AN EXAMPLE OF DATABASE GENERALIZATION WORKFLOW: THE TOPOGRAPHIC DATABASE OF CATALONIA AT 1:25.000

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INTRODUCTION

- The ICC produces and maintains 3 vector databases covering Catalonia at scales 1:5.000, 1:50.000 and 1:250.000
- The ICC costumers need a new vector database detailed, 2.5D but manageable
- 2.5D → photogrammetry, but the availability of 1:5.000 database and the ICC previous generalization experiences offered the possibility to produce the new database using generalization methods

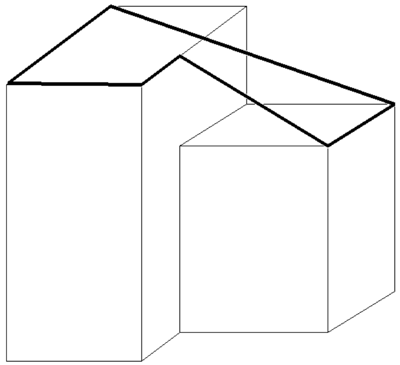
TOPOGRAPHIC DATABASE 1:5.000

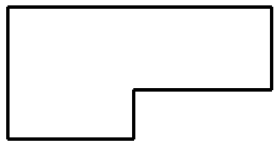
- Version 1   1985 – 1995
  - 2.5D vector data
  - “spaghetti” data
  - DTM generation: grid 15 x 15 meters

- Version 2   1996 – 2004
  - 2.5D vector data
  - GIS oriented database
  - elements for further generalization
  - complete set of documentation
  - DTM and DSM generation: grid 15 x 15 meters

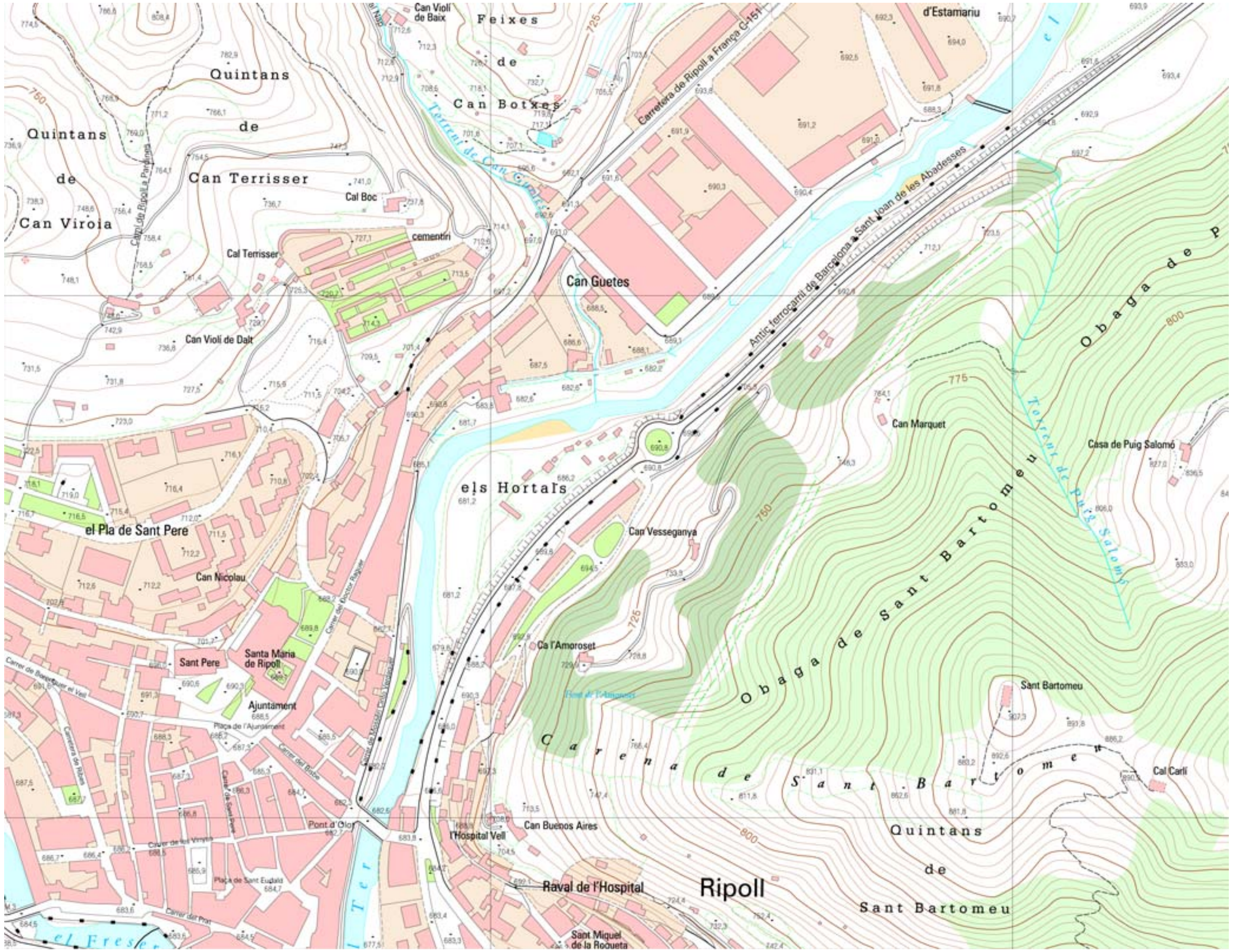
TOPOGRAPHIC DATABASE 1:5.000 v.2

- **Entities:**
  - **points**
  - **lines**
  - **polygons: lines for boundaries and centroids**
- **Each vertex is defined by 3 coordinates**
- **No duplicate lines**
- **Polygons are not 3D surfaces**





TOPOGRAPHIC DATABASE 1:5.000 v.2



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TOPOGRAPHIC DATABASE 1:25.000

- **Data Model**
  - **keeps the object semantics across the different scales of the existing ICC vector databases**
  - **2.5D vector data**
  - **guidelines for generalization and photogrammetric data capture**

- **Updating problems**
  - **links between the original and the generalized DB**
    - **propagation of updates**
  - **updating frequencies**
    - **medium scales more often than large scales**
  - **if DBs are updated separately**
    - **consistency problems**

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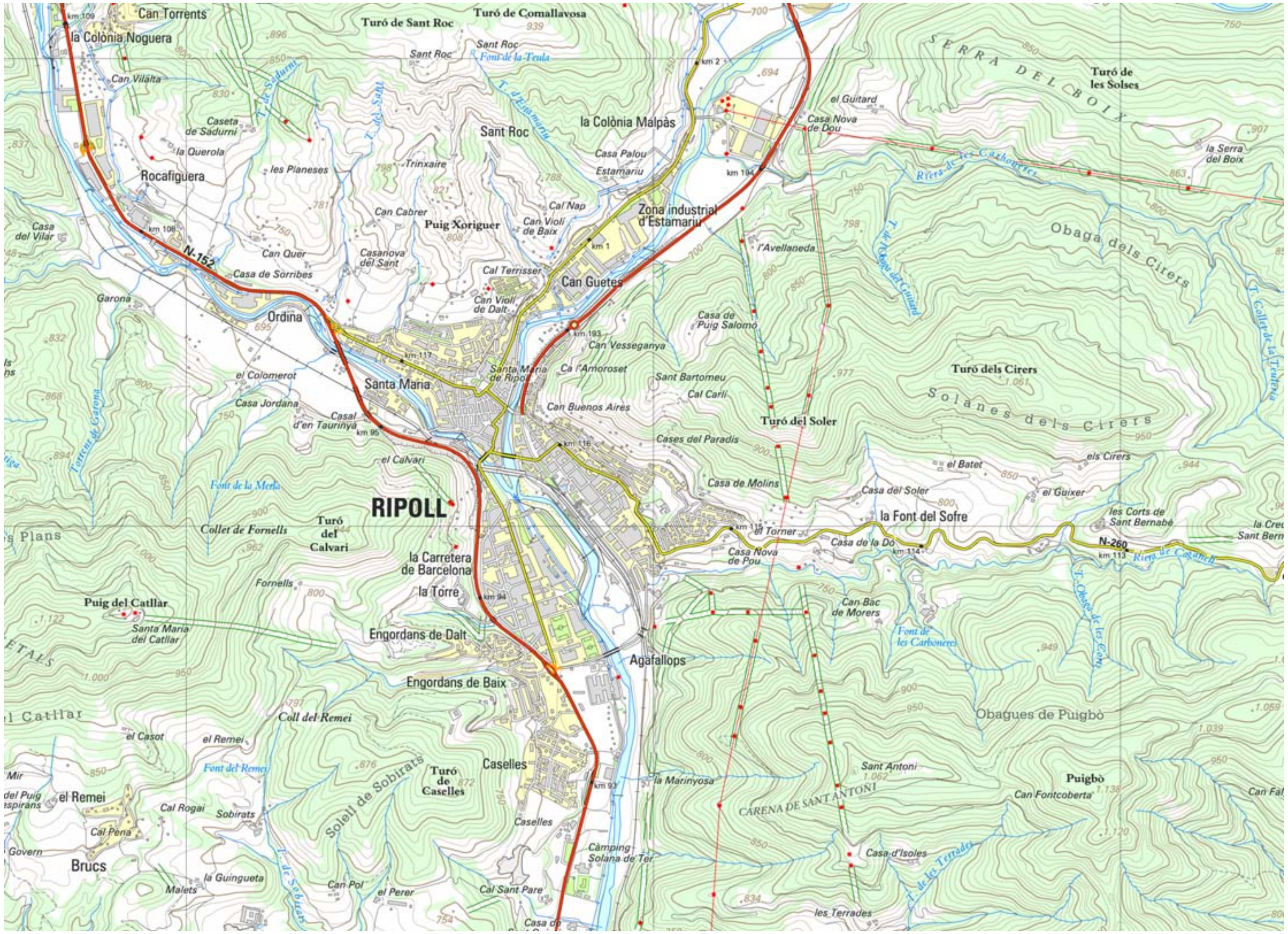
TOPOGRAPHIC DATABASE 1:25.000



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GENERALIZATION SOFTWARE

- Requirements:
  - basic:
    - 2.5D generalization
    - good building simplification
    - easy integration in ICC environment
  - advanced:
    - object oriented system
    - preservation of the original object relationships
    - stereoplotting interface for updating

- Object oriented system → radical change in ICC environment, but the benefits would justify the migration

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GENERALIZATION SOFTWARE TESTED

- **DYNAGEN (Intergraph):**
  - **2.5D data generalization**
  - **poor results in building simplification**
  - **no links between original and generalized data**
  - **no stereoplotting interface**

- **LAMPS2 GENERALIZER (Laser Scan):**
  - **advanced tools (AGENT)**
  - **stereoplotting interface for updating**
  - **generalized data becomes 2D**
  - **no links between original and generalized data**

- **The use of an object oriented software was delayed until full functionalities will be implemented**

GENERALIZATION SOFTWARE USED

- CHANGE (University of Hannover):
  - for building generalization, but
  - 2D data
- ICC software:
  - Z value assignment to generalized buildings
  - other generalization operations
  - map names generalization
  - interactive tools for manual generalization

GENERALIZATION PROCESS: EXAMPLES

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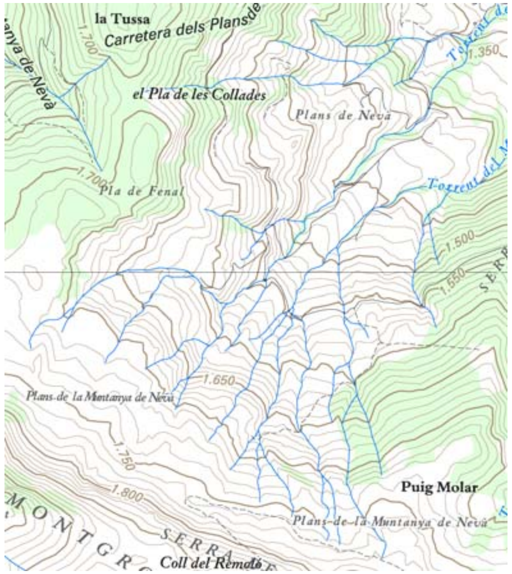
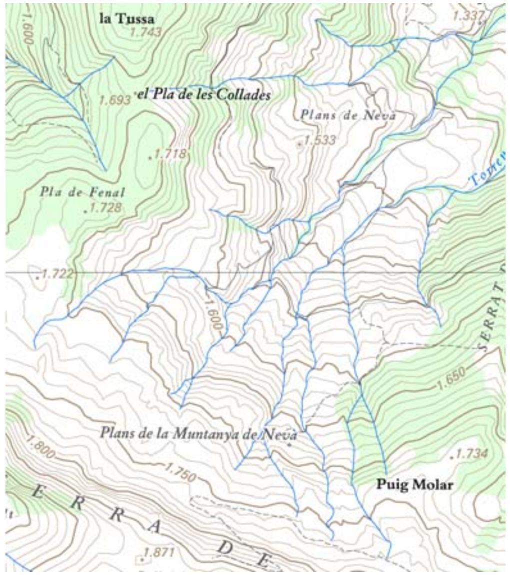
- **Water courses:**
  - **simplification (automatic)**
  - **typification**
  - **collapse for two margins courses**
  - **aggregation, exaggeration and typification for islands**



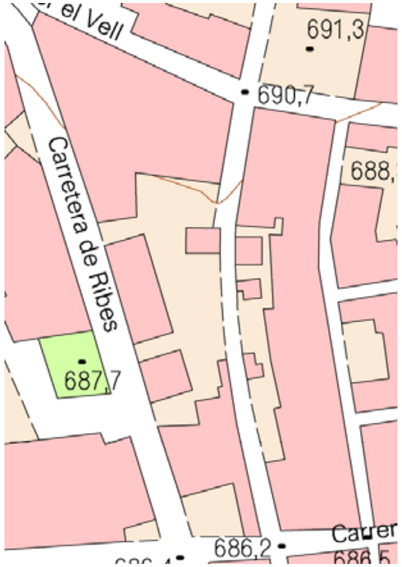


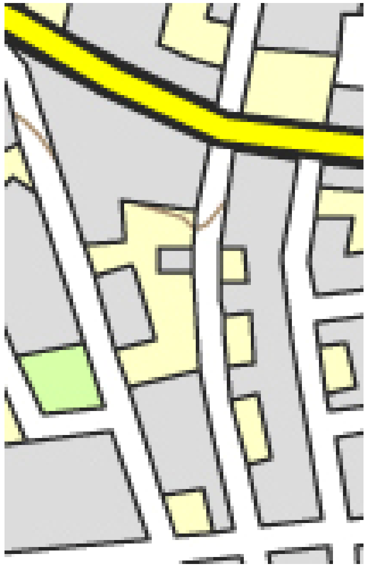
GENERALIZATION PROCESS: EXAMPLES

- **Roads:**
  - **simplification (automatic)**
  - **collapse**
  - **conflict resolution using buffer zones**

GENERALIZATION PROCESS: EXAMPLES

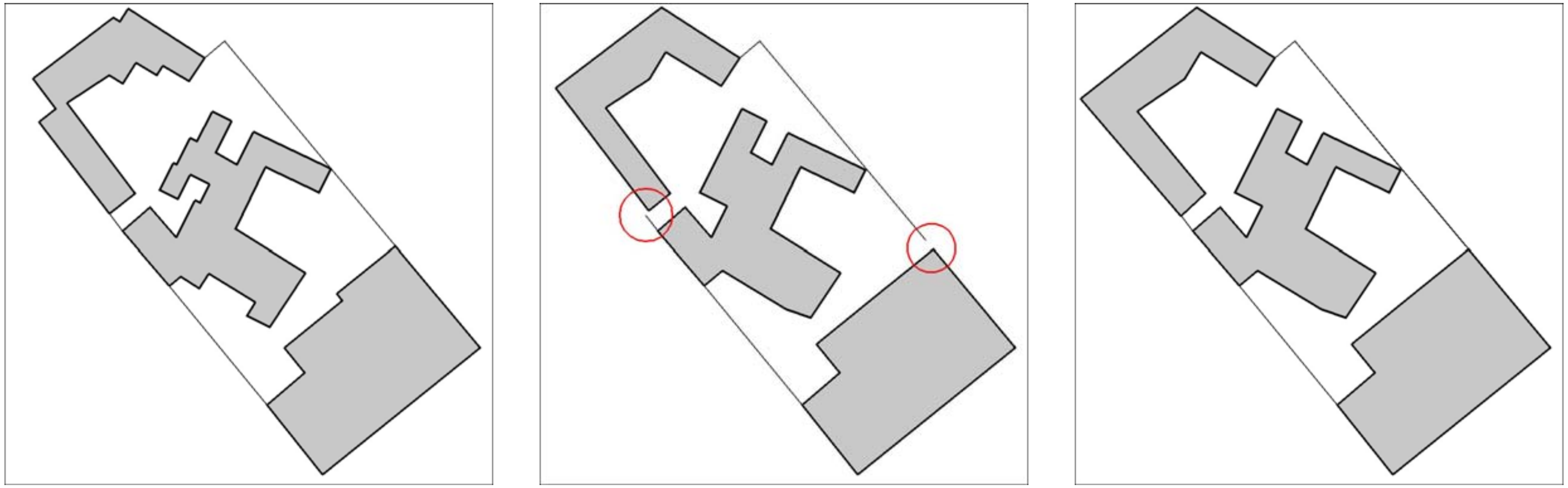
- **Streets:**
  - **width exaggeration**
  - **conflict resolution using buffer zones**





GENERALIZATION PROCESS: EXAMPLES

- **Blocks:**
  - **CHANGE cannot generalize together the buildings and the block lines → the connections are lost**
  - **generalized blocks must be rebuilt manually**



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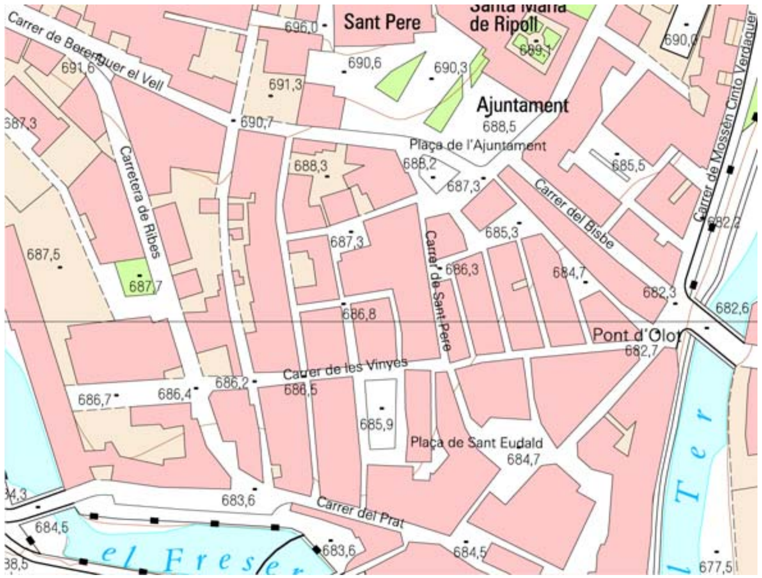
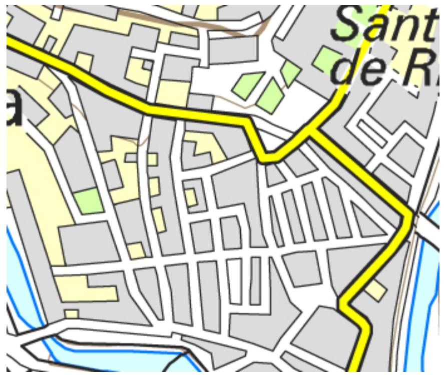
GENERALIZATION PROCESS: EXAMPLES

- **Buildings:**
  - **simplification using CHANGE (automatic)**
  - **aggregation using CHANGE (automatic)**
  - **Z value assignment to generalized vertices (automatic)**
  - **conflict resolution by manual editing**





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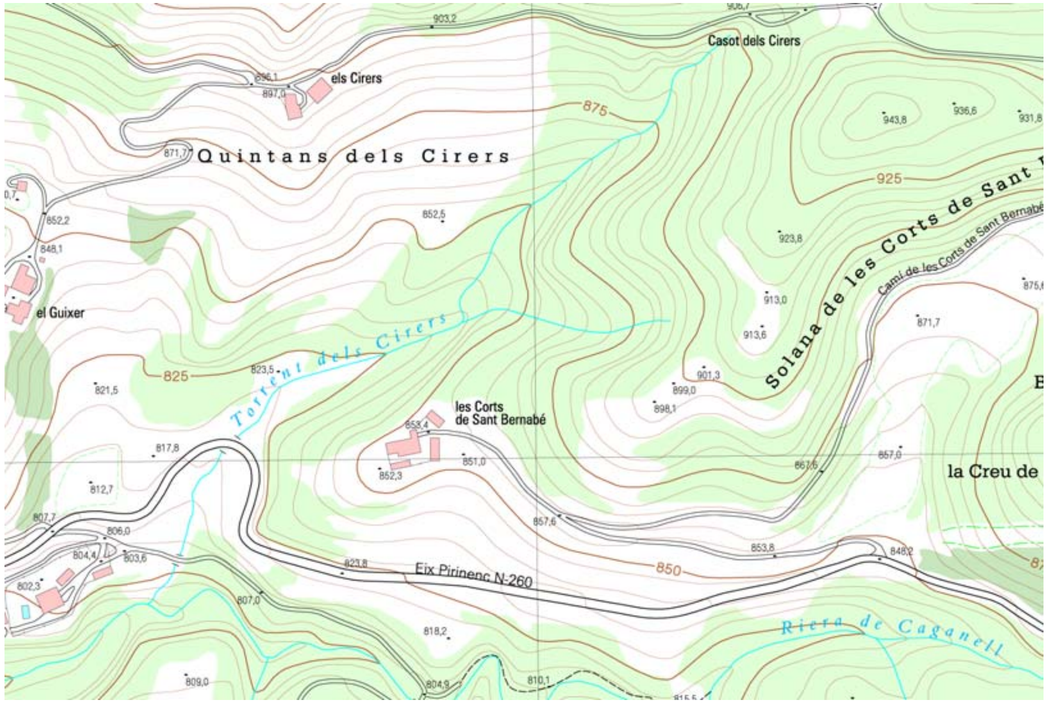
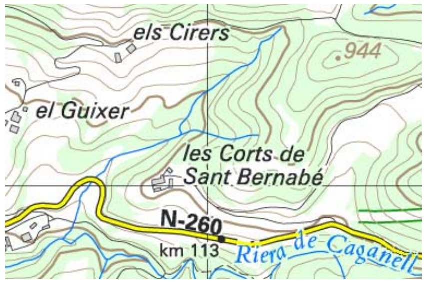
GENERALIZATION PROCESS: EXAMPLES

- **Map names:**
  - **selection (automatic)**
  - **cartographic scaling (automatic)**
  - **manual editing for conflict resolution**





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CONCLUSIONS

- The new workflow has entailed two challenges to the ICC:
    - obtain a DB applying generalization, not only a map
    - derive 2.5D data instead 2D data
- The updating of the generalized DB is an open question. There are no links between original and generalized DBs, so there are two possibilities:
    - update the original DB and generalize again:
        - the coherence is guaranteed, but
        - the cost is very high
    - update separately both DB:
        - the cost is lower
        - the coherence is lost
- ICC will continue working to achieve the goal of the multi-scale topographic DB