text{para},0)))$.
- 7 From the **Unit** list, choose **mm**.
- 8 Click to expand the **Coloring and Style** section. From the **Width** list, choose **1**.

Point Graph 2

- 1 Right-click **Point Graph 1** and choose **Duplicate**.
- 2 In the **Settings** window for **Point Graph**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Study: Infiltration/Solution 2 (sol2)**.

Annotation 1


- 1 In the **Model Builder** window, right-click **Footing Pressure vs. Settlement, Infiltration** and choose **Annotation**.
- 2 In the **Settings** window for **Annotation**, locate the **Annotation** section.

- 3 In the **Text** text field, type Collapse.
- 4 Locate the **Position** section. In the **X** text field, type 15.
- 5 In the **Y** text field, type 65.
- 6 Locate the **Coloring and Style** section. Clear the **Show point** checkbox.
- 7 In the **Footing Pressure vs. Settlement, Infiltration** toolbar, click  **Plot**.


Footing Pressure vs. Settlement, Evaporation

- 1 Right-click **Footing Pressure vs. Settlement, Infiltration** and choose **Duplicate**.
- 2 Drag and drop **Footing Pressure vs. Settlement, Infiltration 1** below **Footing Pressure vs. Settlement, Infiltration**.
- 3 In the **Settings** window for **ID Plot Group**, type Footing Pressure vs. Settlement, Evaporation in the **Label** text field.

Point Graph 2

- 1 In the **Model Builder** window, expand the **Footing Pressure vs. Settlement, Evaporation** node, then click **Point Graph 2**.
- 2 In the **Settings** window for **Point Graph**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Study: Evaporation/Solution 3 (sol3)**.
- 4 In the **Footing Pressure vs. Settlement, Evaporation** toolbar, click  **Plot**.

Cut Line 2D 1

- 1 In the **Results** toolbar, click  **Cut Line 2D**.
- 2 In the **Settings** window for **Cut Line 2D**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Mirror 2D 2**.
- 4 Locate the **Line Data** section. In row **Point 2**, set **x** to 6.
- 5 In row **Point 1**, set **y** to 3.
- 6 In row **Point 2**, set **y** to 3.

Cut Line 2D 2

- 1 Right-click **Cut Line 2D 1** and choose **Duplicate**.
- 2 In the **Settings** window for **Cut Line 2D**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Mirror 2D 3**.

Vertical Displacement

- 1 In the **Results** toolbar, click  **ID Plot Group**.
- 2 Drag and drop below **Footing Pressure vs. Settlement, Evaporation**.

- 3 In the **Settings** window for **ID Plot Group**, type Vertical Displacement in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Cut Line 2D 1**.
- 5 From the **Time selection** list, choose **Last**.
- 6 Locate the **Title** section. From the **Title type** list, choose **Manual**.
- 7 In the **Title** text area, type Vertical Displacement due to Flow Rate.
- 8 Locate the **Plot Settings** section.
- 9 Select the **x-axis label** checkbox. In the associated text field, type Position (m).
- 10 Select the **y-axis label** checkbox. In the associated text field, type Vertical displacement (mm).
- 11 Locate the **Legend** section. From the **Position** list, choose **Lower right**.

Line Graph 1

- 1 Right-click **Vertical Displacement** and choose **Line Graph**.
- 2 In the **Settings** window for **Line Graph**, locate the **y-Axis Data** section.
- 3 In the **Expression** text field, type `v-withsol('sol1',v,setval(para,1))`.
- 4 From the **Unit** list, choose **mm**.
- 5 Locate the **x-Axis Data** section. From the **Parameter** list, choose **Expression**.
- 6 In the **Expression** text field, type `c1n1x`.
- 7 Click to expand the **Legends** section. Select the **Show legends** checkbox.
- 8 From the **Legends** list, choose **Manual**.
- 9 In the table, enter the following settings:

Legends

Infiltration

Line Graph 2


- 1 Right-click **Line Graph 1** and choose **Duplicate**.
- 2 In the **Settings** window for **Line Graph**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Cut Line 2D 2**.
- 4 From the **Time selection** list, choose **Last**.
- 5 Locate the **Legends** section. In the table, enter the following settings:

Legends



Evaporation

6 In the **Vertical Displacement** toolbar, click  **Plot**.

Pressure Head vs. Elevation, Infiltration

- 1 In the **Results** toolbar, click  **ID Plot Group**.
- 2 Drag and drop below **Vertical Displacement**.
- 3 In the **Settings** window for **ID Plot Group**, type Pressure Head vs. Elevation, Infiltration in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Study: Infiltration/ Solution 2 (sol2)**.
- 5 From the **Time selection** list, choose **From list**.
- 6 In the **Times (d)** list, choose **0, 0.5, 1, and 5**.
- 7 Locate the **Title** section. From the **Title type** list, choose **Label**.
- 8 Locate the **Plot Settings** section.
- 9 Select the **x-axis label** checkbox. In the associated text field, type Negative pressure head (m).
- 10 Select the **y-axis label** checkbox. In the associated text field, type Elevation (m).
- 11 Locate the **Legend** section. From the **Position** list, choose **Lower right**.

Line Graph 1

- 1 Right-click **Pressure Head vs. Elevation, Infiltration** and choose **Line Graph**.
- 2 In the **Settings** window for **Line Graph**, locate the **Selection** section.
- 3 Click to select the  **Activate Selection** toggle button.
- 4 Select Boundary 1 only.
- 5 Locate the **y-Axis Data** section. In the **Expression** text field, type Y.
- 6 Locate the **x-Axis Data** section. From the **Parameter** list, choose **Expression**.
- 7 In the **Expression** text field, type $-d1.Hp$.
- 8 In the **Pressure Head vs. Elevation, Infiltration** toolbar, click  **Plot**.
- 9 Locate the **Legends** section. Select the **Show legends** checkbox.
- 10 From the **Legends** list, choose **Evaluated**.
- 11 In the **Legend** text field, type $eval(\tau, \text{ day})$ days.


Line Graph 2

- 1 In the **Model Builder** window, right-click **Pressure Head vs. Elevation, Infiltration** and choose **Line Graph**.
- 2 In the **Settings** window for **Line Graph**, locate the **Data** section.


- 3 From the **Dataset** list, choose **Study: Infiltration/Solution 2 (sol2)**.
- 4 From the **Time selection** list, choose **Last**.
- 5 Select Boundary 1 only.
- 6 Locate the **y-Axis Data** section. In the **Expression** text field, type Y.
- 7 Locate the **x-Axis Data** section. From the **Parameter** list, choose **Expression**.
- 8 In the **Expression** text field, type -Hp_in.
- 9 Click to expand the **Coloring and Style** section. Find the **Line markers** subsection. From the **Marker** list, choose **Circle**.
- 10 From the **Positioning** list, choose **Interpolated**.
- 11 Locate the **Legends** section. Select the **Show legends** checkbox.
- 12 From the **Legends** list, choose **Manual**.
- 13 In the table, enter the following settings:

Legends

Gardener solution

- 14 In the **Pressure Head vs. Elevation, Infiltration** toolbar, click  **Plot**.

Pressure Head vs. Elevation, Infiltration


- 1 In the **Model Builder** window, click **Pressure Head vs. Elevation, Infiltration**.
- 2 Click  **Plot**.

Pressure Head vs. Elevation, Evaporation

- 1 Right-click **Pressure Head vs. Elevation, Infiltration** and choose **Duplicate**.
- 2 Drag and drop **Pressure Head vs. Elevation, Infiltration 1** below **Pressure Head vs. Elevation, Infiltration**.
- 3 In the **Settings** window for **ID Plot Group**, type Pressure Head vs. Elevation, Evaporation in the **Label** text field.
- 4 Locate the **Data** section. From the **Dataset** list, choose **Study: Evaporation/Solution 3 (sol3)**.

Line Graph 2

- 1 In the **Model Builder** window, expand the **Pressure Head vs. Elevation, Evaporation** node, then click **Line Graph 2**.
- 2 In the **Settings** window for **Line Graph**, locate the **Data** section.
- 3 From the **Dataset** list, choose **Study: Evaporation/Solution 3 (sol3)**.

- 4 Locate the **x-Axis Data** section. In the **Expression** text field, type `-Hp_out`.
- 5 In the **Pressure Head vs. Elevation, Evaporation** toolbar, click  **Plot**.