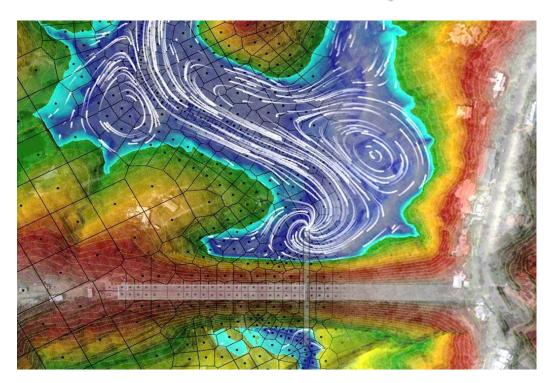


HEC-RAS 5.0 Training New Zealand Workshop Guide



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In conjunction with the lecture notes, these workshops are designed to prepare you to build, run, and animate 1D and 2D flood models using the new features available in HEC-RAS 5.0.5

Additional resources: www.surfacewater.biz/workshops/

Key:





Left-click

Right-click

Double-click

Select Link

Draw



Introduction: Getting started

This guidance document describes a basic model setup process for:

- HEC-RAS one-dimensional (1D) flood model
- HEC-RAS two-dimensional (2D) flood model

This guide includes new features available in HEC-RAS Version 5.0.5 and assumes that users have downloaded and installed the latest version.

The schematic image below shows an example of the file setup for the files that will be developed for these exercises along with the relevant icons for creating, running, and viewing basic HEC-RAS models.

Reading from left to right, the HEC-RAS icons that will be covered in these exercises correspond to the following files:

- HEC-RAS project file (*.prj)
- Geometry file (*.g01)
- Unsteady flow file (*.u01)
- Plan file (*.p01)
- RAS Mapper file (*.rasmapper)

The first four icons shown in the inset image below require user input with a defined title that is associated with each file name. The RAS Mapper file (*.rasmapper) is automatically created and does not require the selection of a title.

Before beginning, an appropriate folder structure should be set up under a HEC-RAS directory created within the overall project folder. Here is an example of the folders to be created:

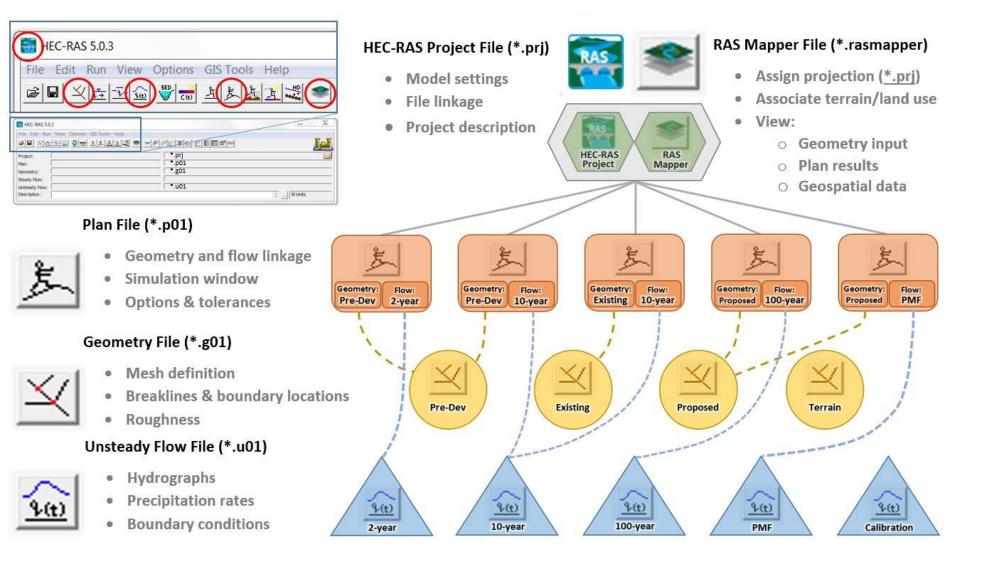
- Aerial photos
- Hydrology
- Land use
- Projection
- Results
- Terrain
- Shape files

This folder structure may be adjusted to suit organisational IT requirements and geospatial data standards. Available shape files, terrain files, hydrographs, and other relevant files should be placed in the appropriate folders before proceeding. It would be beneficial to create new layers outside of HEC-RAS for some features first, such as:

- Catchment delineations
- Flow paths
- Cross section and long section profile alignments
- Roadway or levee centreline alignments
- Building footprints

These features should be defined as shape files using CAD or GIS software (Arc, QGIS, AutoCAD, etc.). The shape file should include a name field, and individual features should be assigned names that will allow clarity and consistency in the HEC-RAS model once the shape file is imported.

HEC-RAS File Management:



Download elevation data (Skip this step if terrain and projection are already available)

• Google "New Zealand elevation data" and select Land Information New Zealand (LINZ) website

C ₽₽8↓e	new zealand elevation data						۹		
	All	Images	News	Maps	Videos	More	Set	ttings	Tools

About 3,620,000 results (0.47 seconds)

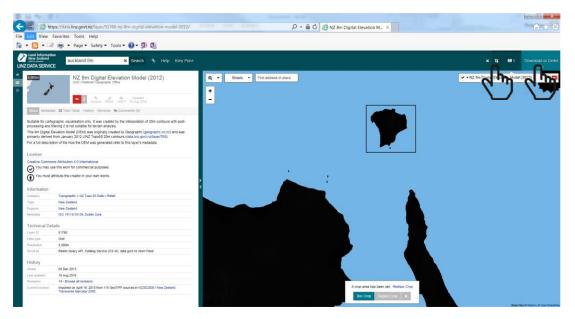
Elevation data | Land Information New Zealand (LINZ) www.linz.govt.nz > Data > LINZ data -

Dec 20, 2016 - Access elevation data through the LINZ Data Service.

Select LINZ (Land Information New Zealand) and browse to "NZ Data Service"



- Select area of interest, select geotif format and NZGD2000 projection, download DEM file
- Hint: Search for 1m or 8m data to view coverage extents
- Hint: Older versions of Internet Explorer may not work; Chrome or Firefox may be preferred.

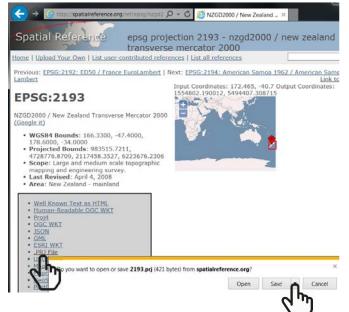


Google "New Zealand projection files", find relevant zone (NZGD2000 for example)

G¶¶8 e	new zealand projection file						۹	
	All	Images	Videos	Shopping	News	More	Settings	Tools
	About 504,000 results (0.38 seconds)							

NZGD2000 / New Zealand Transverse Mercator 2000: EPSG ... spatialreference.org/ref/epsg/nzgd2000-new-zealanthransverse-mercator-2000/ ▼ Apr 4, 2008 - NZGD2000 / New Zealand Transverse Mercator 2000 (Google it). WGS84 Bounds: 166.3300, -47.4000, 178.6000, -34.0000; Projected Bounds: ...

- Select relevant prj file and download to project directory
- Suggest renaming file to descriptive name ("NZGD 2000 NZTM Projection File.prj") and saving under separate "Projection" subdirectory





Workshop 1: Set Up Project File and RAS Mapper



- Download the latest version of HEC-RAS (Version 5.0.4)
 - Google "Download HEC-RAS" 0
 - Download link: http://www.hec.usace.army.mil/software/hec-ras/downloads.aspx 0
 - Recommend installing with Example Projects 0

Google	download hec-ras							Q
	All	Videos	Images	News	Maps	More	Settings	Tools
	Abou	t 97,500 res	ults (0.49 see	conds)				

HEC-RAS Downloads - Hydrologic Engineering Center - Army www.hec.usars.army.mil/software/hec-ras/downloads.aspx -These setue package include HEC-RAS 5.0.3, Documentation, and optionally the Example Projects. Primary Download Site: Download HEC-RAS 5.0.3 Setup ...

ĨŦĨ	US Army Corps of Engineers
₀	
DME > SOFTWARE > HEC-RA	<u>S</u> > DOWNLOADS
HEC-RAS	HEC-RAS has been developed for the U.S. Army Corps of Engineers (USACE). However, software developed at the Hydrologic Engineering Center is made available to the public whenever appropriate. Use is not restricted and
HEC-RAS	individuals outside of USACE may use the program without charge. HEC will not provide user assistance or support
Features	for this software to non-USACE users. Downloading this software indicates full acceptance of your responsibility in the use of this program. Please see the distribution policy for more details.
What's New	the use of this program. Please see the distribution policy for more details.
Downloads	Current Version HEC-RAS 5.0.3:
Documentation	These setup package include HEC-RAS 5.0.3, Documentation, and optionally the Example Projects.
FAQs	Primary Download Site:
Known Issues	Image: Comparison of the set o
Bug Report	C m
Suggestions	Alternate Download Site:
00	Downood HEC-RAS 5.0.3 Setup Package Documentation, and Example Data sets (538 MB)
Demo	
Sponsors	Supported Operating Systems:
Collaborators	Windows XP, Vista, 7, 8, 8.1, and 10 both 32-bit and 64-bit

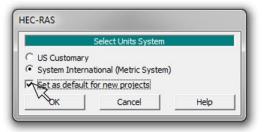
Open HEC-RAS (Select HEC-RAS 5.0.4 from Start Menu) •



	\cup
HEC-RAS 5.0.4	
File Edit Run View Options GIS Tools Help	
Project:	
Plan:	
Geometry:	
Steady Flow:	
Unsteady Flow:	
Description :	🗘 SI Units
L	

Set unit systems to default to SI units (Options | Unit System)

File Edit Run View	Options GIS Tools Help		
Image: Constraint of the second se	Program Setup Default Parameters Unit system (US Customary/SI) Convert Project Units Convert Horizontal Coordinate Systems	+	▰◣ਁ◾◣ <u>ਁਸ਼</u> װ <u></u> ®ּֽ๛
Steady Flow:			



- Start a new project in SI units (File | New Project)
- If folder structure has not yet been set up, return to introduction for instructions or create a new folder (recommend setting up folder in root directory, not in windows shortcuts)

HEC-RAS 5.0.3	
File Edit Run View Options GIS Tools Help	
New Regject	🛛 🔂 🖬 🖉 🔤 🖉
Open Project	
Save Project	
Save Project As	
Rename Project Title	
Delete Project	
Project Summary	👙 🛄 SI Units
Import HEC-2 Data	

de	File Name	Selected Folder Default Project Folder Document
	*.prj	e:\HEC-RAS
		HEC-RAS
OK Cancel	Help Creater Fo	der





Assign descriptive project title and relevant file name

[Note: the file name will be replicated in many other files with varying file extensions – sometimes to hundreds or even thousands of files. The files are not easily renamed, so choose the file name carefully!]

New Project		
Title	File Name	Selected Folder Default Project Folder Documents
Motukorea Tutorial Model	Motukorea.prj	e:\HEC-RAS\Auckland
OK Cancel Help	Create Folder	e:
Set drive and path, then enter a new project title and file	name.	

RAS	X
Start a new project with "Motukorea.prj" as its file name and Tutorial Model" as its title, in the "e:\HEC-RAS\Auckland\" D The units system will be set to "SI Units" but can be changed Options menu on the main RAS window.	Directory?
ок	Cancel

HEC-RAS 5.0.4			
File Edit Run View	Options GIS Tools Help		
		ᢞ᠍ᡣ└ᢟ᠘ᡛ᠍᠍ᢨᡡ	<u>li mani</u>
Project: Motukor	ea Tutorial Model	e:\HEC-RAS\Auckland\Motukorea.prj	
Plan: Geometry:	Project Title	File Name	
Steady Flow:			
Unsteady Flow:			
Description : Motukor	rea tutorial model for Auckland HEC-RAS traini	ing course developed by Krey Price, Surface Water Solutions. 🔶 🛄 SI Units	5

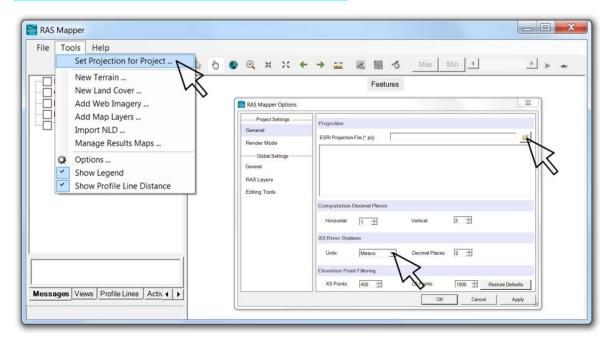
Project Description

- Enter description, including:
 - o Purpose of model
 - $\circ \quad \text{End client} \quad$
 - $\circ \quad \text{Data sources for hydrology} \\$
 - o Data sources for terrain data
 - Name and contact details for modeller
- Save files using File | Save

• Open RAS Mapper (click on RAS Mapper icon or Menu: GIS Tools | RAS Mapper)

HEC-RAS 5.0.4		
File Edit Run View Options GIS Tools Help		
		H aali
Project: Motukorea Tutorial Model e:\HEC-RAS\Auckland\Motukorea.prj		<u> </u>
Plan: V		
Geometry:		
Steady Flow:		
Unsteady Flow:		
Description : Motukorea tutorial model for Auckland HEC-RAS training course developed by Krey Price, Surface Water S	iolutions. 📫 🛄	SI Units

• Set projection (Menu: Tools | Set Projection for Project)



• Change Default XS River Stations to Metres and browse to downloaded projection file

			 Projection 	1		
Organize New f	older				-	0
Documents	 Name 	A	Date modified	Туре	Size	
Music Pictures	N2	ZGD_2000_NZTM_Projection.prj	5/10/2017 9:21 AM	PRJ File		1 KB
Videos						
iller Computer						
🖻 📲 System (C:)						
) 🥪 Toshiba (e:)						
0						
💽 Network	H					
			Ш			_
		2000_NZTM_Projection.prj		 Spatial Pro 	jection Files (*.	pri 🔻



• Confirm details and click "Apply" and "OK"

RAS Mapper Options	X
Project Settings	Projection
General	E:\HEC-RAS\Auckland\Projection\NZGD_2000_NZTM_F
Render Mode	ESRI Projection File (*.prj): [E:\HEC-RAS\Auckland\Projection\NZGD_2000_NZ1M_F]
Global Settings	["GCS_NZGD_2000",DATUM["D_NZGD_2000",SPHEROID ["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT
General	["Degree".0.0174532925199433]].PROJECTION["Transverse_Mercator"].PARAMETER ["False_Easting".1600000.0].PARAMETER["False_Northing".10000000.0].PARAMETER
RAS Layers	["Central_Meridian",173.0],PARAMETER["Scale_Factor",0.9996],PARAMETER ["Latitude_Of_Origin",0.0],UNIT["Meter",1.0]]
Editing Tools	Restore Defaults
	OK Cancel Apply

• Create a new terrain (right-click on Terrain | Create a new terrain) and select "plus" button

RAS Mapper ile Tools Help	5 4		⊕ x	20	()	. LANG	N	1	i Mi	ax Min	4) 	Þ ••
Features Geometries Results Map Layers			rrain Layer Set SRS It Terrain Files					Terrains					
Create a New RAS Terr Add Existing RAS Terra Note: Use "Add	12		Filenam	>						Projectio	n Cell Size	Rounding	Info
existing terrain" if you already have a terrain in hdf format		Ro Ve	put Terrain File unding (Precisic tical Conversio mame:	x [u	/128 Ise Input File (\Brisbane\Te		•] 🔽 Create :	Stitches	☐ Merg	e Inputs to Single Re	ister	
lessages Views Profile Lines Actin											Cr	eate	Cance

Browse to downloaded or provided terrain file (Drag down to additional file types if needed)

Organize New folder			• ==	
Libraries Documents Music Pictures Uideos	Name	Date modified	Type A TIFF image	Siz
System (C:)	8			
Network		Ш		
File name	e.	•	Raster Data (*.tif,*.flt,*	adf) ▼ Cancel

•



•

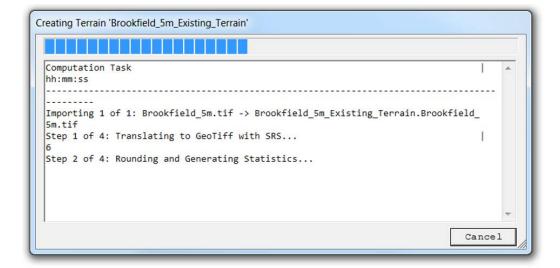
Change file name to relevant description of terrain and click "Create"

ew Terrain Layer	
Set SRS	
+ Filename	Projection Cell Size Rounding Info (Same as Project) 8 None i
×	
Output Terrain File Rounding (Precision): Vertical Conversion:	1/128 Create Stitches Merge Inputs to Single Raster Use Input File (Default) Image: Create Stitches Merge Inputs to Single Raster
Filename:	e:\HEC-RAS\Auckland\Terrain\Terrain.hdf
	Create

Enter the filename for the new Terrain Layer				X
Computer TOSHIBA (E:) HEC-RAS Auckland Terrain	•	47	Search Terrain	Q
File name: Motukorea 8m Existing Terrain				•
Save as type: Terrain (*.hdf)				•
S Browse Folders			Save Cano	el
		_		d

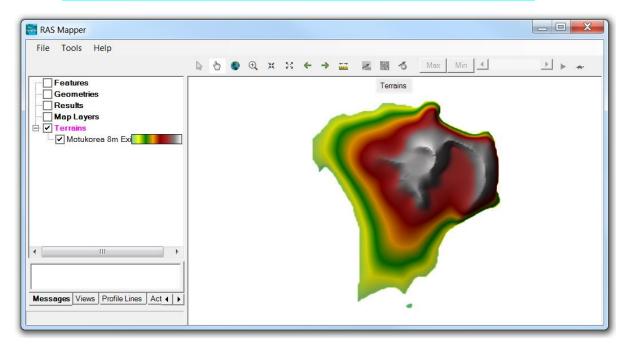
lew Terrain Layer					
Set SRS					
+ Filename		Projection	Cell Size	Rounding	Info
EK.tif		(Same as Project)		None	i
Output Terrain File Rounding (Precision): Vertical Conversion:	1/128 Image: Create Use Input File (Default) Image: Create		Merge	Inputs to Single	
Filename:	E:\HEC-RAS\Auckland\Terrain\Motukorea 8m Exi	sting Terrain.hdf			<i>6</i>
			Cre	eate	Cancel

• Click "Close" when complete



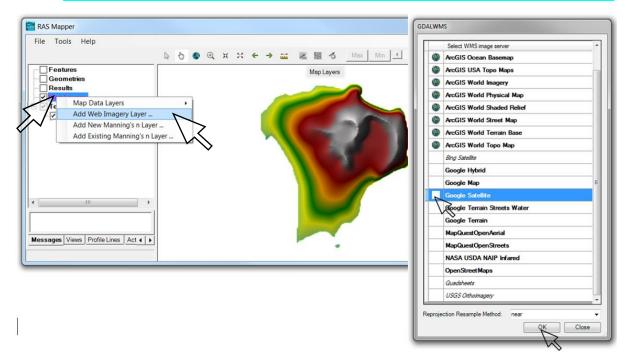
Creating Terrain 'Brookfield_5m_Existing_Terrain'	
	•
Final Processing: Brookfield_5m_Existing_Terrain.hdf	
Step 1 of 3: Creating Brookfield_5m_Existing_Terrain.vrt	
Step 2 of 3: Creating Brookfield_5m_Existing_Terrain.hdf 4	
Step 3 of 3: Creating Stitch-TIN for merging rasters 4	
	=
Terrain Complete 30	
1	_
	Close

• Toggle on Terrains Layer Group, right-click on Terrain and click "Zoom to Layer"

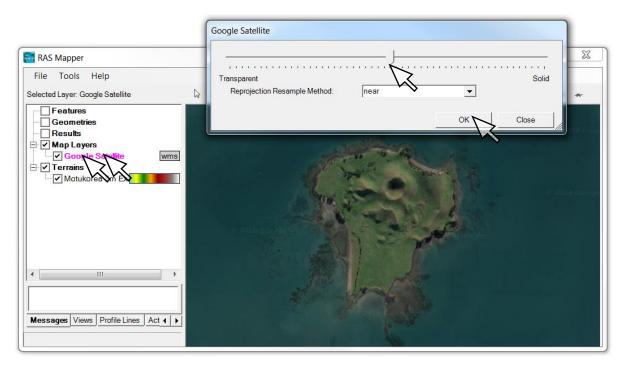




Right-click on "Map Layers", select "Add Web Imagery Layer", and click on "Google Satellite"

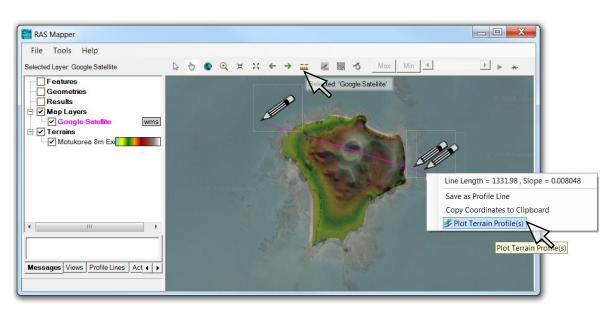


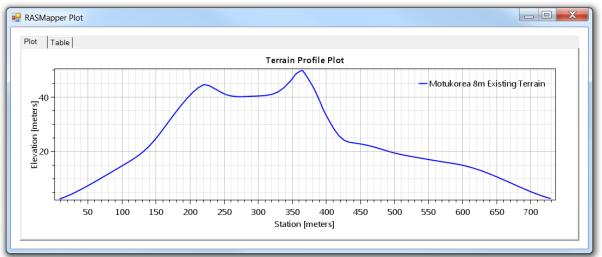
• Double-click on "Google Satellite" and adjust transparency



- Select the measure tool and delineate a profile location
- Double-click when complete and select "Plot Terrain Profiles(s)"







• Click on the "Table" tab to view the profile plot ordinates. Select the blank cell in the upper left to highlight all text. These values can be copied and pasted into Excel or similar program.

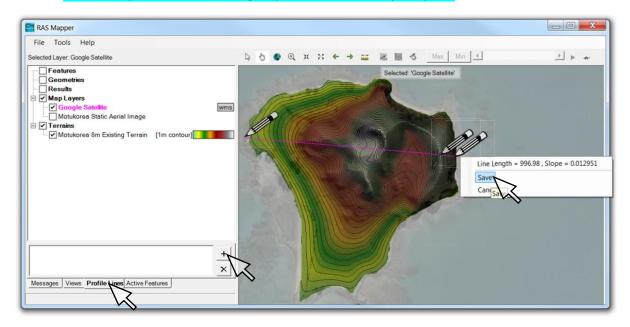
lot Table					
ombined Ta Iotukorea 8m Existing Terrain		Station (meters)	Motukorea 8m Existing Terrain (meters)		_
	1	8.286	2.546		
	2	10.318	2.736		
	3	16.424	3.313		
	4	17.177	3.393		
	5	21.212	3.823		
	6	24.036	4.125		
	7	24.562	4.183		
	8	25.330	4.276		
	9	30.895	4.940		
	10		5 150		



- Repeat the process by selecting the measuring tool, but this time click on "Save as Profile Line" and enter a name for the profile line.
- Right-click on the name of the terrain file, then select "Layer Properties" (or double click on the terrain name).
- Double click on the colour band (or press the Edit button) and adjust all desired parameters, including colour ramp, min/max values, number of displayed values, and transparency.
- Click on "Create" and "Apply" when finished

RAS Mapper		
File Tools Help	Motukorea 8m Existing Terrain - Layer Properties	
Selected Layer: Motukorea 8m Existing Terrain	Motukorea 8m Existing Terrain - Layer Properties Visualization and Information Source Files Vector Line: Point: Line: Label Features with Attribute Column(s) Surface Stretched ✓ Plot Surface ✓ Plot Surface ✓ Plot Surface ✓ Plot Contours ✓ Plot Contours ✓ Plot Hillshade Z Factor:	Image: Select Surface Fill Surface Symbol Settings Color Ramp: Image: Terrain Image: Terrain <t< th=""></t<>
Messages Views Profile Lines Active Features		Approceed

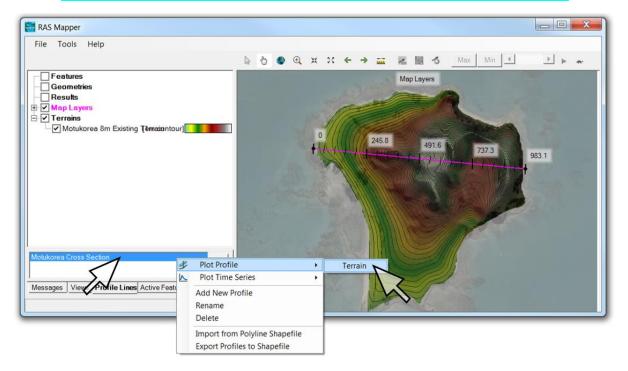
- Select "Plot Contours" and adjust contour line colours and interval
- Select "Plot Hillshade" and adjust Z factor to observe effect on map appearance
- Hint: Use middle mouse button to adjust contour and hillshade values
- Left-click on Profile Lines tab at the lower left of the window, then use the plus button to add a new profile line, and assign a profile name when prompted.



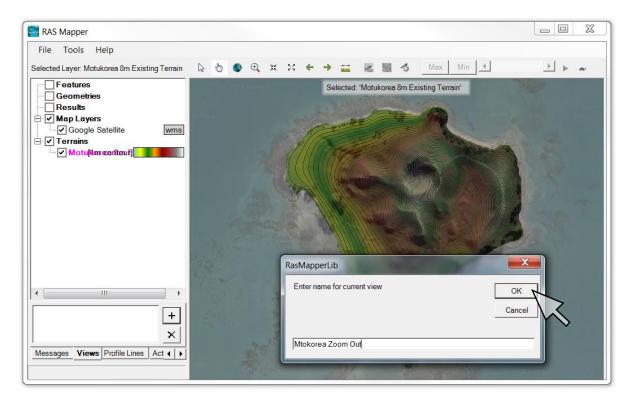


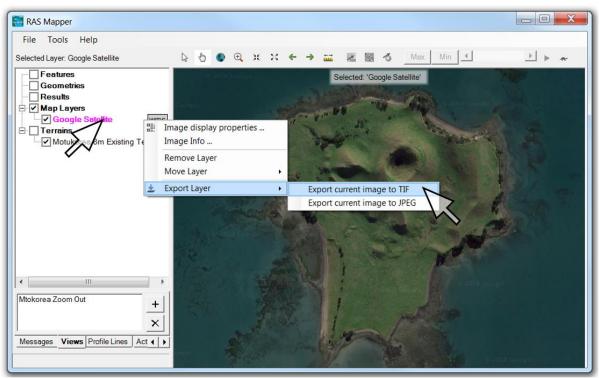
e RAS Mapper	
File Tools Help	
Selected Layer: Google Satellite	
	Selected 'Google Satellite'

• Right-click on the profile name, select "Plot Profile | Terrain" to view the long section



- Zoom to selected zoom levels and save views using view tab
- Note: more instructions for saved views available at <u>www.surfacewater.biz/views/</u>
- Right-click on web imagery and save the view extents as a static image (with a world file)
- Add static aerial images as existing map layers





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Save Cance	el 🔤

RAS Mapper							
File Tools Help	₽ ₺ <) 🕀 x	**	→ <u></u>		Max Min 4	<u>}</u> ⊧ ~
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Add Existing Manning's			Lane B	10.0	R		
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Messages Views Profile Lines Act ()		2			-	6	

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Libraries Documents	🛃 Mo	otukorea Static Aerial Image.tif	10/06/2018 11:07	TIFF image	
📣 Music					
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1					
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🍂 Computer					
Computer System (C:)	E				
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Computer 🌱 System (C:)	E		III		



Bonus GIS and RAS Mapper tasks:

- Create your own shape file three ways:
 - Creating a profile line, then right-click on the assigned name and select "Export Profile to Shapefile".
 - Right-click on Map Layers and select Map Data Layers | Create New Generic Layer and try making point, polyline, and polygon shape files. Right-click on layer name and export as shape file when complete.
 - Right-click on Features and select "Create New Layer". Add features using create features tool. Right-click on layer name and export as shape file when complete.
- Add the newly created shape files to the Map Layers in RAS Mapper
- Adjust symbols, colour palettes, ranges, intervals, and transparency for all layers to optimise the view for later use in the Geometry Editor