

# Water Rights Mapping into CalSim

Presenter: Liheng Zhong

Collaborators: Richard Chen, Hongbing Yin

Bay-Delta Office

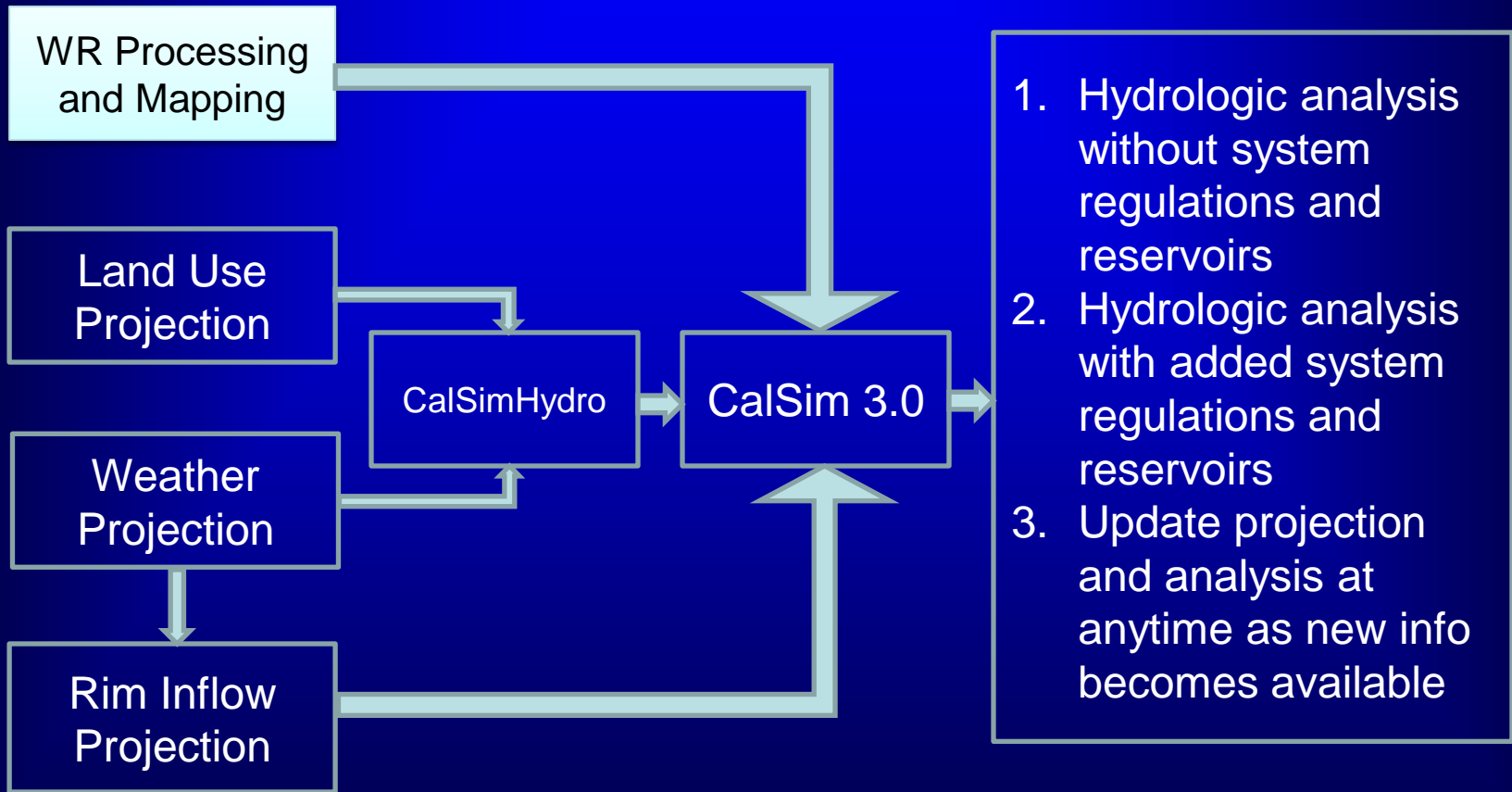
CA Department of Water Resources



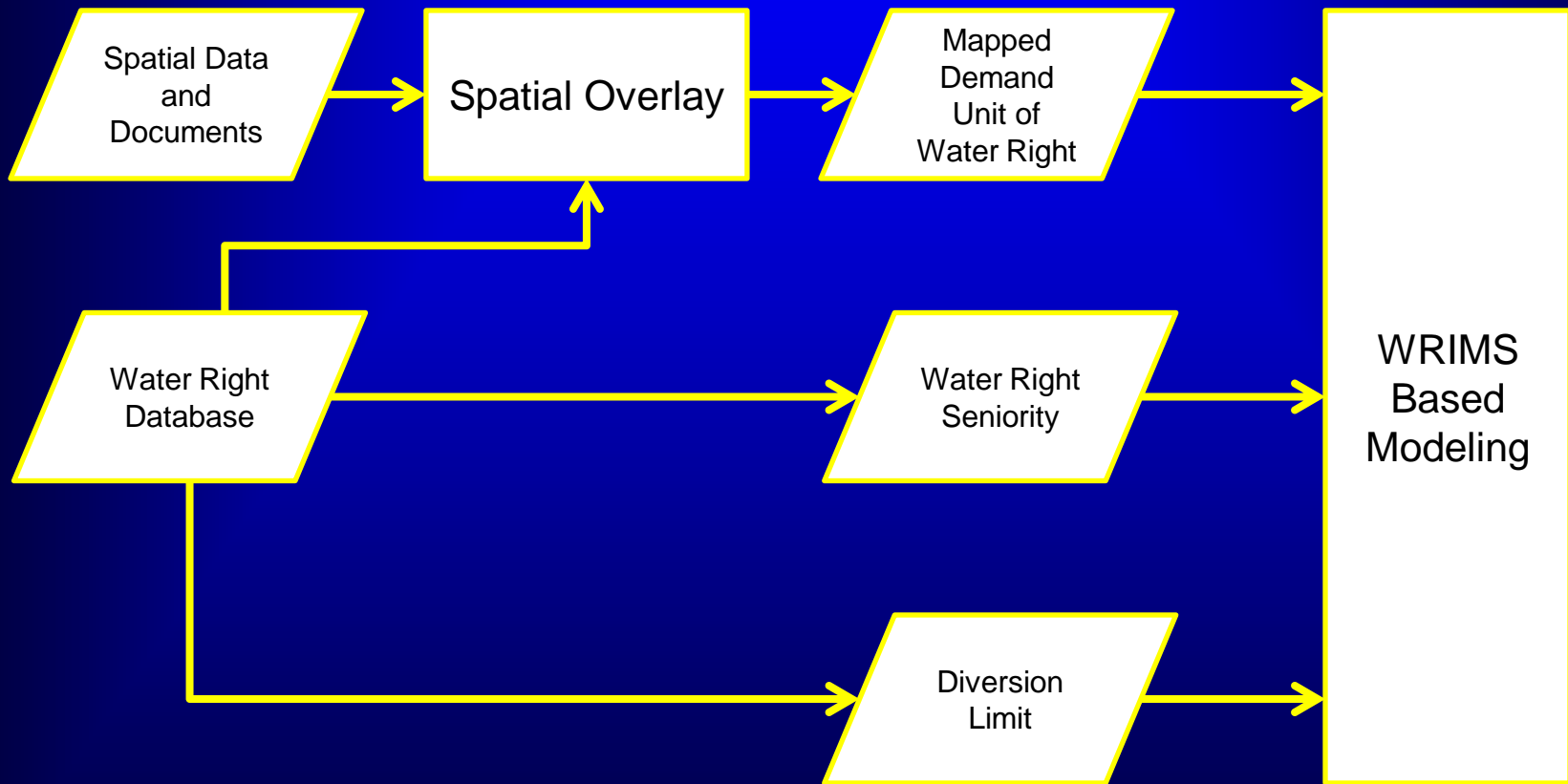
CWEMF Annual Meeting

March 11, 2016

# Incorporating Water Right Based Diversions Into CalSim 3.0 for real-time projection

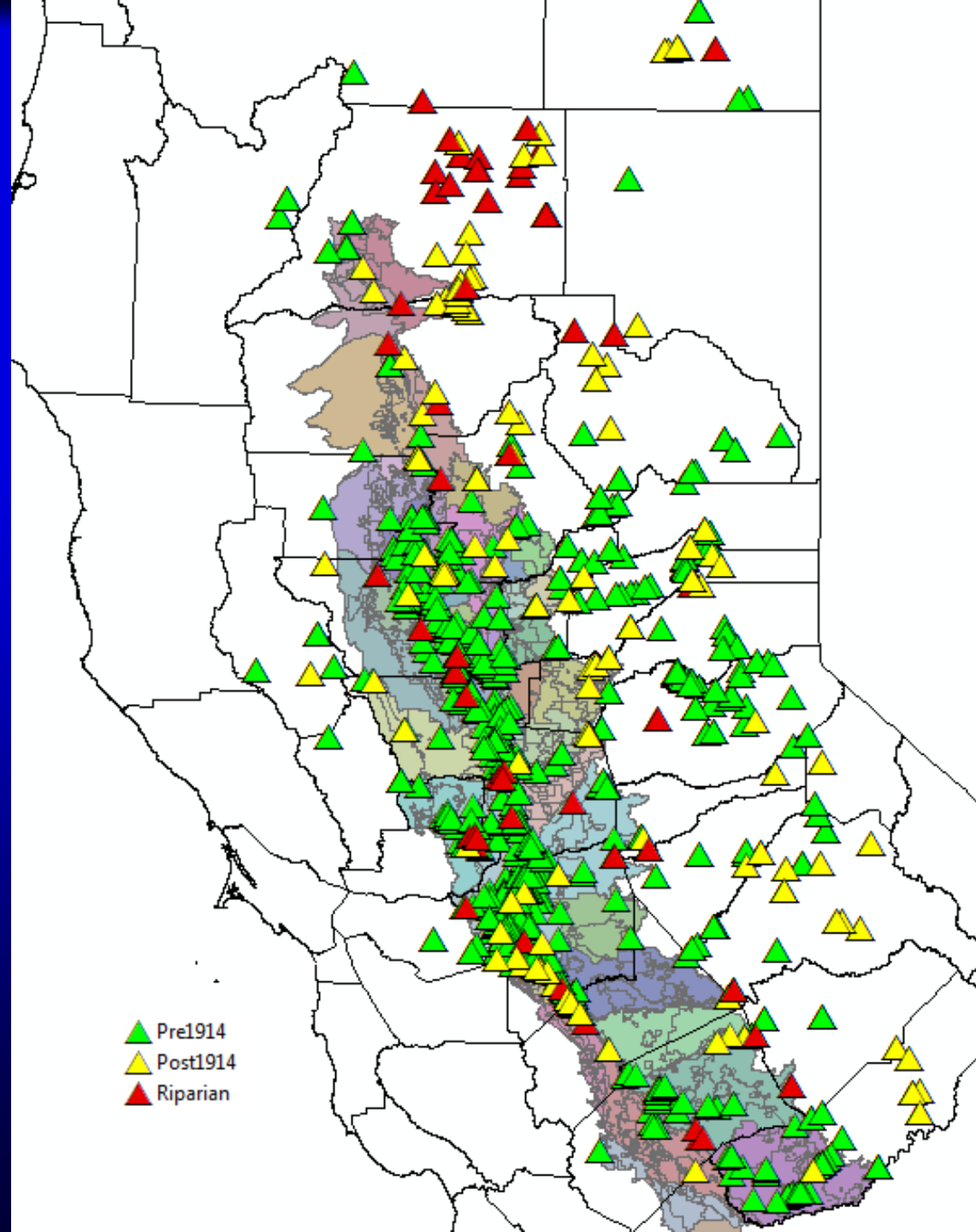


# Process Water Right Data for Model Implementation

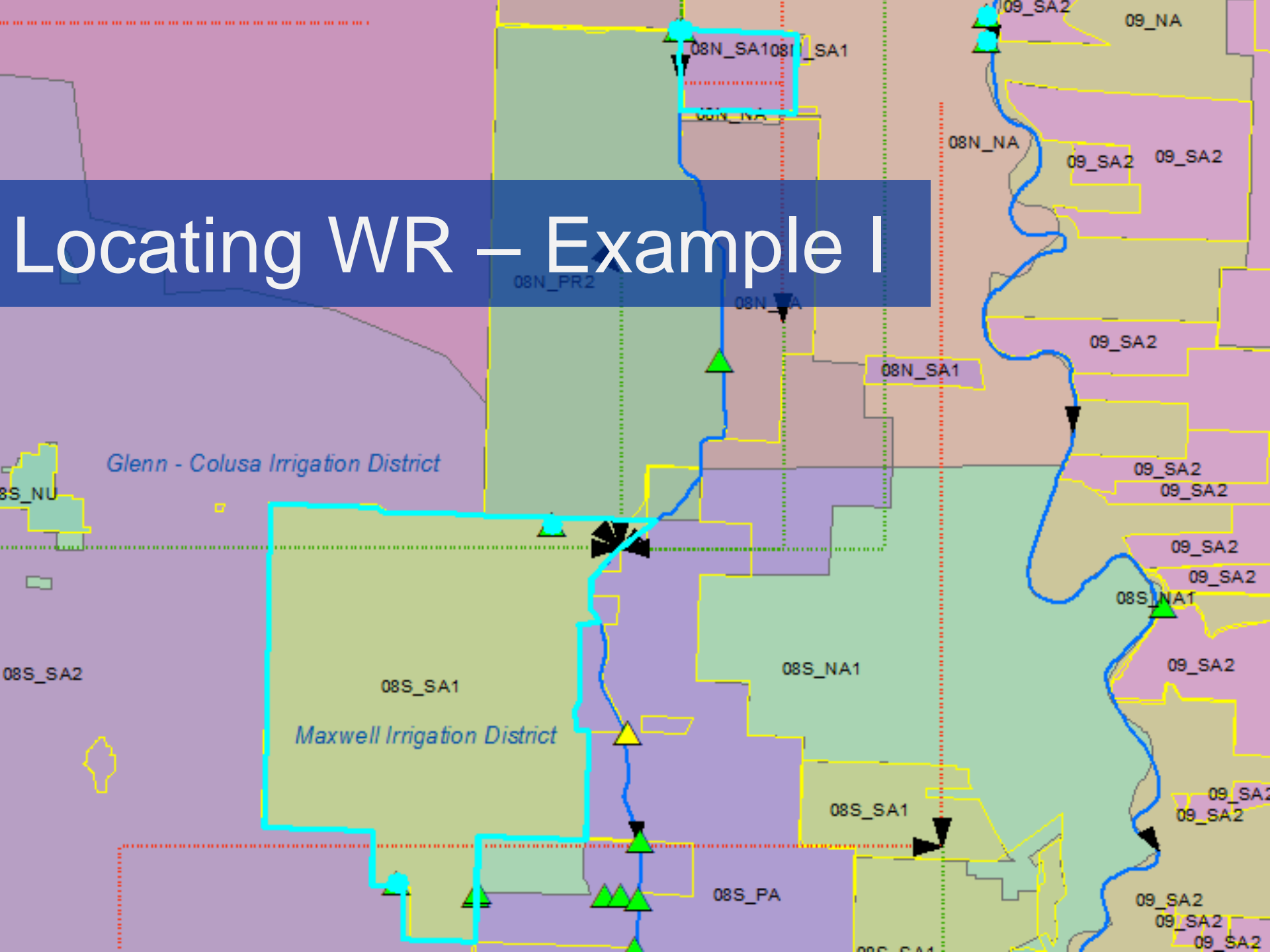


# Spatial Overlay

- Goal:
  - POU  $\leftrightarrow$  DU
- Overlay of layers:
  - CalSim 3.0 Demand Units (minimum model unit of CalSim 3.0)
  - POD (Points of Diversion) of major water rights
  - Available water district boundaries
  - National Hydrography Dataset
  - Public Land Survey System townships

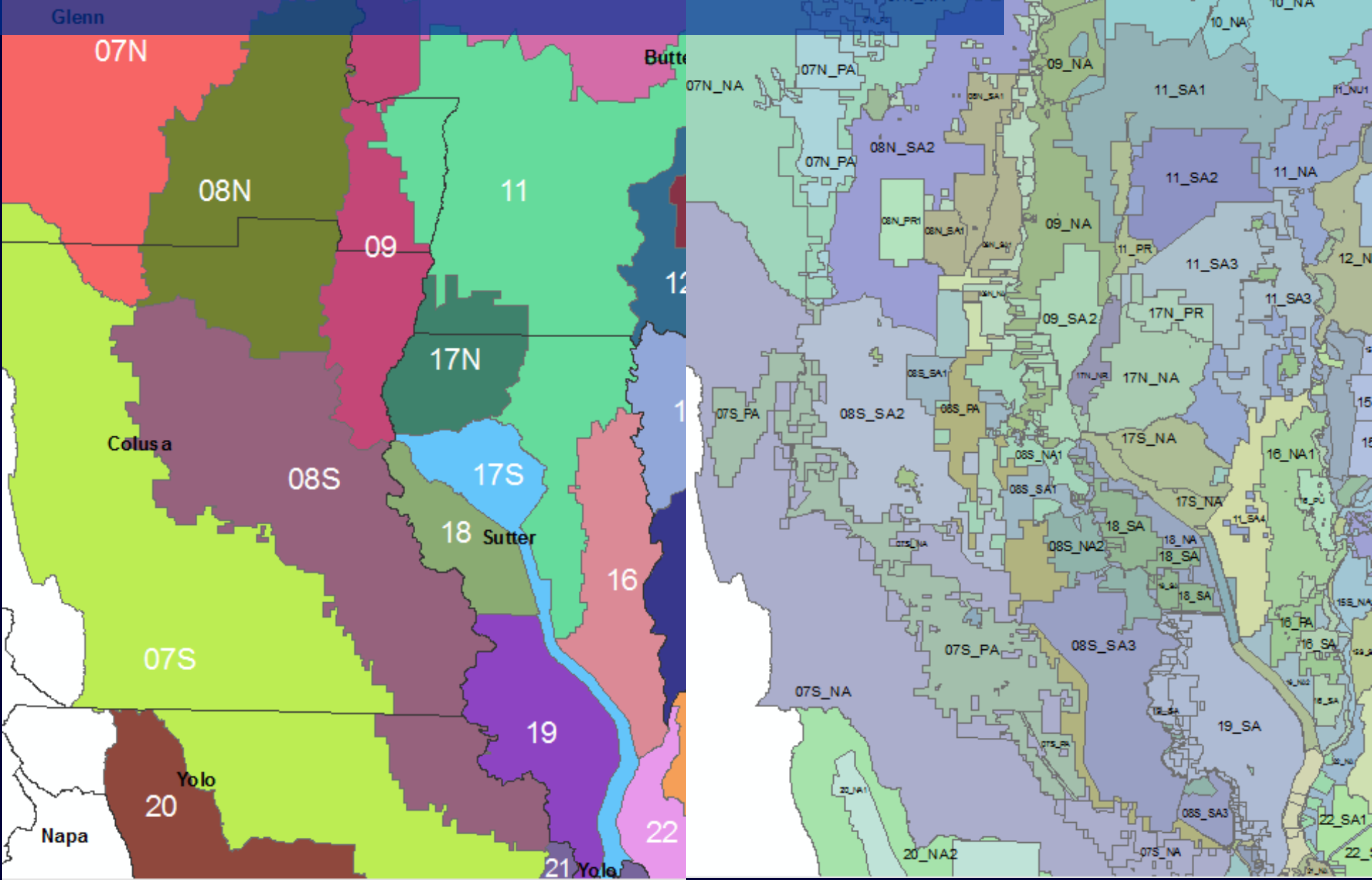


# Locating WR – Example I



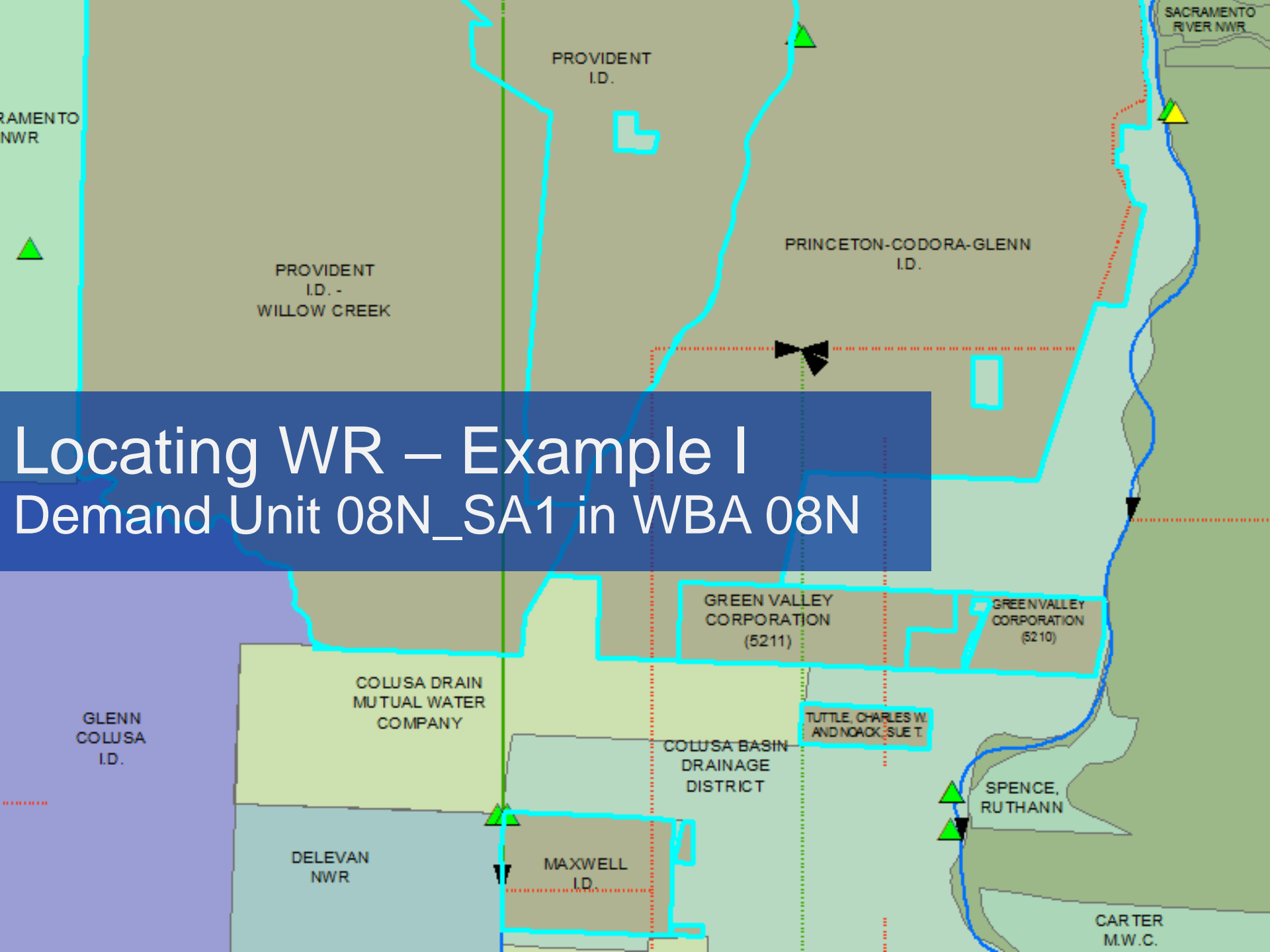
# Locating WR – Example I

## WBA and Demand Unit in CalSim 3.0



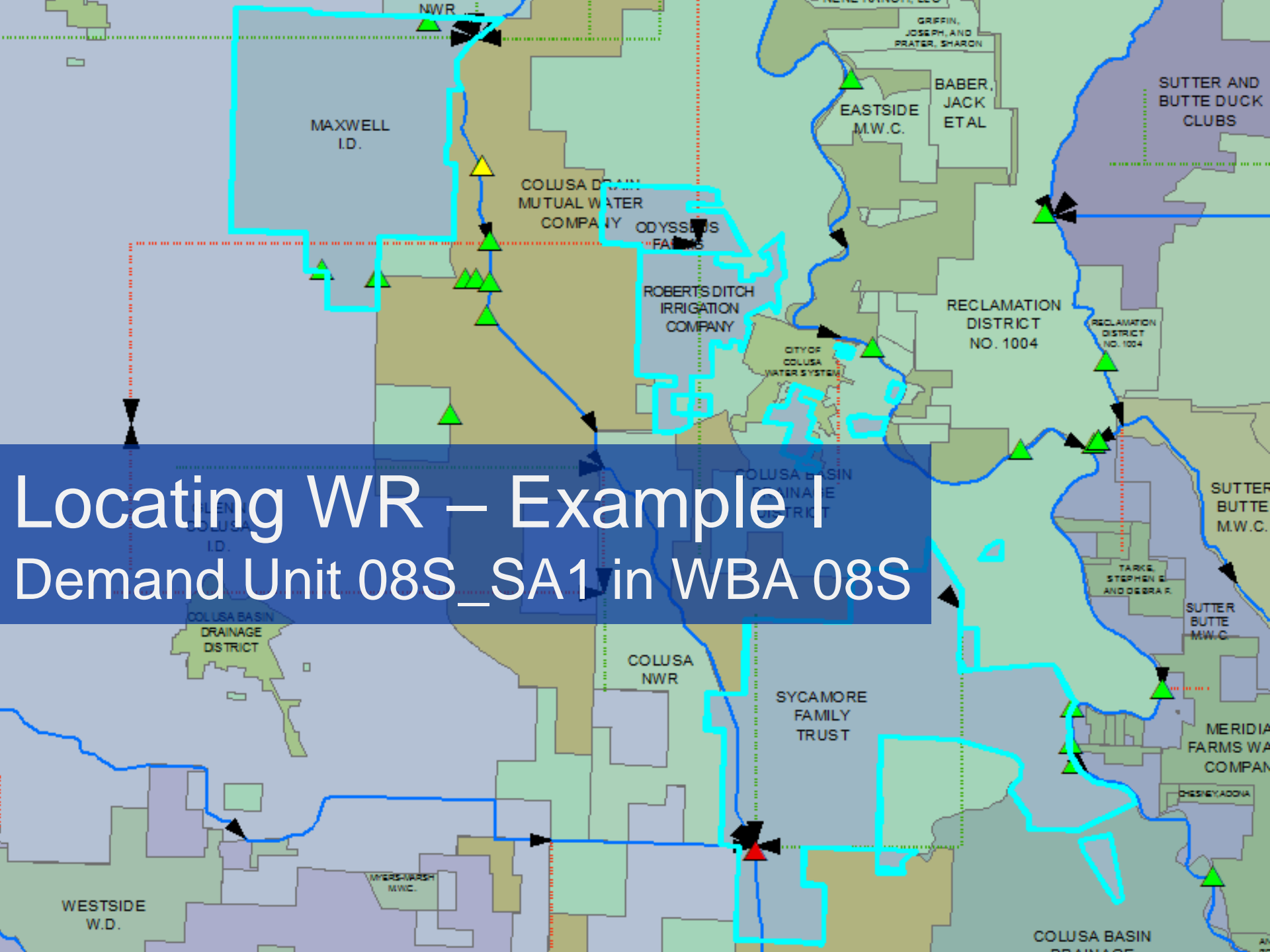
# Locating WR – Example I

## Demand Unit 08N\_SA1 in WBA 08N



# Locating WR – Example I

Demand Unit 08S\_SA1 in WBA 08S





# Locating WR – Example I

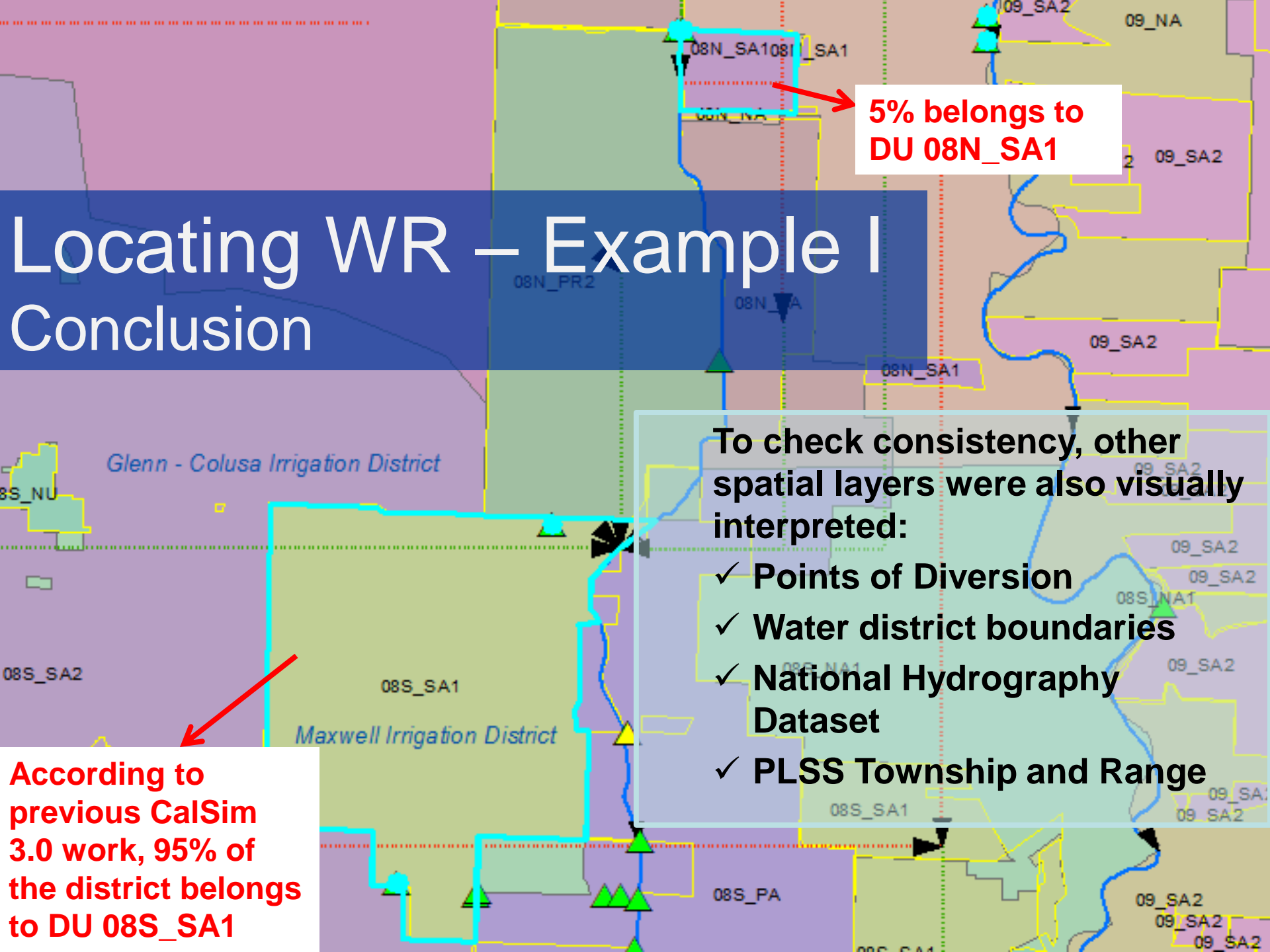
## Conclusion

**5% belongs to  
DU 08N\_SA1**

To check consistency, other spatial layers were also visually interpreted:

- ✓ Points of Diversion
- ✓ Water district boundaries
- ✓ National Hydrography Dataset
- ✓ PLSS Township and Range

**According to  
previous CalSim  
3.0 work, 95% of  
the district belongs  
to DU 08S\_SA1**

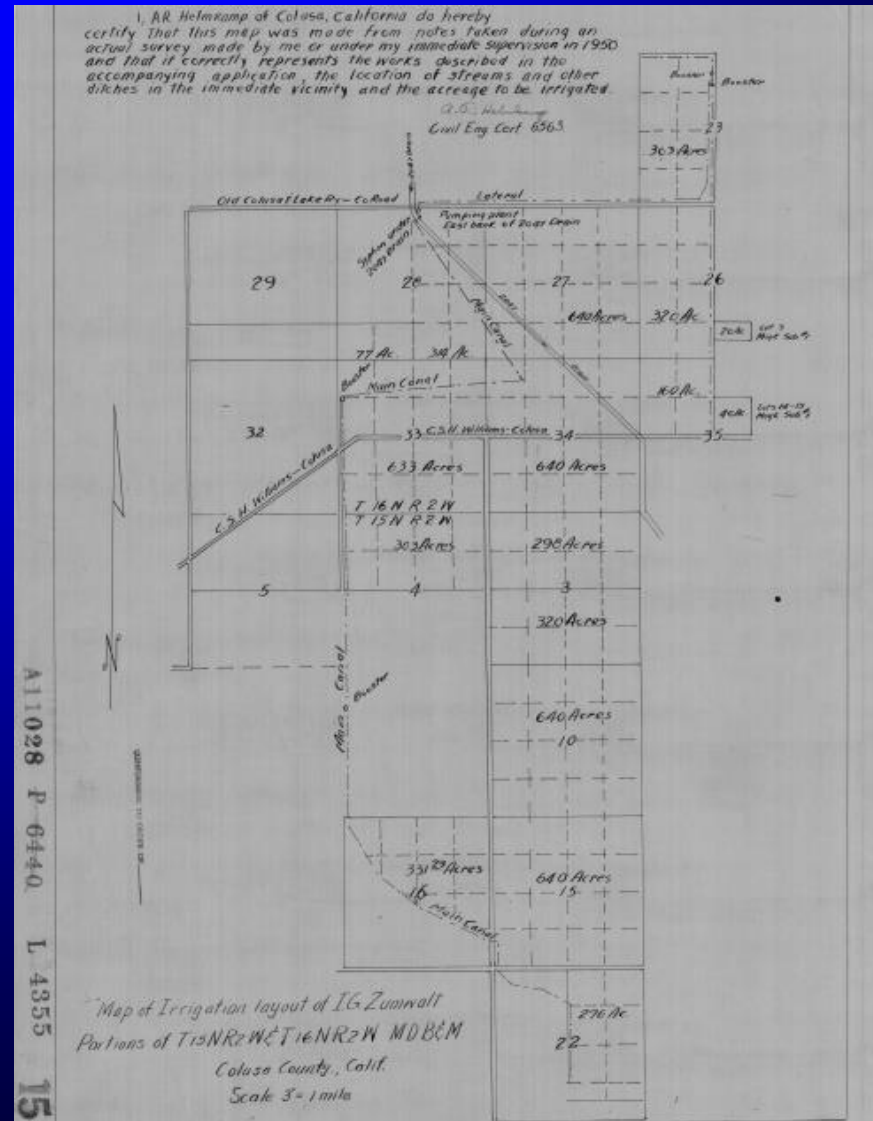


# Locating POU onto Demand Unit – Example II

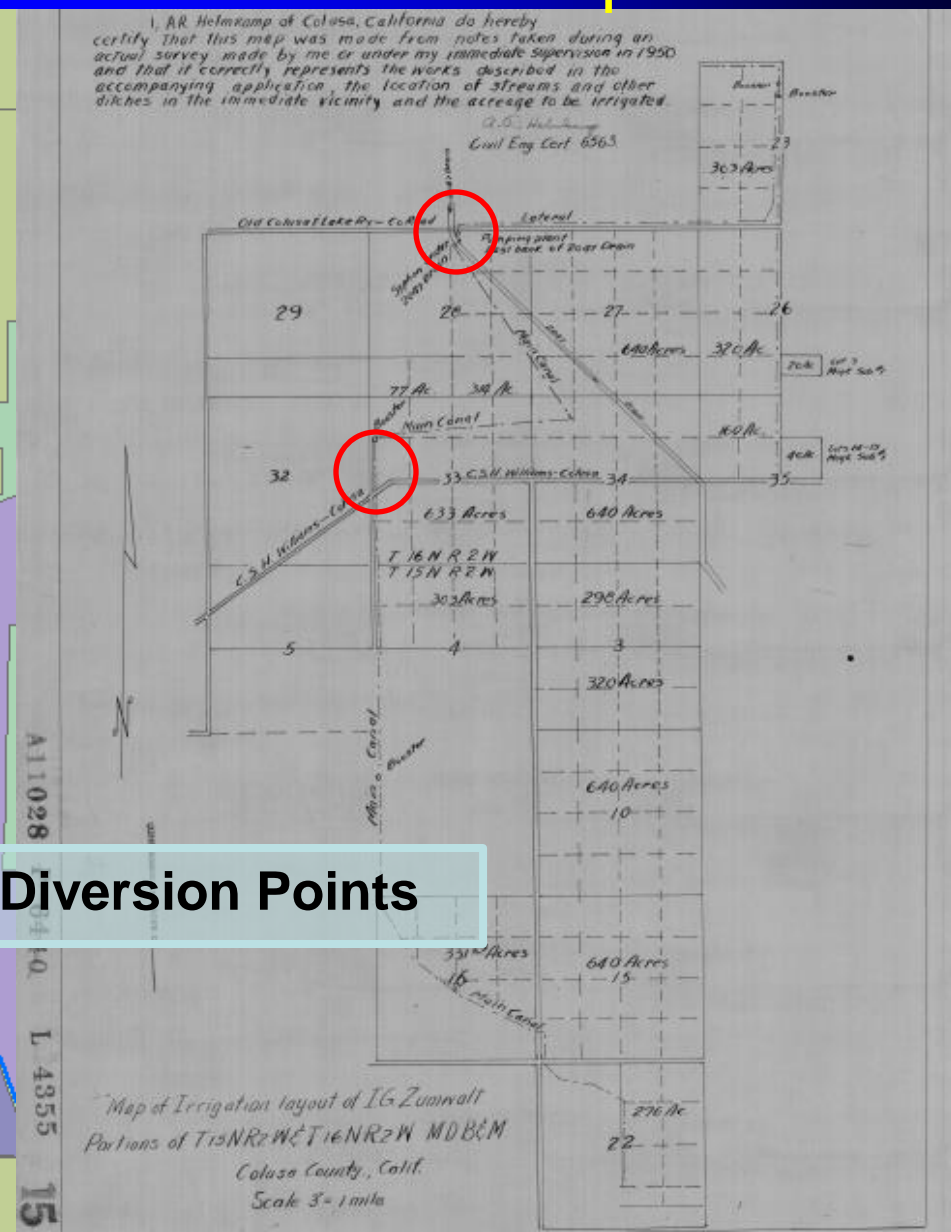
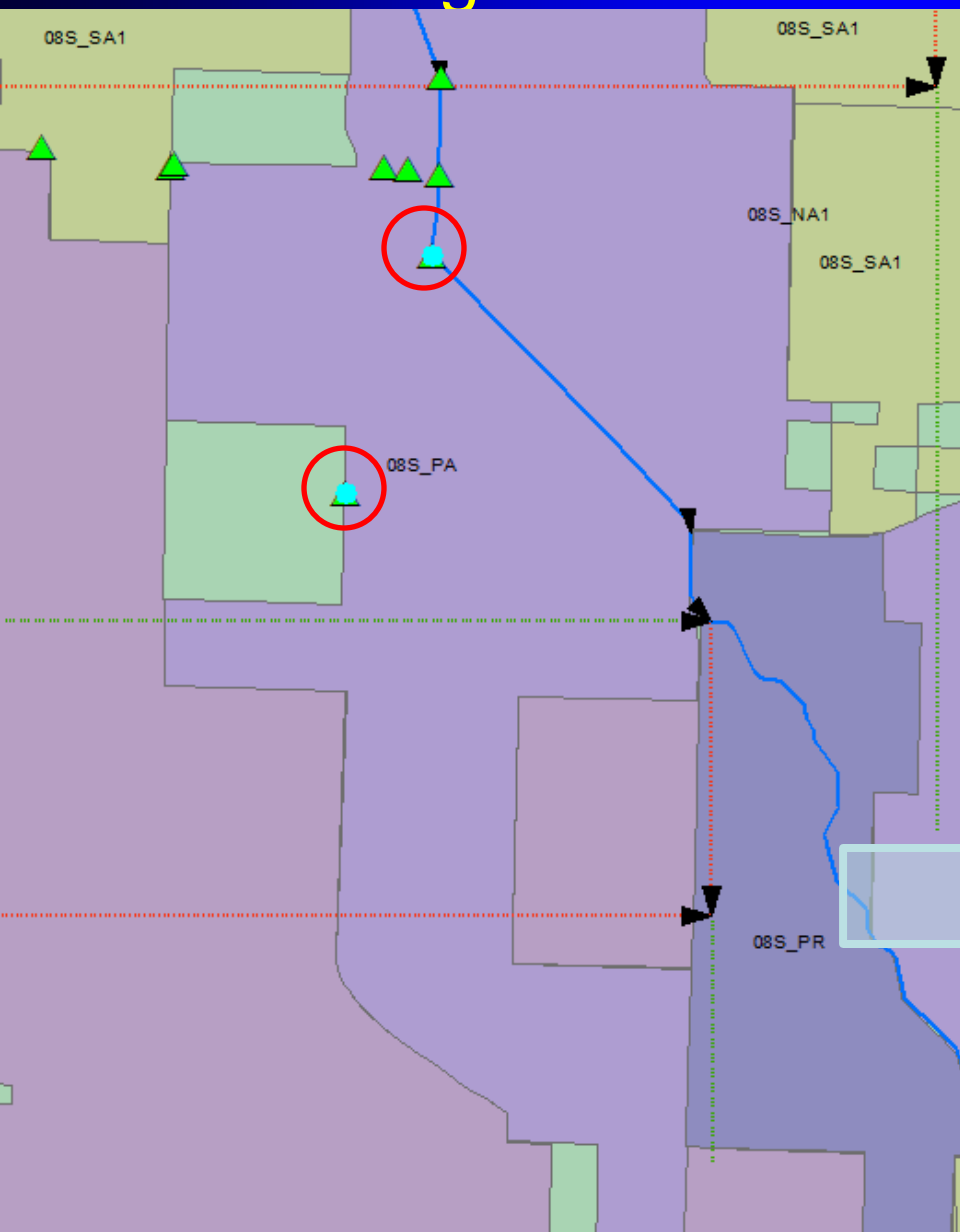
**A011028 by ZUMWALT  
MUTUAL WATER COMPANY**

**No Water district  
boundaries**

- ✓ Scanned POU map (old)
- ✓ CalSim 3.0 Demand Units
- ✓ Points of Diversion
- ✓ National Hydrography Dataset
- ✓ PLSS Township and Range

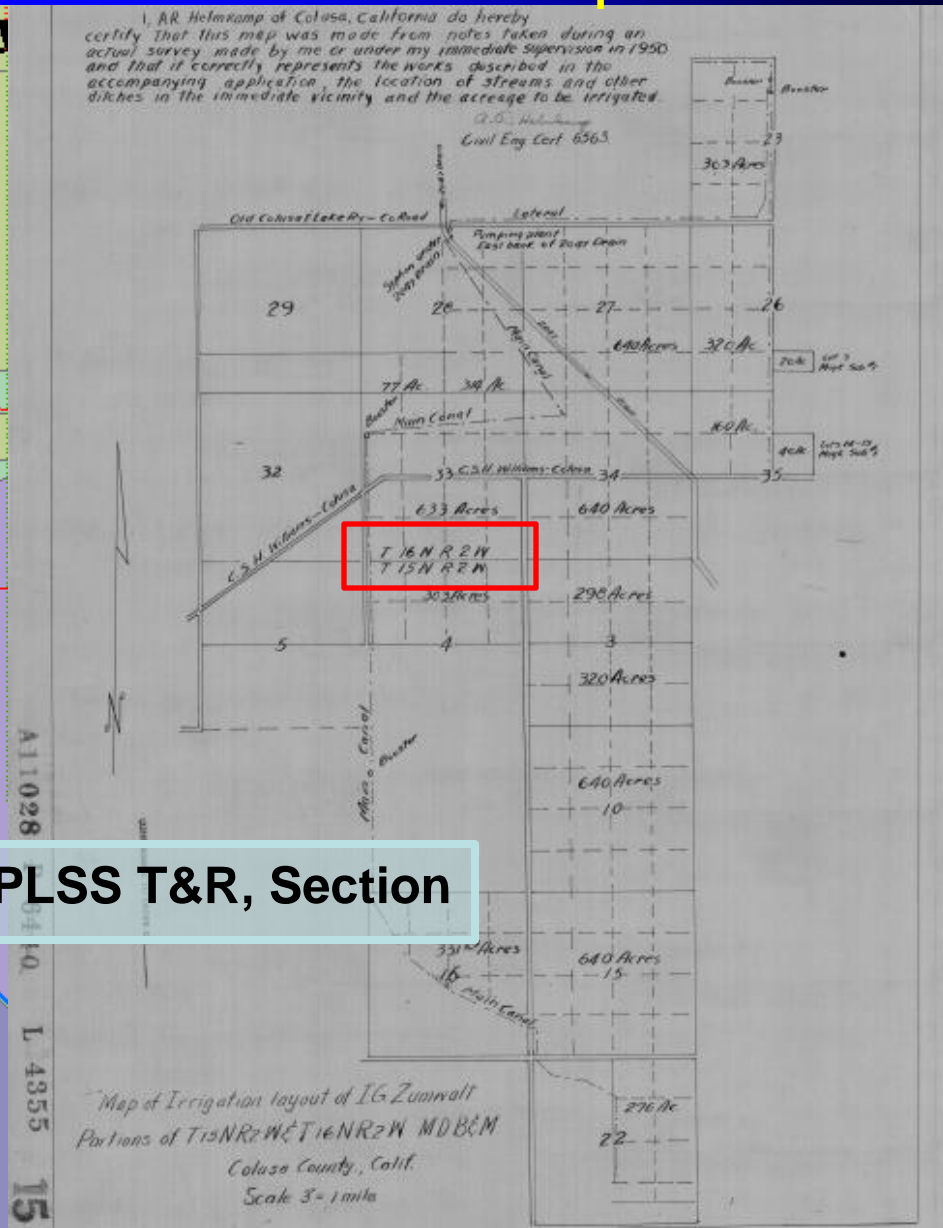
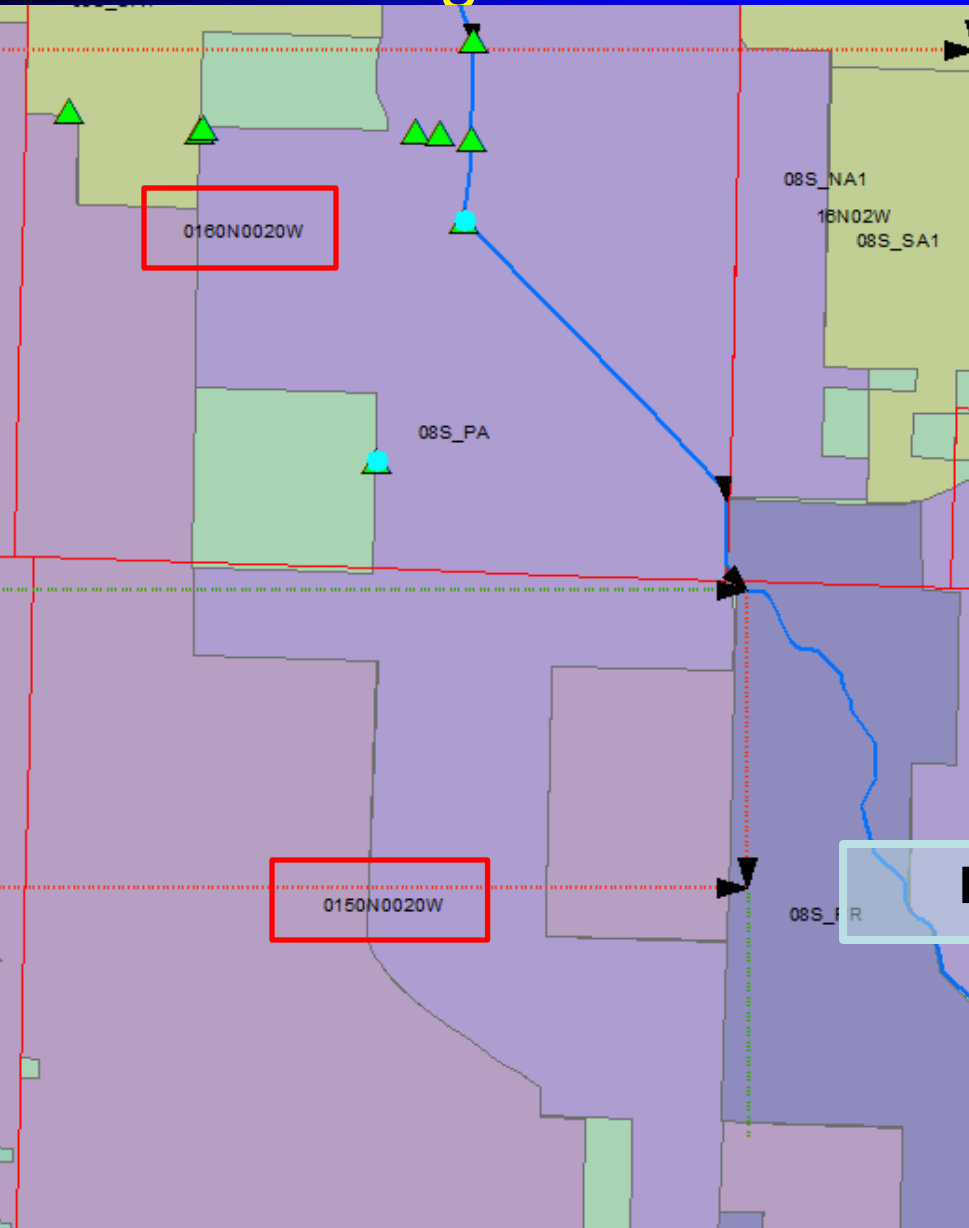


# Locating POU onto Demand Unit – Example II



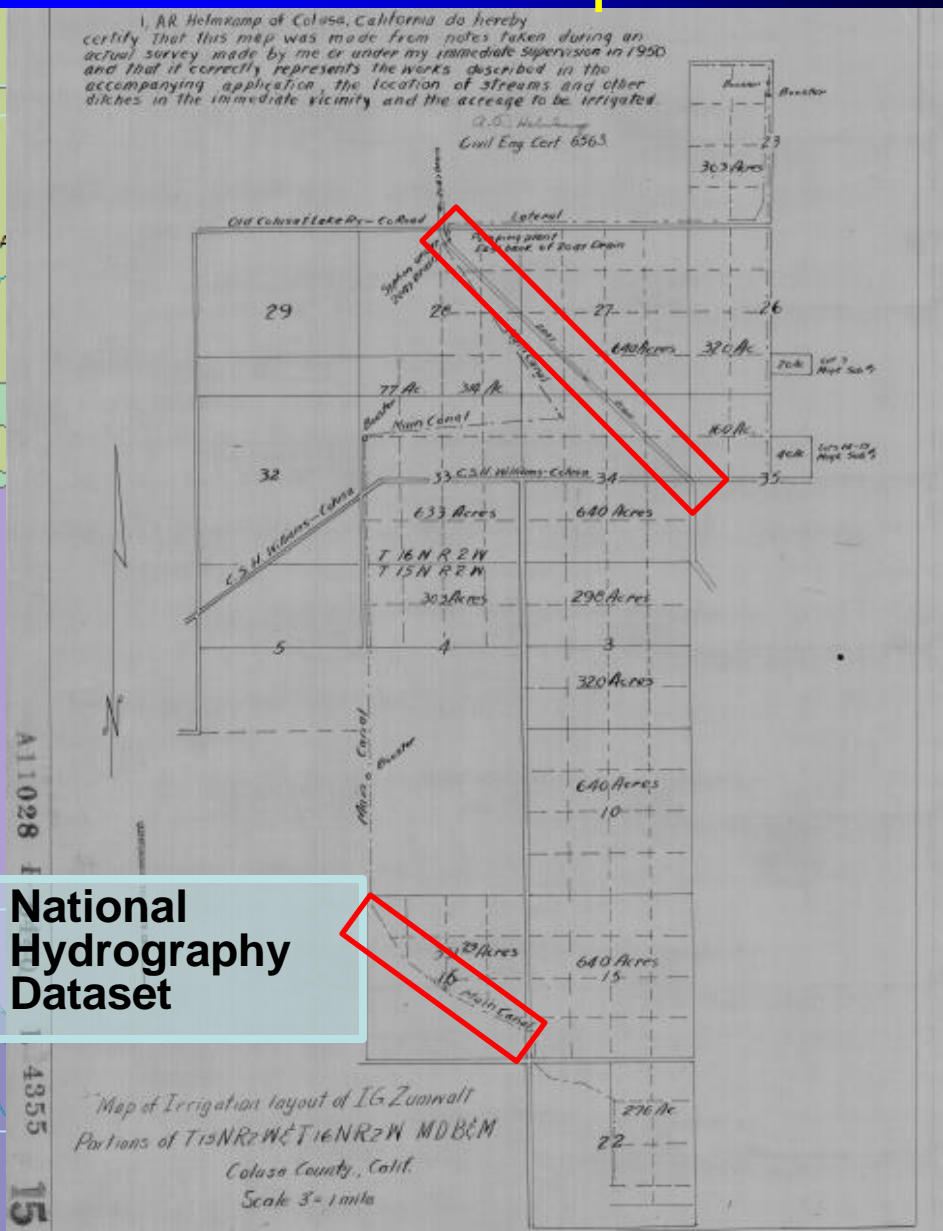
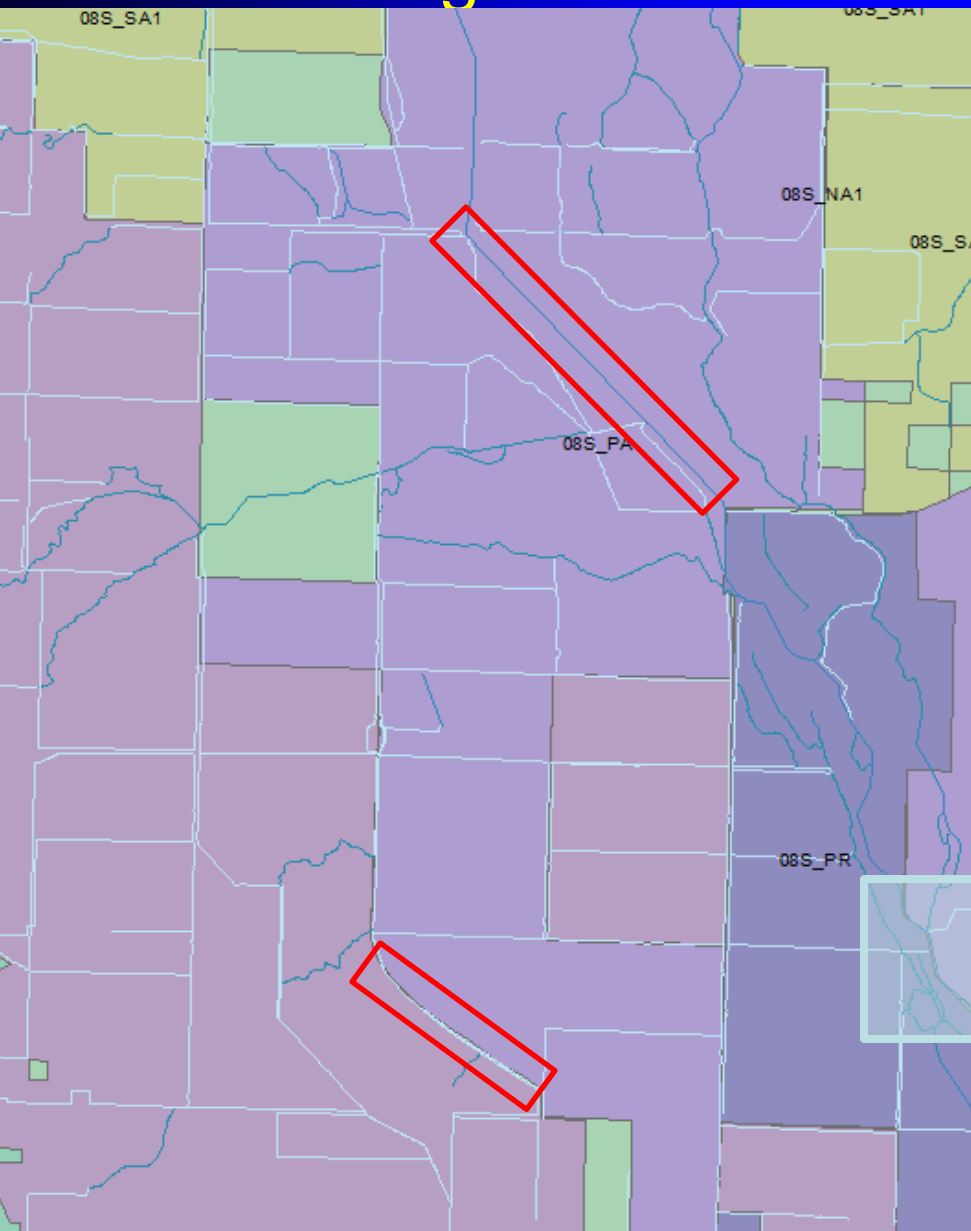
**Diversion Points**

# Locating POU onto Demand Unit – Example II



**PLSS T&R, Section**

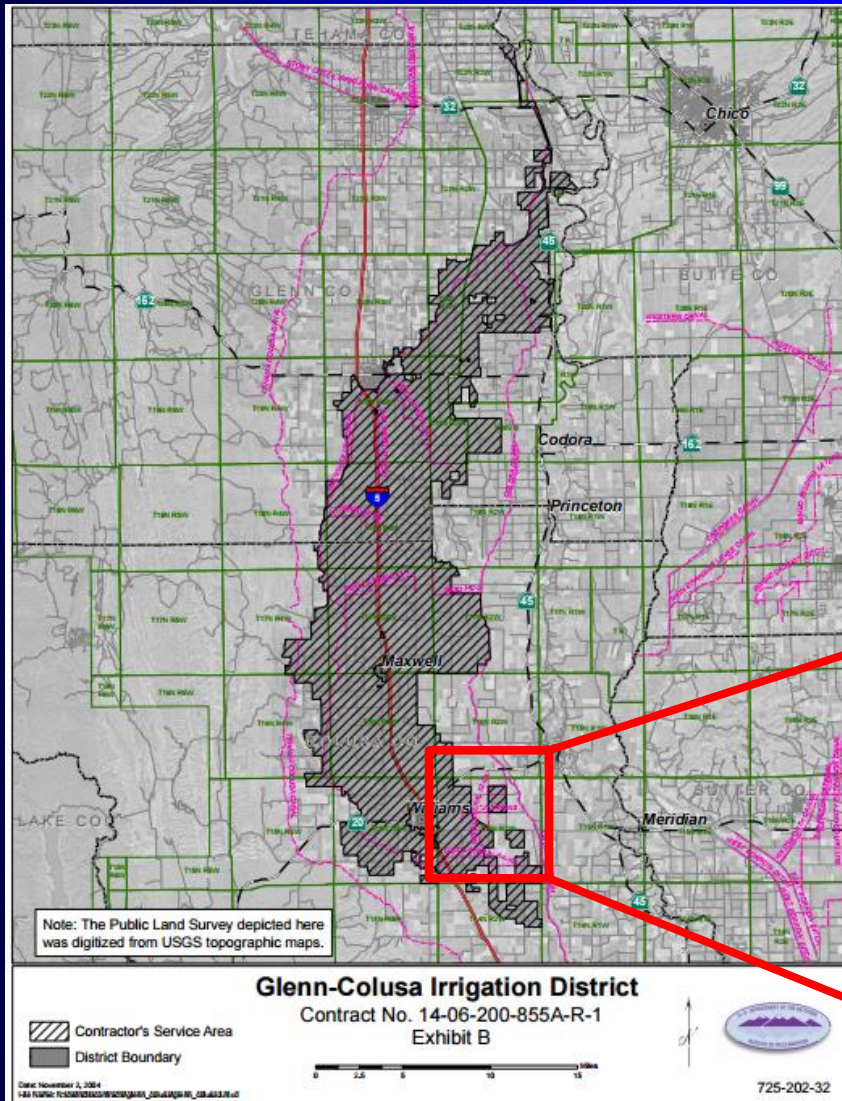
# Locating POU onto Demand Unit – Example II



National Hydrography Dataset



# Locating POU onto Demand Unit – Example II

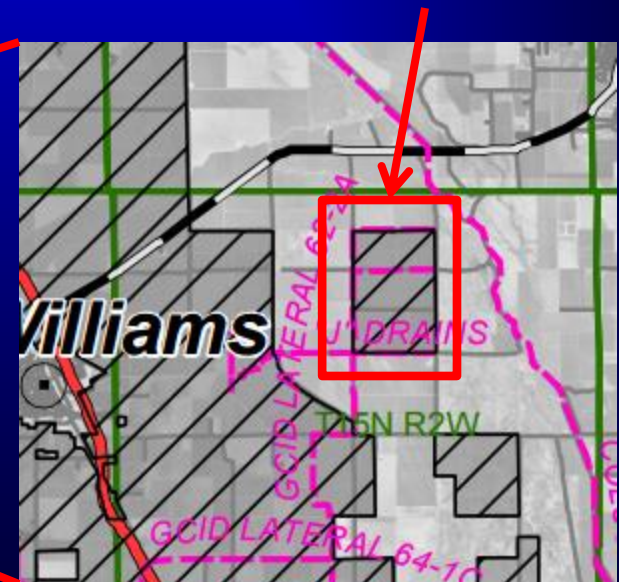


**Source:**

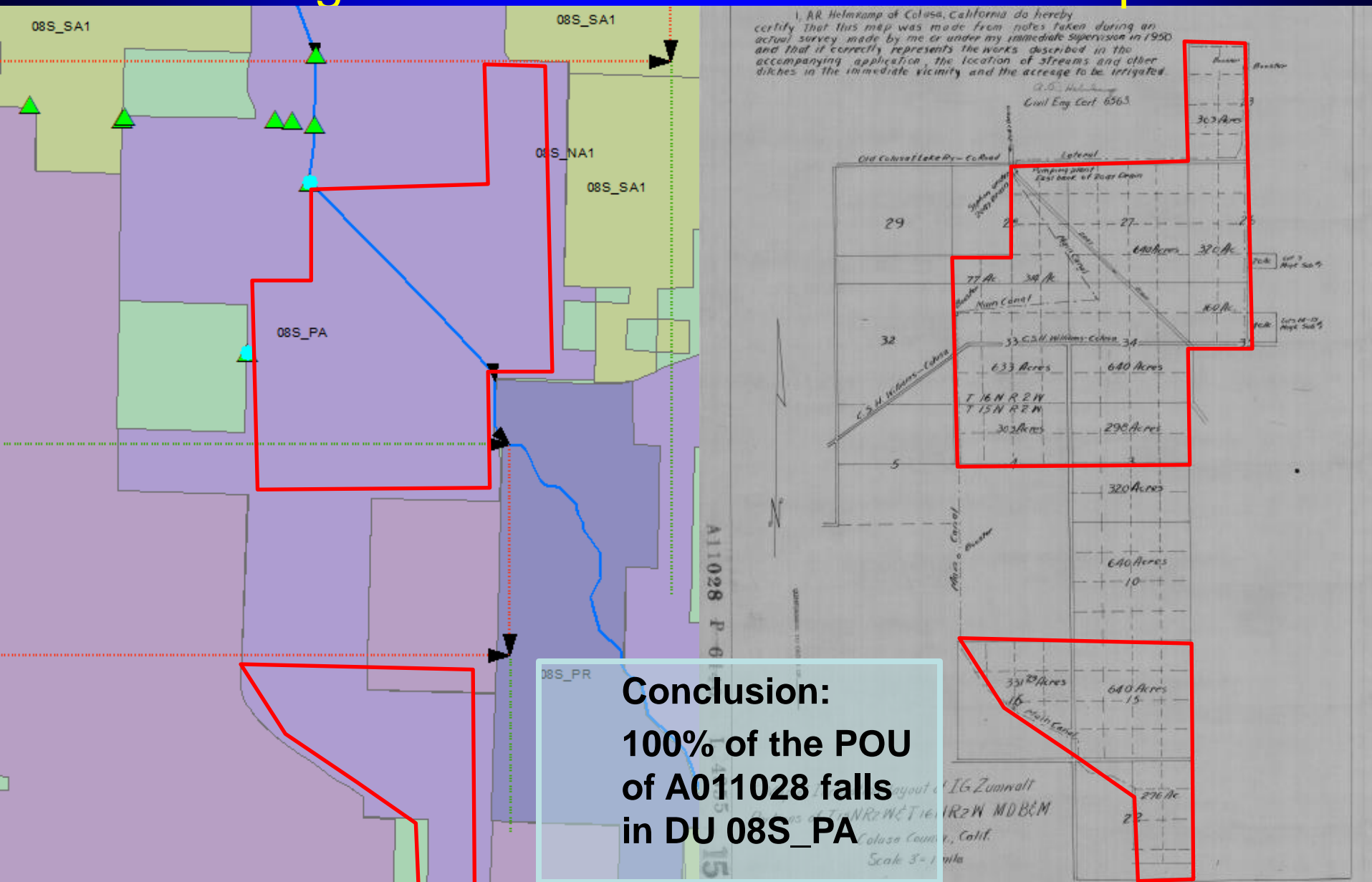
**Map of Glenn-Colusa Irrigation District, CVP Sacramento River Settlement Contract, renewed in 2005**

**Conclusion:**

**The piece of land may not be in the POU of A011028 today.**



# Locating POU onto Demand Unit – Example II



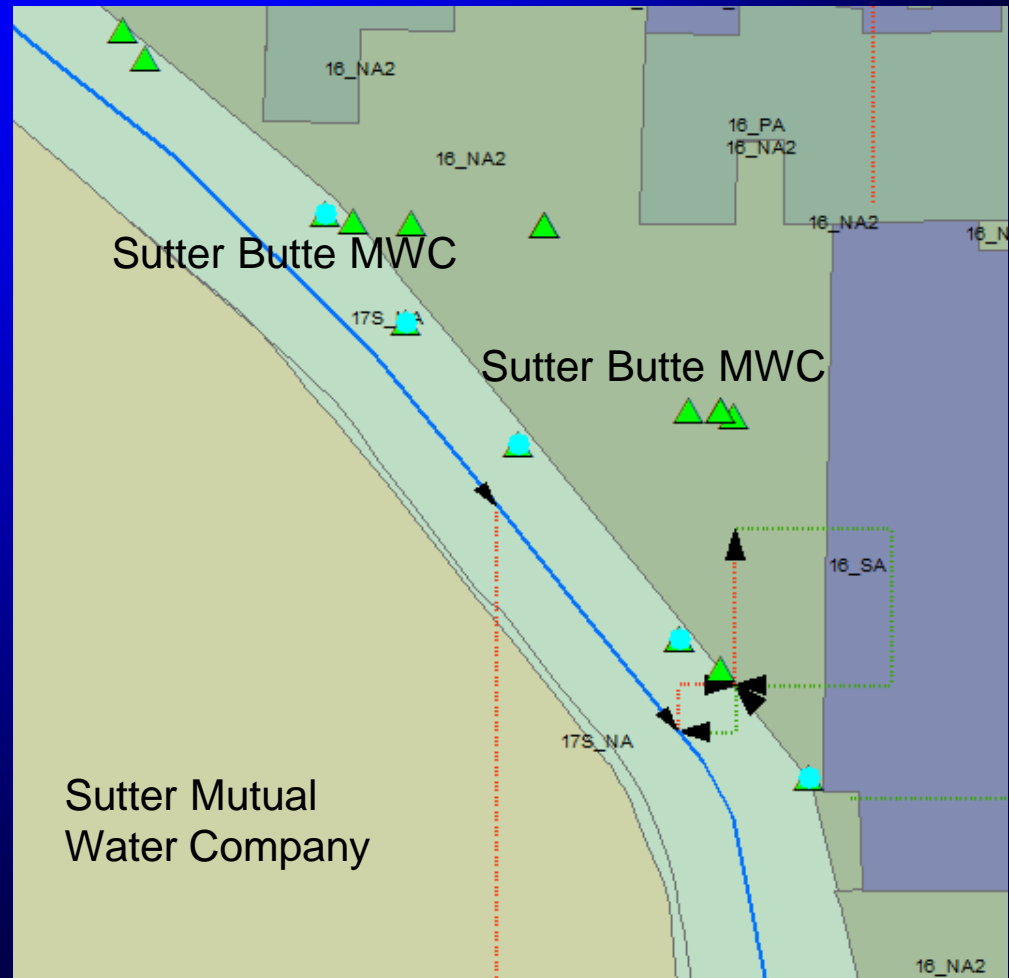
# Locating POU onto Demand Unit – Example III

A006582 by A & G MONTNA  
PROPERTIES LP

No Water district boundaries

No scanned POU map

- ✓ Water right document
- ✓ CalSim 3.0 Demand Units
- ✓ Points of Diversion
- ✓ National Hydrography Dataset
- ✓ PLSS Township and Range



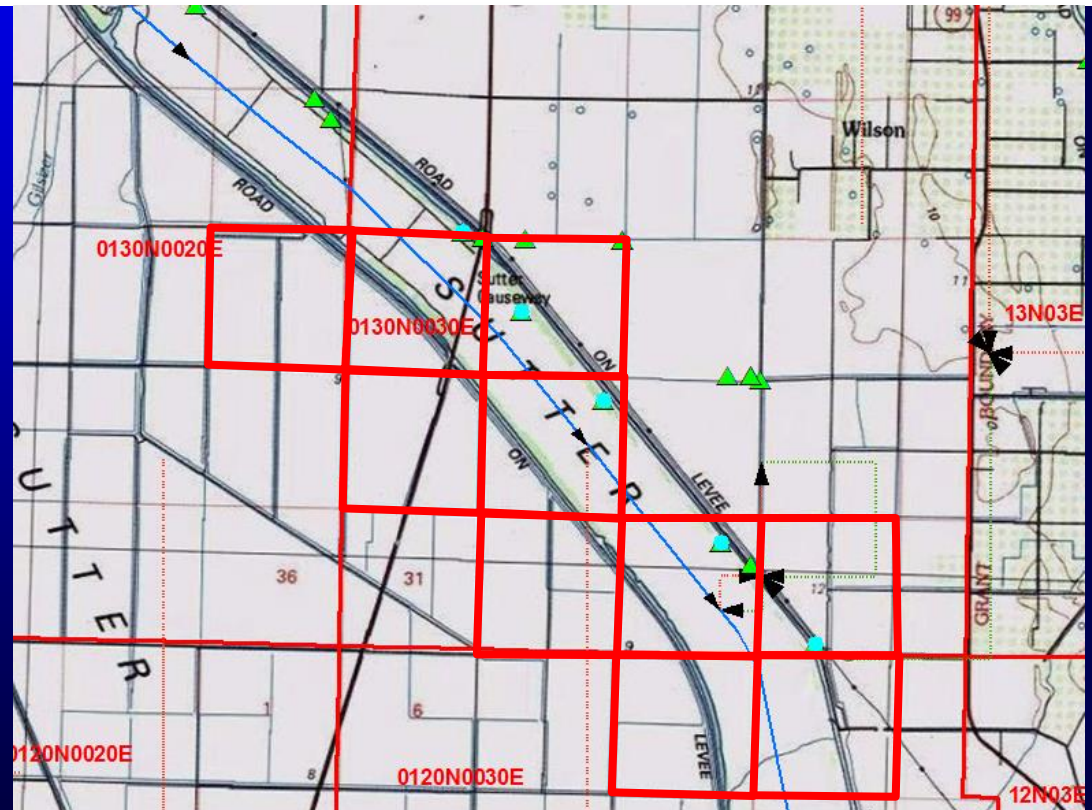


# Locating POU onto Demand Unit – Example III

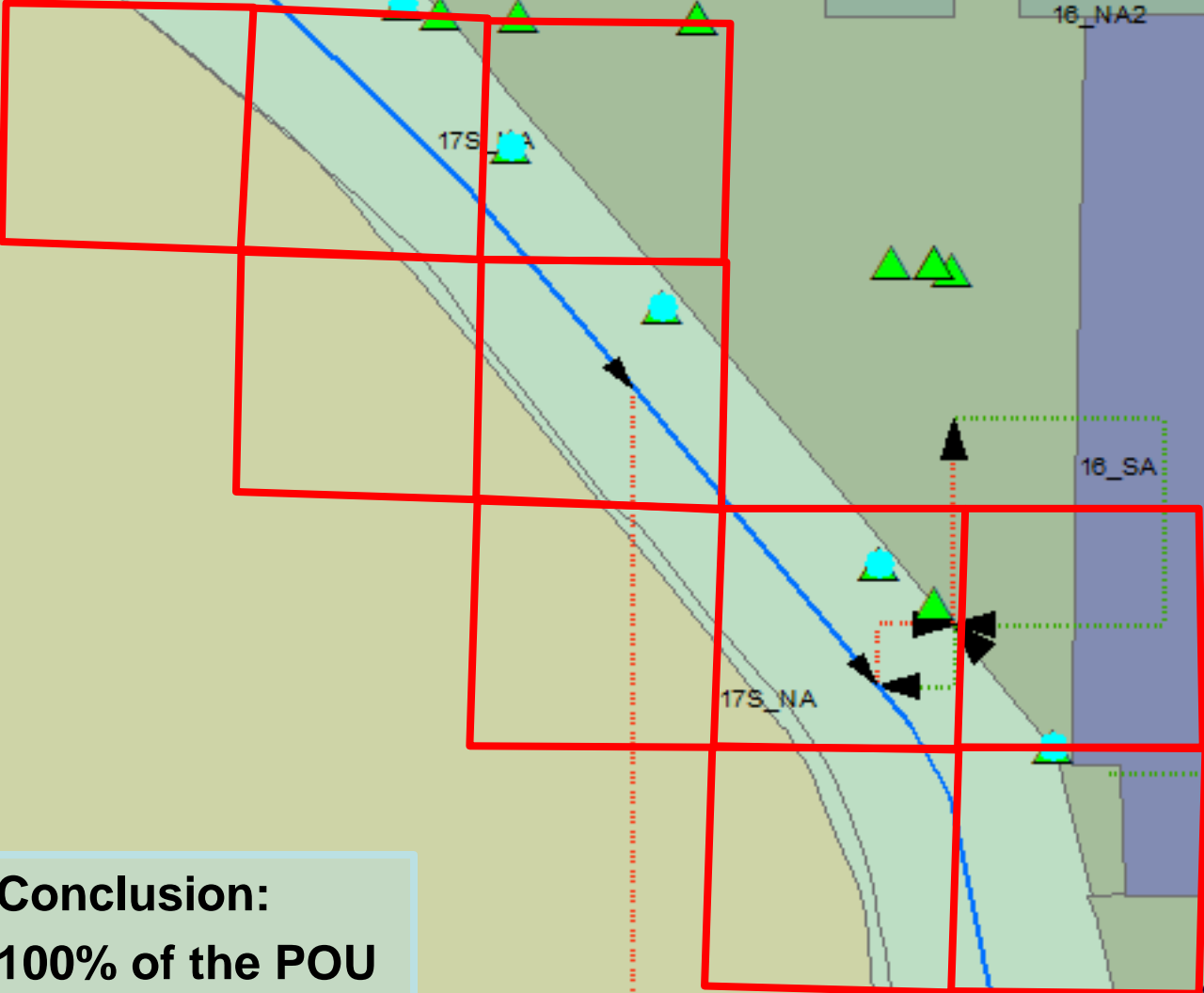
*A description of the lands or the place where such water is put to beneficial use is as follows:*

That portion of the Sutter By-Pass lying between the South lines of Section 19, T. 13 N., R. 3 E., and Sec. 24, T. 13 N., R. 2 E., M.D.B. & M. and the northerly bank of Willow Slough as shown on map filed with the State Engineer on March 26, 1930, containing 1897.65 acres and lying within Section 24, T. 13 N., R. 2 E., Sections 19, 20, 29, 30, 32, 33 and 34, T. 13 N., R. 3 E., and Sections 3, 4 and 9, T. 12 N., R. 3 E., M.D.B. & M.

- ✓ Water right document
- ✓ CalSim 3.0 Demand Units
- ✓ Points of Diversion
- ✓ National Hydrography Dataset
- ✓ PLSS Township and Range

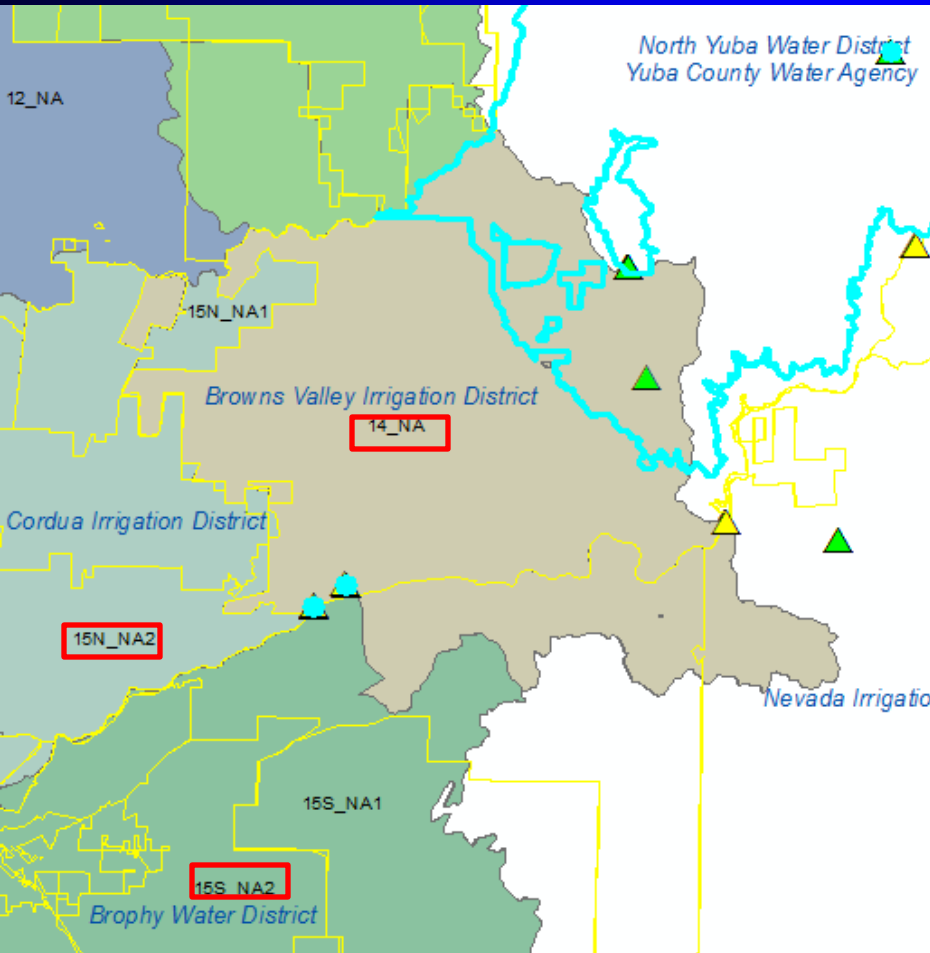


# Locating WR – Example III



**Conclusion:**  
100% of the POU  
of A006582 falls  
in DU 17S\_NA

# Locating POU onto Demand Unit – Example IV



Water diverted under water rights by Yuba County Water Agency (YCWA) is for its own use in 14\_NA as well as contracted users in 14\_NA, 15N\_NA2 and 15S\_NA2

**Table 5-1. Yuba County Water Agency Annual Contract Amounts**

Water Diversion Point and Member Units	Base Contract (AF)	Supplemental Contract (AF)	Total Contract (AF)	District Water Rights (AF)	Total Contract and Water Rights (AF)
<b>Brown's Valley Irrigation District Pump and Line Diversion Facility</b>					
Browns Valley Irrigation District	9,500	-	9,500	24,462 <sup>b</sup>	33,962
<b>South Canal</b>					
Brophy Water District	43,470	32,177	75,647	-	75,647
South Yuba Water District	25,487	18,843	44,330	-	44,330
Dry Creek Mutual Water Company	13,682	3,061	16,743	-	16,743
Wheatland Water District <sup>a</sup>	23,092	17,138	40,230	-	40,230
<b>North Canal</b>					
Cordua Irrigation District	12,000	-	12,000	60,000	72,000
Hallwood Irrigation Company	-	-	-	78,000	78,000
Ramirez Water District	14,790	10,311	25,101	-	25,101
<b>Other</b>					
City of Marysville	-	2,500	2,500	-	2,500
<b>Total</b>	<b>142,021</b>	<b>84,030</b>	<b>226,051</b>	<b>162,462</b>	<b>388,513</b>

<sup>a</sup> Includes both Phase 1 and Phase 2 of the Wheatland Project.

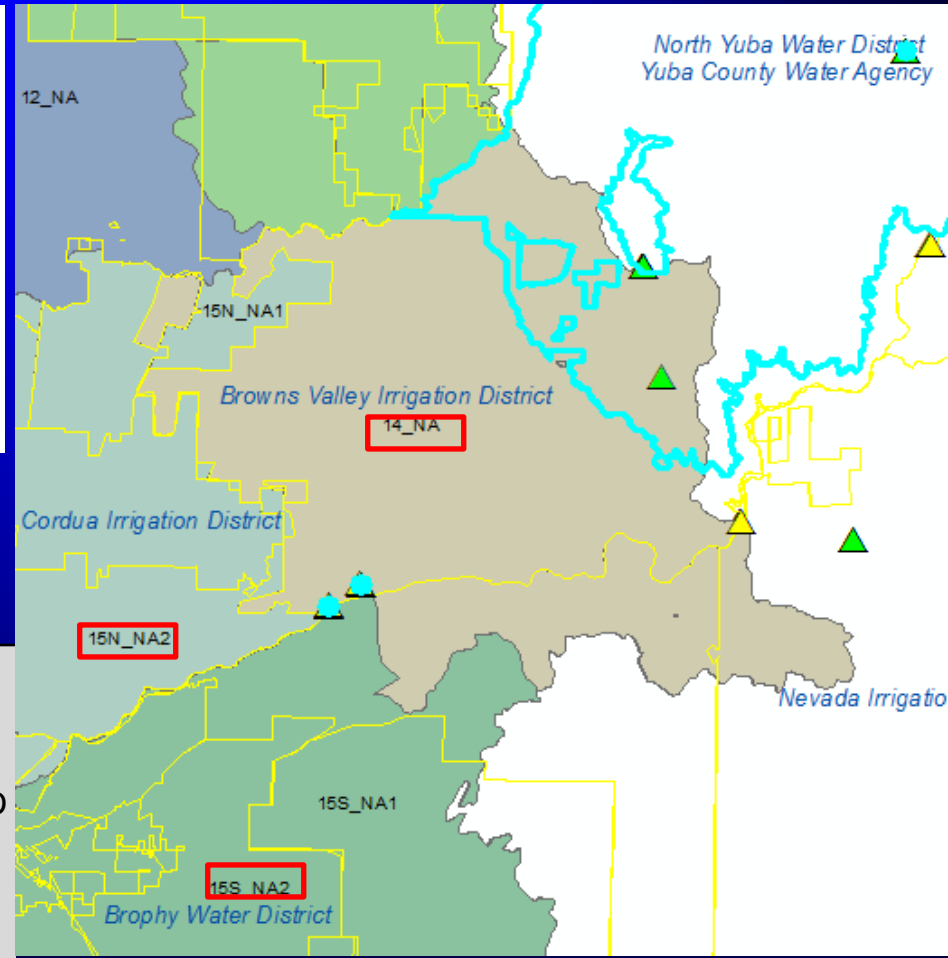
<sup>b</sup> As specified in RD-1664

# Locating POU onto Demand Unit – Example IV

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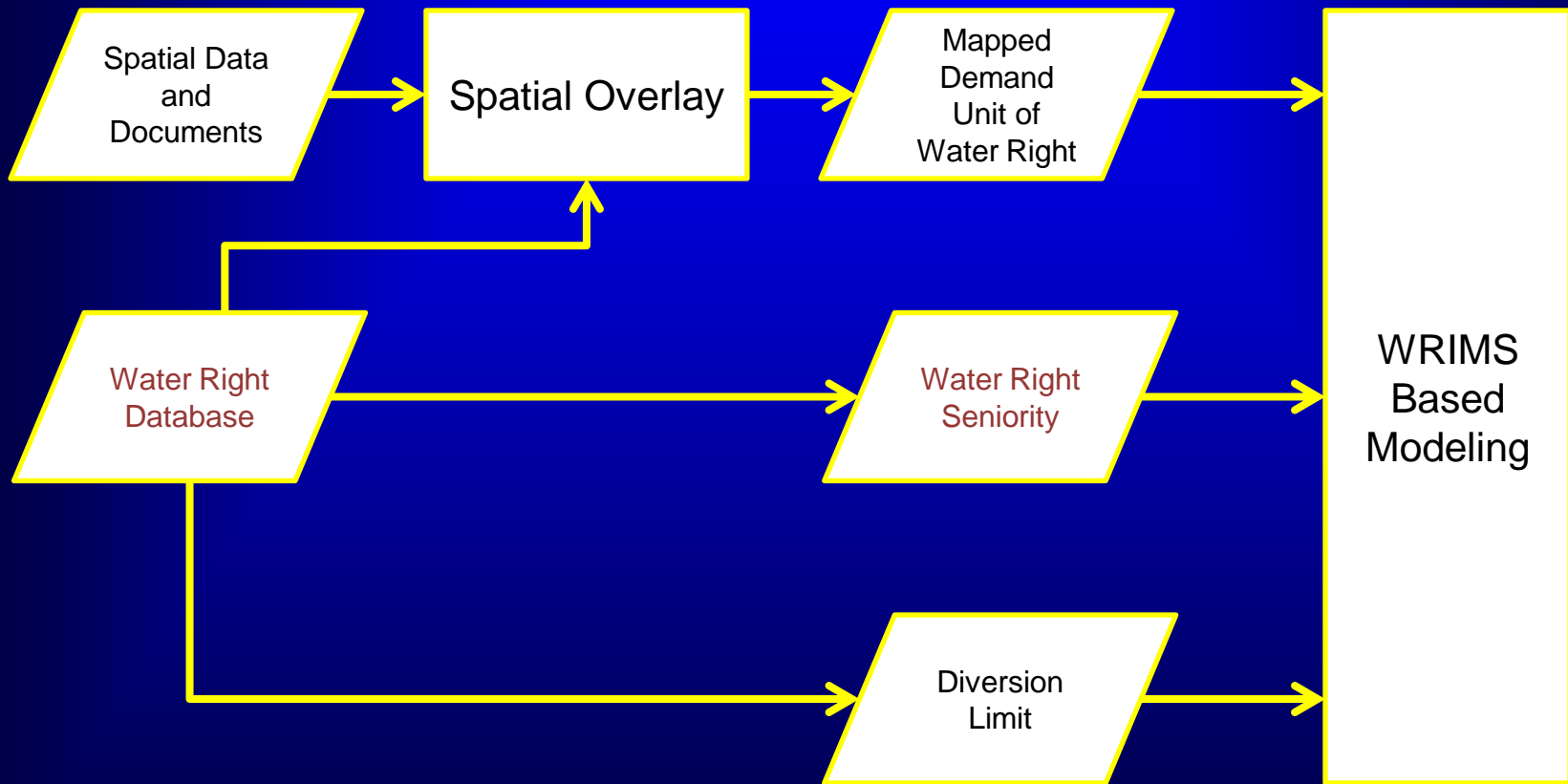
<sup>a</sup> Includes both Phase 1 and Phase 2 of the Wheatland Project.  
<sup>b</sup> As specified in RD-1664



<b>Total diversion</b>	448,502	100%	Average diversion 2010-2013
<b>14_NA</b>	231,951	<b>52%</b>	222,451 for own use (total diversion - total contract) and BVID
<b>15S_NA2</b>	176,950	<b>39%</b>	4 Users along South Canal
<b>15N_NA2</b>	37,101	<b>8%</b>	2 Users along North Canal



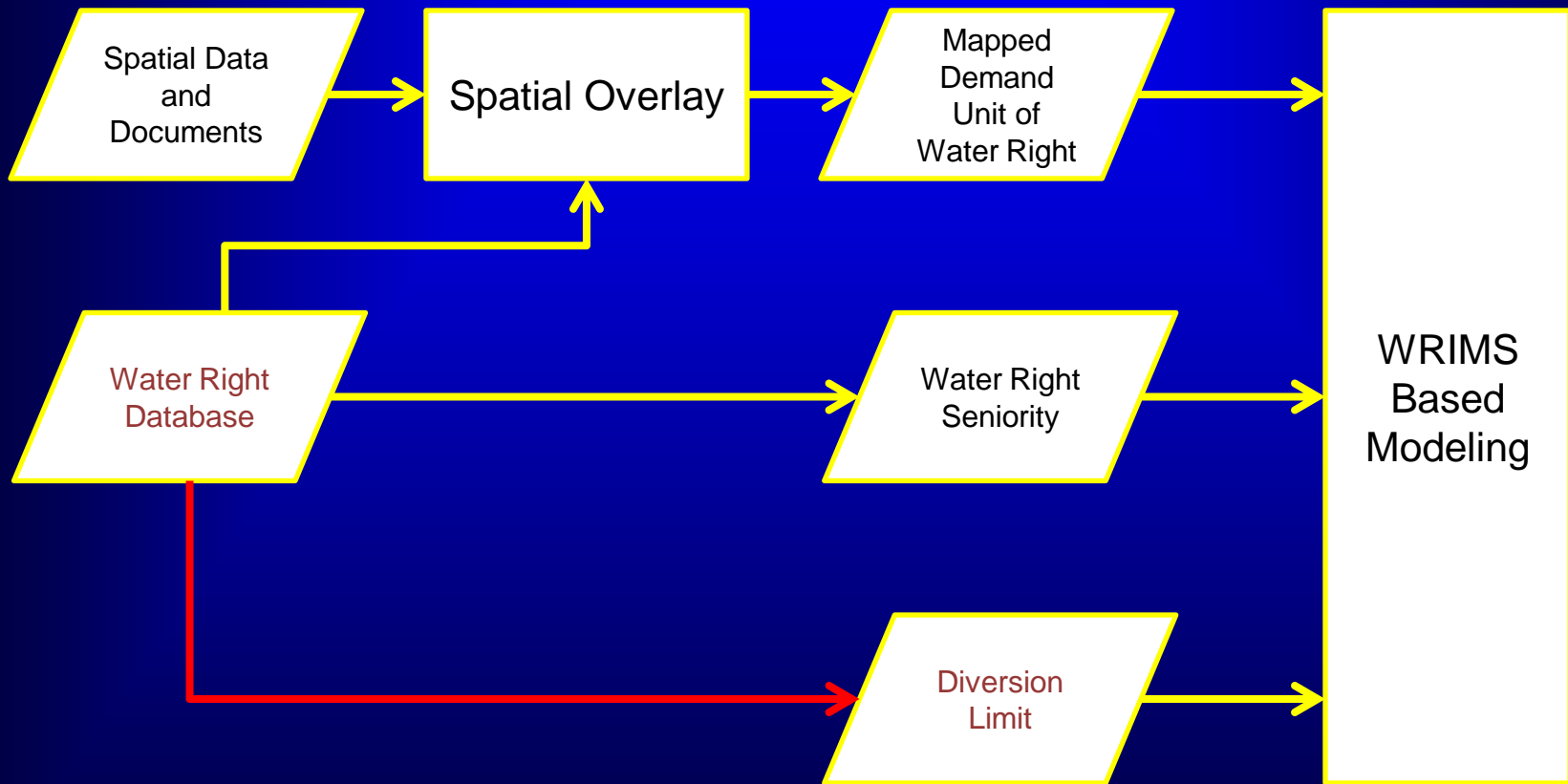
# Process Water Right Data for Model Implementation



# Water Right Seniority

- Riparian Water Rights
  - Property/parcel adjacent to a stream
  - No explicit limit, but:
    - Water used must be from “natural flow”
    - Water cannot be stored
    - Water used must be for reasonable beneficiary use.
- Pre-1914 Appropriative Water Rights
  - Initiated before Dec 19, 1914
  - Limited to quantity of water use by 1914, or planned to be used
- Post-1914 Appropriative Water Rights
  - Requires a permit or license
  - Explicit limits on water used or water stored

# Process Water Right Data for Model Implementation



# Water Right Limit

- Limit on diversion by certain water right could be simple, like (A000018 by Glenn Colusa ID).:
  - Diversion rate from Mar 1<sup>st</sup> to Nov 1<sup>st</sup> of each year cannot exceed 110 cfs
- Or more complicated (A014804 by South Sutter WD):
  - Diversion to storage from Oct 1<sup>st</sup> to Jun 30<sup>th</sup> : <58370 AF/year
  - Total amount to storage of A10221, A2881(Camp Far West ID), A10190(CFW ID), and A14804: <102100 AF/year
  - Total amount (direct diversion + storage) of A10221 and A14804: <180550 AF/year
  - Total beneficial use of A10221 and A14804: < 138300 AF/year
  - Direct diversion rate from Mar 1<sup>st</sup> to Sep 1<sup>st</sup>: <330 cfs
  - Combined rate of A10221 and A14804: <450 cfs
- At present, only for “major” water rights



# Model Implementation

Major Water  
Rights

Code water rights and their restrictions & priority in simulation model **one by one**

Other Water  
Rights

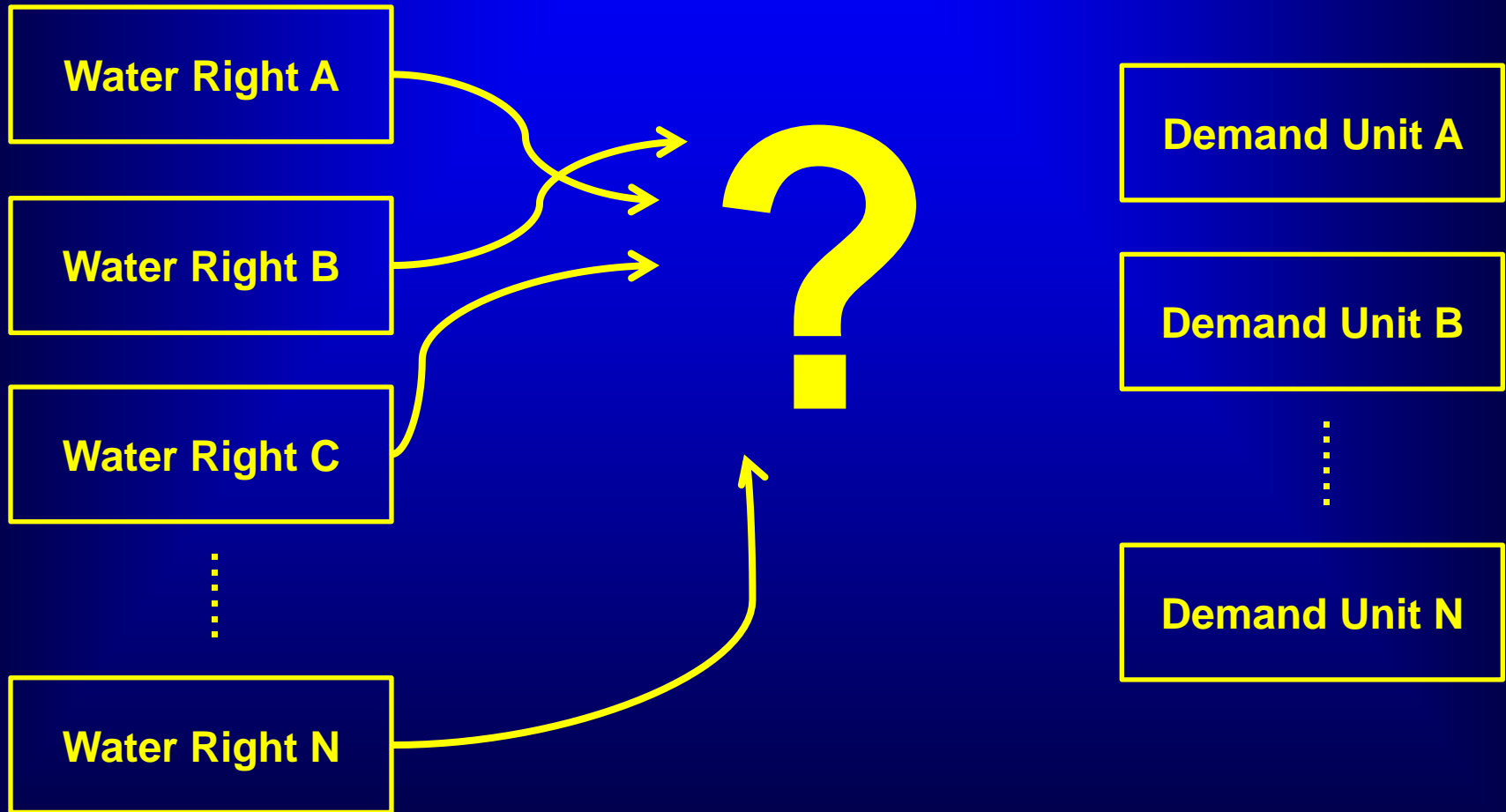
Mapping onto DU by  
spatial overlay with  
HU

Overlay weighted by **area**

Overlay weighted by **demand**



# Mapping by Hydrologic Unit

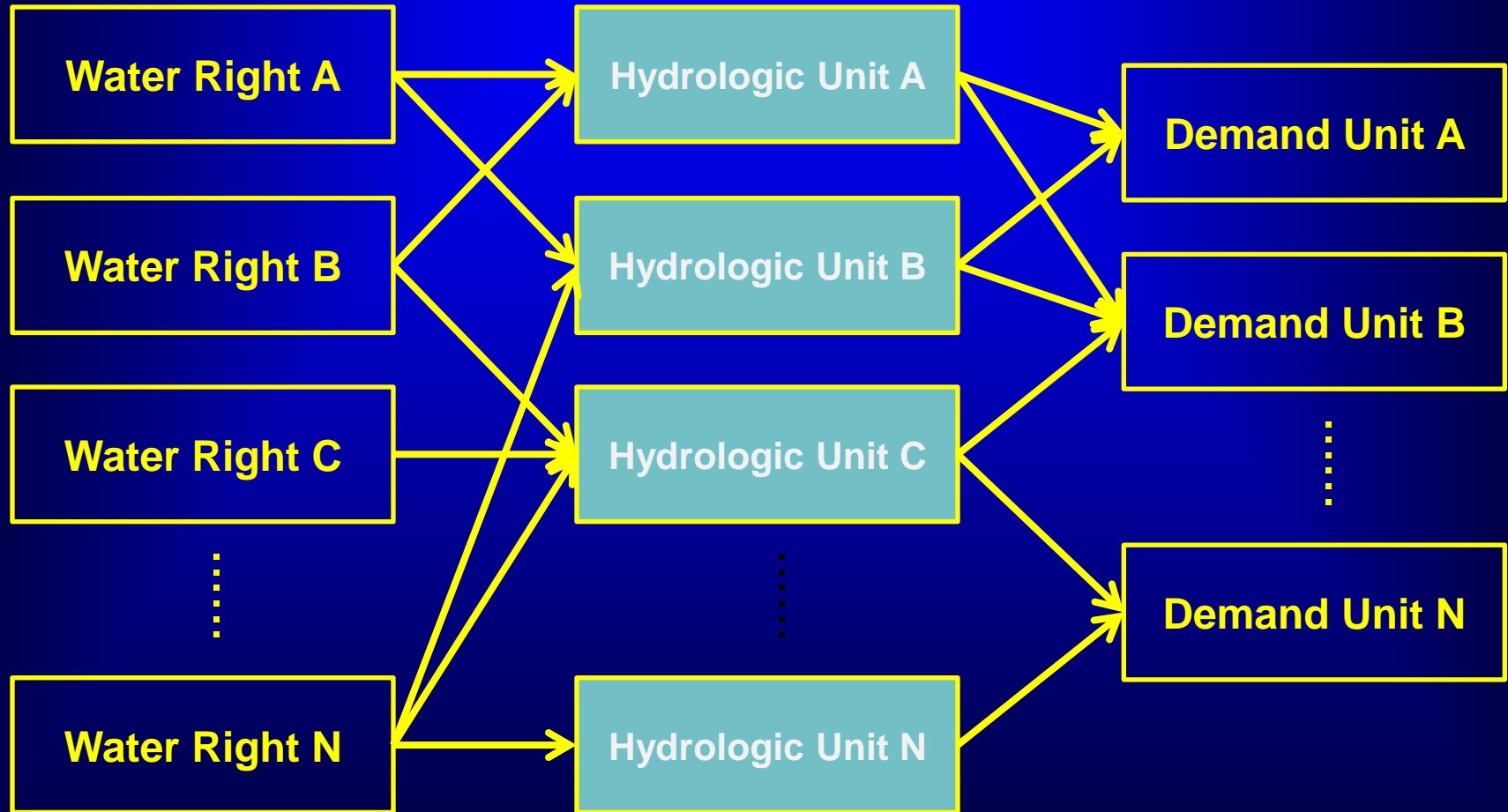




# Mapping by Hydrologic Unit

WDNAME	DU_ID	HUC12	Name
SHASTA CO SA #25 - KESWICK C.S.D.	02_PU	180201540301	Spring Creek
CENTERVILLE C.S.D.	02_PU	180201540302	Sulphur Creek-Sacramento River
SHASTA C.S.D.	02_PU	180201540302	Sulphur Creek-Sacramento River
SHASTA CO SA #25 - KESWICK C.S.D.	02_PU	180201540302	Sulphur Creek-Sacramento River
CENTERVILLE C.S.D.	02_PU	180201540303	Olney Creek-Sacramento River
SHASTA C.S.D.	02_PU	180201540303	Olney Creek-Sacramento River
ANDERSON-COTTONWOOD I.D.	02_SA	180201520703	Pine Creek-South Fork Cottonwood Creek
ANDERSON-COTTONWOOD I.D.	02_SA	180201520804	Hooker Creek
ANDERSON-COTTONWOOD I.D.	02_SA	180201520805	Middle Cottonwood Creek
ANDERSON-COTTONWOOD I.D.	02_SA	180201520806	Lower Cottonwood Creek
ANDERSON-COTTONWOOD I.D.	02_SA	180201540106	South Fork Clear Creek-Clear Creek
ANDERSON-COTTONWOOD I.D.	02_SA	180201540305	Clover Creek-Sacramento River
ANDERSON-COTTONWOOD I.D.	02_SA	180201540502	Anderson Creek-Sacramento River
LAKE CALIFORNIA PROPERTY OWNERS	02_SA	180201550402	Spring Creek-Sacramento River
LEVIATHAN, INC.	02_SA	180201550402	Spring Creek-Sacramento River
CITY OF REDDING - 2871	02_SU	180201540106	South Fork Clear Creek-Clear Creek
CITY OF REDDING - 2871	02_SU	180201540302	Sulphur Creek-Sacramento River
CITY OF REDDING - 2871	02_SU	180201540303	Olney Creek-Sacramento River
CITY OF REDDING - 2871	02_SU	180201540305	Clover Creek-Sacramento River

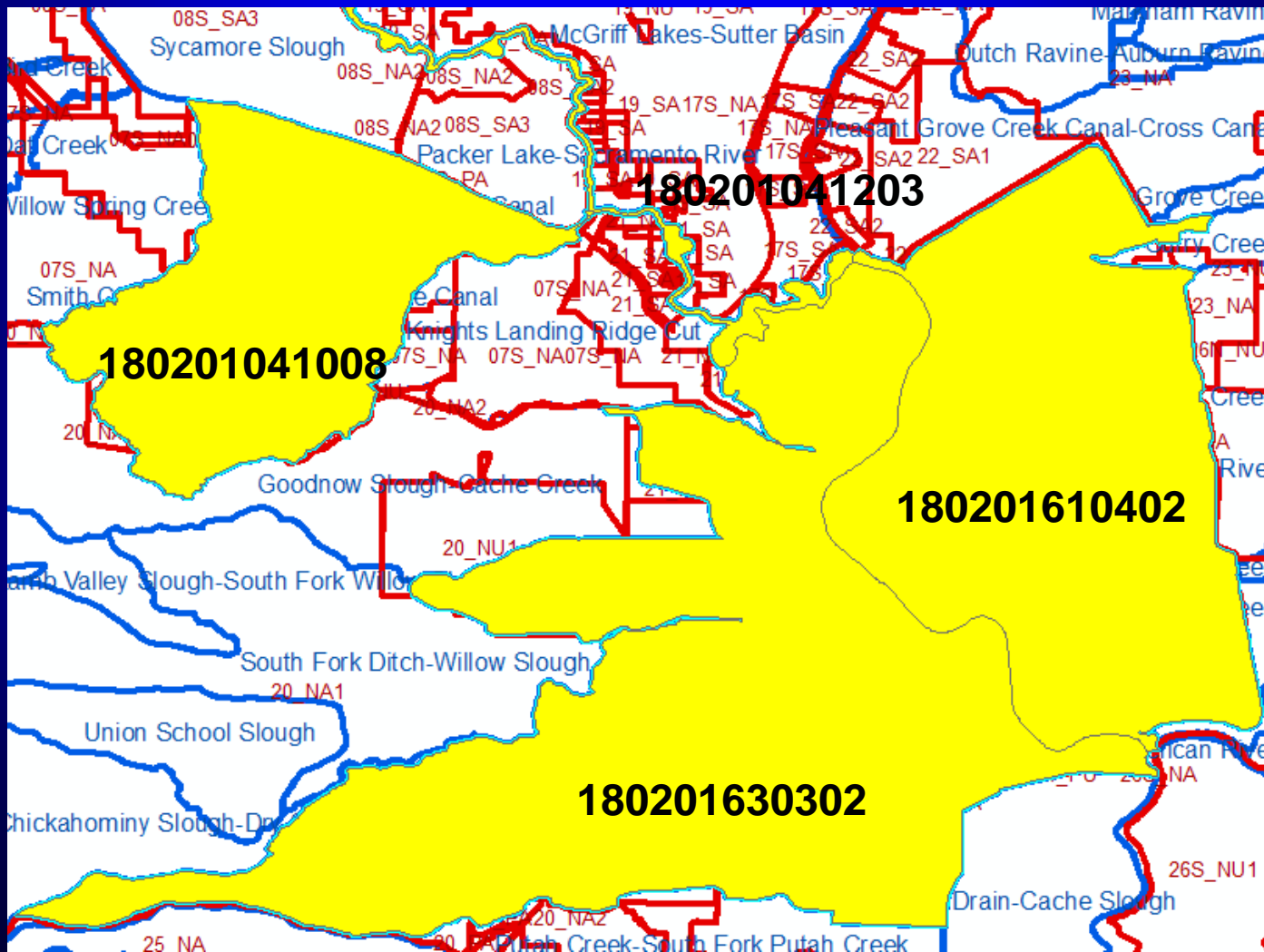
# Mapping by Hydrologic Unit





# Mapping by Hydrologic Unit - Example

A004351	DAVID AND ALICE TE VELDE REVOCABLE FAMILY TRUST	180201610402	180201041203,180201630302,180201041008
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THANK YOU

Questions?