



From LiDAR Terrain to NHD Local Resolution: Urban and Rural Workflows

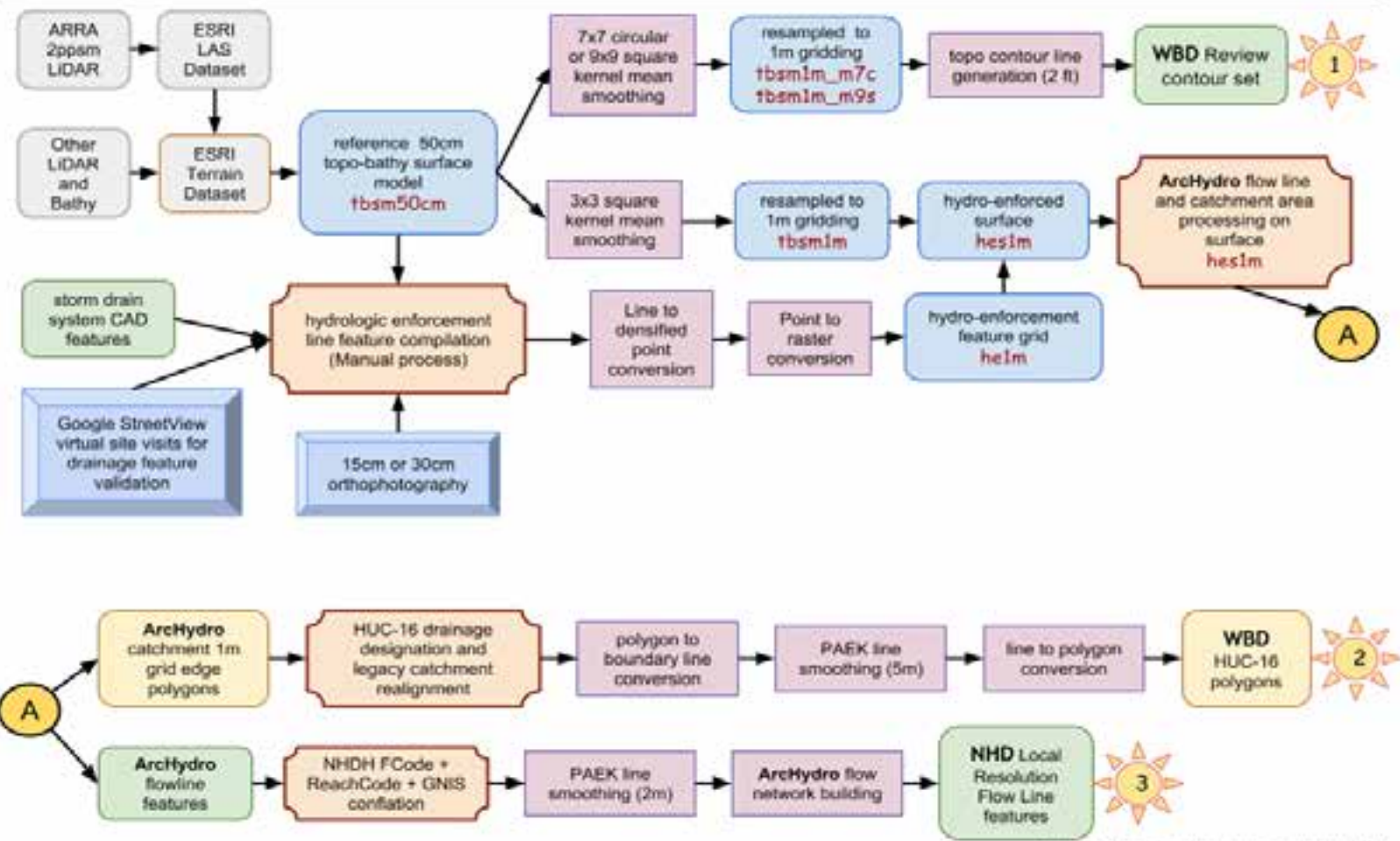
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City and County of San Francisco

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Data CSUMB SFML, CA OPC
Data LDEO-Columbia, NSF, NOAA

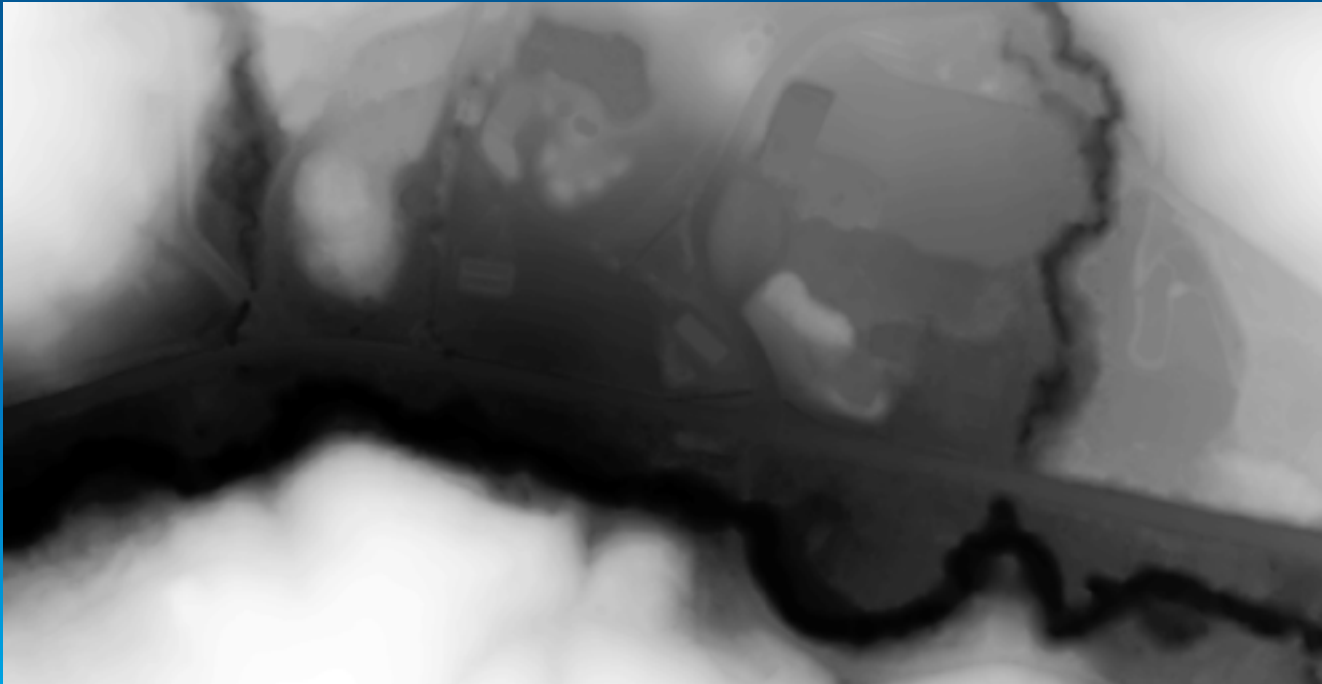
Google earth

California: Marin County NHD Local Resolution + WBD HUC-16 Schematic Data Flow



LiDAR-derived Terrain using ArcGIS for Desktop 3D Analyst

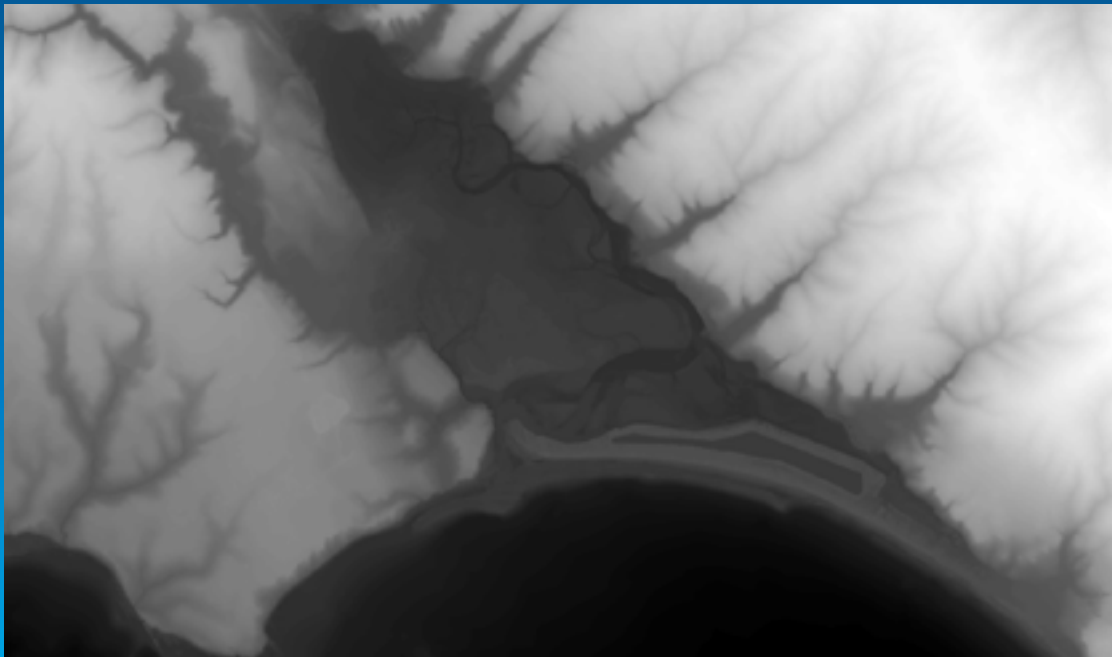
- **Not point cloud: LAS-to-multipoint, Esri Terrain Datasets**
- **Terrain-to-raster with Natural Neighbors interpolation**
- **2ppsm = 50cm gridding, smoothing to 1m gridding**
Much stronger smoothing if extracting contour lines



**San
Geronimo
Creek**

NHD Local Resolution

- US Geological Survey National Hydrography Dataset
- Local Resolution may refer to 1:5000 or larger mapping
- Project goals: < 2m horizontal, nominal 1:2500 accuracy for overlay with building footprints and parcel polygons



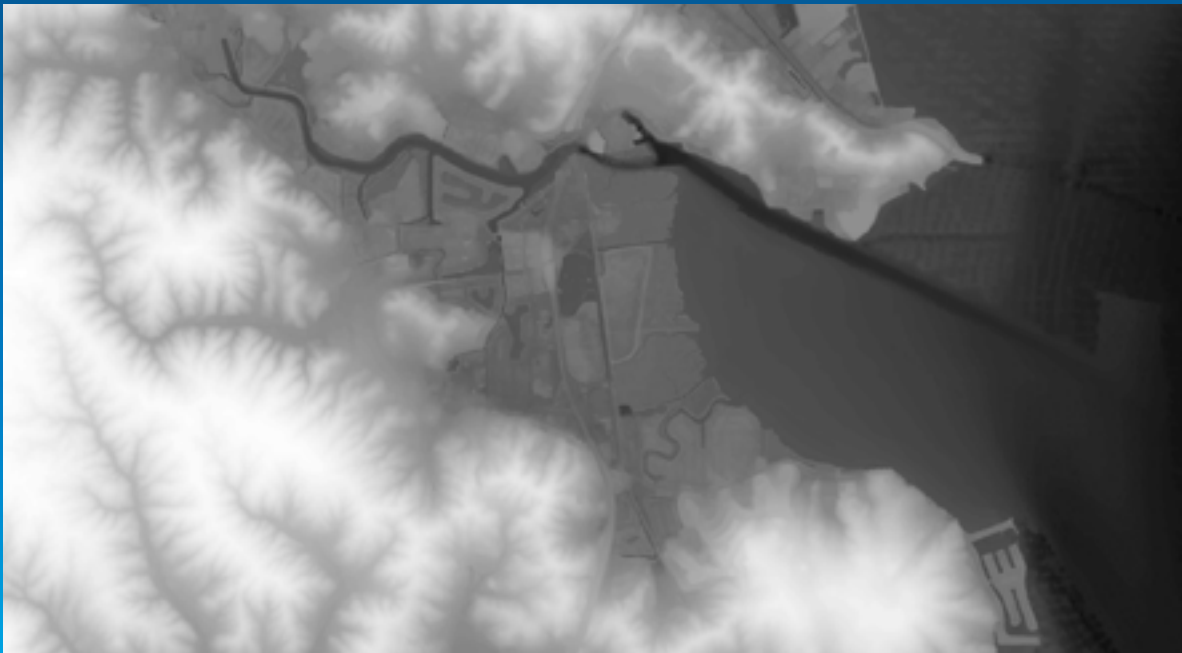
Bolinas Lagoon

Stinson Beach

Seadrift

ArchHydro -- Free ArcGIS for Desktop extension

- **Steepest descent analysis, flow line vectorization**
- **Useful by-products include flow accumulation, catchments used to estimate flow regime and watershed delineation**
- **Workflow outputs are NHD-compatible flow lines and Watershed Boundary Dataset Hydrologic Units (16, 14, 12)**



**Cortez
Madera
Bay**

Hydrologic Enforcement

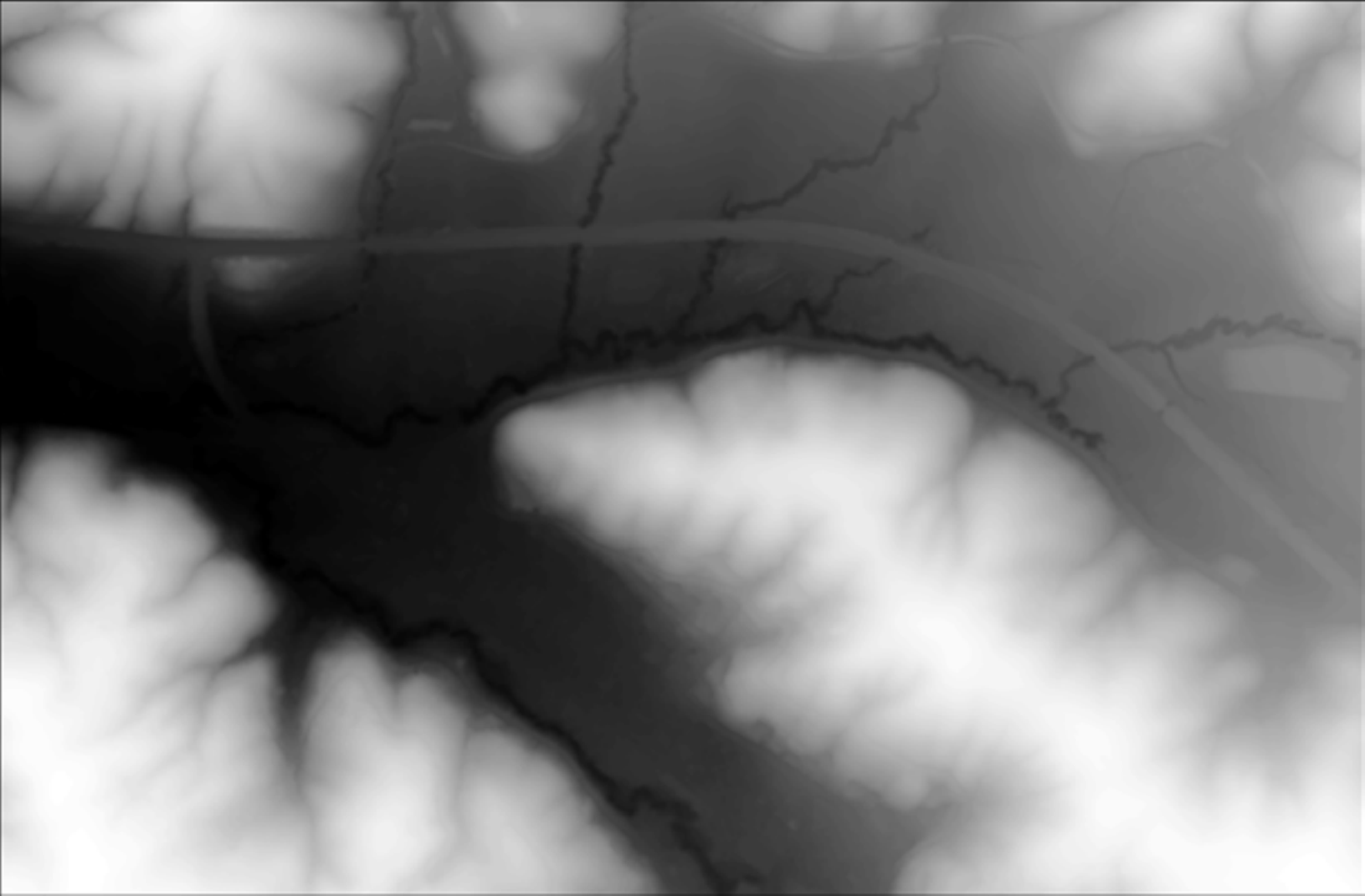
- Project usage: manual constraints to ArcHydro flow paths
- Digitized by hand upstream to provide flow continuity
- Vastly more intensive effort in urbanized areas
- In urban limit, a hydrologic model of storm drain system



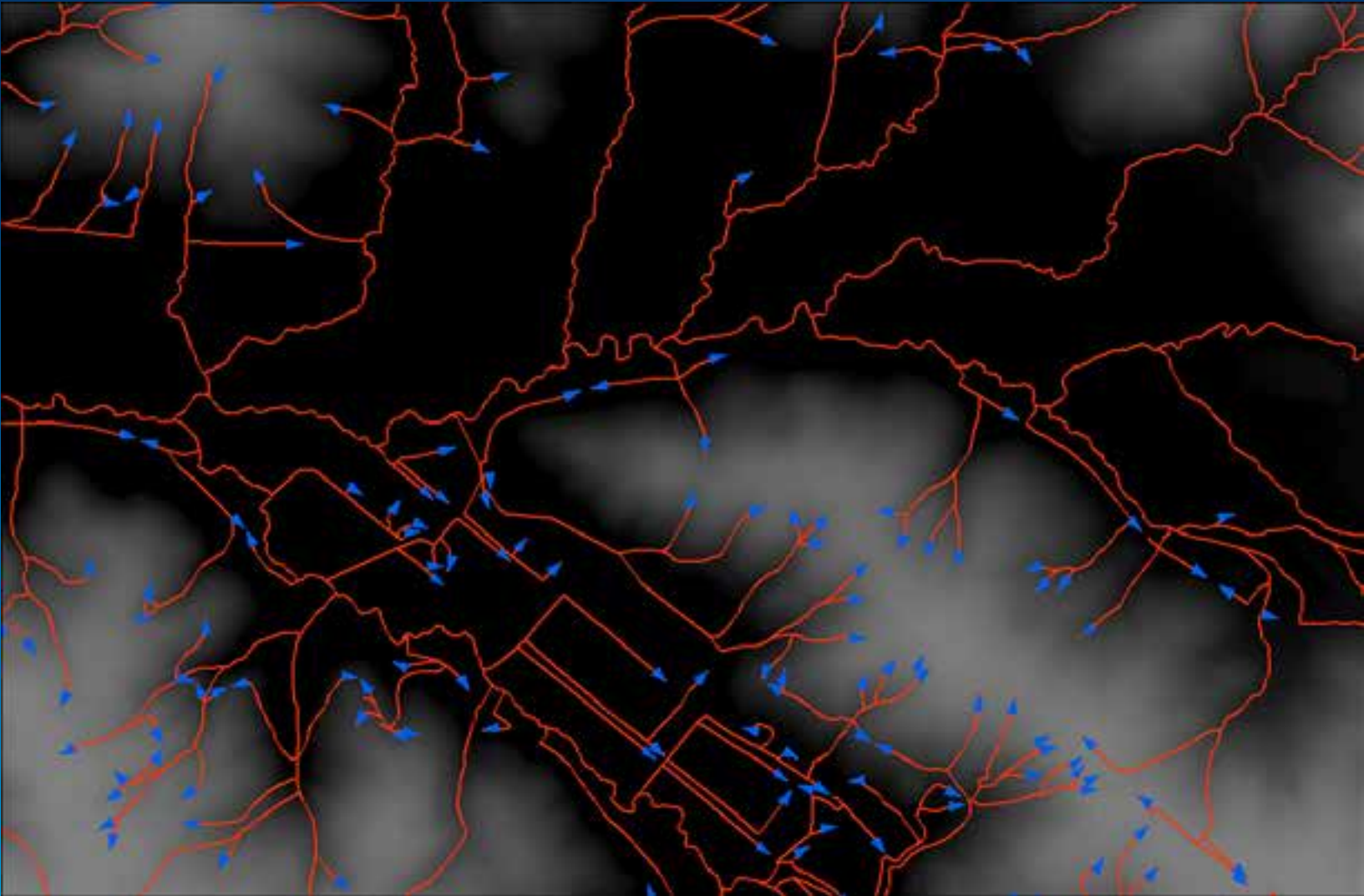
**Digitized
upstream
lines**

**often connect
through pipes
or culverts**

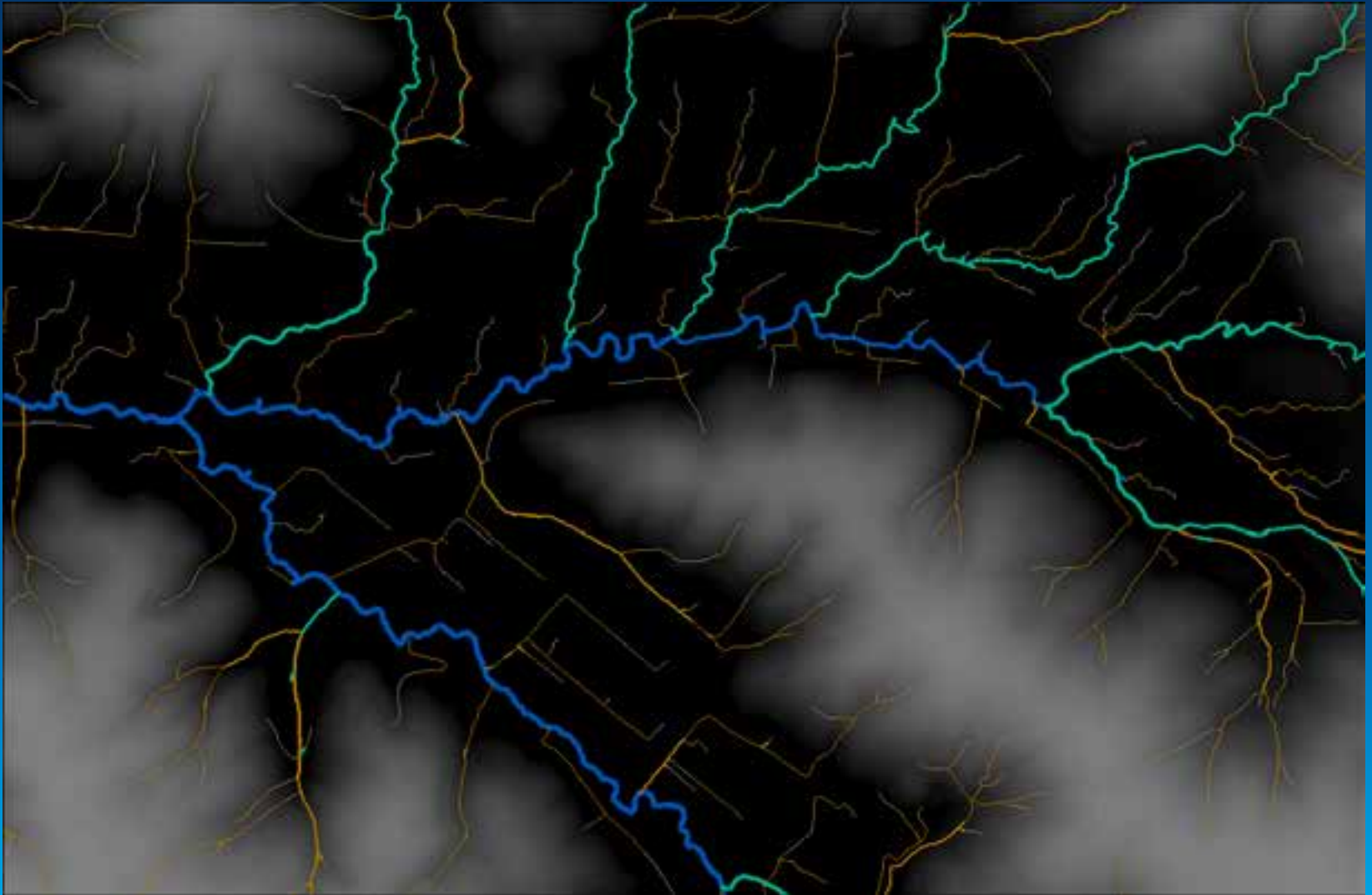
US-CA, Woodacre; LiDAR-derived topo-bathy surface 50cm grid



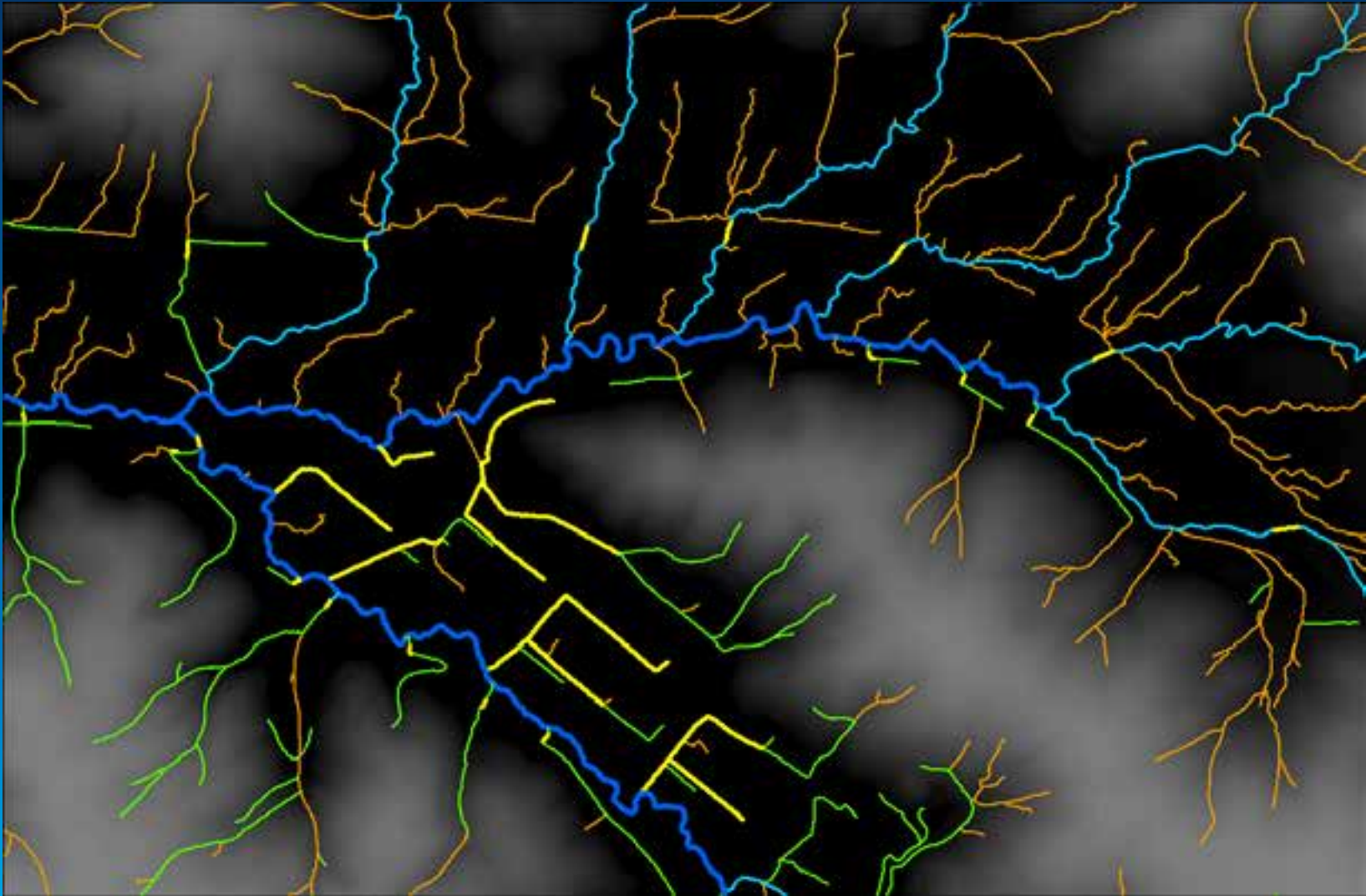
Woodacre; manual hydro-enforcement lines, upstream directed



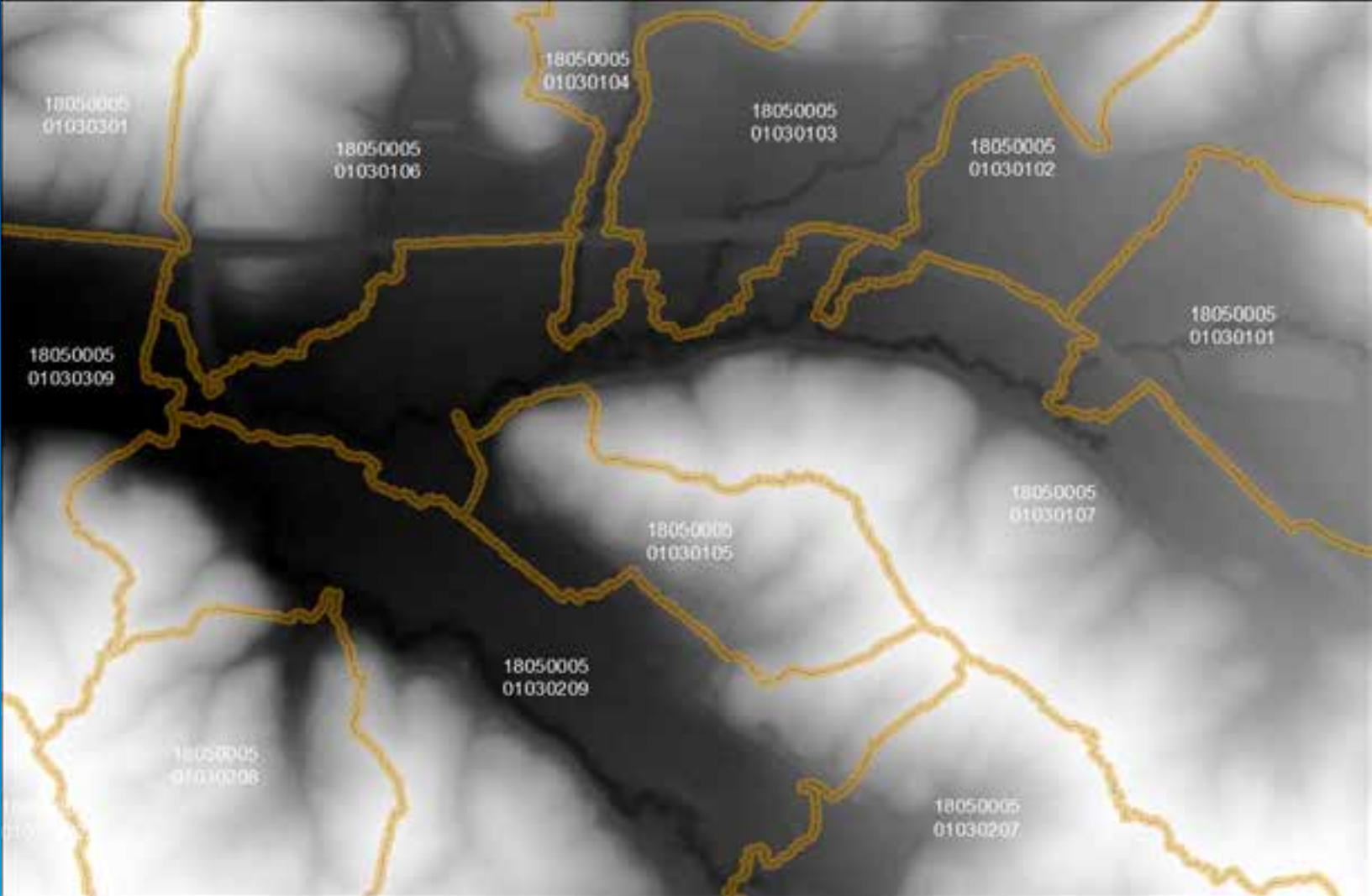
Flow regime estimated from accumulation, tapered symbology



NHD Feature Code (FCode) assignments, manually reviewed



WBD HUC-16 Candidates, prepared for state steward review



Workflow Documentation

- Collaborative editing via shared Google Drive document
- Snapshots posted http://a.3dg.is/Marin_NHD_Local/

ABSTRACT

California: Marin County workflow, processing from LIDAR-derived terrain to yield candidate polygon features for Watershed Boundary Dataset HUC-16 and HUC-14 and networked flow line edge features for National Hydrography Dataset Local Resolution.

This document summarizes workflow to produce model-derived surface flow lines and standards-compliant watershed boundary polygons, at nominal 1:2400 map accuracy when derived from a minimum 2-pulse/m² LIDAR-derived terrain grid. The workflow was developed by GIS analysts at County of Marin, California between 2009–2013 and is being refined as candidate watershed areas and flow lines are reviewed by WBD and NHD stewards at state and federal levels.

The 2009 work built a county terrain model from LIDAR with photogrammetry data, later adding bathymetric coverage. The terrain product was first used to evaluate parcel slopes, and evolutions of the terrain since 2010 have provided a foundation for countywide creek mapping at parcel scales. From the start, improvements in county creek mapping have been intended for publication in National Hydrography Dataset. As terrain resolution and mapping accuracy have improved after ARRA-funded LIDAR arrived in 2011, we now target the NHD Local Resolution repository for flow lines that will be used in a county creek protection ordinance implementation.

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Marin NHD Local + WBD HUC-16 workflow

With USGS integration of NHD and WBD mapping efforts, we now incorporate WBD HUC-16 definition to the workflow, and are adapting to production and QA details of [Federal Standards and Procedures for the National Watershed Boundary Dataset \(WBD\), Fourth Edition](#) and working with our state WBD steward toward certification of HUC-16 from the nominal 1:2400 map accuracy process.

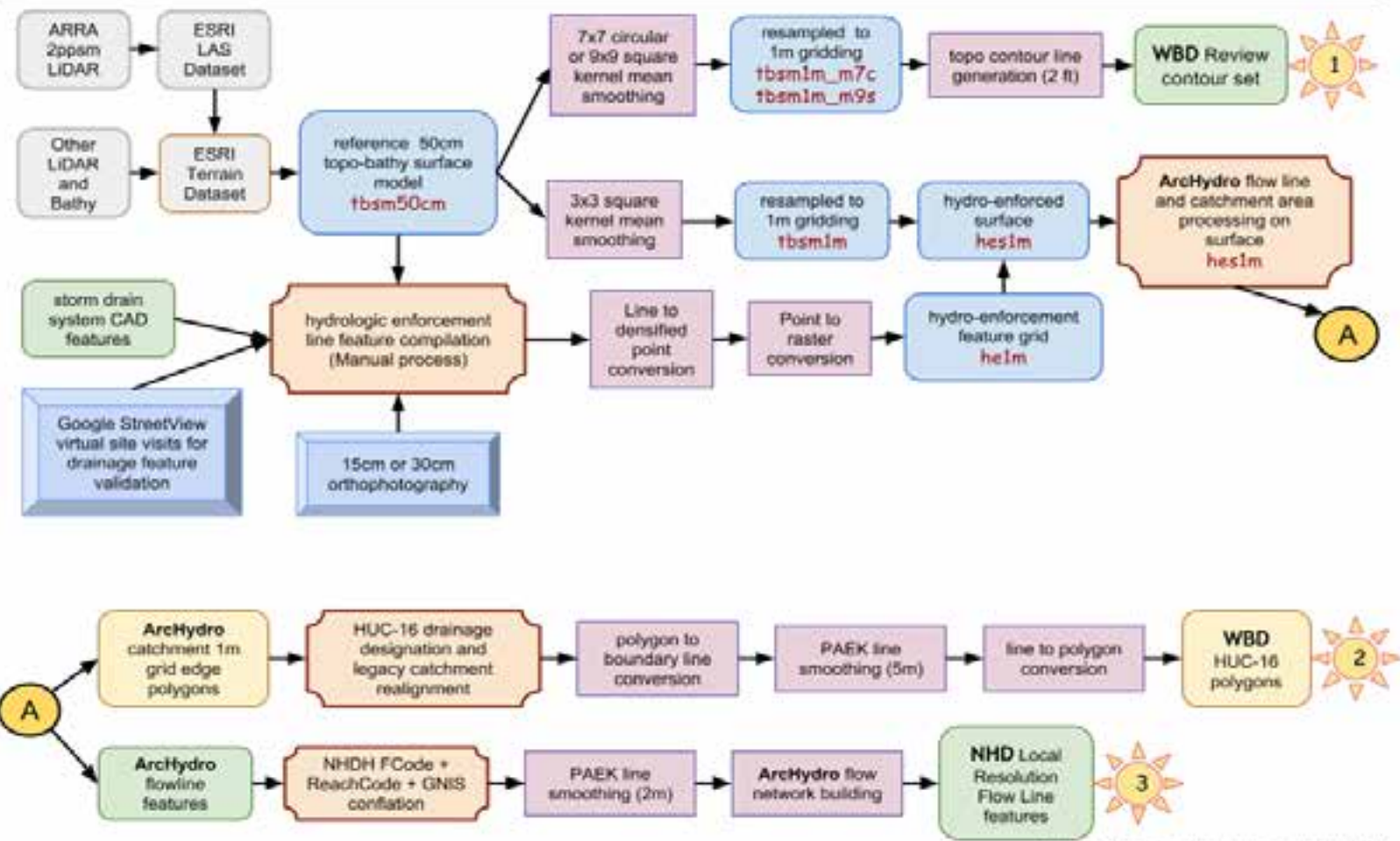
California: Marin County
NHD Local Resolution + WBD HUC-16
Schematic Data Flow

Key:

 Photo imagery	 Workflow	 Watershed boundary	 Flow line attribution		
 Terrain	 Point	 Line	 Polygon	 Node	

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 NHD Local Resolution + WBD HUC-16
 Schematic Data Flow

Key:



Questions?

If I've left time...

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Workflow snapshots posted at
[http://
a.3dg.is/Marin_NHD_Local](http://a.3dg.is/Marin_NHD_Local)

