# Supplementary Guidelines for ENVSOCTY 3GI3

# Exercise 3

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# Knowledge Check before working on E3

E3 Video + Overview Notes

Slide 11: TIN

1. What is TIN
2. How are TINS Constructed
3. Triangulation
   - Delaunay Method
   - Breaklines
4. Surface Feature Types
5. Characteristics of Triangular Facets
6. Interpolation Types
7. Advantages & Disadvantages

Slide 12: Hydrology Tools

1. Hydrologic Preconditioning
   - Flow Direction
   - Sinks and Peaks (Fill)
2. Stream Network & Characteristics
   - Flow Accumulation
   - Stream Link
   - Stream Order
   - Watershed Delineation
   - Basin
   - Flow Length

# Proclamation

You should first view Patrick's *course slides*, *course videos*, *Exercise 3 Overview Notes (3GI3-W25)*, *EX3 - Instructions (3GI3-W25)*, *E3 Introductory Video* before reading this **Supplementary Guidelines**.

These slides are only provided as tips that may help you deal with tasks and questions, but they should never become rigid workflow sheets to limit your imagination or inner drive to learn and explore things.

# 0. Initial Processing of the 5m Stoney Creek DTM

- Refer to tools and steps in E2 when producing the SWOOP
- Coordinate Systems
    - PCS: NAD 1983 CSRS UTM Zone 17N
    - GCS: CGVD 1928
    - File format: 32bit float
- Key question here: How to Set Null for those cell values of 0?
- Remember to Resample them into 5-m resolution (also select the proper resampling technique!)

# Part I. Predict Floods with Unit Hydrographs

- **Key principle:** refer to the Stowe tutorial as something to model after, but for the 2nd and the 5th task refer to the replaced steps in the E3 official guidelines.
- When using the Tasks in the Stowe ArcGIS Pro project, you could change the default geodatabase into the one in the SWOOP project. It's ok if you don't do this, but then all your output files would be stored in the Stowe Geodatabase, so be careful of that.
- The shapes and the number of basins you get after Basin tool in Step D (ii) might be different from the sample picture. It might be ok, just select the watershed region roughly situated the same place as in the picture. Also the Gridcode of that might not be 656.

# **Deliverable 1: 1 Layout of Isochones** (15 marks)

- Must be inserted to PDF as an entire page!
- Map elements:
    - **Basic Elements (**refer to Map Rubrics on A2L**)**
        - ✓ Clear **boundary** line
        - ✓ Informative **title** (e.g., theme, area (can be called “Stoney Creek – Battlefield Creek Watershed”), …)
        - ✓ **Legend** (e.g., layer title, units, decimals, …)
        - ✓ some form of **orientation** (north arrow? graticule? measured grids?)
        - ✓ a **scale** indicator (scale bar? texted scale ratio?)
        - ✓ **credits** (e.g., data source, projection (HCS/VCS) info, (c) your name, your institution, creation date of the map, …)
    - a **labelled histogram** on your layout showing the distribution of flow times in the watershed.
        - ✓ Take care of: title, x-axis label, y-axis label, …

# **Deliverable 2: Line graph of the unit hydrograph** (10 marks)

- Take care of: title, x-axis label, y-axis label, …

# Part II. Surficial Hydrologic Modelling

- **Preprocessing the MRDEM data**
    - Mask to City of Hamilton Region
    - Coordinate systems
    - Create an extra Hillshade
- Review Pat's course slides and videos to figure out how to calculate *sink depths*
- Review Pat's course slides and videos to figure out how to get the *watersheds* and the corresponding *stream network based on flow accumulation being greater than 10000*.

# **Deliverable 3: A layout** containing sinks categorized by the *depth of the sink* (15 marks)

- Must be inserted to PDF as an entire page!
- Displaying sinks that are **greater than 1m** deep
- **Hillshade effect**: drawn on top of a **hillshaded** DEM of the City of Hamilton
- Map elements:
    - **Basic Elements (**refer to Map Rubrics on A2L**)**
        - ✓ Clear **boundary** line
        - ✓ Informative **title** (e.g., theme, area, …)
        - ✓ **Legend** (e.g., layer title, units, …)
        - ✓ some form of **orientation** (north arrow? graticule? measured grids?)
        - ✓ a **scale** indicator (scale bar? texted scale ratio?)
        - ✓ **credits** (e.g., data source, projection (HCS/VCS) info, (c) your name, your institution, creation date of the map, …)
    - Could use a darker background if the map area is white or grey.
    - Could add notes by saying something like: “map displaying sinks of depths greater than 1m ”

# **Deliverable 4: Procedures + Model** (10 marks)

- 5 marks for the description, 5 marks for the model
- “For written responses, you may include **graphics, workflow steps, or additional analyses** to support your answers.”
- Keep track of all the tools and write procedures for this tool (e.g., What is the tool? Why it is used? What parameters I set? What kind of results I get (can list numebrs)? Is a a mathematical equation I could write here?)
- Model in ModelBuilder
    - Write **Labels for each step** and **rename the output** files
    - crop your screen-capture or export it directly into a PDF/SVG (then convert it into JPEG/PNG)
    - Don’t leave any parts in grey color

# **Deliverable 5: A layout** containing *watersheds* and the corresponding *stream network* based on *flow accumulation* being greater than 10000 (15 marks)

- Must be inserted to PDF as an entire page!
- **Hillshade effect**: draped on top of a **hillshaded** DEM of the City of Hamilton
- Map elements:
    - **Basic Elements (**refer to Map Rubrics on A2L**)**
        - ✓ Clear **boundary** line
        - ✓ Informative **title** (e.g., theme, area, …)
        - ✓ some form of **orientation** (north arrow? graticule? measured grids?)
        - ✓ a **scale** indicator (scale bar? texted scale ratio?)
        - ✓ **credits** (e.g., data source, projection (HCS/VCS) info, (c) your name, your institution, creation date of the map, …)
    - Could use a darker background if the map area is white or grey.
    - Since this one might not produce a legend, so **should** add **notes** by saying something like "[number of] watersheds are created based on [criterion]"

# **Deliverable 6: Procedures + Model** (10 marks)

- Refer to Deliverable 4
- Think about what tool you could use to get the stream rankings for answering the two question.

# **Deliverable 7: ONE layout** containing three different stream networks and their corresponding watersheds (15 marks)

- Should change the value of 10000 to different values
- Remember to apply **Hillshade effect**
- Check Map element requirements in Deliverable 3

# **Deliverable 8:** five ways to improve the **accuracy** of the analysis (10 marks)

- Tips
    - Write in bullet points
    - write key terms first, then scientific language as explanation, at least three sentences
    - Can include “graphics, workflow steps, or additional analyses to support your answers.”
    - Be cautious using AI

# Final Submission

- 1 single PDF Document
    - ***Any map (always worth 15 marks) must be a full page, either in portrait or landscape depending on the orientation of the map!!!***
    - *Cover page contains: the exercise number and name (Exercise 3: Hydrologic Modeling), your name, submission date, and your TA's name.)*
    - *Use 12-point font, 1.5 spacing between lines and 1-inch borders*
    - *Correct all spelling and grammatical mistakes/issues*
- Due date: please submit to the Avenue Drop Box by **Monday, March 10, 2025 at 8:00AM.**