CAGRD
CENTRAL ARIZONA GROUNDWATER REPLENISHMENT DISTRICT
A Division of Central Arizona Project

Demand, Obligation and Enrollment

Ken Seasholes
CAGRD Committee Meeting
May 15, 2014

The Number

102,000 AF

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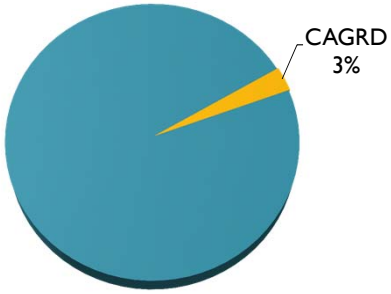
Context

Municipal Demand in CAP Service Area



Total Demand = 1.1 Million Acre Feet (2012)

Challenge

- Projecting obligation requires an understanding of supply and demand for the entire CAP service area, coupled with subdivision-level analysis, and consideration of arcane statutes and rules
  - Member Lands
    - 1,100 Subdivisions
    - 265,000 enrolled lots
  - Member Service Areas
    - Wide range of CAGRD reliance
    - Complex supply portfolios
    - Reporting Excess Groundwater is typically the option of last resort

Previous Efforts

- Current Plan (2004)
  - Large scale planning effort
  - Database development
  - Short & Long-Term "Outlook" models
    - Conventional water resource planning approach
    - Water provider and subdivision-level projections
    - Single forecast; limited flexibility

Previous Efforts

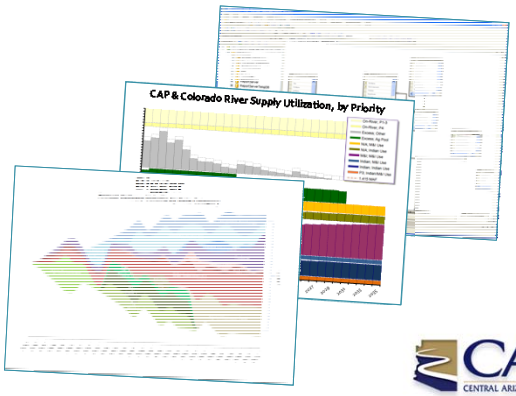
- Mid-Plan Review (2011)
  - Post-bubble autopsy
    - Overly aggressive population & housing projections
    - Assumed Member Land buildout by 2035
    - Underestimation of MSA avoidance strategies
  - Updated projections
    - Scenarios based on aggregate housing unit projections
    - Updated MSA supply portfolios
    - Use of ratios and other blunt adjustments

More Challenges

- Housing volatility
  - Rate and distribution of construction
- Changes in water use patterns
  - Declining per capita use
- Utilization of supplies
  - Leases, exchanges, reallocations and new supplies
  - Groundwater allowances and long-term storage credits
- Regulatory complexity
  - Rules, policies and statutes

Approach

- Build and maintain robust planning and analytical capacity by coupling subject-matter expertise with data and technical tools
  - Data
  - Research
  - Modeling
  - Scenarios



Data

- RPA database
  - CAP data
    - Deliveries
    - Entitlements
  - ADWR data
    - Annual Report data
      - Supplies & Demands
      - Schedule AWS
    - Designations
      - Supply Portfolios
- CAPTR
  - CAGRD Member Land data
    - Parcel water use
    - Certificate of AWS data
    - Constructed lots
- GIS Layers
  - Projected WP boundaries
  - Assessor records
  - Census data
  - Transportation Analysis Zone projections

Research

- Residential demand studies
  - *Woodard (Montgomery & Associates)*
- Population, housing and employment allocation model
  - *Applied Economics*
- Regional forecasting
  - *Eller Economic and Business Research Center*
  - *W.P. Carey Center for Real Estate Theory and Practice*
- In-house
  - Member Land regression analysis

Modeling

- Creation of a service area model
  - All sectors; All supplies
    - 80 Muni Providers; 18 Irrigation Districts; 12 Tribes; 20+ other user categories
    - Full supply accounting (16 different types), including LTSCs
    - Integrates CAGRD projections into overall supply & demand forecasting
    - Suitable for simulating CAP supply buildup & shortage impact
  - Developed with GoldSim modeling software
    - Powerful and flexible development environment

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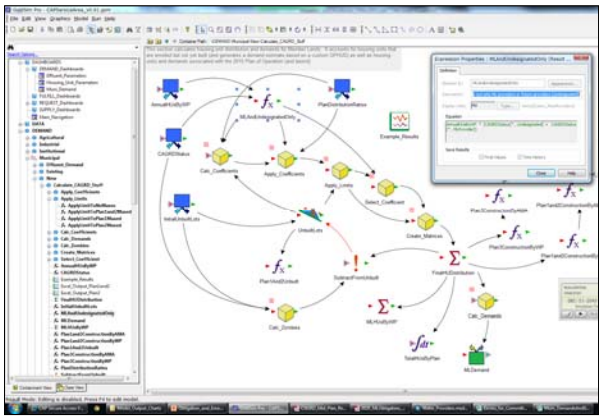
Modeling

- CAP Service Area Model



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Modeling: Demand

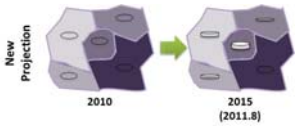
- The model differentiates between new and existing demand
  - Existing demand for each water provider can be adjusted to reflect trends in per capita (or per housing unit) use
  - New demand is tied to housing unit projections for each water provider's anticipated service area
    - Calculation includes the demand from the housing unit itself, as well as a fraction of other service area uses (e.g., commercial uses, parks, etc.)

Modeling: Demand

- The location of new housing units is a critical for determining both demand and CAGRD obligation
  - Different water use characteristics for each provider
  - Different water supply portfolios
  - Different AWS Rules
  - Different relationship to CAGRD

Modeling: Demand

- The overall rate of housing activity can be adjusted, which automatically modifies the provider-specific projections
  - A slower overall rate will delay when provider-specific housing units are projected
    - e.g., if 1,000 units projected for 2030, specifying a lower overall rate will push those 1,000 units out to, say, 2037



Modeling: Demand

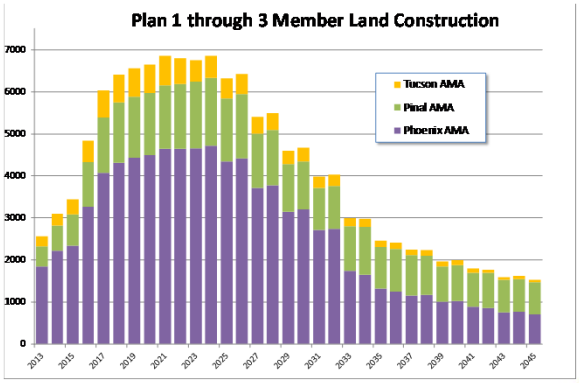
- The result is a unique demand forecast for each water provider, based on exiting demand, projected housing units, estimated demand per housing unit, and assumptions about the rate of change in demand per housing unit

Modeling: ML Demand

- For CAGRD Member Lands, an additional, and more complex, set of demand calculations have to be performed
- It is necessary to account for unbuilt lots in current MLs, and new MLs that will be enrolled in the next ten years
  - The model resolves this by tracking unbuilt lots, and using allocation ratios that change through time

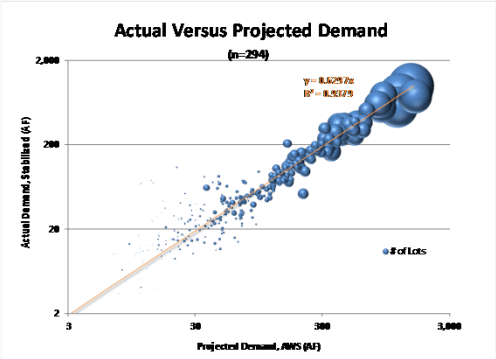
Modeling: ML Demand

- Overall construction reflects housing recovery, and post-Plan 3 subdivision activity



Modeling: ML Demand

- For currently enrolled Member Lands, we have good quality estimates of projected demand, based on analysis of MLs that have "stabilized"

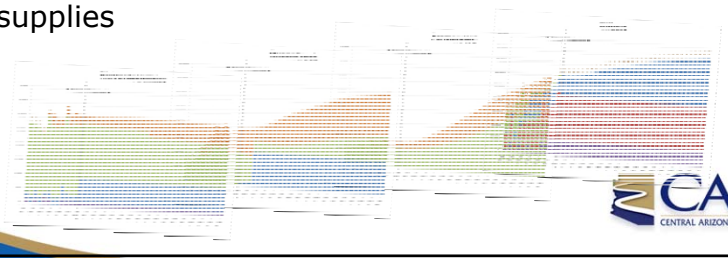


Modeling: Supply

- The model contains each water provider's portfolio of supplies (i.e., entitlements)
  - Annual supplies (e.g., CAP, surface water, effluent)
  - Volumetric supplies (e.g., LTSCs, GW allowances)
  - Accrual (and debiting) of long-term storage credits is modeled, as is incidental recharge and Pinal renewable GW allowances
  - Leases, exchanges, transfers and reallocations through time can also be modeled
    - Current leases, and the CAP NIA reallocation are included
      - Future NIA reallocation not yet fully modeled
      - Potential leases not yet included

Modeling: Supply & Demand

- Supply and demand come together in a "fulfillment" process
  - The demand of each provider is met by stepping through all of the supply types
  - A supply is used to meet a provider's demand based on the availability of the supply, the provider's entitlements, their utilization preferences, and how much demand has already been met with other supplies



Obligation

Obligation: MSAs

- For Member Service Areas, excess groundwater reported to the CAGRD is one of the supplies available to fulfill demand
  - The use of that supply comes after consideration of all other supply types, including CAP, surface water, LTSCs, exempt groundwater and the groundwater allowance

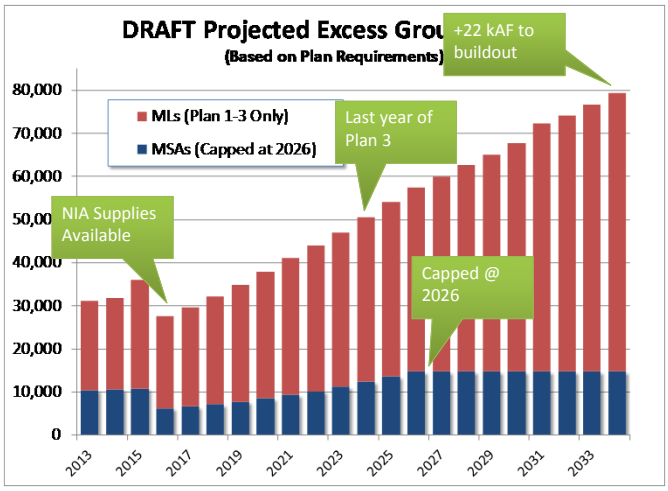
Obligation: Member Lands

- The demand estimates for new and existing Member Lands are converted to obligation by considering;
  - Groundwater reliance of the water provider
  - The provider's reporting percent
  - The ML's groundwater allowance balance
    - When groundwater allowances are exhausted, all groundwater use becomes excess
    - Special consideration must be given to the Pinal AMA's AWS Rules

Obligation: Plan Requirements

- The 20 & 100-year projections are tied to current and likely Members through 2024
- "How much 'liability' has been incurred by the end of the Plan?"
  - For Member Lands, all enrollment through 2024
    - 20-year: Excess Groundwater use through 2034
    - 100-year: Buildout
  - For Member Service Areas, the equivalent is current & committed demand as of 2024
    - 20 & 100-year: 2024 obligation + 2 years (i.e., 2026)

Obligation: Plan Numbers



Obligation: Plan Numbers

- The current obligation forecast is lower and slower than previously projected, but care should be used in making direct comparisons
- Past 2024, the Plan number is lower than what will likely be reported (assuming a Plan 4)
- Further model calibration, refinement and ground-truthing is required
  - Resolve remaining Pinal AMA AWS Rule issues
  - Meet with MSA water resource staff
  - Test wider range of assumptions

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Enrollment

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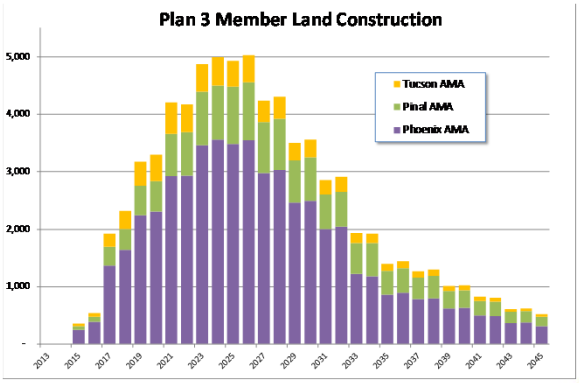
Enrollment: MSAs

- The City of Buckeye is expected to convert from a Member Land provider to a Member Service Area in 2015
  - Associated Member Lands are rendered dormant
- Water Utility of Greater Tonopah may also get a Designation of Assured Water Supply, and become an MSA

Enrollment: Member Lands

- Enrollment is tied to the construction forecast for new (i.e., Plan 3) Member Lands

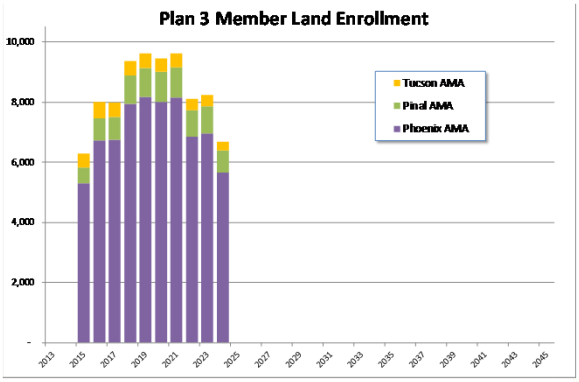


Enrollment: Member Lands

- A Plan 3 housing unit that is constructed, must have been enrolled sometime earlier
  - Enroll → Activate → Construct → Occupy ↘
    Replenish ← Report ↙
- The enrollment must have also occurred sometime between 2015 and 2024
- So, projected enrollment involves shifting the construction forecast backwards in time and compressing the timeframe
- Plus, an extra enrollment factor is applied

Enrollment: Member Lands

- Total units over 10-year period ≈ 85,000, with ≈ 65,000 constructed by 2034



Questions?

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