



Town of Chino Valley

Mayor's Safe-Yield Committee





Town Council Action

Resolution 09-909

Adopted the creation of a Mayor's Safe-Yield Committee



Resolution 09-909

- A Mayor's Safe-Yield Committee is hereby established and consists of:
 - ✓ The Mayor
 - ✓ At least one other Council member(s)
 - ✓ Appropriate Town Staff
 - ✓ Appropriate stakeholders of the community and shall be appointed by the Mayor



Resolution 09-909

- Mayor – Chair of the Committee
- Council member – Vice-chair
- Stakeholders



Resolution 09-909

- The Committee
 - ✓ Review and consider various problems associated with overdraft and safe-yield
 - ✓ Create a detailed safe-yield plan that could outline and implement goals, objectives, and solutions to these problems
 - ✓ The Committee is authorized to create a Technical advisory Committee or other sub-committees as it deems appropriate



Resolution 09-909

- The Committee first task will be to thoroughly understand the current safe-yield and overdraft problems
- Adopt a clear plan, with definable goals and objectives, and consider implementing those components to achieve these goals
- The Committee will report its progress to other regional ongoing safe-yield efforts to share information and progress regarding these complex issues



Definitions

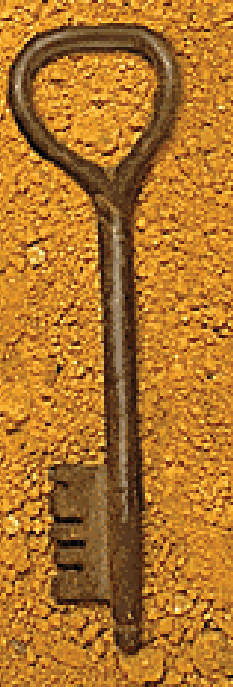
Acre-Foot – 325,851 gallons of water *or* the volume of 1 acre filled with 1 foot of water

Recharge - water that percolates through the ground to eventually meet the water table

Water table - depth below ground level where the ground is completely saturated with water

Assured Water Supply Credit – 1 acre-foot of water delivered every year for 100 years (totaling 100 acre-feet)

Definitions



Certificate of assured water supply (CAWS) – certified 100 year supply of water required for AMA developments meeting specific real estate statute and issued by ADWR or a designated water provider

Specific Yield – is the ratio of the volume of water that drains from a saturated rock owing to the attraction of gravity to the total volume of the rock



Historical Consideration

Prior to 1980

Groundwater Issues Resolved Locally





Prior 1940's

- Prior to the 1940s, water use in the Prescott area was primarily supplied by surface water impoundments and diversions.
- Irrigated agriculture in Chino Valley and Dewey was supplied by impoundments such as Watson and Willow Lakes, or direct diversions from Lynx Creek.
- The introduction of the high-capacity turbine pump in the 1940s gave farmers a way to supplement surface water supplies or to subjugate additional acreage to irrigation.



1980

Groundwater Management Act

THREE PRIMARY GOALS

1. Control severe overdraft occurring in many parts of the state.
2. Provide a means to allocate the state's limited groundwater resources to most effectively meet the changing needs of the state; and
3. Augment Arizona's groundwater through water supply development.



1980

Groundwater Management Act

The Arizona Department of Water Resources was established to accomplish the goals

The Code established three levels of water management to respond to different groundwater conditions:

1. The lowest level of management includes general provisions that apply statewide.
2. The next level of management applies to Irrigation Non-Expansion Areas (INAs).
3. The highest level of management, with the most extensive provisions, is applied to Active Management Areas (AMAs) where groundwater overdraft is most severe.



Active Management Areas (AMA)

The Act contains six key provisions:

1. Establishment of a program of groundwater rights and permits.
2. A provision prohibiting irrigation of new agricultural lands within AMAs.
3. Preparation of a series of five water management plans for each AMA designed to create a comprehensive system of conservation targets and other water management criteria.
4. Development of a program requiring developers to demonstrate a 100-year assured water supply for new growth.
5. A requirement to meter/measure water pumped from all large wells.
6. A program for annual water withdrawal and use reporting. These reports may be audited to ensure water-user compliance with the provisions of the Groundwater Code and management plans.

Penalties may be assessed for non-compliance.



Safe-Yield

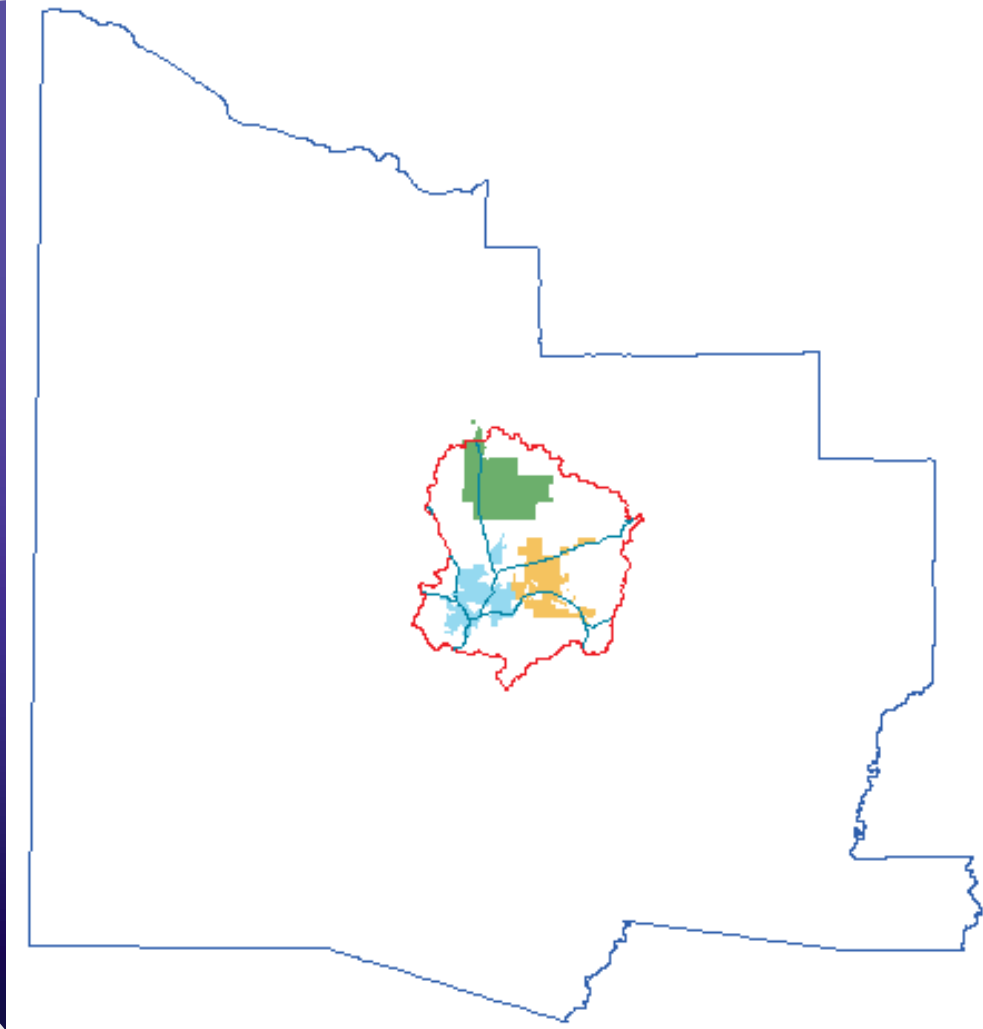
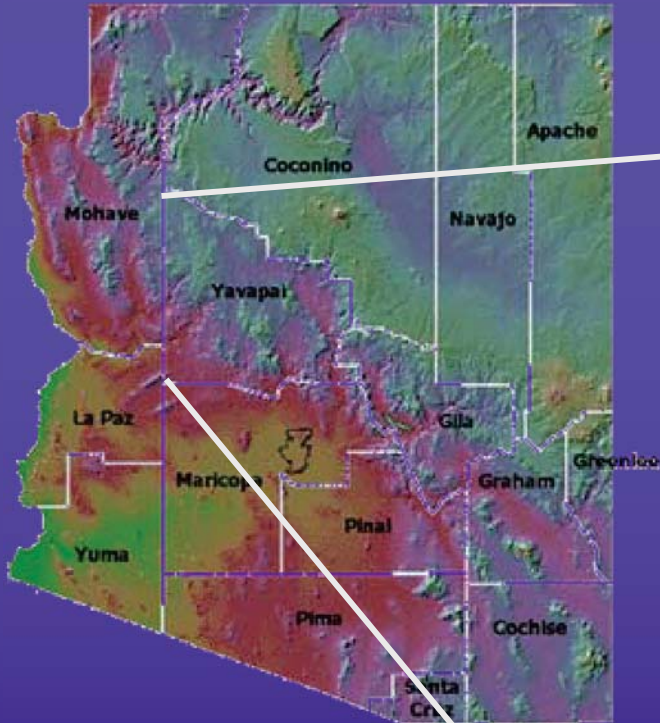
Safe-Yield – As defined in ARS § 45-561 (12) is a groundwater management goal to achieve and thereafter maintain a long-term balance between the amount of groundwater withdrawn in an active management area (AMA) and the annual amount of natural and artificial recharge in an active management area (AMA).

Active Management Areas (AMA) and Irrigation Non-expansion Areas (INA)

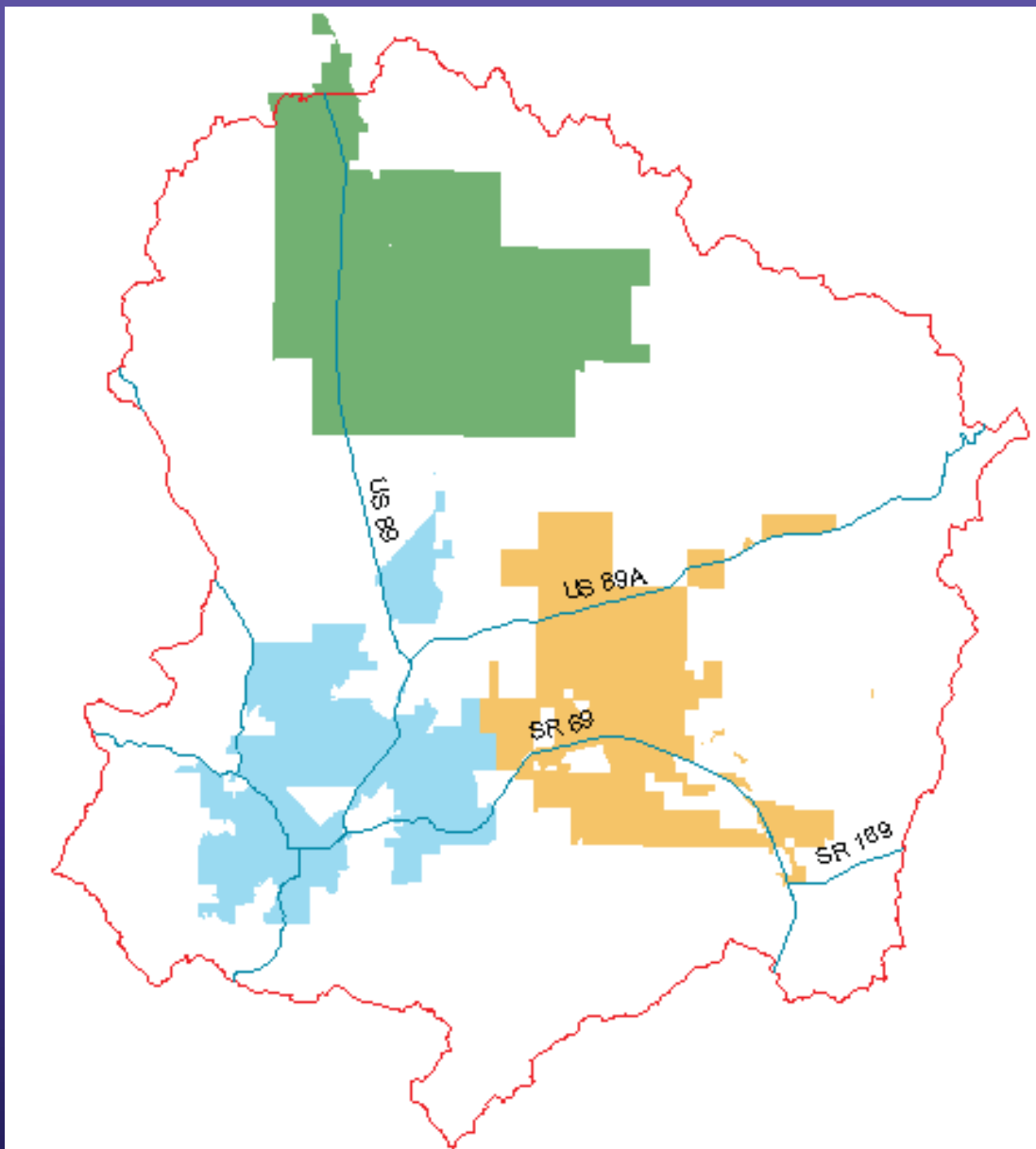


Prescott AMA	485 mile ² ~ 20,000 AF water use
Santa Cruz AMA	750 mile ² ~ 20,000 AF water use
Tucson AMA	3,800 mile ² ~ 300,000 AF water use
Pinal AMA	4,000 mile ² ~ 800,000 AF water use
Phoenix AMA	5,600 mile ² ~ 2 million AF water use

Prescott Active Management Area (AMA)



Prescott AMA



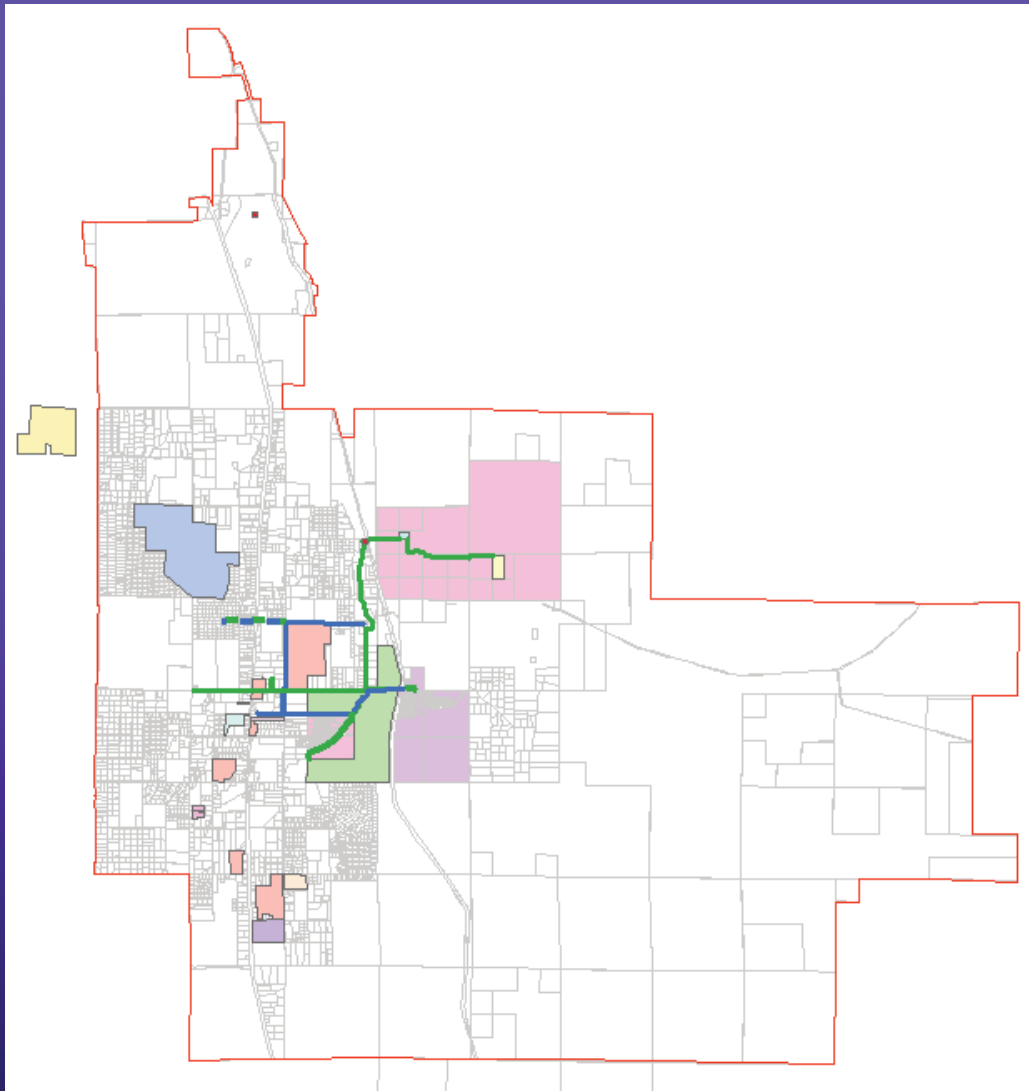
Prescott AMA

- 485 sq. miles

Chino Valley

1. 67 sq. miles (size of Surprise)
2. 86% of land associated with no water rights
3. Historically grown through lot splits and exempt wells
4. Town has established a water & sewer service area
5. There are 8 water service areas within Chino

Town of Chino Valley



Service Area Rights

- 6 private service areas
- 2 municipal service areas
- 1 Irrigation district

Appropriable Rights

Zero

Assured Water Supplies

263 acre-feet

Type I – Non-irrigation rights

15 acre-feet

Type II – Non-irrigation rights

34 acre-feet

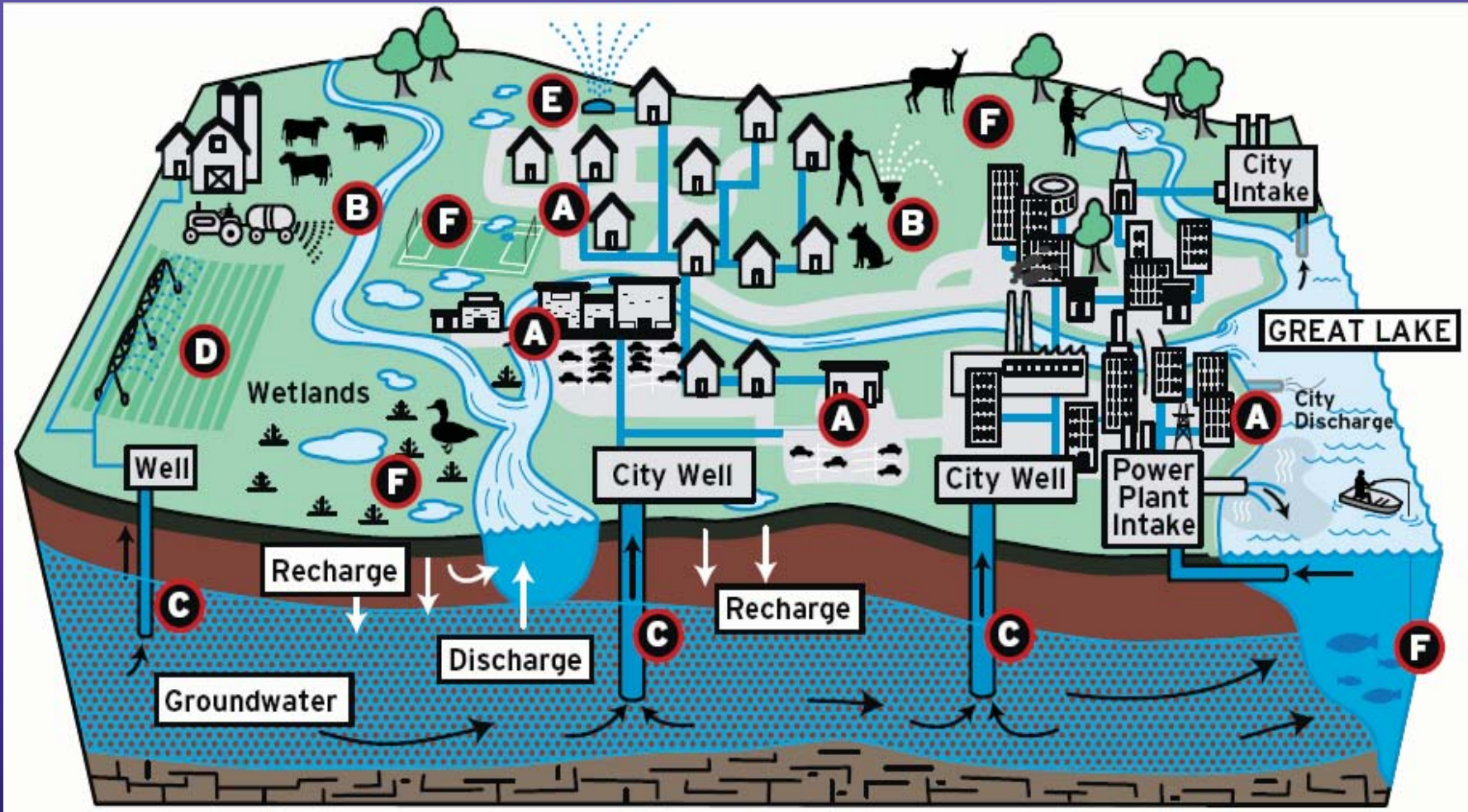
Long Term Storage Credits

50 acre-feet annually

Where is our Water Supply

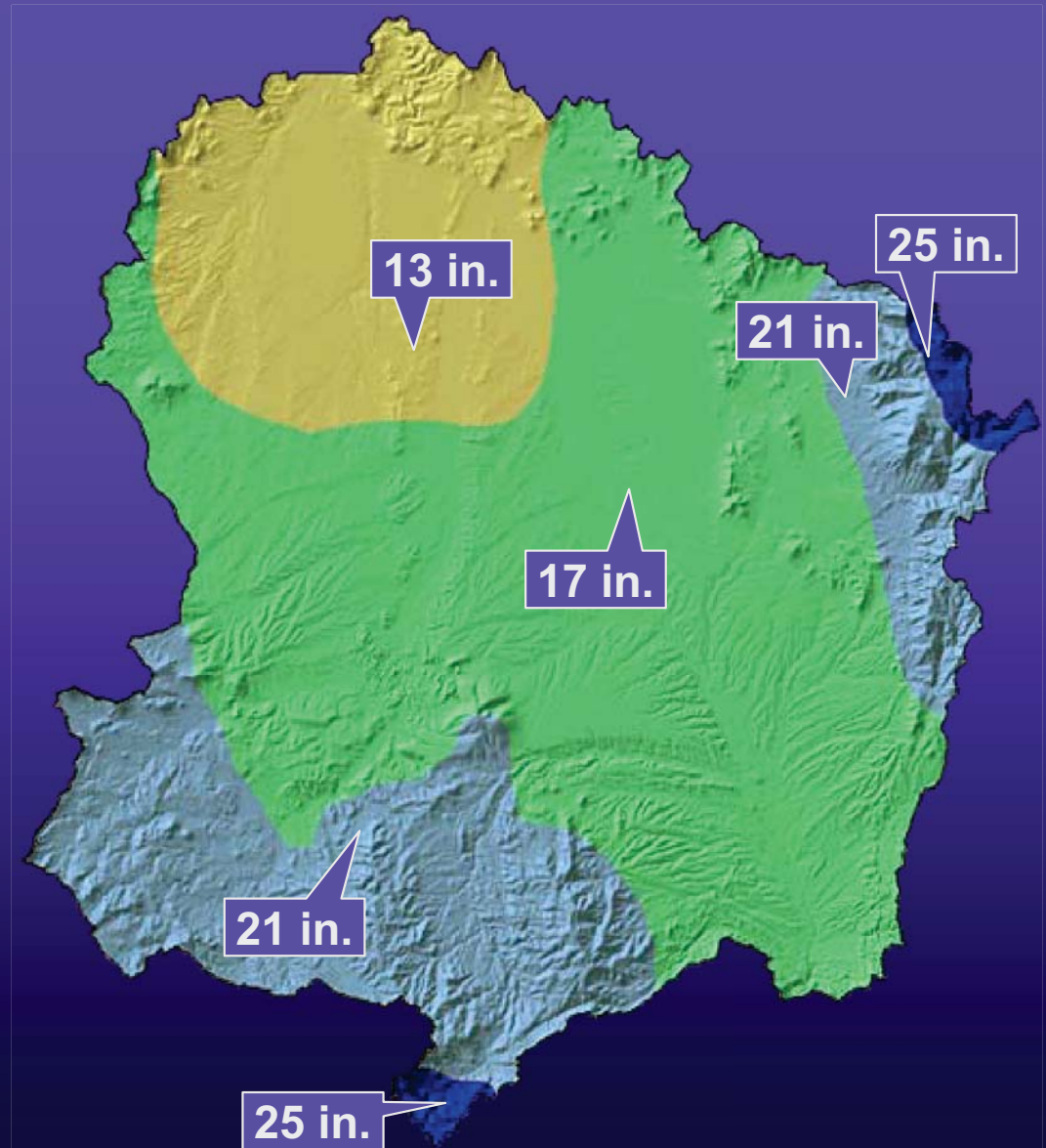


Groundwater Model



Groundwater originates with precipitation in our area

- Widely varying precipitation events in the AMA are responsible for 100% of the natural aquifer recharge



Total Precipitation

- Annual Precipitation – 450,000 AF in the Prescott AMA
- However, only 8,000 AF naturally recharge the aquifer system annually or $< 2\%$

Why?

- Evaporation
- Transpiration
- Runoff
- Interception



General Water Budget Prescott AMA

Groundwater Inflows

Natural Recharge	6,600
Incidental Recharge	2,020
Artificial Recharge:	
City of Prescott	3,480
Chino Valley	155
<u>Prescott Valley</u>	<u>1,740</u>
Total Inflows	13,995

Groundwater Outflows

Groundwater Pumpage:	
Non-Exempt wells	19,160
Exempt Wells	1,830
Groundwater Discharge:	
Underflow to Big Chino	1,800
Del Rio Springs Discharge	1,050
<u>Agua Fria Baseflow</u>	<u>1,300</u>
Total Outflow	25,140

Inflow - Outflow = Change in Storage
13,840 – 25,140 = **-11,145 acre-feet** (overdraft)



Consequences of Long Term Non-Safe-yield Conditions

- Groundwater storage capacity is reduced
- Future reliability of water supplies are less certain
- Water levels decline – currently declining 2.5 to 5 feet per year
- Wells may require deepening
- Water quality problems may increase
- Wells will continue to go dry
- Pumping and drilling costs increase
- Natural discharge to springs and streams may be reduced
- Land subsidence and earth fissuring may occur
- Not sustainable



Little Chino Aquifer Water Budget

Verde Watershed Sub-basin	Saturated Thickness (Blasch et al, 2005; Table 13, p46)	Water in Storage using 4% specific yield	Water in Storage using 10% specific yield
Little Chino	33 million ac ft	1.3 million ac ft	3.3 million ac ft

Due to inherent uncertainty in aquifer properties, storage estimates are appropriately expressed as a range.

Not all water held in storage can be released from the aquifer. Some water will be held in the pore spaces due to surface attraction. Specific yield is more representative of water available by pumping than storage capacity (and is thus used for this calculation). However,

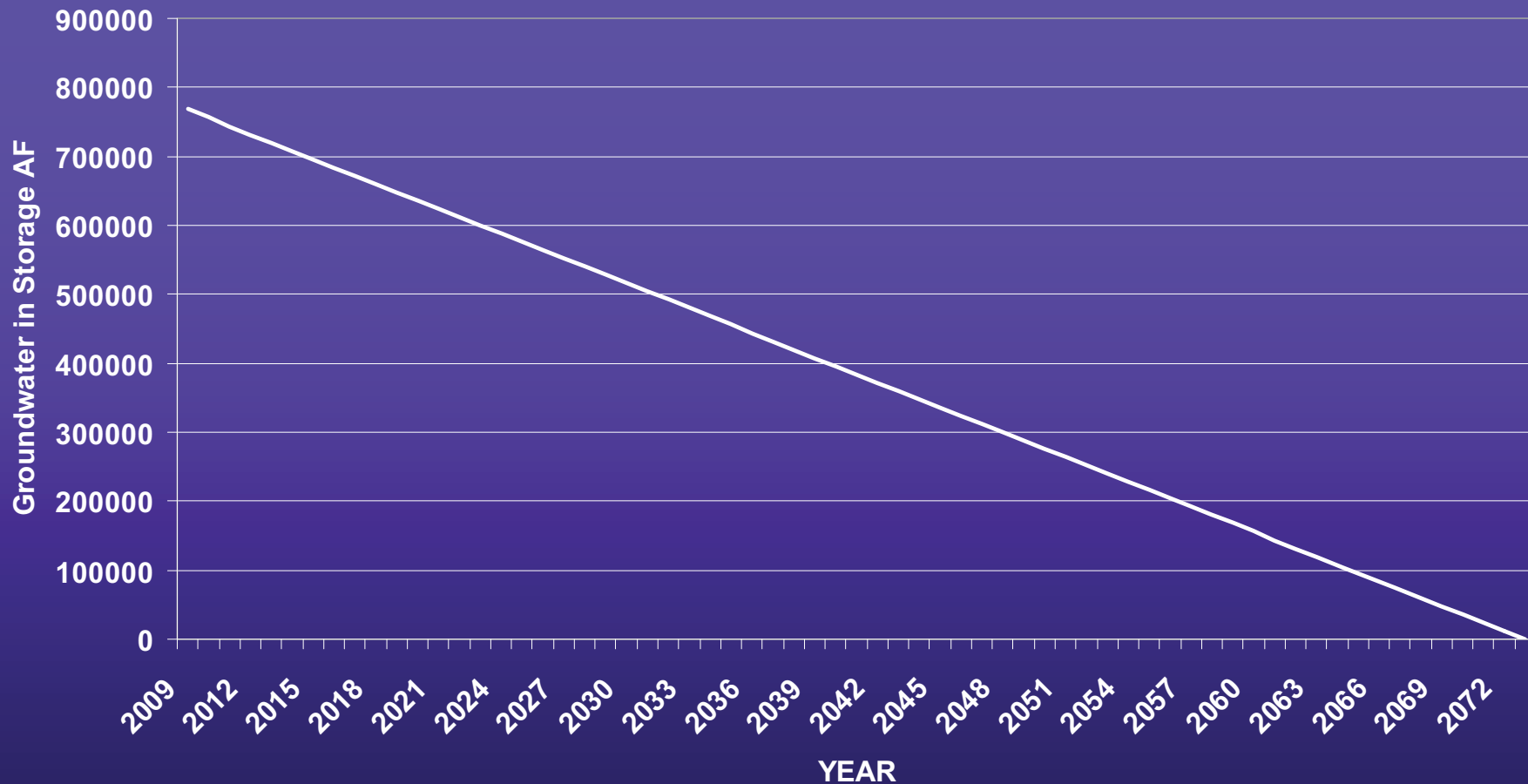
Other factors may limit the amount of recoverable water from storage by pumping wells (and the ability to use the water):

- Aquifer permeability
- Aquifer heterogeneity
- Drilling costs
- Infrastructure costs
- Water Quality
- Legal concerns
- Environmental concerns

Little Chino Water in Storage

60% Efficiency – 12,000 AF over-draft

Over-Draft Conditions



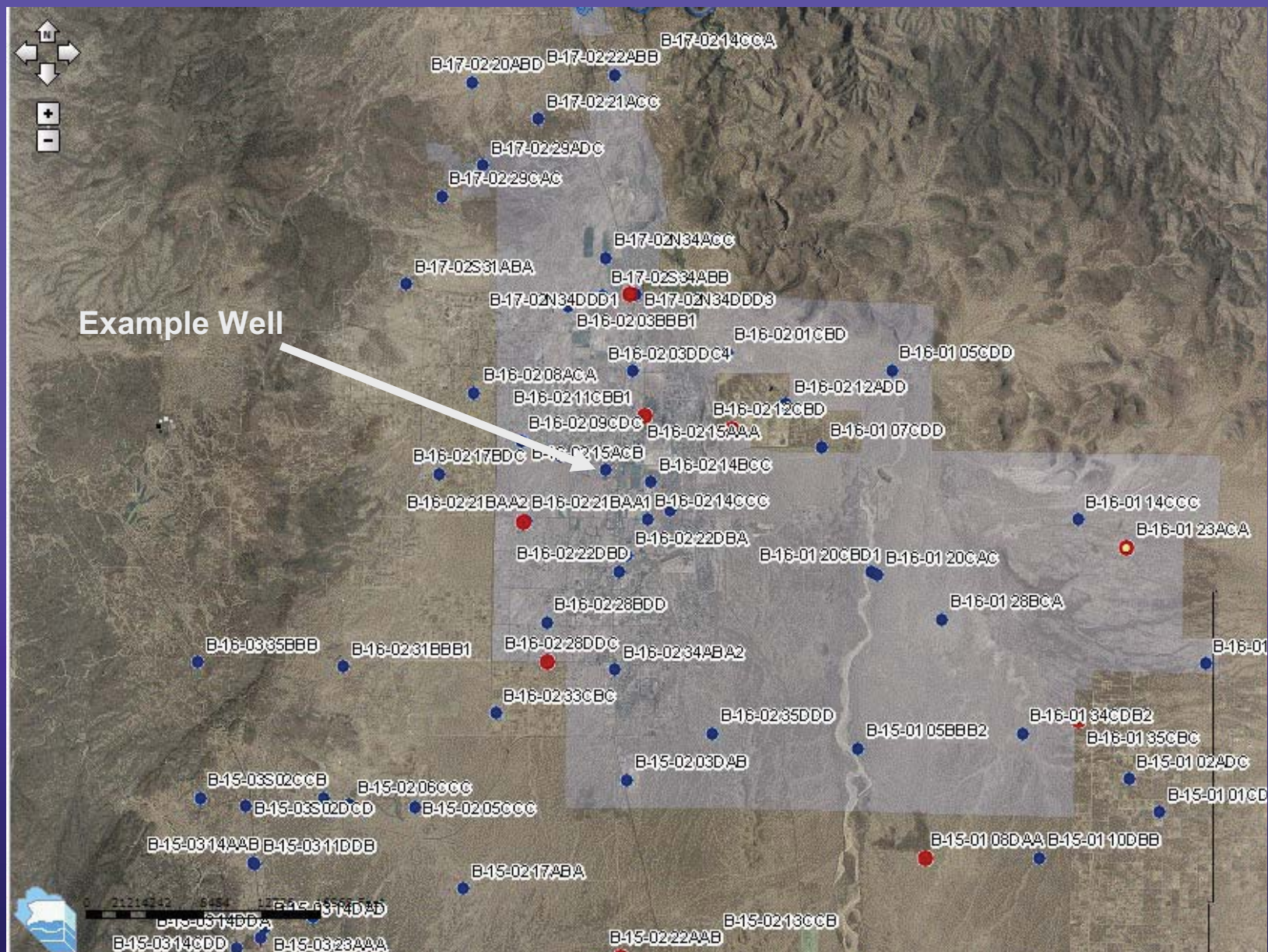


Artificial Recharge

Prescott Valley – sold all its effluent (2,400 AF) and when used will only get back 50% – 60% thus they are working away from safe-yield

Prescott – 1,000 AF effluent directly applied to golf course, and 1,500 AF used for CVID, and remaining has and will use effluent for development – working away from safe-yield

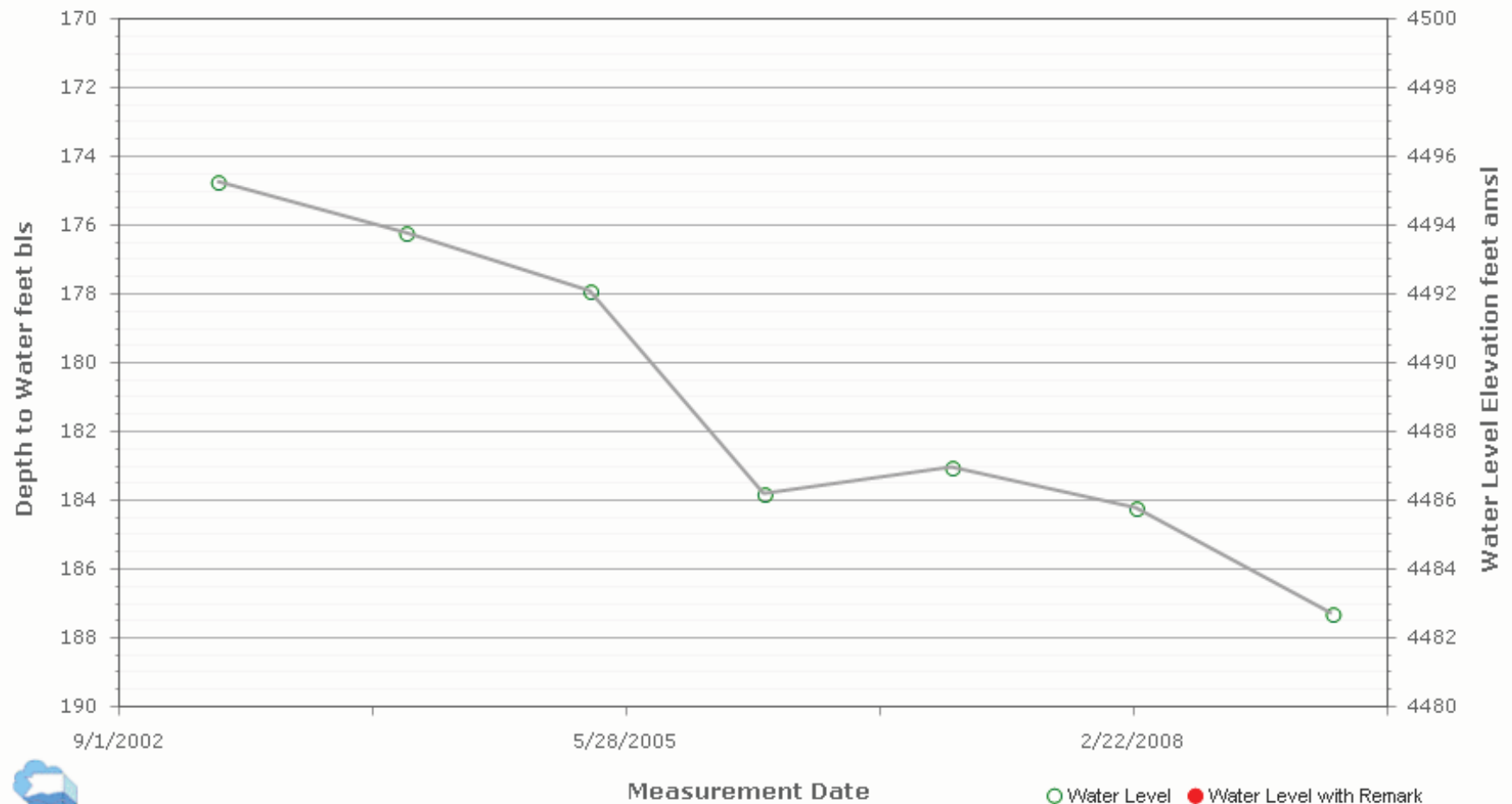
ADWR Monitor Wells



ADWR Hydrograph

Arizona GroundWater Monitoring Site Hydrograph

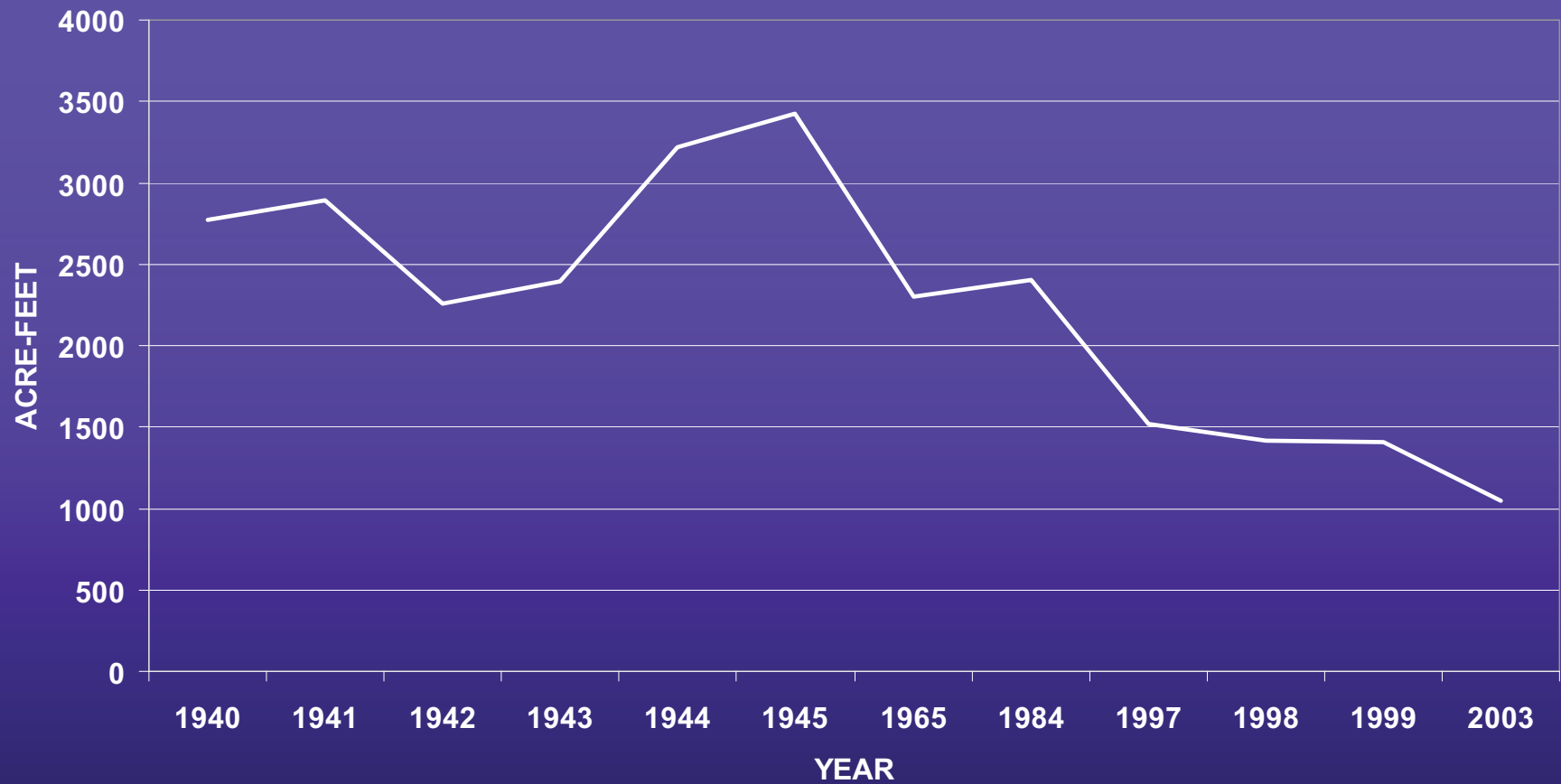
Local ID	Site ID	Registry ID	Latitude NAD27	Longitude NAD27	Alt. (ft amsl)	Water Use	Well Depth (ft)	Case Dia. (in)	Drill Date	Latest WL Date	DTW (ft)	WL Elev. (ft)
B-16-02 15ACB	344613112271901	606691	34° 46' 11.0"	112° 27' 19.4"	4670	IRRIGATION	562	10.50	11/1/1961	3/18/2009	187.3	4482.7



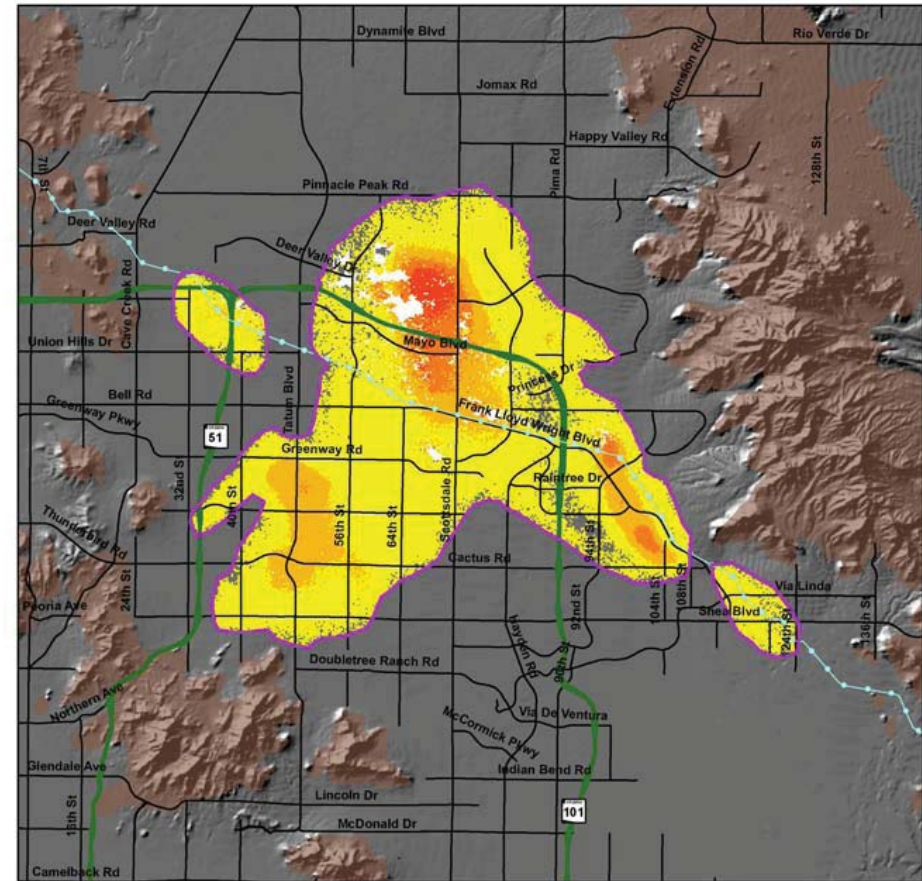
Del Rio Springs



Del Rio Springs



Subsidence



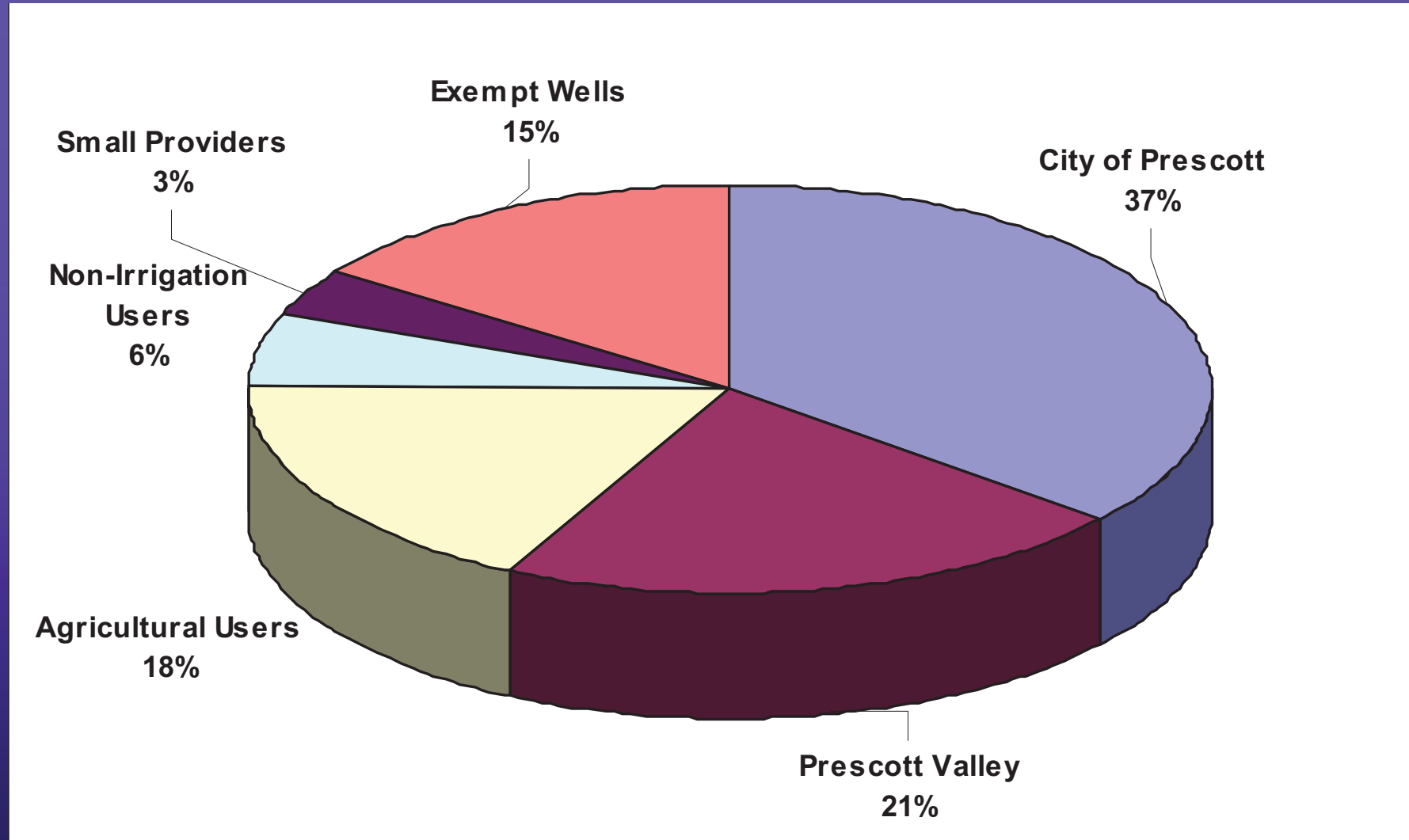
Land Subsidence in Northeast Phoenix and Scottsdale Areas
Based on ADWR EnviSat Time-Series InSAR Data
Time Period of Analysis: 5.0 Years 03/08/2004 To 03/02/2009

- 03/08/2004 To 03/02/2009
- Subsidence Feature
 - Subsidence
 - Decorrelation/No Data
 - 6 To 8 cm
 - 4 To 6 cm
 - 2 To 4 cm
 - 0 To 2 cm
 - Arizona Highways and Interstates
 - Interstate
 - US
 - State
 - Roads
 - Hardrock
 - CAP Canal



Decorrelation (white areas) are areas where the phase of the received satellite signal changed between satellite passes, causing the data to be unusable. This occurs in areas where the land surface has been disturbed (i.e. bodies of water, snow, agriculture areas, areas of development, etc).

Groundwater Pumping by Use





Non-groundwater Supplies Currently Available/Used within the Prescott AMA

Surface water (limited)

Effluent (via direct delivery and through recharge)

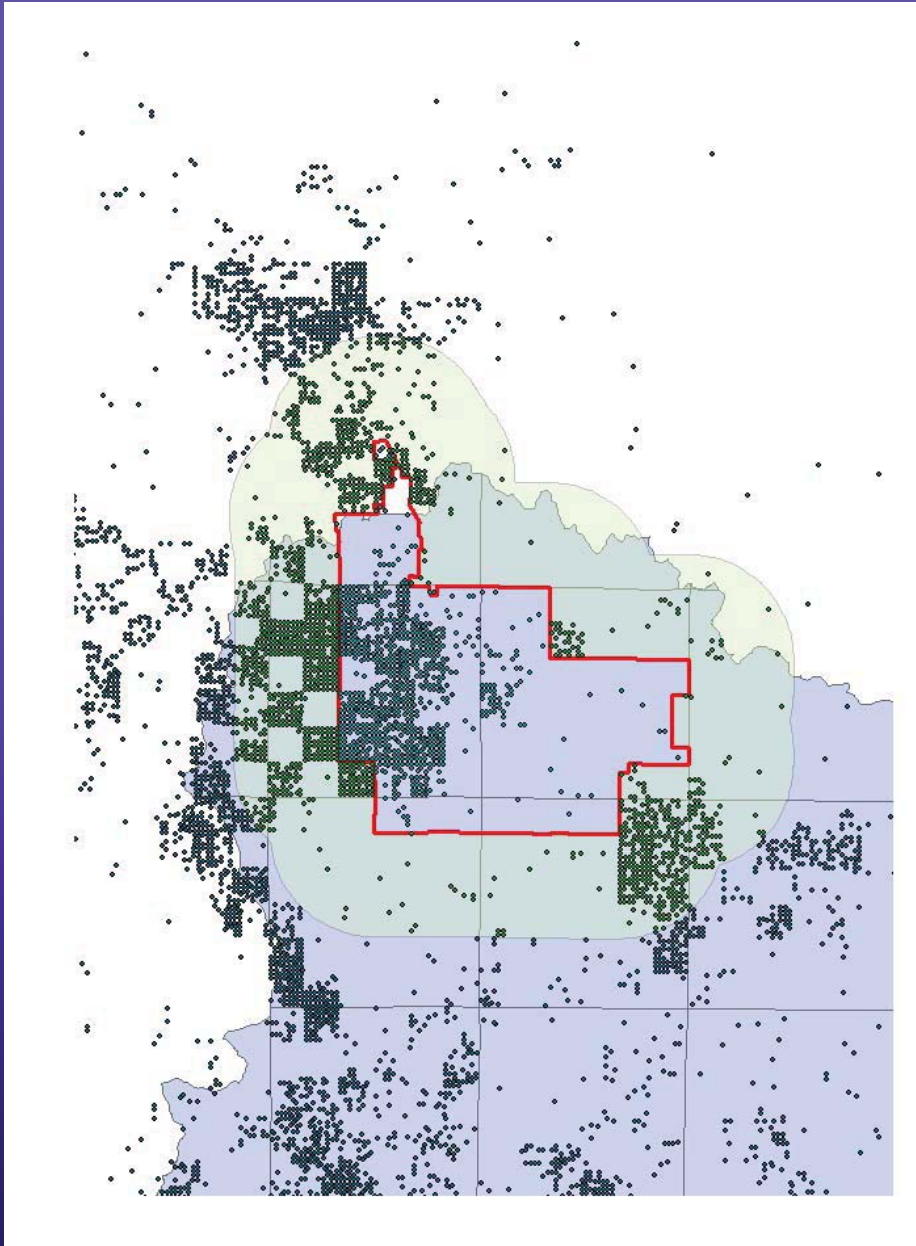
AWS credits from the extinguishment of groundwater rights

Anticipated future water supplies:

Groundwater transported into the AMA from the Big Chino Sub-basin

Groundwater transported into the AMA from the Colorado River

Exempt Wells

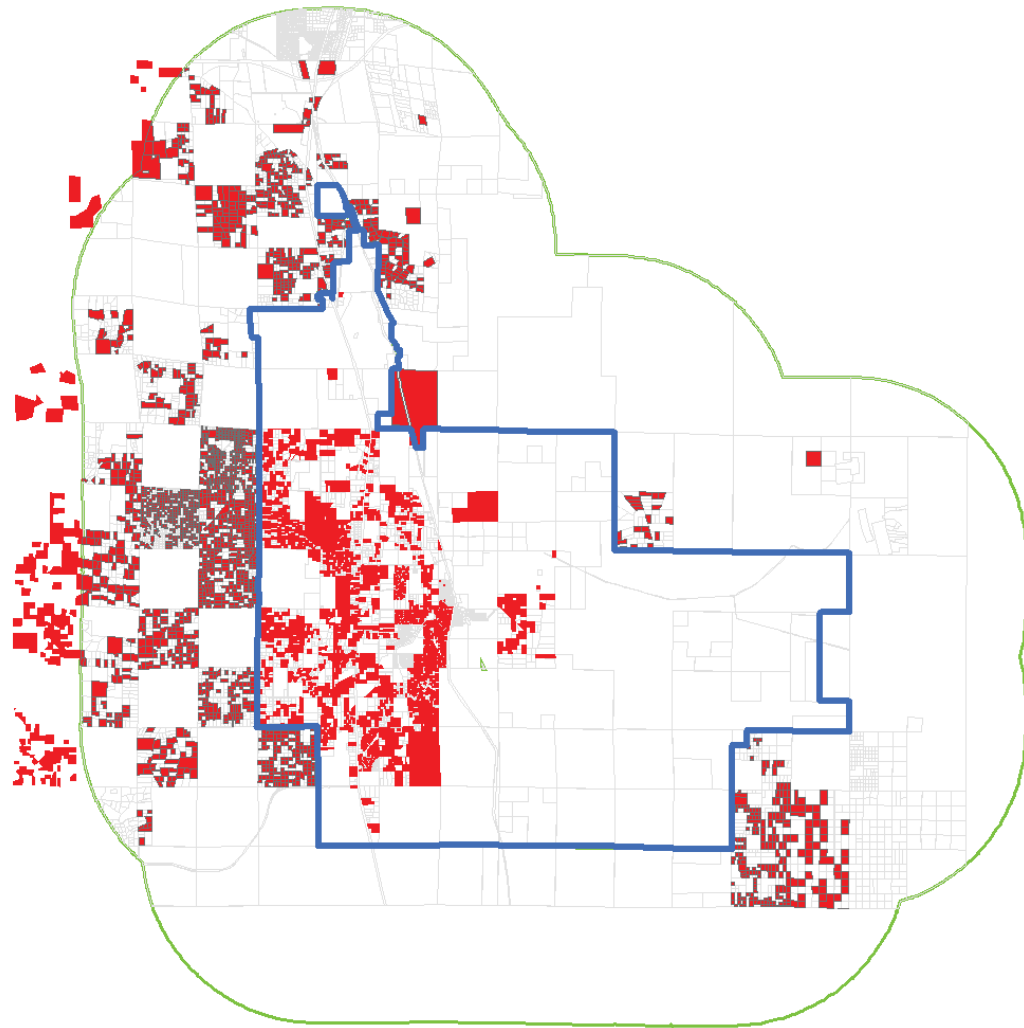


Approximately 4,000 exempt wells drilled within the Town limits of Chino Valley

Approximately 4,000 exempt wells drilled within the 208 planned area of the Town

Approximately 400 new exempt wells drilled within Chino Valley annually

Septic Systems



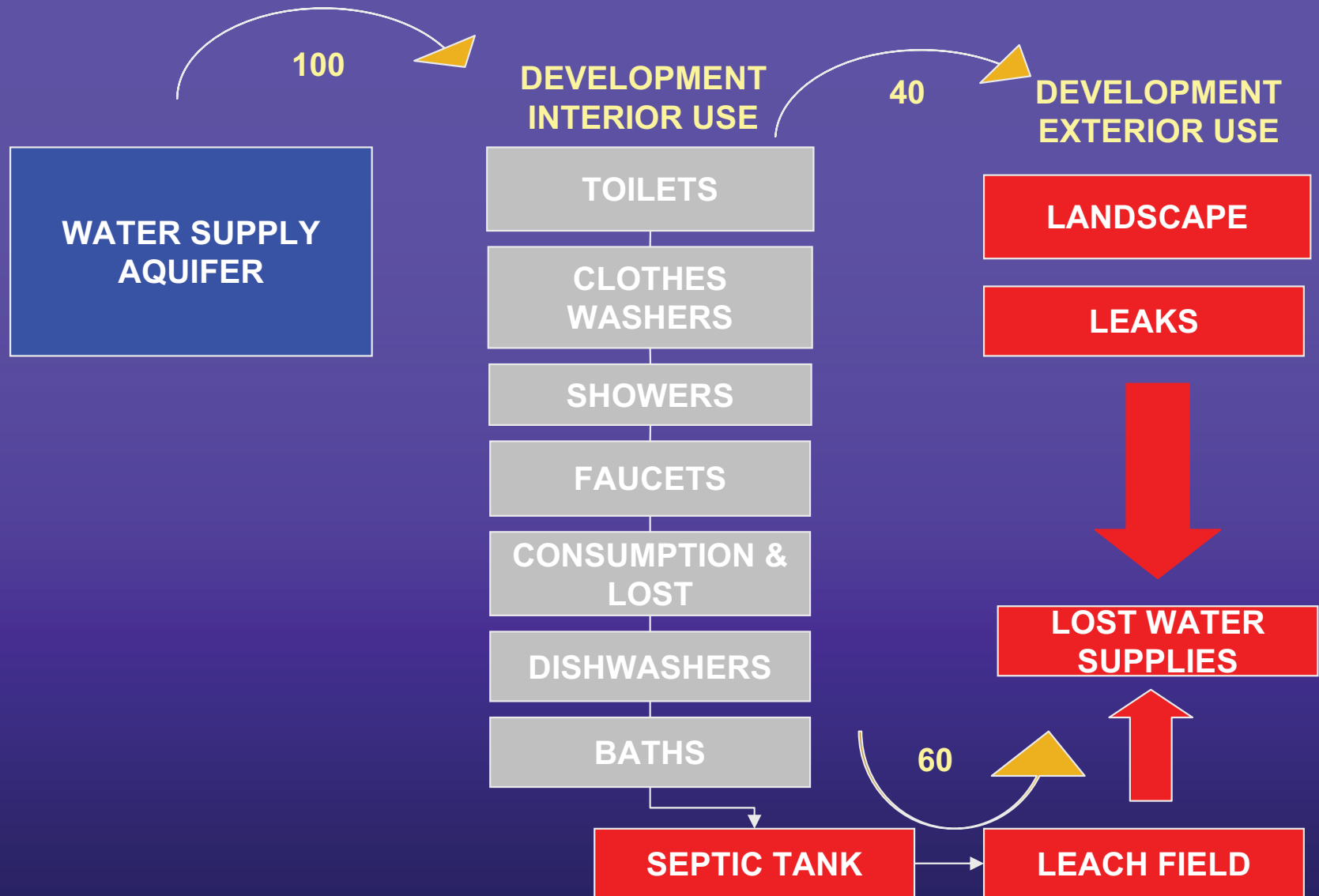


Development Water Budget

1) Showers	10.0 %
2) Clothes washers	13.0 %
3) Dishwashers	.84 %
4) Toilets	16.0 %
5) Baths	1.1 %
6) Leaks	8.2 % % LOST
7) Faucets	9.4 %
8) Landscape watering	40.0 % LOST
9) Other uses	1.3 %

Typical Water Use Equation

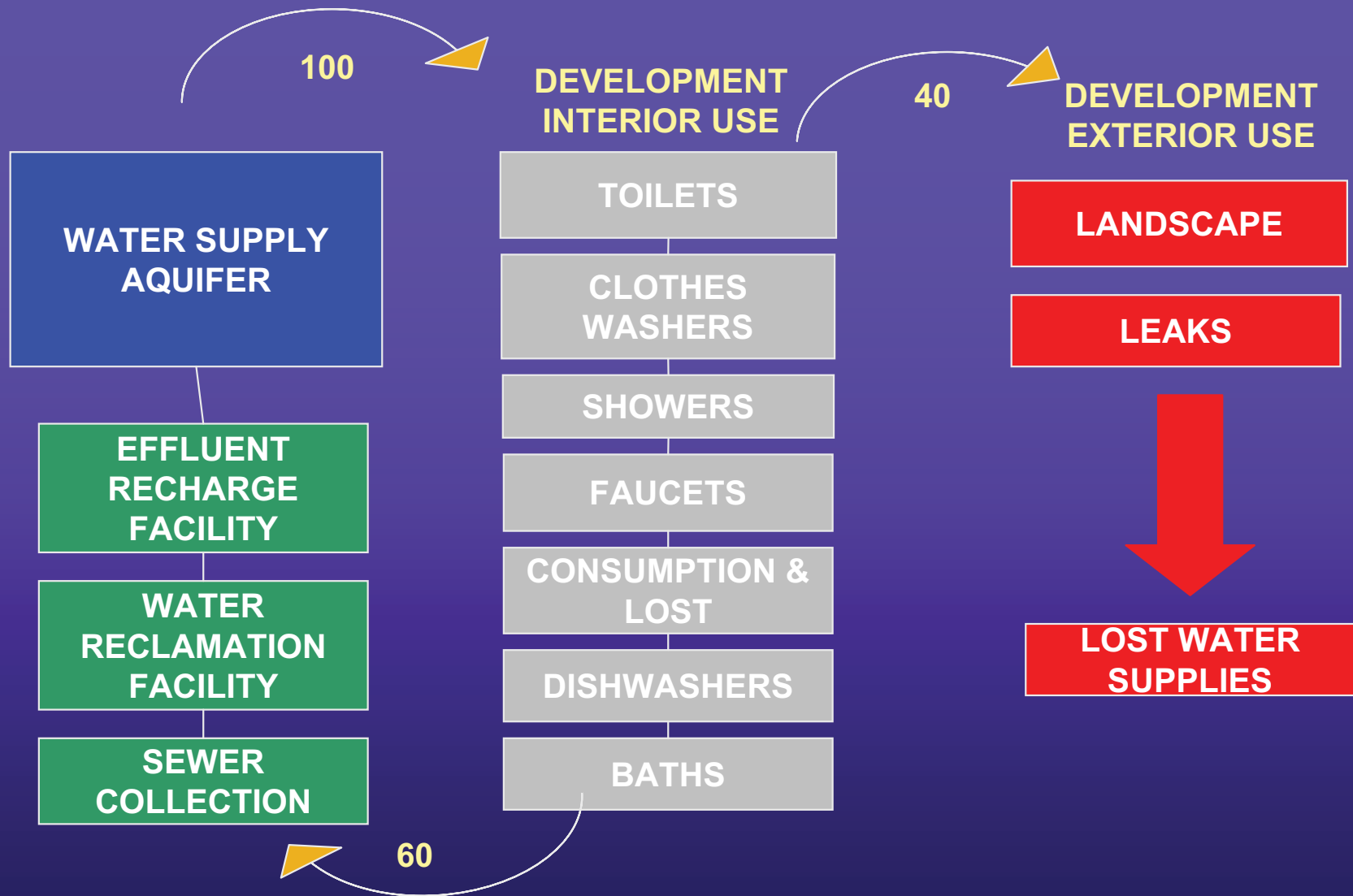
Exempt Well & Septic Systems





Typical Water Use Equation

Exempt well or water service area & sewer connection



What's Been Done Already



FINAL REPORT ON SAFE-YIELD IMPEDIMENTS, OPPORTUNITIES, AND STRATEGIC DIRECTIVE

PREPARED FOR:
**THE GROUNDWATER USERS ADVISORY COUNCIL
OF THE PRESCOTT ACTIVE MANAGEMENT AREA**

BY:
THE SAFE-YIELD SUBCOMMITTEE

November 2006

COMMITTEE APPOINTMENTS

GROUNDWATER USERS ADVISORY COUNCIL:

John Olsen
Larry Tarkowski (Town Manager, Prescott Valley)
Marvin Larson
James Neal

SAFE-YIELD SUBCOMMITTEE MEMBERS (John Olsen, Facilitator):

Karen Fann (Mayor, Chino Valley)
Tom Thurman, (Yavapai County, Board of Supervisors)
Rowle Simmons, (Mayor, City of Prescott)
Mike Flannery, (Vice-Mayor Prescott Valley)
Muriel Haverland, (Citizens Water Advocacy Group)
Chris Moss, (Yavapai-Prescott Indian Tribe)
John Byrne, (Highland Pines Domestic Water Improvement District)

SAFE-YIELD TECHNICAL ADVISORY COMMITTEE:

Mark Holmes, (Water Resources Director, Chino Valley)
Jim Holt, (Water Resources Manager, City of Prescott)
John Munderloh, (Water Resources Manager, Town of Prescott Valley)
John Rasmussen, (Yavapai County Water Advisory Committee)
Howard Mechanic, (Citizens Water Advocacy Group)
Patricia Fitzgerald (Highland Pines Domestic Water Improvement District)



Agreed Upon Principles

- A. All AMA Groundwater Users Should Share In the Goal of Reaching Safe-Yield*
- B. All AMA Groundwater Users should agree on a Strategy to Share Safe-yield Groundwater*
- C. Alternative Water Supplies Should Be Developed For Water Demands That Exceed Safe-Yield Pumping*



Impediments To Achieving Safe-Yield

- A. Over-Allocation of Groundwater Rights*
- B. Exempt Wells*
- C. Insufficient Access to Alternative Water Supplies*
- D. Uncertainty of Imported Alternative Water Supplies*
- E. Lack of Enforcement Mechanisms*
- F. Incomplete Public Understanding*
- G. Lack of Legislative Strategy*



Next Steps & Opportunities

- A. Stakeholder Process*
- B. Natural and Incidental Recharge*
- C. Exempt Wells*
- D. Develop Scientific Data on Exempt Well Uses*
- E. Water Resource Planning*
- F. Special Districts*



Next Steps & Opportunities

G. Legislative Initiatives

H. Alternative Water Supplies

- **Flood Retention, Detention and Recharge**
- **Watershed Management**
- **Regional Transportation of Alternative Water**
- **Weather modification**
- **Importation**



Next Steps & Opportunities

- I. Quantification of Groundwater Supplies*
- J. Public Education*



Upper Verde River Watershed Protection Coalition

1. Formed a Safe-Yield Sub-committee with various stakeholders
2. Reviewed and evaluated what has been done nation-wide regarding over-draft conditions
3. Currently evaluating legislative authorities and district opportunities



Possible Discussion Points

- Strategic plan – presented to Chino Valley Council
- Replenishment – natural & artificial
- Decreased water demands
- Capital projects
- Public education & plan approval
- 15.5 years to accomplish safe-yield
- Town's water sustainability planning



Comments
or Questions ???