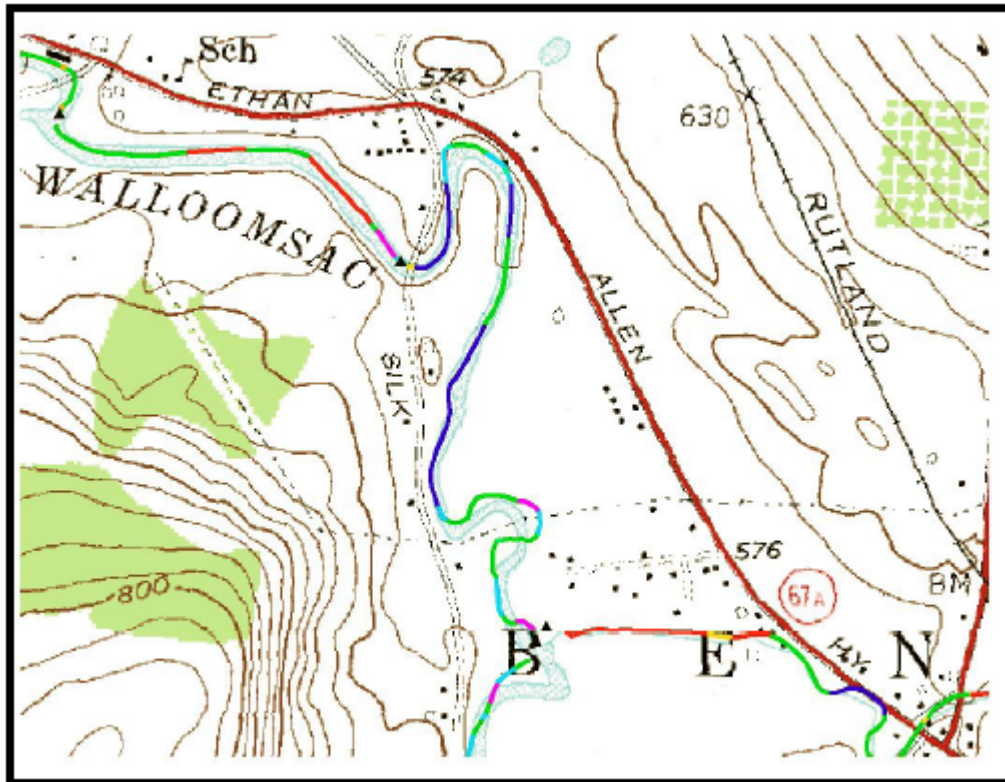


# Vermont Stream Geomorphic Assessment

## Appendix P



## Feature Indexing Tool Directions

Vermont Agency of Natural Resources  
May 2007

\*Some exerts taken directly from the SGAT manual authored by Chris Davis

## TABLE OF CONTENTS

<b>Using the SGAT Feature Indexing Tool (FIT)</b>	<b>3</b>
<b>Getting started</b>	<b>5</b>
<b>Set Up</b>	<b>9</b>
<b>Indexing Features</b>	<b>14</b>
Point Data Entry	14
Line Data Entry	15
Data Entry Example	16
<b>Impact Details</b>	<b>18</b>
Alluvial Fan	20
Debris Jam	20
Bank Armoring or Revetments	21
Beaver Dam	23
Bridge or Culvert	24
Buffer Widths	24
Cross Section Location	25
Development	26
Dredging	26
Erosion	27
Encroachment	28
Flow Regulation and Water Withdrawal	30
Grade Control	31
Gully	32
Mass Failure	33
Migration	34
Steep Riffle or Headcut	35
Storm water input	36
Straightening	37
Stream Crossing	38
<b>Helpful Hints</b>	<b>38</b>
<b>Editing/Modifying FIT data</b>	<b>39</b>
Deleting Impacts	42
Modifying Impacts	43
<b>Segmentation</b>	<b>44</b>
<b>Offset/Extraction</b>	<b>53</b>
<b>Feature Exporting</b>	<b>57</b>

### **USING THE SGAT FEATURE INDEXING TOOL (FIT)**

Evaluation of some of these parameters requires identification and measurement of physical features or characteristics such as bank armoring, channel straightening and locations of berms and roads in the corridor.

Using the SGAT Feature Indexing Tool (FIT) provides an efficient means for documenting and measuring features of interest. Use of the FIT also results in a data base file that can be imported into the DMS, thus eliminating the need to manually enter the data. More technical instructions on acquiring and using the FIT are contained in the SGAT manual.


#### **Evaluation with FIT:**

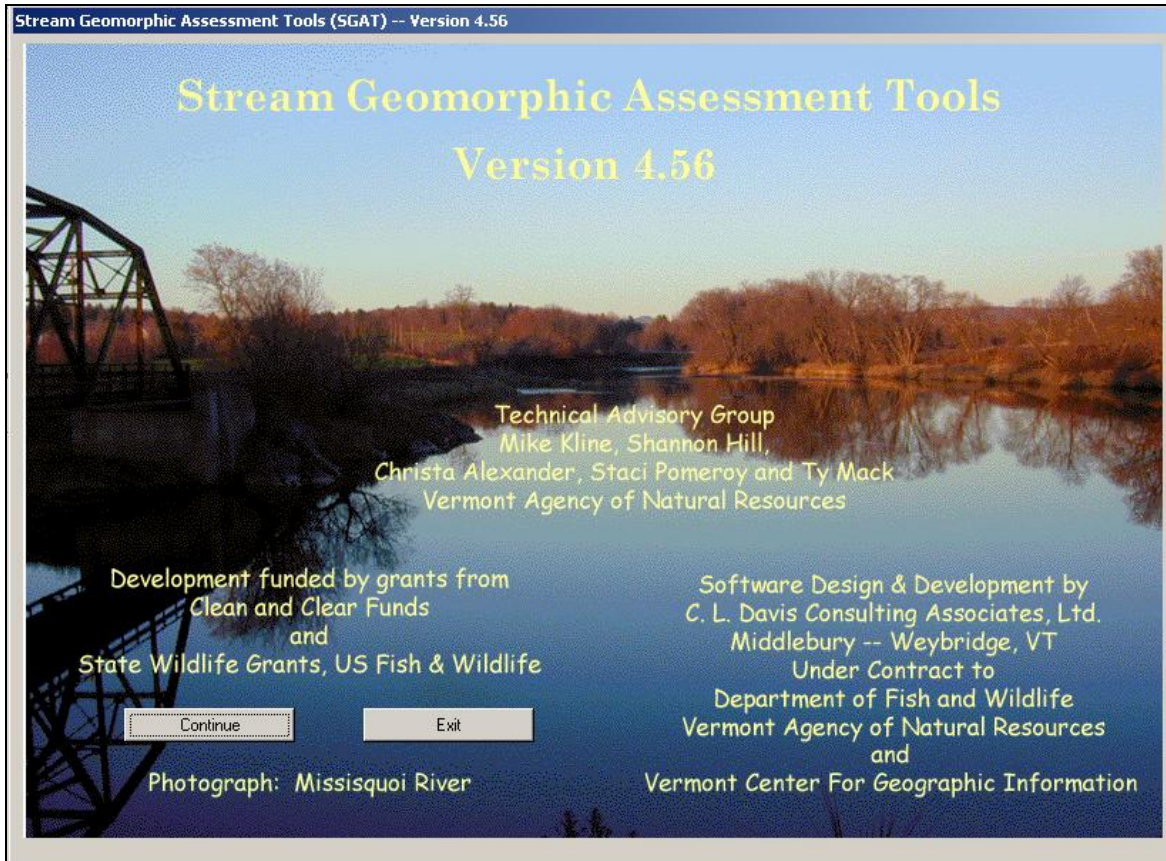
Throughout the Phase 1 and 2 SGA protocol handbooks, the term “FIT” appears in parentheses after each Step # (parameter) for which the FIT can be used to generate data. The Feature Indexing Tool (FIT) should be used to document the following impacts to a stream during the Phase I and II Assessments:

Phase 1	Phase 2	Shape	Impact	Sub-Impact	Location	Option 1	Option 2
3.1	1.2	Point	Alluvial Fan	N/A	N/A	N/A	N/A
5.3	3.1	Polyline	Bank Armoring or Revetment	Rip-Rap Hard Bank Other	Right Bank Left Bank		
N/A	4.9	Point	Beaver Dam	N/A	N/A	Length Affected	
5.2	4.8	Point	Bridge and Culvert	Bridge Culvert Unknown	N/A	Length Affected	
4.3	3.2	Polyline	Buffer Less than 25 feet	N/A	Right Bank Left Bank		
N/A	2.x	Point	Cross Section Location	NOT Representative Representative	N/A	Number	
N/A	4.4	Point	Debris Jam	N/A	N/A		
6.2	1.3	Polyline	Development	N/A	Both Sides One Side		
5.5	5.5	Point	Dredging	Commercial Mining Dredging Gravel Mining	Exact Location General Location		
6.1	1.3	Polyline	Encroachment	Berm Improved Path Railroad Road	Both Sides One Side	Height	
7.2	3.1	Polyline	Erosion	N/A	Left Bank Right Bank	Height	
5.1	4.5	Point	Flow Regulation and Water Withdrawal	Large Bypass Large Run of River Large Store and Release Large Withdrawal Small Bypass Small Run of River Small Store and Release Small Withdrawal	Drinking Flood Control Hydro-electric Other Recreation		
3.2	1.6	Point	Grade Control	Dam Ledge Waterfall Weir	Picture NO Picture	Height Above Water	Total Height
N/A	3.1	Point	Gully	N/A	N/A	Height	
N/A	3.1	Polyline	Mass Failure	N/A	Left Bank Right Bank	Height	
6.4	5.2	Point	Migration	Avulsion Braiding Flood Chute Neck Cutoff Migration			
N/A	5.3	Point	Steep Riffle or Head Cut	Head Cut Steep Riffle			
N/A	4.7	Point	Storm Water Input	Field Ditch Other Overland Flow Road Ditch Tile Drain Urban Storm Water Pipe			
5.4	5.5	Polyline	Straightening	Straightening With Windrowing			
N/A	5.4	Point	Stream Crossing	Animal Crossing Stream Ford			

**Table 1:** Alphabetical table of all Impacts set with the FIT.

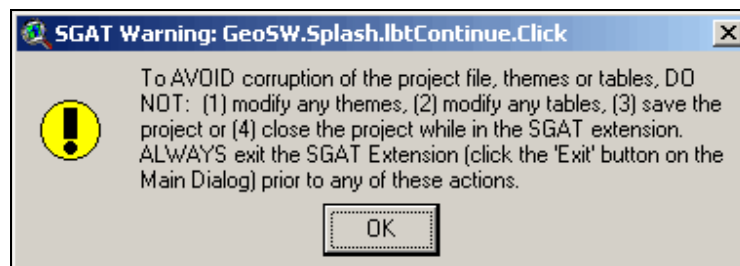
## **GETTING STARTED**

Open your SGAT project (make sure that the view is named “SGAT”). If this is your first time running this project or if your projects has been moved you must turn on your extensions. Now click on the SGAT button  in the top portion of your screen. This will bring up the SGAT cover page (Figure 1).



**Figure 1:** *Stream Geomorphic Assessment Tools (SGAT)—Version 4.56* cover and software information window.

To run the program extension you must click on the grey continue button located in the bottom left. This brings up a pop up warning box called *SGAT Warning: GeoSW.Splash.lbtContinue.Click* (Figure 2)



**Figure 2:** Screen-shot of warning box.

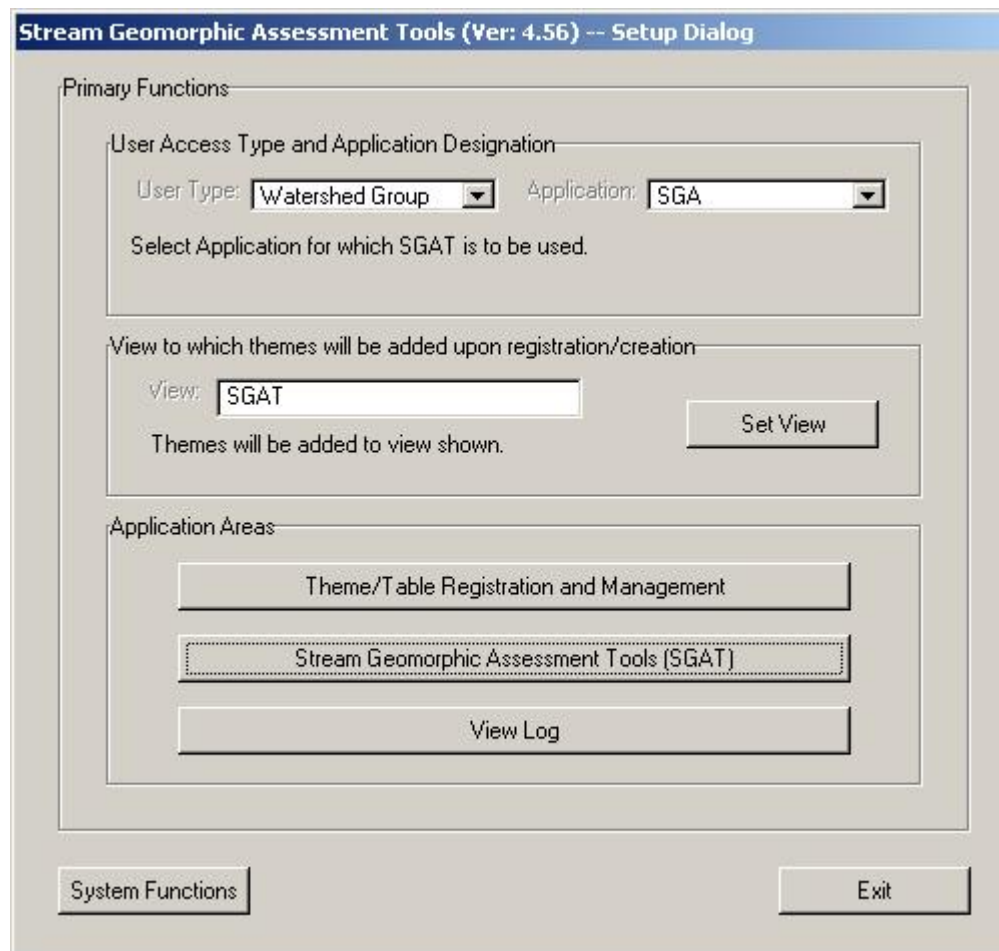
This user warning provides 3 essential rules for the SGAT and FIT process. These rules are:

- 1) Do not modify any themes or tables while SGAT is running.
- 2) Do not save the project while SGAT is Running
- 3) Do not close the project while SGAT is Running

Always Exit the SGAT Extension (by clicking the “Exit” button) before making any of the changes mentioned above then save and reopen SGAT. If this procedure is not followed you **will corrupt your data** and lose the entire FIT project.

Now that you understand this click “ok” to continue.

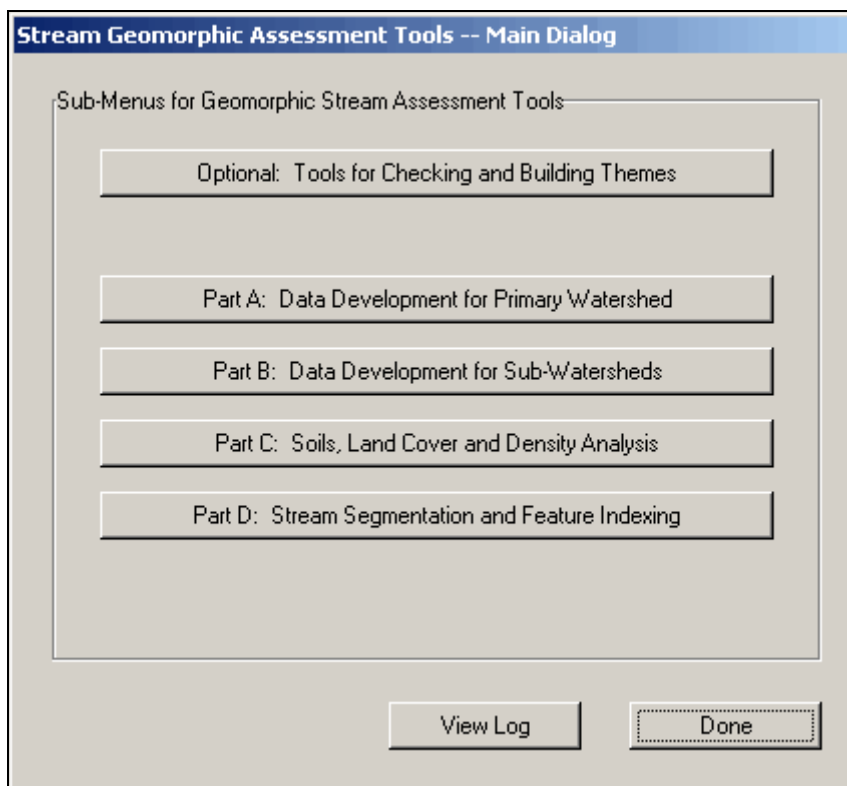
This will bring up the *Stream Geomorphic Assessment Tools (Ver 4.56)—Setup Dialog* window (Figure 3).



**Figure 3:** Screen shot of the SGAT Setup Dialog window.

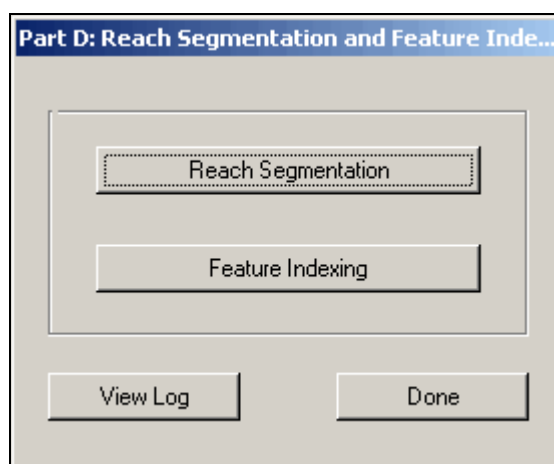
**Note:** the middle section shows that your theme Data will be added to the view labeled “SGAT”

In the lower section you are provided with 3 choices for “Application Areas” Choose the middle button that reads “Stream Geomorphic Assessment Tools (SGAT)”. This will bring up the *Stream Geomorphic Assessment Tools--Main Dialog* window (Figure 4).



**Figure 4:** Screen-shot of the SGAT – Main Dialog window.

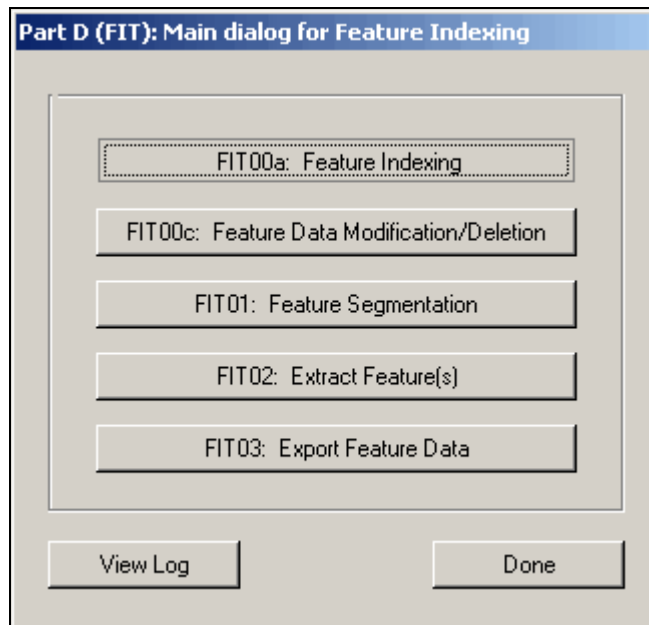
There are 5 possible options for the “Sub-Menus for Geomorphic stream tools”. We want to work with streams, so select bottom button labeled *Part D: Stream segmentation and Feature Indexing*. This will bring up the *Part D: Reach Segmentation and Feature Indexing Window* (Figure 5).



**Figure 5:** Screen-shot of the *Part D: Segmentation and Feature Indexing* window.

Select the button labeled feature indexing and this will bring up the *Part D (FIT): Main dialog for Feature Indexing* window (Figure 6)

--For information about the upper button “Reach Segmentation”, see page 44 of this manual.--



**Figure 6:** Screen shot for the *Part D (FIT): Main dialog for Feature Indexing* window.

This window shows 5 choices for the FIT, select the top choice labeled “FIT00a: Feature Indexing”. This will bring up the *Part D FIT00a: Setup for and Performing Feature Indexing* window (Figure 7)



**(Part D) FIT00a: Setup for and Performing Feature Indexing**

Input Theme(s)

Surface Waters: S05SWFinal.shp Theme for Surface Waters clipped to Sub-Watersheds to be used.

Primary Pour Pt: S02PPt.shp Theme for Primary Pour Pt to be used.

Surface Waters (with TribId Assigned) used for Feature Indexing Created via Setup

Surface Waters: S05SWFinalTribId.shp Theme containing only surface waters for which the Tributary Identifier (TribId) has been assigned is available to perform Feature Indexing.

To be saved in: c:\leslie\battenkill sgat v4.52\DerivdData\

Themes to be Created/Modified through Indexing Features

Pt Impacts: FIT00PtImpact.shp Existing Theme FIT00PtImpact.shp for Impacts: Point Features will be replaced.

Polyline Impacts: FIT00LnImpact.shp Existing Theme FIT00LnImpact.shp for Impacts: Polyline Features will be replaced.

To be saved in: c:\leslie\battenkill sgat v4.52\DerivdData\

Note for insertion into System Log

User Note:

Setup Index Features Done

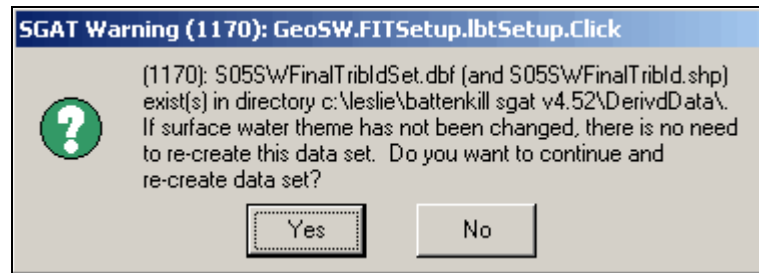
**Figure 7:** Screen shot of the *Part D FIT00a: Setup for and Performing Feature Indexing* window, showing the files that the FIT uses and creates.

The functions within this *Part D* enable one to “index features” with respect to the surface waters. As an example, one may have identified a portion of a stream in which significant bank erosion has been and is occurring. To “index” this as a “feature”, one identifies the beginning and ending points of the erosion along the surfacewater theme. These points are “converted” to a series of polylines that represent the length of stream under erosion. The starting and ending points are those established by the user; however, the polylines are extracted from those representing the surface water, i.e. the polylines are coincident with the surface waters. The process of indexing features enables one to establish multiple impacts (e.g. bank erosion, rip-rap, etc) and subsequently relate those impacts to each other or to other conditions, events or perhaps to predictive modeling.

### **SETUP (YOU ONLY NEED TO RUN SETUP ONE TIME!)**

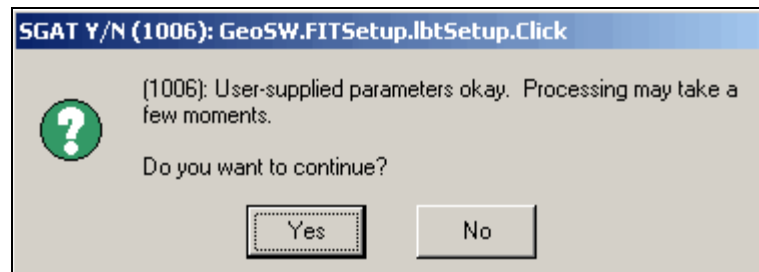
\*If this is the first time you are using the FIT for this project you must select the button labeled “Setup” (after the first time, if nothing in steps 1-9 of SGAT has changed, this is not necessary and you may click the button labeled “Index Features” [Page 11]\*\*).

If you have previously run “Setup” for your project, but changed something in SGAT causing you to have to run it again a warning pop up window will appear (Figure 8)



**Figure 8:** Screen shot of the *SGAT Warning (1170)*.

This asks you if you would like to continue. Click the “Yes” button and this will generate another warning window called the *SGAT Y/N (1006)* window (Figure 9).



**Figure 9:** Screen-shot of the *SGAT Y/N (1006): GeoSW.FITSetup.lbtSetup.Click* window.

This asks you if you would like to continue. Click the “Yes” button (this process will take 30 seconds - 2 minutes depending on the speed of your computer) you can track the progress in the task bar at the bottom of the screen. When it is finished another pop up appears (Figure 10).



**Figure 10:** Screen-shot of the *Setup Completed Successfully* window.

Click the “OK” button to continue and this will bring you back to the *Part D FIT00a: Setup for and Performing Feature Indexing* window.

**(Part D) FIT00a: Setup for and Performing Feature Indexing**

Input Theme(s)

Surface Waters:  Theme for Surface Waters clipped to Sub-Watersheds to be used.

Primary Pour Pt:  Theme for Primary Pour Pt to be used.

Surface Waters (with TribId Assigned) used for Feature Indexing Created via Setup

Surface Waters:  Theme containing only surface waters for which the Tributary Identifier (TribId) has been assigned is available to perform Feature Indexing.

To be saved in: c:\leslie\battenkill sgat v4.52\DerivdData\

Themes to be Created/Modified through Indexing Features

Pt Impacts:  Existing Theme FIT00PtImpact.shp for Impacts: Point Features will be replaced.

Polyline Impacts:  Existing Theme FIT00LnImpact.shp for Impacts: Polyline Features will be replaced.

To be saved in: c:\leslie\battenkill sgat v4.52\DerivdData\

Note for insertion into System Log

User Note:

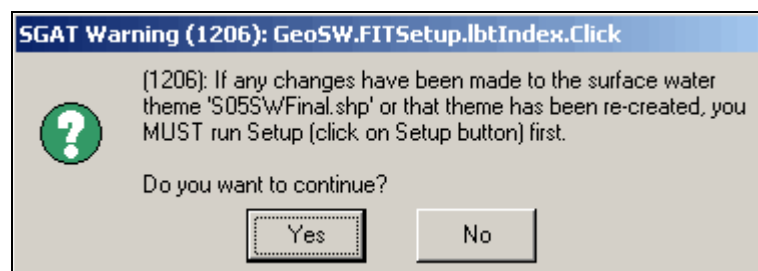
Setup Index Features Done

**Figure 11:** Screen shot of the *Part D FIT00a: Setup for and Performing Feature Indexing* window.

Setup is complete. (\*\*If this is not the first time you are running FIT for this project and nothing has changed in SGAT steps 1-9, you can start here).

## **INDEXING FEATURES**

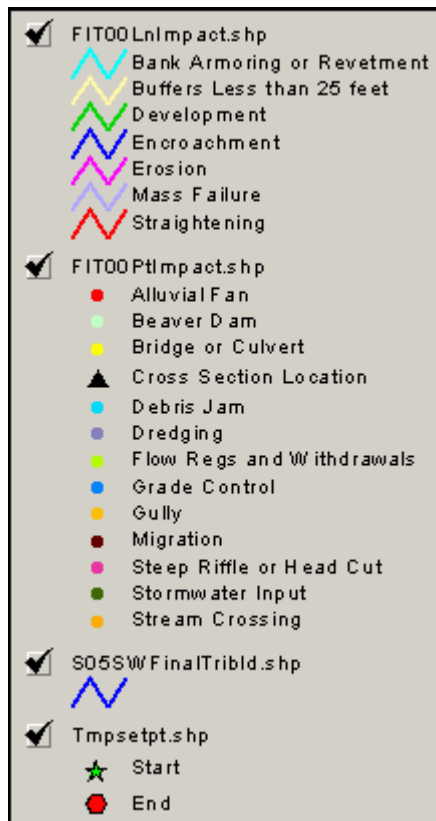
In the *Part D FIT00a: Setup for and Performing Feature Indexing* window click on the “Index Features” button (seen above). You are prompted with another pop up warning (Figure 12).



**Figure 12:** Screen shot of the *SGAT Warning (1206): GeoSW.FITSetup.lbtIndex.Click* window.

If you have already run the Setup, click the “Yes” button to continue. This will cause

4 files to appear in your table of contents (2 line and 2 points files) named “FIT00Lnimpact.shp”, “FIT00Ptimpact.shp”, “S05SWFinalTribId.shp”, and “Tmpsetpt.shp” (Figure 13).



**Figure 13:** Screen shot of the new table of contents items added once Feature Indexing has been started.

This will also cause the *FIT00b: feature indexing* window to appear (Figure 14)

**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact: Alluvial Fan

Sub-Impact:

Location:

Impact Feature Data

Description:

Observation Data

Date: 01/01/2007 Person: Firstname Lastname

Organization: Company name

Procedures for Assigning Impacts to Reaches

Distance from Points to Search for Polylines

Search Distance: 10.0 Meters

Set Pt Location Enables point locations to be identified for indexing a feature.

Clear Pt Location Clear point locations identified (via above).

Set Impact Index feature defined above.

Save Impacts Save features indexed since startup or since last Save.

Cancel Impacts Cancel features indexed since startup or since last Save.

Show View Instructions Done

**Figure 14:** Screen shot showing the *(Part D) FIT00b: Feature indexing* window.

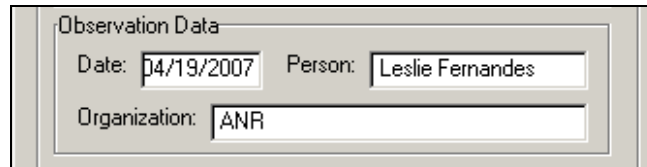
This window represents the heart of the FIT process and you should become familiar with all of its parts. Looking from top to bottom, there are 4 basic parts.

### 1. Impact Feature information:

Impacts are associated with all the steps in the phase 1 and 2 Protocol. The FIT assigns a geographic location to several of the impacts found within the protocol. All of these can be found within the “Impact” drop-down menu, but it is not just the impact we are interested in. We would like more detailed information, like the sub-impact, the location and sometimes a brief description (all of this is discussed in more detail below).

## 2. Observer information:

Each time you re-enter SGAT to use the FIT you must enter your “Observation Data”. First enter today’s Date, then your First and Last name and finally your company or organization’s name (Figure 15).



Observation Data

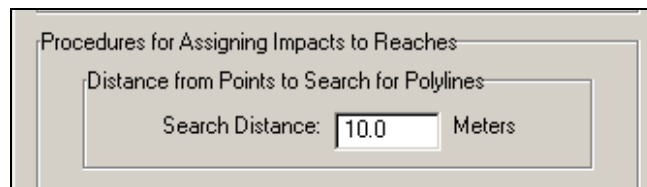
Date: 04/19/2007 Person: Leslie Fernandes

Organization: ANR

**Figure 15:** A screenshot of the observation data entered for April 19<sup>th</sup> 2007, Leslie Fernandes who works at the Agency of Natural Resources (ANR).

## 3. Distance buffer:

All FIT data must be entered in a location that is along the surfacewater file. The FIT program defaults to a 10.0 Meter search distance (Figure 16) between where you click and the actual surfacewater location making the overall process faster. This works like the option in other programs called “snap to grid”.



Procedures for Assigning Impacts to Reaches

Distance from Points to Search for Polylines

Search Distance: 10.0 Meters

**Figure 16:** A screen shot of the Distance from Points to Search for Polylines portion of the (Part D) FIT00b: Feature indexing window, showing the default search distance of 10.0 Meters.

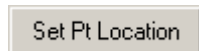
## 4. Procedures for Assigning Impacts to Reaches:

Because there are two types of information we are entering (points and lines), there are two separate procedures involved in constructing the files with FIT.

### POINT DATA ENTRY

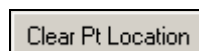
Alluvial fan, Beaver Dam, Bridge and Culvert, Debris Jam, Dredging, Flow Regulation and Water Withdrawal, Grade control, Gully, Mass failure, Migration, Storm Water Input, Steep Riffle or Head Cut, and Stream Crossing

#### The Buttons



Set Pt Location

By clicking this button your mouse becomes active, where ever you click your mouse along the river (or within the search distance) a green star will appear showing the temporary location of a feature.



Clear Pt Location

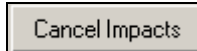
Use this button if the location you have chosen for your point in the previous step is incorrect and that temporary point will be deleted.



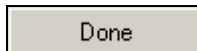
Use this button if the location you have chosen for your point is correct and the point will be stored (still as a temporary point, until it is saved below) in the “FIT00Ptimpact.shp” file.



Use this button to permanently save your points in the “FIT00Ptimpact.shp” file. Save often while working on your project (do not wait until you are finished to save all the points).



Use this button, if for some reason (e.g. you were looking at an incorrect reach in your notes) the points that you have set are not correct. This will remove all points since the last time you saved.



Use this button after you have saved your points and you are finished with you session.

If you select “Done” without saving, **all** indexes from the session will be **lost**!

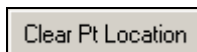
## LINE DATA ENTRY

Bank Armoring or Revetment, Buffer Widths, Development, Erosion, Encroachment, Mass Failure, Straightening

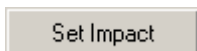
### The Buttons



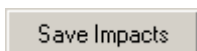
By clicking this button your mouse point becomes active, wherever you place it along the river (or within the search distance). The line data is indexed by clicking twice (making two points). The first point must be made on the river downstream (when you click a green star appears) and the second point must be upstream (when you click a red dot appears). This shows the end points for the temporary location of a line.



Use this button if the location you have chosen for your line is incorrect and the temporary line end points (marked by the red circle and green star) will be deleted.



Use this button if the location you have chosen for your line is correct and the line will be stored (still as a temporary line, until it is saved below) in the “FIT00Lnimpact.shp” file.



Use this button to permanently save your line files in the “FIT00Lnimpact.shp” file. Save often while working on your project (do not wait until you are finished to save all the lines).

Cancel Impacts

Use this button, if for some reason (e.g. you were looking at an incorrect reach in your notes) the lines that you have set are not correct. This will remove all lines since the last time you saved.

Done

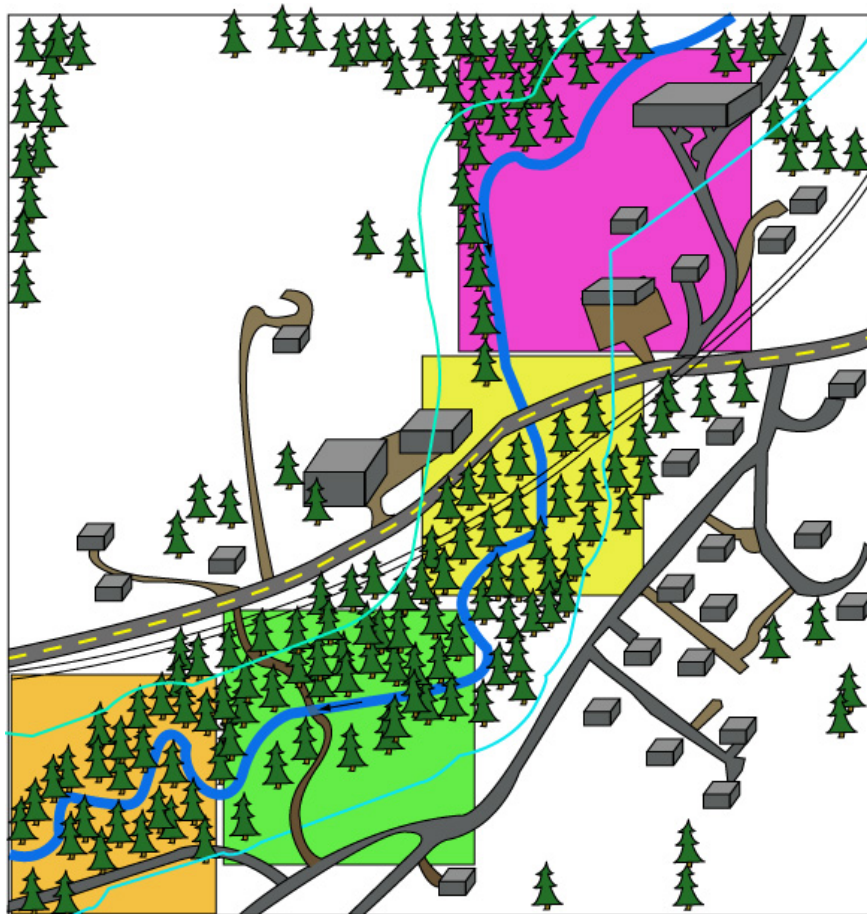
Use this button after you have saved your lines and you are finished with your session.

If you select "Done" without saving, **all** indexes from the session will be **lost**!

**Note: The index has to stop and start again at reach breaks. For example if straightening extends into two reaches the user must index for one reach and then index for another reach.**

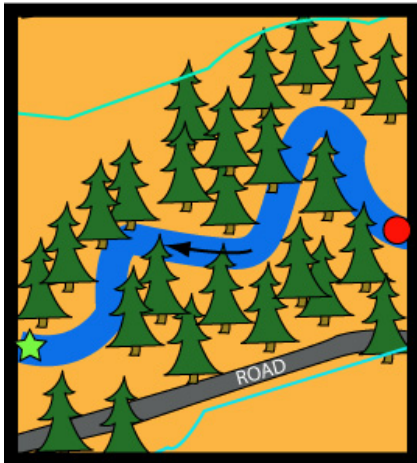
### DATA ENTRY Example:

Now that we have an idea of how to index SGA data lets check out an example (Figure 17).



**Figure 17:** Cartoon image showing a river scenario. Thick blue lines represent the river location. Black arrows show the flow direction. Thin blue lines show the river corridor. Thick grey and brown lines represent paved and dirt roads, respectively. 4 boxes highlight features of interest (orange, green, yellow, and purple).





**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact:

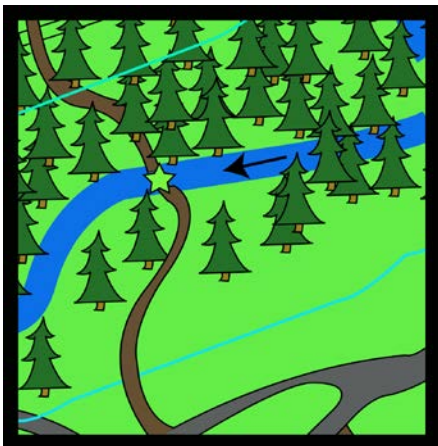
Sub-Impact:

Location:

Impact Feature Data

Height:

**17-1:** The Orange box highlights a situation where a road is present on the left side of the river (looking downstream). Here you would first select the impact *Encroachment* then sub impact *road*, with the location *one side*. The road is 8 ft above the river so you must enter a height of 8. If you are completing a Phase 1 and do not have the height just leave it blank. Now click on the *set point location* button and left-click at a point near the surface water polyline; establishing the downstream end of the road (creating a green star). Zoom/pan to the upstream end of the impact and left-click at a point near the surface water polyline; establishing the upstream end of the road (creating a small red dot), if you are satisfied with the segment size then click the *set impact* button.



**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

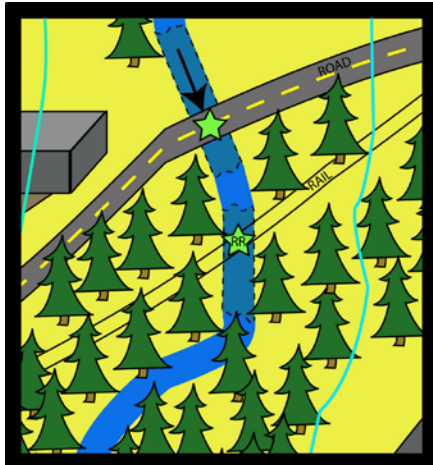
Impact:

Sub-Impact:

Location:

Impact Feature Data

**17-2:** The green box shows a location where a dirt road crosses a river, but there is no bridge. Here you would first select the impact *Stream Crossing* then sub impact *Stream Ford*. Now click on the *set point location* button and Zoom/pan to the area in which the stream crossing is located. Left click at a point near the surface water polyline; establishing the point where the stream ford is located (creating a small green star), if you are satisfied with the point location, then click the *set impact* button.



(Part D) FIT00b: Feature Indexing

Impact Feature to be Indexed

Impact: Bridge or Culvert

Sub-Impact: Bridge

Location:

Impact Feature Data

Length: 100

(Part D) FIT00b: Feature Indexing

Impact Feature to be Indexed

Impact: Bridge or Culvert

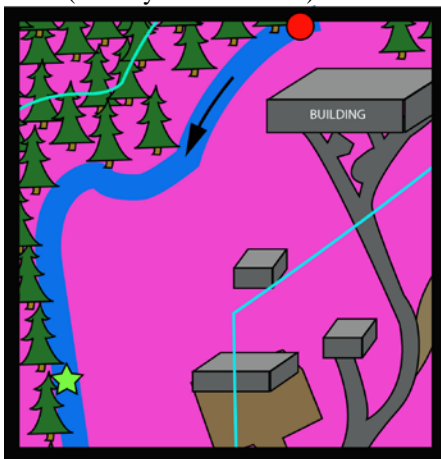
Sub-Impact: Bridge

Location:

Impact Feature Data

Length: 80

**17-3:** The yellow box shows a road bridge and a railroad bridge that crosses the river. Here you would first select the impact *Bridge and Culvert* then Sub-Impact *Bridge*. For bridges and culverts, you are not simply recording the presence of a bridge, you will enter the effected length of the river for that bridge (highlighted by the darker areas with dashed lines). Now click on the *set point location* button and left-click at a point near the surface water polyline; establishing the location of the bridge (creating a green star). Type in a value for length (eg 100). If you are satisfied with the location, then click the *set impact* button. Now you must repeat the same steps for the bridge of the railroad (seen by the “RR” star).



(Part D) FIT00b: Feature indexing

Impact Feature to be Indexed

Impact: Development

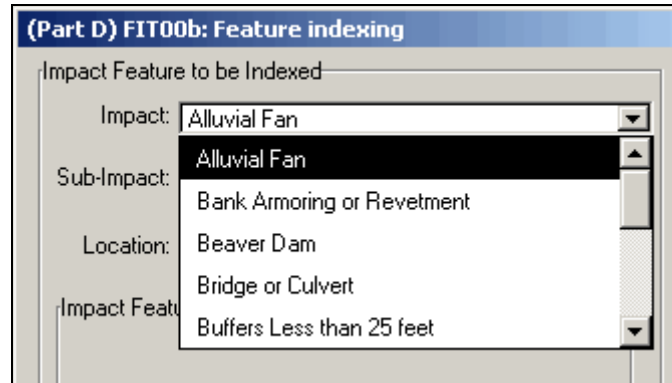
Sub-Impact:

Location: One Side

**17-4:** The purple box shows a series of buildings on the left side of the river. Here you would first select the impact *Development* with no sub impact, and a location of *one side*. Now click on the *set point location* button and left-click at a point near the surface water polyline; establishing the downstream end of the development (creating a green star). Zoom/pan to the upstream end of the impact and left-click at a point near the surface water polyline, establishing the upstream end of the development (creating a small red dot); if you are satisfied with the segment size then click the *set impact* button.

## IMPACT DETAILS

The Feature Indexing Tool should be used to document the presence of 20 different impacts, listed in alphabetical order (Figure 18)



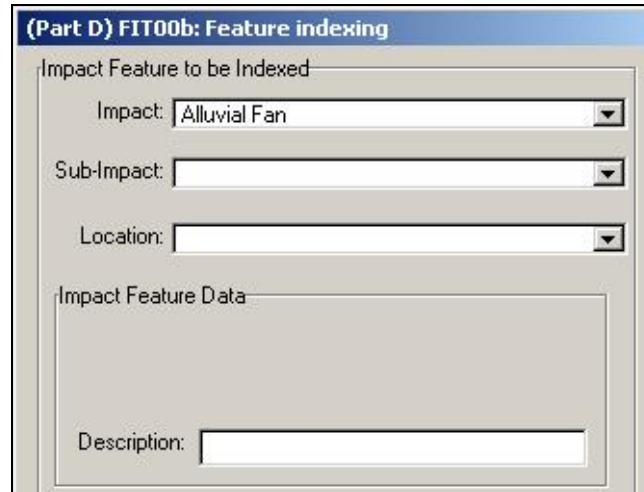
**Figure 18:** Screen shot showing the possible Impacts to be mapped in an FIT project.

- |                               |  |
|-------------------------------|--|
| 1. Alluvial fan               | 11. Erosion                              |
| 2. Bank Armoring or Revetment | 12. Flow Regulation and water withdrawal |
| 3. Beaver Dam                 | 13. Grade control                        |
| 4. Bridge or culvert          | 14. Gully                                |
| 5. Buffer Widths              | 15. Mass failure                         |
| 6. Cross-Section              | 16. Migration                            |
| 7. Debris Jam                 | 17. Steep Riffle or Head Cut             |
| 8. Development                | 18. Storm Water Input                    |
| 9. Dredging                   | 19. Straightening                        |
| 10. Encroachment              | 20. Stream Crossing                      |

Let's start with the *easy* ones... Alluvial Fan and Debris Jam

## ALLUVIAL FAN

Alluvial Fan is entered into the FIT as a point file. Select Alluvial Fan from the “Impact” drop down menu. There is **no Sub-Impact** and **no Location** associated with Alluvial Fans (Figure 19).



(Part D) FIT00b: Feature indexing

Impact Feature to be Indexed

Impact: Alluvial Fan

Sub-Impact:

Location:

Impact Feature Data

Description:

**Figure 19:** Screen shot showing the proper entry for an alluvial.

Zoom to the location of the alluvial fan and mark a location that is approximately in the center of the fan.

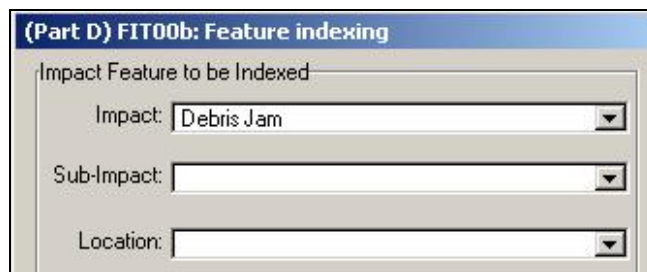
**Refer to Protocol Phase 1 step 3.1 and Phase 2 step 1.3 for specifics**

***\*Remember:*** the presence of an alluvial fan is noted for the reach in the tributary stream that created the fan, **not for the receiving stream reach**.

When the FIT data is uploaded into the DMS the data will automatically be populated for each reach where an alluvial fan is noted. Data must be manually entered into the DMS for reaches where no alluvial fans were present as either *None*, *No Data*, or *Not Evaluated* for Phase 1 and 2.

## DEBRIS JAM

Debris Jam is entered into the FIT as a point file. Select “Debris Jam” from the “Impact” drop down menu. There is **no Sub-Impact** and **no Location** associated with Debris Jams (Figure 20).



(Part D) FIT00b: Feature indexing

Impact Feature to be Indexed

Impact: Debris Jam

Sub-Impact:

Location:

**Figure 20:** Screen shot showing the proper procedure for indexing that debris jam.

Refer to Protocol Phase 2 step 4.4 for specifics (Phase 1 not assessed with FIT)

## BANK ARMORING OR REVETMENTS

Bank Armoring or Revetments are entered in the FIT as a line file. Choose Bank Armoring or revetment from the “Impact” drop down menu. Once this has been selected you must choose a “Sub-Impact” of *Hard Bank*, *Rip-Rap*, or *Other* (Figure 21).

The screenshot shows the 'FIT00b: Feature indexing' window. The 'Impact Feature to be Indexed' section has 'Impact' set to 'Bank Armoring or Revetment'. The 'Sub-Impact' dropdown is open, showing 'Rip-Rap' as the selected option. Below it, the 'Location' dropdown is also open, showing 'Hard Bank' and 'Other' as options. The 'Impact Feature' list shows 'Rip-Rap' as the selected item.

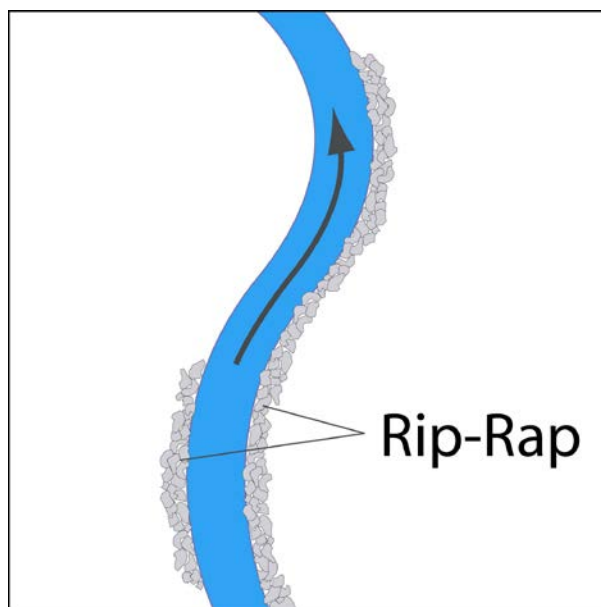
**Figure 21:** Screen shot showing the sub-Impacts associated with the Bank Armoring or Revetment.

After you have chosen the Sub-Impact you will have to mark a “Location” for this sub impact as either the *Left Bank* or the *Right Bank* (Figure 22).

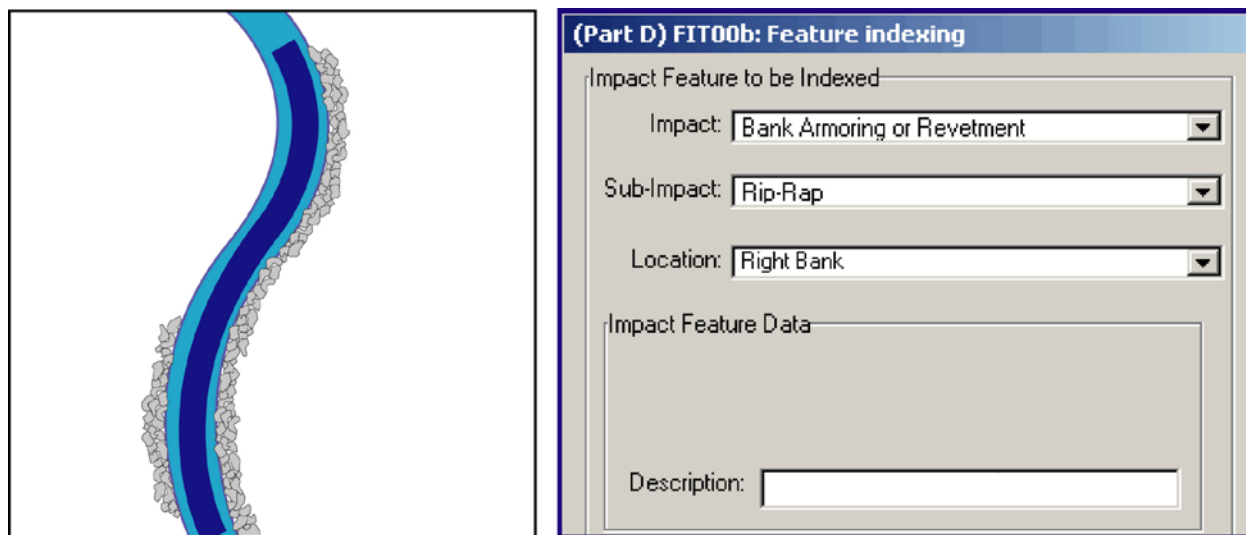
The screenshot shows the 'FIT00b: Feature indexing' window. The 'Impact' is 'Bank Armoring or Revetment' and the 'Sub-Impact' is 'Rip-Rap'. The 'Location' dropdown is open, showing 'Left Bank' as the selected option. The 'Impact Feature' list shows 'Left Bank' and 'Right Bank' as options. The 'Description' field is empty.

**Figure 22:** Screen shot showing the locations (left bank and right bank) associated with the Impact of Bank Armoring or Revetment.

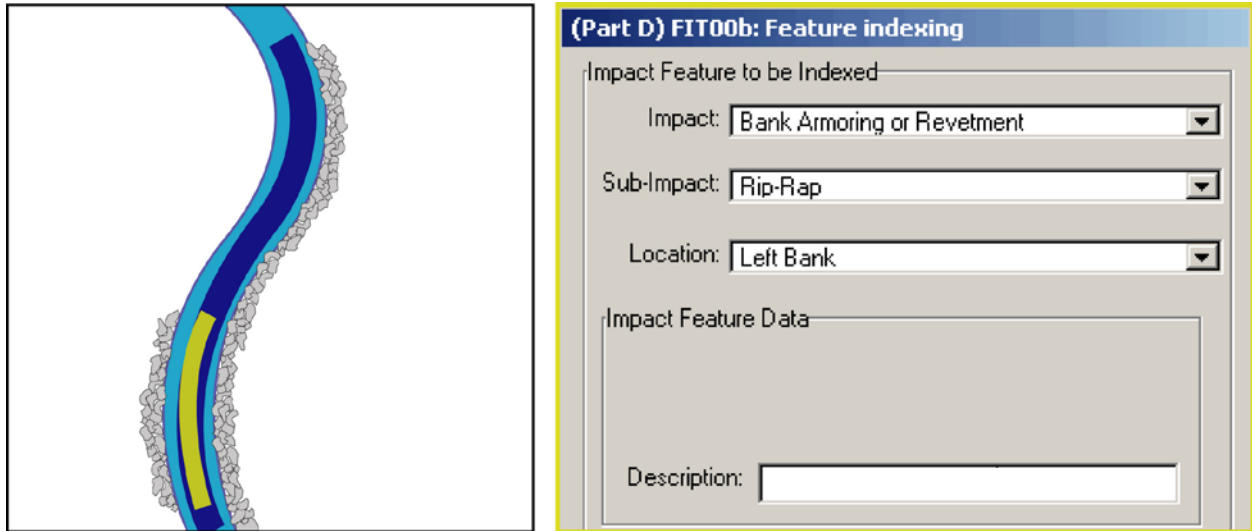
**Special Case:** Rarely cases exist where armoring or revetments are found on both sides of the stream (figure 23), however in this situation you must make two separate lines, one for the right bank revetment (figure 24) and another for the left bank revetment (Figure 25).



**Figure 23:** Schematic showing rip-rap along both banks of the river. Black arrow indicates flow direction of the river.



**Figure 24:** A copy of the rip-rap schematic. Dark blue line shows the presence of rip-rap on the right side seen in the FIT entry.



**Figure 25:** A copy of the idealized rip-rap schematic. Yellow line shows the presence of rip-rap on the left side of the river.

**Refer to Protocol Phase 1 step 5.3 and Phase 2 step 3.1 for specifics**

## BEAVER DAM

Beaver dam is entered into the FIT as a point file. Select Beaver Dam from the “Impact” drop down menu. There is no sub impact or location associated with it. There is a length category in the ‘Impact Feature Data’ area that is for the length of the river up and down stream affected by this beaver dam. This value should be entered as the number of feet (Figure 26).

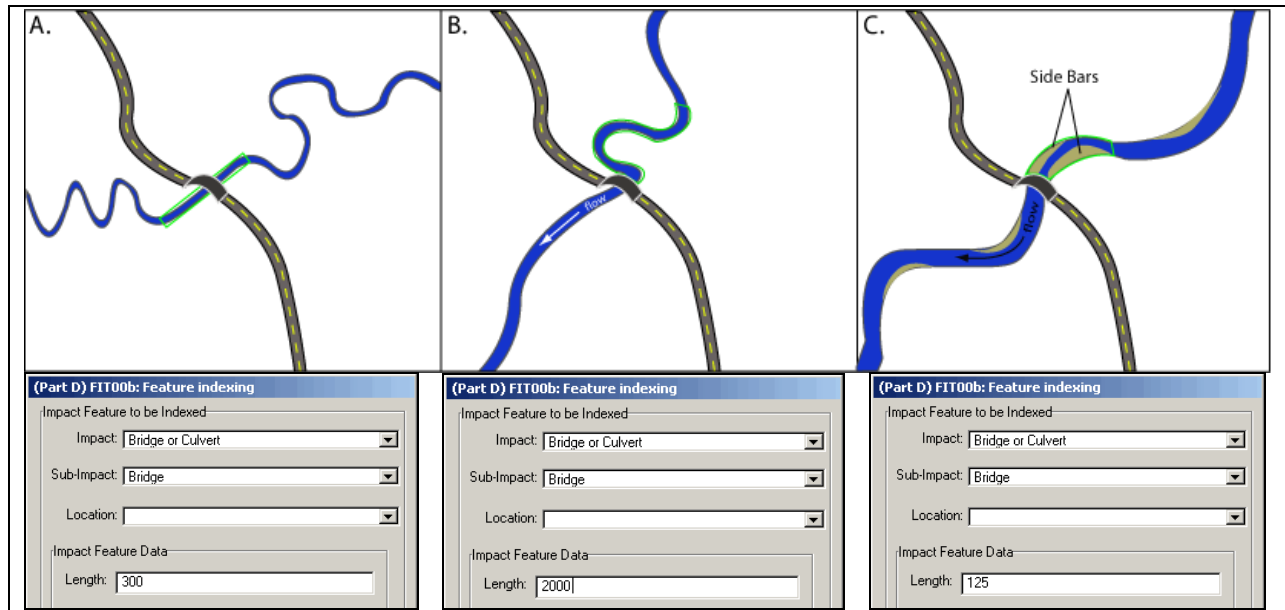
 This is a screenshot of the same software window as in Figure 25, but with different selections. The 'Impact' dropdown is now set to 'Beaver Dam'. The 'Sub-Impact' and 'Location' dropdowns are empty. In the 'Impact Feature Data' section, the 'Length' text box contains the number '100'.

**Figure 26:** Screen shot showing the proper entry for an active or intact beaver dam that has an effective length of 100ft (40ft upstream and 60ft down stream).

**Refer to Protocol Phase 2 step 4.9 for specifics (Phase 1 not assessed)**

## BRIDGE OR CULVERT

Bridges and culverts are entered as a point where the bridge or culvert crosses the river. Select Bridge or Culvert from the “Impact” drop down menu. There is a sub impact to indicate the type of structure (*Bridge, Culvert, Unknown*). You must enter a number (in feet) for the bridge and culvert effected length (Figure 27).



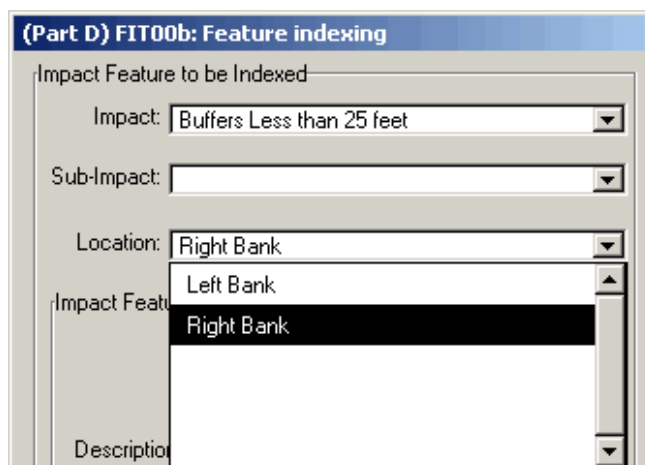
**Figure 27:** **A)** Cartoon image showing surface water straightening both upstream (150ft) and downstream (150ft) of a bridge (outlined in green). This total straightening represents the effected length and a length of 300 should be entered in the FIT. **B)** Cartoon showing a relatively straight river with uncharacteristic meanders forming upstream of a bridge (outlined in green). These meanders represent the effected length of the bridge. Often these meanders can be several thousands of feet long. This length should be entered into the FIT. **C)** Cartoon showing a normal point bar deposition for a river. Upstream of the bridge there is uncharacteristic sediment deposits (highlighted in green). This abnormal deposition area represents the effected length of the bridge and should be entered in the FIT.

Refer to Protocol Phase 1 step 5.2 and Phase 2 step 4.8 for specifics

## BUFFERS LESS THAN 25 FEET

Buffer widths are entered into the FIT as a line file. Select Buffer Widths from the “Impact” drop down menu. There is **no Sub-impact** associated with it. You must however select the location of the buffer to be on either the “Left Bank” or the “Right Bank” (Figure 28)



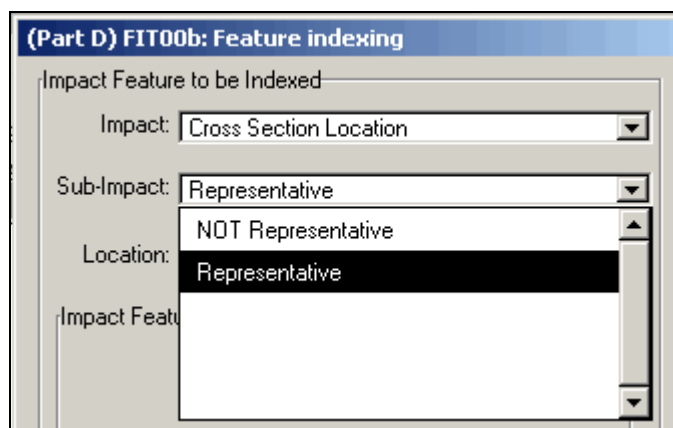


**Figure 28:** Screen shot showing the choices for “Buffers Less than 25 feet” location.

**Refer to Protocol Phase 1 step 4.3 and Phase 2 step 3.2 for specifics**

## CROSS SECTION LOCATION

Cross Section Location is entered into the FIT as a point file. Select Cross Section Location from the “Impact” drop down menu. Once this has been selected you must choose a Sub-Impact of either *Representative* or *NOT Representative* (Figure 29).



**Figure 29:** Screen shot showing the Sub-Impact options for Cross Section Location.

Seeing it is likely that you have taken more than one cross section per reach you must enter a number that coincides with your cross sections in your excel spread sheets (Counting up from the downstream reach break) (Figure 30).

**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact: Cross Section Location

Sub-Impact: NOT Representative

Location:

Impact Feature Data

Number: 2

**Figure 30:** Screen shot showing the proper entry for your second cross section, if it is not the representative.

## DEVELOPMENT

Development is entered into the FIT as a line file. Select Development from the “Impact” Drop down menu. There is **no Sub-Impact** for development, but you are given a choice of “One Side” or “Both Sides” for the location (Figure 31).

**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact: Development

Sub-Impact:

Location: Both Sides

Impact Feature Data

Both Sides

One Side

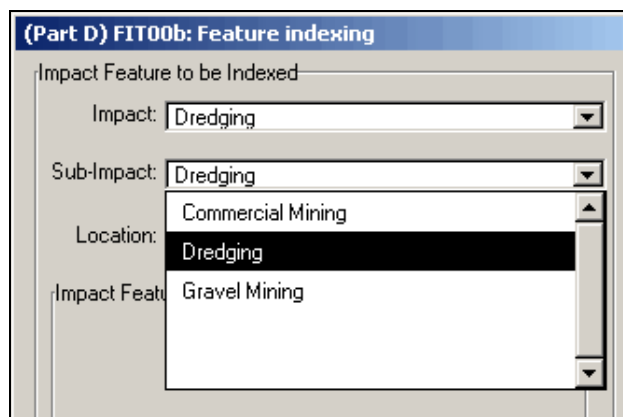
Description:

**Figure 31:** Screen shot showing the locations associated with the “Development” Impact.

**Refer to Protocol Phase 1 step 6.2 and Phase 2 step 1.3 for specifics**

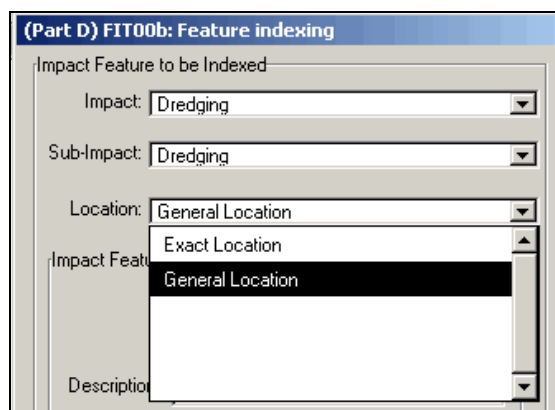
## DREDGING

Dredging is entered into the FIT as a point file marked in the center of the area dredged. Once you select dredging from the “Impact” drop down menu you must then select “Sub-Impact” from the options of *Commercial Mining*, *Dredging*, and *Gravel Mining* (Figure 32).



**Figure 32:** Screen shot showing the Sub-Impacts associated with the Dredging Impact.

After you have chosen a “Sub-Impact” you must choose a “Location” of *Exact Location* or *Approximate Location* (Figure 33).



**Figure 33:** Screen shot showing the locations associated with dredging.

**Refer to Protocol Phase 1 step 5.5 and Phase 2 step 5.5 for specifics**

## EROSION

Erosion is entered in the FIT as a line file. Select Erosion from the “Impact” drop down menu. There are **no Sub-Impacts** for *Erosion*, but you are given a choice of *Left Bank* or *Right Bank* for location (Figure 34).

**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact:

Sub-Impact:

Location:

Impact Feature Data

Height:

Description:

**Figure 34:** Screen shot showing the locations associated with the Erosion Impact.

Once you have chosen the “Location” of the erosion you must then enter the “Impact Feature Data” “Height” (Figure 35) that you collected in the field (or windshield survey).

**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact:

Sub-Impact:

Location:

Impact Feature Data

Height:

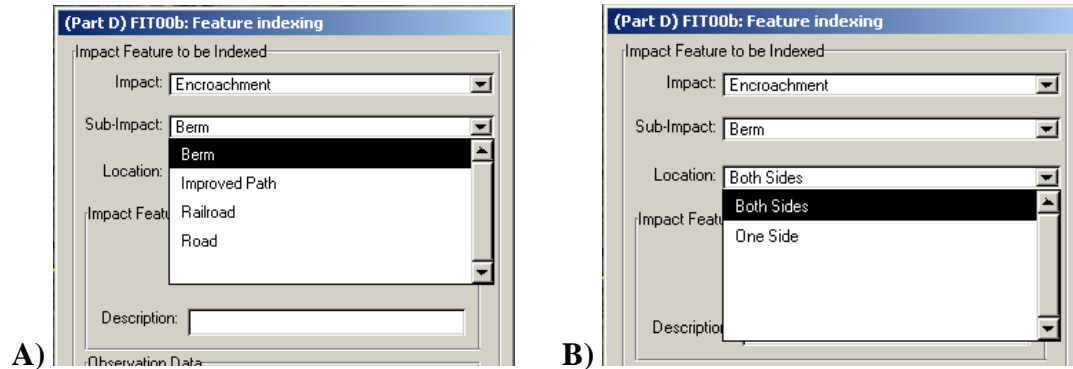
Description:

**Figure 35:** Screen shot showing the proper entry for a five foot high eroding left bank.

**Refer to Protocol Phase 1 step 7.2 and Phase 2 step 3.1 for specifics**

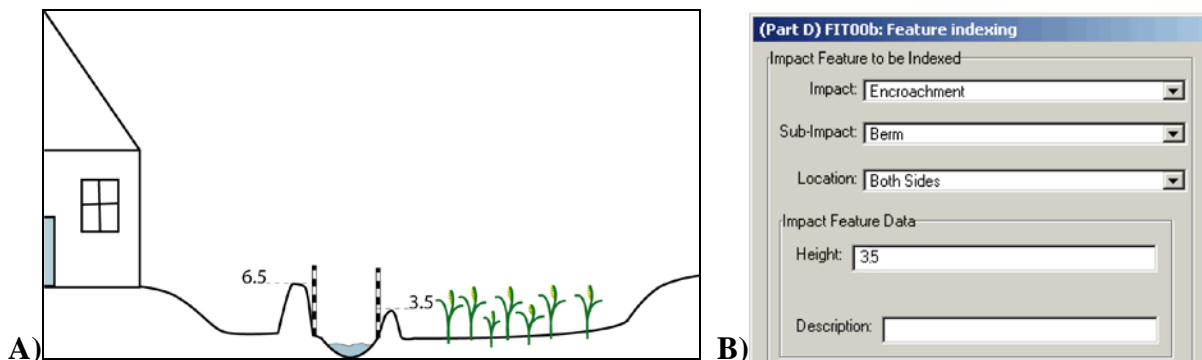
## ENCROACHMENT

Encroachment is entered in the FIT as a line file. Once you have selected Encroachment from the “Impact” drop down menu you must select the “Sub-Impact” from the options *Road*, *Rail Road*, *Improved Path*, or *Berm* (Figure 36A) and then the “Location”; *one side* or *both sides* (Figure 36B).



**Figure 36:** **A)** Screen shot showing the Sub-Impact drop down menu for encroachment. **B)** Screen shot showing the two choices for encroachment locations seen in the drop down menu.

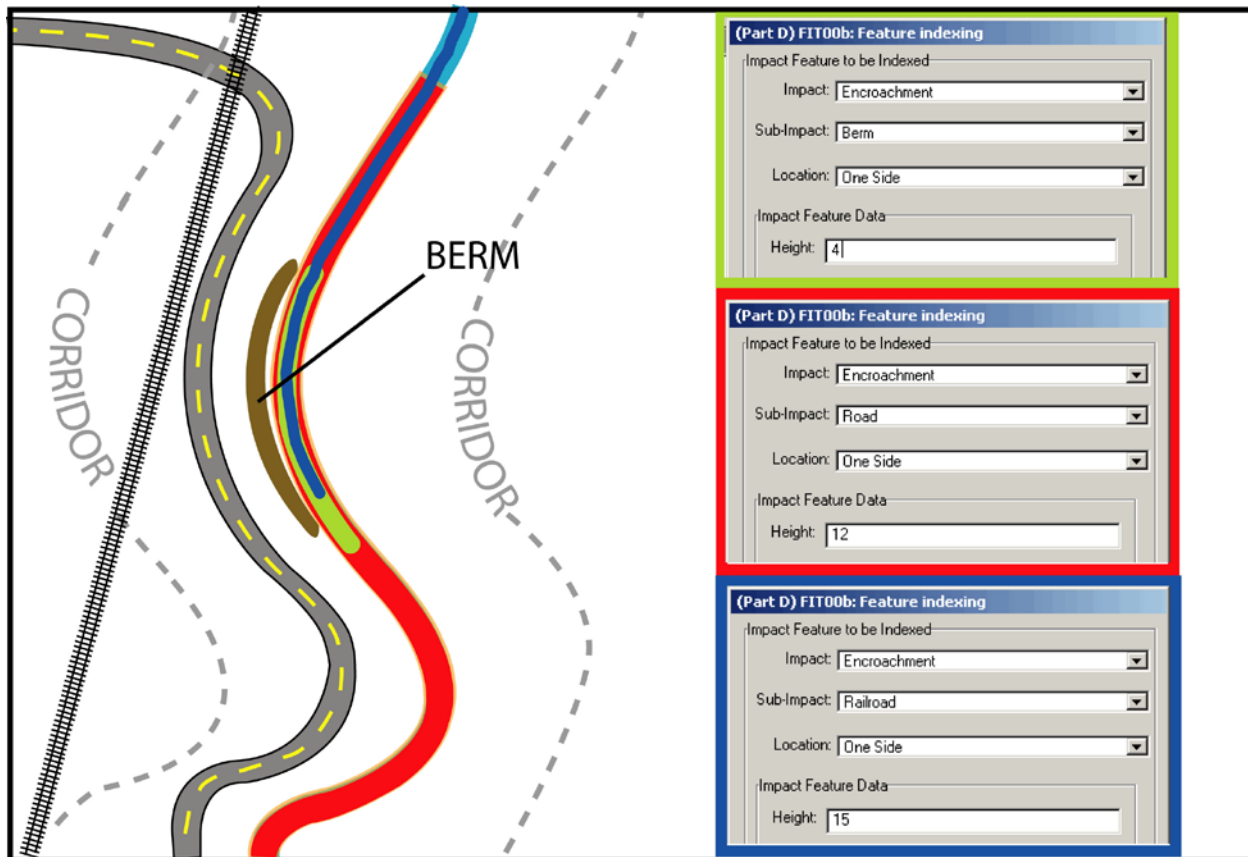
**Example:** Think about a stream with berms on both sides. One large berm was built to protect a house and a smaller berm was built to protect cropland (Figure 37A). This would be entered in the FIT as *Encroachment*, *Berm*, *Both Sides*, with the Height of the lower berm would be recorded as 3.5 feet (Figure 37B).



**Figure 37:** **A)** Cartoon image showing river with a large (6.5 ft high) berm protecting a house on the left and a smaller berm (3.5 ft high) protecting crop on the right. **B)** Screen shot showing the proper entry for the scenario illustrated in “A” where the average of these two berms is entered as a “Height” of 3.5.

### *Encroachment Issues*

Index berms, roads, railroads and improved paths separately, even if they are on the same bank next to each other (Figure 38).

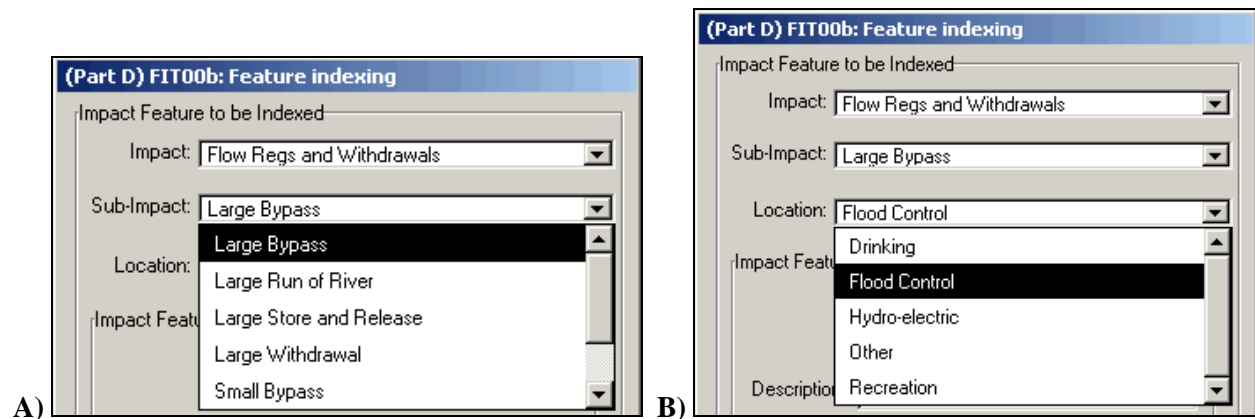


**Figure 38:** Cartoon showing three encroachments in the same geographic corridor location. Green line shows the location of a berm on one side. The red line shows the location of a road on one side. The blue line shows the location of a railroad on one side. **ALL three must be mapped separately with the FIT.**

**Refer to Protocol Phase 1 step 6.1 and Phase 2 step 1.3 for specifics**

## **FLOW REGULATION AND WATER WITHDRAWAL**

Flow Regulation and Water Withdrawal is entered in the FIT as a Point File. Once you have selected Flow Regulation and Water Withdrawal from the “Impact” drop down menu you must select the “Sub-Impact” from the options *Large Bypass*, *Large Run of River*, *Large Store and Release*, *Large Withdrawal*, *Small Bypass*, *Small Run of River*, *Small Store and Release*, or *Small Withdrawal* (Figure 39A). After the Sub-Impact is chosen you would use the “Location” drop down to select the use of the Flow Regulation or Water Withdrawal (Figure 39B) .

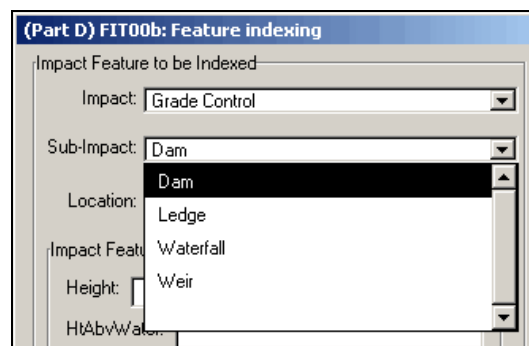


**Figure 39:** A) Screen shot showing the sub impact drop down menu for Flow Regs and Withdrawals. B) Screen shot showing the choices for use of Flow Regs and Withdrawal locations seen in the drop down menu.

Refer to Protocol Phase 1 step 5.1 and Phase 2 step 4.5 for specifics

## GRADE CONTROL

Grade Control is entered in the FIT as a Point File. Once you have selected Grade Control from the “Impact” drop down menu you must select the “Sub-Impact” from the options *Dam*, *Ledge*, *Waterfall*, and *Weir* (Figure 40).

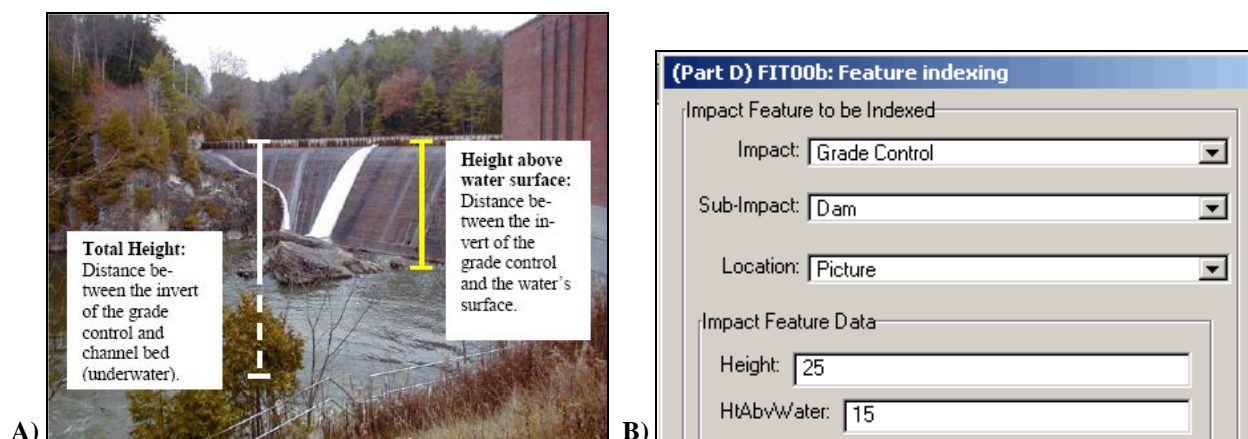


**Figure 40:** Screen shot showing the four “Sub-Impact” options for Grade Controls.

Once you have chosen the Sub-Impact you must select whether or not a picture was taken. Due to a program issue this data is selected from the “Location” drop down menu (Figure 41).

**Figure 41:** Screen shot showing select if you have taken a picture of the grade control or not.

After you have selected whether or not a picture was taken, you must enter some “Impact Feature Data”. You must enter two measurements. First you must enter the total height (in feet) for the grade control in the box labeled “Height” and then the height above the water surface (in feet) in the box labeled “HtAbvWater” (Figure 42).



**Figure 42:** A) A large manmade dam. Total height seen by white line and height above water seen by the yellow line. B) Screen shot showing the proper heights entered in the FIT for the dam in part A.

Refer to Protocol Phase 1 step 3.2 and Phase 2 step 1.6 for specifics

## GULLY

Gully is entered in the FIT as a point file. Select Gully from the “Impact” drop down menu. There is **no Sub-Impact** and **no Location** to enter, but you must enter a height and a length (in feet) (Figure 43). The length is the number of feet the gully extends into the side slope.



**(Part D) FIT00b: Feature indexing**

Impact Feature to be Indexed

Impact:

Sub-Impact:

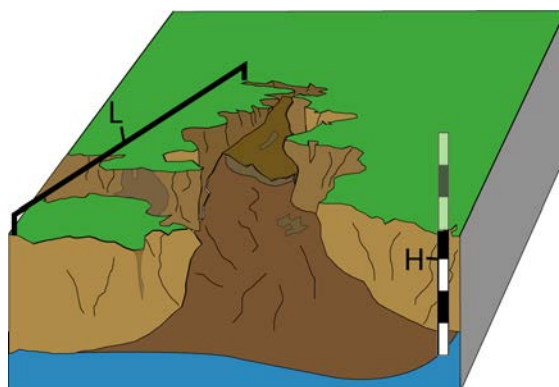
Location:

Impact Feature Data

Height:

**Figure 43:** Screen shot showing the proper entry for a gully with the height of 8ft.

The gully height is measured where the gully intersects the stream (Figure 44). Mark the point where the gully intersects the surface water.



**Figure 44:** Cartoon image showing correct location to measure the gully as it enters the stream.

**Refer to Protocol Phase 2 step 3.1 for specifics (Phase 1 not assessed)**

## MASS FAILURE

Mass Failure is entered in the FIT as a line file. Select Mass Failure from the “Impact” drop down menu. There is **no Sub-Impact** for Mass failure, but you must choose either Right Bank or Left Bank from the location drop down menu (Figure 45).

(Part D) FIT00b: Feature indexing

Impact Feature to be Indexed

Impact: Mass Failure

Sub-Impact:

Location: Right Bank

Left Bank

Right Bank

Height:

Description:

**Figure 45:** Screen shot showing the location options for Mass Failures.

Once you have entered a location you must enter a number (in feet) for the height of the Mass failure (Figure 46).

(Part D) FIT00b: Feature indexing

Impact Feature to be Indexed

Impact: Mass Failure

Sub-Impact:

Location: Right Bank

Impact Feature Data

Height: 38

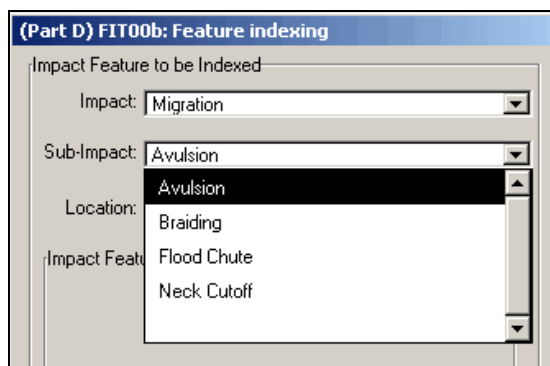
Description:

**Figure 46:** Screen shot showing the proper way to enter a 38 foot high Mass Failure located on the Right Bank.

**Refer to Protocol Phase 2 step 3.1 for specifics (Phase 1 not assessed)**

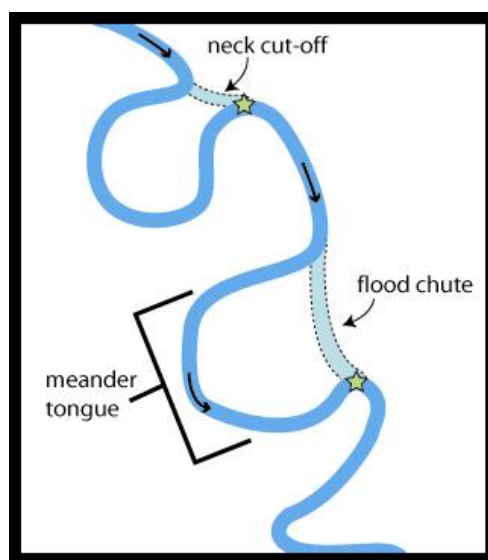
## MIGRATION

Migration is entered in the FIT as a point file. Once you have chosen Migration from the “Impact” drop down menu, you must select a Sub-Impact from the options *Avulsion*, *Braiding*, *Flood Chute*, *Migration*, and *Neck Cutoff* (Figure 47). There is **no Location** associated with the Migration Impact.



**Figure 47:** Screen shot showing the Sub-Impacts associated with the Migration Impact.

Migration is marked at the **down stream end** of the feature (Figure 48).

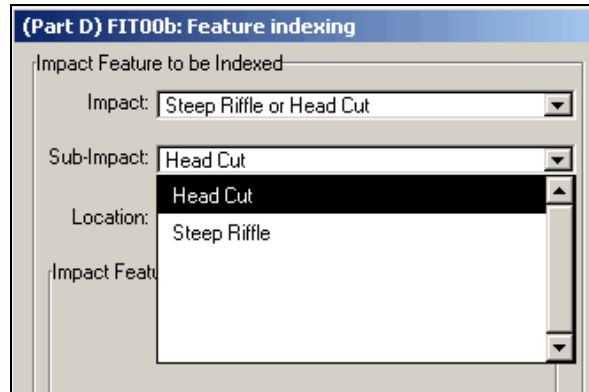


**Figure 48:** Schematic of a river showing a flood chute and a neck cut off (black arrows show flow direction) with the proper **downstream** location FIT marker (green star) for each.

Refer to Protocol Phase 1 step 6.4 and Phase 2 step 5.2 for specifics

### STEEP RIFFLE OR HEAD CUT

Steep Riffle or Head Cut is entered in the FIT as a point file. Once you have Selected *Steep Riffle* or *Head Cut* from the “Impact” drop down menu you must choose a “Sub-Impact” of either *Steep Riffle* or *Head Cut* (Figure 49). There is **no Location** associated with the Steep Riffle or Head Cut impact.

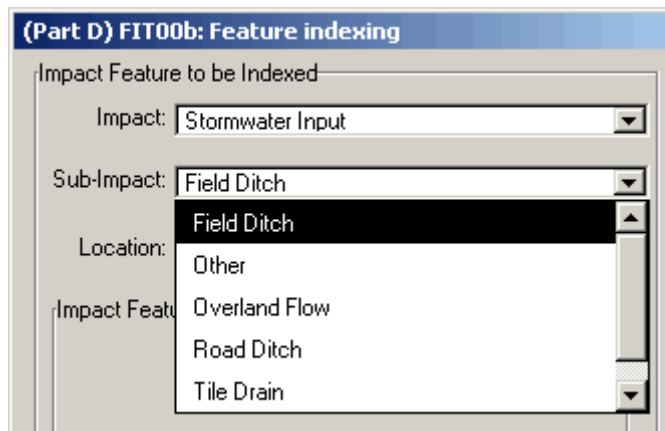


**Figure 49:** Screen shot showing the “Sub-Impact” options associated with the Steep Riffle or Head Cut “Impact”.

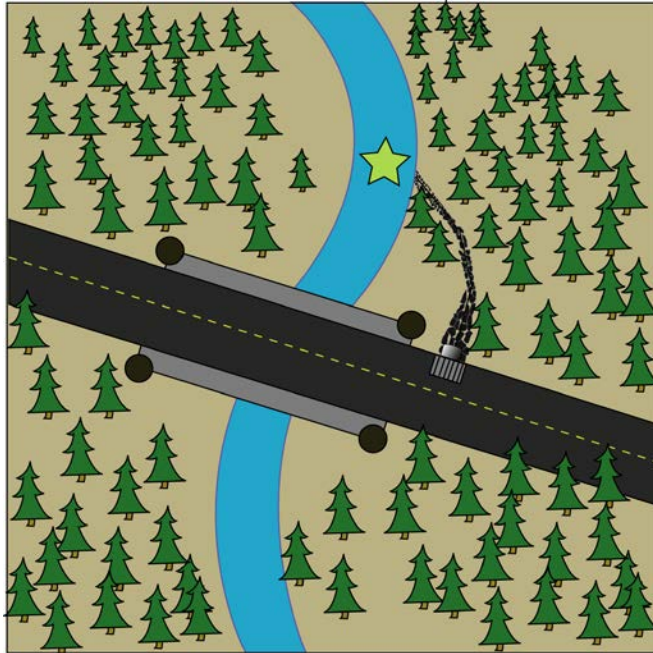
**Refer to Protocol Phase 2 step 5.3 for specifics (Phase 1 not assessed)**

## STORMWATER INPUT

Stormwater Input is entered into the FIT as a point file. Once you have selected Stormwater Input from the “Impact” drop down menu (Figure 50) you must select the one of the “Sub-Impact” options of *Tile Drain*, *Road Ditch*, *Urban Stormwater Pipe*, *Field Ditch*, and *Overland Flow*. There is **no Location** associated with the Stormwater Input. After you have chosen your Sub-Impact, mark the point where the storm water flow enters the river (Figure 51).



**Figure 50:** Screen shot showing the Sub-Impact options for Stormwater Input.

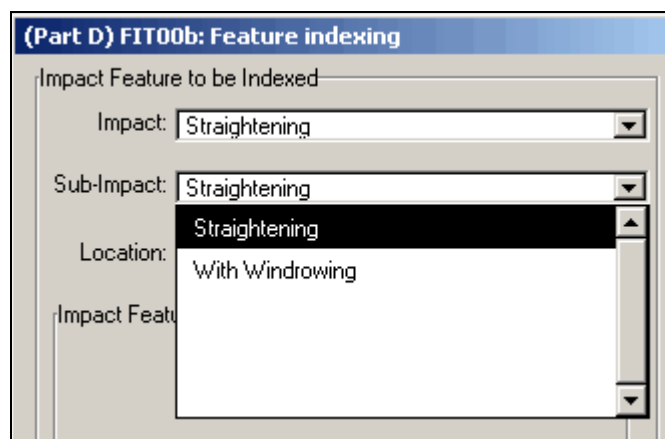


**Figure 51:** A schematic showing an Urban Stormwater Pipe, where a road crosses over a river and there is a grate to catch water draining into the river. The green star illustrates where to mark the storm water input on the river.

Refer to Protocol Phase 2 step 4.6 for specifics (Phase 1 not assessed)

## STRAIGHTENING

Straightening is entered in the FIT as a line file. Once you have selected Straightening from the “Impact” drop down menu you must choose a Sub-Impact of either *Straightening* or *With Windrowing* (Figure 52). There is **no Location** associated with the Straightening Impact.

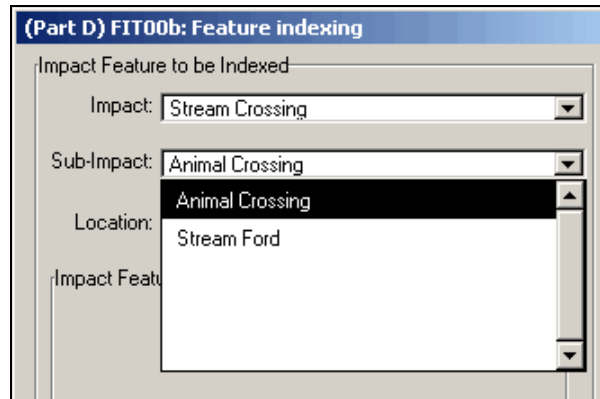


**Figure 52:** Screen shot showing the sub-Impacts associated with the Straightening Impact.

Refer to Protocol Phase 1 step 5.4 and Phase 2 step 5.5 for specifics

## STREAM CROSSING

Stream crossing is entered in the FIT as a point file. Once you have selected Stream Crossing from the “Impact” drop down menu, you must choose a “Sub-Impact” of either *Animal Crossing* or *Stream Ford* (Figure 53).



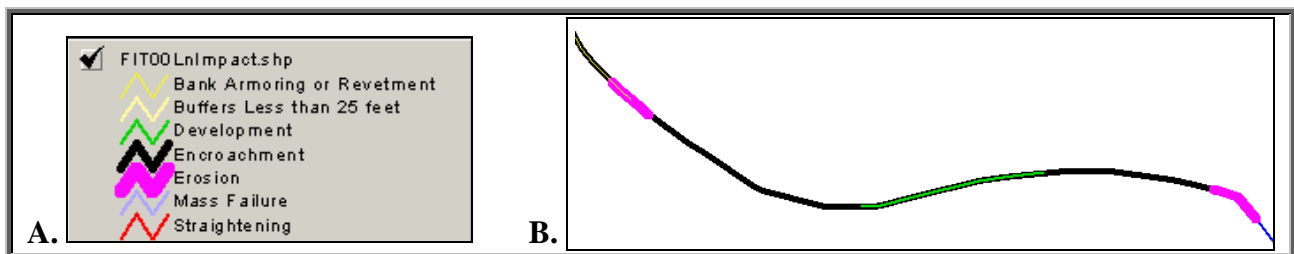
**Figure 53:** Screen shot showing the sub-Impacts associated with the Stream Crossing Impact.

Mark the intersection of the stream crossing and the surface water with a point.

**Refer to Protocol Phase 2 step 5.4 for specifics (Phase 1 not assessed)**

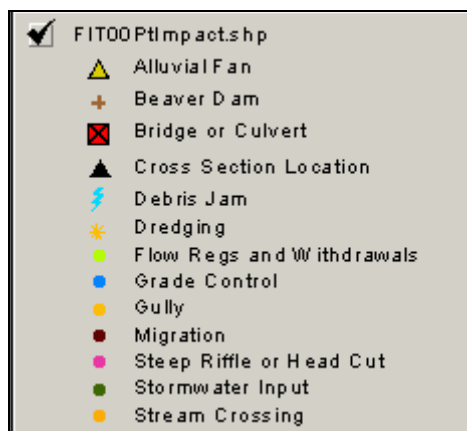
## HELPFUL HINTS

While using the FIT you may find it hard to see what you are indexing now as well as what you have indexed in the past. To make this easier it is helpful to make some of your lines (FIT00LnImpacts.shp) different thicknesses (Figure 54A). This way when you are looking at an area of your map that has multiple impacts they will all be visible (Figure 54B).



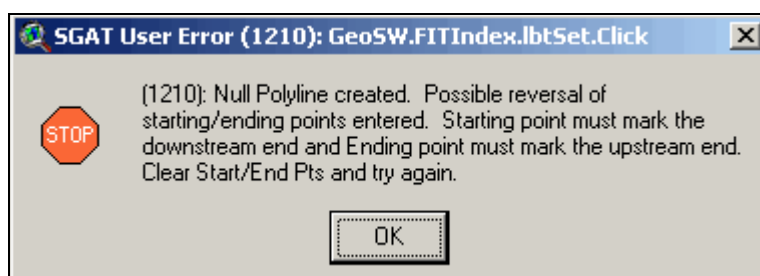
**Figure 54:** A) Screen shot from the table of contents showing varying line widths for the FIT00LnImpact.shp. B) Screen shot from the same project showing a location of the river where there is Development (green line), Erosion (pink line), and encroachments (black line). The blue line represents the surface water.

It is also beneficial to change the symbols and the size of the points for FIT00PtImpact.shp (Figure 55).



**Figure 55:** Screen shot from the table of contents showing helpful symbol changes for Alluvial Fan, Grade Control and Migration.

**Note:** A check is made to determine if the vertex order of the polyline is correct, i.e. that the vertex 0 (the green star) is the downstream end. If the order is reversed, then the vertex order is reversed in the surface water extract theme this will create and error pop-up window (Figure 56).



**Figure 56:** Screen shot of the *SGAT User Error (1210): GeoSW.FITIndex.lbtSet.Click* pop-up window.

### **EDITING /MODIFYING FIT DATA**

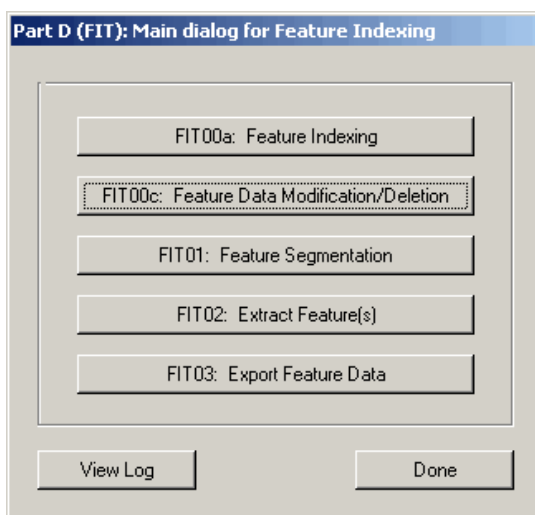
There are two ways in which you can edit and modify FIT data. If you are ArcView3.x savvy you will be able to directly edit the data within the attribute table (Figure 57). If you do not feel comfortable with the procedure mentioned above it is strongly recommended that you edit or modify the FIT data using the Dialog provided in step FIT00c: Feature Data Modification and deletion.

Shape	Impactid	Tribid	Ph2segid	Rchptid	Rchsegid	Impact	Subimpact	Location	Date
PolyLine	294	T1S1	T1S1.02-	T1S1.02	-	Development		One Side	08/31/2006
PolyLine	295	T1S1	T1S1.02-	T1S1.02	-	Development		Both Sides	08/31/2006
PolyLine	296	T1S1	T1S1.04-	T1S1.04	-	Development		One Side	08/31/2006
PolyLine	297	T1	T1.02-	T1.02	-	Development		One Side	08/31/2006
PolyLine	299	T1	T1.02-	T1.02	-	Development		Both Sides	08/31/2006
PolyLine	300	T1	T1.02-	T1.02	-	Development		Both Sides	08/31/2006
PolyLine	301	T1	T1.02-	T1.02	-	Development		Both Sides	08/31/2006
PolyLine	302	T1	T1.02-	T1.02	-	Development		Both Sides	08/31/2006
PolyLine	303	T1	T1.02-	T1.02	-	Development		One Side	08/31/2006
PolyLine	304	T1	T1.02-	T1.02	-	Development		One Side	08/31/2006
PolyLine	305	T1	T1.02-	T1.02	-	Development		Both Sides	08/31/2006
PolyLine	306	T1	T1.01-	T1.01	-	Development		One Side	08/31/2006
PolyLine	307	T1	T1.01-	T1.01	-	Development		One Side	08/31/2006
PolyLine	308	T1	T1.01-	T1.01	-	Development		One Side	08/31/2006
PolyLine	309	T1	T1.01-	T1.01	-	Development		Both Sides	08/31/2006
PolyLine	310	T1	T1.01-	T1.01	-	Development		One Side	08/31/2006
PolyLine	311	M	M01-	M01	-	Development		One Side	08/31/2006
PolyLine	312	M	M01-	M01	-	Development		Both Sides	08/31/2006
PolyLine	315	M	M01-	M01	-	Development		One Side	08/31/2006
PolyLine	316	M	M01-	M01	-	Development		Both Sides	08/31/2006
PolyLine	317	M	M01-	M01	-	Development		One Side	08/31/2006
PolyLine	318	M	M02-	M02	-	Encroachment	Road	One Side	08/31/2006

**Figure 57:** Screen shot showing the attribute table for FIT00LnImpact.shp. Simple changes can be made if you made the mistake of entering Development as “One Side” instead of “Both Sides” you can change this in the attribute table (make sure there are no extra spaces when you type the data in).

### STEP FIT00c: Feature Data Modification/Deletion

Select the “FIT00c: Feature Data Modification/Deletion” button in the *Part D (FIT): Main dialog for Feature Indexing* window (Figure 58).



**Figure 58:** Screen shot of the *Part D (FIT): Main dialog for Feature Indexing* Window.

This will bring up the *(Part D) FIT00c: Feature Data Modification/Deletion* window (Figure 59). This dialog permits modification of the data associated with *impacts* during the *Feature Indexing* of *Step FIT00*. In addition, one can delete features entirely, which enables one to re-index (via *Step FIT00*) a given feature to reposition its geographic location.



**(Part D) FIT00c: Feature Data Modification/Deletion**

**Impact Themes**

Point Theme:  Theme for Impacts: Point Features to be used.

Polyline Theme:  Theme for Impacts: Polyline Features to be used.

**Identification Data (Cannot be modified)**

(1) Impact Type: ☐ Point Impact ☒ Polyline Impact

(2) Reach Id:

(3) Impact Id:

Impact:

Reach(es):

**Attribute Data (can be modified)**

Sub-Impact:  Location:

**Impact Feature Data**

Description:

**Observation Data**

Date:  Person:  Organization:

**Note for Insertion into System Log**

User Note:

Buttons: Delete, Save, Cancel, Done

**Figure 59:** Screen shot showing all the input and output options for the (Part D) FIT00c: Feature Data Modification/Deletion window.

This dialog shows the theme containing point impacts created in *Step FIT00* and the theme containing polyline impacts created in *Step FIT00*.

The following describes the approach to be used for modifying a given *Impact*.

1. In the *Impact Type* panel, select whether the impact is represented as a point or a polyline Feature (Figure 60). This identifies which theme the impact will reside in; either the point impact theme or the polyline impact theme. In addition, when the *Impact Type* is selected, the control labeled *Reach Id* will be populated with a list of those reaches for which impacts of the selected feature type have been indexed.

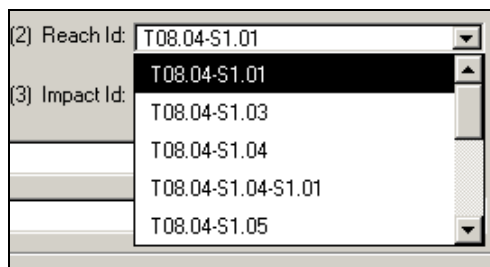
(1) Impact Type

☒ Point Impact ☐ Polyline Impact

**Figure 60:** Screen shot showing the two options for impact type.

**Note:** Only those *RchPtId*'s for which impacts have been indexed will be listed in the *Reach Id* control.

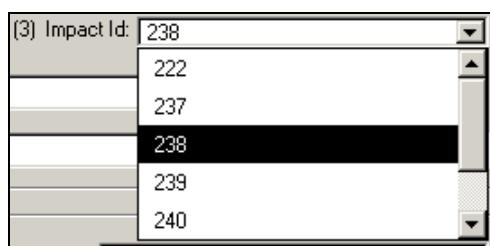
2. Select the *Reach Id* from the drop down menu (Figure 61) in which the *Impact* was indexed. In certain cases, an impact of the polyline feature type may cross multiple reaches. All reaches in which a given impact is located will be listed in the disabled (grayed out) field labeled *Reaches*. When a reach is selected, the *Impact Id*s assigned to impacts that fall within the reach are listed in the control labeled *Impact Id*.



**Figure 61:** Screen shot showing the drop down menu options for Reach Id..

**Note:** Only those *ImpactId*'s for impacts that are located within the given *Reach Id* will be listed in the *Impact Id* control.

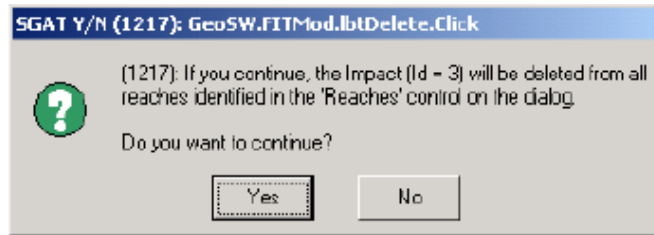
3. Select the *Impact Id* from the drop down menu (Figure 62). Once an impact id is selected, the data assigned during feature indexing will be displayed on the dialog. Always make sure that the correct impact has been selected prior to making any changes. Using the description field may be the primary means of differentiating between similar impacts on the same reach.



**Figure 62:** Screen shot showing the drop down menu for Impact Id.

## DELETING IMPACTS

Once the correct impact has been displayed, one can either delete the impact or make modifications to the data associated with it. To *Delete* the impact currently displayed on the dialog, click on the *Delete* button. Following that, a “warning” message will be displayed (Figure 63).



**Figure 63:** Screen shot showing the *SGAT Y/N (1217): GeoSW.FITMod.lbtDelete.Click* pop-up window.

If the *Delete* button was clicked upon accidentally, select “*No*”. Otherwise, click on “*Yes*”. In the latter case, all records, if more than one, associated with the impact will be *marked* for deletion. It is possible that multiple records exist for a given impact represented by a polyline feature. This will occur if the impact crosses sub-watershed (or reach) boundaries. In this case, there will be one record for each reach in which the impact is located.

**Note:** As indicated, the records will be *marked* for deletion. They will not actually be deleted from the impact theme until one clicks on the *Save* button. Alternatively, one can click on the *Cancel* button to remove any modifications made, including marking records for deletion.

Once an impact has been *deleted*, the *Cancel* and *Save* buttons will be enabled.

## MODIFYING IMPACTS

Once the (1) Impact Type (point or polyline), (2) Reach Id and (3) Impact Id have been selected, the data associated with the impact can be modified. Effectively, all data can be modified *except* the geographic location and/or extent of impact and the following data:

- Impact Type,
- Reach Id(s),
- Impact Id, and
- Impact Name.

If it is necessary to change any of the above, then the impact will have to be deleted. Then, a new impact indexed via *Step FIT00a*. All other data can be modified via this dialog.

To modify data, type in or select the revised values. Once a change has been made, the *Save* and *Cancel* buttons will be enabled.

### Using the *Save* and *Cancel* Buttons

The *Save* or *Cancel* buttons will be enabled once any changes to data have been made. This includes the deletion of an impact.

All changes to data or deletions are pending. To make changes permanent, click on the *Save* button. To cancel all changes since the start of the session or since the last *Save* operation, click on the *Cancel* button.

## Upon Completion

Click on the *Done* button to return to the *Main* dialog for feature indexing.

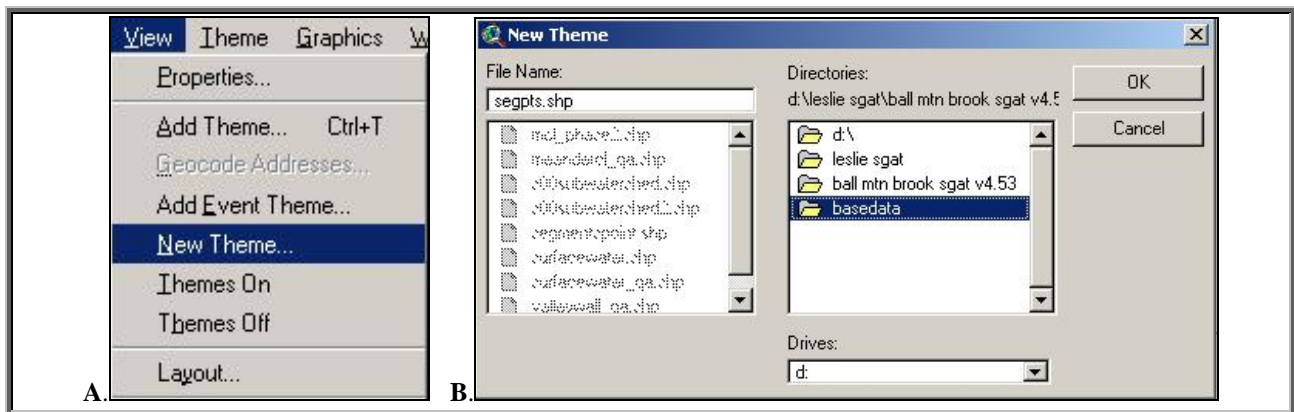
### SEGMENTATION (Phase 2)

The *reach segmentation* capability of *Step FIT01* provides users with the ability to segment impacts (indexed features) in the identical manner in which surface waters have been segmented (via *Part D, Reach Segmentation*). This enables one to visually display impacts by reach segments, as well as to link to data maintained in the DMS.

SGAT will segment your reaches into separate polylines for you, as long as you make a point shape file with points at your mapped segment breaks. Once you have marked all your segments SGAT will make a polyline shapefile representing the surface waters “broken” at the location of the projected segment points.

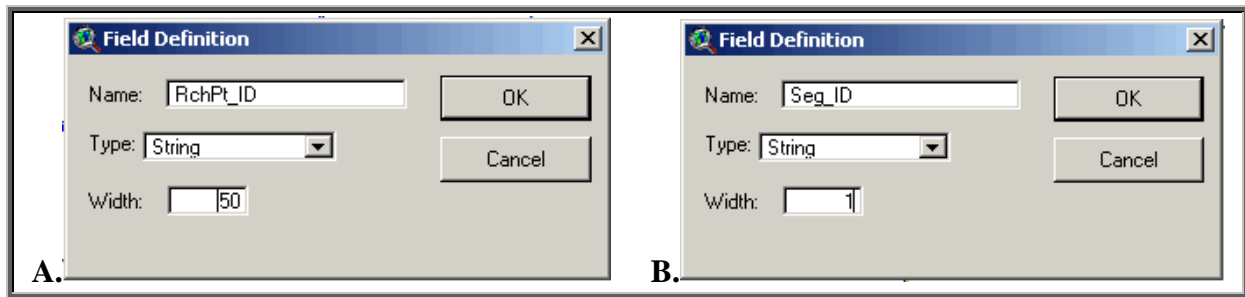
### The user-supplied shape file

Before you start SGAT you must make a point shape file (Figure 64A). You can assign any name to this point file. This shape file must contain point features that define the approximate location at which the reaches are to be broken. It is expected that the number of reach breaks would normally be 5 or less per segment. This shapefile must be saved in your project’s “basedata” folder (Figure 64B).



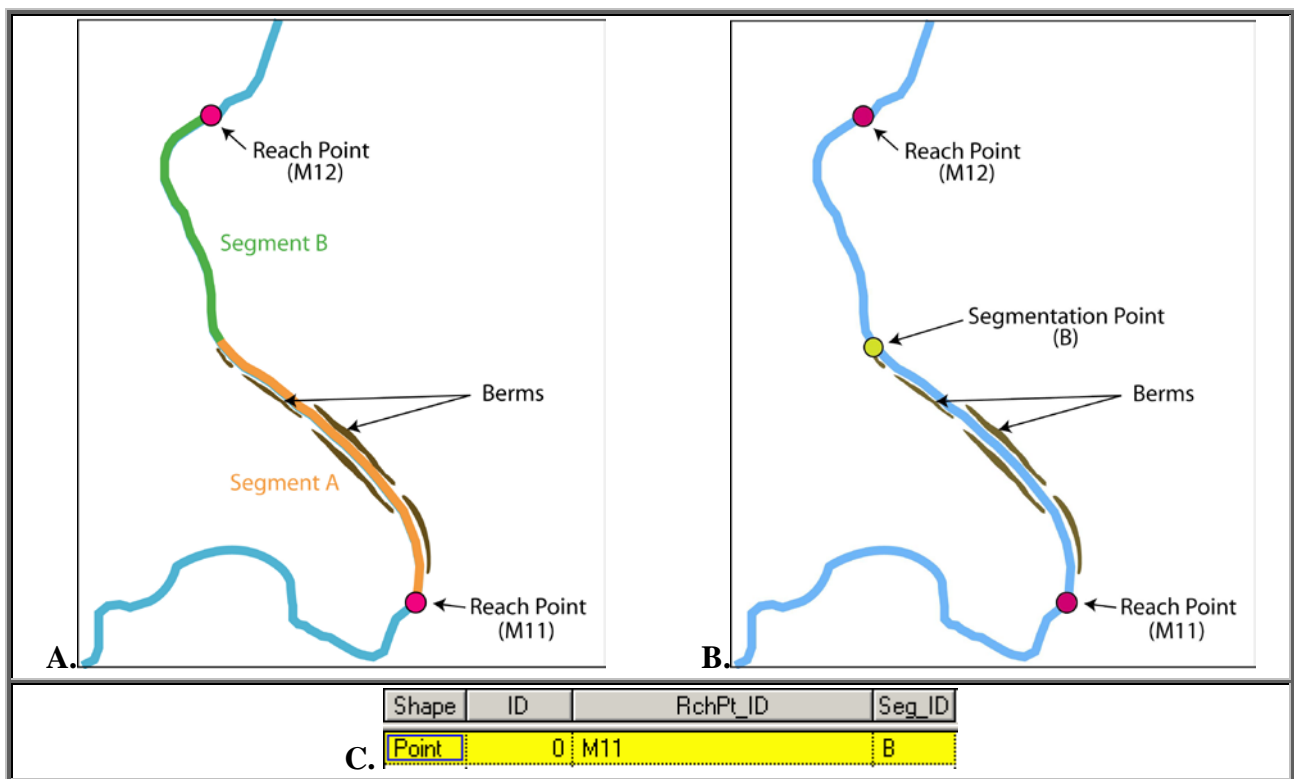
**Figure 64:** A) Screen shot showing where to find “New Theme” creation in ArcView3x. B) Screen shot showing where to save the newly made point shape file.

Once you have created the shapefile you must modify the attribute table so that it has two added fields, one containing the *Reach Point Id* associated with the reach that is to be segmented; and the other is a *Segment Id* for each segmentation point. The field containing the *Reach Point Id* is used to ensure that the proper surface water (polyline) is being segmented (in this field type in the name of the reach that you are segmenting). Because the reach point Id consists of letters and numbers you will assign the “Type” as a “String”. Reach names often can be very long (e.g. M01-S01-T03.5) so you must leave enough room in the “Width” field (Figure 65A). The Segment Id for the segmentation points can be a sequential number or letter that restarts with each reach break. Commonly reaches will have between 1-10 segments and never over 26 (a-z range in the alphabet), so a width of 1 is suitable (Figure 65B).



**Figure 65: A)** Screen shot of *Field Definition* window showing the proper entry for the Reach Point ID field. **B)** Screen shot of the *Field Definition* window showing the proper entry for the Segmentation ID field. [The name you choose for your field can differ, as long as you remember what you named it]

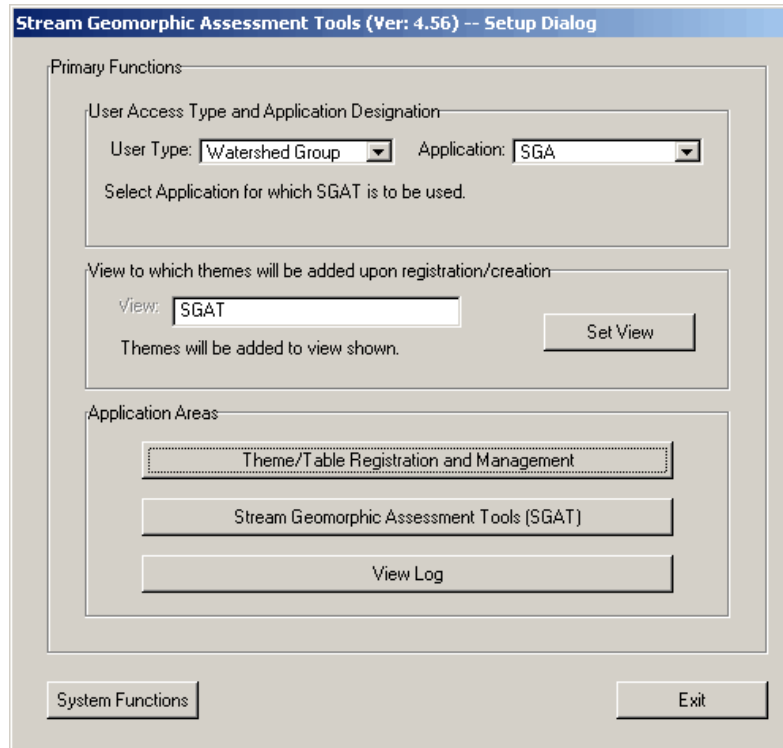
**Example:** If you were in the field and you noted that reach M11 was heavily bermed in one section, you may want to divide this reach into two segments (Figure 66A). When creating your segment shapefile, you will make a point (on the surfacewaters) where the segment break is (Figure 66B). In the attribute table you must enter the “reach point ID” as **M11** and the “Segment ID” as **B** (Figure 66C). **There will NEVER be a segment ID labeled A.**



**Figure 66: A)** Cartoon showing M11 of a made up stream. A contractor divided M11 into two segments (orange and green) based on the presence of berms. **B)** Cartoon showing the same river section. When segmenting in the FIT the contractor made a single point (green dot) at the exact location between the two segments. **C)** Screen shot of the attribute table entry for the segmentation point in M11.

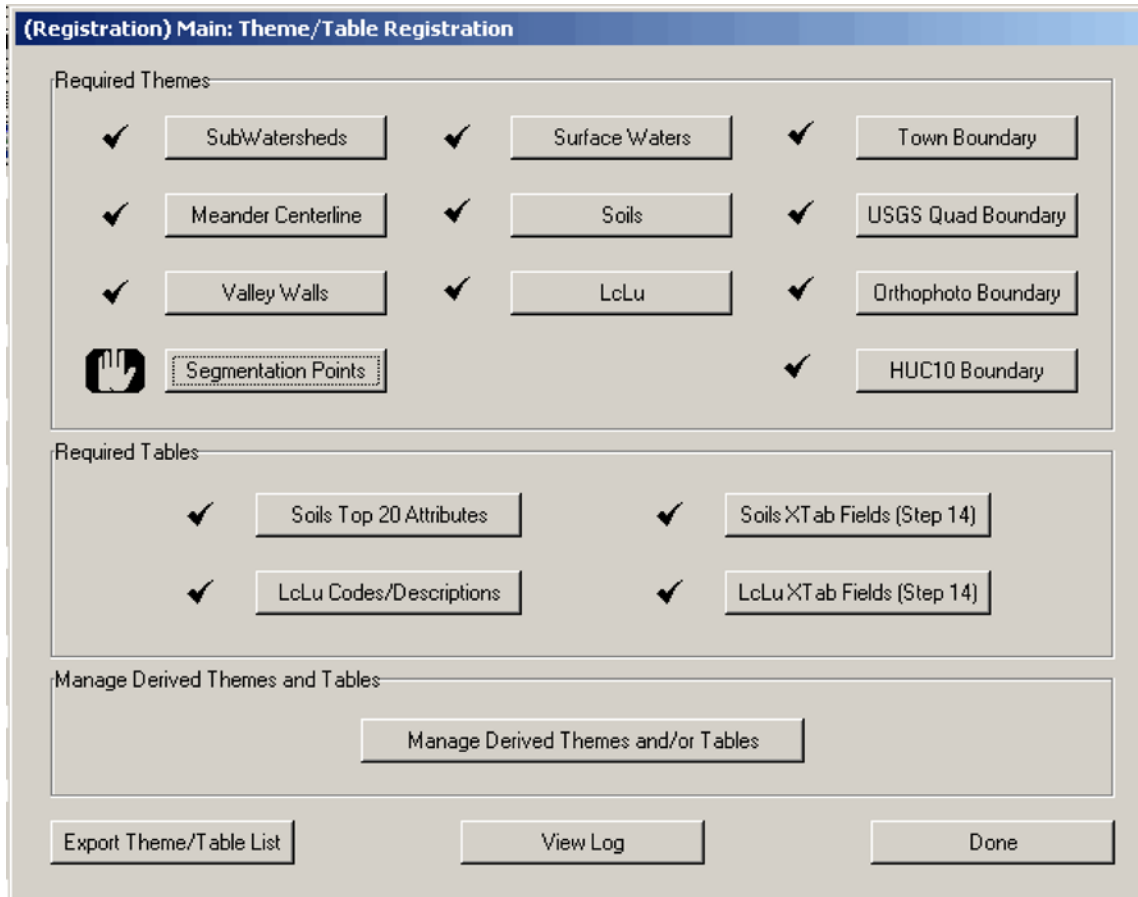
**Note there are two segments, but only one segment point.**

Once you have created the segmentation point shapefile for all your reaches you must register it in SGAT. Click on the SGAT extension button. This will bring up the *Stream Geomorphic Assessment Tools (Ver: 4.56) – Setup Dialog* window. Select the “Theme/Table Registration and Management” button from the “Application Areas”(Figure 67).





**Figure 67:** Screen shot of the *Stream Geomorphic Assessment Tools (Ver: 4.56) – Setup Dialog* window

This will bring up the *(Registration) Main: Theme/Table Registration* window (Figure 68).

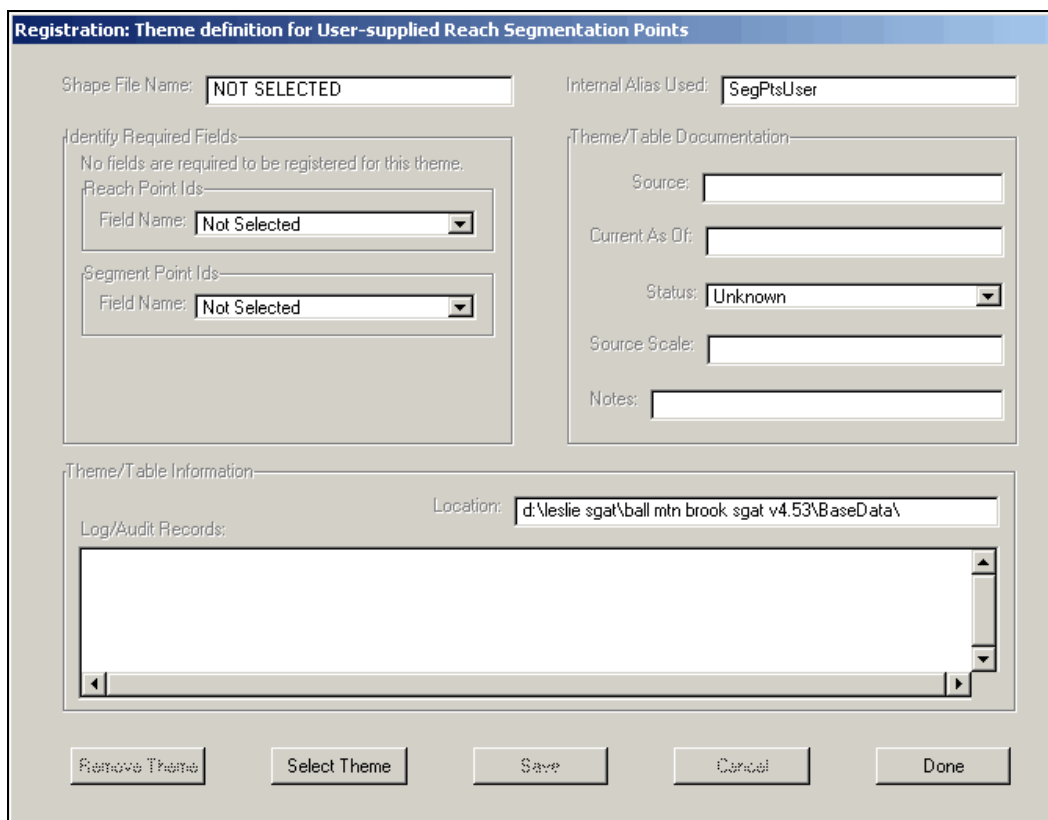


**Figure 68:** Screen shot of the *(Registration) Main: Theme/Table Registration* window.

In this window you will see all  and one . The check symbol means that the item has been registered and the hand symbol means it has not. Notice the hand symbol is next to the “Segmentation Points” button.

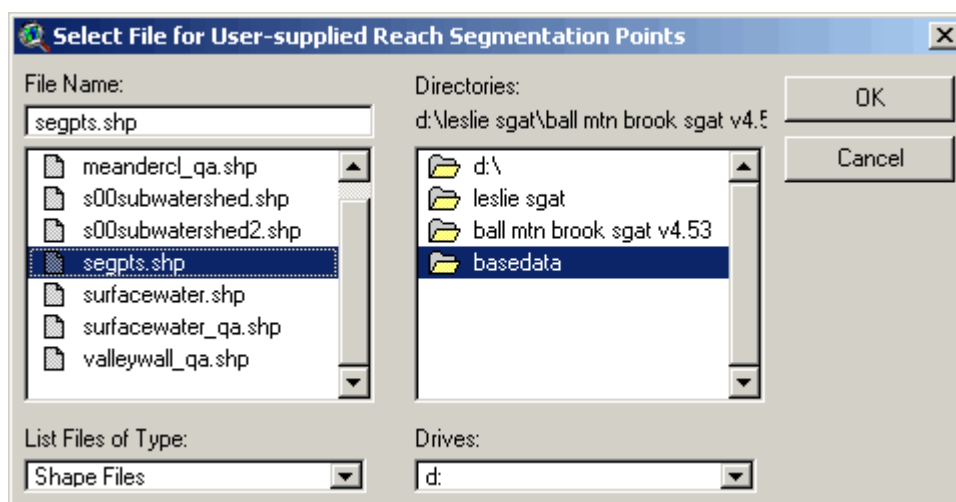
**If you are segmenting surface water it must have a meander centerline digitized for the reach you would like to segment.**

If you click on that button it will bring up the *Registration: Theme definition for User-Supplied Reach Segmentation Points* window (Figure 69).



**Figure 69:** Screen shot of the *Registration: Theme definition for User-Supplied Reach Segmentation Points* window.

Now click on **Select Theme**. This will bring up the Select File for User-supplied Reach Segmentation Point window (Figure 70), which you can use to browse for your segment point shape file.

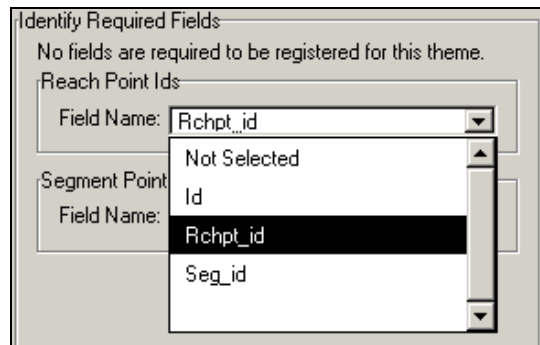


**Figure 70:** Screen shot of the Select File browser window, showing how to navigate to the location (in the basedata folder of your project) of your shapefile on your computer.

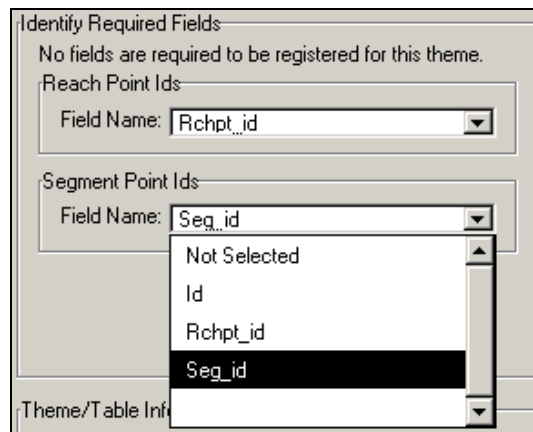
Once you have selected your file, click the “OK” button. This will bring you back to the *Registration: Theme definition for User-Supplied Reach Segmentation Points* window. On the



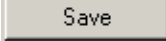



left side of this window you must now tell the FIT which field in your shape files attribute table is for the Reach Point ID (Figure 71) and which field is for the Segment ID (Figure 72).



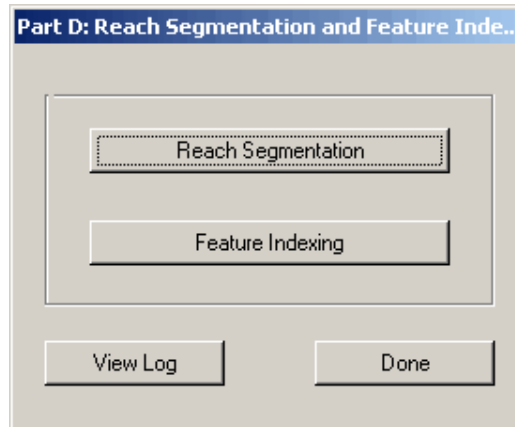
**Figure 71:** Screen shot from *Registration: Theme definition for User-Supplied Reach Segmentation Points* window, showing the “Reach Point Ids” “Field Name” drop down menu.



**Figure 72:** Screen shot from *Registration: Theme definition for User-Supplied Reach Segmentation Points* window, showing the “Segment Point Ids” “Field Name” drop down menu.

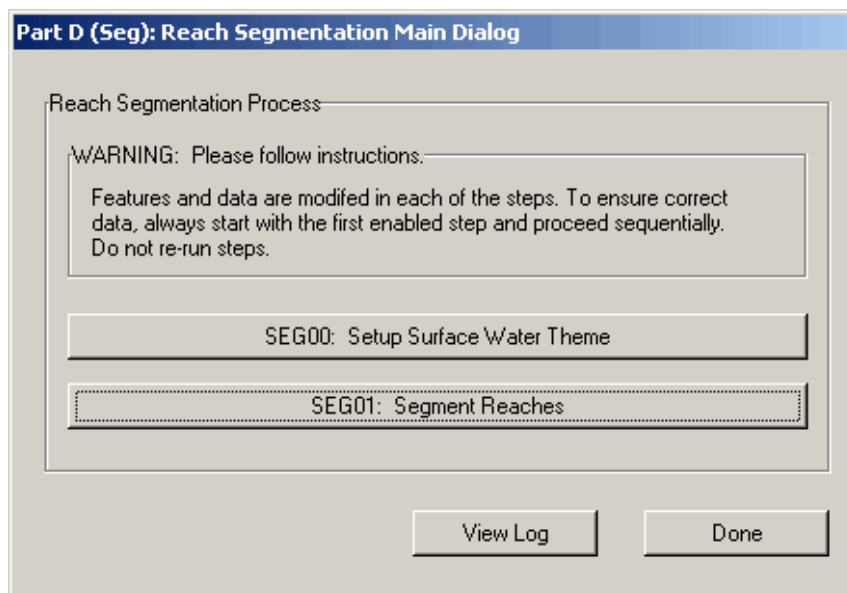
When you have assigned the fields for both reach and segment you must click on  to save the data, followed by  to exit this set up. This will bring you back to the *(Registration) Main: Theme/Table Registration* window. Notice the “Segmentation Points” button now has a  next to it, because it is registered now. Click  to exit.

Now that SGAT has your segment points it can segment the reaches. To do so we must open the Stream Geomorphic Assessment Tools by clicking on the “Stream Geomorphic Assessment Tools (SGAT)” button in the *Stream Geomorphic Assessment Tools (Ver4.56)—Setup Dialog* window. Now select Part D: Stream Segmentation and Feature Indexing button. This will bring up the *Part D: Reach Segmentation and Feature Indexing* window (Figure 73). Now click the button labeled *Reach Segmentation*.



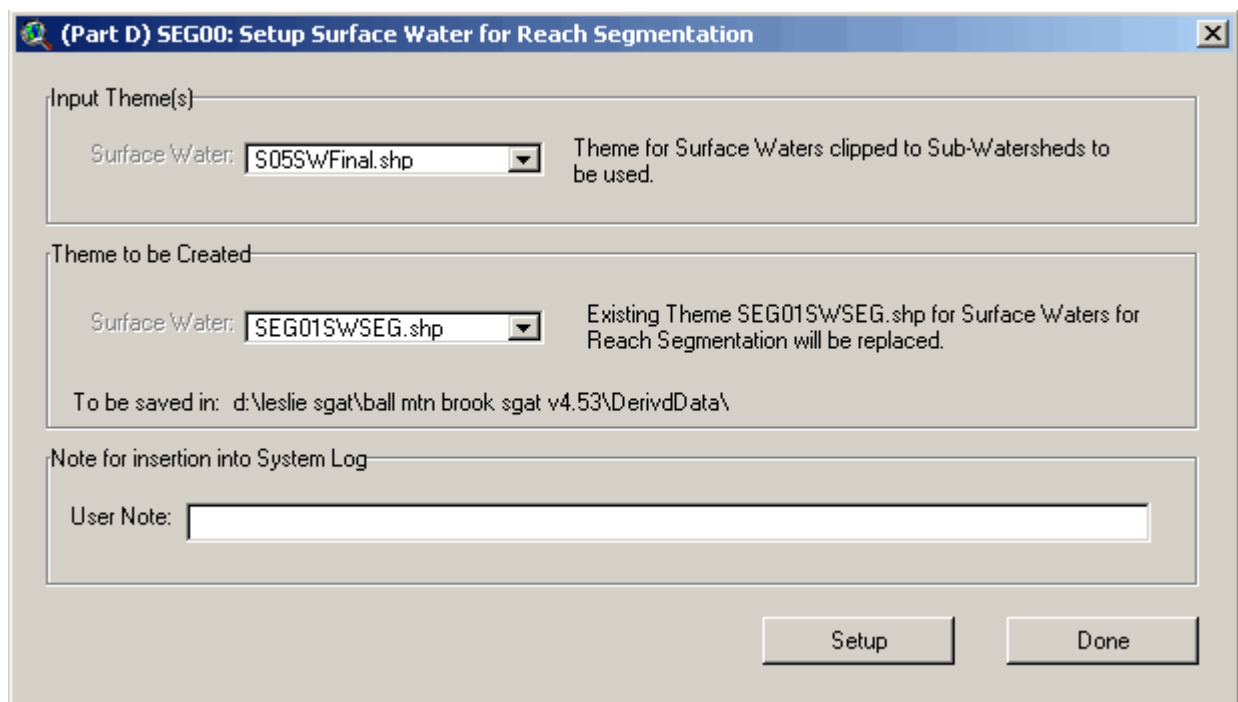
**Figure 73:** Screen shot of the *Part D: Reach Segmentation and Feature Indexing* window.

This will bring up the *Part D (Seg): Reach Segmentation Main Dialog* window (Figure 74). Both of these steps must be completed, but it is important to start at the top and work your way down. Click on the “SEG00: Setup Surface Water Theme” button.



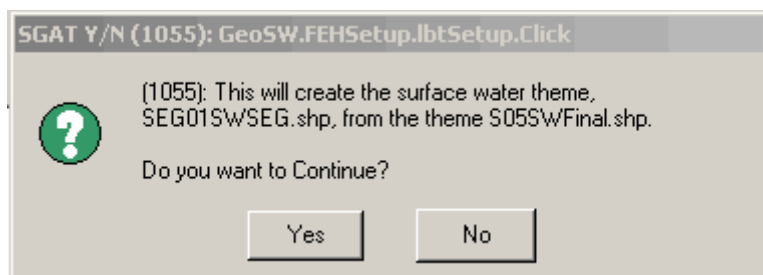
**Figure 74:** Screen shot of the *Part D (Seg): Reach Segmentation Main Dialog* window.

This will bring up the *(Part D)SEG00: Setup Surface Water for Reach Segmentation* window (Figure 75). Here you see two themes. The input theme area is populated by a value predetermined from earlier steps in SGAT and the theme to be created will replace the segmented surface water theme in your “DerivedData” folder. You do not have the option to change anything in this window. Click the “Setup” button to continue.



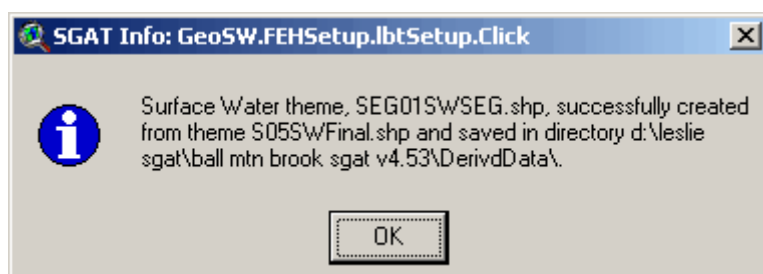
**Figure 75:** Screen shot of the *(Part D)SEG00: Setup Surface Water for Reach Segmentation* window

You will be prompted with the (1055) Y/N pop-up window (Figure 76) asking you if you want to continue. Click “Yes”.




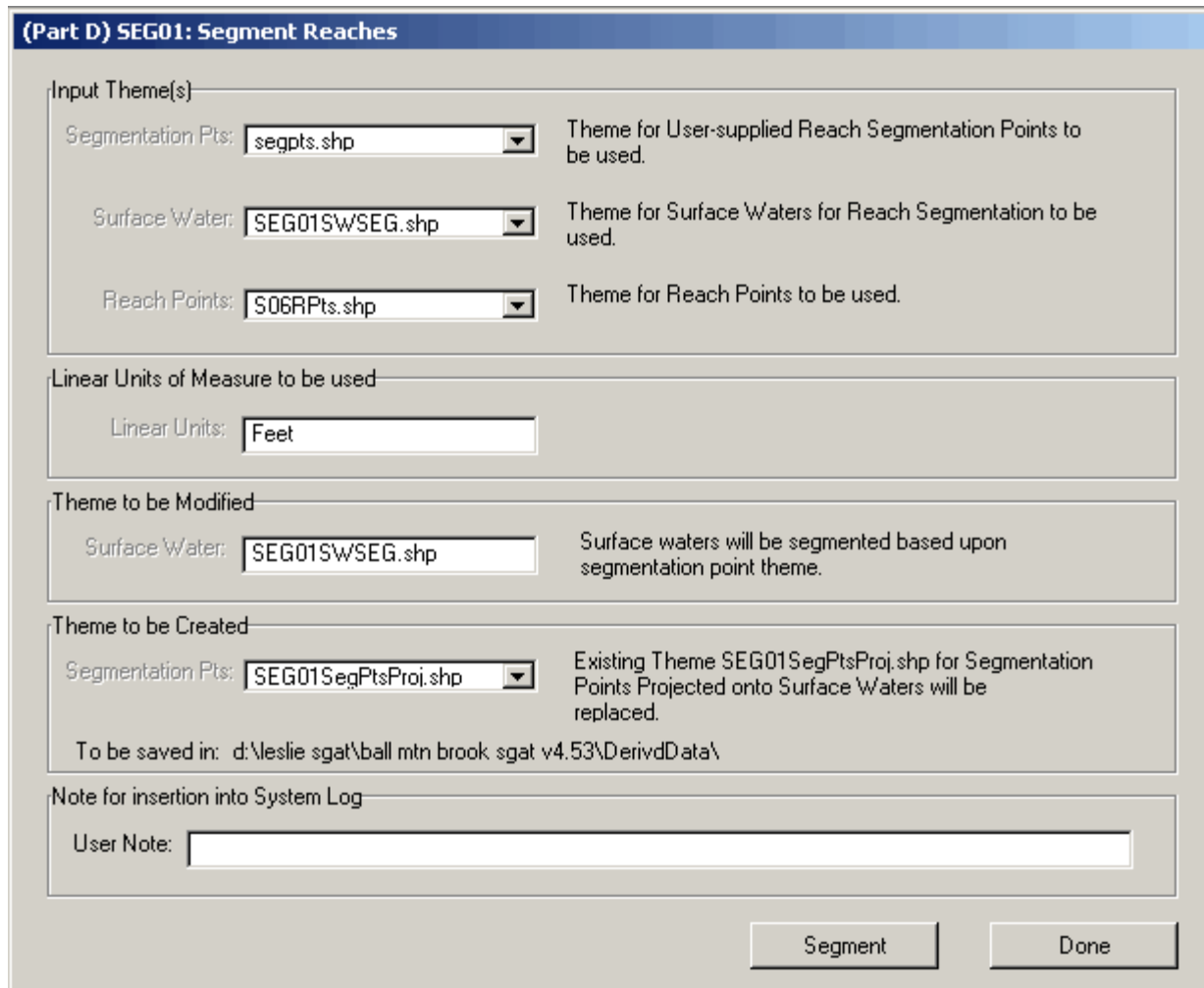
**Figure 76:** Screen shot of the *SGAT Y/N (1055): GeoSW.FEHSetup.lbtSetup.Click* window.

After a few seconds the SGAT Info pop-up will appear (Figure 77) telling you the name of the file (SEG01SWSEG.shp) and the location (in the “\DerivedData” folder) where it is saved. Click “OK” to continue.



**Figure 77:** Screen shot of the *SGAT Info: GeoSW.FEHSetup.lbtSetup.Click* window.

Surface waters are now set up. Click  to continue. This will bring you back to the *Part D (Seg): Reach Segmentation Main Dialogue* window. Now select the lower button “SEG01: Segment Reaches”. This will bring up the *(Part D) SEG01: Segment Reaches* window (Figure 78).



**(Part D) SEG01: Segment Reaches**

**Input Theme(s)**

Segmentation Pts:  Theme for User-supplied Reach Segmentation Points to be used.

Surface Water:  Theme for Surface Waters for Reach Segmentation to be used.

Reach Points:  Theme for Reach Points to be used.

**Linear Units of Measure to be used**

Linear Units:

**Theme to be Modified**

Surface Water:  Surface waters will be segmented based upon segmentation point theme.

**Theme to be Created**

Segmentation Pts:  Existing Theme SEG01SegPtsProj.shp for Segmentation Points Projected onto Surface Waters will be replaced.

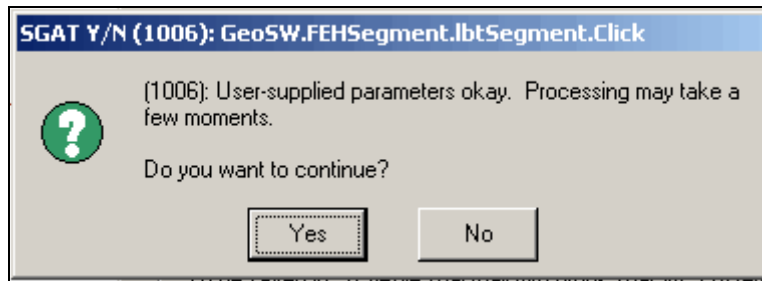
To be saved in: d:\leslie sgat\ball mtn brook sgat v4.53\DerivdData\

**Note for insertion into System Log**

User Note:

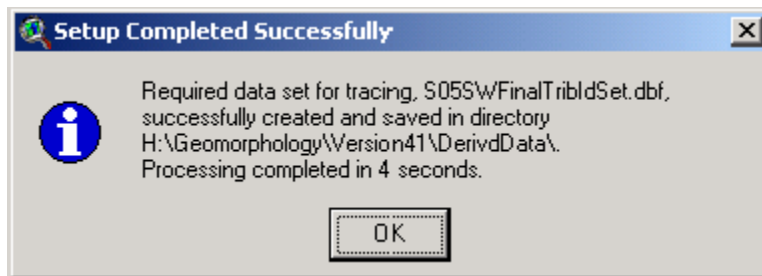
**Figure 78:** Screen shot of showing the *(Part D) SEG01:Segment Reaches* window. The upper portion displays the theme representing the user supplied segmentation points, the theme representing the surface water created in step SEG00 and the theme representing the reach points created in Part B, step06. Below this is the theme to be created or modified that contains the *polyline* impact features that have been indexed and below that is the theme to be created or modified that contains the *point* impact features that have been indexed.

Leave all the default settings and press the “Segment” button. This will bring up the *SGAT Y/N (1006): GeoSW.FEHSegment.lbtSegment.Click* window (Figure 79). Click “Yes” to continue.



**Figure 79:** Screen shot of the *SGAT Y/N (1006): GeoSW.FEHSegment.lbtSegment.Click* window

A message similar to the following will be issued upon completion of the *Setup* procedure (Figure 80). The process is complete, click “OK”.



**Figure 80:** Screen shot of the *Setup Completed Successfully* window.

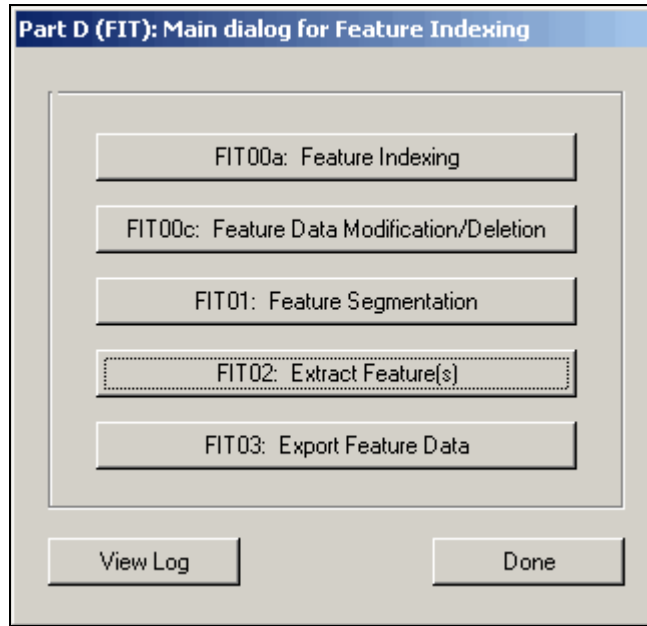
Click the “Done” button to exit the *(Part D) SEG01 Segment Reaches* window. Now click the “Done” button to exit back to the *PartD (Seg): Reach Segmentation Main Dialog* window. Upon completion of the *Setup* procedure, you can proceed on with indexing features by clicking on the button labeled *Features Indexing* button to return to the *Part D* main menu for feature indexing.

## **FIT SEGMENTATION!!!**

### **OFFSET/EXTRACT** (optional)

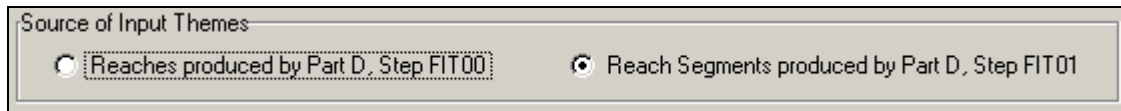
Since it is possible that multiple impacts may be partially or completely coincident, the ability to extract specific impact types (including sub-impact and location) is provided. The resulting shape files can be used for cartographic display of impacts on maps, using various offsets, colors and line weights.

Starting from the *Part D (FIT): Main dialog for Feature Indexing* window (Figure 81), click on the “FIT02: Extract Features” button.



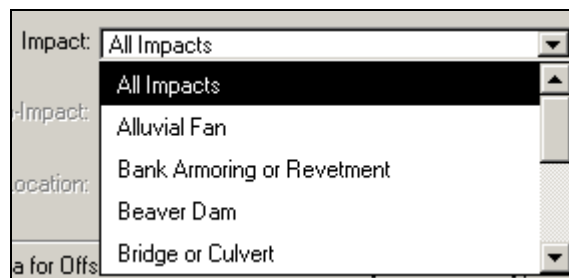
**Figure 81:** Screen shot of the *Part D (FIT): Main Dialog for Feature Indexing* window.

This will bring up the *(Part D) FIT02:Extract Impacts with Offset* window. When searching for the feature that you would like to extract you are given some options to help narrow it down. First you must select whether or not you have segmented your reaches. If you have segmented, then select “Reach Segments produced by Part D, Step FIT01” (Figure 82).



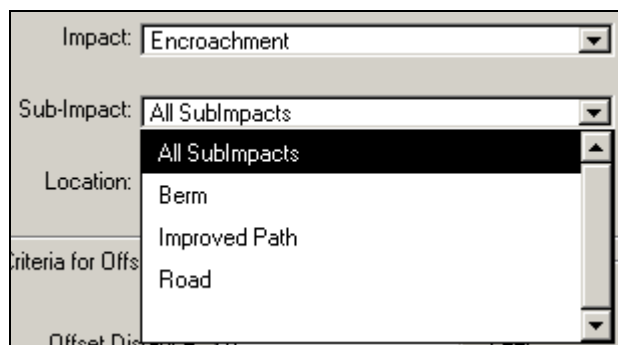
**Figure 82:** Screen shot from the *(Part D) FIT02:Extract Impacts with Offset* window, showing the two options for “Source of Input Themes”.

Now you must choose the impact you are interested in from the Impact drop down menu (Figure 83). [Let’s say you choose Encroachment]



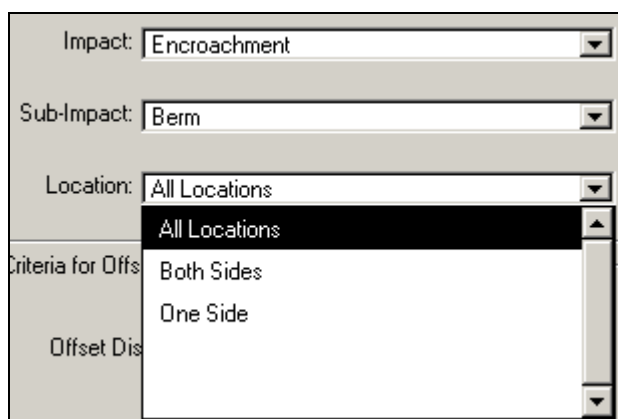
**Figure 83:** Screen shot from the *(Part D) FIT02:Extract Impacts with Offset* window, showing the “Impact” drop down menu.

Now you have the option of extracting all encroachments or choosing a specific encroachment from the Sub-Impact drop down menu (Figure 84).



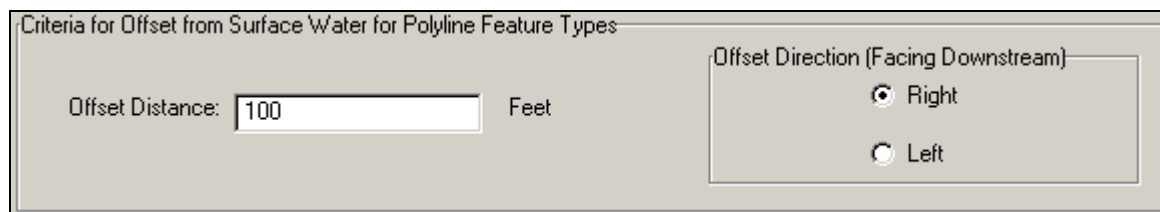
**Figure 84:** Screen shot from the (Part D) *FIT02:Extract Impacts with Offset* window showing the Sub-Impact drop down menu for Encroachment.

[Let's say you choose Berm] Now you must choose the location you are interested in. You can extract all locations or for berms you have a choice of either one side or both sides (Figure 85).



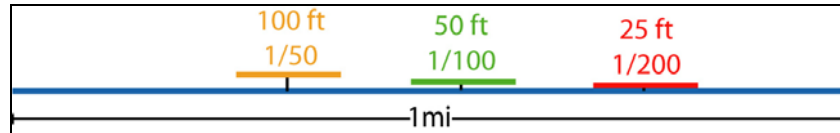
**Figure 85:** Screen shot from the (Part D) *FIT02:Extract Impacts with Offset* window showing the Locations associated with the *Berm* Sub-Impact.

[Let's say you choose Both Sides] Now you must choose the distance of offset (how far away from the surface water the feature will plot) and on what side (Right or Left, looking down stream) (Figure 86).



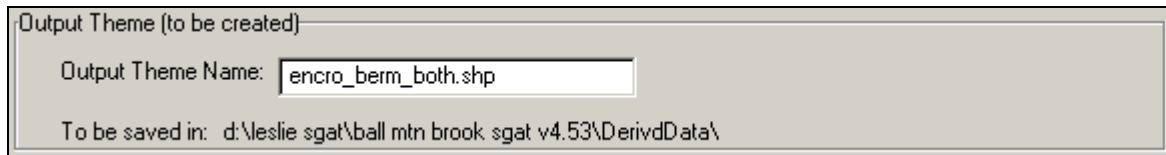
**Figure 86:** Screen shot from the (Part D) *FIT02:Extract Impacts with Offset* window showing 100 feet of offset to the right.

The Offset Distance should be selected based on your observation scale. A good rule of thumb is to use an offset distance equal to 1/100 of the scale in which you intend to view your data at (Figure 87).



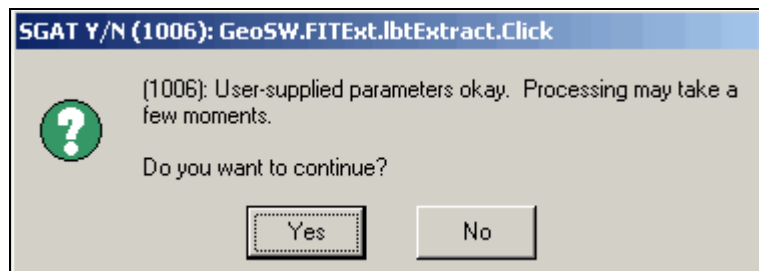
**Figure 87:** Schematic showing a 1 mile stretch of river with various offset distances in feet and their respective ratios (offset/total river length).

Finally it is time to extract the feature(s) of choice. You have the option of saving the shape file with the default names assigned by the FIT or changing the name to something that will hold more significance with you (Figure 88).



**Figure 88:** Screen shot from the (Part D) FIT02: Extract Impacts with Offset window showing a possible export name for encroachment-berms-both sides.

Click the “Extract” button and this will bring up the *SGAT Y/N (1006): GeoSW.FITExt.lbtExtract.Click* pop-up window (Figure 89). Click “Yes” to continue.



**Figure 89:** Screen shot of the *SGAT Y/N (1006): GeoSW.FITExt.lbtExtract.Click* window.

After a few seconds the *SGAT Info: GeoSW.FITExt.lbtExtract.Click* window will pop-up (Figure 90) reminding you of the name of the file and where it is saved. Click “OK” to Continue.



**Figure 90:** Screen shot of the *SGAT Info: GeoSW.FITExt.lbtExtract.Click* window.

### Note: Grayed-out text

You will find that, for some of your impacts, text in this display window will be grayed-out (Figure 91). This means that you do not have the ability to change it. This is normal.



Criteria for Extract

Impact:

Sub-Impact:

Location:

Feature Type

☒ Point

☐ Polyline

---

Criteria for Offset from Surface Water for Polyline Feature Types

Offset Distance:  Feet

Offset Direction (Facing Downstream)

☐ Right

☒ Left

**Figure 91:** Screen shot from the *(Part D) FIT02: Extract Impacts with Offset* window showing the Impact of Grade control. Sub-impact is grayed out because ledge was the only Grade control that was entered for this reach. Offset distance is also grayed out because points can only be extracted and cannot be offset.

After you have extracted the files you want, click on the “Done” button in the *(Part D) FIT02: Extract Impacts with Offset* window and this will bring you back to the *Part D (FIT) Main Dialog for Feature Indexing* window.

### **FEATURE EXPORTING**

Finally, the ability to export impacts is provided. The export file is a dBase table that can subsequently be imported into the DMS (data management system used to maintain the tabular data associated with geomorphic assessments).

Starting in the *Part D (FIT): Main dialog for Feature Indexing* window click on the “FIT03: Export Feature Data” button (Figure 92).

**Part D (FIT): Main dialog for Feature Indexing**

**Figure 92:** Screen shot of the *Part D (FIT): Main Dialog for Feature Indexing* window.

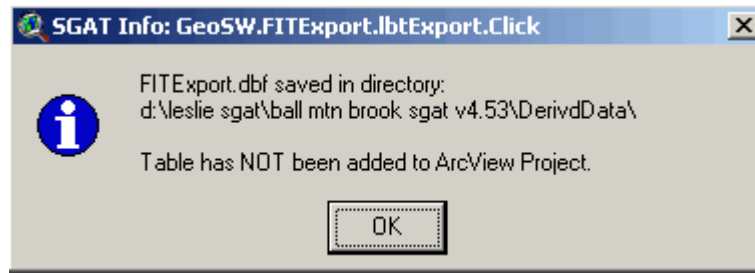
This will bring up the *(Part D) FIT03: Export Feature Data to dBase Table* window. You cannot change anything in this window (Figure 93). Click the “Export” button to create a “.dbf” file.

**Figure 93:** Screen shot of the *(Part D) FIT03: Export Feature Data to dBase Table* window.

This will bring up the *SGAT Y/N (1006): GeoSW.FITExt.lbtExtract.Click* window (Figure 94). Click “Yes” to continue.

**Figure 94:** Screen shot of the *SGAT Y/N (1006): GeoSW.FITExt.lbtExtract.Click* window.

This will bring up the *SGAT Info: GeoSW.FITExport.lbtExport.Click* window (Figure 95) reminding you of the name (“FITEExport.dbf”) of the file and where it is saved (in the “\DerivedData” folder). Click “OK” to continue.



**Figure 95:** Screen shot of the *SGAT Info: GeoSW.FITExt.lbtExtract.Click* window.

After you have Exported the Data, Click the “Done” button in the Bottom right corner of the *(Part D) FIT03:Export Feature Data to a dBase Table* window and that will bring you back to the *Part D (FIT): Main Dialog For Feature Indexing* window.

**Pat yourself on the back. You are finished working with the FIT.**