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THE NATIONAL GEOSPATIAL CONFERENCE

Presented at the FIG Working Week 2025,
6-10 April 2025 in Brisbane, Australia
FIG **Geospatial**
Council of Australia

Collaboration, Innovation and Resilience: Championing a Digital Generation

Brisbane, Australia 6-10 April



Streamlining GIS Workflows

Leveraging ChatGPT for Python Automation in ArcGIS Pro and ArcGIS Enterprise

John Bickmore – Senior Spatial Analyst, WaterNSW
In collaboration with ChatGPT



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Key Takeaways

- The role of Python and AI in GIS
- How AI-generated Python scripts were used to assist WaterNSW migrate from ArcGIS Enterprise 10.9.1 to 11.3 and ensure logical structuring of data and improved management of metadata
- The process of refining AI-generated code iteratively



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WORKING WEEK 2025

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Collaboration, Innovation and Resilience:
Championing a Digital Generation



Geospatial Council of Australia

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WaterNSW - Who we are – in numbers *in FY23



41 Major dams

20 & 21

in regional NSW

in Greater Sydney

Warragamba Dam is one of the largest urban water supply dams in the world.

The lake created by damming the Warragamba River is **four times the size of Sydney Harbour** and stores up to 80% of Sydney's water.

~10000

people serving our customers and communities

Delivering two-thirds

of water used in NSW

Almost 50%

of our people are based in the regions

465 GL of water delivered to Greater Sydney*

4023 GL

of rural water delivered to our customers*

16 K Km² of Greater Sydney's drinking water catchment

41 K licensed water users

4 K

enquiries into our call centre each month

900+

river monitoring gauges

300+

weirs

5 K+

water licensing applications processed per year

3.5 K

students educated via curriculum-linked excursions*

760

water sources providing real-time data

70 K+

visitors to Warragamba Dam Visitor Centre per year

30

Customer Advisory Group (CAG) meetings per year

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Australian Government

CHCN AV

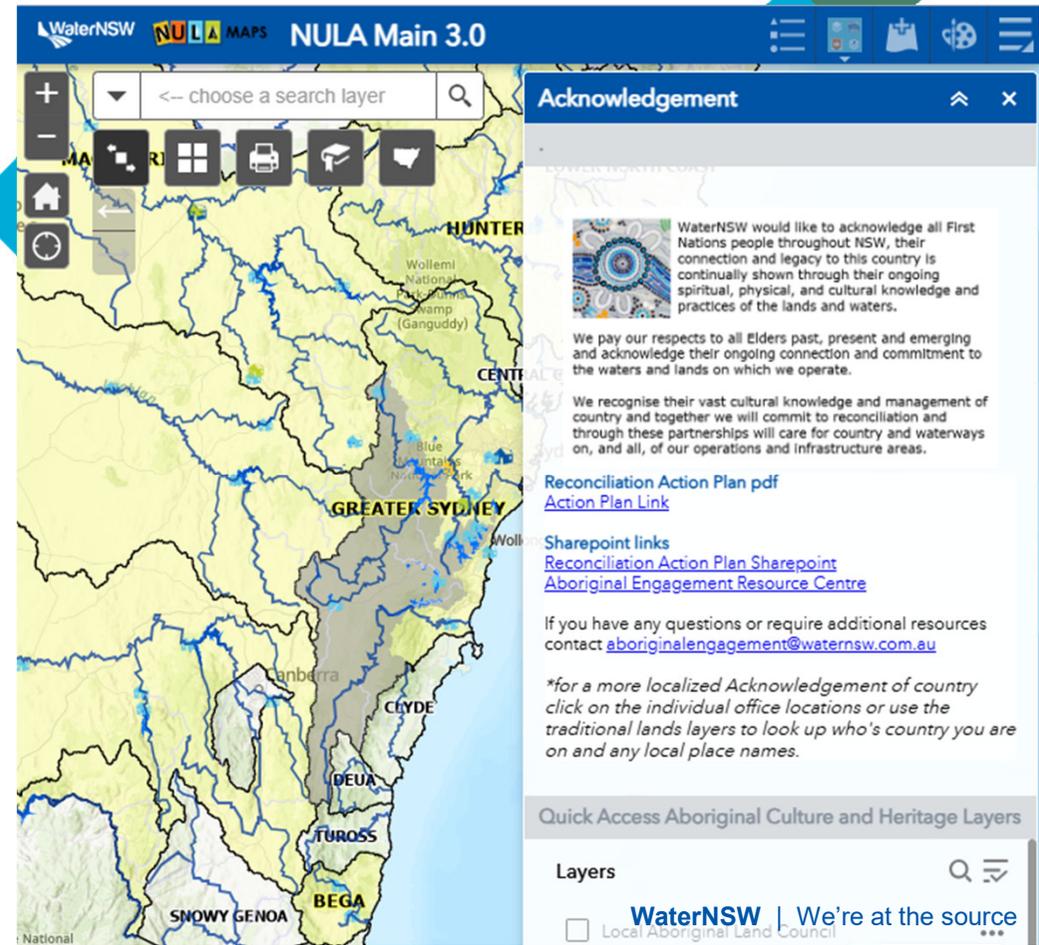


THE SCIENCE OF WHERE™



Why do we need Python?

- GIS Data is big and getting bigger
- GIS functionality is expanding and updating constantly
- Managing hundreds of GIS layers and services manually is slow and error-prone
- Python scripting can automate repetitive GIS tasks
- But writing scripts manually is time-consuming and requires knowledge of Python



The role of AI

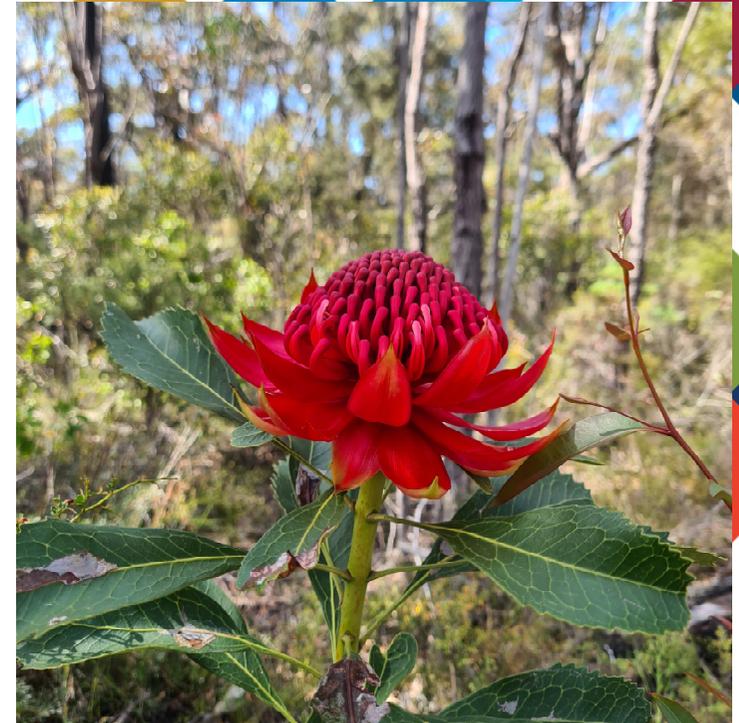
- ChatGPT can help GIS professionals generate Python code efficiently and accurately
- Can write 100s of lines of code in seconds
- AI allows non-coders to access the power of Python
- **No extensive coding experience needed! – basic GIS knowledge and logical structuring of requests are key**



GIS Challenges in Large-Scale Data Management

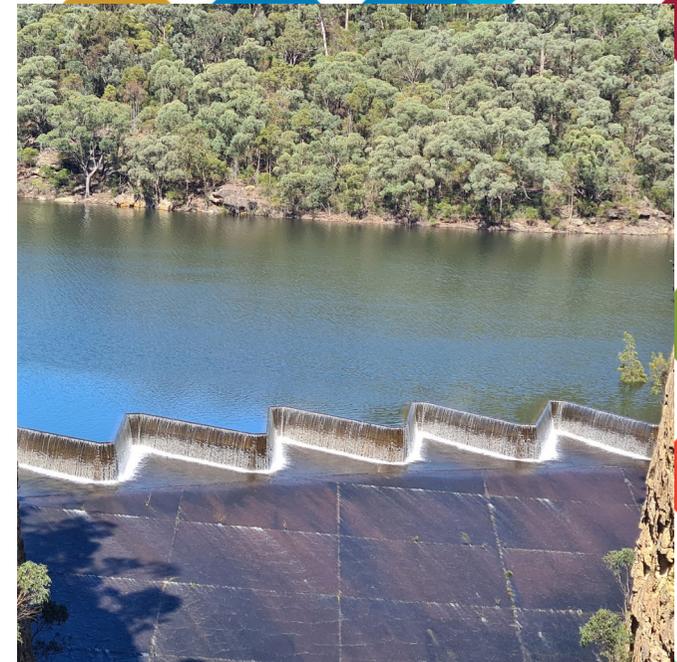
Managing Thousands of GIS items: The Need for Automation

- Migration from ArcGIS Enterprise 10.9.1 to 11.3 presented unique challenges
 - The 10.9.1 environment was corrupted, preventing a direct upgrade
 - The new 11.3 environment needed to be built from scratch, providing an opportunity to implement structured organization from the start and to standardize feature class nomenclature during migration
 - 4-week overlap before shutting down the 10.9.1 environment
 - Scripts needed to be compatible with Pro 3.0



SCRIPT 1 - Creating ArcGIS Pro Projects from CSV Data

- **PLR** – Give me a script to use in command line for Pro 3.0 to create 15 Pro projects with maps. Project names are in column A of WSD.csv and Map names are in Column B. Template Project is
 - 14 Projects with 93 Maps – each Map represents a service in Enterprise
 - Initial ChatGPT-generated script attempted to create new maps but faced Python limitations. Python could rename an existing map but was unable to create a new map.
 - ChatGPT will not admit defeat – After over 10 iterations it was recycling code that had not worked.
- **Updated PLR** – I have updated the template to contain 15 maps. Can you rename the maps according to column B instead of creating a new map
 - Python created projects and renamed maps based on the CSV file
- **Update 2** – Can you populate metadata from columns
 - Ensured projects had pre-named, structured maps with filled-in metadata fields



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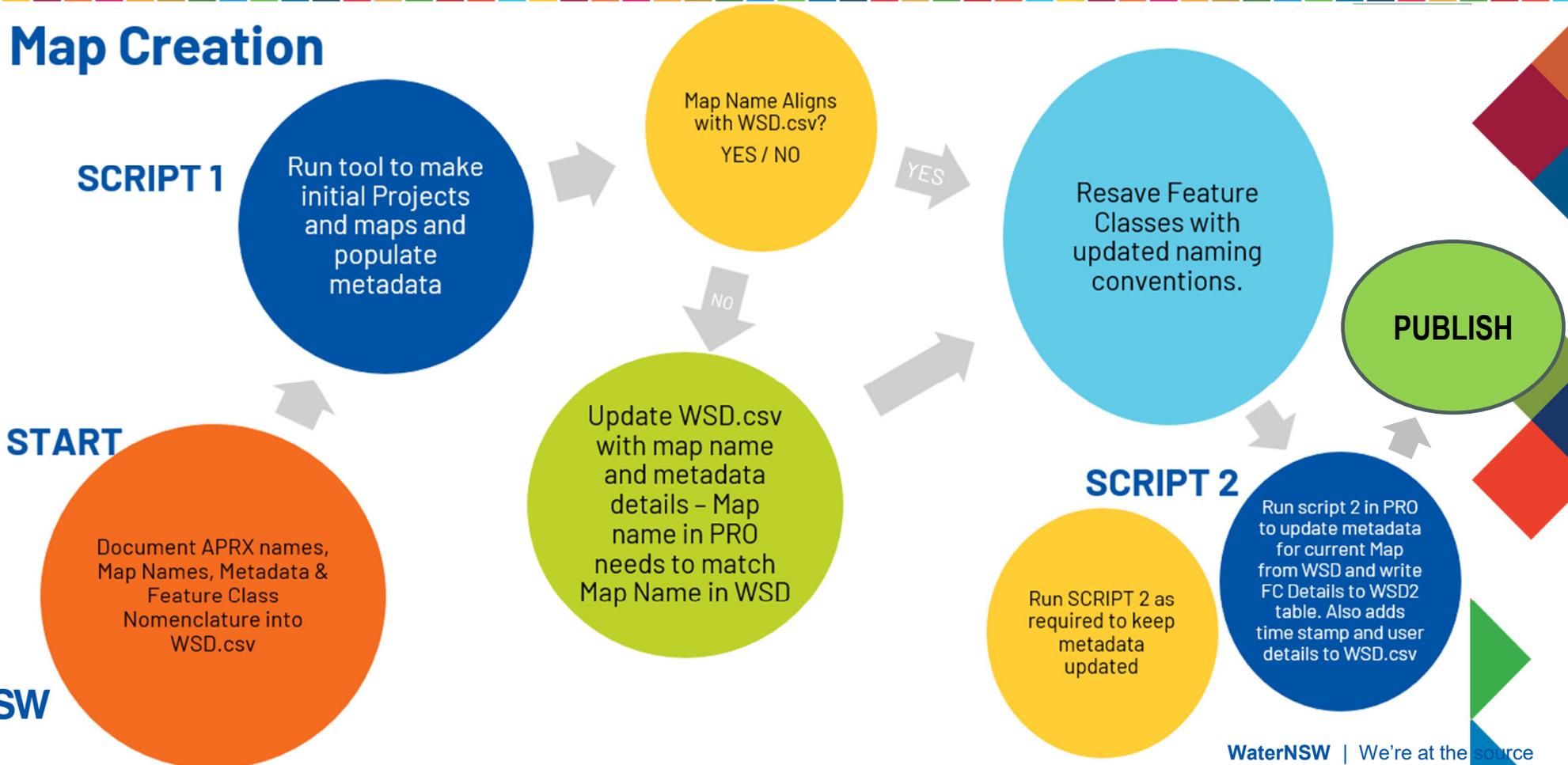
SCRIPT 2 – Updating Metadata & Feature Class Tracking

- **PLR** – Can you update the script below to work in the Python window of ArcGIS Pro 3.0 to update metadata for the current map in the TOC.
 - User needed to ensure that WSD.csv was updated with metadata details and MAP name matched current map.
 - WSD.csv became the single source of all metadata
- **Updated PLR** – Can you also list all the items in the TOC to csv2 and include any definition queries, projections and data source.
 - The script tracked all feature classes in each map and listed them to a second CSV with def queries, projections and other attributes
 - Enabled understanding of data usage and implications of changes





Map Creation



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The Iterative Process – Refining AI-Generated Code

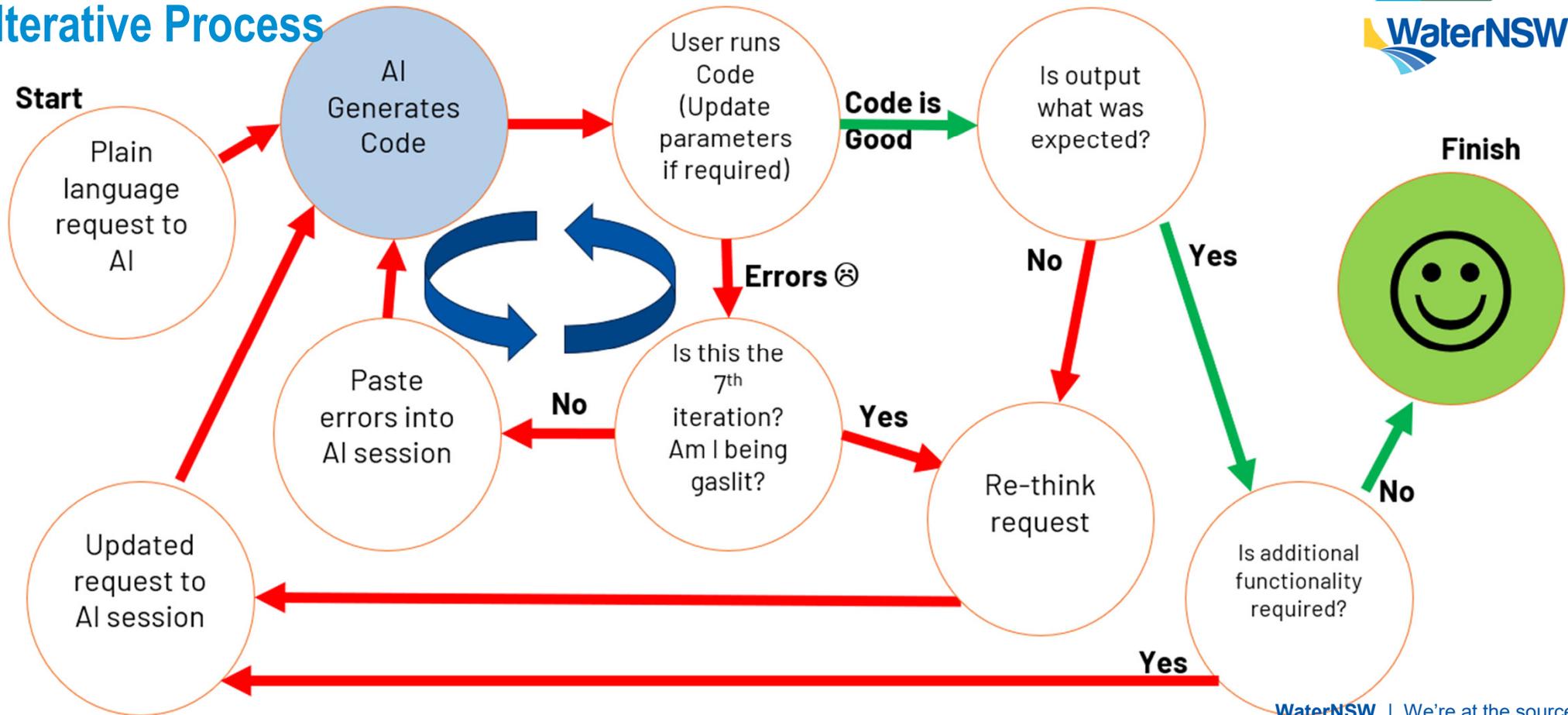
Improving Python Scripts Through Iteration

- AI-generated scripts often needed refinement. Depending on the complexity of the request it is unlikely to work on first attempt
- Challenges faced:
 - Syntax errors and unexpected limitations.
 - Realization: Python couldn't create new maps but could rename existing ones.
- Iterative process:
 - Generate code → Test code → Review errors → Refine code → Repeat.
- Outcome: Fully functional workflow integrated with GIS systems.





The Iterative Process



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The Iterative Process – Asking the Question

Plain Language Specific Version Context



Can you write me a python code to use in ArcGIS PRO version 3.0 that works with the current map.
The code should write the name of the current map, current aprx, current user as well as data and time to this csv -
C:\CodingStuff\MapNames.csv

Here is a Python script that will work in ArcGIS Pro 3.0. It retrieves the current map name, ArcGIS Pro project name, current user, and the date and time, then appends this information to a CSV file at C:\CodingStuff\MapNames.csv.

Steps:

1. Open ArcGIS Pro.
2. Run this script in the Python window or save it as a script tool.

```
python
import arcpy
import os
import csv
from datetime import datetime
import getpass

# Define output CSV file
csv_file = r"C:\CodingStuff\MapNames.csv"

# Get the current ArcGIS Pro project
aprx = arcpy.mp.ArcGISProject("CURRENT")
```

```
print(f"Data written to {csv_file}")
```

Output Example (C:\CodingStuff\MapNames.csv):

```
mathematica
Project Path,Map Name,User,Date & Time
C:\Users\john.bickmore\Documents\MyProject.aprx,WaterInfrastructureMap,john.bickmore,2025-
```

Explanation:

- Gets the current ArcGIS Pro project (aprx).
- Retrieves the first available map (current_map).
- Gets the current username (user).
- Captures the current date and time (current_datetime).
- Appends this information to C:\CodingStuff\MapNames.csv.
- Adds headers if the file does not exist.

Let me know if you need modifications!

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Is this conversation helpful so far? 👍 👎 ✕



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The Iterative Process – Refining AI-Generated Code

```
Traceback (most recent call last):  
  File "<string>", line 30, in <module>  
FileNotFoundError: [Errno 2] No such file or directory:  
'C:\\CodingStuff\\MapNames.csv'
```



It looks like the directory `C:\CodingStuff\` does not exist. The script is trying to write to a CSV file in a non-existent folder.

Solution

Ensure the directory exists before writing the file by adding a check to create the folder if needed.

Updated Code

```
python Copy Edit  
  
import arcpy  
import os  
import csv  
from datetime import datetime  
port getpass
```

REPEAT as required

If errors persist – consider rethinking the question or make suggestions to ChatGPT

Your requests will improve over time

You will learn with every iteration and request

You will never code as fast as the AI

Security & Compliance Considerations

- No sensitive data was shared with ChatGPT
- Scripts were designed to handle credentials locally
- AI-assisted automation must adhere to organisational security protocols



Future of AI in GIS Workflows

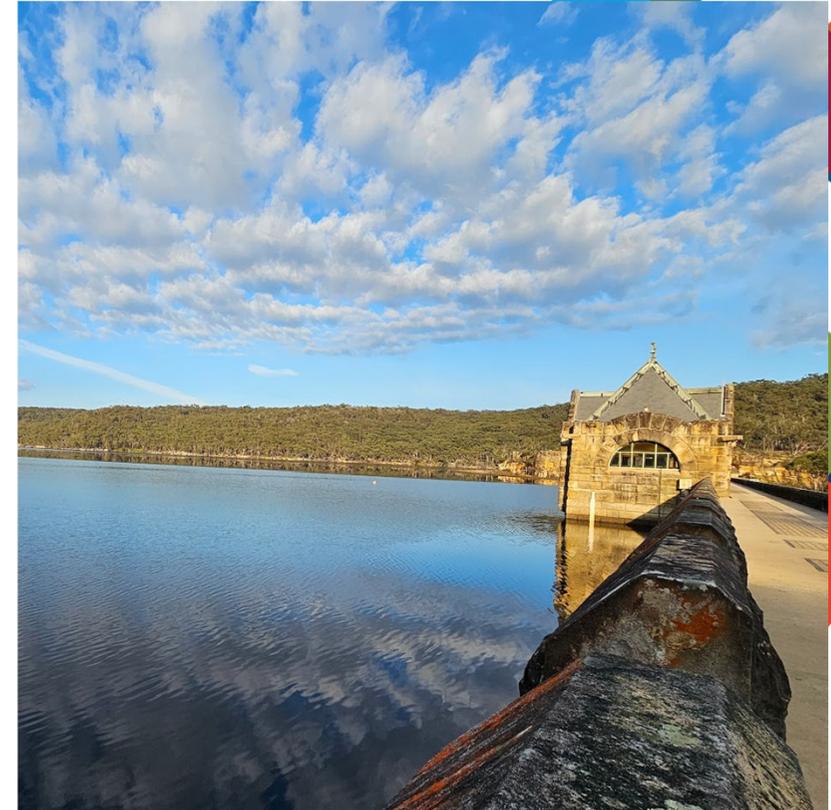
- Python can be used in all aspects of GIS
- The opportunities for AI to assist in all aspects of GIS are nearly endless.
- Create Python toolboxes for everyday tasks
- Updating existing Python 2 code to 3 code
- Arcade Scripting for popups and elsewhere
- Ask the AI what it can do - **Ask about basic processes that you do every day – You might be surprised to find some more efficient ways to get your job done**
- The AI is improving
- PRO AI Assistant & Metadata Assistant (BETA 3.4)??



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Lessons Learned and Best Practice

- Start with the minimum requirements
- Use plain language, include any versions of software in your plain language request and context
- Paste any errors back to ChatGPT as many times as needed
- If errors persist – think about other ways to achieve the required result
- Once code is working, you can ask ChatGPT to add enhancements to improve your code
- Do not give ChatGPT admin credentials or any sensitive information
- **ChatGPT will not judge you for asking very basic questions**



The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



2nd relevant SDG

6 CLEAN WATER AND SANITATION



3rd relevant SDG

10 REDUCED INEQUALITIES



SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals



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Thank you
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