



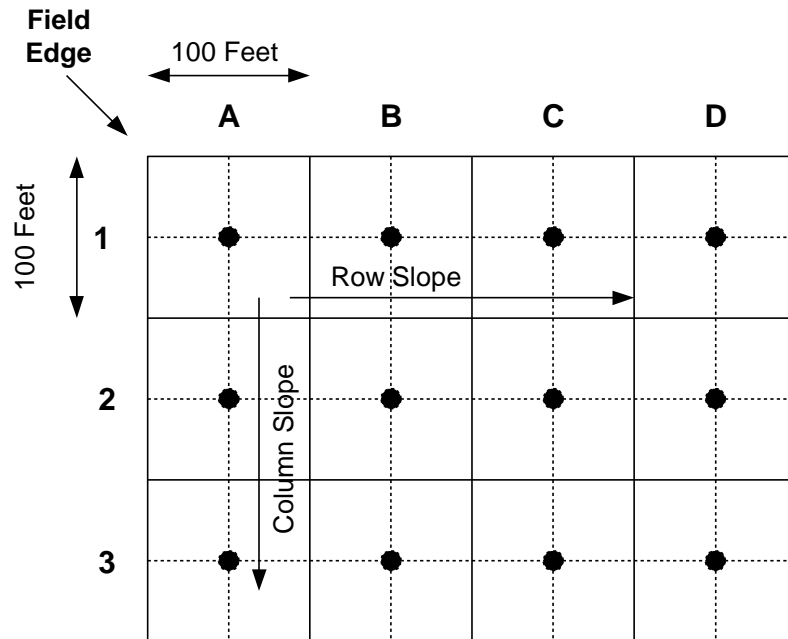
GRADEPLANE for Windows

GRADEPLANE is designed for Land Levelers and farmers and provides an easy way to design and output cut/fill maps for grading land to specified slopes. It uses the common, plane method of field design and expects you to enter surveyed Elevation or Rod Readings into a spreadsheet type Grid. Once data is surveyed and entered, **GRADEPLANE** calculates the field “best fit” slopes and creates a field design automatically based on the best fit. It does this “on the fly” as you are entering field data. As soon as you have field data entered, your best fit design is done. Of course, you can fine tune the design any way you want, changing row and column slopes, importing and exporting yardage, create sections and break lines, and engineer smooth transitions at breaks. The standard version allows fields to be designed in up to seven Sectors and can engineer smooth transitions at sector breaks in either the column or row direction. With the standard version you can also monitor the progress of your work as you cut the field and check the design to insure your field will balance. The standard version also includes 3 D graphs of your field data and designs which makes field layout easier to visualize.

While **GRADEPLANE** is easy to use, it is assumed you know how to use a personal computer and Windows software, and you know about Land Grading and designing fields for irrigation. All calculations in GradePlane are estimates based on survey data that you provide. If your survey is incorrect to begin with, then all results and designs estimate will also be incorrect. Also, recognize that GradePlane makes yardage calculations based on the assumption that you grade the field as you specified in your design. If you don't cut the field to the specified slopes or if you don't properly setup or calibrate your landgrading equipment then your results may not be those listed on your Cutsheet. GradePlane makes the design calculation process easier and faster, but you are the ultimate field designer. Make sure the designed output is what you would normally expect to see and if not, check your data to make sure all is correctly entered. And, of course, a Cutsheet is only a small part of the process. It takes a skilled land grader to turn the design into a graded field. You need keep a close eye as grading progresses to insure you are grading the field as you designed it and your assumptions are valid.

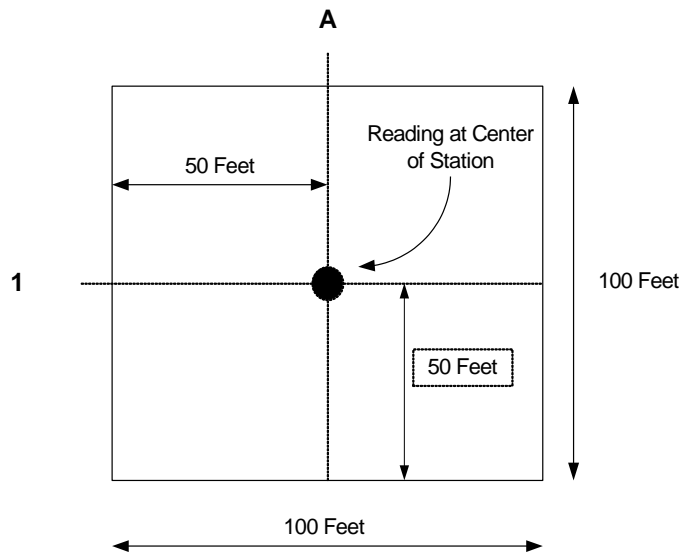
Field Survey

GRADEPLANE requires data to be surveyed on a square grid. The field doesn't have to be exactly square, but the survey must be based on regularly spaced grid intervals, rather than randomly surveyed data points. The standard is 100 feet between **stations** (which is the default),

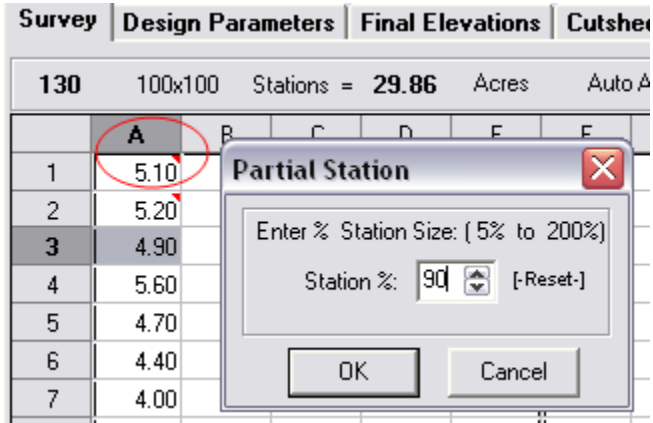


but you are free to specify other grid intervals if you prefer. In all cases, the first grid line of your survey should begin about one-half the grid interval from the edge of the field. You then lay out your survey grid by drawing perpendicular lines spaced at the grid interval in both the Row and Column directions. In GradePlane **Columns** are Up and Down on the page and represented by Letters and **Rows** are Left to Right on the page and represented by numbers.

When surveying, you record either **rod readings** or **elevations** at each grid intersection. This reading becomes the representative elevation of the entire 100 feet square station, so make sure the location is really representative of the entire section, if not, move location slightly before recording the reading.



GRADEPLANE allows you designate any grid location as a **partial station** (versions 1.50 and above) For fields that are not a perfect rectangle partial stations allow you to better estimate cut and fill yardage. You may designate a partial station to be 5 % to 150 % of a normal sized station. Gradeplane will adjust field areas and yardages accordingly. For example, if your regular grid size is 100 feet by 100 feet, designating a partial station size as 50% would reduce the area used from 10,000 square feet to 5,000 square feet. You designate a partial station by highlighting, one or more stations using the mouse, then *Right-Click* the mouse on the highlighted cells and choose set partial station. Enter the partial station value. You can also access the partial station option for the Design Main Menu section. Partial stations will be marked with a small red triangle in the upper right hand corner of the spreadsheet to indicate the station grid size is not 100%. Click on [-Reset-] to return the cell to 100%



You can design fields using feet, acres and Cubic Yards, or meters, hectares and cubic meters.

Default Design Values

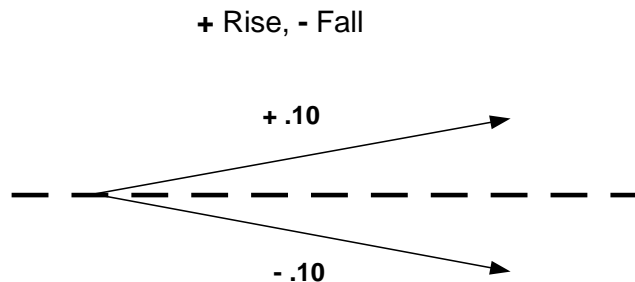
The default values for GradePlane are:

- Data Type: **Elevations**
- Units: **Feet/Yards/Acres**
- Grid Size: **100 feet by 100 feet**
- Cut/Fill Ratio: **1.25**

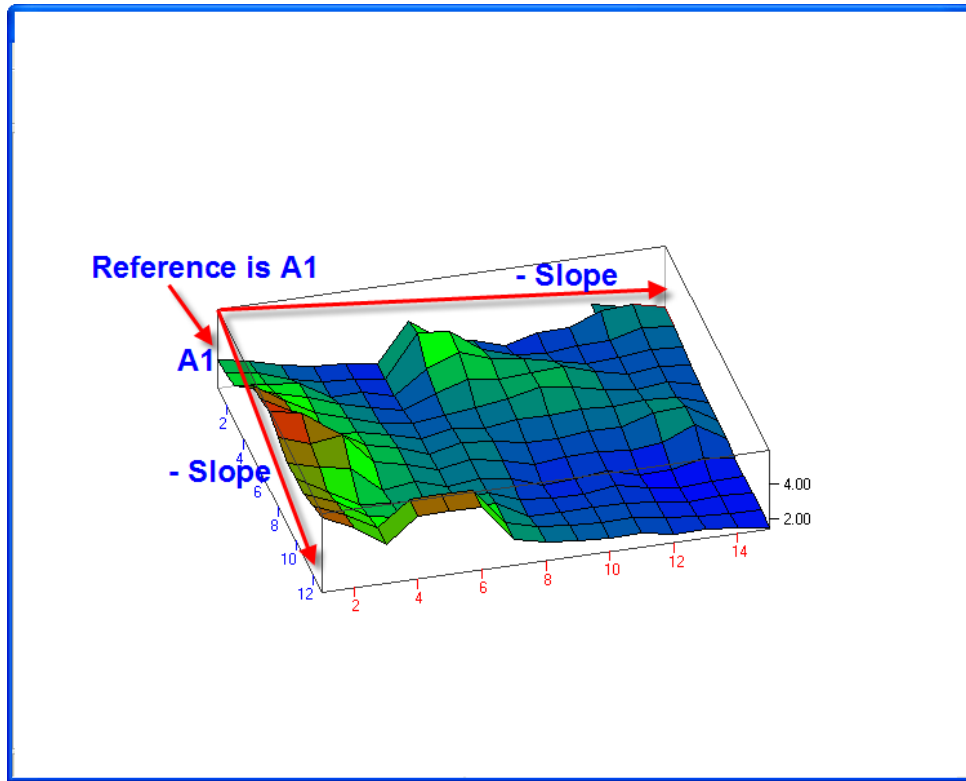
You may change any of the above values by selecting: **Options, Preferences** from the Main Menu. The values you enter become the new default values until you again change any of the values. These values will be stored with any Field data saved.

Slopes

In **GRADEPLANE**, increasing slopes (rise) are positive numbers and falling slopes (fall) are negative numbers referenced to the upper left hand corner of the spreadsheet (Cell **A1**). Rows are left to right and identified with numbers Columns are top to bottom and identified with letters.



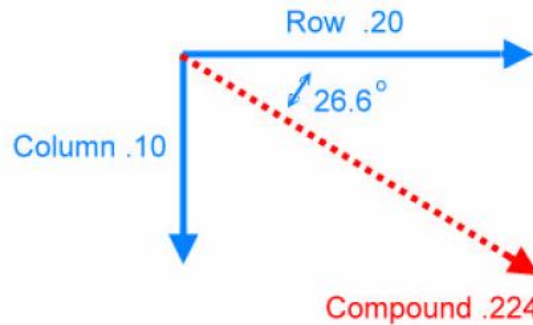
If you specify a 0.10 Row slope, then slopes along the rows increase in slope 0.10 feet per 100 feet, left to right, from Column A to M. If you specify a - 0.10 Column slope, slope down the columns decrease in slope 0.10 feet per 100 feet, top to bottom, from Row 1 to Row 10. On the printed Cutsheet, map arrows will print showing the direction of fall. Do note that slopes are



specified **per 100 feet (or % slope)** regardless of the grid size. If your grid size is not 100 feet then your slopes will be adjusted accordingly when display on the spreadsheets. For example, with 50 a ft grid size, a specified 0.10 Row slope would be 0.05 per 50 feet (the grid size).

Although most land graders talk in terms of *Row* slope and *Cross* slopes, in reality, the field plane also slopes in one direction at a particular slope and angle from a specified reference point.. This value is the normally referred to as the compound slope. Even though you enter row and column slopes, GradePlane also calculates the **compound slope** for use in setting up single slope lasers. To use compound slope you, normally, set your laser to the specified compound slope value, point the laser in the direction of the larger slope, then rotate (or turn) the specified angle in the direction of the smaller slope and set the compound slope value. However, follow your laser manufacturer's guidelines for setting compound slope.

Slopes: + Up (Rise) - Down (Fall)
Reference is Always Grid Cell A-1



Elevations and Rod Readings

Standard field surveying methods normally use some type of transit or optical level along with a survey rod. A survey rod usually denotes zero at the bottom and increases in tenths of foot up to seven or eight feet tall. Using a survey rod results in “**rod readings**” that are inversely proportional to field elevations. (The lower the rod reading, the higher the elevation.) These rod readings can be converted to elevations. GradePlane accepts either Rod Readings or Elevations and converts between the two types of data using a real or arbitrary bench mark or instrument height. Recognize that increasing readings along a row or column indicate a fall when using rod readings, and a rise when using elevations. However, GradePlane always indicates slopes the same: negative numbers indicate a fall from left to right on the grid (or top to bottom) and positive numbers indicate a rise. Normally you should always survey in and use **Elevations**, unless you either already have a field surveyed in Rod Readings or you have a preference for Rod Readings. You must specify the correct data type BEFORE entering survey readings into GradePlane. If you do specify the field data to be in Elevations, but you really entered the data in Rod Readings (or vice versa) then simply specify the data correctly under the Preferences menu AFTER entering all the data. If you somehow get half the data in rod readings and half in elevations you will have to start over.

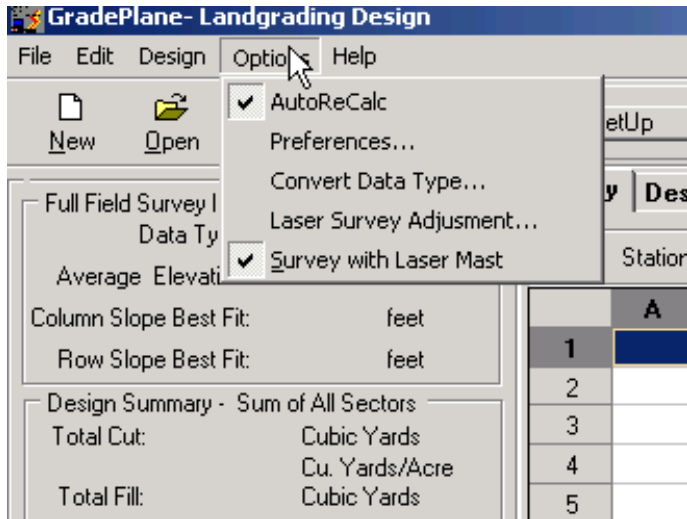
Elevation Data Input Directly into GRADEPLANE from a Laser Receiver.

If your Laser receiver control unit/box can output standard computer RS232 serial data, you may be able to directly read your survey data into the GradePlane spreadsheet grid from a Laser

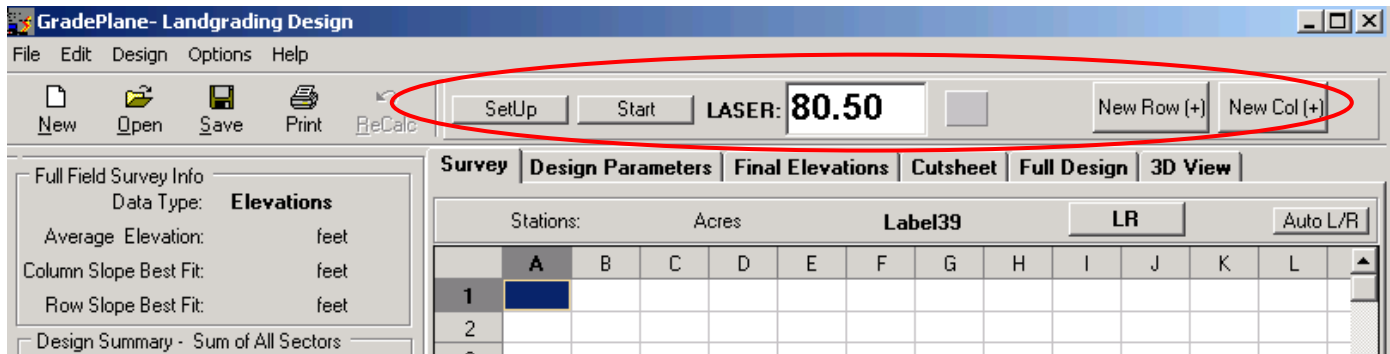
Control Box connected to a Laptop computer serial port. Check with your equipment manufacturer for the proper serial cable to connect between the control box and your laptop.

Connect your Laptop serial port to the Laser Mast control box with a serial cable as specified by the control box manufacturer.

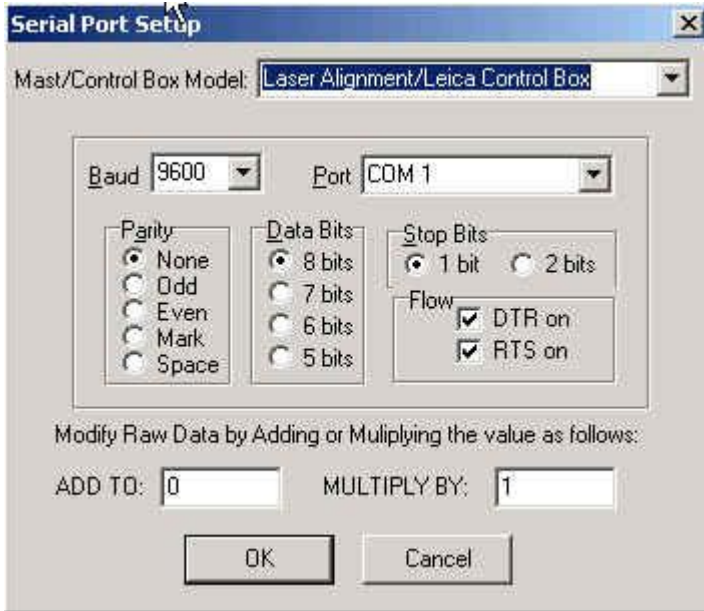
Start GradePlane and Select Survey with Laser Mast from the Options Menu.



You'll then see the Laser Mast Panel appear. It shows several buttons and a read out display for the elevation values:



Next, click on the **Setup** Button to setup the serial port parameters. You will see the following Dialog:

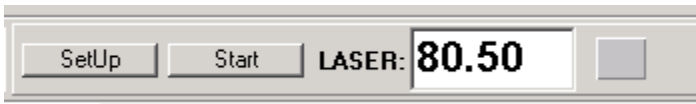


From the serial port setup, select your control box type/manufacturer, which will establish default values for your equipment. If your serial port parameters are different than the default values, then change them according to your equipment requirements.

The two boxes near the bottom of the above dialog box labeled “ADD TO” and MULTIPLY BY” allow you to adjust the raw numbers coming in from the Control Box . You can add a constant value to each reading, or multiply each reading by a constant value. These will normally be adjusted based on the type of control box you use, however change these values if you want. Click OK to close the setup screen. Since **GRADEPLANE** only accepts elevation readings less than 1000, in some case you must use these correction factors. For example, if your control box outputs in hundredths, e.g. 8500. You should “MULTIPLY BY” 0.01 to convert the value to 85.00.

Next, click on the **Start** button which turns on the Port and starts collecting data from your survey mast.

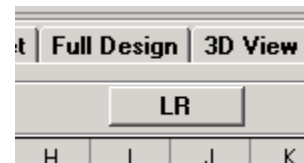
You should see the latest reading from your control box in the Laser box:



Now you can start collecting data. Drive to the proper grid station and press the **RETURN** key on your keyboard to enter the Mast Elevation data into the spreadsheet.

Each time you press **RETURN**, the mast data will be entered and your cursor will advance to the next cell.

The auto advance button will automatically advance left to right (LR) to start . But, by clicking on the button, you can change the auto advance direction to right to left (RL), up to down (UD), or down to



Up (DU) Each time you click on the button it will toggle to the next value. So, if you get out of sync, just keep pressing the button until you get to the direction you want.

GRADEPLANE is set up to make surveying in any direction fairly easy using the Mast. Once you get started surveying, when you get to the end of a row or column press either the + key or the * key on the numeric keypad and the cursor will advance to a new row or column and the auto advance direction will reverse allowing you to survey back the other direction.

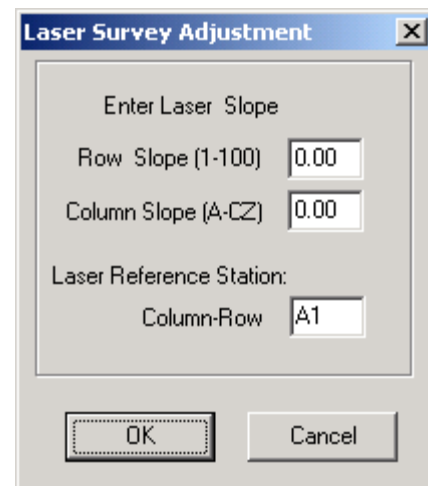
You can also reverse directions by pressing the **New Row** or **New Col** buttons if you want. It is usually easier to use the keyboard.

When you're done surveying with the Laser, press the **STOP** button to turn off the serial port and un-select "**Survey with Laser Mast**" from the options menu.

Laser Survey Adjustment - Surveying using a Laser with Slope

In some situations, a field may have such large slope changes from one side to other that you may want to survey using a laser containing slope to obtain all survey readings with one laser setup. **GRADEPLANE** can correct data surveyed this way and convert to the actual elevations. In order to do this, you will need to specify the laser slopes and a reference station for the Laser location. Gradeplane will then add or subtract the appropriate slope values from the measured values depending on the location within the field. This will be a one time conversion to modify the raw data. After loading or importing your raw uncorrected field survey data, Select **Laser Survey Adjustment** from the **Options** Menu. This brings up a dialog box where you enter the Row and Column slopes and the Laser Reference Station. The Laser Reference station is simply the station location that will have 0 adjustment. After entering these values, click "OK." All the survey data values will be corrected and the design will recalculate. You should then save the field data under a different name.

If you happen to make an error when entering slopes, the only way to recover is to again select the **Laser Survey Adjustment** and enter the opposite values to un-correct the data. For example, if you entered a row slope of .10 and it was incorrect. Select the item again and enter **-.10** as the slope. This returns the values to the way they were. Another option is to re-load the raw uncorrected data and start over.



Volume Calculations

The overall objective with land grading is to grade a particular field to a designed plane with the specified field row and cross slopes. The design plane is then compared to the existing field survey and either cut or fill values are specified for each grid location depending on whether the station is above or below the desired design plane. Dirt is moved from cut stations to fill stations

to create the designed plane. You also normally want the cut yardage to equal the fill yardage so that the field is balanced. That is, you don't want to be short or long on dirt when you're done.

GRADEPLANE uses the specified grid interval and the amount of cut or fill at each station to determine the overall cut volume and fill volume. Gradeplane uses the summation method, where it is assumed that each grid section is flat, and the surveyed elevation is the elevation of the entire grid section. This assumption may not be true, so it is important that the elevation surveyed be representative of the entire grid elevation. For stations 100 feet by 100 feet, a one tenth cut or fill across the station represents about 37 cubic yards of earth moved. $(100 \times 100 \times 0.10) / 27$ cubic feet. Usually, you want to have dirt "balance" across the entire field. When a field is balanced, you have exactly the right amount of dirt moved.

Due to soil shrinkage you need more cut volume than fill volume. In order to balance yardage you need to know and enter the ratio of a field's cut to fill. Total yards cut, divided by Total yards filled is the Cut to Fill ratio. The Cut to Fill ratio you enter is only an estimate of the actual field cut to fill ratio. Cut to fill ratios will always vary depending on the type of soil, moisture content, depth of cuts, and farming history. Normally cut to fill ratios are between 1.2 and 1.5 but they vary. If you grade in one area, you can normally determine a good starting point based on past experience. However, if your cut to fill ratio is incorrect, your yardage calculations may not be accurate and your field may not balance. It is the land grader's responsibility to ensure that the cut to fill ratio is correct, and if not, make adjustments in setup during grading. The grader must tally the cuts and fills as work progresses and adjust elevation up or down to insure balance.

Using the specified slopes, GradePlane adjusts the design plane elevation up or down to achieve the desired cut to fill ratio. Raising the plane reduces cut volume and increases the fill volume. Lowering the plane increases cuts and decreases fills. GradePlane defaults to a 1.25 Cut/Fill ratio which means you cut 125% of the required fill volume. You can adjust the ratio, to any value, and you should use a ratio appropriate for the type of soil you are grading.

Data Entry

GRADEPLANE defaults to elevations as the data type. You can change this value to Rod Readings from the **Options, Preferences** Menu. GradePlane remembers any settings you change in the Preferences menu and saves them as defaults. Leave the data type set to elevations unless you know you have a survey in Rod Readings, or you prefer rod readings (and know how to get them) when conducting a survey.

To begin a new field design, first specify the data type (rod readings or elevations) and field border distances (if not ½ the grid size), then begin entering your survey readings. If you specify the data type as Rod Readings, but enter elevations, everything will be backwards and calculations will be incorrect. Readings may be up to 999.99. GradePlane remembers the previous value entered so a previous reading value can be repeated simply by pressing the **Enter** Key. As you enter data and press the enter key, you automatically advance to the next cell (from Left to Right.) You can change this to advance from right to left if you prefer. You change the direction by clicking on the **Auto L/R** button just above the upper right hand corner of the Survey data entry spreadsheet. At the end of each data line, pressing the '*' or the '+' key will advance to the next row and return you to column 1 in the spreadsheet.

Field Design

GRADEPLANE will automatically calculate and display a “best fit” design based on the surveyed data. When you enter or import your field data, the field design is created for you automatically using the calculated *best fit* slopes for the field.

GradePlane calculates a least-squares best fit of the field using an average of the row and column elevation profiles. The best fit will conform to the natural trend of the field slopes and be very close to the optimal design for moving minimum yardage.

However, the best fit slopes are calculated values based on the average of each of the row and column slopes. Clicking on the “Use Best Fit Slopes” check box, sets the best fit slopes as the design slopes. You still may need to adjust slopes up or down slightly to obtain the slopes that will minimize the cut yardage.

Gradeplane includes an option to automatically Minimize yards by incrementing the best fit slopes up and down slightly until values are found that minimizes the cut yardage. You can also make slight adjustments up or down in your row or column slopes manually by clicking on the small up or down arrows next the slope entry boxes. If you press the Minimize Yards button GradePlane will try to minimize the best fit yardage by adjusting the slopes and then will set your design slopes to these calculated value. It then automatically un-

checks the checkbox. Clicking it again will repeat the process. Although this is a convenient feature, it also takes extra processing time, therefore you are required to select it manually. Also, even though GradePlane attempts to minimize yardage, in some cases you still might be able to get a slightly lower yardage by adjusting the slopes up or down manually.

Entire Field		
<input type="checkbox"/> Use Best Fit Slopes	Minimize Yardage	
Avg. Elevation:	4.41	
Cut/Fill Ratio:	1.25	
Column Slope: (up/down)	0.000	<input type="checkbox"/> Blend
Row Slope: (across)	0.000	<input type="checkbox"/> Blend
Import/Export: (+ Import, - export)	0	
Total Cut:	7884 Cu. Yards/Acre	
Total Fill:	264 Cu. Yards/Acre	
Comp. Slope:	0.172	Rotate 22.2 Deg.

Usually, you’ll want to normalize the best fits slopes to standard values, for example, change .087 to 0.10, but other than that, choosing the best fit design is the design for minimum construction. Of course, change the slope values to anything you want. Experiment, and see how your adjustments change the total yardage. The overall design is based on the original survey, the specified row and column slopes and the Cut/Fill ratio. Changing any of these values affects the total yardage calculation.

You can also specify to **Import** or **Export** yardage from the field. If you need to obtain yardage to build a road or crown, you specify the amount as a design parameter. Likewise, if you have additional yardage you need to waste in a field, GradePlane can handle that also. Positive numbers designate import, and negative numbers indicate export. Gradeplane considers import or export yardage when calculating the overall cut/fill ratio.

You also can affect the field design by specifying the final elevation at a particular location. For example, if you know you want the elevation at station **E5** to be 44.50, you can force the elevation to be that value. GradePlane will then use your specified Row and Column slopes to force the design to have an elevation of 44.50 at station E5. However, this will cause the Cut/Fill to move away from the specified 1.25 to whatever is necessary to make the design work. You can

Entire Field		
<input type="checkbox"/> Use Best Fit Slopes	Minimize Yardage	
Avg. Elevation:	4.41	
Cut/Fill Ratio:	1.00	
Column Slope: (up/down)	-0.159	<input type="checkbox"/> Blend
Row Slope: (across)	0.065	<input checked="" type="checkbox"/> Blend
Import/Export: (+ Import, - export)	-500	
Total Cut:	7884 Cu. Yards/Acre	
Total Fill:	264 Cu. Yards/Acre	
Comp. Slope:	0.172	Rotate 22.2 Deg.

specify Row and Column slopes, and, *either* the Cut/Fill Ratio *or* the final elevation at a particular station, but not both.

To specify a final elevation value, select the “final elevation” tab to view the final elevation spreadsheet. Use your cursor or mouse to go to a station and type in the final elevation you want.

GRADEPLANE

recalculates the design to force the station to that elevation. The cut/fill ratio will be adjusted to whatever is necessary to achieve the design.

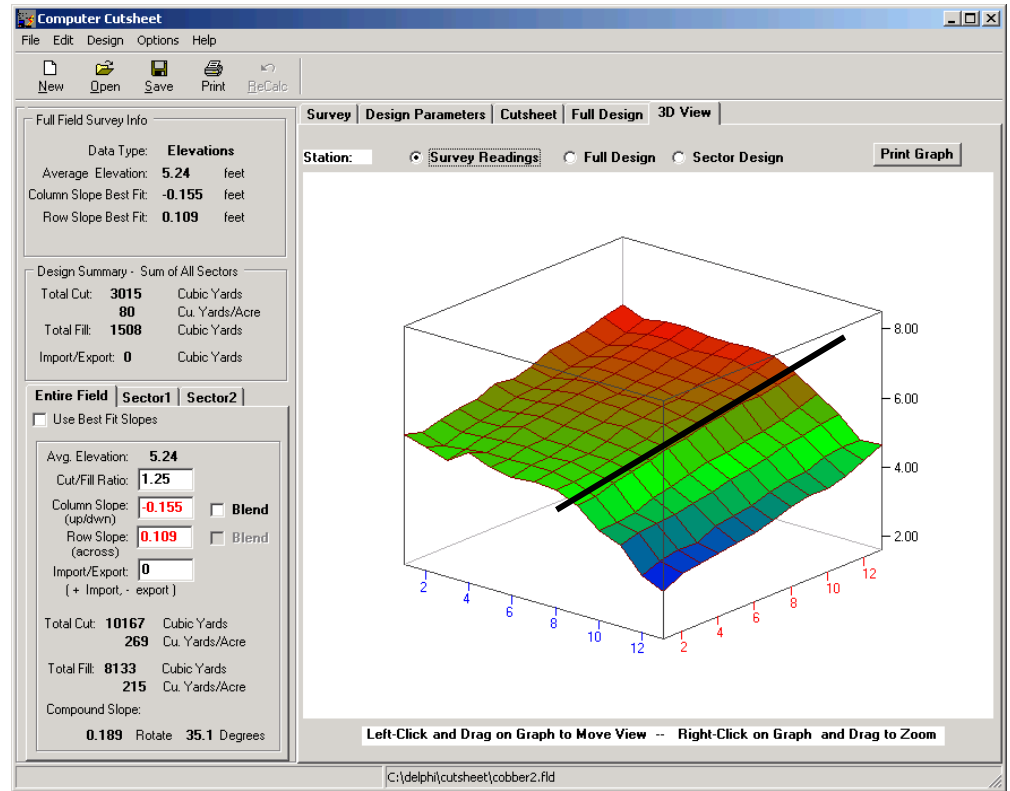
Defining Multiple Sectors

In some cases you may find a particular field that has two or more well defined natural slope areas or sections as is the case in the field shown here. If you recognize this, and your final design criteria is not overly rigid, you can

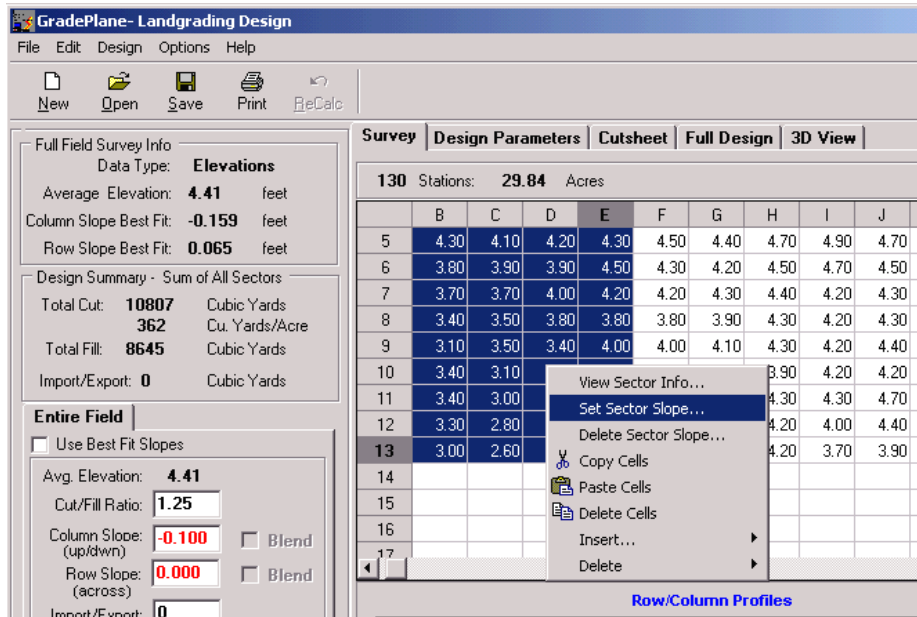
save a considerable amount in construction costs by specifying sectors in your field with different design parameters conforming closely to the natural shape of the field. GradePlane not only allows you define multiple sectors, but also engineers the field so that at the hinge or breaklines, the field sections blend smoothly without abrupt elevation changes, and yardages balance across the entire field. Few other landgrading design programs can accomplish this.

GRADEPLANE can divide a field into multiple rectangular sectors (up to seven) and specify design parameters into each section separately. You can accomplish the same thing by dividing a large field into pieces and entering readings as separate fields. However, using sectors has the advantage of allowing you design the two sectors together and allow smooth transitions at the break lines.

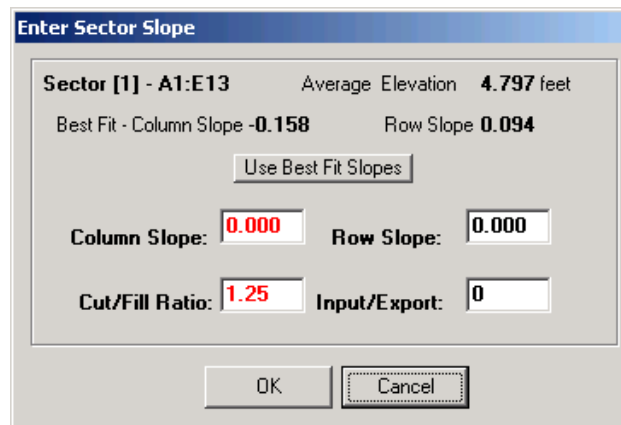
Each section can have its own Row and Column slopes, cut/fill ratio, and import/export yardage. Initially each section of the field will be a separate design plane and there could be significant differences in elevation at the break lines. By selecting **Blend** in either the Row or Column Direction, GradePlane will engineer the field planes so there is a smooth transition at the break points. However, you can only blend in one direction at a time. For example, if you select blend in the Column direction, slopes will blend at break lines along the Rows. The Row slopes must be the same across both sectors for the blend to work. If you blend in the Column direction, GradePlane uses the Row slope in sector number 1 for the Row slope for all sectors. This works the same if you select Blend in the Column direction.



To define a sector, you first highlight the section of the field using your mouse. In the Survey screen move the mouse cursor to the upper left corner of the sector you want to define, hold down the left mouse button and drag across the stations until you reach the lower right hand corner of the sector. Release the left mouse button and the sector will remain highlighted. Now, click the right mouse button which will bring up a Pop-Up menu. Select the Menu Item **Set Sector Slope...**



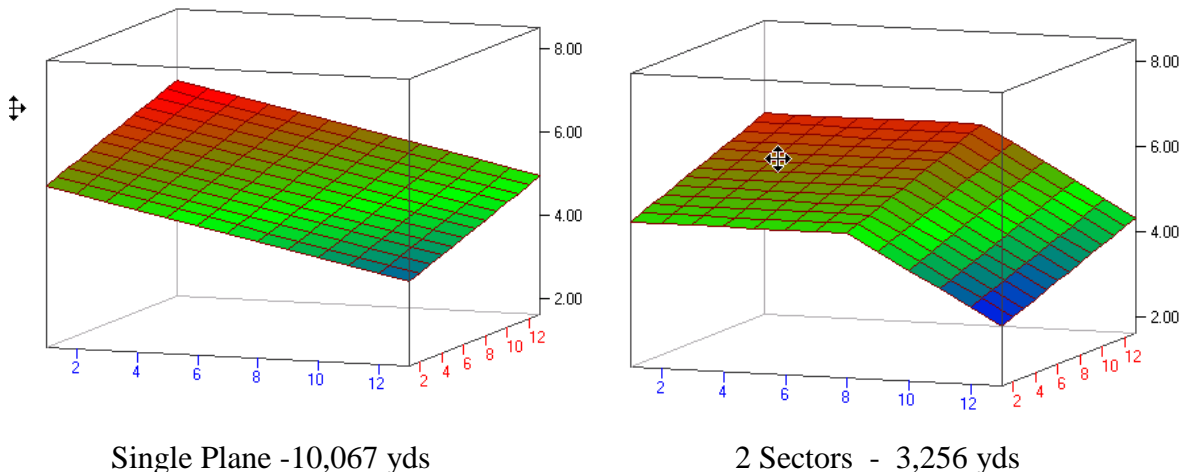
You should see the following dialog box.



Enter your desired values. You can either click on the “Use Best Fit Slopes” button to accept the best fit slopes. Or, you can enter any slopes you want in the appropriate boxes. You can change any of these slopes later, so at this point you can enter anything you want. Click OK, when done. If you change your mind click cancel. Repeat the above process to define additional sectors.

You can also “View Sector Info” from the Pop-Up menu instead of setting the slopes. This item provides information about the sector defined, but doesn’t allow to you enter slopes. If you just want to check different sectors, then use this option.

Here is the same field from above, the graphs show both a single plane design and a two sector design. By conforming the design to the natural field contour with two sectors instead of using one plane, the total yardage moved is lowered considerably.



If you want to delete sectors you can select “**Delete All Sectors**” from the design menu. Or while in the Survey spreadsheet, right click your mouse in the Sector you want to delete and select “**Delete Sector.**” You must delete sectors in the reverse order that you created them. That is, you must delete sector 2, before you delete sector 1.

Printing

After completing your field design you will want to print your designs. GradePlane has several different printing options where you can specify the printout desired. You can print the old survey readings, a working map or Cutsheet, or a full map that lists old readings, new designed readings and the cuts and fills. You can print more than one map by selecting the respective box in the print menu. The print menu also allows you to print a page header with your business name, plus you can add a field name and customer name. The page header entered will become the default and will print on future maps until you change it.

You can also print any of the 3-D graphs. You print these from the 3-D view tab on the main screen. Select the 3-D view you want printed, and click on the **Print Graph** button.

Convert Data Type

This option allows you to convert data from Rod Readings to Elevations or Vice Versa. You must enter a bench mark or Instrument Height Value which will be used to convert the data. This can be the actual instrument height or some arbitrary number. **GRADEPLANE** simply subtracts all survey readings from the specified number. For example, if you have a 4.3 Rod Reading and specify 10 for the benchmark, the Elevation becomes $10 - 4.3$ or 5.7. If you entered data incorrectly and the data is really elevations and not rod readings (or vice versa) then simply specify the data correctly under the Preferences menu. Don’t use convert data type.

Loading and Saving Field Data

GRADEPLANE uses standard windows menus for saving and loading field data files. When saving GradePlane files the **.fld** extension will be added to your field names. For example, “myfield” becomes **myfield.fld**. You can save the data whenever you want, plus you will be given the option to save data changed data before exiting.

Import Data

GradePlane can import data saved in from other data collectors. Select **File, Import Data...** then select the appropriate file format.

You can also **Cut and Paste** readings from any spreadsheet type application. For example, if someone provided you with field data entered into Excel, you load the file into Excel, then elect and copy the data from there and Paste the data into the GradePlane data entry screen.

Keyboard Navigation

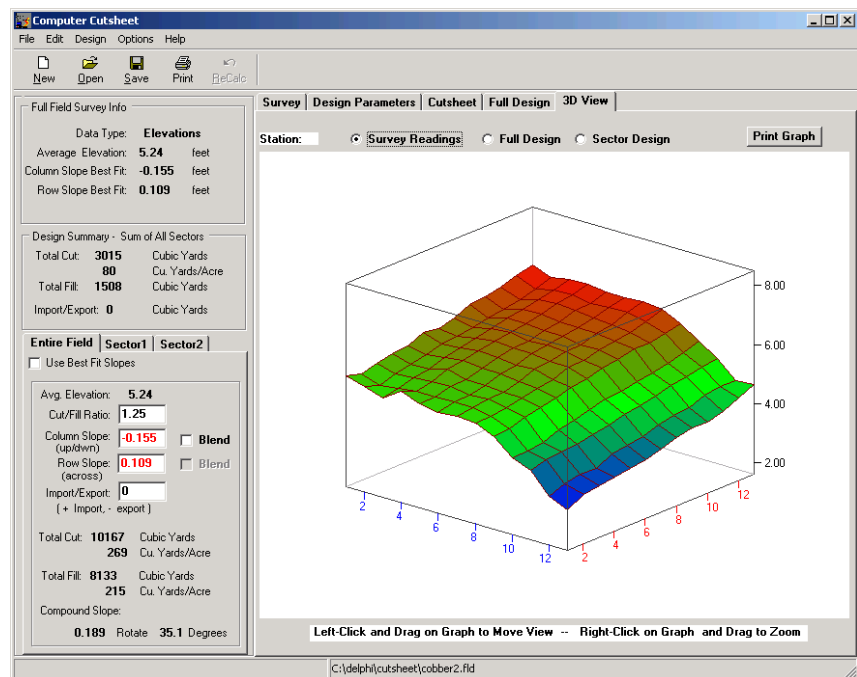
The following key combinations allow better navigation when entering field survey data.

Home	Goto Current Row, Column A
Ctrl Home	Goto Cell A1
*, +	Goto Row + 1 , Column A
End	Goto Current Row, Last Column
Delete	Delete Cell Contents

3-D Graph

GRADEPLANE allows you to view and print 3 dimensional graphic views of your survey readings and designs. You view the graphs by selecting the **3D View** tab. Graphs make it easier to visualize your field designs. For example, by looking at a graph of the survey readings you can better decide where you might divide a field into sectors.

In the example below the surveyed field graph makes it easy to see a significant change in natural slope at

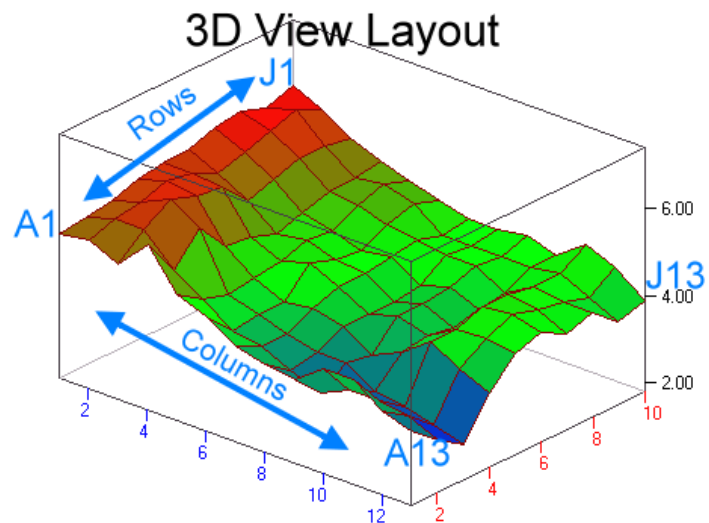


about Row 8. In this case, you might choose to design the field in two sectors instead of one plane.

From the 3D view window you can choose to view either the Survey Readings or field Design by clicking on the button above the graph. You can also print the selected graph by clicking on the Print Graph button.

The 3D graph view is rotated from the way the data entry spreadsheet looks in order to give a better perspective of the field.

You can rotate or Zoom in on the graph view using your mouse. To rotate the graph for a different view click and hold down your left mouse button while the cursor is over the graph. By dragging the mouse you can rotate the graph. Likewise, if you hold down the right mouse button and drag, the graph gets larger or smaller depending on the direction you drag.



Check Cut/Fill Ratio

The Cut/Fill ratio entered into GradePlane is only an estimate. If you estimate wrong, your field may not balance. That is, you may end up with left over dirt when the field is completed or not have enough dirt for all of the required fills. In either case, this causes added time or expense in re-grading or rework to fix the problem. You always want to end up with exactly the needed amount of cut and fill to make your earthwork balance.

In order to do this, the land grader must continually check work progress to figure out whether the field is "going long" or "going short" and make small grade adjustments to compensate. GradePlane provides tools to help you do this. On the printed Cutsheet, the cuts and fills for each row and column are listed. By adding up the cuts and fills for the portion of the field already completed, the grader can determine if the field is going long or short and then raise or lower setup elevation to compensate.

GradePlane also does this automatically and tells you the estimated amount to raise or lower elevation. This is another feature no other design programs offer. The **Check Cut/Fill Ratio** option does this for you. In order to use this option, you first must select the Cutsheet Tab and be viewing the Cutsheet on your Computer Screen. You then use the mouse to Highlight the stations already graded. If you have completed a square area, you simply press the left mouse button and drag the cursor across the cells to select. If you don't have a square area completed, you add individual cells to the selection by holding down the **Ctrl key**, then pressing the left mouse button while the cursor is over the cell you want to add. After the cells are selected a button will show in the upper right hand corner of the spreadsheet. Click on this button to check the ratio, (You can also do this by pressing the right mouse button to bring up the pop-up menu, or select this option

from the Main Menu - Design item.) In any case, GradePlane calculates the actual cut/fill ratio of the stations already completed, and gives an estimate of how far you should raise or lower the elevation to adjust for the real Cut/Fill ratio.

As example, if your field designed cut/fill ratio was 1.25 and after completing a third of the field you check the real Cut/Fill ratio find it is 1.50 your design is not cutting enough to balance. If you don't change your setup, the field will come up short. What you should do is lower the setup elevation by a few hundredths of foot to increase your cut/fill ratio. By continuing to check cut/fill and making adjustments the land grader can assure the grade is correct and the field balances.

Survey	Design Parameters	Cutsheet	Full Design	3D View									
<input checked="" type="radio"/> Full Field Design <input type="radio"/> Sector Design				Check Cut/Fill Ratio									
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	0.04F	0.31F	0.26F	0.26F	0.32F	0.20F	0.41F	0.35F	0.22F	0.28F	0.27F	0.21F	0.17F
2	0.09F	0.38F	0.31F	0.29F	0.31F	0.25F	0.33F	0.36F	0.33F	0.36F	0.36F	0.33F	0.28F
3	0.12F	0.13F	0.09F	0.11F	0.07F	0.04F	0.05F	0.04F	0.02F	0.06F	0.02F	0.02F	-0.01C
4	-0.44C	-0.11C	-0.12C	-0.19C	-0.17C	-0.20C	-0.18C	-0.17C	-0.13C	-0.13C	-0.16C	-0.15C	-0.18C
5	-0.35C	-0.25C	-0.29C	-0.18C	-0.24C	-0.30C	-0.28C	-0.19C	-0.24C	-0.21C	-0.27C	-0.17C	-0.24C
6	-0.37C	-0.40C	-0.33C	-0.31C	-0.39C	-0.38C	-0.43C	-0.41C	-0.38C	-0.35C	-0.33C	-0.39C	-0.39C
7	-0.60C	-0.55C	-0.51C	-0.44C	-0.48C	-0.57C	-0.50C	-0.49C	-0.41C	-0.46C	-0.46C	-0.55C	-0.58C
8	-0.69C	-0.58C	-0.58C	-0.57C	-0.55C	-0.55C	-0.64C	-0.56C	-0.59C	-0.54C	-0.53C	-0.57C	-0.66C
9	-0.58C	-0.49C	-0.58C	-0.56C	-0.59C	-0.61C	-0.58C	-0.61C	-0.59C	-0.61C	-0.49C	-0.52C	-0.52C
10	-0.18C	-0.08C	-0.07C	-0.15C									-0.26C
11	-0.10C	-0.13C	-0.07C	-0.01C									-0.01C
12	0.44F	0.34F	0.36F	0.47F									0.43F
13	0.56F	0.37F	0.42F	0.43F									0.22F
Cut	-3.31	-2.59	-2.54	-2.41									-2.85
Fill	1.25	1.53	1.44	1.56									1.10
17													
18													
19													
20													
21													

Check Cut/Fill Ratio

Full Field - Actual Cut/Fill Ratio: 2.17
Lower Elevation: -0.02

Sectors - Actual Cut/Fill Ratio: 2.30
Lower Elevation: 0.00

OK

In the Cutsheet above we have highlighted an area that we have completed grading and clicked on the **Check Cut/Fill Ratio** button. The dialog box informs us that the actual cut/fill ratio for the graded area is 2.17. In this case our estimated ratio was 2.00, so we need to lower the field elevation by .02 feet since we are actually cutting more than we first estimated and we need to do the same on the rest of the field.

For this feature to work properly, you need to use it very soon after the field work begins. If you wait until the field is almost done, you might not have enough remaining work to make the cut adjustment and still smooth the field. Anytime the adjustment estimates are more than a tenth (.10) you probably have waited too long to make adjustments and will have to regrade portions of the entire field.

What this option does is takes the stations you have completed and balanced, and calculates the actual cut to fill ratio. It then removes those stations from the field and recalculates the design using the actual cut to fill ratio. Finally it compares the elevation of the remaining stations to the original design elevations and estimates the amount you need to raise or lower the elevation. This feature is another tool, and won't replace land grading experience. You can do the same thing and create a new cutsheet by deleting all the stations completed from your survey and change the cut to fill ratio to the new estimate.

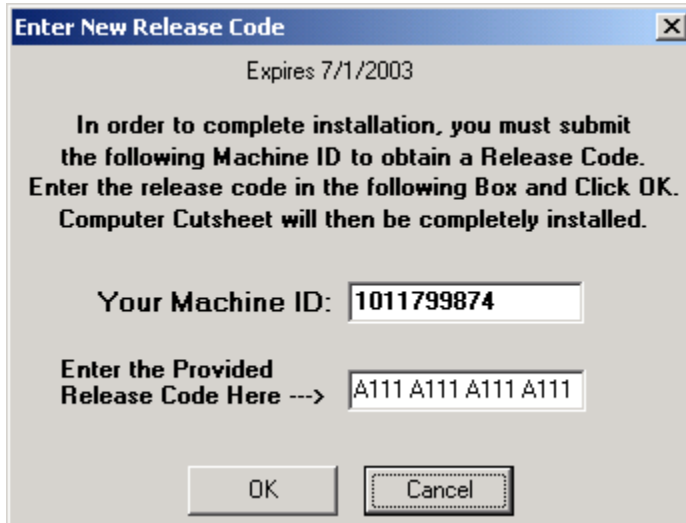
Installation

In you received **GRADEPLANE** on a CD ROM, it should automatically start and give you an installation menu when you place the CD Rom in your computer. If it does not, to install GradePlane you simply run the program **GPsetup.exe** from the program disk provided or from the folder where you downloaded this file. If you know where the file is located on your hard

drive (CD Rom or floppy disk), Double click on the file name from Windows Explorer, **or** Run the file from the **Start, Run** option on the start Menu. Follow the prompts on the screen for installation. GradePlane will normally be installed in the **c:\program files\GradePlane** directory.

You can only install GradePlane on one Computer. **After installing it will only fully function for 30 days.** To complete the installation process after installing GradePlane, you must obtain a final **Release Code** by e-mail or mail to permanently authorize the program on your Computer .

To get your release code, first start GradePlane. From the Main Screen click the **Help** menu item. Then click on **Install**. You will see a box similar to the following:



Copy the machine ID number. In the above example, the machine ID number is **1011799874**. Send your Machine ID number by e-mail to support@Gradeplane.com or to your dealer and request a final release code. You will then be sent a release code similar to **A123 A123 A123 A123** Open the Help Menu and click on Install option to again see the above dialog box. Enter the release code in the second box above and click OK. GradePlane will then be completely install and won't expire. Record and save your release code. Once installed, the Install option will disappear.

You are only authorized to use GradePlane on one Computer.

Entering a New Release Code

In some situations you may need to enter a new release code. For example, if your release code has expired, you will need to enter a new code to continuing using GradePlane. After you obtain the new code by e-mail, open the Help Menu and click on the **About...** menu item.

You should see the following:



Click on the **New Code** button which will bring up the Final Install dialog and allow you to enter the new release code. Click Ok.

Questions/Support

If you have questions or problems contact your dealer or contact us by E-Mail at support@gradeplane.com

Main Menu

The screenshot shows the main menu of a software application with several callout boxes:

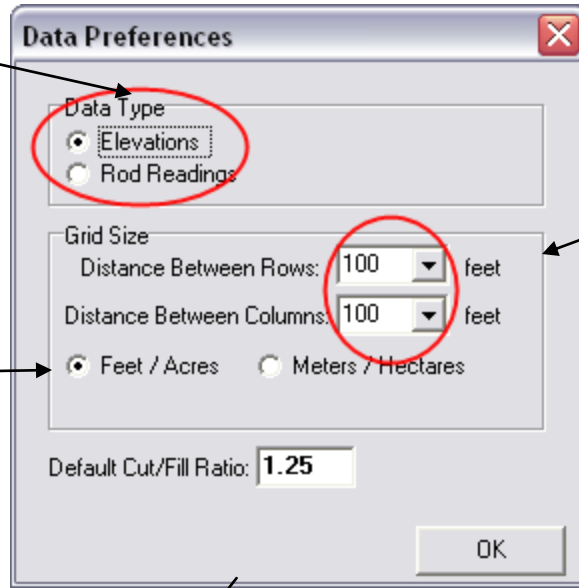
- Select Tabs to display Cutsheet or Full Data:** Points to the 'Cutsheet' tab in the top navigation bar.
- Shows best fit values and average elevation:** Points to the 'Full Field Survey Info' section, specifically the 'Average Elevation' field.
- Totals Cut/Fill yardage when using multiple sectors:** Points to the 'Design Summary - Sum of All Sectors' section, specifically the 'Total Cut' and 'Total Fill' fields.
- Click to change Auto Advance Direction:** Points to the 'Auto L/R' button in the top right of the spreadsheet area.
- Enter desired row and column slopes and Cut to fill ratios:** Points to the 'Entire Field' section, specifically the 'Cut/Fill Ratio', 'Column Slope', and 'Row Slope' fields.
- Select this box to use best fit values in design:** Points to the 'Use Best Fit Slopes' checkbox in the 'Entire Field' section.
- Shows graph of Row and Column Profiles:** Points to the 'Row/Column Profiles' graph at the bottom of the window.

The spreadsheet area contains the following data:

Stations:	Acres												Auto L/R
	A	B	C	D	E	F	G	H	I	J	K	L	
1													
2	Enter Field Survey Data Here												
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													

The 'Row/Column Profiles' graph shows a vertical axis from 0 to 1,000 and a horizontal axis from 1 to 24. A legend indicates 'Row' (red line) and 'Col' (green line).

Options Menu Items

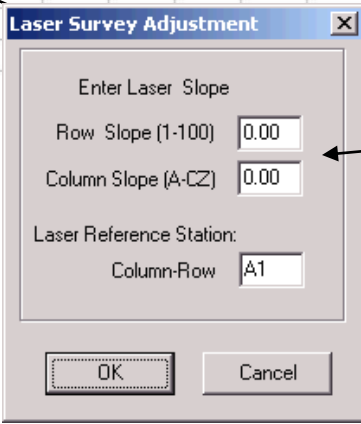
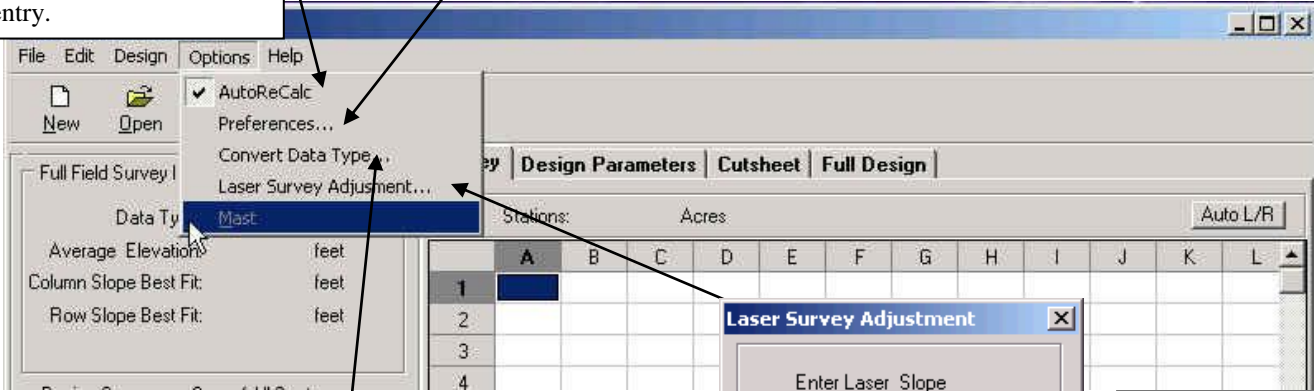


Specify Elevations or Rod Readings

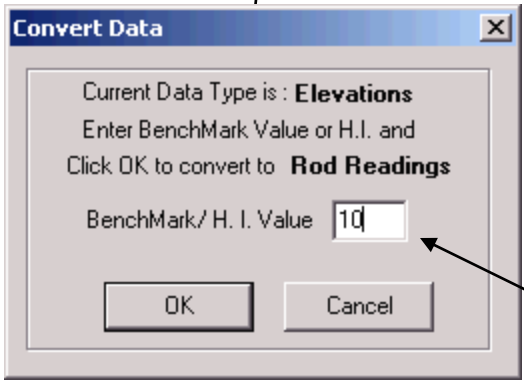
Enter grid interval

Specify Feet/Acres or Meters/Hectares

Auto calculates a new field design every time any data is changed. Turn this off with very large fields to speed data entry.



Adjusts survey readings IF survey was made using a laser with slope added. This subtracts out the laser slope based on the location of the laser.



Convert from Elevations to Rod Readings or vice versa. Enter a benchmark value, then all readings will be subtracted from this value to convert.

Sector Slopes and Blending

Computer Cutsheet
File Edit Design Options Help

New Open Save Print ReCalc

Full Field Survey Info
Data Type: **Elevations**
Average Elevation: **4.41** feet
Column Slope Best Fit: **-0.159** feet
Row Slope Best Fit: **0.065** feet

Design Summary - Sum of All Sectors
Total Cut: **8970** Cubic Yards
301 Cu. Yards/Acre
Total Fill: **7176** Cubic Yards
Import/Export: **0** Cubic Yards

Entire Field **Sector1** Sector2

Station: **4.24**
Ratio: **1.25**
Slope: **-0.188** Blend
Slope: **0.052** Blend
Import/Export: **0**
(+ Import, - export)

Total Cut: **4529** Cubic Yards
300 Cu. Yards/Acre
Total Fill: **4289** Cubic Yards
240 Cu. Yards/Acre
Compound Slope:
0.195 Rotate **15.5** Degrees

Survey Design Parameters Cutsheet Full Design

130 Stations: **29.84** Acres Auto L/R

	A	B	C	D	E	F	G	H	I	J	K	L
1	5.10	5.20	5.30	5.50	5.60	5.60	5.80	5.90	5.70	5.90		
2	5.20	5.40	5.50	5.70	5.60	5.30	5.50	5.70	5.90	5.60		
3	4.90	5.40	5.80	5.60	5.50	4.90	5.10	5.30	5.30	5.20		
4	5.60	4.70	5.40	4.70	4.60	4.40	4.60	4.80	4.80	4.90		
5	4.70	4.30	4.10	4.20	4.30	4.50	4.40	4.70	4.90	4.70		
6	4.40	3.80	3.90	3.90	4.50	4.30	4.20	4.50	4.70	4.50		
7	4.00	3.70	3.70	4.00	4.20	4.20	4.30	4.40	4.20	4.30		
8	3.80	3.40	3.50	3.80	3.80	3.80	3.90	4.30	4.20	4.30		
9	3.70	3.10	3.50	3.40	4.00	4.00	4.10	4.30	4.20	4.40		
10	4.20	3.40	3.10	3.70	3.80	3.70	3.80	3.90	4.20	4.20		
11	4.20	3.40	3.00	4.20	4.20	4.40	4.40	4.30	4.30	4.70		
12	3.70	3.30	2.80	3.80	4.20	4.50	4.30	4.20	4.00	4.40		
13	3.50	3.00	2.60	3.50					3.70	3.90		

Row/Column Profiles
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12 13
— Row 3 — Col B

Enter Field Survey Values C:\delphi\cutsheet\demoFld.fld

Sectors are outlined on on all screens

If designed with multiple slopes these tabs show sector design values.

Selecting blend, engineers smooth transitions at break lines

Pop Up Menu Items

Highlight a section of the field using the left Mouse button then press the right mouse button to bring up the Pop Up Menu. Then select **View or Set Sector Info**. (Only in the Standard Cutsheet Version.)

Sector Info

Sector[1]- A1:E13 Average Elevation 4.242 feet
Best Fit - Column Slope -0.188 Row Slope 0.052

OK

Enter Sector Slope

Sector [1] - A1:E13 Average Elevation 4.242 feet
Best Fit - Column Slope -0.188 Row Slope 0.052

Use Best Fit Slopes

Column Slope: Row Slope:

Cut/Fill Ratio: Input/Export:

OK Cancel

View Sector Info...
Set Sector Slope...
Delete Sector Slope...
Copy Cells
Paste Cells
Cut Cells
Insert...
Delete

Row/Column Profiles

6
4
2
0

1 2 3 4 5 6 7 8 9 10

— Row 1 — Col A

Enter Field Survey Values C:\delphi\cutsheet\demoFld.fld

Pressing the **Right** mouse button brings up this 'Pop-Up' menu used to set, view and delete sector slopes. (Not available in the lite Version)