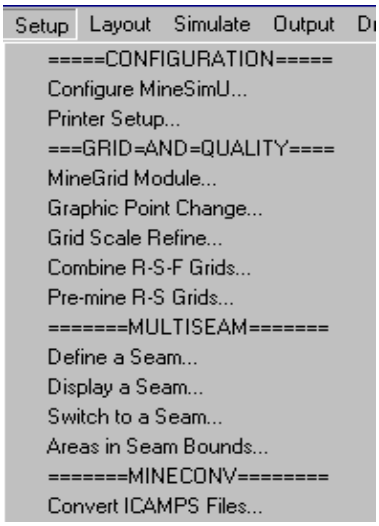
English MineSimU Tutorial

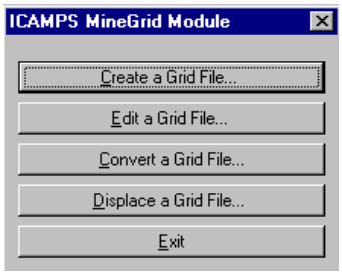
The MineSimU module of ICAMPS does underground mine planning. This module provides timing maps, production forecasts and related information for budgeting, evaluating mine plans and equipment acquisitions. Each ICAMPS module runs inside AutoCAD and combines standard AutoCAD commands with special ICAMPS commands which are unique to mine planning. Each ICAMPS header menu has five pulldowns for the most commonly used standard AutoCAD commands; three on the left labeled Tools, Edit and Display and two on the far right labeled Draw and File. The center pulldowns access special ICAMPS functions. In the MineSimU module, these pulldowns are labeled Setup, Layout, Simulate and Output as shown below.
Developing a mine plan and generating maps, reports and other budgetary data require the following inputs: A gridded seam model for geological data, a calendar of working days and shifts, a mine layout, a file of machine characteristics and the sequence in which areas will mined. These inputs are generated in the following steps. To begin the tutorial you must open a drawing. Use the drawing **TUTORIAL.DWG** which is in the directory **X:\applied\datadir** where **X** is the drive where you have loaded the MineSimU software.

1. Creating a Grid

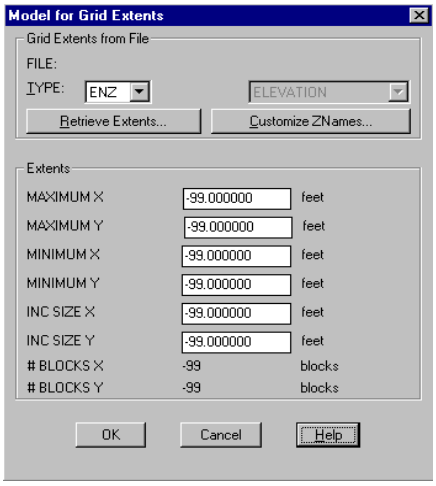
The recommended first step is to create an ICAMPS grid. Grids for individual seam parameters (hereafter called Z-files) are combined into a master grid which contains up to fourteen parameters. MineSimU will accept Z-files from many different geological modelling systems. For this example, we will create a grid called **NEWGRID** and add seam height information from a Z-file called **SEAMHT.ENZ.** First select the **Setup** option from the header menu as shown below.



Next select the **MineGrid Module** option which will bring up the following menu.



Click the **Create a Grid File** option from the pulldown menu.



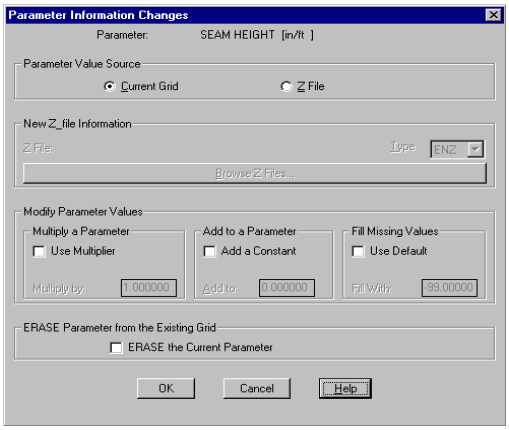
A dialog box for entering the file name and path will appear. Type **X:\applied\datadir\Newgrid** in the edit box. After entering the file information, click the **OK** button. The **Model for Grid Extents** dialog box will appear as shown below.

Notice that the Grid Extents and other data are grayed out and full of -99's. To create the master grid file, you must first input this information. MineSimU extracts this data from a Z-file you specify. Normally this file will come from the first Z-parameter you insert into the master grid. You must specify the type of Z-file. Click the down arrow next to the word **TYPE:** to display the file type formats which MineSimU will accept. The file **SEAMHT.ENZ** is in the **ENZ** format. Most systems will export an ENZ file format (Easting,Northing and Z value for each grid node). But, CPS and Surfcadd (Scad) only export in their own format. QSB formats are optional Z-file exporting options in MineSurf.

Select **ENZ** as the file type and click the **Retrieve Extents** button. The following dialog box will appear. Type the file name and path, **X:\applied\datadir\SEAMHT.ENZ** or click the **Browse** button and search through the directories to find this file.

After you designate the file, click the **OK** button and you will return to the previous dialog box but now the grid extents (maximum and minimum x and y values in the grid), grid increment size and number of blocks in the X and Y direction will be highlighted and filled with the new values.

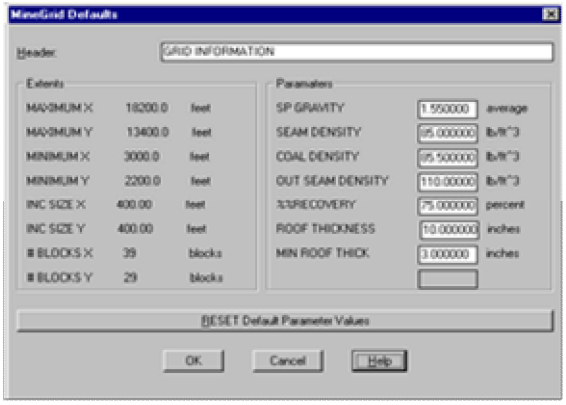
Now you can enter data into the master grid. Click the box next to the word **ELEVATION** on the upper right and select the parameter **Seam Height**. Clicking the **OK** button will save this information and bring up a dialog box as shown in the following example.



To add other Z parametr data to the master grid file NEWGRID, highlight the **parameter** in the list of parameters and click the **Add/Change** button. The following dialog box will appear with the Z parameter name at the top.

If you had other Z-parameter files you could add them to the master grid at this time. The source of the grid data will default to Z File. You must specify the **Type** of file format and type the path and name for the **Z-parameter** file or browse for the file name and path. Then click the **OK** button. The preceding dialog box will reappear with today's date next to **parameter** you added to the master grid file.

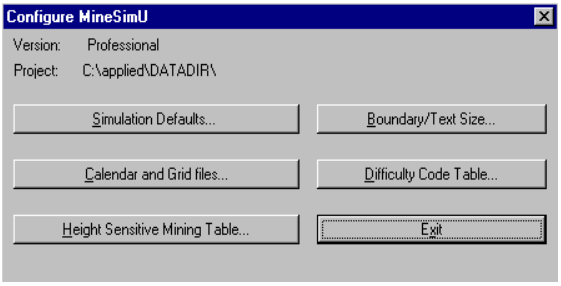
We will now enter the default values for missing grid node values. Click the **Edit Default Parameter Values** button. The following dialog box will appear.



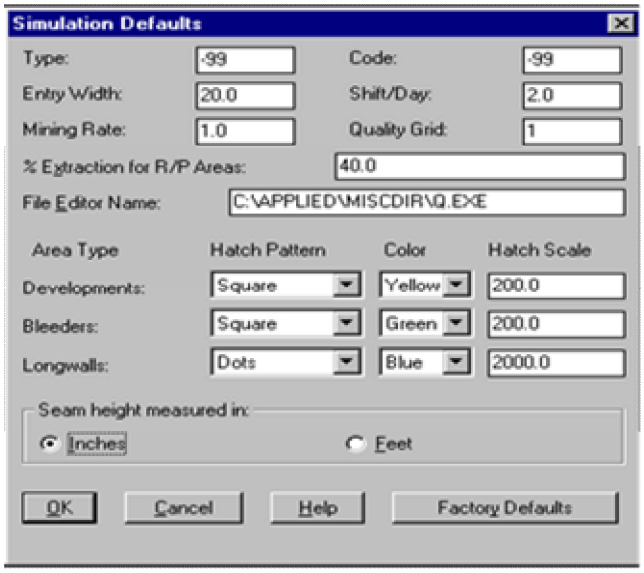
Use the edit boxes on the right to change the default values. Type **85** for the density of coal and **125** for the out of seam density and then click the **OK** button. The previous dialog box will appear. For now click the **Save** button to save your inputs in the ICAMPS grid file and exit the grid creation process. There will be a short pause while the Z parameter values are loaded into the ICAMPS grid file. Hit the **Enter** key to return to the MineGrid Module menu. All the other **MineGrid Module** menu options can be ignored at this time.

2. Set defaults

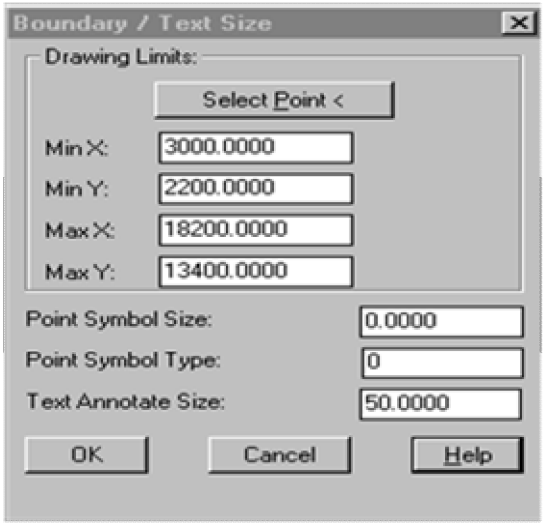
You normally need to enter default values once per mine. Select the **Setup** header. Click the first option in the menu, **Configure MineSimU**. The following dialog box will appear.



Select the **Simulation Defaults** option. The following dialog box will appear. You can accept all the defaults, but you should input **20** as the entry width to match the example in the tutorial. Likewise the defaults on the right are usually acceptable. Normally you would replace any of the defaults with the values you most commonly use. For the english version of MineSimU, you must also indicate whether your seam height is in feet or inches. The metric version assumes all seam heights are in meters. Click the **Inches** box for this example and then **OK** to leave this option.

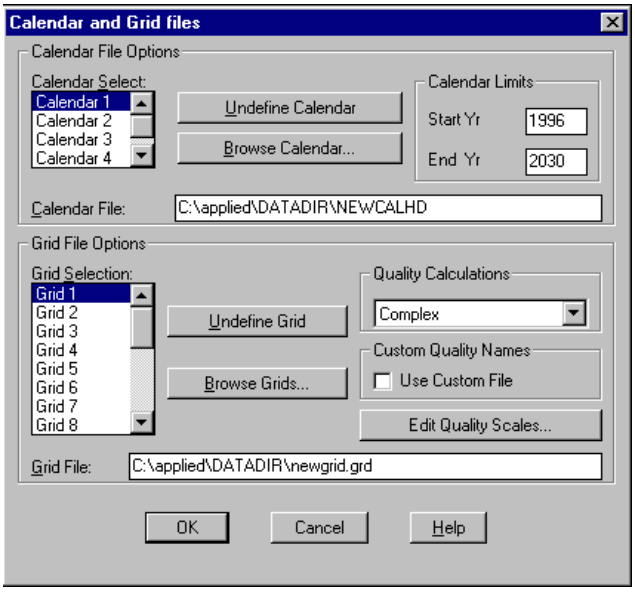


Next select the **Boundary and Text Size** option to bring up the following dialog box.



The boundary should span the maximum extend of your mine layout. For this example type **3000 and 2200** for the minimum **X** and **Y** respectively and **18200** and **13400** for the maximum **X** and **Y** respectively. Accept the existing defaults for the other parameters. They can be changed later as needed. Click **OK** to return to the **Configure MineSimU** dialog box.

When you develop a mine plan in MineSimU, you must assign calendars to machines and master grids to mining areas. Instead of typing long paths and file names each time a calendar or grid is specified, each calendar is assigned a unique number from 1 to 20 and each master grid is numbered from 1 to 20. When you need to specify a calendar or grid, you merely type its reference number. These numbers are assigned in the **Calendar and Grid Files** option. When you select this option, the following dialog box appears.



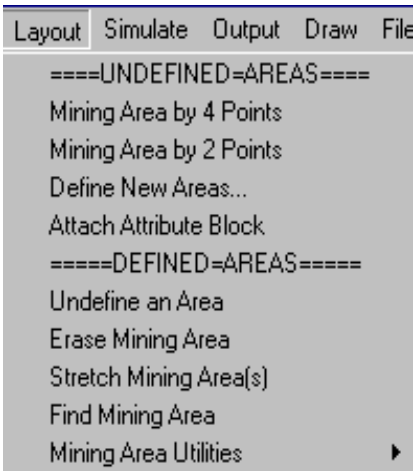
The dialog box comes up defaulted to calendar 1. Type the path **X:\applied\datadir** and the name **NewcalHD**. If the calendar already existed, you could use the browse button to search for this file. The calendar file can be empty at this point. You must create at least one calendar and we will use only one in this example. Your own application may require several calendars if your machines work on different schedules.

You must also specify at least one ICAMPS grid file. The dialog box comes up defaulted to grid 1. For this example we will use the grid **Newgrid.grd** in the directory **X:\applied\datadir**. Click the **Browse** button to search for the desired grid file. Additional grids are not required in this case, but you have the option to specify up to 20 grids in one mine drawing.

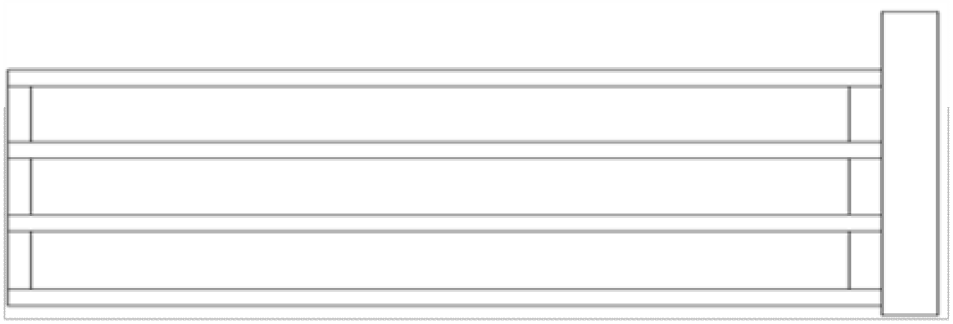
The other options in **Configure MineSimU** dialog box, **Difficulty Code and Height Sensitive Mining** can be omitted for the time being.

3. Layout/define mining areas

The next step is to draw the mine layout. Each mining area is drawn as a four sided closed polygon which represents the rib to rib outline of the area. There are two methods for drawing mining areas, one is to pick the corners using the cursor and is most useful if you already have an AutoCAD drawing of the mine layout. The other, called mining area by two points, is most useful if you are drawing on a blank screen or are adding mining areas to an existing layout and the area to be drawn are regular parallelograms. To start the layout, select the **Layout** pulldown menu as shown below.



We will use the **Mining Area by Two Points** method to draw the small mine shown below which consists of a set of mains, three longwall panels and the required longwall gates and startup rooms.



Assume the mains have five entries on 80 feet centers and the entry are 20 feet wide. The rib to rib width will be 340 feet. The mains start 500 feet before the first longwall gate. Each gate has three entries on 60 centers with 20 feet wide entries for a total width of 140 feet. Each longwall panel is 500 feet wide and 5000 feet long. Start at the coordinate 13750, 5950 and draw the right side of the mains. The total length of the mains is 500 feet plus the width of four 140 feet wide gates and three 500 feet longwalls for a total length of 2560 feet. The gates are 5340 feet long (5000 feet for the longwall panel plus 200 feet for a barrier pillar and 140 feet for the startup room).

Be sure you have the **Osnap** function turned **OFF** before you begin. Select the **LAYOUT** pulldown menu and choose the **Mining Areas by Two Points** option. A series of command line prompts will appear. Type your response to each prompt and then press **Enter** (<R>). The first command line prompt will ask for the first point:

Pick center of starting side/<R> to end

Type **13750,5950**. The cursor will now be at the location13750, 5950 and the command line will ask for the second point:

Pick center of ending side:

Type **@2560<270**. The next command line prompt will ask:

Azimuth/Perpendicular/Pick Orientation

You want the mains to be rectangular, so type **P** for perpendicular. The next prompt will ask:

Enter Perpendicular Width Left of First Side:

The ICAMPS convention is to assume you are looking from the first point to the second point. Since the points you placed coincide with the right side of the mains, type **340** as the distance to the left side. The next prompt asks:

Enter Perpendicular Width Right of First Side

Enter **0**.

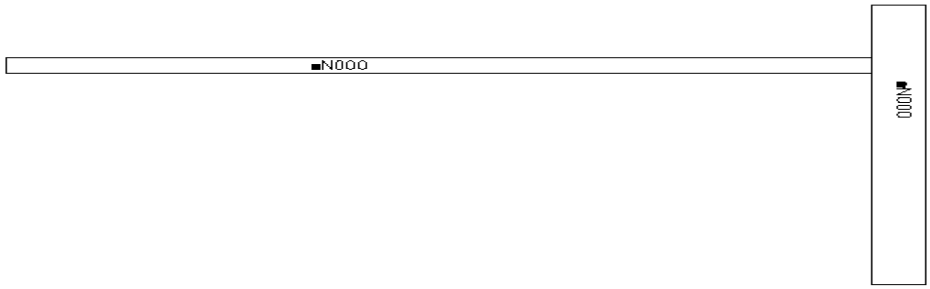
The mining area will now appear as a four sided polyline with the long axis north - south. Next you are asked to place the label for the polyline.

Pick point to start label:

Pick a point inside the polyline near the center. The next prompt asks you to pick a point to orient the label on the drawing:

Pick Alignment point:

Pick a point so that the label is aligned with the long axis of the polyline. The label **N000** and an attribute block should now appear inside the mining area.
Now use the mining area by two points method to draw the other mining areas. To make a neat, accurate drawing, select the appropriate **SNAP** function from the **Tools** pulldown to pick a point on the existing drawing. For example, to draw the first gate with the center of the starting side at 500 feet below the upper right corner of the mains, at the prompt, type **13750,5450**. To make the gate horizonal, extending off to the left and 5340 feet long, in response to the **Pick the center of the ending side** prompt, type **@5340<180**. Now type **P** for perpendicular and make the area width to the left **140** feet and **zero** feet to the right. Respond to the label orientation prompts to make a horizontal label near the center of the gate. The mining area for the gate will now appear as shown below.



Now draw the mining area for the start up room. Again use the **Mining Area by Two points** method to draw the area. Select the **Intersection** snap mode from the **Tools** pull down menu. Now pick the lower left corner of the first gate you drew as the center of the starting side. Since the long wall panels are 500 feet wide, the center of the ending side will be at 500 below the starting side. Type **@500<270** in response to the prompt for the center of the ending side, then **P** for perpendicular, and **140** for the area width to the left and **0** feet as the width to the right. Again pick the label in the middle of the area and oriented horizontally to the right.

Next draw the first longwall panel using the two point method.Use the **Intersection** snap mode to pick the upper right corner of the start up gate as the center of the starting side and the lower right corner as the center of the ending side. Make the width to the left **5000 and 0** to the right. The mining area for the longwall panel will end 200 short of the mains. This space will be a barrier pillar.

You have drawn mining areas but in order to schedule the mining, each mining area must be **Defined**. A defined area is designated as either a development, bleeder or longwall, given a number, name and associated with specific scheduling information.To define the mining areas you have drawn, select the **Layout** pulldown menu and choose the option **Define New Areas**. The following dialog box will appear.

For every mining area you must enter the **Area type**, **Name, Seam and Grid number** and the direction of mining. If the area is a development or bleeder, you must also specify the **entry width and percent extraction**.

Fill in the edit boxes below the List box. Start with the area we called the Mains. Select **Development** for the type, an identification (ID) number is automatically assigned. The edit boxes for **Entry Width, and % Extraction, Seam and Grid** automatically default to the values you specified in the **Configure MineSimU** setup procedure. Accept the defaults for now and type a name, such as **East Mains**. Next click on the button labeled **Pick**, The following command line prompt will appear:

Pick attribute block of area to be defined/<R> to end:

Now pick the attribute block for the mining area we referred to as the mains when you drew the mining area.

After you pick the attribute block the following prompt appears:

Is Correct area highlighted (Yes,No)/<Yes>:

The mains area should now be highlighted. Press the **Enter** key to take the "**Yes**" default.

The mining area will now be shown with each vertex numbered and green arrows will point inward from the middle of each side of the mining area. The following command line prompt will appear:

Pick direction of mining/<R> to end:

Pick the arrow on the North side of the area because you want to mine in the North to South direction. After you pick the direction of mining, the area's type abbreviation and ID number will appear in the list box along with the other information you entered.

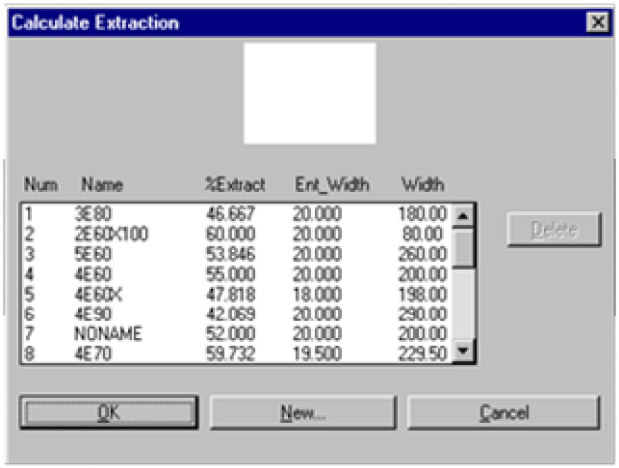
Now repeat the above process for the gate. Give this area the name **Gate1**, accept the defaults, pick the attribute box for the mining area at the top of the screen and choose the East to West mining direction arrow.

Do the longwall panel the same way. Name it **Longwall1**. You will notice the entry width and percent extraction are grayed out and default to **0.00** feet and **100** percent respectively. Accept the defaults, pick the attribute box for the longwall mining area and select the West to East mining direction.

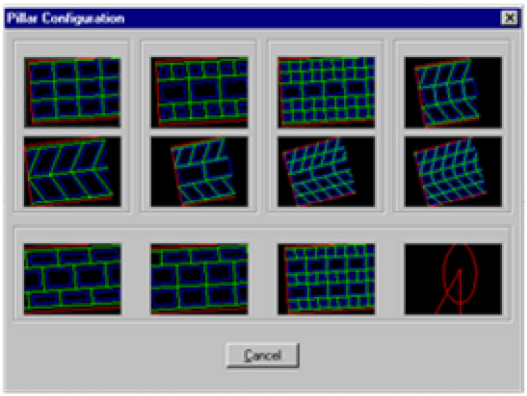
You will notice that the **Define New Areas** dialog box also has a **Draw** button. This button lets you draw mining areas at the same time as you are defining them. That is, instead of picking the attribute box of a previously drawn mining area, you select the drawing method, by four points or two points, and click the **Draw** button. You then follow the same procedure as described above for drawing mining areas.

We took the defaults for the entry width and % Extraction. Let us enter the theoretically exact values for the East

Main mining area. The entry width and spacing were given above. Highlight the line for East Mains area in the list box and click the **Calc. % Extract...** Button. The **Calculate Extraction** dialog box will appear as shown below.



If you have not used this option previously, the list box will be empty. To calculate the percent extraction for the East Mains area, click the **New** button. A icon screen of **Pillar Configurations** will appear as shown below.



Assume the pillars have a uniform rectangular pattern. Click the icon in the upper left hand corner of the dialog box. The following command line prompts will appear:

Calculation Adjust. is NORMAL/MinerBorer/RoadHeader (N/M/R) <N>:

Accept the **Normal** default which applies to Entries having a rectangular cross section such as cut with a continuous miner.

Number of entries:

Type **5**

Specify entry spacing individually/ (Yes,No) <No>:

Take the **No** default.

Center-to-Center distance of Abutment entries:

Type **80**

Specify entry widths individually/ (Yes,No) <NO>:

Take the **No** default.

Entry Width:

Type **20**

Center-to-Center distance of Abutment Pillar crosscuts:

Type **100**

Crosscut Width:

Type **20**

After you enter the cross-cut width, the calculated percent extraction and mining area width appear in the command line.

Percent extraction: 43.529
Keep Configuration (Yes/No) <Y>:

Take the **Y** option and the next command line prompt will ask:

Enter Name of this configuration <NoName>
Type a name which will help you identify the configuration in the future such as **5E80X100** for the name. The new configuration will appear at the bottom of the list. To assign the calculated percent extraction to the defined mining area we called East Mains, highlight the new configuration line in the list box and click the **OK** button.

You are now returned to the **Define New Areas** dialog box. The percent extraction in the edit box will now be **43.53**. Click the **Change** button to replace the previous value for percent extraction in the list box.

Highlight the line for **Gate1** and repeat the above steps to calculate the theoretical percent extraction. Assume both the gate and startup room will have uniform rectangular pillars on 60 by 80 feet centers and the entry and cross-cut widths are 20 feet. Name this calculation **3E60X80.** The calculated percent extraction of **57.14** will appear in the edit box. Click the **Change** button to insert this value into the percent extraction for **Gate2**. Now highlight the line for the **Startup1** room, click the **Calculate % extraction** and select the line named **3E60X80** and click **OK**. The calculated value of **57.14** will now appear in the percent extraction edit box. Click the **Change** button to update the percent extraction for Startup1.

The information in the list box is not saved permanently with the drawing until you click the **SAVE** button. Click the **SAVE** button; the defined mining areas information will be saved in a file called **Area Definition** and the mining area ID numbers will now replace the N000 labels in the drawing.

Now expand the mine layout by adding additional gates, start up rooms and longwall panels. Use the **Mining Areas by Two Points** method to draw the second and third set of gates, startups and longwalls. Increment each name by 1, For example the second gate will be Gate2 and the third will be Gate3 etc. You may want to use the **Define New Areas** method to draw and define the areas in one procedure.

When a layout consists of a repeating pattern, the easiest procedure is to copy the previously defined areas. MineSimU has a copy function in the **Mining Area Utilities** options under the **Layout** pulldown. Try this feature to draw the fourth gate. Click the **Mining Area Utilities** option to display the following menu.

Select the **Copy Areas** option from the list.

Caution: Do not use the standard AutoCAD COPY command to copy mining areas!

When you save a defined area, the area identifier and scheduling information for each area are written in the **Area Definition** file. The **ICAMPS COPY** command automatically draws the copied areas polylines, attaches an attribute block, assigns a unique ID number to the new area, transfers the static information from the copied attribute block, and asks for information that is unique and user dependent, i.e. the area name, and updates the Area definition file with a record for each new area or subarea. The AutoCAD **COPY** command simply duplicates the information in the drawing. AutoCAD does not assign a unique ID number to a copied area, will not ask for the area name and does not update the area definition file. **Consequently areas copied with the AutoCAD copy command cannot be scheduled.**

When you select the **Copy Areas** option, the following command line prompts appear.

Surround attribute blocks of areas to be copied(4 point polygon):

The enclosing polyline can be of any shape or size. Window around the attribute block for **Gate1**. Only areas with attribute blocks completely inside the window will be copied.

Pick first corner:
Pick second corner:
Pick third corner:
Pick fourth corner:

After you create the window you are asked to specify how to displace the selected areas.

Displace by (Point/Feet/Quit) <Q>:

Type **P** to select the point method.

Use the **Intersection** snap mode to select the upper left hand corner of Gate1 as the base point. The next prompt asks for the magnitude of the displacement of the base point.

MAGNITUDE <XXXX>:

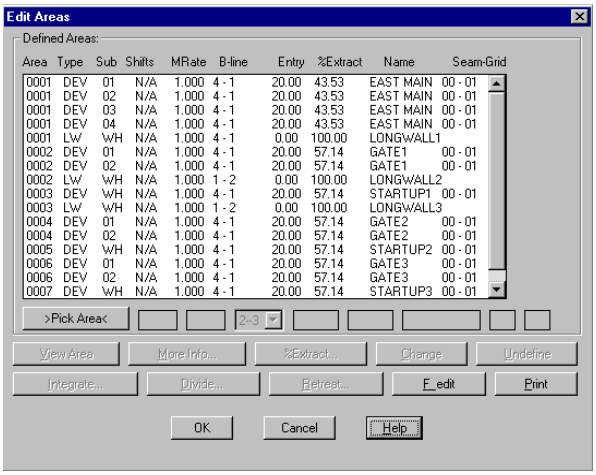
XXXX is the distance from the base point to the current position of the cursor. Pick the lower left hand corner of Startup3 as the displacement point.

The copied areas will now appear, one at a time. The copied area's ID's will appear on the command line with a default to the next available number. You can take the default or assign another ID number. Next the command line prompt will ask for area name. Name the new gate **Gate4.** After you enter the name, the area attribute block and ID label appear on the drawing. If you were copying several areas, the process would repeat for each copied area.

Although you have defined the mining areas, you may not want to mine them as one continuous area. Rather, you probably will advance the mains until you pass a gate, stop, stub off the gate to allow for construction work, and then continue to mine the mains until you pass the next gate. Therefore, to assign work to the mining machines, you should divide the large mining areas into two or more sub-areas according to how they will be mined. You will then assign these sub-areas to machines.

The function to divide mining areas is in the **Edit Mining Area File** option under the **Simulate** pulldown menu as shown below.

When you select the **Edit Mining Areas** option, a dialog box will appear as shown in the following example.



Each mining area you have defined will appear in the list. To sub-divide the **Mains**, highlight its line and click the divide button. The screen will automatically zoom to the **Mains** area and the numbers **1 and 2** will appear at each corner of the end where you specified the mining to begin. The following command line prompt will ask you to select the side to sub-divide.

Enter side to use (1,2): <1>:

You are asked to select a side to subdivide, because a mining area can have an odd shape, and one side may be more suitable as a reference for sub-dividing the area. In this case select the side adjacent to the gates because you will want to divide the area relative to where the gate begin.

After you select the side the following prompt appears:

Enter length (or pick point) of subarea 1/ [0] to exit <YYYY>:

YYYY is the total length of the **Mains**.

In most cases the sub-division points are not critical and you can select the points visually. Where the sub-divisions are more critical, type the exact distance to the point where you want to subdivide. For this application use the cursor to pick the point for the first subdivision. A white rubber banding line will appear that starts at the selected corner. Estimate a point a couple of breaks past **Gate1**. The prompt will repeat but YYYY changes to the length of the remaining undivided section of the area. As above, pick points beyond **Gate2 and Gate3** and press **Enter** to complete the sub-dividing.

Next divide Gates 1,2 and 3 into two parts. Highlight **Gate1**, select either side 1 or 2 and pick a point to create a stub about two breaks long and press **Enter** to leave the remaining distance as one long sub-area. Repeat the process for **Gate2 and Gate3**.

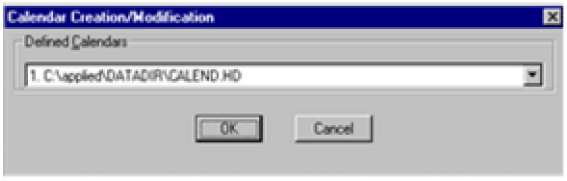
To check your work, select the **View mining areas** option under the **Simulate** pulldown menu. After you select this option, the following command line prompt will appear.

Area definition file display (Show/Draw/Quit) <Q>:

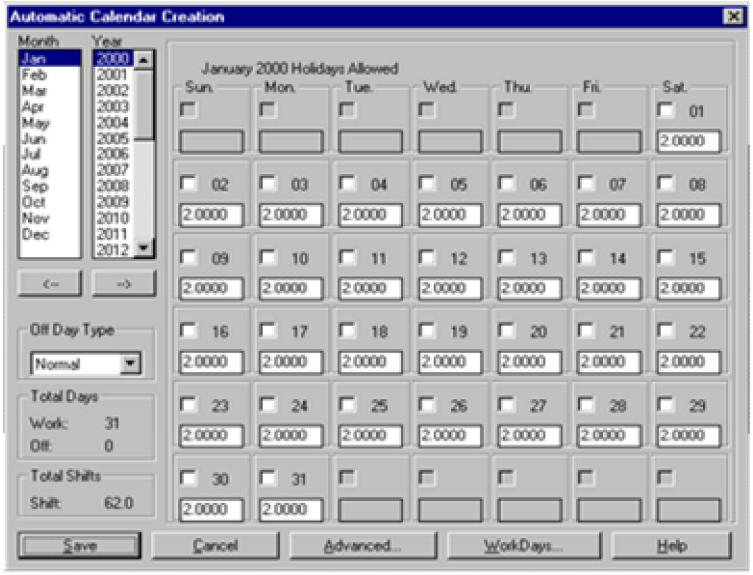
Enter **S** for the **Show** option. The areas with their sub-divisions should appear as shown below. The arrows indicate the direction of mining for each area and/or sub-area.

4. Create working days calendar

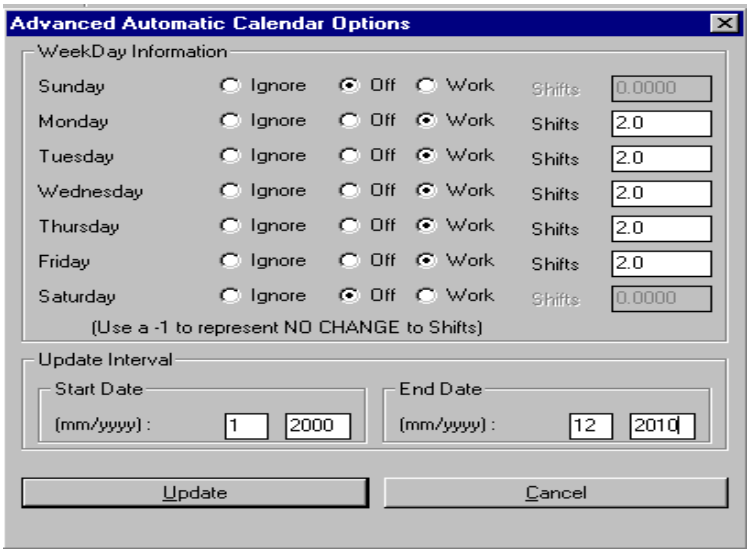
Next you must create at least one working days calendar. Select the **Edit Calendar File** option from the pulldown menu under the **Simulate** option. The following dialog box will appear.



The dialog box contains the calendar file you named in the **Configure MineSimU** option under **Setup** pulldown. Click **OK** and a wall calendar for the first month of the first year will appear in the next dialog box as shown in the following example. You can pull up the wall calendar display for any month of any year by highlighting the desired month and year in the **Month-Year** list on the upper left. A check mark in the small box in each day indicates non-working days.



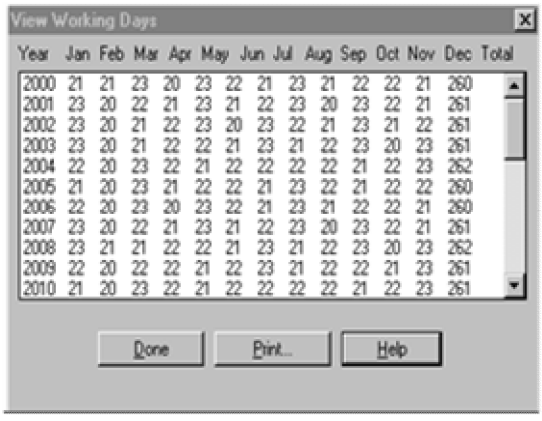
First turn off the non-working days that are common to each month, such as Saturday and/or Sunday, use the **Advanced** option at the bottom of the dialog box. The following dialog box will appear. Click the circles under **OFF** for Saturday and Sunday and under **WORK** for the other days of the week. If you want your mine to work only four days per week, make a weekday an **OFF** day. The **Shift/Day** column will contain **-1's** which indicate to use default values. You can either key in the values for each day or accept the defaults. If you are editing an existing calendar, the **Shifts/Day** will default to the prior existing values in the calendar. If you are creating a new calendar, the **Shifts/Day** will be the **Shifts/Day** you specified in the **Simulation Defaults** option under **Setup**. Then key in the **Starting** and **Ending** months and years for the calendar. For this example make the **Starting Month and Year** 1 and 2000 and the **Ending Month and Year** 12 and 2007. Then click the **Update** button.



Holidays and vacation schedules tend to vary among mining companies, countries and years so that an automatic procedure to indicate holidays and vacation days for every month of every year for every application would not be appropriate. To indicate such **OFF** days, go to the desired month and year and click the small box in the square for the day. Indicating holidays and vacation days will take only a few minutes and the process will rarely be repeated because calendars, once created, seldom change.

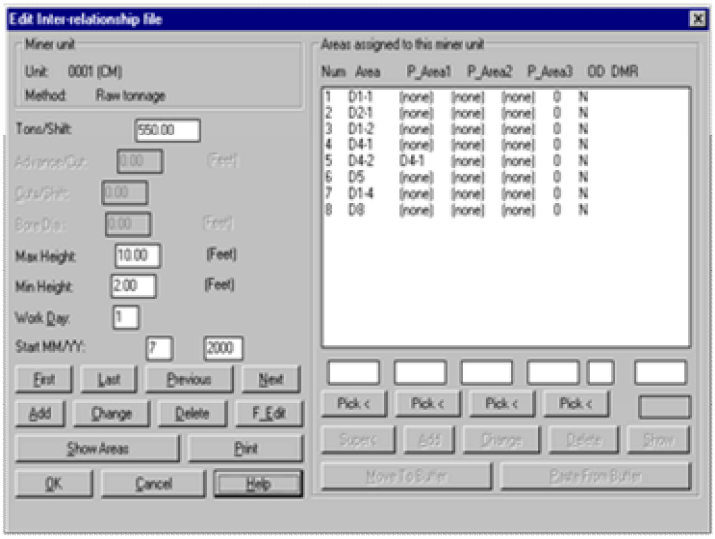
If necessary, you can indicate the reason for the non-standard non-working days. If you highlight the word **Holiday** before you click off the days, an **H** appears in each day you click off. Similarly a **V** appears in each day you click off if you highlight the word **Vacation** before you click off the days. This information appears in some forms of the scheduling **Output**.

The number of working and non-working days in each month appears in the dialog box for the month. To see a table of working days for every month of every year and the total working days for each year, click the **Work Days** button in any month's display. The list looks as follows.



5. Specify machine parameters

The final input to the scheduling process requires certain technical information about each mining machine and a list of mining areas assigned to each machine. This information is stored in the **Machine Sequence** file. To create this file, select the **Edit Machine Sequence W/Draw** option under the **Simulate** pulldown menu. The drawing will now show the mining areas including all the subareas color coded by area type and the following dialog box will appear.



Before mining areas can be assigned to a machine, you must define the machine. The dialog box initially comes up with the machine information area grayed out. To define a machine, click the **ADD** button on the lower left side of the dialog box. A dialog box as shown in the following example will appear superimposed on the previous dialog box.

Enter the machine number, up to four digits long, in the **Machine Number** edit box. Then type the machine name, such as Joy CM12, in the **Text** edit box. Now select a calendar for the machine. Previously you assigned numbers to each calendar file named in the **Calendar/Grid Files** option within the **Configure MineSimU** option under the **Setup** pulldown menu. Type the calendar number or select the calendar from the pull down list. In this example you have created only one calendar file, therefore assign calendar number **1** to the machine.

In the process of assigning mining areas to machines, the previously assigned areas will be colored to indicate which machine will mine the each area. You must assign a color to the machine and also indicate how mining production will be measured. The production options are raw tonnage per shift, clean tonnage per shift and advance per shift.

For this example, type 1 for the machine **number**, name it **Joy Miner**, assign calendar **1** to the machine and make its color **Green** and use **Raw tonnage per shift** as the measure of machine production. Click the **OK** button to accept your responses. The dialog box will disappear and now you must enter certain quantitative information for the machine. Enter **500** as the raw tonnage production rate per shift, make the maximum mining height **12** feet, the minimum mining height **3** feet and set the machine available date to the first work day of July, 2000, i.e. day **1**, month **7** and year **2000**.

6. Assign Mining Areas to Machines

You must now assign mining areas to machines in the order they will be mined. Highlight the top line of the list box on the right and the select the **Super** button. The dialog box will disappear, and following messages appear in the command lines.

Please wait while drawing areas...
Indicating Assigned Areas...
Starting Super Pick process (CANCEL or RETURN to End)...
Pick a point inside the AREA to ADD <#X on List>:

The previously assigned mining areas will contain diagonal lines in the color of the machine to which they have been assigned. In this example none should have been previously assigned.
Move the cursor inside the first area you want this machine to mine and click the left hand button. The following message appears on the command line.

... ZZZ Added to the mining unit!

where **ZZZ** is the area ID number. The Pick prompt reappears.

The selected area will appear in green with diagonal lines crossing through the area to indicate it has already been assigned to an area. You repeat the process until you either run out of areas to mine or you click the Enter button to stop the procedure. The dialog box will reappear with the following message in the lower left corner.

[Y] Areas Added...

Where **Y** is the number of areas added to the list of mining areas assigned to this machine.

For this example, assign areas in the following order:

subdivision 1 of the Mains.	D1-1
subdivision 1 of Gate1.	D2-1
subdivision 2 of the Mains .	D1-2
subdivision 1 of Gate2.	D4-1
subdivision 3 of the Mains.	D1-3
subdivision 1 of Gate 3.	D6-1
subdivision 4 of the Mains	D1-4
the entire Gate 4 area.	D8

Now repeat the above procedure to create a second Continuous miner. Make it the number 2 machine, call it Joy 12B, use cyan for its color. All the other options can be the same as for the first continuous miner. Assign mining areas to this machine in the following order:

subdivision 2 of Gate 1	D2-2
the entire Startup Room 1	D3
subdivision 2 of Gate 2	D4-2
the entire Startup room 2	D5
subdivision 2 of Gate 3	D6-2
the entire Startup room 3	D7

This machine must wait for continuous miner 1 to complete the stubs of the gates. You must edit the list of mining areas assign to Continuous miner 2 to indicate these requirements. They are called precedence or **P-Areas**. Highlight the line for subdivision 2 of Gate1 (D2-2) and click the pick button under P-Area1. The dialog box will disappear. Pick a point in subdivision 1 of Gate1 and click the right mouse button. The ID D2-1 will appear in the edit box under P-Area1. Click the **Change** button to insert the precedence area in the line for D2-2. Repeat the process for the areas D4-2 and D6-2, which require precedence areas D4-1 and D6-1 respectively.

Next create a long wall mining machine. Make it machine 3, call it **Longwall** and assign **magenta** as its color. Use the same calendar as for the continuous miners. Make the production rate **4000** tons per shift, Maximum mining height **8** feet, minimum mining height **5** feet and the start date the **first** working day of **January, 2001**.

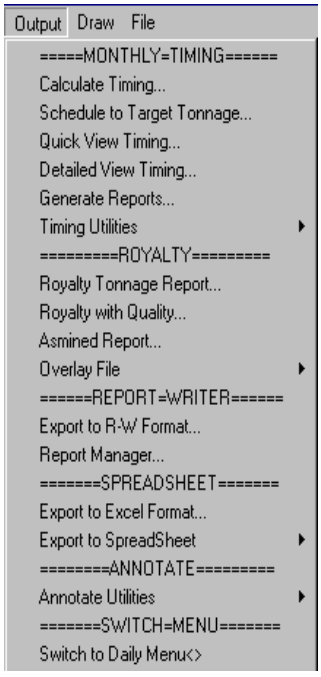
Assign the longwall areas to this machine in the sequence Longwall1, Longwall2 and Longwall3. After assigning the longwall areas, highlight Longwall1 (L1) and pick area D5 as the precedence area. Longwall moves normally require a significant amount of time between finishing one panel and beginning the next. The scheduling system allows for this time. The column labelled **OD**, which stands for **Offset Days**, contain the number of working days allowed for a longwall move. Highlight the line for L1 and type **15** in the edit box below the column labelled **OD** and click the **Change** button. 15 offset days will now appear in the line for L1. We will ignore the column headed DMR for the time being.

Repeat the process of adding precedence areas and offset days for the other two longwall panels. Pick areas **D7** and **D9** as the precedence areas for Longwalls 2 and 3 (L2 and L3) respectively and assign **15** working days (offset days} to each for the longwall move.

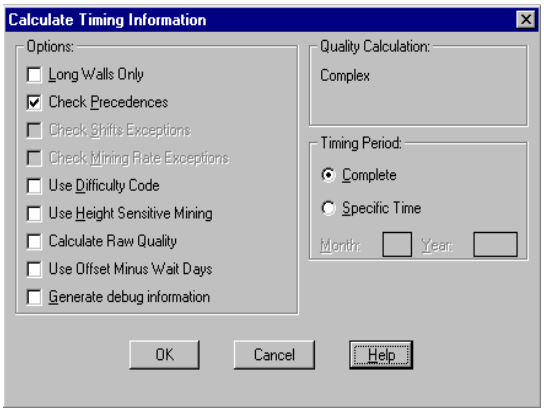
If you need to move from one miner unit to another, click the **Next** or **Previous** buttons. The system should now have the information to schedule the mine. Click the **OK** button and select the **Save** option.

7. Calculate Timing and Display Results

To calculate the timing, click the **Output** pulldown; the following menu will appear.

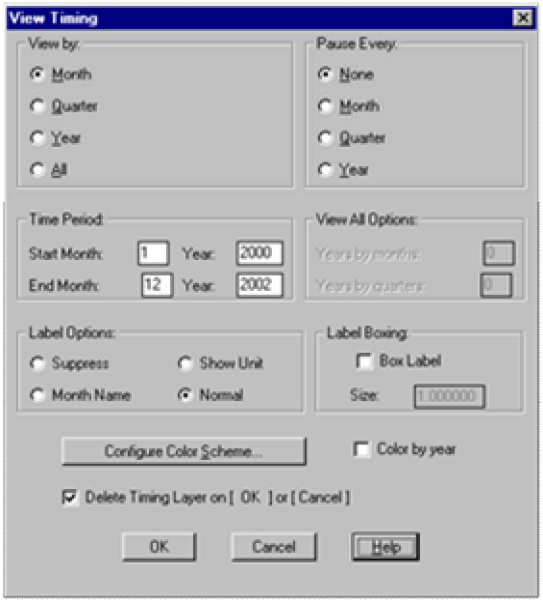


and select the **Calculate Timing** option from the pulldown menu. The following dialog box will appear.



Click the **Check Precedences** option, the **Complete** time period and press **OK**. A scheduling progress status report will now appear while the system calculates the timing. It includes a list of mining areas, their status and the dates for the current work. The **Done** button becomes highlighted when scheduling is complete. Click the **DONE** button.

Now select the **Quick View Timing** option to display the timing map. The dialog box shown below will appear. Select View by: **Month**, Pause Every: **Year** and type the Time Period: Start Month: **1** of Year: **2000** and End Month: **12** of Year: **2002**. Use the **Normal** Label option. Toggle the **Delete Timing Layer on** button **ON** so the previous timing map will be erased when you display another timing run. Click **OK**. The timing map will be displayed for the first year. Click the **Enter** button to display the second year.



If you examine the timing map, you will see that continuous miner unit 1 finishes long before the other continuous miner unit and the start of Longwall1 could be delayed. To balance the work load between the continuous miners and to insure the longwall development is done as soon as possible, reassign the mining areas. Select the **Edit Machine Sequence w/Draw** option from the **Simulate** pulldown menu. To make changes, use the **Paste to Buffer** and **Paste from Buffer** options. Assign the mining areas in the following sequences.

Continuous miner 1.

subdivision 1 of the Mains. D1-1
subdivision 1 of Gate1. D2-1
subdivision 2 of the Mains. D1-2
subdivision 1 of Gate2. D4-1
subdivision 2 of Gate2.. D4-2

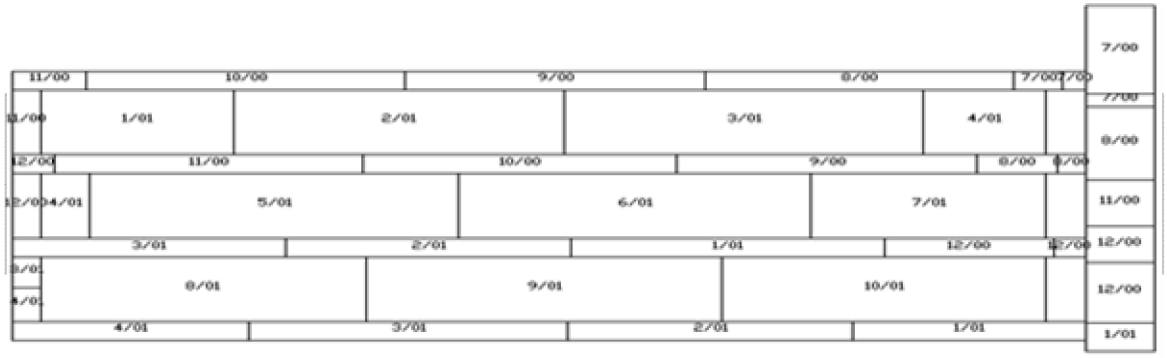
Startup room 2. D5
subdivision 4 of the mains D1-4
Gate 4. D8

Continuous miner 2.

subdivision 2 of Gate 1 D2-1
Startup Room 1 D3
subdivision 3 of the Mains D1-3
Subdivision 1 of Gate 3 D6-1
Subdivision 2 of Gate 3 D6-2
Startup Room 3 D7

Place the areas in the buffer in the order specified above. Start with Continuous miner 2. Highlight the line for **D4-2** and click **Move to Buffer**. The line for **D4-2** will disappear and the following line for **D5** will be highlighted. Click **Move to Buffer** again and then click **Previous** to go to Continuous miner 1. Highlight the line where you want the areas in the buffer to be inserted, in this case the line for **D1-3** and click the **Paste from Buffer** button. Now highlight **D1-3** and paste it to the buffer. Repeat the process for **D6-1** . Then click **Next**, highlight the line for **D6-2** and click **Paste from Buffer**. The precedence specified between D2-2 and D2-1 will not affect the timing , but you can eliminate it by highlighting the line for **D2-2**, erase **D2-1** from the edit box and click the **Change** button. Eliminate other unnecessary precedences and then click the **OK** button and select **Save** to save the changes.

Now rerun the **Calculate Timing** and **View Timing** options. The timing map should look like the following figure. The continuous miners are about equally loaded and the longwalls are not waiting for any development work.



Output is also available in the form of production reports and a machine rebuild/replace schedule. See the manual for procedures to generate these documents and to use the more advanced features not covered by this tutorial.