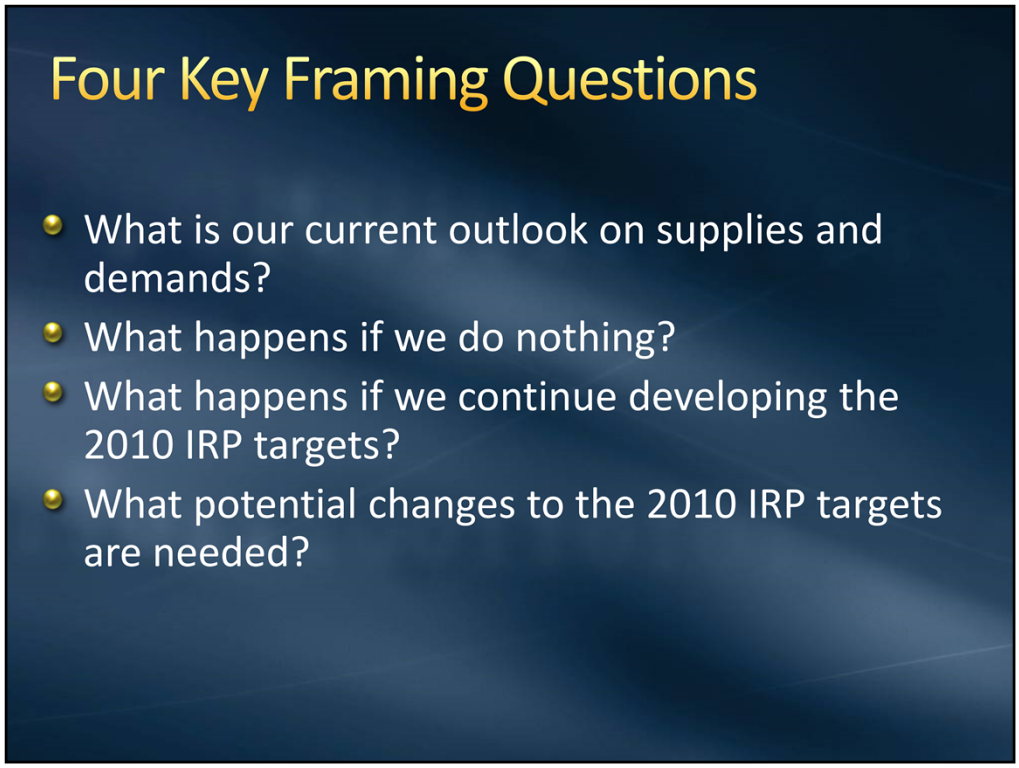
Thank you mr. chairman members of the committee, this is item 4b an oral report on draft results from the IRP technical process.



There is a lot of technical information for us to go through today, so I would like to frame the discussion using these four questions…

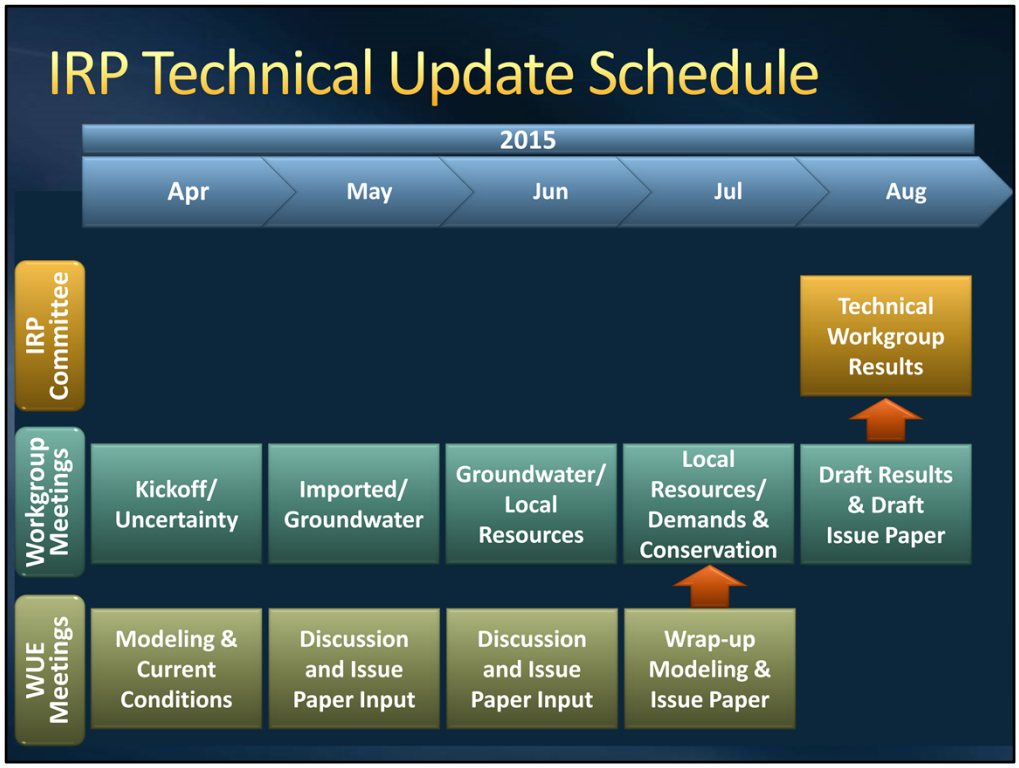
To begin I will walk you through all of the draft forecasts developed through the MA technical process; this will answer our first question "What is our current outlook on supplies and demands?"

Next we will take a look at two water balance scenarios, this first answers or next question "What happens if we do nothing from here on out?"
The second answers the questions "what happens if we continue with the 2010 IRP approach?"

Information from this analysis will help inform our fourth question "what potential changes to the 2010 targets are needed?"

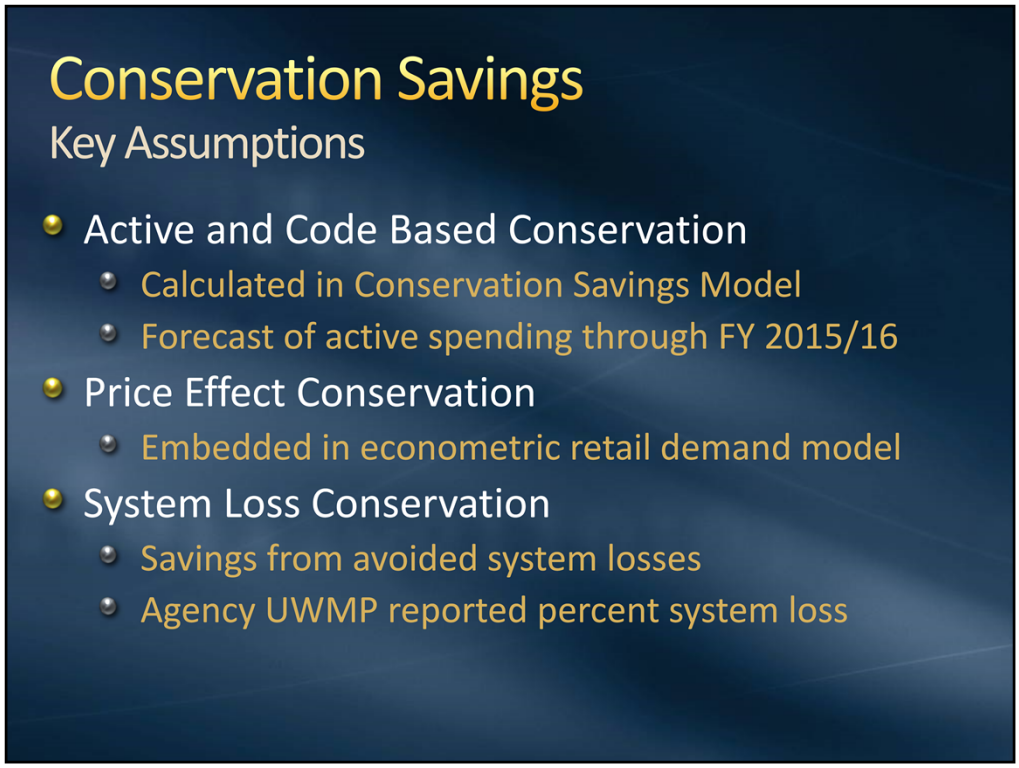
Let’s take a look at our first question…

Let's take a look at the draft forecasts developed in the MA technical workgroup process… establish our current conditions and set up to look at our "do nothing case"

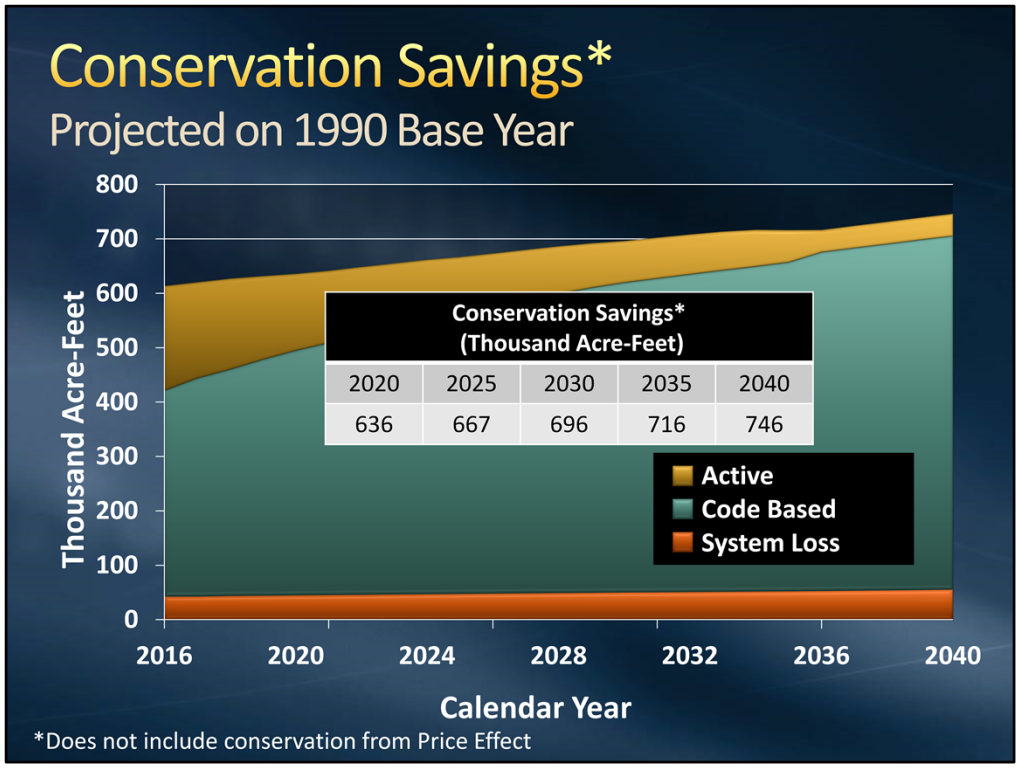


This slide is meant to illustrate the technical process that has been occurring and how this information has been gathered and brought to your committee today. The forecasts we are about to walk trough were developed through an in depth process with more than a dozen meetings, a lot of input and information, **I will just be providing the highlights.**

Let’s begin with conservation



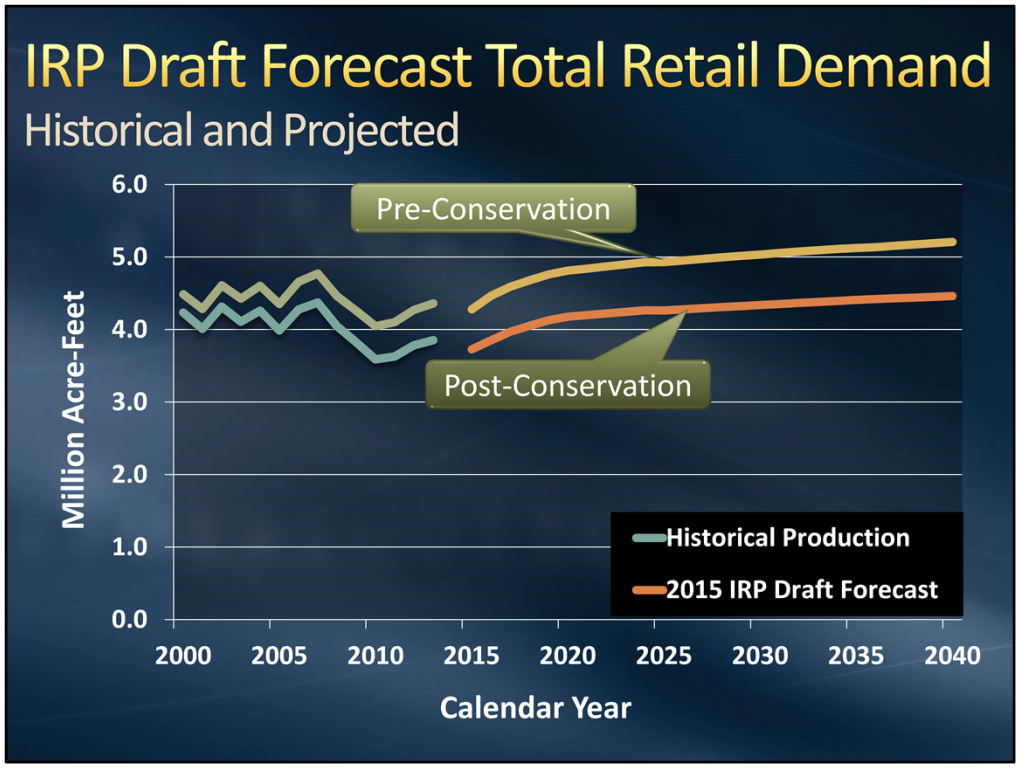
Our forecasts include 4 types of savings:
Active and code based (passive) conservation savings model
Price calculated in retail demand model
System loss, taken from UWMPs



This chart shows the forecast of conservation savings from our **current outlook, without additional actions**…
code based grows with demographics, active projected for authorized spending, price included in retail demand model… total grows over time.

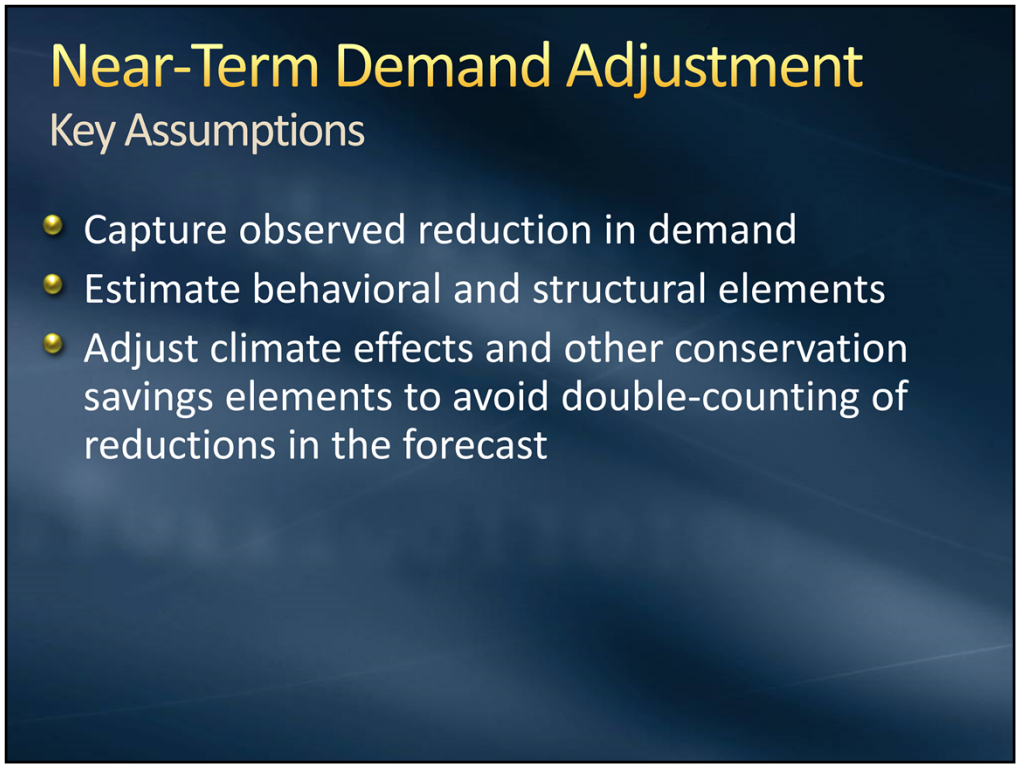
Next let’s look at retail demands

Retail demands are based on the most recent forecasts produced by the regional transportation planning agencies
We upgraded our demand model, produced by Brattle Group.
Additional forecasts of demands provided directly from your member agencies.



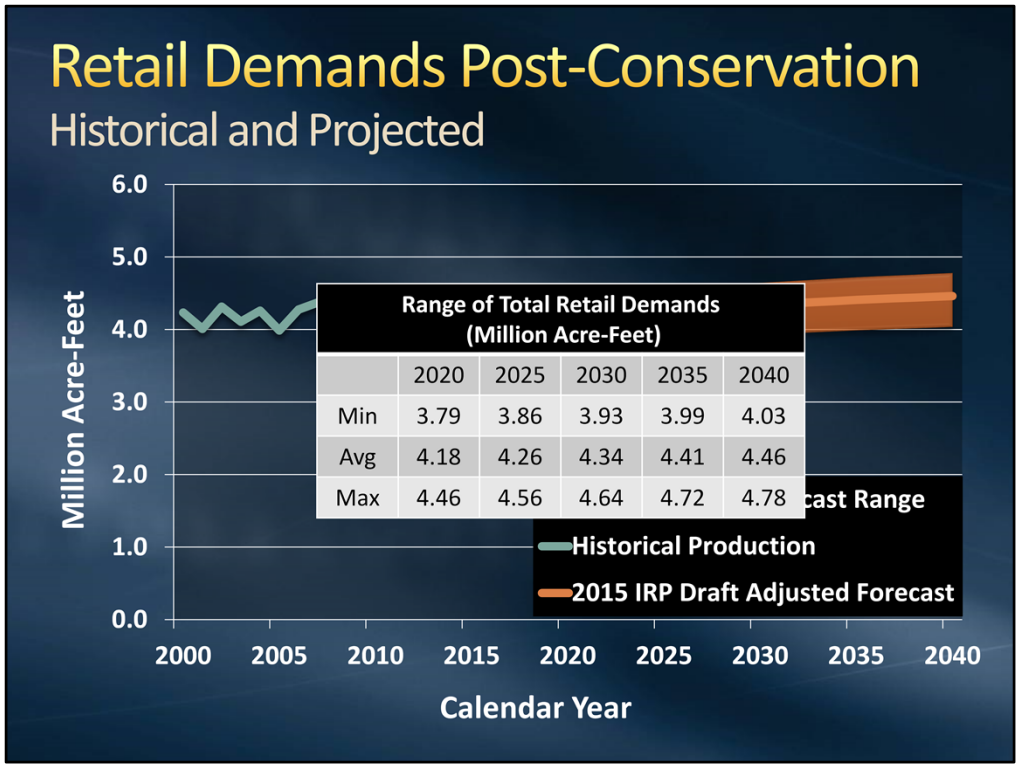
Let's look at total retail demands, here's a bit of history for reference, here's the draft forecast pre-conservation (except price which is embedded)
Next let's apply that conservation forecast to look at post-conservation retail demand.

Ramp-up to account for near-term actions



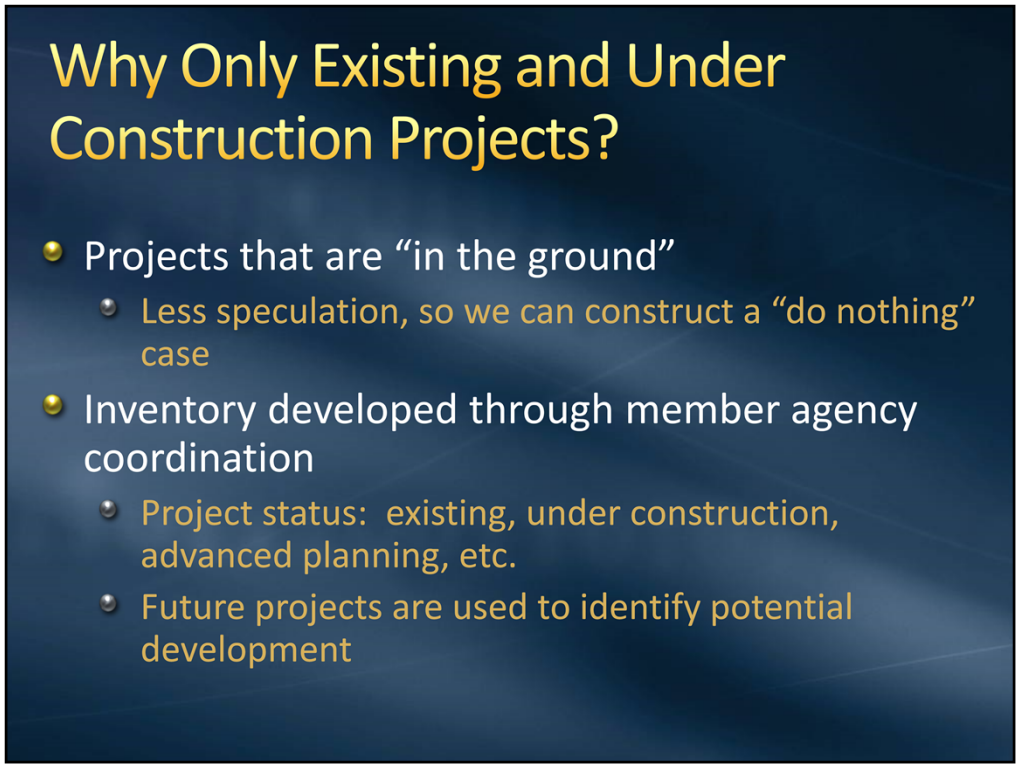
I want to highlight one of the adjustments that we've made to the **Work on this!!!**

Estimated 2015 – difference from forecast, considering climate conditions
Estimated based on past studies how much is behavioral and how much is structural (permanent)
Adjusted for conservation savings already captured in conservation forecast



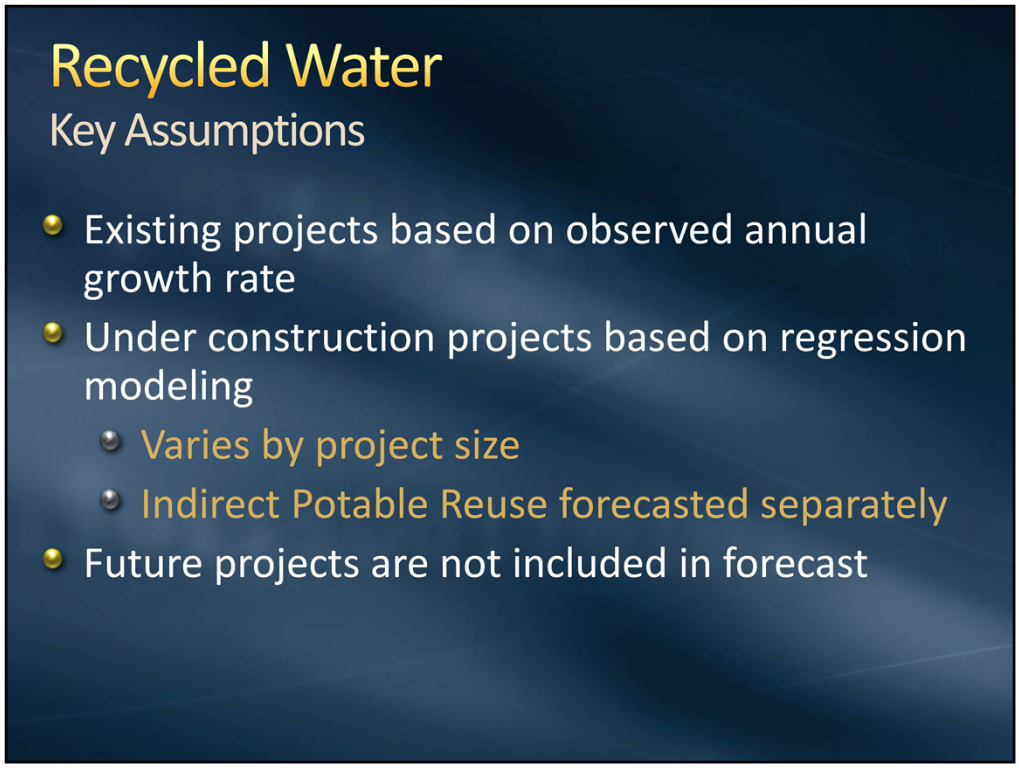
Another factor is **climate impacts**, we will see this in a number of places as we go through this presentation.
Forecast is not just a average, range, not just min- max either, we look at 90 different climate effects in each year of the forecast

Next let’s look at the draft forecasts for local supplies

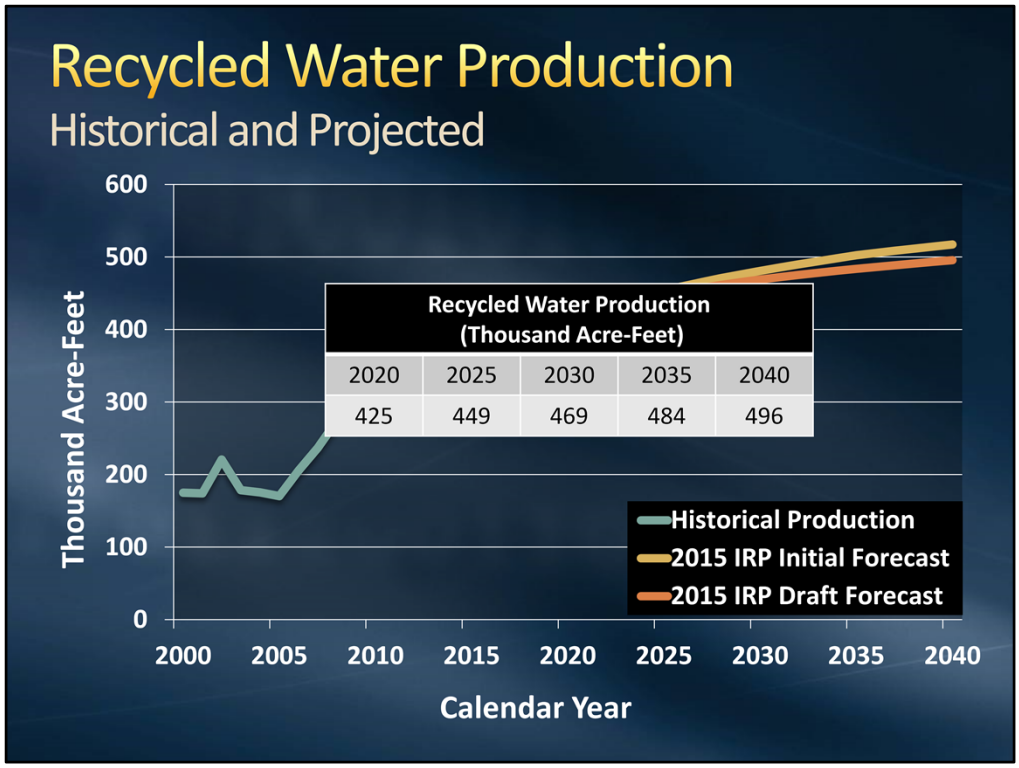


First I want to take a few seconds to talk about what is included in the forecasts, much like conservation, only use existing and under construction projects.
This allows us to define our current conditions or “do nothing case” so that we can build off of it.

Developed an inventory of all projects through ma coordination, various levels of development from conceptual to existing. Future projects are used to identify potential we will use these… **how/when?**



First let's take a look at recycled water, existing and under construction.

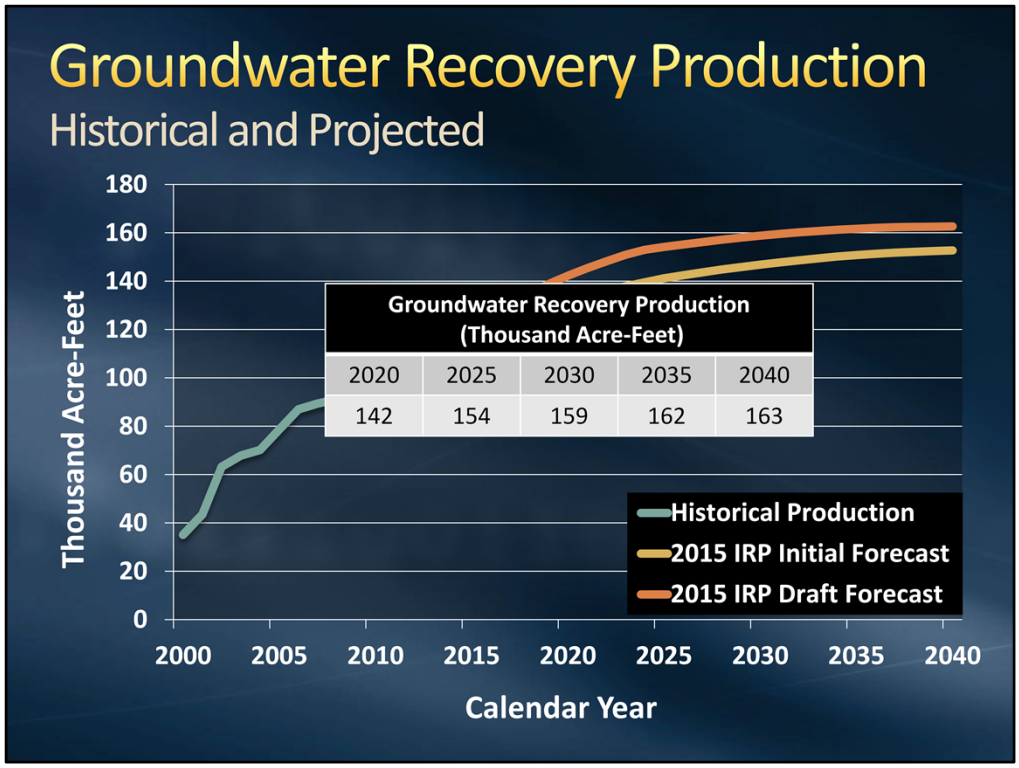


History for context, initial forecast from april, updated from process with MA's
Does not vary significantly based on climate
Summary

Groundwater Recovery

Key Assumptions

- Existing projects based on observed annual growth rate
- Under construction projects based on regression modeling
- Future projects are not included in forecast



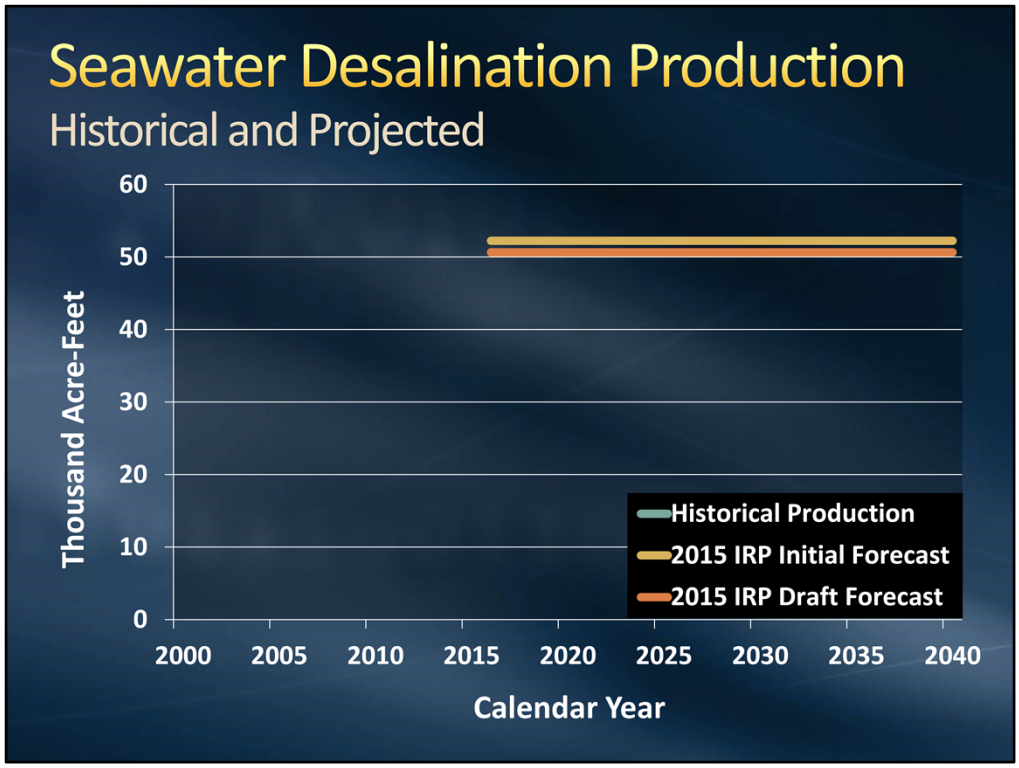
Does not vary significantly based on climate.

Seawater Desalination

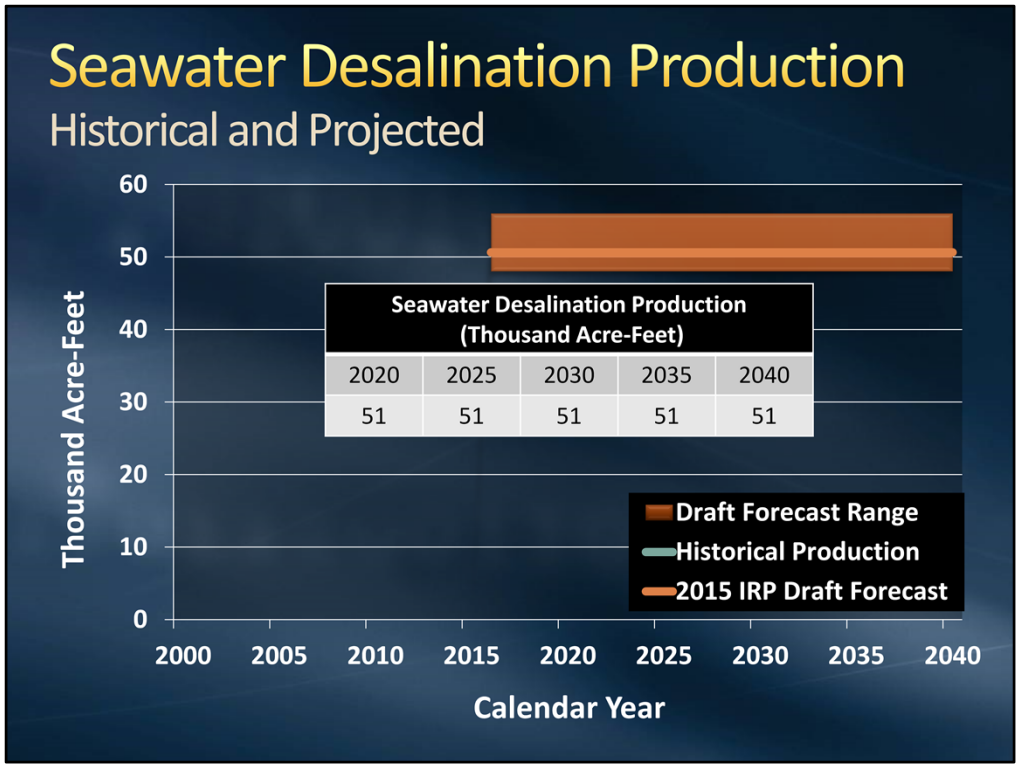
Key Assumptions

- No existing projects
- Under construction projects include Carlsbad facility
  - Dry year = 100%
  - Normal year = 93%
  - Wet year = 86%
- Future projects are not included in forecast

One under construction project, will be existing shortly…
Some variation based on climate, range from contract minimum up to maximum according to SDCWA staff.



No Historical production, very slight change from initial forecast in april.



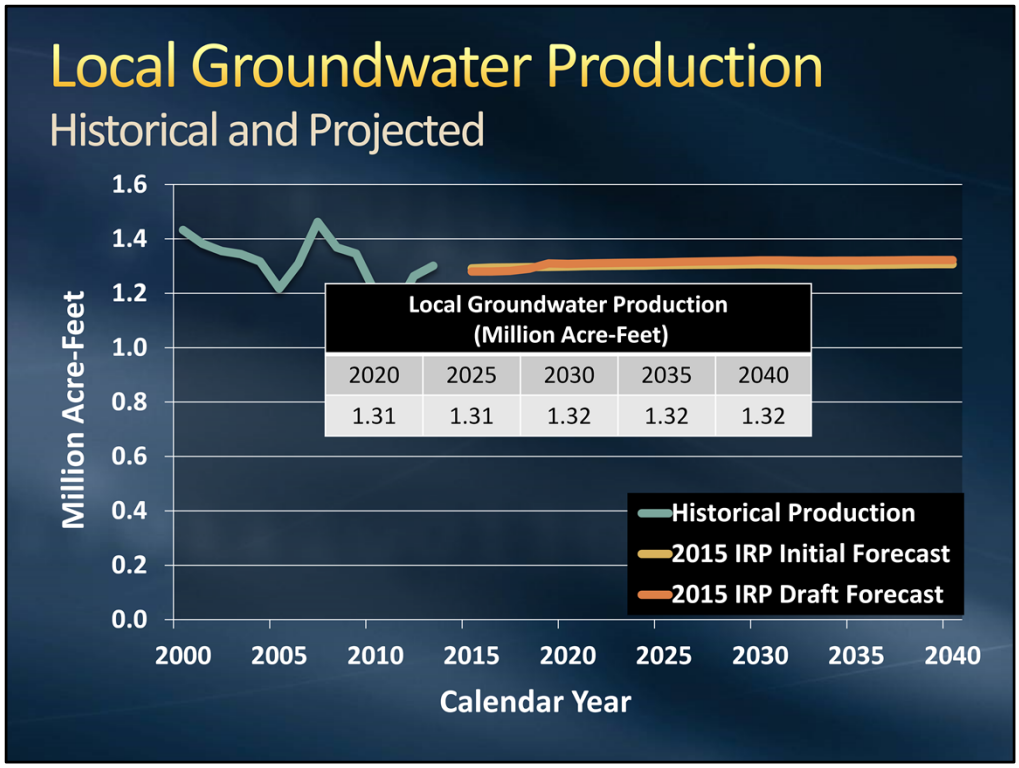
Slight climate range as described.
Table shows average values.

Local Groundwater

Key Assumptions

- Member Agency input
- Orange County Basin assumed 70% BPP for 2015-18 and 75% BPP thereafter
- Adjudicated basins based on 2009-13 averages
- Sustainable production
- Basin operating safe yield
- Supported by storm, recycled, and imported water

Groundwater forecasts developed with agencies, refined in technical process. Generally based on adjudications or basin management **Need a little help here!**



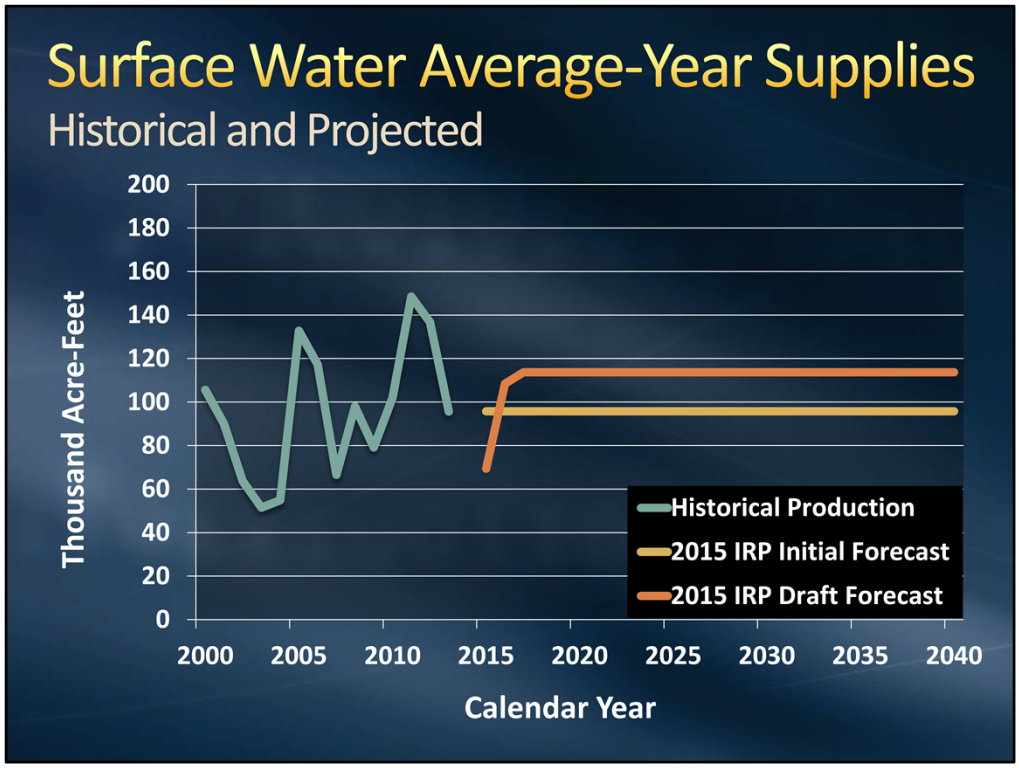
History, very slight change from initial forecast… some variation due to climate, orange county or multiple dry-year scenarios.
Incorporated into modeling, not show here due to the scale.

Surface Water

Key Assumptions

- Member Agency input
- SDCWA reservoir production based on regression model using 91 observed hydrologies
- Other reservoirs based on 2009-2013 average

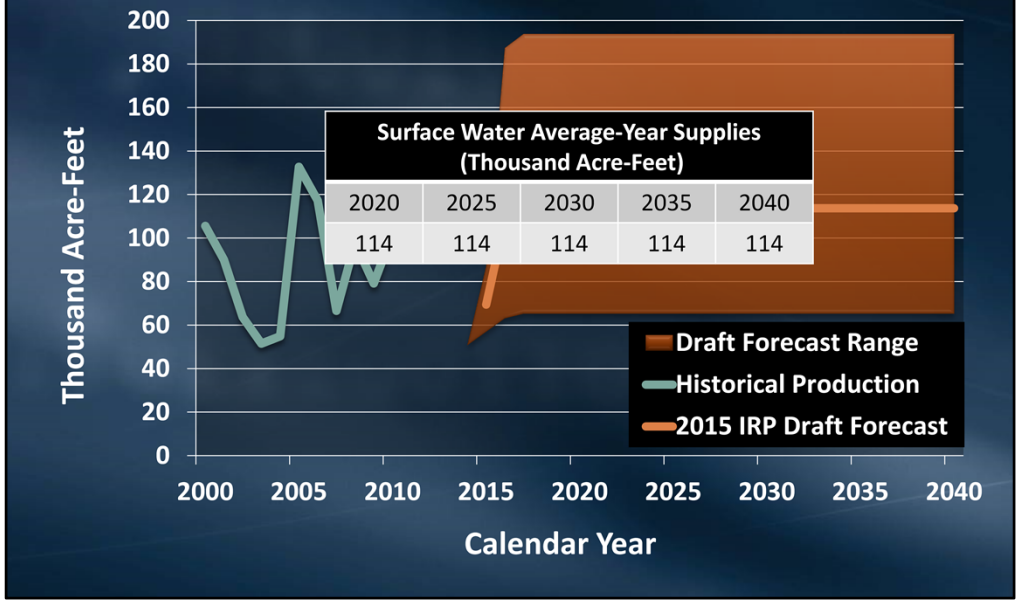
Surface water,
Average levels of production
SDCWA reservoirs modeled, need help here.



History, hints at climate variation, initial forecast, draft forecast… 2015 locked in at a low value.

Surface Water Average-Year Supplies

Historical and Projected



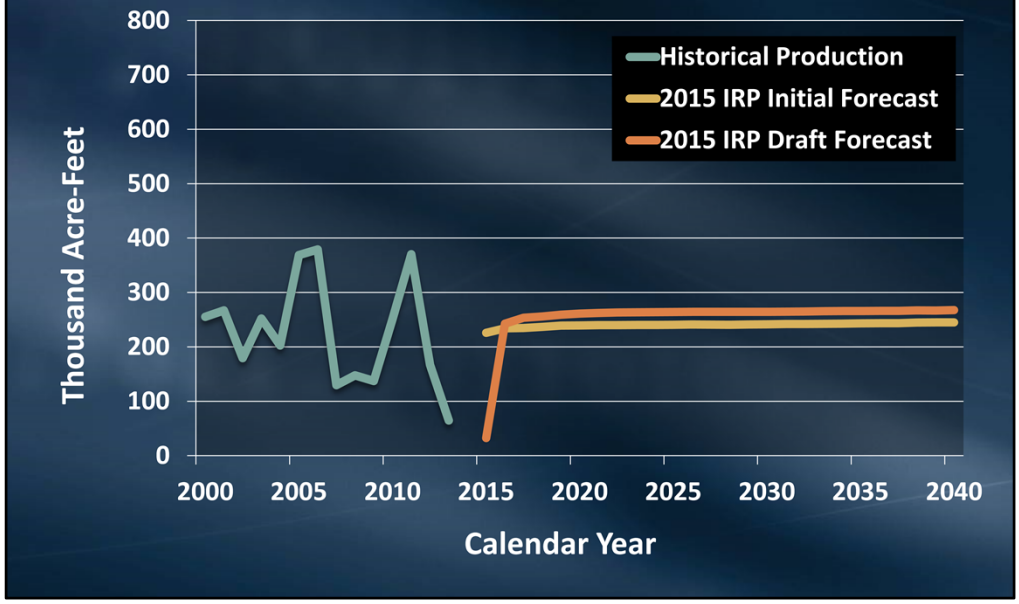
Surface Water Average-Year Supplies (Thousand Acre-Feet)				
2020	2025	2030	2035	2040
114	114	114	114	114

Los Angeles Aqueduct
Key Assumptions

- Los Angeles Aqueduct Simulation Model
  - LADWP provided forecast
- 1922-2012 hydrology

LAA Average-Year Supplies

Historical and Projected

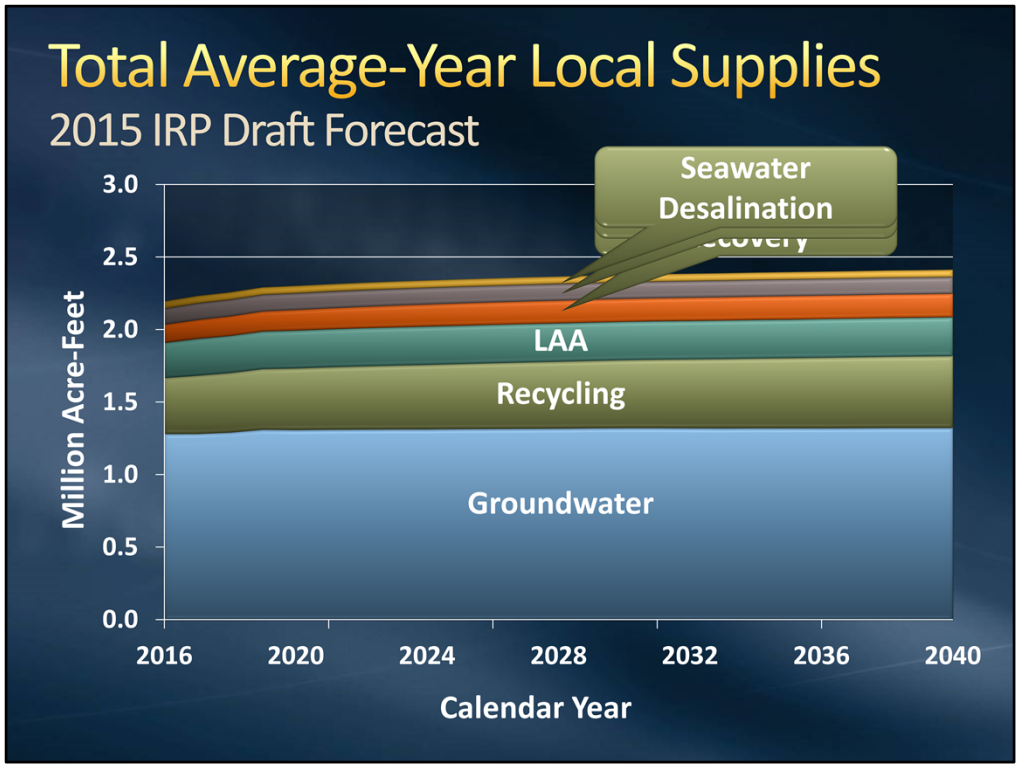


LAA Average-Year Supplies

Historical and Projected

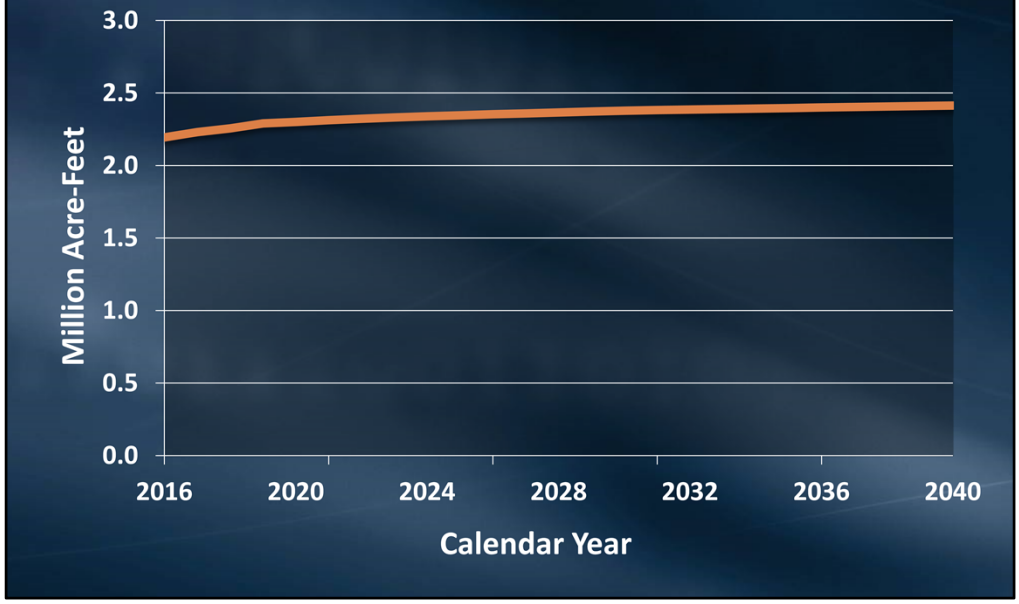
Los Angeles Aqueduct Average-Year Supplies (Thousand Acre-Feet)

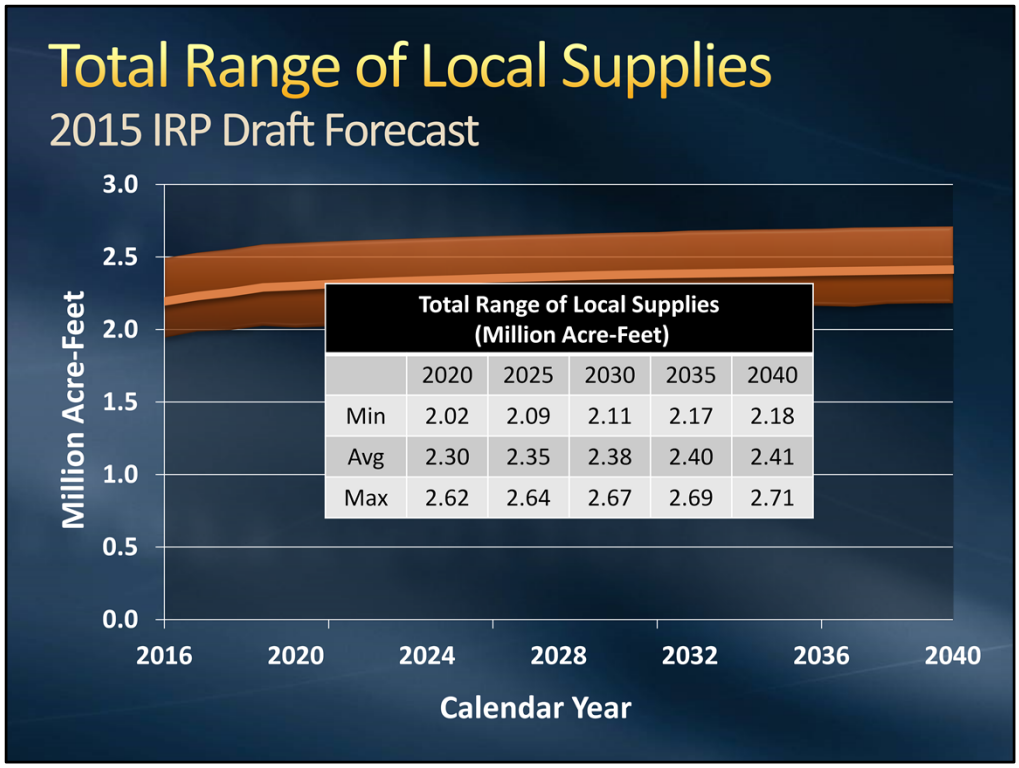
2020	2025	2030	2035	2040
261	264	264	266	268


Total Average-Year Local Supplies
2015 IRP Draft Forecast
Seawater Desalination
LAA
Recycling
Groundwater
Million Acre-Feet
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2016
2020
2024
2028
2032
2036
2040
Calendar Year

Total Average-Year Local Supplies

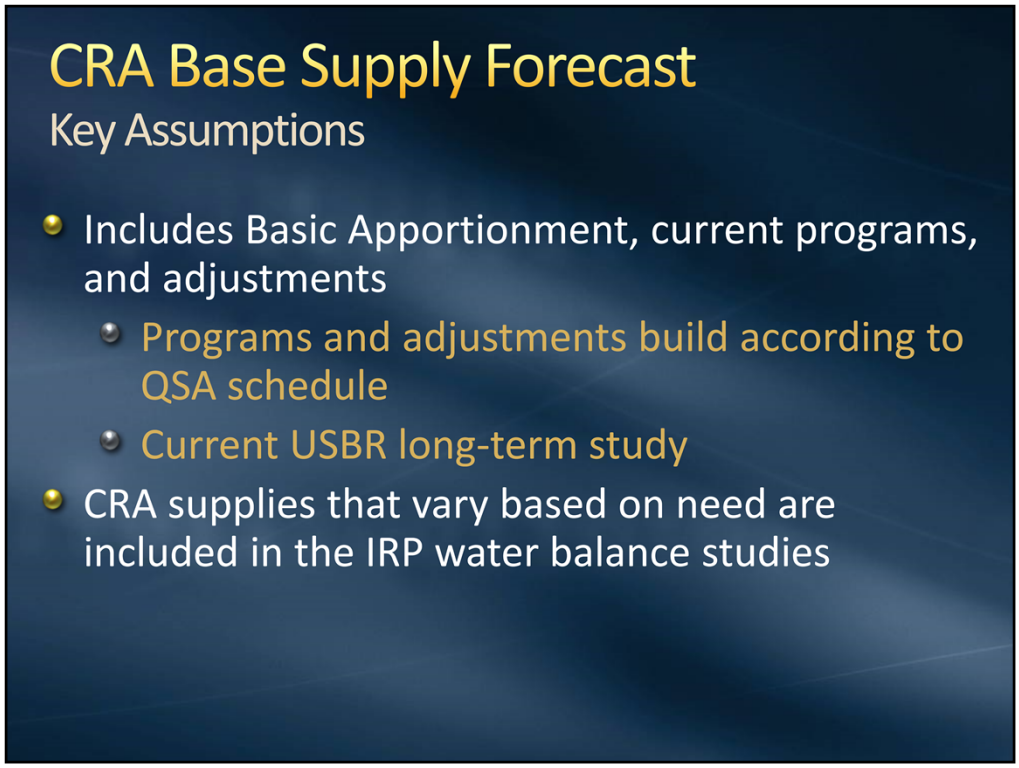
2015 IRP Draft Forecast



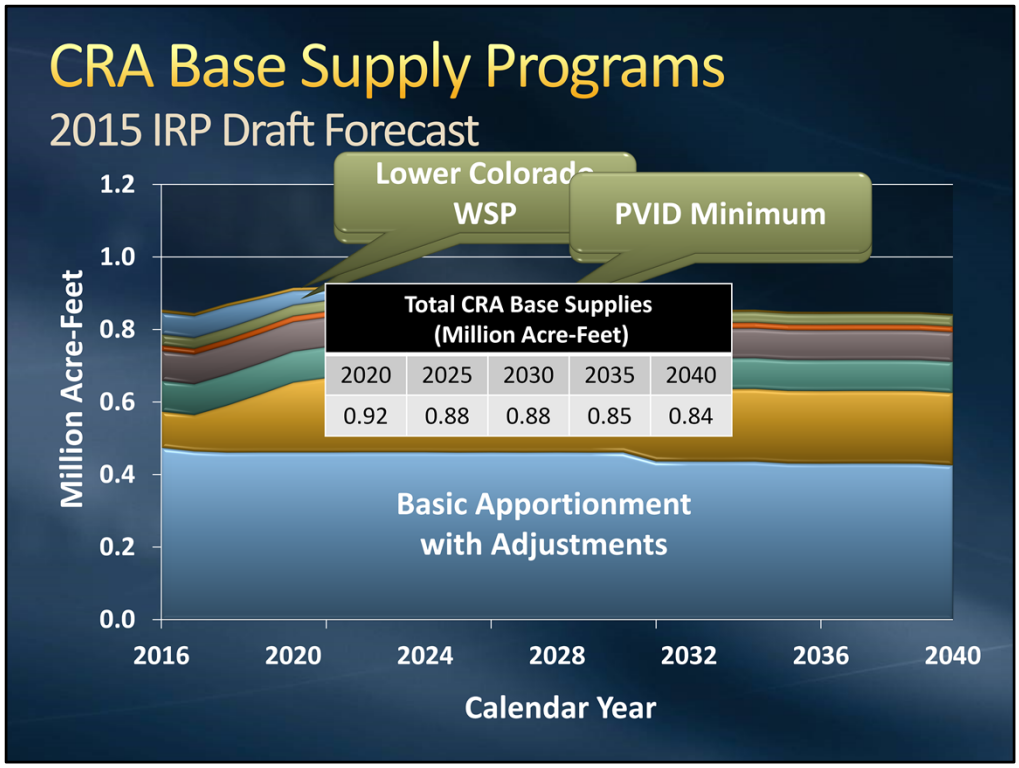


Get a feel for range in local supply production… again 91 climate impacts in shaded area per year

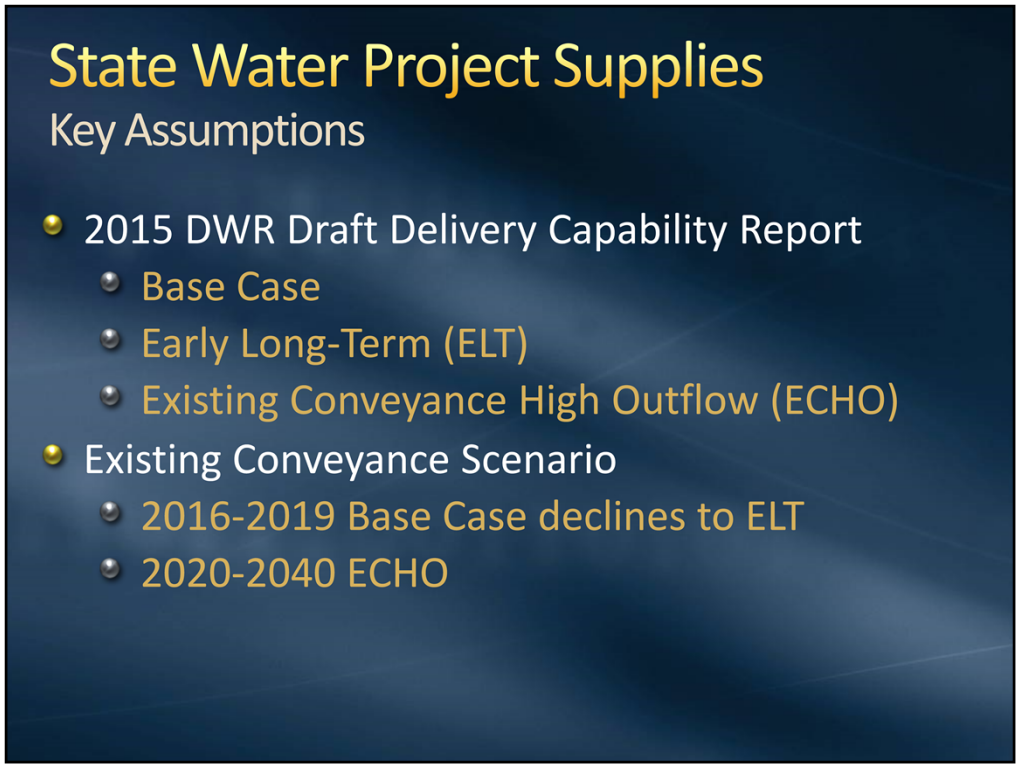
Finally let’s take a look at the imported supply forecasts



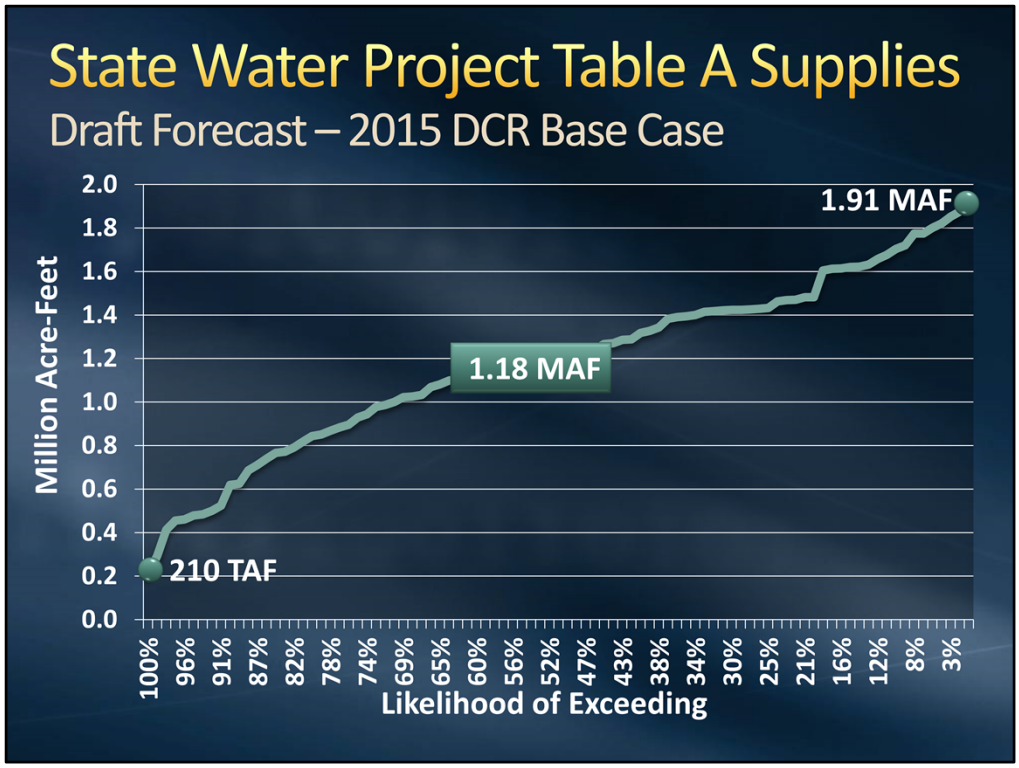
Colorado river assumptions, basic apportionment, programs, adjustments and obligations
Just base supply programs



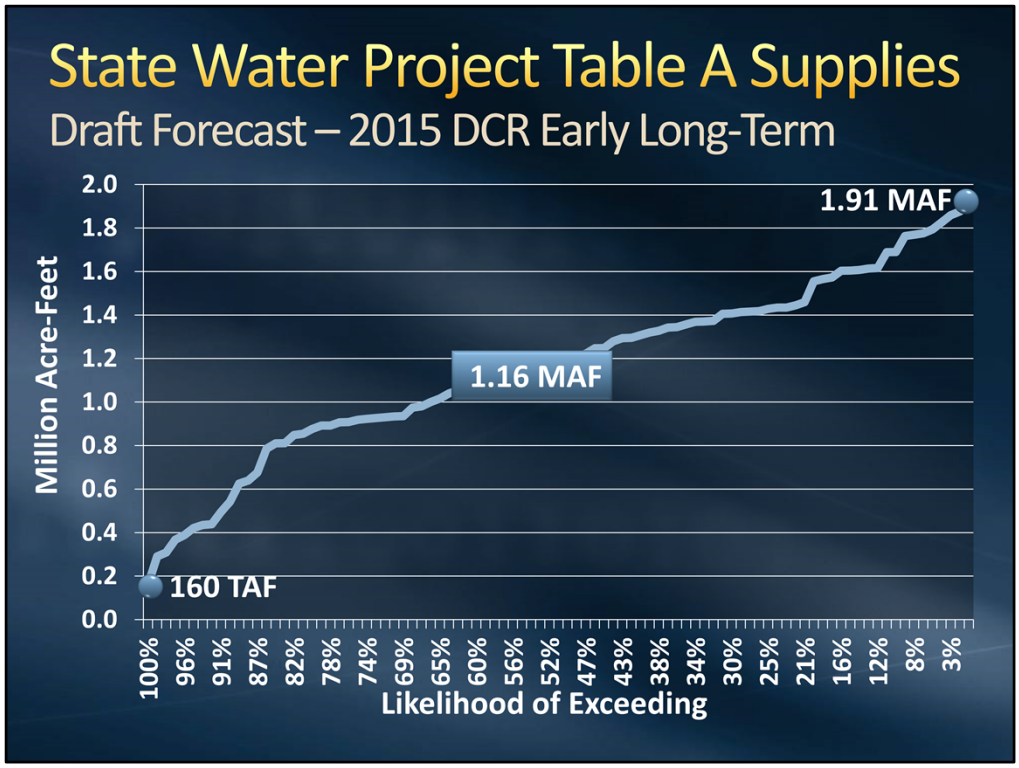
Some variation from year to year, not due to climate rather due to how we operate our resources.
Recognize SDCWA supplies are separately



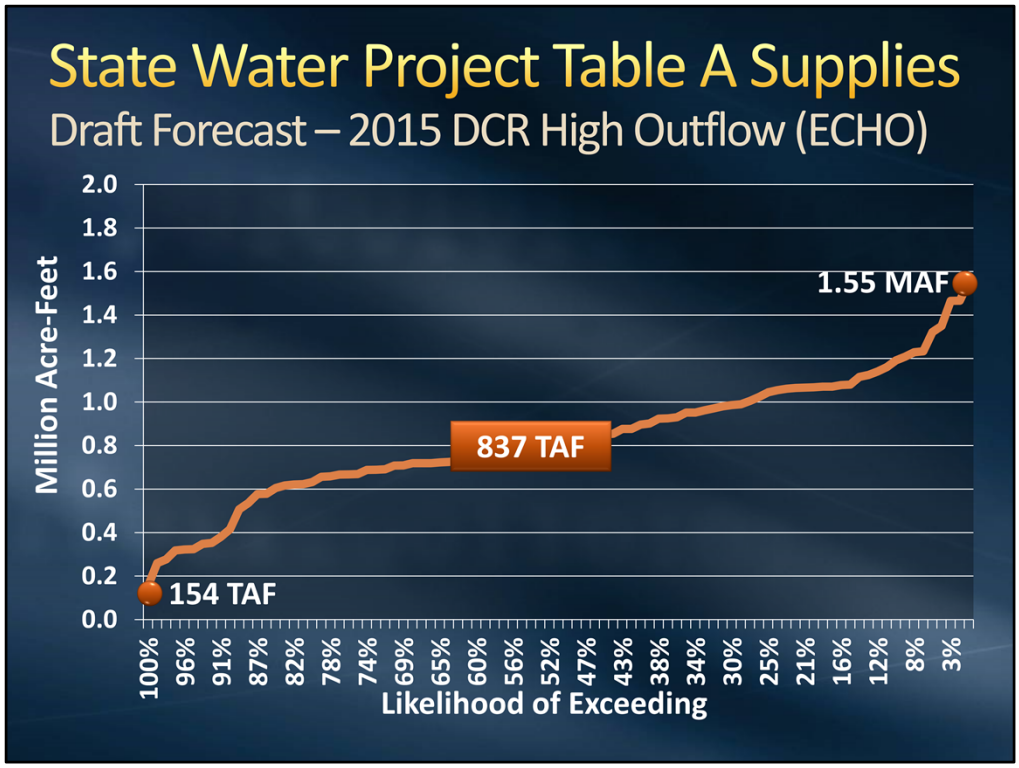
MWD deliveries for same scenarios shown by steve



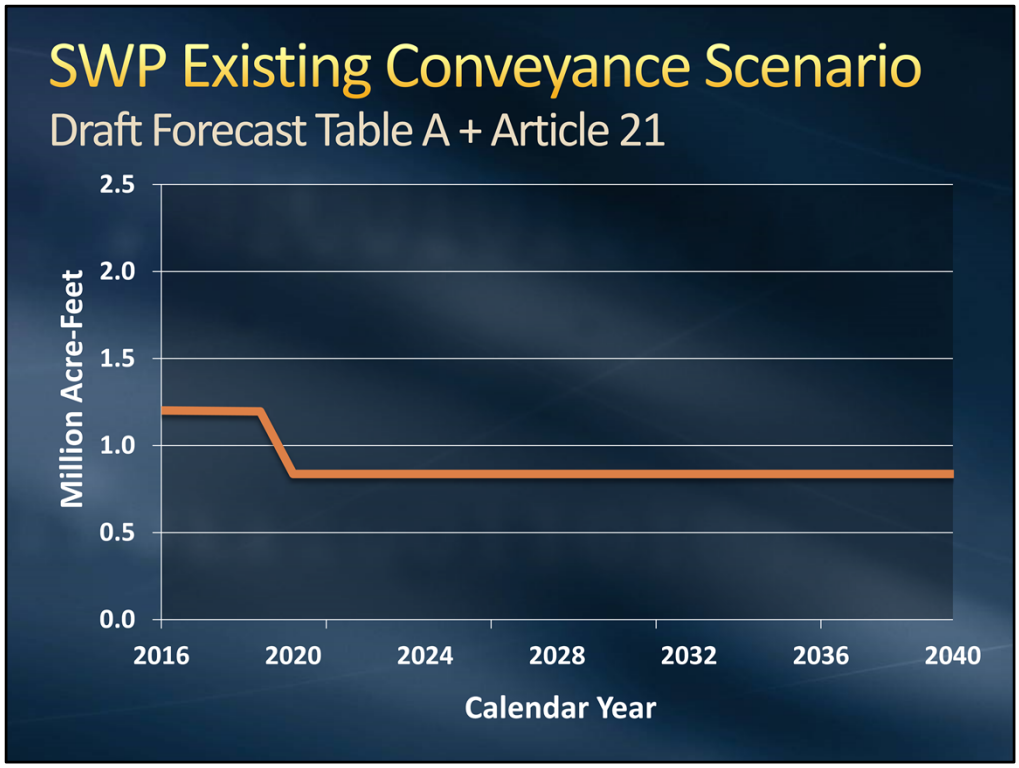
Near-term study
Probability or Exceedance chart… 90+ climate outcomes per year ranked in order from lowest (bottom left) to highest (top right).



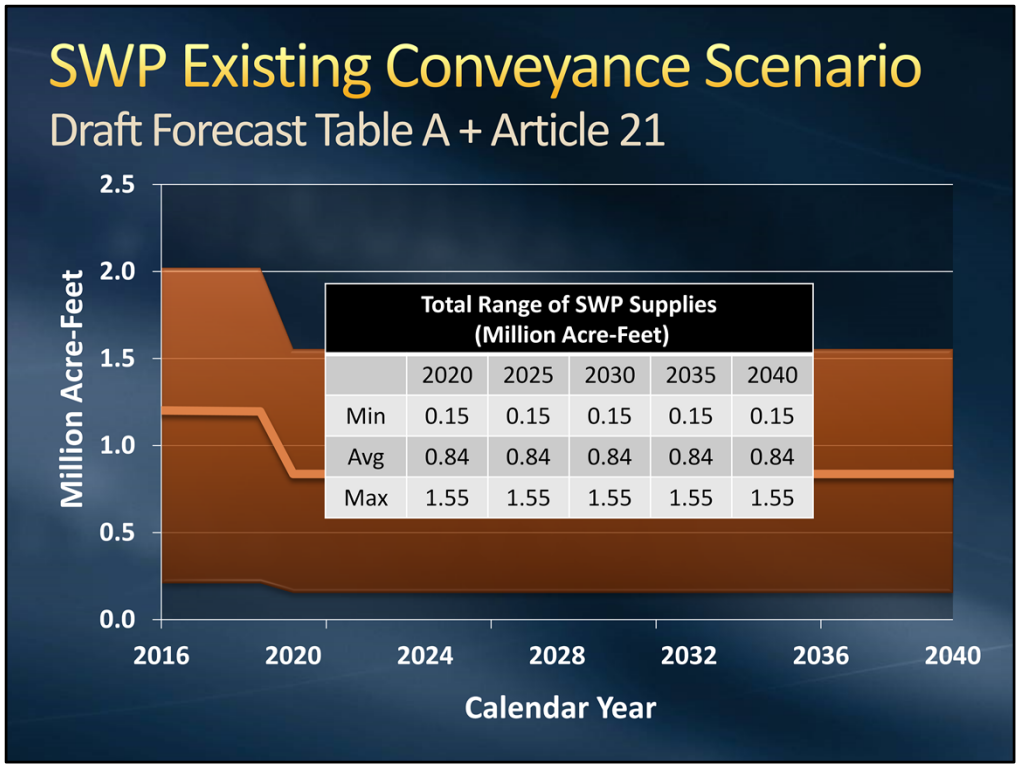
Early long-term, same as base case with climate change



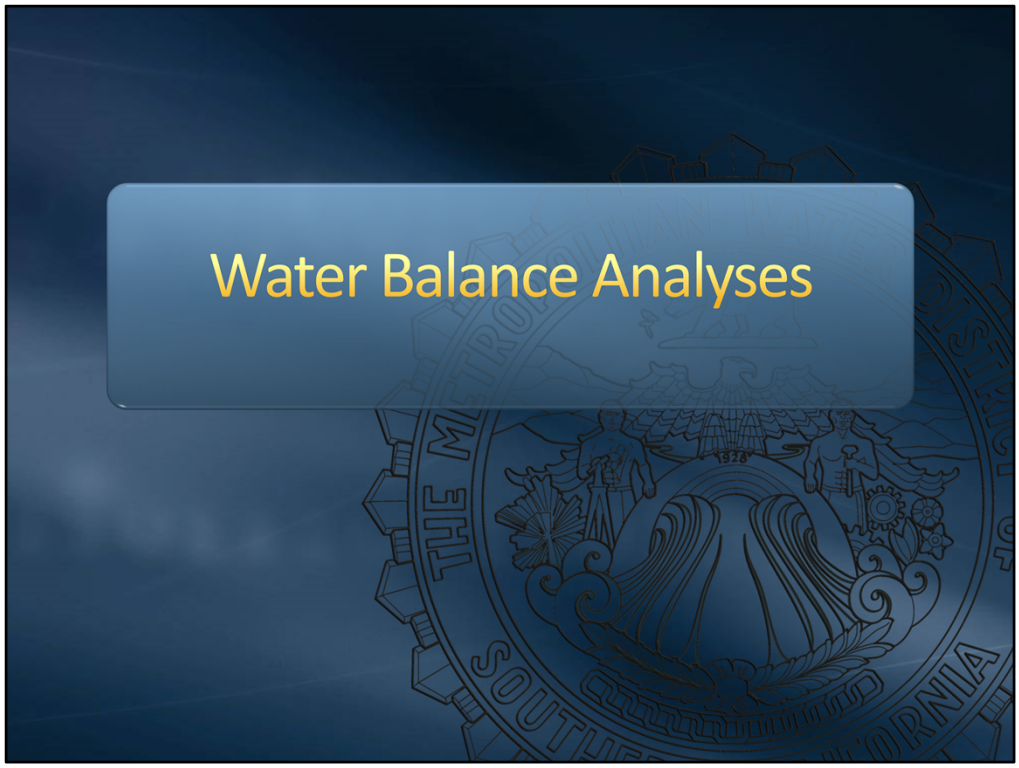
High outflow scenario, additional restrictions as steve described



In addition to supplies shown, small amount of Article21 supplies added in.
Shows the average delivery over time, begin with Base Case, slowly declining towards early long-term, dropping to high outflow scenario in 2020.



As we talked about each of the studies has a range around it, this chart shows the full range of climate impacts around the average over time.
This concludes our look at current water supplies and demands (question 1)

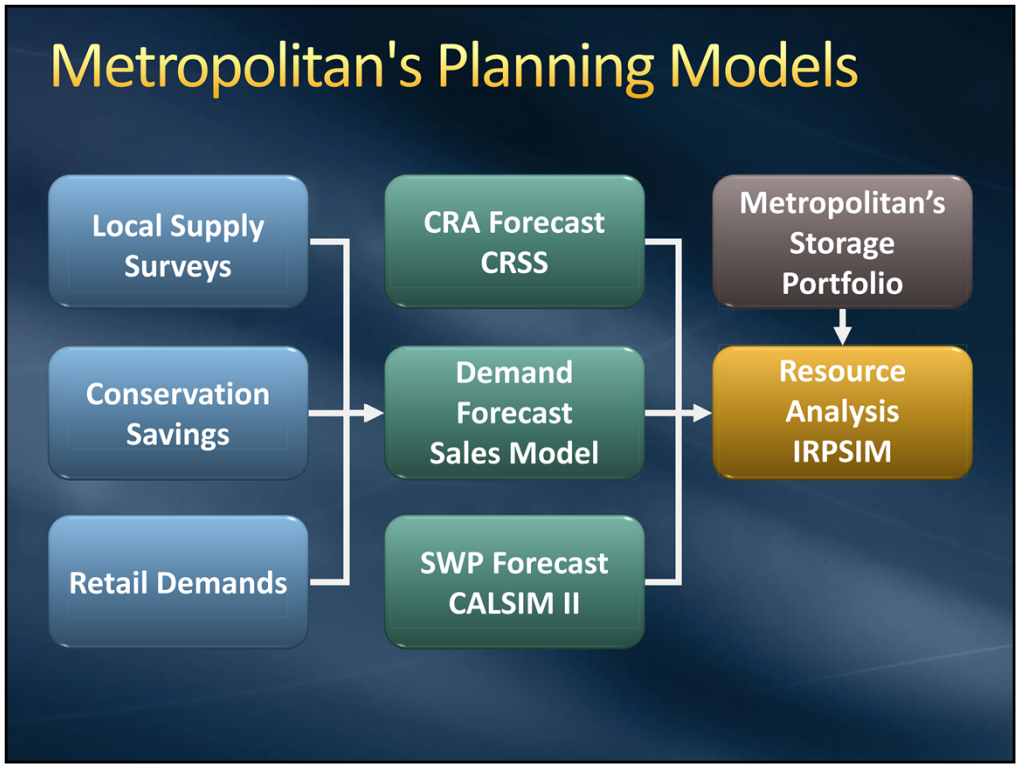


That concludes the review of our forecasts answers and answers our first question “What is the current outlook of supplies and demands”
Now we can use this information to build our water balances and look at questions two and three “What happens if we do nothing” and “what happens if we take the 2010 IRP approach”

Needs for Building a Water Balance Analysis

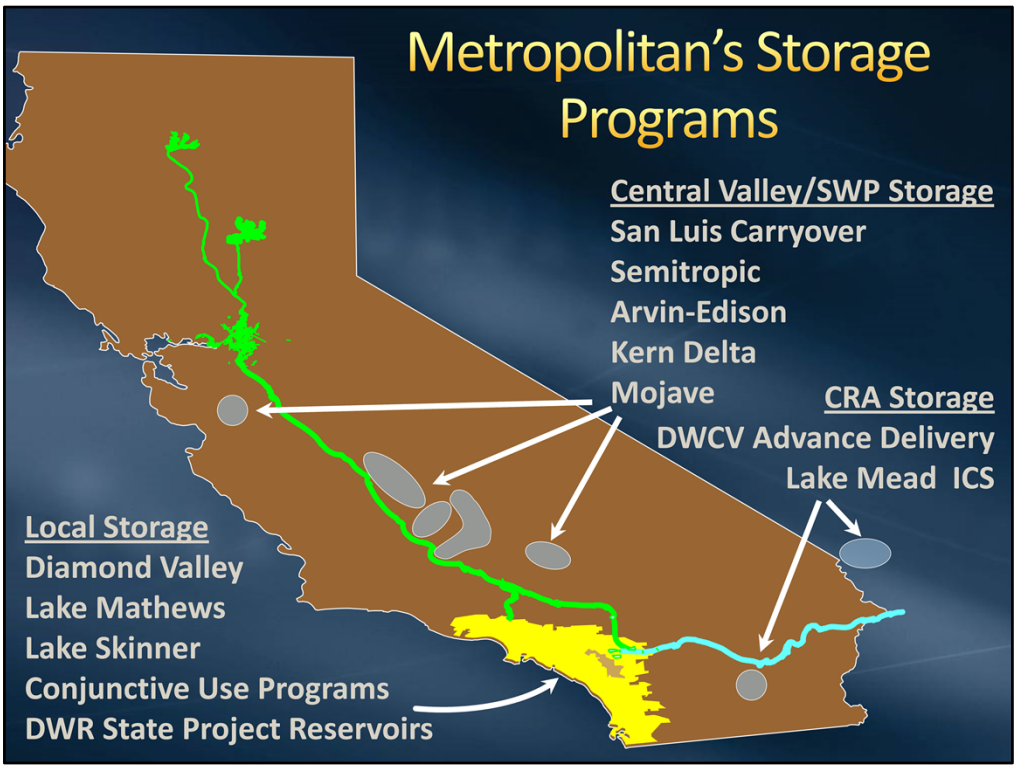
- Forecasts of supplies and demands by hydrology
- A modeling tool that can:
  - Integrate hydrology based forecasts
  - Operate a storage and transfer portfolio
- Reliability measures to evaluate the water balance outcomes

There are a few additional things that we need to do our analysis
Forecasts of supplies and demands that vary by climate – check
Modeling tools that can handle all of the hydrology, operate storage and transfers
Reliability measures, so that we know if the water balance is



Modeling tools that produce these forecast with climate range, input to IRPSIM model.
Mass balance model, goal is to balance supplies and demands each year using storage portfolio… storage impacts carry to next year, and so on.
Basically a giant calculator, that can take forecasts by climate and by year and incorporate them into water balances.

Grey box – storage portfolio



All of these programs are modeled in IRPSIM

Storage Portfolio

Key Assumptions

- Each storage program is modeled in IRPSIM
  - Storage capacity
  - Put capacity
  - Take capacity
  - Program or evaporative losses
- 2016 estimated starting storage balances
- Emergency storage of ~630 TAF is held aside

Detailed coding to describe put, take, storage capacity, running balance in storage.
For our water balances, we will start with estimated 2016 conditions.
We do not assume the use of emergency storage.

MWD Storage Programs Summary

Million Acre-Feet

	Storage Capacity	Put Capacity*	Take Capacity*	2016 Est. Starting
Central Valley & SWP	1.63	0.54	0.56	0.42
Colorado River	2.39	0.65	0.60	0.22
In-Region	1.30	0.90	0.94	0.14
Total Dry-Year	5.32	2.09	2.10	0.77
Emergency	0.63	0.63	0	0.63
Total	**5.95**	**2.72**	**2.10**	**1.40**

*Shows maximum capacities, actual capacity varies based on contract terms

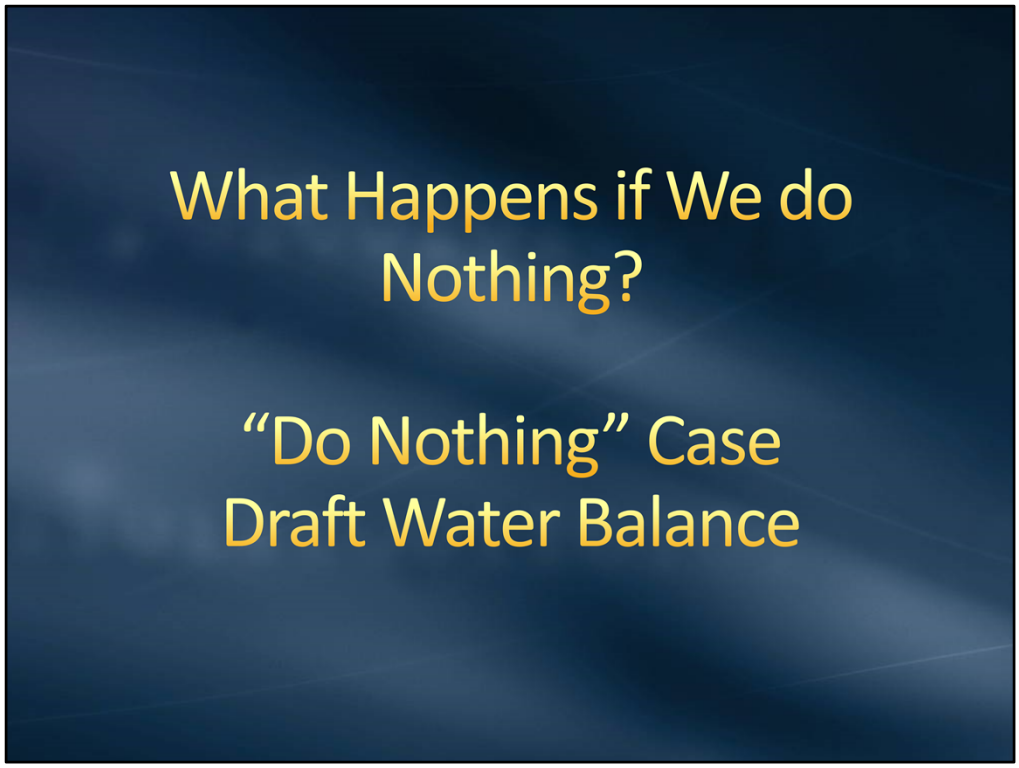
Quick summary by area, kind of capacities available. Focus on highlighted area, total storage, total put, and total take capacity… **limited based on water in storage**
Estimated starting balance of just under 800 taf

And finally, to complete our water balances we need some reliability measures.

Potential Measures of Reliability

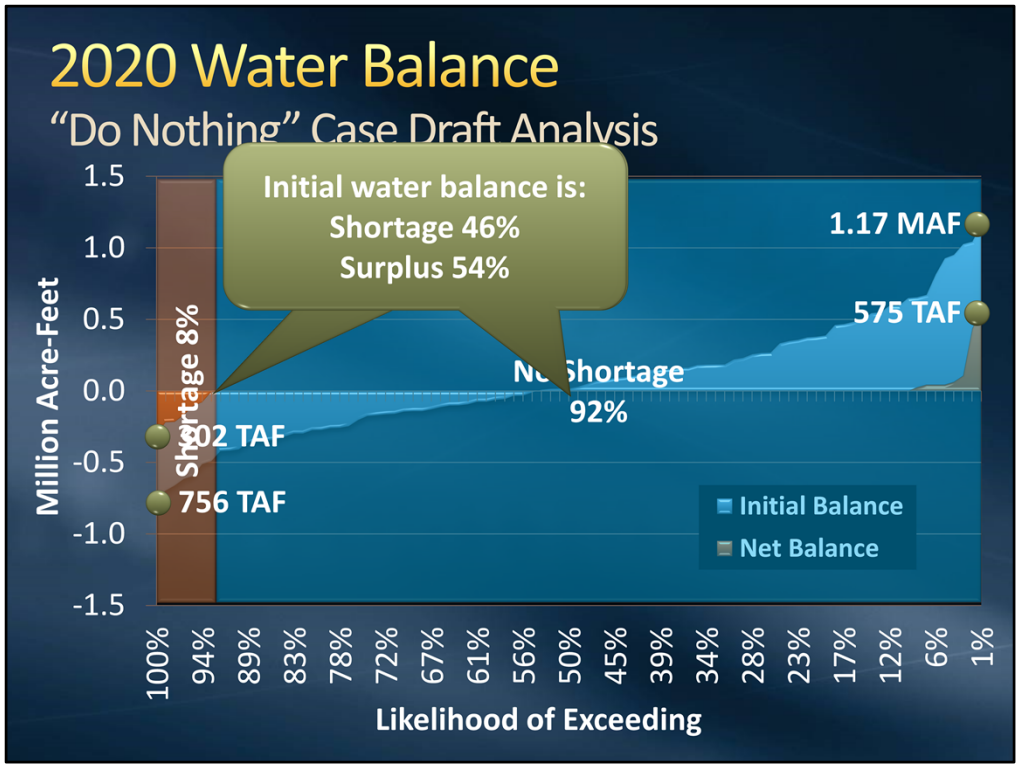
- Supply shortages
  - Frequency of shortage (aka probability)
  - Size of shortage
  - IRP reliability goal: "100% reliability under foreseeable hydrologic conditions"
- Storage thresholds
  - Minimum storage level
  - Average storage level

Number of things we could look at, tend to focus on shortages and storage levels.

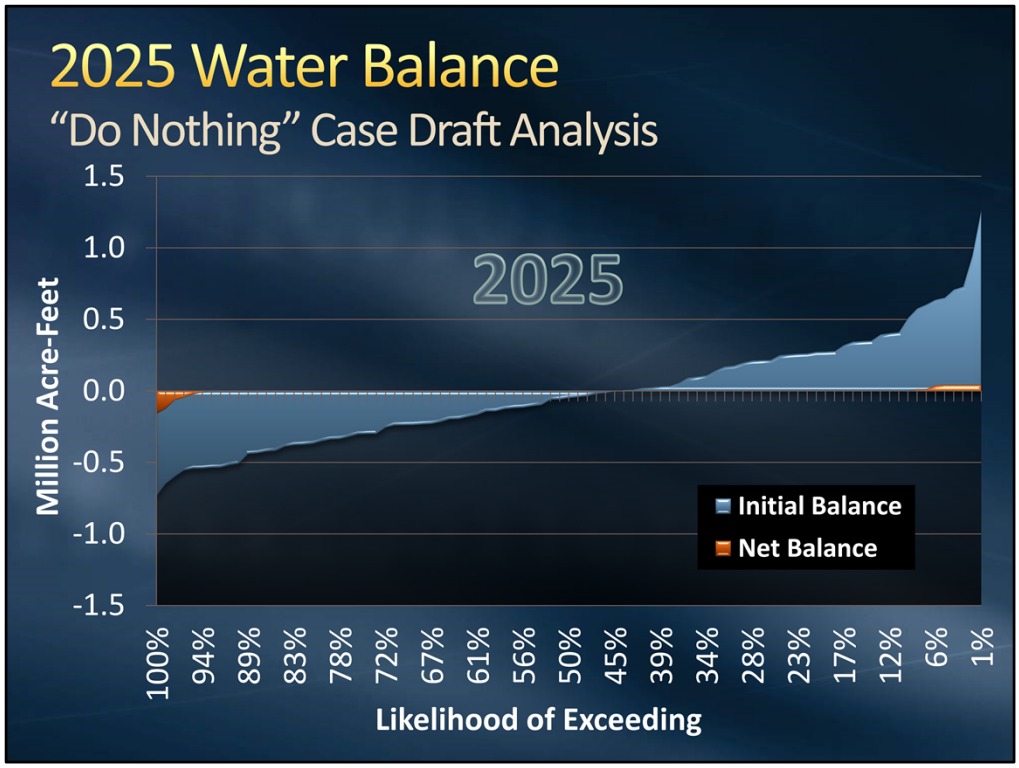


Ok, so we have all of the pieces in place to build our first water balance: forecasts, modeling tools, metrics

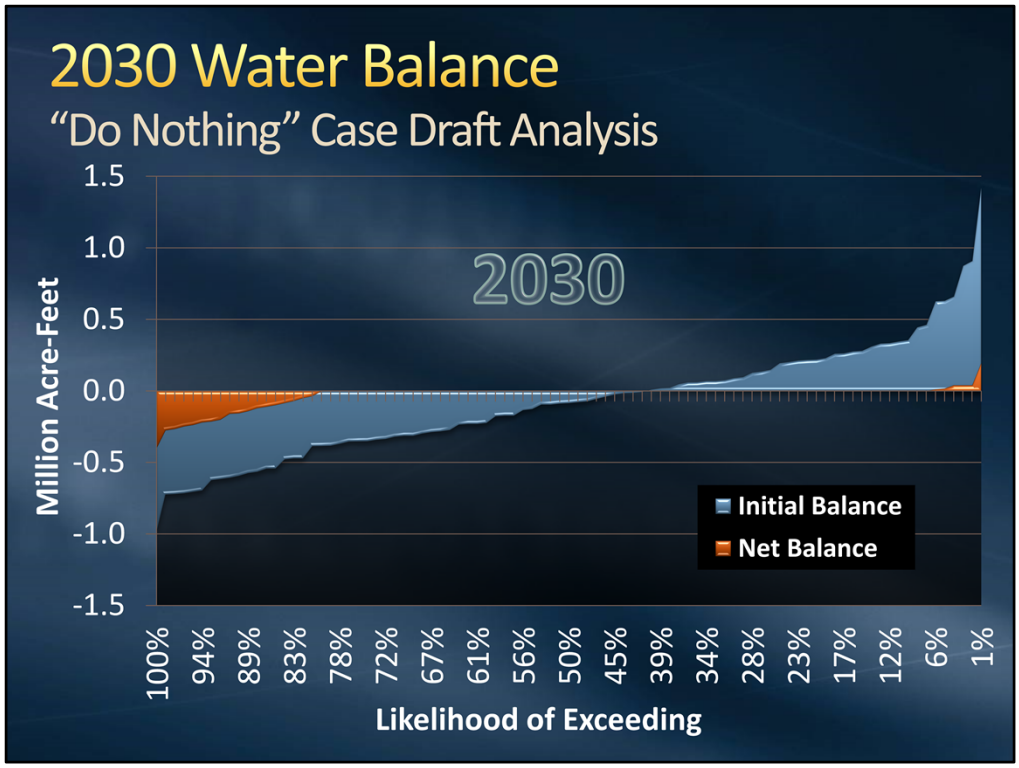
Let’s take a look at future reliability with this information… this will help us answer our second question, “what happens if we do nothing?”

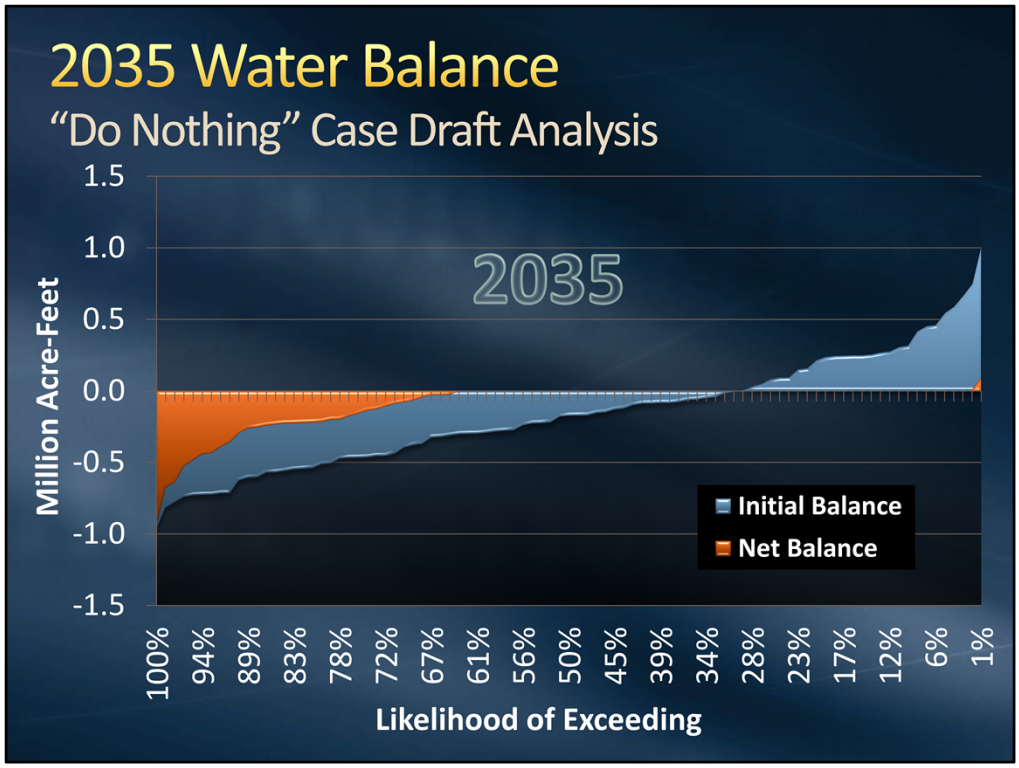


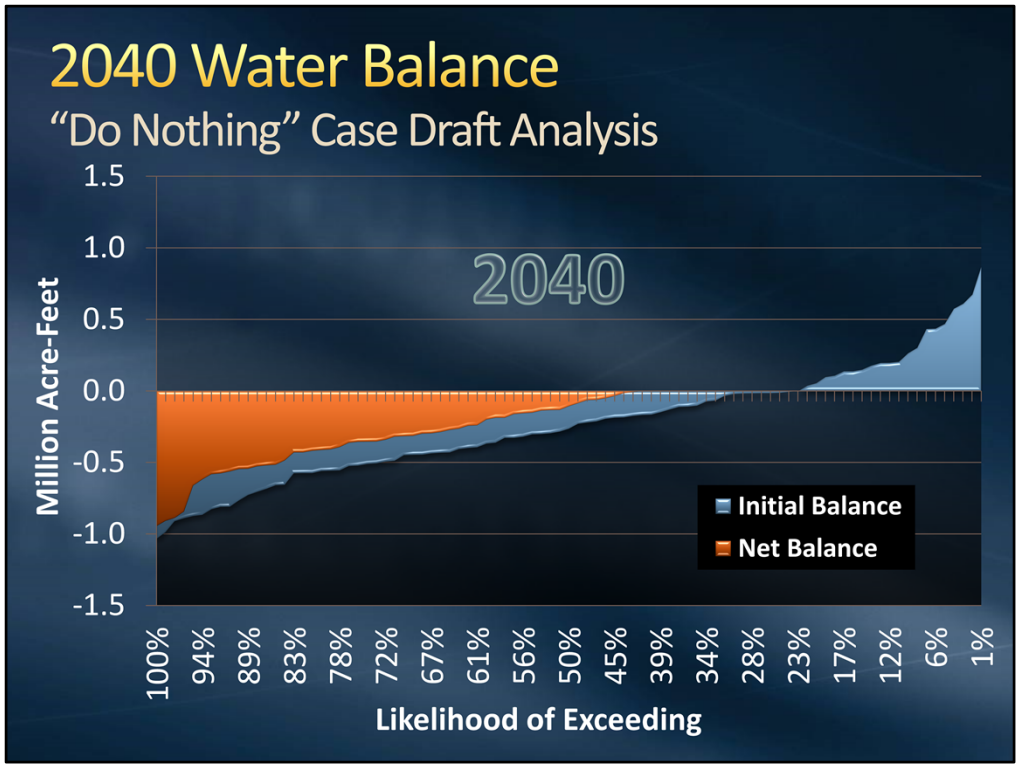
Look at the results for the year 2020.
90 outcome based on variation in demands and supplies due to climate.
Initial water balance, supplies minus demands, no additional actions, raw water balance
Frequency, max shortage, max surplus



Model produces this information for every year in the forecast 2016-2040,
Quickly click through in 5 year increments… note the surplus area on the upper right shrinking, and the shortage area on the lower left growing.

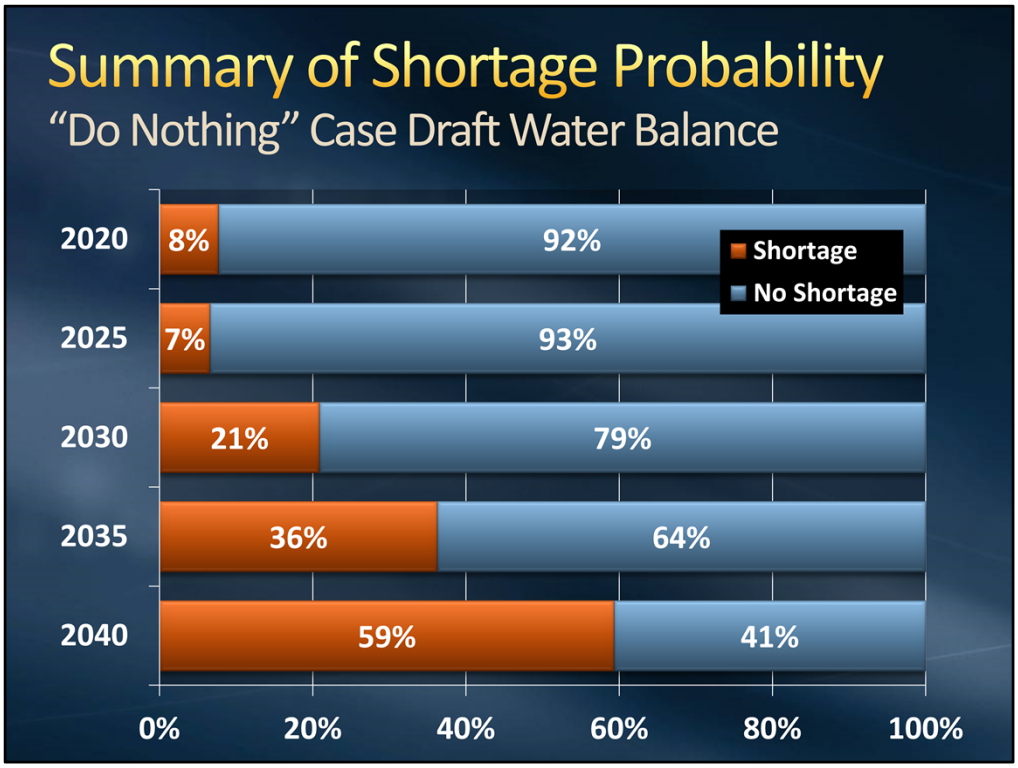

2030 Water Balance
"Do Nothing" Case Draft Analysis
2030
Million Acre-Feet
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
100%
94%
89%
83%
78%
72%
67%
61%
56%
50%
45%
39%
34%
28%
23%
17%
12%
6%
1%
Likelihood of Exceeding
Initial Balance
Net Balance

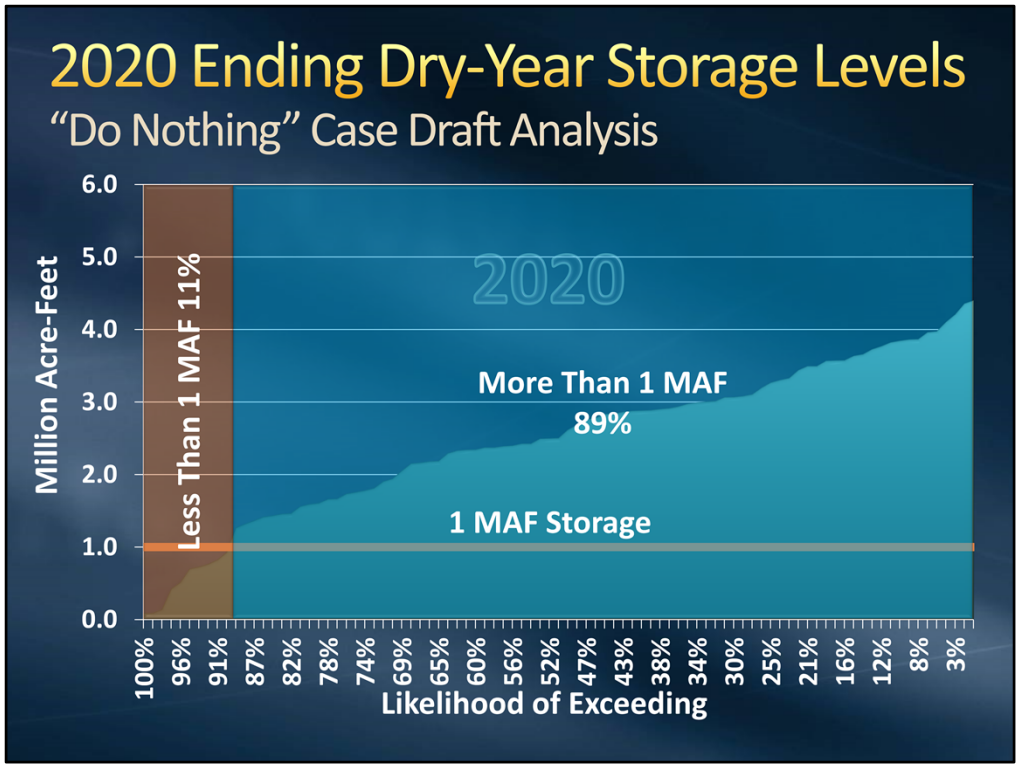

2035 Water Balance
"Do Nothing" Case Draft Analysis
2035
Million Acre-Feet
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
Initial Balance
Net Balance
100%
94%
89%
83%
78%
72%
67%
61%
56%
50%
45%
39%
34%
28%
23%
17%
12%
6%
1%
Likelihood of Exceeding


2040 Water Balance
"Do Nothing" Case Draft Analysis
2040
Million Acre-Feet
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
Initial Balance
Net Balance
100%
94%
89%
83%
78%
72%
67%
61%
56%
50%
45%
39%
34%
28%
23%
17%
12%
6%
1%
Likelihood of Exceeding

Summary of Shortage Probability

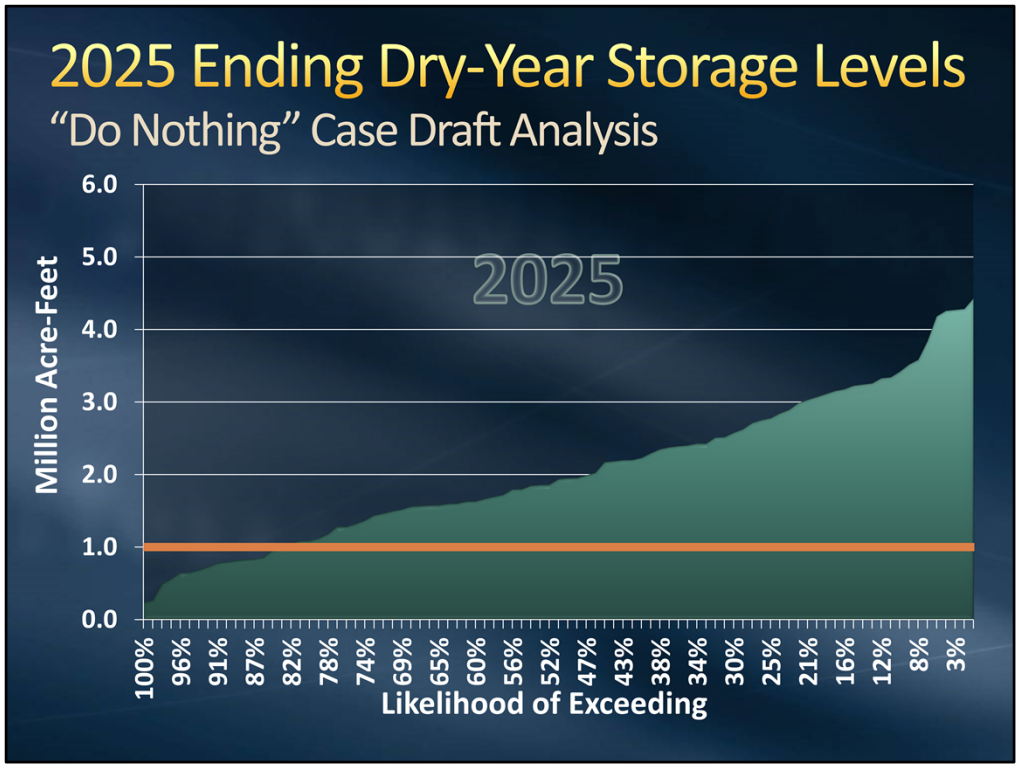
"Do Nothing" Case Draft Water Balance





Let's take a second look at this do nothing water balance with a different evaluation metric… ending storage level, corresponding to the 90+ water balance outcomes that we looked at for 2020.

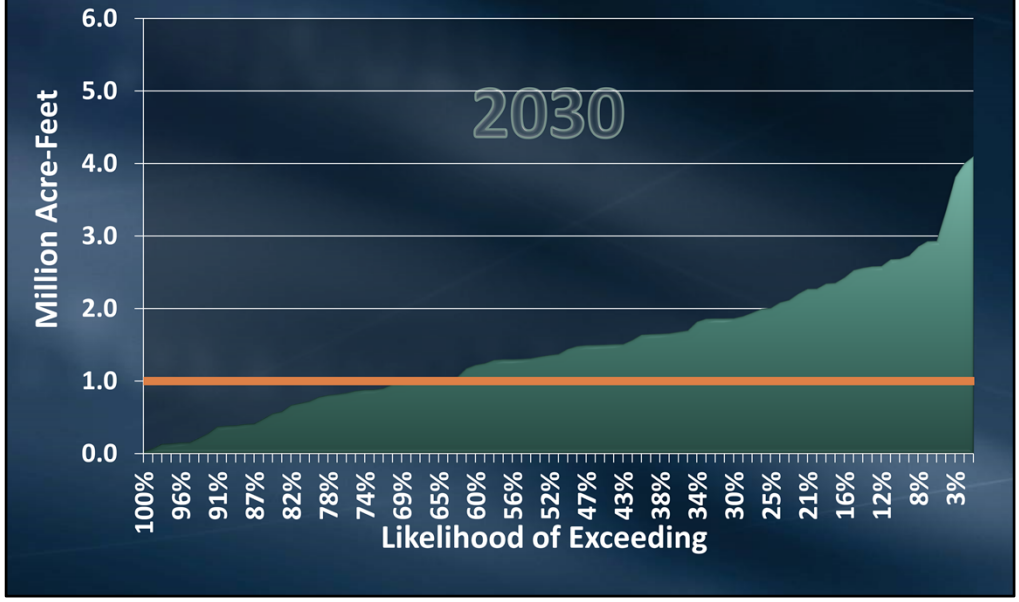
For this analysis we've chosen 1 million acre-feet as a minimum storage threshold to evaluate against.
Tends to be the range where we start to feel uncomfortable, or unreliable. Situation, we are in this year and in 2008-2009 when we talk about implementing allocations.
So not actually out of water as in the shortage look, but uncomfortable.



Animate through in 5 year increments, see more and more of the storage outcomes falling below 1 MAF line

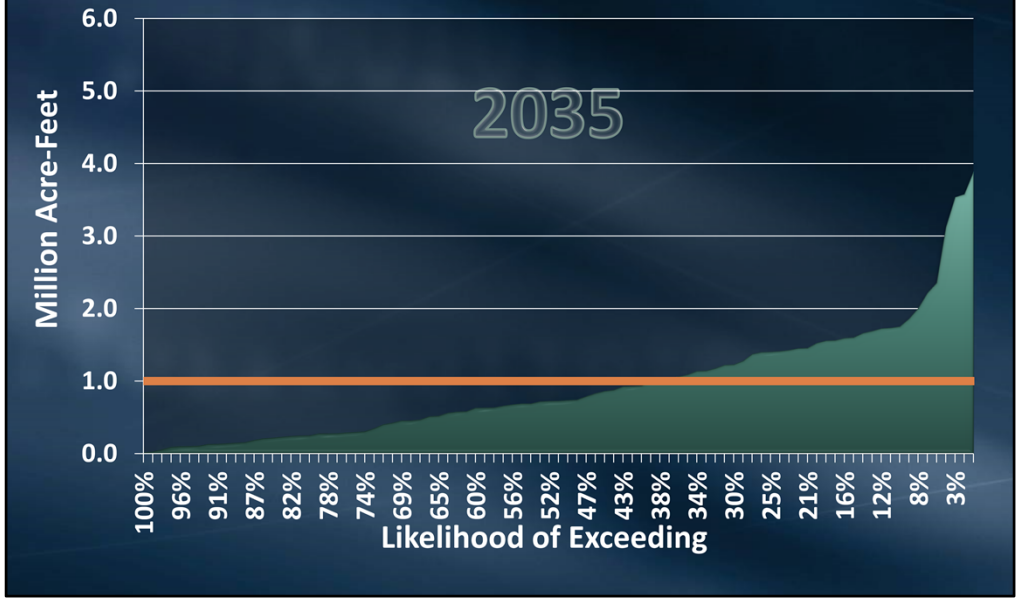
2030 Ending Dry-Year Storage Levels

"Do Nothing" Case Draft Analysis



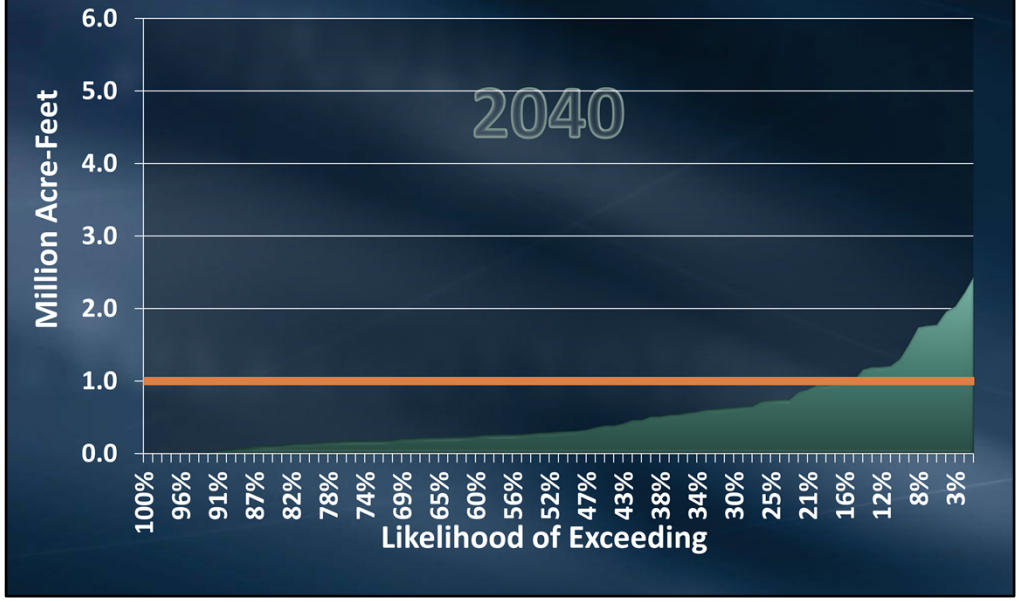
2035 Ending Dry-Year Storage Levels

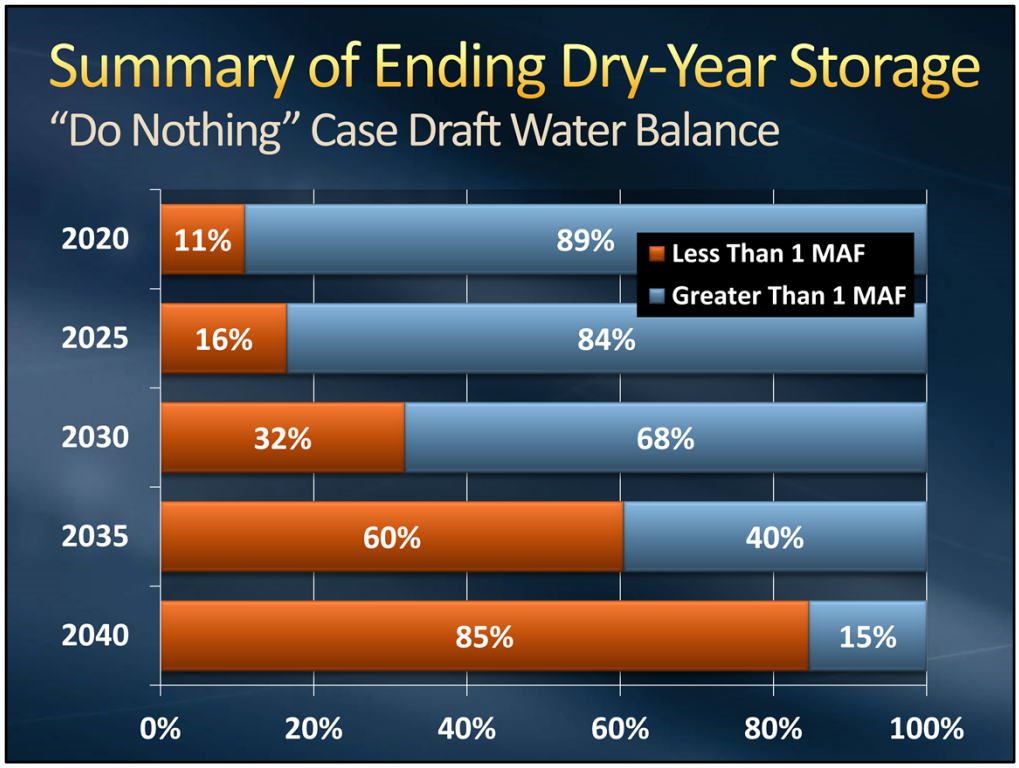
"Do Nothing" Case Draft Analysis



2040 Ending Dry-Year Storage Levels

"Do Nothing" Case Draft Analysis





Summary of those charts,
Even greater amount of the time, than actual shortage, perceived unreliability.

Observations

"Do Nothing" Case Draft Water Balance

- The "do nothing" approach is not sustainable
- Shortage probability and size both increase over time
  - Total retail demands increase over time
  - Constant or decreasing local and imported supplies
- Storage quantity decreases over time
  - Less water to store
  - Higher needs for storage to balance supplies and demands
- Significant resource investments are needed

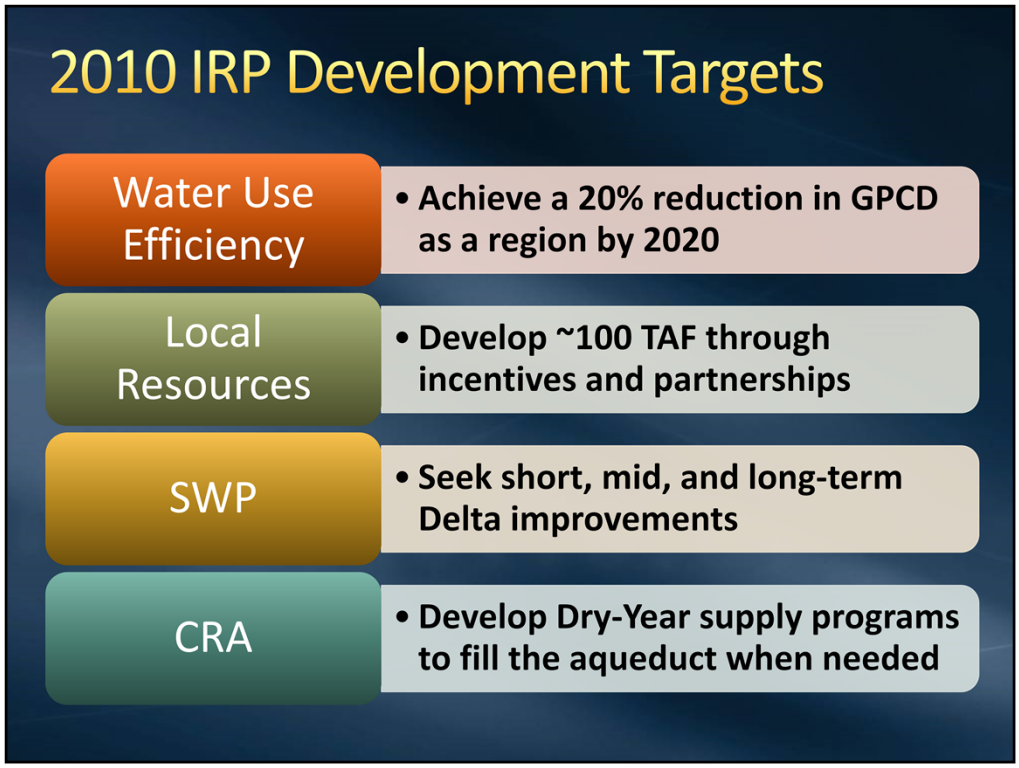
Answers our question #2 "What happens if we do nothing?"
Clearly not sustainable approach.

Shortage

Storage

Points to significant resource investment needs.

Speaking of significant resource investments.
Let's tackle question #3 what happens if we continue to develop the 2010 IRP targets
Take the "do nothing" water balance and re-run it with targeted

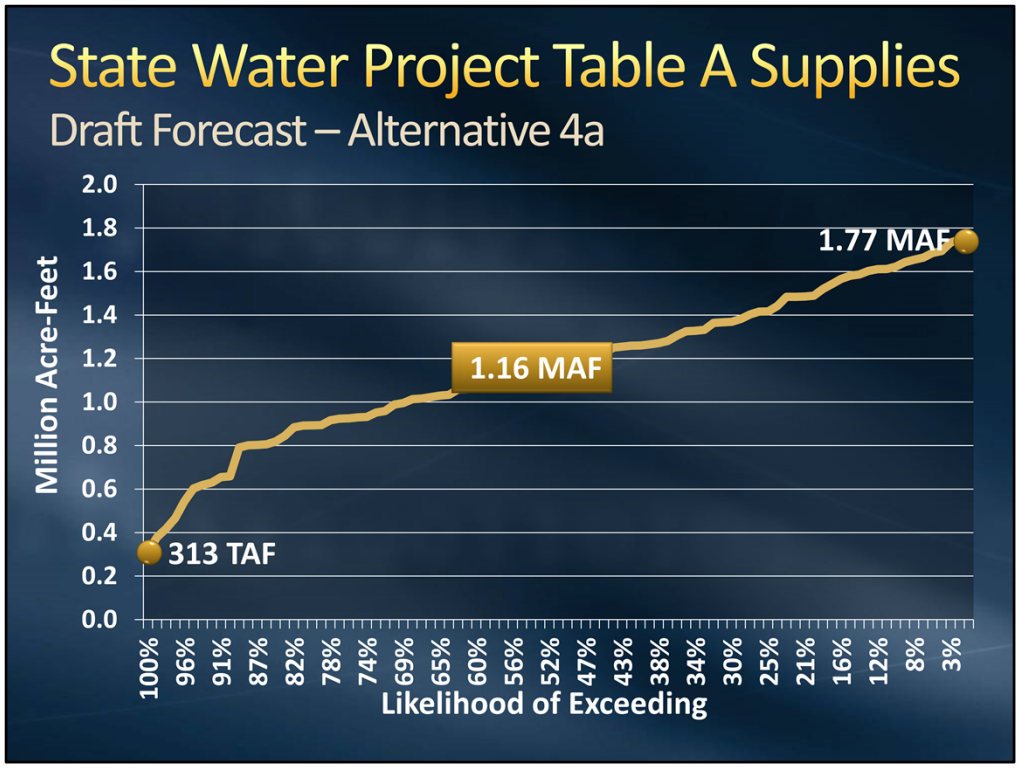


Water Use Efficiency
Conservation and recycling to achieve a 20% reduction at the regional level

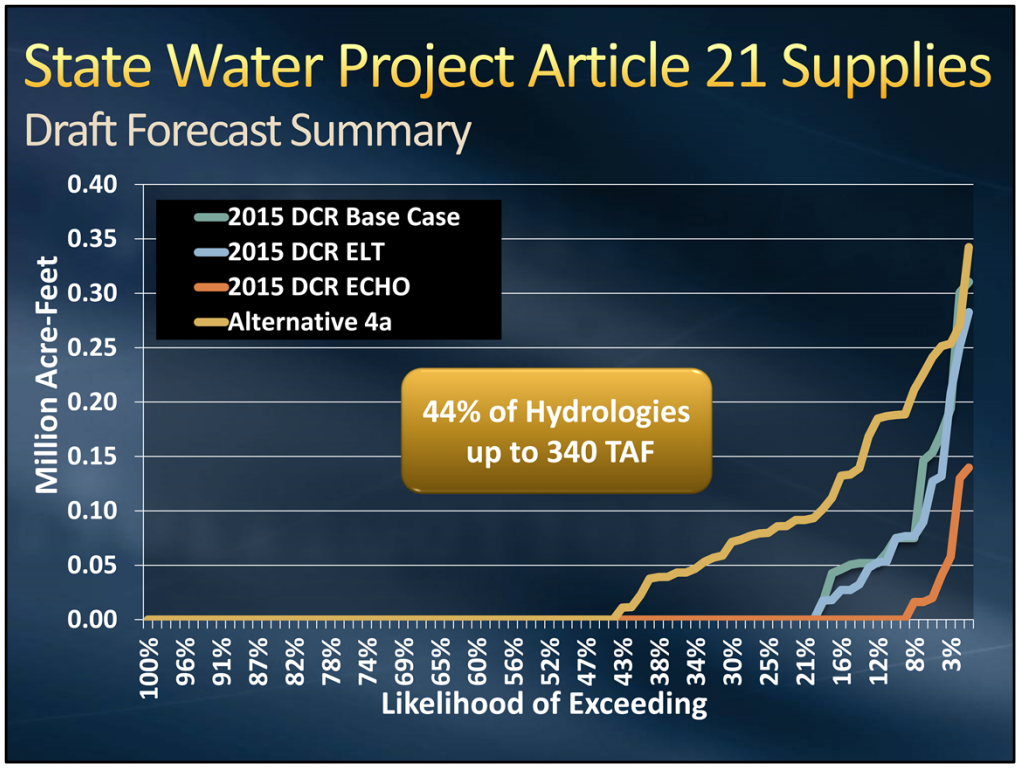
Local Resources
Sought to develop just over 100 TAF of additional local supplies through groundwater recovery, seawater desalination (and recycling)

State Water Project
Show you what this looks like based on what Steve went over

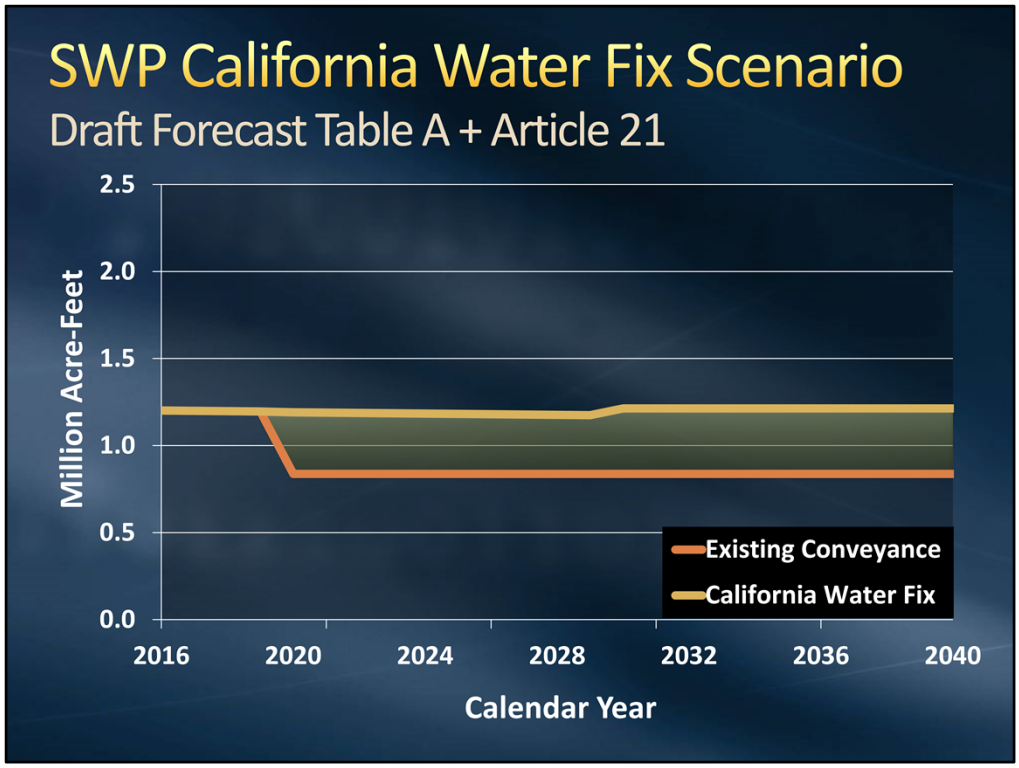
Colorado River
Essentially there, assuming no additional development beyond existing supplies and programs… implications that we will touch on later.



Full range of climate impacted supplies for Alternative 4a



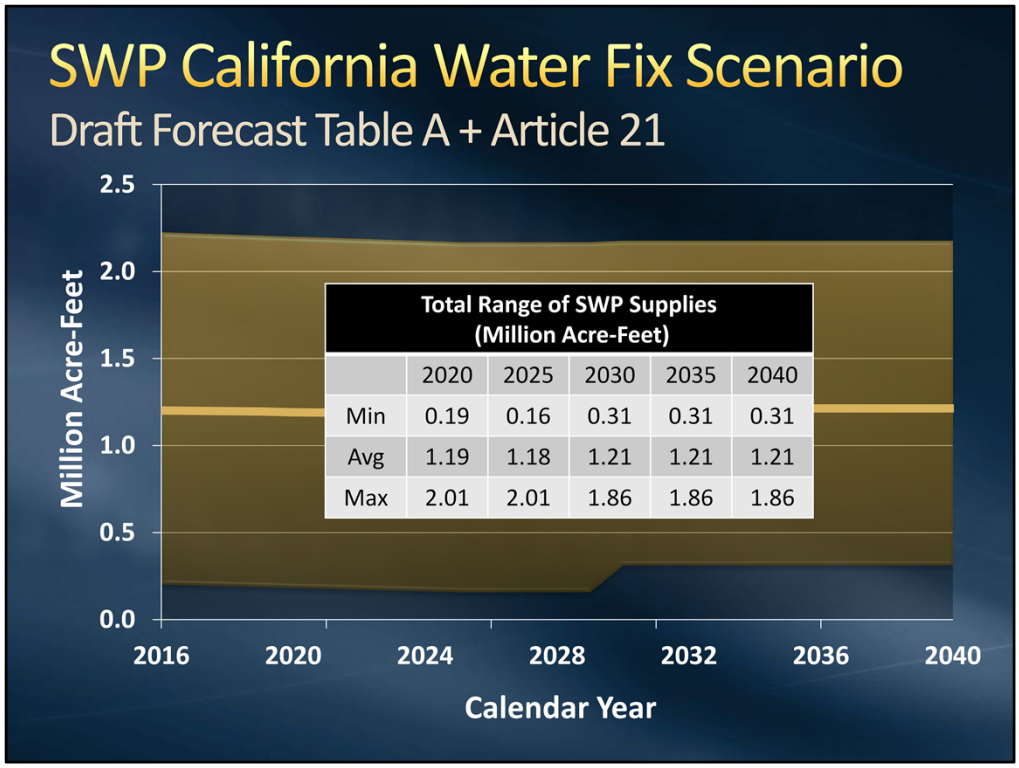
Article 21 starts to contribute significantly with the cal water fix.



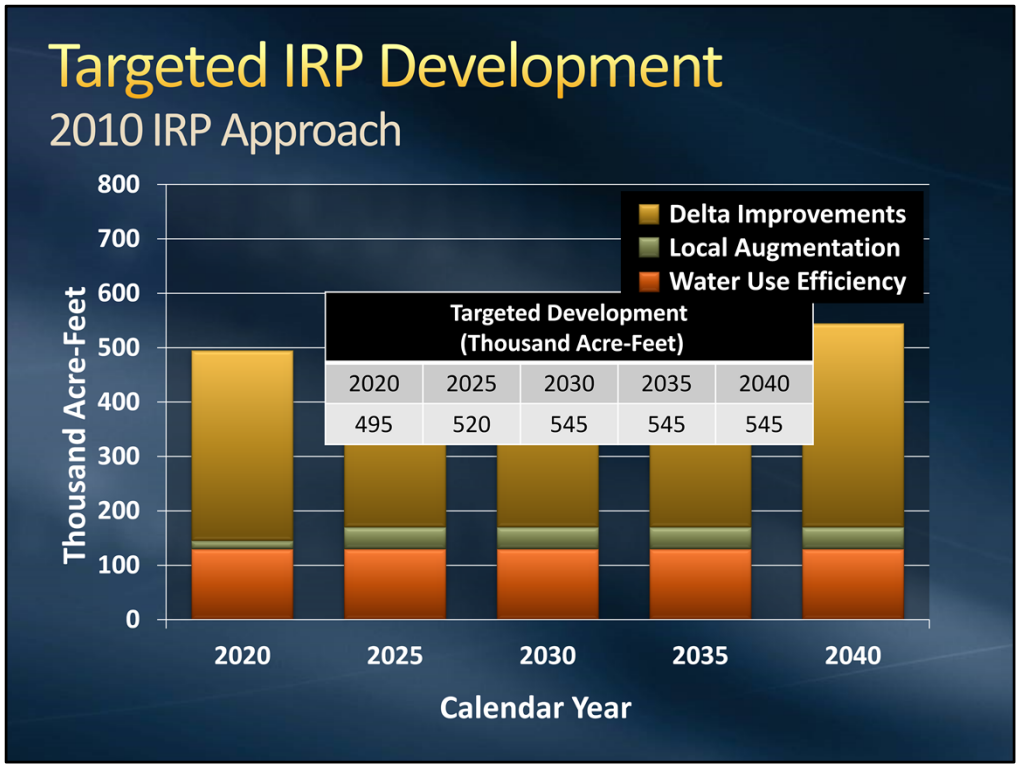
Let's see how this plays out over time.
Existing scenario for context

Added together table A and Article 21, same look over time:
Base case declining to early long-term, no high outflow scenario, cal water fix 2030 online date.

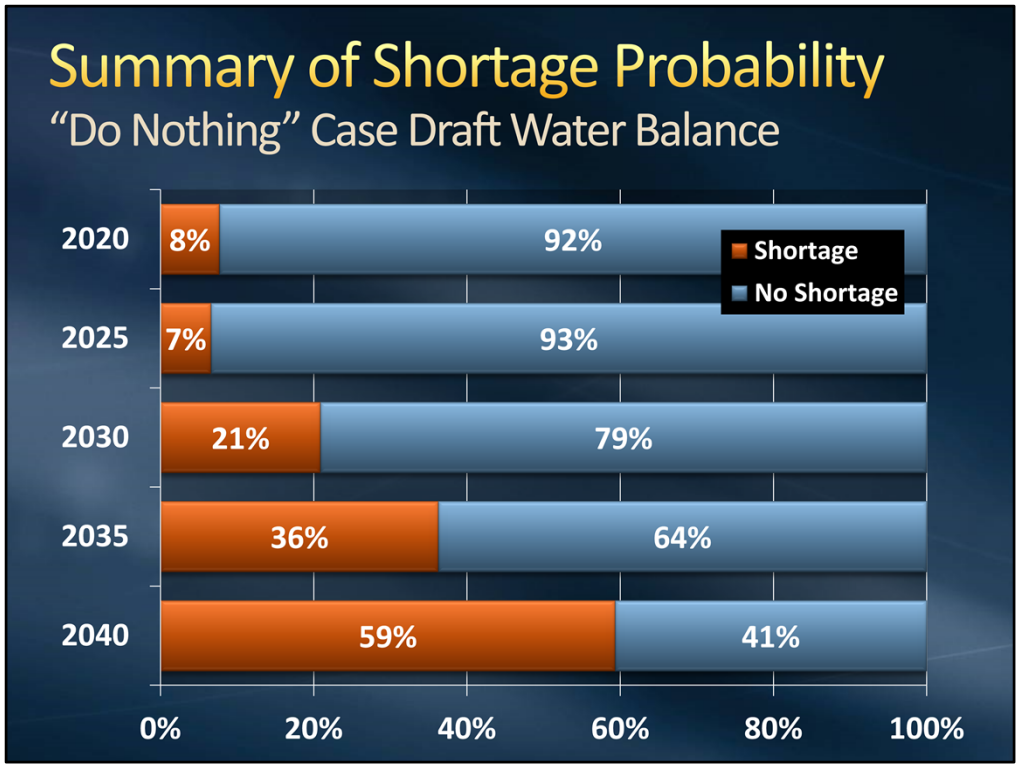
Assumptions for Shaded area!!!



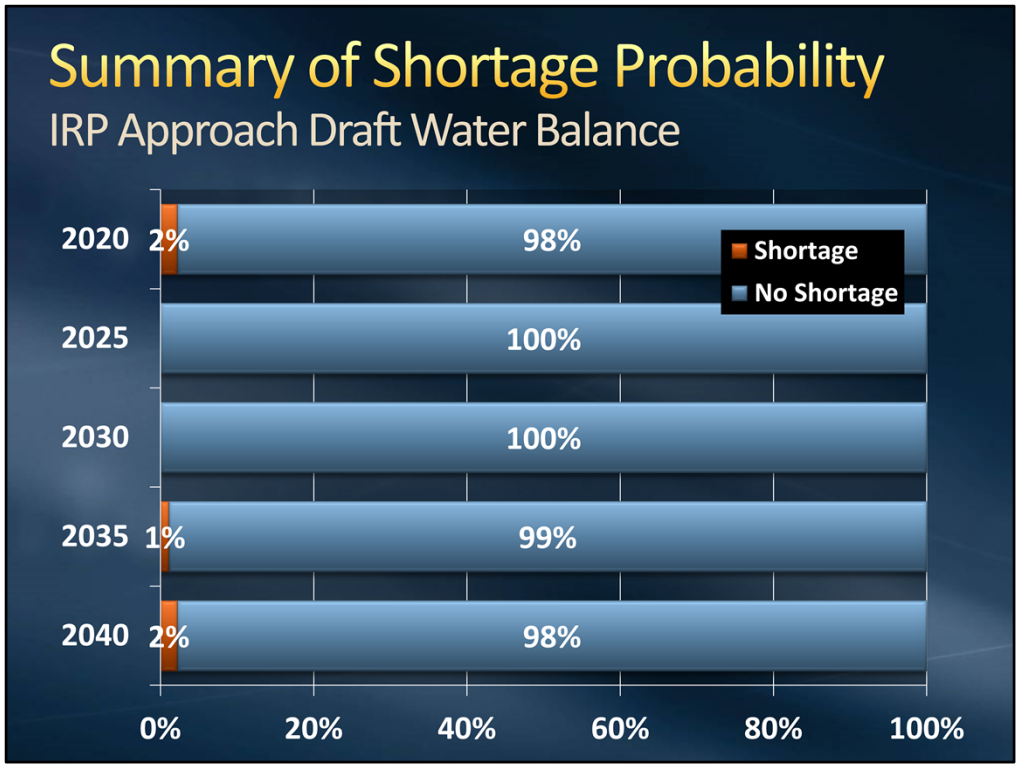
Full rage of climate impacts around that average forecast



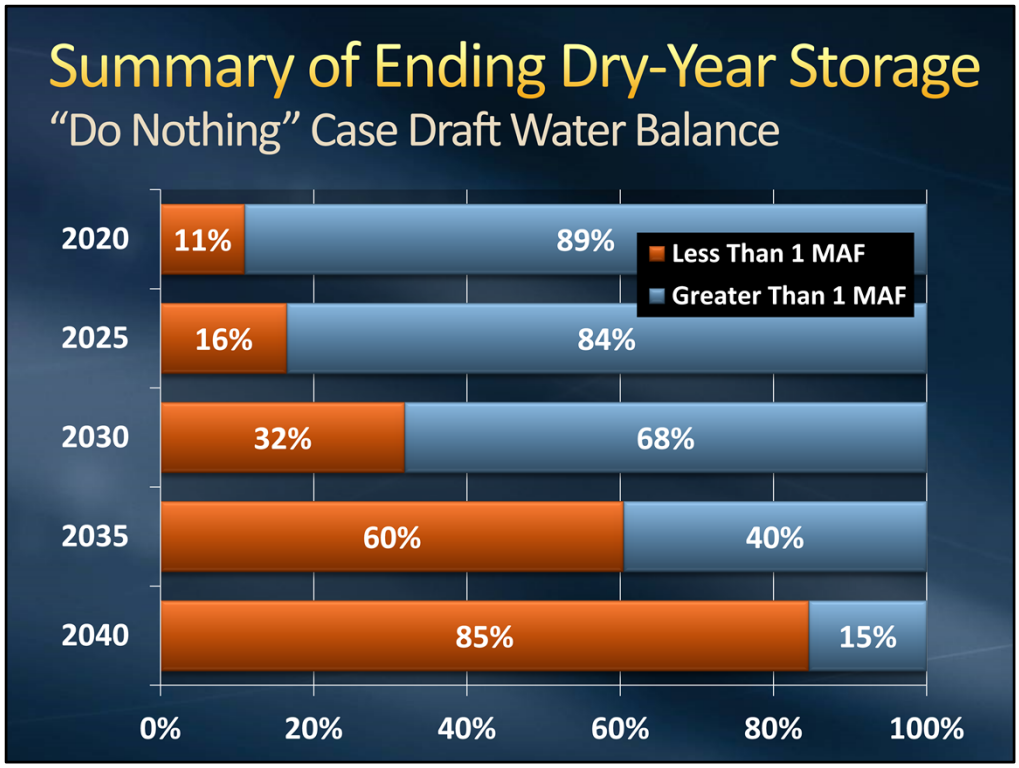
Stack up additional investments that would be made under the 2010 IRP approach.
20% reduction: Demographics, demands, conservation, recycling, 130 TAF of additional water use efficiency
100 Local Augmentation: a bit over half-way there, 40 TAF remaining, Carlsbad making up most of difference
Delta – California water fix (average year supplies)
Feel for additional development. Made great strides since the 2010 IRP, still have a ways to go, no small task to do.



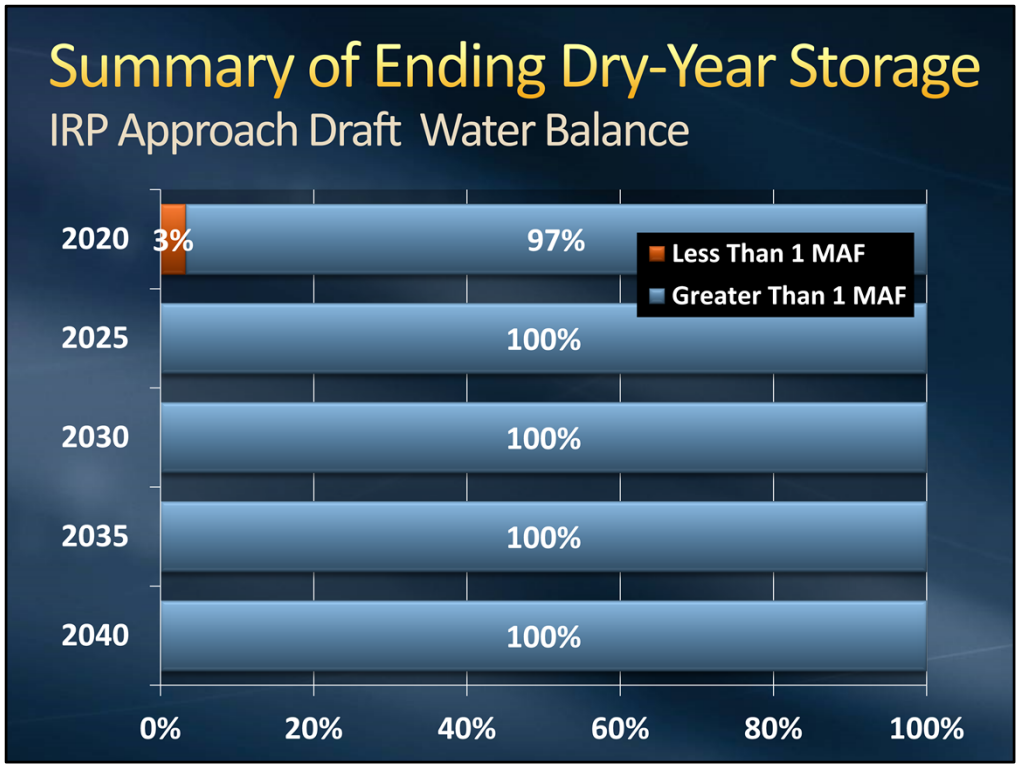
Summary from our "do nothing" case, replace with updated IRP approach analysis



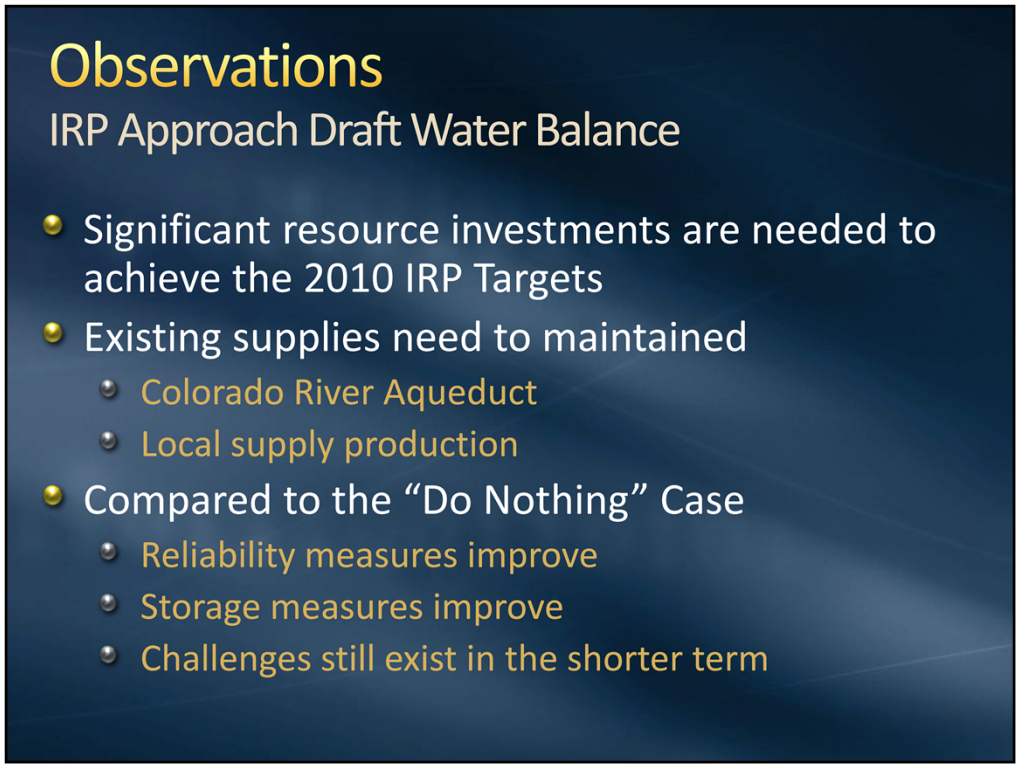
Shortages are nearly gone. Small percentage in the near term and longer-term, suggest pretty close to goals.



Let's take a look at storage impact. "do nothing" vs IRP approach.

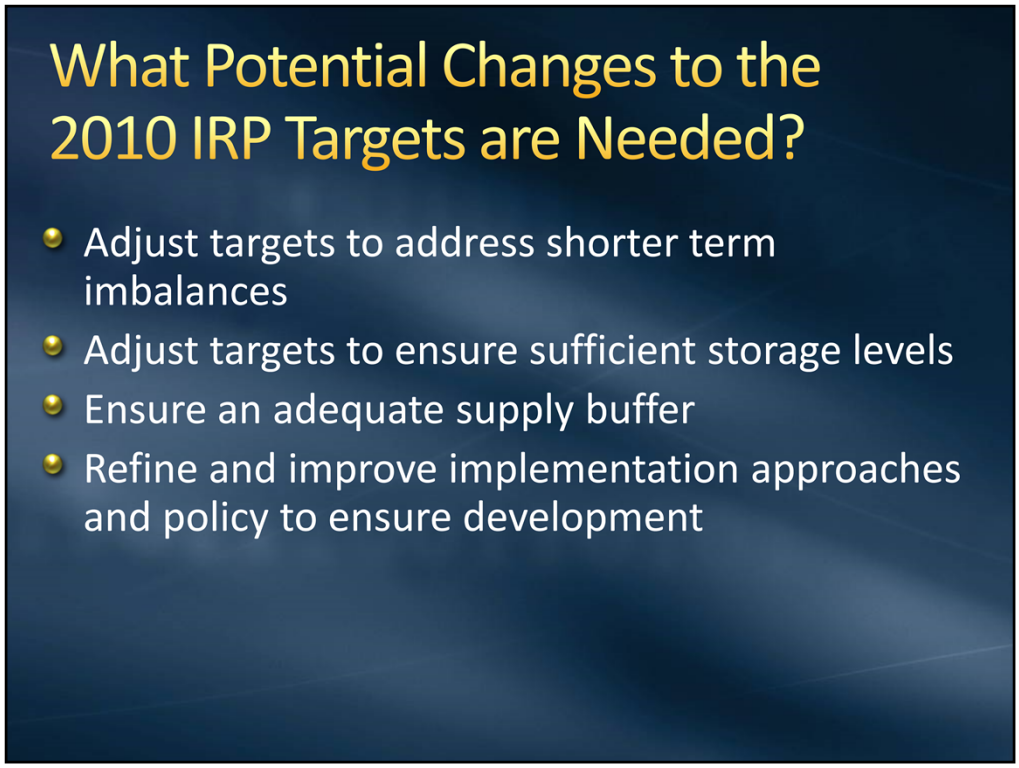


Huge reduction in storage below 1 MAF.



Still need to make these investments to achieve the reliability shown. 2010 targets represent continued significant investments.
Existing supply forecasts need to be maintained… uncertainty behind the Colorado river supplies, and local supplies particularly groundwater (will talk about next month)

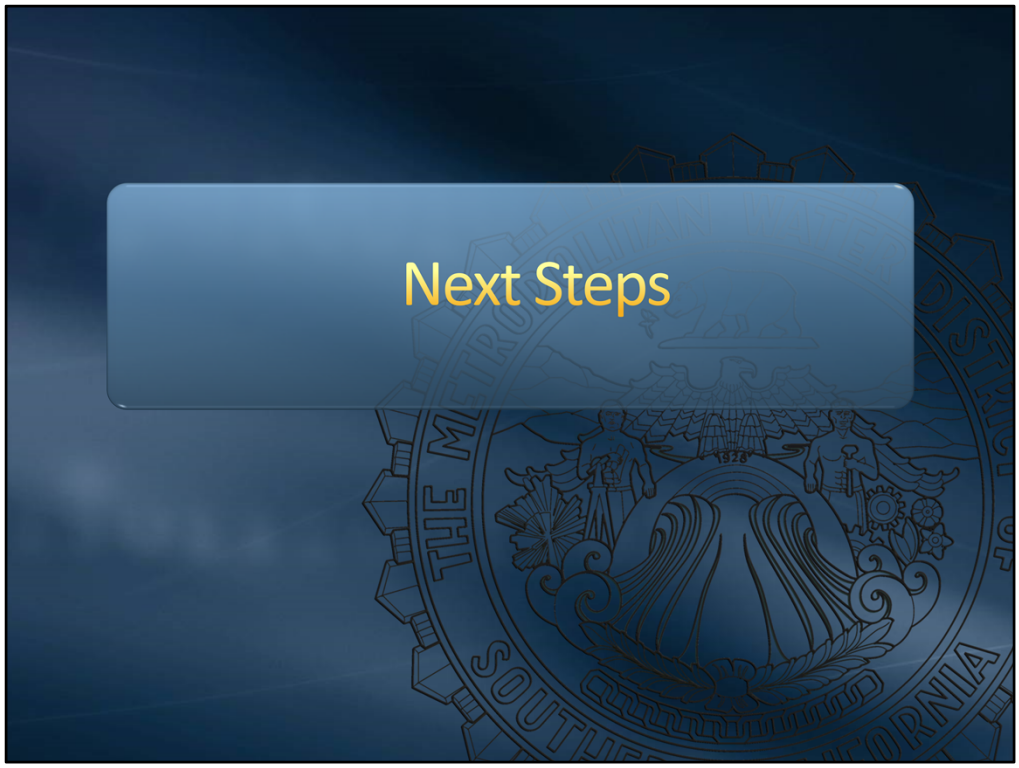
Short-term challenges based on current conditions, and development schedules of supplies.



Brings us to our final question. “What potential changes are needed to the 2010 IRP targets?”

Not going to answer this question today… look at this next month. Results provide some direction.
Need to look at strategies or adjustments in the approach to deal with shorter-term

Need Help Here!


Next Steps

Upcoming Technical Process Activities
September 2015

- Member Agency Workgroup September 9th
- IRP Committee Meeting September 22nd
  - Technical process draft results
    - Potential resource development targets
  - Update on IRP outreach

Upcoming Technical Process Activities
October 2015

- Member Agency Workgroup October 5th
- IRP Public Outreach Workshop
- IRP Committee Meeting October 27th
  - Update on IRP outreach
  - IRP Issue Paper Addendum
  - Inventory of policy issues
  - Approach for “IRP Phase 2” Board process


THE METROPOLITAN WATER DISTRICT OF
SOUTHERN CALIFORNIA