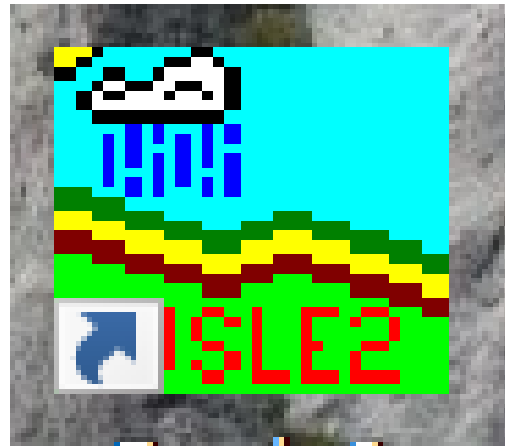
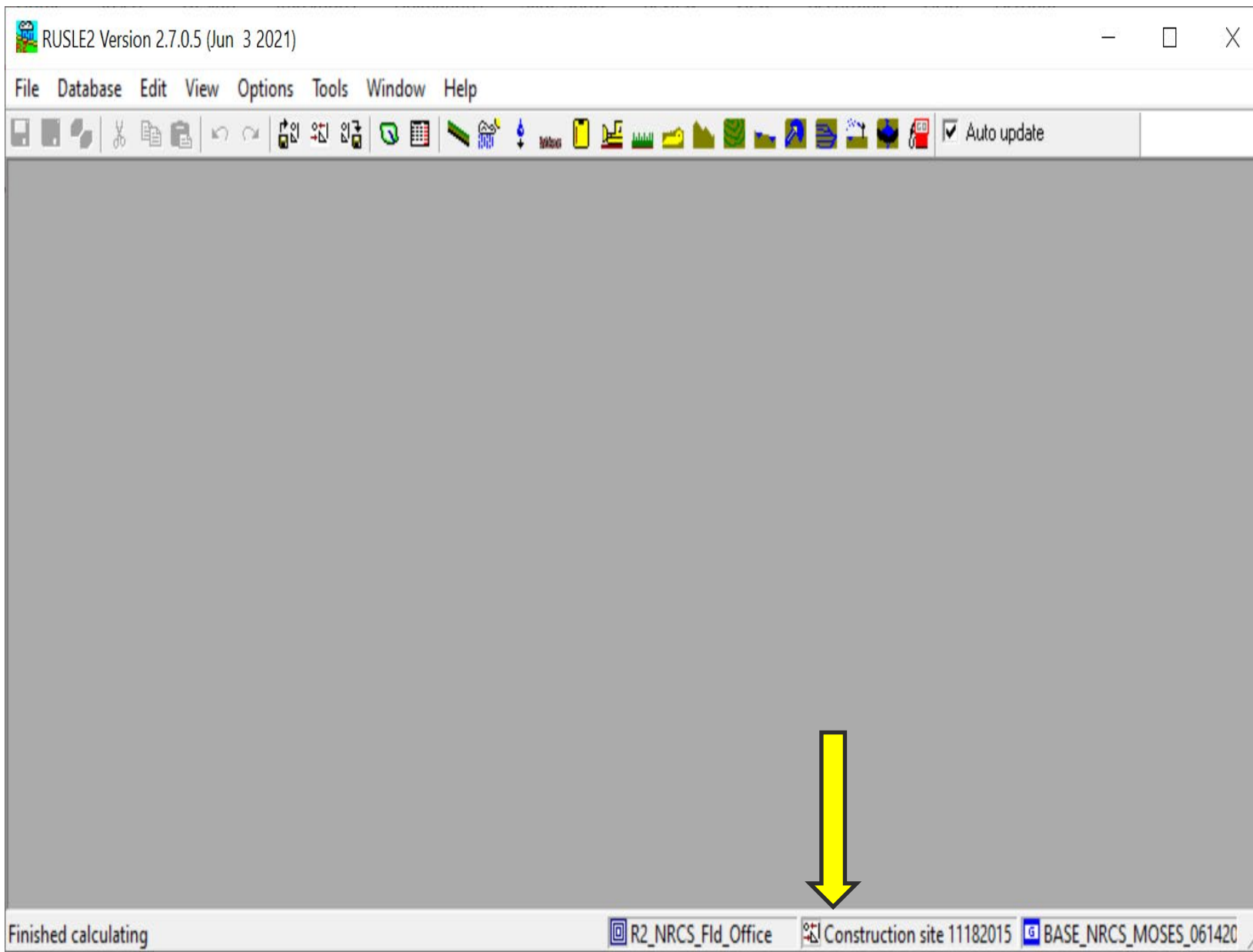


Calculating BMP Sediment Removal Effectiveness Using RUSLE2 for Natural Buffer Zone Encroachment



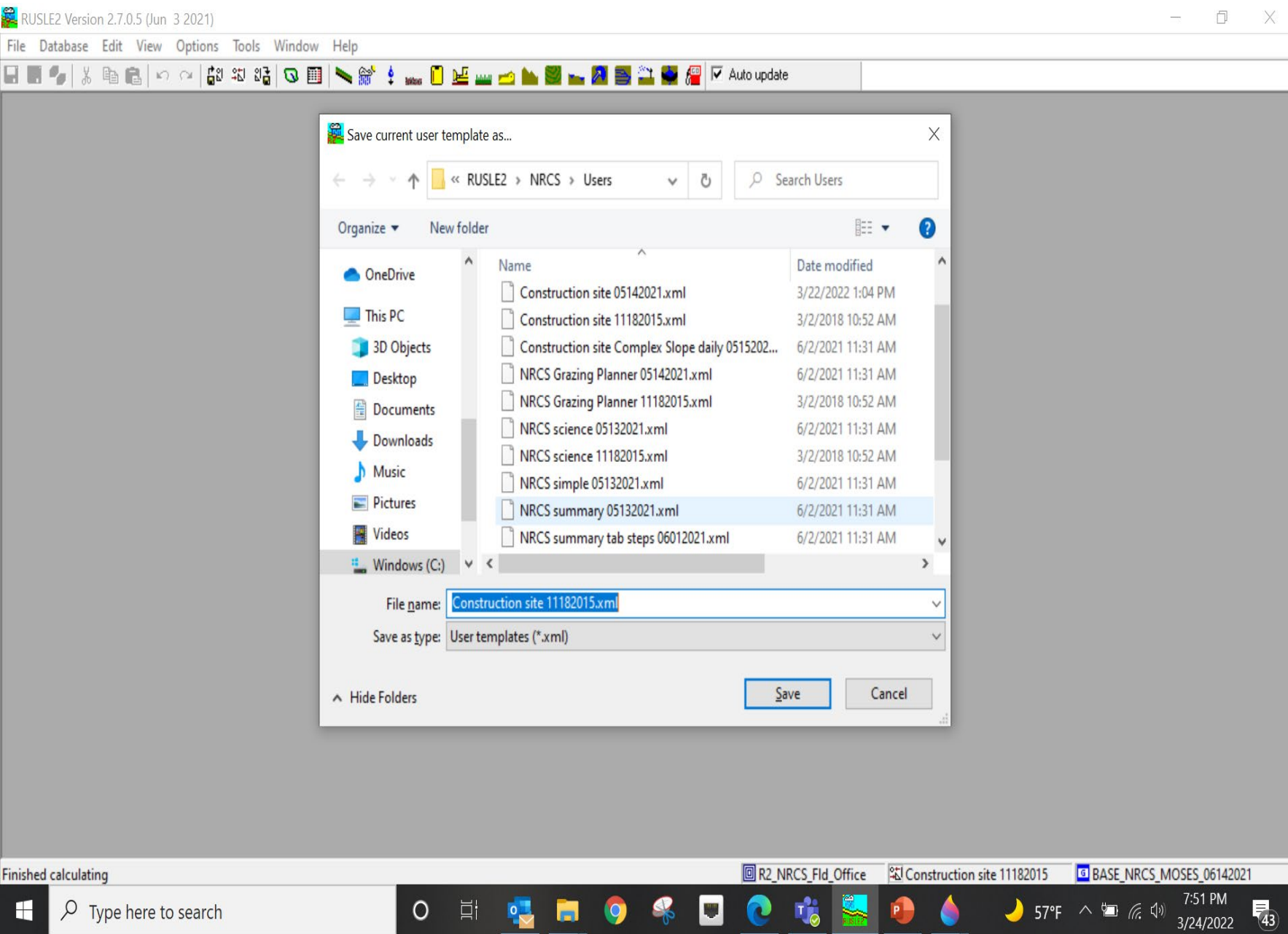


**Pre-Encroachment (Natural) Profile to
Determine
Baseline Sediment Delivery**

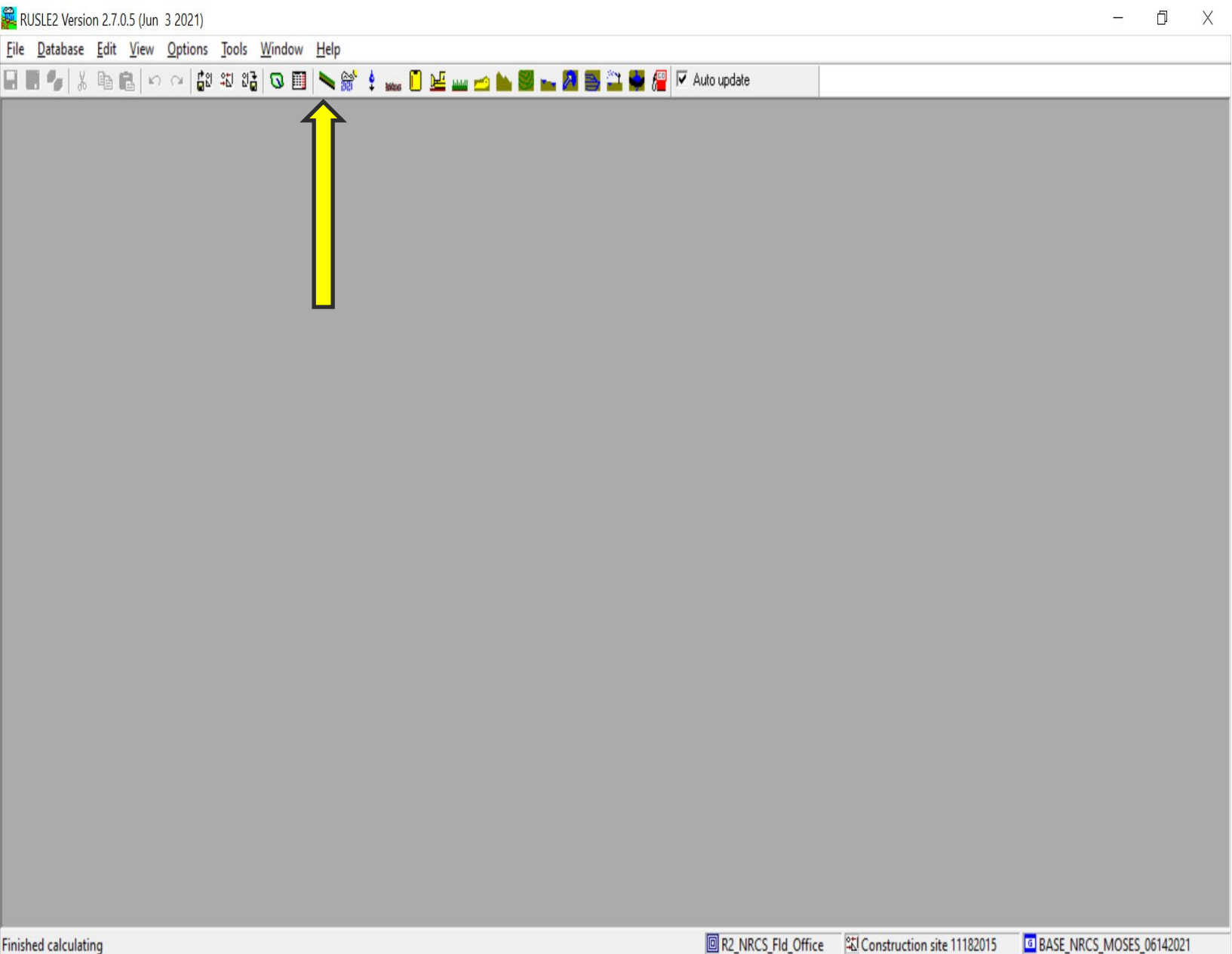


- Upon opening the RUSLE2 app this screen should appear.
 - The yellow arrow indicates which mode you are in.
 - To change modes, right click on the middle cell and select “Edit”.
- The link below will direct you to the USDA’s website to download the RUSLE2 app.

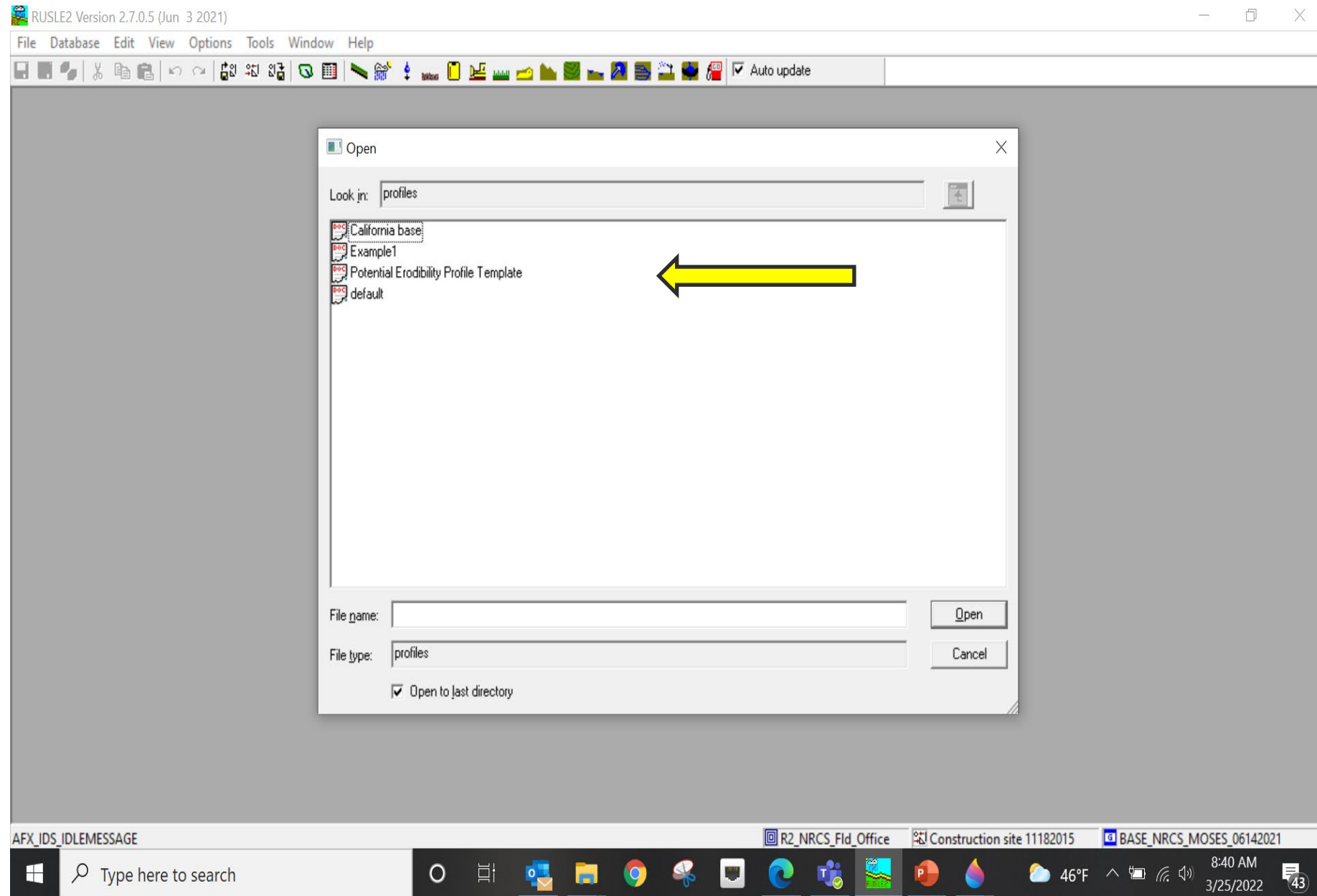
<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/tools/rusle2/?cid=stelprdb1247274>



- You may select between “Construction site” and “Construction site Complex Slope” if your site has numerous topography breaks.



- To access the profile templet page, click on the green slope icon on the center tool bar.



- In the dialog box, select the file labeled “Potential Erodibility Profile Template”, then click open.

RUSLE2 Version 2.7.0.5 (Jun 3 2021) - [Profile: Potential Erodibility Profile Template]

File Database Edit View Options Tools Window Help

Auto update

Manage Soil Topo

Add break Erase break

STEP 1: Choose location to set climate:
Location default

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	150	default

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	150	6.0	9.0	140	150

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	150	150	Continuously tilled and smoothed	137	1

Adjust yields
Adjust yields
Yields

STEP 5: Set supporting practices:
Contouring a. rows up-and-down hill
Diversion/terrace, sediment basin (none)

STEP 6: Set perm. barrier system:
Perm. barrier set open

Soil loss, t/ac/yr 140
Sediment delivery, t/ac/yr 137
Soil loss erod. portion, t/ac/yr 140

Finished calculating

R2_NRCS_Fld_Office Construction site 11182015 BASE_NRCS_MOSES_06142021

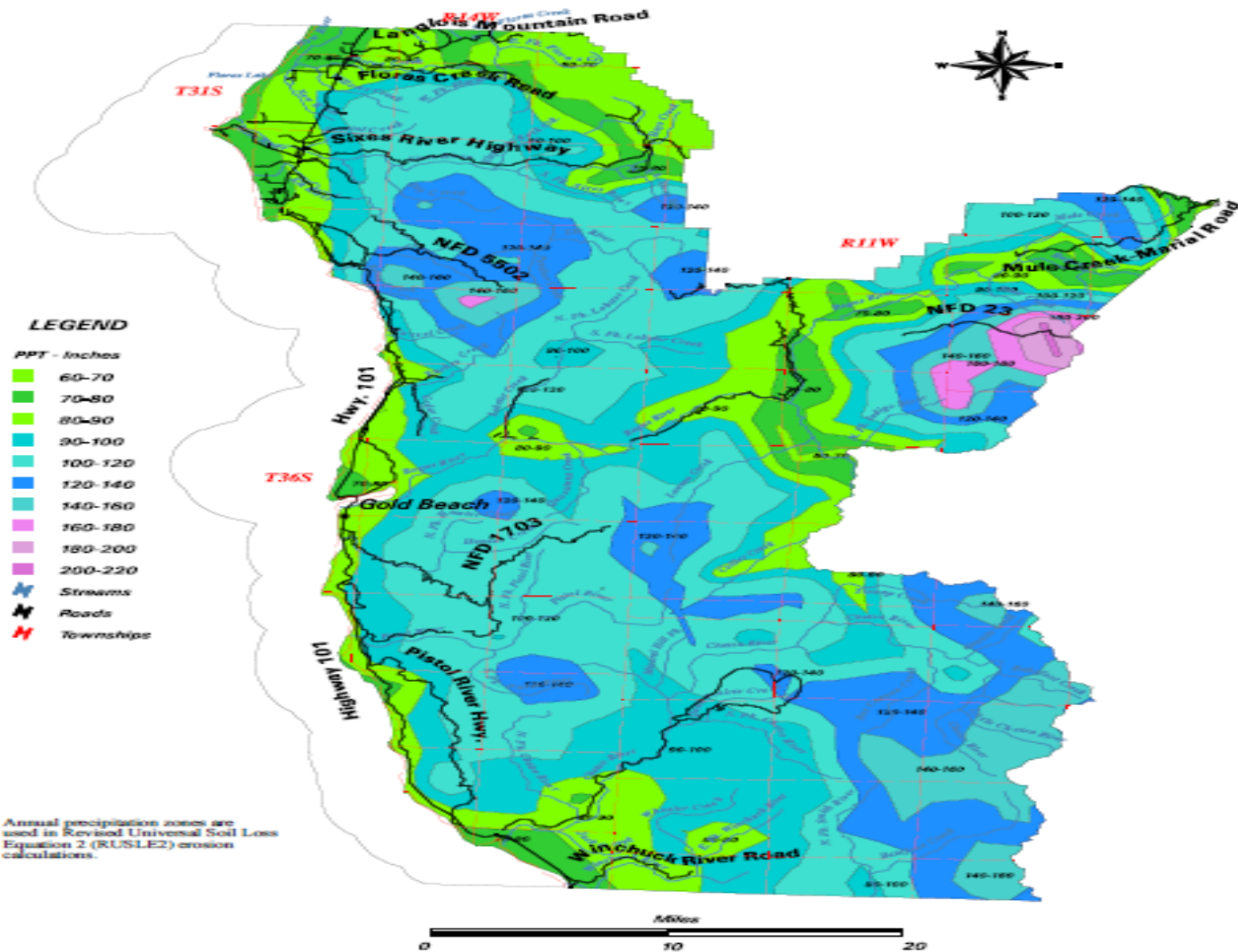
Type here to search

8:42 AM 46°F 3/25/2022

- This is a platform from which you will develop baseline and proposed encroachment profiles that will predict sediment delivery to the waterbody associated with the natural buffer zone on your site.

ANNUAL PRECIPITATION RANGES

Curry County, Oregon



LEGEND

PPT - Inches

60-70

70-80

80-90

90-100

100-120

120-140

140-160

160-180

180-200

200-220

Streams

Roads

Townships

Annual precipitation zones are used in Revised Universal Soil Loss Equation 2 (RUSLE2) erosion calculations.

Source: Map produced by NRCS State Office GIS staff, Portland, Oregon, 2004.
Source scale: streams, roads and townships, 1:100,000.
Source scale: precipitation zones 1:250,000, from FRESM.
This map is for general planning purposes only.

- Refer to the NRCS county maps found on DEQ's Stormwater construction webpage and find the appropriate expected precipitation for you site.
- The legend shows precipitation amount by color.
 - Select the R-value
 - For this example, select values 80-90.

Profile: Potential Erodibility Profile Template*

Manage Soil Topo

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	150	default

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	150	6.0	9.0	120	150

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	150	150	Continuously tilled and smoothed	119	1

STEP 5: Set supporting practices:
Contouring: a. rows up-and-down hill
Diversion/terrace, sediment basin: (none)

STEP 6: Set perm. barrier system:
Perm. barrier set: open

Soil loss, t/ac/yr: 120
Sediment delivery, t/ac/: 119

- The second step is to choose the soil type.
 - This can be found on the following.
 - Geotechnical Report
 - Other analysis detailing site characteristics.

RUSLE2 Version 2.7.0.5 (Jun 3 2021) - [Profile: Potential Erodibility Profile Template*]

File Database Edit View Options Tools Window Help

Auto update

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	150	Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%

STEP 3: Set slope topograp

Segment	Seg length (horiz), ft
1	150

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	150	150	Continuously tilled and smoothed	119	1

STEP 5: Set supporting practices:
Contouring: a. rows up-and-down hill
Diversion/terrace, sediment basin: (none)

STEP 6: Set perm. barrier system:
Perm. barrier set: open

Soil loss, t/ac/yr: 120
Sediment delivery, t/ac/: 119
Soil loss erod. portion, t/ac/yr: 120

Finished calculating

R2_NRCS_Fld_Office Construction site 11182015 BASE_NRCS_MOSES_06142021

- The example selected is Quillamook silt loam at 85%.
 - 0% to 7% slope
 - 125 ft of slope length
- Abegg gravelly loam at 85%
 - 25 ft nearest waterbody boundary.

Profile: Potential Erodibility Profile Template*

Manage Soil Topo

Add break Erase break

STEP 1: Choose location to set climate:
Location USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	125	...Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%
2	25	...egg gravelly loam, 7 to 20 percent slopes\Abegg Gravelly loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	150	6.0	9.0	120	150

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	150	150	Continuously tilled and smoothed	118	1

STEP 5: Set supporting practices: Contouring a. rows up-and-down hill
Diversion/terrace, sediment basin (none)

STEP 6: Set perm. barrier system: Perm. barrier set open

Soil loss, t/ac/yr 110
Sediment delivery, t/ac/ 118

- You will notice a break in the soil type at 125 ft.
 - This indicates a change in soil type.

RUSLE2 Version 2.7.0.5 (Jun 3 2021)

File Database Edit View Options Tools Window Help

Auto update

Profile: Potential Erodibility Profile Template*

Manage Soil Topo

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	125	...Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%
2	25	...egg gravelly loam, 7 to 20 percent slopes\Abegg Gravelly loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	125	6.0	7.5	110	130
2	25	15	11	190	25

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	150	150	Continuously tilled and smoothed	193	1

STEP 5: Set supporting practices:
Contouring: a. rows up-and-down hill
Diversion/terrace, sediment basin: (none)

STEP 6: Set perm. barrier system:
Perm. barrier set: open

Soil loss, t/ac/yr: 110
Sediment delivery, t/ac/yr: 193

- If there is a change in topography or grade break, in the length of the slope, add the necessary slope length segments to STEP 3.
- In this scenario the 125 ft of upland slope is at a 6% grade, and the 25ft nearest the waterbody is at 15% steepness.
- You will so see a red break at 125 ft on the slope profile diagram.

Profile: Potential Erodibility Profile Template*

Manage Soil Topo

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	125	Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%
2	25	egg gravelly loam, 7 to 20 percent slopes\Abegg Gravelly loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	125	6.0	7.5	18	130
2	25	15	11	15	25

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	100	100	Strip/Barrier Managements\Bare ground; rough surface	79.8	1
2	101	1.0	Strip/Barrier Managements\Silt fence	26.5	1
3	150	49	Strip/Barrier Managements\Cool season grass; not harvested	15.5	1

STEP 5: Set supporting practices: Contouring a. rows up-and-down hill

Soil loss, t/ac/yr: 80

Sediment delivery, t/ac/yr: 15.5

STEP 6: Set perm. barrier system: Perm. barrier set open

- Step 4: Management conditions.
 - Baseline sediment transport maintaining a 50 ft buffer.
 - Must meet this baseline to be approved
- Adding segments to Step 4 aides in recreating site conditions.
 - Enter examples as shown
- Step 5: Supporting practices
 - Enter as shown.

Profile: Potential Erodibility Profile Template*

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	125	...Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%
2	25	...egg gravelly loam, 7 to 20 percent slopes\Abegg Gravelly loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	125	6.0	7.5	18	130
2	25	15	11	15	25

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	100	100	Strip/Barrier Managements\Bare ground; rough surface	79.8	1
2	101	1.0	Strip/Barrier Managements\Silt fence	26.5	1
3	150	49	Strip/Barrier Managements\Cool season grass; not harvested	15.5	1

STEP 5: Set supporting practices:
Contouring: a. rows up-and-down hill
Diversion/terrace, sediment basin: (none)

STEP 6: Set perm. barrier system:
Perm. barrier set: open

Soil loss, t/ac/yr: 89
Sediment delivery, t/ac/yr: 15.5

- You have just created the baseline profile that your as-built profile will derived from.
- The sediment delivery of your site just be less than or equal to the maximum tons/acre allowed per-year.

Encroached Sediment Delivery Profile

BMP Sediment Removal Effectiveness



RUSLE2 Version 2.7.0.5 (Jun 3 2021)

File Database Edit View Options Tools Window Help

Auto update

Profile: Potential Erodibility Profile Template*

Add break Erase break

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	125	...Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%
2	25	...egg gravelly loam, 7 to 20 percent slopes\Abegg Gravelly loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	125	6.0	7.5	18	130
2	25	15	11	15	25

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	100	100	Strip/Barrier Managements\Bare ground; rough surface	79.8	1
2	101	1.0	Strip/Barrier Managements\Silt fence	26.5	1
3	150	49	Strip/Barrier Managements\Cool season grass; not harvested	15.5	1

STEP 5: Set supporting practices:
Contouring: a. rows up-and-down hill
Diversion/terrace, sediment basin: (none)

Soil loss, t/ac/yr: 80

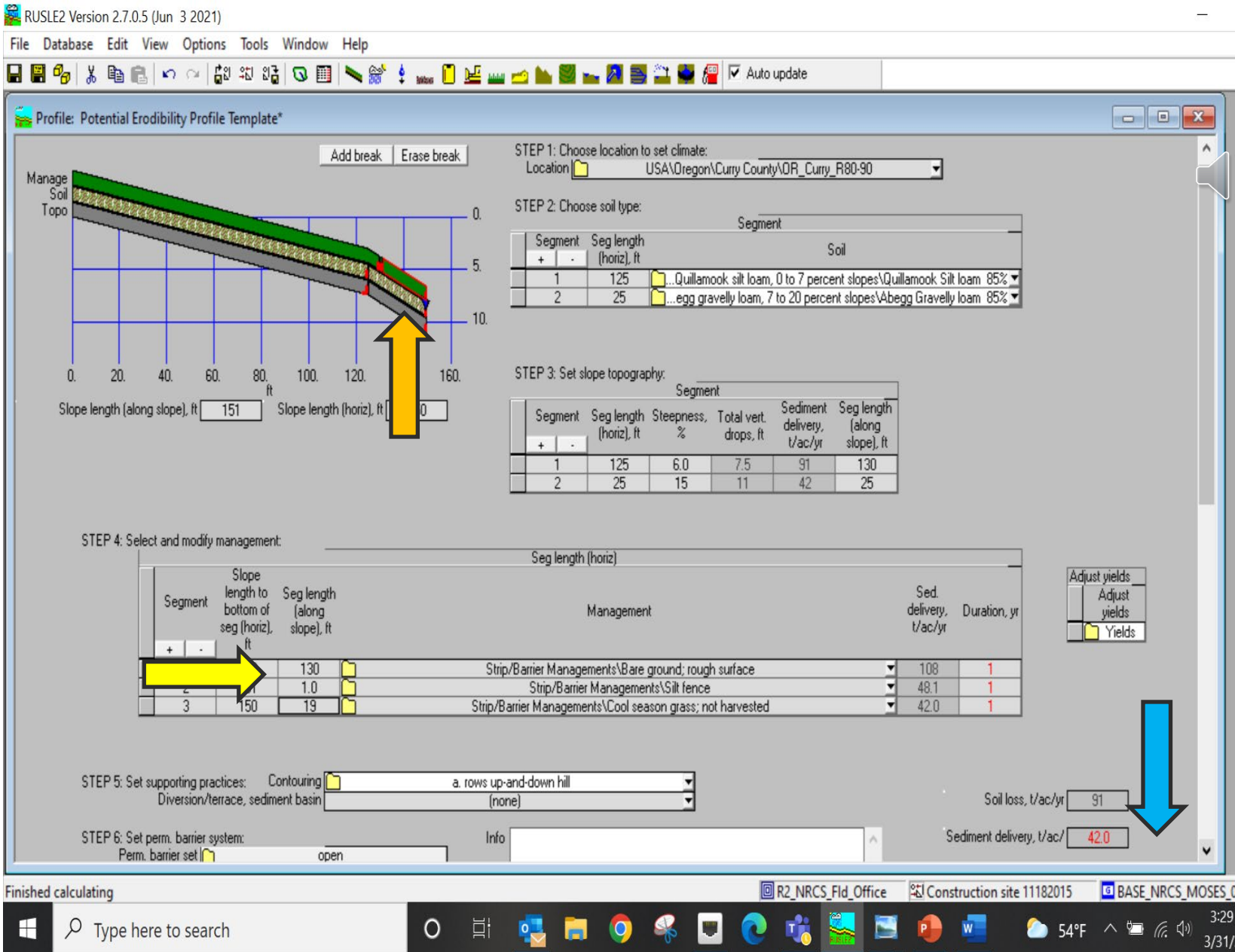
Sediment delivery, t/ac/yr: 15.5

STEP 6: Set perm. barrier system:
Perm. barrier set: open

Finished calculating

R2_NRCS_Fld_Office Construction site 11182015 BASE 99% available (10.5 3/31)

- The encroach profile can be created using the existing baseline profile.
- Steps: 3, 4, and 6 are the only ones that need to be modified.
- The image to the left is the baseline from the previous example.



- The applicant is proposing to encroach 30 ft into the natural buffer zone.
 - Step 4: Segment 1 is changed to 130 ft and segment 2 to 131.
 - Segment 3 will adjust automatically to 19 ft.
- Notice how the reduce length of the buffer results in 3x the sediment delivery load to 42 tons.

Profile: Potential Erodibility Profile Template*

Manage Soil Topo

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
1	125	...Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%
2	25	...egg gravelly loam, 7 to 20 percent slopes\Abegg Gravelly loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
1	125	6.0	7.5	91	130
2	25	15	11	42	25

STEP 4: Select and modify management:

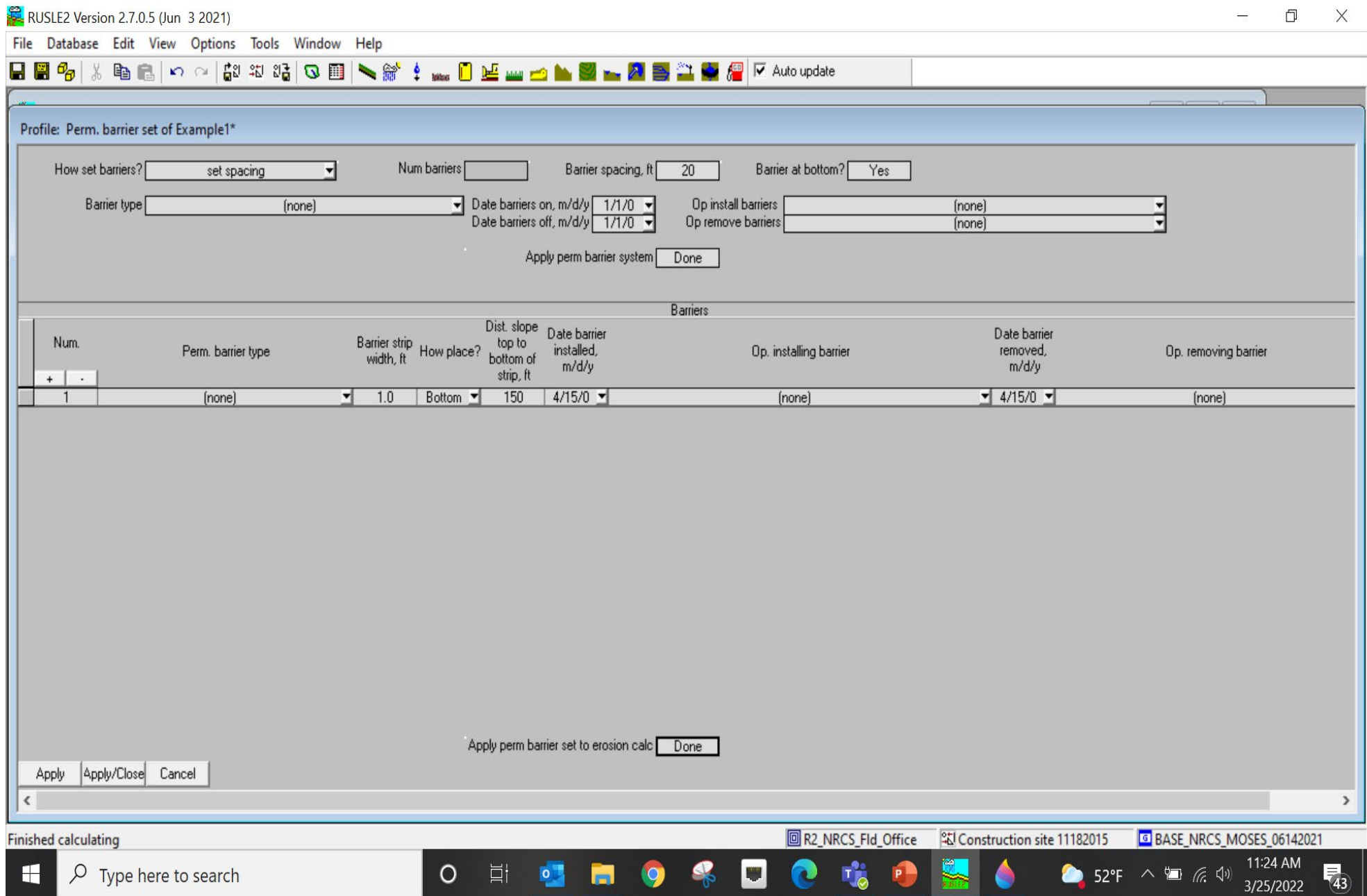
Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
1	130	130	Strip/Barrier Managements\Bare ground; rough surface	108	1
2	131	1.0	Strip/Barrier Managements\Silt fence	48.1	1
3	150	19	Strip/Barrier Managements\Cool season grass; not harvested	42.0	1

STEP 5: Set supporting... Contouring: a. rows up-and-down hill
Diversions, sediment basin: (none)

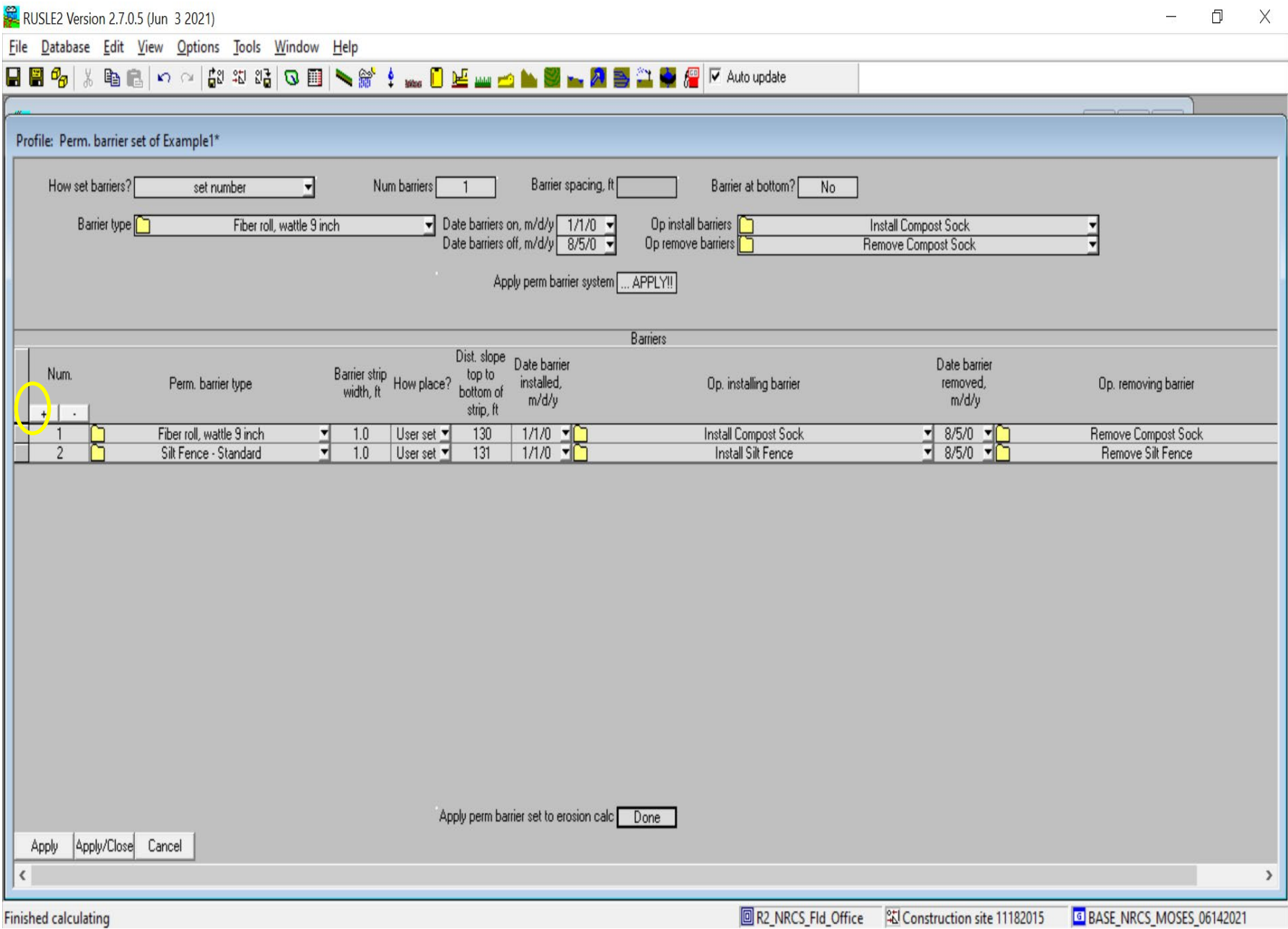
STEP 6: Set perm. barrier system: Perm. barrier set: open

Soil loss, t/ac/yr: 91
Sediment delivery, t/ac/yr: 42.0

- Open the file folder in Step 6 and select BMPs in effort to mitigate the increased sediment loads.



- The BMP wizard will display as shown



- Populate top half of wizard with bmp type, number, date implement/removed, and if it is to be installed at bottom of slope and click apply.

- The bottom section will populate based on your inputs.

- You can add BMPs by click the plus sign. To add these BMPs, click “Apply/Close”.

RUSLE2 Version 2.7.0.5 (Jun 3 2021)

File Database Edit View Options Tools Window Help

Auto update

Profile: Example2*

Manage Soil Topo

Add break Erase break

STEP 1: Choose location to set climate:
Location: USA\Oregon\Curry County\OR_Curry_R80-90

STEP 2: Choose soil type:

Segment	Seg length (horiz), ft	Soil
+	-	
1	155	...Quillamook silt loam, 0 to 7 percent slopes\Quillamook Silt loam 85%

STEP 3: Set slope topography:

Segment	Seg length (horiz), ft	Steepness, %	Total vert. drops, ft	Sediment delivery, t/ac/yr	Seg length (along slope), ft
+	-				
1	125	0.0010	0.00		
2	25	6.0	1.5	5.6	25
3	5	15	2.3	5.6	5.1

STEP 4: Select and modify management:

Segment	Slope length to bottom of seg (horiz), ft	Seg length (along slope), ft	Management	Sed. delivery, t/ac/yr	Duration, yr
+	-				
1	133	130	Strip/Barrier Managements\Bare ground; rough surface	10.5	1
2	134	1.0	MAN_PTR:INTERNAL[1]	10.7	1
3	135	1.0	Strip/Barrier Managements\Silt fence	6.44	1
4	155	20	Strip/Barrier Managements\Cool season grass; not harvested	5.65	1

STEP 5: Set supporting practices:
Contouring: a. rows up-and-down hill
Diversion/terrace, sediment basin: (none)

STEP 6: Set perm. barrier system:
Perm. barrier set: open

Soil loss, t/ac/yr: 1.2
Sediment delivery, t/ac/yr: 5.65

Finished calculating

R2_NRCS_Fld_Office Construction site 11182015 BASE_NRCS_MOSES

Type here to search

52°F 12:00 3/29

- Grading changes the slope of the upland area as shown in Step 3. The upland 125 foot length is now flat at 0% steepness.

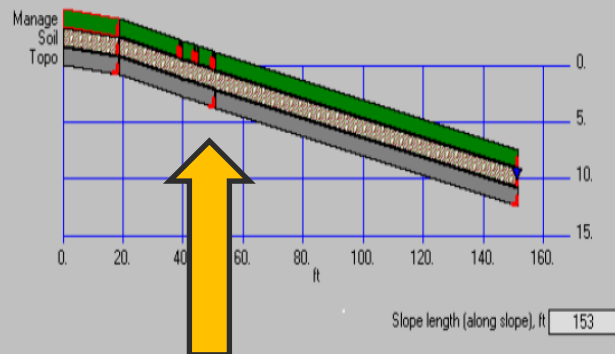
- Added wattles are shown as breaks in management section of profile and in Step 4- Segment 2 as MAN PTR-Internal.

STEP 1: Choose location to set climate:

Location: USA\Oregon\Washington County\OR_Washington_R44-48 Climate is Normal? Climate-Smart Planner

STEP 2: Choose soil type:

Segment		Soil
Segment	Seg length (horiz), ft	
1	19.0	...y, Oregon\T11B Cornelius and Kinton silt loams, 2 to 7 percent slopes\Cornelius Silt loam 45%
2	133	...y, Oregon\T11C Cornelius and Kinton silt loams, 7 to 12 percent slopes\Cornelius Silt loam 45%



STEP 3: Set slope topography:

Segment		Steepness, rise/run	Soil loss, t/ac/yr	Sediment delivery, t/ac/yr
Segment	Seg length (horiz), ft			
1	19.0	0.05	6.1	6.1
2	32.0	0.09	-0.99	1.6
3	101	0.09	0.024	0.57

Slope length (horiz), ft: 152.00
 Crit. length, ft: 19

Slope length (along slope), ft: 153

STEP 4: Select and modify management:

Segment		Management	Duration, yr	Soil loss, t/ac/yr	Sed. delivery, t/ac/yr
Segment	Seg length (horiz), ft				
1	19.0	CMZ 54\Construction Site Templates\default	1	6.1	6.1
2	20.0	CMZ 54\Construction Site Templates\default	1	16	11
3	1.00	MAN_PTR:INTERNAL[2]	1	0.24	1.1
4	4.00	Strip Barrier Managements\Dense grass; not harvested	1	-7.2	9.4
5	1.00	MAN_PTR:INTERNAL[1]	1	-330	1.9

Adjust yields: Yields
 General yield level:

STEP 5: Set supporting practices:

Contouring: default
 Diversion/terrace, sediment basin: (none)
 Strips/barriers: man. strips set in profile

Slope length to flow path (horiz)				
Flow path	Slope length to flow path (horiz), ft	Type of flow path	Sed. del. in, t/ac/yr	Sed. del. out, t/ac/yr
1	152	default	0.57	0.57

STEP 6: Set perm. barrier system:

Perm. barrier set: open

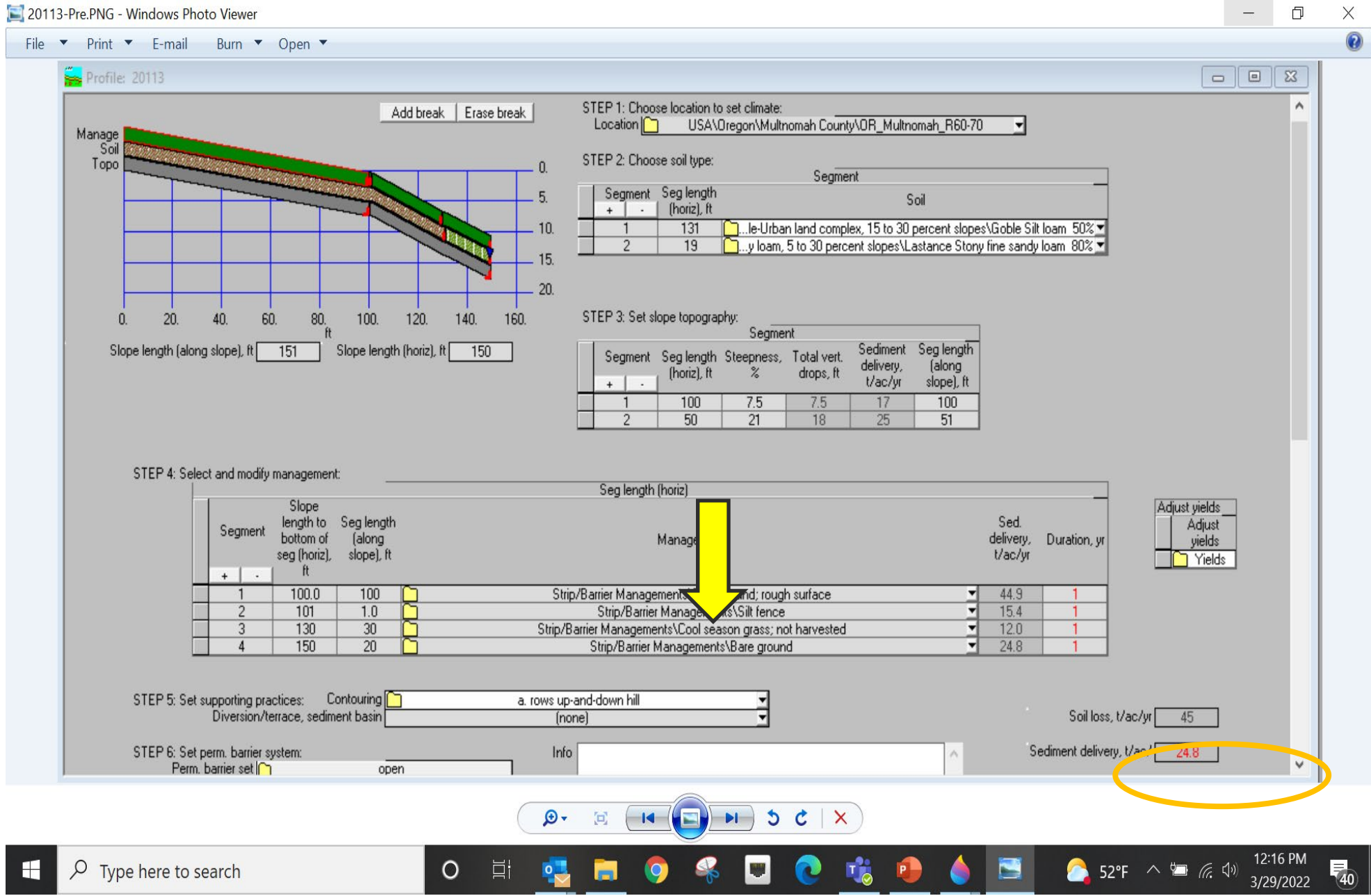
Info:

Sediment delivery, t/ac/yr: 0.57
 Soil loss erod. portion, t/ac/yr: 2.96
 Sediment delivery, t/ac/yr: 0.57

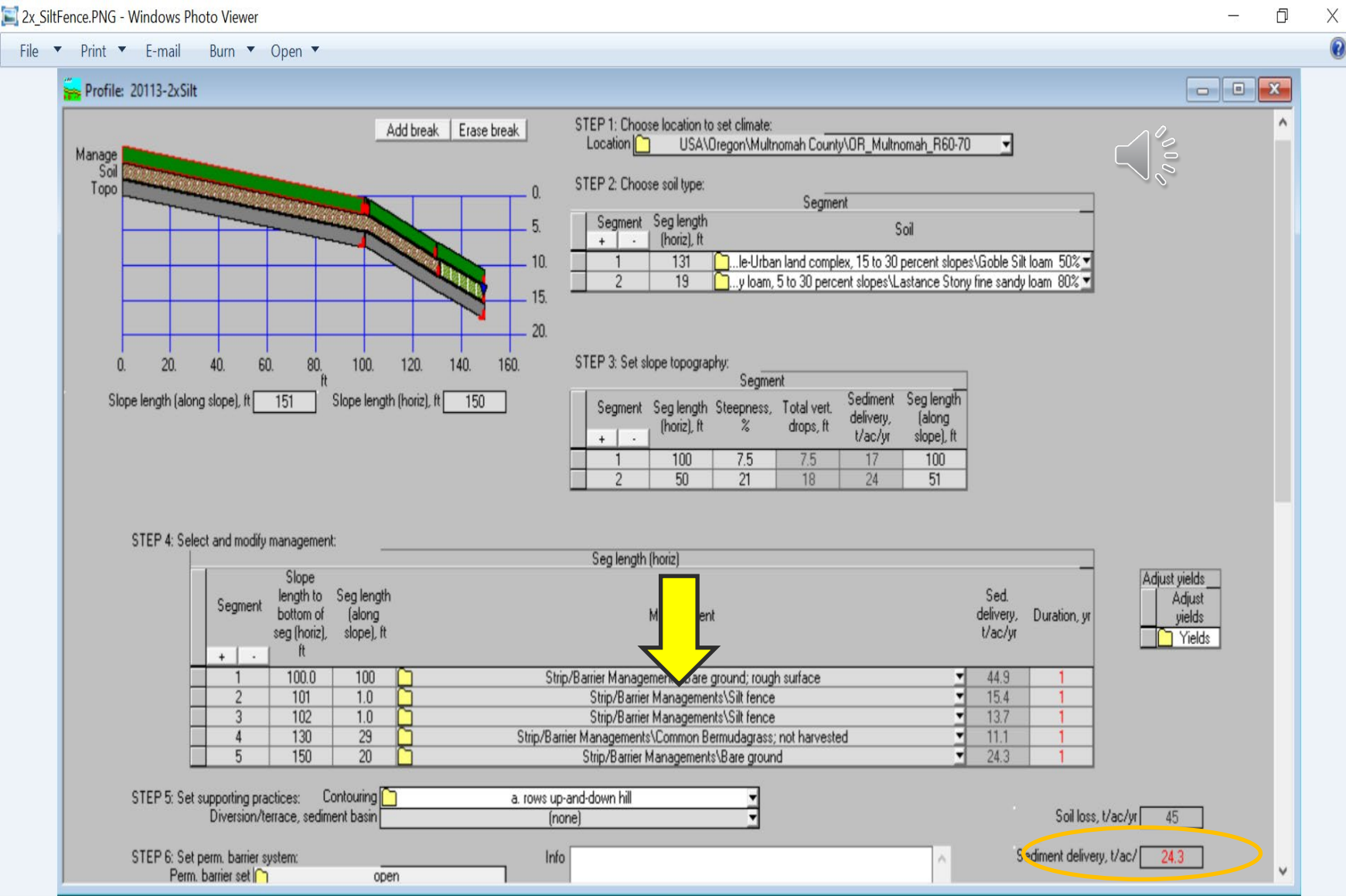
- A series of 3 wattles is proposed to mitigate construction impacts.
- This proposal was approved.

Sediment Delivery Justification for not Allowing Doubling of Sediment Fence in Natural Buffer Zone





- Shown is a profile with a single silt fence, the sediment delivery amount is a 24.8 tons/ac/year.



- The profile shown is the same as pervious slide, except a second silt fence proposed.
- Notice how the sediment delivery-**24.3 tons**-is almost the same as when one fence is installed-**24.8 tons**.
- Particles that can pass through one silt fence will pass through additional, regardless of the amount that are installed.

Required RUSLE2 Submittals

- Submit the Baseline and Encroached (“As-Built”) RUSLE2 Profiles as an attachment to the ESCP
 - Screen Shots work well
- If Step 4 of the encroached profile has a manually entered BMP from Step 6, be sure to add captioning or a note to inform DEQ technical reviewer of the BMP type proposed.
- Check to ensure the proposed BMPs selected in the encroached profile match those on the ESCP
- Save your profiles in RUSLE2 in case revisions are necessary
- You can find additional resources, such as Oregon climate and soil databases, and Oregon County annual expected precipitation maps at:
<https://www.oregon.gov/deq/wq/wqpermits/Pages/Stormwater-Construction.aspx>