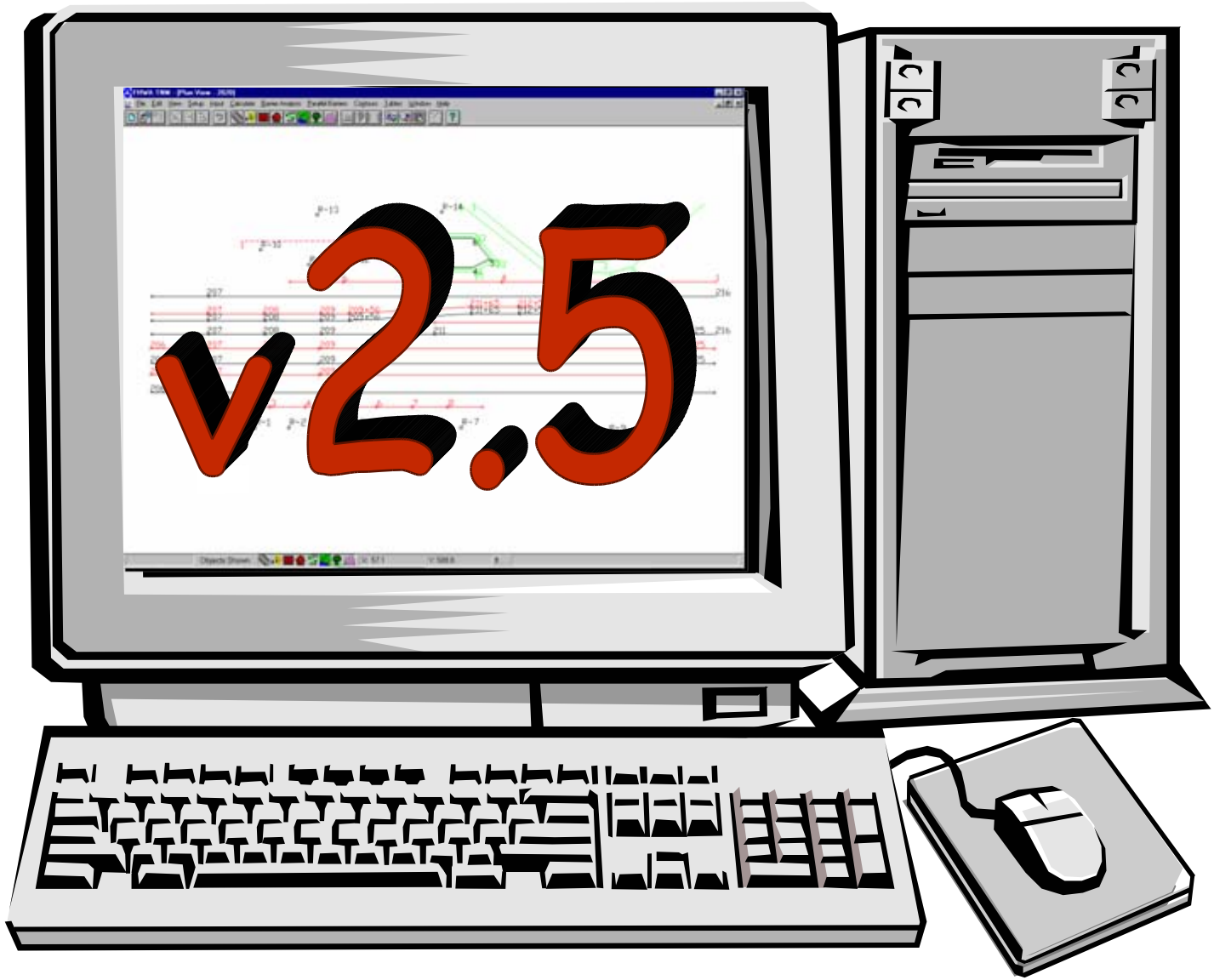
# User's Guide: Traffic Noise Model

*TxDOT Environmental Affairs Division*
*Effective Date: 2005*
*730.03.GUI*
*Version 2.5*

# TxDOT User's Guide: Traffic Noise Model (TNM)




Produced by the Environmental Affairs Division (2005)

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# INTRODUCTION

This guide is intended for use by analysts with both technical and non-technical backgrounds.

All information in this guide is presented in a WYSIWYG, 11x8½ landscape format and emphasizes the manual (stubby-pencil) approach. However, the use/importing of MicroStation files can greatly enhance the overall process and is also addressed.

Most of the required tasks in TNM may be accomplished in a number of different ways. Therefore, a variety of techniques are presented in this guide to provide the analyst with a range of choices - - although every possible technique is not addressed.

Read all steps on each page before performing the first step on each page.

Each step is identified by two numbers: one number (1, 2, 3, etc.) to describe the step in text form and one number (1, 2, 3, etc.) to locate the step in the appropriate TNM window.

This guide emphasizes the use of the mouse rather than shortcut keys - - although shortcut keys may be used.

= single click of the left mouse button
= double click of the left mouse button

**NOTE:** the best way to learn TNM is through repetition of the various, required tasks. Although this guide affords the opportunity to repeat various tasks, it will be necessary for the analyst to use TNM on several additional practice or actual projects to become proficient.

Each district will identify a single focal point for all TNM issues. Provide all TNM comments and questions to the district focal point for review and forwarding, if necessary, to the Environmental Affairs Division.

Additional TNM references:
- FHWA User's Guide
- FHWA tutorial on CD
- TxDOT/ENV web site (to be developed)

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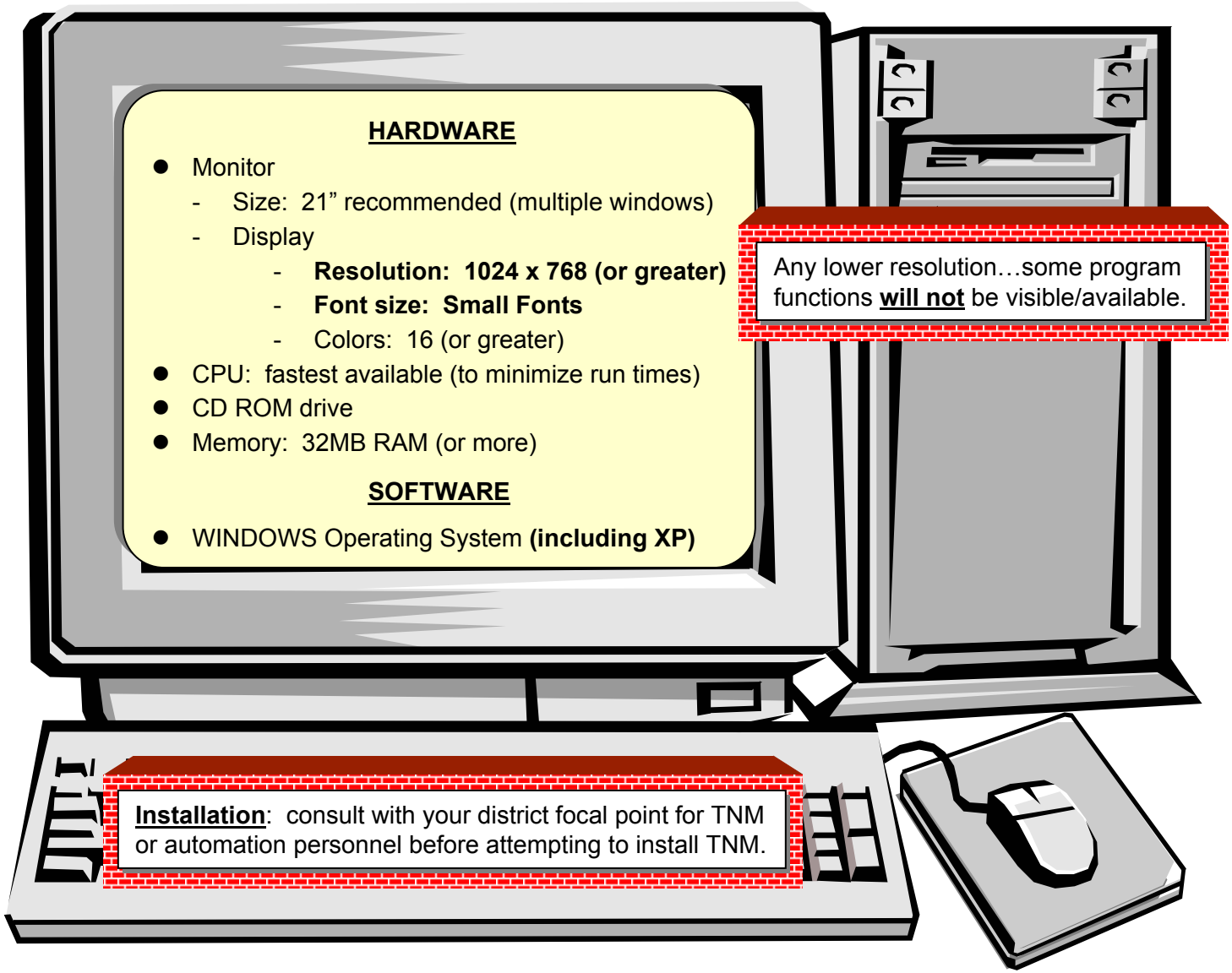
# HARDWARE/SOFTWARE REQUIREMENTS



## HARDWARE

- Monitor
  - Size: 21" recommended (multiple windows)
  - Display
    - **Resolution: 1024 x 768 (or greater)**
    - **Font size: Small Fonts**
    - Colors: 16 (or greater)
- CPU: fastest available (to minimize run times)
- CD ROM drive
- Memory: 32MB RAM (or more)

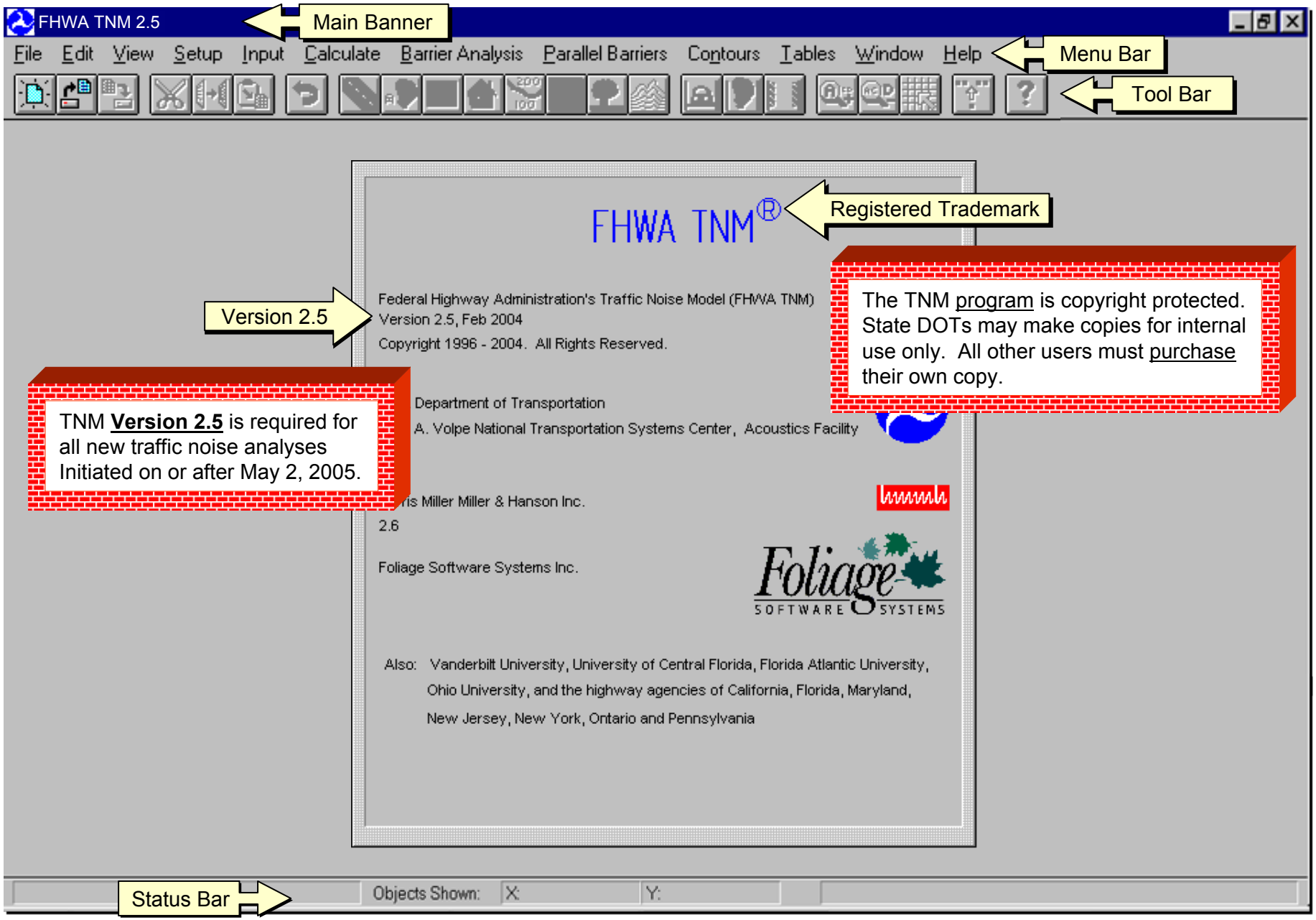
## SOFTWARE

- WINDOWS Operating System **(including XP)**

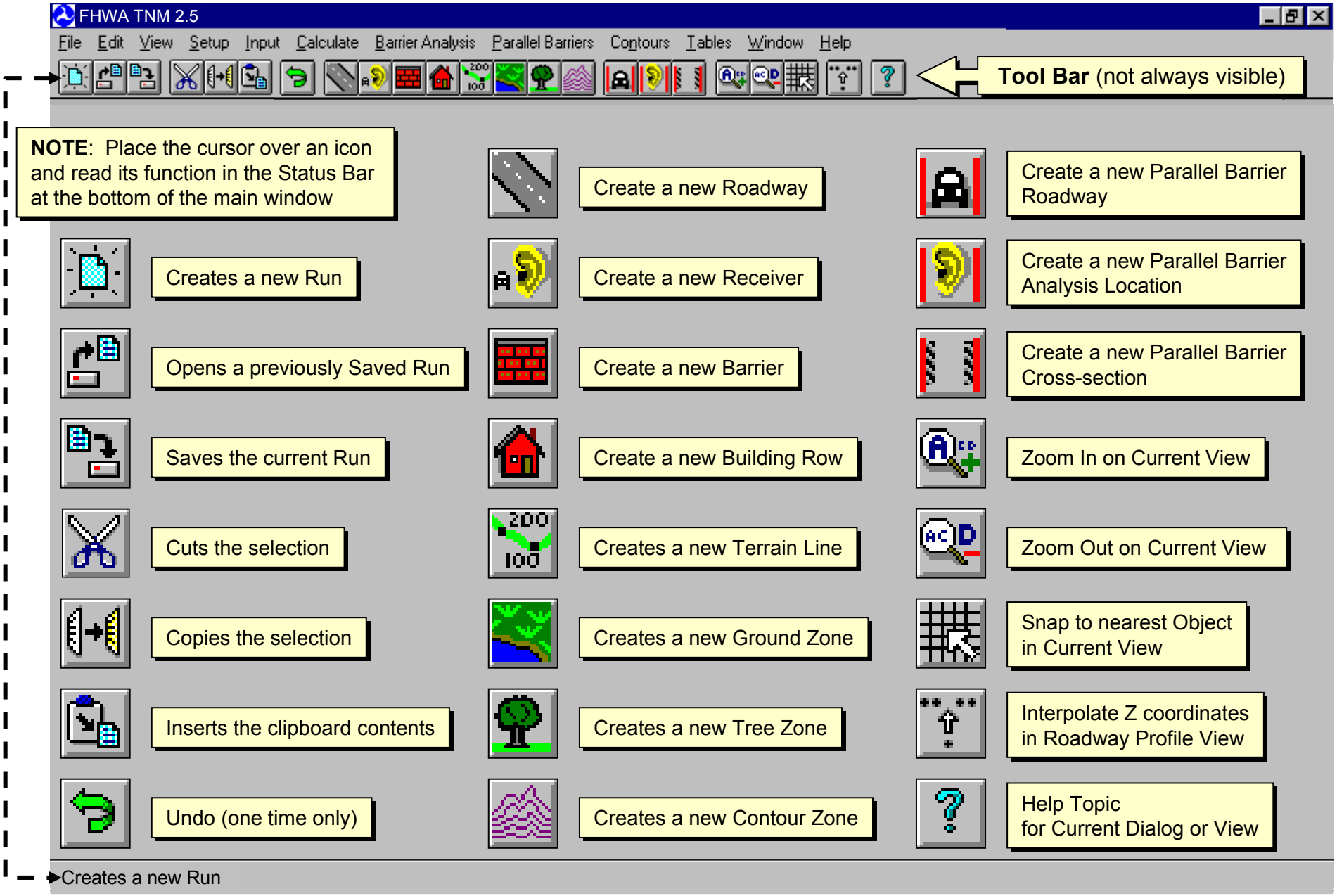
Any lower resolution…some program functions **will not** be visible/available.

**Installation**: consult with your district focal point for TNM or automation personnel before attempting to install TNM.

## OPENING SCREEN (Main Window)



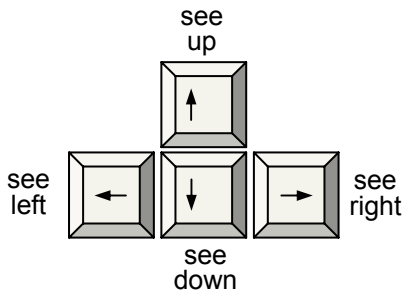
# ICONs in TOOL BAR



# FREQUENTLY USED TOOLS (1 of 2)

- **Move the View of Objects in the Plan View**

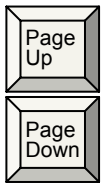
  - move in the direction you want to **see**




- **Change the Size of the View in the Plan View**

Recommended Method

- Zoom In/Zoom Out




**Zoom In** (bigger objects)

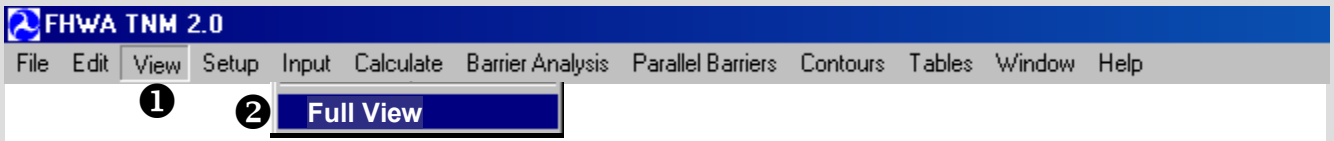
**Zoom Out** (smaller objects)

Alternate Method

- Zoom In ..... draw box around segments/objects to be enlarged

- Zoom Out ..... reduces segments/objects in Plan View by 25%

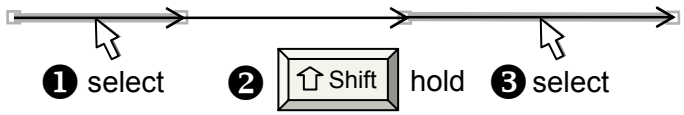
- **Maximize the Size of the View of <u>All</u> Objects in the Plan View**



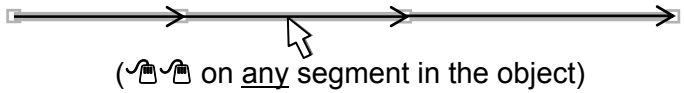
# FREQUENTLY USED TOOLS (2 of 2)

- **Select Segment(s) and Objects**
  - select one segment

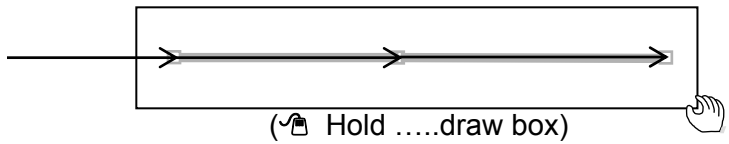
  - select multiple segments



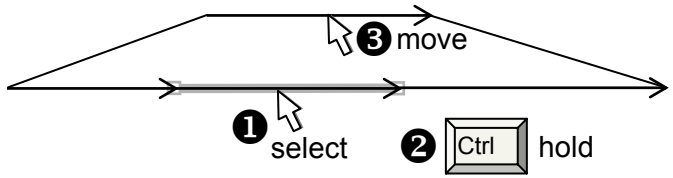

  - select entire object



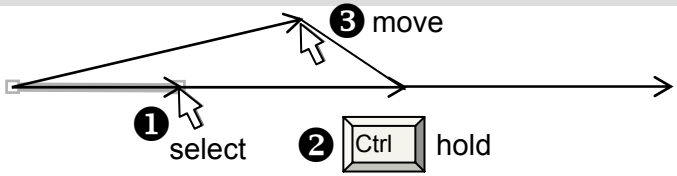

  - select everything in a box




- **Move Segments**
  - moving segment or object



- **Move Points**
  - moving one point



# SENDING/RECEIVING TNM RUNS

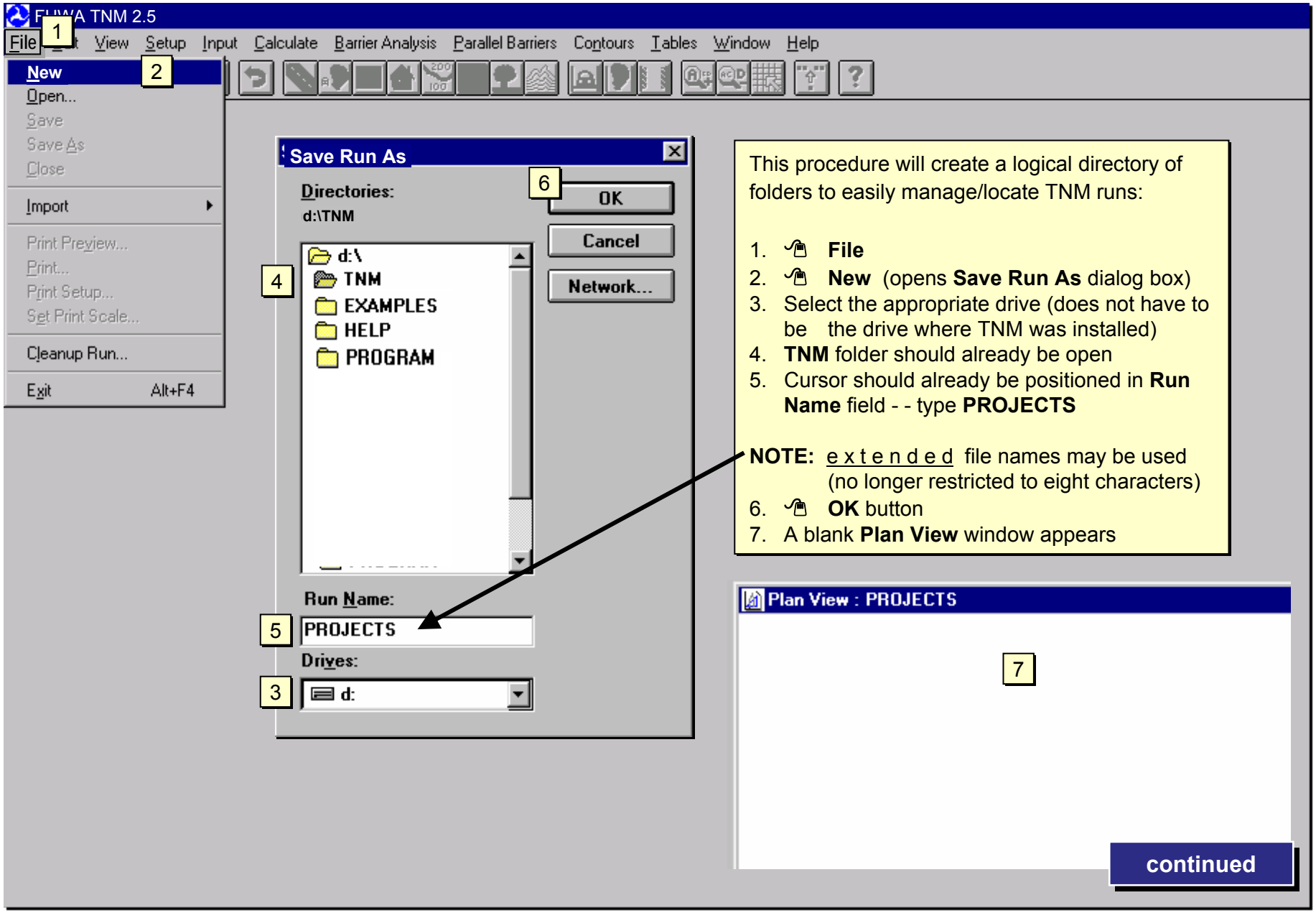
It is possible to send/receive files associated with TNM runs as attachments in GroupWise.

**Sending** TNM runs: send all **files** (not folder) associated with each run. Files can be sent and received as attachments to eMail (GroupWise). Large files (over 4 MB) should be zipped, or sent during off-peak times, or sent on disk or CD by snail mail.

- Each/every TNM run (folder) creates two basic files. The names of the two files are identical for each/every run:
  1. "**objects.dat**"
  2. "**objects.idx**"
- Therefore, to avoid confusion when sending files for multiple runs, send the files for each run in separate GroupWise eMails.
- Remember to include any additional files created by the run.

**Receiving** TNM runs: create a new folder, then "**Save As**" both files for the run in the new folder.

# STARTING a NEW RUN (1 of 2)



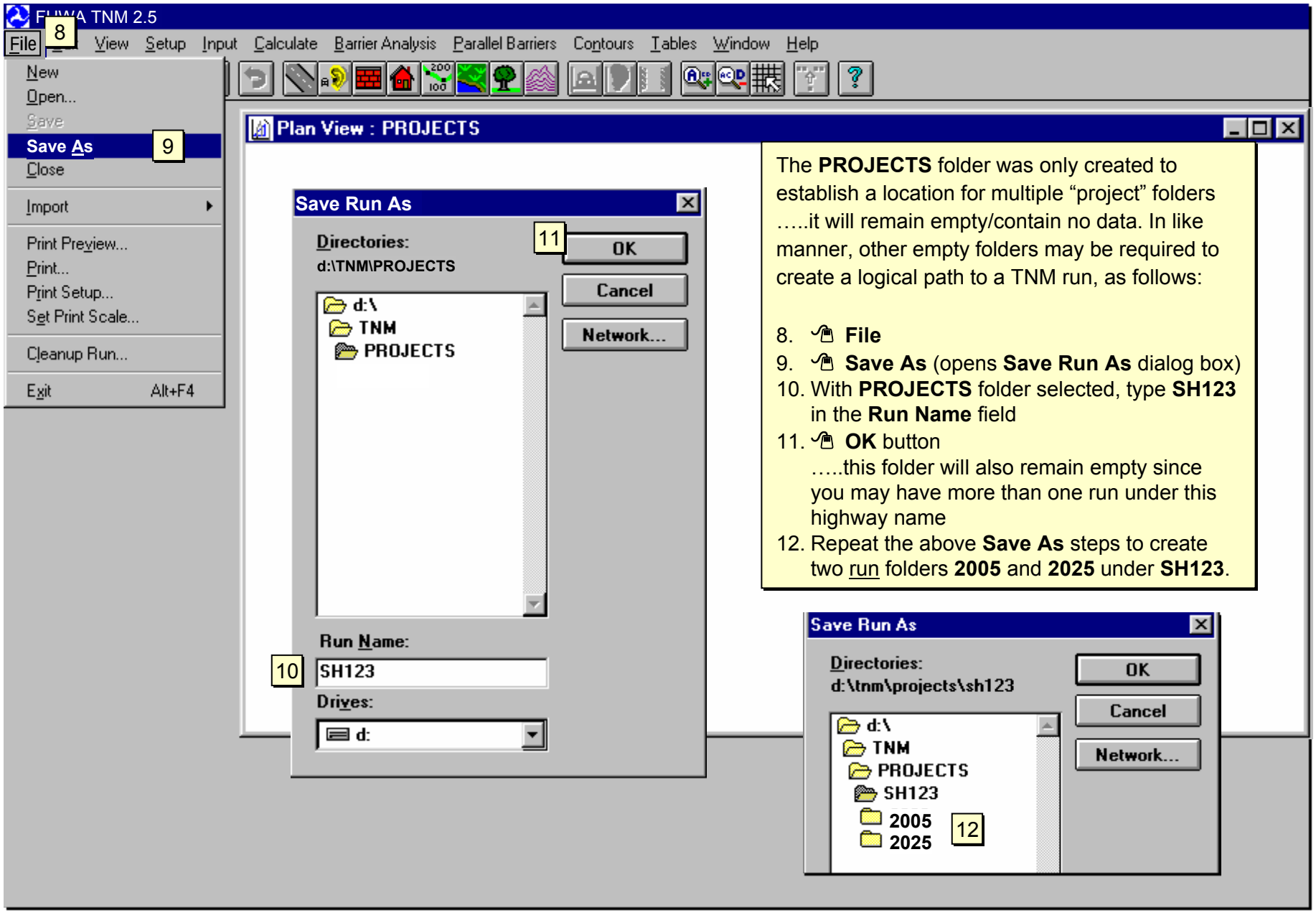

This procedure will create a logical directory of folders to easily manage/locate TNM runs:

1. **File**
2. **New** (opens **Save Run As** dialog box)
3. Select the appropriate drive (does not have to be the drive where TNM was installed)
4. **TNM** folder should already be open
5. Cursor should already be positioned in **Run Name** field - - type **PROJECTS**

**NOTE:** extended file names may be used (no longer restricted to eight characters)

6. **OK** button
7. A blank **Plan View** window appears

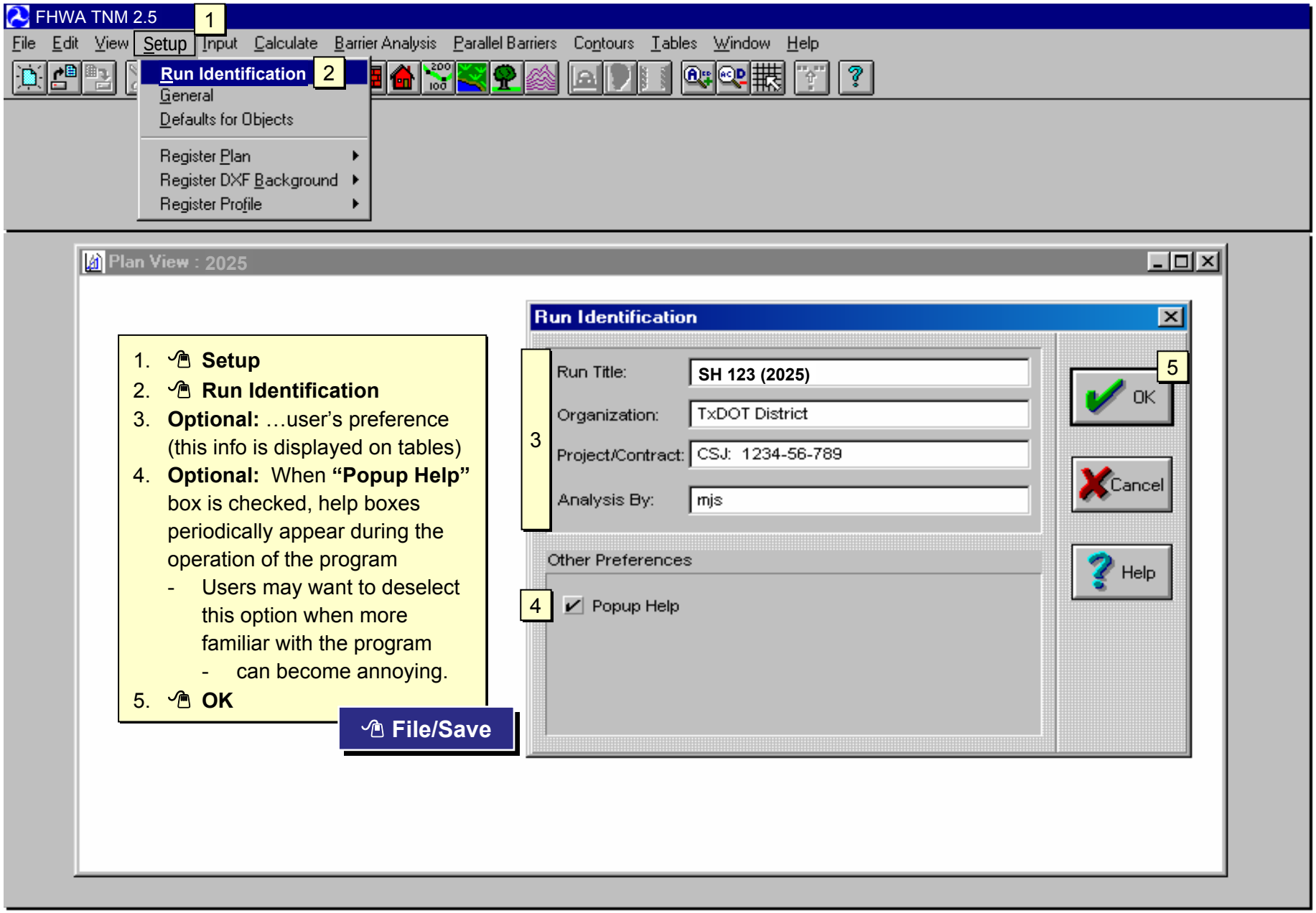
# STARTING a NEW RUN (2 of 2)



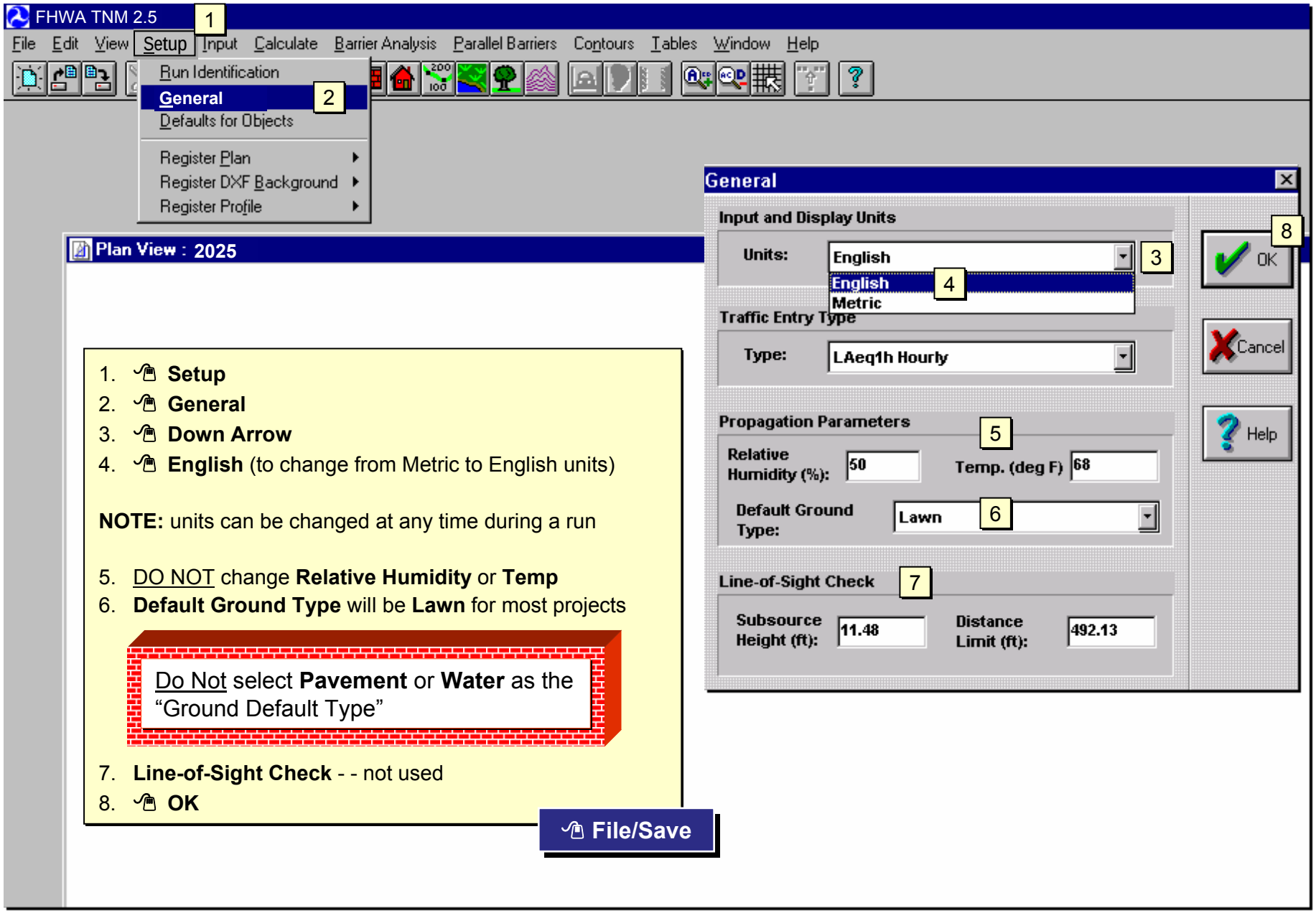

The **PROJECTS** folder was only created to establish a location for multiple "project" folders …..it will remain empty/contain no data. In like manner, other empty folders may be required to create a logical path to a TNM run, as follows:

8. **File**
9. **Save As** (opens **Save Run As** dialog box)
10. With **PROJECTS** folder selected, type **SH123** in the **Run Name** field
11. **OK** button
    …..this folder will also remain empty since you may have more than one run under this highway name
12. Repeat the above **Save As** steps to create two run folders **2005** and **2025** under **SH123**.

# SETUP: RUN IDENTIFICATION



# SETUP: GENERAL




1. **Setup**
2. **General**
3. **Down Arrow**
4. **English** (to change from Metric to English units)

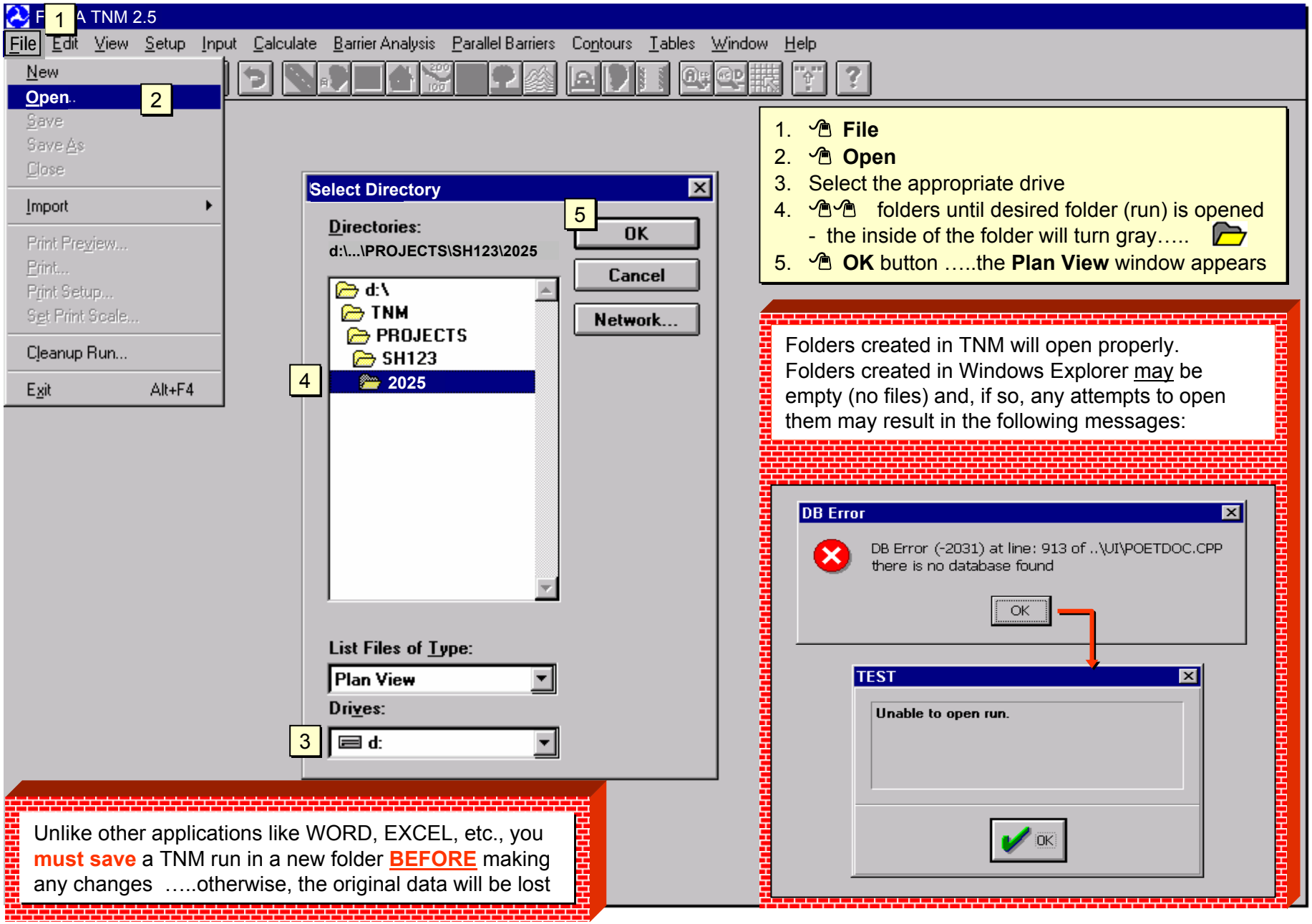
**NOTE:** units can be changed at any time during a run

5. DO NOT change **Relative Humidity** or **Temp**
6. **Default Ground Type** will be **Lawn** for most projects

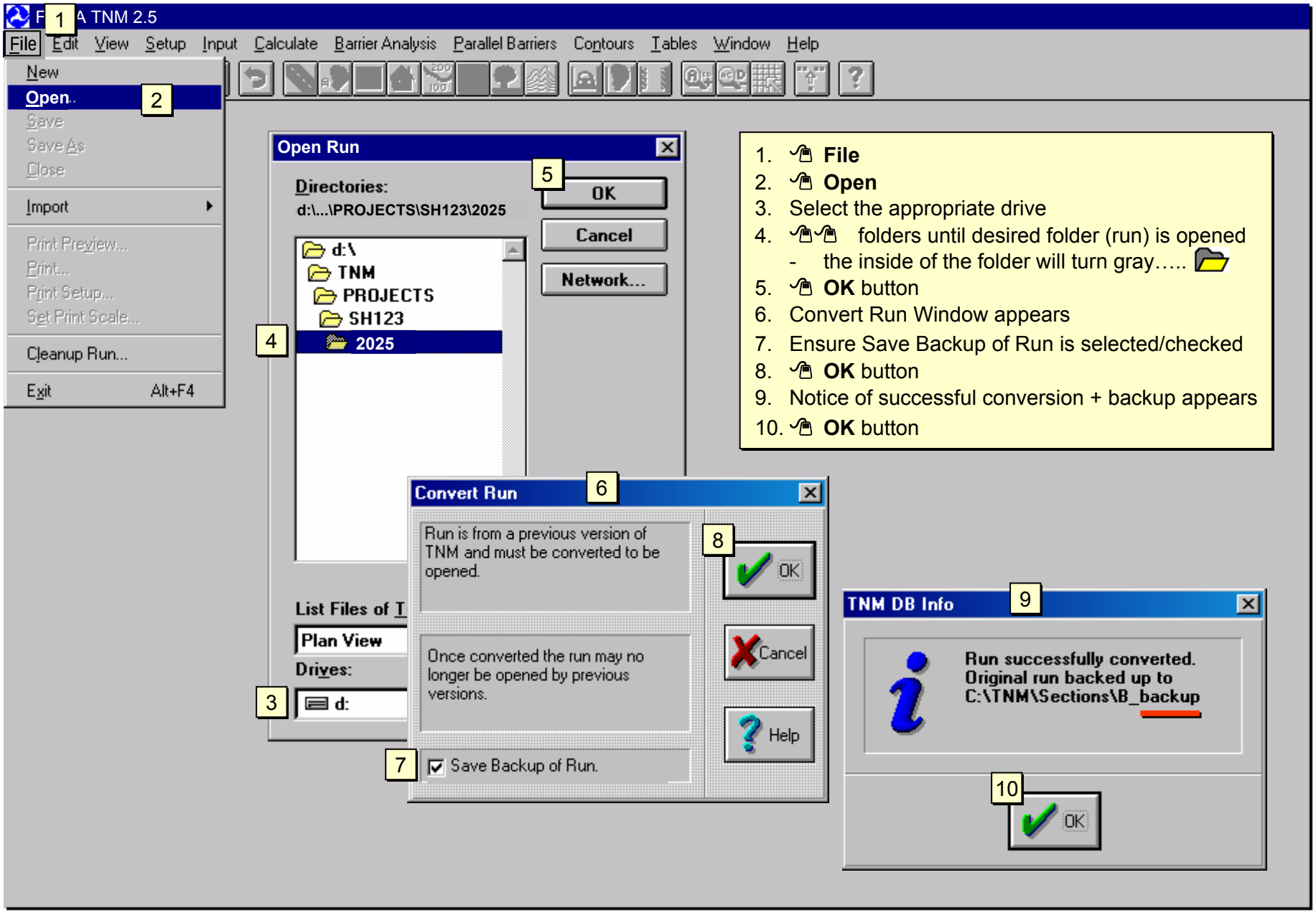
> Do Not select **Pavement** or **Water** as the "Ground Default Type"

7. **Line-of-Sight Check** - - not used
8. **OK**

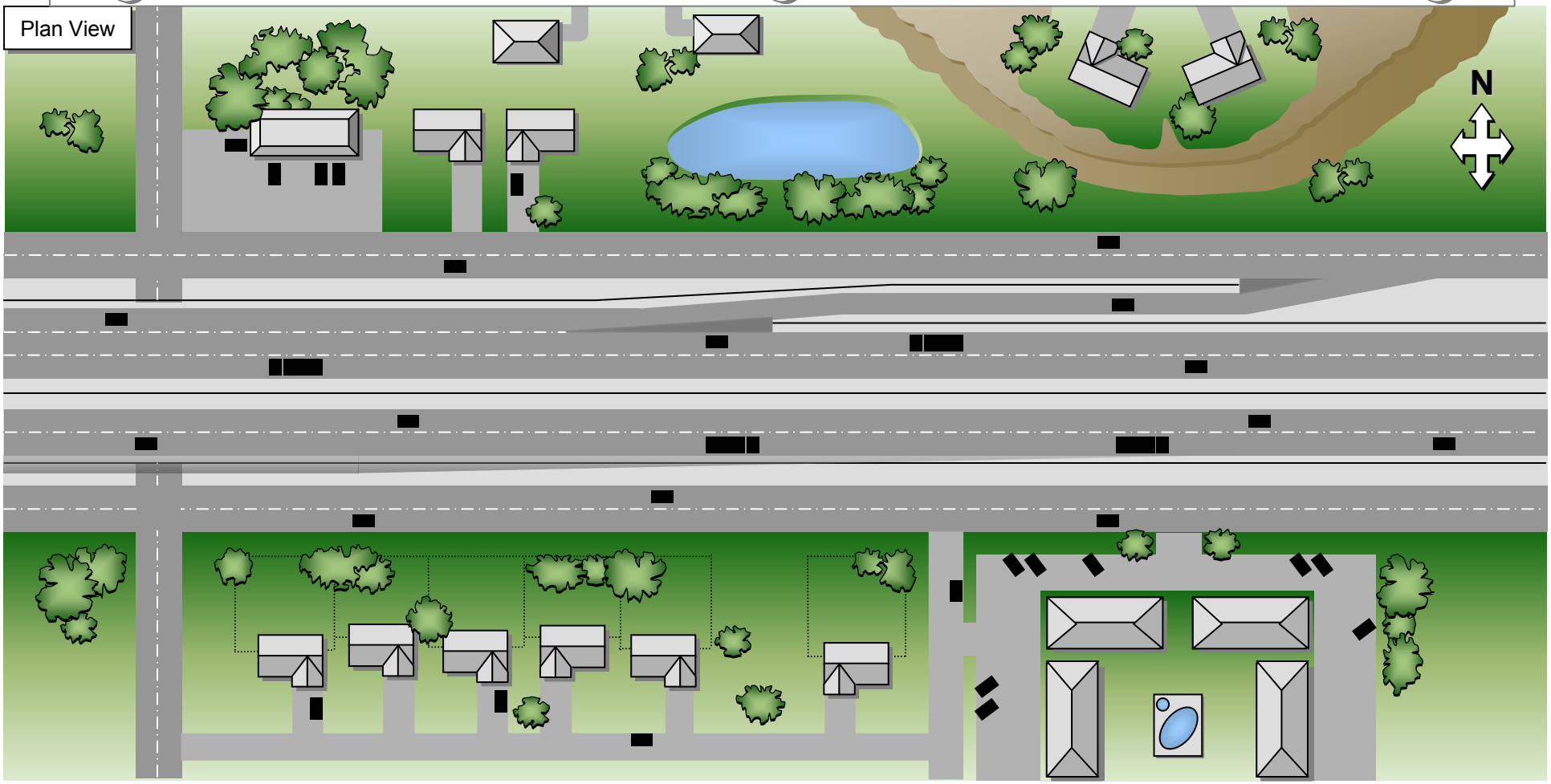
# OPENING/CHANGING/SAVING an "EXISTING" RUN



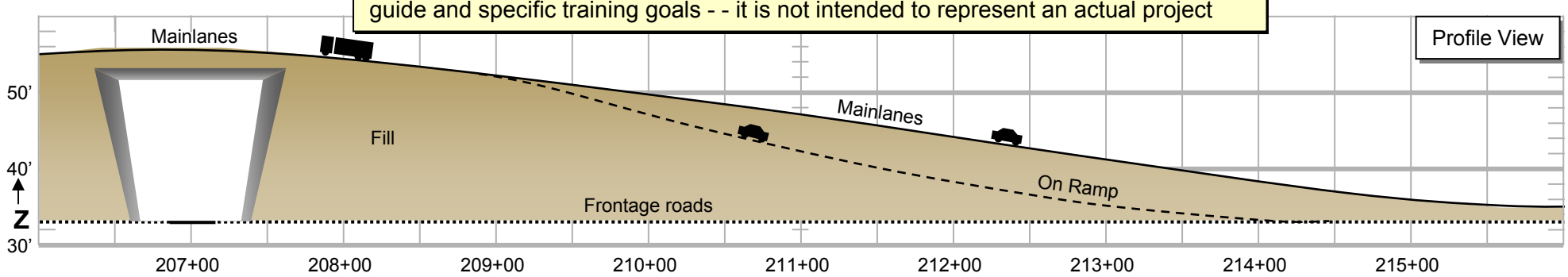
# OPENING an OLD RUN (previous to v2.5)

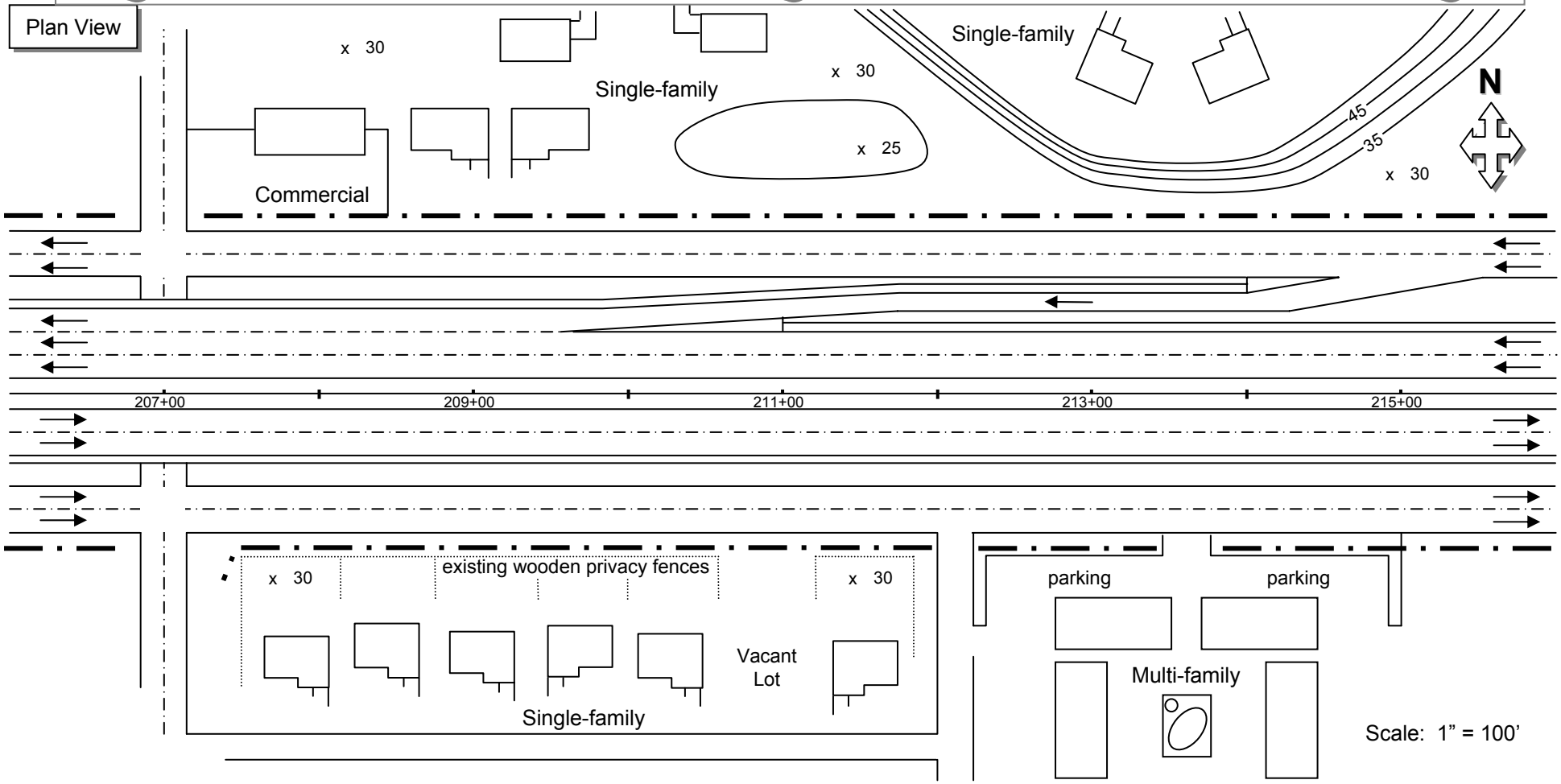



1. **File**
2. **Open**
3. Select the appropriate drive
4. folders until desired folder (run) is opened
   - the inside of the folder will turn gray…..
5. **OK** button
6. Convert Run Window appears
7. Ensure Save Backup of Run is selected/checked
8. **OK** button
9. Notice of successful conversion + backup appears
10. **OK** button




**NOTE**: This is an artificial representation of a highway project for the purposes of this guide and specific training goals - - it is not intended to represent an actual project



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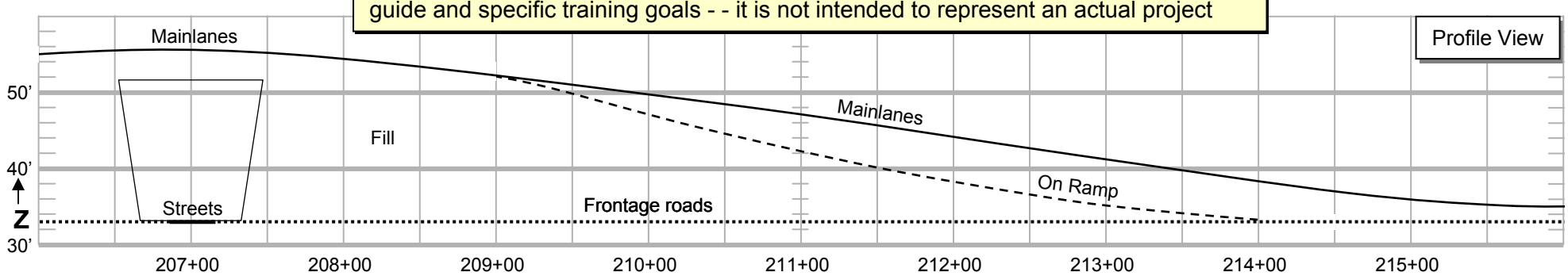
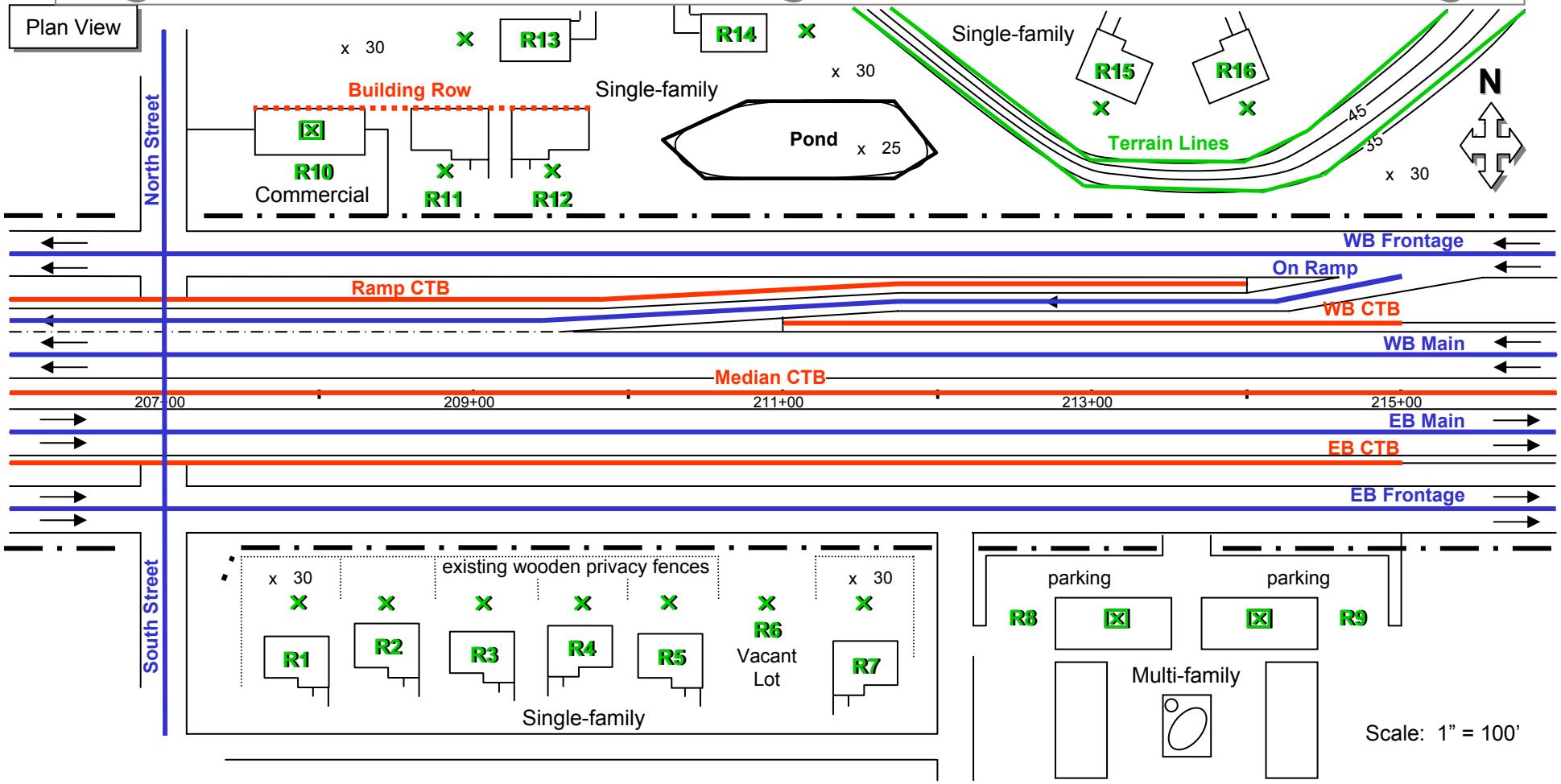
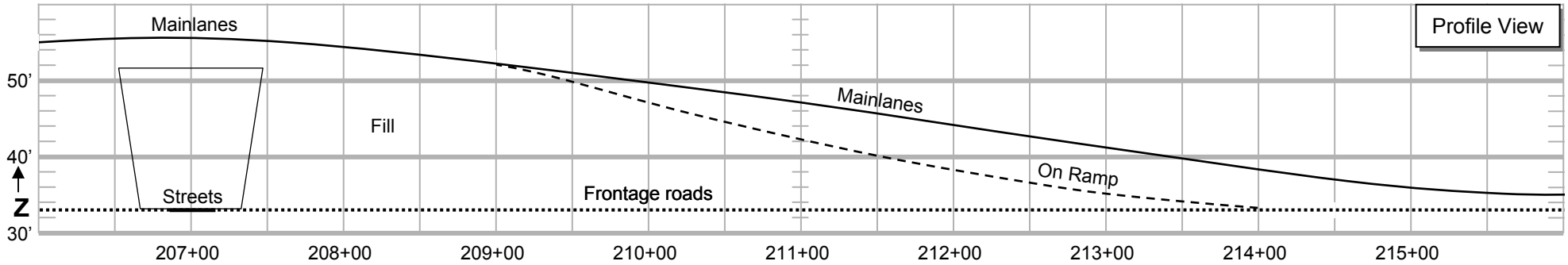
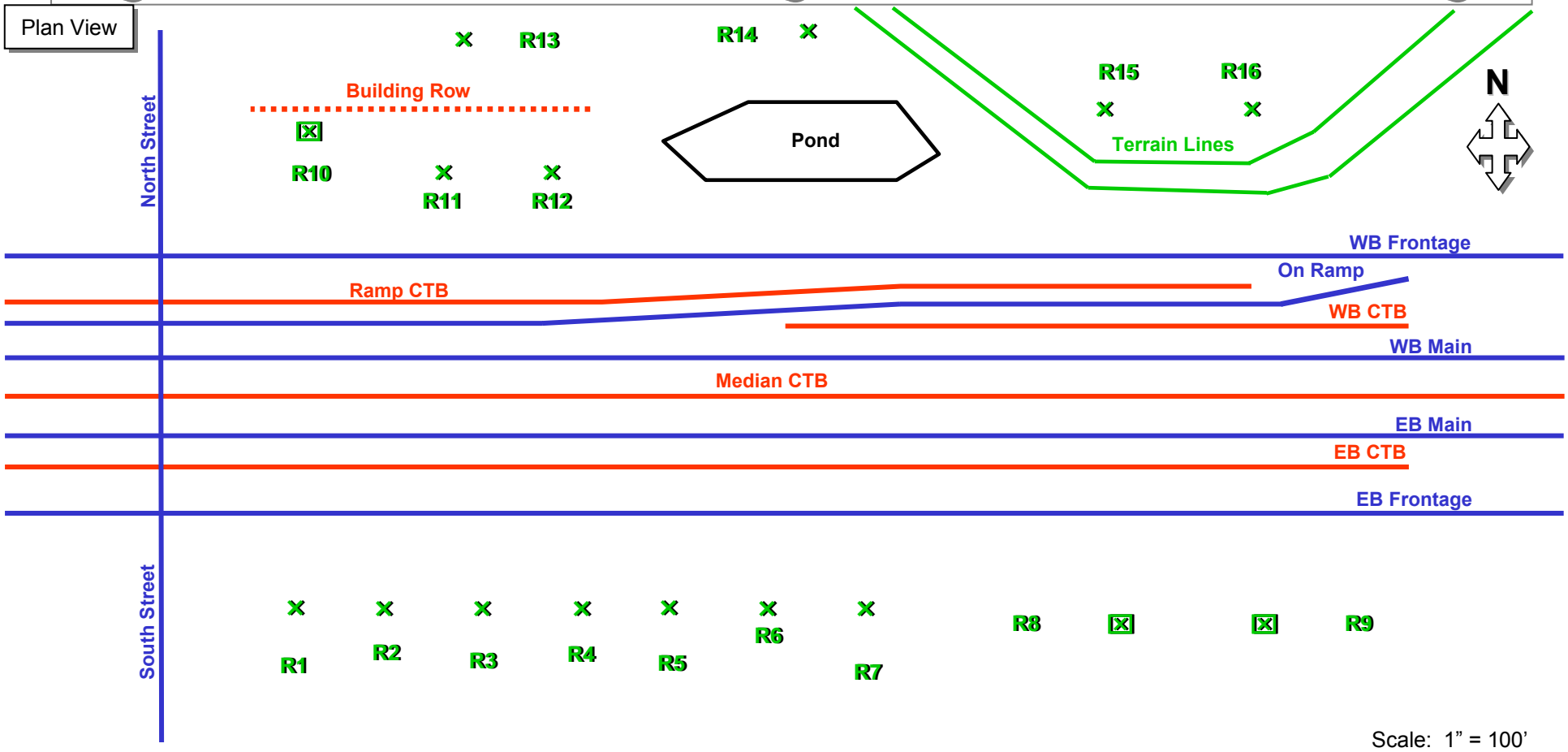
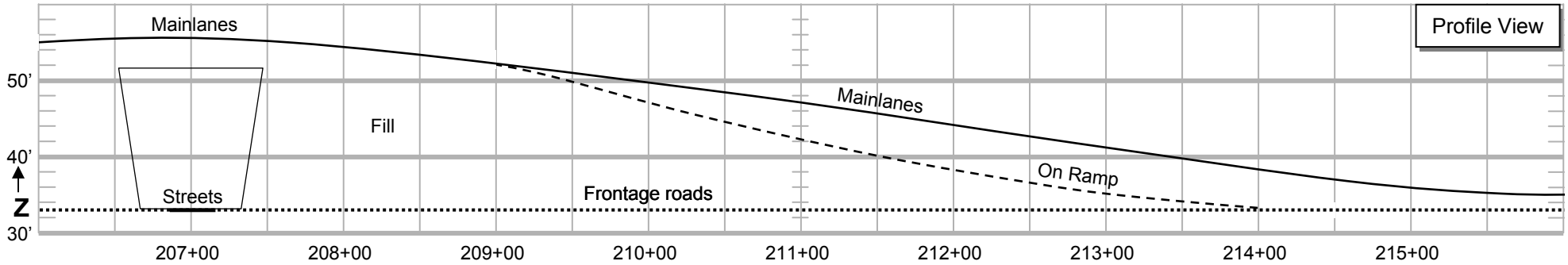
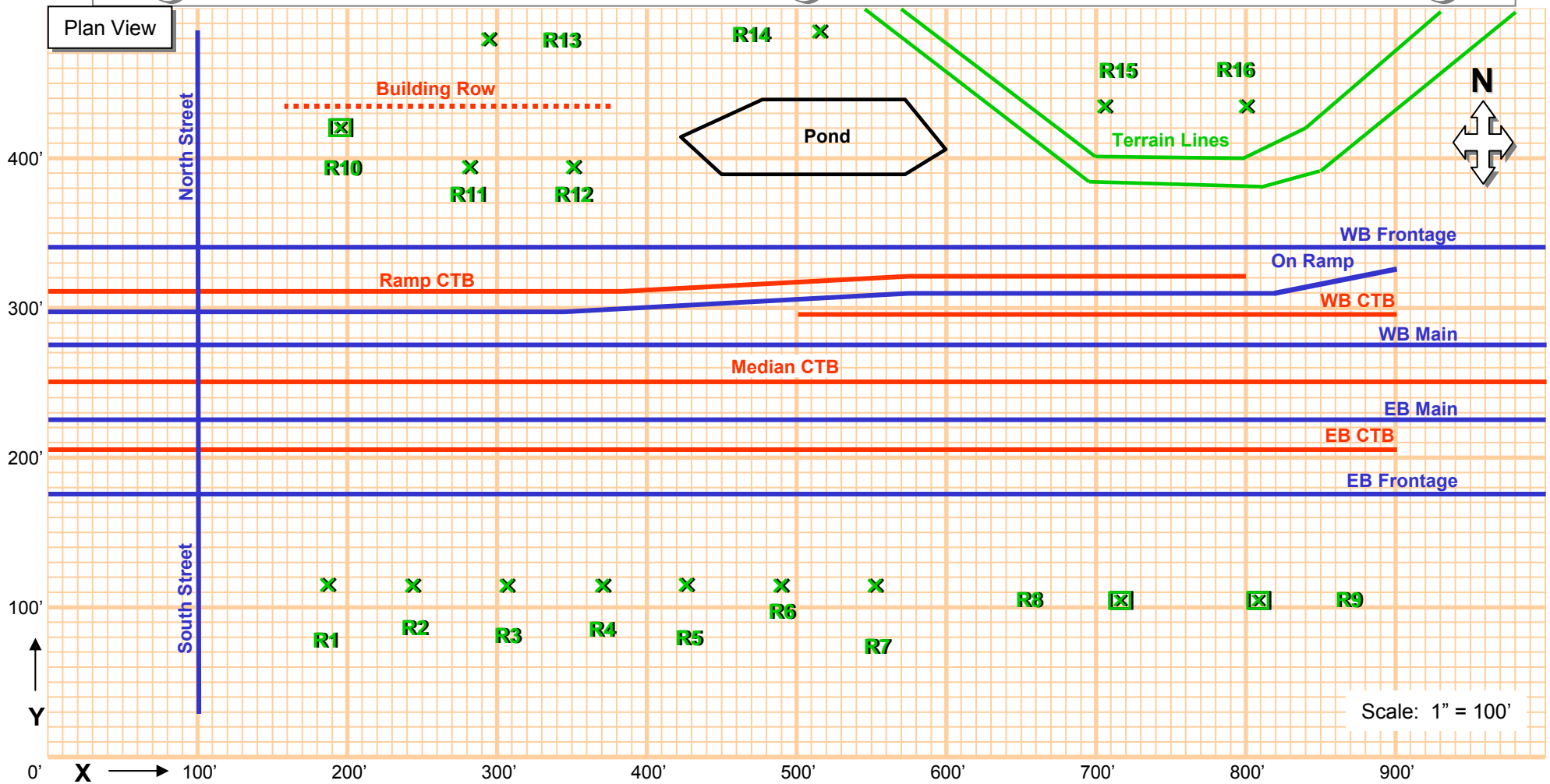


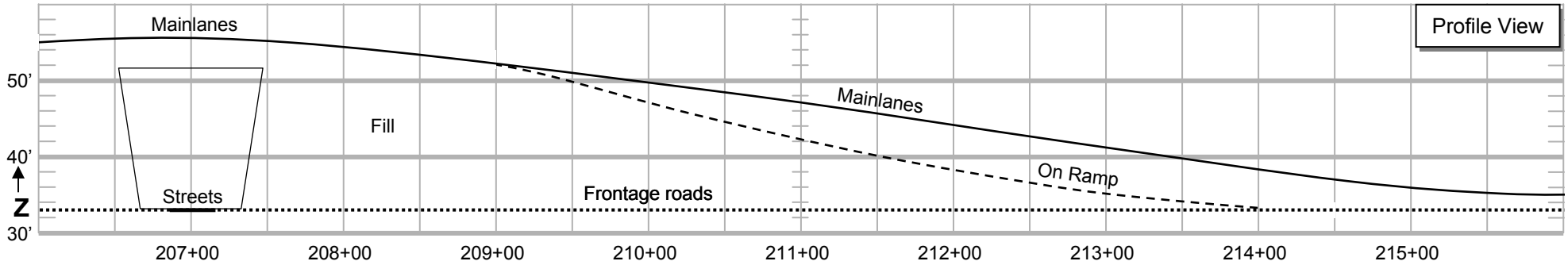

Plan View
North Street
South Street
x 30
R13
R14
x 30
Single-family
R15
R16
Building Row
Single-family
Pond
x 25
Terrain Lines
45
35
x 30
N
R10
Commercial
R11
R12
WB Frontage
On Ramp
Ramp CTB
WB CTB
WB Main
Median CTB
207+00
209+00
211+00
213+00
215+00
EB Main
EB CTB
EB Frontage
x 30
existing wooden privacy fences
x 30
R1
R2
R3
R4
R5
R6
Vacant
Lot
R7
Single-family
parking
parking
R8
R9
Multi-family
Scale: 1" = 100'

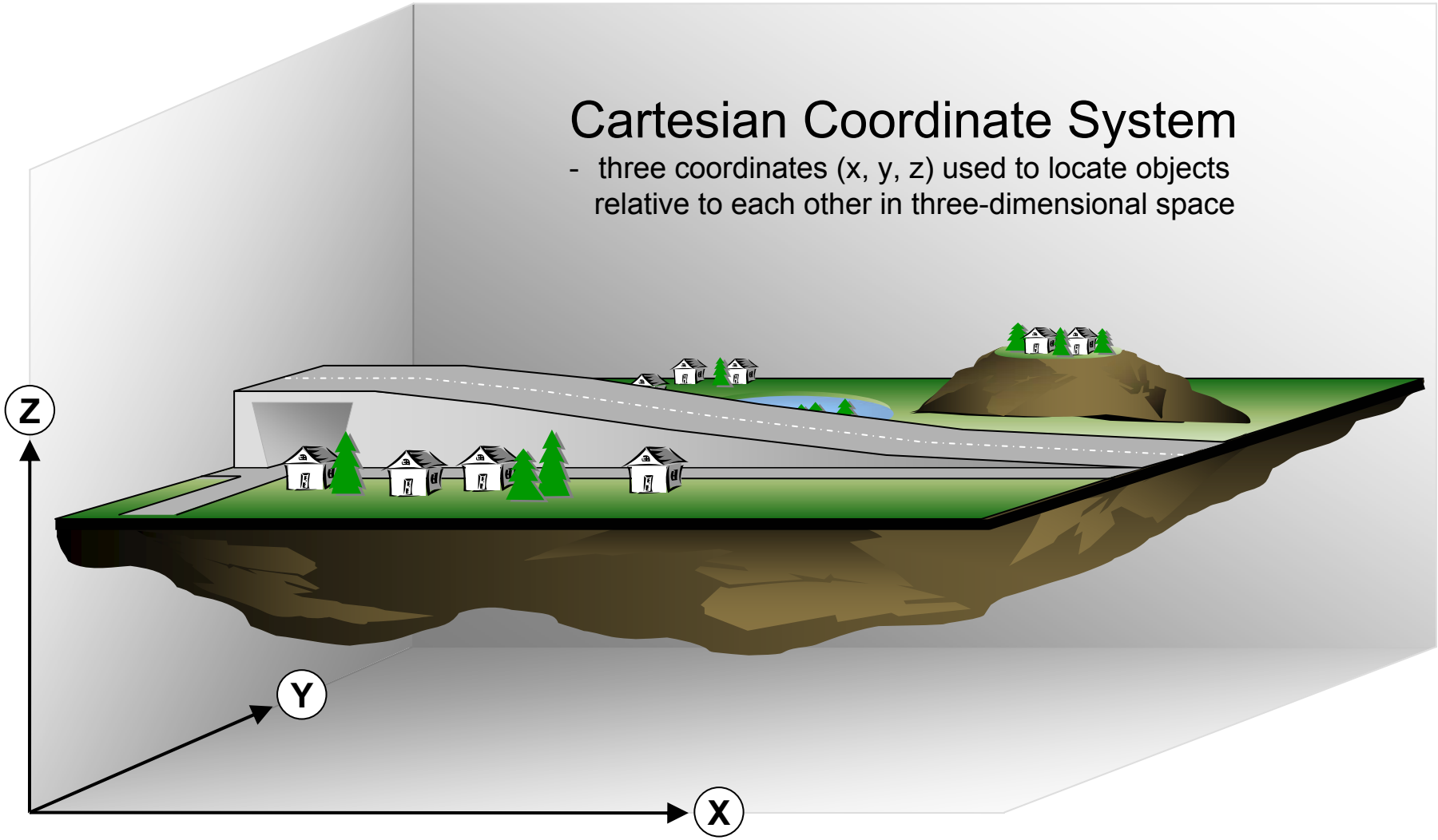

Profile View
Mainlanes
50'
Fill
Mainlanes
40'
Z
Streets
Frontage roads
On Ramp
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00


Plan View
North Street
South Street
Building Row
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
Pond
Terrain Lines
N
WB Frontage
On Ramp
Ramp CTB
WB CTB
WB Main
Median CTB
EB Main
EB CTB
EB Frontage
Scale: 1" = 100'


Profile View
Mainlanes
Fill
Streets
Frontage roads
Mainlanes
On Ramp
50'
40'
Z
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00


Plan View
North Street
South Street
Building Row
Pond
Terrain Lines
N
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
WB Frontage
On Ramp
Ramp CTB
WB CTB
WB Main
Median CTB
EB Main
EB CTB
EB Frontage
Scale: 1" = 100'
400'
300'
200'
100'
0'
Y
X
100'
200'
300'
400'
500'
600'
700'
800'
900'


Profile View
Mainlanes
Fill
Mainlanes
On Ramp
Streets
Frontage roads
50'
40'
30'
Z
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00


Cartesian Coordinate System
- three coordinates (x, y, z) used to locate objects relative to each other in three-dimensional space
Z
Y
X

Plan View

## ROADWAYS - - Basic Considerations (1 of 4)

**Number of Roadways: model each lane as a separate roadway with slightly overlapping edges …..even for simple two-lane projects.**

**NOTE:** for the purposes of this guide and to limit the time required to complete this guide, each lane is not modeled as a separate roadway.

**Length**:
- Non-freeway: 500' past last receiver
- Freeway: 1000' past last receiver

Model roadways in the direction of traffic.

**New Roadways:** TNM allows input of different traffic speeds, volumes and mixes on different segments of the same roadway.

Slight horizontal curves may be modeled in straight line segments without compromising accuracy

Long projects with individual pockets of receivers should be modeled in separate short/small runs.

**NOTE**: Include all roadways directly associated with the proposed project …even though no construction/improvements are planned for these "associated" roadways.
- For example, this would typically include all mainlanes, frontage roads, ramps, etc.

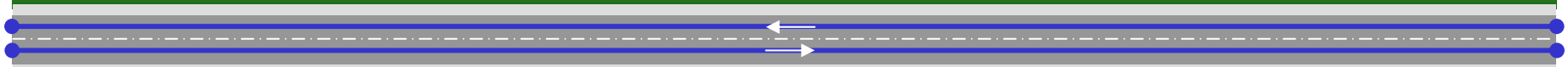
Profile View

**Elevation**: slight vertical curves (≤1.5% slope) may be modeled in flat segments without compromising accuracy -- assumes the adjacent terrain (elevation of receivers) closely matches the roadway slope/elevation.

50'
40'
Z
30'

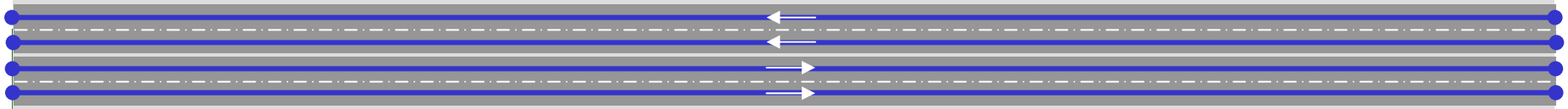
207+00 208+00 209+00 210+00 211+00 212+00 213+00 214+00 215+00

## ROADWAYS - - Basic Considerations (2 of 4)



**● 2-lane -- straight and flat (slope ≤1.5%) ●**

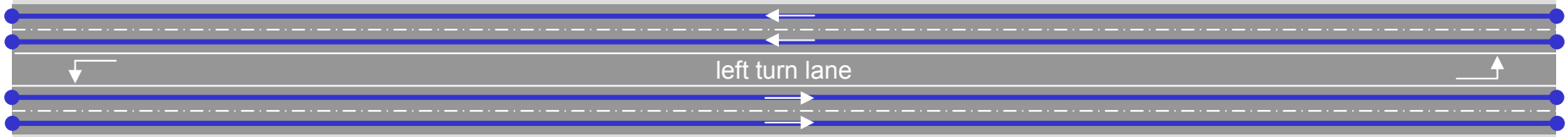
- **Number of Roadways:** model both (2) roadways – one in each direction.
- **Overlap:** roadway edges **must** overlap …simply increase the width of each roadway by 0.1 foot.
- **Traffic Split:** model Directional Distribution as depicted in the traffic data.
- **Width:** width of travel lanes - - it is not necessary to include the width of shoulders.
- **Elevation:** simpler to use zero (default) for all Z coordinates rather than the actual elevation.



**● 4-lane undivided -- straight and flat (slope ≤1.5%) ●**

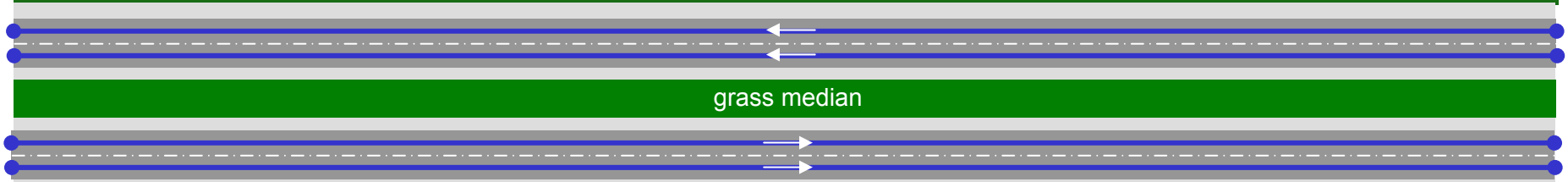
- **Number of Roadways:** model all four roadways – two in each direction.
- **Overlap:** roadway edges **must** overlap …simply increase the width of each roadway by 0.1 foot.
- **Traffic Split:** model Directional Distribution as depicted in the traffic data.
- **Width:** width of travel lanes - - it is not necessary to include the width of shoulders.
- **Elevation:** simpler to use zero (default) for all Z coordinates rather than the actual elevation.

## ROADWAYS - - Basic Considerations (3 of 4)




● **4-lane <u>divided</u> -- straight/flat (slope ≤1.5%)** ●
(divided by left turn lane or grass median)

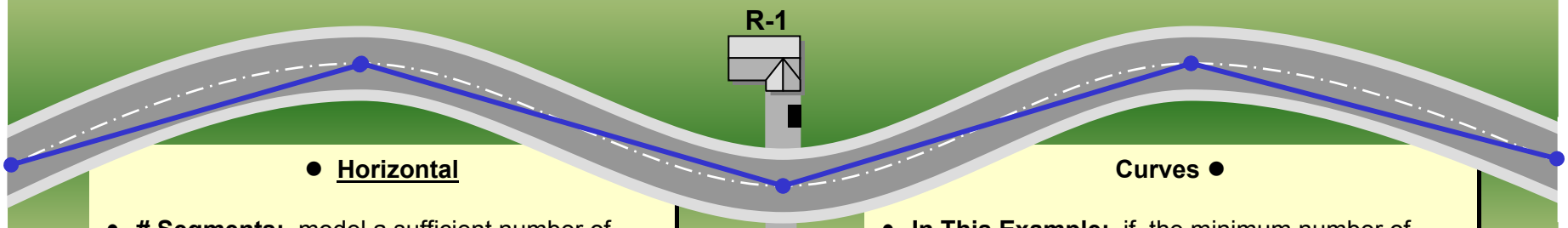
- **Number of Roadways:** model all four roadways – two in each direction.
- **Turn Lane:** model the turn lane as a roadway with zero traffic.
- **Overlap:** roadway (including turn lane) edges **<u>must</u>** overlap …simply increase the width of each adjacent/abutting roadway by 0.1 foot.
- **Traffic Split:** model the Directional Distribution as depicted in the traffic data.
- **Width:** width of travel lanes - - it is not necessary to include the width of shoulders.
- **Elevation:** simpler to use zero (default) for all Z coordinates rather than the actual elevation.
- **Median:** it is not necessary to model a "grass" median as a "lawn" ground zone if the "default" ground zone the TNM run is "lawn."



Plan View

## ROADWAYS - - Basic Considerations (4 of 4)

Roadways must be modeled in straight-line segments.



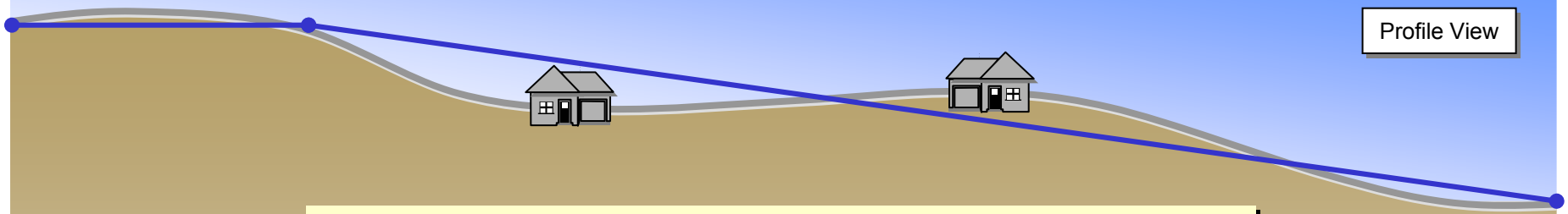

● **Horizontal**

- **# Segments:** model a sufficient number of segments to adequately define the horizontal curves (more segments = more accuracy). This is a judgement call that depends on the location of adjacent receivers.

**Curves** ●

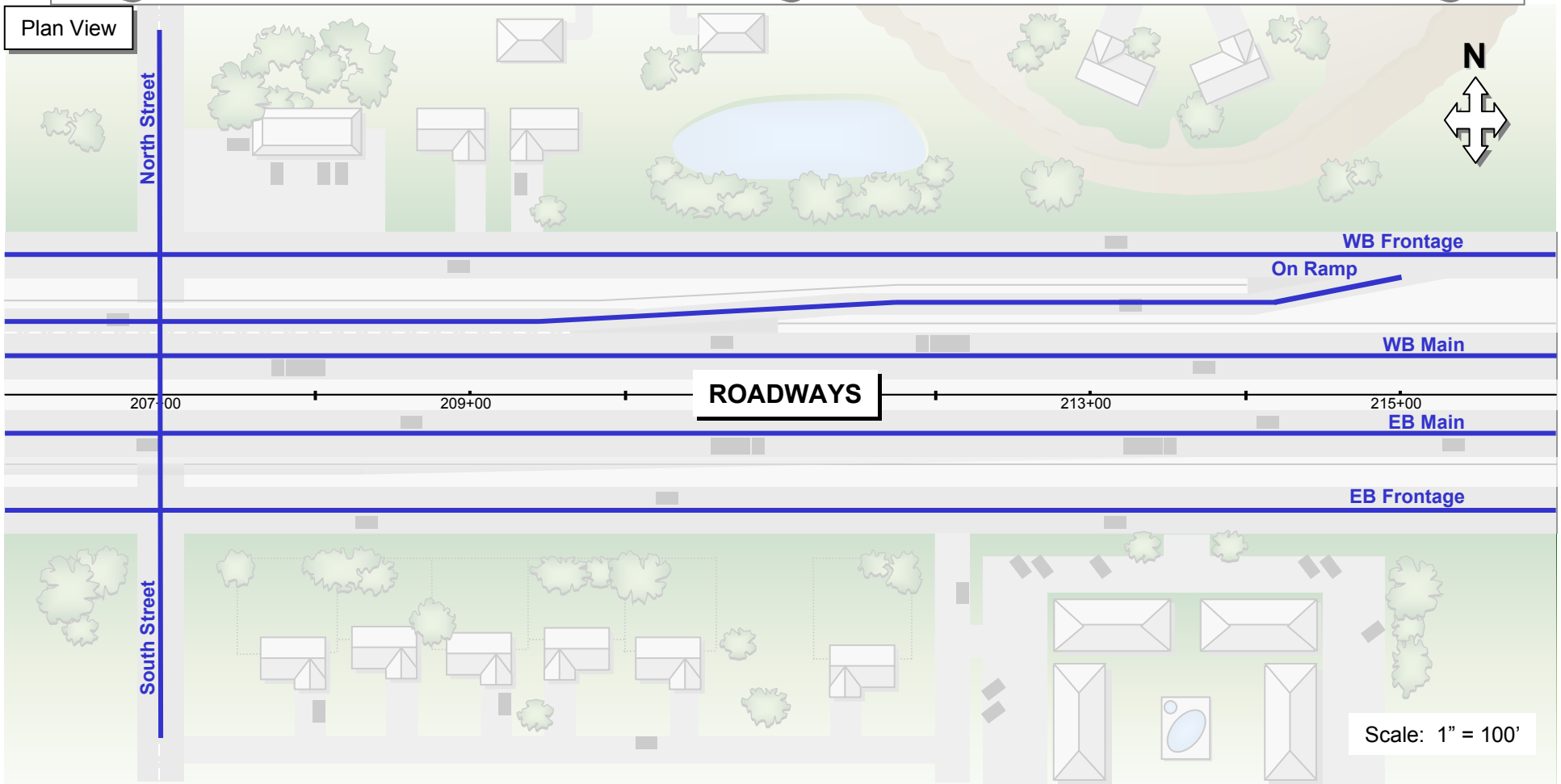
- **In This Example:** if the minimum number of only **four segments (defined by five points)** was used to define these horizontal curves, noise levels would be slightly higher than actual at **R-1** and slightly lower than actual at **R-2**.

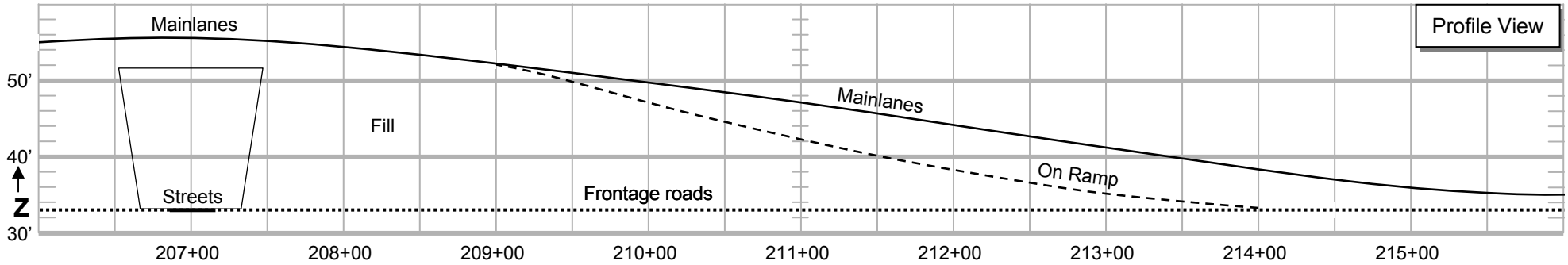
Profile View



● **Vertical Curves** ●

- **# Segments:** model a sufficient number of segments to adequately define the vertical curves (more segments = more accuracy). This is a judgement call that depends on the topography of the surrounding terrain, the elevation of adjacent receivers and the relationship to adjacent roadways and traffic barriers.
  - Model segments in the direction of traffic.
- **In this example,** additional segments are required.


Plan View
North Street
N
WB Frontage
On Ramp
WB Main
ROADWAYS
207+00
209+00
213+00
215+00
EB Main
EB Frontage
South Street
Scale: 1" = 100'


Profile View
Mainlanes
50'
Fill
Mainlanes
40'
Z
Streets
Frontage roads
On Ramp
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

Plan View

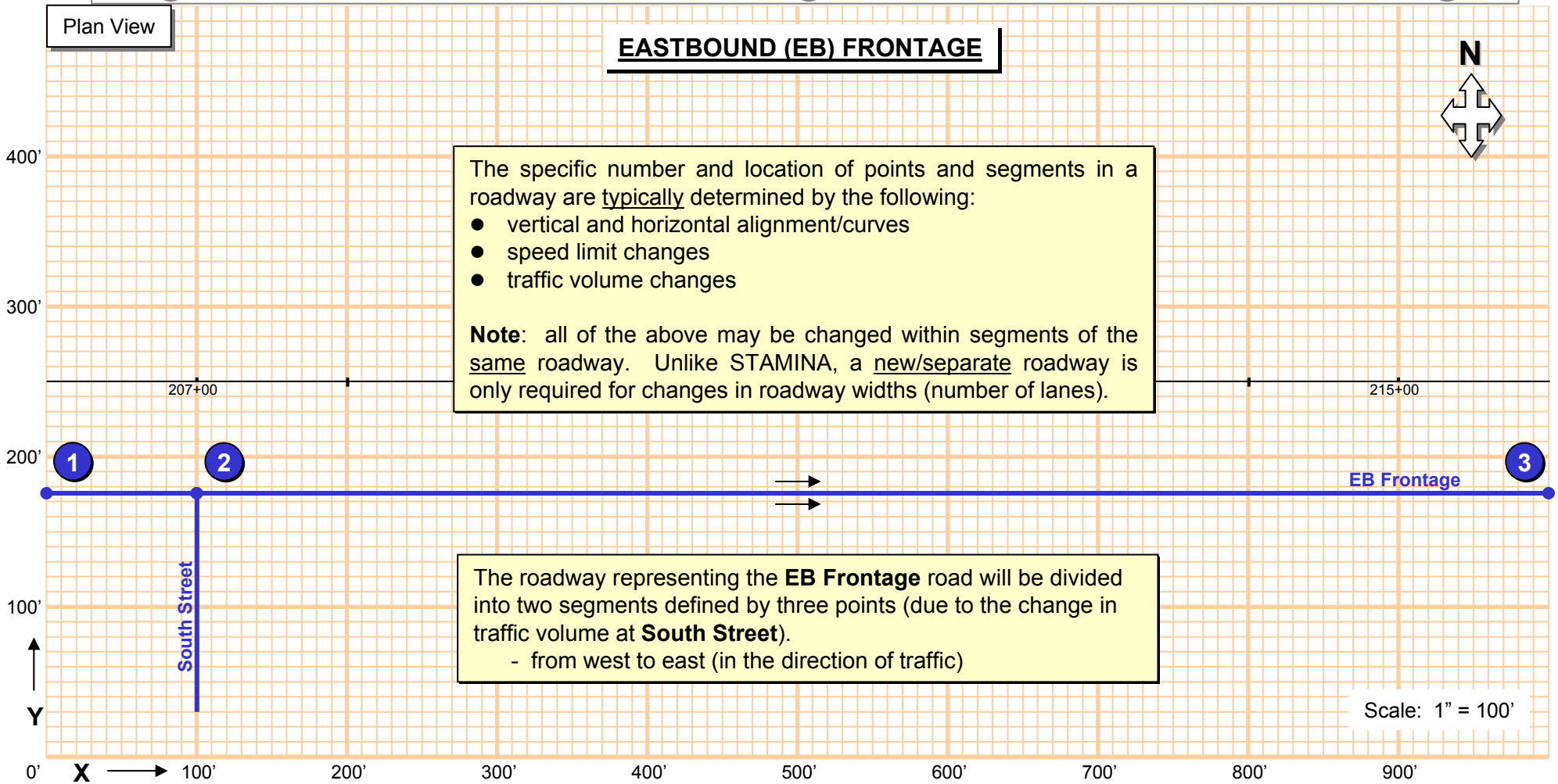
## EASTBOUND (EB) FRONTAGE

N

The specific number and location of points and segments in a roadway are typically determined by the following:

- vertical and horizontal alignment/curves
- speed limit changes
- traffic volume changes

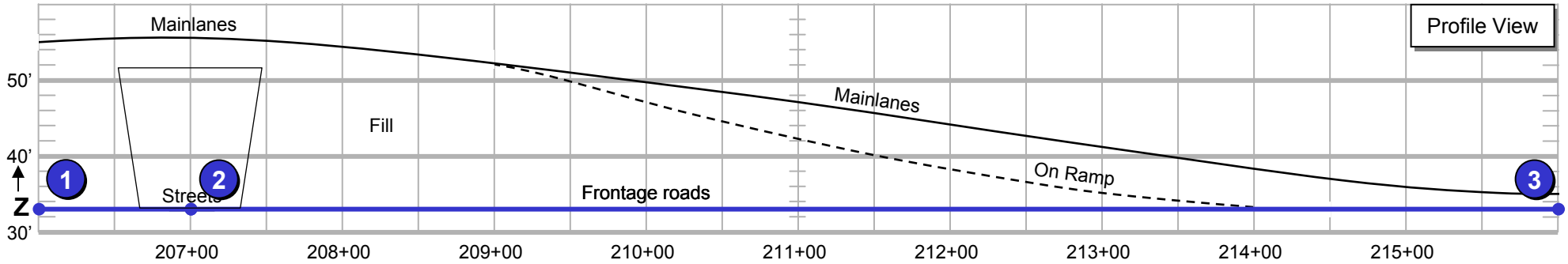
**Note**: all of the above may be changed within segments of the same roadway. Unlike STAMINA, a new/separate roadway is only required for changes in roadway widths (number of lanes).



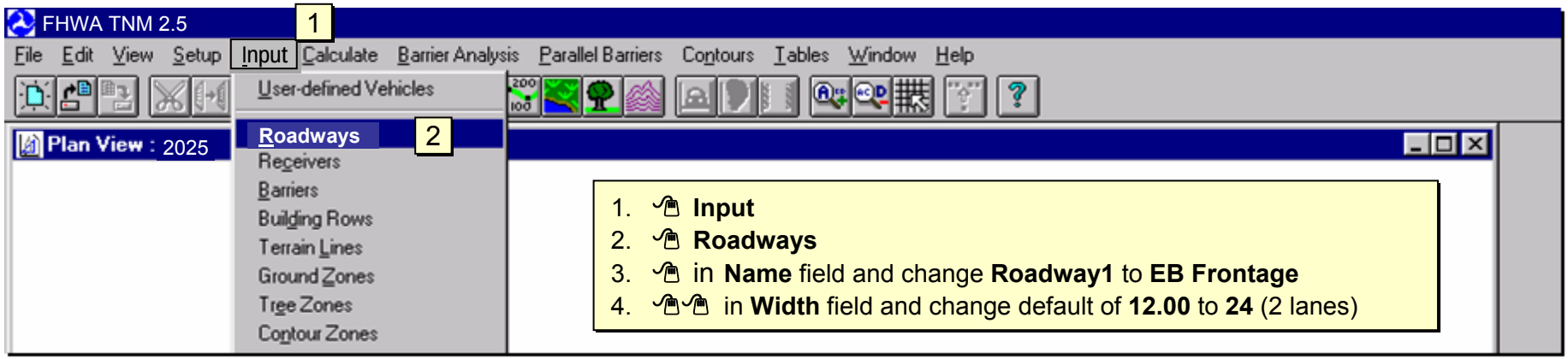

The roadway representing the **EB Frontage** road will be divided into two segments defined by three points (due to the change in traffic volume at **South Street**).

- from west to east (in the direction of traffic)

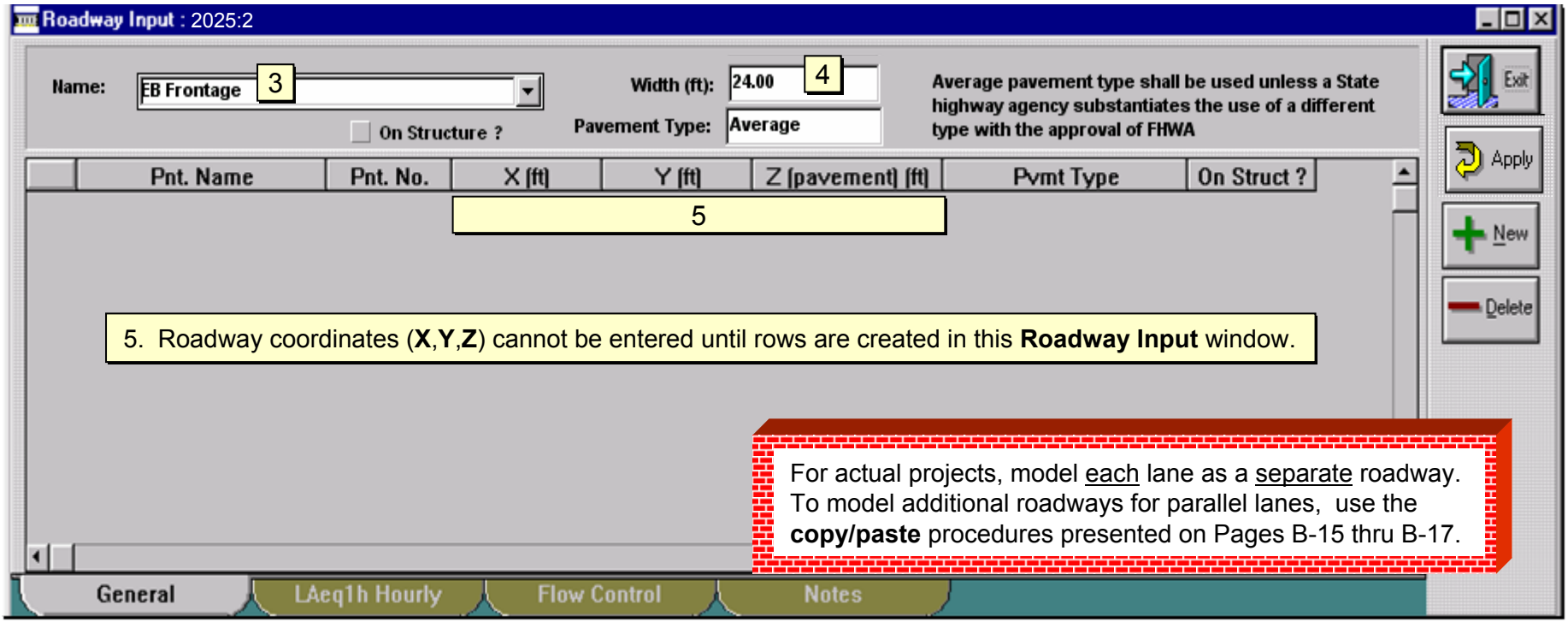
Scale: 1" = 100'



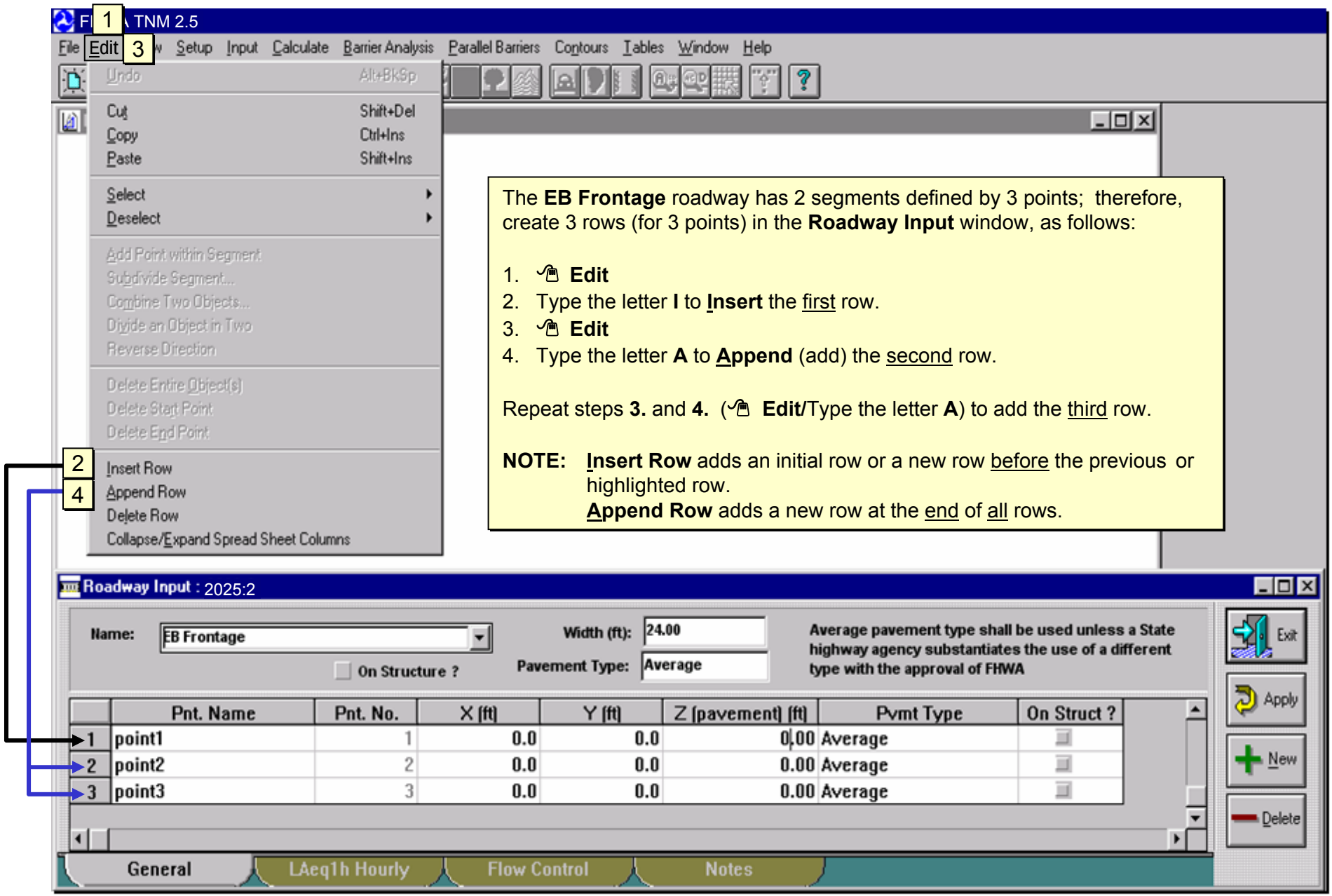
# ROADWAY INPUT: EB FRONTAGE (1 of 4)




Blank **Roadway Input** window appears



# ROADWAY INPUT: EB FRONTAGE (2 of 4)




The **EB Frontage** roadway has 2 segments defined by 3 points; therefore, create 3 rows (for 3 points) in the **Roadway Input** window, as follows:

1. **Edit**
2. Type the letter **I** to **Insert** the first row.
3. **Edit**
4. Type the letter **A** to **Append** (add) the second row.

Repeat steps **3.** and **4.** (**Edit**/Type the letter **A**) to add the third row.

**NOTE:** **Insert Row** adds an initial row or a new row before the previous or highlighted row.
**Append Row** adds a new row at the end of all rows.

# ROADWAY INPUT: EB FRONTAGE (3 of 4)

Roadway Input : 2025:2

Name: EB Frontage

On Structure ?

Width (ft): 24.00

Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Exit

Apply

New

Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 206 | 1 | 0.0 | 175.0 | 33.00 | Average | |
| 2 | 207 | 2 | 100.0 | 175.0 | 33.00 | Average | |
| 3 | 216 | 3 | 1000.0 | 175.0 | 33.00 | Average | |

General | LAeq1h Hourly

Plan View : 2025:1

**Window/Tile Horizontal**

1. Ensure the **General** tab at the bottom of the **Roadway Input** window is selected.
2. Enter **X**,**Y**,**Z** coordinates for two segments/three points (Refer to Page B-6) …..always enter coordinates in the direction of traffic.

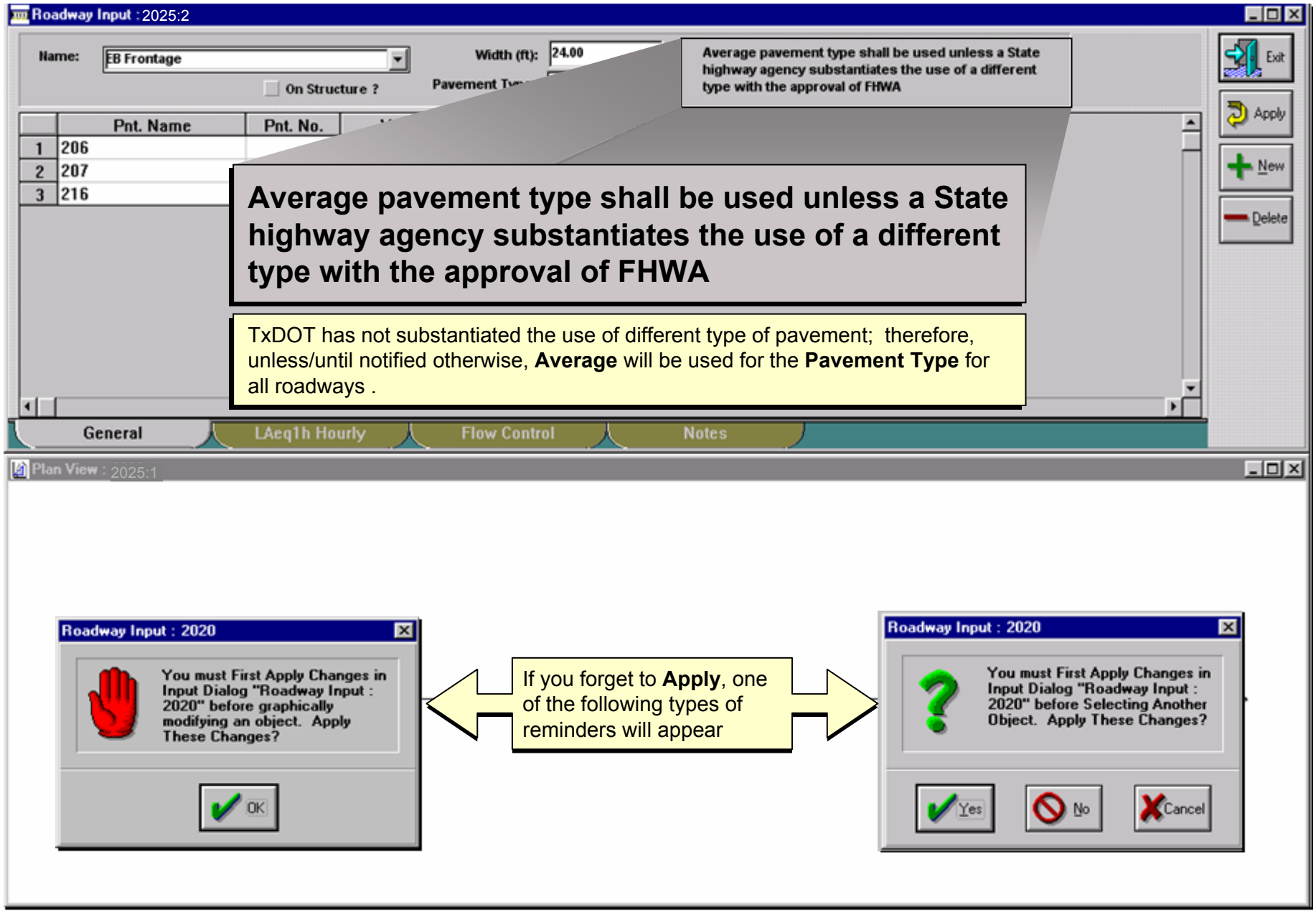
   **NOTE**: new inputs and changes appear in **RED** until applied …..font does not appear in **RED** until after moving out of the cell

3. Change **Pnt. Names** to the Station numbers for each point.
4. **Apply** (button becomes active when any changes are made).
5. Line drawing of roadway "should" appear in **Plan View** window.

**File/Save**

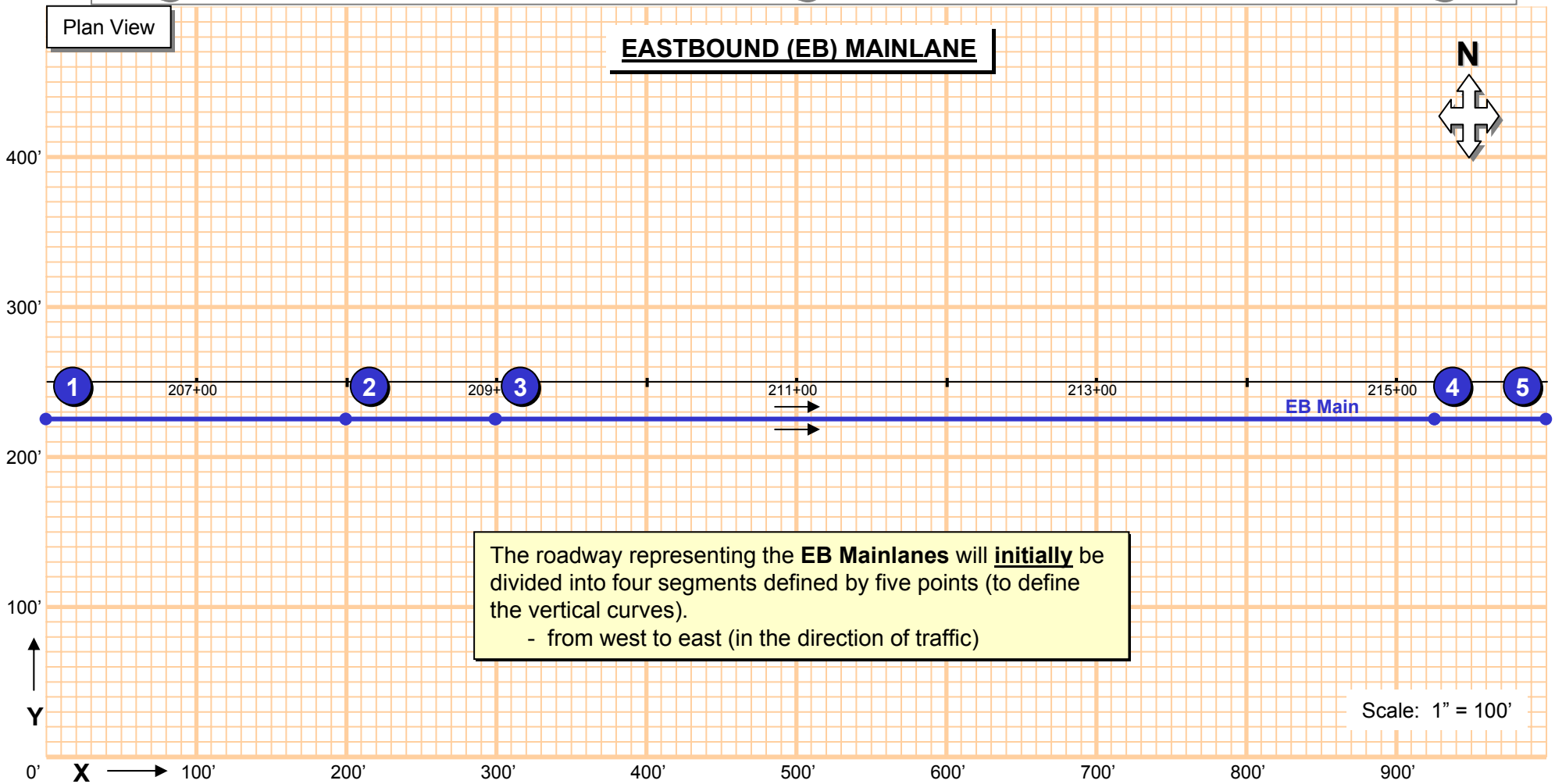
**NOTE**: due to an inherent anomaly in TNM, the first object modeled may not appear in the **Plan View** or may not be able to be viewed properly in **View**, **Full View**. In order to properly view **EB Frontage**, it may be necessary to **Save**, **Close** and re-**Open** the run.

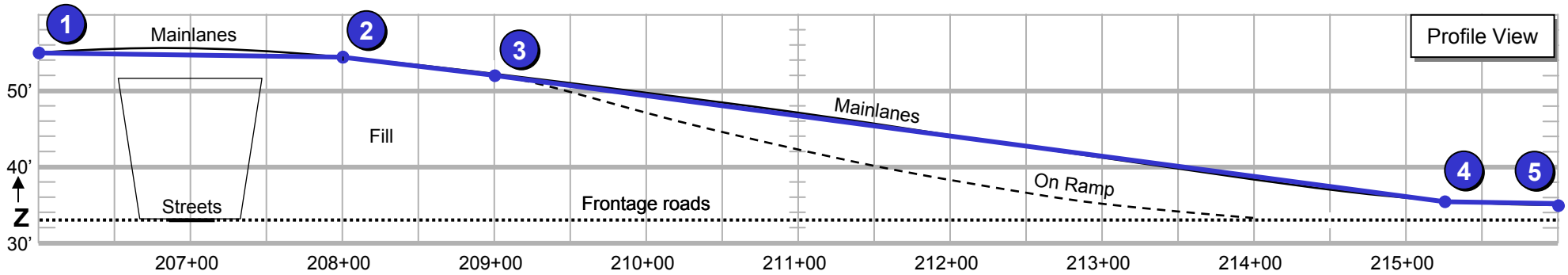
## ROADWAY INPUT: EB FRONTAGE (4 of 4)




**Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA**

TxDOT has not substantiated the use of different type of pavement; therefore, unless/until notified otherwise, **Average** will be used for the **Pavement Type** for all roadways .


Plan View
EASTBOUND (EB) MAINLANE
N
400'
300'
200'
100'
0'
Y
X
100'
200'
300'
400'
500'
600'
700'
800'
900'
1
2
3
4
5
207+00
209+
211+00
213+00
215+00
EB Main
The roadway representing the EB Mainlanes will initially be divided into four segments defined by five points (to define the vertical curves).
- from west to east (in the direction of traffic)
Scale: 1" = 100'


Profile View
1
2
3
4
5
Mainlanes
Fill
Streets
Frontage roads
Mainlanes
On Ramp
50'
40'
30'
Z
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

# ROADWAY INPUT: EB MAIN (1 of 3)

Roadway Input : 2025:2

Name: EB Main (2)

On Structure ?

Width (ft): 24 (3)

Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Exit

Apply (7)

New (1)

Delete

| | Pnt. Name (6) | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 206 | 4 | 0.0 | 225.0 | 55.00 | Average | |
| 2 | 208 | 5 | 200.0 | 225.0 | 54.00 | Average | |
| 3 | 209 | 6 | 300.0 | 225.0 | 52.00 | Average | |
| 4 | 215+25 | 7 | 925.0 | 225.0 | 36.00 | Average | |
| 5 | 216 | 8 | 1,000.0 | 225.0 | 35.00 | Average | |

(4) (5)

General

Plan View : 2025:1

1. **New**
2. in **Name** field and change default of **Roadway2** to **EB Main**.
3. in **Width** field and change default of **12.00** to **24** (2 lanes).
4. **Insert/Append** five new rows (four segments defined by five points).
5. Enter **X**,**Y**,**Z** coordinates (Refer to Page B-11).
6. Change **Pnt. Names** to Station numbers.
7. **Apply**
8. Line drawing of **EB Mainlane** appears in **Plan View** window.

**File/Save**

(8)

For actual projects, model each lane as a separate roadway. To model additional roadways for parallel lanes, use the **copy/paste** procedures presented on Pages B-15 thru B-17.

# ROADWAY INPUT: EB MAIN (2 of 3)

To better define the vertical curve between the first two points (**206** and **208**), **subdivide** the first segment into two segments.

1. first segment of EB Main to select it (gray shadow along segment).
2. **Edit**
3. **Subdivide Segment** (window appears).
4. The **Number of Segments** is set at the default of **2** - - no change.
5. **OK**
6. Two equally divided segments (one new point) are displayed in **Plan View**.

continued

# ROADWAY INPUT: EB MAIN (3 of 3)

Roadway Input : 2025:2

Name: EB Main

On Structure ?

Width (ft): 24.00

Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Exit

Apply

New

Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 206 | 4 | 0.0 | 225.0 | 55.00 | Average | |
| 2 | 207 | 9 | 100.0 | 225.0 | 56.00 | Average | |
| 3 | 208 | 5 | 200.0 | 225.0 | 54.00 | Average | |
| 4 | 209 | 6 | 300.0 | 225.0 | 52.00 | Average | |
| 5 | 215+25 | 7 | 925.0 | 225.0 | 36.00 | Average | |
| 6 | 216 | 8 | 1,000.0 | 225.0 | 35.00 | Average | |

General

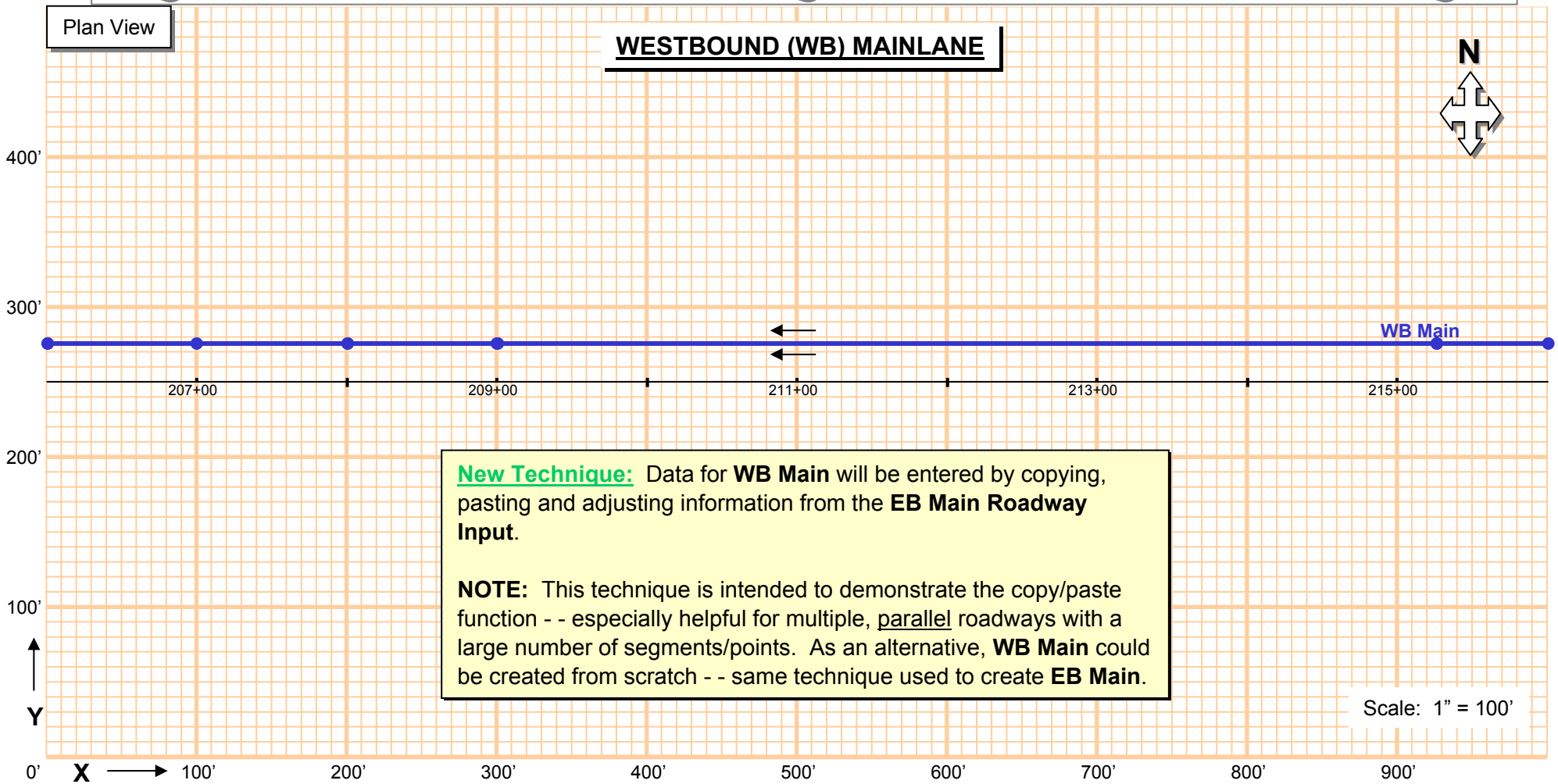
Plan View : 2025:1

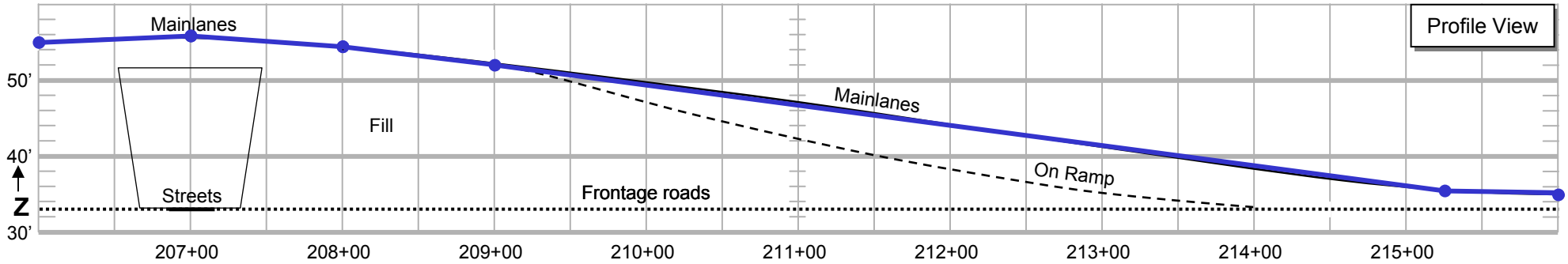
…….continued from previous page.

Subdivided segments are always equally divided - - the new point is located at an equal distance between points **206** and **208**, and at an average height between points **206** and **208**. It is important to confirm that the **X**,**Y**,**Z** coordinates for the new point accurately define the vertical curve.

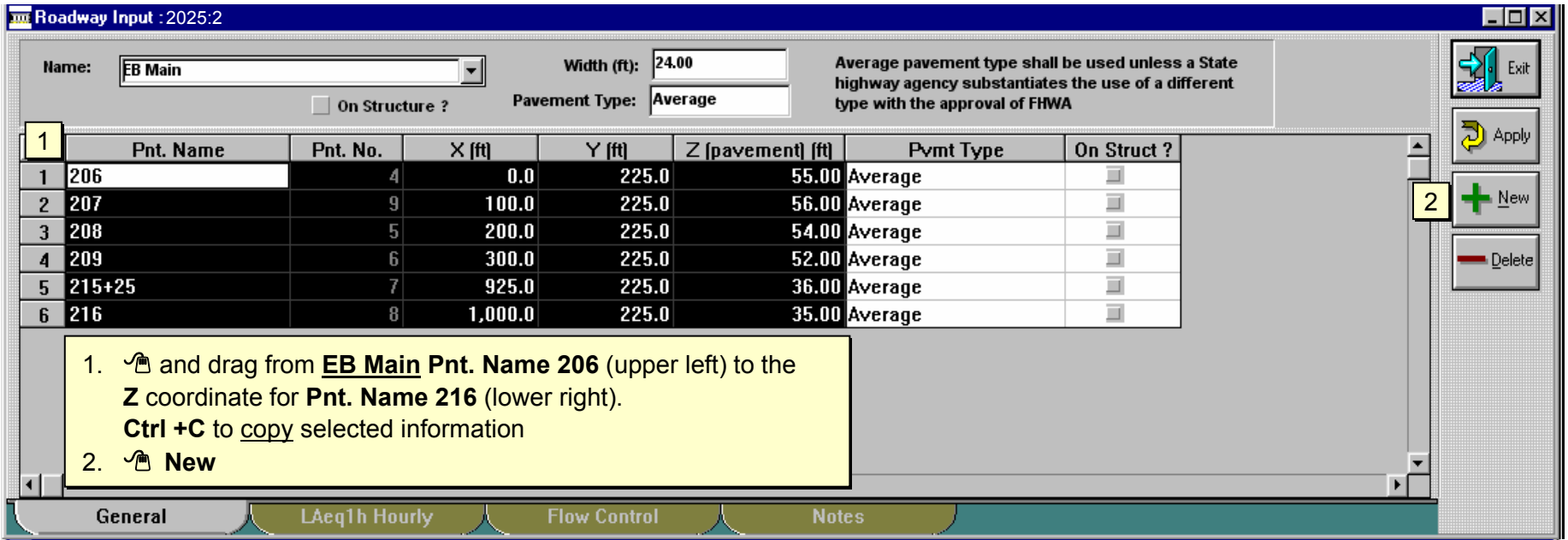
8. Change the **Pnt. Name** for the new point to the Station number.
9. Confirm that the **X** and **Y** coordinates are correct.
10. Adjust the **Z** coordinate to the correct elevation (Refer to Page B-11).
11. **Note**: ignore numbers in **Pnt. No.** column - - do not be concerned that numbers are not in order - - it is not necessary to "re-number" these points.
12. **Apply**

**File/Save**

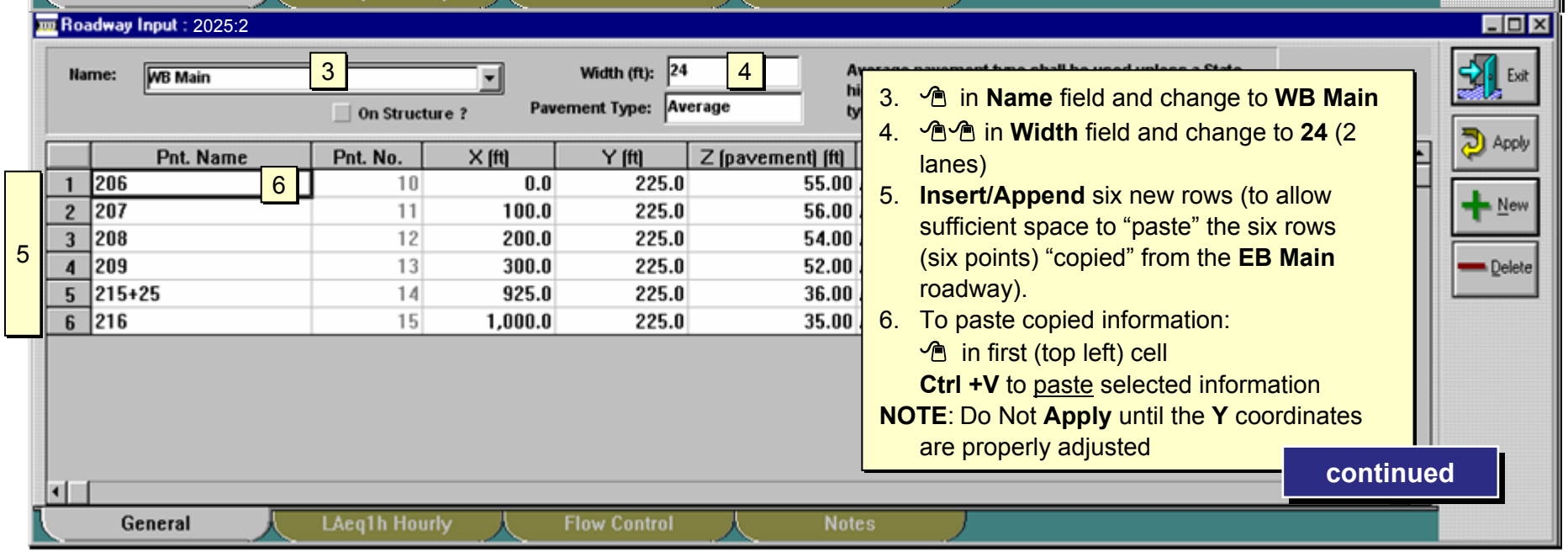

Plan View
WESTBOUND (WB) MAINLANE
N
400'
300'
200'
100'
0'
Y
X
100'
200'
300'
400'
500'
600'
700'
800'
900'
WB Main
207+00
209+00
211+00
213+00
215+00
New Technique: Data for WB Main will be entered by copying, pasting and adjusting information from the EB Main Roadway Input.
NOTE: This technique is intended to demonstrate the copy/paste function - - especially helpful for multiple, parallel roadways with a large number of segments/points. As an alternative, WB Main could be created from scratch - - same technique used to create EB Main.
Scale: 1" = 100'


Profile View
Mainlanes
Fill
Streets
Frontage roads
Mainlanes
On Ramp
50'
40'
30'
Z
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

# ROADWAY INPUT: WB MAIN (1 of 3)




1. and drag from **EB Main** **Pnt. Name 206** (upper left) to the **Z** coordinate for **Pnt. Name 216** (lower right).
   **Ctrl +C** to copy selected information
2. **New**




3. in **Name** field and change to **WB Main**
4. in **Width** field and change to **24** (2 lanes)
5. **Insert/Append** six new rows (to allow sufficient space to "paste" the six rows (six points) "copied" from the **EB Main** roadway).
6. To paste copied information:
   in first (top left) cell
   **Ctrl +V** to paste selected information

**NOTE**: Do Not **Apply** until the **Y** coordinates are properly adjusted

continued

# ROADWAY INPUT: WB MAIN (2 of 3)

Roadway Input : 2025:2

Name: WB Main

Width (ft): 24

Pavement Type: Average

On Structure ?

Average pavement type shall be used unless a State highway agency substantiates the use of a different ty

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) |
|---|---|---|---|---|---|
| 1 | 206 | 10 | 0.0 | 275.0 | 55.00 |
| 2 | 207 | 11 | 100.0 | 275.0 | 56.00 |
| 3 | 208 | 12 | 200.0 | 275.0 | 54.00 |
| 4 | 209 | 13 | 300.0 | 275.0 | 52.00 |
| 5 | 215+25 | 14 | 925.0 | 275.0 | 36.00 |
| 6 | 216 | 15 | 1,000.0 | 275.0 | 35.00 |

7

8

Exit

Apply

New

Delete

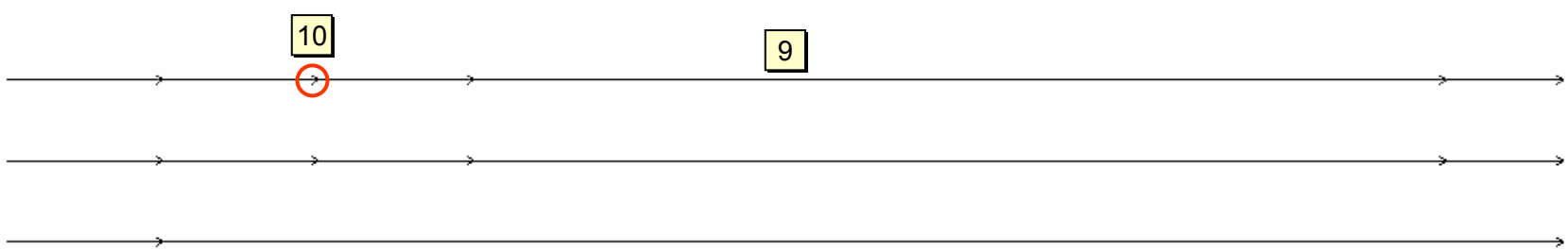
General | LAeq1h Hourly | Flow Control | Notes

……continued from previous page.

7. Adjust all **Y** coordinates for **WB Main** (Refer to Page B-15)
8. **Apply**
9. The **WB Main** roadway is depicted in **Plan View** window
10. As indicated by the arrow, **WB Main** is not heading in the direction of traffic. Therefore, the final step will reverse the direction of the roadway.

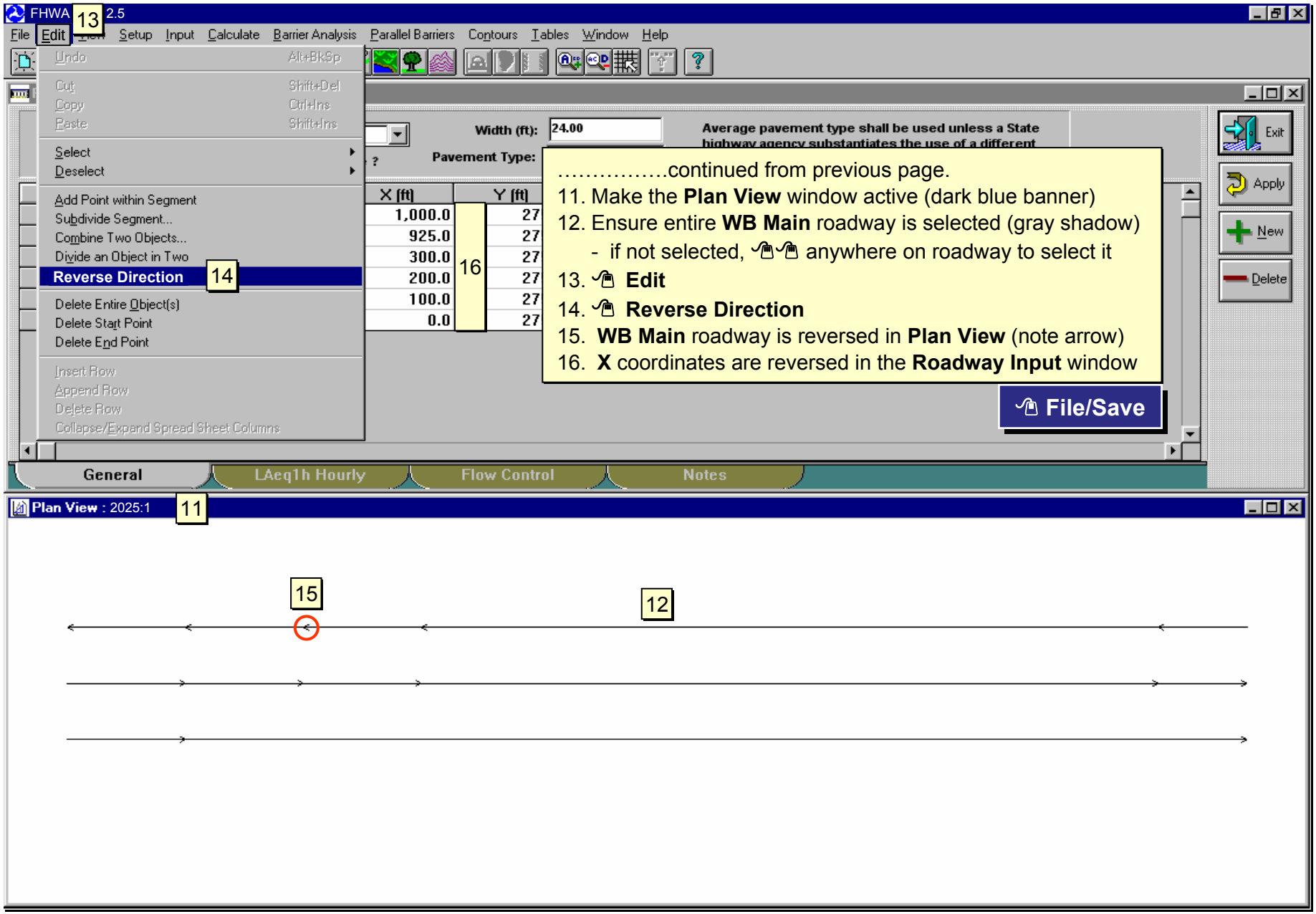
continued

Plan View : 2025:1




For actual projects, model each lane as a separate roadway. To model additional roadways for parallel lanes, use this **copy/paste** procedure.

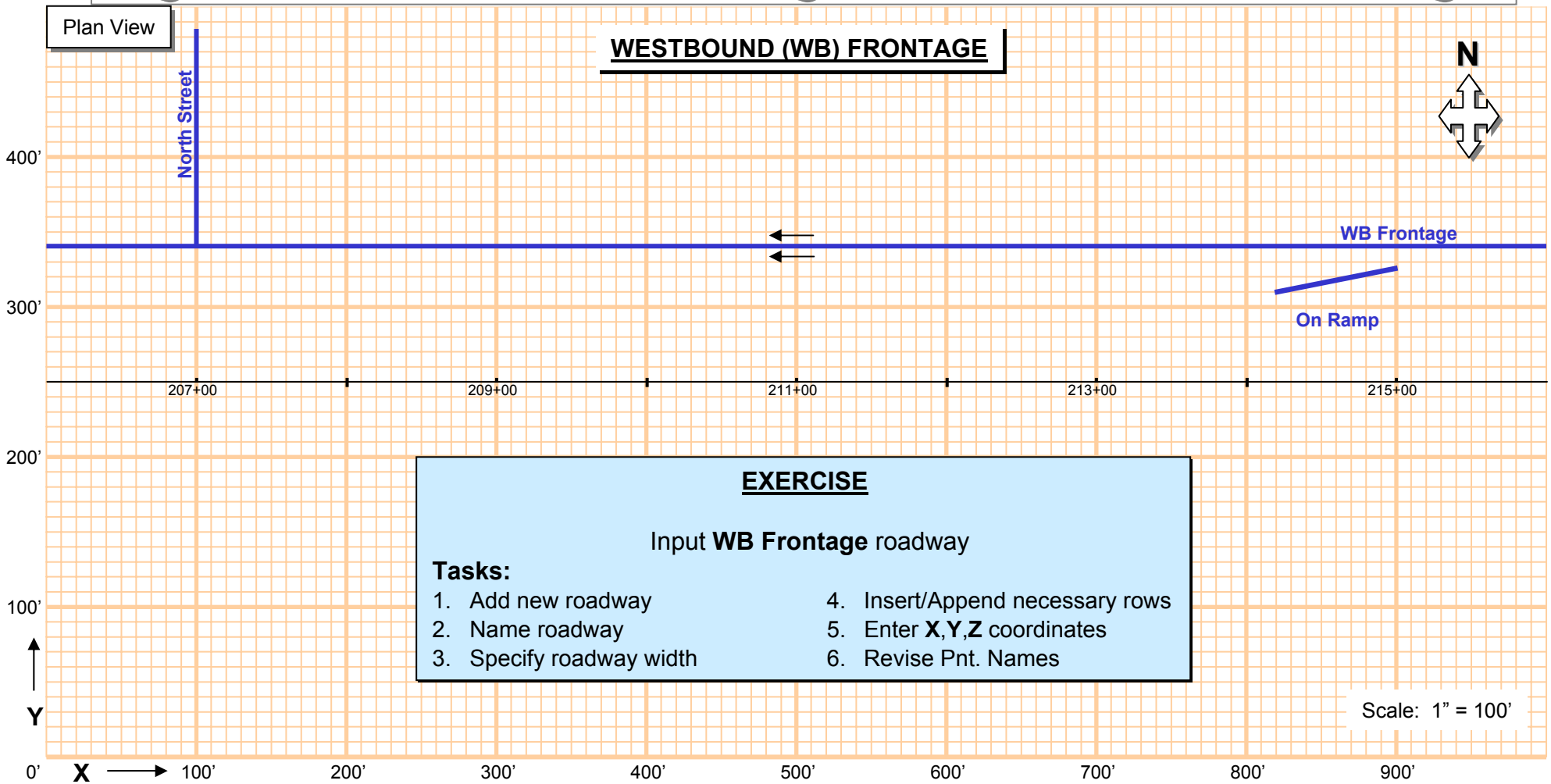
# ROADWAY INPUT: WB MAIN (3 of 3)




……continued from previous page.

11. Make the **Plan View** window active (dark blue banner)
12. Ensure entire **WB Main** roadway is selected (gray shadow)
    - if not selected, anywhere on roadway to select it
13. **Edit**
14. **Reverse Direction**
15. **WB Main** roadway is reversed in **Plan View** (note arrow)
16. **X** coordinates are reversed in the **Roadway Input** window

**File/Save**

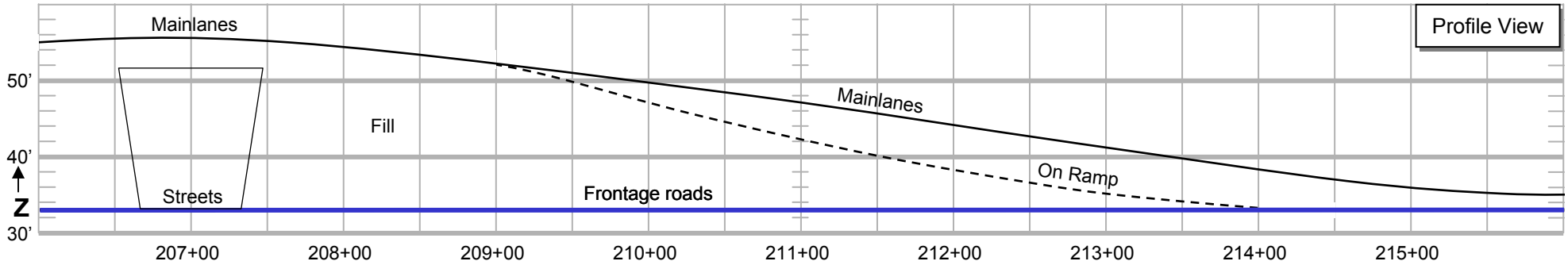


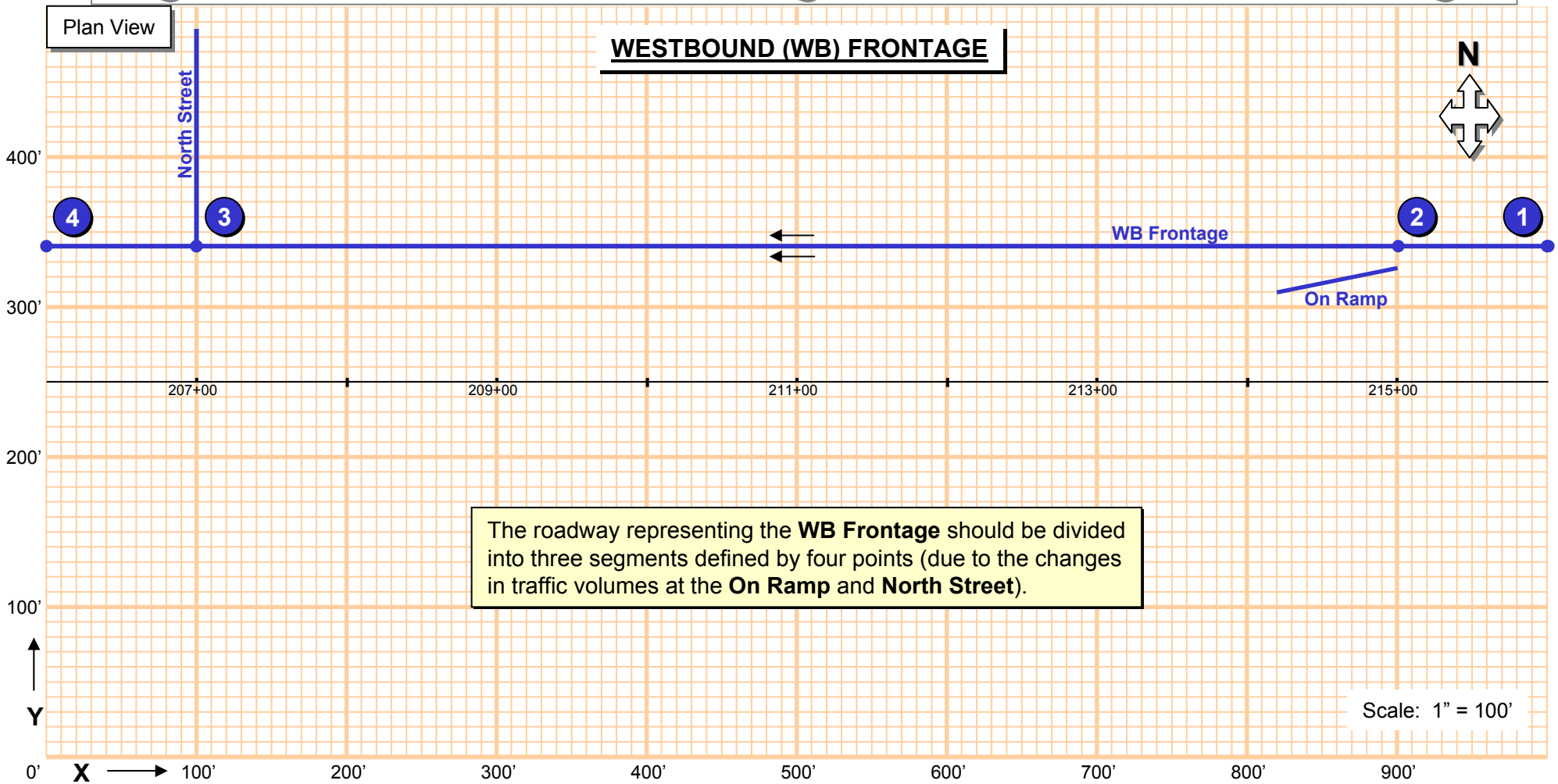

**EXERCISE**

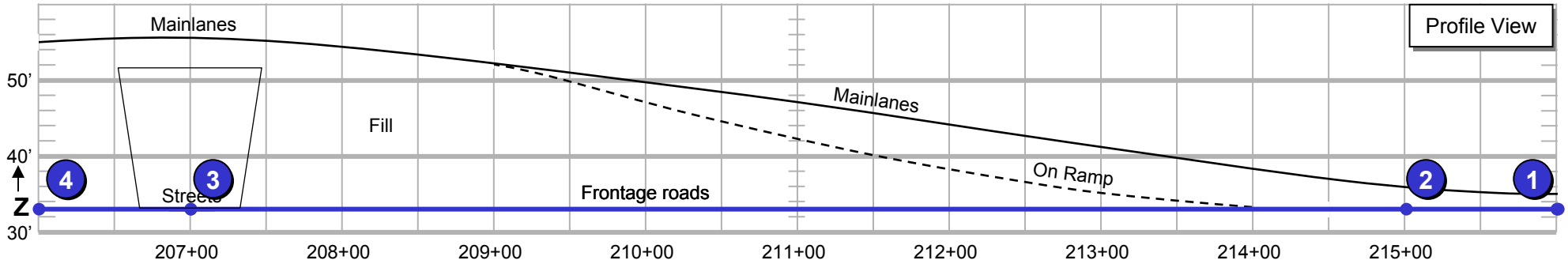
Input **WB Frontage** roadway

**Tasks:**

1. Add new roadway
2. Name roadway
3. Specify roadway width
4. Insert/Append necessary rows
5. Enter **X**,**Y**,**Z** coordinates
6. Revise Pnt. Names




Plan View
WESTBOUND (WB) FRONTAGE
N
North Street
WB Frontage
On Ramp
4
3
2
1
400'
300'
200'
100'
0'
Y
X
207+00
209+00
211+00
213+00
215+00
100'
200'
300'
400'
500'
600'
700'
800'
900'
The roadway representing the **WB Frontage** should be divided into three segments defined by four points (due to the changes in traffic volumes at the **On Ramp** and **North Street**).
Scale: 1" = 100'


Profile View
Mainlanes
Mainlanes
Fill
On Ramp
Frontage roads
Street
4
3
2
1
50'
40'
30'
Z
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

# ROADWAY INPUT: WB FRONTAGE

Roadway Input : 2025:2

Name: WB Frontage (2)

On Structure ?

Width (ft): 24 (3)

Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Exit

Apply (7)

New (1)

Delete

| | Pnt. Name (6) | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 216 | 16 | 1,000.0 | 340.0 | 33.00 | Average | |
| 2 | 215 | 17 | 900.0 | 340.0 | 33.00 | Average | |
| 3 | 207 | 18 | 100.0 | 340.0 | 33.00 | Average | |
| 4 | 206 | 19 | 0.0 | 340.0 | 33.00 | Average | |

(4) (5)

General LAeq1

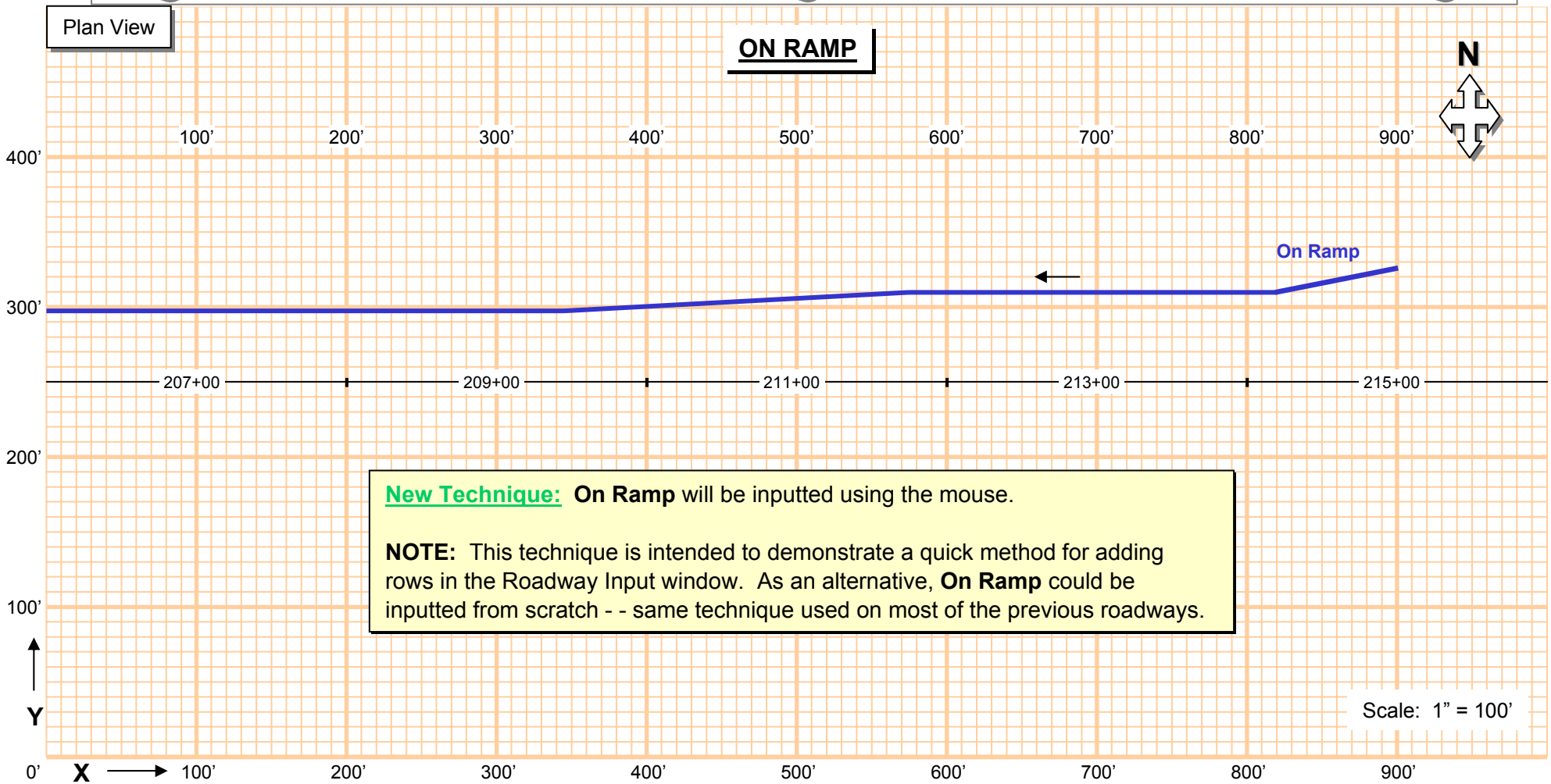
Plan View : 2025:1

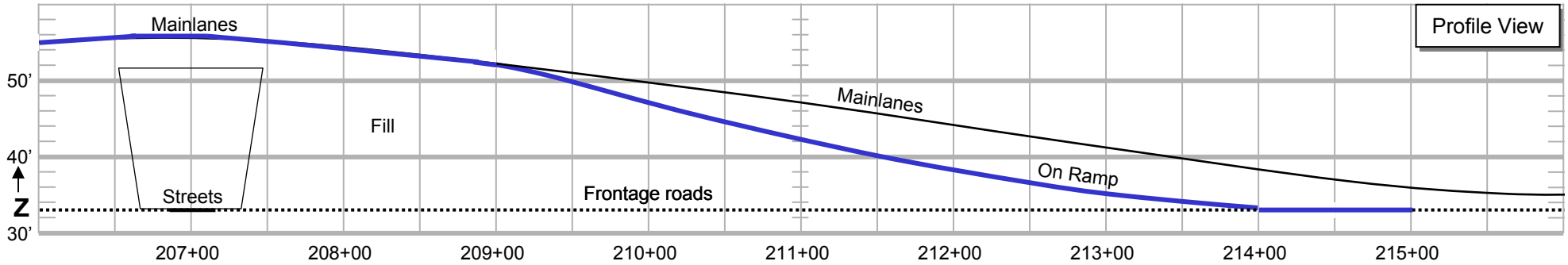
1. **New**
2. in **Name** field and change to **WB Frontage**
3. in **Width** field and change to **24** (2 lanes)
4. **Insert/Append** four new rows (three segments defined by four points)
5. Enter **X**,**Y**,**Z** coordinates for three segments/four points in the direction of traffic (Refer to Page B-20)
6. Change **Pnt. Names** to Station numbers
7. **Apply**
8. Line drawing of **WB Frontage** appears in **Plan View** window

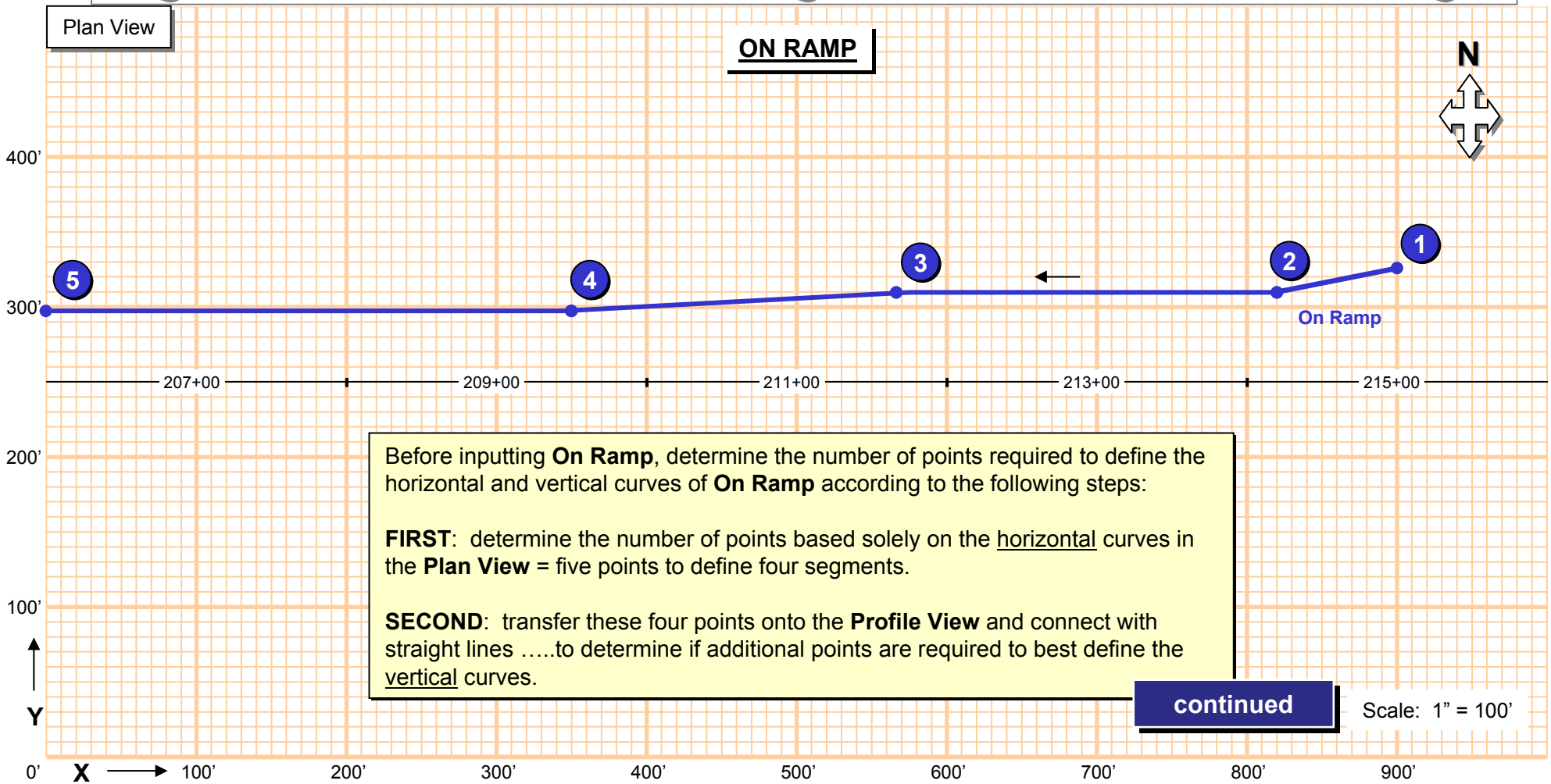
**File/Save**

(8)

For actual projects, model each lane as a separate roadway. To model additional roadways for parallel lanes, use the **copy/paste** procedures presented on Pages B-15 thru B-17.


Plan View
ON RAMP
N
100' 200' 300' 400' 500' 600' 700' 800' 900'
400'
300'
200'
100'
0'
Y
X
On Ramp
207+00 209+00 211+00 213+00 215+00
New Technique: On Ramp will be inputted using the mouse.
NOTE: This technique is intended to demonstrate a quick method for adding rows in the Roadway Input window. As an alternative, On Ramp could be inputted from scratch - - same technique used on most of the previous roadways.
Scale: 1" = 100'


Profile View
Mainlanes
Fill
Streets
Frontage roads
Mainlanes
On Ramp
50'
40'
30'
Z
207+00 208+00 209+00 210+00 211+00 212+00 213+00 214+00 215+00



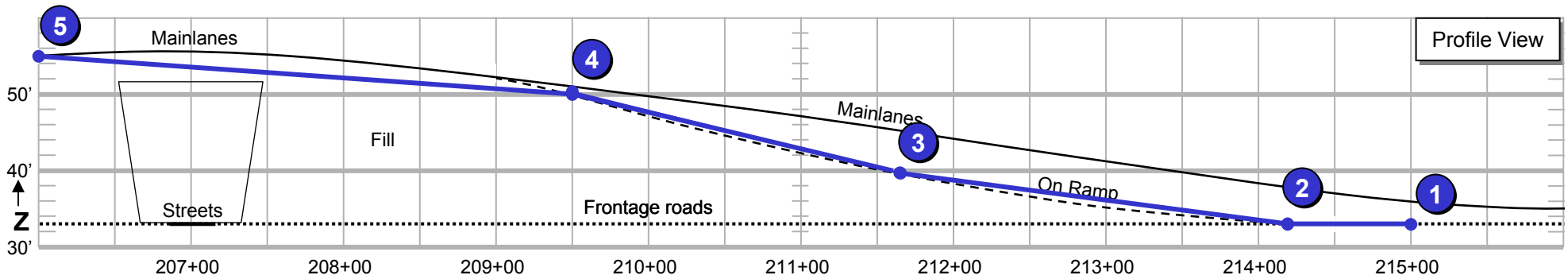

Before inputting **On Ramp**, determine the number of points required to define the horizontal and vertical curves of **On Ramp** according to the following steps:

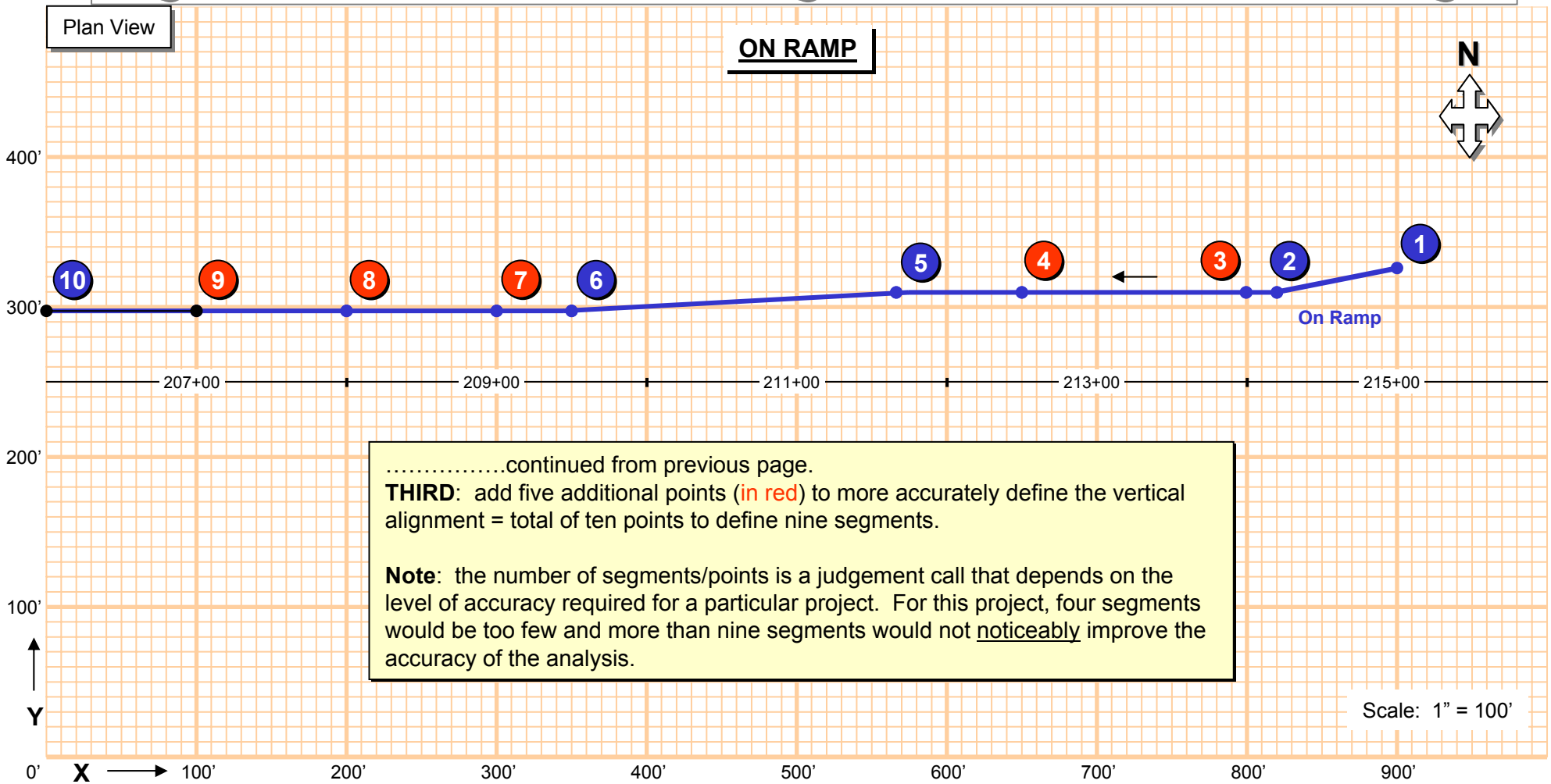
**FIRST**: determine the number of points based solely on the horizontal curves in the **Plan View** = five points to define four segments.

**SECOND**: transfer these four points onto the **Profile View** and connect with straight lines …..to determine if additional points are required to best define the vertical curves.

continued

Scale: 1" = 100'

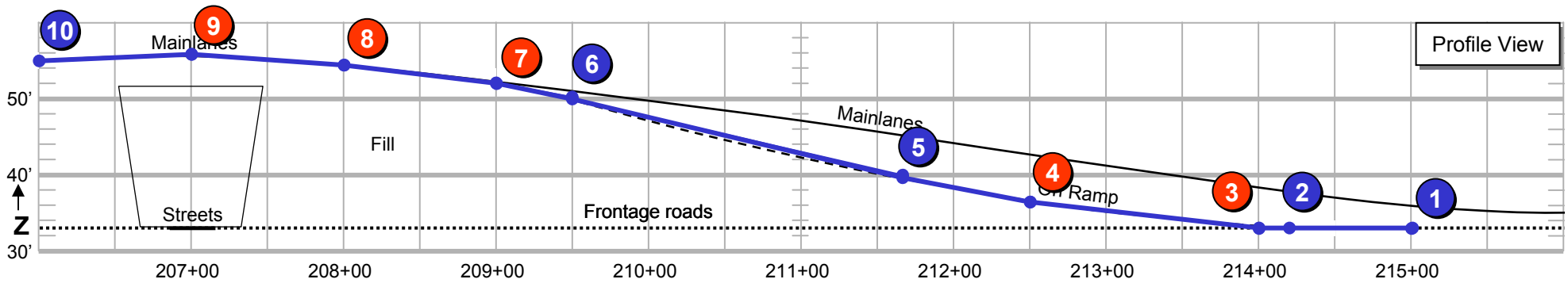


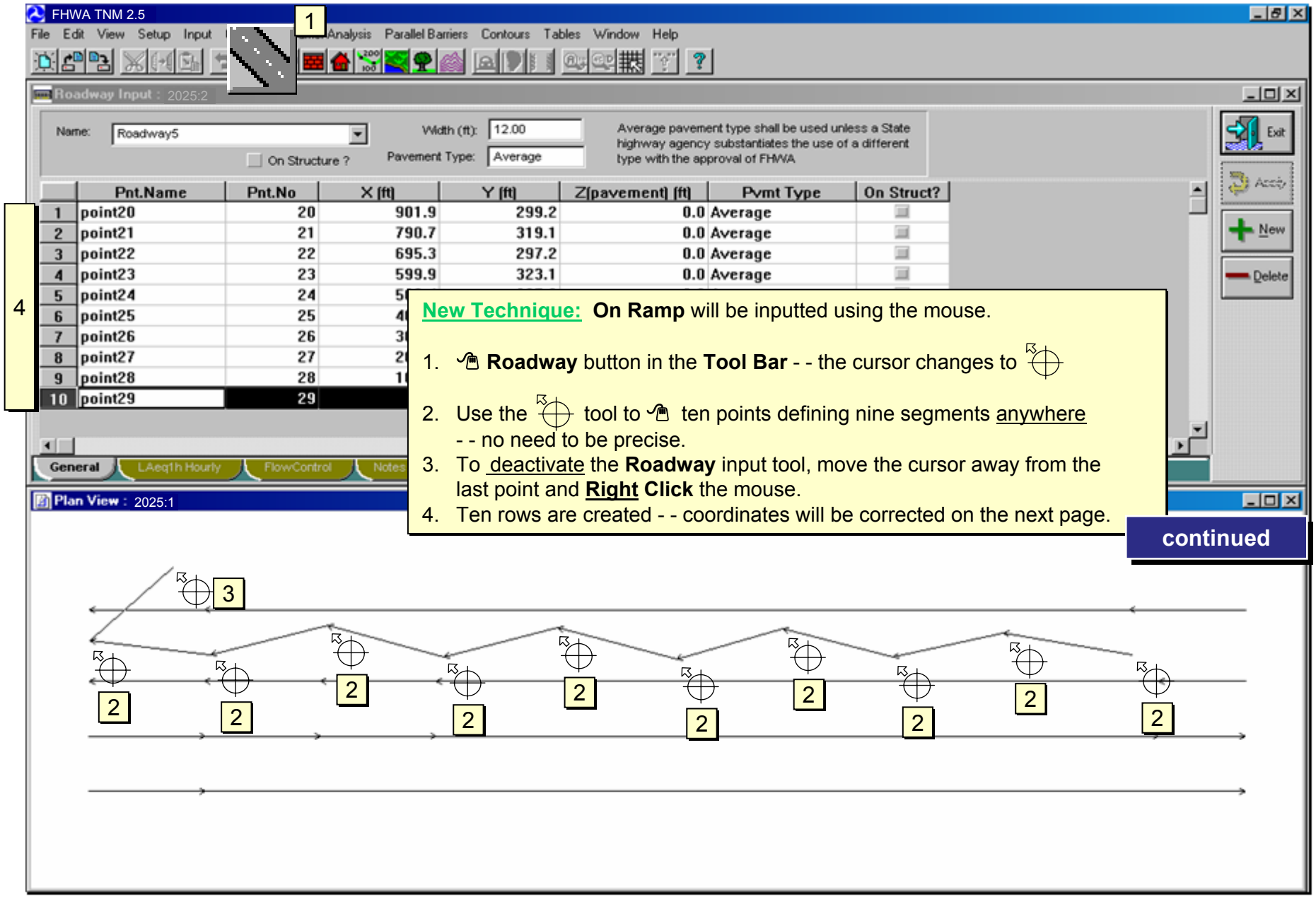



……continued from previous page.

**THIRD**: add five additional points (in red) to more accurately define the vertical alignment = total of ten points to define nine segments.

**Note**: the number of segments/points is a judgement call that depends on the level of accuracy required for a particular project. For this project, four segments would be too few and more than nine segments would not noticeably improve the accuracy of the analysis.






**New Technique:** **On Ramp** will be inputted using the mouse.

1. **Roadway** button in the **Tool Bar** - - the cursor changes to
2. Use the tool to ten points defining nine segments anywhere - - no need to be precise.
3. To deactivate the **Roadway** input tool, move the cursor away from the last point and **Right Click** the mouse.
4. Ten rows are created - - coordinates will be corrected on the next page.

continued

# ROADWAY INPUT: ON RAMP

Roadway Input : 2025:2

Name: On Ramp (5) Width (ft): 12.00 (6)

On Structure ? Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

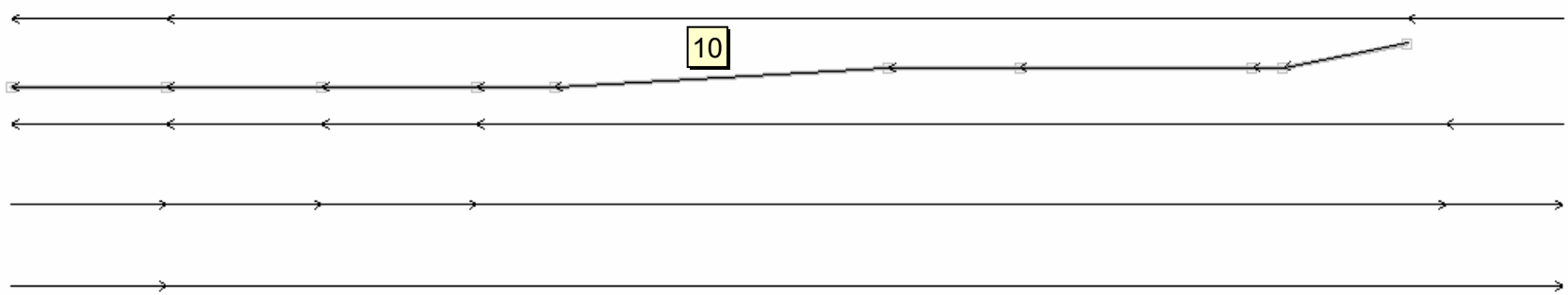
Exit Apply (9) New Delete

| | Pnt. Name (8) | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 215 | 20 | 900.0 | 325.0 | 33.00 | Average | |
| 2 | 214+20 | 21 | 820.0 | 310.0 | 33.00 | Average | |
| 3 | 214 | 22 | 800.0 | 310.0 | 33.00 | Average | |
| 4 | 212+50 | 23 | 650.0 | 310.0 | 36.00 | Average | |
| 5 | 211+65 | 24 | 565.0 | 310.0 | 40.00 | Average | |
| 6 | 209+50 | 25 | 350.0 | 298.0 | 50.00 | Average | |
| 7 | 209 | 26 | 300.0 | 298.0 | 52.00 | Average | |
| 8 | 208 | 27 | 200.0 | 298.0 | 54.00 | Average | |
| 9 | 207 | 28 | 100.0 | 298.0 | 56.00 | Average | |
| 10 | 206 | 29 | 0.0 | 298.0 | 55.00 | Average | |

(7)

General | LAeq1h Hourly | Flow Control | Note

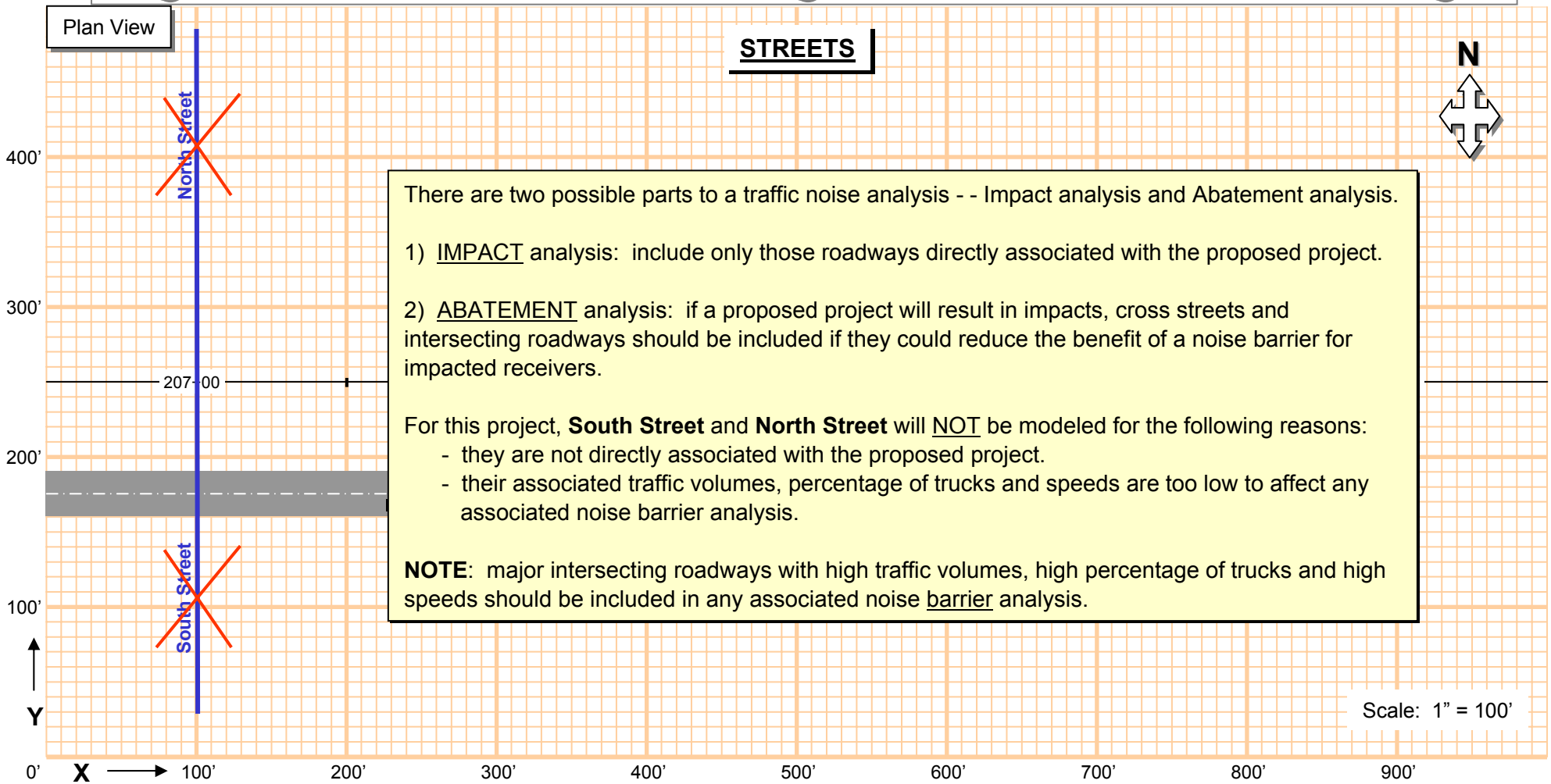
Plan View : 2025:1




…….continued from previous page.

5. **Name** the new roadway
6. Specify the roadway **Width**
7. Enter correct **X**,**Y**,**Z** coordinates (Refer to Page B-24)
8. Change **Pnt. Names**
9. **Apply**
10. **On Ramp** jumps to proper position in **Plan View**

**File/Save**




There are two possible parts to a traffic noise analysis - - Impact analysis and Abatement analysis.

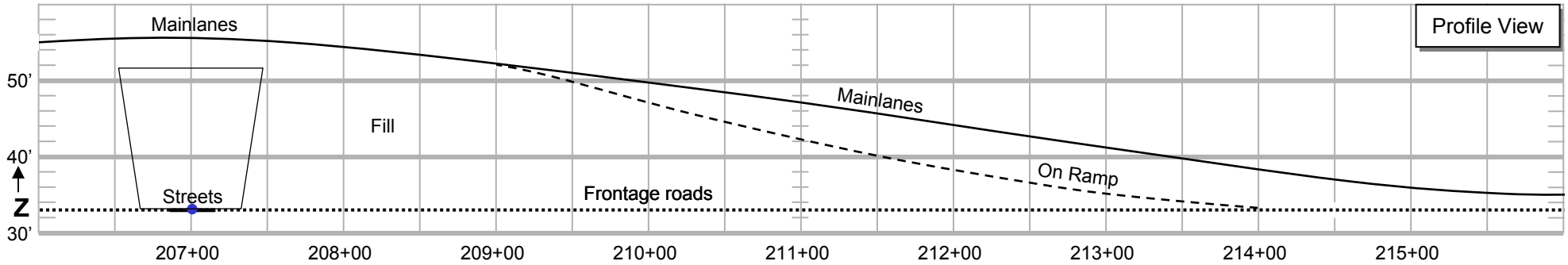
1) IMPACT analysis: include only those roadways directly associated with the proposed project.

2) ABATEMENT analysis: if a proposed project will result in impacts, cross streets and intersecting roadways should be included if they could reduce the benefit of a noise barrier for impacted receivers.

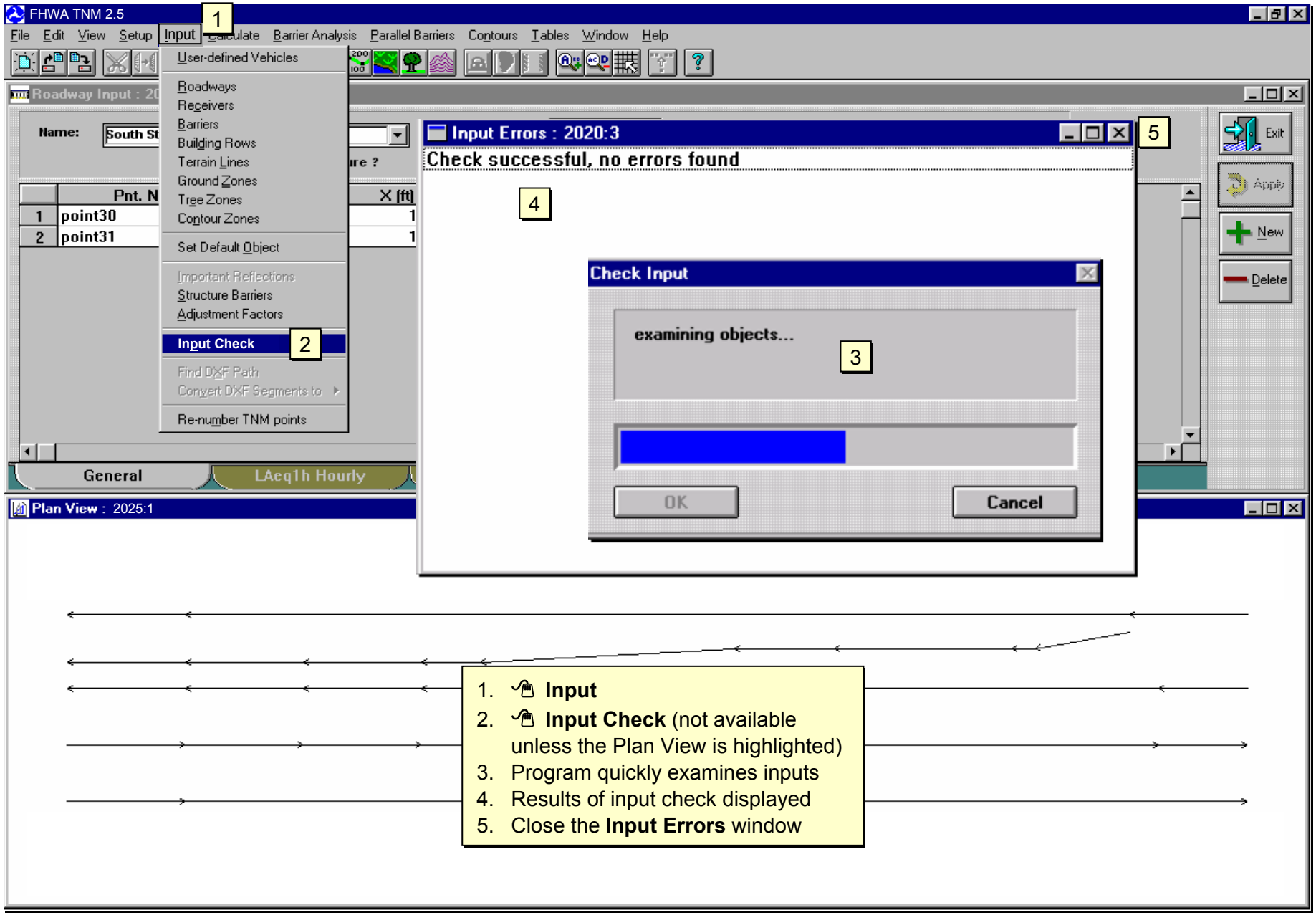
For this project, **South Street** and **North Street** will NOT be modeled for the following reasons:

- they are not directly associated with the proposed project.
- their associated traffic volumes, percentage of trucks and speeds are too low to affect any associated noise barrier analysis.

**NOTE**: major intersecting roadways with high traffic volumes, high percentage of trucks and high speeds should be included in any associated noise barrier analysis.

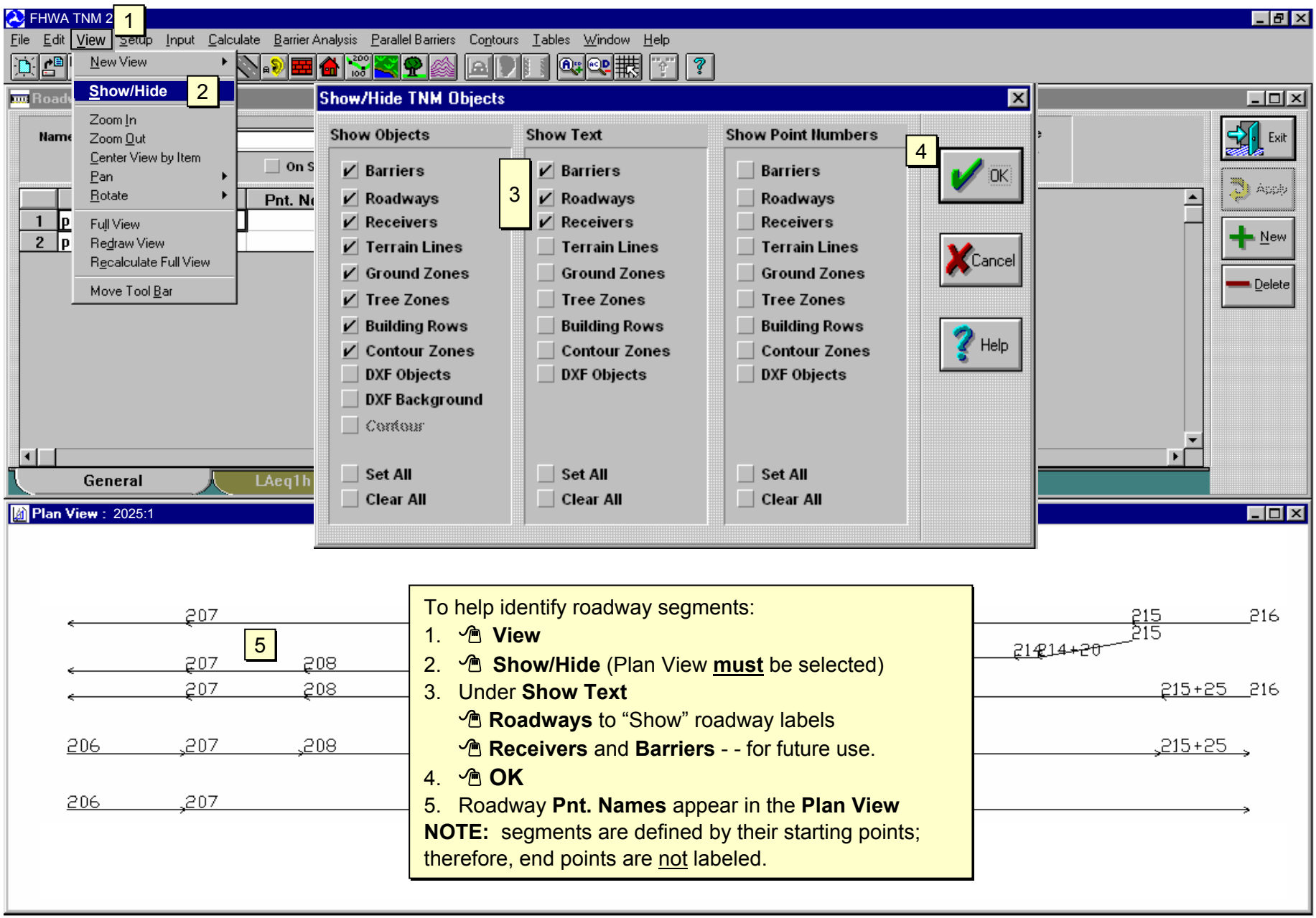


# INPUT CHECK




1. **Input**
2. **Input Check** (not available unless the Plan View is highlighted)
3. Program quickly examines inputs
4. Results of input check displayed
5. Close the **Input Errors** window

# SHOW/HIDE




To help identify roadway segments:

1. View
2. **Show/Hide** (Plan View **must** be selected)
3. Under **Show Text**
   - **Roadways** to "Show" roadway labels
   - **Receivers** and **Barriers** - - for future use.
4. **OK**
5. Roadway **Pnt. Names** appear in the **Plan View**

**NOTE:** segments are defined by their starting points; therefore, end points are not labeled.

# TRAFFIC DATA REQUEST FORM

**DISTRICT:** _____ **COUNTY:** _____ **CSJ:** _____

**HIGHWAY:** _____

**LIMITS:** _____

**DISTRICT PRIORITY:** _____ **EST. LETTING DATE:** _____

**EXISTING NUMBER OF LANES:** _____

**PROPOSED NUMBER OF LANES:** _____

**NOTE:** submit this request form to TxDOT/TPP as soon as possible. Traffic data is NOT provided by TxDOT/ENV.

**DISTRICT CONTACT PERSON:** _____

**TELEPHONE NUMBER:** _____

**PLEASE ATTACH A 8-1/2" X 11" LOCATION MAP**

The following to be completed: (please mark information to be provided)

✓ **1.** Basic Highway Traffic Data for pavement design
(No line diagram analysis is required)
A. Base Year/Beginning year: 2005
B. Forecasted 20 year: 2025
C. Forecasted 30 year: _____
D. Directional Distribution
E. K-factor

✓ **2.** Vehicle classification for environmental studies (Air and Noise Analysis).
both main lanes and frontage roads

✓ **3.** Line Diagram Analysis (turning movements, please provide line diagram).

_____ **4.** Complete Corridor Analysis (includes basic highway traffic data for pavement and environmental studies and detailed schematic turning movements; please provide detailed schematic).

# TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

District Date

| Description of Location | Average Daily Traffic 2005 | Average Daily Traffic 2025 | Base Year Dir Dist % | Base Year K Factor | Base Year Percent Trucks ADT | Base Year Percent Trucks DHV | ATHWLD | Percent Tandem Axles in ATHWLD | Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2000 to 2025) Flexible Pavement | SN | Rigid Pavement | SLAB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SH 123<br>From<br>To | 50,000 | 75,500 | 60-40 | **10.5** | 9.0 | 7.2 | 10,200 | 40 | 615,000 | 3 | 658,000 | 8" |

The **K Factor** and **% of DHV** are the only items on this sheet that are used in the analysis. All other information is either not applicable or available on the sheet containing the turning movements.

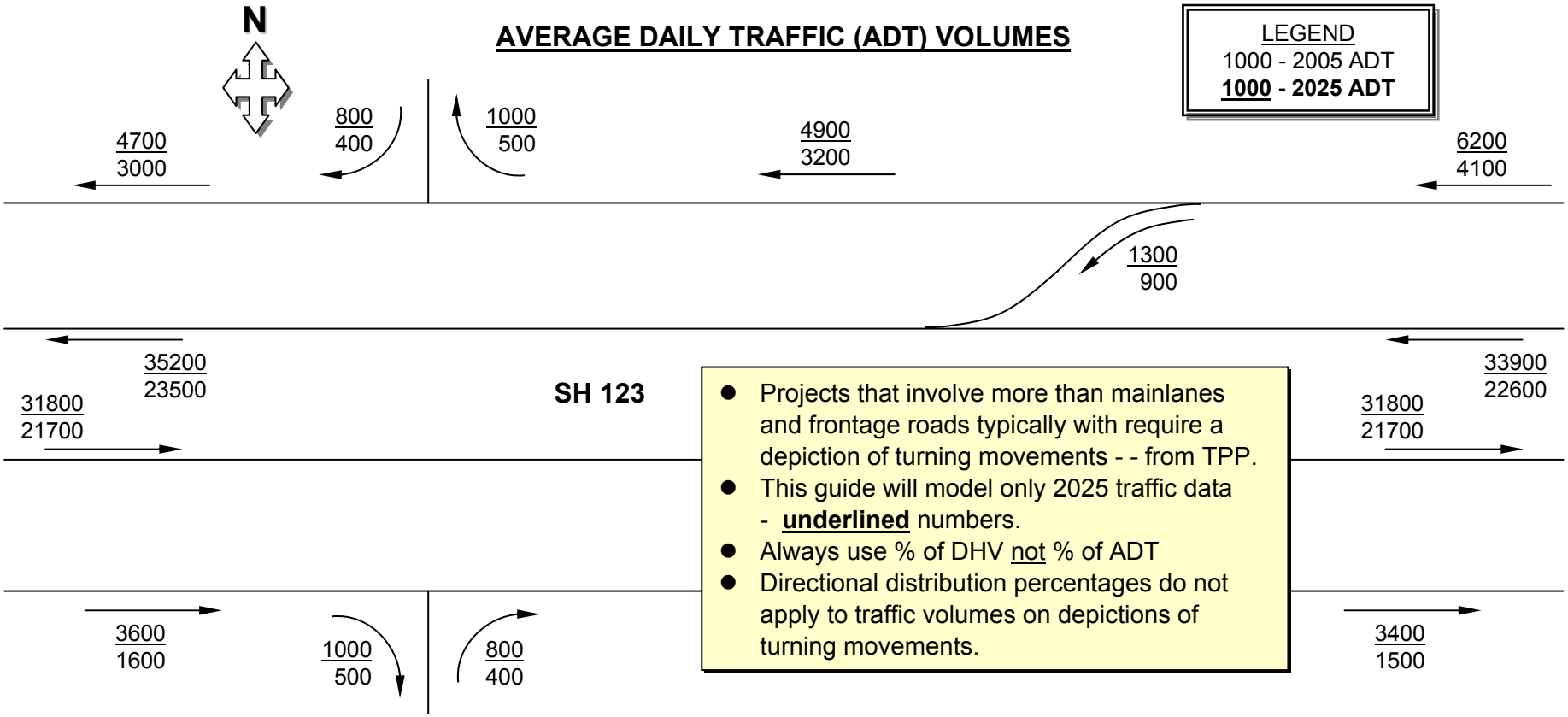
NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES

Data for Use in Air & Noise Analysis

| Vehicle Class | Base Year % of ADT | Base Year **% of DHV** |
|---|---|---|
| Light Duty | 91.0 | **92.8** |
| Medium Duty | 6.0 | **4.2** |
| Heavy Duty | 3.0 | **3.0** |

## AVERAGE DAILY TRAFFIC (ADT) VOLUMES

LEGEND
1000 - 2005 ADT
**1000 - 2025 ADT**



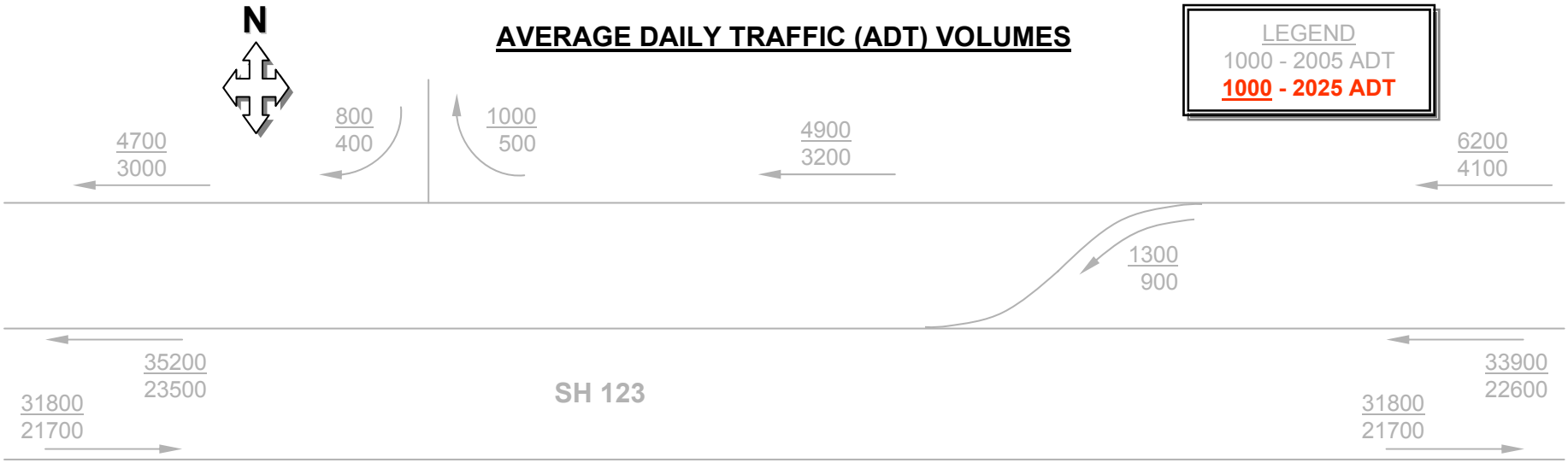

- Projects that involve more than mainlanes and frontage roads typically with require a depiction of turning movements - - from TPP.
- This guide will model only 2025 traffic data - **underlined** numbers.
- Always use % of DHV not % of ADT
- Directional distribution percentages do not apply to traffic volumes on depictions of turning movements.

| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | **% of DHV** |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | **98.3** |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | **1.7** |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | **0.0** |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

## AVERAGE DAILY TRAFFIC (ADT) VOLUMES



| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | % of DHV |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | 98.3 |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | 1.7 |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | 0.0 |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

# TRAFFIC INPUT: EB FRONTAGE (1 of 4)

Roadway Input : 2025:2

Name: On Ramp

Width (ft): 24

Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

EB Frontage
EB Main
WB Main
WB Frontage
On Ramp

| | | | | Y [ft] | Z[pavement] [ft] | Pvmt Type | On Struct? |
|---|---|---|---|---|---|---|---|
| 1 | 215 | | 0.0 | 325.0 | 33.0 | Average | |
| 2 | 214 | | 0.0 | 310.0 | 33.0 | Average | |
| 3 | 214 | 22 | 800.0 | 310.0 | | | |
| 4 | 212+50 | 23 | 650.0 | 310.0 | | | |
| 5 | 211+65 | 24 | 565.0 | 310.0 | | | |
| 6 | 209+50 | 25 | 350.0 | 298.0 | | | |
| 7 | 209 | 26 | 300.0 | 298.0 | 52.0 | Average | |
| 8 | 208 | 27 | 200.0 | 298.0 | 54.0 | Average | |
| 9 | 207 | 28 | 100.0 | 298.0 | 56.0 | Average | |
| 10 | 206 | 29 | 0.0 | 298.0 | 55.0 | Average | |

1. Down Arrow
2. EB Frontage
3. LAeq1h Hourly tab

General | LAeq1h Hourly | Flow Control | Notes

Exit | Apply | New | Delete

Roadway Input : 2025:2

Name: EB Frontage

Segment: 206

Copy All

| | Vehicle Type | Veh / hr | Speed [mph] |
|---|---|---|---|
| 1 | Auto | 372 | 40.00 |
| 2 | Medium Truck | 6 | 40.00 |
| 3 | Heavy Truck | 0 | 0.00 |
| 4 | Buses | 0 | 0.00 |
| 5 | Motorcycle | 0 | 0.00 |

4. Enter **Veh/hr** and **Speed (mph)** for Autos and Medium Trucks (Refer to Page C-4)

- Compute **Veh/hr** as follows:

First compute DHV = ADT (x) K-factor (%) 3600 (x) .105 = 378
Then **Veh/hr** = DHV (x) Vehicle Type (%) Autos: 378 (x) .983 = **372**
Medium Trucks: 378 (-) 372 = **6**

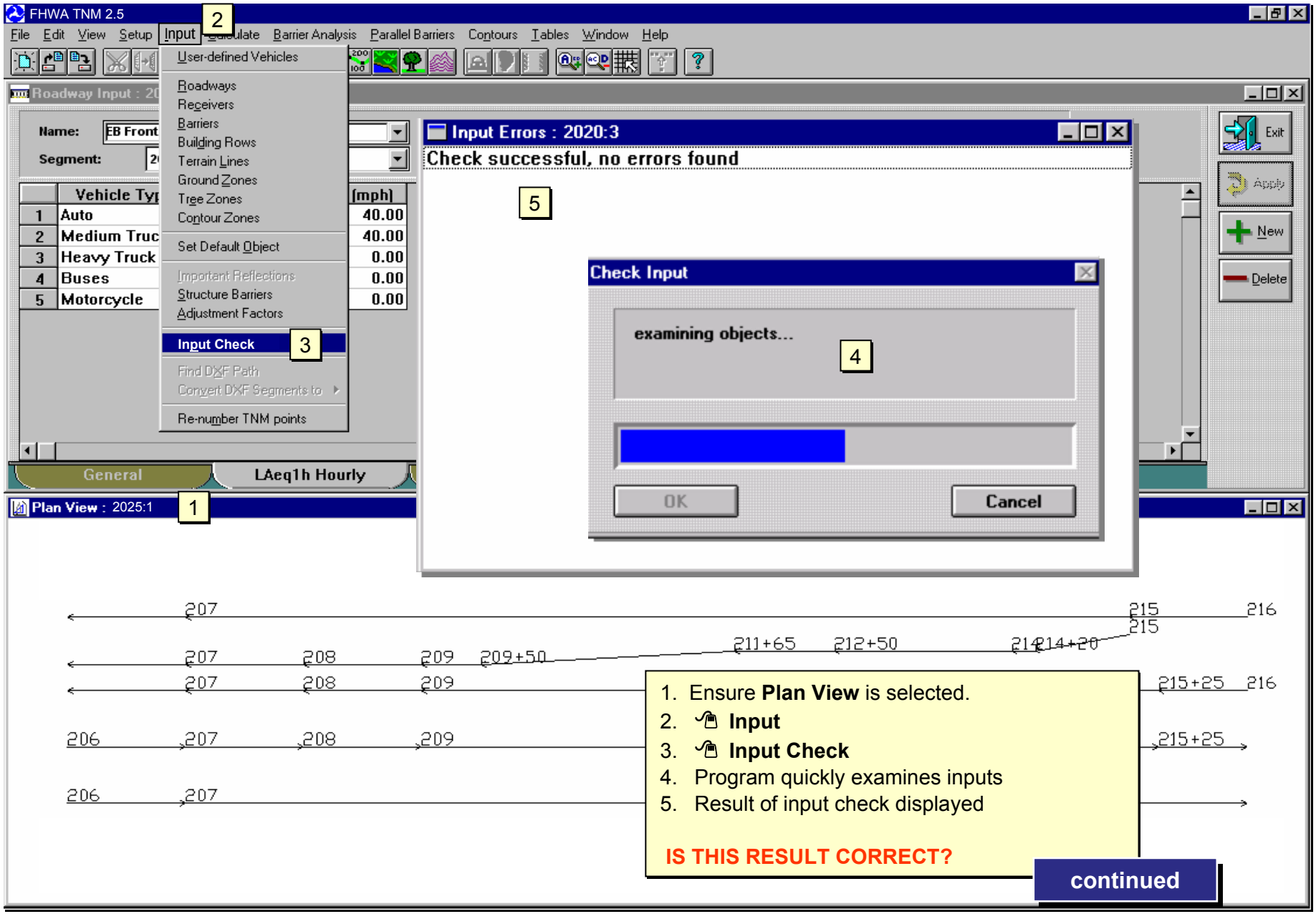
5. **Apply**

**File/Save**

General | LAeq1h Hourly | Flow Control | Notes

Exit | Apply | New | Delete

# TRAFFIC INPUT: EB FRONTAGE (2 of 4)



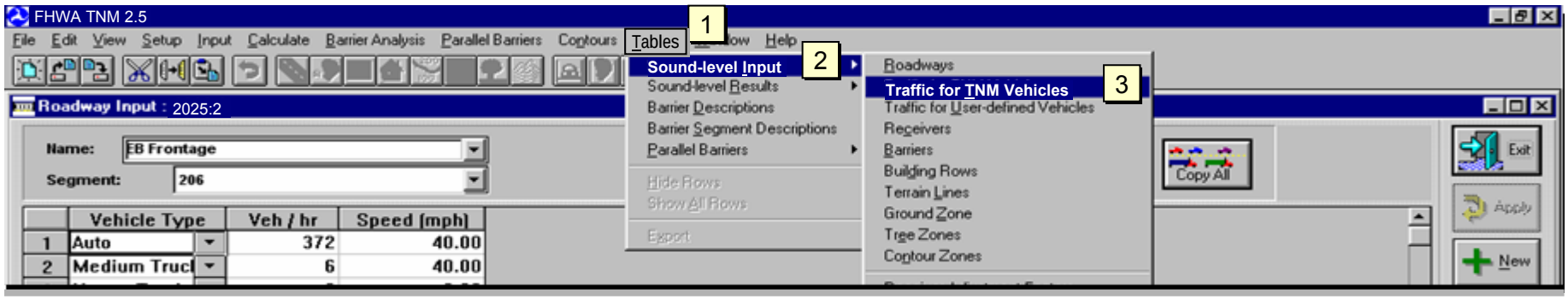
# TRAFFIC INPUT: EB FRONTAGE (3 of 4)

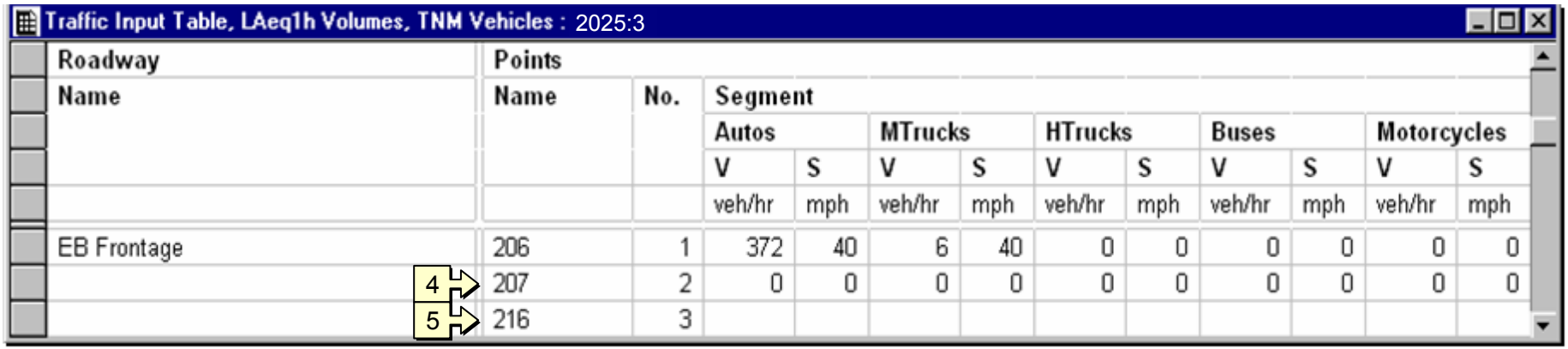
- **The results of this check are misleading** - - the information entered to this point is correct; **however**, it is **incomplete** and, therefore, the missing information must be added.
- To determine which information is missing:

1. **Tables**
2. Highlight **Sound-level Input** - - these tables should be reviewed throughout the modeling process.
3. **Traffic for TNM Vehicles**

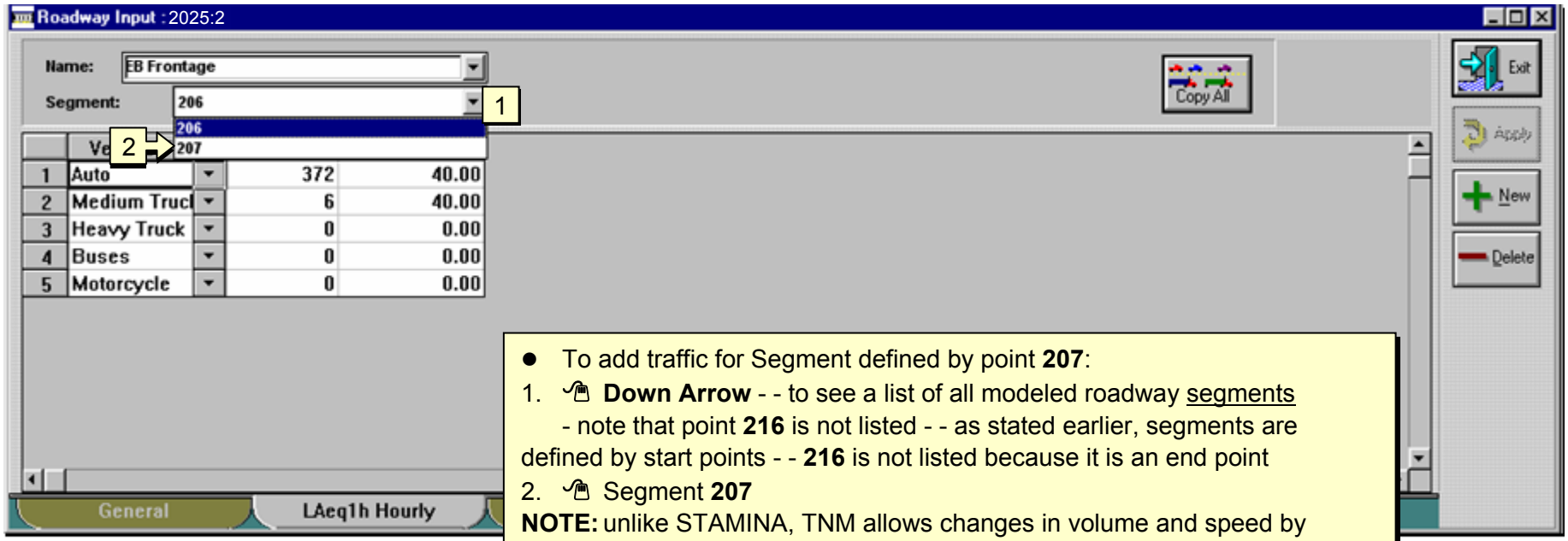
**NOTE**: be careful not to select "Traffic for User-defined Vehicles"

4. **Incomplete information**: no traffic has been entered for the segment defined by starting point **207**.
5. Spaces are blank for point **216** - - this is correct. Segments are defined by their starting points, therefore, end points do not contain any traffic = all blank spaces.



# TRAFFIC INPUT: EB FRONTAGE (4 of 4)




- To add traffic for Segment defined by point **207**:

1. **Down Arrow** - - to see a list of all modeled roadway segments - note that point **216** is not listed - - as stated earlier, segments are defined by start points - - **216** is not listed because it is an end point
2. Segment **207**

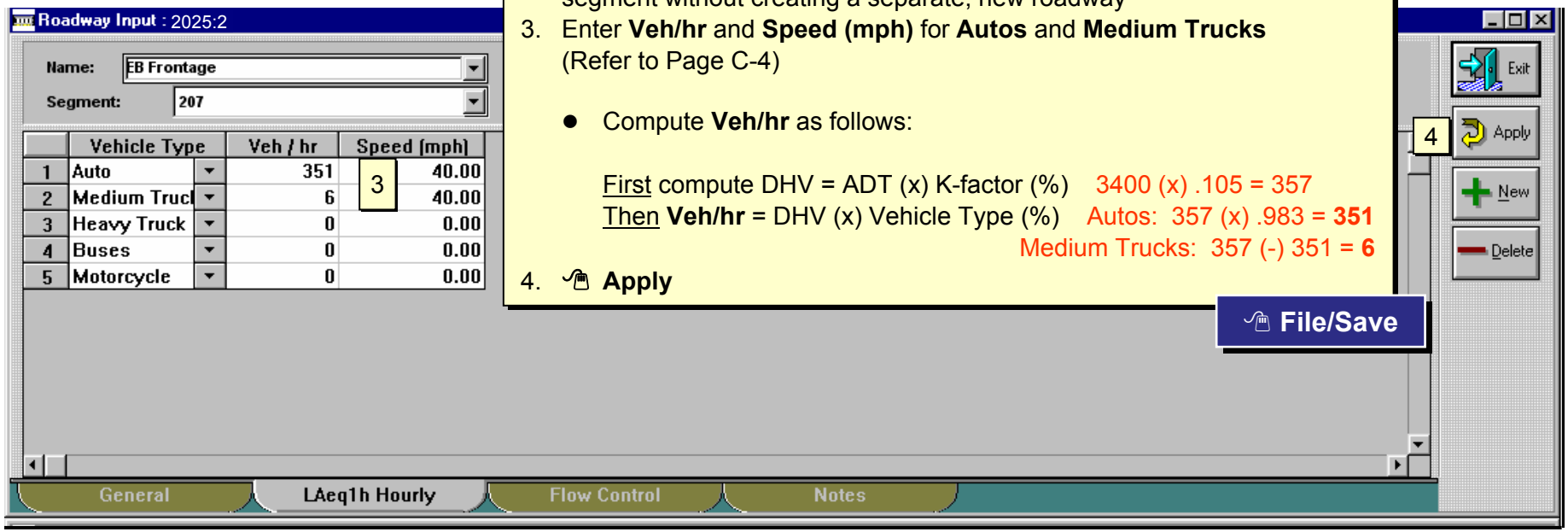
**NOTE:** unlike STAMINA, TNM allows changes in volume and speed by segment without creating a separate, new roadway

3. Enter **Veh/hr** and **Speed (mph)** for **Autos** and **Medium Trucks** (Refer to Page C-4)

   - Compute **Veh/hr** as follows:

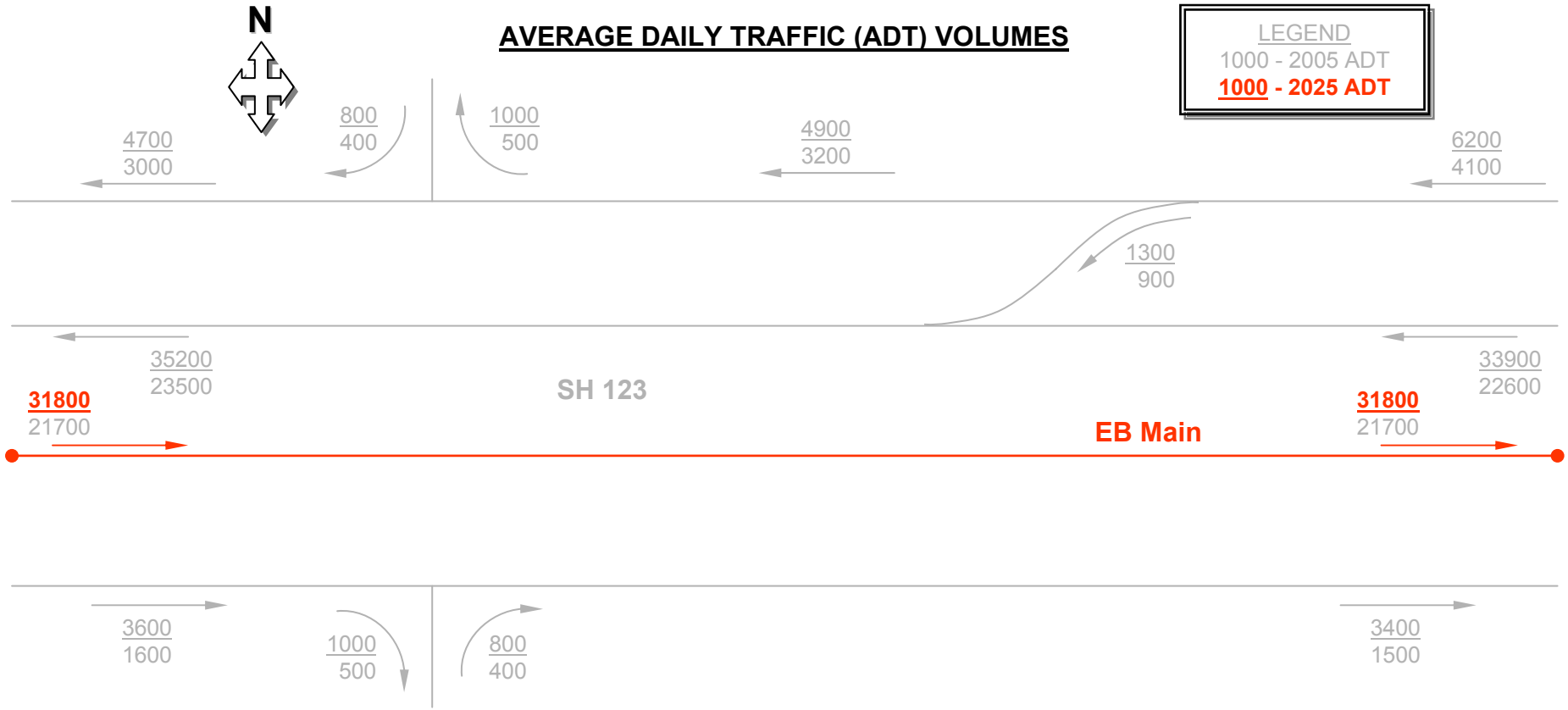
     First compute DHV = ADT (x) K-factor (%) 3400 (x) .105 = 357
     Then **Veh/hr** = DHV (x) Vehicle Type (%) Autos: 357 (x) .983 = **351**
     Medium Trucks: 357 (-) 351 = **6**

4. **Apply**




**File/Save**

## AVERAGE DAILY TRAFFIC (ADT) VOLUMES




| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | % of DHV |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | 98.3 |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | 1.7 |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | 0.0 |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

# TRAFFIC INPUT: EB MAIN (1 of 2)

Roadway Input : 2025:2

Name: EB Main (1)

Segment: 206

| | Vehicle Type | Veh / hr | Speed (mph) |
|---|---|---|---|
| 1 | Auto | 3099 | 65.00 |
| 2 | Medium Truck | 140 | 65.00 |
| 3 | Heavy Truck | 100 | 65.00 |
| 4 | Buses | 0 | 0.00 |
| 5 | Motorcycle | 0 | 0.00 |

(2)

(3) Copy All

Exit

(5) Apply

New

Delete

Copy Traffic

Do you wish to copy traffic from 206 to all other segments in the Roadway?

(4) Yes No Cancel

The **Copy All** button will not be visible if the display resolution is not 1024 x 768 (or greater) with "Small Fonts."

General | LAeq1h Hourly

Plan View : 2025:1

207 216

207 208 209

207 208 209 +25 216

206 207 208 209 +25

206 207

1. Select **EB Main**
2. Enter **Veh/hr** and **Speed (mph)** for Autos, Medium Trucks, and Heavy Trucks (Refer to Page C-9)

   - Compute DHV and Veh/hr as follows:

     DHV = ADT (x) K-factor (%) = 31800 (x) .105 = 3339
     Veh/hr = DHV (x) Vehicle Type (%) Autos: 3339 (x) .928 = **3099**
     Medium Trucks: 3339 (x) .042 = **140**
     Heavy Trucks: 3339 (-) 3099 (-) 140 = **100**

3. **Copy All** - - since all segments of **EB Main** contain the same Veh/hr and Speeds
4. **Yes** - - to confirm you wish to automatically copy all traffic data from Segment **206** to all other segments of **EB Main**
5. **Apply**

**File/Save**

# TRAFFIC INPUT: EB MAIN (2 of 2)

FHWA TNM 2.5

File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help

1

Sound-level Input 2
Sound-level Results
Barrier Descriptions
Barrier Segment Descriptions
Parallel Barriers
Hide Rows
Show All Rows
Export

Roadways
Traffic for TNM Vehicles 3
Traffic for User-defined Vehicles
Receivers
Barriers
Building Rows
Terrain Lines
Ground Zone
Tree Zones
Contour Zones
Receiver Adjustment Factors
Structure Barriers
Barrier Noise Reduction Coefficients

Roadway Input : 2025:2

Name: EB Main
Segment: 206

| | Vehicle Type | Veh / hr | Speed (mph) |
|---|---|---|---|
| 1 | Auto | 3099 | 65.00 |
| 2 | Medium Truck | 140 | 65.00 |
| 3 | Heavy Truck | 100 | 65.00 |
| 4 | Buses | 0 | 0.00 |
| 5 | Motorcycle | 0 | 0.00 |

Copy All
Exit
Apply
New
Delete

General | LAeq1h Hourly | Flow

1. **Tables**
2. Highlight **Sound-level Input** - - these tables should be reviewed throughout the modeling process
3. **Traffic for TNM Vehicles**

**NOTE**: be careful not to select "Traffic for User-defined Vehicles"

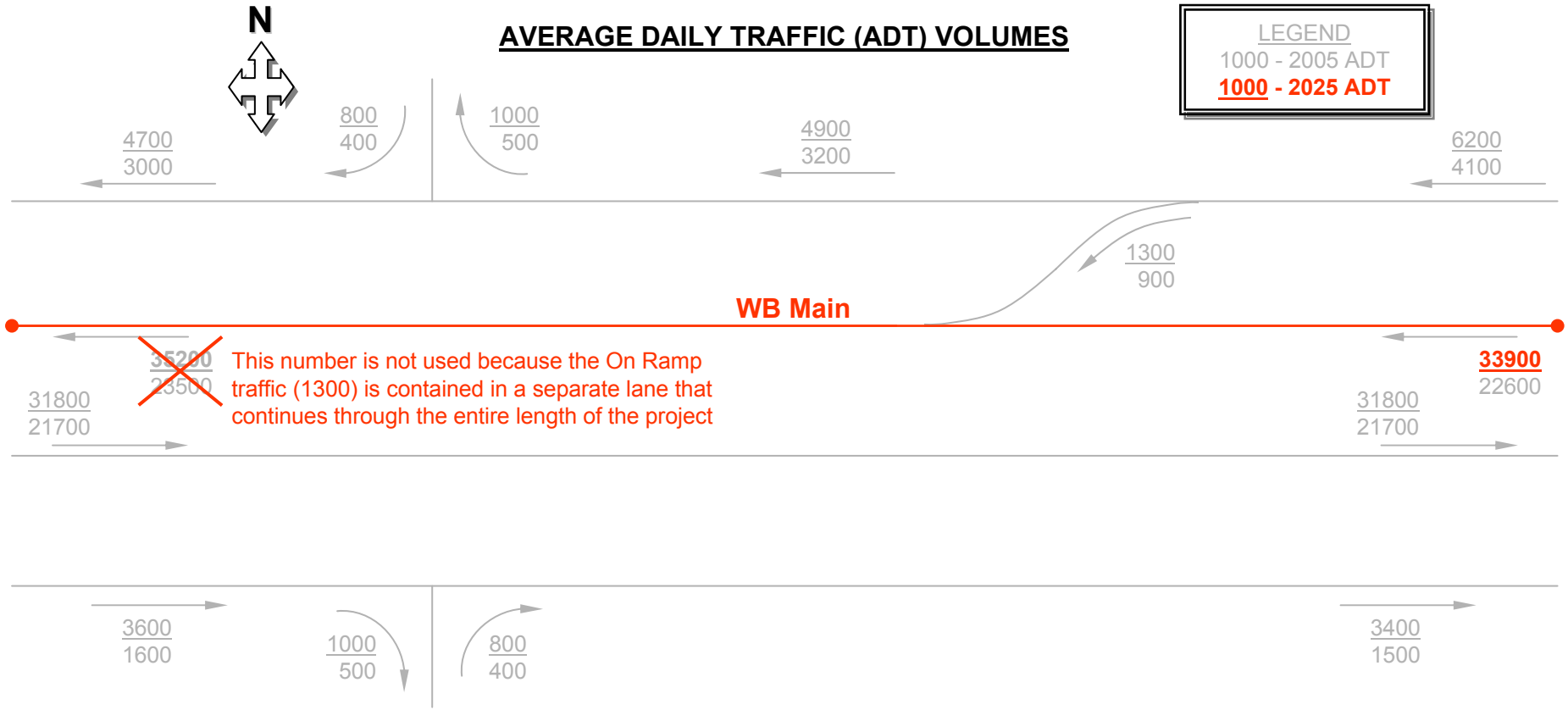
4. Information was **correctly/completely** copied to all segments
5. Spaces are blank for point **216** for both roadways - - this is correct - - end points do not define segments; therefore, end points should not contain any traffic = all blank spaces

Traffic Input Table, LAeq1h Volumes, TNM Vehicles : 2025:3

| Roadway Name | Points Name | No. | veh/hr | mph | veh/hr | mph | veh/hr | mph | veh/hr | mph | veh/hr | mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EB Frontage | 206 | 1 | 372 | 40 | 6 | 40 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 207 | 2 | 351 | 40 | 6 | 40 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 216 | 3 | | | | | | | | | | |
| EB Main | 206 | 4 | 3099 | 65 | 140 | 65 | 100 | 65 | 0 | 0 | 0 | 0 |
| | 207 | 9 | 3099 | 65 | 140 | 65 | 100 | 65 | 0 | 0 | 0 | 0 |
| | 208 | 5 | 3099 | 65 | 140 | 65 | 100 | 65 | 0 | 0 | 0 | 0 |
| | 209 | 6 | 3099 | 65 | 140 | 65 | 100 | 65 | 0 | 0 | 0 | 0 |
| | 215+25 | 7 | 3099 | 65 | 140 | 65 | 100 | 65 | 0 | 0 | 0 | 0 |
| | 216 | 8 | | | | | | | | | | |
| WB Main | 216 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 215+25 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 209 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 208 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

5 5 4

## AVERAGE DAILY TRAFFIC (ADT) VOLUMES

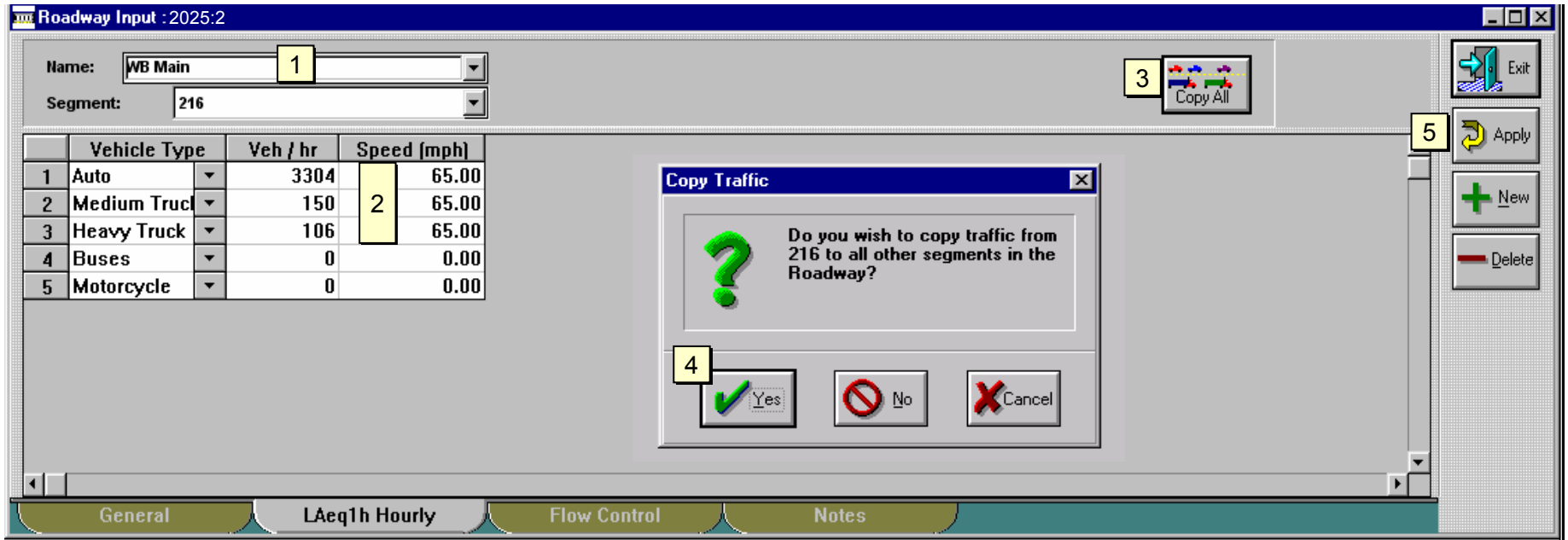


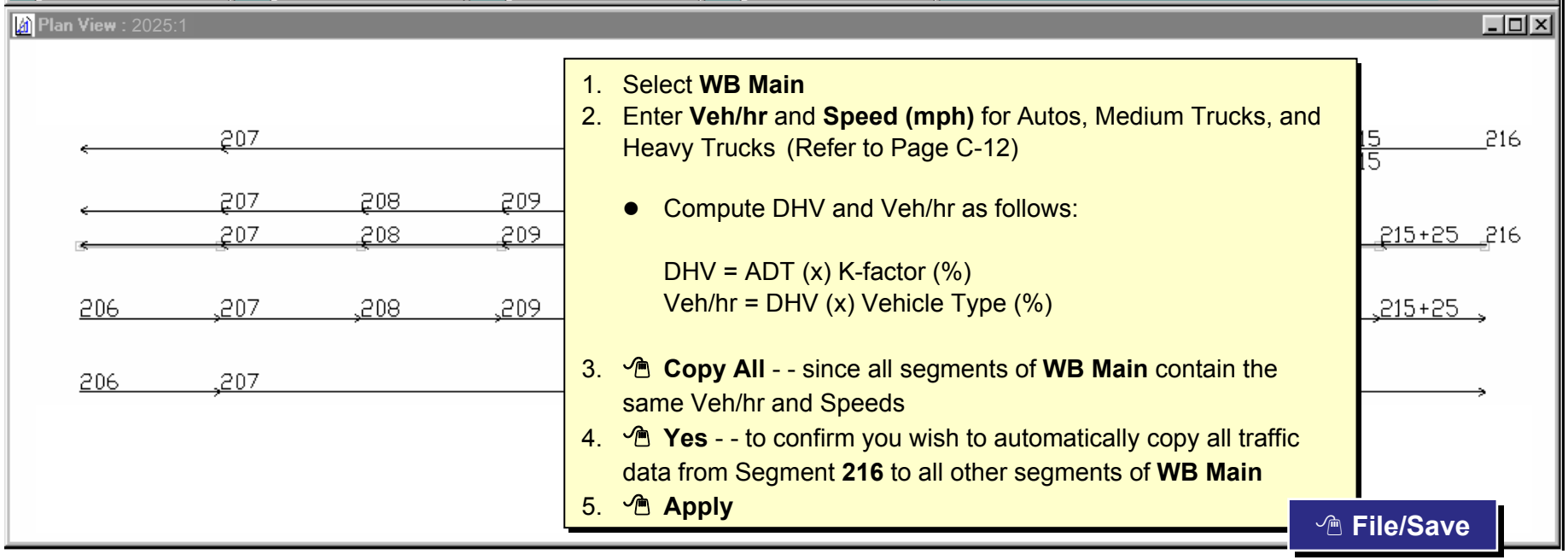

| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | % of DHV |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | 98.3 |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | 1.7 |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | 0.0 |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

# TRAFFIC INPUT: WB MAIN




1. Select **WB Main**
2. Enter **Veh/hr** and **Speed (mph)** for Autos, Medium Trucks, and Heavy Trucks (Refer to Page C-12)

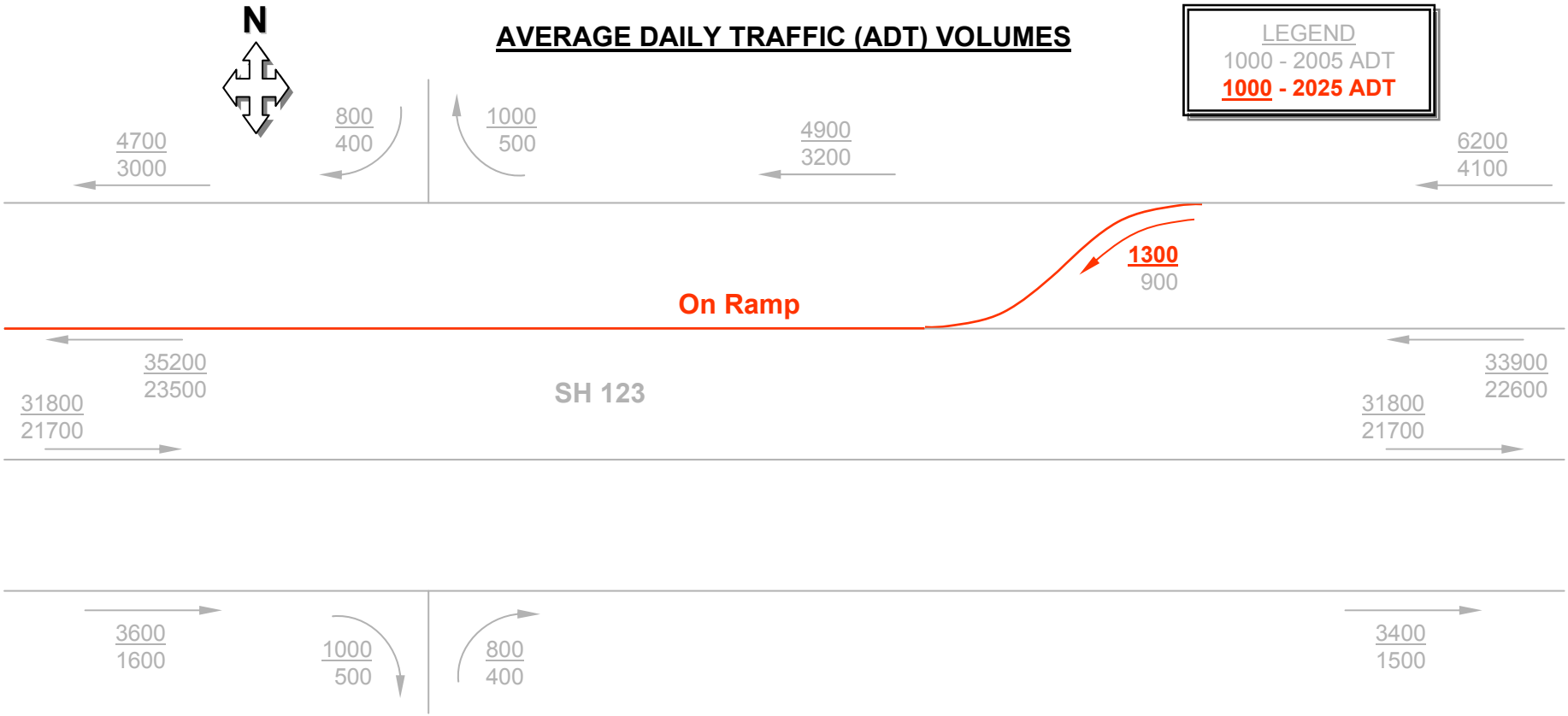
   - Compute DHV and Veh/hr as follows:

     DHV = ADT (x) K-factor (%)
     Veh/hr = DHV (x) Vehicle Type (%)

3. **Copy All** - - since all segments of **WB Main** contain the same Veh/hr and Speeds
4. **Yes** - - to confirm you wish to automatically copy all traffic data from Segment **216** to all other segments of **WB Main**
5. **Apply**

**File/Save**

## AVERAGE DAILY TRAFFIC (ADT) VOLUMES

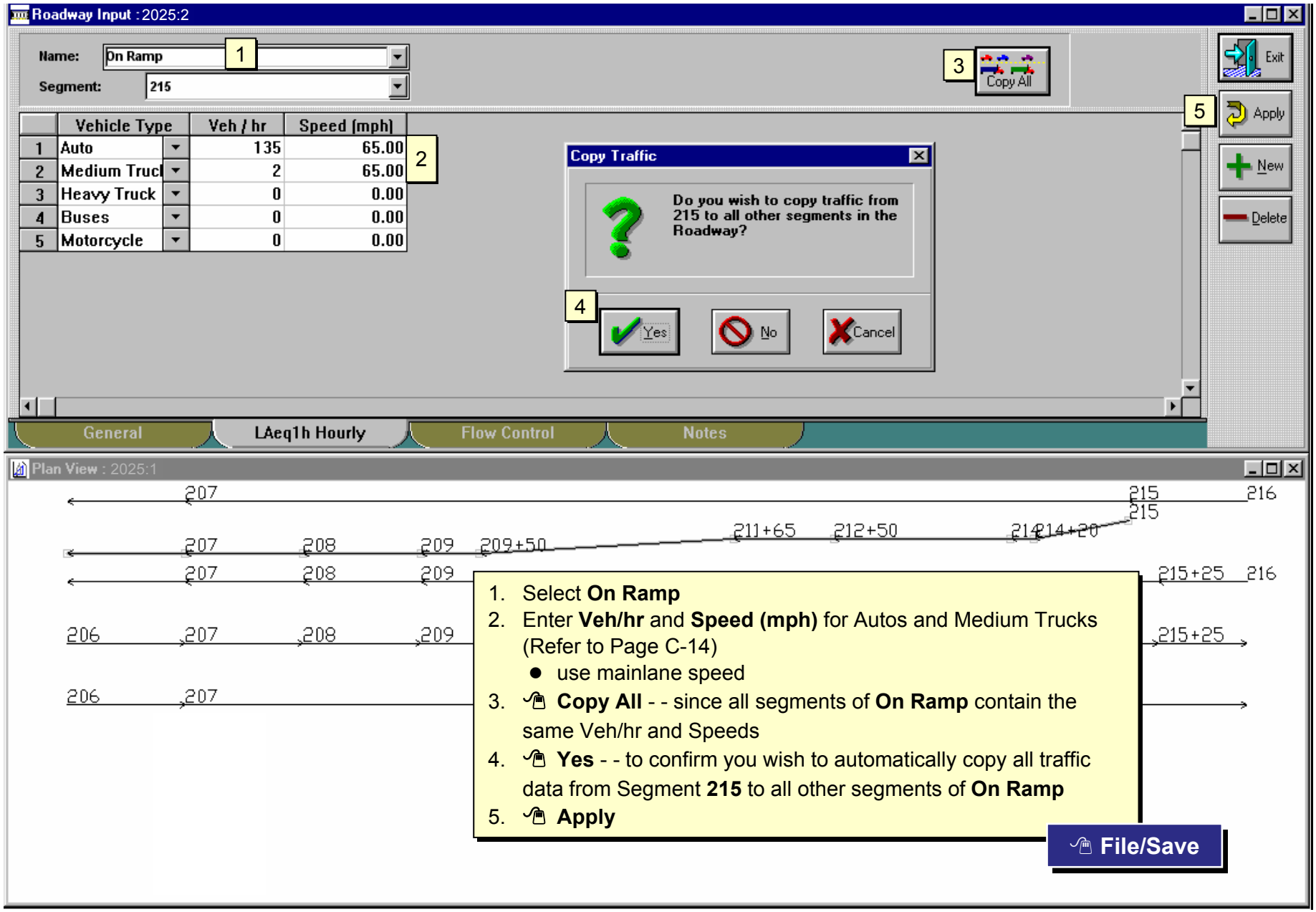



| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | % of DHV |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | 98.3 |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | 1.7 |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | 0.0 |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

# TRAFFIC INPUT: ON RAMP (1 of 2)



# TRAFFIC INPUT: ON RAMP (2 of 2)

Roadway Input : 2025:2

Name: On Ramp

Speed Constraint (mph): 40 (4)

Vehicles Affected (%): 100 (5)

Control Device: None (2)

None
Stop
Signal
Toll
Onramp (3)

Exit
Apply (6)
New
Delete

| | Pnt. Name | Pnt. No. |
|---|---|---|
| 1 | 215 | 20 |
| 2 | 214+20 | 21 |
| 3 | 214 | 22 |
| 4 | 212+50 | 23 |
| 5 | 211+65 | 24 |
| 6 | 209+50 | 25 |
| 7 | 209 | 26 |
| 8 | 208 | 27 |
| 9 | 207 | 28 |
| 10 | 206 | 29 |

(1)

General | LAeq1h Hourly | Flow Control | Notes

Plan View : 2025:1

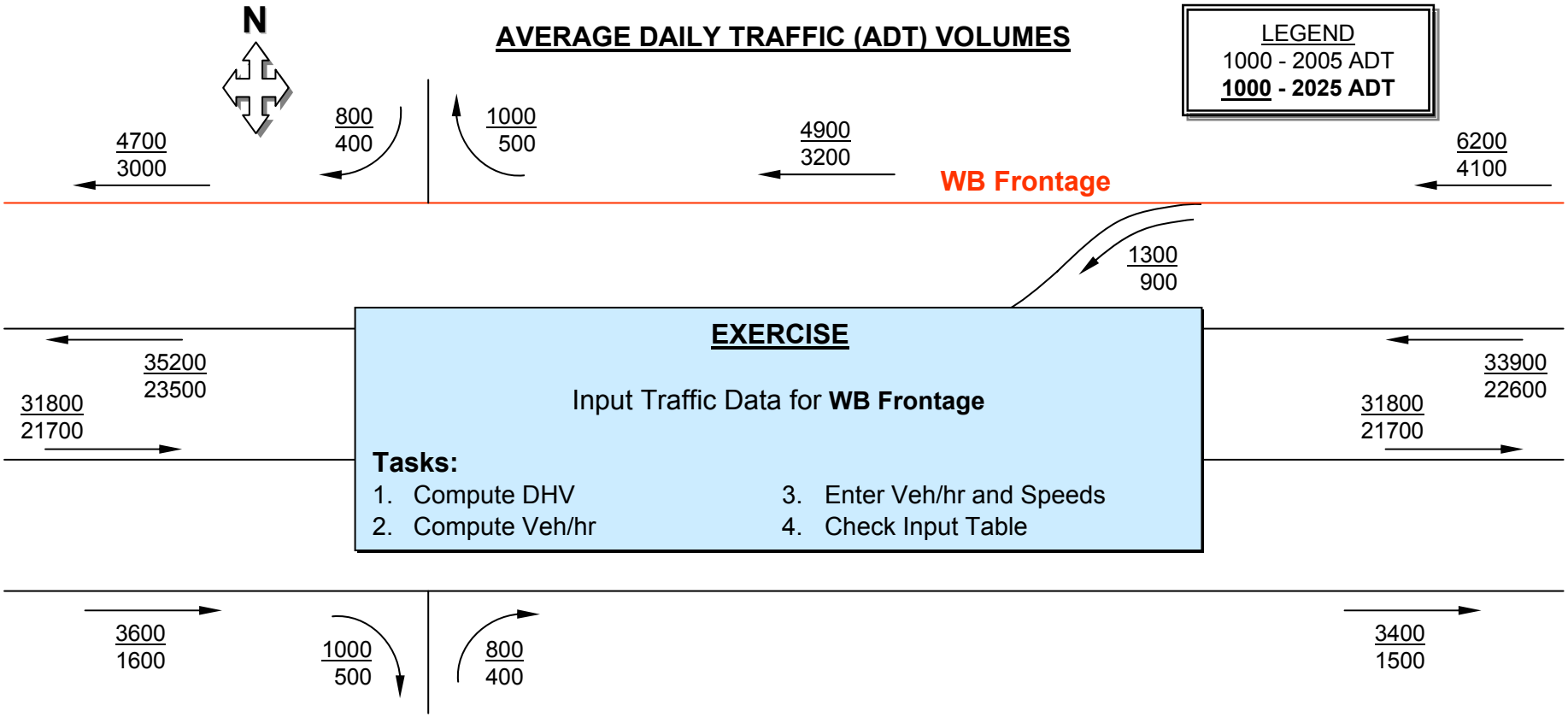
207 215 216
207 208 209 209+50 211+65 212+50 214 214+20 215
207 208 209 215+25 216
206 207 208 209 215+25
206 207

1. **Flow Control** tab
2. **Down Arrow** to see the list of possible **Control Devices**
3. **Onramp**
4. in **Speed Constraint** field and enter frontage speed of **40**

**NOTE:** the speed constraint is the speed at the beginning of the control device - - the final speed is the speed previously entered under traffic data (LAeq1h Hourly tab)

5. Leave **Vehicles Affected (%)** at **100**
6. **Apply**

**File/Save**

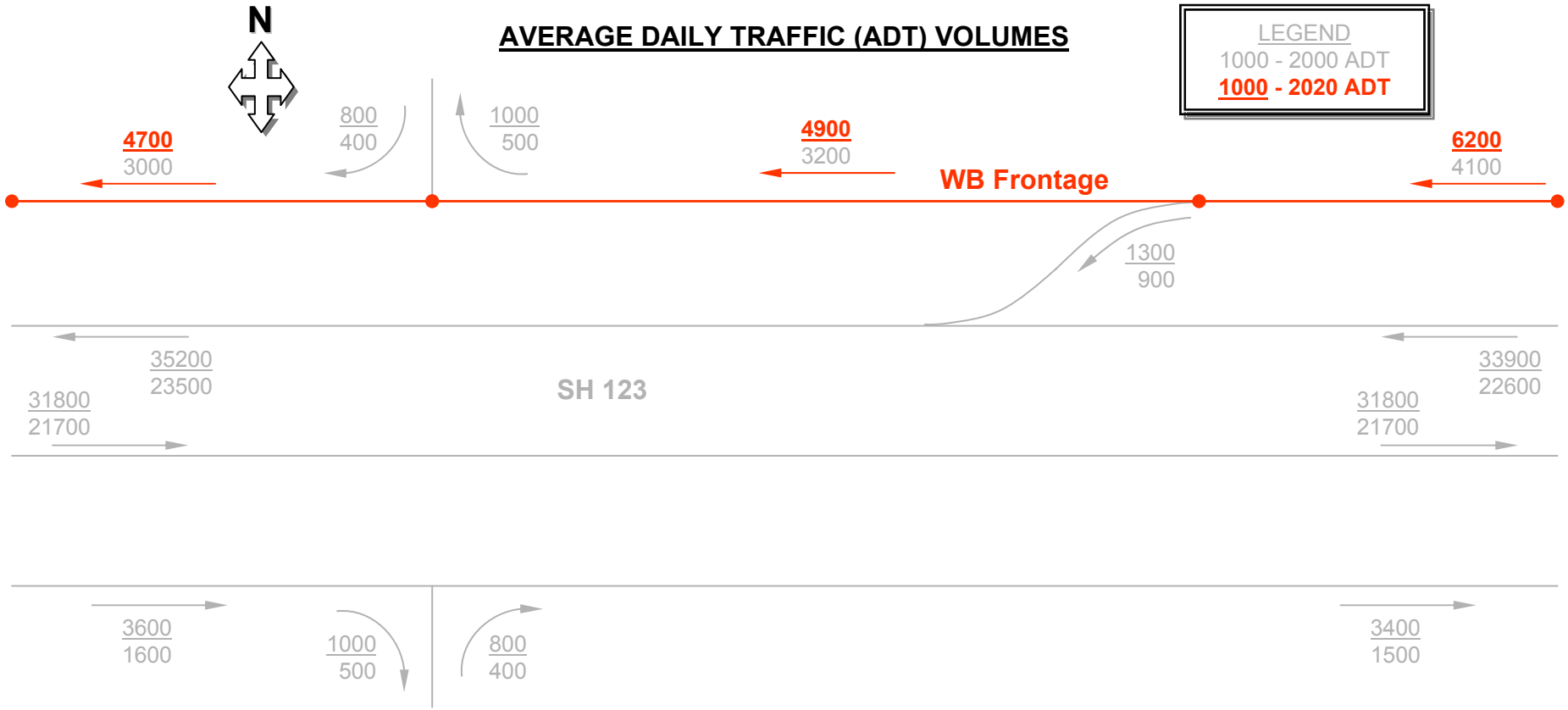



| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | **% of DHV** |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | **98.3** |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | **1.7** |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | **0.0** |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

## AVERAGE DAILY TRAFFIC (ADT) VOLUMES




| | Mainlanes (65 SPEED LIMIT) | | Frontage Roads and Streets (40 SPEED LIMIT) | |
|---|---|---|---|---|
| | % of ADT | % of DHV | % of ADT | % of DHV |
| Light Duty Vehicles | 91.0 | 92.8 | 97.0 | 98.3 |
| Medium Duty Vehicles | 6.0 | 4.2 | 2.0 | 1.7 |
| Heavy Duty Vehicles | 3.0 | 3.0 | 1.0 | 0.0 |

**K-factor: 10.5%**

**DHV = ADT** (x) **K-factor**

# TRAFFIC INPUT: WB FRONTAGE

Roadway Input : 2025:2

Name: WB Frontage (1)
Segment: 216

| | Vehicle Type | Veh / hr | Speed (mph) |
|---|---|---|---|
| 1 | Auto | 640 | 40.00 |
| 2 | Medium Truck | 11 | 40.00 |
| 3 | Heavy Truck | 0 | 0.00 |
| 4 | Buses | 0 | 0.00 |
| 5 | Motorcycle | 0 | 0.00 |

(2) (3)

1. Select **WB Frontage** - - Segment **216**
2. Enter **Veh/hr** and **Speed (mph)** for Autos and Medium Trucks (Refer to Page C-15)
3. **Apply**

Roadway Input : 2020:2

Name: WB Frontage
Segment: 215 (4)

| | Vehicle Type | Veh / hr | Speed (mph) |
|---|---|---|---|
| 1 | Auto | 506 | 40.00 |
| 2 | Medium Truck | 9 | 40.00 |
| 3 | Heavy Truck | 0 | 0.00 |
| 4 | Buses | 0 | 0.00 |
| 5 | Motorcycle | 0 | 0.00 |

(5) (6)

4. Select Segment **215**
5. Enter **Veh/hr** and **Speed (mph)** for Autos and Medium Trucks (Refer to Page C-15)
6. **Apply**

Roadway Input : 2025:2

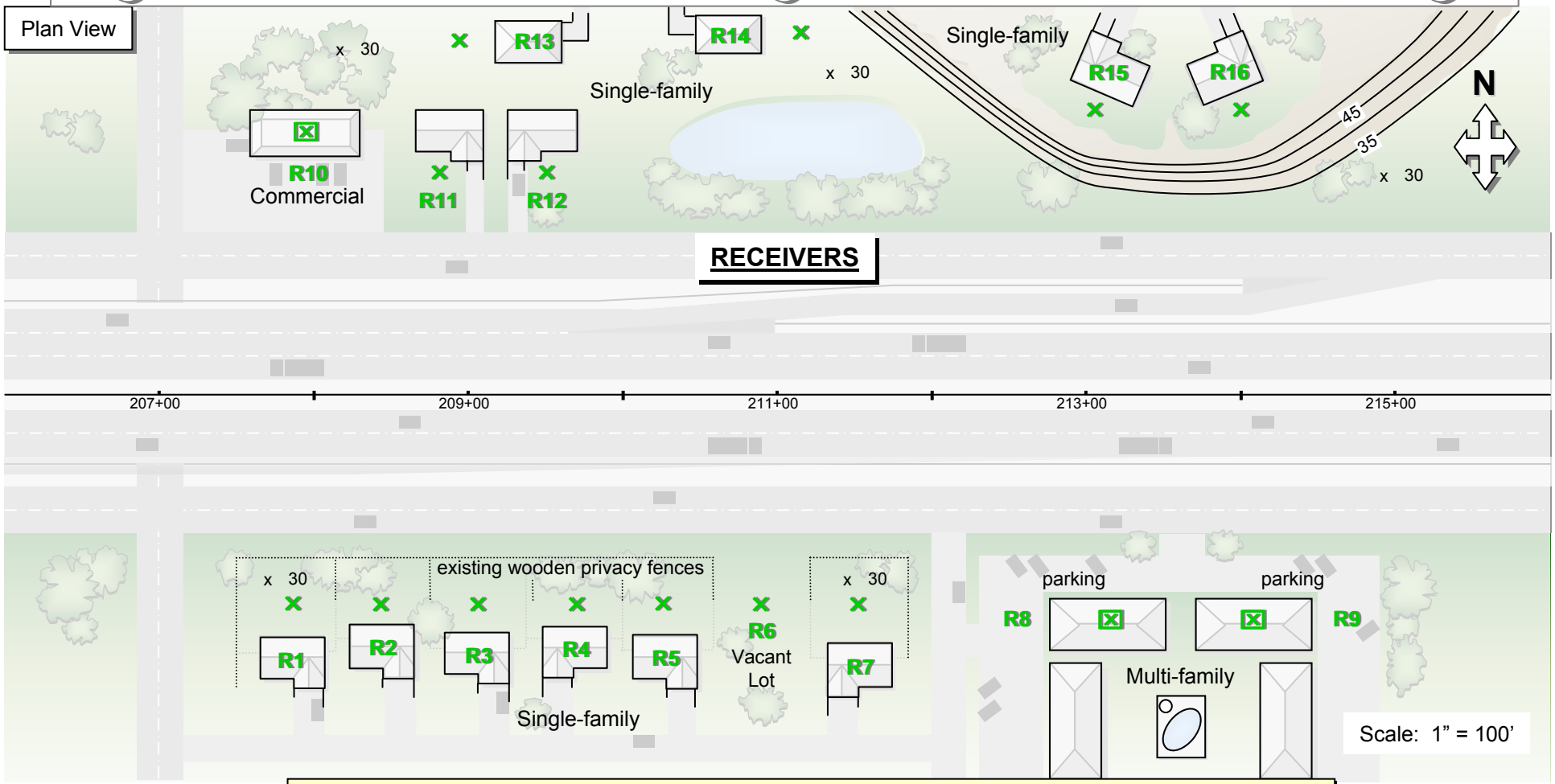
Name: WB Frontage
Segment: 207 (7)

| | Vehicle Type | Veh / hr | Speed (mph) |
|---|---|---|---|
| 1 | Auto | 486 | 40.00 |
| 2 | Medium Truck | 8 | 40.00 |
| 3 | Heavy Truck | 0 | 0.00 |
| 4 | Buses | 0 | 0.00 |
| 5 | Motorcycle | 0 | 0.00 |

(8) (9)

7. Select Segment **207**
8. Enter **Veh/hr** and **Speed (mph)** for Autos and Medium Trucks (Refer to Page C-15)
9. **Apply**

**File/Save**

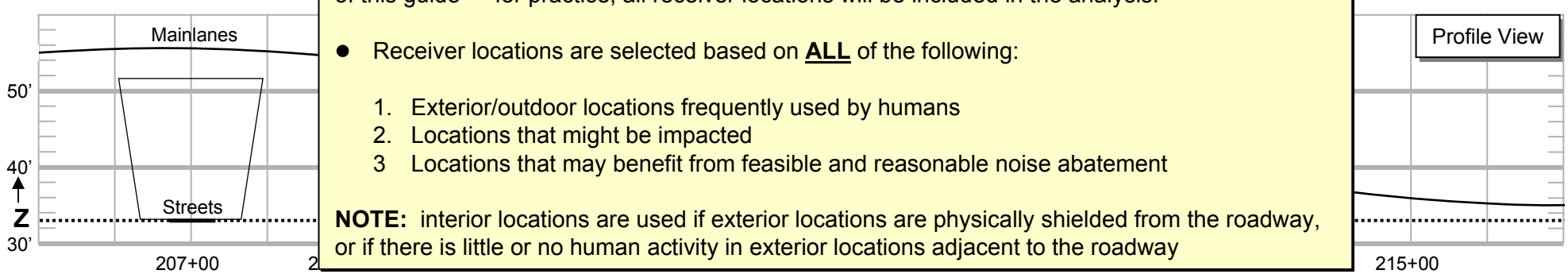


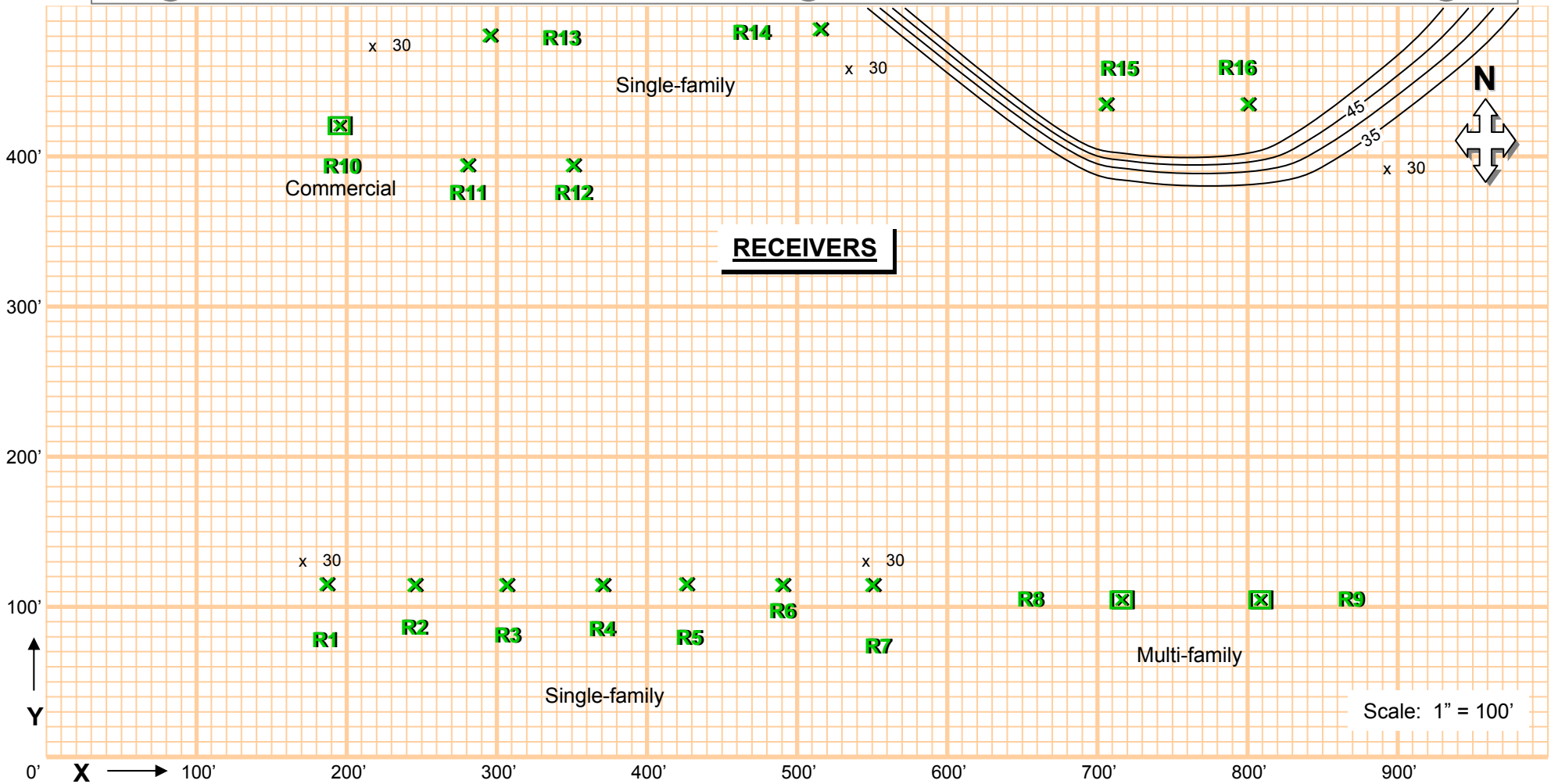

Typically, the number of receivers is limited to representative locations; however, for the purpose of this guide - - for practice, all receiver locations will be included in the analysis.

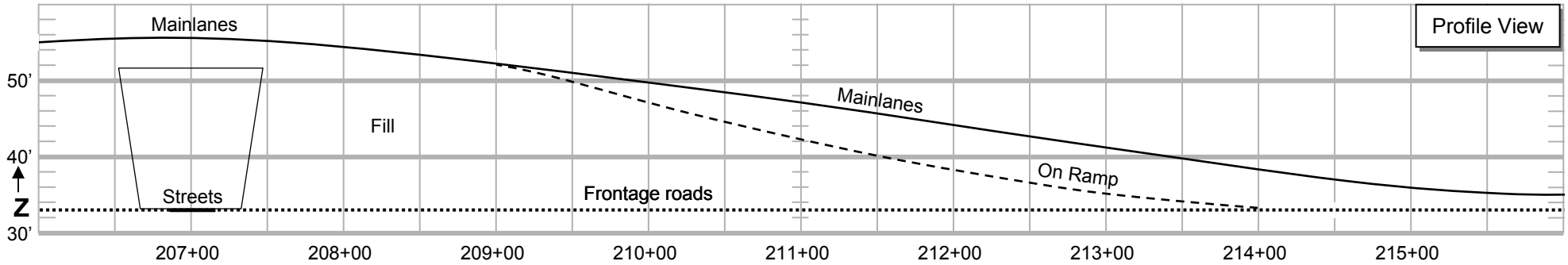
- Receiver locations are selected based on **ALL** of the following:

  1. Exterior/outdoor locations frequently used by humans
  2. Locations that might be impacted
  3 Locations that may benefit from feasible and reasonable noise abatement

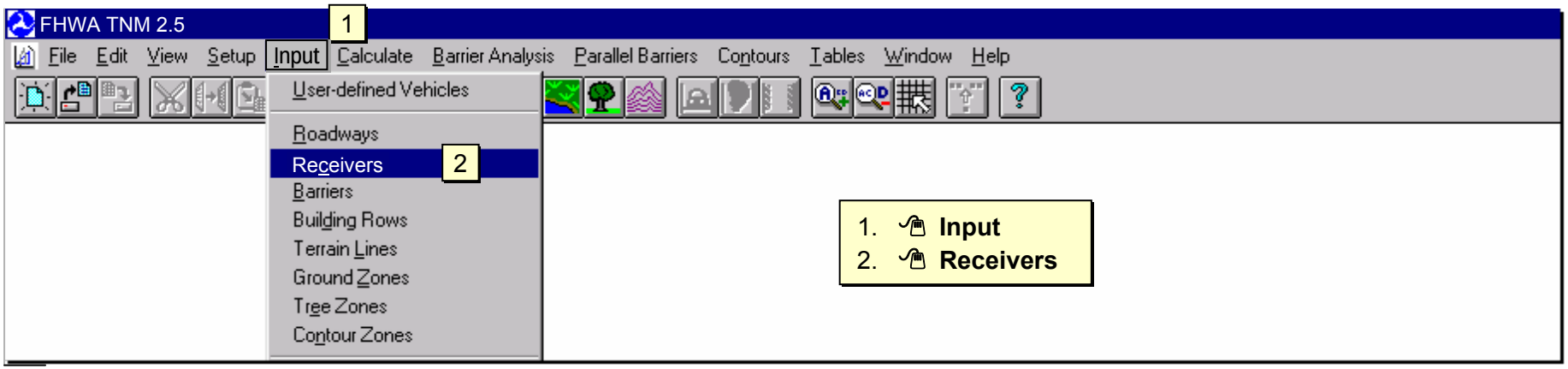
**NOTE:** interior locations are used if exterior locations are physically shielded from the roadway, or if there is little or no human activity in exterior locations adjacent to the roadway



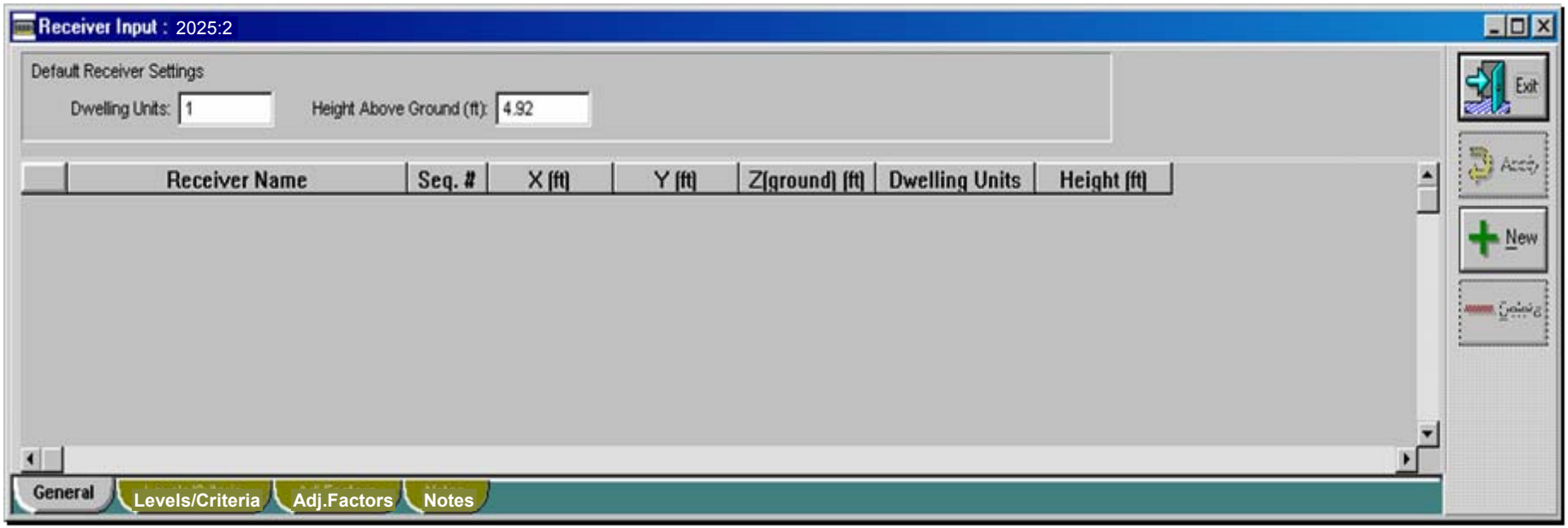

RECEIVERS
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
Single-family
Commercial
Multi-family
Single-family
x 30
45
35
N
Scale: 1" = 100'
Y
X
0'
100'
200'
300'
400'
500'
600'
700'
800'
900'


Profile View
Mainlanes
Mainlanes
Fill
Streets
Frontage roads
On Ramp
Z
50'
40'
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

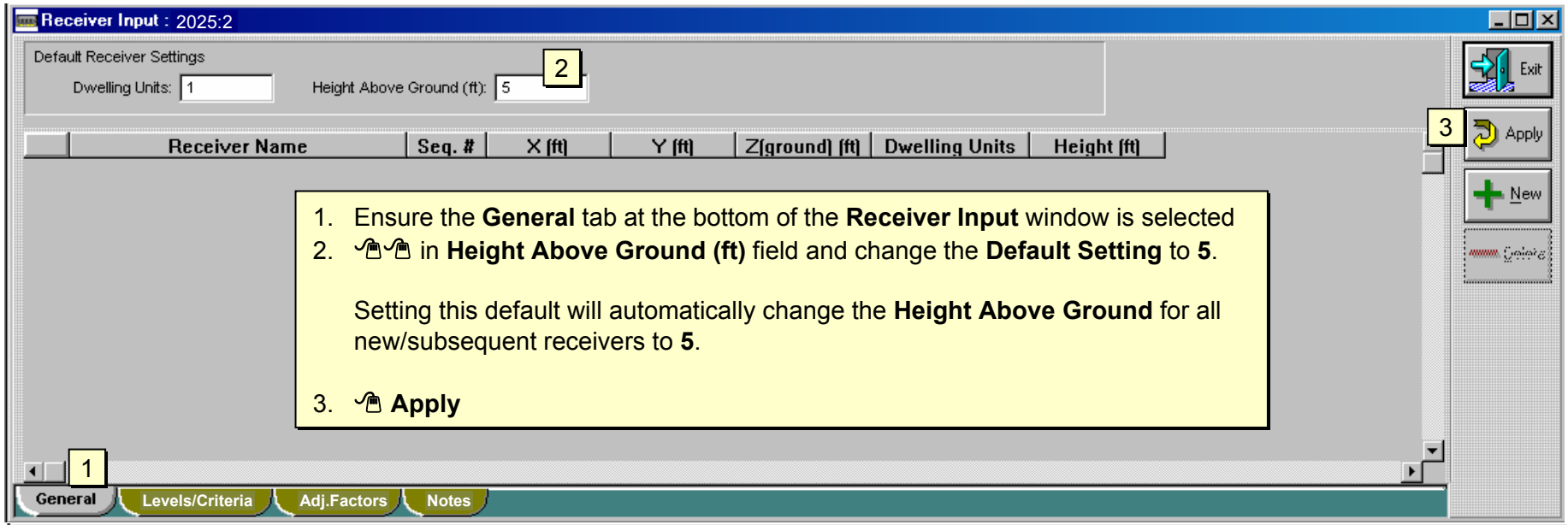
# RECEIVER INPUT (1 of 7)




Blank **Receiver Input** window appears



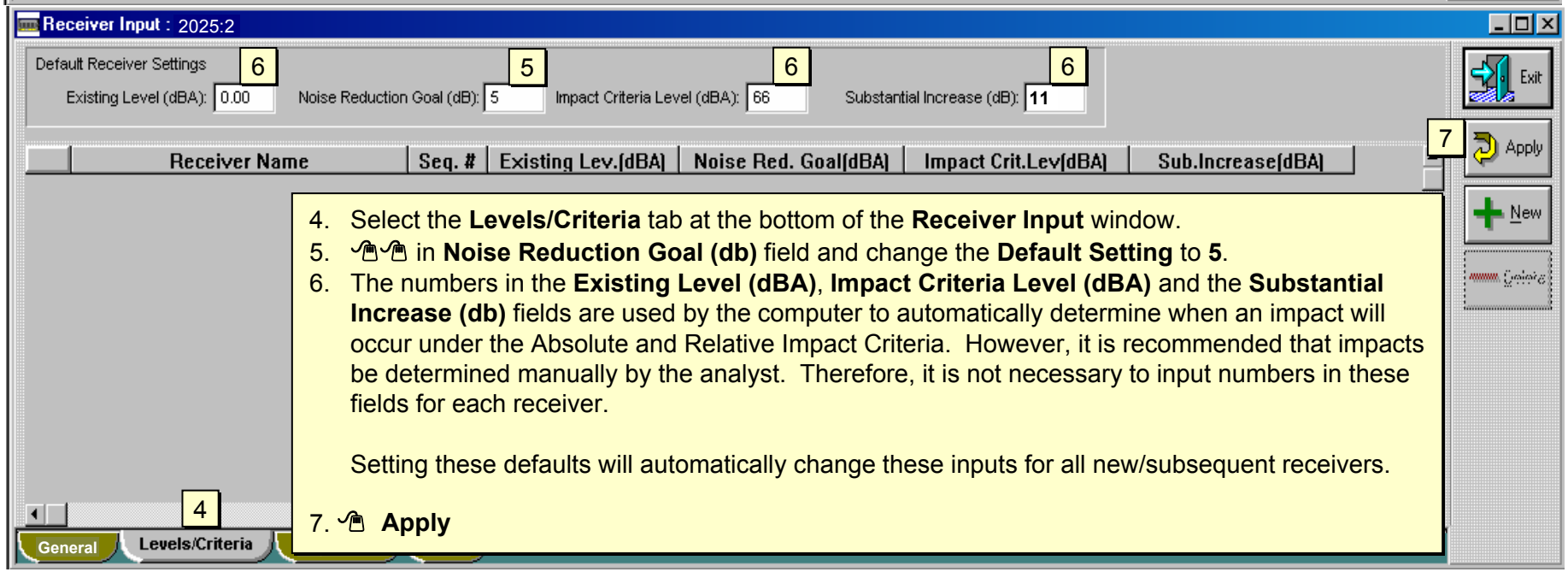
# RECEIVER INPUT (2 of 7)




1. Ensure the **General** tab at the bottom of the **Receiver Input** window is selected
2. in **Height Above Ground (ft)** field and change the **Default Setting** to **5**.

   Setting this default will automatically change the **Height Above Ground** for all new/subsequent receivers to **5**.

3. **Apply**

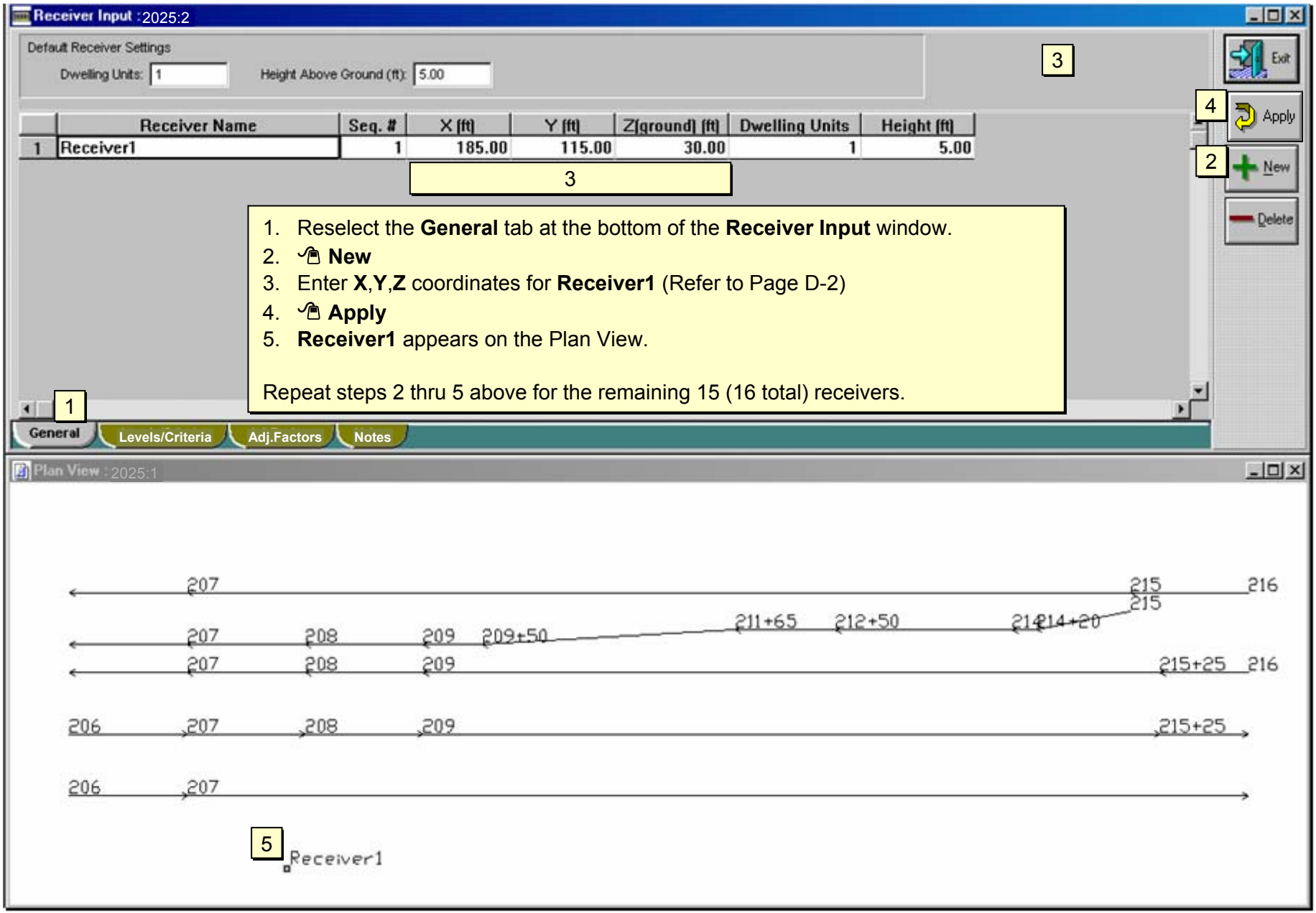



4. Select the **Levels/Criteria** tab at the bottom of the **Receiver Input** window.
5. in **Noise Reduction Goal (db)** field and change the **Default Setting** to **5**.
6. The numbers in the **Existing Level (dBA)**, **Impact Criteria Level (dBA)** and the **Substantial Increase (db)** fields are used by the computer to automatically determine when an impact will occur under the Absolute and Relative Impact Criteria. However, it is recommended that impacts be determined manually by the analyst. Therefore, it is not necessary to input numbers in these fields for each receiver.

   Setting these defaults will automatically change these inputs for all new/subsequent receivers.

7. **Apply**

# RECEIVER INPUT (3 of 7)




1. Reselect the **General** tab at the bottom of the **Receiver Input** window.
2. **New**
3. Enter **X**,**Y**,**Z** coordinates for **Receiver1** (Refer to Page D-2)
4. **Apply**
5. **Receiver1** appears on the Plan View.

Repeat steps 2 thru 5 above for the remaining 15 (16 total) receivers.

# RECEIVER INPUT (4 of 7)

Receiver Input : 2025:2

Default Receiver Settings

Dwelling Units: 0 Height Above Ground (ft): 5.00

Exit

3 Apply

New

Delete

| | Receiver Name | Seq. # | X (ft) | Y (ft) | Z(ground) (ft) | Dwelling Units | Height (ft) |
|---|---|---|---|---|---|---|---|
| 1 | R-1 | 1 | 185.00 | 115.00 | 30.00 | 1 | 5.00 |
| 2 | Receiver2 | 2 | 245.00 | 115.00 | 30.00 | 1 | 5.00 |
| 3 | Receiver3 | 3 | 305.00 | 115.00 | 30.00 | 1 | 5.00 |
| 4 | Receiver4 | 4 | 370.00 | 115.00 | 30.00 | 1 | 5.00 |
| 5 | Receiver5 | 5 | 425.00 | 115.00 | 30.00 | 1 | 5.00 |
| 6 | Receiver6 | 6 | 490.00 | 115.00 | 30.00 | 1 | 5.00 |
| 7 | Receiver7 | 7 | 550.00 | 115.00 | 30.00 | 1 | 5.00 |
| 8 | Receiver8 | 8 | 715.00 | 105.00 | 30.00 | 1 | 5.00 |
| 9 | Receiver9 | 9 | 810.00 | 105.00 | 30.00 | 1 | 5.00 |
| 10 | Receiver10 | 10 | 195.00 | 420.00 | 30.00 | 1 | 5.00 |
| 11 | Receiver11 | 11 | 280.00 | 395.00 | 30.00 | 1 | 5.00 |
| 12 | Receiver12 | 12 | 350.00 | 395.00 | 30.00 | 1 | 5.00 |
| 13 | Receiver13 | 13 | 295.00 | 480.00 | 30.00 | 1 | 5.00 |
| 14 | Receiver14 | 14 | 515.00 | 485.00 | 30.00 | 1 | 5.00 |
| 15 | Receiver15 | 15 | 705.00 | 435.00 | 50.00 | 1 | 5.00 |
| 16 | Receiver16 | 16 | 800.00 | 435.00 | 50.00 | 1 | 5.00 |

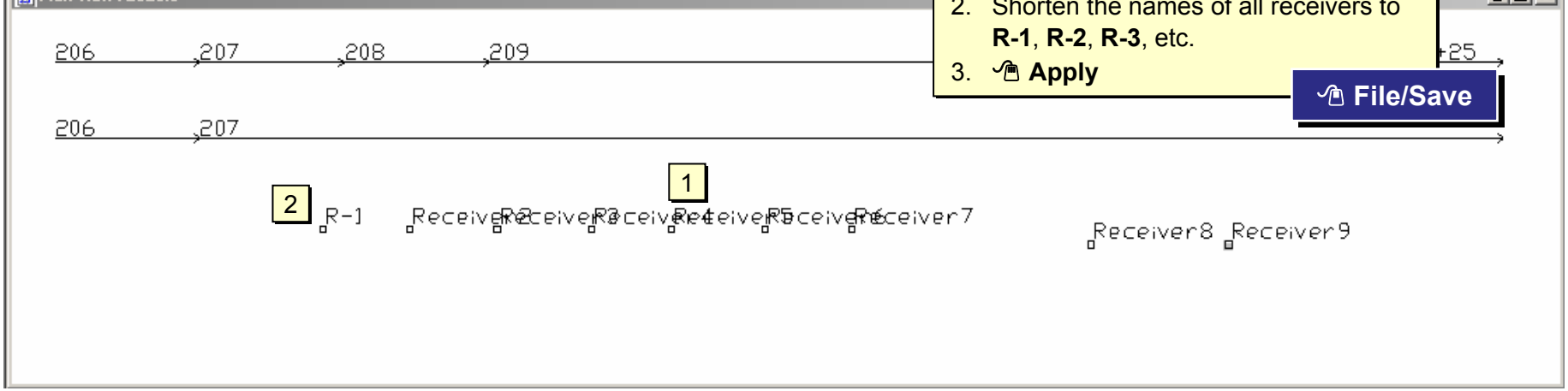
2

General | Levels/Criteria | Adj.Factors | Notes

1. Long **Receiver Names** can be difficult to read on the Plan View.
2. Shorten the names of all receivers to **R-1**, **R-2**, **R-3**, etc.
3. **Apply**

**File/Save**

Plan View : 2025:1



# RECEIVER INPUT (5 of 7)

Receiver Input : 2025:2

Default Receiver Settings

Dwelling Units: 0 Height Above Ground (ft): 5.00

Exit

2 Apply

New

Delete

| | Receiver Name | Seq. # | X (ft) | Y (ft) | Z(ground) (ft) | Dwelling Units | Height (ft) |
|---|---|---|---|---|---|---|---|
| 1 | R-1 | 1 | 185.00 | 115.00 | 30.00 | 1 | 5.00 |
| 2 | R-2 | 2 | 245.00 | 115.00 | 30.00 | 1 | 5.00 |
| 3 | R-3 | 3 | 305.00 | 115.00 | 30.00 | 1 | 5.00 |
| 4 | R-4 | 4 | 370.00 | 115.00 | 30.00 | 1 | 5.00 |
| 5 | R-5 | 5 | 425.00 | 115.00 | 30.00 | 1 | 5.00 |
| 6 | R-6 | 6 | 490.00 | 115.00 | 30.00 | 1 | 5.00 |
| 7 | R-7 | 7 | 550.00 | 115.00 | 30.00 | 1 | 5.00 |
| 8 | R-8 | 8 | 715.00 | 105.00 | 30.00 | 2 | 5.00 |
| 9 | R-9 | 9 | 810.00 | 105.00 | 30.00 | 2 | 5.00 |
| 10 | R-10 | 10 | 195.00 | 420.00 | 30.00 | 1 | 5.00 |
| 11 | R-11 | 11 | 280.00 | 395.00 | 30.00 | 1 | 5.00 |
| 12 | R-12 | | | | | | |
| 13 | R-13 | | | | | | |
| 14 | R-14 | | | | | | |
| 15 | R-15 | 15 | 705.00 | 435.00 | 50.00 | 1 | |
| 16 | R-16 | 16 | 800.00 | 435.00 | 50.00 | 1 | 5.00 |

1

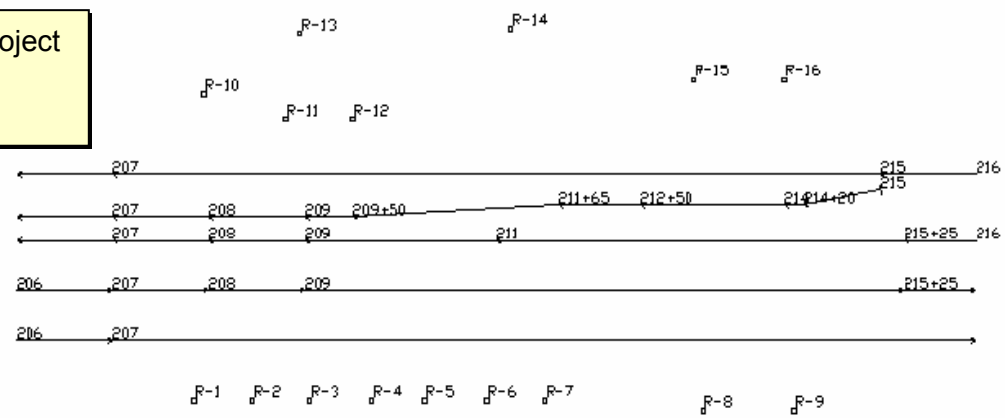
1. Change the number of **Dwelling Units** for **R-8** and **R-9** to **2** (apartments)
2. **Apply**

**File/Save**

General | Levels/Criteria | Adj.Factors | Notes

Plan View : 2025:1

To see a **Full View** of the project in the Plan View window:….
**View/Full View**



# RECEIVER INPUT (6 of 7)

Receiver Input : 2025:2

Default Receiver Settings

Existing Level (dBA): 0.00 Noise Reduction Goal (dB): 5.00 Impact Criteria Level (dBA): 66 Substantial Increase (dB): 11.00

Exit

3 Apply

New

Delete

| | Receiver Name | Seq. # | Existing Lev.(dBA) | Noise Red. Goal(dBA) | Impact Crit.Lev(dBA) | Sub.Increase(dBA) |
|---|---|---|---|---|---|---|
| 1 | R-1 | 1 | 0.00 | 5.00 | 66 | 11.00 |
| 2 | R-2 | 2 | 0.00 | 5.00 | 66 | 11.00 |
| 3 | R-3 | 3 | 0.00 | 5.00 | 66 | 11.00 |
| 4 | R-4 | 4 | 0.00 | 5.00 | 66 | 11.00 |
| 5 | R-5 | 5 | 0.00 | 5.00 | 66 | 11.00 |
| 6 | R-6 | 6 | 0.00 | 5.00 | 66 | 11.00 |
| 7 | R-7 | 7 | 0.00 | 5.00 | 66 | 11.00 |
| 8 | R-8 | 8 | 0.00 | 5.00 | 51 | 11.00 |
| 9 | R-9 | 9 | 0.00 | 5.00 | 51 | 11.00 |
| 10 | R-10 | 10 | 0.00 | 5.00 | 51 | 11.00 |
| 11 | R-11 | 11 | 0.00 | 5.00 | 66 | 11.00 |
| 12 | R-12 | | | | | 11.00 |
| 13 | R-13 | | | | | 11.00 |
| 14 | R-14 | | | | | 11.00 |
| 15 | R-15 | | | | | 11.00 |
| 16 | R-16 | | | | | 11.00 |

2

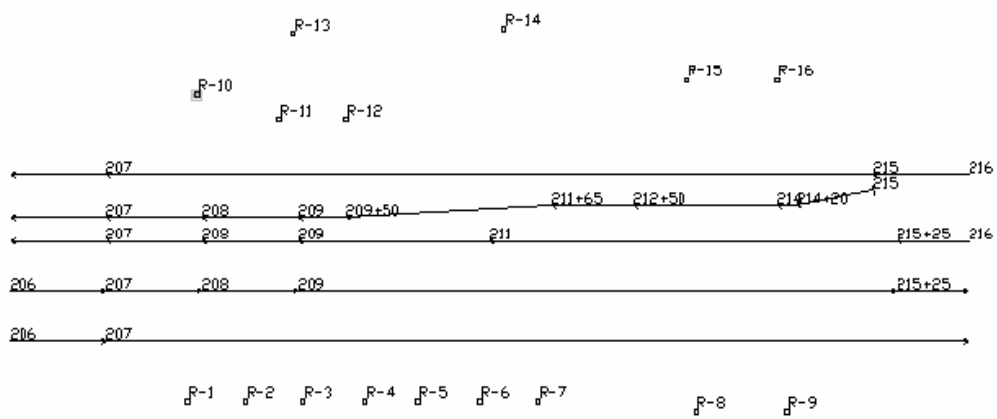
1. Select **Levels/Criteria** tab.
2. Change the **Impact Crit.Level** to **51** (interior) for **R-8** and **R-9** (apartments), and **R-10** (business)
3. **Apply**

**File/Save**

1

General | Levels/Criteria | Adj.Factors | Notes

Plan View : 2025:1



# RECEIVER INPUT (7 of 7)

Receiver Input : 2025:2

Default Receiver Settings

Activate All Receivers | Deactivate All Receivers

Exit | Apply | New | Delete

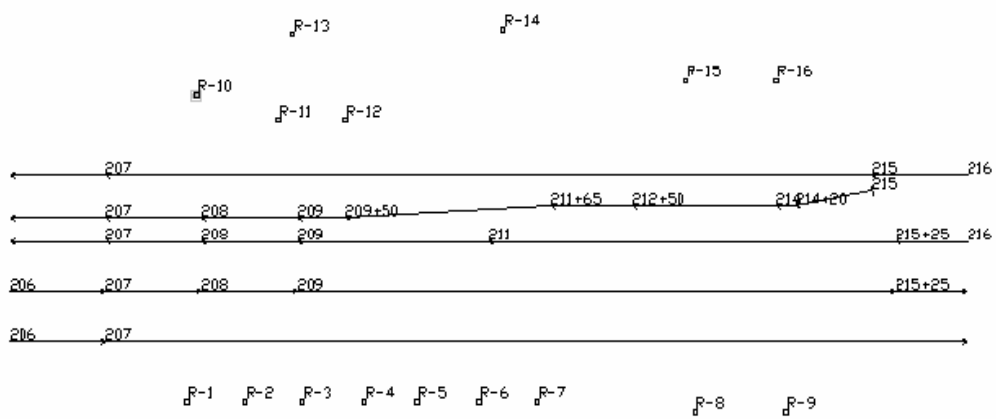
| | Receiver Name | Seq. # | Active | Notes |
|---|---|---|---|---|
| 1 | R-1 | 1 | ☑ | |
| 2 | R-2 | 2 | ☑ | |
| 3 | R-3 | 3 | ☑ | |
| 4 | R-4 | 4 | ☑ | |
| 5 | R-5 | 5 | ☑ | |
| 6 | R-6 | 6 | ☑ | |
| 7 | R-7 | 7 | ☑ | |
| 8 | R-8 | 8 | ☑ | NAC Cat E (interior) subtract 25 dBA (masonry construction) |
| 9 | R-9 | 9 | ☑ | NAC Cat E (interior) subtract 25 dBA (masonry construction) |
| 10 | R-10 | 10 | ☑ | NAC Cat E (interior) subtract 25 dBA (masonry construction) |
| 11 | R-11 | 11 | ☑ | |
| 12 | R-12 | 12 | ☑ | |
| 13 | R-13 | 13 | ☑ | |
| 14 | R-14 | 14 | ☑ | |
| 15 | R-15 | 15 | ☑ | |
| 16 | R-16 | 16 | ☑ | |

General | Levels/Criteria | Adj.Factors | Notes

1. Select **Notes** tab.
2. Leave all receivers **Active** = sound levels will be calculated for all receivers
3. Enter a Note for **R-8, R-9 and R-10** to indicate that **25 dBA** will be subtracted from the calculated sound level
   …..to account for the interior adjustment for masonry construction
4. **Apply**

**File/Save**

Plan View : 2025:1



Plan View

## EXISTING BARRIERS

At this point in the analysis, it is important to identify and model any existing elements in the propagation path between the traffic and receivers that could serve to reduce noise levels at the receivers. For this project, the only additional design element that will be modeled is the solid concrete traffic barriers (CTB) on the elevated sections of the project.

N

Ramp CTB

WB CTB

Median CTB

207+00 209+00 211+00 213+00 215+00

EB CTB

**NOTE**: consult with the project engineer to determine the exact location and length of CTBs, especially in regard to sight distance on/near ramps.

existing wooden privacy fences

x 30 x 30

Vacant

Although wooden privacy fences may also act as a barrier to noise by providing some noise reduction that should be subtracted from modeled noise levels at associated receivers, due to the elevated geometry of the mainlanes in this project, these privacy fences provide **no** noise reduction for these residences/receivers.
**NOTE:** masonry privacy fences/walls can be modeled in TNM (as barriers) while wooden privacy fences cannot (due to sound transmission between the wood slats).

Scale: 1" = 100'

Profile View

Mainlanes

50'

40'

Z

30'

Streets

**NOTE:** CTBs are an integral part of the design of the project and, as such, are **not** considered to be noise barriers even though they can serve to reduce noise levels by as much as 2-3 dBA. Because of this, solid CTBs should be considered on elevated sections of roadways adjacent to residential areas in lieu of fences or guardrails or any other non-solid traffic barriers that provide no reduction in noise levels.

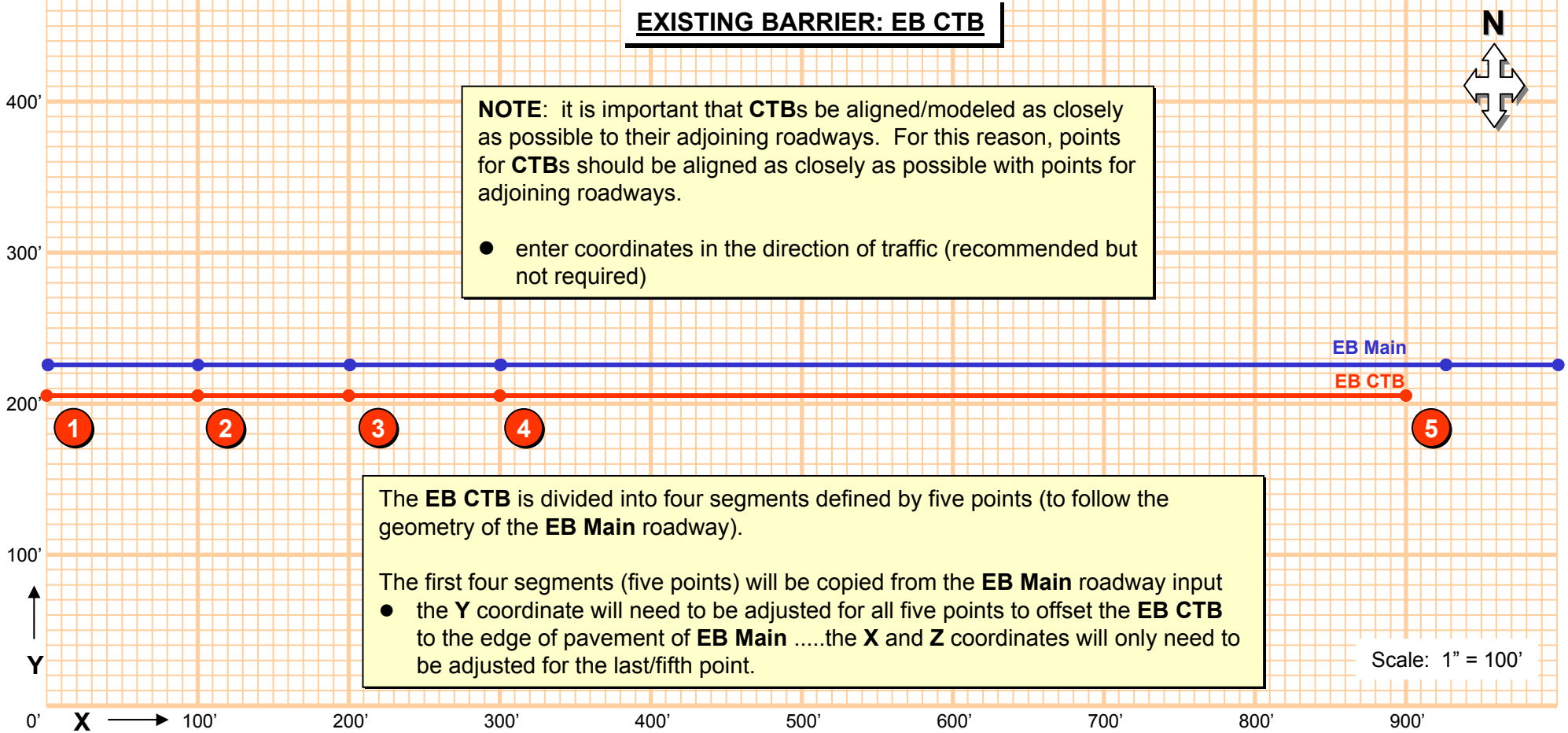
207+00 208+00 209+00 210+00 211+00 212+00 213+00 214+00 215+00

Plan View

## EXISTING BARRIER: EB CTB

**NOTE**: it is important that **CTB**s be aligned/modeled as closely as possible to their adjoining roadways. For this reason, points for **CTB**s should be aligned as closely as possible with points for adjoining roadways.

- enter coordinates in the direction of traffic (recommended but not required)

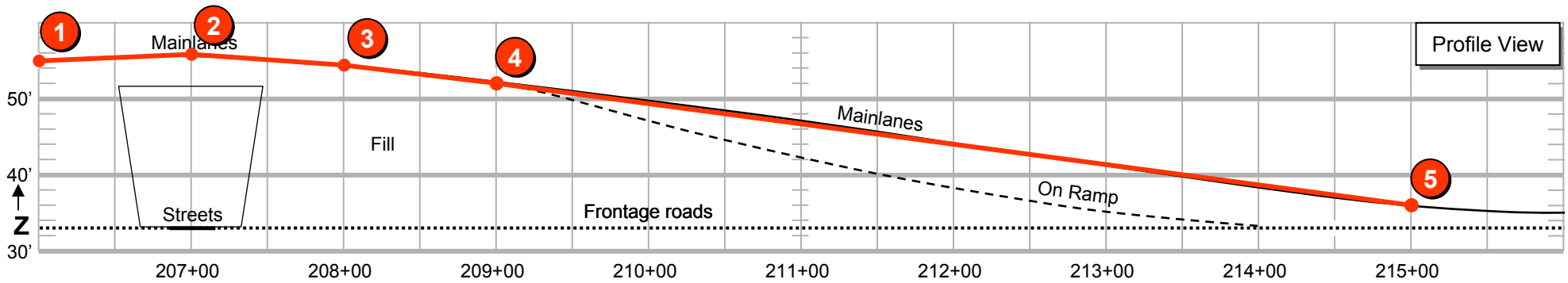



The **EB CTB** is divided into four segments defined by five points (to follow the geometry of the **EB Main** roadway).

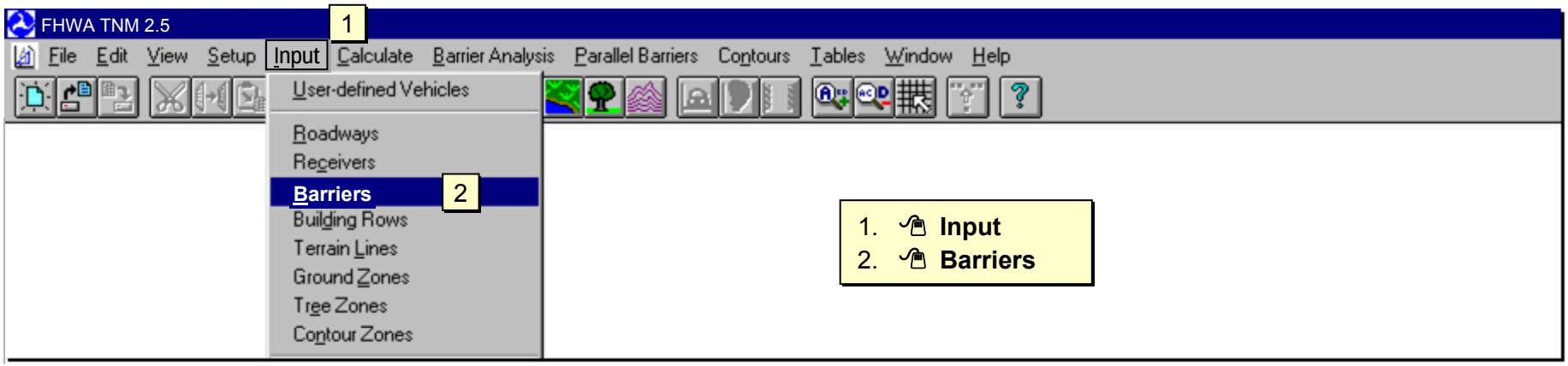
The first four segments (five points) will be copied from the **EB Main** roadway input

- the **Y** coordinate will need to be adjusted for all five points to offset the **EB CTB** to the edge of pavement of **EB Main** .....the **X** and **Z** coordinates will only need to be adjusted for the last/fifth point.

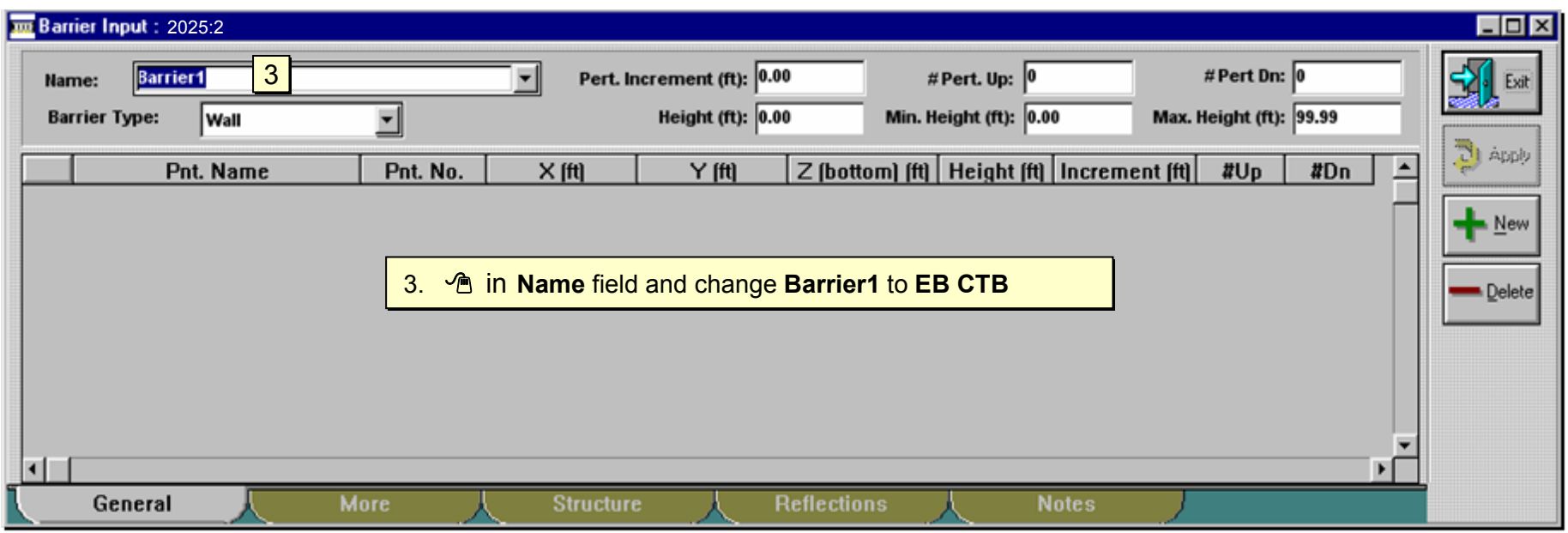
Scale: 1" = 100'



# EXISTING BARRIER INPUT: EB CTB (1 of 4)




Blank **Barrier Input** window appears



# EXISTING BARRIER INPUT: EB CTB (2 of 4)

Roadway Input : 2025:3

Name: EB Main (2) Width (ft): 24.00

On Structure ? Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 206 (3) | 4 | 0.0 | 225.0 | 55.00 | Average | |
| 2 | 207 | 9 | 100.0 | 225.0 | 56.00 | Average | |
| 3 | 208 | 5 | 200.0 | 225.0 | 54.00 | Aver | |
| 4 | 209 | 6 | 300.0 | 225.0 | 52.00 | Aver | |
| 5 | 215+25 | 7 | 925.0 | 225.0 | 36.00 | Aver | |
| 6 | 216 | 8 | 1,000.0 | 225.0 | 35.00 | Aver | |

General | LAeq1h Hourly | Flow Control | Notes

Exit | Apply | New | Delete

Barrier Input : 2025:2

Name: EB CTB Pert. Increment (ft): 0.00 # Pert.

Barrier Type: Wall Height (ft): 0.00 Min. Height

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Heig |
|---|---|---|---|---|---|---|
| 1 | 206 (5) | 1 | 0.0 | 205.0 | 55.00 | |
| 2 | 207 | 2 | 100.0 | 205.0 | 56.00 | |
| 3 | 208 | 3 | 200.0 | 205.0 | 54.00 | |
| 4 | 209 | 4 | 300.0 | 205.0 | 52.00 | |
| 5 | 215+25 | 5 | 1,000.0 | 225.0 | 36.00 | |

(4)

General | More | Structure | Reflections | Notes

Exit | Apply | New | Delete

Plan View : ... (1)

1. Minimize the **Plan View**
2. Open the **Roadway Input** window and select **EB Main**.

**Window/Tile Horizontal**

To copy information from **EB Main**:

3. and drag from **Pnt. Name 206** (upper left) to the **Z** coordinate for **215+25**.
   **Ctrl +C** to copy selected information
4. **Insert/Append** a total of five new rows in the **Barrier Input** window (to allow sufficient space to "paste" the four rows (four points) "copied" from the **EB Main** roadway).
5. To paste copied information in **EB CTB**:
   in first (top left) cell
   **Ctrl +V** to "paste" selected information

**NOTE**: Do Not **Apply** until the data for all five points is properly adjusted.

**continued**

# EXISTING BARRIER INPUT: EB CTB (3 of 4)

Barrier Input : 2025:2

Name: EB CTB | Pert. Increment (ft): 0.00 | # Pert. Up: 0 | # Pert Dn: 0

Barrier Type: Wall | Height (ft): 0.00 | Min. Height (ft): 0.00 | Max. Height (ft): 99.99

Exit | Apply (9) | New | Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 206 | 1 | 0.0 | 205.0 | 55.00 | 2.67 | 0.00 | 0 | 0 |
| 2 | 207 | 2 | 100.0 | 205.0 | 56.00 | 2.67 | 0.00 | 0 | 0 |
| 3 | 208 | 3 | 200.0 | 205.0 | 54.00 | 2.67 | 0.00 | 0 | 0 |
| 4 | 209 | 4 | 300.0 | 205.0 | 52.00 | 2.67 | 0.00 | 0 | 0 |
| 5 | 215 | 5 | 900.0 | 205.0 | 36.00 | 2.67 | 0.00 | 0 | 0 |

(6) (7) (8)

General | More

……continued from previous page.

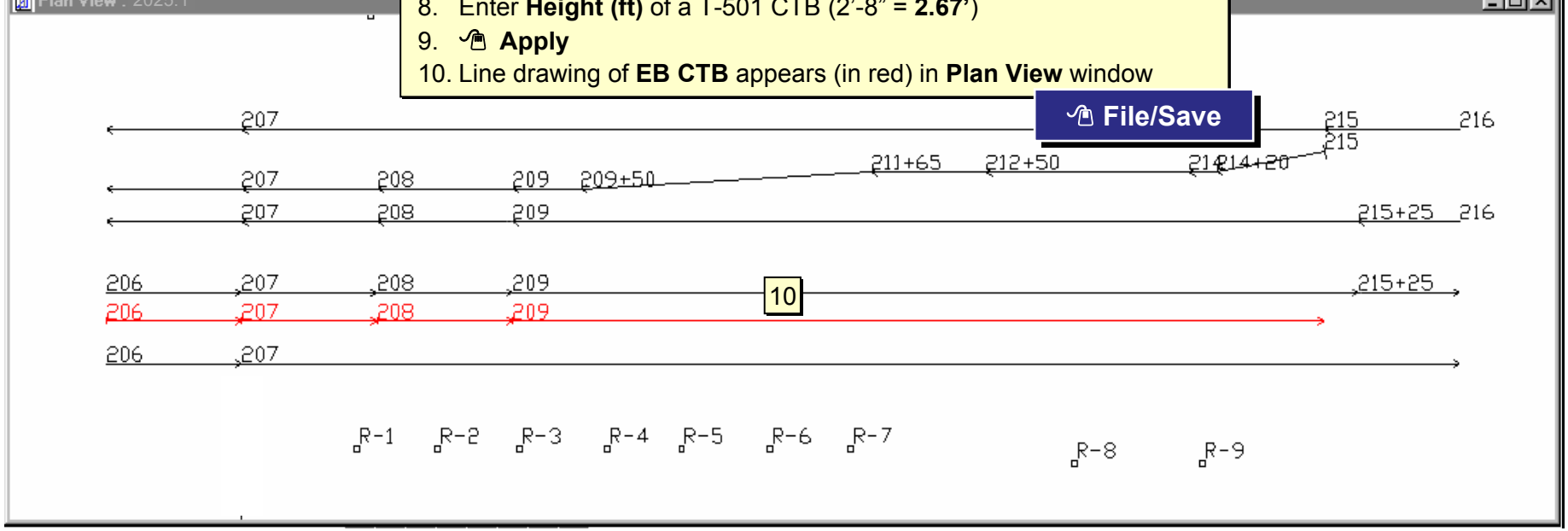
- Close the Roadway Input window

**Window/Tile Horizontal**

6. Adjust all **Y** coordinates (Refer to Page E-2)
7. Adjust the **Pnt. Name** and the **X** and **Z** coordinates for the fifth point (Refer to Page E-2)
8. Enter **Height (ft)** of a T-501 CTB (2'-8" = **2.67'**)
9. **Apply**
10. Line drawing of **EB CTB** appears (in red) in **Plan View** window

**File/Save**

Plan View : 2025:1



# EXISTING BARRIER INPUT: EB CTB (4 of 4)

Barrier Input : 2025:2

Name: EB CTB

Barrier Type: Wall

1

Pert. Increment (ft): 0.00 # Pert. Up: 0 # Pert Dn: 0

Height (ft): 0.00 Min. Height (ft): 0.00 Max. Height (ft): 99.99

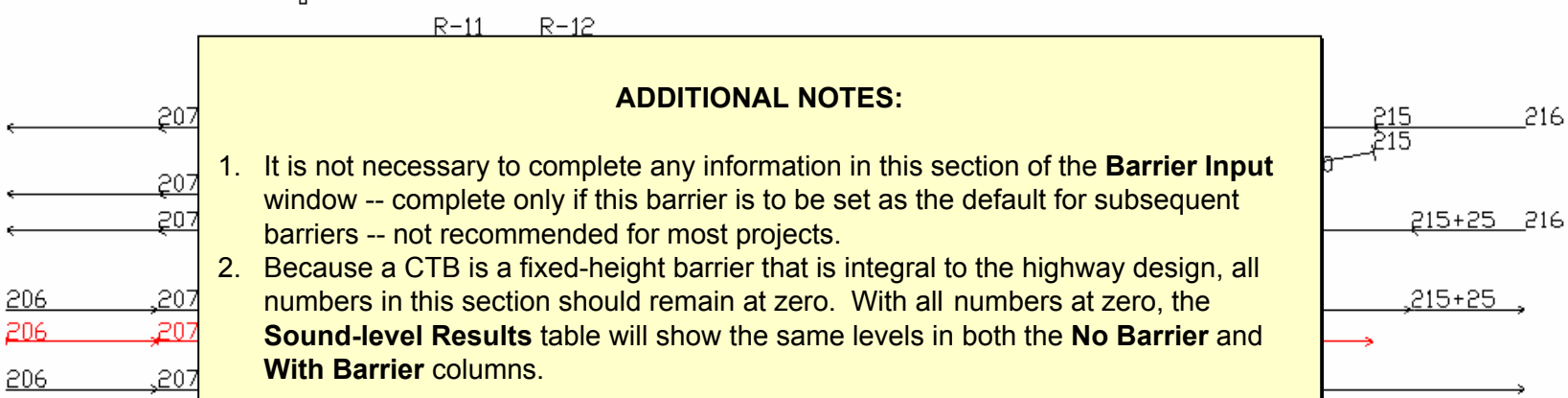
| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 206 | 1 | 0.0 | 205.0 | 55.00 | 2.6 | 0.00 | 0 | 0 |
| 2 | 207 | 2 | 100.0 | 205.0 | 56.00 | 2.6 | 0.00 | 0 | 0 |
| 3 | 208 | 3 | 200.0 | 205.0 | 54.00 | 2.6 | 0.00 | 0 | 0 |
| 4 | 209 | 4 | 300.0 | 205.0 | 52.00 | 2.6 | 0.00 | 0 | 0 |
| 5 | 215 | 5 | 900.0 | 205.0 | 36.00 | 2.6 | 0.00 | 0 | 0 |

2

Exit Apply New Delete

General More Structure Reflections Notes

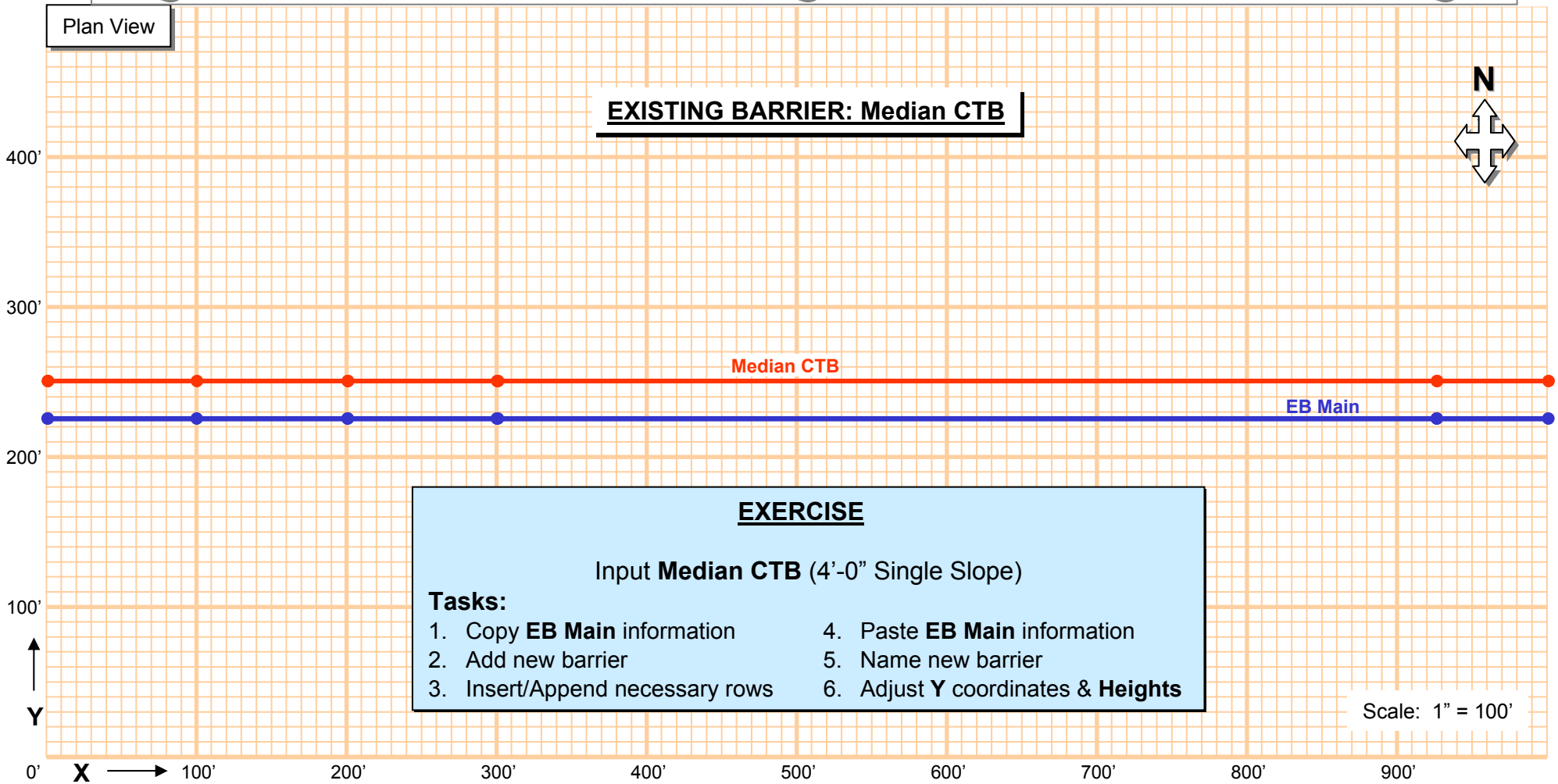
Plan View : 2025:1




**ADDITIONAL NOTES:**

1. It is not necessary to complete any information in this section of the **Barrier Input** window -- complete only if this barrier is to be set as the default for subsequent barriers -- not recommended for most projects.
2. Because a CTB is a fixed-height barrier that is integral to the highway design, all numbers in this section should remain at zero. With all numbers at zero, the **Sound-level Results** table will show the same levels in both the **No Barrier** and **With Barrier** columns.

**NOTE**: If it is important to know the noise level reduction attributable to the CTB, ensure there are no other "barriers" in the run and simply add a non-zero number such as **1** in the **Increment (ft)** column for each point.

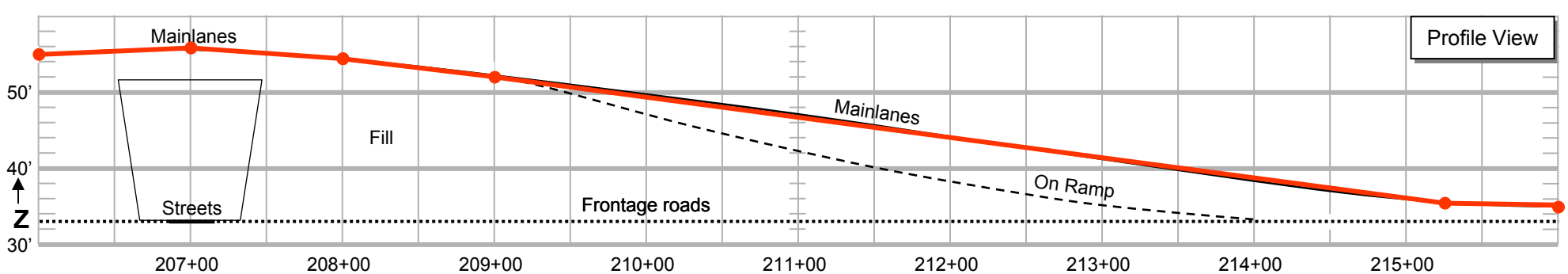


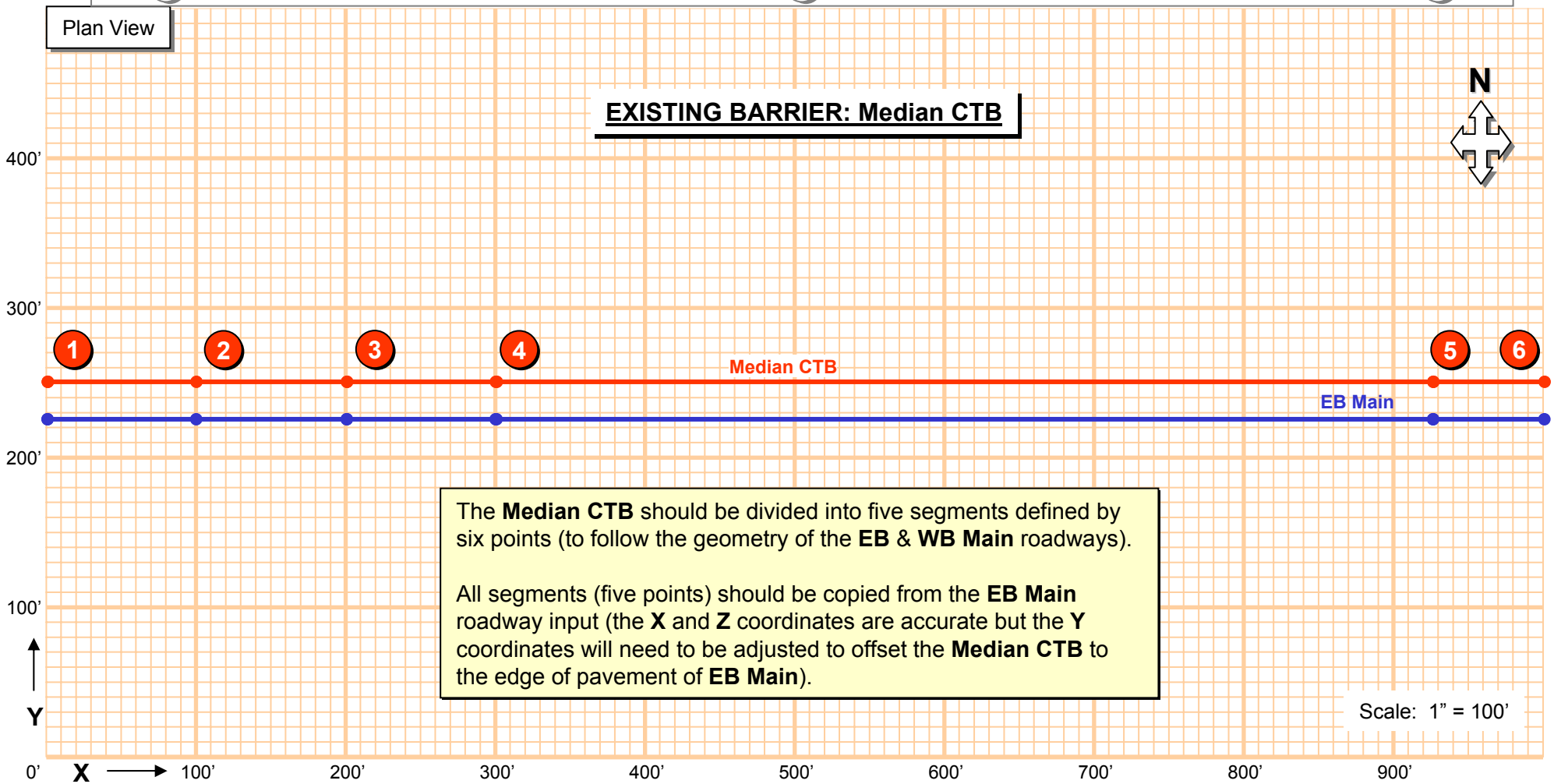

**EXERCISE**

Input **Median CTB** (4'-0" Single Slope)

**Tasks:**

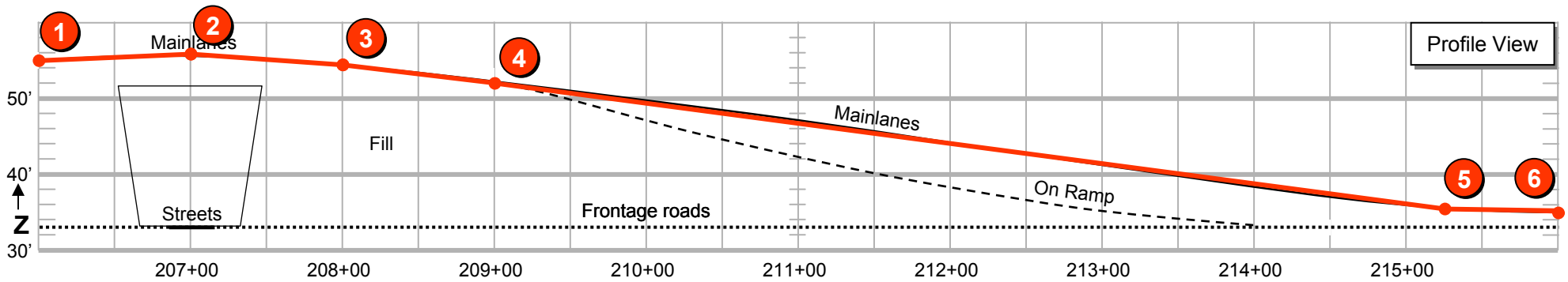
1. Copy **EB Main** information
2. Add new barrier
3. Insert/Append necessary rows
4. Paste **EB Main** information
5. Name new barrier
6. Adjust **Y** coordinates & **Heights**






The **Median CTB** should be divided into five segments defined by six points (to follow the geometry of the **EB** & **WB Main** roadways).

All segments (five points) should be copied from the **EB Main** roadway input (the **X** and **Z** coordinates are accurate but the **Y** coordinates will need to be adjusted to offset the **Median CTB** to the edge of pavement of **EB Main**).



# EXISTING BARRIER INPUT: Median CTB (1 of 2)

Roadway Input : 2025:3

Name: EB Main (2) Width (ft): 24.00

On Structure ? Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 206 (3) | 4 | 0.0 | 225.0 | 55.00 | Average | |
| 2 | 207 | 9 | 100.0 | 225.0 | 56.00 | Average | |
| 3 | 208 | 5 | 200.0 | 225.0 | 54.00 | Ave | |
| 4 | 209 | 6 | 300.0 | 225.0 | 52.00 | Ave | |
| 5 | 215+25 | 7 | 925.0 | 225.0 | 36.00 | Ave | |
| 6 | 216 | 8 | 1,000.0 | 225.0 | 35.00 | Ave | |

General | LAeq1h Hourly | Flow Control | Notes

Exit | Apply | New | Delete

1. Minimize the **Plan View**
2. Open the **Roadway Input** window and select **EB Main**.

**Window/Tile Horizontal**

To copy information from **EB Main**:

3. and drag from **Pnt. Name 206** (upper left) to the **Z** coordinate for **Pnt. Name 216** (sixth row).
   **Ctrl +C** to copy selected information
4. **New** (Barrier Input)
5. **Insert/Append** a total of six new rows in the **Barrier Input** window (to allow sufficient space to "paste" the six rows "copied" from the **EB Main** roadway).
6. To paste copied information in **EB CTB**:
   in first (top left) cell
   **Ctrl +V** to "paste" selected information
7. **Name** and change to **Median CTB**

**NOTE**: Do Not **Apply** until the **Y** coordinates and **Heights** are properly adjusted.

**continued**

Barrier Input : 2025:2

Name: Median CTB (7) Pert. Increment (ft): 0.00 # Pert

Barrier Type: Wall Height (ft): 0.00 Min. Height

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | He |
|---|---|---|---|---|---|---|
| 1 | 206 (6) | 6 | 0.0 | 225.0 | 55.00 | |
| 2 | 207 | 7 | 100.0 | 225.0 | 56.00 | |
| 3 | 208 | 8 | 200.0 | 225.0 | 54.00 | |
| 4 | 209 | 9 | 300.0 | 225.0 | 52.00 | |
| 5 | 215+25 | 10 | 925.0 | 225.0 | 36.00 | |
| 6 | 216 | 11 | 1,000.0 | 225.0 | 35.00 | |

(5)

General | More | Structure | Reflections | Notes

Exit | Apply | New (4) | Delete

Plan View :... (1)

# EXISTING BARRIER INPUT: Median CTB (2 of 2)

Barrier Input : 2025:2

Name: Median CTB | Pert. Increment (ft): 0.00 | # Pert. Up: 0 | # Pert Dn: 0

Barrier Type: Wall | Height (ft): 0.00 | Min. Height (ft): 0.00 | Max. Height (ft): 99.99

Exit | Apply | New | Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 206 | 6 | 0.0 | 250.0 | 55.00 | 4.00 | 0.00 | 0 | 0 |
| 2 | 207 | 7 | 100.0 | 250.0 | 56.00 | 4.00 | 0.00 | 0 | 0 |
| 3 | 208 | 8 | 200.0 | 250.0 | 54.00 | 4.00 | 0.00 | 0 | 0 |
| 4 | 209 | 9 | 300.0 | 250.0 | 52.00 | 4.00 | 0.00 | 0 | 0 |
| 5 | 215+25 | 10 | 925.0 | 250.0 | 36.00 | 4.00 | 0.00 | 0 | 0 |
| 6 | 216 | 11 | 1,000.0 | 250.0 | 35.00 | 4.00 | 0.00 | 0 | 0 |

7 8 9

General More

……continued from previous page.

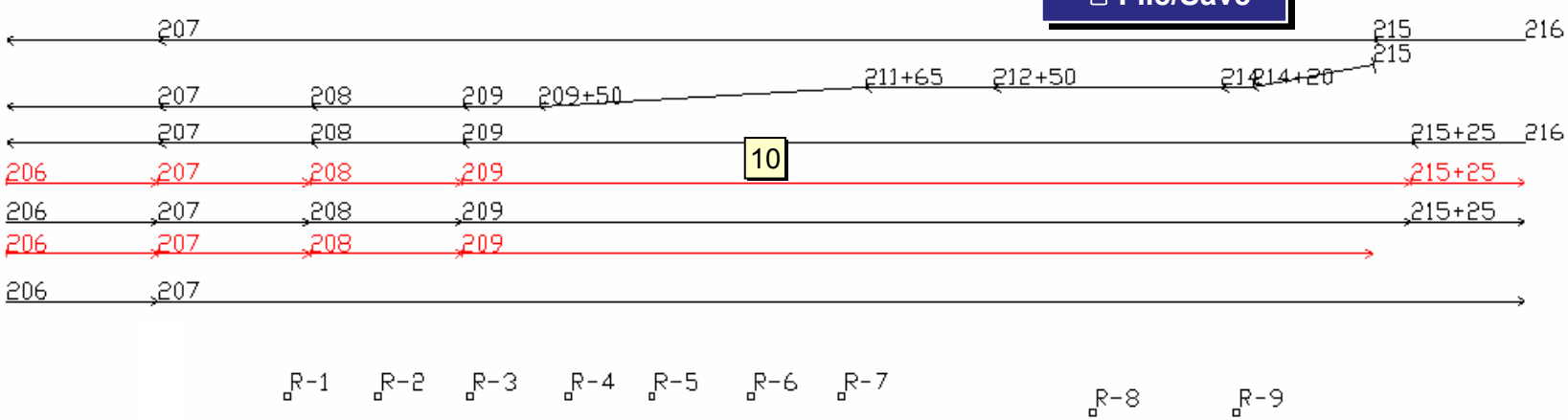
- Close the Roadway Input window

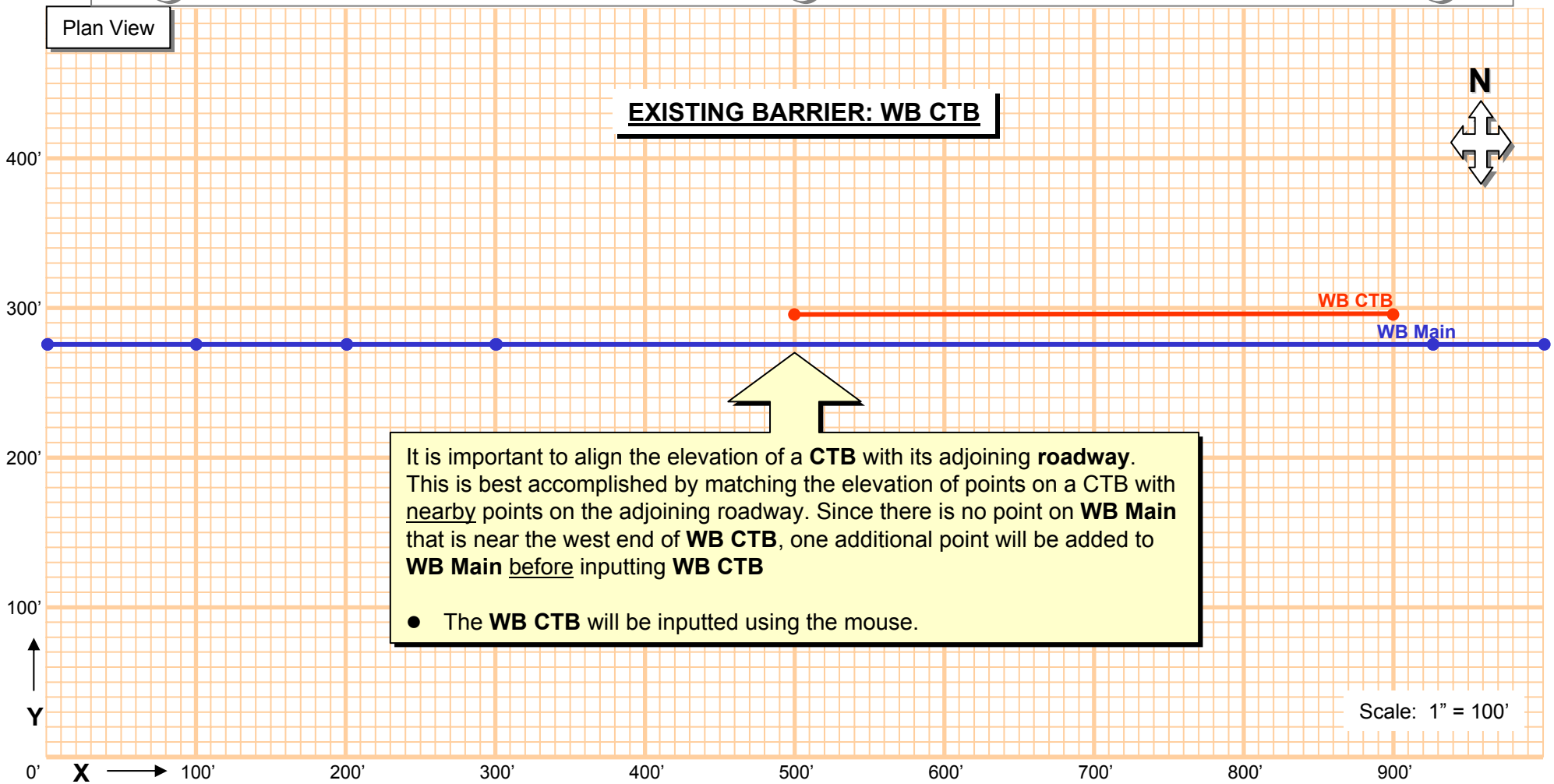
**Window/Tile Horizontal**

7. Adjust all **Y** coordinates (Refer to Page E-8)
8. Enter **Height (ft)** of a Single Slope CTB (4'-0" = **4**)
9. **Apply**
10. Line drawing of **EB CTB** appears (in red) in **Plan View** window

**File/Save**

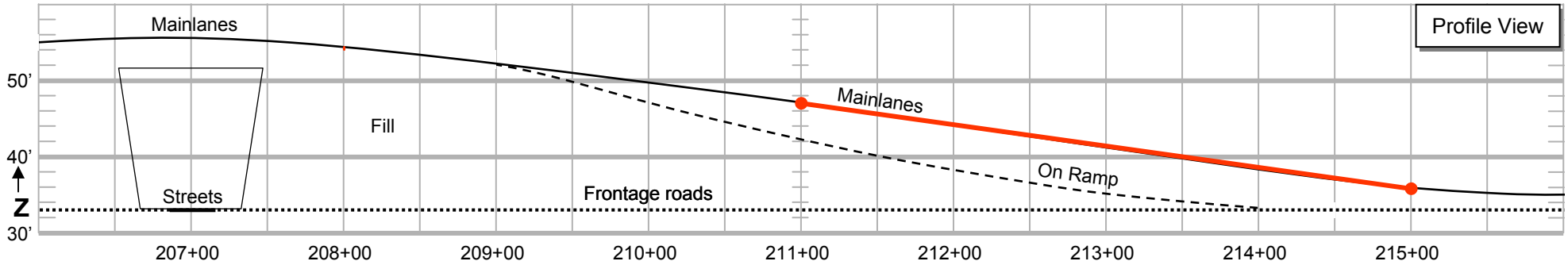
Plan View : 2025:1






It is important to align the elevation of a **CTB** with its adjoining **roadway**. This is best accomplished by matching the elevation of points on a CTB with nearby points on the adjoining roadway. Since there is no point on **WB Main** that is near the west end of **WB CTB**, one additional point will be added to **WB Main** before inputting **WB CTB**

- The **WB CTB** will be inputted using the mouse.



# EXISTING BARRIER INPUT: WB CTB (1 of 4)

- Minimize the **Barrier Input** window.
- Open the **Roadway Input** window and select the **WB Main** roadway.

1. Ensure the **Plan View** window is active (dark blue banner).
2. anywhere on Segment **215+25** of **WB Main** to select it (gray shadow along segment).
3. **Edit**
4. **Add Point within Segment**.
5. A new point, **point 32**, is added in the middle of Segment 215+25.

continued

**NOTE**: The new point (**point 32**) is located at an equal distance and average height between points **215+25** and **209**. Therefore, the **X** and **Z** coordinates will need to be adjusted.

# EXISTING BARRIER INPUT: WB CTB (2 of 4)

Roadway Input : 2025:2

Name: WB Main

On Structure ?

Width (ft): 24.00

Pavement Type: Average

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Exit

Apply

New

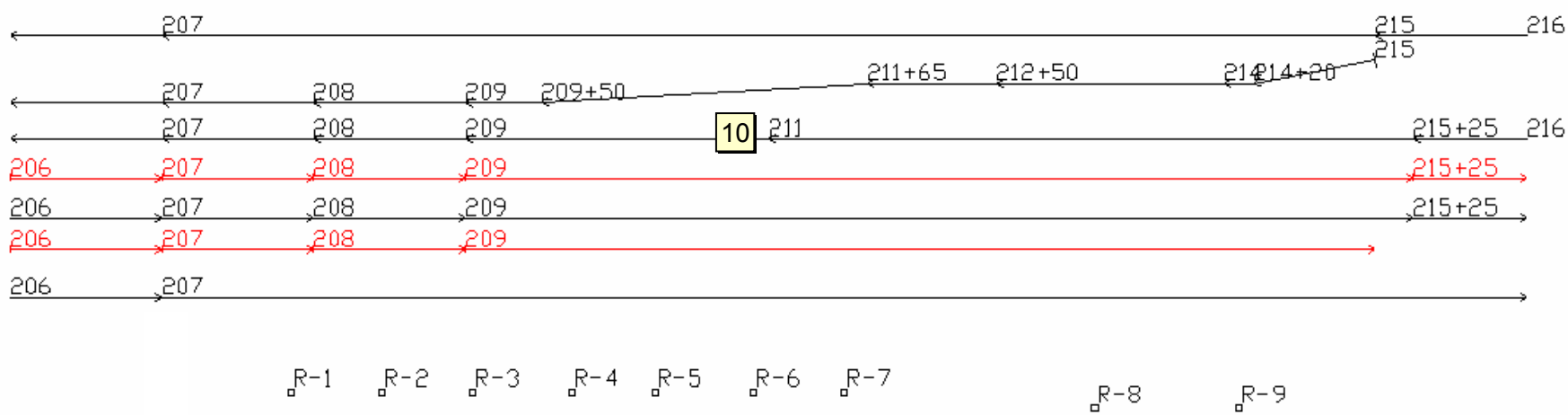
Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (pavement) (ft) | Pvmt Type | On Struct ? |
|---|---|---|---|---|---|---|---|
| 1 | 216 | 15 | 1,000.0 | 275.0 | 35.00 | Average | |
| 2 | 215+25 | 14 | 925.0 | 275.0 | 36.00 | Average | |
| 3 | 211 | 32 | 500.0 | 275.0 | 47.00 | Average | |
| 4 | 209 | 13 | 300.0 | 275.0 | 52.00 | Average | |
| 5 | 208 | 12 | 200.0 | 275.0 | 54.00 | Average | |
| 6 | 207 | 11 | 100.0 | 275.0 | 56.00 | Average | |
| 7 | 206 | 10 | 0.0 | 275.0 | 55.00 | Average | |

6 8 7 7 9

General

Plan View : 2025:1




…….continued from previous page.

6. Change the **Pnt. Name** for the new point to the Station number.
7. Adjust the **X** and **Z** coordinates (Refer to Page E-11).
8. **Note**: ignore numbers in **Pnt. No.** column - - do not be concerned that numbers are not in order - - it is not necessary to "re-number" these points.
9. **Apply**
10. New point **211** shifts to the correct position in the **Plan View**.

**File/Save**

# EXISTING BARRIER INPUT: WB CTB (3 of 4)

FHWA TNM 2.5

File Edit View Setup Input Calculate Parallel Barriers Contours Tables Window Help

1

Barrier Input : 2025:2

Name: Barrier3 Pert. Increment (ft): 0.00 # Pert. Up: 0 # Pert Dn: 0

Barrier Type: Wall Height (ft): 0.00 Min. Height (ft): 0.00 Max. Height (ft): 99.99

Exit Apply New Delete

4

| | Pnt. Name | Pnt. No. | X [ft] | Y [ft] | Z [bottom] [ft] | Height [ft] | Increment [ft] | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | point12 | 12 | 859.2 | 290.3 | 0.00 | 0.00 | 0.00 | 0 | 0 |
| 2 | point13 | 13 | 546.8 | 292.2 | 0.00 | 0.00 | 0.00 | 0 | 0 |

General

- Close the **Roadway Input** window.
- Restore the **Barrier Input** window.

1. **Barrier** button in the **Tool Bar** - - the cursor changes to
2. Use the tool to two points defining one segment anywhere in the general vicinity of **WB CTB** - - no need to be precise.
3. To deactivate the **Roadway** input tool, move the cursor away from the last point and **Right Click** the mouse or deselect the button in the **Tool Bar**
4. Two rows are created - - coordinates will be corrected on the next page.

continued

Plan View : 2025:1

R-11 R-12

207 215 216 215

207 208 209 209+50 211+65 212+50 214 214+20

207 208 209 211 point12 215+25 216

206 207 208 209 2 2 215+25

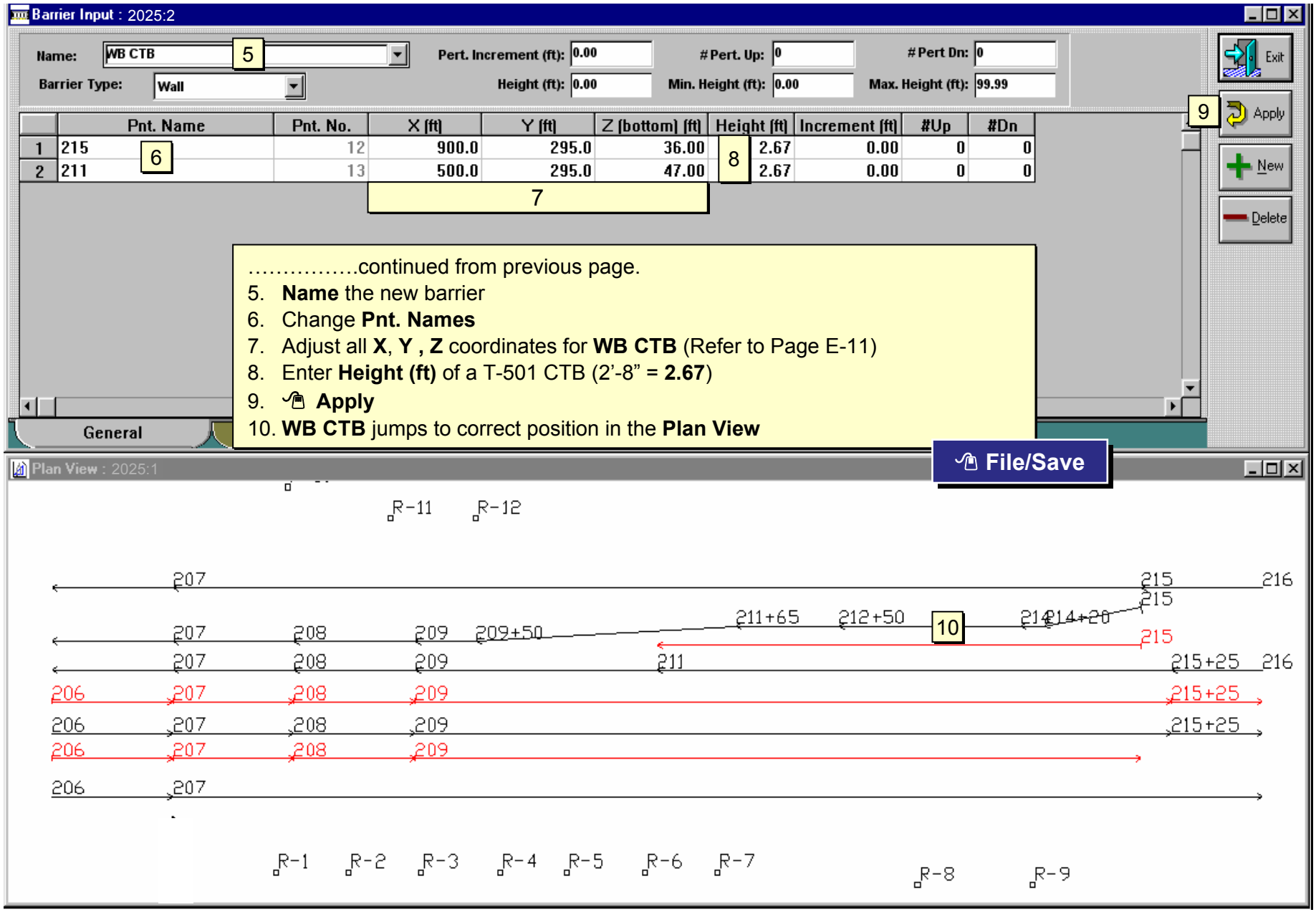
206 207 208 209 215+25

206 207 208 209 3

206 207

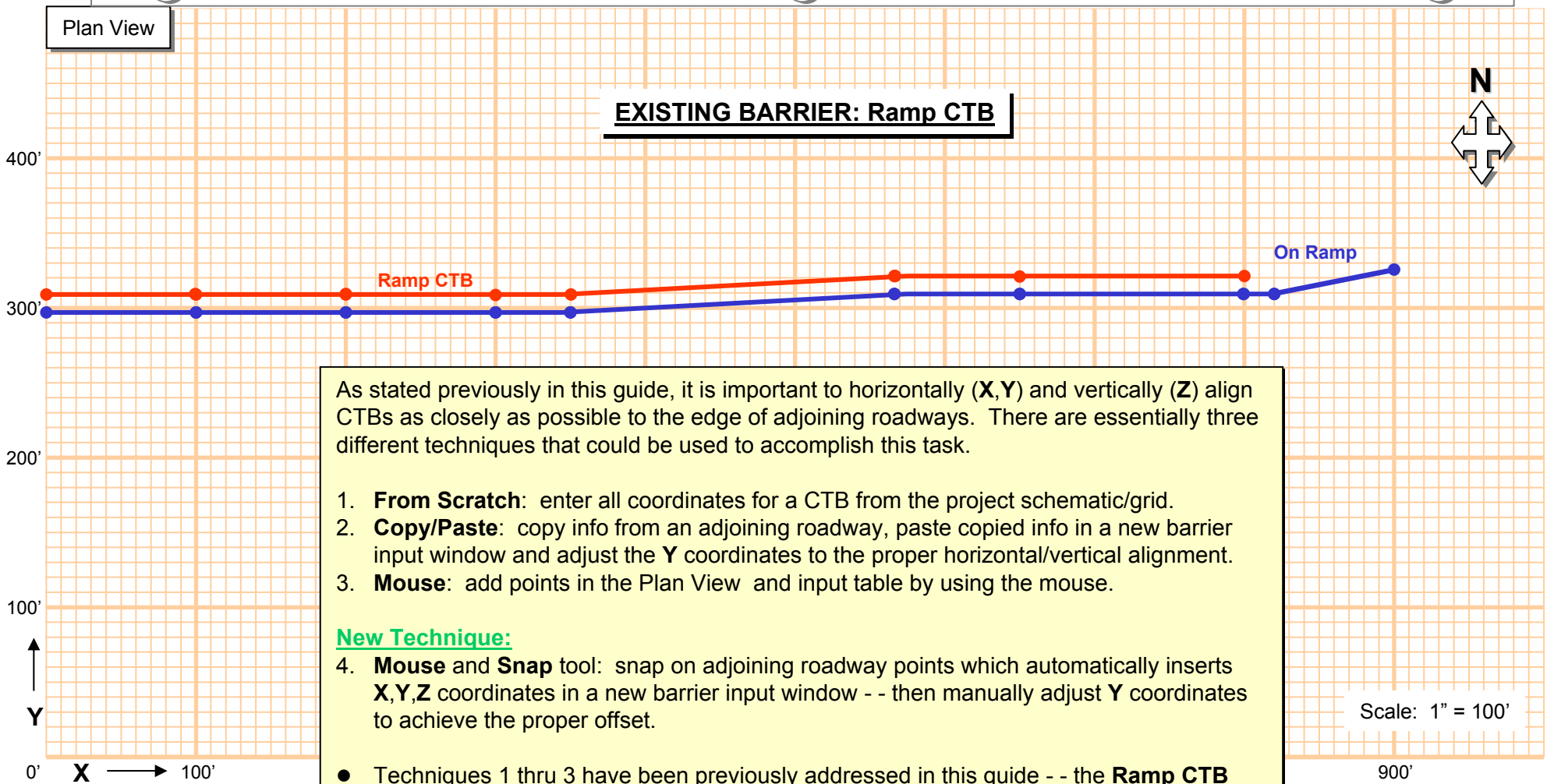
R-1 R-2 R-3 R-4 R-5 R-6 R-7 R-8 R-9

# EXISTING BARRIER INPUT: WB CTB (4 of 4)




……continued from previous page.

5. **Name** the new barrier
6. Change **Pnt. Names**
7. Adjust all **X**, **Y** , **Z** coordinates for **WB CTB** (Refer to Page E-11)
8. Enter **Height (ft)** of a T-501 CTB (2'-8" = **2.67**)
9. **Apply**
10. **WB CTB** jumps to correct position in the **Plan View**



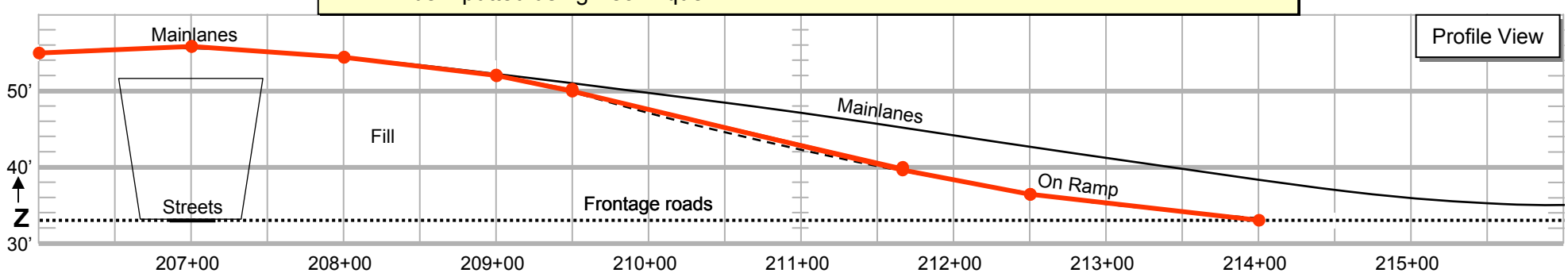

As stated previously in this guide, it is important to horizontally (**X**,**Y**) and vertically (**Z**) align CTBs as closely as possible to the edge of adjoining roadways. There are essentially three different techniques that could be used to accomplish this task.

1. **From Scratch**: enter all coordinates for a CTB from the project schematic/grid.
2. **Copy/Paste**: copy info from an adjoining roadway, paste copied info in a new barrier input window and adjust the **Y** coordinates to the proper horizontal/vertical alignment.
3. **Mouse**: add points in the Plan View and input table by using the mouse.

**New Technique:**

4. **Mouse** and **Snap** tool: snap on adjoining roadway points which automatically inserts **X**,**Y**,**Z** coordinates in a new barrier input window - - then manually adjust **Y** coordinates to achieve the proper offset.

- Techniques 1 thru 3 have been previously addressed in this guide - - the **Ramp CTB** will be inputted using Technique #4.



# EXISTING BARRIER INPUT: Ramp CTB (1 of 2)

FHWA TNM 2.5

File Edit View Setup Input Calculate ...sis Parallel Barriers Contours Tables ...p

1

Barrier Input : 2025:2

7

Name: Barrier4 Pert. Increment (ft): 0.00 # Pert. Up: 0 # Pert Dn: 0

Barrier Type: Wall Height (ft): 0.00 Min. Height (ft): 0.00 Max. Height (ft): 99.99

| | Pnt. Name | Pnt. No. | X [ft] | Y [ft] | Z [bottom] [ft] | Height [ft] | Increment [ft] | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | point14 | 14 | 800.0 | 310.0 | 33.00 | 0.00 | 0.00 | 0 | 0 |
| 2 | point15 | 15 | 650.0 | 310.0 | 36.00 | 0.00 | 0.00 | 0 | 0 |
| 3 | point16 | 16 | 565.0 | 310.0 | 40.00 | 0.00 | 0.00 | 0 | 0 |
| 4 | point17 | 17 | 350.0 | 298.0 | 50.00 | 0.00 | 0.00 | 0 | 0 |
| 5 | point18 | 18 | 300.0 | 298.0 | 52.00 | 0.00 | 0.00 | 0 | 0 |
| 6 | point19 | 19 | 200.0 | 298.0 | 54.00 | 0.00 | 0.00 | 0 | 0 |
| 7 | point20 | 20 | 100.0 | 298.0 | 56.00 | 0.00 | 0.00 | 0 | 0 |
| 8 | point21 | 21 | 0.0 | 298.0 | 55.00 | 0.00 | 0.00 | 0 | 0 |

Exit Apply New Delete

General

- Deselect **Show Text** for **Barriers** (to minimize clutter)

1. **Barrier** then **Snap** buttons in the **Tool Bar** - - the cursor changes to
2. Use the tool and (snap to) all eight points of the **Ramp** roadway beginning with **214** and ending with **206**
3. To deactivate the **Barrier** and **Snap** input tools, move the cursor away from the last point and **Right Click** the mouse or deselect both buttons in the **Tool Bar**.

- The Ramp CTB is drawn on top of the On-Ramp.

**NOTE**: **X**,**Y**,**Z** coordinates are automatically inserted in the **Barrier Input** window for a new barrier (**Barrier4**) and the barrier is drawn on top of the **Ramp** roadway in the **Plan View**. The **Names**, **Y** coordinates and **Heights** will be adjusted on the next page.

continued

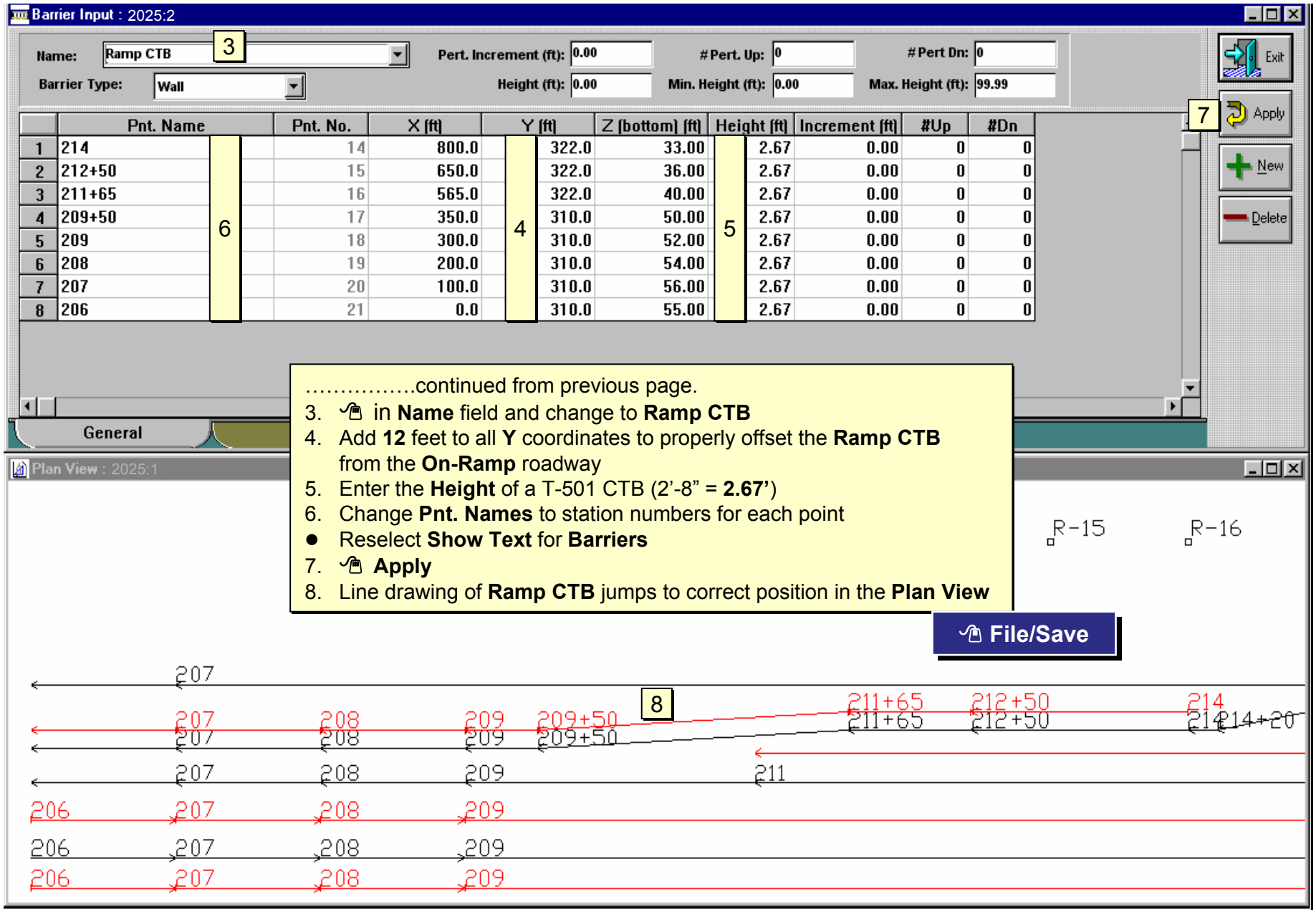
Plan View : 2025:1

R-16

207 3 207 208 209 209+50 211+65 212+50 214 214+20 211 2 2 2 2 2 2 2 2 End 207 208 209 Begin

Enlarge and center **Plan View:** use **Page Up** (magnify) and **Arrow** keys

# EXISTING BARRIER INPUT: Ramp CTB (2 of 2)



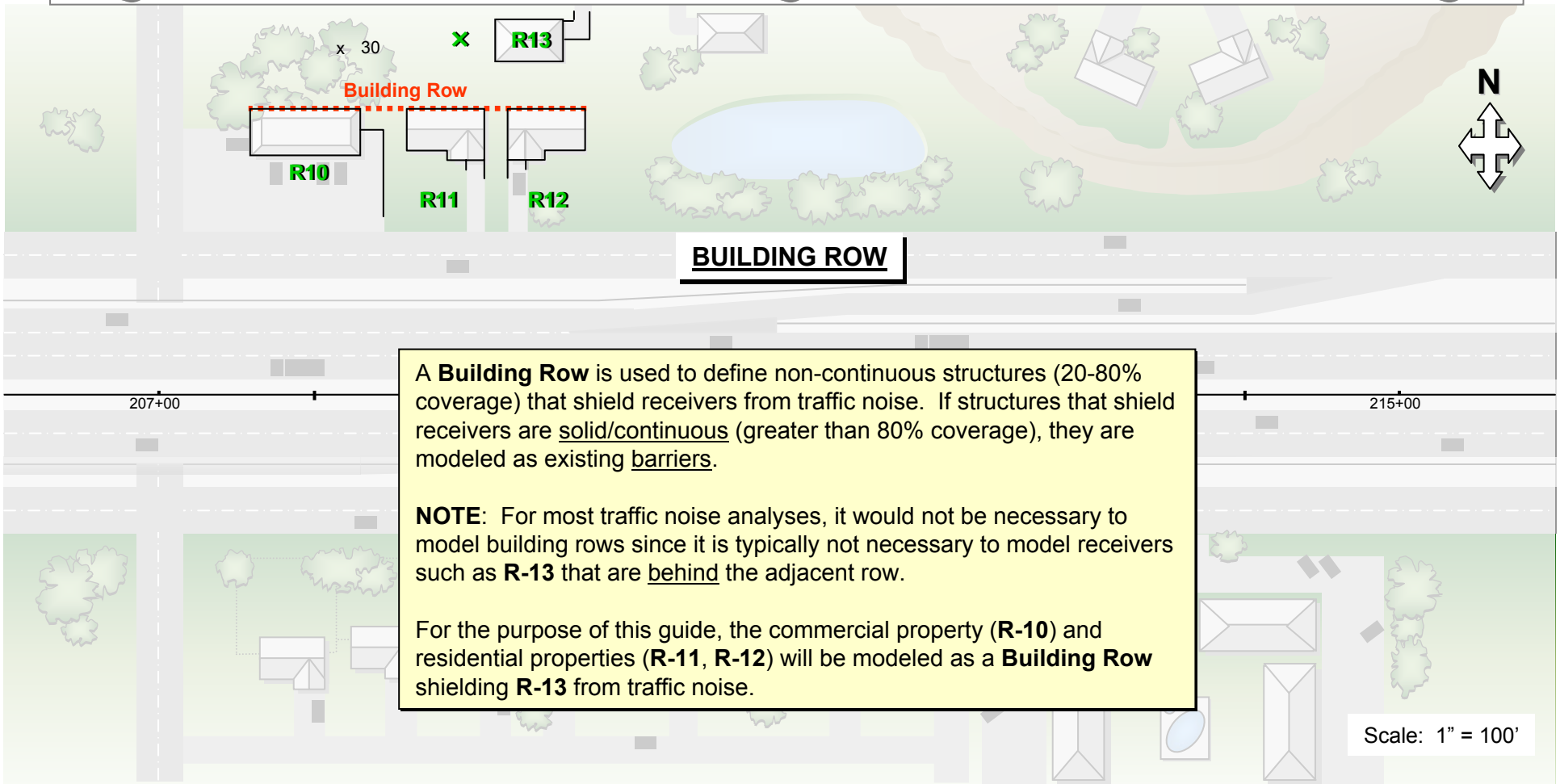

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 214 | 14 | 800.0 | 322.0 | 33.00 | 2.67 | 0.00 | 0 | 0 |
| 2 | 212+50 | 15 | 650.0 | 322.0 | 36.00 | 2.67 | 0.00 | 0 | 0 |
| 3 | 211+65 | 16 | 565.0 | 322.0 | 40.00 | 2.67 | 0.00 | 0 | 0 |
| 4 | 209+50 | 17 | 350.0 | 310.0 | 50.00 | 2.67 | 0.00 | 0 | 0 |
| 5 | 209 | 18 | 300.0 | 310.0 | 52.00 | 2.67 | 0.00 | 0 | 0 |
| 6 | 208 | 19 | 200.0 | 310.0 | 54.00 | 2.67 | 0.00 | 0 | 0 |
| 7 | 207 | 20 | 100.0 | 310.0 | 56.00 | 2.67 | 0.00 | 0 | 0 |
| 8 | 206 | 21 | 0.0 | 310.0 | 55.00 | 2.67 | 0.00 | 0 | 0 |

……continued from previous page.

3. in **Name** field and change to **Ramp CTB**
4. Add **12** feet to all **Y** coordinates to properly offset the **Ramp CTB** from the **On-Ramp** roadway
5. Enter the **Height** of a T-501 CTB (2'-8" = **2.67'**)
6. Change **Pnt. Names** to station numbers for each point

- Reselect **Show Text** for **Barriers**

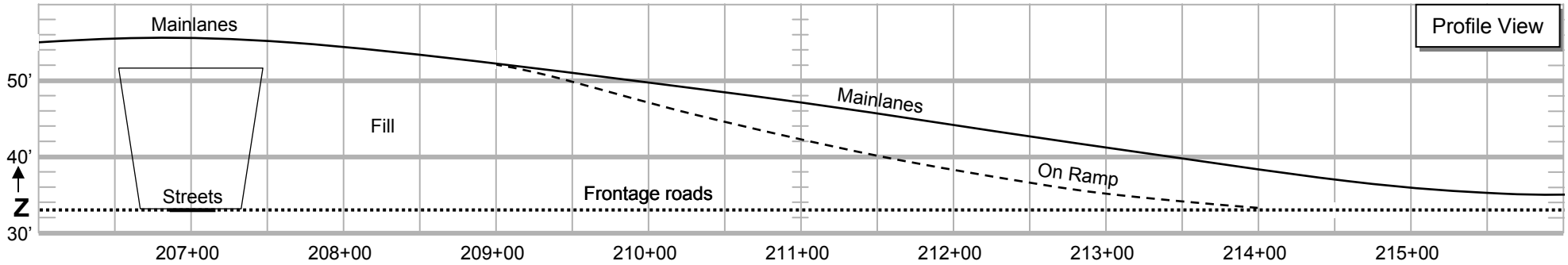
7. **Apply**
8. Line drawing of **Ramp CTB** jumps to correct position in the **Plan View**

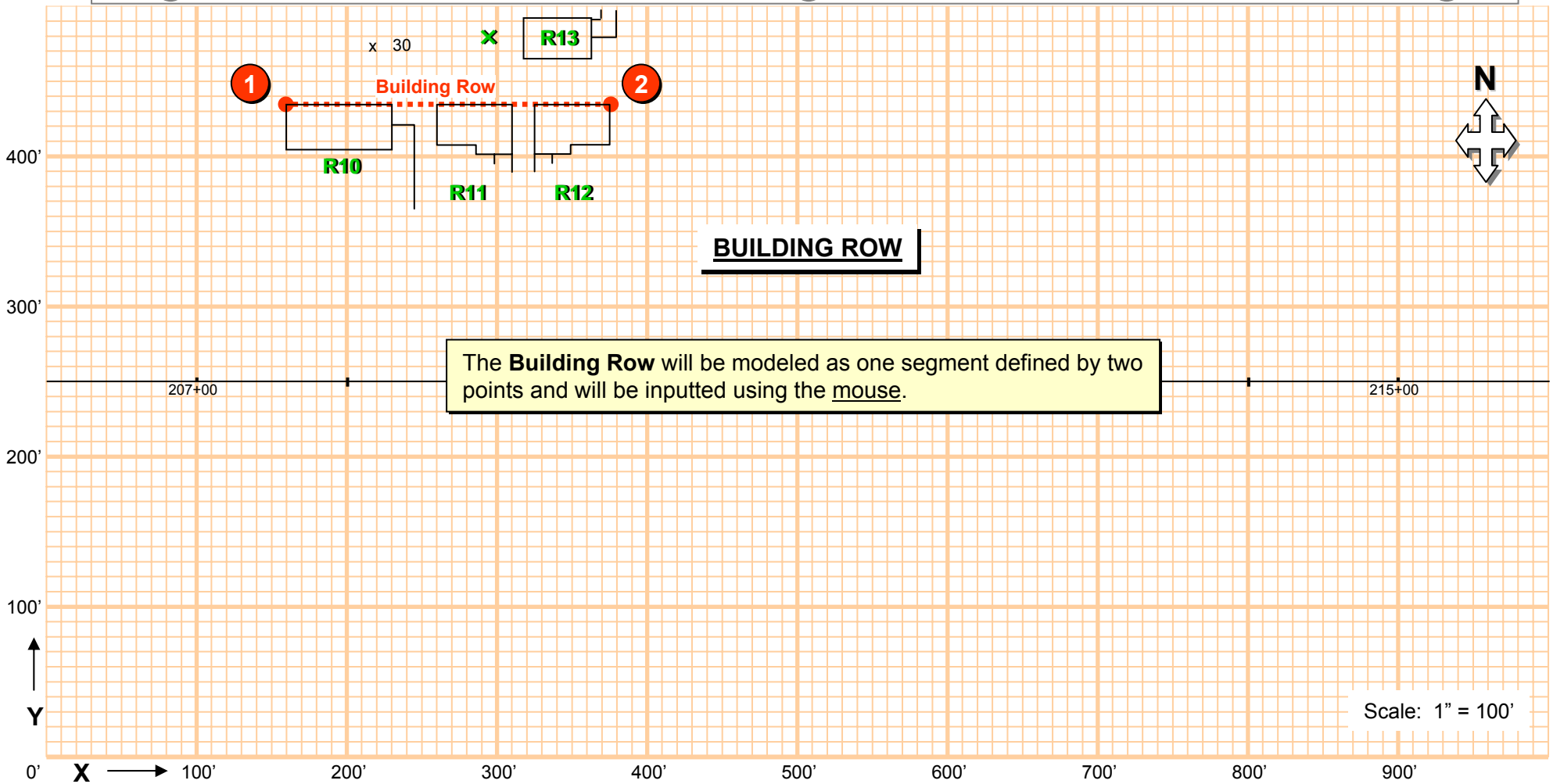


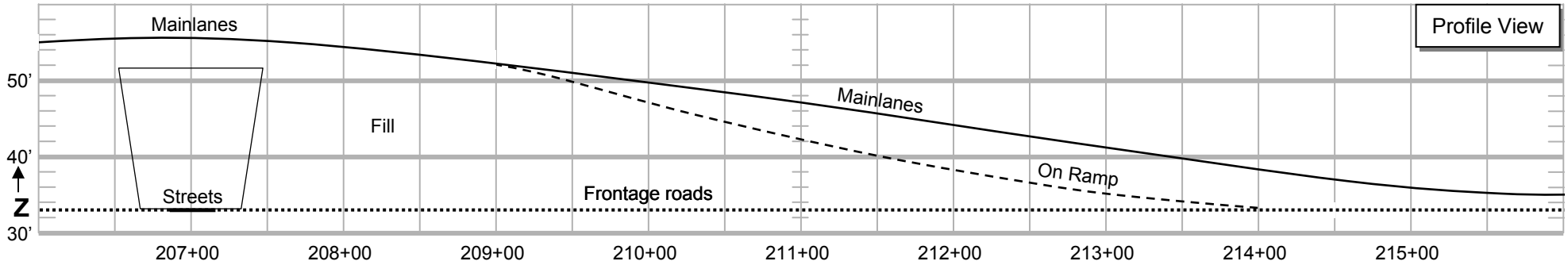

A **Building Row** is used to define non-continuous structures (20-80% coverage) that shield receivers from traffic noise. If structures that shield receivers are solid/continuous (greater than 80% coverage), they are modeled as existing barriers.

**NOTE**: For most traffic noise analyses, it would not be necessary to model building rows since it is typically not necessary to model receivers such as **R-13** that are behind the adjacent row.

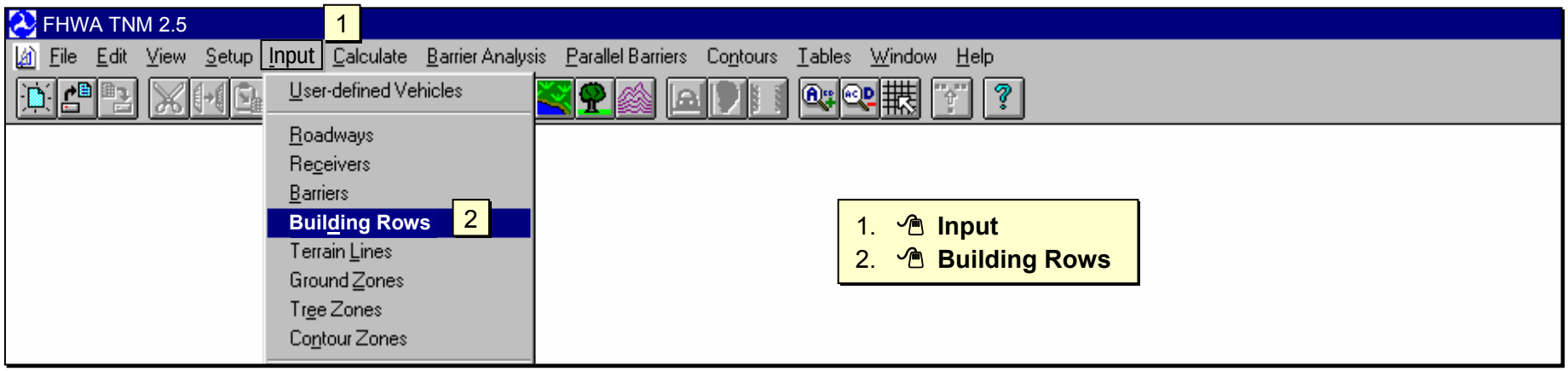
For the purpose of this guide, the commercial property (**R-10**) and residential properties (**R-11**, **R-12**) will be modeled as a **Building Row** shielding **R-13** from traffic noise.



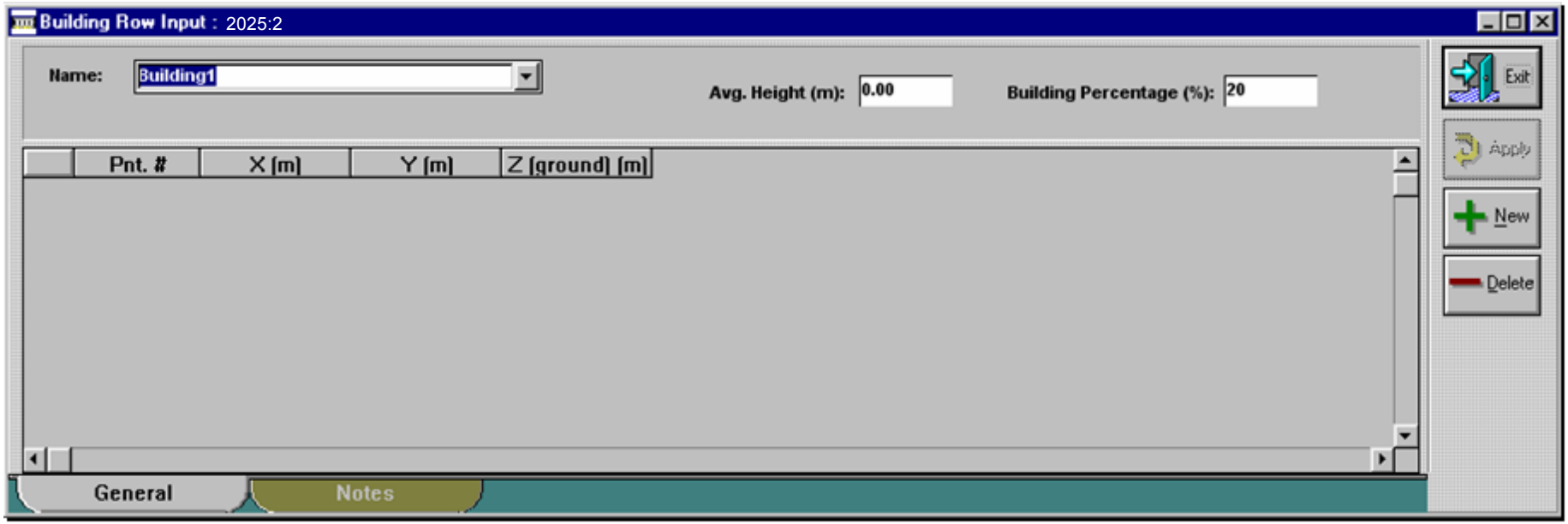

x 30
R13
1
2
Building Row
R10
R11
R12
N
BUILDING ROW
The **Building Row** will be modeled as one segment defined by two points and will be inputted using the mouse.
207+00
215+00
400'
300'
200'
100'
Y
0'
X
100'
200'
300'
400'
500'
600'
700'
800'
900'
Scale: 1" = 100'


Profile View
Mainlanes
Mainlanes
Fill
On Ramp
Streets
Frontage roads
50'
40'
Z
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

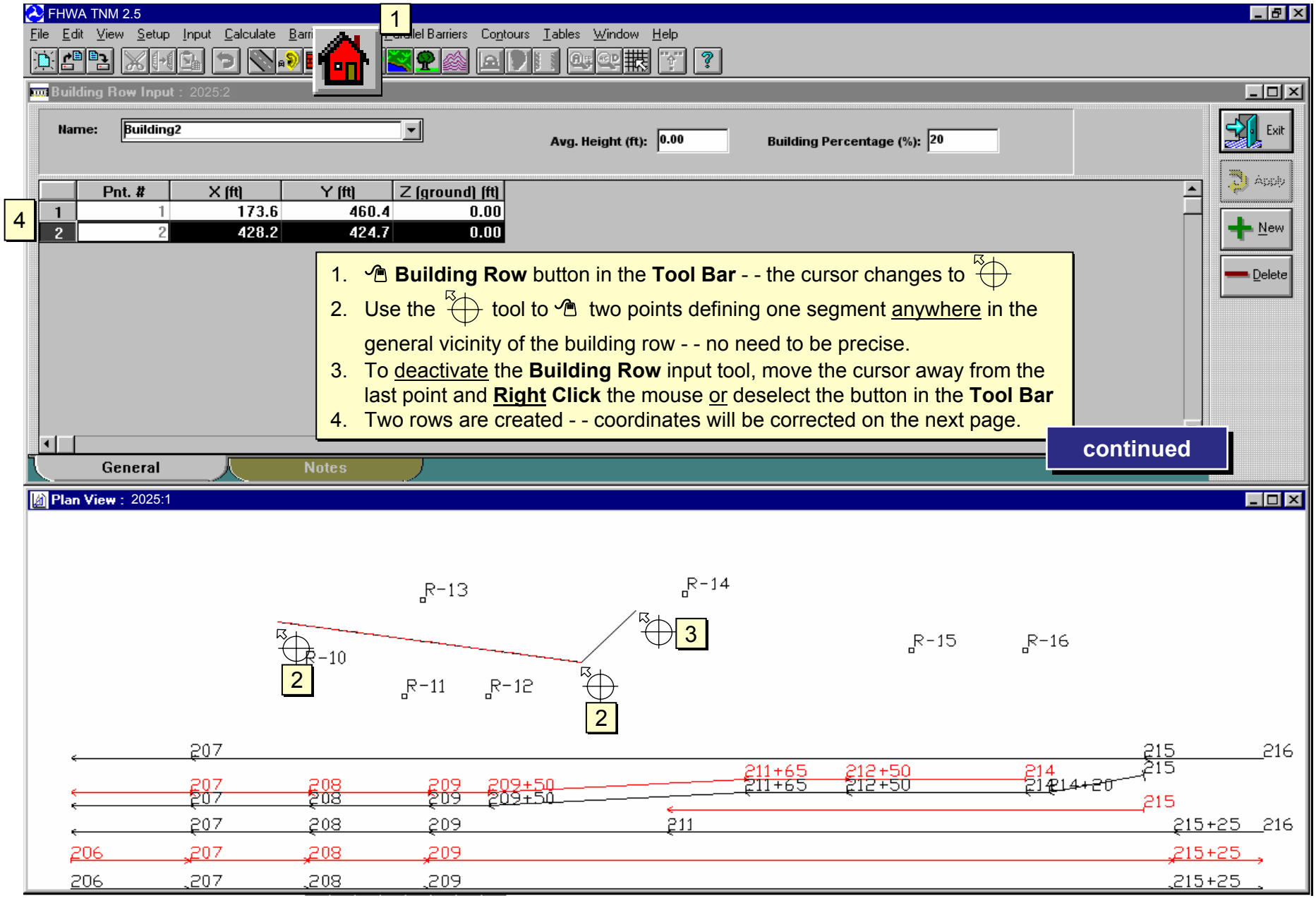
# BUILDING ROW INPUT (1 of 3)




Blank **Building Row Input** window appears



# BUILDING ROW INPUT (2 of 3)



# BUILDING ROW INPUT (3 of 3)

Building Row Input : 2025:2

Name: R-10, 11, 12 (5)  Avg. Height (ft): 15.00 (6)  Building Percentage (%): 79 (7)

Exit  Apply (9)  New  Delete

| | Pnt. # | X (ft) | Y (ft) | Z (ground) (ft) |
|---|---|---|---|---|
| 1 | 1 | 160.0 | 435.0 | 30.00 |
| 2 | 2 | 375.0 | 435.0 | 30.00 |

(8)

General  Notes

……continued from previous page.

5. in **Name** field and change **Building2** to **R-10,11,12**
6. in **Avg. Height** field and change to **15** (estimated)
7. in **Building Percentage** field and change from default of **20** to **79**

$$\frac{\textbf{Width of structures minus gaps (170)}}{\textbf{Total width of structures and gaps (215)}} = 79\%$$

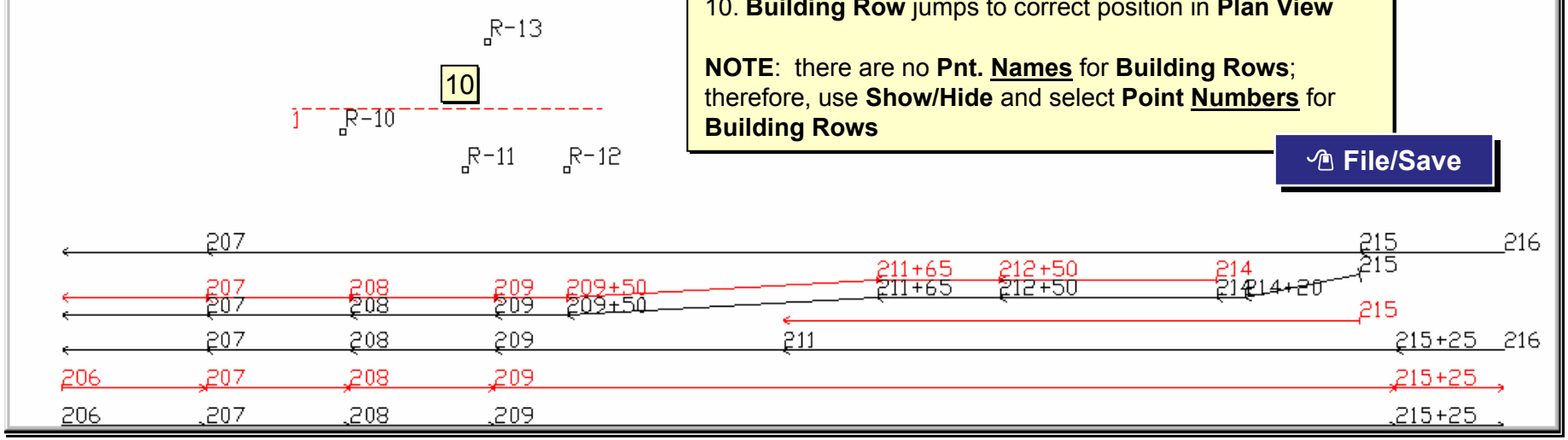
**NOTE:** minimum percentage allowed is 20
maximum percentage allowed is 80
(model structures >80 as existing barriers)

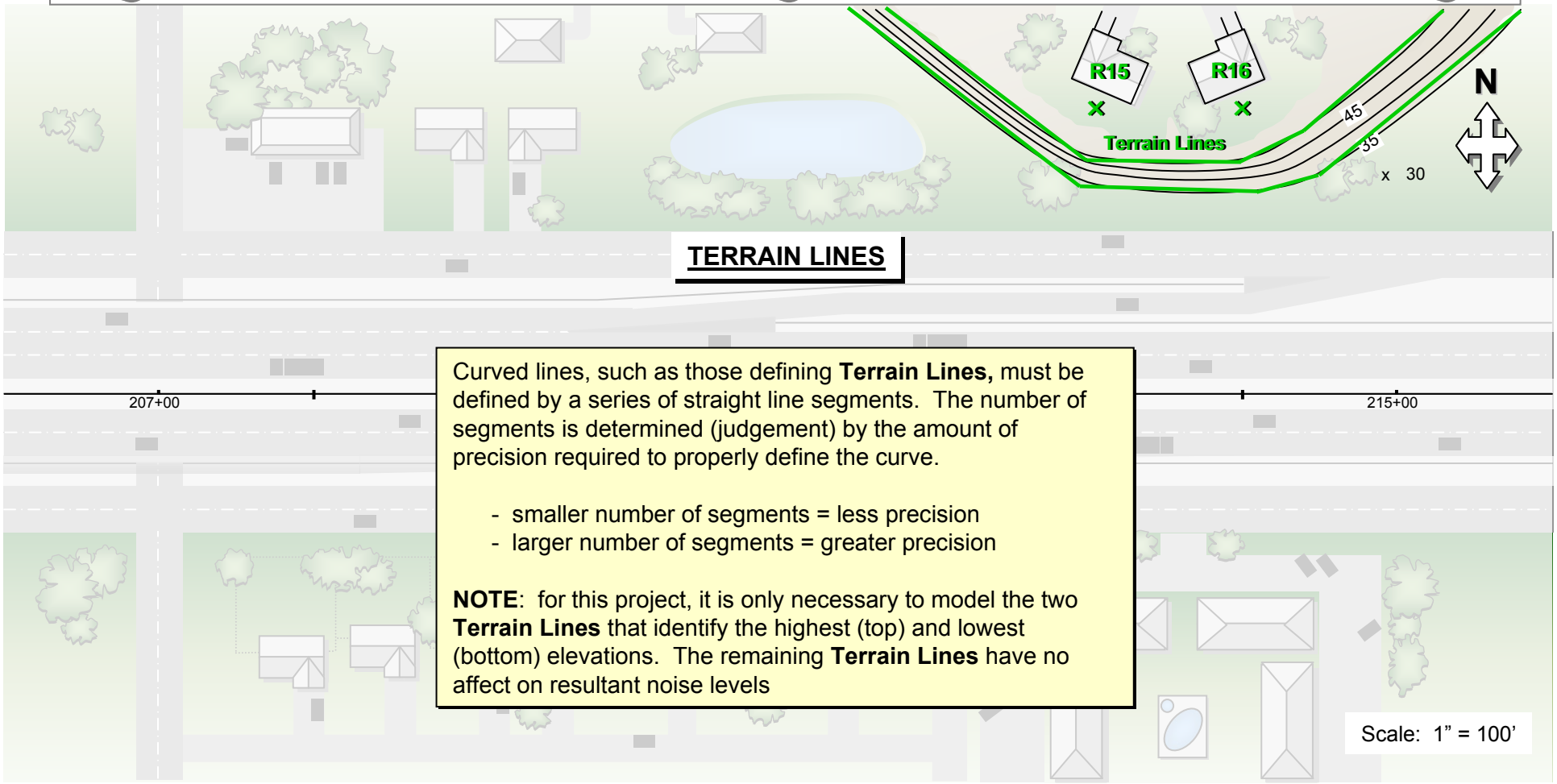
8. Enter correct **X**,**Y**,**Z** coordinates (Refer to Page F-2)
9. **Apply**
10. **Building Row** jumps to correct position in **Plan View**

**NOTE**: there are no **Pnt. Names** for **Building Rows**; therefore, use **Show/Hide** and select **Point Numbers** for **Building Rows**

**File/Save**

Plan View : 2025:1

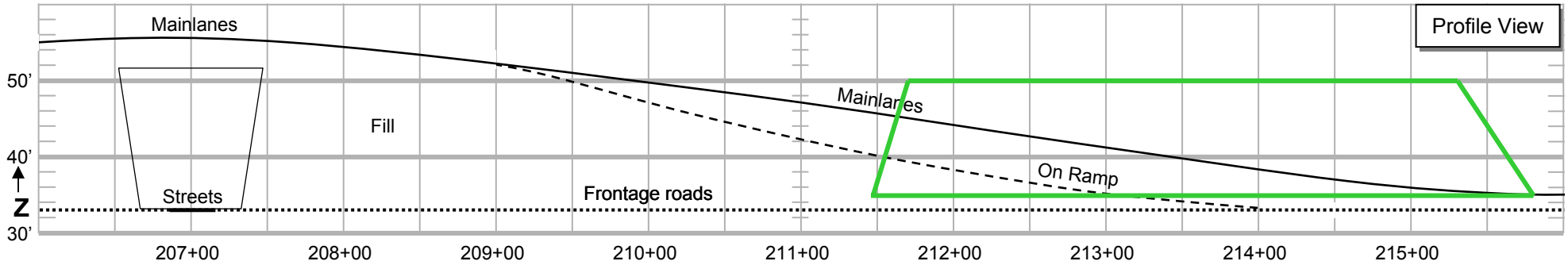


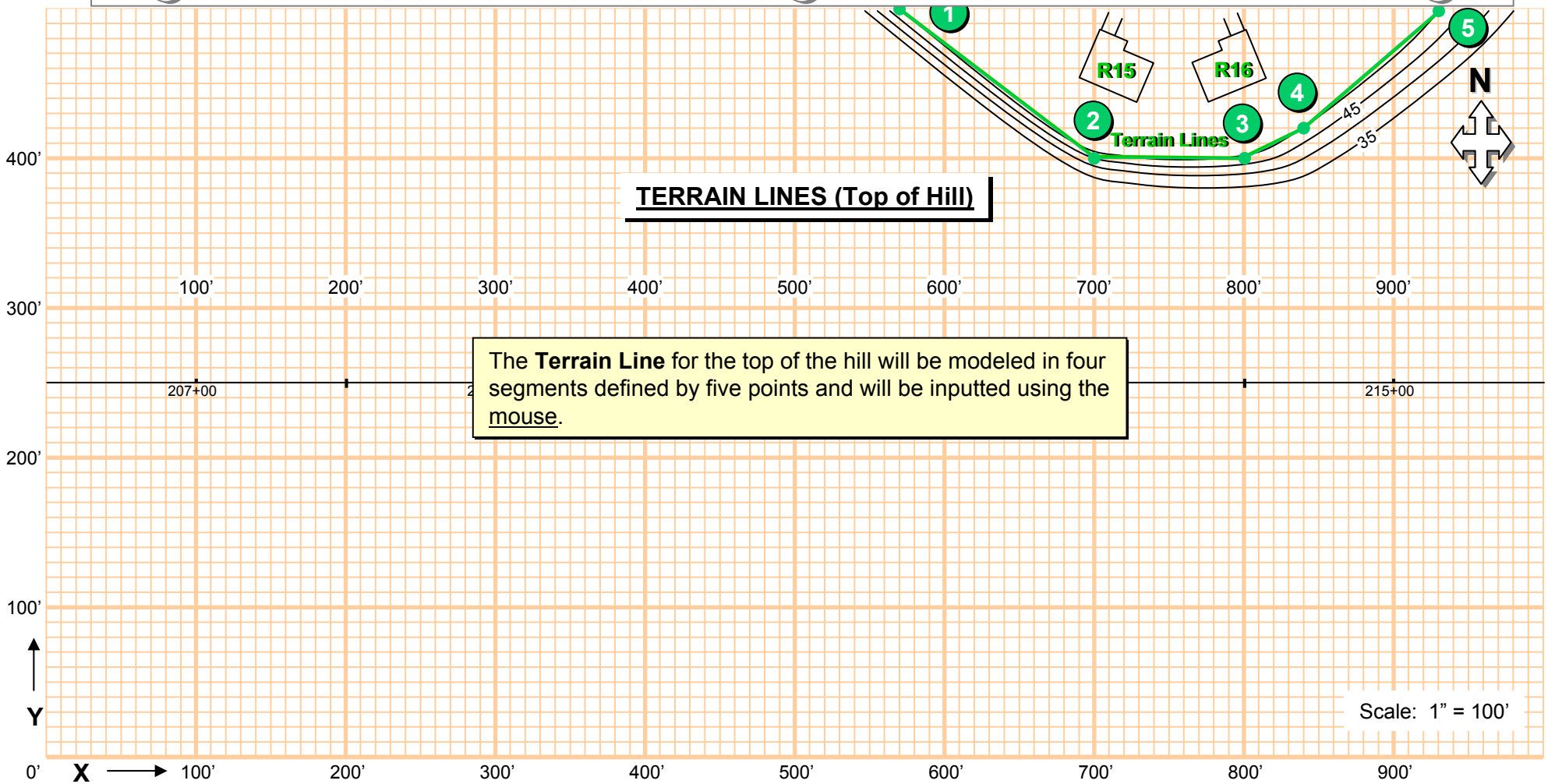



Curved lines, such as those defining **Terrain Lines,** must be defined by a series of straight line segments. The number of segments is determined (judgement) by the amount of precision required to properly define the curve.

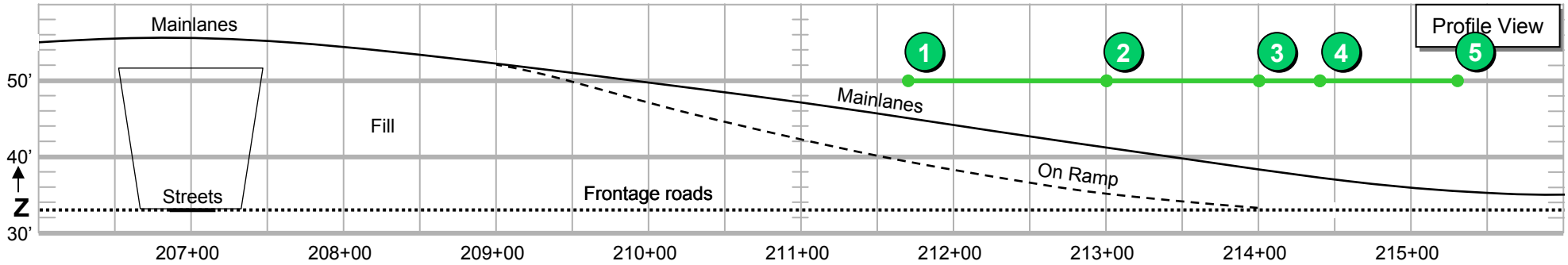
- smaller number of segments = less precision
- larger number of segments = greater precision

**NOTE**: for this project, it is only necessary to model the two **Terrain Lines** that identify the highest (top) and lowest (bottom) elevations. The remaining **Terrain Lines** have no affect on resultant noise levels

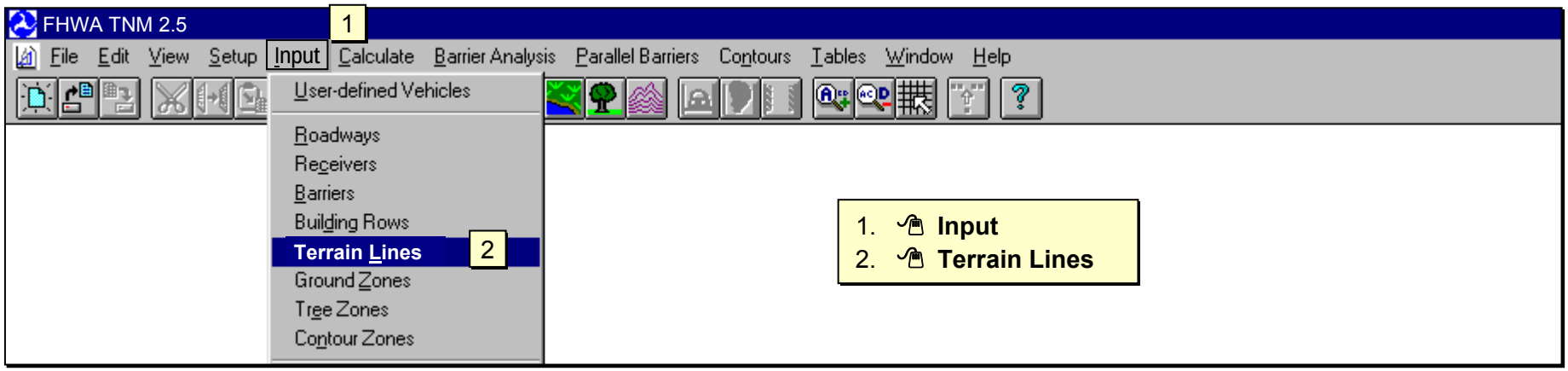




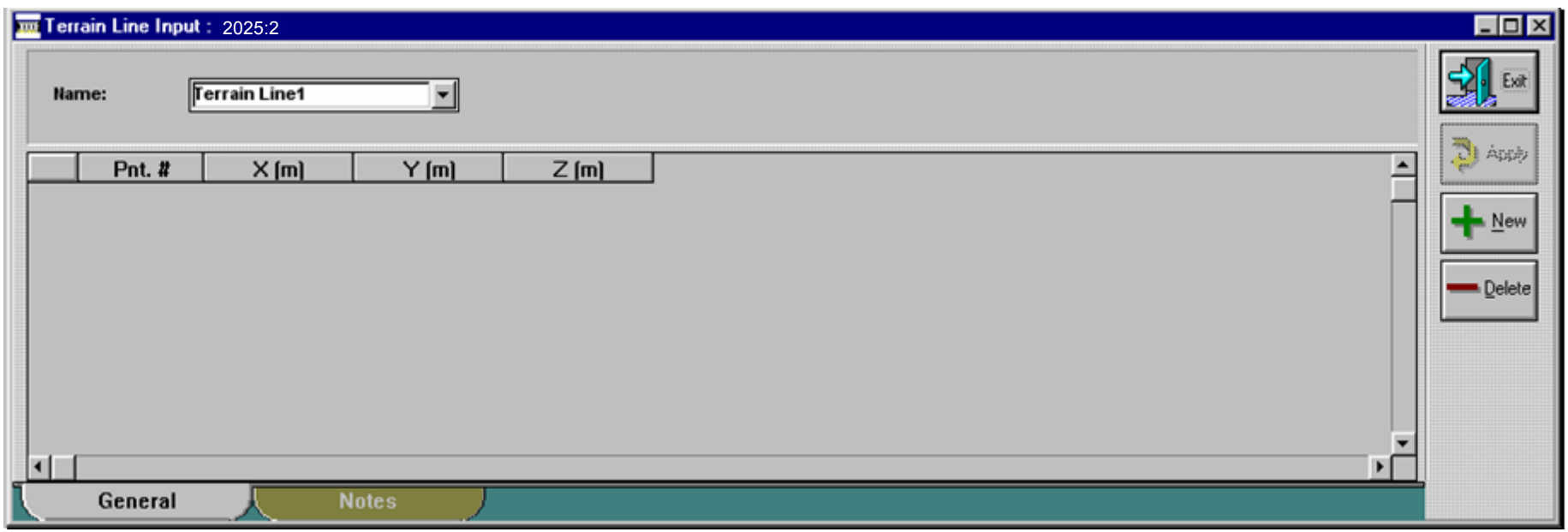

The **Terrain Line** for the top of the hill will be modeled in four segments defined by five points and will be inputted using the mouse.



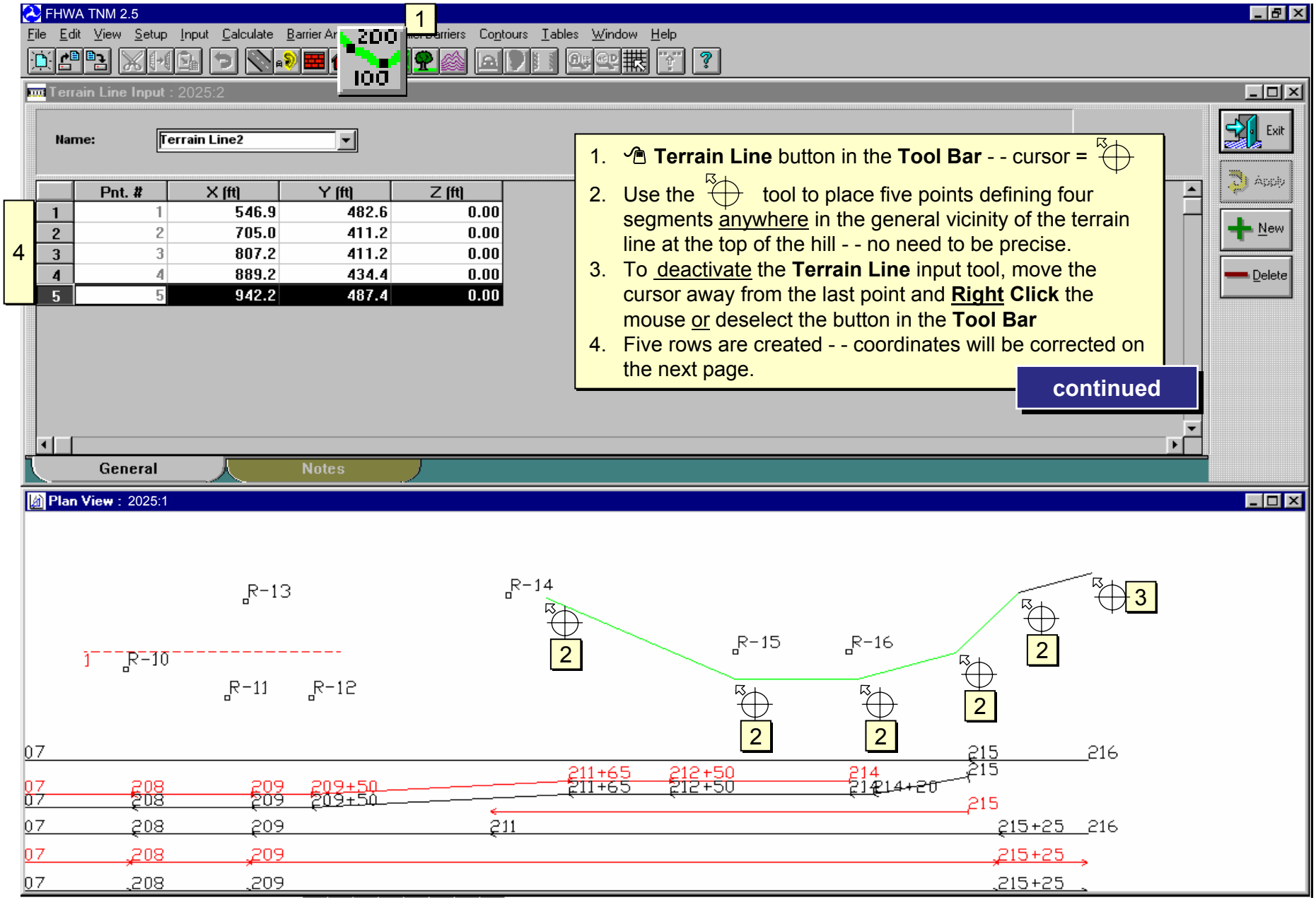
# TERRAIN LINE INPUT: Top of Hill (1 of 5)




Blank **Terrain Line Input** window appears



# TERRAIN LINE INPUT: Top of Hill (2 of 5)



# TERRAIN LINE INPUT: Top of Hill (3 of 5)

Terrain Line Input : 2025:2

Name: Top of Hill 5

| | Pnt. # | X [ft] | Y [ft] | Z [ft] |
|---|---|---|---|---|
| 1 | 1 | 570.0 | 500.0 | 50.00 |
| 2 | 2 | 700.0 | 400.0 | 50.00 |
| 3 | 3 | 800.0 | 400.0 | 50.00 |
| 4 | 4 | 840.0 | 420.0 | 50.00 |
| 5 | 5 | 930.0 | 500.0 | 50.00 |

6

7 Apply

Exit

New

Delete

General Notes

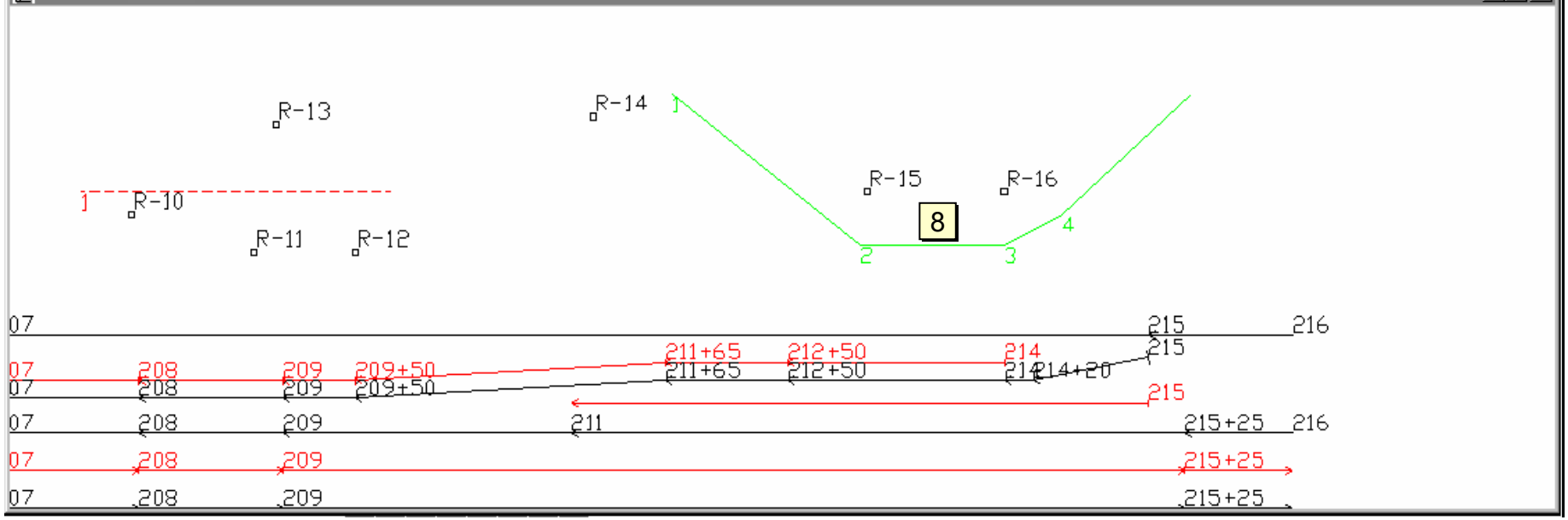
File/Save

…….continued from previous page.

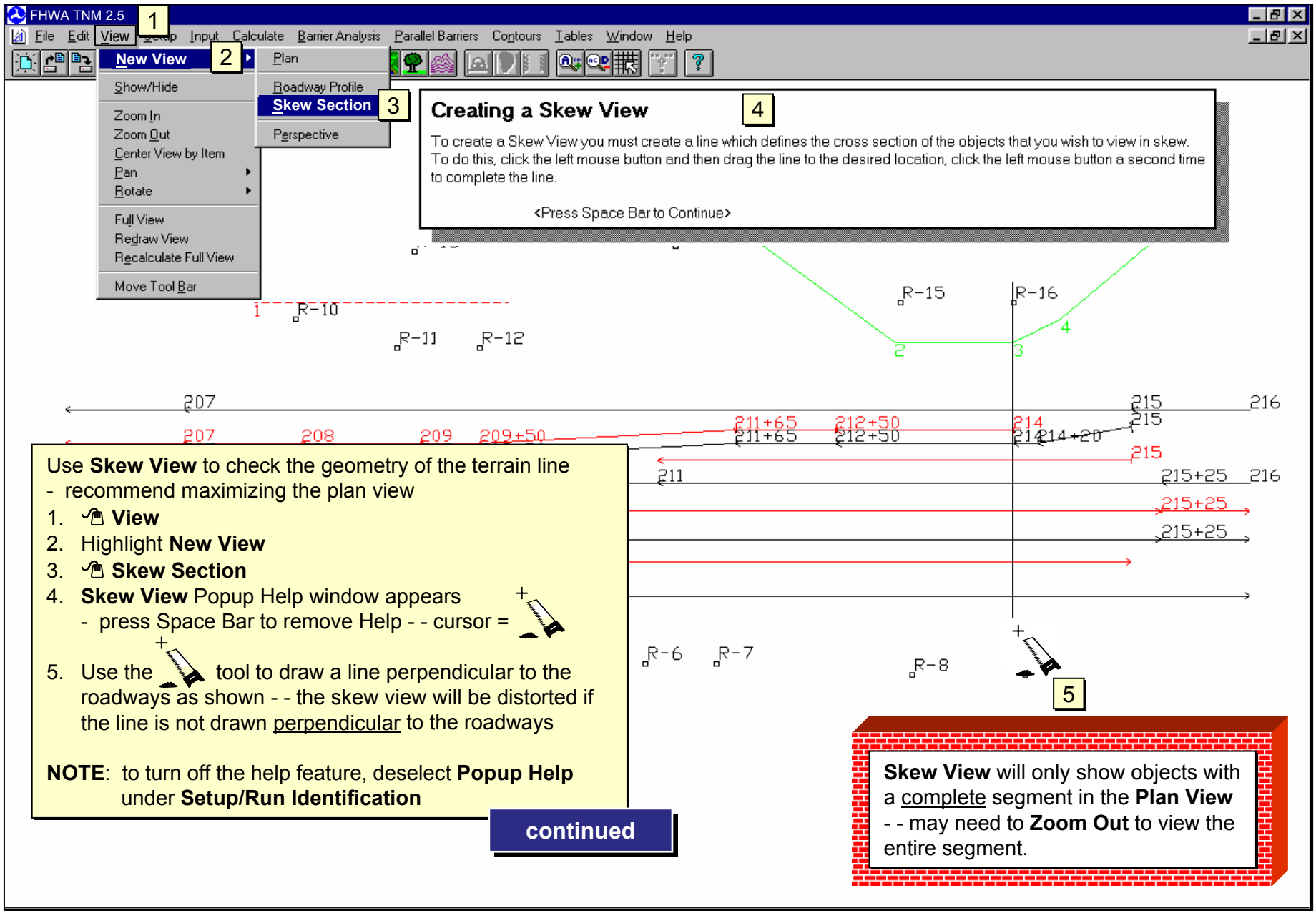
5. in **Name** field and change **Terrain Line 2** to **Top of hill**
6. Enter correct **X**,**Y**,**Z** coordinates (Refer to Page G-2)
7. **Apply**
8. **Terrain Line** jumps to proper position in **Plan View**

**NOTE**: there are no **Pnt. Names** for **Building Rows**; therefore, use **Show/Hide** and select **Point Numbers** for **Terrain Lines**

Plan View : 2025:1



# TERRAIN LINE INPUT: Top of Hill (4 of 5)




Use **Skew View** to check the geometry of the terrain line
- recommend maximizing the plan view

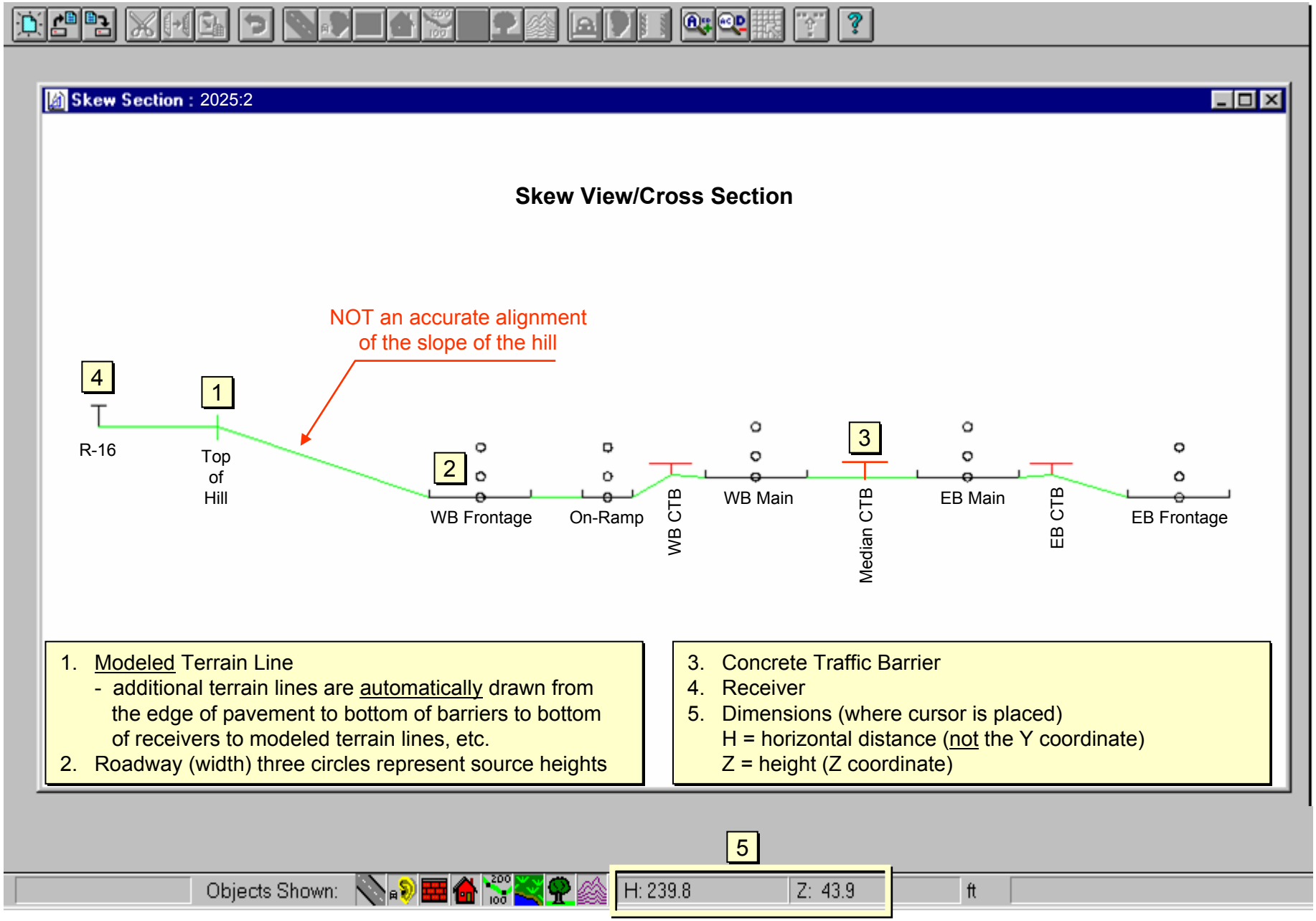
1. **View**
2. Highlight **New View**
3. **Skew Section**
4. **Skew View** Popup Help window appears
   - press Space Bar to remove Help - - cursor =
5. Use the tool to draw a line perpendicular to the roadways as shown - - the skew view will be distorted if the line is not drawn perpendicular to the roadways

**NOTE**: to turn off the help feature, deselect **Popup Help** under **Setup/Run Identification**

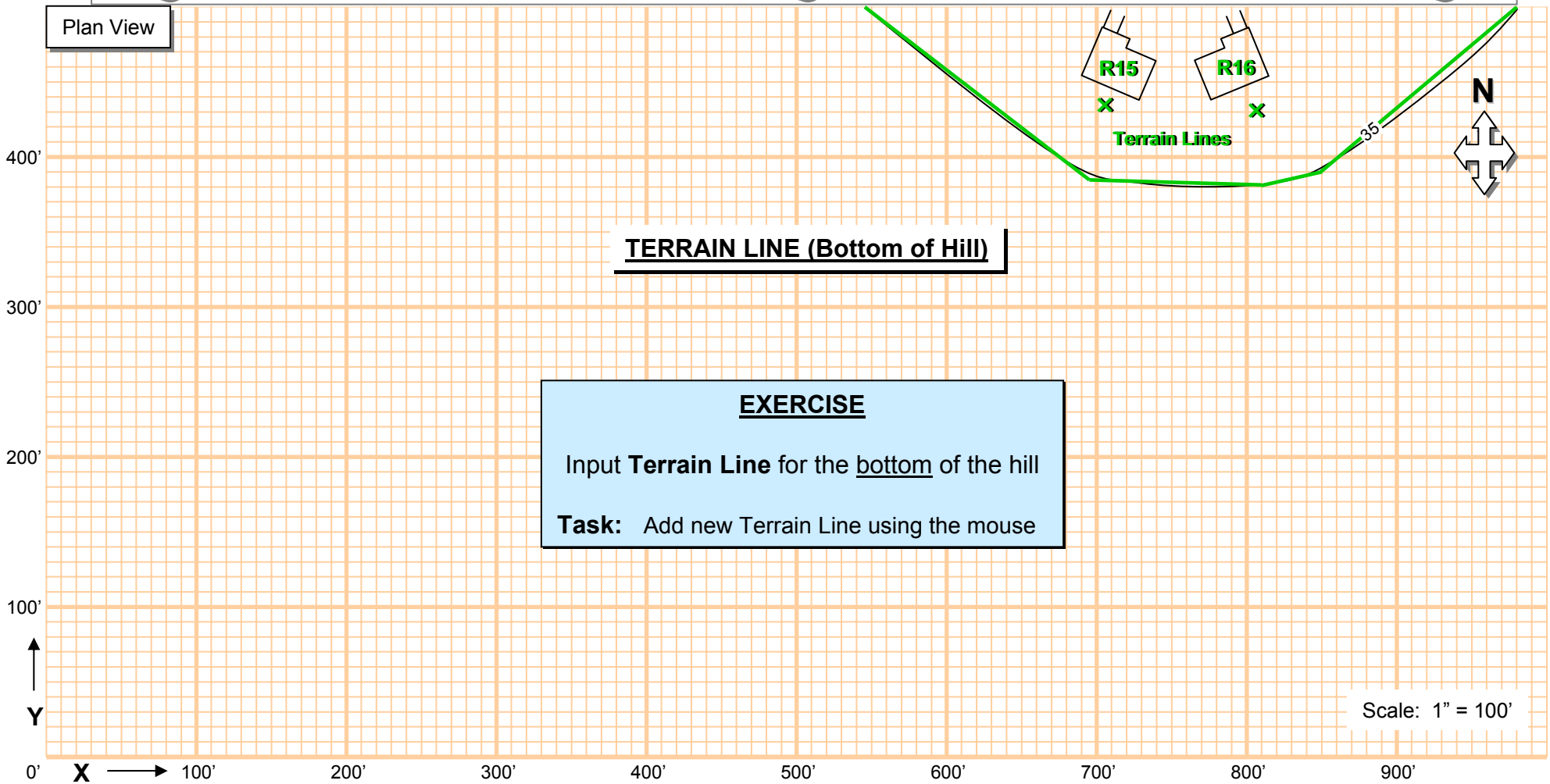
continued

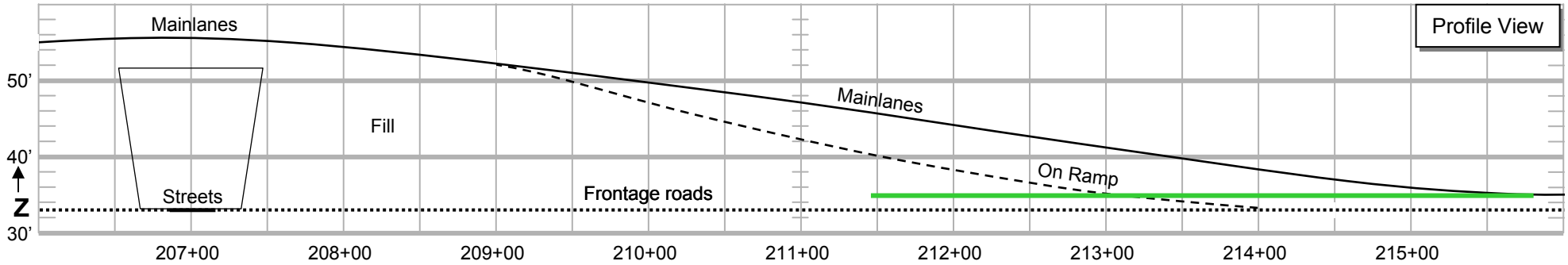
**Skew View** will only show objects with a complete segment in the **Plan View** - - may need to **Zoom Out** to view the entire segment.

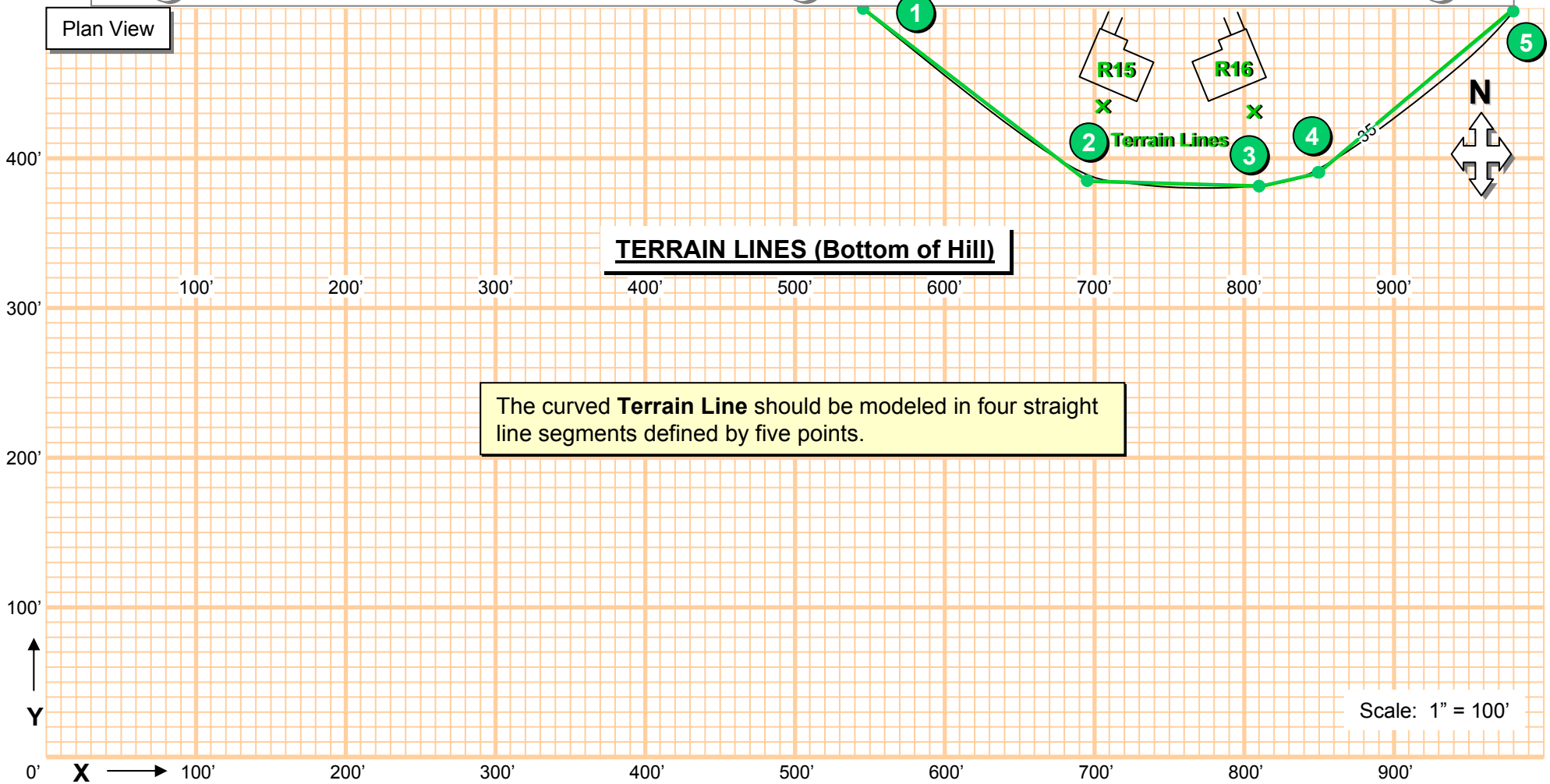
# TERRAIN LINE INPUT: Top of Hill (5 of 5)

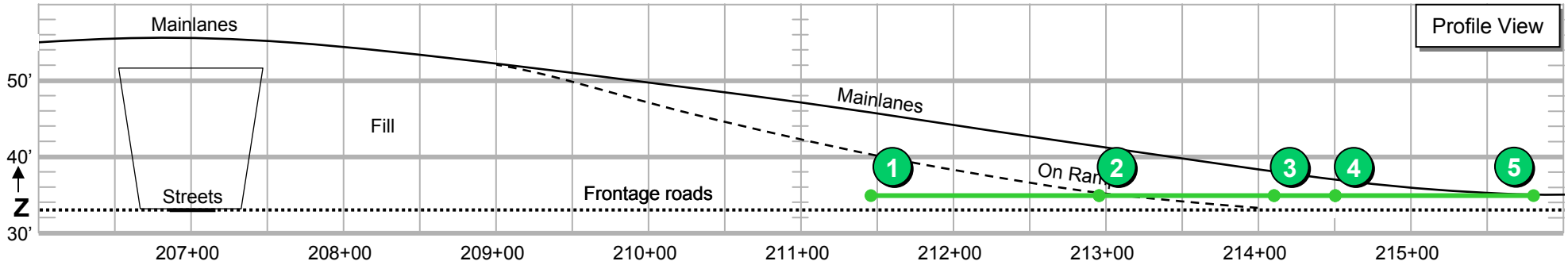



1. Modeled Terrain Line
   - additional terrain lines are automatically drawn from the edge of pavement to bottom of barriers to bottom of receivers to modeled terrain lines, etc.
2. Roadway (width) three circles represent source heights
3. Concrete Traffic Barrier
4. Receiver
5. Dimensions (where cursor is placed)
   H = horizontal distance (not the Y coordinate)
   Z = height (Z coordinate)


Plan View
R15
R16
Terrain Lines
35
N
TERRAIN LINE (Bottom of Hill)
EXERCISE
Input Terrain Line for the bottom of the hill
Task: Add new Terrain Line using the mouse
Scale: 1" = 100'
400'
300'
200'
100'
Y
0'
X
100'
200'
300'
400'
500'
600'
700'
800'
900'


Profile View
Mainlanes
Fill
Mainlanes
On Ramp
Streets
Frontage roads
50'
40'
Z
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00


Plan View
R15
R16
Terrain Lines
1
2
3
4
5
35
N
TERRAIN LINES (Bottom of Hill)
The curved **Terrain Line** should be modeled in four straight line segments defined by five points.
Scale: 1" = 100'
Y
X
0'
100'
200'
300'
400'
500'
600'
700'
800'
900'


Profile View
Mainlanes
Mainlanes
Fill
Streets
Frontage roads
On Ramp
1
2
3
4
5
Z
50'
40'
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

# TERRAIN LINE INPUT: Bottom of Hill (1 of 3)

FHWA TNM 2.5

File Edit View Setup Input Calculate Barrier Ar... Barriers Contours Tables Window Help

Terrain Line Input : 2025:2

Name: Bottom of Hill

| | Pnt. # | X [ft] | Y [ft] | Z [ft] |
|---|---|---|---|---|
| 1 | 6 | 545.0 | 500.0 | 35.00 |
| 2 | 7 | 695.0 | 385.0 | 35.00 |
| 3 | 8 | 810.0 | 380.0 | 35.00 |
| 4 | 9 | 850.0 | 390.0 | 35.00 |
| 5 | 10 | 980.0 | 500.0 | 35.00 |

General Notes

Exit Apply New Delete

1. **Terrain Line** icon in the **Tool Bar - -** cursor =
   - Use the tool to place five points defining four segments slightly below the terrain line previously modeled for the top of the hill - - no need to be precise.
   - Deactivate the **Terrain Line** input tool - - move the cursor away from the last point and **Right Click** the mouse or deselect the icon in the **Tool Bar**
2. Five rows are created
3. in **Name** field and change **Terrain Line 3** to **Bottom of hill**
4. Enter correct **X**,**Y**,**Z** coordinates (Refer to Page G-9)
5. **Apply**
6. **Terrain Line** jumps to proper position in **Plan View**

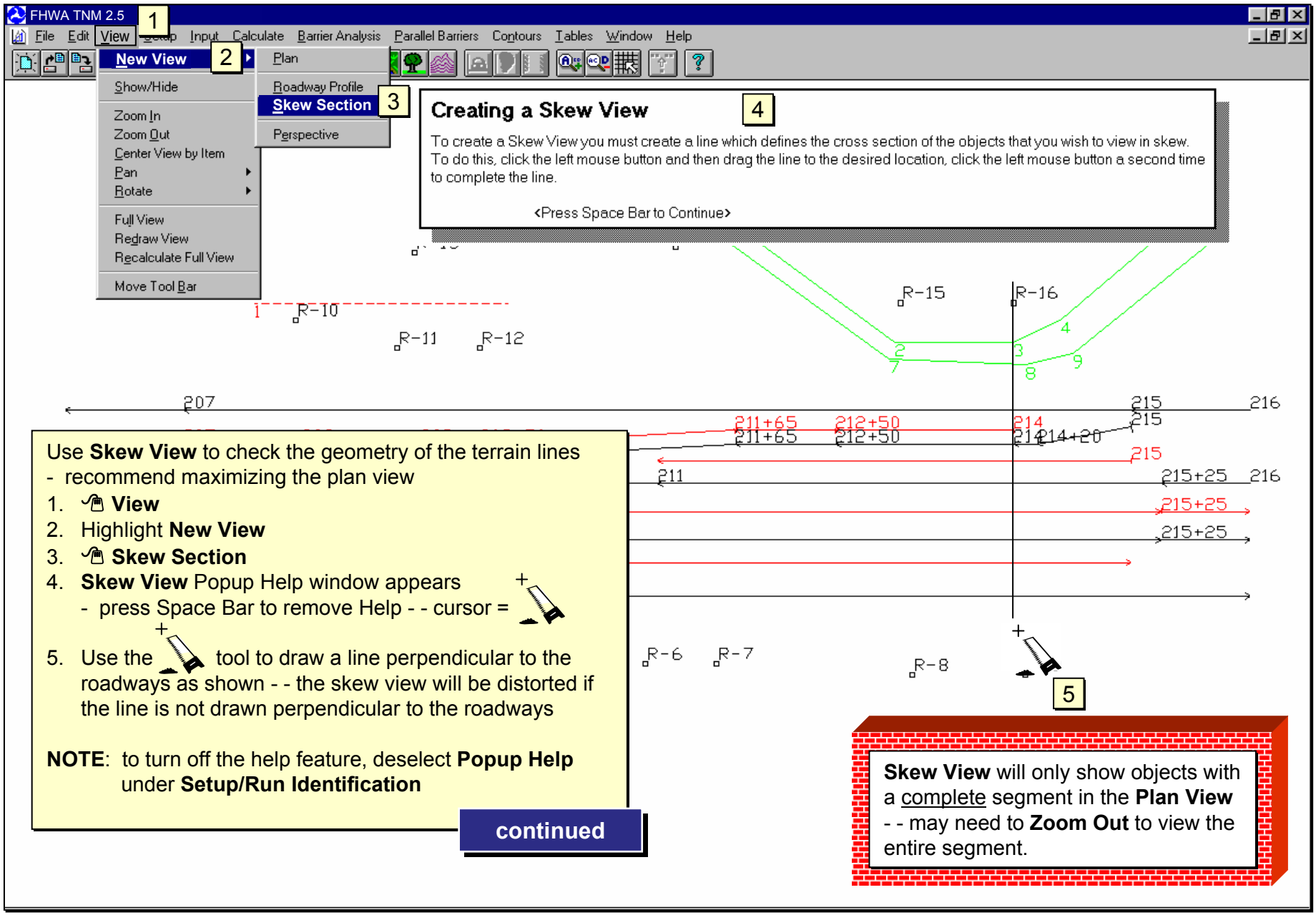
**File/Save**

Plan View : 2025:1

R-13 R-14 R-15 R-16 R-10 R-11 R-12

07 208 209 209+50 211+65 212+50 214 214+20 215 216 211 215+25

# TERRAIN LINE INPUT: Bottom of Hill (2 of 3)




Use **Skew View** to check the geometry of the terrain lines
- recommend maximizing the plan view

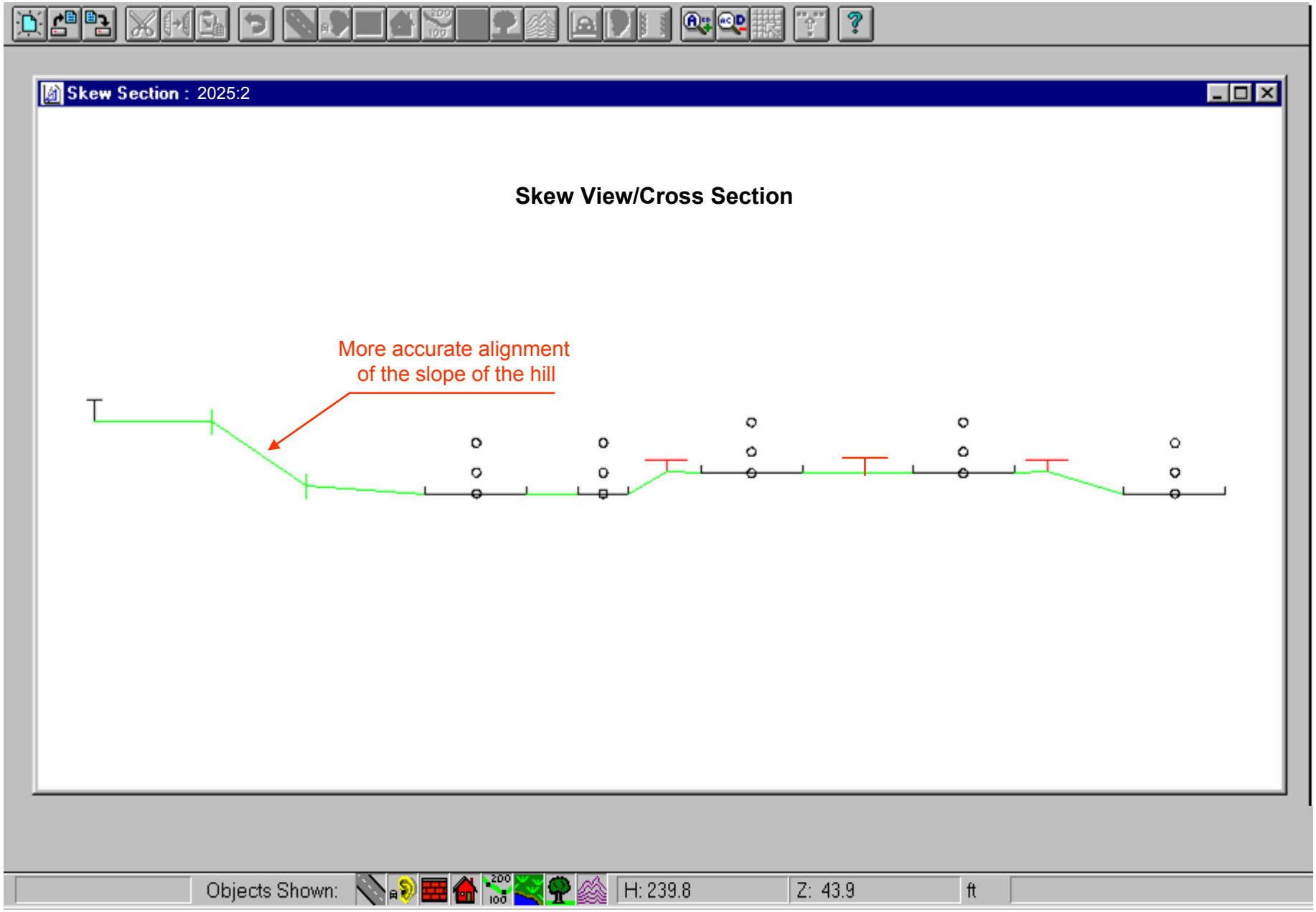
1. **View**
2. Highlight **New View**
3. **Skew Section**
4. **Skew View** Popup Help window appears
   - press Space Bar to remove Help - - cursor =
5. Use the tool to draw a line perpendicular to the roadways as shown - - the skew view will be distorted if the line is not drawn perpendicular to the roadways

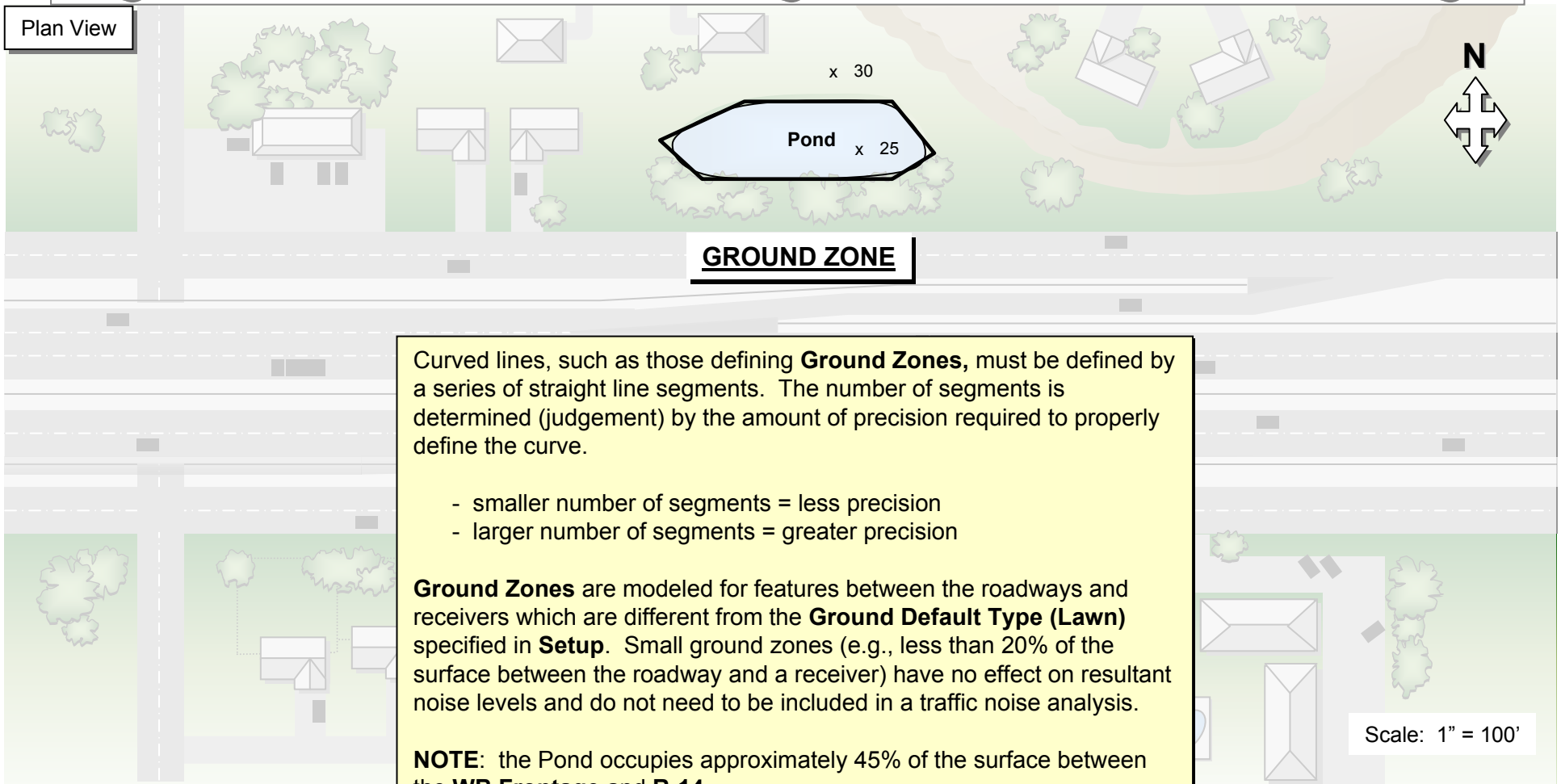
**NOTE**: to turn off the help feature, deselect **Popup Help** under **Setup/Run Identification**

continued

**Skew View** will only show objects with a complete segment in the **Plan View** - - may need to **Zoom Out** to view the entire segment.

## TERRAIN LINE INPUT: Bottom of Hill (3 of 3)



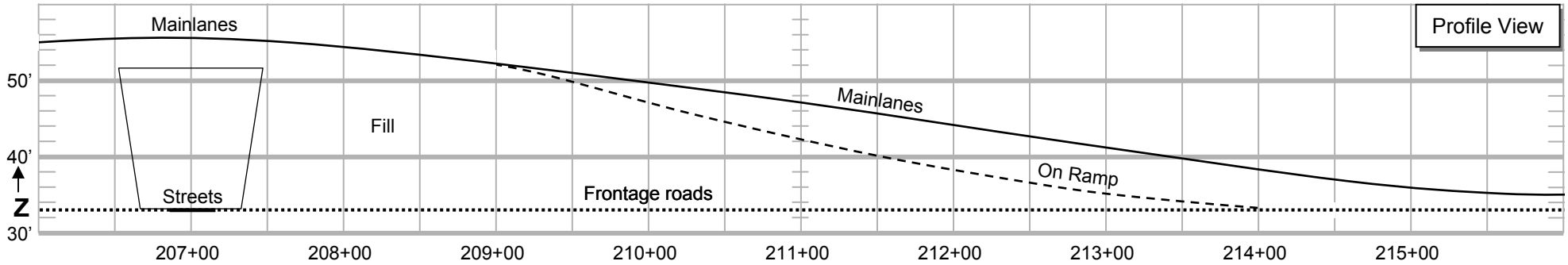


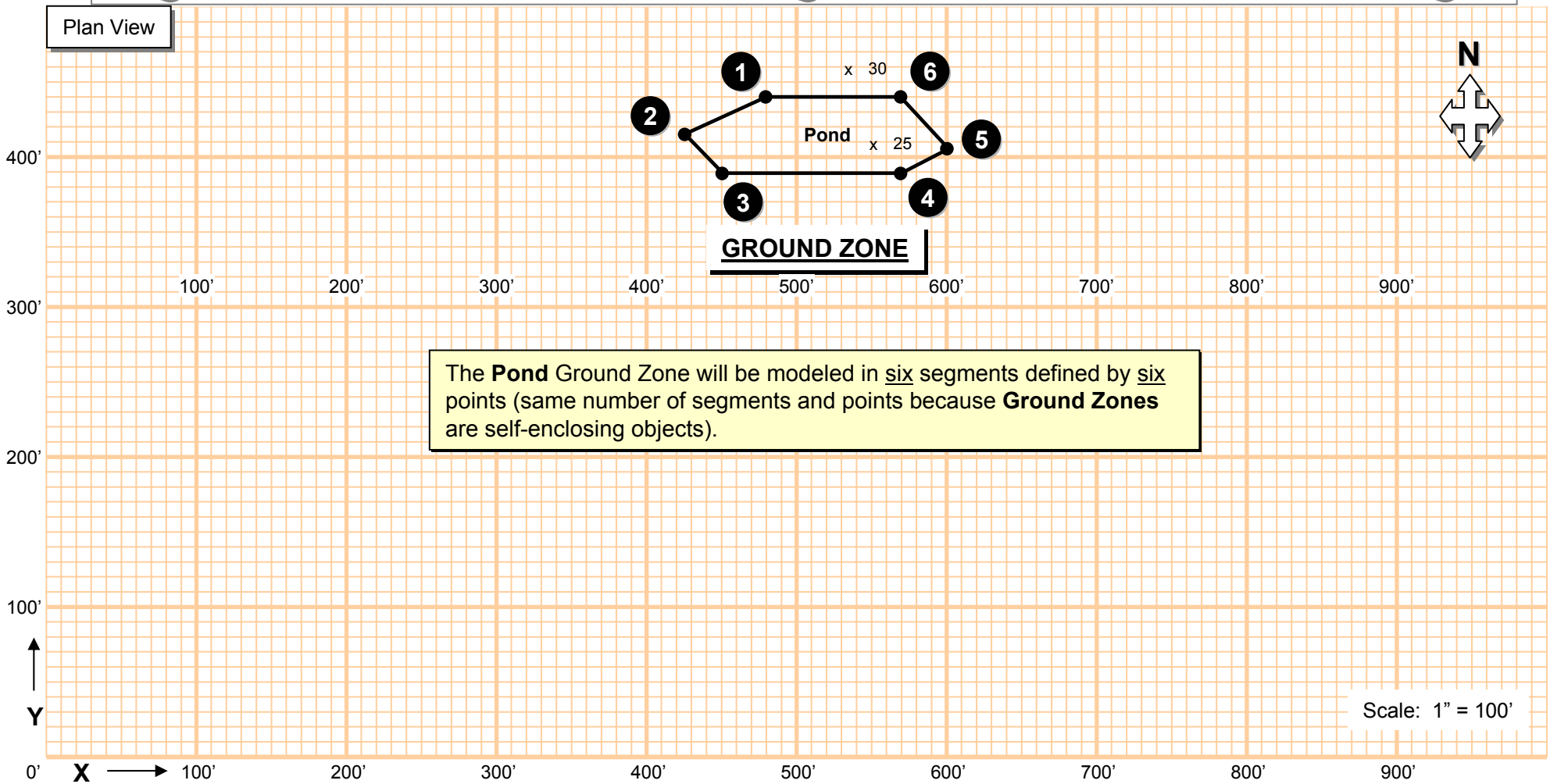

Curved lines, such as those defining **Ground Zones,** must be defined by a series of straight line segments. The number of segments is determined (judgement) by the amount of precision required to properly define the curve.

- smaller number of segments = less precision
- larger number of segments = greater precision

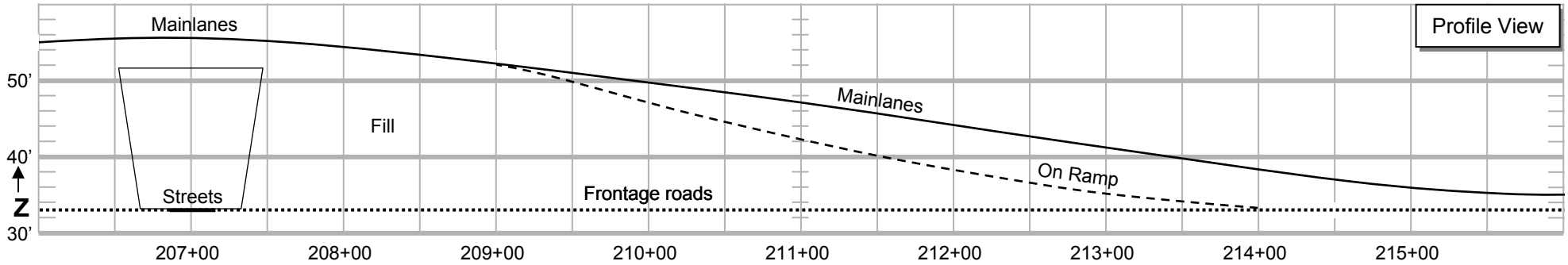
**Ground Zones** are modeled for features between the roadways and receivers which are different from the **Ground Default Type (Lawn)** specified in **Setup**. Small ground zones (e.g., less than 20% of the surface between the roadway and a receiver) have no effect on resultant noise levels and do not need to be included in a traffic noise analysis.

**NOTE**: the Pond occupies approximately 45% of the surface between the **WB Frontage** and **R-14**.

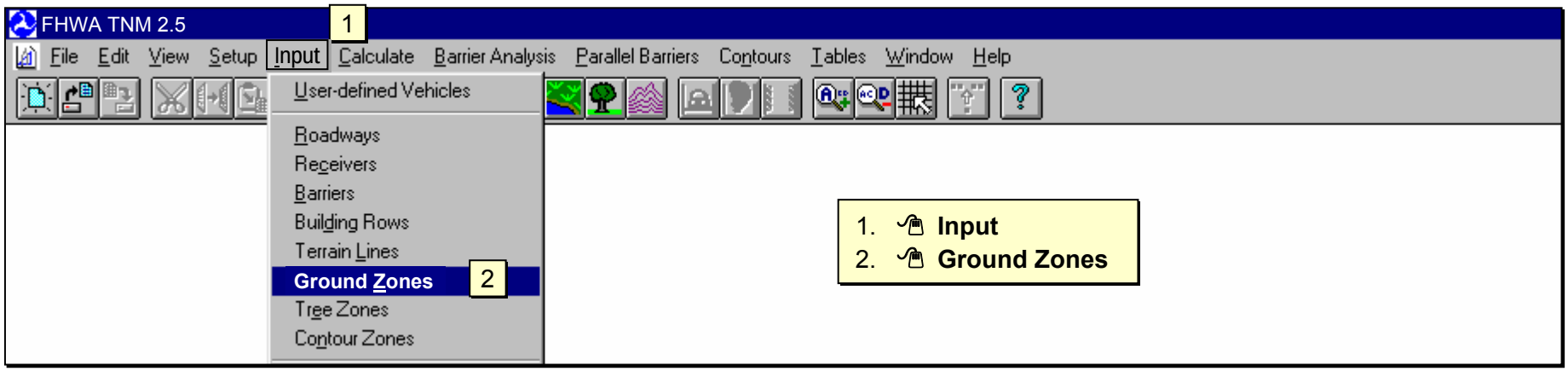




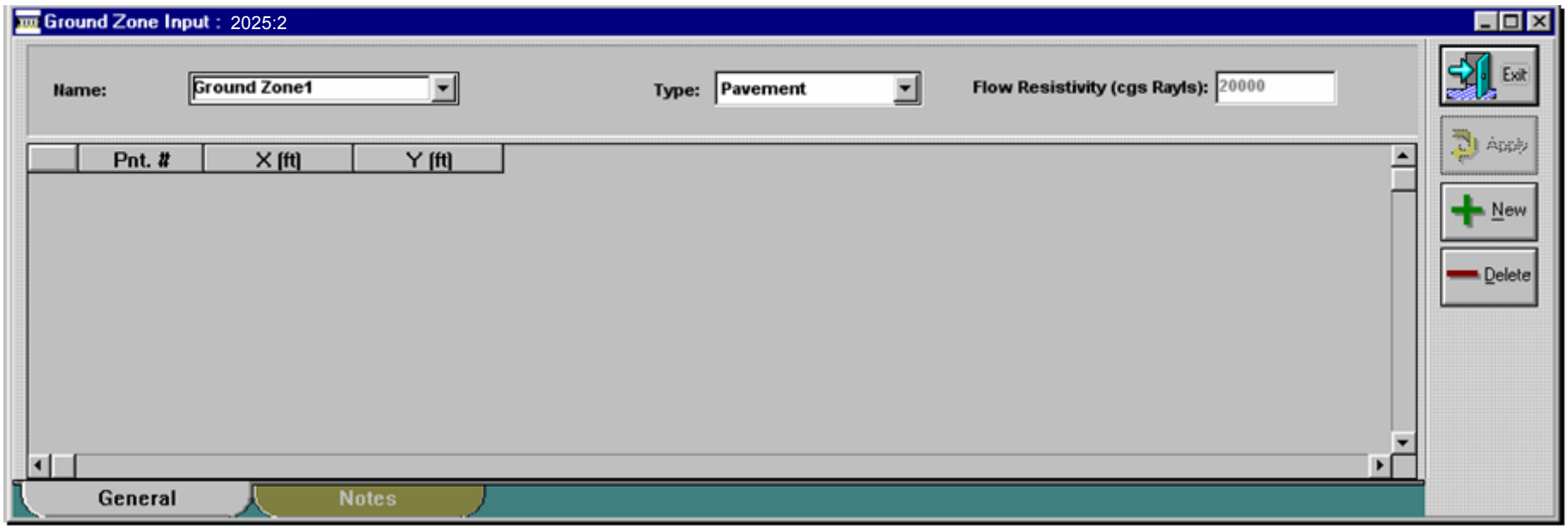

The **Pond** Ground Zone will be modeled in six segments defined by six points (same number of segments and points because **Ground Zones** are self-enclosing objects).



## GROUND ZONE INPUT: Pond (1 of 3)




Blank **Ground Zone Input** window appears



# GROUND ZONE INPUT: Pond (2 of 3)

FHWA TNM 2.5

File Edit View Setup Input Calculate Barrier Analysis Contours Tables Window Help

1

Ground Zone Input : 2025:2

Name: Ground Zone2 Type: Pavement Flow Resistivity (cgs Rayls): 20000

Exit Apply New Delete

4

| | Pnt. # | X [ft] | Y [ft] |
|---|---|---|---|
| 1 | 1 | 443.9 | 453.3 |
| 2 | 2 | 398.7 | 408.2 |
| 3 | 3 | 439.2 | 388.3 |
| 4 | 4 | 560.8 | 388.3 |
| 5 | 5 | 596.6 | 424.1 |
| 6 | 6 | 535.5 | 454.7 |

**Enlarge Plan View: use Arrow and Page Up (magnify) keys**

Ensure the **Plan View** window is active (dark blue banner)

1. **Ground Zone** icon in the **Tool Bar** - - the cursor changes to
2. Use the tool to place six points defining six segments anywhere in the general vicinity of the pond - - no need to be precise.
3. To deactivate the **Ground Zone** input tool, move the cursor away from the last point and **Right Click** the mouse
4. Six rows are created - - coordinates will be adjusted on the next page.

**continued**

General Notes

Plan View : 2025:1

R-13 R-14 R-15 R-16 R-10 R-11 R-12

1 2 3 4 7 8 9

208 209 209+50 211+65 212+50 214

# GROUND ZONE INPUT: Pond (3 of 3)

Ground Zone Input : 2025:2

Name: Pond Surface 5 Type: Water 6 Flow Resistivity (cgs Rayls): 20000 7

Exit 9 Apply New Delete

| | Pnt. # | X [ft] | Y [ft] |
|---|---|---|---|
| 1 | 1 | 480.0 | 440.0 |
| 2 | 2 | 425.0 | 415.0 | 
| 3 | 3 | 450.0 | 390.0 |
| 4 | 4 | 570.0 | 390.0 |
| 5 | 5 | 600.0 | 405.0 |
| 6 | 6 | 570.0 | 440.0 |

8

General Notes

…….continued from previous page.

5. in **Name** field and change **Ground Zone 2** to **Pond Surface**
6. down arrow in the **Type** field and **Water**
7. **Flow Resistivity** changes automatically with the ground **Type**
8. Enter correct **X**,**Y** coordinates (Refer to Page H-2)

**NOTE**: there are no **Z** coordinates for Ground Zones since they are automatically placed on the surface of surrounding terrain

9. **Apply**
10. **Ground Zone** jumps to proper position in **Plan View**

**NOTE**: there are no **Pnt. Names** for **Ground Zones**; therefore, use **Show/Hide** and select **Point Numbers** for **Ground Zones.**

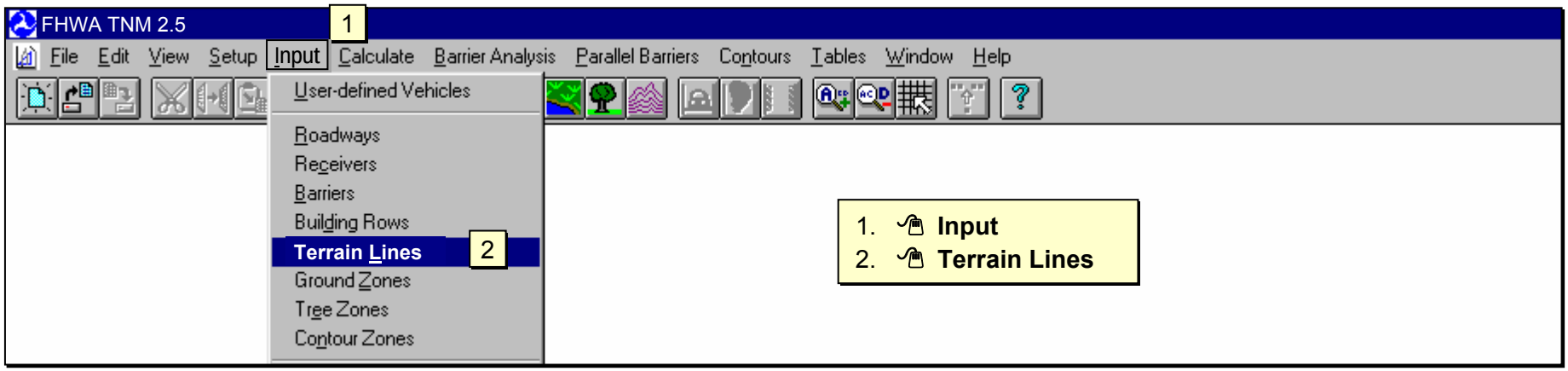
**File/Save**

Plan View : 2025:1

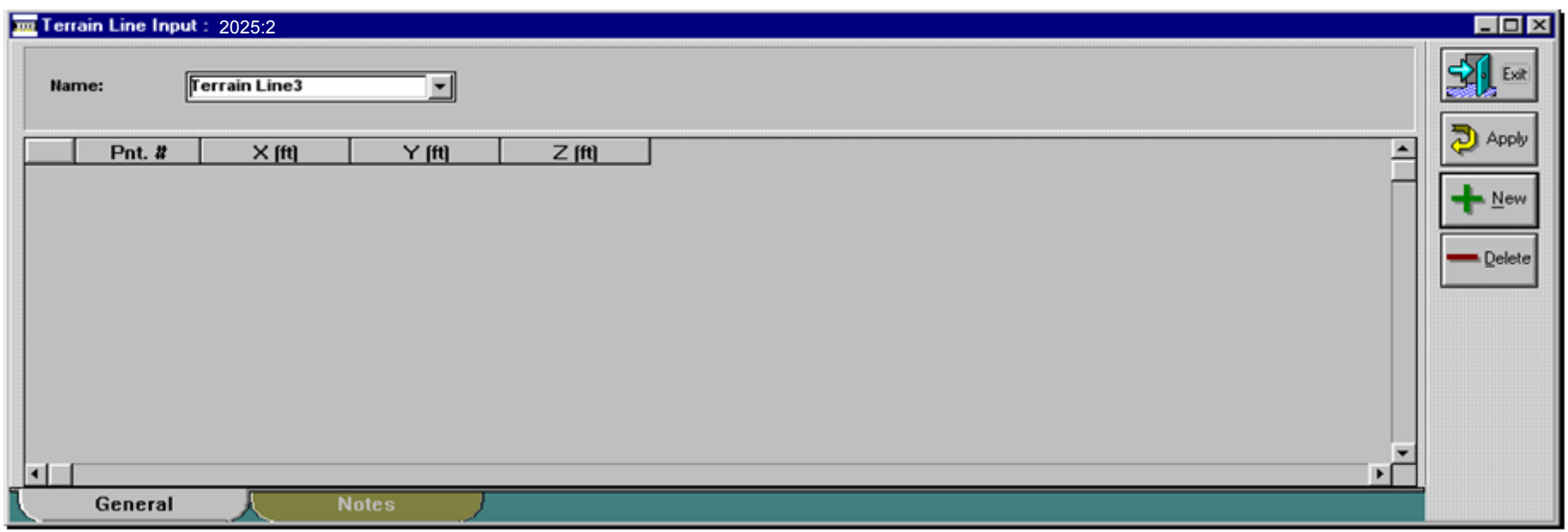
R-13 R-14 R-15 R-16 R-10 R-11 R-12 10 208 209 209+50

**NOTE**: since **Z** coordinates are not used for Ground Zones, without any further steps, the elevation of the surface of the pond would be the same as the surface of the surrounding terrain (30'). Therefore, two terrain lines will be modeled around the pond to define the elevation of the surface of the pond (25') and the top of the embankment (30').

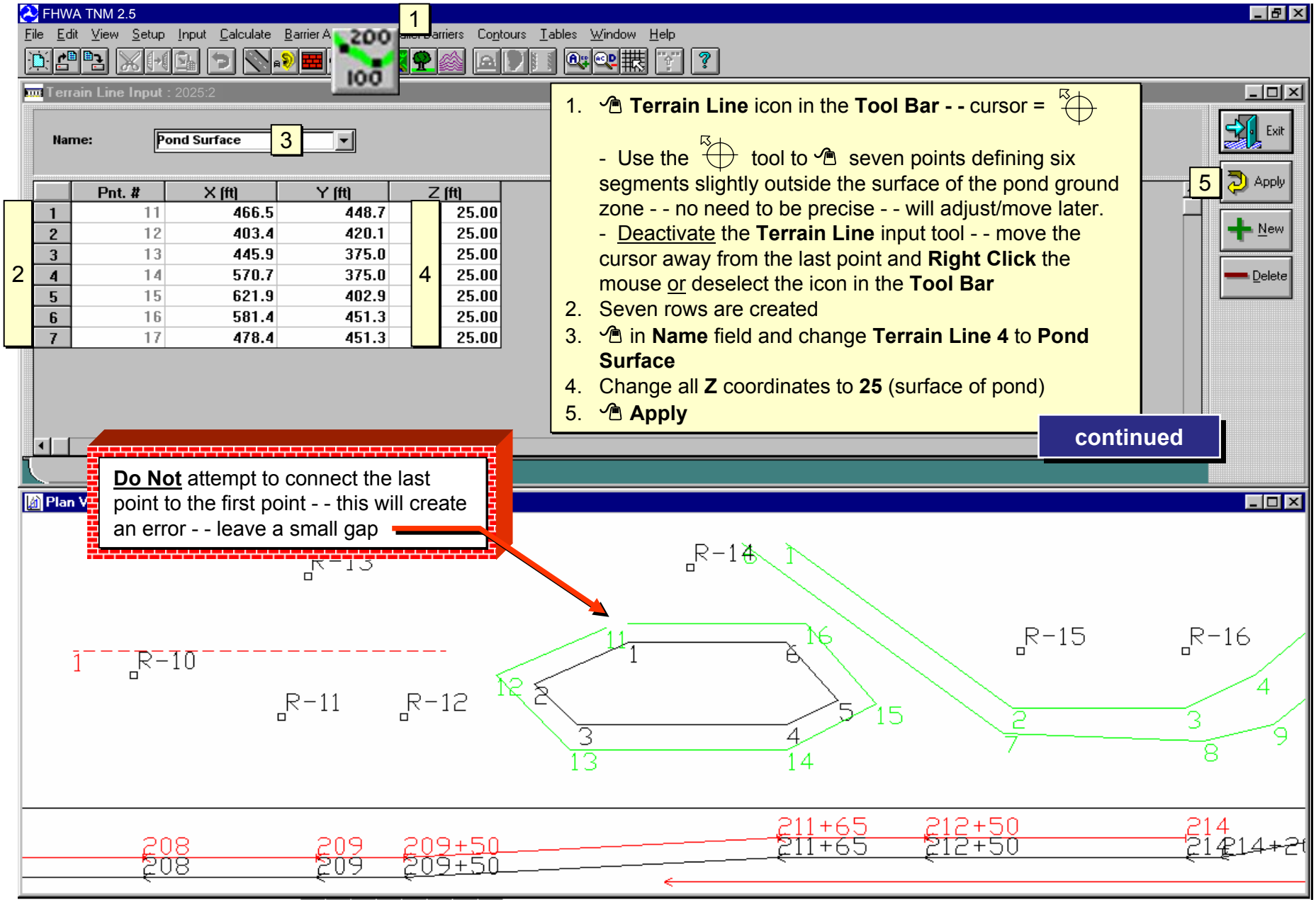
# TERRAIN LINE INPUT: Pond Surface (1 of 5)



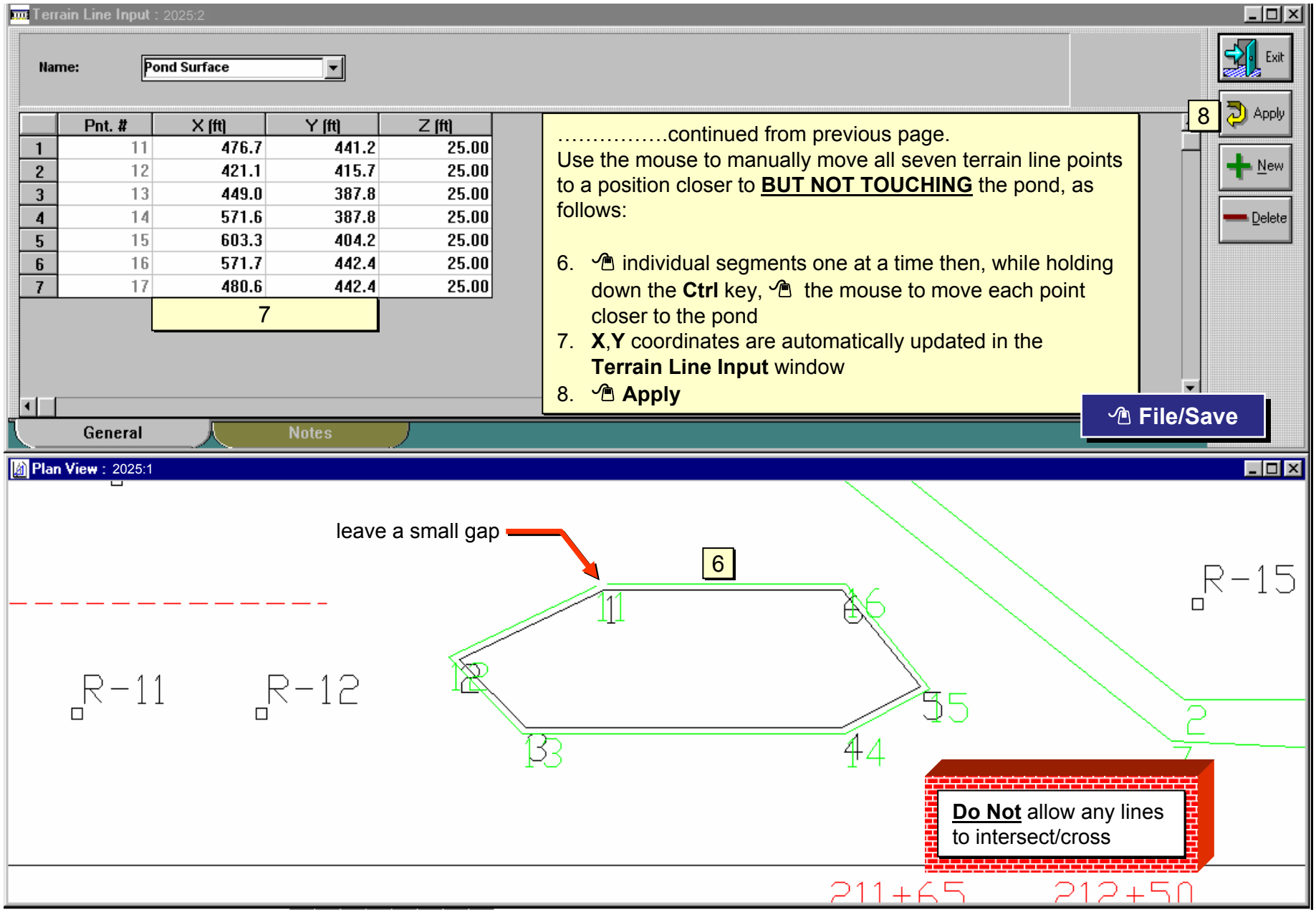

Blank **Terrain Line Input** window appears



# TERRAIN LINE INPUT: Pond Surface (2 of 5)



# TERRAIN LINE INPUT: Pond Surface (3 of 5)

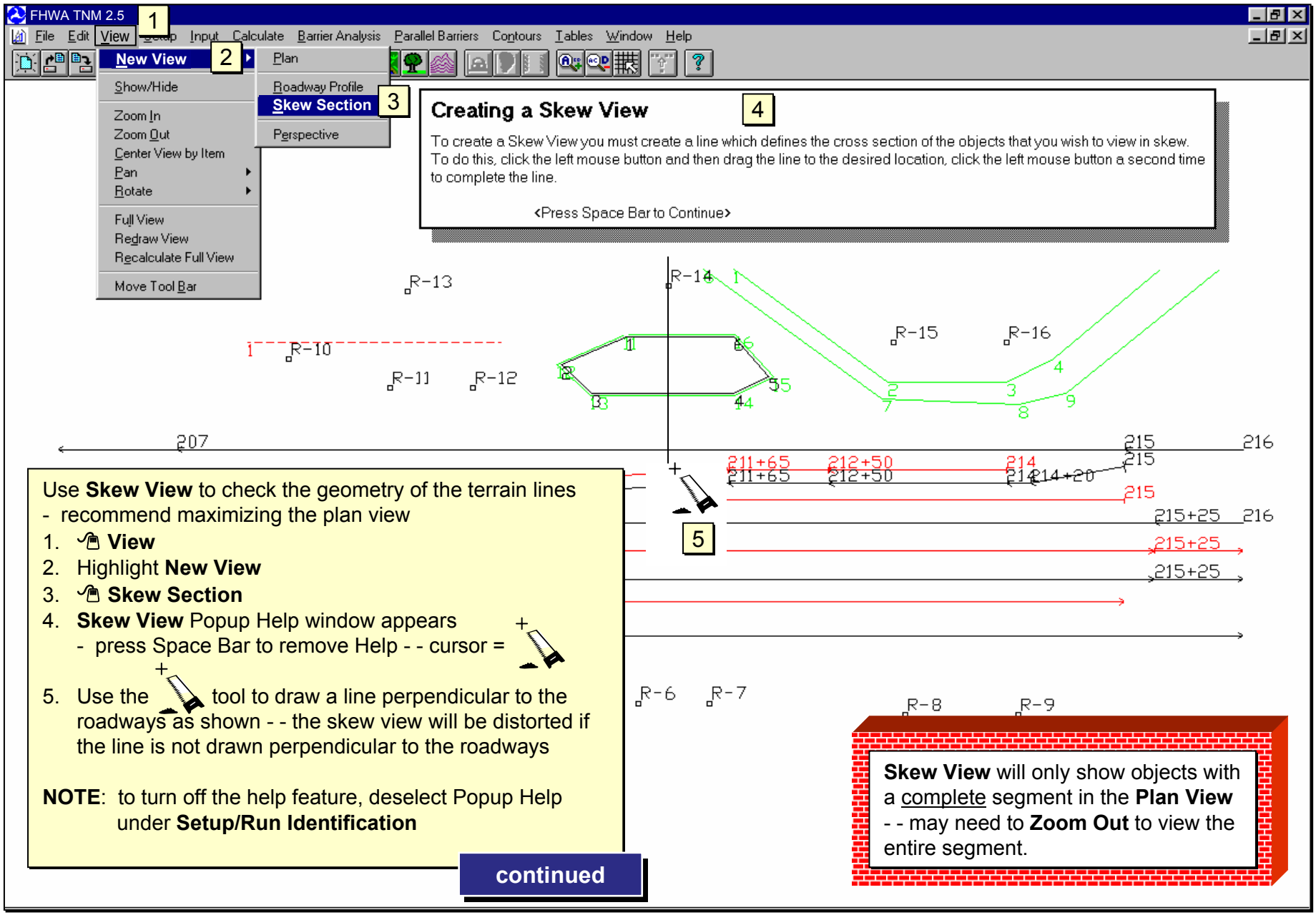



| | Pnt. # | X [ft] | Y [ft] | Z [ft] |
|---|---|---|---|---|
| 1 | 11 | 476.7 | 441.2 | 25.00 |
| 2 | 12 | 421.1 | 415.7 | 25.00 |
| 3 | 13 | 449.0 | 387.8 | 25.00 |
| 4 | 14 | 571.6 | 387.8 | 25.00 |
| 5 | 15 | 603.3 | 404.2 | 25.00 |
| 6 | 16 | 571.7 | 442.4 | 25.00 |
| 7 | 17 | 480.6 | 442.4 | 25.00 |

……continued from previous page.
Use the mouse to manually move all seven terrain line points to a position closer to **BUT NOT TOUCHING** the pond, as follows:

6. individual segments one at a time then, while holding down the **Ctrl** key, the mouse to move each point closer to the pond
7. **X**,**Y** coordinates are automatically updated in the **Terrain Line Input** window
8. **Apply**

# TERRAIN LINE INPUT: Pond Surface (4 of 5)



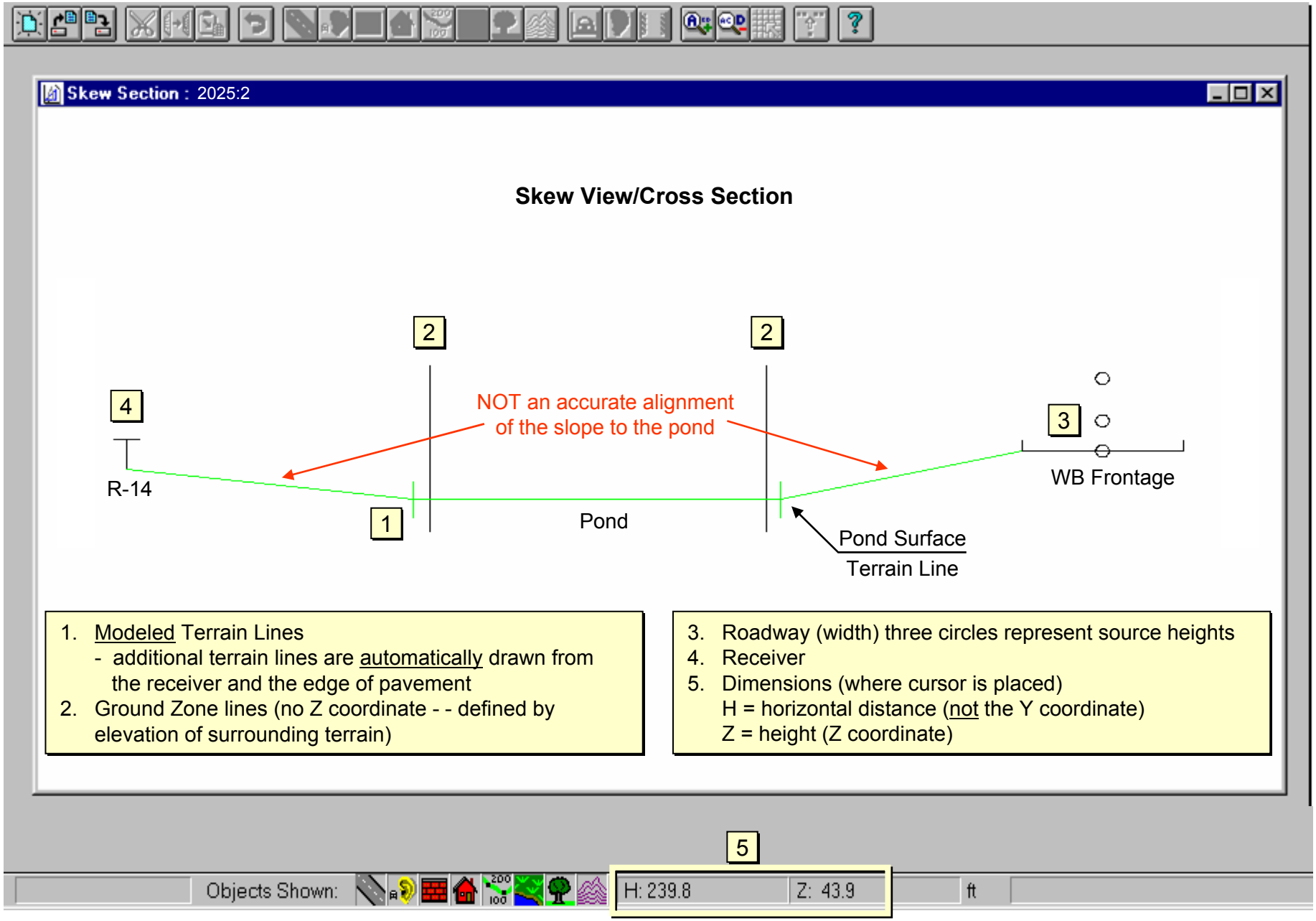

Use **Skew View** to check the geometry of the terrain lines
- recommend maximizing the plan view

1. **View**
2. Highlight **New View**
3. **Skew Section**
4. **Skew View** Popup Help window appears
   - press Space Bar to remove Help - - cursor =
5. Use the tool to draw a line perpendicular to the roadways as shown - - the skew view will be distorted if the line is not drawn perpendicular to the roadways

**NOTE**: to turn off the help feature, deselect Popup Help under **Setup/Run Identification**

continued

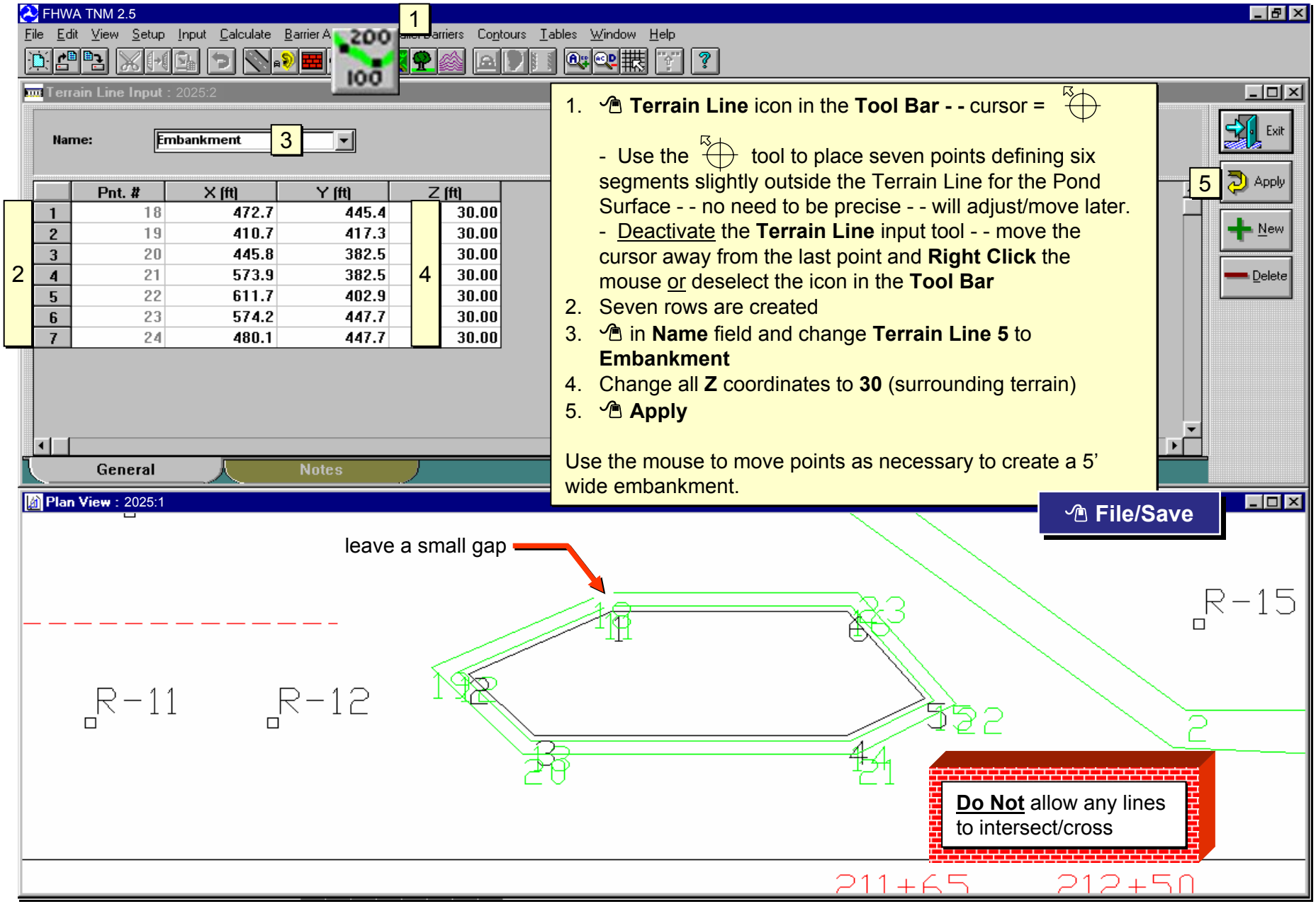
# TERRAIN LINE INPUT: Pond Surface (5 of 5)




1. Modeled Terrain Lines
   - additional terrain lines are automatically drawn from the receiver and the edge of pavement
2. Ground Zone lines (no Z coordinate - - defined by elevation of surrounding terrain)

3. Roadway (width) three circles represent source heights
4. Receiver
5. Dimensions (where cursor is placed)
   H = horizontal distance (not the Y coordinate)
   Z = height (Z coordinate)

# TERRAIN LINE INPUT: Embankment (1 of 3)

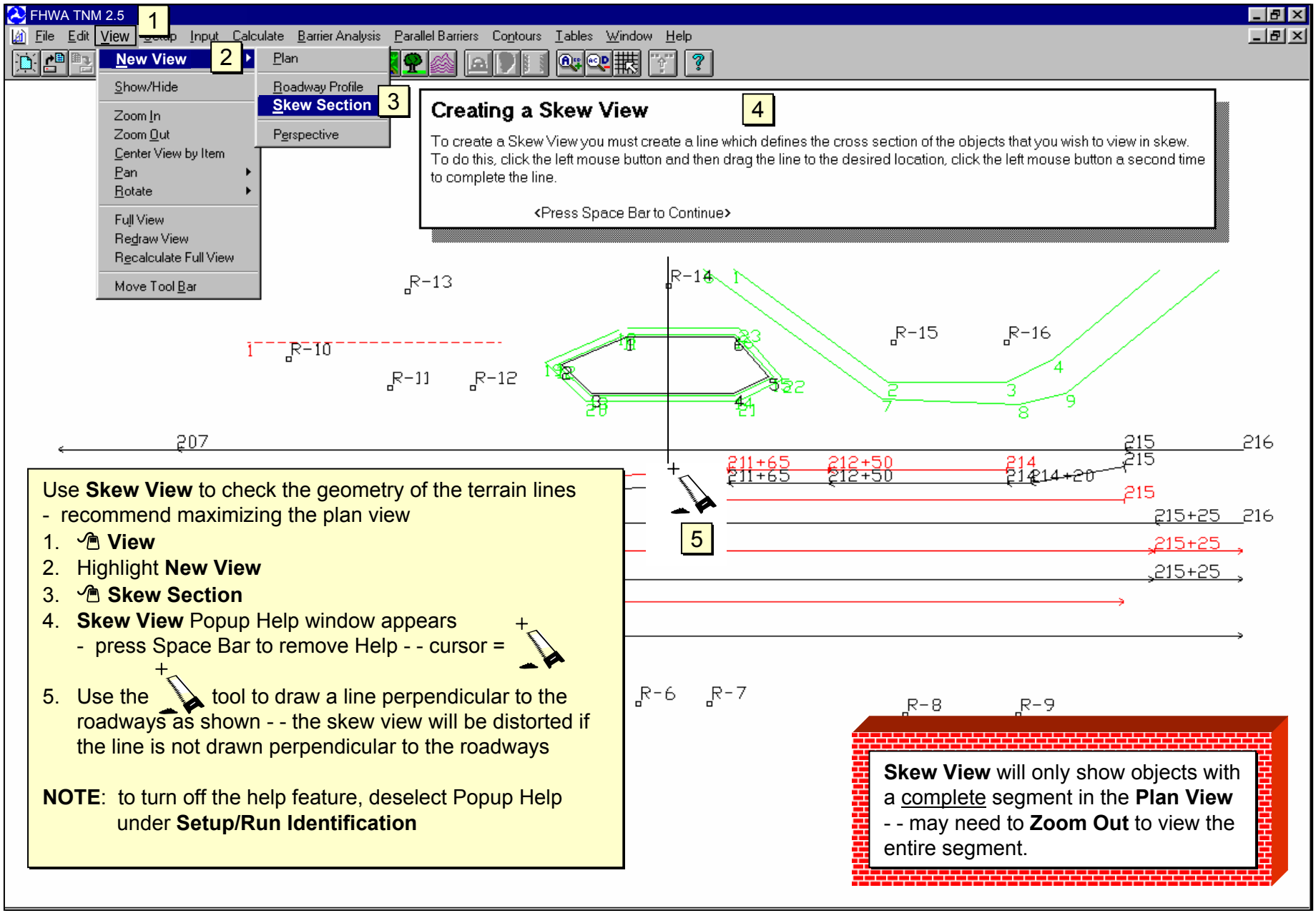



1. **Terrain Line** icon in the **Tool Bar - -** cursor =

   - Use the tool to place seven points defining six segments slightly outside the Terrain Line for the Pond Surface - - no need to be precise - - will adjust/move later.
   - Deactivate the **Terrain Line** input tool - - move the cursor away from the last point and **Right Click** the mouse or deselect the icon in the **Tool Bar**
2. Seven rows are created
3. in **Name** field and change **Terrain Line 5** to **Embankment**
4. Change all **Z** coordinates to **30** (surrounding terrain)
5. **Apply**

Use the mouse to move points as necessary to create a 5' wide embankment.

# TERRAIN LINE INPUT: Embankment (2 of 3)

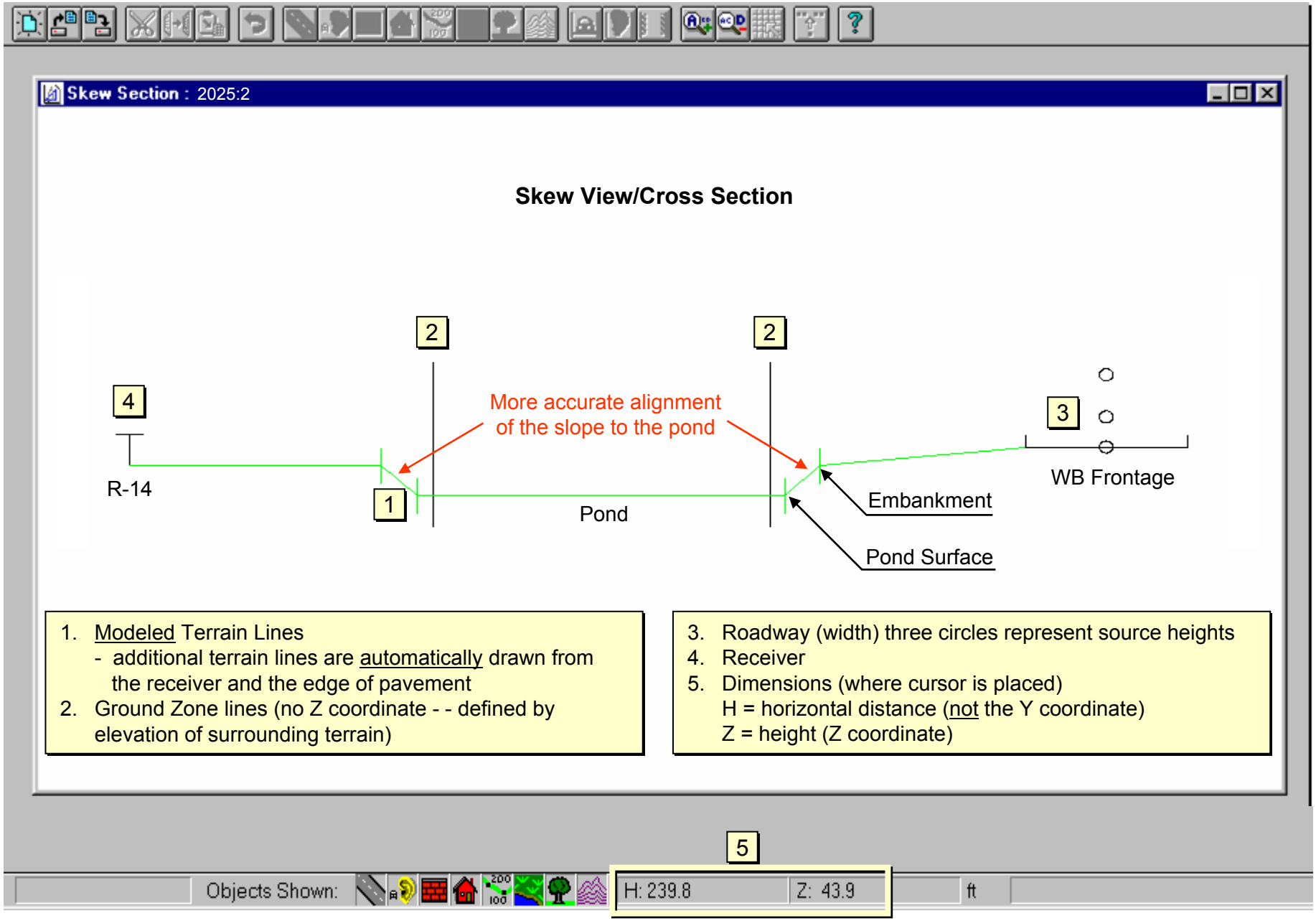



Use **Skew View** to check the geometry of the terrain lines
- recommend maximizing the plan view

1. **View**
2. Highlight **New View**
3. **Skew Section**
4. **Skew View** Popup Help window appears
   - press Space Bar to remove Help - - cursor =
5. Use the tool to draw a line perpendicular to the roadways as shown - - the skew view will be distorted if the line is not drawn perpendicular to the roadways

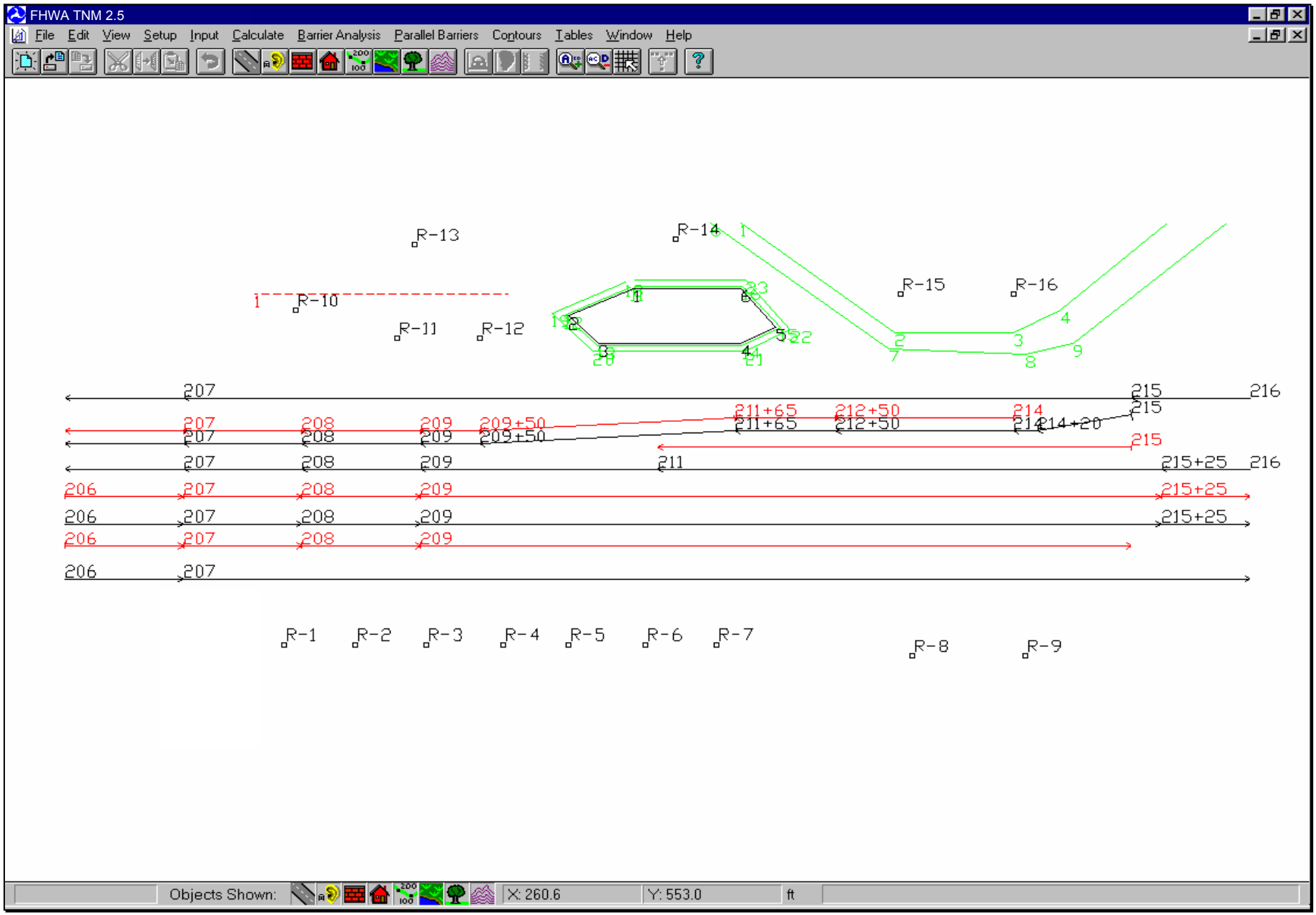
**NOTE**: to turn off the help feature, deselect Popup Help under **Setup/Run Identification**

# TERRAIN LINE INPUT: Embankment (3 of 3)

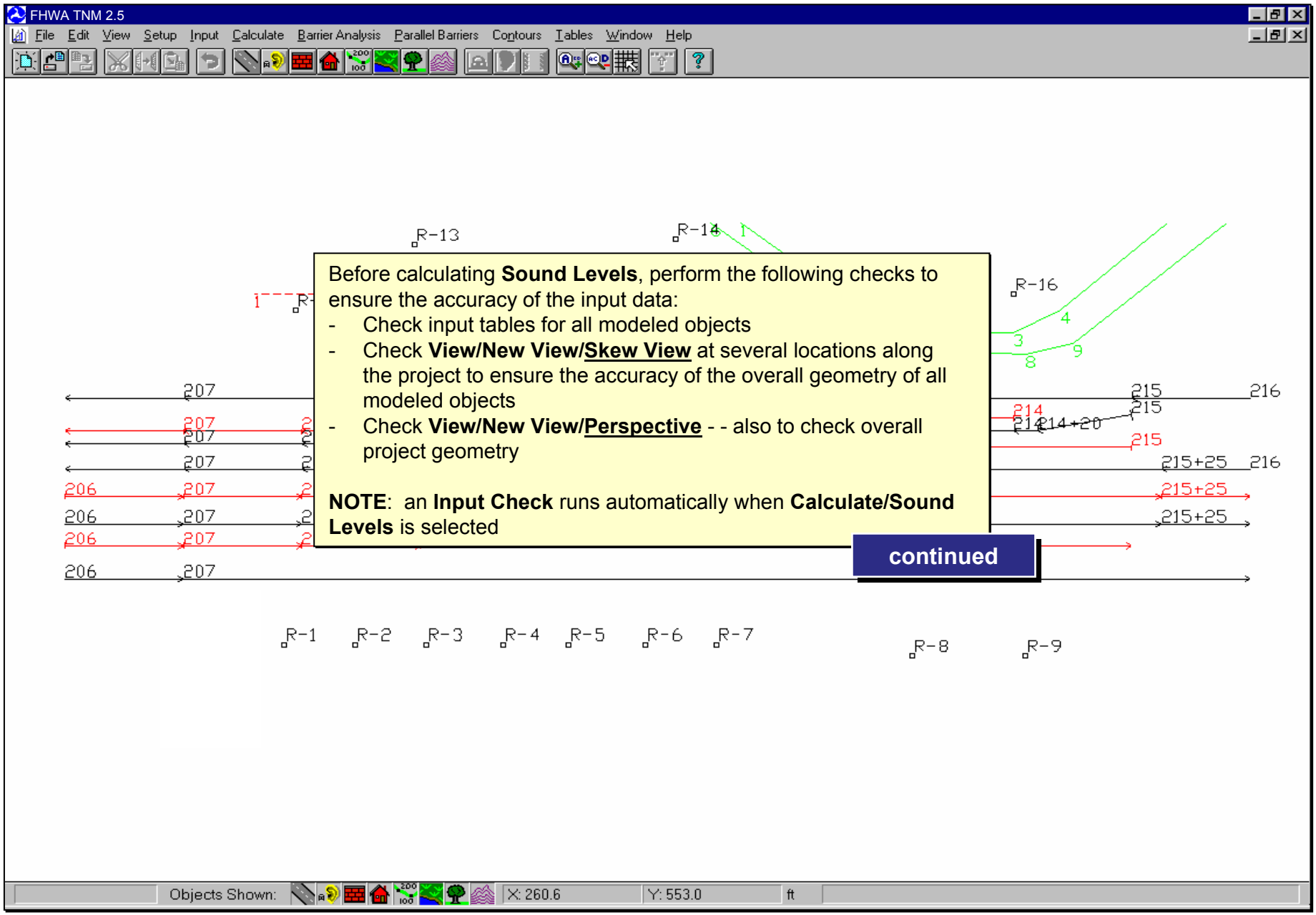



1. Modeled Terrain Lines
   - additional terrain lines are automatically drawn from the receiver and the edge of pavement
2. Ground Zone lines (no Z coordinate - - defined by elevation of surrounding terrain)
3. Roadway (width) three circles represent source heights
4. Receiver
5. Dimensions (where cursor is placed)
   H = horizontal distance (not the Y coordinate)
   Z = height (Z coordinate)

# COMPLETED PROJECT (WITHOUT ABATEMENT)



# CALCULATE SOUND LEVELS (1 of 3)



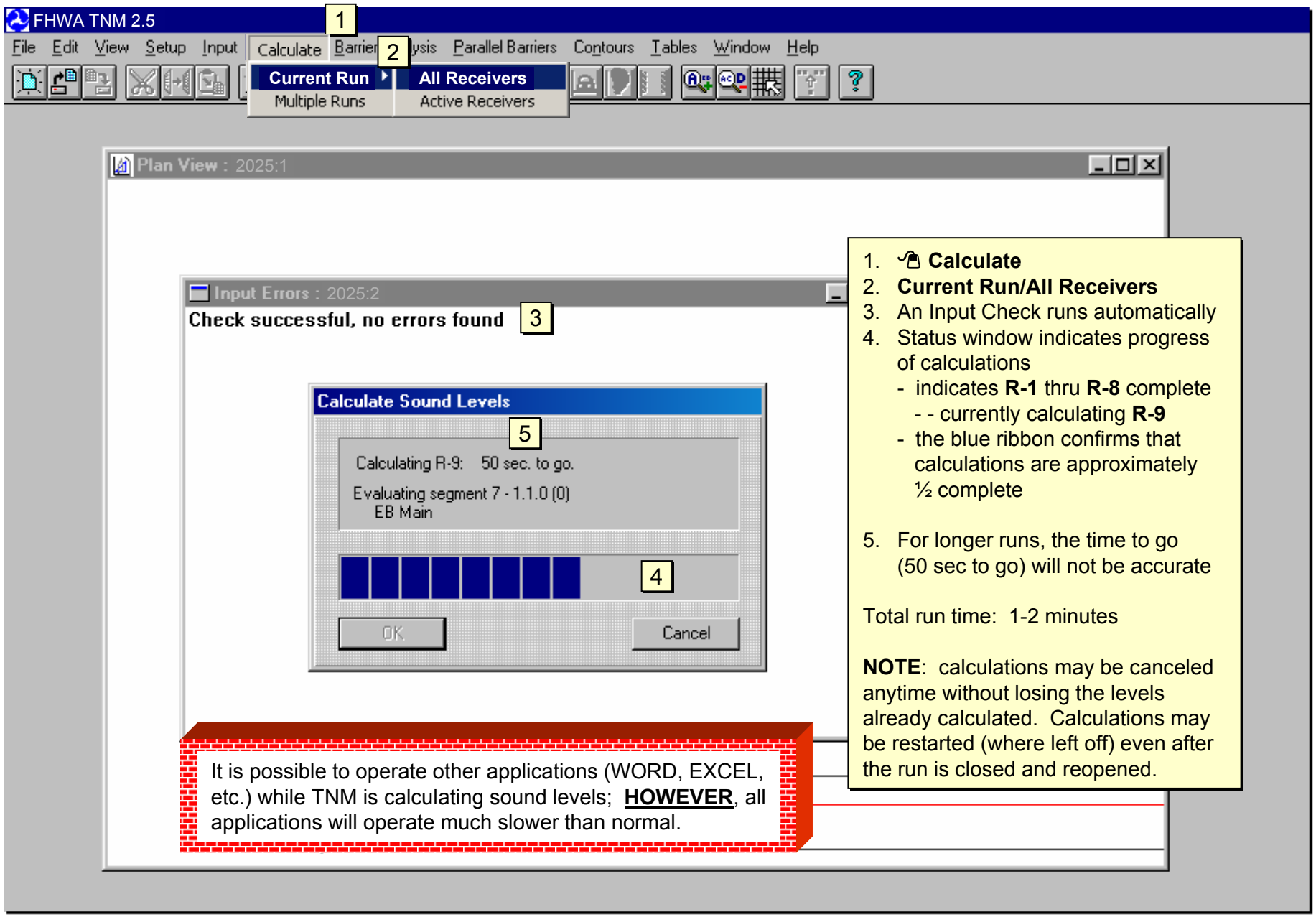

Before calculating **Sound Levels**, perform the following checks to ensure the accuracy of the input data:

- Check input tables for all modeled objects
- Check **View/New View/<u>Skew View</u>** at several locations along the project to ensure the accuracy of the overall geometry of all modeled objects
- Check **View/New View/<u>Perspective</u>** - - also to check overall project geometry

**NOTE**: an **Input Check** runs automatically when **Calculate/Sound Levels** is selected

continued

# CALCULATE SOUND LEVELS (2 of 3)



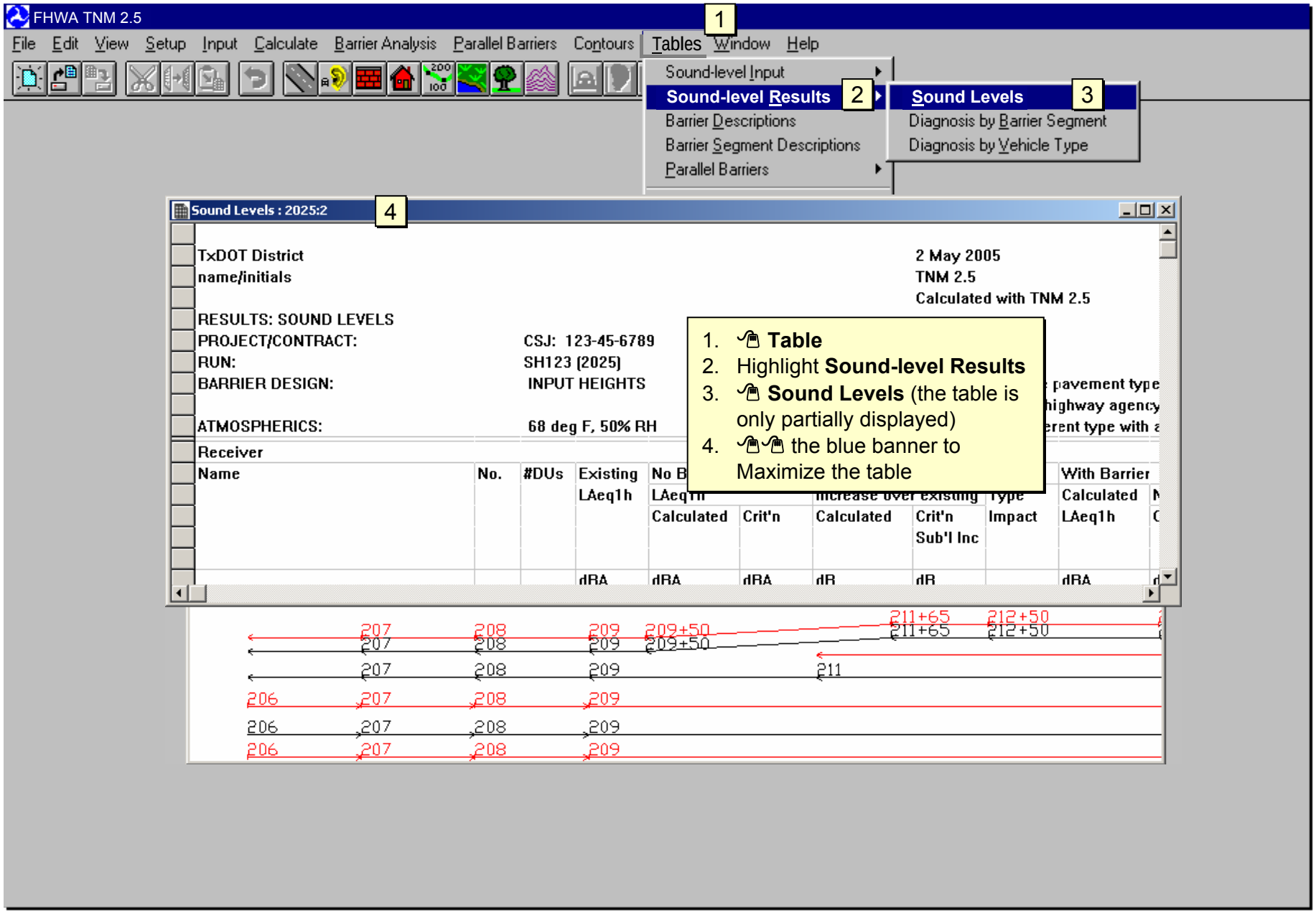

1. **Calculate**
2. **Current Run/All Receivers**
3. An Input Check runs automatically
4. Status window indicates progress of calculations
   - indicates **R-1** thru **R-8** complete
     - - currently calculating **R-9**
   - the blue ribbon confirms that calculations are approximately ½ complete
5. For longer runs, the time to go (50 sec to go) will not be accurate

Total run time: 1-2 minutes

**NOTE**: calculations may be canceled anytime without losing the levels already calculated. Calculations may be restarted (where left off) even after the run is closed and reopened.

It is possible to operate other applications (WORD, EXCEL, etc.) while TNM is calculating sound levels; **HOWEVER**, all applications will operate much slower than normal.

# CALCULATE SOUND LEVELS (3 of 3)



# SOUND LEVEL RESULTS (1 of 2)

TxDOT District
name/initials

2 May 2005
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: CSJ: 123-45-6789
RUN: SH123 (2025)
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

| Receiver Name | No. | #DUs | Existing LAeq1h | No Barrier LAeq1h Calculated | Crit'n | Increase over existing Calculated | Crit'n Sub'l Inc | Type Impact | With Barrier Calculated LAeq1h | Noise Reduction Calculated | Goal | Calculated minus Goal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBA | dBA | dBA | dB | dB | | dBA | dB | dB | dB |
| R-1 | 1 | 1 | 0.0 | 66.2 | 66 | 66.2 | 11 | Snd Lvl | 66.2 | 0.0 | 5 | -5.0 |
| R-2 | 2 | 1 | 0.0 | 66.5 | 66 | 66.5 | 11 | Snd Lvl | 66.5 | 0.0 | 5 | -5.0 |
| R-3 | 3 | 1 | 0.0 | 66.7 | 66 | 66.7 | 11 | Snd Lvl | 66.7 | 0.0 | 5 | -5.0 |
| R-4 | 4 | 1 | 0.0 | 67.0 | 66 | 67.0 | 11 | Snd Lvl | 67.0 | 0.0 | 5 | -5.0 |
| R-5 | 5 | 1 | 0.0 | 67.3 | 66 | 67.3 | 11 | Snd Lvl | 67.3 | 0.0 | 5 | -5.0 |
| R-6 | 6 | 1 | 0.0 | 67.5 | 66 | 67.5 | 11 | Snd Lvl | 67.5 | 0.0 | 5 | -5.0 |
| R-7 | 7 | 1 | 0.0 | 67.8 | 66 | 67.8 | 11 | Snd Lvl | 67.8 | 0.0 | 5 | -5.0 |
| R-8 | 8 | 2 | 0.0 | 69.0 | 66 | 69.0 | 11 | Snd Lvl | 69.0 | 0.0 | 5 | -5.0 |
| R-9 | 9 | 2 | 0.0 | 69.4 | 66 | 69.4 | 11 | Snd Lvl | 69.4 | 0.0 | 5 | -5.0 |
| R-10 | 10 | 1 | 0.0 | 65.2 | 66 | 65.2 | 11 | — | 65.2 | 0.0 | 5 | -5.0 |
| R-11 | 11 | 1 | 0.0 | 66.4 | 66 | 66.4 | 11 | Snd Lvl | 66.4 | 0.0 | 5 | -5.0 |
| R-12 | 12 | 1 | 0.0 | 66.8 | 66 | 66.8 | 11 | Snd Lvl | 66.8 | 0.0 | 5 | -5.0 |
| R-13 | 13 | 1 | 0.0 | 64.0 | 66 | 64.0 | 11 | — | 64.0 | 0.0 | 5 | -5.0 |
| R-14 | 14 | 1 | 0.0 | 66.2 | 66 | 66.2 | 11 | Snd Lvl | 66.2 | 0.0 | 5 | -5.0 |
| R-15 | 15 | 1 | 0.0 | 71.0 | 66 | 71.0 | 11 | Snd Lvl | 71.0 | 0.0 | 5 | -5.0 |
| R-16 | 16 | 1 | 0.0 | 72.1 | 66 | 72.1 | 11 | Snd Lvl | 72.1 | 0.0 | 5 | -5.0 |

| Dwelling Units | # DUs | Noise Reduction Min | Avg | Max |
|---|---|---|---|---|
| | | dB | dB | dB |
| All Selected | 18 | 0.0 | 0.0 | 0.0 |
| All Impacted | 16 | 0.0 | 0.0 | 0.0 |
| All that meet NR Goal | 0 | 0.0 | 0.0 | 0.0 |

## SOUND LEVEL RESULTS (2 of 2)

TxDOT District
name/initials

**IMPACT ASSESSMENT**

2 May 2005
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: CSJ: 123-45-6789
RUN: SH123 (2025)
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Drop the number after the decimal point. Do not round to the nearest whole number.

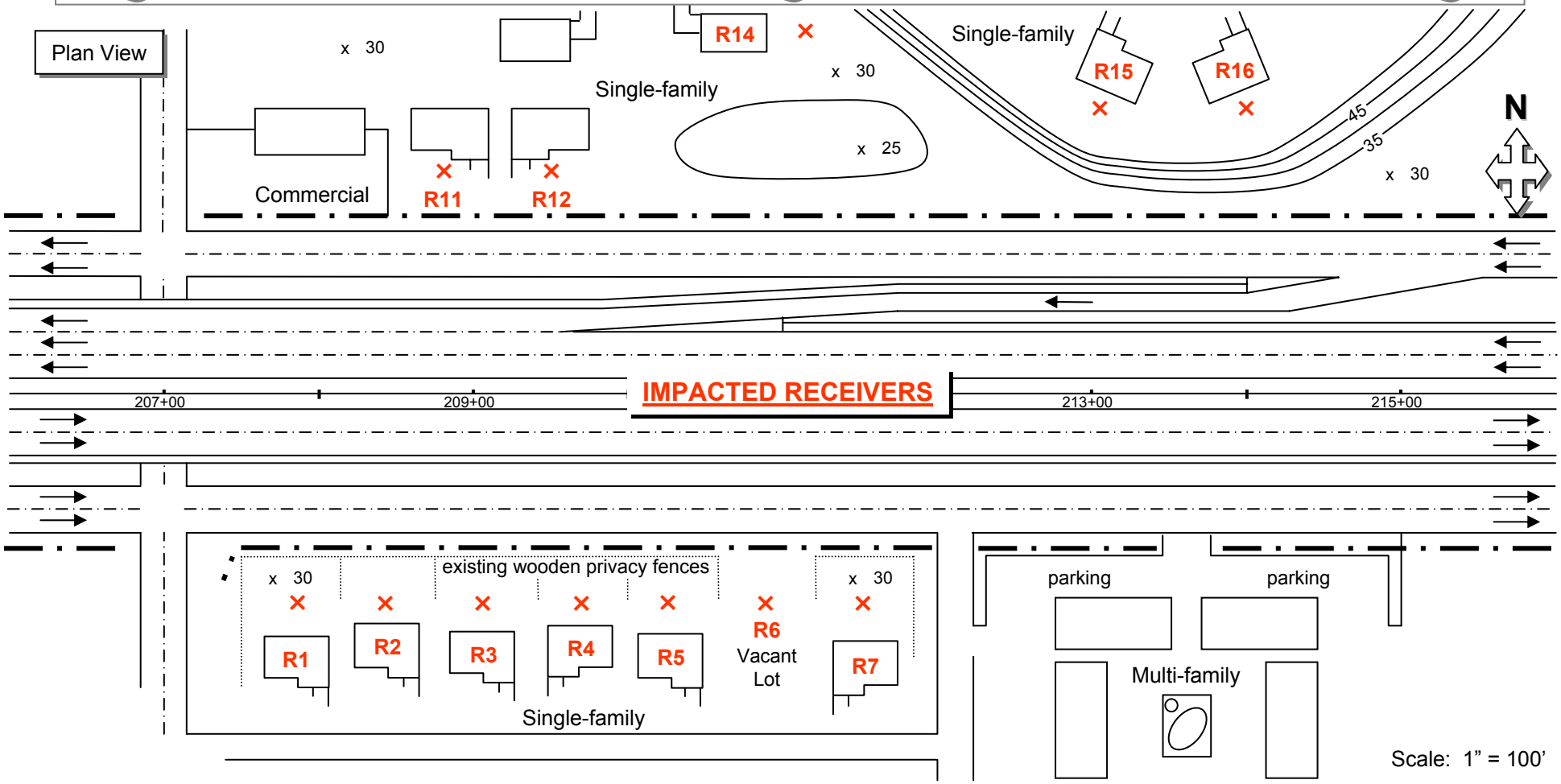
| Receiver Name | No. | #DUs | Exist LAeq | | | ase over existing lated | Crit'n Sub'l Inc | Type Impact | With Barrier Calculated LAeq1h | Noise Reduction Calculated | Goal | Calculated minus Goal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBA | dBA | BA | dB | dB | | dBA | dB | dB | dB |
| R-1 | 1 | 1 | 0.0 | 66.2 | Impact | | | Snd Lvl | 66.2 | 0.0 | 5 | -5.0 |
| R-2 | 2 | 1 | 0.0 | 66.5 | Impact | | | Snd Lvl | 66.5 | 0.0 | 5 | -5.0 |
| R-3 | 3 | 1 | 0.0 | 66.7 | Impact | | | Snd Lvl | 66.7 | 0.0 | 5 | -5.0 |
| R-4 | 4 | 1 | 0.0 | 67.0 | Impact | | | Snd Lvl | 67.0 | 0.0 | 5 | -5.0 |
| R-5 | | | 0.0 | 67.3 | Impact | | | Snd Lvl | 67.3 | 0.0 | 5 | -5.0 |
| R-6 | | | 0.0 | 67.5 | Impact | | | Snd Lvl | 67.5 | 0.0 | 5 | -5.0 |
| R-7 | | | 0.0 | 67.8 | Impact | | | Snd Lvl | 67.8 | 0.0 | 5 | -5.0 |
| R-8 | | | 0.0 | 69.0 | Minus 25 = 44 = No Impact | | | Snd Lvl | 69.0 | 0.0 | 5 | -5.0 |
| R-9 | | | 0.0 | 69.4 | Minus 25 = 44 = No Impact | | | Snd Lvl | 69.4 | 0.0 | 5 | -5.0 |
| R-10 | | | 0.0 | 65.2 | Minus 25 = 40 = No Impact | | | — | 65.2 | 0.0 | 5 | -5.0 |
| R-11 | | | 0.0 | 66.4 | Impact | | | Snd Lvl | 66.4 | 0.0 | 5 | -5.0 |
| R-12 | 12 | 1 | 0.0 | 66.8 | Impact | | | Snd Lvl | 66.8 | 0.0 | 5 | -5.0 |
| R-13 | 13 | 1 | 0.0 | 64.0 | No Impact | | | — | 64.0 | 0.0 | 5 | -5.0 |
| R-14 | 14 | 1 | 0.0 | 66.2 | Impact | | | Snd Lvl | 66.2 | 0.0 | 5 | -5.0 |
| R-15 | 15 | 1 | 0.0 | 71.0 | Impact | | | Snd Lvl | 71.0 | 0.0 | 5 | -5.0 |
| R-16 | 16 | 1 | 0.0 | 72.1 | Impact | | | Snd Lvl | 72.1 | 0.0 | 5 | -5.0 |

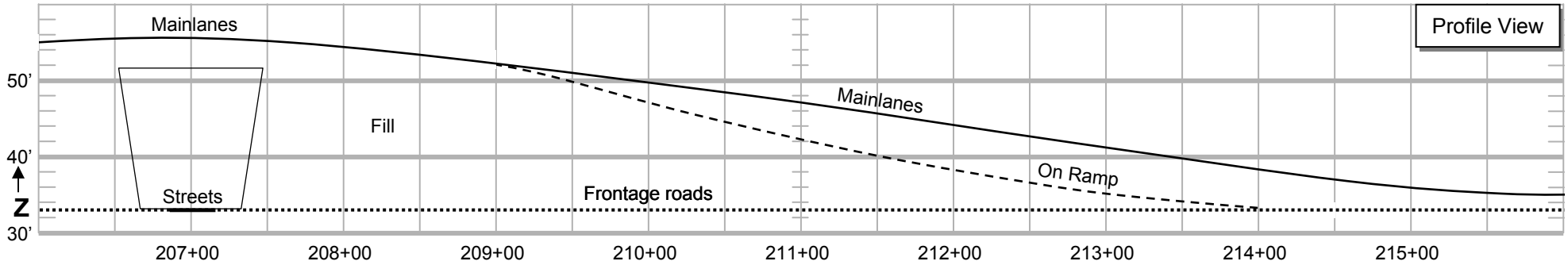
Ignore impacts automatically calculated by the program. Determine all impacts by manual calculation only.

| Dwelling Units | # DUs | Noise Reduction Min | Avg | Max |
|---|---|---|---|---|
| | | dB | dB | dB |
| All Selected | 18 | 0.0 | 0.0 | 0.0 |
| All Impacted | 16 | 0.0 | 0.0 | 0.0 |
| All that meet NR Goal | 0 | 0.0 | 0.0 | 0.0 |

**Impact Type**
**Snd Lvl** = Absolute Impact Criterion
**Increase** = Relative Impact Criterion
**Both** = Both Impact Criteria

No reductions since the CTBs are fixed-height traffic barriers not noise barriers.


Plan View
x 30
R14
Single-family
x 30
Single-family
R15
R16
45
35
N
x 25
x 30
Commercial
R11
R12
207+00
209+00
IMPACTED RECEIVERS
213+00
215+00
existing wooden privacy fences
x 30
x 30
R1
R2
R3
R4
R5
R6
Vacant Lot
R7
Single-family
parking
parking
Multi-family
Scale: 1" = 100'


Profile View
Mainlanes
50'
Fill
Mainlanes
40'
Z
Streets
Frontage roads
On Ramp
30'
207+00
208+00
209+00
210+00
211+00
212+00
213+00
214+00
215+00

# CTB NOISE LEVEL REDUCTION

TxDOT District name/initials

RESULTS: SOUND LEVELS
PROJECT/CONTRACT:
RUN:
BARRIER DESIGN:

ATMOSPHERICS: 68 deg F, 50% RH

hall be used unless
ubstantiates the use
of a different type with approval of FHWA.

## EXERCISE

You want to show the project engineer the noise level reduction that would result from solid CTBs rather than guard rails or fences.

**Task**: Determine the **Calculated Noise Reduction** of all CTBs combined.

| Receiver Name | No. | #DUs | Existing LAeq1h | No Barrier LAeq1h Calculated | Crit'n | Increase over existing Calculated | Crit'n Sub'l Inc | Type Impact | With Barrier Calculated LAeq1h | Noise Reduction Calculated | Goal | Calculated minus Goal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBA | dBA | dBA | dB | dB | | dBA | dB | dB | dB |
| R-1 | 1 | 1 | 0.0 | 66.2 | 66 | 66.2 | 11 | Snd Lvl | 66.2 | 0.0 | 5 | -5.0 |
| R-2 | 2 | 1 | 0.0 | 66.5 | 66 | 66.5 | 11 | Snd Lvl | 66.5 | 0.0 | 5 | -5.0 |
| R-3 | 3 | 1 | 0.0 | 66.7 | 66 | 66.7 | 11 | Snd Lvl | 66.7 | 0.0 | 5 | -5.0 |
| R-4 | 4 | 1 | 0.0 | 67.0 | 66 | 67.0 | 11 | Snd Lvl | 67.0 | 0.0 | 5 | -5.0 |
| R-5 | 5 | 1 | 0.0 | 67.3 | 66 | 67.3 | 11 | Snd Lvl | 67.3 | 0.0 | 5 | -5.0 |
| R-6 | 6 | 1 | 0.0 | 67.5 | 66 | 67.5 | 11 | Snd Lvl | 67.5 | 0.0 | 5 | -5.0 |
| R-7 | 7 | 1 | 0.0 | 67.8 | 66 | 67.8 | 11 | Snd Lvl | 67.8 | 0.0 | 5 | -5.0 |
| R-8 | 8 | 2 | 0.0 | 69.0 | 66 | 69.0 | 11 | Snd Lvl | 69.0 | 0.0 | 5 | -5.0 |
| R-9 | 9 | 2 | 0.0 | 69.4 | 66 | 69.4 | 11 | Snd Lvl | 69.4 | 0.0 | 5 | -5.0 |
| R-10 | 10 | 1 | 0.0 | 65.2 | 66 | 65.2 | 11 | — | 65.2 | 0.0 | 5 | -5.0 |
| R-11 | 11 | 1 | 0.0 | 66.4 | 66 | 66.4 | 11 | Snd Lvl | 66.4 | 0.0 | 5 | -5.0 |
| R-12 | 12 | 1 | 0.0 | 66.8 | 66 | 66.8 | 11 | Snd Lvl | 66.8 | 0.0 | 5 | -5.0 |
| R-13 | 13 | 1 | 0.0 | 64.0 | 66 | 64.0 | 11 | — | 64.0 | 0.0 | 5 | -5.0 |
| R-14 | 14 | 1 | 0.0 | 66.2 | 66 | 66.2 | 11 | Snd Lvl | 66.2 | 0.0 | 5 | -5.0 |
| R-15 | 15 | 1 | 0.0 | 71.0 | 66 | 71.0 | 11 | Snd Lvl | 71.0 | 0.0 | 5 | -5.0 |
| R-16 | 16 | 1 | 0.0 | 72.1 | 66 | 72.1 | 11 | Snd Lvl | 72.1 | 0.0 | 5 | -5.0 |

| Dwelling Units | # DUs | Noise Reduction Min | Avg | Max |
|---|---|---|---|---|
| | | dB | dB | dB |
| All Selected | 18 | 0.0 | 0.0 | 0.0 |
| All Impacted | 16 | 0.0 | 0.0 | 0.0 |
| All that meet NR Goal | 0 | 0.0 | 0.0 | 0.0 |

Before making any changes to this run, save the run under a different name using **File/Save As ….. 2025\CTB**.

# CTB NOISE LEVEL REDUCTION (1 of 3)

Barrier Input : CTB:2

Name: EB CTB (1) Pert. Increment (ft): 0.00 # Pert. Up: 0 # Pert Dn: 0

Barrier Type: Wall Height (ft): 0.00 Min. Height (ft): 0.00 Max. Height (ft): 99.99

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 206 | 1 | 0.0 | 205.0 | 55.00 | 2.67 | 1.00 | 0 | 0 |
| 2 | 207 | 2 | 100.0 | 205.0 | 56.00 | 2.67 | 1.00 | 0 | 0 |
| 3 | 208 | 3 | 200.0 | 205.0 | 54.00 | 2.67 | 1.00 | 0 | 0 |
| 4 | 209 | 4 | 300.0 | 205.0 | 52.00 | 2.67 | 1.00 | 0 | 0 |
| 5 | 215 | 5 | 900.0 | 205.0 | 36.00 | 2.67 | 1.00 | 0 | 0 |

(2) (3) Exit Apply New Delete

General More

- Open the **Barrier Input** window

1. Select **EB CTB**
2. Change the Increment for <u>all</u> points to **1**
3. **Apply**
4. Select each of the three remaining CTBs individually and change the **Increment** for <u>all</u> points in <u>each</u> CTB to **1**
5. **Apply** after changing each CTB

**File/Save**

Barrier Input : CTB:2

Name: EB CTB

EB CTB
Median CTB
WB CTB
Ramp CTB (4)

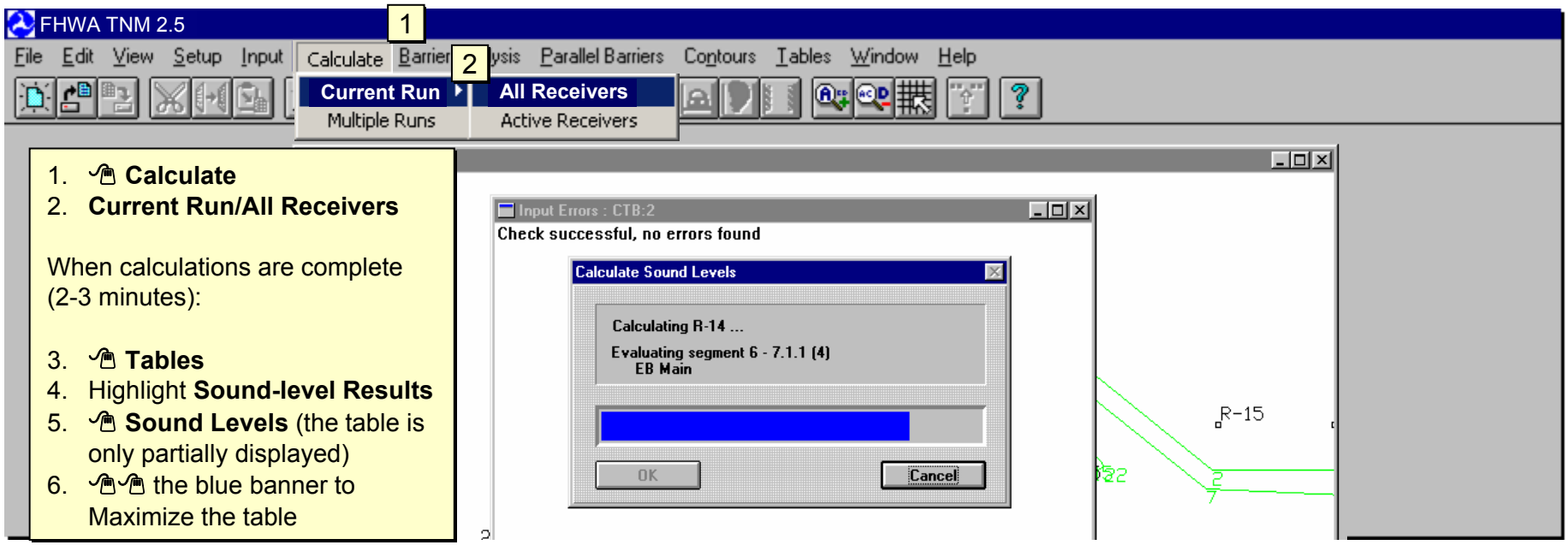
Height (ft): 0.00 Min. Height (ft): 0.00

| | | | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 206 | 1 | 0.0 | 205.0 | 55.00 | 2.67 | 1.00 | 0 | 0 |
| 2 | 207 | 2 | 100.0 | 205.0 | 56.00 | 2.67 | 1.00 | 0 | 0 |
| 3 | 208 | 3 | 200.0 | 205.0 | 54.00 | 2.67 | 1.00 | 0 | 0 |
| 4 | 209 | 4 | 300.0 | 205.0 | 52.00 | 2.67 | 1.00 | 0 | 0 |
| 5 | 215 | 5 | 900.0 | 205.0 | 36.00 | 2.67 | 1.00 | 0 | 0 |

(5) Exit Apply New Delete

General More Structure Reflections Notes

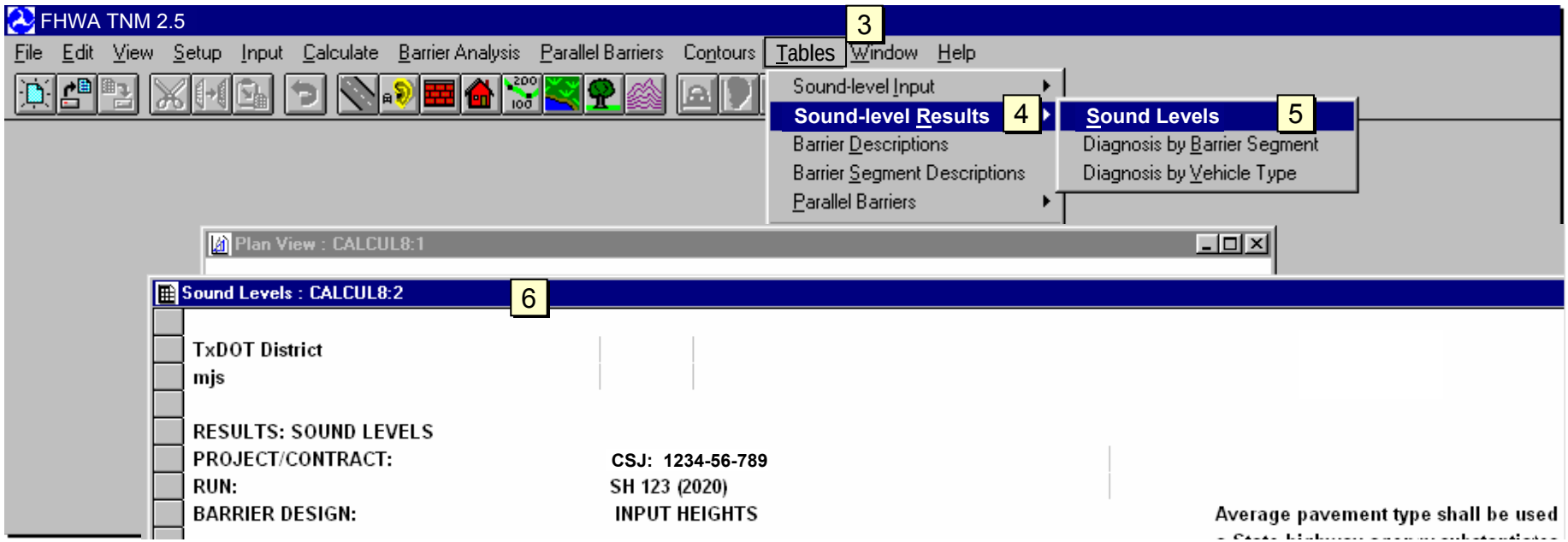
# CTB NOISE LEVEL REDUCTION (2 of 3)




1. **Calculate**
2. **Current Run/All Receivers**

When calculations are complete (2-3 minutes):

3. **Tables**
4. Highlight **Sound-level Results**
5. **Sound Levels** (the table is only partially displayed)
6. the blue banner to Maximize the table



# CTB NOISE LEVEL REDUCTION (3 of 3)

TxDOT District
name/initials

2 May 2005
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: CSJ: 123-45-6789
RUN: SH123 (2025)
BARRIER DESIGN: INPUT HEIGHTS

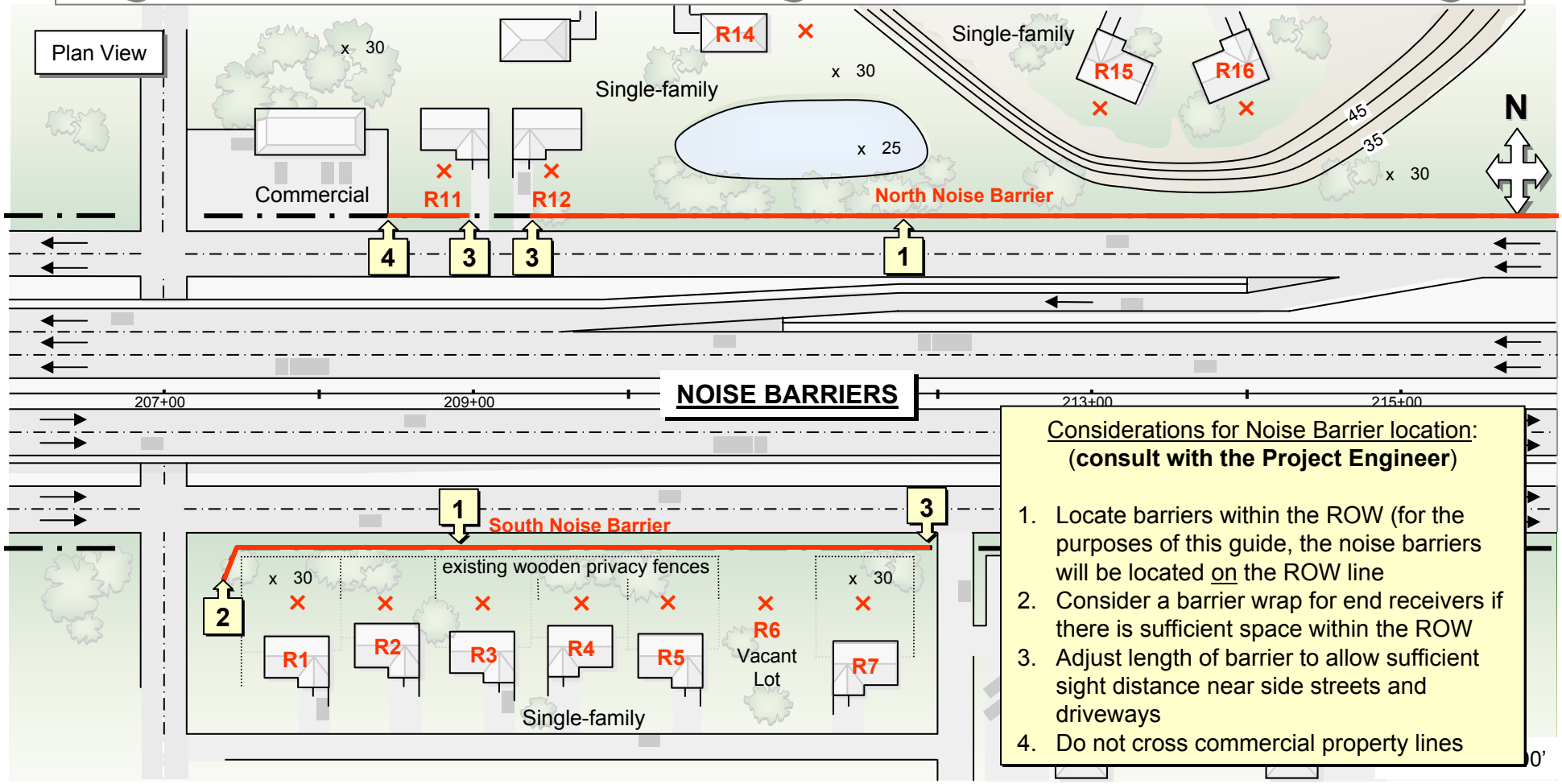
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

| Receiver Name | No. | #DUs | Existing LAeq1h | No Barrier LAeq1h Calculated | Crit'n | Increase over existing Calculated | Crit'n Sub'l Inc | Type Impact | With Barrier Calculated LAeq1h | Noise Reduction Calculated | Goal | Calculated minus Goal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBA | dBA | dBA | dB | dB | | dBA | dB | dB | dB |
| R-1 | 1 | 1 | 0.0 | 68.7 | 66 | 68.7 | 11 | Snd Lvl | 66.2 | 2.5 | 5 | -2.5 |
| R-2 | 2 | 1 | 0.0 | 68.8 | 66 | 68.8 | 11 | Snd Lvl | 66.5 | 2.3 | 5 | -2.7 |
| R-3 | 3 | 1 | 0.0 | 68.9 | 66 | 68.9 | 11 | Snd Lvl | 66.7 | 2.2 | 5 | -2.8 |
| R-4 | 4 | 1 | 0.0 | 69.2 | 66 | 69.2 | 11 | Snd Lvl | 67.0 | 2.2 | 5 | -2.8 |
| R-5 | 5 | 1 | 0.0 | 69.3 | 66 | 69.3 | 11 | Snd Lvl | 67.3 | 2.0 | 5 | -3.0 |
| R-6 | 6 | 1 | 0.0 | 69.5 | 66 | 69.5 | 11 | Snd Lvl | 67.5 | 2.0 | 5 | -3.0 |
| R-7 | 7 | 1 | 0.0 | 69.6 | 66 | 69.6 | 11 | Snd Lvl | 67.8 | 1.8 | 5 | -3.2 |
| R-8 | 8 | 2 | 0.0 | 71.8 | 66 | 71.8 | 11 | Snd Lvl | 69.0 | 2.8 | 5 | -2.2 |
| R-9 | 9 | 2 | 0.0 | 72.4 | 66 | 72.4 | 11 | Snd Lvl | 69.4 | 3.0 | 5 | -2.0 |
| R-10 | 10 | 1 | 0.0 | 67.1 | 66 | 67.1 | 11 | Snd Lvl | 65.2 | 1.9 | 5 | -3.1 |
| R-11 | 11 | 1 | 0.0 | 68.2 | 66 | 68.2 | 11 | Snd Lvl | 66.4 | 1.8 | 5 | -3.2 |
| R-12 | 12 | 1 | 0.0 | 68.6 | 66 | 68.6 | 11 | Snd Lvl | 66.9 | 1.7 | 5 | -3.3 |
| R-13 | 13 | 1 | 0.0 | 66.4 | 66 | 66.4 | 11 | Snd Lvl | 64.0 | 2.4 | 5 | -2.6 |
| R-14 | 14 | 1 | 0.0 | 67.9 | 66 | 67.9 | 11 | Snd Lvl | 66.2 | 1.7 | 5 | -3.3 |
| R-15 | 15 | 1 | 0.0 | 74.5 | 66 | 74.5 | 11 | Snd Lvl | 71.0 | 3.5 | 5 | -1.5 |
| R-16 | 16 | 1 | 0.0 | 74.2 | 66 | 74.2 | 11 | Snd Lvl | 72.0 | 2.2 | 5 | -2.8 |

| Dwelling Units | # DUs | Noise Reduction Min | Avg | Max |
|---|---|---|---|---|
| | | dB | dB | dB |
| All Selected | 18 | 1.7 | 2.2 | 3.5 |
| All Impacted | 18 | 1.7 | 2.2 | 3.5 |
| All that meet NR Goal | 0 | 0.0 | 0.0 | 0.0 |

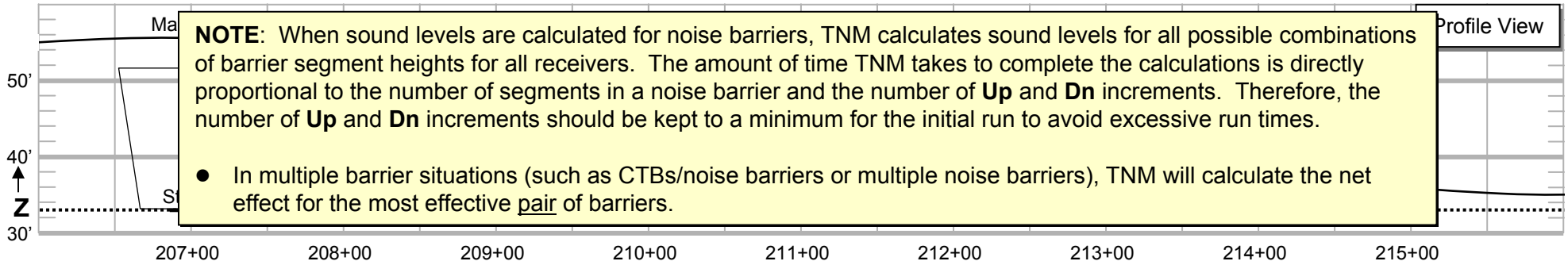
**Noise Reductions** attributable to the CTBs. For some projects, they may be sufficient to avoid impacts.




## NOISE BARRIERS

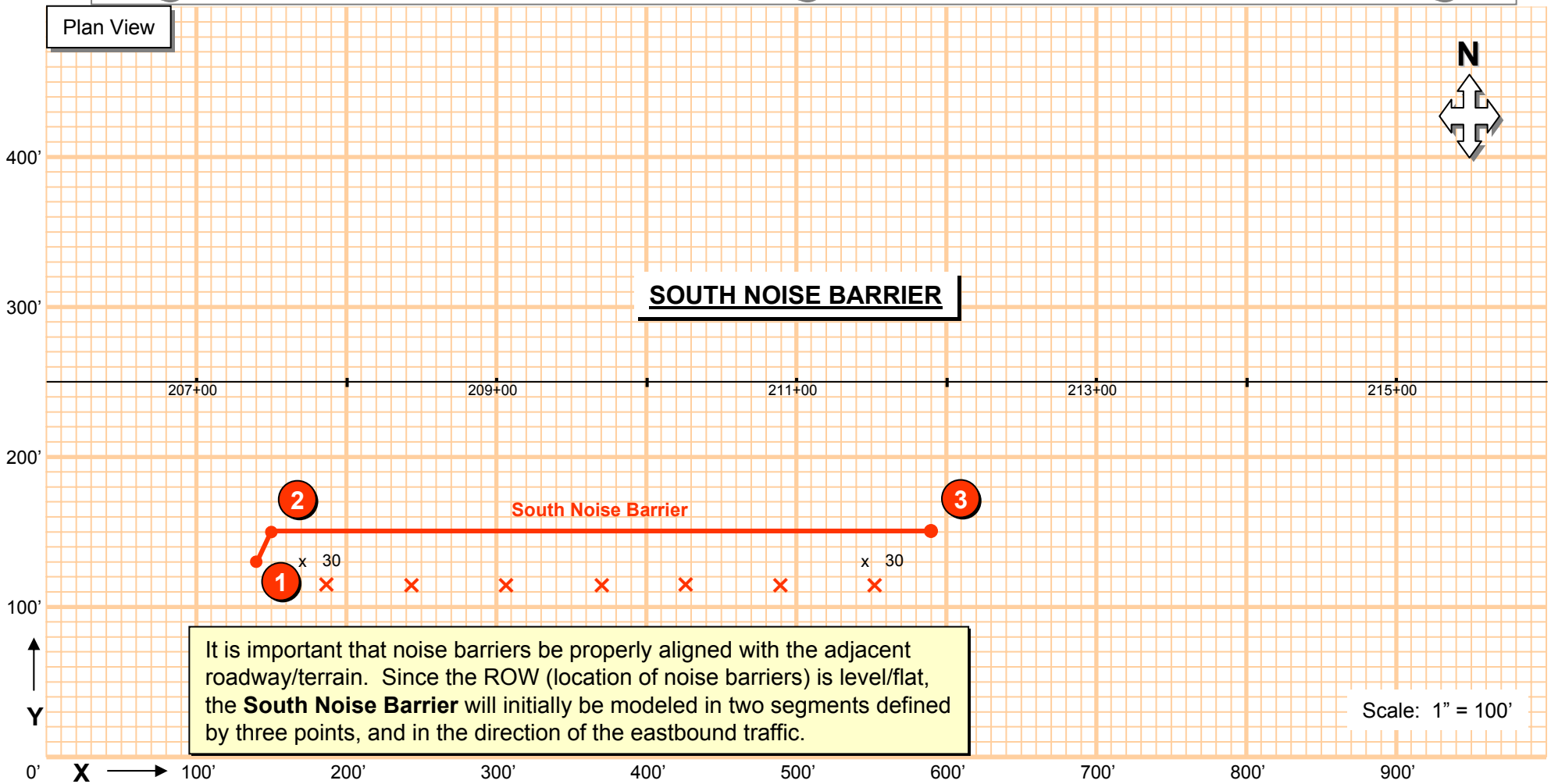
Considerations for Noise Barrier location:
(**consult with the Project Engineer**)

1. Locate barriers within the ROW (for the purposes of this guide, the noise barriers will be located on the ROW line
2. Consider a barrier wrap for end receivers if there is sufficient space within the ROW
3. Adjust length of barrier to allow sufficient sight distance near side streets and driveways
4. Do not cross commercial property lines

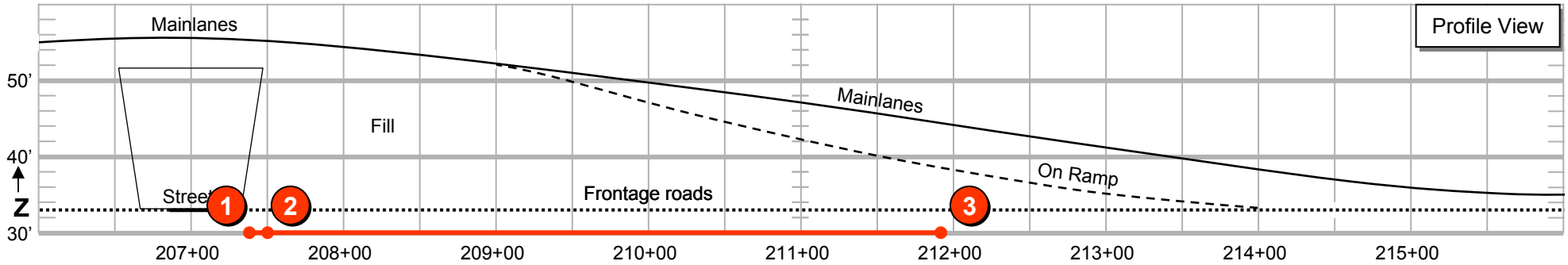



**NOTE**: When sound levels are calculated for noise barriers, TNM calculates sound levels for all possible combinations of barrier segment heights for all receivers. The amount of time TNM takes to complete the calculations is directly proportional to the number of segments in a noise barrier and the number of **Up** and **Dn** increments. Therefore, the number of **Up** and **Dn** increments should be kept to a minimum for the initial run to avoid excessive run times.

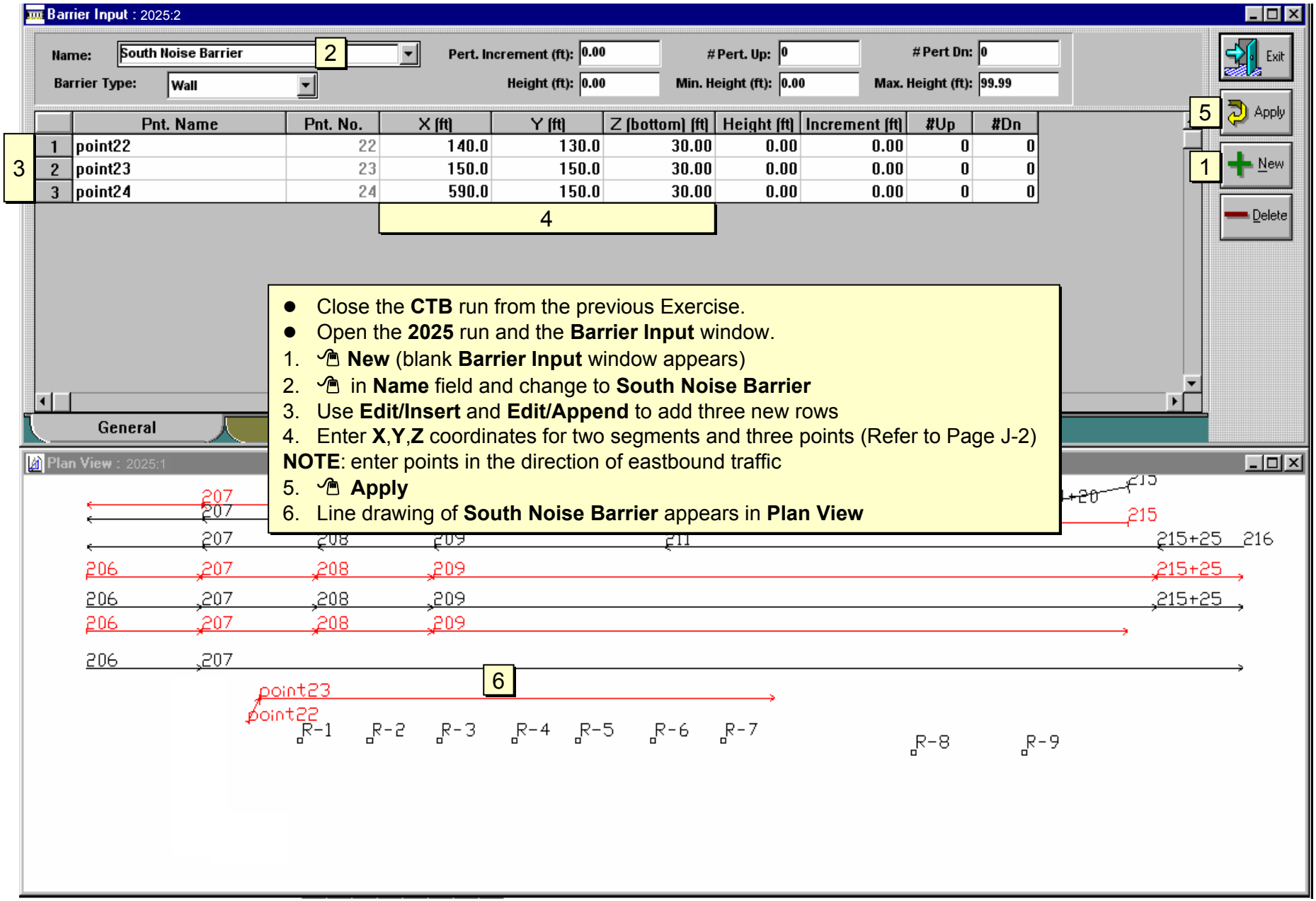
- In multiple barrier situations (such as CTBs/noise barriers or multiple noise barriers), TNM will calculate the net effect for the most effective pair of barriers.




It is important that noise barriers be properly aligned with the adjacent roadway/terrain. Since the ROW (location of noise barriers) is level/flat, the **South Noise Barrier** will initially be modeled in two segments defined by three points, and in the direction of the eastbound traffic.



# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (1 of 8)



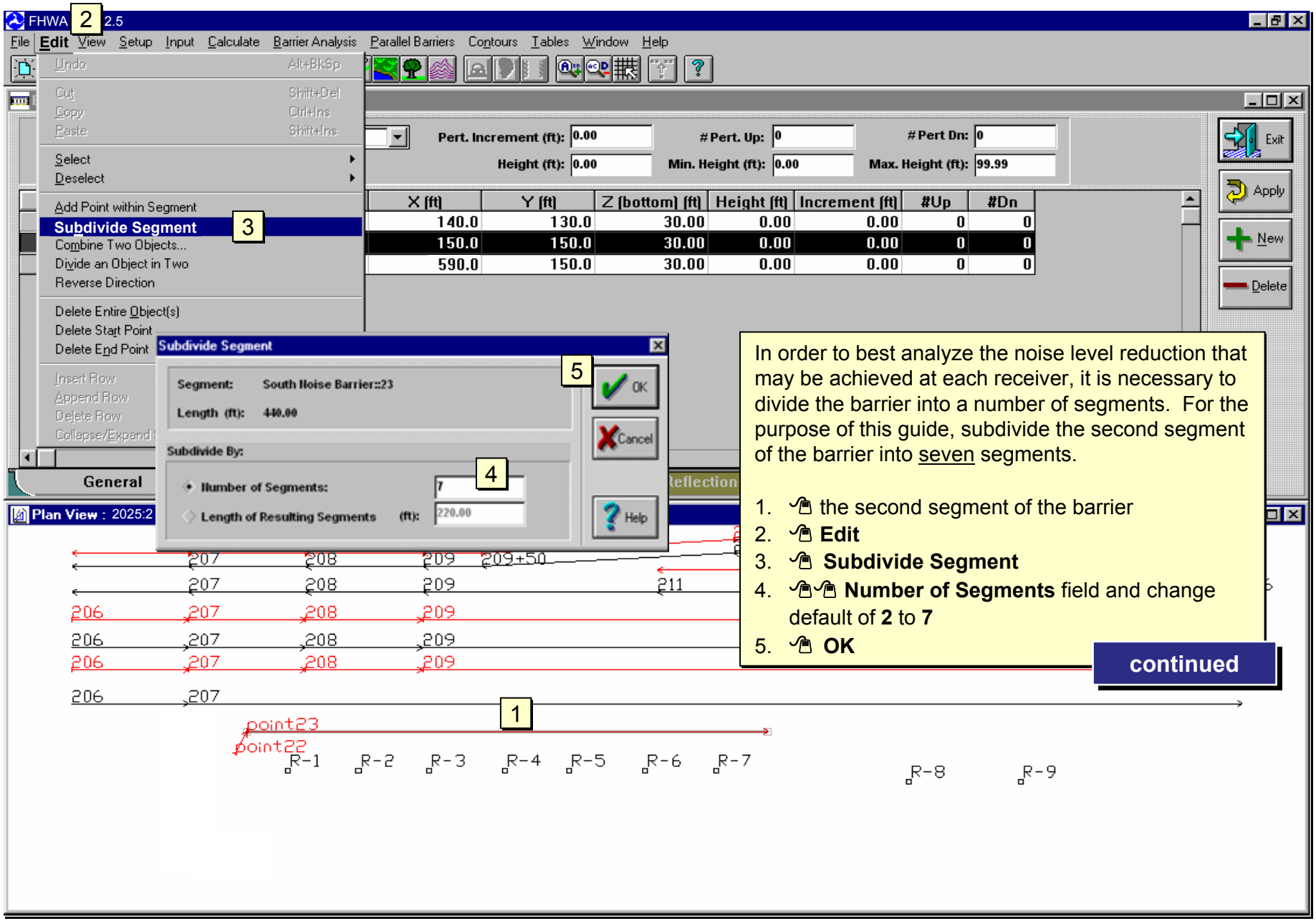

- Close the **CTB** run from the previous Exercise.
- Open the **2025** run and the **Barrier Input** window.

1. **New** (blank **Barrier Input** window appears)
2. in **Name** field and change to **South Noise Barrier**
3. Use **Edit/Insert** and **Edit/Append** to add three new rows
4. Enter **X**,**Y**,**Z** coordinates for two segments and three points (Refer to Page J-2)

**NOTE**: enter points in the direction of eastbound traffic

5. **Apply**
6. Line drawing of **South Noise Barrier** appears in **Plan View**

# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (2 of 8)




In order to best analyze the noise level reduction that may be achieved at each receiver, it is necessary to divide the barrier into a number of segments. For the purpose of this guide, subdivide the second segment of the barrier into seven segments.

1. the second segment of the barrier
2. **Edit**
3. **Subdivide Segment**
4. **Number of Segments** field and change default of **2** to **7**
5. **OK**

continued

# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (3 of 8)

Barrier Input : 2025:2

Name: South Noise Barrier

Barrier Type: Wall

Pert. Increment (ft)

Height (ft)

This top section of the **Barrier Input** window is not used

Exit

Apply

New

Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 22 | 140.0 | 130.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 2 | 2 | 23 | 150.0 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 3 | 3 | 25 | 212.9 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 4 | 4 | 26 | 275.7 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 5 | 5 | 27 | 338.6 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 6 | 6 | 28 | 401.4 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 7 | 7 | 29 | 464.3 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 8 | 8 | 30 | 527.1 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 9 | 9 | 24 | 590.0 | 150.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |

7 8 9

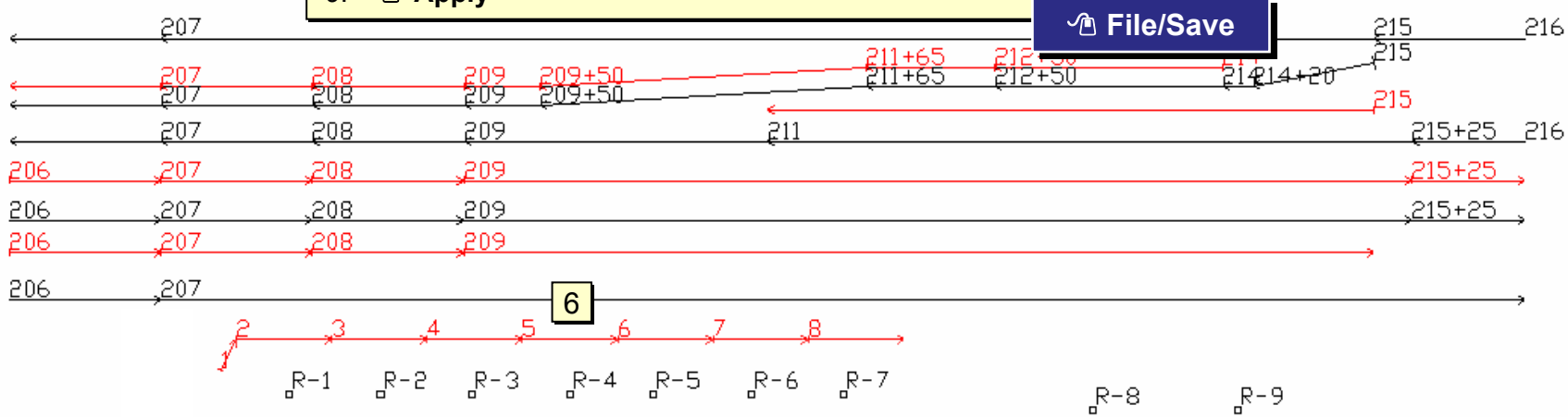
General

…….continued from previous page.

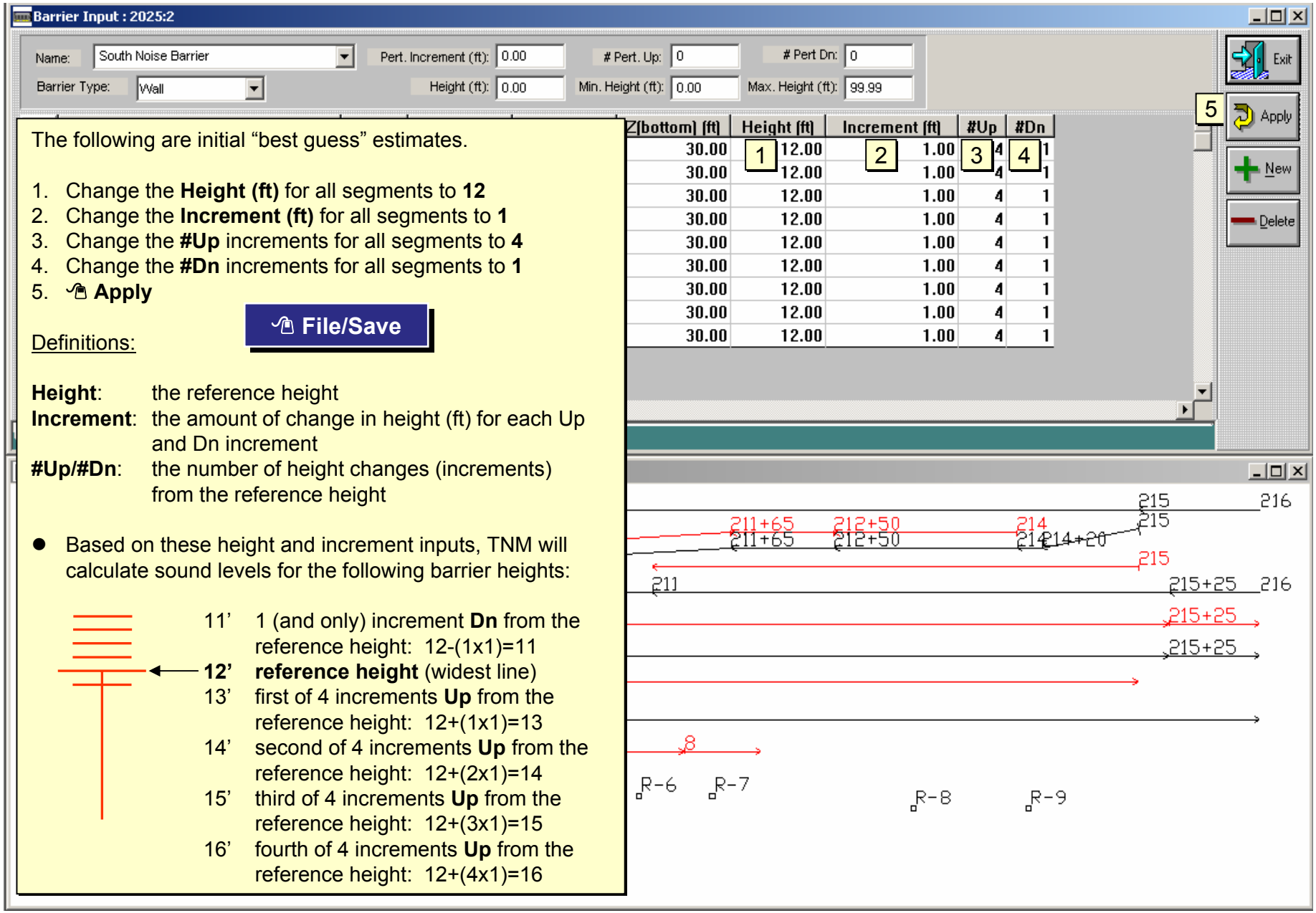
6. Seven new equally divided segments are displayed in **Plan View**
7. Six new lines/points are added in the **Barrier Input** window
8. Change **Pnt. Names** to **1** thru **9**.
9. **Apply**

**File/Save**

Plan View : 2025:1



# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (4 of 8)




The following are initial "best guess" estimates.

1. Change the **Height (ft)** for all segments to **12**
2. Change the **Increment (ft)** for all segments to **1**
3. Change the **#Up** increments for all segments to **4**
4. Change the **#Dn** increments for all segments to **1**
5. **Apply**

**File/Save**

Definitions:

**Height**: the reference height
**Increment**: the amount of change in height (ft) for each Up and Dn increment
**#Up/#Dn**: the number of height changes (increments) from the reference height

- Based on these height and increment inputs, TNM will calculate sound levels for the following barrier heights:



11' 1 (and only) increment **Dn** from the reference height: 12-(1x1)=11
**12' reference height** (widest line)
13' first of 4 increments **Up** from the reference height: 12+(1x1)=13
14' second of 4 increments **Up** from the reference height: 12+(2x1)=14
15' third of 4 increments **Up** from the reference height: 12+(3x1)=15
16' fourth of 4 increments **Up** from the reference height: 12+(4x1)=16

# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (5 of 8)

Barrier Input : 2025:2

Name: South Noise Barrier | Pert. Increment (ft): 0.00 | # Pert. Up: 0 | # Pert Dn: 0

Barrier Type: Wall | Height (ft): 0.00 | Min. Height (ft): 0.00 | Max. Height (ft): 99.99

Exit | Assy | New | Delete

| | Pnt.Name | Pnt.No | X (ft) | Y (ft) | Z(bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 22 | 140.0 | 130.0 | 30.00 | 12.00 | 1.00 | 4 | 1 |
| 2 | 2 | 23 | 150.0 | 150.0 | 30.00 | 12.00 | 1.00 | 4 | 1 |
| 3 | 3 | 24 | 212.9 | 150.0 | 30.00 | 12.00 | 1.00 | 4 | 1 |
| 4 | 4 | 25 | 275.7 | 150.0 | 30.00 | 12.00 | 1.00 | 4 | 1 |
| 5 | 5 | 26 | 338.6 | 150.0 | 30.00 | 12.00 | 1.00 | 4 | 1 |
| 6 | 6 | 27 | 401.4 | 150.0 | 30.00 | 12.00 | 1.00 | 4 | 1 |
| 7 | 7 | | | | | | | 4 | 1 |
| 8 | 8 | | | | | | | 4 | 1 |
| 9 | 9 | | | | | | | 4 | 1 |

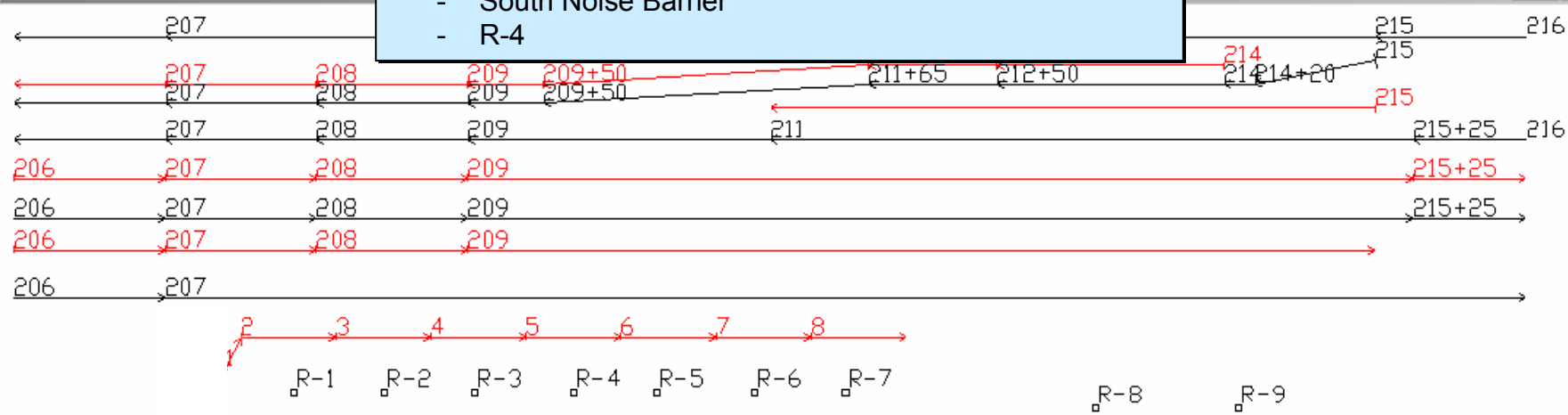
General | More | Structure | Reflectio

## EXERCISE

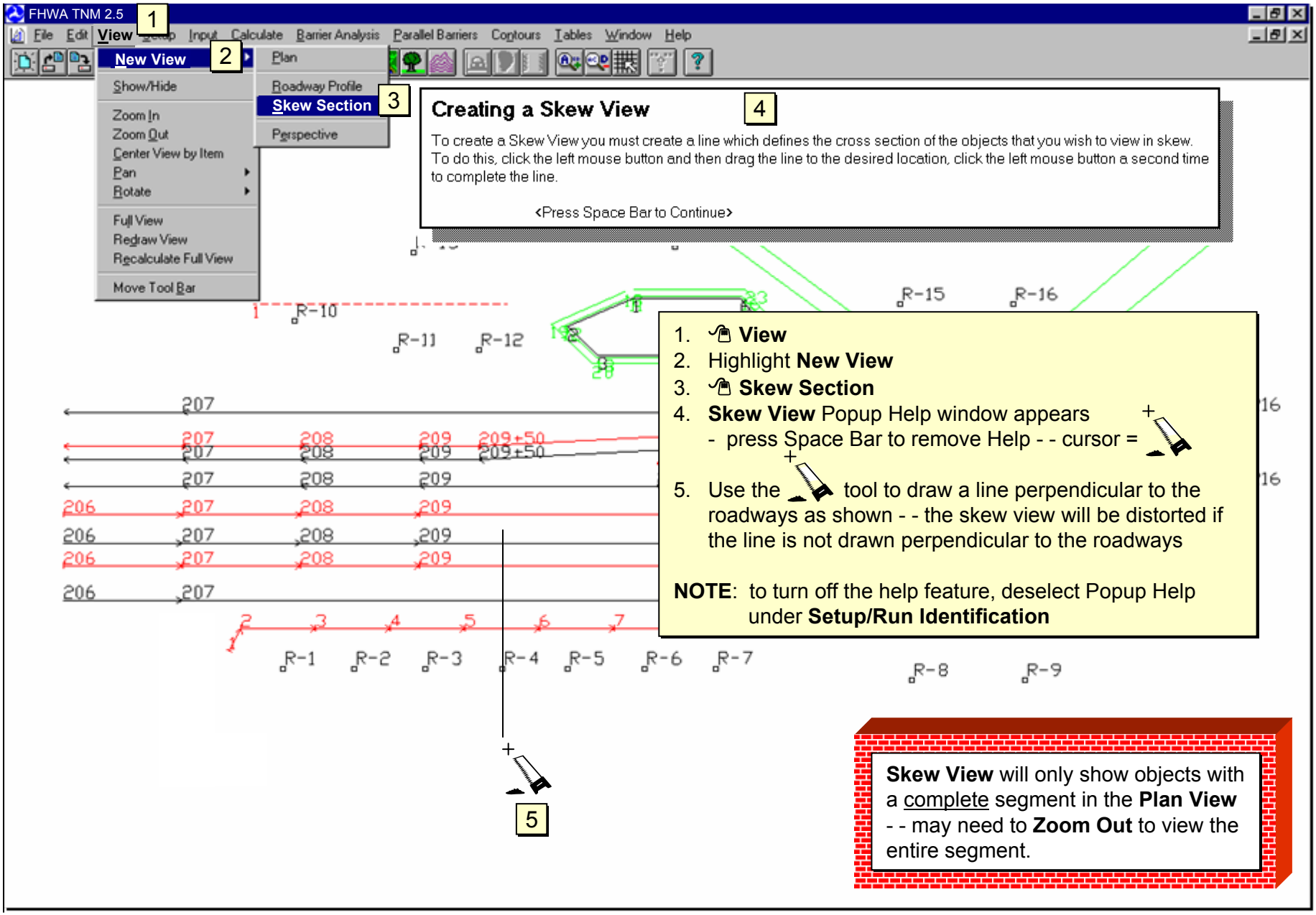
**Task**: Draw a **Skew Section** through the following objects:

- EB Main
- EB CTB
- EB Frontage
- South Noise Barrier
- R-4

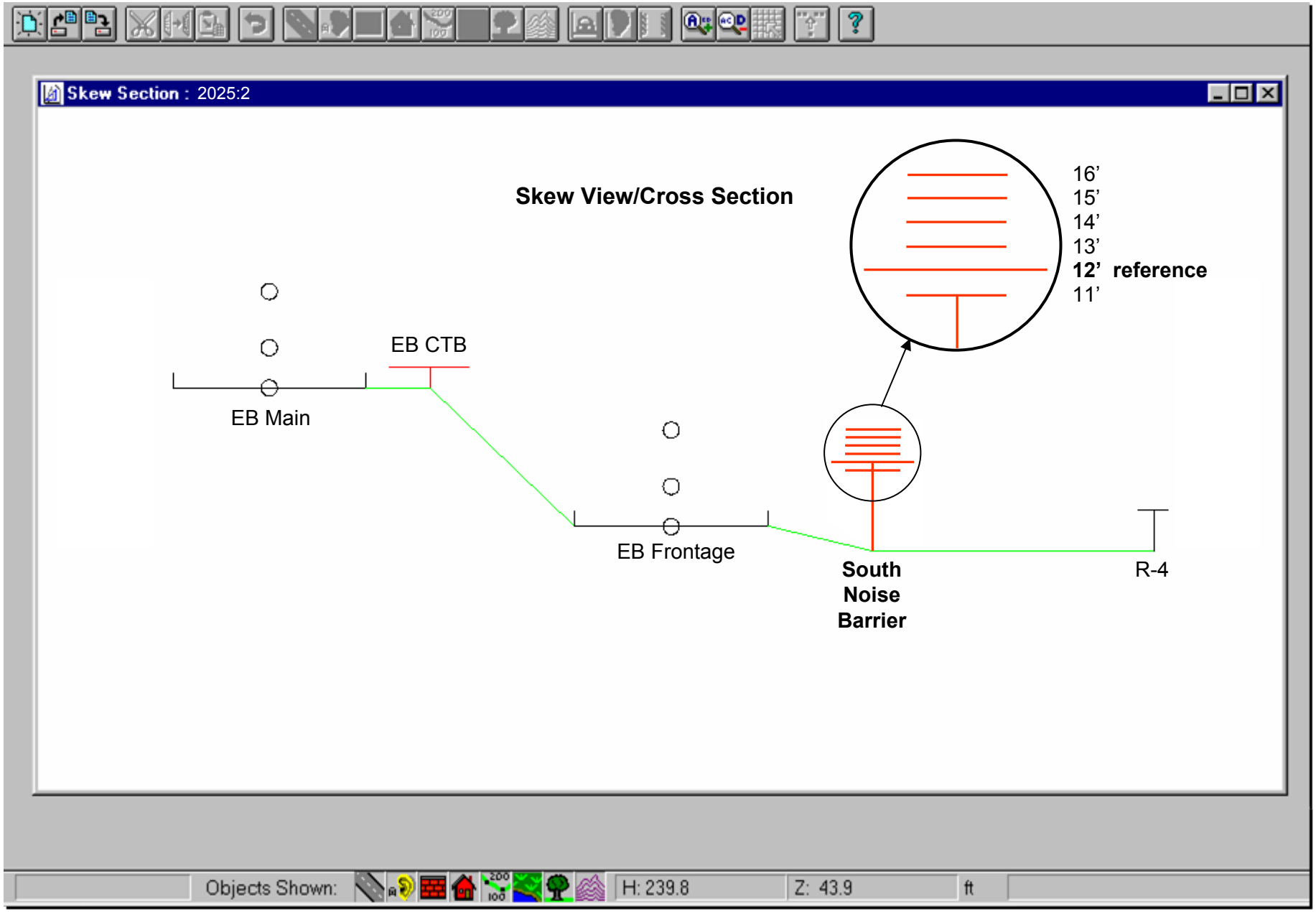
Plan View : 2025:1



# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (6 of 8)



# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (7 of 8)



# NOISE BARRIER INPUT: SOUTH NOISE BARRIER (8 of 8)

Barrier Input : 2025:2

Name: South Noise Barrier

Barrier Type: Wall

Cost ($/sq ft): 18 (2)

Additional Cost ($/ft): 0.00

| | Pnt. Name | Pnt. No. |
|---|---|---|
| 1 | 1 | 22 |
| 2 | 2 | 23 |
| 3 | 3 | 25 |
| 4 | 4 | 26 |
| 5 | 5 | 27 |
| 6 | 6 | 28 |
| 7 | 7 | 29 |
| 8 | 8 | 24 |

Exit (3) Apply New Delete

1. **More** tab at the bottom of the window
2. **Cost ($/sq ft)** field and enter **18**
3. **Apply**

**File/Save**

(1) General | More | Structur

Barrier Input : 2025:2

Name: South Noise Barrier

Barrier Type: Wall

NRC LSide: 0.00

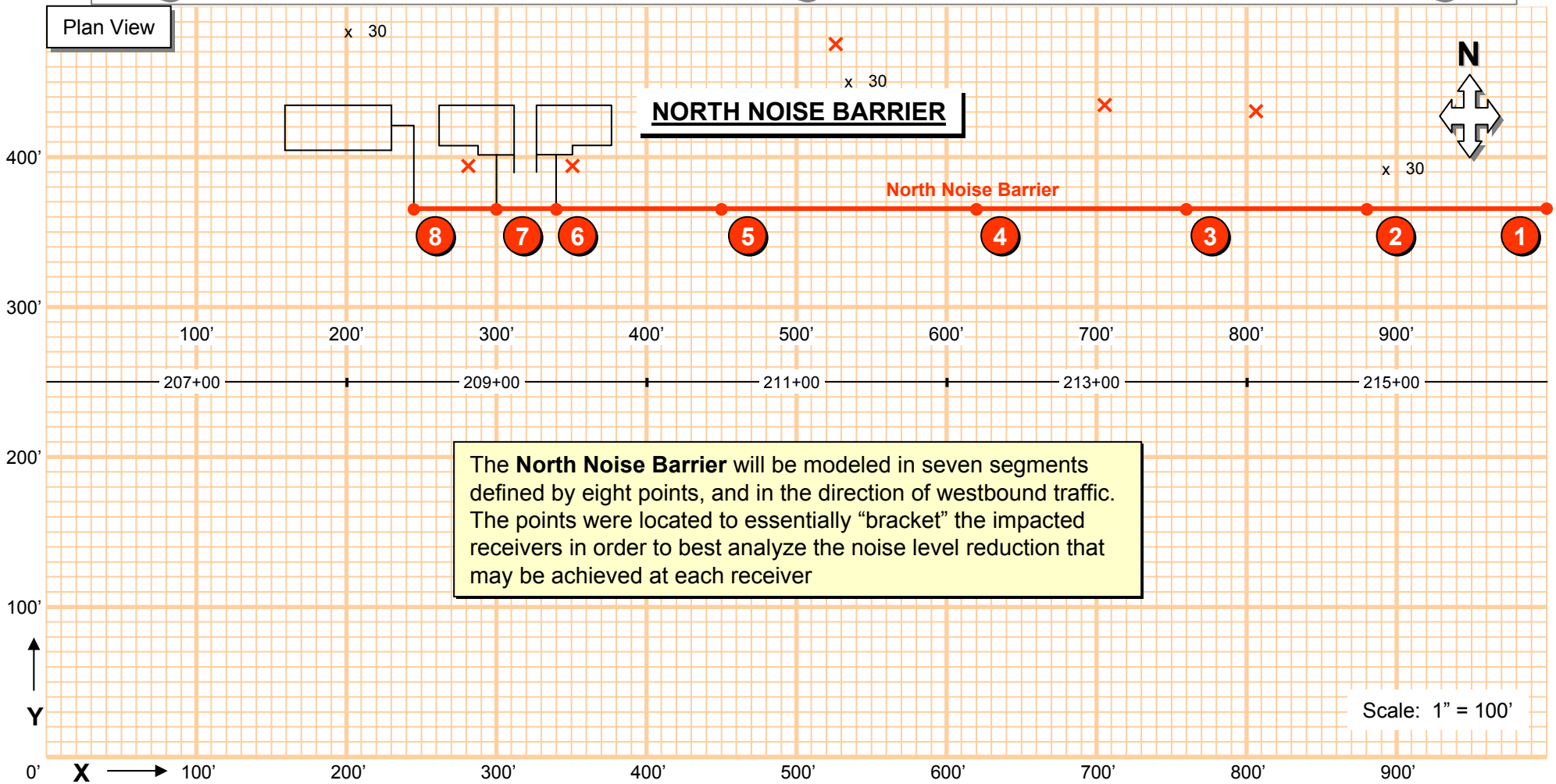
NRC RSide: 0.00

4. **Reflections** tab at the bottom of the window
5. The **Reflections?** feature is currently not active
6. **NRC** (Noise Reduction Coefficients) would primarily be modeled for absorptive treatment on the roadway side (Lside) of the barrier. The NRC would be provided by the vendor. For this barrier, do not enter any NRC value = non absorptive.

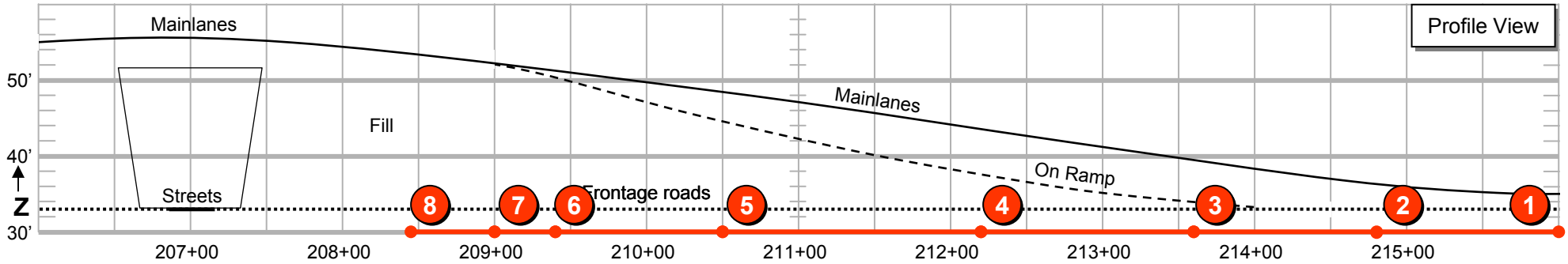
| | Pnt. Name | Pnt. No. | Reflections? | Plan View | Plan View | Textual | NRC LSide | NRC RSide |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 22 | (5) | Show | Select | Edit | (6) 0.00 | 0.00 |
| 2 | 2 | 23 | | Show | Select | Edit | 0.00 | 0.00 |
| 3 | 3 | 25 | | Show | Select | Edit | 0.00 | 0.00 |
| 4 | 4 | 26 | | Show | Select | Edit | 0.00 | 0.00 |
| 5 | 5 | 27 | | Show | Select | Edit | 0.00 | 0.00 |
| 6 | 6 | 28 | | Show | Select | Edit | 0.00 | 0.00 |
| 7 | 7 | 29 | | Show | Select | Edit | 0.00 | 0.00 |
| 8 | 8 | 24 | | Show | Select | Edit | 0.00 | 0.00 |

Exit Apply New Delete

(4) General | More | Structure | Reflections | Notes




The **North Noise Barrier** will be modeled in seven segments defined by eight points, and in the direction of westbound traffic. The points were located to essentially "bracket" the impacted receivers in order to best analyze the noise level reduction that may be achieved at each receiver



# NOISE BARRIER INPUT: NORTH NOISE BARRIER (1 of 3)

Barrier Input : 2025:2

Name: North Noise Barrier (2) Pert. Increment (ft): 0.00 # Pert. Up: 0 # Pert Dn: 0

Barrier Type: Wall Height (ft): 0.00 Min. Height (ft): 0.00 Max. Height (ft): 99.99

Exit | Apply (6) | New (1) | Delete

| | Pnt. Name | Pnt. No. | X (ft) | Y (ft) | Z (bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 31 | 1,000.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 2 | 2 | 32 | 880.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 3 | 3 | 33 | 760.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 4 | 4 | 34 | 620.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 5 | 5 | 35 | 450.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 6 | 6 | 36 | 340.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 7 | 7 | 37 | 300.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |
| 8 | 8 | 38 | 245.0 | 365.0 | 30.00 | 0.00 | 0.00 | 0 | 0 |

(3) (4) (5)

General

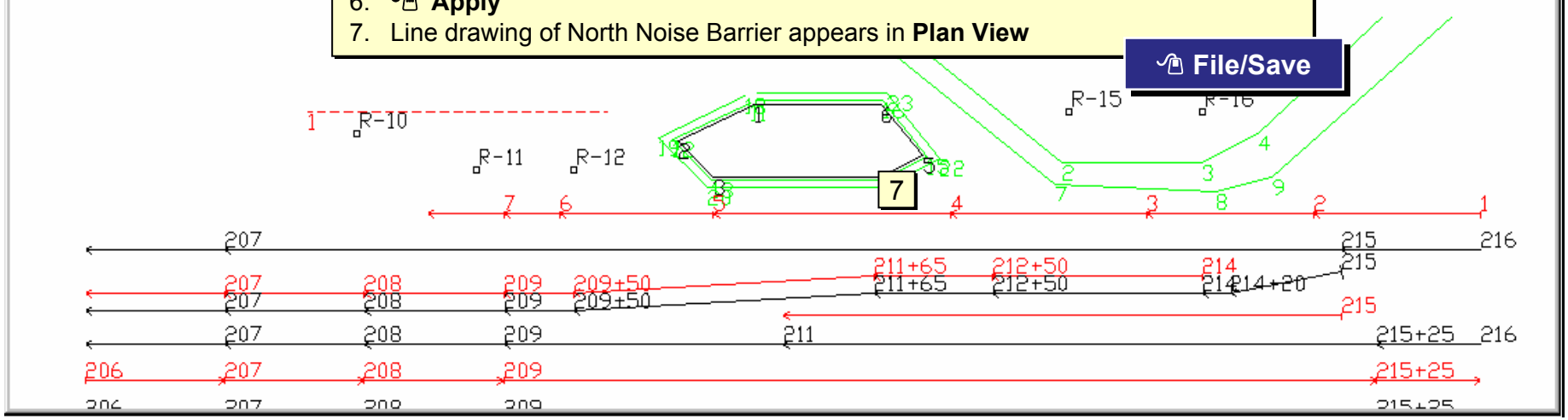
1. **New** (blank **Barrier Input** window appears)
2. in **Name** field and change to **North Noise Barrier**
3. Use **Edit/Insert** and **Edit/Append** to add eight new rows
4. Enter **X**,**Y**,**Z** coordinates for seven segments and eight points (Refer to Page J-11)

**NOTE**: enter points in the direction of westbound traffic

5. Change **Pnt. Names** to **1** thru **8**.
6. **Apply**
7. Line drawing of North Noise Barrier appears in **Plan View**

**File/Save**

Plan View : 2025:1



# NOISE BARRIER INPUT: NORTH NOISE BARRIER (2 of 3)

Barrier Input : 2025:2

Name: North Noise Barrier | Pert. Increment (ft): 0.00 | # Pert. Up: 0 | # Pert Dn: 0

Barrier Type: Wall | Height (ft): 0.00 | Min. Height (ft): 0.00 | Max. Height (ft): 99.99

Exit | Apply | New | Delete

| Pnt.Name | Pnt.No | X (ft) | Y (ft) | Z(bottom) (ft) | Height (ft) | Increment (ft) | #Up | #Dn |
|---|---|---|---|---|---|---|---|---|
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |
| | | | | 30.00 | 16.00 | 2.00 | 3 | 0 |

1 2 3 4 5

The following are initial "best guess" estimates.

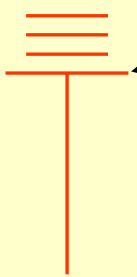
1. Change the **Height (ft)** for all segments to **16**
2. Change the **Increment (ft)** for all segments to **2**
3. Change the **#Up** increments for all segments to **3**
4. Leave the **#Dn** increments for all segments at **0**
5. **Apply**

**File/Save**

Definitions:

**Height**: the reference height
**Increment**: the amount of change in height (ft) for each Up and Dn increment
**#Up/#Dn**: the number of height changes (increments) from the reference height

- Based on these height and increment inputs, TNM will calculate sound levels for the following barrier heights:



**16'** **reference height** (widest line)
18' first of four increments **Up** from the reference height: 16+(1x2)=18
20' second of four increments **Up** from the reference height: 16+(2x2)=20
22' third of four increments **Up** from the reference height: 16+(3x2)=22

# NOISE BARRIER INPUT: NORTH NOISE BARRIER (3 of 3)

Barrier Input : 2025:2

Name: North Noise Barrier
Barrier Type: Wall
Cost ($/sq ft): 18 (2)
Additional Cost ($/ft): 0.00

| | Pnt. Name | Pnt. No. |
|---|---|---|
| 1 | 1 | 30 |
| 2 | 2 | 31 |
| 3 | 3 | 32 |
| 4 | 4 | 33 |
| 5 | 5 | 34 |
| 6 | 6 | 35 |
| 7 | 7 | 36 |
| 8 | 8 | 37 |

Exit | Apply (3) | New | Delete

1. **More** tab at the bottom of the window
2. **Cost ($/sq ft)** field and enter **18**
3. **Apply**

**File/Save**

General | More (1) | Structur

Barrier Input : 2025:2

Name: North Noise Barrier
Barrier Type: Wall
NRC LSide: 0.00
NRC RSide: 0.00

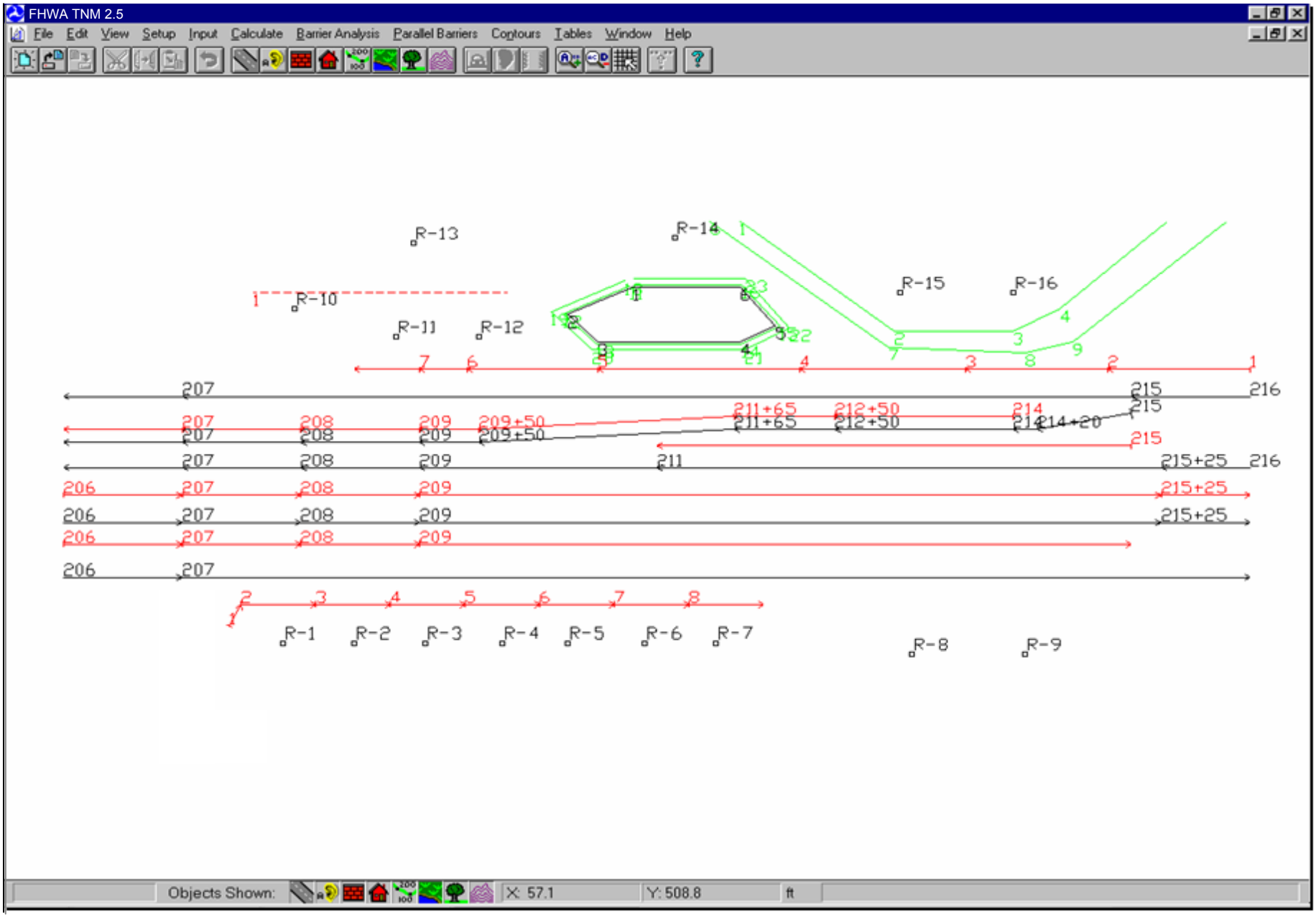
4. **Reflections** tab at the bottom of the window
5. The **Reflections?** feature is currently not active
6. **NRC** (Noise Reduction Coefficient) would primarily be modeled for absorptive treatment on the roadway side of the barrier. The NRC would be provided by the vendor. For this barrier, do not enter any NRC value = non absorptive.

| | Pnt. Name | Pnt. No. | Reflections? | Plan View | Plan View | Textual | NRC LSide | NRC RSide |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 30 | (5) | Show | Select | Edit | (6) 0.00 | 0.00 |
| 2 | 2 | 31 | | Show | Select | Edit | 0.00 | 0.00 |
| 3 | 3 | 32 | | Show | Select | Edit | 0.00 | 0.00 |
| 4 | 4 | 33 | | Show | Select | Edit | 0.00 | 0.00 |
| 5 | 5 | 34 | | Show | Select | Edit | 0.00 | 0.00 |
| 6 | 6 | 35 | | Show | Select | Edit | 0.00 | 0.00 |
| 7 | 7 | 36 | | Show | Select | Edit | 0.00 | 0.00 |
| 8 | 8 | 37 | | Show | Select | Edit | 0.00 | 0.00 |

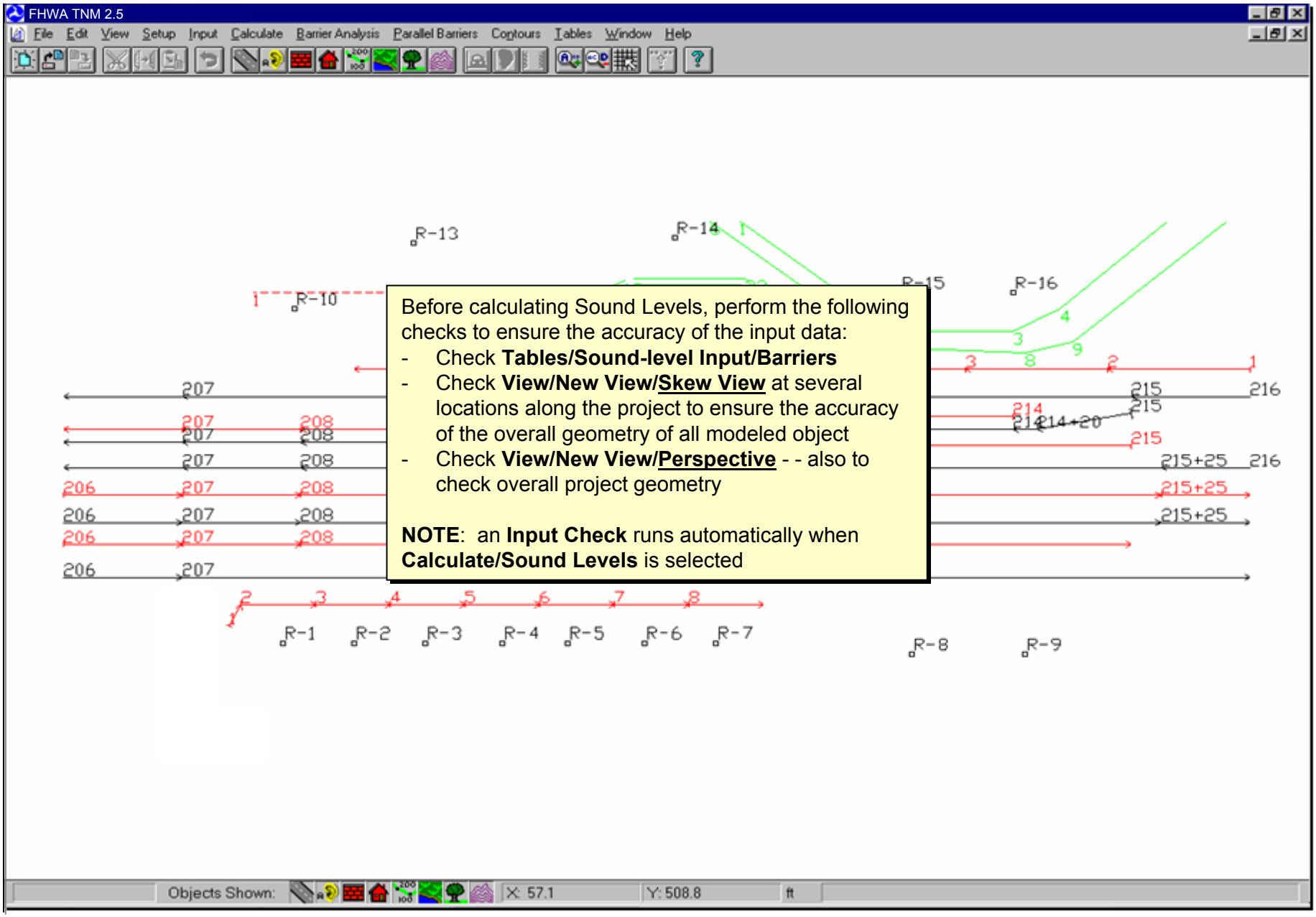
Exit | Apply | New | Delete

General | More | Structure | Reflections (4) | Notes

# OVERALL MODELED PROJECT (WITH NOISE BARRIERS)



# CALCULATE SOUND LEVELS (WITH ABATEMENT)

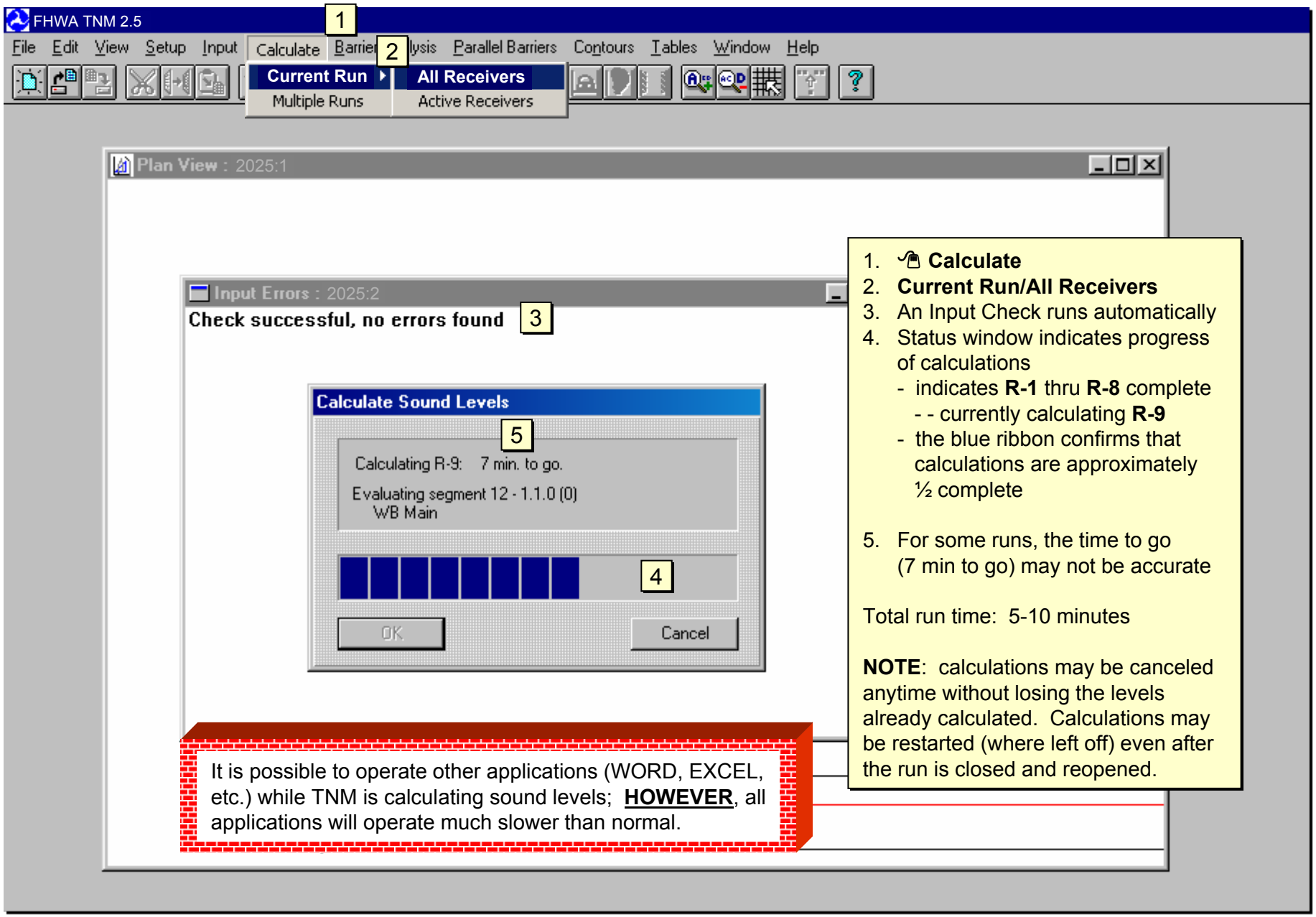



Before calculating Sound Levels, perform the following checks to ensure the accuracy of the input data:

- Check **Tables/Sound-level Input/Barriers**
- Check **View/New View/<u>Skew View</u>** at several locations along the project to ensure the accuracy of the overall geometry of all modeled object
- Check **View/New View/<u>Perspective</u>** - - also to check overall project geometry

**NOTE**: an **Input Check** runs automatically when **Calculate/Sound Levels** is selected

# CALCULATE SOUND LEVELS




1. **Calculate**
2. **Current Run/All Receivers**
3. An Input Check runs automatically
4. Status window indicates progress of calculations
   - indicates **R-1** thru **R-8** complete
   - - currently calculating **R-9**
   - the blue ribbon confirms that calculations are approximately ½ complete
5. For some runs, the time to go (7 min to go) may not be accurate

Total run time: 5-10 minutes

**NOTE**: calculations may be canceled anytime without losing the levels already calculated. Calculations may be restarted (where left off) even after the run is closed and reopened.

It is possible to operate other applications (WORD, EXCEL, etc.) while TNM is calculating sound levels; **HOWEVER**, all applications will operate much slower than normal.

# NOISE BARRIER (INITIAL) ASSESSMENT

TxDOT District 2 May 2005
name/initials

Tables/Sound-level Results Sound Levels

M 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: CSJ: 123-45-6789
RUN: SH123 (2025)
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

| Receiver Name | No. | #DUs | Existing LAeq1h | No Barrier LAeq1h Calculated | Crit'n | Increase over existing Calculated | Crit'n Sub'l Inc | Type Impact | With Barrier Calculated LAeq1h | Noise Reduction Calculated | Goal | Calculated minus Goal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | dBA | dBA | dBA | dB | dB | | dBA | dB | dB | dB |
| R-1 | 1 | 1 | 0.0 | | | | | Snd Lvl | 65.0 | 1.3 | 5 | -3.7 |
| R-2 | 2 | 1 | 0.0 | | | | | Snd Lvl | 65.4 | 1.2 | 5 | -3.8 |
| R-3 | 3 | 1 | 0.0 | | | | | Snd Lvl | 65.4 | 1.5 | 5 | -3.5 |
| R-4 | 4 | 1 | 0.0 | | | | | Snd Lvl | 65.1 | 2.0 | 5 | -3.0 |
| R-5 | 5 | 1 | 0.0 | | | | | Snd Lvl | 64.8 | 2.5 | 5 | -2.5 |
| R-6 | 6 | 1 | 0.0 | | | | | Snd Lvl | 64.8 | 2.8 | 5 | -2.2 |
| R-7 | 7 | 1 | 0.0 | | | | | Snd Lvl | 65.8 | 2.2 | 5 | -2.8 |
| R-8 | 8 | 2 | 0.0 | | | | | | 69.0 | 0.0 | 5 | -5.0 |
| R-9 | 9 | 2 | 0.0 | | | | | | 69.4 | 0.0 | 5 | -5.0 |
| R-10 | 10 | 1 | 0.0 | | | | | — | 64.3 | 0.9 | 5 | -4.1 |
| R-11 | 11 | 1 | 0.0 | | | | | Snd Lvl | 60.7 | 5.9 | 5 | 0.9 |
| R-12 | 12 | 1 | 0.0 | | | | | Snd Lvl | 59.2 | 7.8 | 5 | 2.8 |
| R-13 | 13 | 1 | 0.0 | | | | | — | 62.2 | 1.8 | 5 | -3.2 |
| R-14 | 14 | 1 | 0.0 | | | | | Snd Lvl | 63.8 | 2.6 | 5 | -2.4 |
| R-15 | 15 | 1 | 0.0 | | | | | Snd Lvl | 71.2 | 0.0 | 5 | -5.0 |
| R-16 | 16 | 1 | 0.0 | | | | | Snd Lvl | 72.2 | 0.0 | 5 | -5.0 |

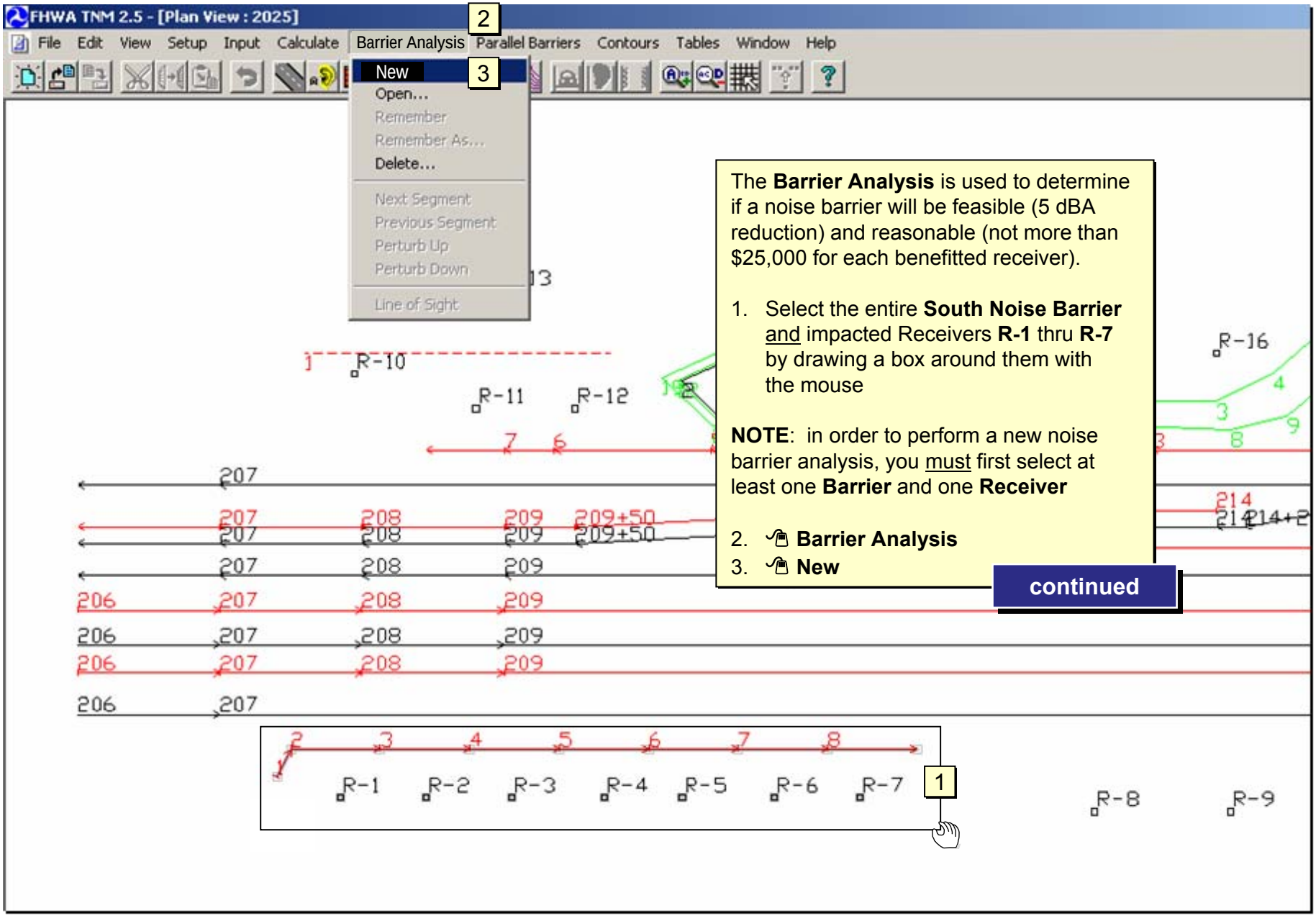
Noise levels **With Barrier** and **Noise Reductions** are based on the reference heights for each noise barrier:

South Noise Barrier: **12'**
North Noise Barrier: **14'**

**Note**: **Noise Reductions** do not account for the CTBs since they were modeled as fixed-height traffic barriers.

| Dwelling Units | # DUs | Noise Reduction Min | Avg | Max |
|---|---|---|---|---|
| | | dB | dB | dB |
| All Selected | 18 | 0.0 | 2.0 | 7.8 |
| All Impacted | 16 | 0.0 | 2.1 | 7.8 |
| All that meet NR Goal | 2 | 5.9 | 6.8 | 7.8 |

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (1 of 8)




The **Barrier Analysis** is used to determine if a noise barrier will be feasible (5 dBA reduction) and reasonable (not more than $25,000 for each benefitted receiver).

1. Select the entire **South Noise Barrier** <u>and</u> impacted Receivers **R-1** thru **R-7** by drawing a box around them with the mouse

**NOTE**: in order to perform a new noise barrier analysis, you <u>must</u> first select at least one **Barrier** and one **Receiver**

2. **Barrier Analysis**
3. **New**

**continued**

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (2 of 8)

Sound Levels : 2025:3

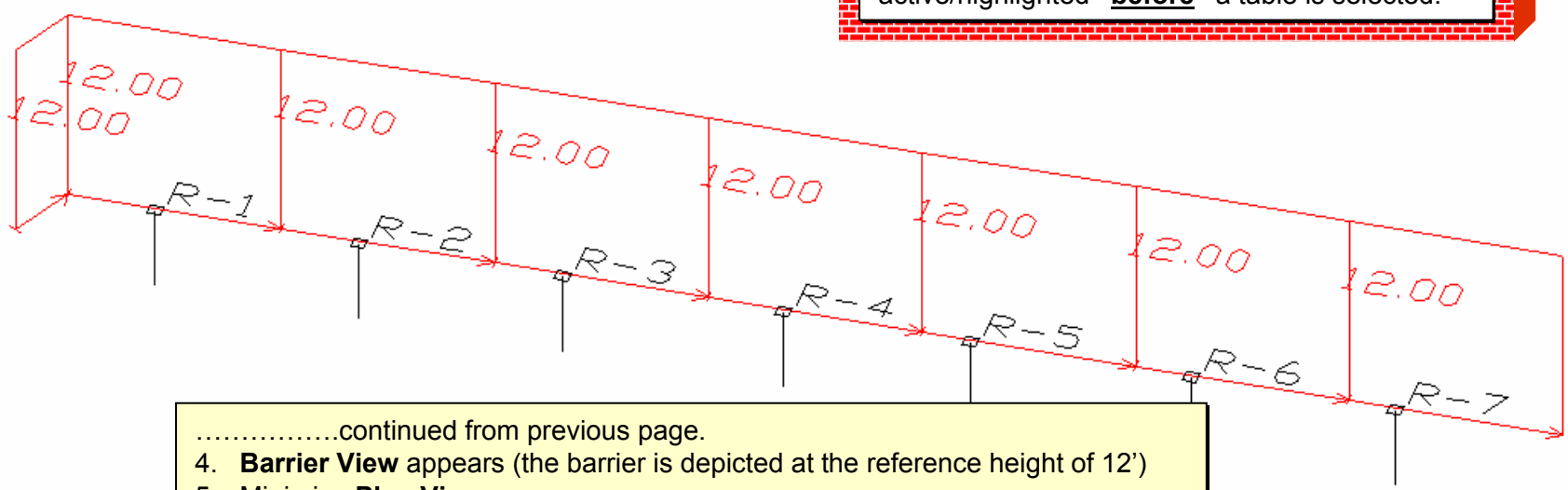
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R-1 | 1 | 1 | 0.0 | 66.3 | 66 | 66.3 | 11 | Snd Lvl | 65.0 | 1.3 | 5 | -3. |
| R-2 | 2 | 1 | 0.0 | 66.6 | 66 | 66.6 | 11 | Snd Lvl | 65.4 | 1.2 | 5 | -3. |
| R-3 | 3 | 1 | 0.0 | 66.9 | 66 | 66.9 | 11 | Snd Lvl | 65.4 | 1.5 | 5 | -3. |
| R-4 | 4 | 1 | 0.0 | 67.1 | 66 | 67.1 | 11 | Snd Lvl | 65.1 | 2.0 | 5 | -3. |
| R-5 | 5 | 1 | 0.0 | 67.3 | 66 | 67.3 | 11 | Snd Lvl | 64.8 | 2.5 | 5 | -2. |
| R-6 | 6 | 1 | 0.0 | 67.6 | 66 | 67.6 | 11 | Snd Lvl | 64.8 | 2.8 | 5 | -2. |
| R-7 | 7 | 1 | 0.0 | 68.0 | 66 | 68.0 | 11 | Snd Lvl | 65.8 | 2.2 | 5 | -2. |

6

Barrier View-unsaved : 2025:2

Tables associated with a barrier analysis will not provide proper data unless the **Barrier View** is active/highlighted **"before"** a table is selected.

4




…….continued from previous page.

4. **Barrier View** appears (the barrier is depicted at the reference height of 12')
5. Minimize **Plan View**
6. With **Barrier View** highlighted, open the **Sound Level** (Results) table. Adjust the size of the windows to be able to easily view the noise levels for the seven receivers in the table as well as the **Barrier View** of the barrier and receivers.
   - **Window/Tile Horizontal** (resize windows as appropriate)
   - **View/Full View** to maximize and center the Barrier View
   - **Show/Hide/Receivers** (to show labels/text for receivers)

5

Plan View : 2...

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (3 of 8)

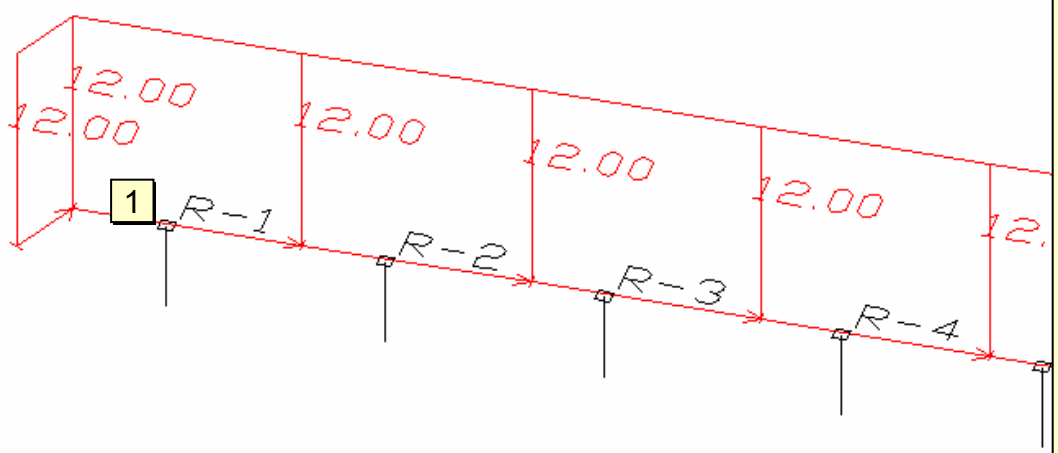
Sound Levels : 2025:3

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R-1 | 1 | 1 | 0.0 | 66.3 | 66 | 66.3 | 11 | Snd Lvl | 65.0 | 1.3 | 5 | -3. |
| R-2 | 2 | 1 | 0.0 | 66.6 | 66 | 66.6 | 11 | Snd Lvl | 65.4 | 1.2 | 5 | -3. |
| R-3 | 3 | 1 | 0.0 | 66.9 | 66 | 66.9 | 11 | Snd Lvl | 65.4 | 1.5 | 5 | -3. |
| R-4 | 4 | 1 | 0.0 | 67.2 | 66 | 67.2 | 11 | Snd Lvl | 64.8 | 2.0 | 5 | -3. |
| R-5 | 5 | 1 | 0.0 | 67.5 | 66 | 67.5 | 11 | Snd Lvl | 64.8 | 2.5 | 5 | -2. |
| R-6 | 6 | 1 | 0.0 | 67.6 | 66 | 67.6 | 11 | Snd Lvl | 64.8 | 2.8 | 5 | -2. |
| R-7 | 7 | 1 | 0.0 | 68.0 | 66 | 68.0 | 11 | Snd Lvl | 65.8 | 2.2 | 5 | -2. |

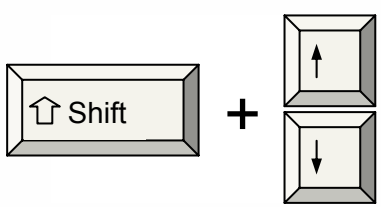
3 3

Noise level reductions are based on the reference height of 12 feet.

Barrier View-unsaved : 2025:2




2




TNM has already pre-calculated the noise levels/noise level reductions for all heights for all barrier segments and all receivers.

The next step will be to adjust the height of each barrier segment to achieve a feasible reduction in noise levels at the impacted receivers, if possible -- to arrive at the maximum number of "benefited" receivers.

To adjust the height of barrier segments:

1. Select/adjust one segment:
   the bottom line of one segment
   Select/adjust all segments:
   the bottom line of any segment
2. Use the **Shift + Arrow Up/Dn** keys to increase/decrease the height of the selected barrier segment(s)
3. As the height is changed, the noise levels **With Barrier** and **Noise Reductions** change immediately.

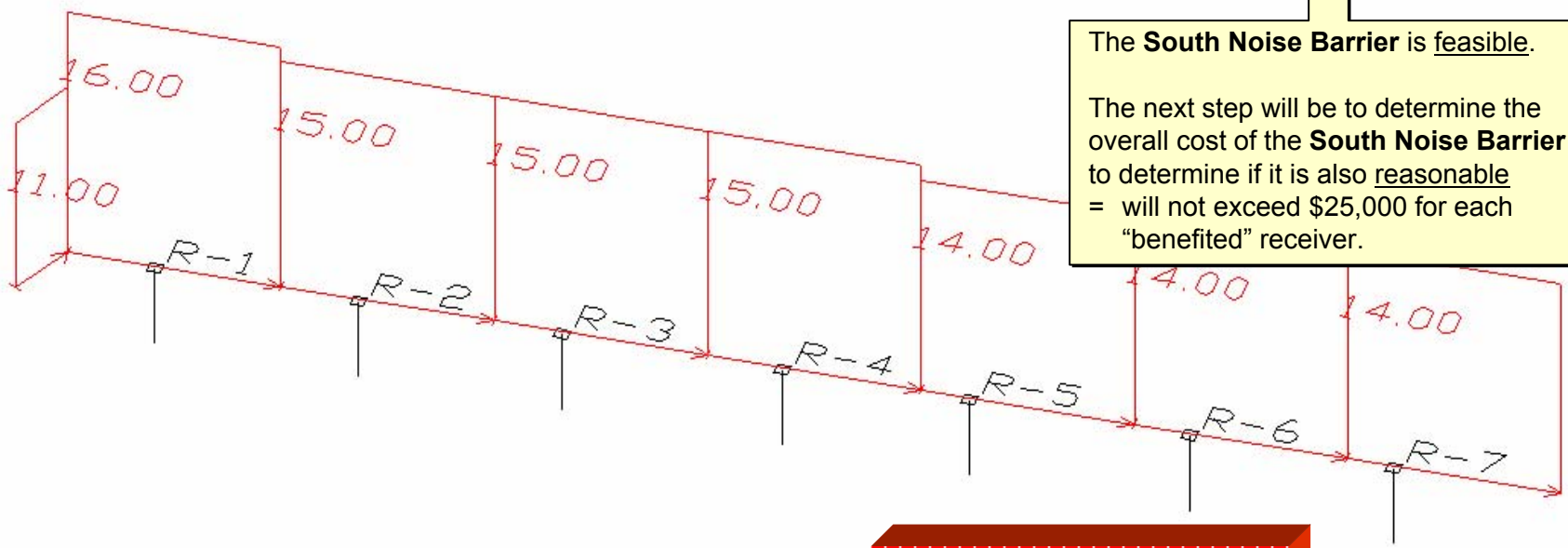
Plan View : 2...

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (4 of 8)

Sound Levels : 2025:3

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R-1 | 1 | 1 | 0.0 | 66.3 | 66 | 66.3 | 11 | Snd Lvl | 60.9 | 5.4 | 5 | 0. |
| R-2 | 2 | 1 | 0.0 | 66.6 | 66 | 66.6 | 11 | Snd Lvl | 61.0 | 5.6 | 5 | 0. |
| R-3 | 3 | 1 | 0.0 | 66.9 | 66 | 66.9 | 11 | Snd Lvl | 61.3 | 5.6 | 5 | 0. |
| R-4 | 4 | 1 | 0.0 | 67.1 | 66 | 67.1 | 11 | Snd Lvl | 61.3 | 5.8 | 5 | 0. |
| R-5 | 5 | 1 | 0.0 | 67.3 | 66 | 67.3 | 11 | Snd Lvl | 61.9 | 5.4 | 5 | 0. |
| R-6 | 6 | 1 | 0.0 | 67.6 | 66 | 67.6 | 11 | Snd Lvl | 62.9 | 4.7 | 5 | -0. |
| R-7 | 7 | 1 | 0.0 | 68.0 | 66 | 68.0 | 11 | Snd Lvl | 64.3 | 3.7 | 5 | -1. |

Barrier View-SNB-fr-2 : 2025:2




The **South Noise Barrier** is feasible.

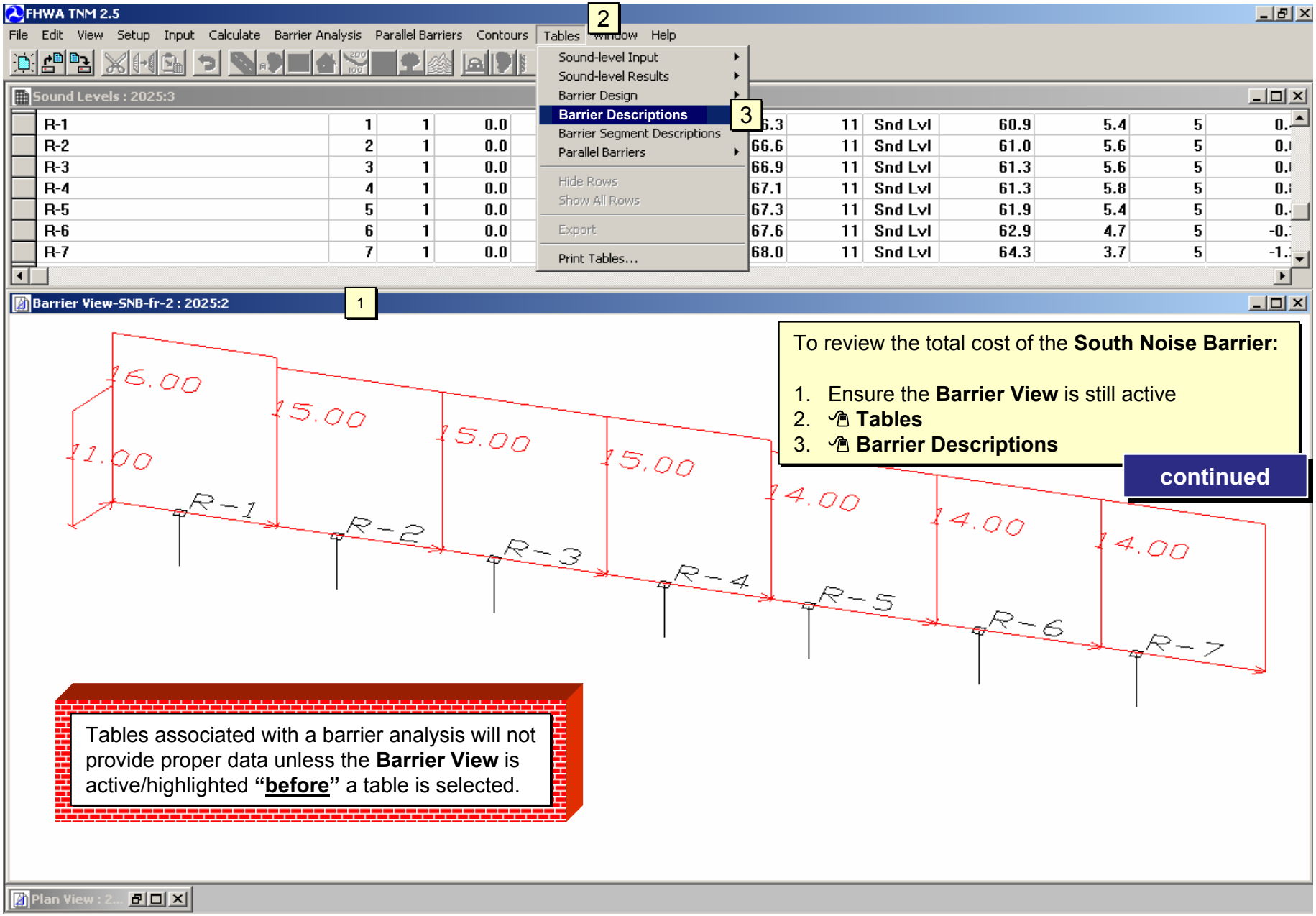
The next step will be to determine the overall cost of the **South Noise Barrier** to determine if it is also reasonable
= will not exceed $25,000 for each "benefited" receiver.

This symbol helps orient the **X**, **Y**, **Z** axes and is called an "axiomaticator."

Noise barrier analyses often have more than one solution … multiple solutions that are all feasible and reasonable.

Plan View : Z...

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (5 of 8)




To review the total cost of the **South Noise Barrier:**

1. Ensure the **Barrier View** is still active
2. **Tables**
3. **Barrier Descriptions**

**continued**

Tables associated with a barrier analysis will not provide proper data unless the **Barrier View** is active/highlighted **"before"** a table is selected.

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (6 of 8)

Barrier Descriptions Table : 2025:4 4

| Name | Type | Heights along Barrier Min | Avg | Max | Length | If Wall Area | If Berm Volume | Top Width | Run:Rise | Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | ft | ft | ft | sq ft | cu yd | ft | ft:ft | $ |
| South Noise Barrier | W | 11.00 | 14.53 | 16.00 | 462 | 6720 | | | | 120965 |
| | | | | | | | | | Total Cost: | 120965 |

Sound Levels : 2025:3

| | | | | | | |
|---|---|---|---|---|---|---|
| R-1 | 11 | Snd Lvl | 60.9 | 5.4 | 5 | 0. |
| R-2 | 11 | Snd Lvl | 61.0 | 5.6 | 5 | 0. |
| R-3 | 11 | Snd Lvl | 61.3 | 5.6 | 5 | 0. |
| R-4 | 11 | Snd Lvl | 61.3 | 5.8 | 5 | 0. |
| R-5 | 11 | Snd Lvl | 61.9 | 5.4 | 5 | 0. |
| R-6 | 11 | Snd Lvl | 62.9 | 4.7 | 5 | -0. |
| R-7 | 11 | Snd Lvl | 64.3 | 3.7 | 5 | -1. |

…….continued from previous page.

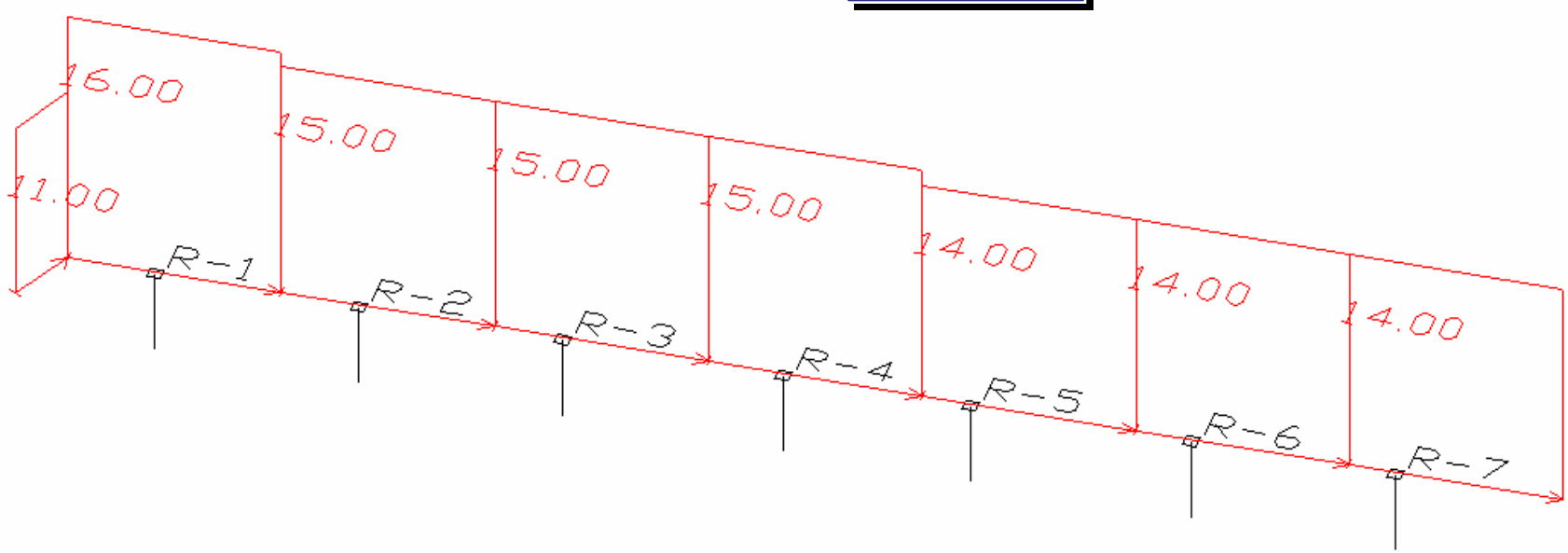
4. The **Barrier Descriptions** table provides the total length, area and cost of all eight segments of the **South Noise Barrier.**

- Adjust the size of the windows to simultaneously view all three.

Task: Adjust the height of the segments to reduce the overall cost while maintaining the same number of "benefited receivers.

continued

Barrier View-SNB-fr-2 : 2025:2




Plan View : 2...

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (7 of 8)

Barrier Descriptions Table : 2025:4

| Name | Type | Heights along Barrier Min | Avg | Max | Length | If Wall Area | If Berm Volume | Top Width | Run:Rise | Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | ft | ft | ft | sq ft | cu yd | ft | ft:ft | $ |
| South Noise Barrier | W | 14.00 | 14.86 | 16.00 | 440 | 6537 | | | | 117668 |
| | | | | | | | | | Total Cost: | 117668 |

6

Sound Levels : 2025:3

| | | | | | | |
|---|---|---|---|---|---|---|
| R-1 | Snd Lvl | 61.3 | 5.0 | 5 | 0. |
| R-2 | Snd Lvl | 60.3 | 6.3 | 5 | 1. |
| R-3 | Snd Lvl | 60.7 | 6.2 | 5 | 1. |
| R-4 | Snd Lvl | 61.2 | 5.9 | 5 | 0. |
| R-5 | Snd Lvl | 61.9 | 5.4 | 5 | 0. |
| R-6 | Snd Lvl | 62.9 | 4.7 | 5 | -0. |
| R-7 | Snd Lvl | 64.3 | 3.7 | 5 | -1. |

7

…….continued from previous page.

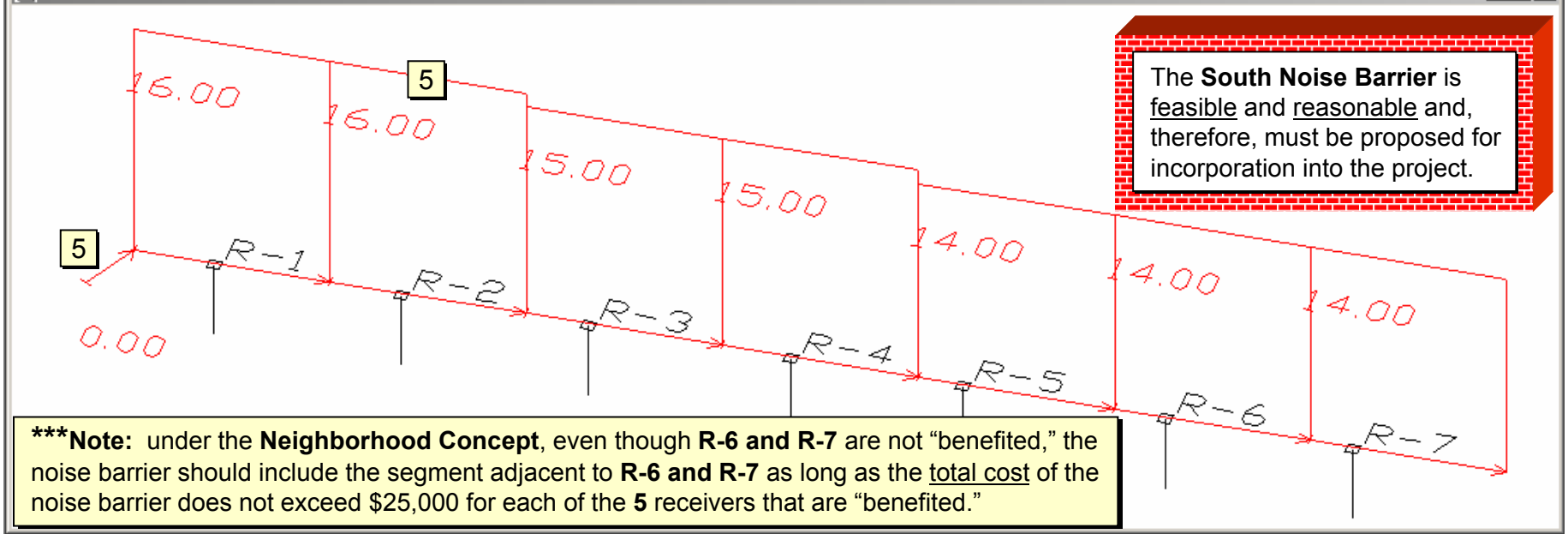
5. Adjusted segments (1 and 3)

6. **Total Cost ($117,668)**

7. **Benefited Receivers (5)**

= $23,534***

Barrier View-unsaved : 2025:2

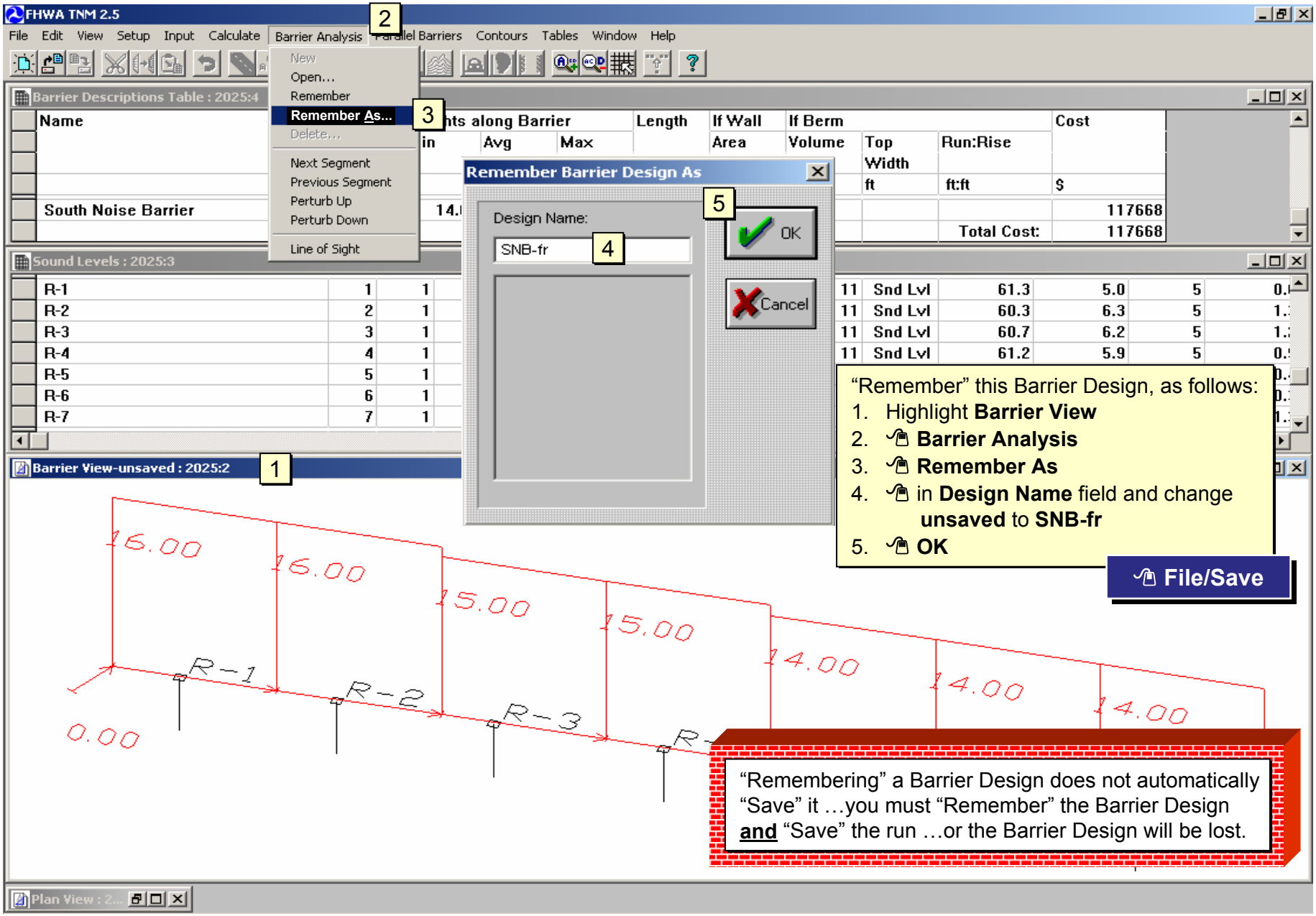



The **South Noise Barrier** is feasible and reasonable and, therefore, must be proposed for incorporation into the project.

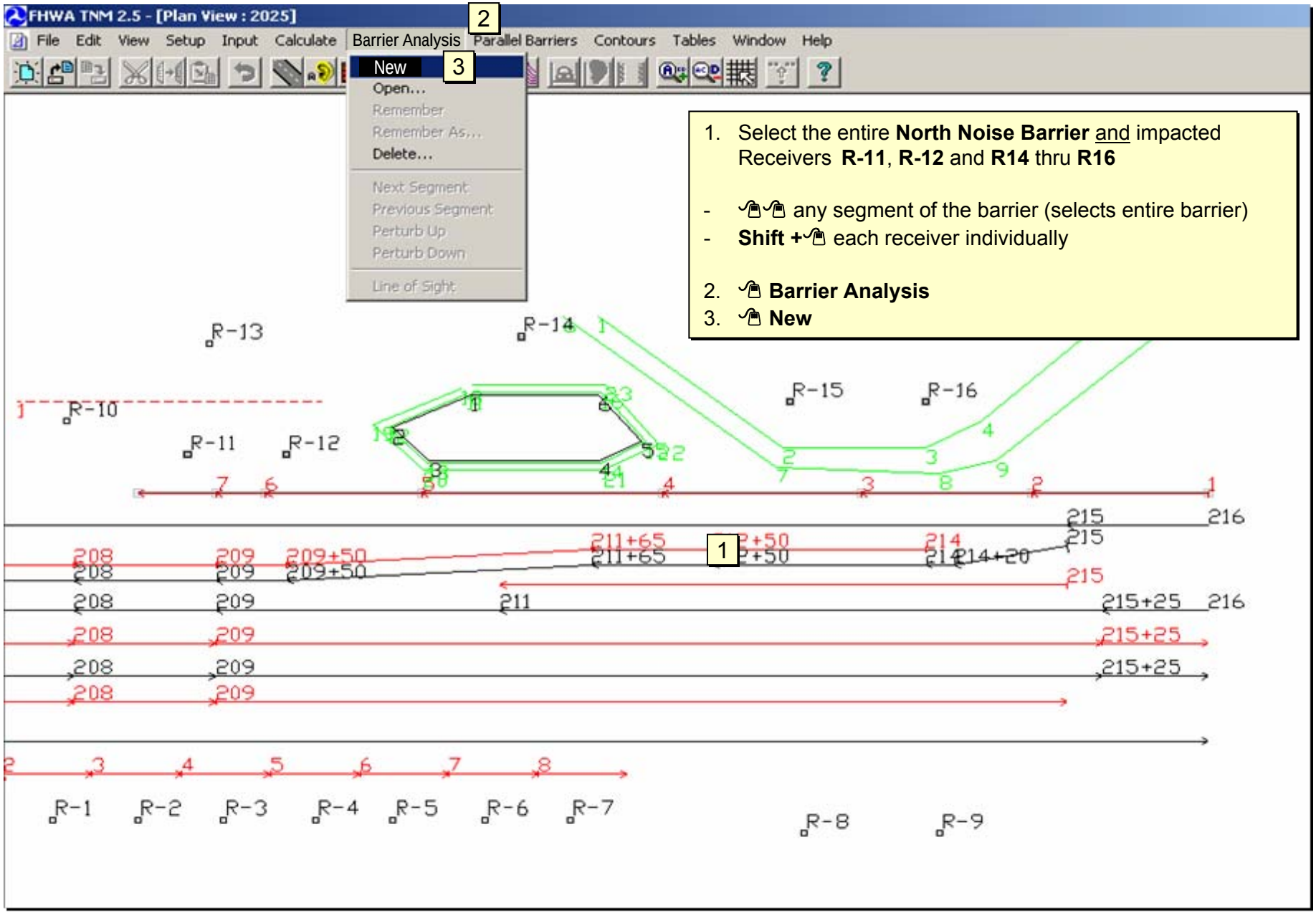
***Note: under the **Neighborhood Concept**, even though **R-6 and R-7** are not "benefited," the noise barrier should include the segment adjacent to **R-6 and R-7** as long as the total cost of the noise barrier does not exceed $25,000 for each of the **5** receivers that are "benefited."

Plan View : 2...

# BARRIER ANALYSIS: SOUTH NOISE BARRIER (8 of 8)



# BARRIER ANALYSIS: NORTH NOISE BARRIER (1 of 5)



# BARRIER ANALYSIS: NORTH NOISE BARRIER (2 of 5)

Barrier Descriptions Table : 2025:4

| Name | ngth | If Wall Area | If Berm Volume | Top Width | Run:Rise | Cost |
|---|---|---|---|---|---|---|
| | | sq ft | cu yd | ft | ft:ft | $ |
| North Nois | 720 | 11520 | | | | 207360 |
| | | | | | Total Cost: | 207360 |

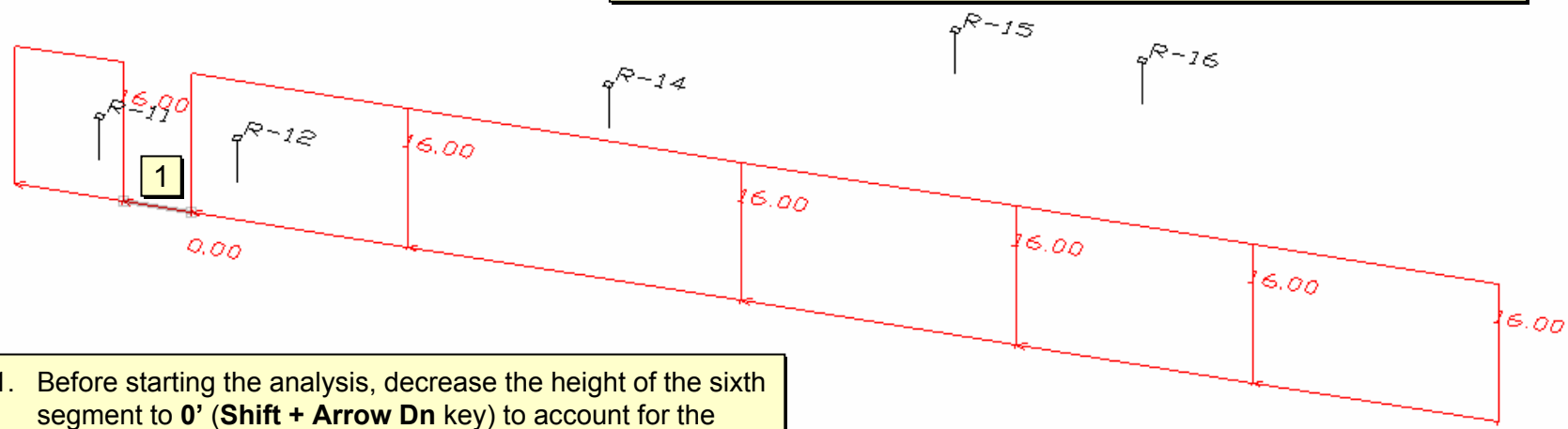
Tables associated with a barrier analysis will not provide proper data unless the **Barrier View** is active/highlighted "**before**" a table is selected.

Sound Levels : 2025:3

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R-11 | 11 | 1 | 0.0 | 66.6 | 66 | 66.6 | 11 | Snd Lvl | 62.8 | 3.8 | 5 | -1. |
| R-12 | 12 | 1 | 0.0 | 67.0 | 66 | 67.0 | 11 | Snd Lvl | 62.3 | 4.7 | 5 | -0. |
| R-14 | 14 | 1 | 0.0 | 66.4 | 66 | 66.4 | 11 | Snd Lvl | 63.8 | 2.6 | 5 | -2. |
| R-15 | 15 | 1 | 0.0 | 71.2 | 66 | 71.2 | 11 | Snd Lvl | 71.2 | 0.0 | 5 | -5. |
| R-16 | 16 | 1 | 0.0 | 72.2 | 66 | 72.2 | 11 | Snd Lvl | 72.2 | 0.0 | 5 | -5. |

Barrier View-unsaved : 2025:2

With the **Barrier View** active/highlighted, open the **Sound Levels** and **Barrier Descriptions** tables and adjust the size of the windows to be able to easily view all three windows and "show" labels/text for receivers




1. Before starting the analysis, decrease the height of the sixth segment to **0'** (**Shift + Arrow Dn** key) to account for the gap for the driveways for Receivers **R-11** and **R-12**. Note that noise reductions drop below "feasible" levels.

Plan View : 2...

# BARRIER ANALYSIS: NORTH NOISE BARRIER (3 of 5)

Barrier Descriptions Table : 2025:4

| Name | Type | Heights along Barrier Min | Avg | Max | Length | If Wall Area | If Berm Volume | Top Width | Run:Rise | Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | ft | ft | ft | sq ft | cu yd | ft | ft:ft | $ |
| North Noise Barrier | W | 16.00 | 16.00 | 16.00 | 720 | 11520 | | | | 207360 |
| | | | | | | | | | Total Cost: | 207360 |

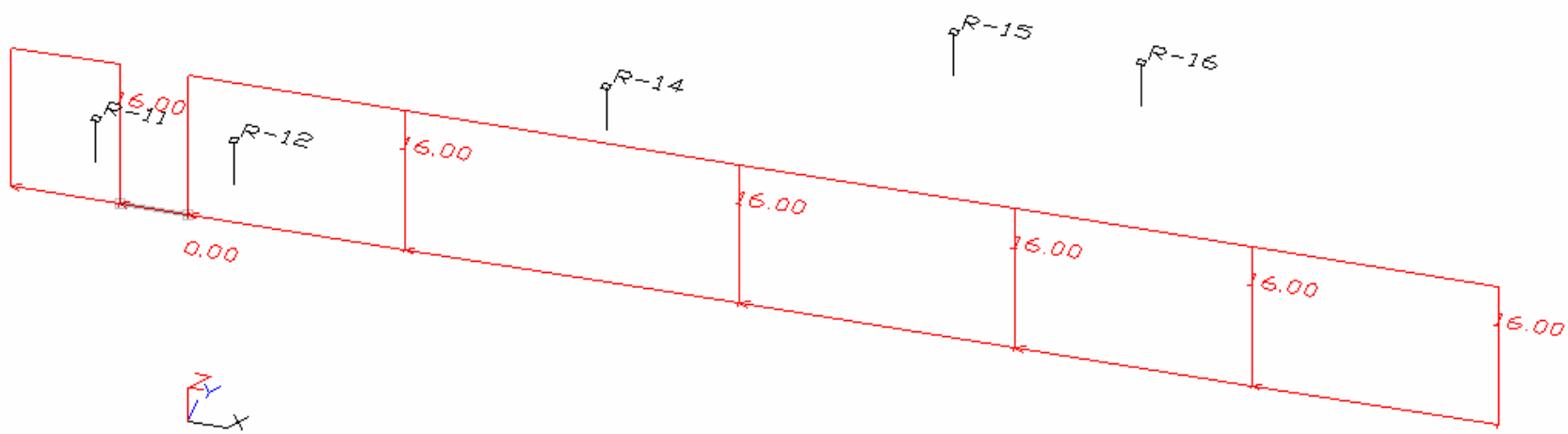
Sound Levels : 2025:3

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R-11 | 11 | 1 | 0.0 | 66.6 | 66 | 66.6 | 11 | Snd Lvl | 62.8 | 3.8 | 5 | -1. |
| R-12 | 12 | 1 | 0.0 | 67.0 | 66 | 67.0 | 11 | Snd Lvl | 62.3 | 4.7 | 5 | -0. |
| R-14 | 14 | 1 | 0.0 | 66.4 | 66 | 66.4 | 11 | Snd Lvl | 63.8 | 2.6 | 5 | -2. |
| R-15 | | | | | | | | | | 0.0 | 5 | -5. |
| R-16 | | | | | | | | | | 0.0 | 5 | -5. |

**EXERCISE**

**Task**: Adjust the height of all remaining segments of the **North Noise Barrier** to attempt to achieve a **feasible** reduction (5 dBA) in noise levels at a **reasonable** cost ($25,000 or less for each benefited receiver) for any or all of the selected receivers.

Barrier View-unsaved : 2025:2




Plan View : 2...

# BARRIER ANALYSIS: NORTH NOISE BARRIER (4 of 5)

Barrier Descriptions Table : 2025:4

| Name | Type | Heights along Barrier Min | Avg | Max | Length | If Wall Area | If Berm Volume | Top Width | Run:Rise | Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | ft | ft | ft | sq ft | cu yd | ft | ft:ft | $ |
| North Noise Barrier | W | 16.00 | 18.82 | 22.00 | 475 | 8940 | | | | 160920 |
| | | | | | | | | | Total Cost: | 160920 |

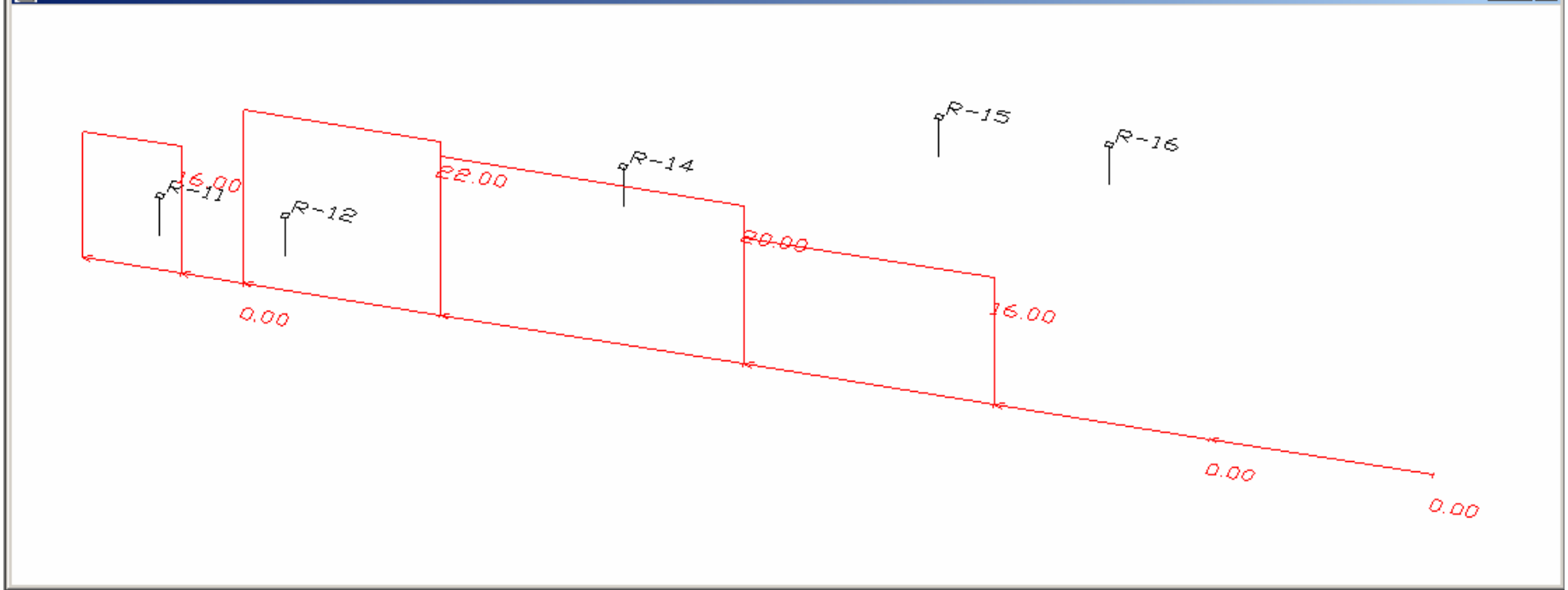
Sound Levels : 2025:3

| | | | | | |
|---|---|---|---|---|---|
| R-11 | Snd Lvl | 62.7 | 3.9 | 5 | -1. |
| R-12 | Snd Lvl | 61.9 | 5.1 | 5 | 0. |
| R-14 | Snd Lvl | 61.1 | 5.3 | 5 | 0. |
| R-15 | Snd Lvl | 71.2 | 0.0 | 5 | -5. |
| R-16 | Snd Lvl | 72.2 | 0.0 | 5 | -5. |

It is only possible to achieve a feasible reduction in noise levels at two impacted receivers (**R-12** and **R-14**); however, the cost for this barrier (**$160,920**) far exceeds the $25,000 limit for each benefited receiver.

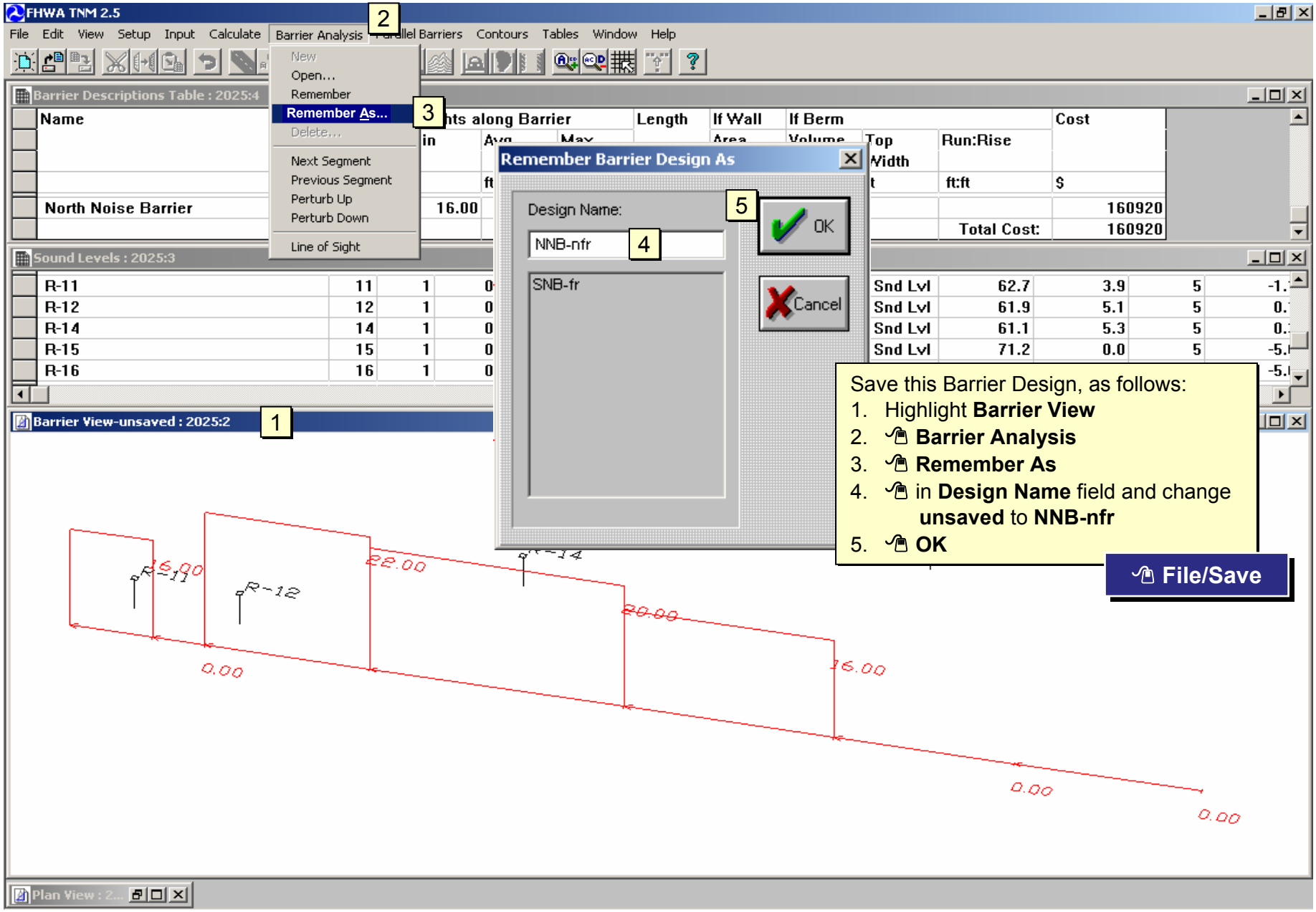
The **North Noise Barrier** is <u>not</u> feasible <u>and</u> reasonable for any receivers

Barrier View-unsaved : 2025:2




Plan View : 2...

# BARRIER ANALYSIS: NORTH NOISE BARRIER (5 of 5)




Save this Barrier Design, as follows:

1. Highlight **Barrier View**
2. **Barrier Analysis**
3. **Remember As**
4. in **Design Name** field and change **unsaved** to **NNB-nfr**
5. **OK**

**File/Save**

# IMPORTING A MICROSTATION FILE (1 of 4)

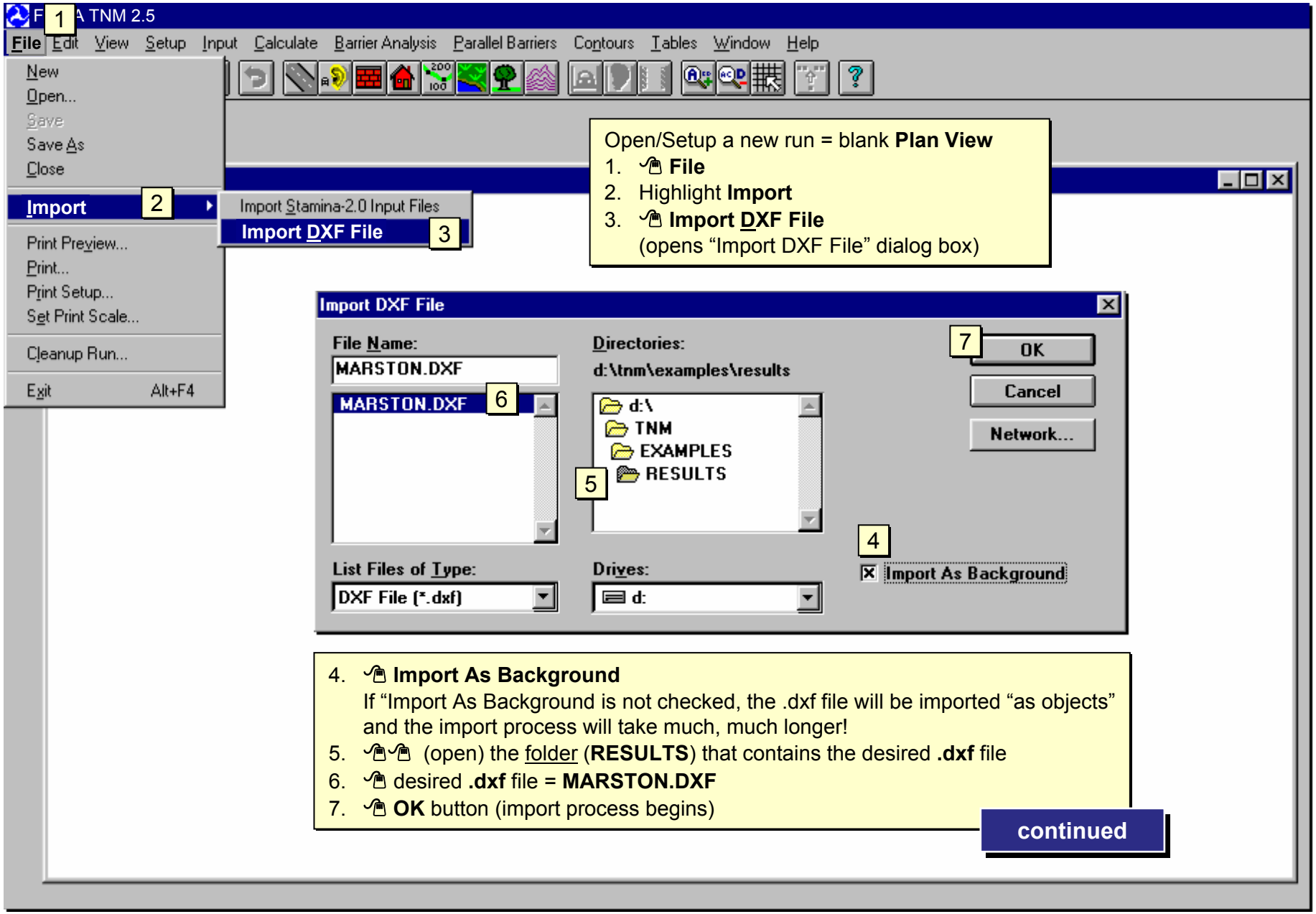
MicroStation **.dgn** files must be exported from MicroStation in a **.dxf** format before importing into TNM.

Before importing into TNM, **.dxf** files should be as small (in memory) as possible. Consider the following:

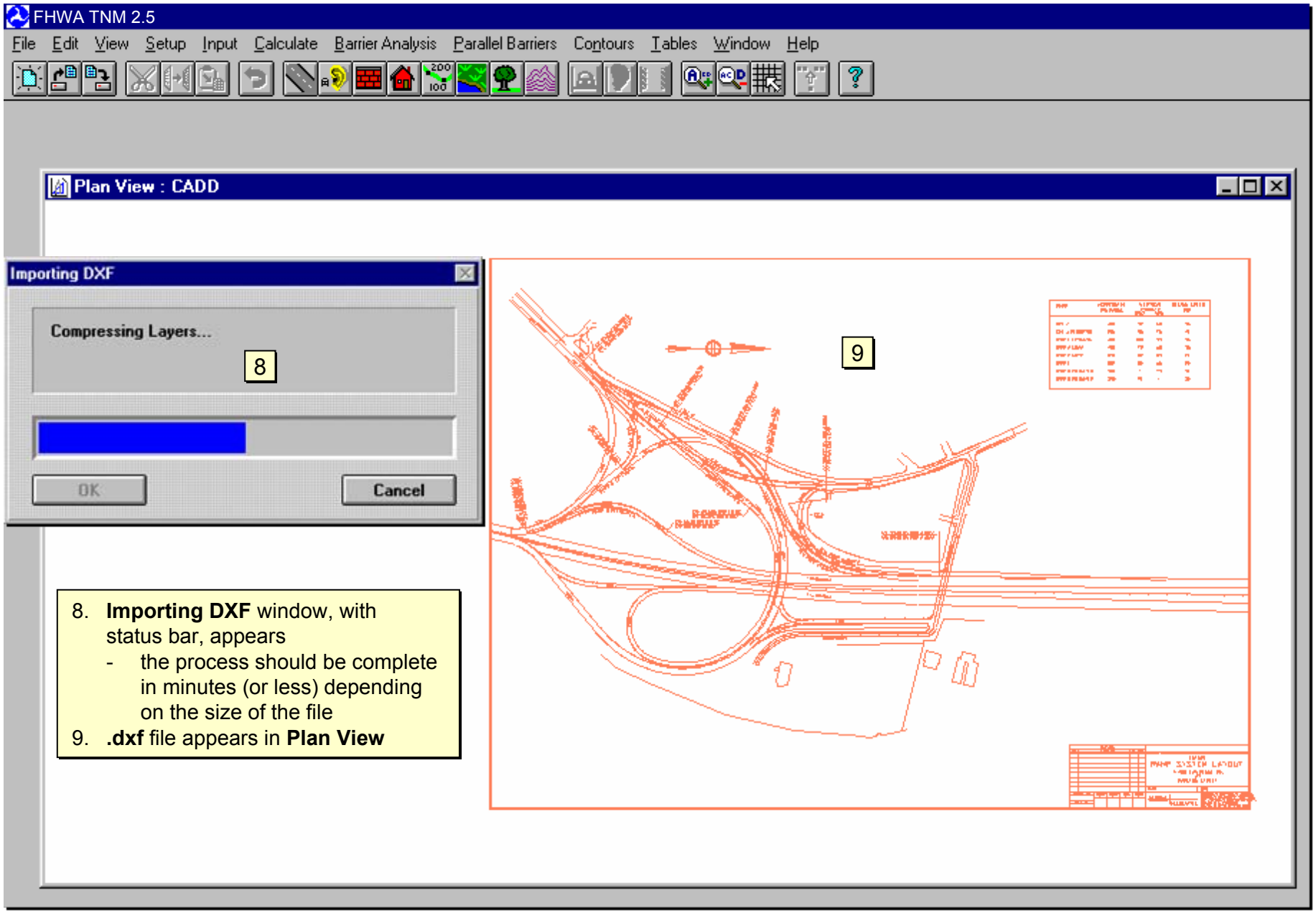
- hide/eliminate all information (levels) not required for a noise analysis
  - include the following information:
    - plan view of the entire project - - eliminate any profile views - - although a hard copy of the profile view is necessary to determine Z coordinates
    - centerlines or edges of pavement
      - to determine horizontal alignment
    - edge of pavement
      - to locate concrete traffic barriers (when applicable)
    - station numbers
      - to precisely determine Z coordinates (elevations) on profile view
    - outline of adjacent buildings
      - to locate receivers
    - topographic information (elevation numbers NOT contour lines)
      - to determine elevation of receivers
      - to determine elevation adjacent land features that may serve to reduce noise levels
- hide/eliminate levels that contain multiple curved lines for features such as tree lines and/or contour lines (typically not required for a noise analysis) - - curved lines add greatly to the size/memory of a .dxf file
- divide very large project files into multiple, smaller files
- redraw lines (for required features such as roadways) that contain a high number of individual segments - - if not redrawn, these lines can severely complicate or even block/crash the import process
- redefine the global origin (optional)

**NOTE**: TNM may not import all types of MicroStation elements - - see Page 28 of the TNM User's Guide for a list of items TNM can and cannot import.

# IMPORTING A MICROSTATION FILE (2 of 4)

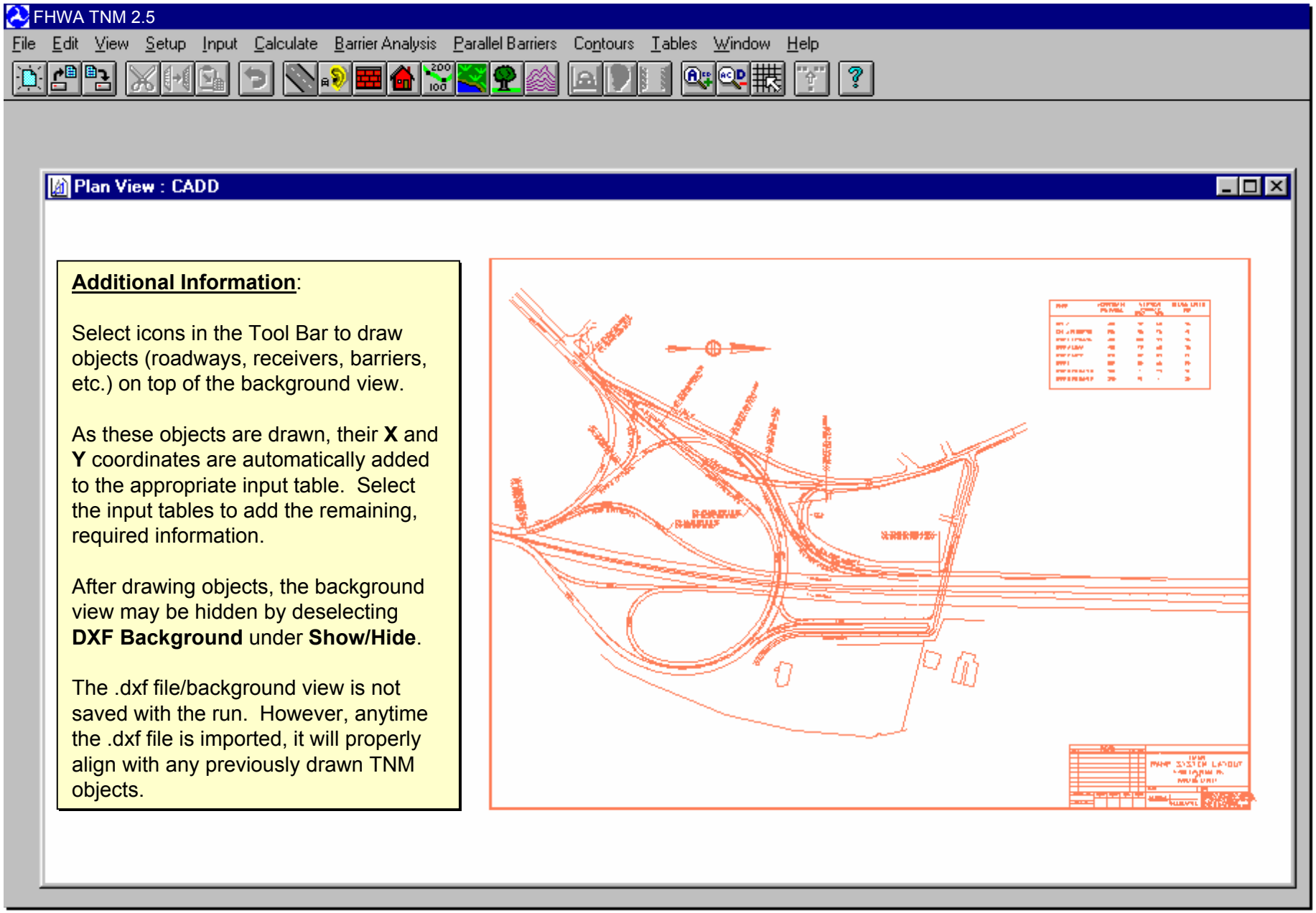


# IMPORTING A MICROSTATION FILE (3 of 4)




8. **Importing DXF** window, with status bar, appears
   - the process should be complete in minutes (or less) depending on the size of the file
9. **.dxf** file appears in **Plan View**

# IMPORTING A MICROSTATION FILE (4 of 4)




**Additional Information**:

Select icons in the Tool Bar to draw objects (roadways, receivers, barriers, etc.) on top of the background view.

As these objects are drawn, their **X** and **Y** coordinates are automatically added to the appropriate input table. Select the input tables to add the remaining, required information.

After drawing objects, the background view may be hidden by deselecting **DXF Background** under **Show/Hide**.

The .dxf file/background view is not saved with the run. However, anytime the .dxf file is imported, it will properly align with any previously drawn TNM objects.