

Avoiding the GIS-Model Disconnect:

Identifying the major hurdles associated with hydraulic model creation and updating from GIS



Hydraulic Model & GIS Specialists
For Water & Wastewater Systems



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Introduction



- GIS and Model Integration is the future
- Benefits of Integrating the Model and the GIS
 - Goal: Build and update models faster
- Potential Difficulties exist
 - GIS may not be designed with modeling in mind
 - Initial Model creation can experience many hurdles
- Goal of this talk:
 - Identify the hurdles so they can be addressed



Hurdle #1: Rally the troops and plan your attack



- Knowing who should be involved is half the battle
- Knowing where you are going is the other half
- What to do:
 - Identify key stakeholders and decision makers
 - i.e. GIS, modeling, management
 - Identify key goals and purposes:
 - What will the model be used for?
 - Who will maintain what
 - The model..., the GIS...
 - What resources are available for this task?
 - Do we need outside assistance?

Hurdle #2: Watch Out for Identity Theft



- Modeling requires a unique ID
- The GIS feature class object ID may not be unique across the entire GIS
- Other Key ID Requirements
 - Needs to remain unique in the GIS
 - Can't be re-indexed
 - Not to be reused
- Can use a separate MODEL_ID for key elements

Hurdle #3: What's Hot and What's Not

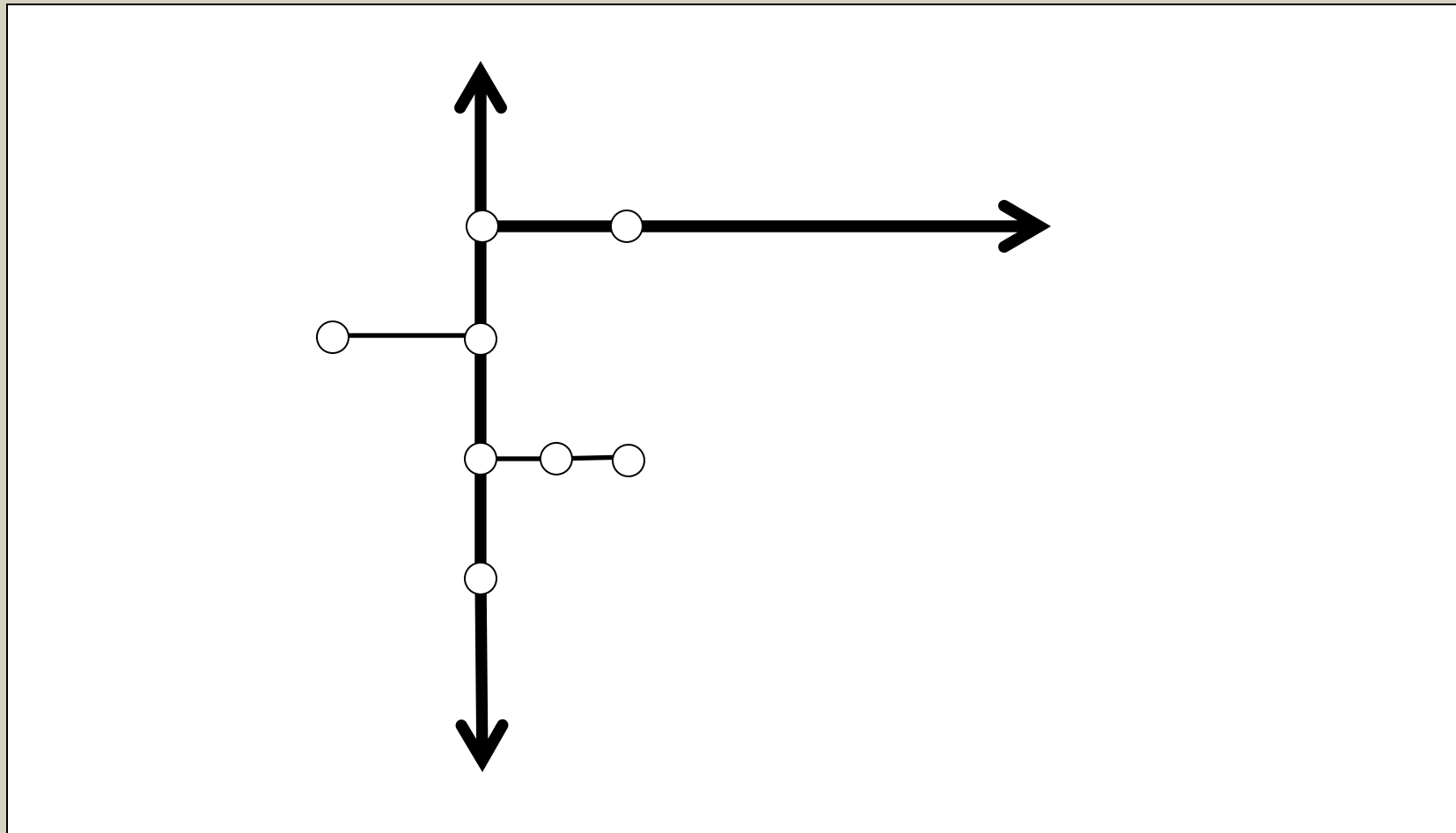


- Not all elements in the GIS will be in the Model
 - **“What's Hot”** – What is included
 - **“What's Not”** – What is excluded
- Typical elements included
 - Mains and elements at Main endpoints
 - Major Lateral lines that split mains (+ their points)
- Potential solutions
 - Make all elements in a subtype “in” or “out”
 - Use a field in the GIS to assist
 - i.e. -”IN_MODEL” (YES or NO)
 - Initially determined by the modeler
 - Consistency allows for automatic query use

Hurdle #3: What's Hot and What's Not



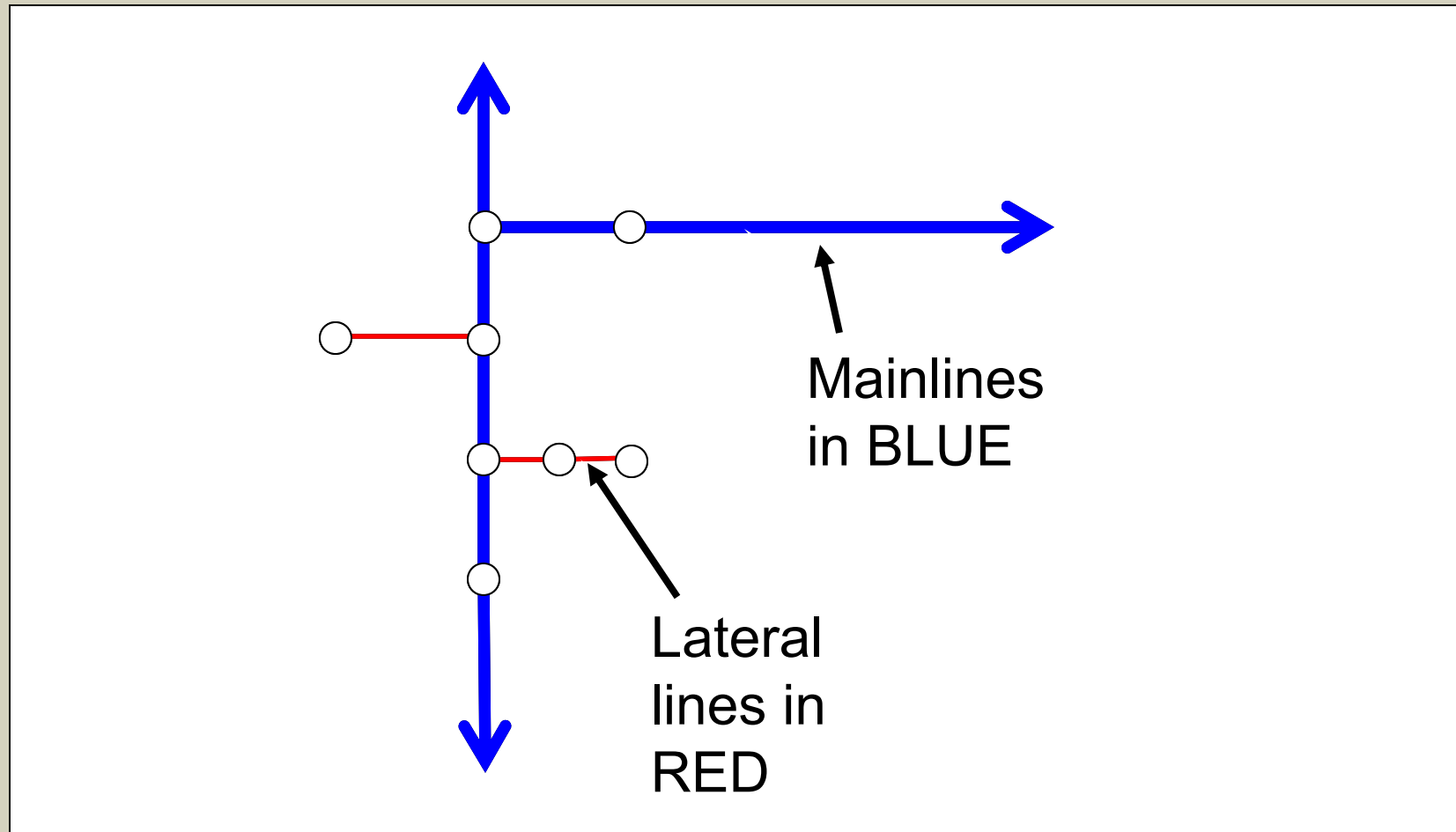
- -- GIS elements



Hurdle #3: What's Hot and What's Not



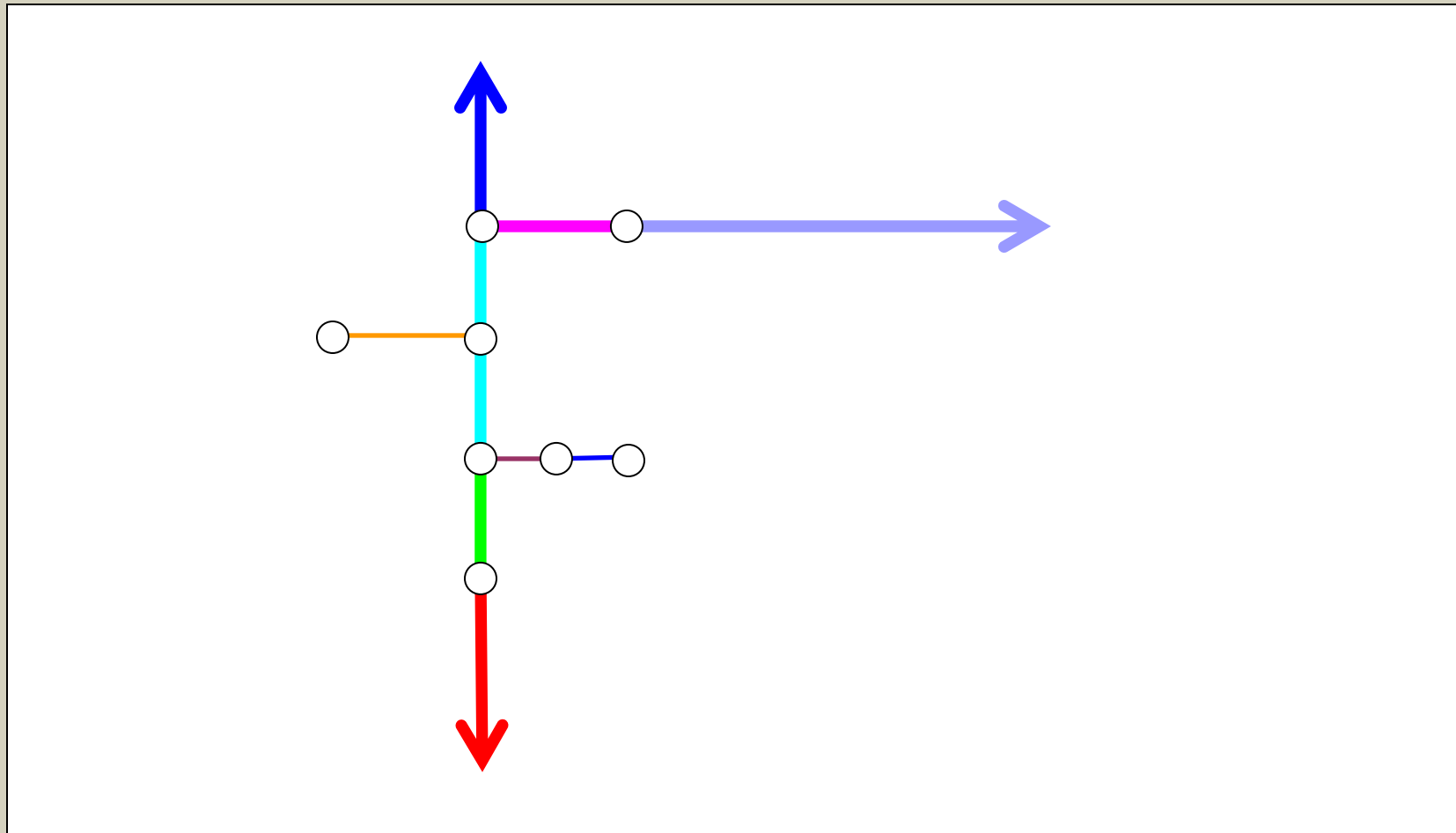
- Mains vs. Laterals



Hurdle #3: What's Hot and What's Not



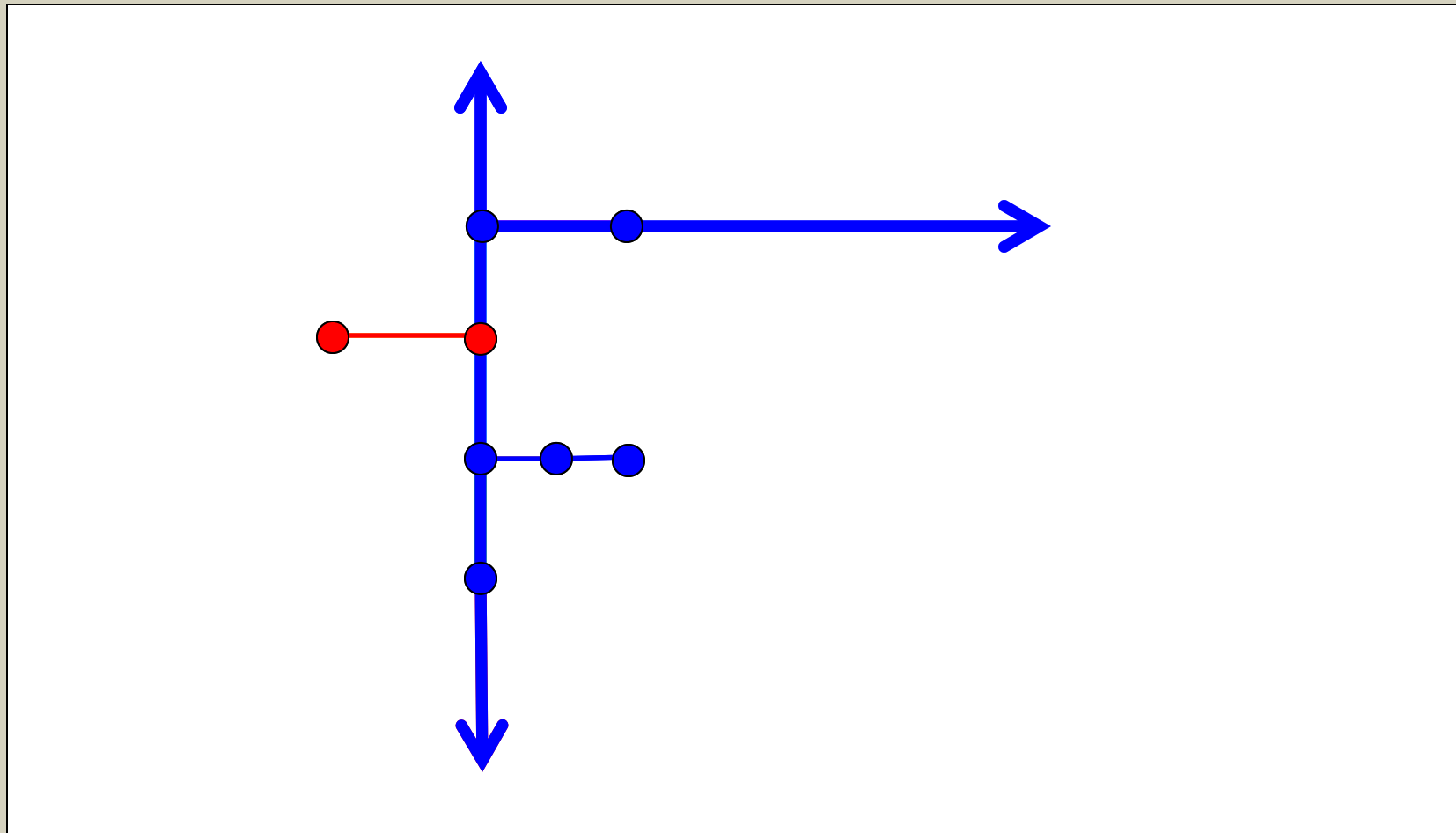
- What splits the mains?



Hurdle #3: What's Hot and What's Not



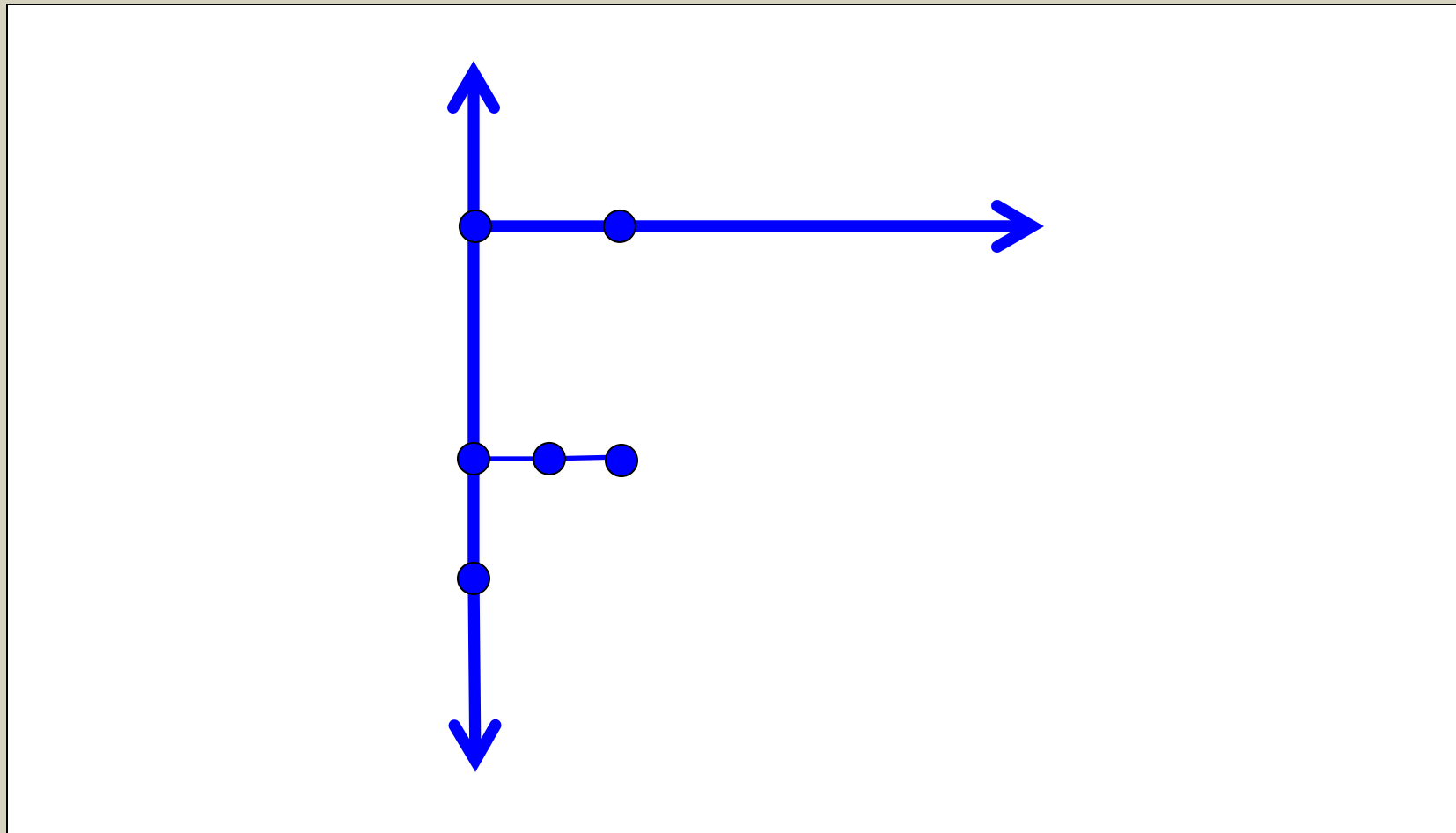
- What's in - what's out



Hurdle #3: What's Hot and What's Not



- Final Model Data



Hurdle #4: Don't Get Lost in Translation



- GIS feature classes \neq Model element types
 - Must Translate GIS \rightarrow Model
- Model Elements
 - Six primary types
 - Junctions, Pipes, Valves, Pumps, Tanks, Reservoirs
 - Some model platforms have more...
- Potential Solutions
 - Make all Feature class subtypes translate to a single model element type
 - Use a field in the GIS to assist in translation
 - i.e. - "MODEL_TYPE"

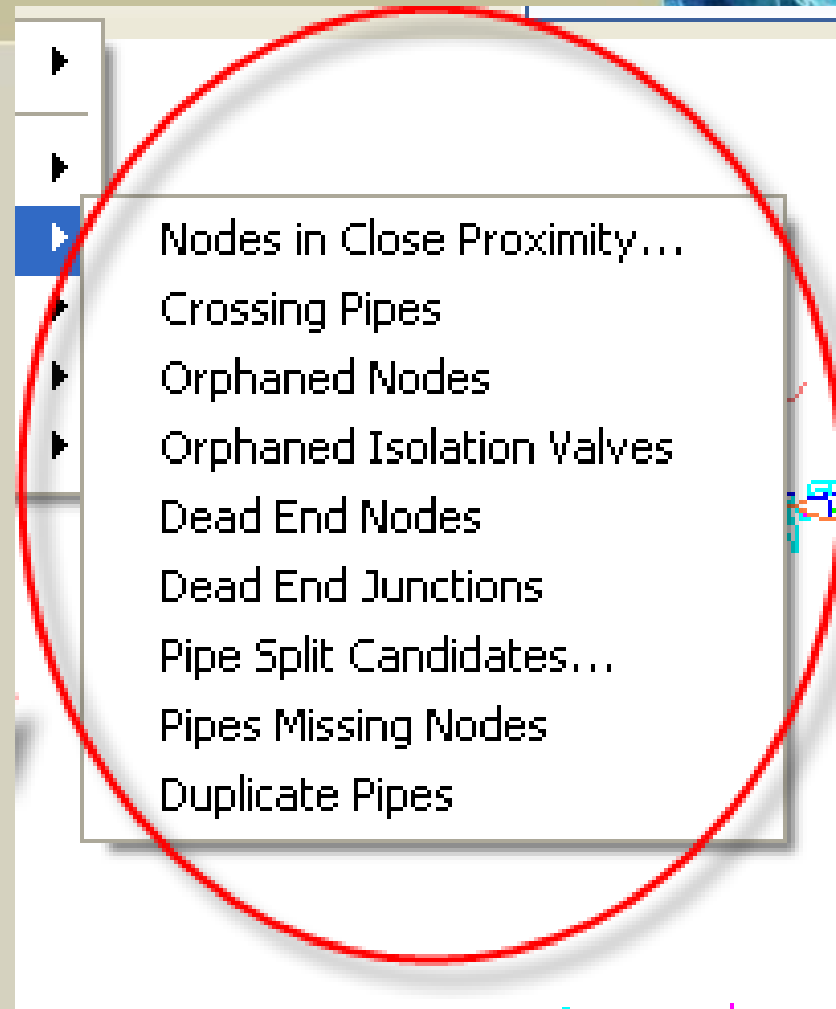
Hurdle #5: Leg bone connected to the knee bone



- How elements are connected together (i.e. their topology) is very important for models
- Many topological issues are not obvious in map applications
 - (so may be easily overlooked in GIS)
- Modeling requires very specific topological rules and considerations within the GIS
 - Topology shows how pipes and water can flow (affects system hydraulics)
- Geometric Networks can resolve many typical issues observed
 - *unfortunately problems can still arise!!*



Hurdle #5: Leg bone connected to the knee bone



- *Model software tools can identify topological problems*



Hurdle #5: Leg bone connected to the knee bone



Key GIS Items to Verify/Change

- Ensure all pipes are split at “major” points
- Ensure pipes entering and exiting pumps and valves follow the expected flow of water.
- Develop a process to Address topology and/or connectivity issues
- Track and maintain TO_NODE and FROM_NODE for all pipes

Hurdle #6: Facilities are High Maintenance

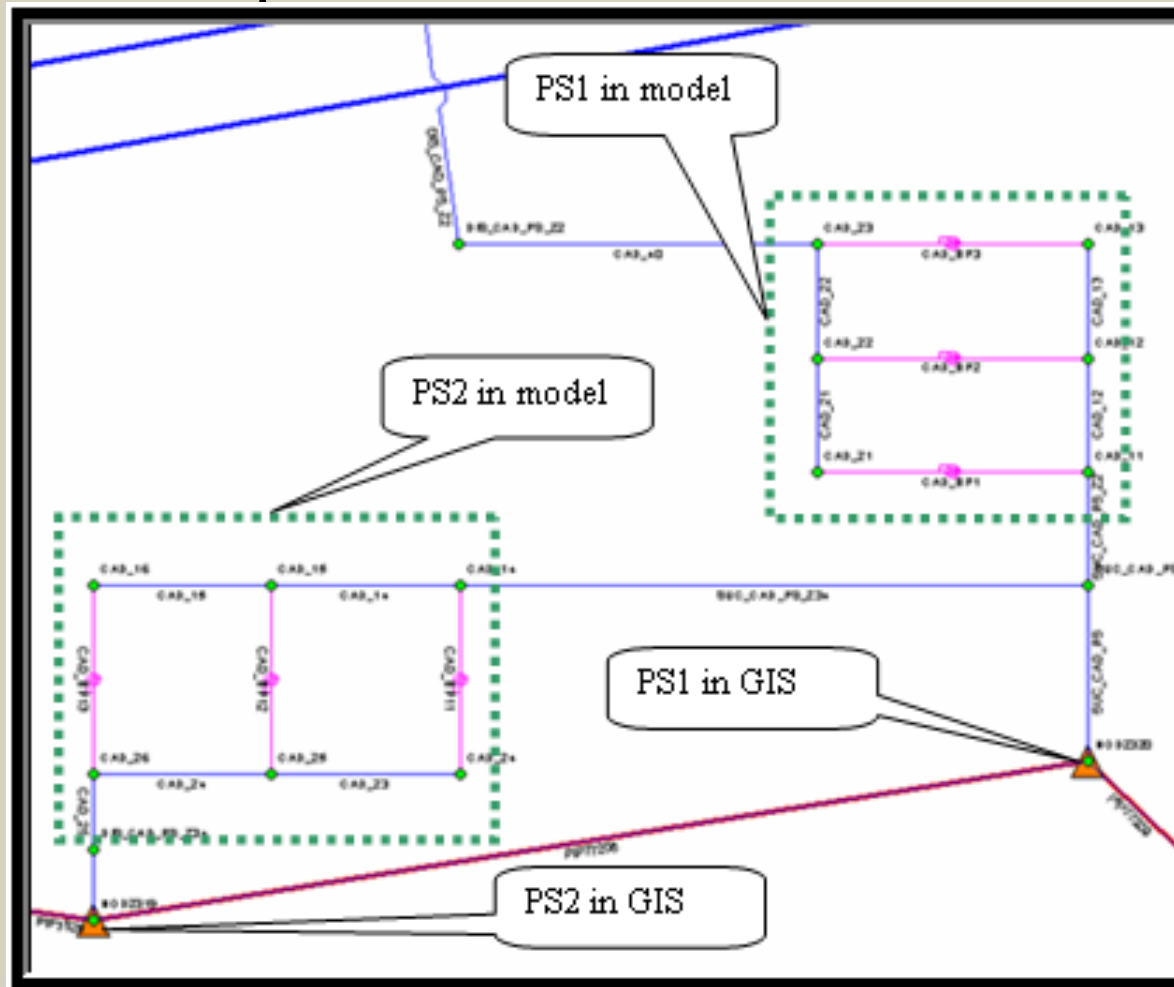


- Facilities are often forgotten or treated without much thought in GIS
 - Why? -*Don't need the detail in most maps!*
- Model Facilities require special considerations
 - Additional elements may be required
 - Wells
 - Purchased water connections
 - Some elements may have to be combined
 - Multiple reservoirs
 - Some may have to be added
 - “Point type” pump stations
 - identify the suction and discharge node in GIS
 - Control valve stations

Hurdle #6: Facilities are High Maintenance



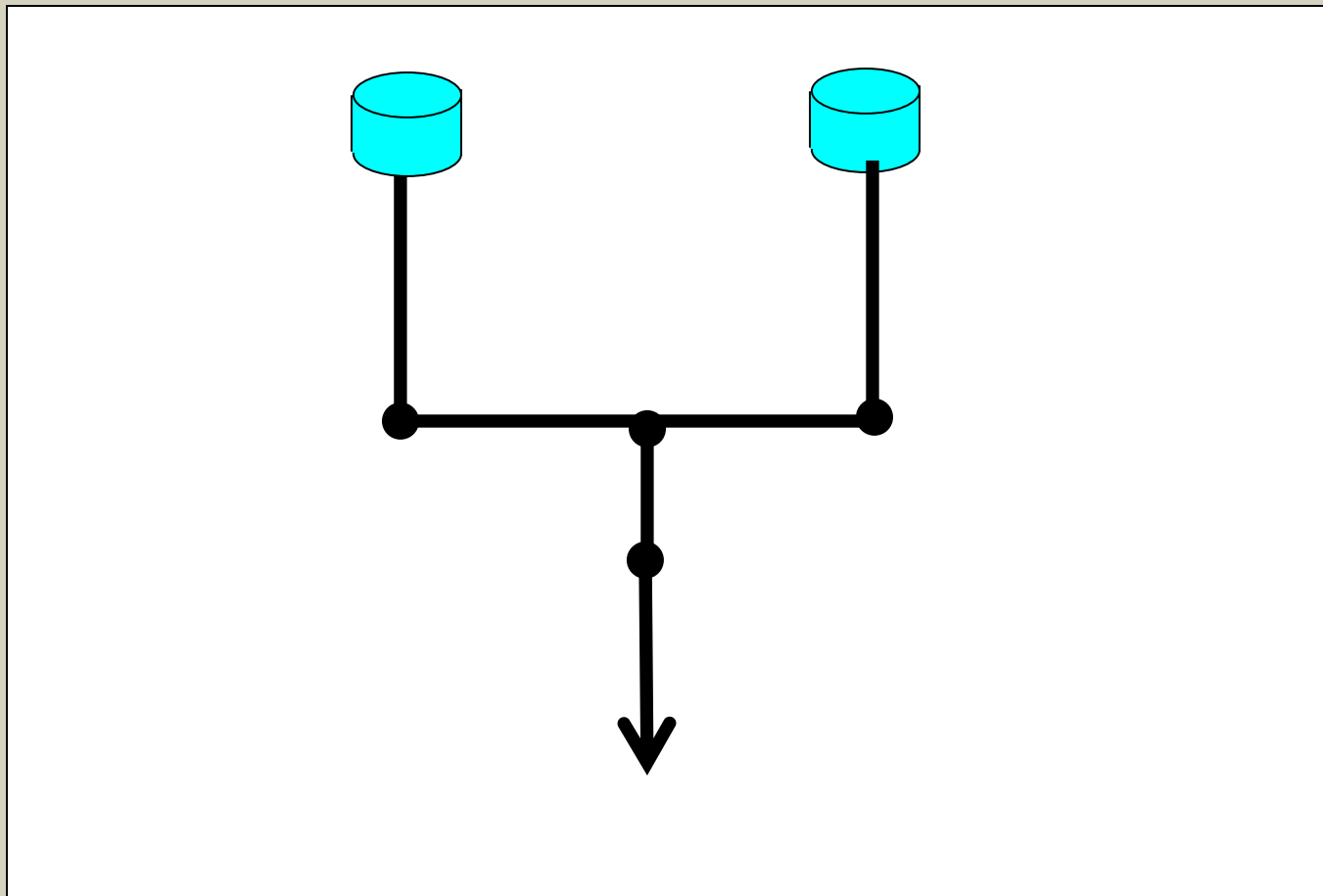
Pump Station Representation in GIS and the Model



Hurdle #6: Facilities are High Maintenance



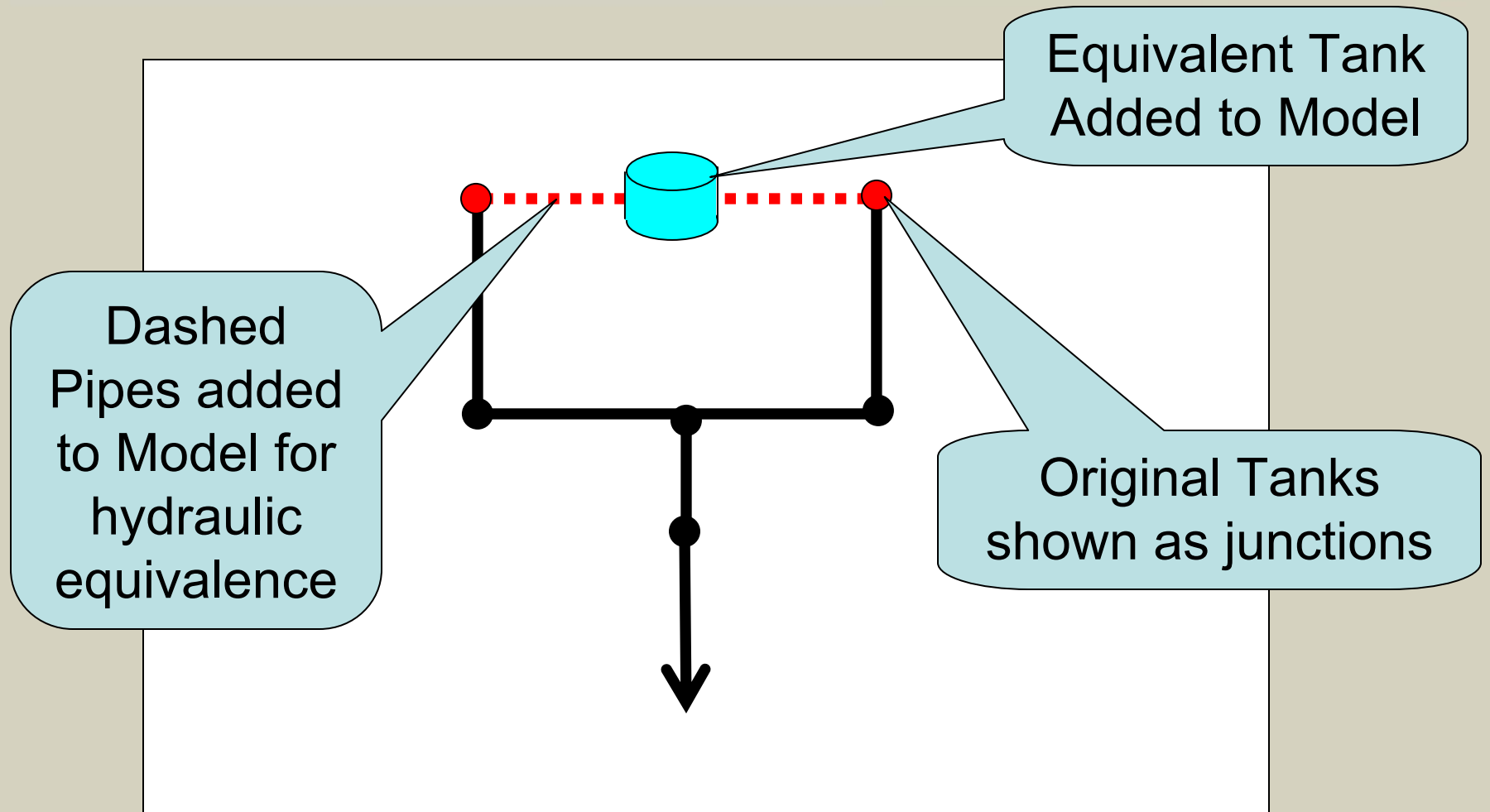
Multiple Reservoirs in GIS



Hurdle #6: Facilities are High Maintenance



Multiple Reservoirs in Model



Hurdle #7 – Be a Bean Counter



- Track certain key model data in GIS
- Key fields
 - IN_MODEL, MODEL_TYPE (*noted earlier*)
 - Other Helpful Fields
 - Demand Junction
 - Fireflow Assignment
 - Pipe C-factor
- Key Point: This can save time in updating
 - *Why?* – A High % of elements do not change

Hurdle #8 - Obituaries and Makeovers



- Tracking deletions and changes in the GIS
 - Deleted elements in the GIS may have to be manually removed
 - Focus on changed elements
- Potential Solutions:
 - Use Feature Class for deleted elements
 - Use Field to identify date edited
 - Use Software tools to identify changed and/or deleted elements
 - FME Desktop – *by Safe Solutions*

Hurdle #9: New Paint or Extreme Makeover?



- Clear understanding of model update process
- Updates involve more than just elements and geometry
 - Model demands
 - Scenario Set-Up
 - Propagate data to scenarios
 - Copy data from old models
 - Results Verification & Validation checks

Understanding what is involved and having a plan!!

Hurdle #10: Get a game plan together

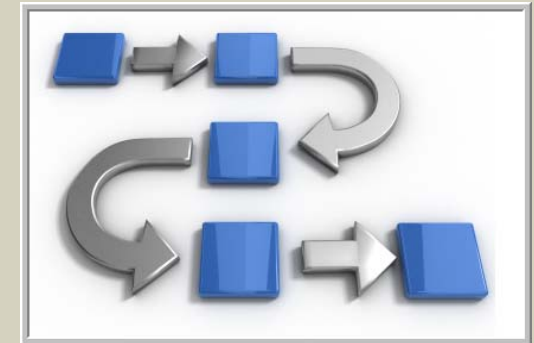


- Develop a flowchart of the update process
 - Who does what
 - What are the major steps
 - Use the results from previous hurdles
- Pilot studies are helpful
 - Identify oversights and work out the kinks
 - Finalize the plan
- Bring the plan into full implementation
- Final plan is a living document

GIS-TO-MODEL UPDATE STEPS SUMMARY



1. Save an archive copy of latest Model
2. Export GIS data to be Modeled
3. Translate GIS to model elements
4. Remove deleted elements from Model
5. Import new GIS data to Model
6. Perform QA and topology checks
7. Update key missing data for new or changed elements
8. Reassign Model demands
9. Update scenario specific data
10. Validate Model performance
11. Export Model specific data back to the GIS



Final Thoughts...



- GIS-Model Integration is the ***future!***
- Don't get tripped up on the hurdles!
- Plan the work and work the plan...
- The ideas presented here are meant to help get the process started
- The best solutions are often client specific





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