

## Water Supply Advisory Committee December Meeting Committee Member Packet

Wednesday, December 10

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	3b	Official Agenda
4. Materials for Agenda items 4, 6, 7, 12, and 13 Alts Evaluation and MCDS Report: (all agenda items for these materials will be numbered as related to Agenda item 4)	<b>4a</b>	<b>Summary Description of Alternatives</b>
	4b	Alternative Evaluation Summary Sheets
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## Water Supply Advisory Committee December Meeting Committee Member Packet

Friday, December 12

### Table of Contents

Items that are provided in the Friday packet distribution are listed in bold

Agenda Number and Item	Document Item Number	Document Name
2. Committee Member Updates	2a	Update on Activities of Soquel Creek Water District
3. Agenda Review	3a	Flow Agenda November WSAC Meeting
	<b>3b</b>	<b>Official Agenda</b>
4. Materials for Agenda items 4, 6, 7, 12, and 13 Alts Evaluation and MCDS Report: (all agenda items for these materials will be numbered as related to Agenda item 4)	4a	Summary Description of Alternatives
	4b	Alternative Technical Evaluation Summary Info
	4c	Summary of Ratings
	4d	Analysis of Ratings
	<b>4e</b>	<b>The Role of Uncertainty – Part 1</b>
	4f	Rating Details Spreadsheet (same as document 4c)
	4g	Criteria, Subcriteria and Rating Scales
	4h	Statistics on MCDS Usage (please see document 4d)
	<b>4i</b>	<b>Committee Comments on Ratings</b>
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	4l	The Role of Uncertainty – Part 2
16. Proposed Meeting Schedule for remainder of WSAC process	16a	Proposed WSAC Meeting Schedule
<b>17. Subcommittee Reports</b>	<b>17a</b>	<b>Proposed Planning Subcommittee Work Plan</b>
<b>20. Materials resulting from the previous meeting</b>	<b>20a</b>	<b>Action Agenda for November meeting</b>

**TO:** WATER SUPPLY ADVISORY COMMITTEE (WSAC)  
**FROM:** HEIDI LUCKENBACH  
**SUBJECT:** UPDATE ON SOQUEL CREEK WATER DISTRICT ACTIVITIES  
**DATE:** DECEMBER 17, 2014

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**Soquel Creek Water District Board Meetings**

On 12/16/14 the Board will be asked to approve a \$280,000 engineering services contract with Black and Veatch for technical advisory services for groundwater replenishment using recycled water.

**Collaborative Groundwater Work**

The second scoping meeting for the groundwater model was held in November 2014. This meeting focused on (1) addressing uses and incorporating priorities for the model; (2) defining the extents of the model; (3) discussing data sources for model calibration and model sources (4) defining the roles and responsibilities of the “Groundwater Model Partners.”

A meeting of the Mid-County Groundwater Stakeholder Advisory Group will be held on Thursday December 18, 2014. The agenda includes: An overview of the new Sustainable Groundwater Management Act of 2014; A presentation on “Community Engagement and Collaborative Decision Making” by David Ceppos from the Center for Collaborative Policy, Sacramento State; and a citizen-led exercise “Getting to the Right Questions” by Jon Kennedy.

**Other**

Staff from Soquel Creek Water District, Central Water District, and Scotts Valley Water District toured two recycled water projects: the Orange County Water District’s Groundwater Replenishment System and West Basin’s Water Recycling Facility and was able to ask some very in-depth questions related to community acceptability and strategic planning. District staff has arranged a tour of Santa Clara Valley Water District’s Silicon Valley Groundwater Advanced Water Purification Center for their board of directors on February 18, 2015. WSAC members are welcome to join the tour.

The District will be rolling out Water Smart, individualized home water reports to all residential customers in January.

They will also be rolling out Waterfluence for all our landscape accounts in early 2015.

**Water Supply Advisory Committee Meeting**

**First session: Wednesday December 17**

**5:00 p.m. – 9:30 p.m.**

**Fellowship Hall, Peace United Church of Christ  
(formerly the First Congregational Church)**

**900 High Street, Santa Cruz**

**Second session: Friday December 19**

**2:00 p.m. – 6:00 p.m.**

**Fellowship Hall, Peace United Church of Christ  
(formerly the First Congregational Church)**

**900 High Street, Santa Cruz**

**Flow Agenda<sup>1</sup>**

**First Session:**

**Roll Call**

**1. Welcome to the public and public comment (5:00-5:10)**

We encourage members of the public to attend this Committee's meetings and invite public comment about items on the agenda at the beginning of each session. We will invite additional comment during the session before making major decisions. We invite public comments about items relevant to this Committee's work but not on the meeting's agenda during the Oral Communication section at the end of Friday's session.

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<sup>1</sup> This is the Flow Agenda prepared for use by the co-facilitators. It includes information that is excluded from the official agenda about the timing of the meeting and the content of agenda items. We expect that, as much as we hope to stick to this flow agenda, we will have to make adjustments during the meeting to the schedule and the contents described here. The Committee is required to do pretty much exactly what the official agenda says, so we get the "wiggle room" we need in the official agenda by making the official version less specific about schedule and content. You will easily recognize the official agenda by the lighthouse logo on its first page.



**2. Committee member updates (5:10-5:20)**

Members provide news of significant communication between them and organizations with significant interest in the development of water policy in Santa Cruz.

**3. Agenda Review (5:20-5:30)**

The Committee reviews the agenda for both sessions of this meeting.

Desired outcomes:

- Understanding of the relevance of this meeting's tasks to the Committee's work as a whole
- Agreement on the agenda for this meeting

**NOTE: The following note applies to Agenda items 4, 6, 7, 12, and 13:**

The Agenda items listed above are all related to the evaluation of the alternatives selected for consideration using the multi-criteria decision support (MCDS) model. While specific time frames and different agenda items and time frames are provided for each agenda item, it is highly likely that the Committee will cover the material and actions related to these Agenda items in a more fluid manner than laid out.

The Desired Outcomes of this set of Agenda Items are as follows:

- Committee understanding of the additional information developed by the technical team on each of the 12 proposals being considered in the MCDS modeling work;
- Committee understanding and confidence about the decision space framed by the 12 proposals being considered;
- Increasing self-awareness and mutual awareness about the effect of different weights on the perceived strengths and weaknesses of various proposals
- Increasing appreciation for the importance of a shared baseline and the benefit of considering a range of future scenarios;
- Increasing appreciation and understanding of the role of uncertainty in decision making and, in particular, how understanding of uncertainty can be used to prioritize additional research and analysis;
- Increasing Committee understanding of the role of values in decision making; and
- Increasing the Committee's ability to work with alternatives to create portfolios of use in the next stage of the Committee's work.

**4. Alternative Evaluations and MCDS Report (5:30-8:00)**

Bill Faisst of Brown and Caldwell will provide a short presentation on the work the technical team has done in further defining and developing information about the alternatives being evaluated using the MCDS model.

- Alts evaluation overview presentation – (5:30-5:40)

Carie Fox and Philip Murphy from InfoHarvest will lead the Committee in a discussion that will include the following:

- Committee debrief on rating process – (5:40-5:50)
- Overview of MCDS interim Report – (5:50-6:15)
- Discussion of the Committee's weights: distribution of weights, decision's sensitivity to weights – (6:15-6:45)
- Discussions of Ratings: Initial ratings, changes to ratings, comments on alternatives and/or ratings; sensitivity to ratings – (6:45-7:15)
- Discussion of Uncertainty: Overall uncertainty; uncertainty of the alternatives – (7:15-7:40)
- Discussion of shifts in weights and ratings depending on three simplified future scenarios – (7:40-8:00)

Desired outcome:

- Understanding of the results of the Committee's ratings of alternatives, weights for the various criteria in the three simplified scenarios and the uncertainty associated with alternatives and ratings.

**5. Break (8:00-8:10)**

**6. Discussion of what the ratings and sensitivity analyses tell us about what the Research Agenda needs to focus on (8:10-9:00)**

Carie Fox and Philip Murphy guide the Committee through the discussion of the sensitivity analyses and the WSAC Technical Team, Independent Review Panel and the Committee discuss and begin developing topics and issues for the Research Agenda.

Desired Outcome:

- Understanding and initial agreement on areas to focus the Research Agenda on (note: the Friday agenda will include additional discussion and opportunities to develop and focus the Research Agenda)

**7. Identification of What If scenarios to run for presentation and discussion during session 2 on Friday (9:00-9:25)**

Committee members provide ideas to the MCDS team (Carie and Philip) about additional evaluations, analyses or what if scenarios they'd like to be able to consider and discuss at the Friday session.

Desired Outcome:

- Identification of additional MCDS model runs that will provide additional perspective, information, or provide additional analyses that will help the Committee identify Research Agenda items

### **8. Wrap up, plans for second session and evaluation of this session (9:25-9:30)**

Desired Outcomes:

- Continuity between sessions
- Understanding of the quality of the session's process

## **Second Session**

### **9. Public comment (2:00-2:10)**

We encourage members of the public to attend this Committee's meetings and invite public comment about items on the agenda at the beginning of each session. We will invite additional comment during the session before making major decisions. We invite public comments about items relevant to this Committee's work but that are not on the meeting's agenda during the Oral Communication section at the end of this session.

### **10. Correspondence received from the community (2:10-2:15)**

Mike Rotkin reports on correspondence received from the community.

Desired outcomes:

- Understanding of the correspondence received
- Agreement on any direction to be given to the Corresponding Secretary

### **11. Reflections on the previous session (2:15-2:20)**

The Committee considers the salient points from the previous session and reviews the agenda for today's session.

Desired outcomes:

- Acknowledgement of the major achievements of the previous session
- Agreement on any changes to today's agenda

### **12. Additional modeling runs and results (2:20-3:00)**

The MCDS team will present and the Committee will discuss the results of additional analyses or what if scenarios run between session one and session two.

Desired Outcome:

- Understanding of additional analyses and results from MCDS model runs.

**13. Additional discussion and agreement on the Research Agenda (3:00-4:00)**

Carie Fox and Philip Murphy guide the Committee through the discussion of the sensitivity analyses and the WSAC Technical Team, Independent Review Panel and the Committee discuss and begin developing topics and issues for the Research Agenda and Technical Work Plan.

Desired Outcomes:

- Agreement on issues and areas to focus the Research Agenda on
- Understanding of the proposed Technical Work Plan and the expected work to be done during the next phase of the Committee's work.
- Agreement on direction to the Technical Consultants regarding the Technical Work Plan

**14. Break (4:00-4:10)**

**15. Planning Subcommittee process planning work session (4:10-5:00)**

The Subcommittee reports on and engages the Committee in follow up on its strategic planning work session on December 16<sup>th</sup> that focused on creating a draft proposed process for the next phase of the Committee's work that is created to be supportive of the technical analyses work that will be the focus during the real deal.

Desired outcomes:

- Committee agreement on the basic structure of the technical work and the Committee work process that will carry it through the technical analysis phase of the work

**16. Discussion and agreement on proposed meeting schedule for the remaining phases of the Committee's work. (5:00-5:10)**

Desired Outcome:

- Committee agreement on its meeting schedule for the remainder of its work

**17. Subcommittee reports (5:10-5:40)**

- Recon Outreach Subcommittee  
Report on:
  - Editorial Board Meeting
  - Additional plans for outreach and community engagement
- Planning Subcommittee  
Report on:
  - Proposed Planning Subcommittee Work Plan

Desired Outcomes:

- Sharing information on the work being done by subcommittees with the full Committee
- Agreement on the formation, composition, charge, duration, scope and communication parameters of any Subcommittee to replace the Recon Outreach Subcommittee
- Committee direction to subcommittees

**18. Materials resulting from the previous meeting (5:40-5:45)**

Desired Outcome

- Agreement on final version of Action Agenda from previous meeting

**19. Oral communication (5:45-5:55)**

We invite public comments about items relevant to the Committee's work but not on the meeting's agenda

**20. Evaluation and wrap up (5:55-6:00)**

Review the session and consider items to be carried forward to the next meeting.

**21. Adjourn (6:00)**

Peace United Church of Christ  
Fellowship Hall  
900 High St.  
Santa Cruz, California 95060



## WATER SUPPLY ADVISORY COMMITTEE (WSAC) AGENDA

### Regular Meeting

December 17 - December 19, 2014

5:00 P.M. REGULAR MEETING - SESSION ONE (DECEMBER 17): FELLOWSHIP HALL

2:00 P.M. REGULAR MEETING - SESSION TWO (DECEMBER 19): FELLOWSHIP HALL

**Statements of Disqualification:** Section 607 of the City Charter states that "...All members present at any meeting must vote unless disqualified, in which case the disqualification shall be publicly declared and a record thereof made."

The City of Santa Cruz has adopted a Conflict of Interest Code, and Section 8 of that Code states that no person shall make or participate in a governmental decision which he or she knows or has reason to know will have a reasonably foreseeable material financial effect distinguishable from its effect on the public generally.

**General Business:** Any document related to an agenda item for the General Business of this meeting distributed to the WSAC less than 72 hours before this meeting is available for inspection at the Water Administration Office, 212 Locust Street, Suite A, Santa Cruz, California. These documents will also be available for review at the WSAC meeting with the display copy at the rear of the Council Chambers.

**Appeals:** Any person who believes that a final action of this advisory body has been taken in error may appeal that decision to the City Council. Appeals must be in writing, setting forth the nature of the action, the basis upon which the action is considered to be in error, and addressed to the City Council in care of the City Clerk Administrator.

**Other - Appeals** must be received by the City Clerk Administrator within ten (10) calendar days following the date of the action from which such appeal is being taken. An appeal must be accompanied by a fifty dollar (\$50) filing fee.

**City Councilmember Attendance:** Four or more members of the City Council may be in attendance at this meeting.

The City of Santa Cruz does not discriminate against persons with disabilities. Out of consideration for people with chemical sensitivities we ask that you attend fragrance free. Upon request, the agenda can be provided in a format to accommodate special needs. Additionally, if you wish to attend this public meeting and will require assistance such as an interpreter for American Sign Language, Spanish, or other special equipment, please call the City Clerk's Department at 420-5030 at least five days in advance so that we can arrange for such special assistance, or email [CityClerk@cityofsantacruz.com](mailto:CityClerk@cityofsantacruz.com). The Cal-Relay system number: 1-800-735-2922.

## **Water Supply Advisory Committee Agenda**

**December 17, 2014 - 5:00 PM - 9:30 PM**

### **SESSION ONE**

**Call to Order - Meeting Convenes**

**Roll Call**

#### **1. Welcome to Public and Public Comment**

An opportunity for public comment on agenda items is provided at the beginning of each session of the meeting. An opportunity for oral communication by members of the public about issues relevant to the work of the Committee is provided at the end of the final session of the meeting. Additionally the Committee will provide an opportunity for public comment before major decisions are made.

#### **2. Committee Member Updates**

Committee Members will update the Committee on significant communications with other Santa Cruz entities that share interest in the development of water policy in Santa Cruz.

#### **3. Agenda Review**

Co-Facilitator Carie Fox will lead Committee Members in a review of the agenda for the WSAC's ninth meeting.

**NOTE:** The following note applies to Agenda items 4, 6, 7, 12, and 13:

The Agenda items listed above are all related to the evaluation of the alternatives selected for consideration using the multi-criteria decision support (MCDS) model. While specific time frames and different agenda items and time frames are provided for each agenda item, it is highly likely that the Committee will cover the material and actions related to these Agenda items in a more fluid manner than laid out.

#### **4. Alternative Evaluations and MCDS Report**

Bill Faisst of Brown and Caldwell will provide a short presentation on the work the technical team has done in further defining and developing information about the alternatives being evaluated using the MCDS model.

**5. Break**

**6. Discussion of what the ratings and sensitivity analyses tell us about what the Research Agenda needs to focus on**

Carie Fox and Philip Murphy will guide the Committee through discussion of the sensitivity analyses, and the Committee, WSAC Technical Team and Independent Review Panel will discuss and begin developing topics and issues for the Research Agenda.

**7. Identification of “What If” scenarios to run for presentation and discussion during session 2 on Friday**

Committee members will provide ideas to the MCDS team (Carie Fox and Philip Murphy) about additional evaluations, analyses or “What If” scenarios they’d like to be able to consider and discuss at the Friday session.

**8. Written Review and Wrap Up - Identification of any incomplete issues to be carried forward to tomorrow’s session.**

**Adjournment** - The Water Supply Advisory Committee will adjourn from its first session on December 17 of the regular meeting of December 17 - December 19, 2014 to its second and final session on December 19 for an open session after the hour of 2:00 p.m. in the Fellowship Hall, at the Peace United Church of Christ.



## **Water Supply Advisory Committee Agenda**

**December 19, 2014 - 2:00 PM - 6:00 PM**

### **SESSION TWO**

**Call to Order - Meeting Reconvenes**

**Roll Call**

**9. Public Comment**

**10. Correspondence Received from the Community**

Committee Corresponding Secretary Mike Rotkin will lead Committee Members in discussion of correspondence received from members of the public since the previous Committee meeting. The intent of this discussion is to assist with understanding the content of correspondence from the public, and to agree on any direction to be given to the Corresponding Secretary.

**11. Review of Previous Session**

Co-Facilitator Nicholas Dewar will lead the Committee Members in a review of the previous session and an overview of the current session. The intent of this review and overview is to assist in the understanding of salient points from the previous session and reach agreement on any changes that need to be made to the current session's agenda.

**12. Additional modeling runs and results**

The MCDS team will present, and the Committee will discuss, results of additional analyses or "what if" scenarios run between session one and session two.

**13. Additional discussion and agreement on the Research Agenda**

Carie Fox and Philip Murphy will guide the Committee through discussion of the sensitivity analyses, and the Committee, WSAC Technical Team, and Independent Review Panel will discuss and begin developing topics and issues for the Research Agenda and Technical Work Plan.

**14. Break**

**15. Planning Subcommittee process planning work session**

The Subcommittee will report on and engage the Committee in follow up to the Subcommittee's strategic planning work session on December 16<sup>th</sup>, the goal of which was to draft a proposed process for the next phase of the Committee's work, which will focus on the technical analyses work.

**16. Discussion and agreement on proposed meeting schedule for the remaining phases of the Committee's work.**

Committee will discuss and agree on its meeting schedule for the remainder of its work.

**17. Recon Outreach Subcommittee Update**

Recon Outreach Subcommittee members will report on the Editorial Board Meeting and additional plans for outreach and community engagement.

**18. Phase 2/Real Deal Planning Subcommittee Update**

Phase 2/Real Deal Planning Subcommittee members will report on their proposed Planning Subcommittee Work Plan.

**19. Materials resulting from the previous meeting**

Committee Members will review the Action Agenda prepared for the previous meeting.

**20. Oral communication****21. Written Review and Wrap Up - Identification of any incomplete issues to be carried forward to next meeting and meeting evaluations.**

**Adjournment - The Water Supply Advisory Committee will adjourn from the second session on December 19 of the regular meeting of November 19 - 21, 2014 to its next meeting on February 4, 2015 at 5:00 PM and February 6, 2015 at 2:00 PM location yet to be determined.**

## Draft

## Santa Cruz Water Supply Advisory Committee

## Preliminary Descriptions for Alternatives 5 through 13, Selected for Recon Evaluation and MCDS Exercise

This summary presents descriptions for nine Recon Level alternatives based on Brown and Caldwell's (BC) interpretation and evaluation of proposals submitted to the Water Supply Advisory Committee (WSAC) for the City of Santa Cruz (City). Where a proposal included two or more potential variations or where an alternative apparently had a potentially fatal flaw, BC chose a single alternative for detailed develop.

**5. Bevirt North Coast:** This alternative for initial comparison uses only the Liddell quarry which would hold about 650 million gallons (MG) since its construction would not require building a dam. The San Vicente site was dropped since the San Mateo Peninsula Open Space Trust and the Sempervirens Fund have acquired the site and initiated creation of a conservation easement over the site to prevent future development. If the City withdrew stored water over a 3-year drought cycle, production would be about 200 MG annually after allowing for evaporation and leakage losses.

This alternative has several outstanding issues, e.g., water rights (new diversion location from which to fill the reservoir, routing of fill pipeline), geotechnical and construction issues associated with installing a liner on steep slopes over a porous karst formation, preparation and approval of environmental documents, California Department of Fish and Wildlife (CDFW) and National Marine Fisheries Service (NMFS) approvals for water diversions from streams with salmonoid populations, and agreements with the landowner about ownership and operations .

**6. SCWD McKinney Expanded Treatment Capacity:** This alternative for initial comparison would add a new 14-mgd water treatment plant (WTP) (pretreatment for turbidity control and membrane filtration) near the Tait Street Diversion to produce treated water that would be piped directly into the distribution system. The write up for this alternative indicates that the alternative would allow an annual water diversion increase of about 560 MG.

The alternative has several outstanding issues, e.g., determine the final treatment train (MF would need pretreatment ahead of MF for elevated SLR turbidity concentration), preparation and approval of environmental documents, determination if water rights and diversion permits would need modifications, and development of a plan to store and use diverted water beneficially. If the City would have excess water during normal or wet years, it might transfer extra water to Soquel Creek Water District (SqCWD) and/or Scotts Valley Water District (SVWD) but doing so would require agreements with the agencies and likely would trigger water rights permit modifications since the place of use would change.

**7. SCWD McKinney WSAC Ranney Collector:** This alternative for initial comparison would use Ranney collectors with a 12.9-mgd capacity (maximum capacity allowed under the current City of Santa Cruz [City] diversion permit), installed near the City's Felton diversion to draw water allocated under the City's existing water rights. Water drawn through the collectors would have greatly reduced turbidity. Much higher water quality would allow continuous refilling of Loch Lomond while also operating the GHWTP. More studies would be required to project increased diversion opportunity, however the increased diversion likely would be somewhat less than about 560 MG annually as projected for Alternative 6.

The alternative has several outstanding issues, e.g., the City would need to conduct additional analyses for available flow, addressing any bypass requirements under the habitat conservation plan. The City would also need to determine its plan to store and use diverted water beneficially. If the City would have excess water during normal or wet years, the City might transfer extra water to Soquel Creek Water District (SqCWD) and/or Scotts Valley Water District (SVWD) but doing so would require agreements with the agencies and likely would trigger water rights permit modifications since the place of use would change.

**8. Paul Lochquifer:** This alternative would use treated water sold by the City to Soquel Creek County Water District (SqCWD) during normal and wet years. SqCWD would use the transferred water either for groundwater recharge through seven 250-gallon-per-minute (gpm) recharge wells, for conjunctive use (well field resting) recharge, or both. The City would take more water from its San Lorenzo River and/or Newell Creek diversions, about 2.5 million gallons per day (mgd) or about 915 MG annually, to match the desalination alternative. If recharge occurred continuously for five years, total transferred water would be about 4,600 MG. Facilities would include Ranney collectors at the Felton Diversion, to insure that the Graham Hill Water Treatment Plant (GHWTP) could treat the diverted water continuously. During drought years the City would receive returned water (groundwater) from SqCWD. The City also would pump its Tait Street wells year round since the recharged Purisima aquifer would yield available water without causing seawater intrusion. Potential yield would be 2 mgd from the Live Oak wells and 2.5 mgd from SqCWD; 4.5 mgd total. If the City used these sources for six months, total production, after deducting out a 1-mgd production allowance for the existing wells, would be about 640 MG annually.

This alternative has several outstanding issues, e.g., water rights (modification of place of use), assembling appropriate information to site injection wells, modeling the Purisima aquifer to project better potential performance, and agreement with SqCWD on how the alternative's water would be conveyed, shared and paid for.

**9. Ripley Reuse for Agriculture:** This alternative for initial comparison would produce filtered disinfected effluent (CA Title 22 unrestricted water) from the City Wastewater Treatment Plant (WWTP) at a rate of about 4.3 mgd. The City would pump the effluent north through a new pipeline aligned along the railroad right of way, with turnouts to irrigate up to about 1,300 acres on private land and leased land on properties owned by the California State Parks (CSP) and the United States Bureau of Land Management (BLM). This process is assumed to take place over 180 days per year and total water available for crop irrigation would be about 780 MG. The City would build 12 new 250-gpm extraction wells that discharge into new pipeline that in turn would connect to the existing City North Coast pipeline. The water would combine with diverted surface water from the City North Coast rights, for treatment at the GHWTP. To develop space for new facilities within the WWTP site, the City would need to relocate its Line Maintenance Facility from the WWTP site to a new site on the West Side.

The alternative has several outstanding issues, e.g., legal agreements with CSP, BLM, and property owners and with irrigators, securing the right of way for the new delivery and return pipelines such as along the railroad ROW, geotechnical investigations for well construction, assessment of the groundwater basin to ensure that operation would not adversely affect the groundwater basin, permitting through the California Coastal Commission, preparation and approval of CEQA/NEPA documents (NEPA is included because the project includes BLM land), and location and purchase of new Line Maintenance Facility site.

**10. SCWA Regional Aquifer Restoration:** This alternative would have the same components as Alternative 8 (“Paul Lochquifer”) but the recharge and return rates would be lower. This alternative would transfer about 800 MG from the City to SqCWD over an extended period but SqCWD would return only about 145 MG to the City during dry years. The City’s drought production from its Live Oak wells would increase from 1 mgd to 2 mgd, or about 365 MG. The long-term average approximate production increase appears to be  $[(145+365)/6.5] = 78$  MG.

The alternative has several outstanding issues, e.g., water rights (modification of place of use), assembling appropriate information to site injection wells, modeling the Purisima aquifer to project better potential performance, and agreement with SqCWD on how the alternative’s water would be conveyed, shared and paid for.

**11. SCWD Water Reuse:** This alternative for initial comparison would produce complete advance treatment (CAT) water from the City Wastewater Treatment Plant (WWTP) at a rate of about 3.7 mgd. The City would pump the CAT water from the WWTP through a new pipeline to the Bay street Reservoirs site where the new pipeline would connect to the existing North Coast pipeline. The combined water would flow to the inlet end of the GHWTP, to be treated and distributed to the City. This alternative would produce up to about 1350 MG annually. The City would have the option of selling surplus treated water to either SqCWD or Scotts Valley Water District as part of either a conjunctive use (aquifer resting) or ASR project.

To develop space for new facilities within the WWTP site, the City would need to relocate its Line Maintenance Facility from the WWTP site to a new site on the West Side.

This alternative has several outstanding issues, e.g., permitting such reuse through CA Division of Drinking Water, gaining public acceptance for adding CAT water as part of its potable water supply, and possibly reaching agreements with adjacent agencies.

**12. SWC Desalination:** This alternative for initial comparison would use seawater desalting through a new reverse osmosis desalination facility to produce about 2.5 mgd for addition to the City potable water supply. Annual production would be about 915 MG. This alternative’s components and development would match those for the previously proposed scwd2 desalination facility. For comparison with other alternatives, BC has assumed that the City would own and operate the facility and would use the water produced year round. Excess water would allow the City to either idle the Live Oak wells for conjunctive use aquifer recover to perhaps undertake Live Oak well operation in an ASR mode to restore the aquifer more rapidly.

This alternative has several outstanding issues, e.g., environmental document completion, permitting through the California Coastal Commission, and public vote approving alternative implementation.

**13. Trevi Forward Osmosis Desalination:** This alternative for initial comparison would use seawater desalting through a Trevi forward osmosis (FO) system. This alternative’s other components would match those for seawater desalting.

The alternative has several outstanding issues, e.g., Trevi technology is still in its infancy and being tested at a pilot scale. As described, it would require a lower grade heat source for separately drawing the solution from the potable water but the alternative description did not designate a source for lower grade heat.

Since the Trevi FO is still at the developmental stage, BC has not developed this alternative further. If future testing and implementation by other entities prove its value, it could replace RO if the City was to select and implement Alternative 12.

Criteria	Rating Set	WaterSmart	Landscaping, Capture, Reuse	Water Neutral Development	North Coast Water	The Loquifer Alternative	Expanded Treatment Capacity	Ranney Collectors on Site	Reuse for Agriculture	Aquifer Restoration	Water Reuse (Potable)	Desal RO	Desal FO
Implementability	Technical Feasibility Legal Feasibility	Demonstrated in field Can probably acquire	Demonstrated in field Can probably acquire	Demonstrated in field Can probably acquire	Promising in 3-5 years Can probably acquire V slow no regulatory chng	Widely used Can probably acquire	Widely used Can probably acquire	Widely used Can probably acquire	Widely used Can probably acquire	Widely used Can probably acquire	Widely used Can probably acquire	Widely used Can probably acquire	Promising in 6-10 years Can probably acquire
Cost-Effectiveness	Regulatory Feasibility	Easy and quick	Easy and quick	Easy and quick	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	V slow no regulatory chng	V slow no regulatory chng
	Political Feasibility	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years	Acceptable in 5 years
	Cost to City: Upfront Costs	19	4.30E+04	0	7.80E+04	6.30E+04	1.95E+05	4.50E+04	1.15E+05	8.10E+04	7.80E+04	7.80E+04	7.80E+04
	Cost to City: Operation and Maintenance Cost to Customer: Rates	1.00E+05 1	1.00E+05 2	1.00E+05 0	1.50E+06 2	1.20E+06 5	1.50E+06 1	8.50E+05 4	7.00E+05 3	1.50E+06 5	1.70E+06 6	2.00E+06 6	1.50E+06 6
Community Well-being	Cost to Customer: Individual Purchase Regional Water Stability	None 4 jurisdictions	Significant SC Water only	Small SC Water only	None 2 jurisdictions	None 4 jurisdictions	None 4 jurisdictions	None 4 jurisdictions	None 2 jurisdictions	None 4 jurisdictions	None SC Water only	None 2 jurisdictions	None 2 jurisdictions
Zero Gap	Local Economy	No effect	Slight positive	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs
650 Gap	Local Economy	No effect	Slight positive	Negative for local jobs	Positive local job	Negative for local jobs	Negative for local jobs	Slight negative	Slight negative	Negative for local jobs	Negative for local jobs	Negative for local jobs	Negative for local jobs
Billion Gallon Gap	Local Economy	No effect	Slight positive	Negative for local jobs	Positive local job	Negative for local jobs	Negative for local jobs	Slight negative	Slight negative	Negative for local jobs	Positive local jobs	Positive local jobs	Postive local jobs
Environmental Well-being	Energy	5	5	5	3	3	3	4	2	3	2	1	2
	Marine Ecosystem Health	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm	does not harm
	Freshwater and Riparian Health	About as it is now	About as it is now	About as it is now	About as it is now	Plentiful healthier water	About as it is now	Plentiful healthier water	Plentiful healthier water	Plentiful healthier water	Plentiful healthier water	Plentiful healthier water	Plentiful healthier water
	Groundwater Resources	Does not affect	Does not affect	Does not affect	Depletes Resource	Actively restores	Does not affect	Does not affect	Allows restoration	Actively restores	Allows restoration	Allows restoration	Allows restoration
Adaptability	Infrastructure Resilience	Doesn't improve resilienc	Doesn't improve resilienc	Doesn't improve resilienc	Most challenges well	Doesn't improve resilienc	Most challenges well	Many moderately well	Some somewhat	Many moderately well	Many moderately well	Most challenges well	Most challenges well
Zero Gap	Reliable Supply	No change	No change	No change	Makes system sig more rel	Makes system less reliablSlightly more	Slightly more reliable	Slightly more reliable	Slightly more reliable	Somewhat more reliable	Makes system sig more rel	Makes system sig more rel	Makes system sig more rel
650 Gap	Reliable Supply	Makes system less reliabl	Makes system less reliabl	Makes system less reliabl	Makes system sig more rel	Makes system less reliabl	Slightly more reliable	Slightly more reliable	Slightly more reliable	Somewhat more reliable	Makes system sig more rel	Makes system sig more rel	Makes system sig more rel
Billion Gallon Gap	Reliable Supply	Makes system less reliabl	Makes system less reliabl	Makes system less reliabl	Makes system sig more rel	Makes system less reliabl	Slightly more reliable	Slightly more reliable	Slightly more reliable	Somewhat more reliable	Makes system sig more rel	Makes system sig more rel	Makes system sig more rel
Effectiveness	Scalability	Not scalable	Can scale to ~ 300 MG gap	Not scalable	Can scale to ~1BG gap	gap	Can scale to ~ 300 MG gap	Can scale to ~ 300 MG gap	Can scale to ~650 MG gap	gap	Can scale to ~1BG gap	Can scale to ~1BG gap	Can scale to ~1BG gap
	Preserves Future Choices	Somewhat inc choice	Somewhat inc choice	Somewhat inc choice	City locked in	City locked in	Reduces choice	Increases choice	Reduces choice	Reduces choice	Reduces choice	City locked in	City locked in
	Yield	95	576	17	1800	800	330	330	850	600	900	900	900
	Flexibility Addresses Peak Season Demand	Does not increase Maybe	Does not increase Yes	Somewhat increases No	Moderately increases Yes	Moderately increases Maybe	Moderately increases Yes	Moderately increases Yes	Moderately increases Yes	Greatly increases Yes	Greatly increases Yes	Greatly increases Yes	Greatly increases Yes

Note: the only ratings changes the City made across scenarios were in local economy and reliable supply; these appear in the shaded rows.

# Interim Report A

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Philip Murphy, InfoHarvest & Carie Fox, Fox Mediation

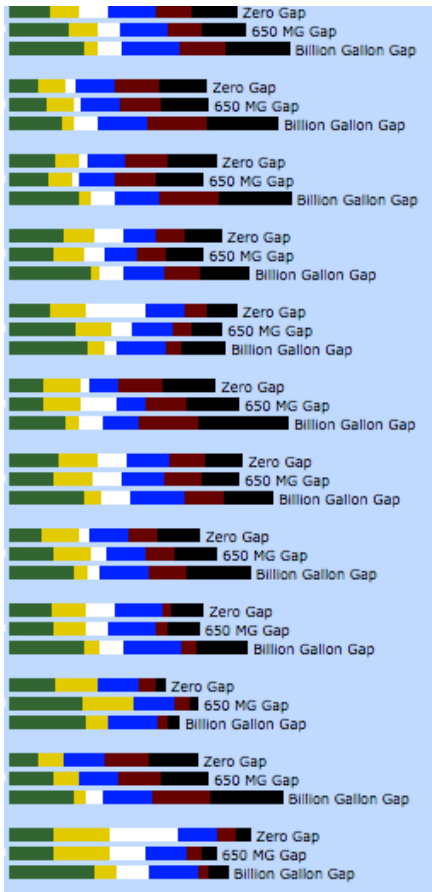
*Prepared for the Water Supply Advisory Committee December Packet*

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## I.



## I. Introduction



This document is a pastiche of graphs, tables and brief narratives capturing Committee Member work on the online WSAC Decision model. The purpose of these packet materials is to provide fodder for discussion in the December meeting and to help fulfill the goals of Recon.

The document contains use statistics and a great deal of information about Ctte-member weights. *Interim Report B* will contain similar information about the ratings changes Ctte members made.

The second person—‘you’—refers to the Ctte Members.

You can relate this report back to the website by going to [https://www.decisionharvest.com/dhroot/dhowners/santacruz/vreports/scwsac\\_recon\\_cmtee\\_comments.asp](https://www.decisionharvest.com/dhroot/dhowners/santacruz/vreports/scwsac_recon_cmtee_comments.asp)

Don’t worry about the tokens—we aren’t gathering data any more.

*The above graphic is an example of a stacked bar graph generated on the WSAC Recon Website.*

## II. Usage Statistics

There's no secret: you did a lot of work, as you can see in figure II.1. The usage statistics also indicate the intense thought you gave to the ratings (figures II.2-3), and the weights, figure II.4. And then—oh, you wonderful Committee—you really came through for the political feasibility ratings, figure II.5.

	Zero Gap	640 MG Gap	Billion Gap	Total Views	I am done!s	Comments
	16	90	16	122	4	2
	161	132	161	454	15	34
	168	100	39	307	3	4
	39	99	59	197	4	0
	49	62	37	148	4	8
	35	36	70	141	10	0
	89	39	19	147	1	1
	310	259	136	705	14	24
	49	45	67	161	10	0
	150	20	63	233	3	1
	6	1	205	212	4	1
	87	130	138	355	7	0
	89	33	32	154	7	2
	149	58	42	249	4	4
<b>Total</b>	<b>1397</b>	<b>1104</b>	<b>1084</b>	<b>3585</b>	<b>90</b>	<b>81</b>

Figure II.1: Broad Usage Statistics

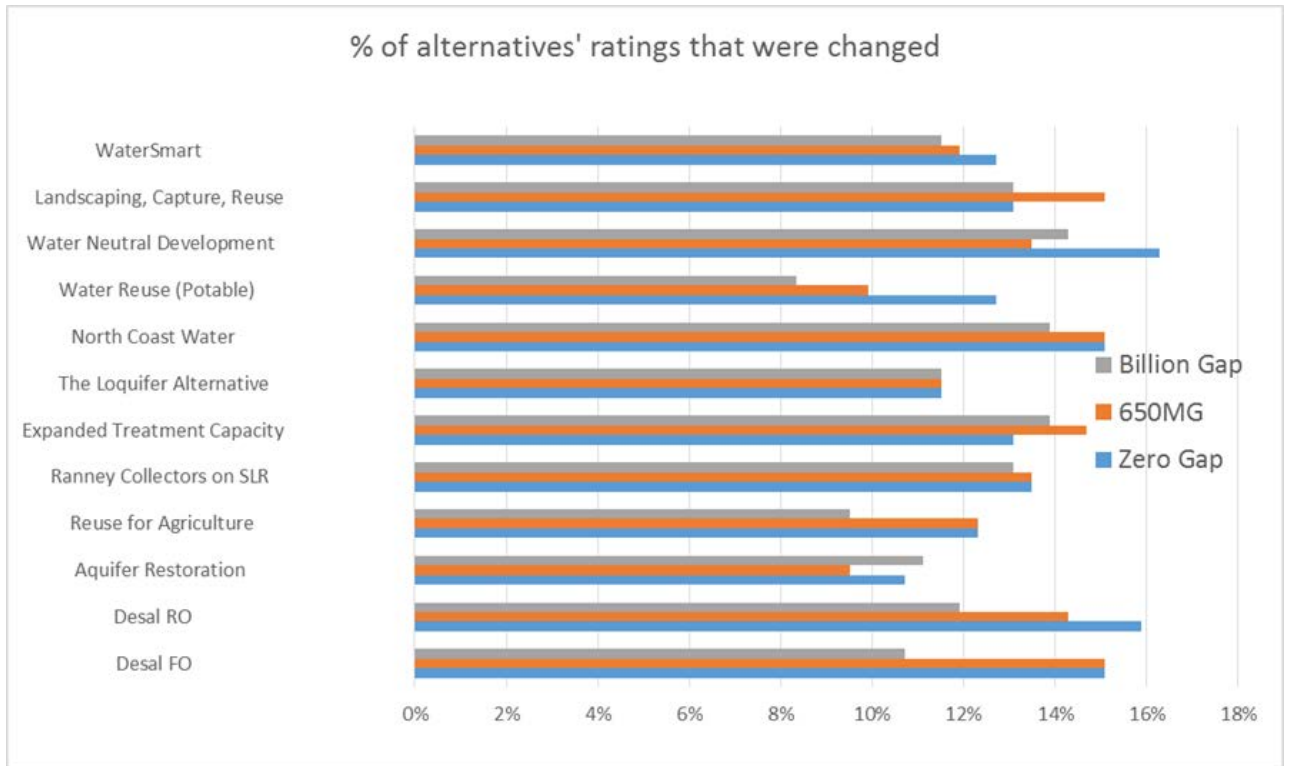


Figure II.2: Percentage of ratings that were changed.

*(As you can see from the next graphic, some people did not change ratings for different scenarios, so we are working to prepare a composite.)*

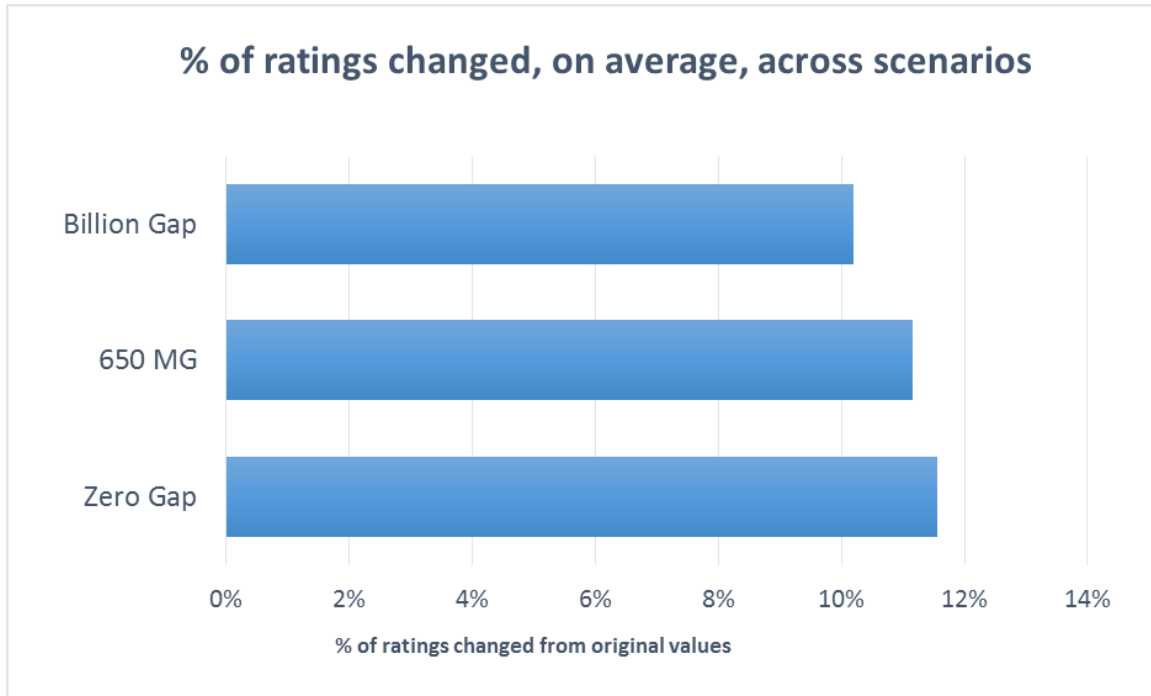


Figure II.3: Ctte Ratings Changes Across Scenarios

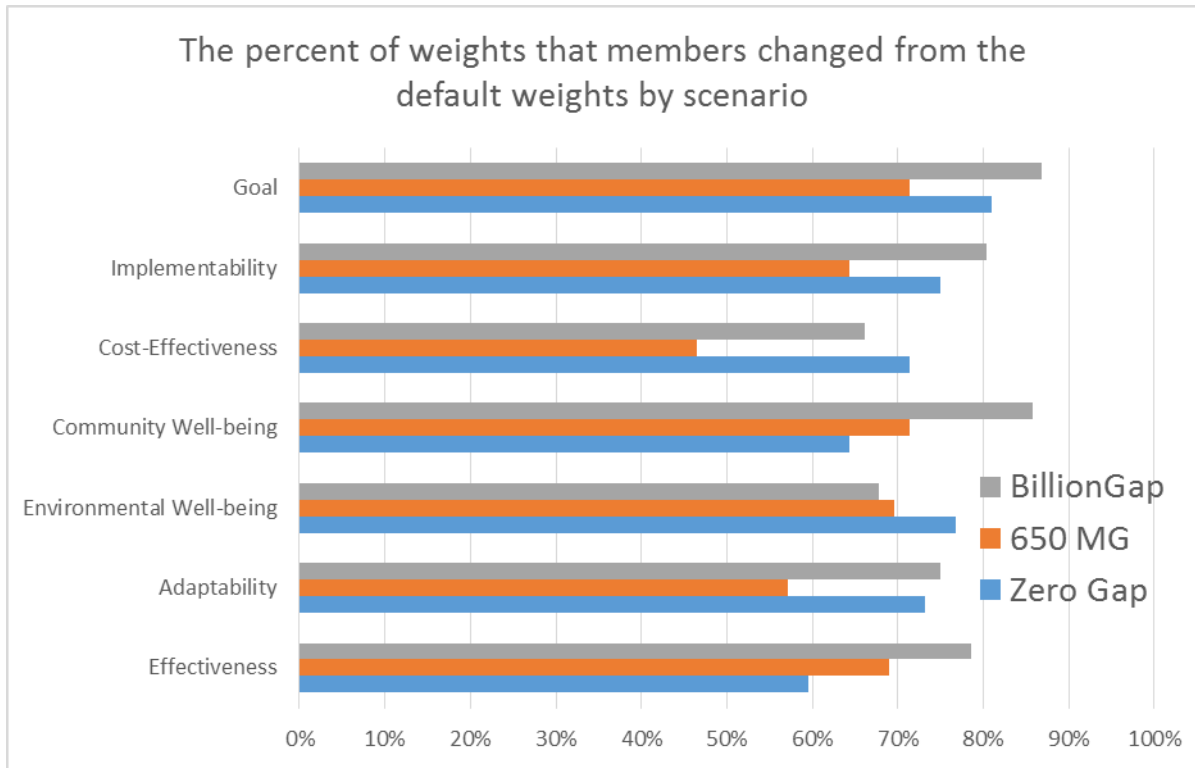


Figure II.4 Overall frequency of weights changes the Ctte made.

The weights were set to a default value mid-scale, so 80% is close to perfect. Members energetically stamped their own balance to the models and they hit all three scenarios thoughtfully and evenly.

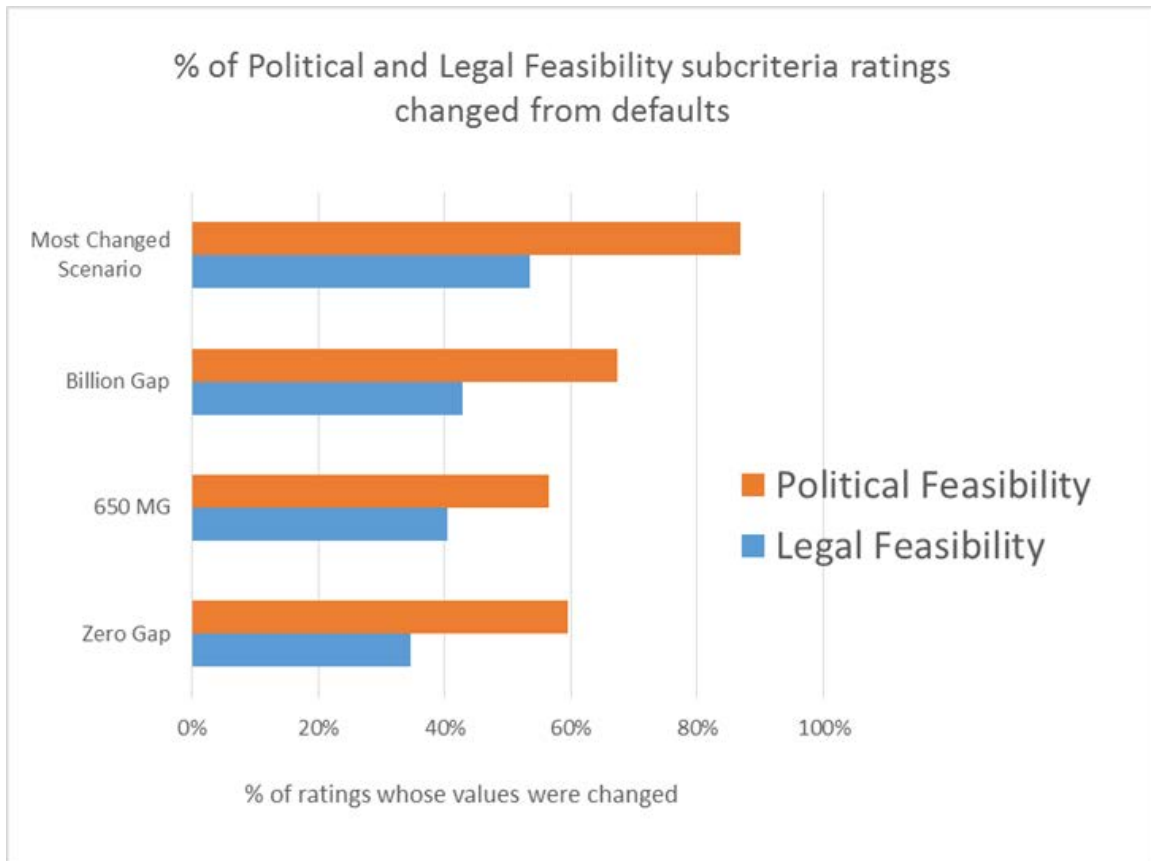


Figure II.5: The Ctte took Political Feasibility very Seriously

Wow! 80% overall is quite good as we would not track if you happened to leave a rating at the default value. The drop-off on legal feasibility is understandable—that should probably have been an expert rating for you to respond to rather than originate.

### III. Now for the Weights

As you recall from the website (see thumbnail insert), you first apportioned your weights among high level criteria and then divided your weights among the subcriteria.



Part of what we wanted you to see is that you could agree on the same ‘facts,’ (ratings) but if your values (weights) are different the stacked bar graph could look quite different. The second motive for having you register your weights is that, for Recon, it is as important to determine which values differences drive your decision. And perhaps most interestingly, we wanted you to ponder how your weights might change across scenarios. (This relates to the capacity-building aspect of Recon and to the preparation for scenario work in the Real Deal.)

In this section, we present information about overall trends, showing min-max on the weights and then a standard deviation (figures III.1 and III.2). We then break that information out by scenario—quite interesting! See figures III.3-5.

But the most fascinating graphs, we would argue, are the individual weights portraits. Figure III.6 shows a composite, the following 14 radar graph sets represent each of your weights portraits.

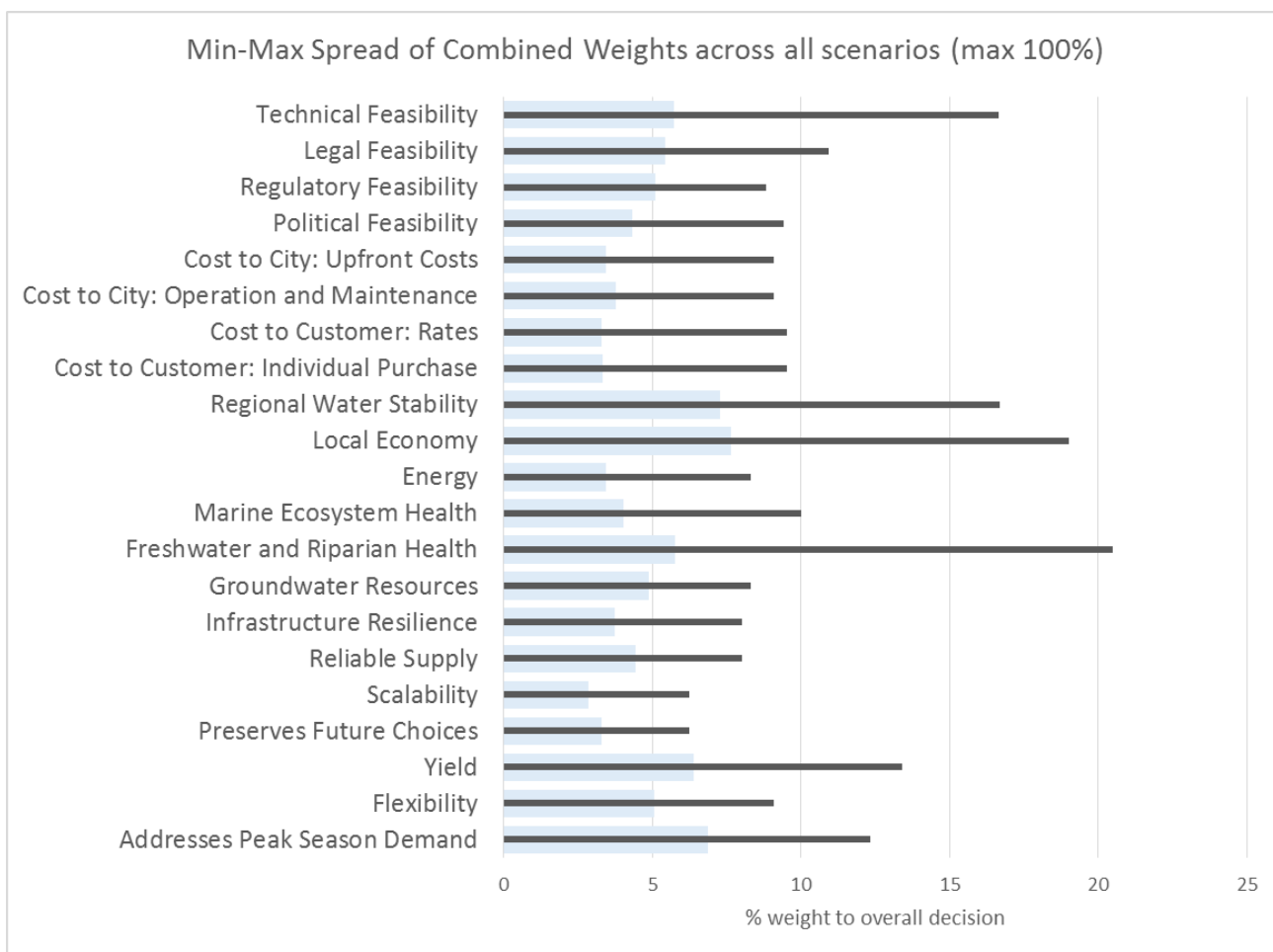


Figure III.1: Min-Max across scenarios.

*Clearly at least one individual set the weight of each sub-criterion to 0 on at least one of the scenarios. The blue bars are the averages, presented only for context (averaging weights is usually nonsensical except to provide a reference point for the variability, which is what we really care about).*



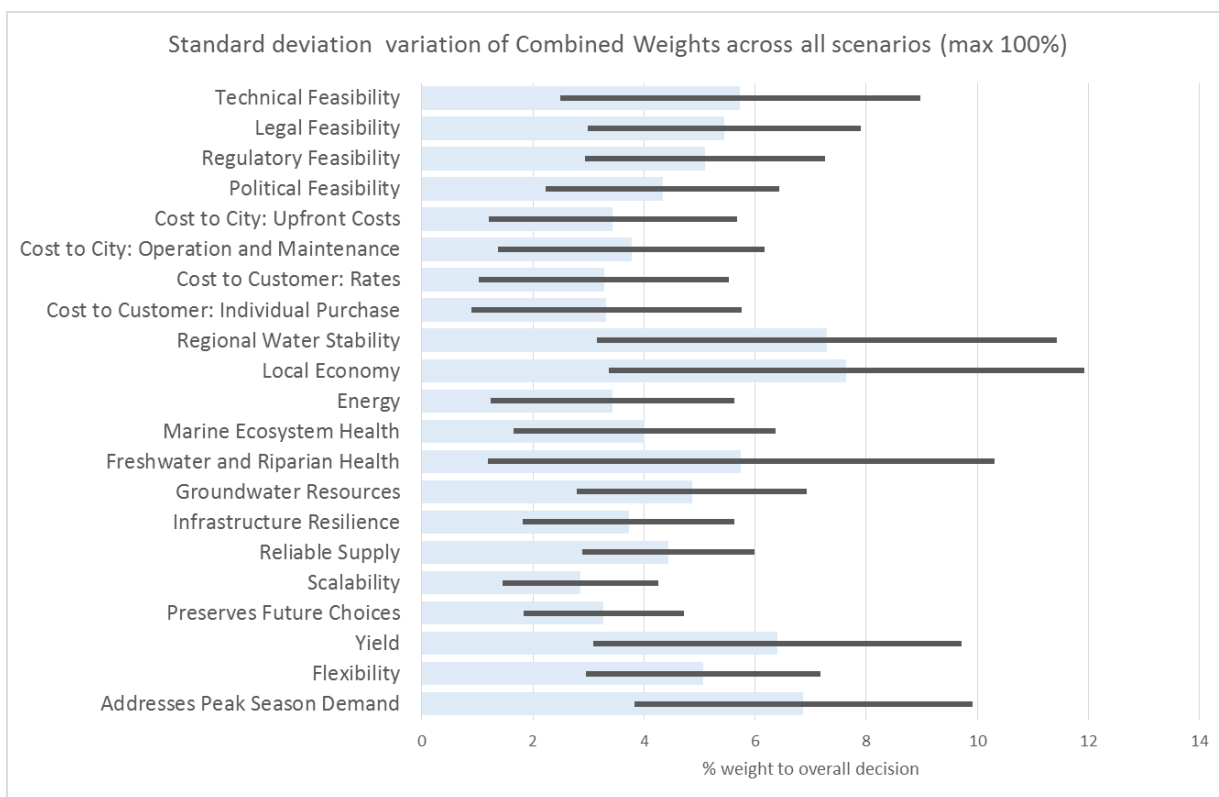


Figure III.2: Standard Deviation Weights by Criteria

*This is the same information as the last figure, but now looking at a standard deviation rather than min-max. (Remember that stats class? Think of the standard deviation as the shoulder of the bell curve, leaving out the outliers.) You can see that some subcriteria have a much wider spread than others.*

## Zero Gap

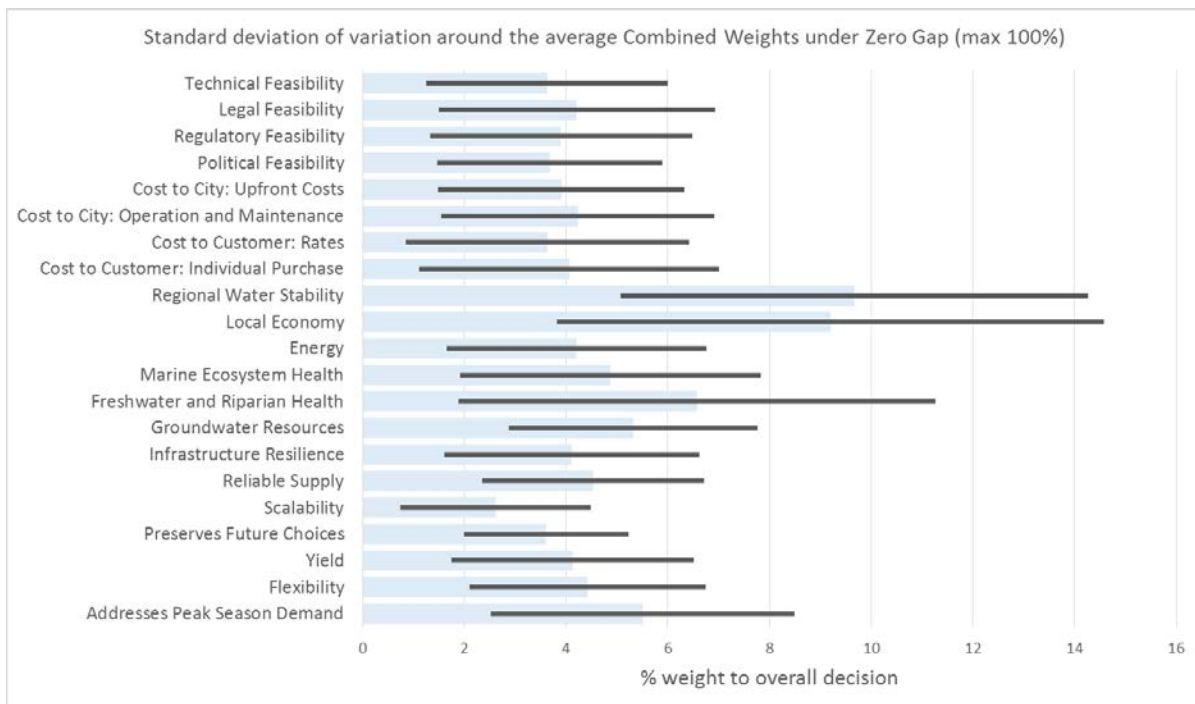


Figure III.3: The weights applied to Zero Gap have the widest variation.

*Be aware the shifting horizontal scale of the three scenarios*

## 650 MG

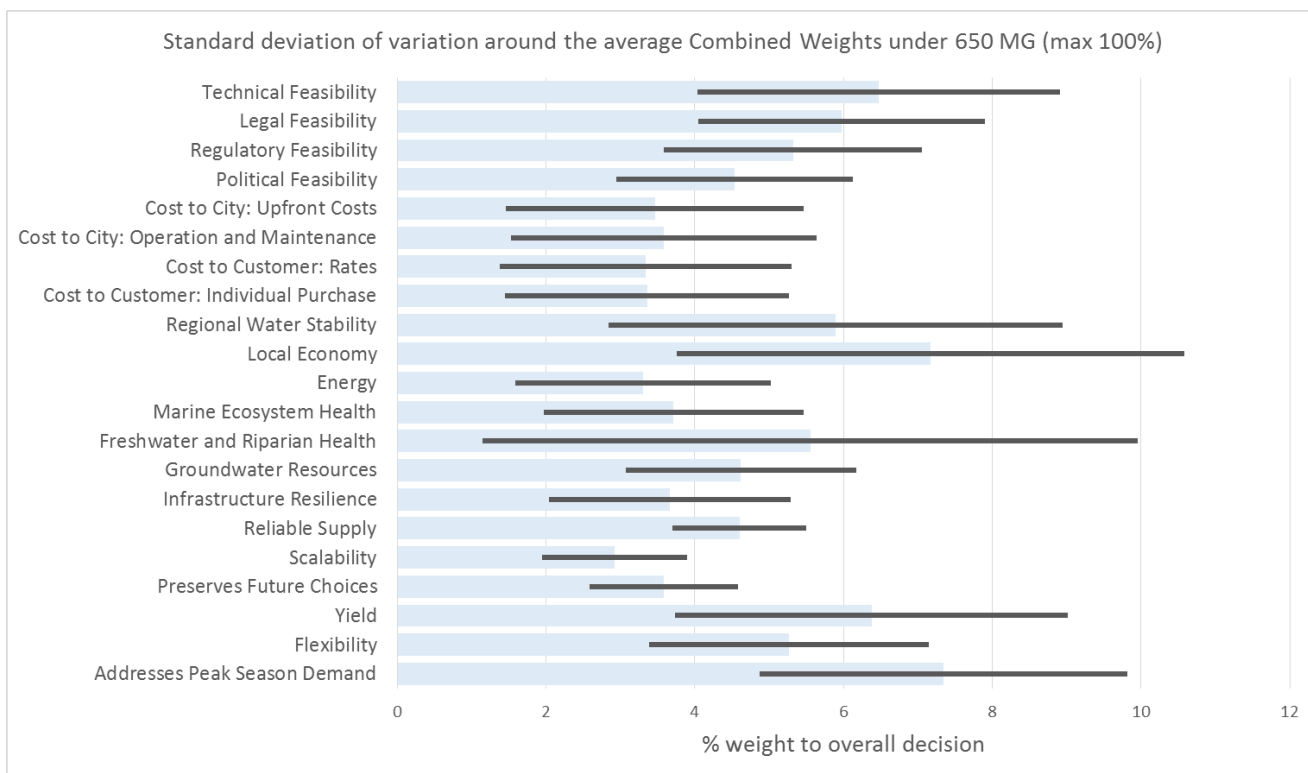


Figure III.4: The 650 MG Gap Weights / Standard Deviation.

Note – when a sub-criterion has more weight, its variance will generally increase because of that larger multiplier.

1 BG

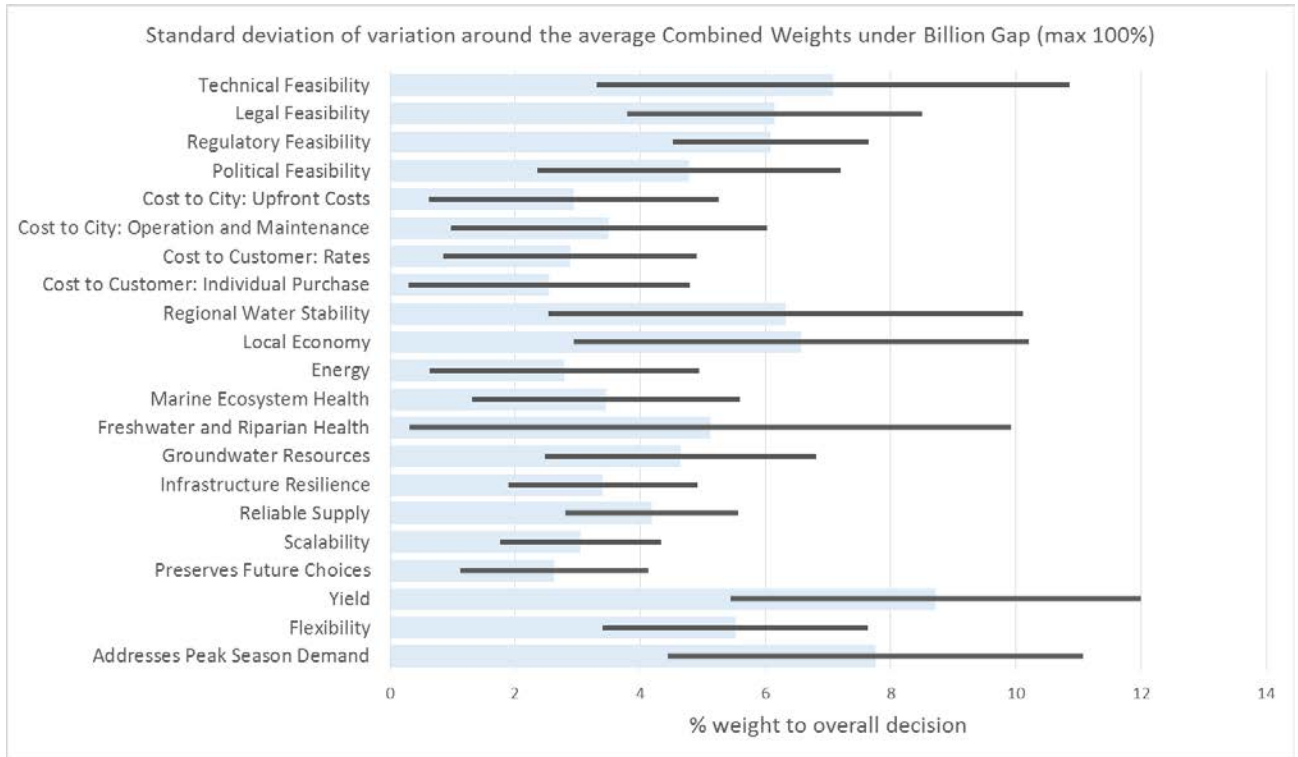


Figure III.5: The BG Weights

*In the Billion Gap, Yield is generally more important, and has wider variation across committee members.*

## The Weights Portraits

Seeing the spread in combined weight for the sub-criteria provides some insights in the spread of thinking of the Committee members, though it is rather abstract:

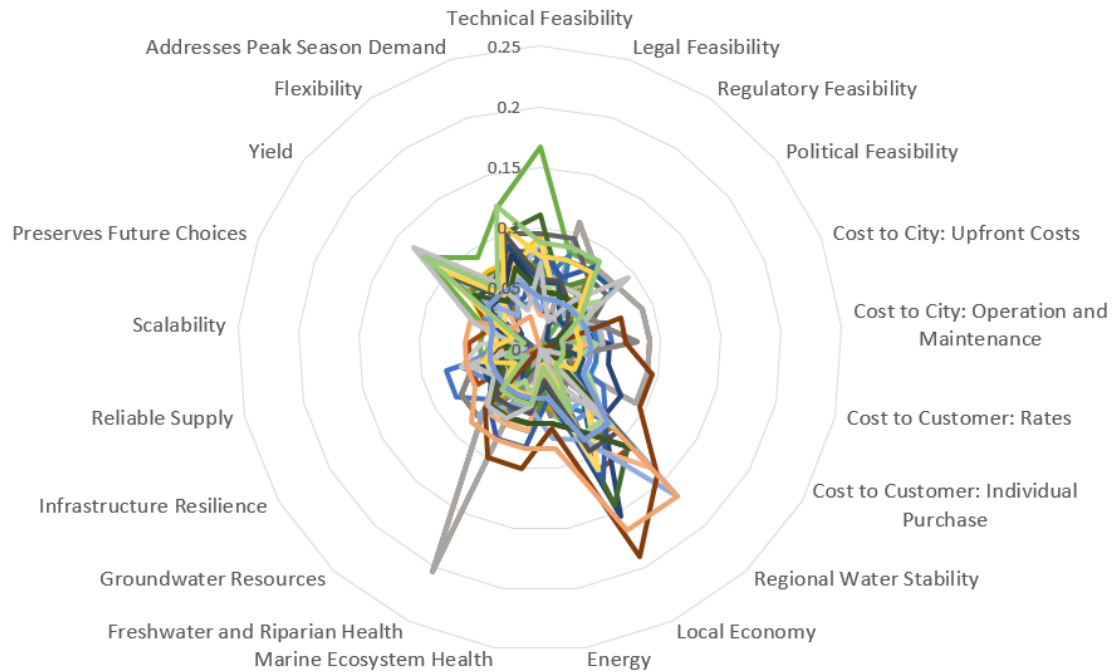
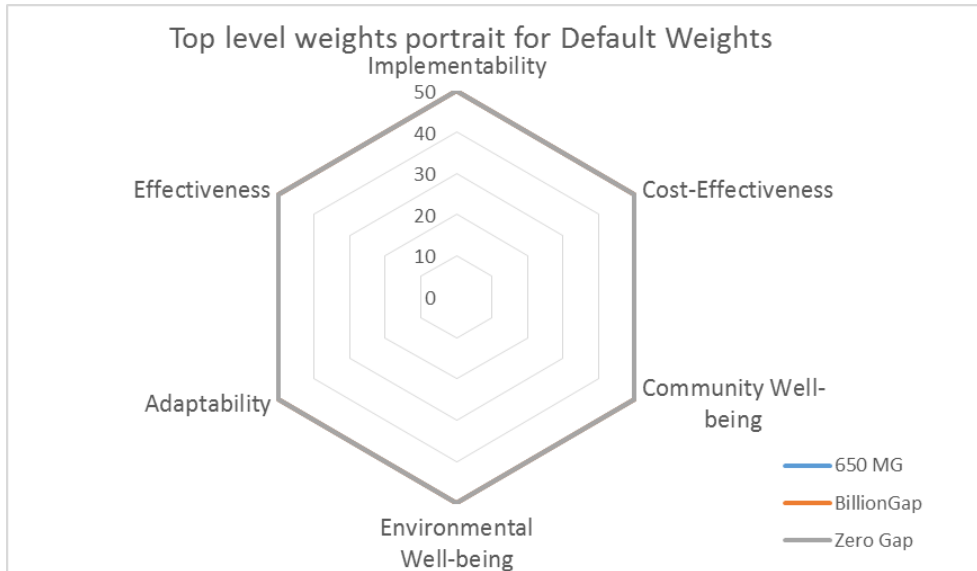


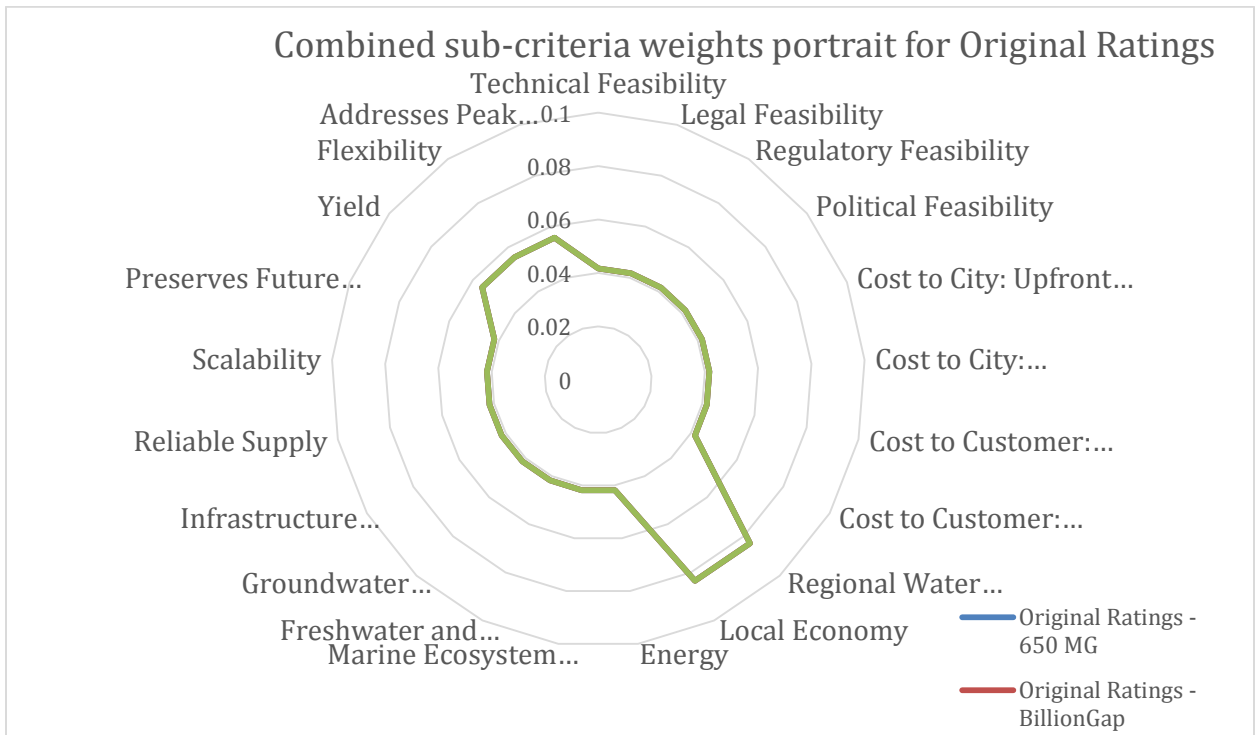
Figure III.6: Combined Weights Portrait

What is useful from this squiggle is where it doesn't go—none of the subcriteria approach the outer ring. This means you all have nuanced positions—even Committee member number 1! (Whose daring and interesting portrait starts off the gallery... read on and see for yourselves.)

First, the default: If all weights were set to the midpoint, as the defaults are set, then the “portrait” of the top criteria weights for all three scenarios would be simply:

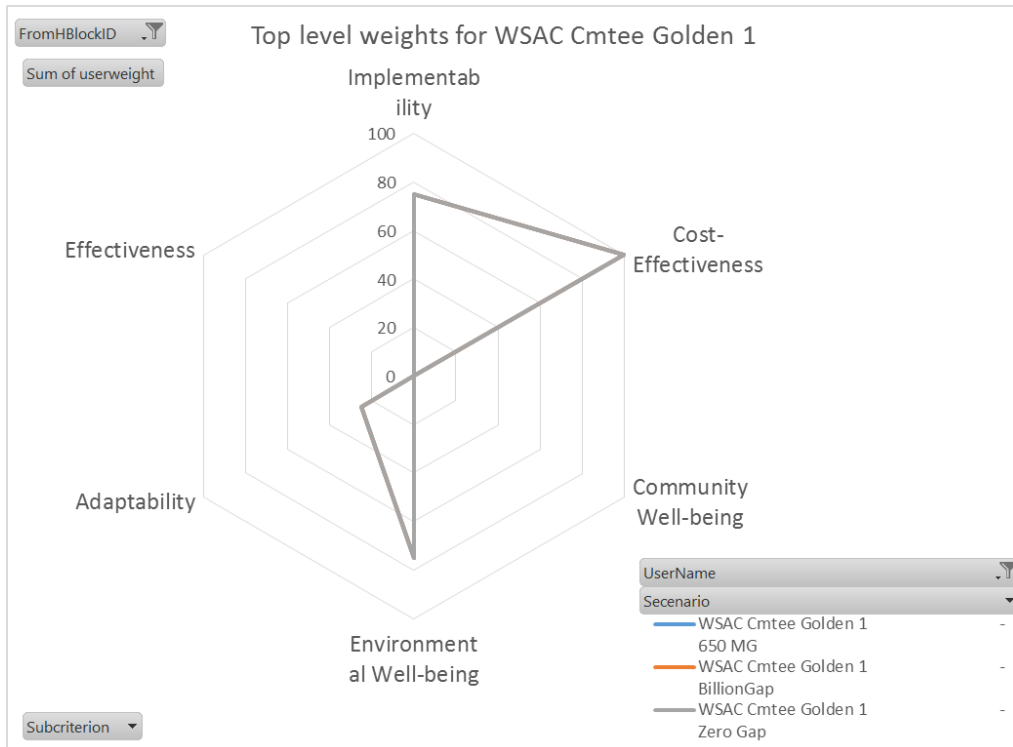


You only see the grey polygon for the Zero Gap scenario; the other two are hidden underneath.



When you see this shape peeking through, it suggests the ctte member skipped the weights for that scenario.

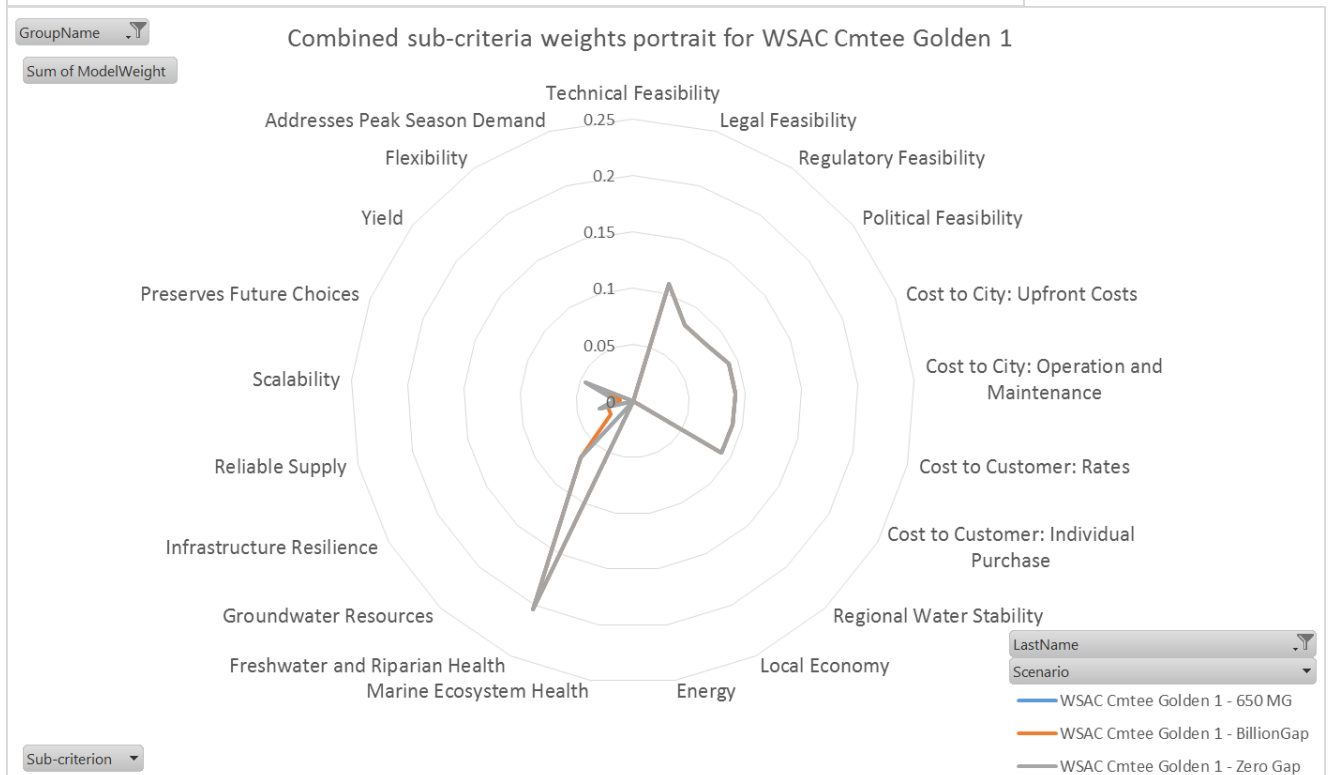
## Cmtee Member 1



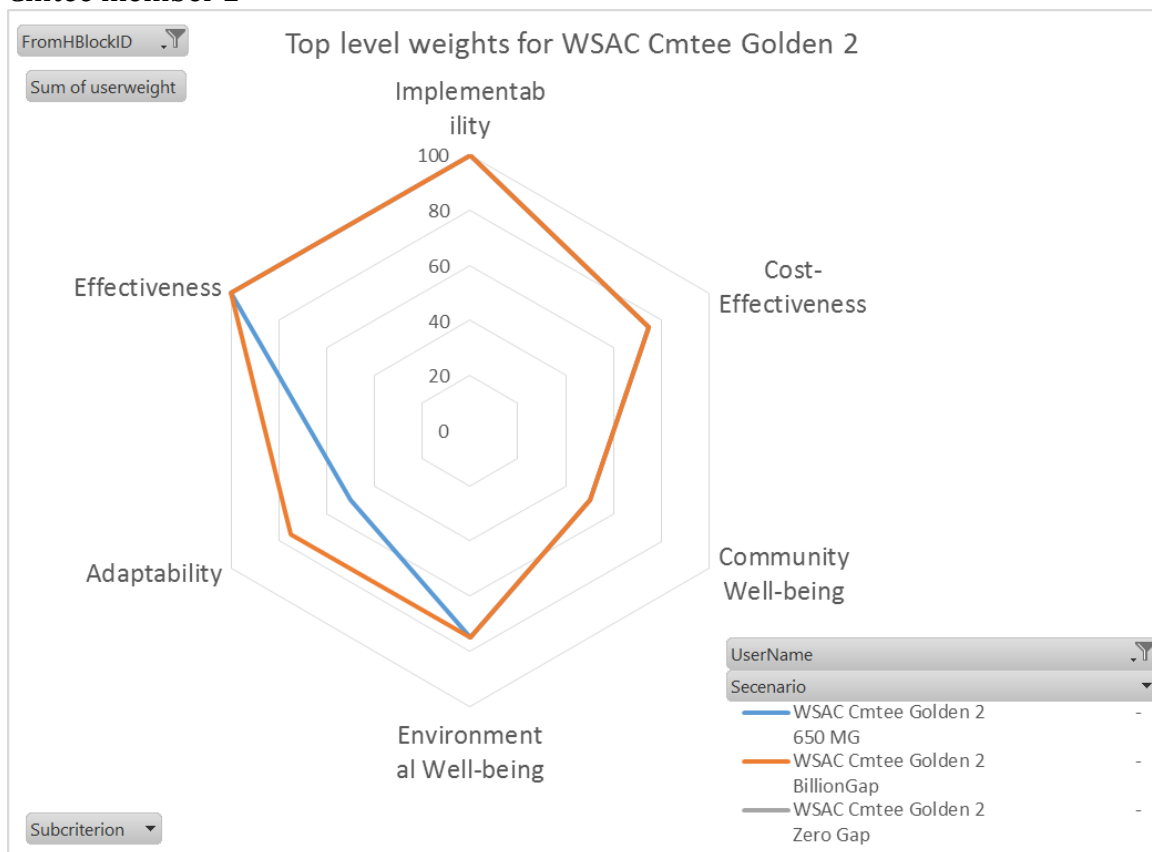
This person did not change weights from scenario to scenario, except for the little bit that peeks out relating to scalability and reliable supply in the subcriterion portrait below.

And it is arguably the most distinctive 'portrait.'

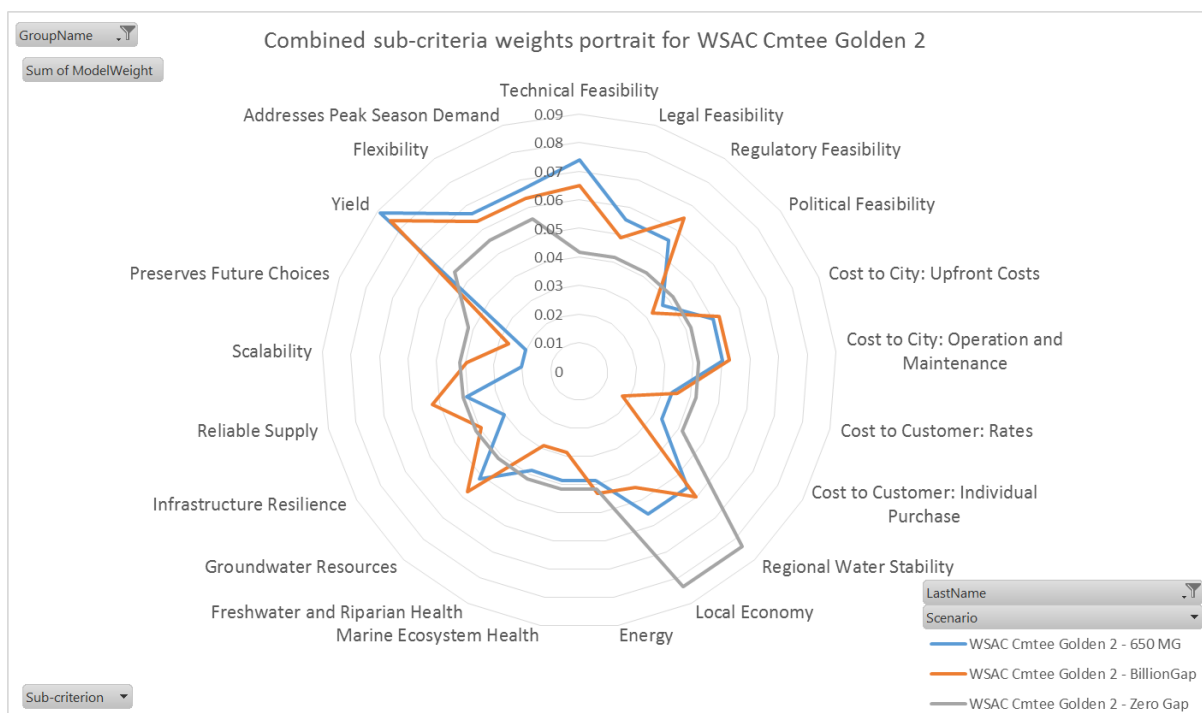
This person also supplied a lot of the 'zeros' that showed up in the min max.



Cmtee member 2

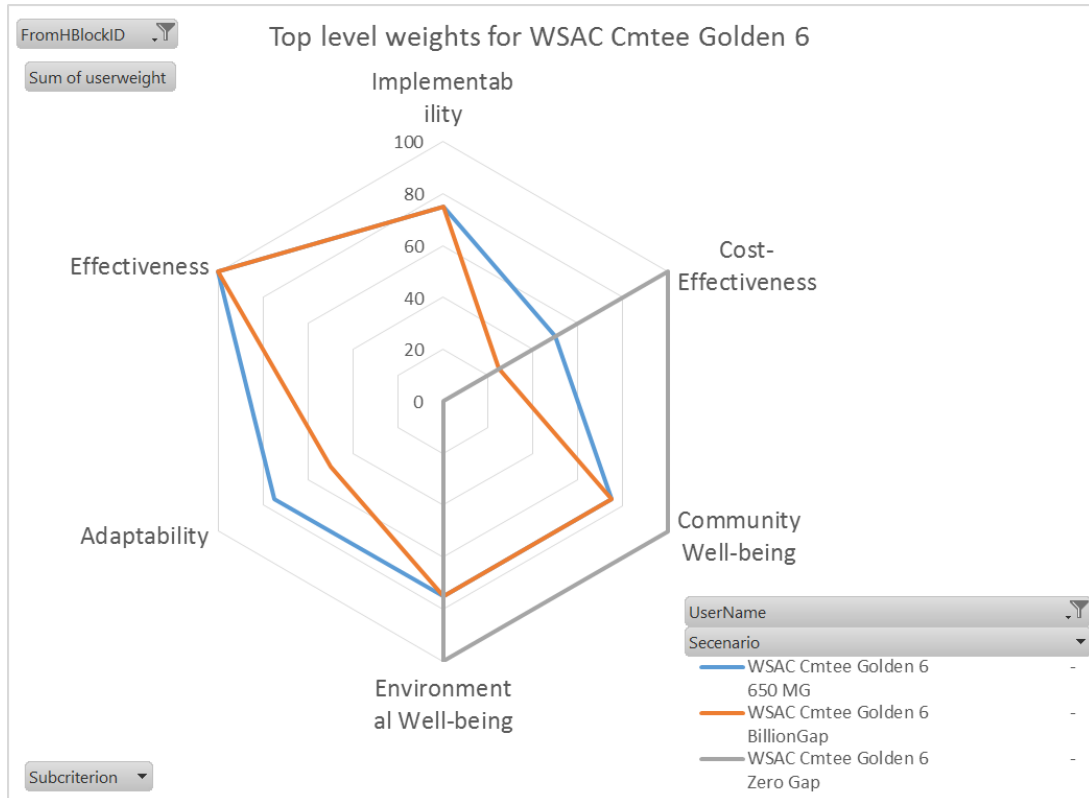


This person did not weigh the zero gap scenario (as you can see by the default gray shape below) but did emphasize adaptability for the BG Gap.

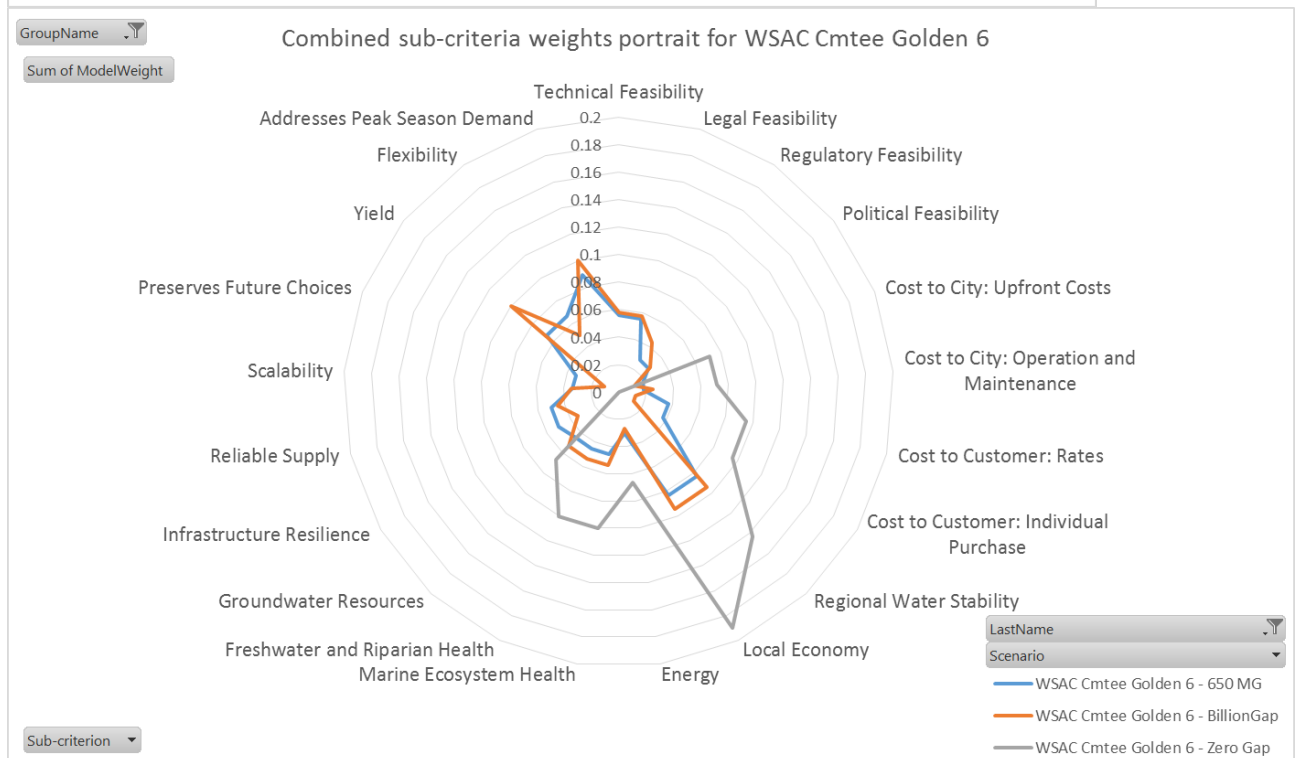




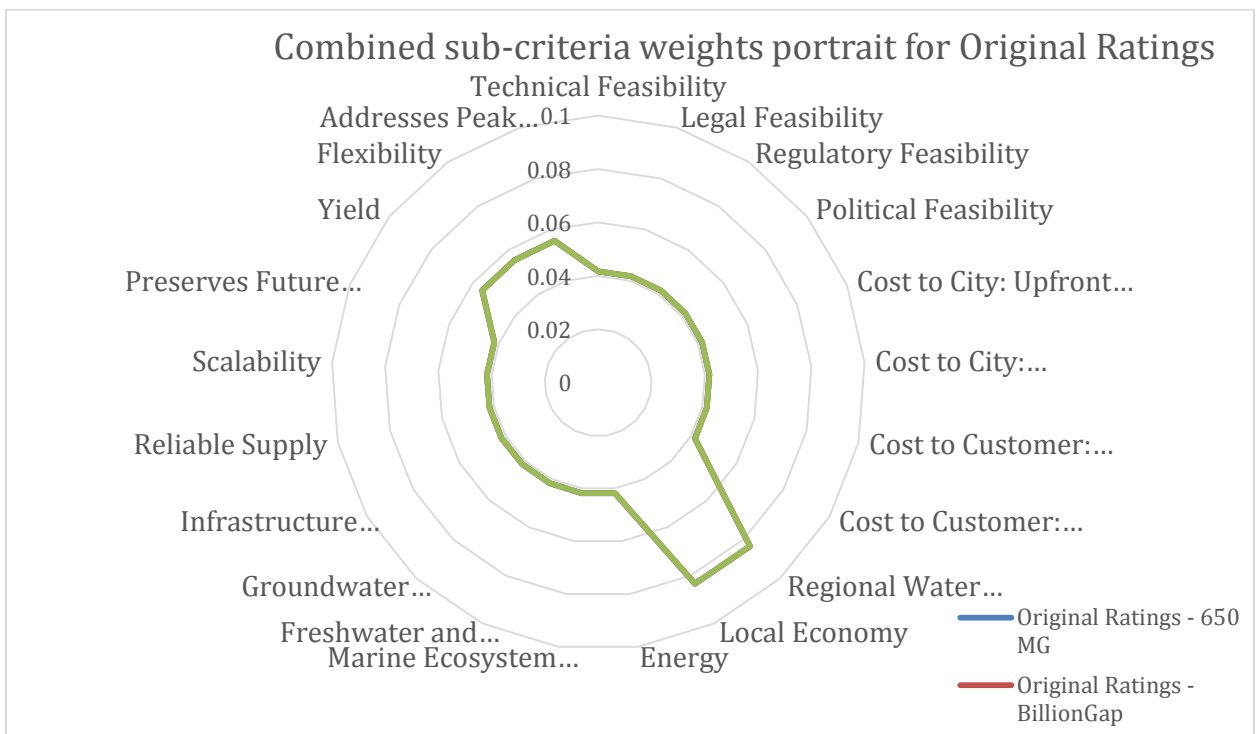
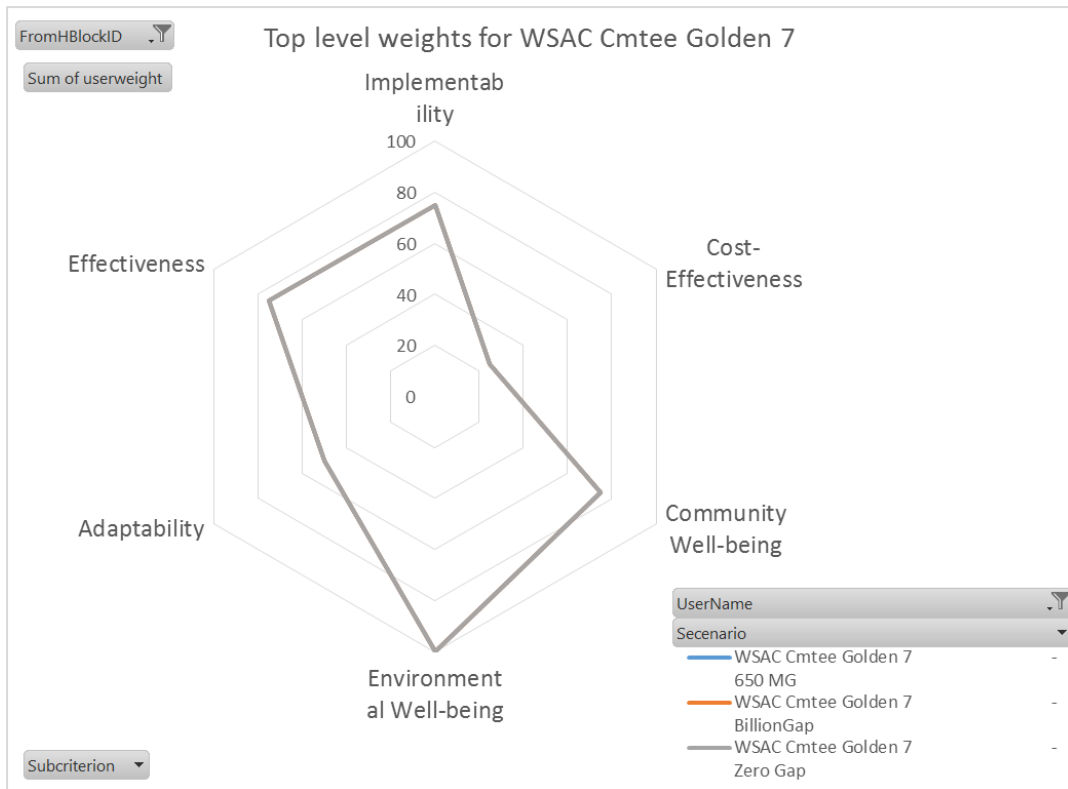
Cmtee member 6



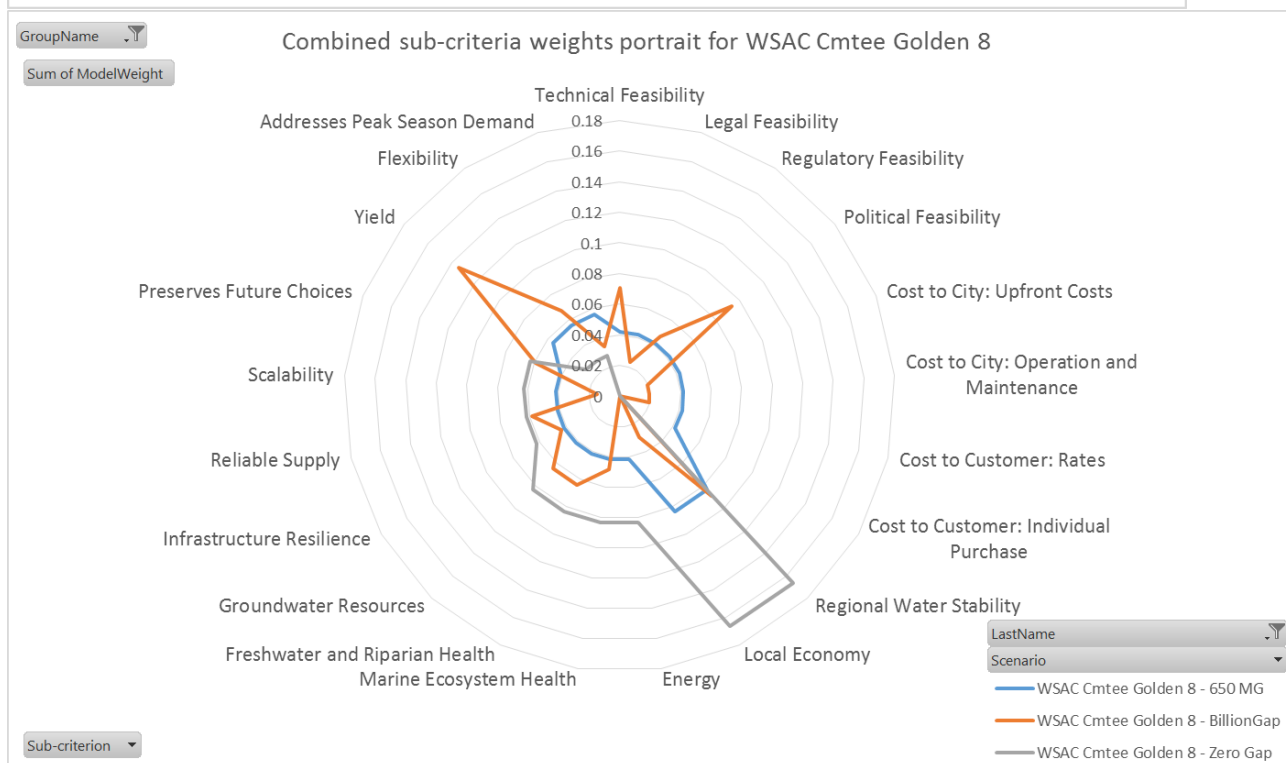
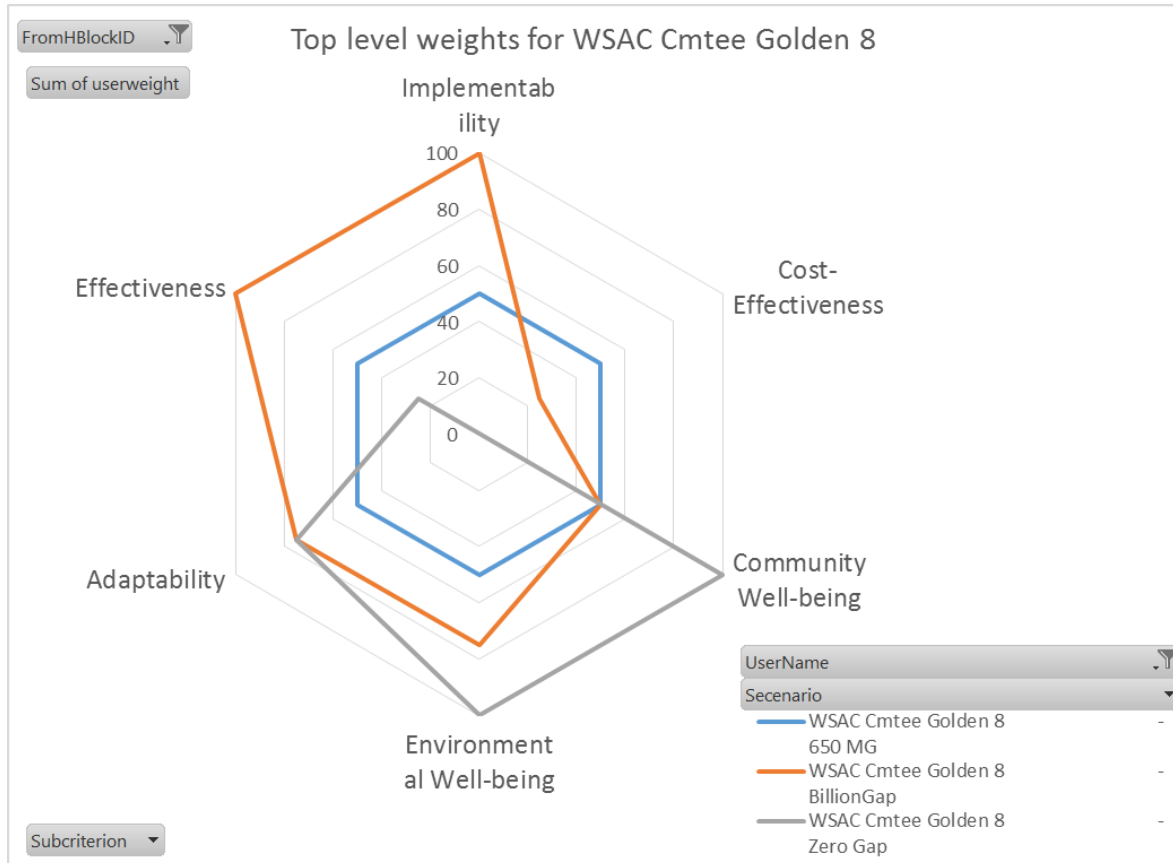
Intriguingly different weights across scenarios! (The 650 line is hidden under the BG line in a couple of places). Several people gave 'adaptability' a spike in the middle scenario.



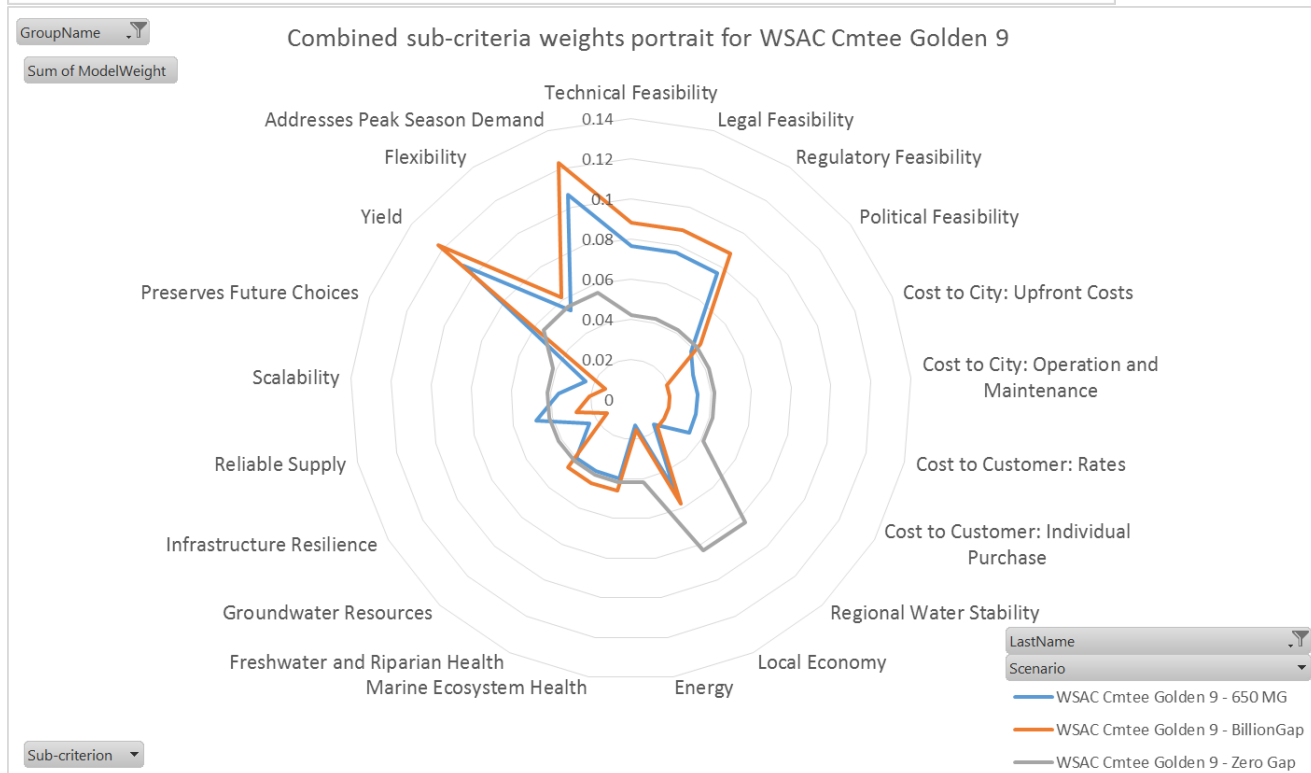
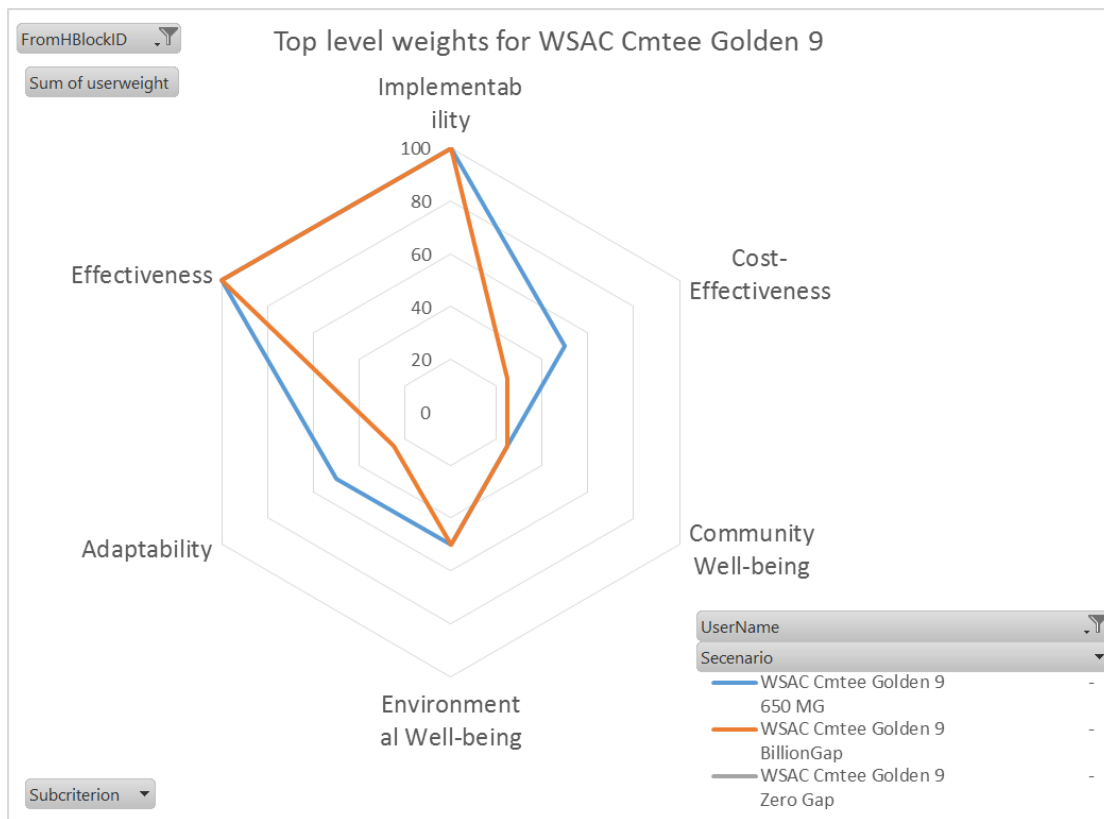
Cmtee Member 7



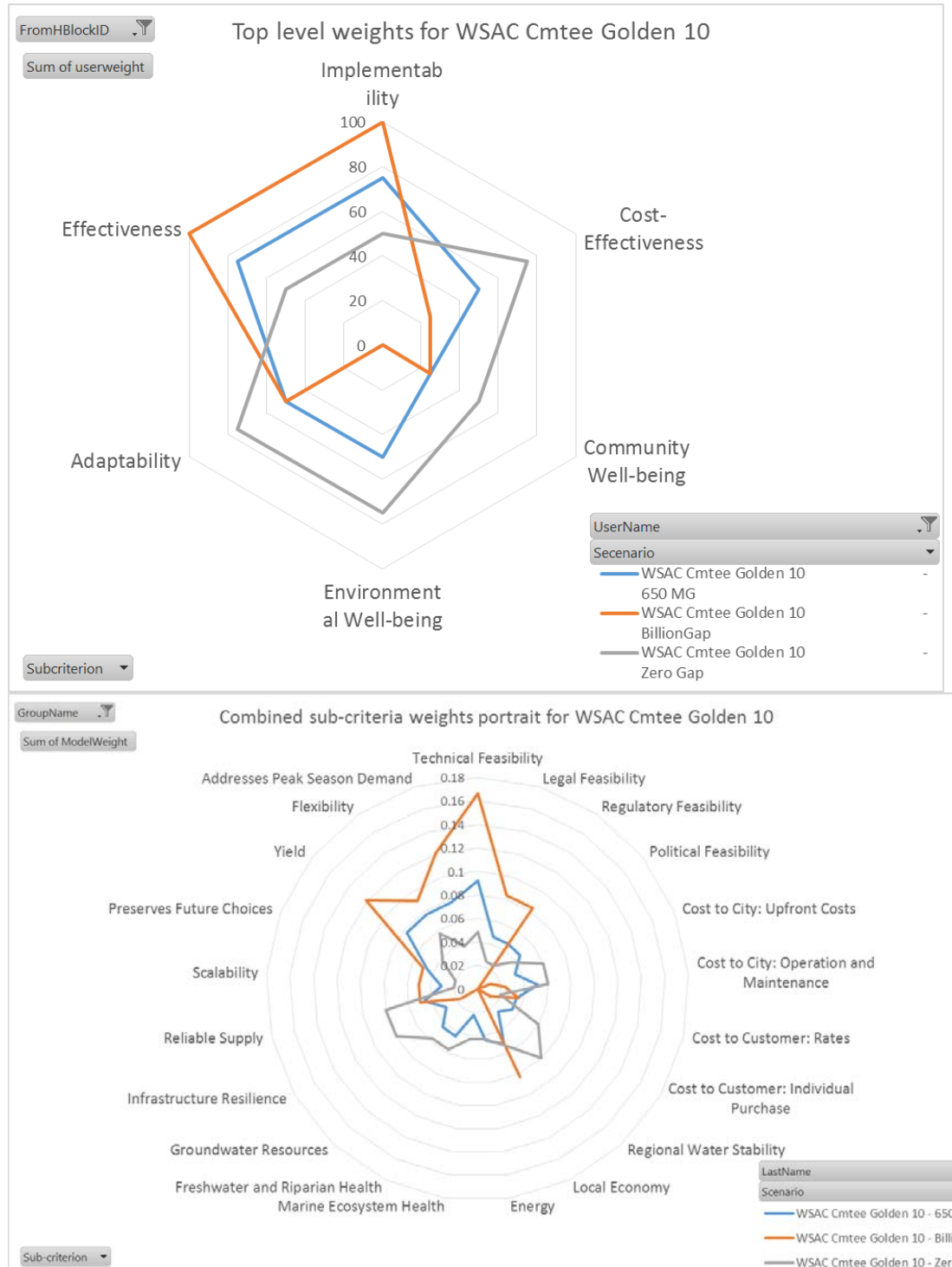
# Cmtee Member 8



Cmtee Member 9

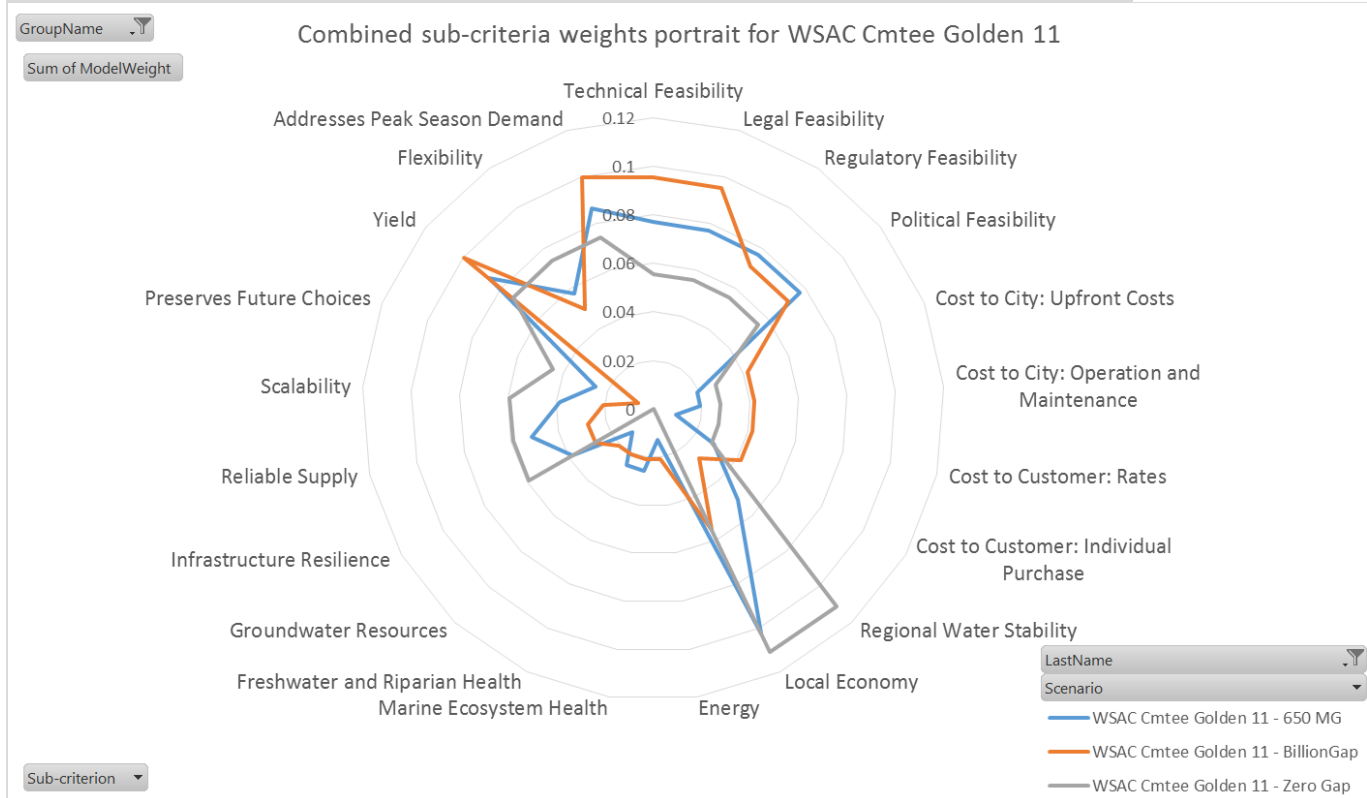
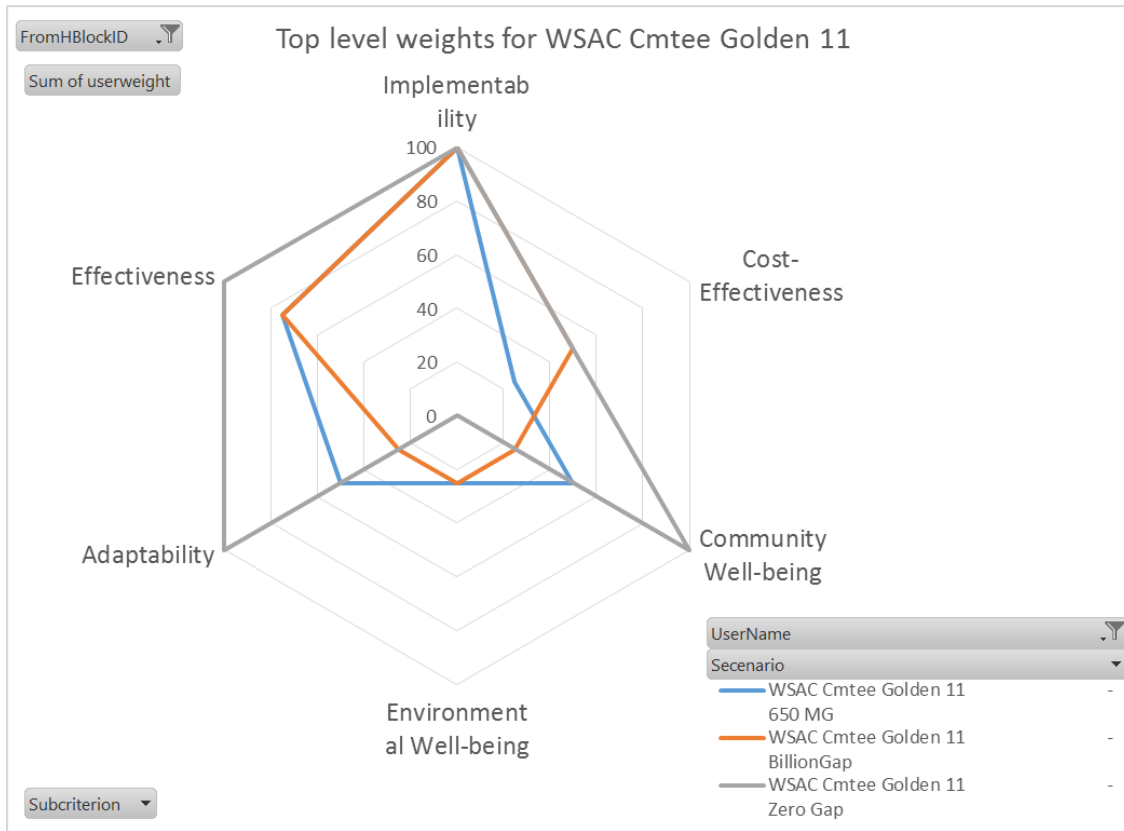


Cmtee Member 10

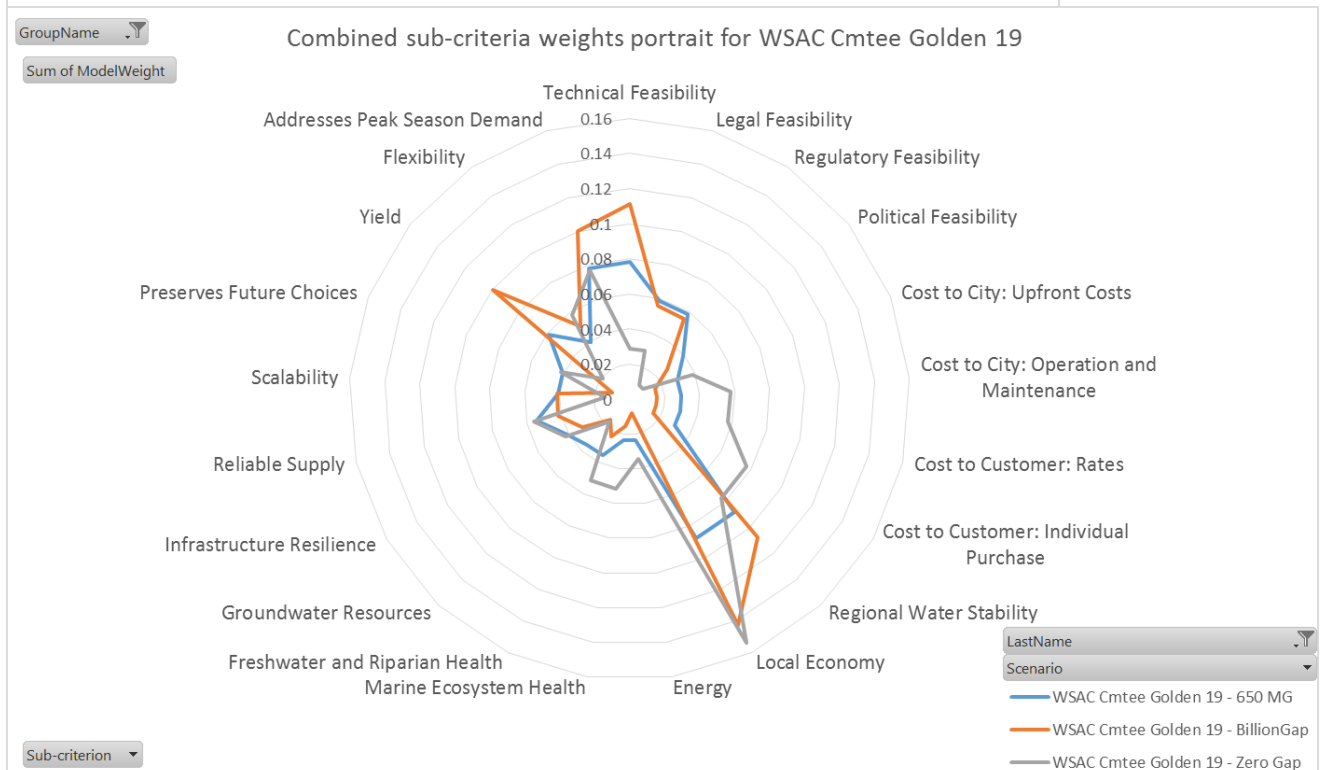
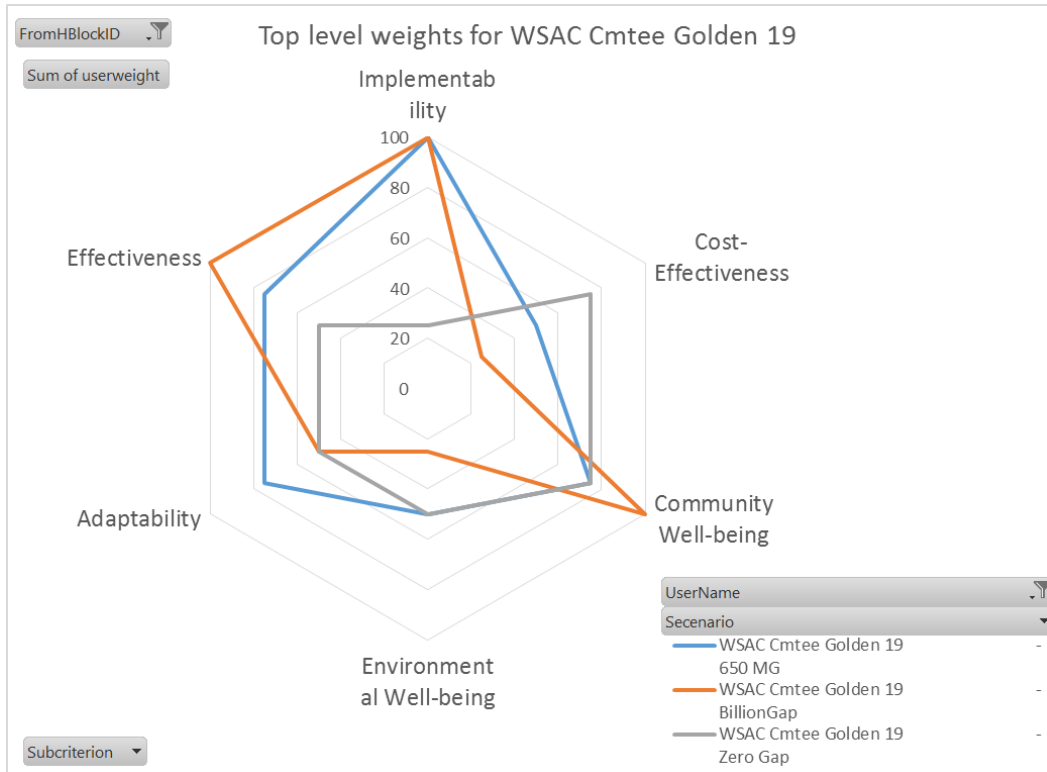


Several Cmtee Members gave less weight to the environment as the gap increased. (The same pattern is apparent for "local economy.")

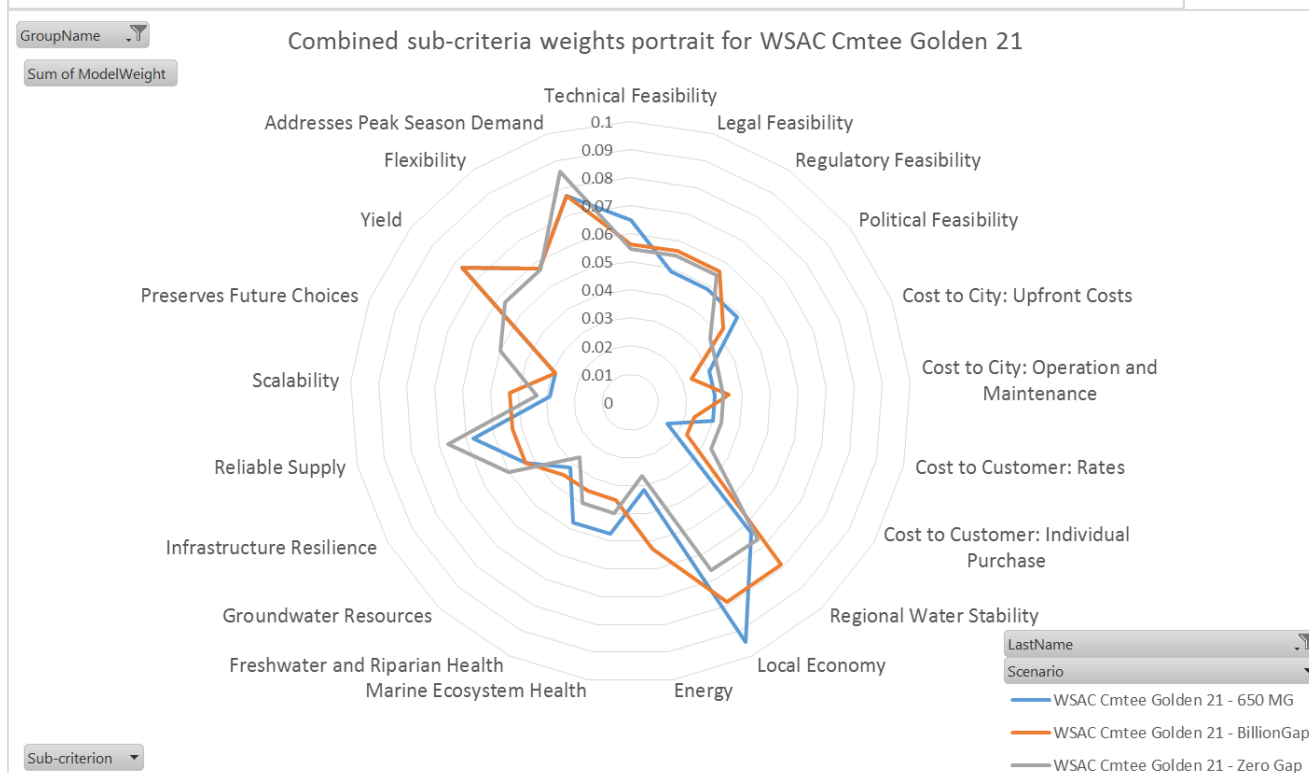
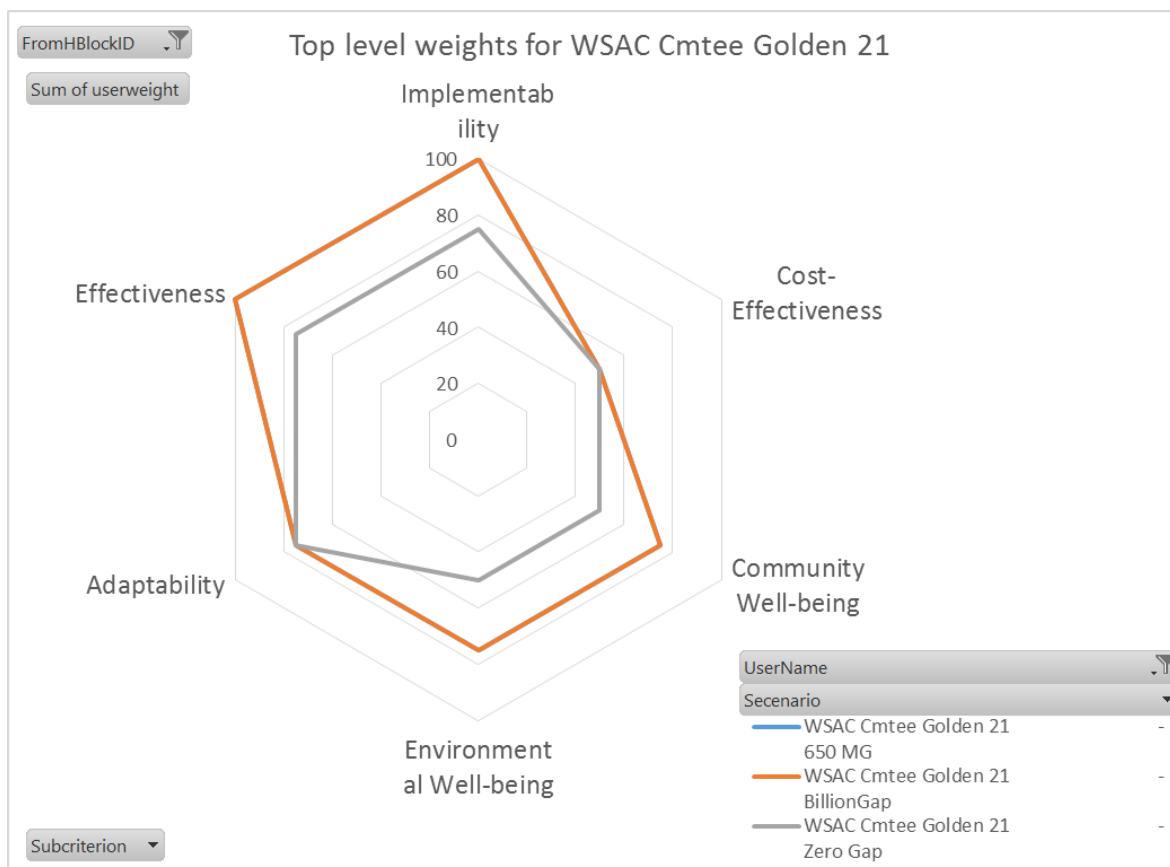
# Cmtee Member 11



Cmtee Member 19

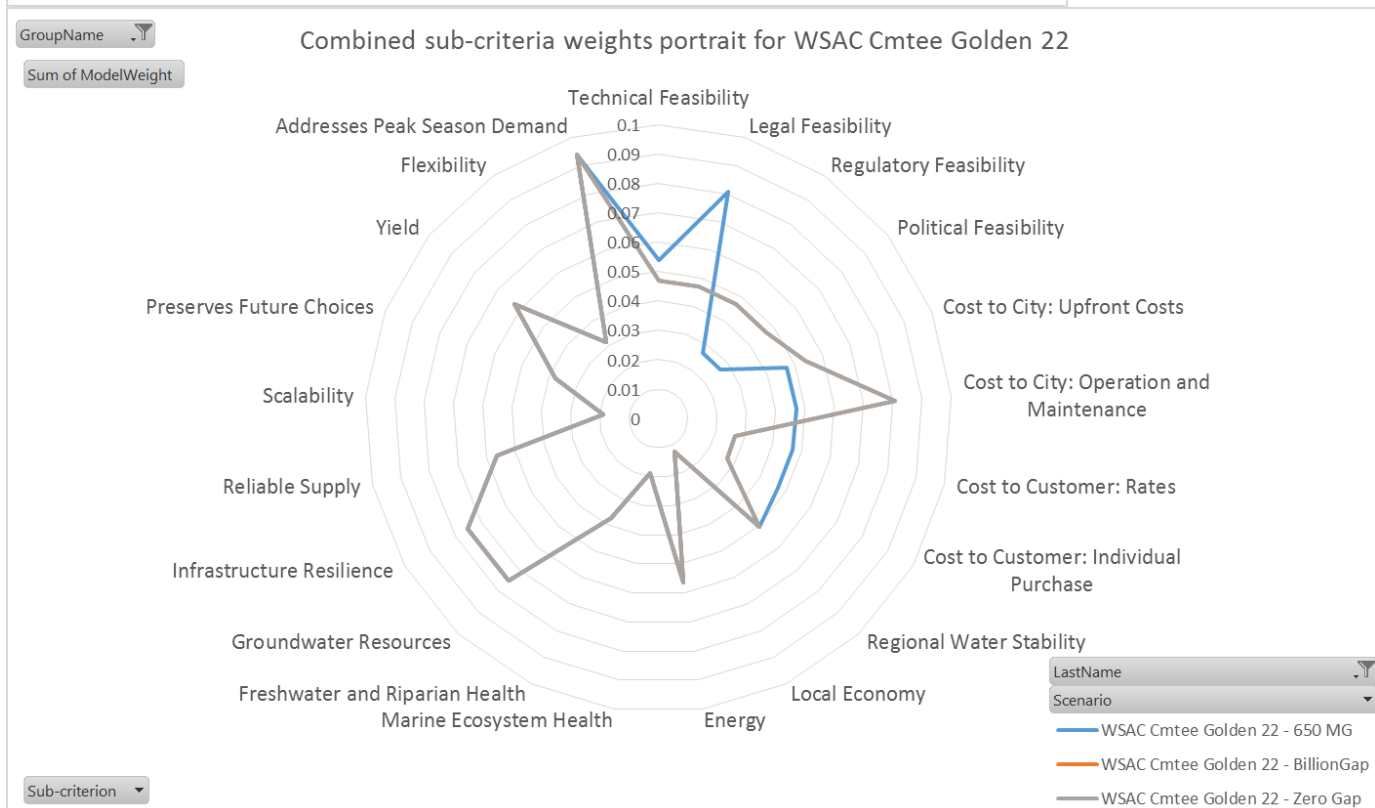
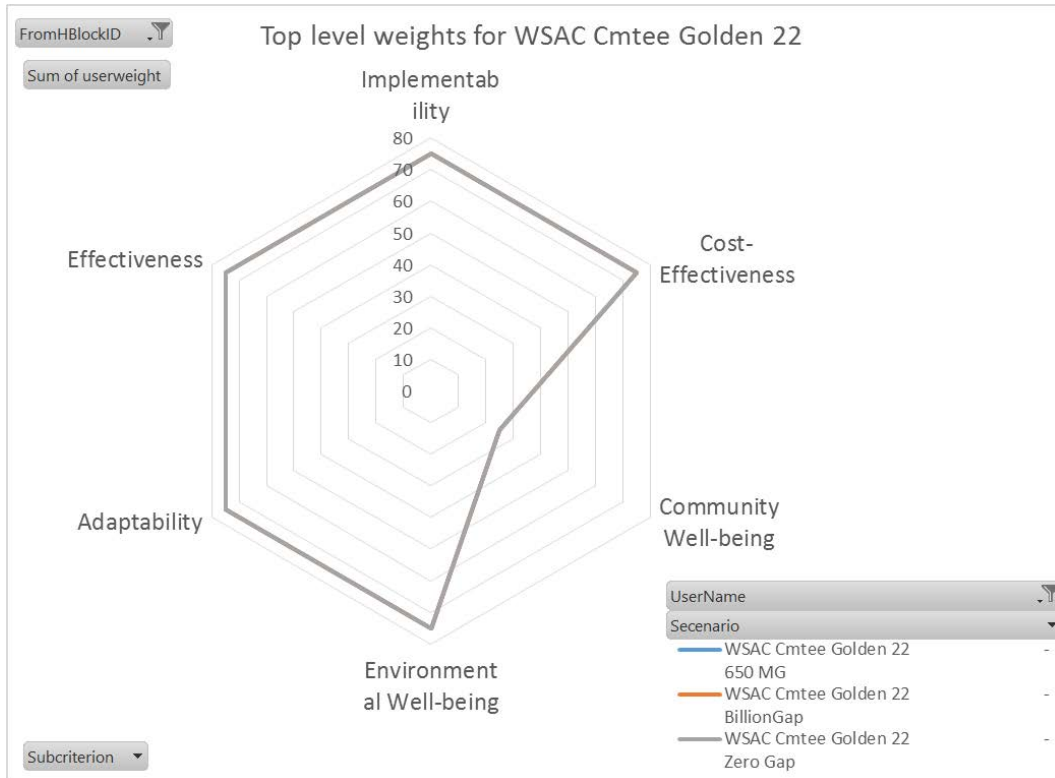


Cmtee Member 21

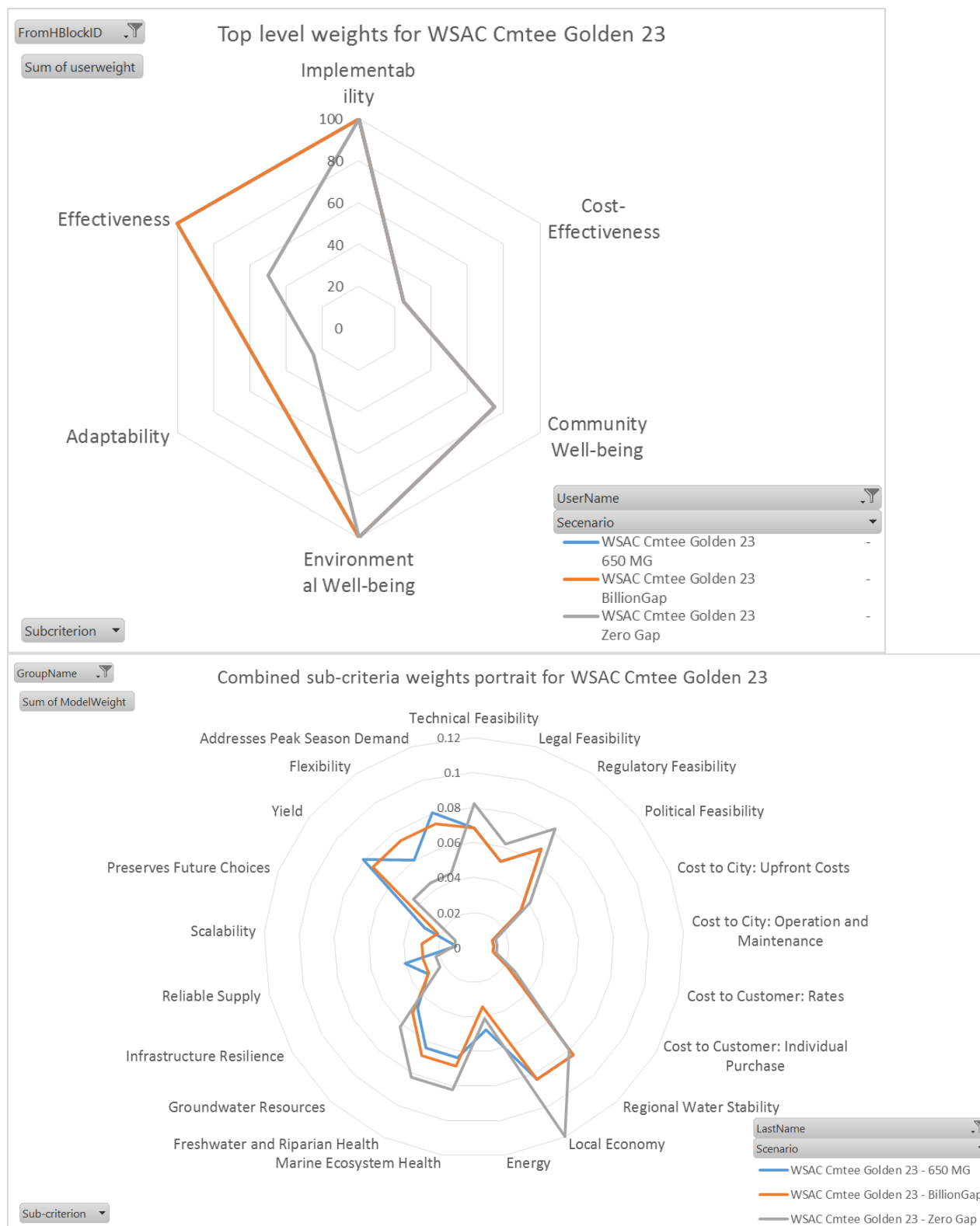




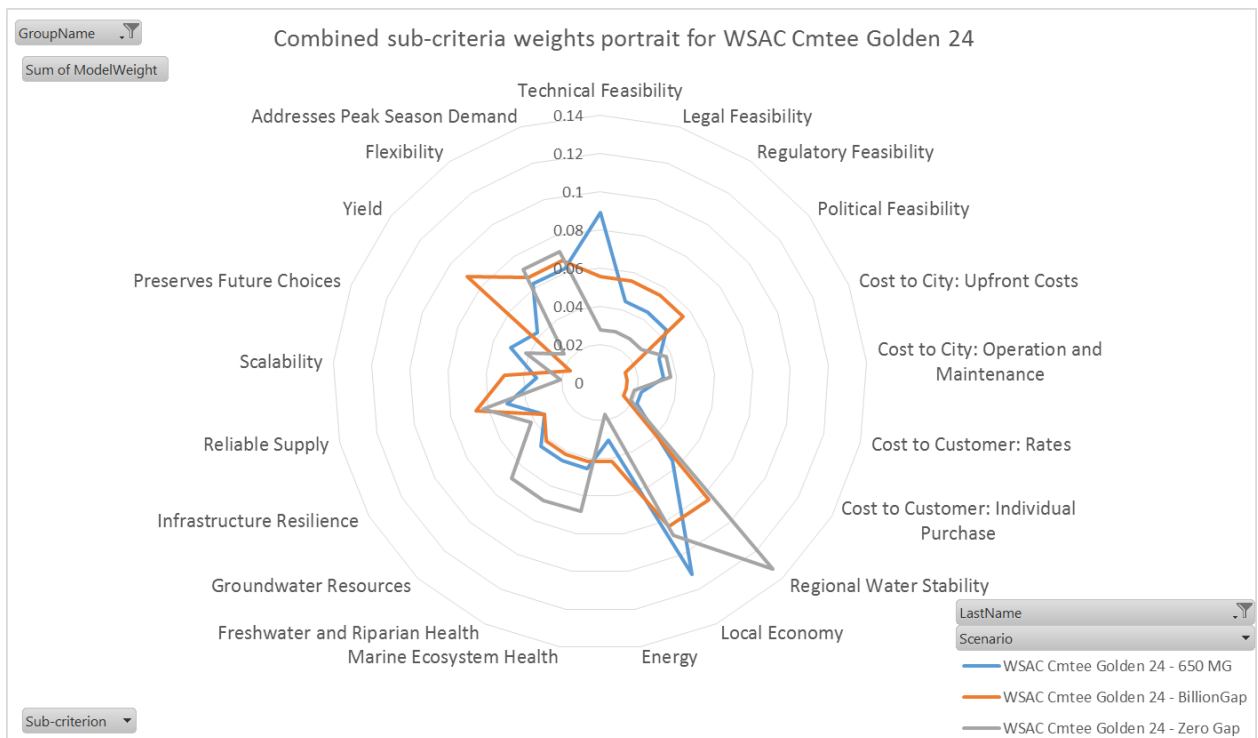
## Cmtee Member 22



Cmtee Member 23



# Cmtee Member 24



# Cmtee Member 25



## Appendix A: Base Numbers

### General

Unless specifically noted, all graphs and tables reflect data from all 14 Cmtee members based on 14 unique "Golden" tokens, and only those 14 unique tokens.

### Change Activity

When a Cmtee member changes a weight or ratings to a value other than the default (weights or Political/legal Feasibility) or City ratings, I detect that and call it a change.

Definition: % change of weights or ratings is the ratio of the weights or ratings members changed divided by all the weights or ratings that were there to change.

#### Weights to change:

Editable weights in 1 model =  $6 + 4 + 4 + 2 + 4 + 4 + 3 = 27$

Number of Cmtee Members = 14

Number of Scenarios = 3

Total number of weights that could be changed =  $3 \times 14 \times 27 = 1,134$

Number of weights each member could change =  $3 \times 27 = 81$

#### Ratings to change:

Number of Proposals = 12

Number of Sub-criteria = 21

Editable Ratings in 1 model =  $12 \times 21 = 252$

Totals Ratings that could be changed =  $3 \times 14 \times 252 = 10,584$  (!)

Number of Ratings each member could change =  $3 \times 252 = 756$

**Important to note:** if a member happens to agree with the default or city ratings, or default weight value, so doesn't enter a different value, it won't be recorded as a change. So if we see a detected % change at 80-90%, that likely indicates a completely rated/weighted set.

# Uncertainty Postage Stamps

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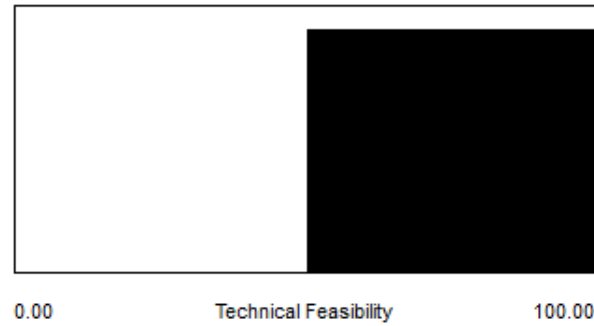
In this document, please find graphics of uncertainty for those ratings that had uncertainty associated. The numeric scales are self-evident. For the 5-point verbal scales, if a triangle shape leaned over by one point, that means “there is a better than 1:19 chance that this is actually the correct answer, but we still think the top of the triangle shows the most likely correct answer.” *Better than 1 in 19* is very hard to conceptualize—I think you will find it is hard to think about such long odds. But it is a worthwhile exercise, as we can think of lots of historic events where something with similar odds turned out, in fact, to be true.

If the graphic shows a box instead of a triangle (a uniform distribution) that means “heck, it could be a 2 or a 3 or a 4—I just can’t say.”

We refer to these as postage stamps because they are grainy small graphics. But still, pictures that tell a lot of words...

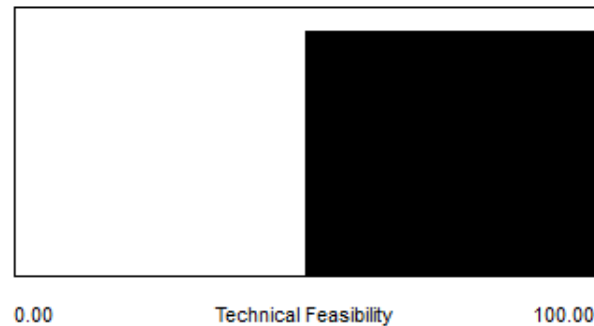
**Uncertainty in: Technical Feasibility  
For: WaterSmart**

Uniform distribution with parameters:  
Minimum: 50.09 Technical Feasibility  
Maximum: 100.00 Technical Feasibility



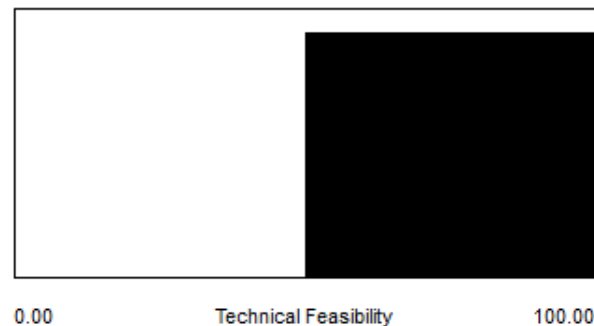
**Uncertainty in: Technical Feasibility  
For: Landscaping, Capture, Reuse**

Uniform distribution with parameters:  
Minimum: 50.00 Technical Feasibility  
Maximum: 100.00 Technical Feasibility



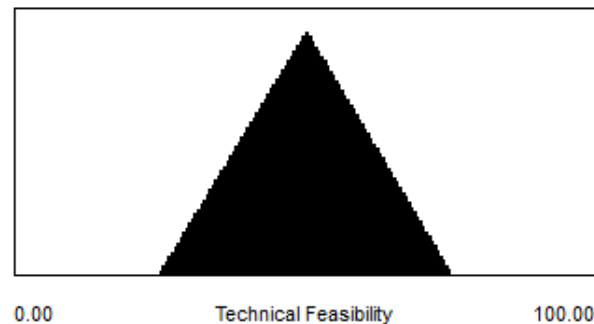
**Uncertainty in: Technical Feasibility  
For: Water Neutral Development**

Uniform distribution with parameters:  
Minimum: 50.00 Technical Feasibility  
Maximum: 100.00 Technical Feasibility



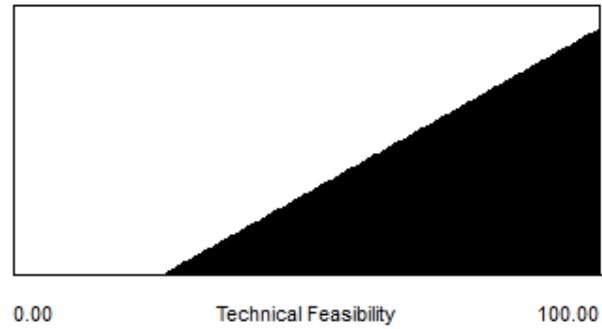
**Uncertainty in: Technical Feasibility  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 24.54 Technical Feasibility  
Likeliest: 50.00 Technical Feasibility  
Maximum: 75.07 Technical Feasibility



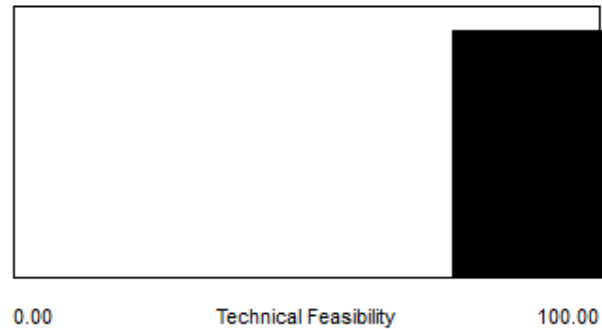
**Uncertainty in: Technical Feasibility  
For: The Loquifer Alternative**

Triangular distribution with parameters:  
Minimum: 25.00 Technical Feasibility  
Likeliest: 100.00 Technical Feasibility  
Maximum: 100.00 Technical Feasibility



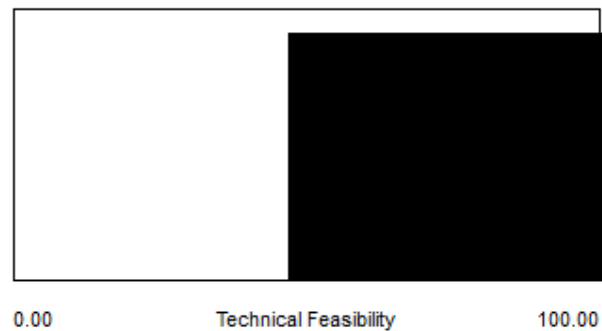
**Uncertainty in: Technical Feasibility  
For: Reuse for Agriculture**

Uniform distribution with parameters:  
Minimum: 75.00 Technical Feasibility  
Maximum: 100.00 Technical Feasibility



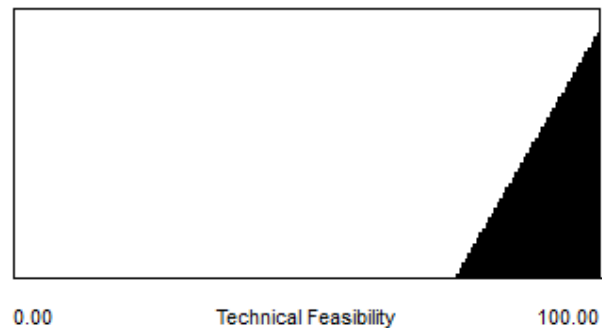
**Uncertainty in: Technical Feasibility  
For: Water Reuse (Potable)**

Uniform distribution with parameters:  
Minimum: 46.89 Technical Feasibility  
Maximum: 100.00 Technical Feasibility



**Uncertainty in: Technical Feasibility  
For: Desal RO**

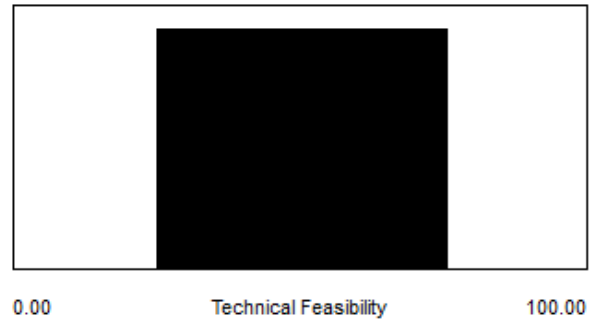
Triangular distribution with parameters:  
Minimum: 75.00 Technical Feasibility  
Likeliest: 100.00 Technical Feasibility  
Maximum: 100.00 Technical Feasibility





**Uncertainty in: Technical Feasibility  
For: Desal FO**

Uniform distribution with parameters:  
Minimum: 25.00 Technical Feasibility  
Maximum: 75.00 Technical Feasibility



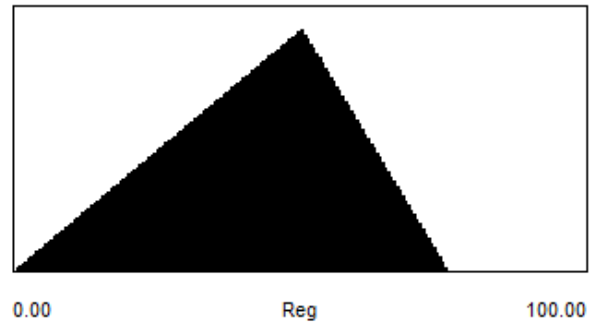
**Uncertainty in: Regulatory Feasibility  
For: Landscaping, Capture, Reuse**

Triangular distribution with parameters:  
Minimum: 75.46 Reg  
Likeliest: 100.00 Reg  
Maximum: 100.00 Reg



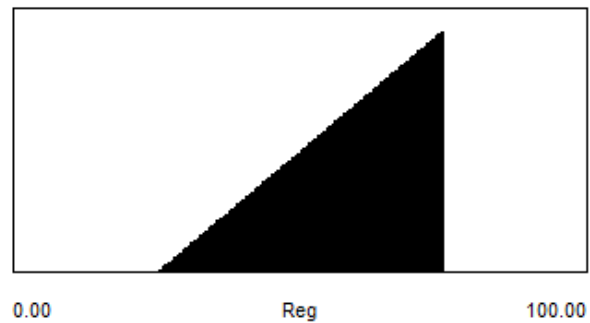
**Uncertainty in: Regulatory Feasibility  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 0.00 Reg  
Likeliest: 50.00 Reg  
Maximum: 75.43 Reg



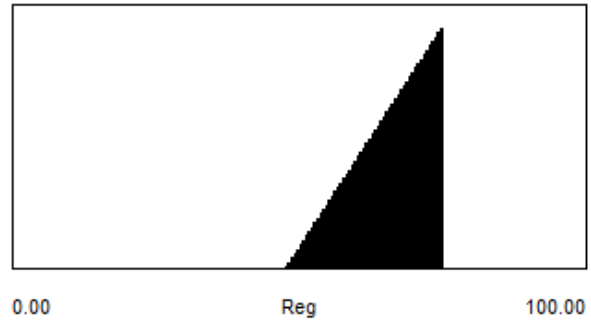
**Uncertainty in: Regulatory Feasibility  
For: The Loquifer Alternative**

Triangular distribution with parameters:  
Minimum: 24.91 Reg  
Likeliest: 74.68 Reg  
Maximum: 74.68 Reg



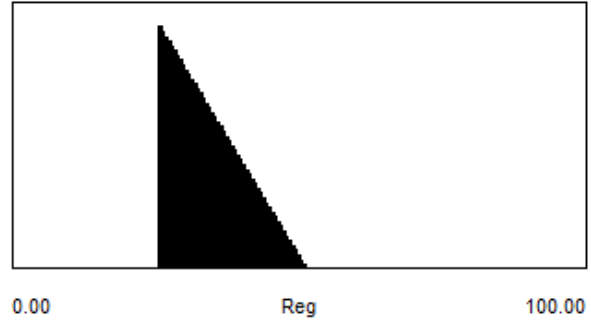
**Uncertainty in: Regulatory Feasibility  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 47.25 Reg  
Likeliest: 75.00 Reg  
Maximum: 75.00 Reg



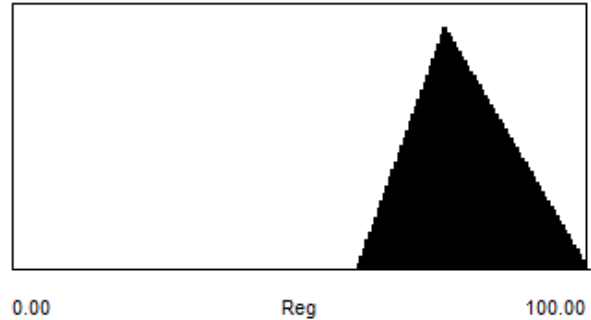
**Uncertainty in: Regulatory Feasibility  
For: Reuse for Agriculture**

Triangular distribution with parameters:  
Minimum: 25.00 Reg  
Likeliest: 25.00 Reg  
Maximum: 50.89 Reg



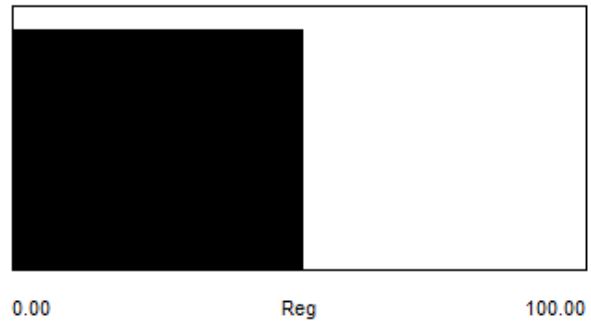
**Uncertainty in: Regulatory Feasibility  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 59.71 Reg  
Likeliest: 75.00 Reg  
Maximum: 100.00 Reg



**Uncertainty in: Regulatory Feasibility  
For: Water Reuse (Potable)**

Uniform distribution with parameters:  
Minimum: 0.00 Reg  
Maximum: 50.00 Reg



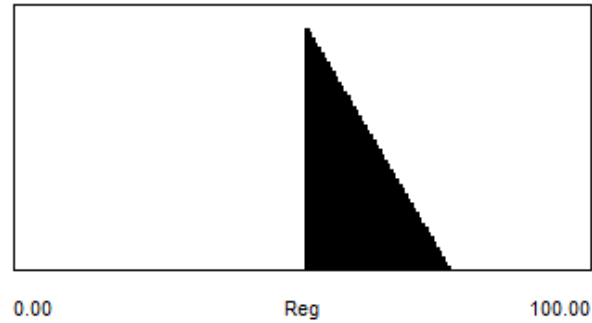
**Uncertainty in: Regulatory Feasibility  
For: Desal RO**

Triangular distribution with parameters:

Minimum: 50.00 Reg

Likeliest: 50.00 Reg

Maximum: 75.43 Reg



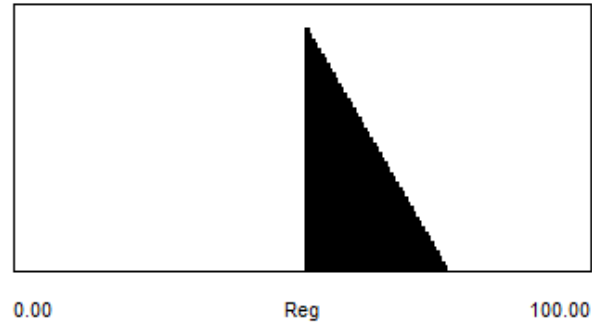
**Uncertainty in: Regulatory Feasibility  
For: Desal FO**

Triangular distribution with parameters:

Minimum: 50.00 Reg

Likeliest: 50.00 Reg

Maximum: 75.00 Reg



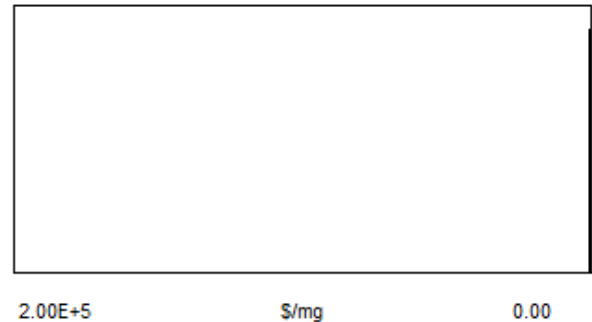
**Uncertainty in: Cost to City: Upfront Costs  
For: WaterSmart**

Triangular distribution with parameters:

Minimum: 38.00 \$/mg

Likeliest: 19.00 \$/mg

Maximum: 19.00 \$/mg



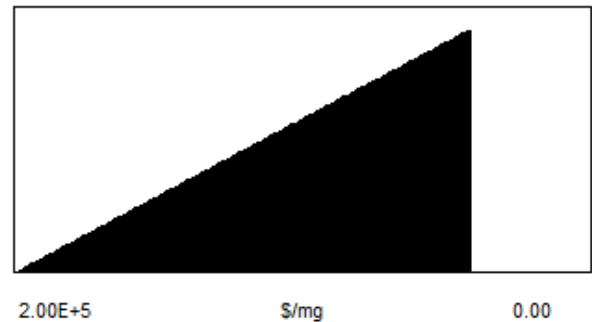
**Uncertainty in: Cost to City: Upfront Costs  
For: Landscaping, Capture, Reuse**

Triangular distribution with parameters:

Minimum: 200000.00 \$/mg

Likeliest: 43000.00 \$/mg

Maximum: 42539.68 \$/mg



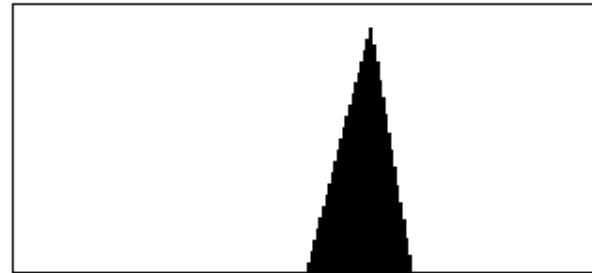
**Uncertainty in: Cost to City: Upfront Costs  
For: North Coast Water**

Triangular distribution with parameters:

Minimum: 100000.00 \$/mg

Likeliest: 78000.00 \$/mg

Maximum: 64000.00 \$/mg



2.00E+5 \$/mg 0.00

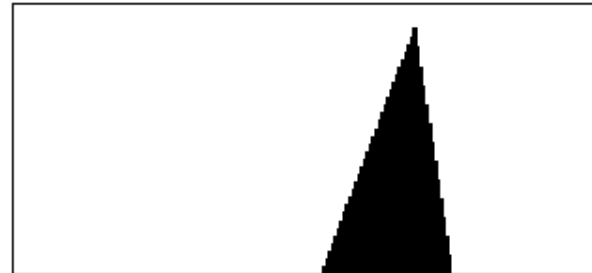
**Uncertainty in: Cost to City: Upfront Costs  
For: The Loquifer Alternative**

Triangular distribution with parameters:

Minimum: 95000.00 \$/mg

Likeliest: 63000.00 \$/mg

Maximum: 50000.00 \$/mg



2.00E+5 \$/mg 0.00

**Uncertainty in: Cost to City: Upfront Costs  
For: Reuse for Agriculture**

Triangular distribution with parameters:

Minimum: 170000.00 \$/mg

Likeliest: 115000.00 \$/mg

Maximum: 90000.00 \$/mg



2.00E+5 \$/mg 0.00

**Uncertainty in: Cost to City: Upfront Costs  
For: Aquifer Restoration**

Triangular distribution with parameters:

Minimum: 150000.00 \$/mg

Likeliest: 105000.00 \$/mg

Maximum: 65000.00 \$/mg



2.00E+5 \$/mg 0.00

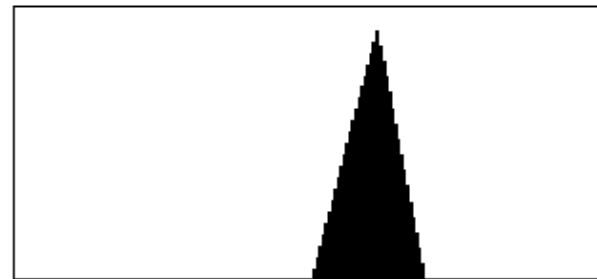
**Uncertainty in: Cost to City: Upfront Costs  
For: Water Reuse (Potable)**

Triangular distribution with parameters:

Minimum: 100000.00 \$/mg

Likeliest: 78000.00 \$/mg

Maximum: 62000.00 \$/mg



2.00E+5 \$/mg 0.00

**Uncertainty in: Cost to City: Upfront Costs  
For: Desal FO**

Triangular distribution with parameters:

Minimum: 100000.00 \$/mg

Likeliest: 78000.00 \$/mg

Maximum: 62000.00 \$/mg



2.00E+5 \$/mg 0.00

**Uncertainty in: Cost to City: Operation and Maintenance  
For: Landscaping, Capture, Reuse**

Triangular distribution with parameters:

Minimum: 150000.00 O & M \$/yr

Likeliest: 100000.00 O & M \$/yr

Maximum: 100000.00 O & M \$/yr



2.00E+6 O & M \$/yr 1.00E+5

**Uncertainty in: Cost to City: Operation and Maintenance  
For: Water Neutral Development**

Triangular distribution with parameters:

Minimum: 150000.00 O & M \$/yr

Likeliest: 100000.00 O & M \$/yr

Maximum: 100000.00 O & M \$/yr



2.00E+6 O & M \$/yr 1.00E+5

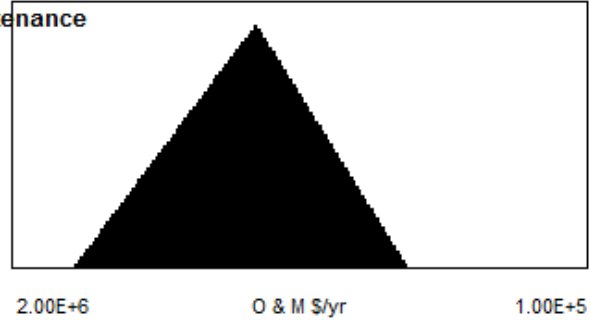
**Uncertainty in: Cost to City: Operation and Maintenance  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 2000000.00 O & M \$/yr  
Likeliest: 1500000.00 O & M \$/yr  
Maximum: 1053944.00 O & M \$/yr



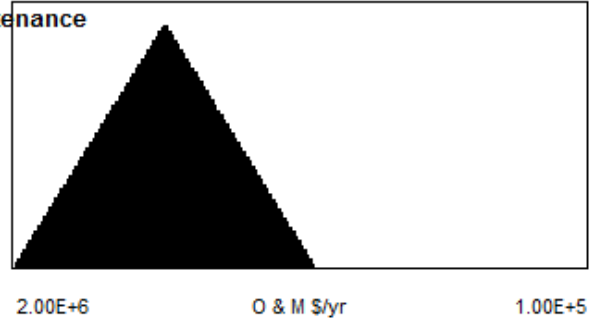
**Uncertainty in: Cost to City: Operation and Maintenance  
For: The Loquifer Alternative**

Triangular distribution with parameters:  
Minimum: 1800000.00 O & M \$/yr  
Likeliest: 1200000.00 O & M \$/yr  
Maximum: 700000.00 O & M \$/yr



**Uncertainty in: Cost to City: Operation and Maintenance  
For: Expanded Treatment Capacity**

Triangular distribution with parameters:  
Minimum: 2000000.00 O & M \$/yr  
Likeliest: 1500000.00 O & M \$/yr  
Maximum: 1005226.00 O & M \$/yr



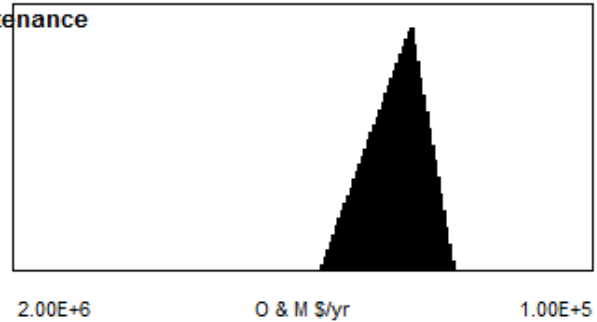
**Uncertainty in: Cost to City: Operation and Maintenance  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 1300000.00 O & M \$/yr  
Likeliest: 850000.00 O & M \$/yr  
Maximum: 601562.90 O & M \$/yr



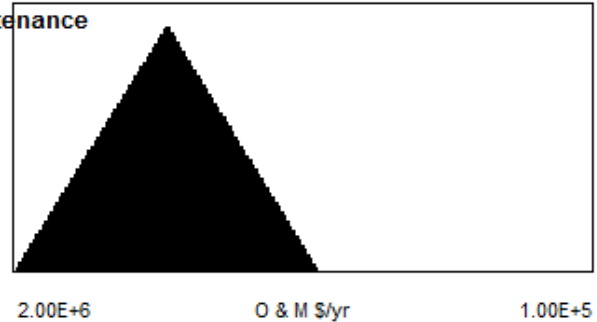
**Uncertainty in: Cost to City: Operation and Maintenance  
For: Reuse for Agriculture**

Triangular distribution with parameters:  
Minimum: 1000000.00 O & M \$/yr  
Likeliest: 700000.00 O & M \$/yr  
Maximum: 560000.00 O & M \$/yr



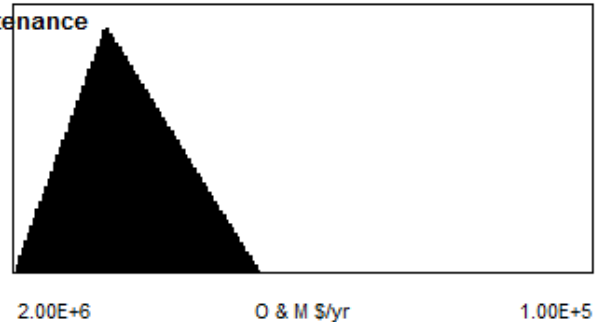
**Uncertainty in: Cost to City: Operation and Maintenance  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 2000000.00 O & M \$/yr  
Likeliest: 1500000.00 O & M \$/yr  
Maximum: 1005226.00 O & M \$/yr



**Uncertainty in: Cost to City: Operation and Maintenance  
For: Water Reuse (Potable)**

Triangular distribution with parameters:  
Minimum: 2000000.00 O & M \$/yr  
Likeliest: 1700000.00 O & M \$/yr  
Maximum: 1199170.00 O & M \$/yr



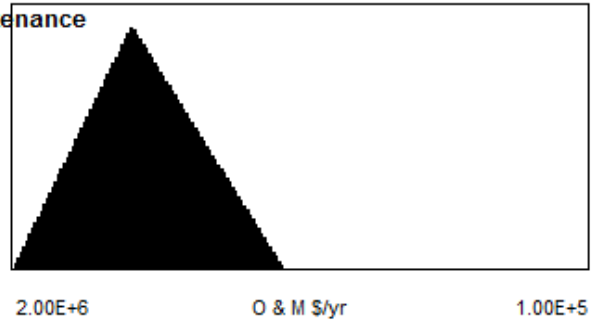
**Uncertainty in: Cost to City: Operation and Maintenance  
For: Desal RO**

Triangular distribution with parameters:  
Minimum: 2000000.00 O & M \$/yr  
Likeliest: 2000000.00 O & M \$/yr  
Maximum: 1610720.00 O & M \$/yr



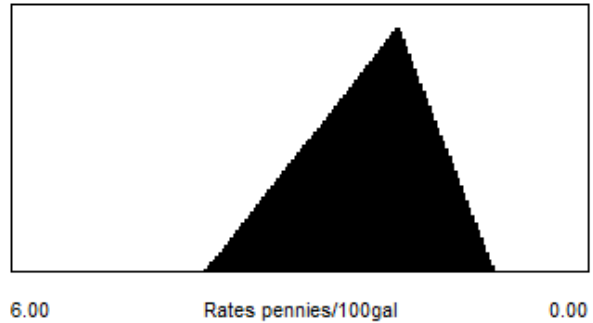
**Uncertainty in: Cost to City: Operation and Maintenance  
For: Desal FO**

Triangular distribution with parameters:  
Minimum: 2000000.00 O & M \$/yr  
Likeliest: 1608865.00 O & M \$/yr  
Maximum: 1108230.00 O & M \$/yr



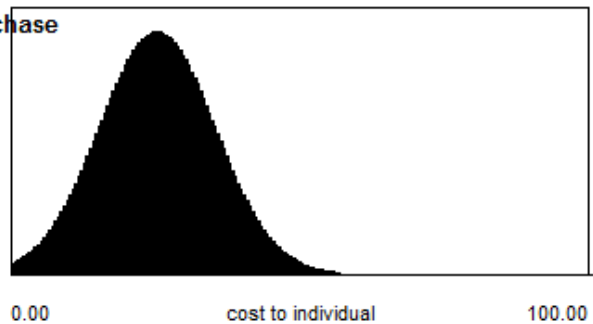
**Uncertainty in: Cost to Customer: Rates  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 4.00 Rates pennies/100gal  
Likeliest: 2.00 Rates pennies/100gal  
Maximum: 1.00 Rates pennies/100gal



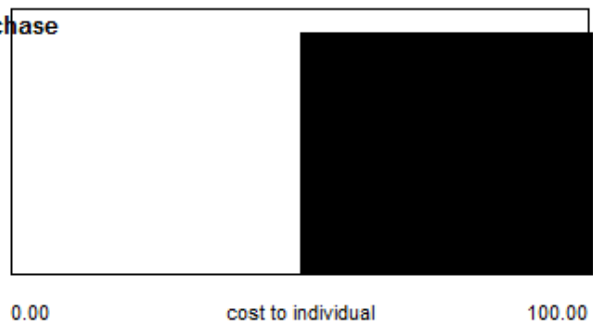
**Uncertainty in: Cost to Customer: Individual Purchase  
For: Landscaping, Capture, Reuse**

Normal distribution with parameters:  
Minimum: 0.00 cost to individual  
Likeliest: 25.00 cost to individual  
Maximum: 100.00 cost to individual  
Std. Deviation: 10.00 cost to individual



**Uncertainty in: Cost to Customer: Individual Purchase  
For: Water Neutral Development**

Uniform distribution with parameters:  
Minimum: 50.00 cost to individual  
Maximum: 100.00 cost to individual





**Uncertainty in: Local Economy  
For: WaterSmart**

Uniform distribution with parameters:  
Minimum: 0.00 Local Economy  
Maximum: 25.62 Local Economy



**Uncertainty in: Local Economy  
For: Landscaping, Capture, Reuse**

Uniform distribution with parameters:  
Minimum: 0.00 Local Economy  
Maximum: 39.90 Local Economy



**Uncertainty in: Local Economy  
For: North Coast Water**

Uniform distribution with parameters:  
Minimum: 27.84 Local Economy  
Maximum: 100.00 Local Economy



**Uncertainty in: Local Economy  
For: The Loquifer Alternative**

Uniform distribution with parameters:  
Minimum: 26.74 Local Economy  
Maximum: 100.00 Local Economy



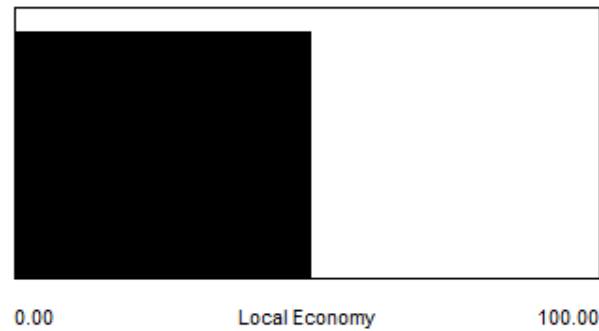
**Uncertainty in: Local Economy  
For: Ranney Collectors on SLR**

Uniform distribution with parameters:  
Minimum: 25.64 Local Economy  
Maximum: 87.89 Local Economy



**Uncertainty in: Local Economy  
For: Aquifer Restoration**

Uniform distribution with parameters:  
Minimum: 0.00 Local Economy  
Maximum: 50.00 Local Economy



**Uncertainty in: Local Economy  
For: Water Reuse (Potable)**

Uniform distribution with parameters:  
Minimum: 25.64 Local Economy  
Maximum: 100.00 Local Economy



**Uncertainty in: Local Economy  
For: Desal RO**

Uniform distribution with parameters:  
Minimum: 25.27 Local Economy  
Maximum: 100.00 Local Economy



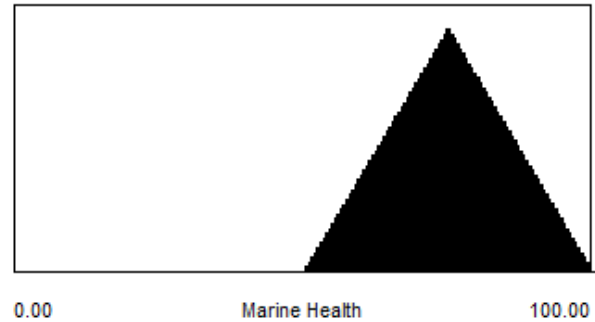
**Uncertainty in: Local Economy  
For: Desal FO**

Uniform distribution with parameters:  
Minimum: 25.64 Local Economy  
Maximum: 100.00 Local Economy



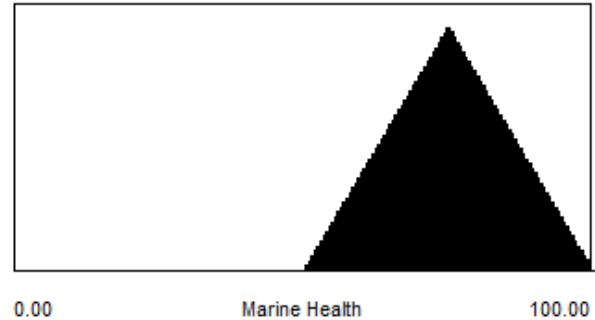
**Uncertainty in: Marine Ecosystem Health  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 50.00 Marine Health  
Likeliest: 75.02 Marine Health  
Maximum: 100.00 Marine Health



**Uncertainty in: Marine Ecosystem Health  
For: The Loquifer Alternative**

Triangular distribution with parameters:  
Minimum: 50.00 Marine Health  
Likeliest: 75.02 Marine Health  
Maximum: 100.00 Marine Health



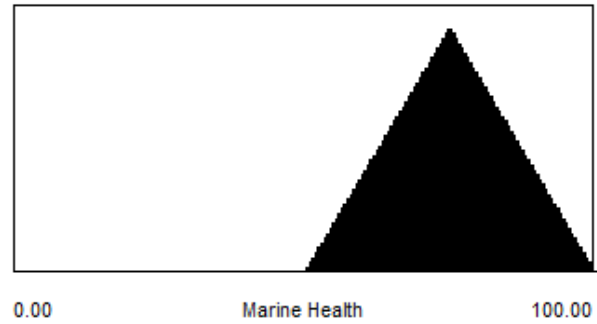
**Uncertainty in: Marine Ecosystem Health  
For: Expanded Treatment Capacity**

Triangular distribution with parameters:  
Minimum: 50.00 Marine Health  
Likeliest: 74.46 Marine Health  
Maximum: 100.00 Marine Health



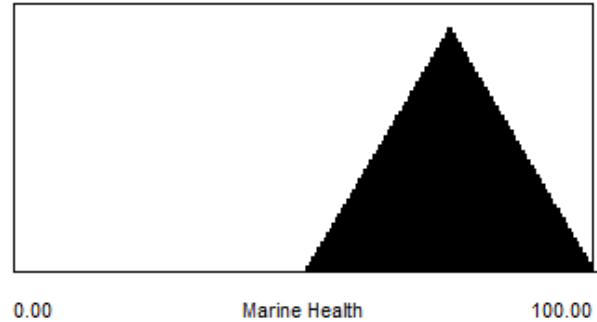
**Uncertainty in: Marine Ecosystem Health  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 50.00 Marine Health  
Likeliest: 75.00 Marine Health  
Maximum: 100.00 Marine Health



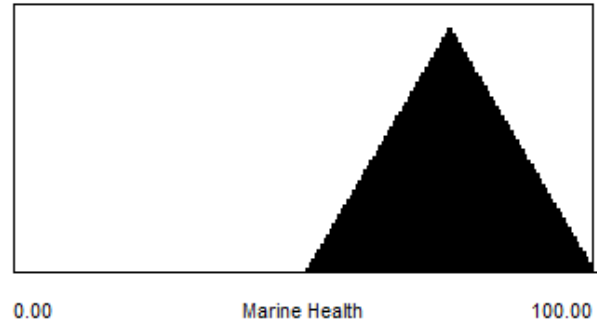
**Uncertainty in: Marine Ecosystem Health  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 50.00 Marine Health  
Likeliest: 75.00 Marine Health  
Maximum: 100.00 Marine Health



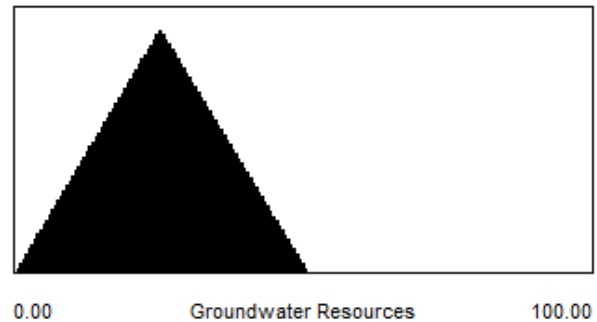
**Uncertainty in: Marine Ecosystem Health  
For: Water Reuse (Potable)**

Triangular distribution with parameters:  
Minimum: 50.18 Marine Health  
Likeliest: 75.00 Marine Health  
Maximum: 100.00 Marine Health



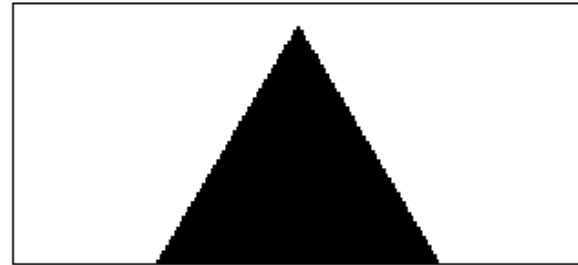
**Uncertainty in: Groundwater Resources  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 0.00 Groundwater Resources  
Likeliest: 25.00 Groundwater Resources  
Maximum: 50.53 Groundwater Resources



**Uncertainty in: Groundwater Resources  
For: Expanded Treatment Capacity**

Triangular distribution with parameters:  
Minimum: 25.00 Groundwater Resources  
Likeliest: 50.00 Groundwater Resources  
Maximum: 75.00 Groundwater Resources



0.00 Groundwater Resources 100.00

**Uncertainty in: Groundwater Resources  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 25.00 Groundwater Resources  
Likeliest: 50.00 Groundwater Resources  
Maximum: 75.00 Groundwater Resources



0.00 Groundwater Resources 100.00

**Uncertainty in: Infrastructure Resilience  
For: Aquifer Restoration**

Uniform distribution with parameters:  
Minimum: 60.46 Infrastructure Resilience  
Maximum: 100.00 Infrastructure Resilience



0.00 Infrastructure Resilience 100.00

**Uncertainty in: Infrastructure Resilience  
For: Water Reuse (Potable)**

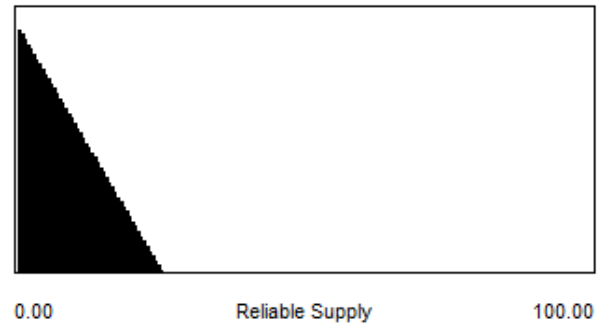
Triangular distribution with parameters:  
Minimum: 52.01 Infrastructure Resilience  
Likeliest: 83.33 Infrastructure Resilience  
Maximum: 100.00 Infrastructure Resilience



0.00 Infrastructure Resilience 100.00

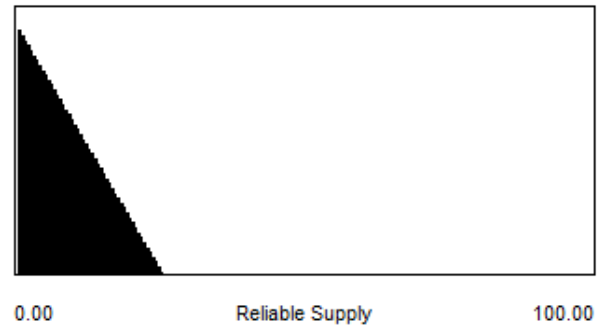
**Uncertainty in: Reliable Supply  
For: WaterSmart**

Triangular distribution with parameters:  
Minimum: 0.00 Reliable Supply  
Likeliest: 0.00 Reliable Supply  
Maximum: 25.25 Reliable Supply



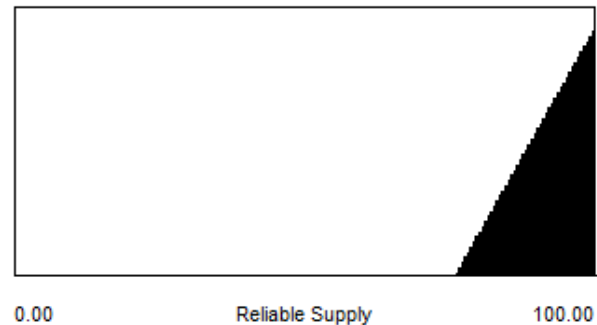
**Uncertainty in: Reliable Supply  
For: Landscaping, Capture, Reuse**

Triangular distribution with parameters:  
Minimum: 0.00 Reliable Supply  
Likeliest: 0.00 Reliable Supply  
Maximum: 25.25 Reliable Supply



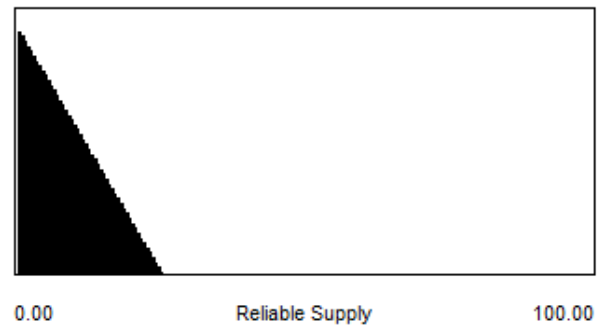
**Uncertainty in: Reliable Supply  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 75.82 Reliable Supply  
Likeliest: 100.00 Reliable Supply  
Maximum: 100.00 Reliable Supply



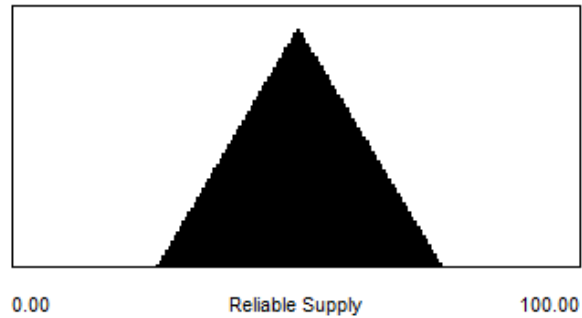
**Uncertainty in: Reliable Supply  
For: The Loquifer Alternative**

Triangular distribution with parameters:  
Minimum: 0.00 Reliable Supply  
Likeliest: 0.00 Reliable Supply  
Maximum: 25.25 Reliable Supply



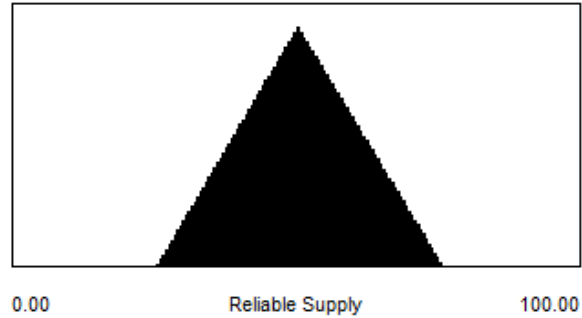
**Uncertainty in: Reliable Supply  
For: Expanded Treatment Capacity**

Triangular distribution with parameters:  
Minimum: 25.27 Reliable Supply  
Likeliest: 50.00 Reliable Supply  
Maximum: 75.43 Reliable Supply



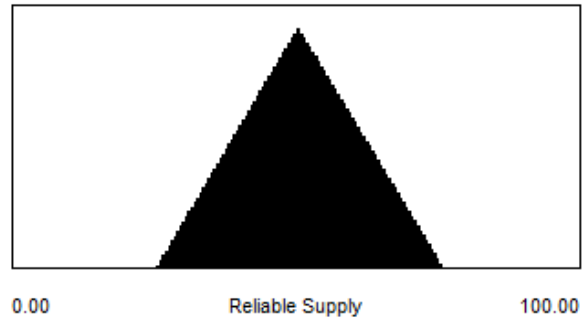
**Uncertainty in: Reliable Supply  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 25.27 Reliable Supply  
Likeliest: 50.00 Reliable Supply  
Maximum: 75.43 Reliable Supply



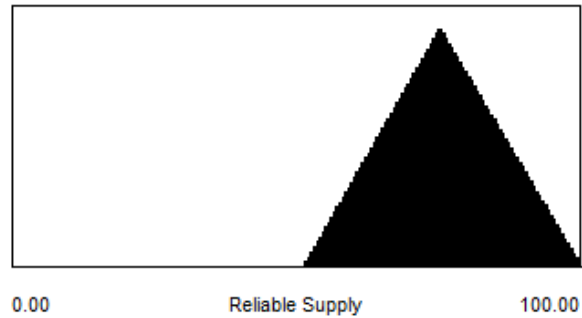
**Uncertainty in: Reliable Supply  
For: Reuse for Agriculture**

Triangular distribution with parameters:  
Minimum: 25.27 Reliable Supply  
Likeliest: 50.00 Reliable Supply  
Maximum: 75.43 Reliable Supply



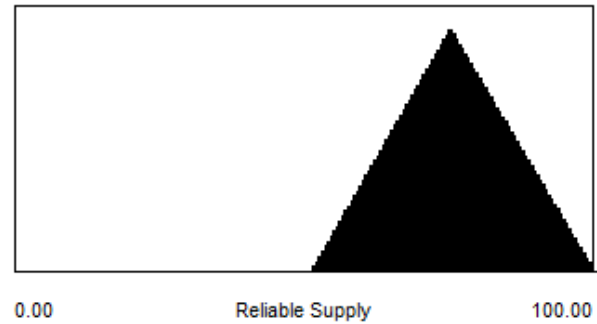
**Uncertainty in: Reliable Supply  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 50.92 Reliable Supply  
Likeliest: 75.00 Reliable Supply  
Maximum: 100.00 Reliable Supply



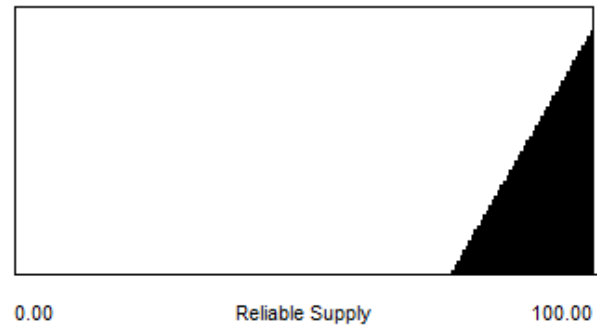
**Uncertainty in: Reliable Supply  
For: Water Reuse (Potable)**

Triangular distribution with parameters:  
Minimum: 50.92 Reliable Supply  
Likeliest: 75.00 Reliable Supply  
Maximum: 100.00 Reliable Supply



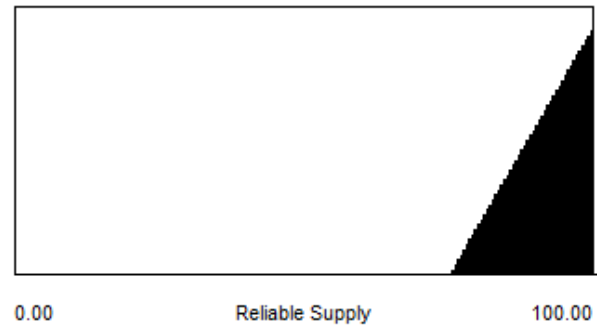
**Uncertainty in: Reliable Supply  
For: Desal RO**

Triangular distribution with parameters:  
Minimum: 75.09 Reliable Supply  
Likeliest: 100.00 Reliable Supply  
Maximum: 100.00 Reliable Supply



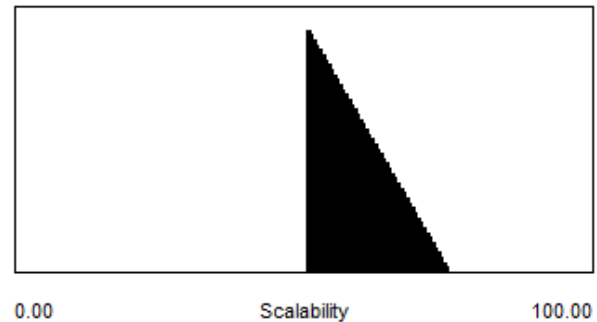
**Uncertainty in: Reliable Supply  
For: Desal FO**

Triangular distribution with parameters:  
Minimum: 75.09 Reliable Supply  
Likeliest: 100.00 Reliable Supply  
Maximum: 100.00 Reliable Supply



**Uncertainty in: Scalability  
For: The Loquifer Alternative**

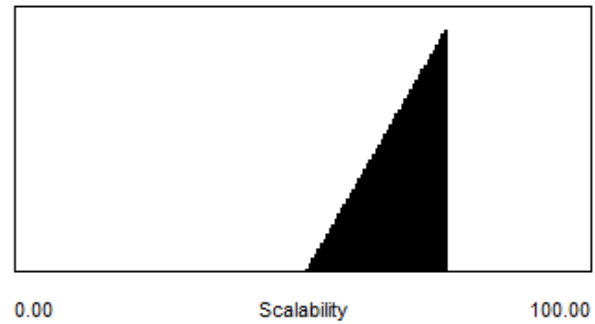
Triangular distribution with parameters:  
Minimum: 50.00 Scalability  
Likeliest: 50.00 Scalability  
Maximum: 75.07 Scalability





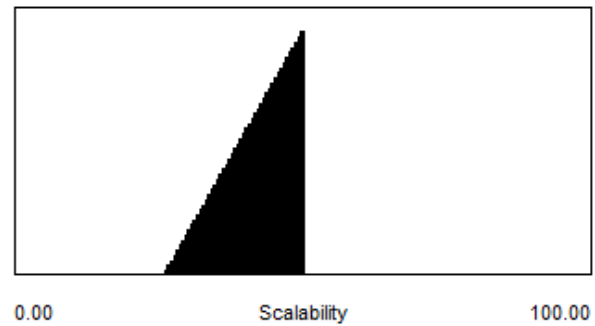
**Uncertainty in: Scalability  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 50.18 Scalability  
Likeliest: 75.00 Scalability  
Maximum: 75.00 Scalability



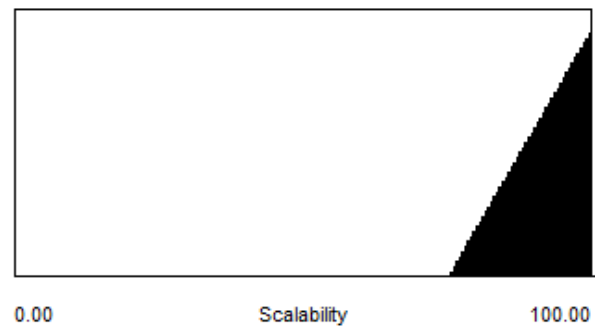
**Uncertainty in: Scalability  
For: Reuse for Agriculture**

Triangular distribution with parameters:  
Minimum: 25.64 Scalability  
Likeliest: 50.00 Scalability  
Maximum: 50.00 Scalability



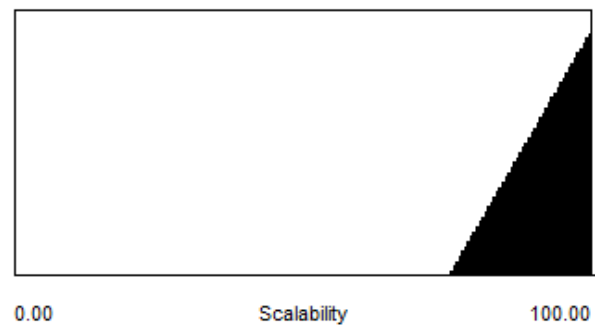
**Uncertainty in: Scalability  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 75.09 Scalability  
Likeliest: 100.00 Scalability  
Maximum: 100.00 Scalability



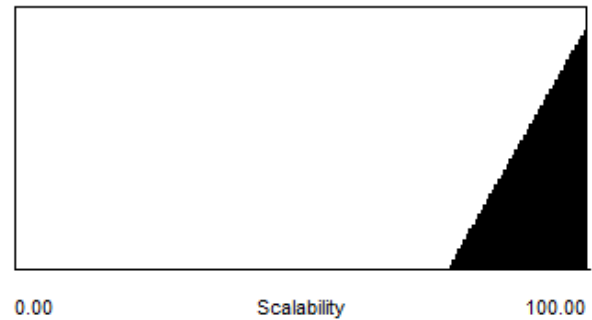
**Uncertainty in: Scalability  
For: Water Reuse (Potable)**

Triangular distribution with parameters:  
Minimum: 75.09 Scalability  
Likeliest: 100.00 Scalability  
Maximum: 100.00 Scalability



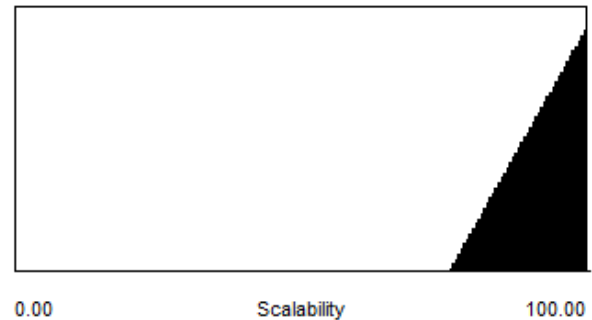
**Uncertainty in: Scalability  
For: Desal RO**

Triangular distribution with parameters:  
Minimum: 75.46 Scalability  
Likeliest: 100.00 Scalability  
Maximum: 100.00 Scalability



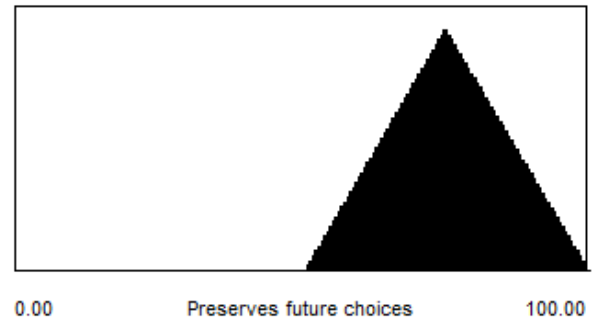
**Uncertainty in: Scalability  
For: Desal FO**

Triangular distribution with parameters:  
Minimum: 75.82 Scalability  
Likeliest: 100.00 Scalability  
Maximum: 100.00 Scalability



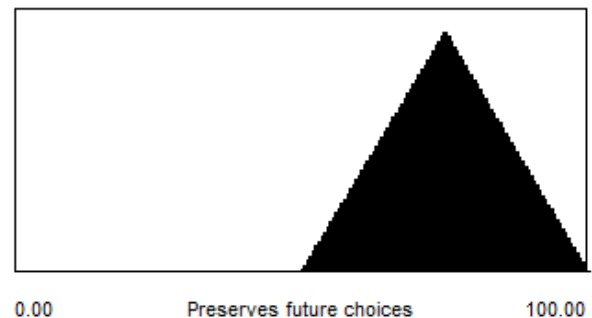
**Uncertainty in: Preserves Future Choices  
For: Landscaping, Capture, Reuse**

Triangular distribution with parameters:  
Minimum: 50.55 Preserves future choices  
Likeliest: 75.00 Preserves future choices  
Maximum: 100.00 Preserves future choices



**Uncertainty in: Preserves Future Choices  
For: Water Neutral Development**

Triangular distribution with parameters:  
Minimum: 49.82 Preserves future choices  
Likeliest: 75.00 Preserves future choices  
Maximum: 100.00 Preserves future choices



**Uncertainty in: Preserves Future Choices  
For: North Coast Water**

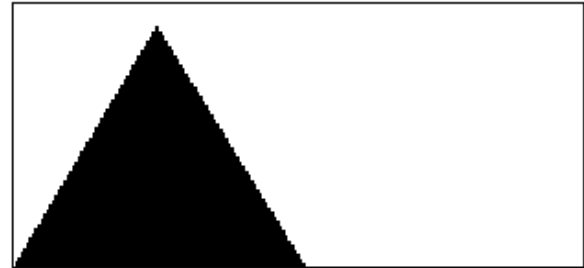
Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 0.00 Preserves future choices  
Maximum: 25.25 Preserves future choices



0.00 Preserves future choices 100.00

**Uncertainty in: Preserves Future Choices  
For: Expanded Treatment Capacity**

Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 25.00 Preserves future choices  
Maximum: 50.89 Preserves future choices



0.00 Preserves future choices 100.00

**Uncertainty in: Preserves Future Choices  
For: Ranney Collectors on SLR**

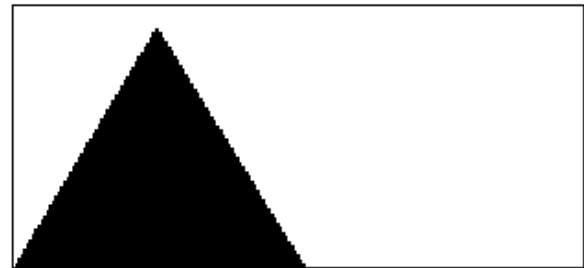
Triangular distribution with parameters:  
Minimum: 75.46 Preserves future choices  
Likeliest: 100.00 Preserves future choices  
Maximum: 100.00 Preserves future choices



0.00 Preserves future choices 100.00

**Uncertainty in: Preserves Future Choices  
For: Reuse for Agriculture**

Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 25.00 Preserves future choices  
Maximum: 50.89 Preserves future choices



0.00 Preserves future choices 100.00

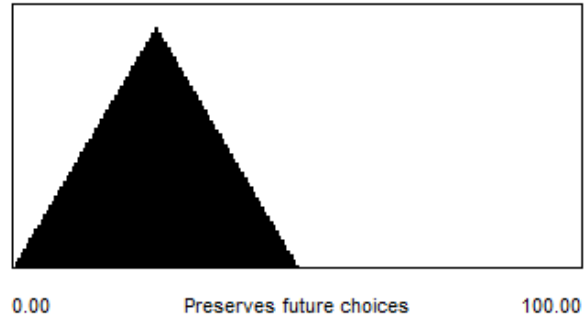
**Uncertainty in: Preserves Future Choices  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 25.00 Preserves future choices  
Maximum: 75.26 Preserves future choices



**Uncertainty in: Preserves Future Choices  
For: Water Reuse (Potable)**

Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 25.00 Preserves future choices  
Maximum: 49.79 Preserves future choices



**Uncertainty in: Preserves Future Choices  
For: Desal RO**

Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 0.00 Preserves future choices  
Maximum: 25.62 Preserves future choices



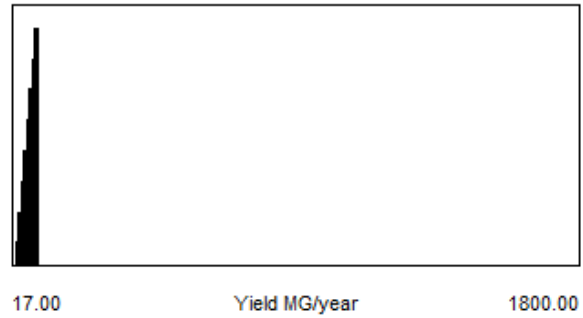
**Uncertainty in: Preserves Future Choices  
For: Desal FO**

Triangular distribution with parameters:  
Minimum: 0.00 Preserves future choices  
Likeliest: 0.00 Preserves future choices  
Maximum: 25.25 Preserves future choices



**Uncertainty in: Yield  
For: WaterSmart**

Triangular distribution with parameters:  
Minimum: 19.00 Yield MG/year  
Likeliest: 95.00 Yield MG/year  
Maximum: 95.00 Yield MG/year



**Uncertainty in: Yield  
For: Landscaping, Capture, Reuse**

Uniform distribution with parameters:  
Minimum: 57.00 Yield MG/year  
Maximum: 591.30 Yield MG/year



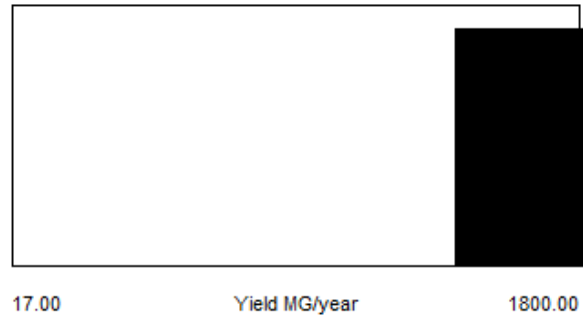
**Uncertainty in: Yield  
For: Water Neutral Development**

Uniform distribution with parameters:  
Minimum: 17.00 Yield MG/year  
Maximum: 20.00 Yield MG/year



**Uncertainty in: Yield  
For: North Coast Water**

Uniform distribution with parameters:  
Minimum: 1400.00 Yield MG/year  
Maximum: 1800.00 Yield MG/year



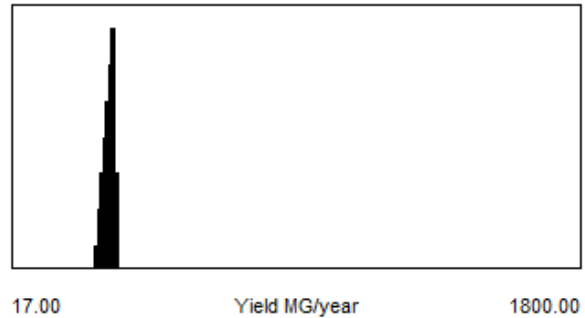
**Uncertainty in: Yield  
For: The Loquifer Alternative**

Uniform distribution with parameters:  
Minimum: 82.31 Yield MG/year  
Maximum: 960.00 Yield MG/year



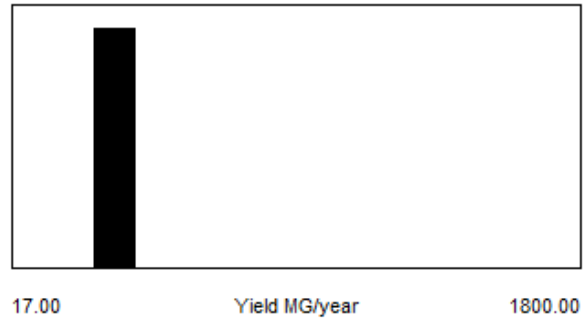
**Uncertainty in: Yield  
For: Expanded Treatment Capacity**

Triangular distribution with parameters:  
Minimum: 270.00 Yield MG/year  
Likeliest: 330.00 Yield MG/year  
Maximum: 343.12 Yield MG/year



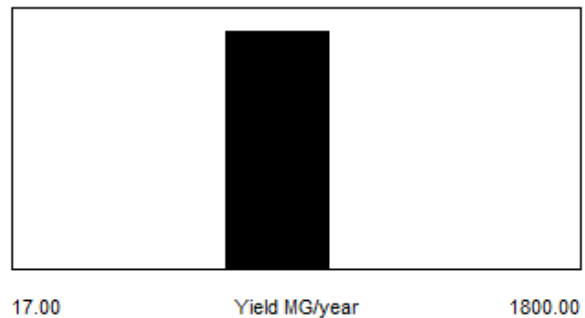
**Uncertainty in: Yield  
For: Ranney Collectors on SLR**

Uniform distribution with parameters:  
Minimum: 270.00 Yield MG/year  
Maximum: 400.00 Yield MG/year



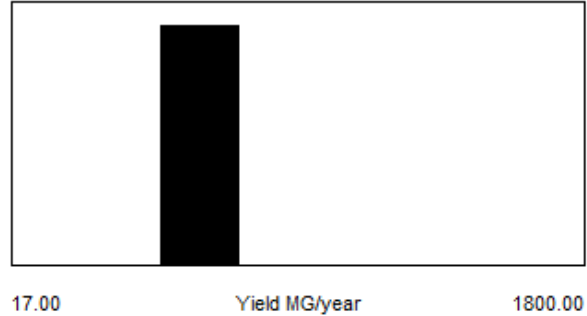
**Uncertainty in: Yield  
For: Reuse for Agriculture**

Uniform distribution with parameters:  
Minimum: 680.00 Yield MG/year  
Maximum: 1000.00 Yield MG/year



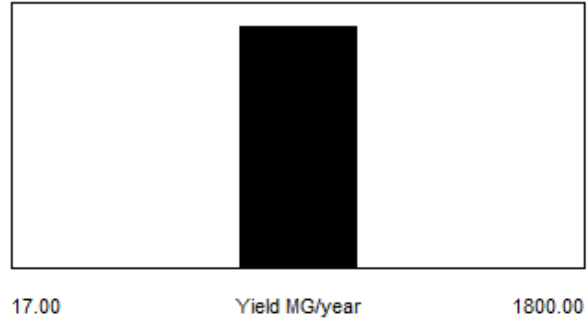
**Uncertainty in: Yield  
For: Aquifer Restoration**

Uniform distribution with parameters:  
Minimum: 480.00 Yield MG/year  
Maximum: 720.00 Yield MG/year



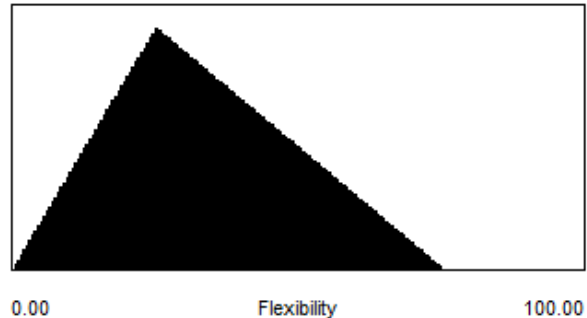
**Uncertainty in: Yield  
For: Water Reuse (Potable)**

Uniform distribution with parameters:  
Minimum: 730.00 Yield MG/year  
Maximum: 1080.00 Yield MG/year



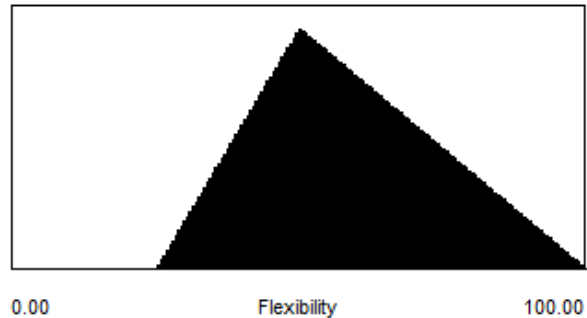
**Uncertainty in: Flexibility  
For: WaterSmart**

Triangular distribution with parameters:  
Minimum: 0.00 Flexibility  
Likeliest: 25.00 Flexibility  
Maximum: 75.00 Flexibility



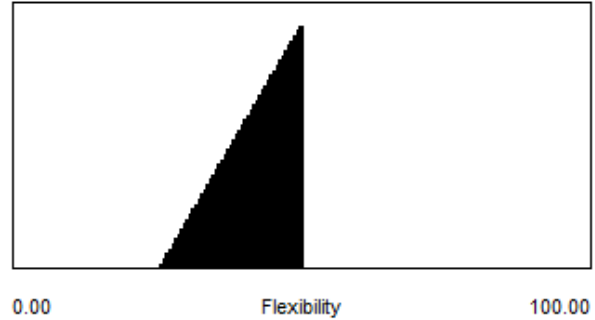
**Uncertainty in: Flexibility  
For: Landscaping, Capture, Reuse**

Triangular distribution with parameters:  
Minimum: 25.00 Flexibility  
Likeliest: 50.00 Flexibility  
Maximum: 100.00 Flexibility



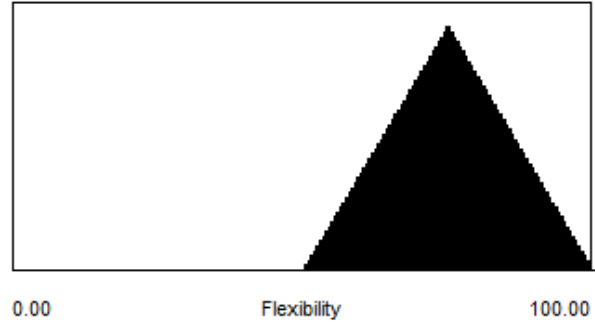
**Uncertainty in: Flexibility  
For: Water Neutral Development**

Triangular distribution with parameters:  
Minimum: 25.00 Flexibility  
Likeliest: 50.00 Flexibility  
Maximum: 50.00 Flexibility



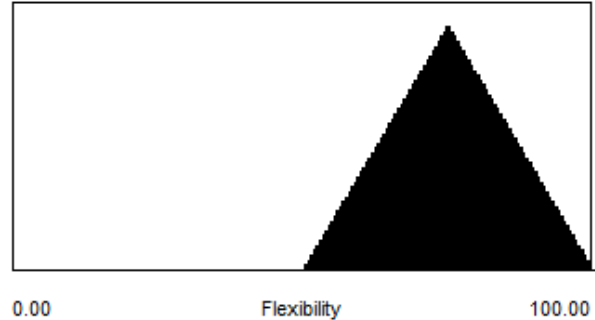
**Uncertainty in: Flexibility  
For: North Coast Water**

Triangular distribution with parameters:  
Minimum: 50.00 Flexibility  
Likeliest: 75.00 Flexibility  
Maximum: 100.00 Flexibility



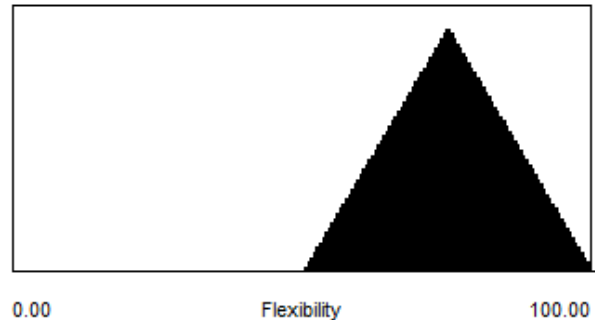
**Uncertainty in: Flexibility  
For: The Loquifer Alternative**

Triangular distribution with parameters:  
Minimum: 50.00 Flexibility  
Likeliest: 75.00 Flexibility  
Maximum: 100.00 Flexibility



**Uncertainty in: Flexibility  
For: Expanded Treatment Capacity**

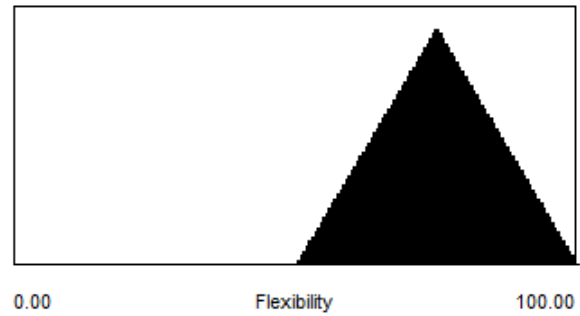
Triangular distribution with parameters:  
Minimum: 50.00 Flexibility  
Likeliest: 75.00 Flexibility  
Maximum: 100.00 Flexibility





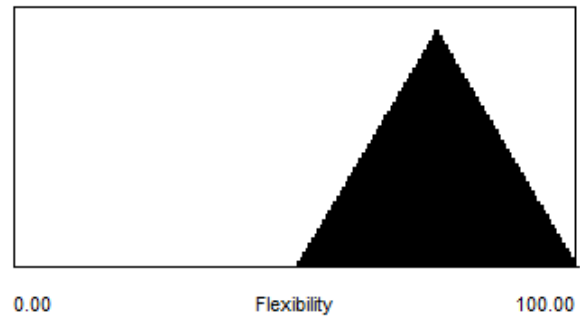
**Uncertainty in: Flexibility  
For: Ranney Collectors on SLR**

Triangular distribution with parameters:  
Minimum: 50.00 Flexibility  
Likeliest: 75.00 Flexibility  
Maximum: 100.00 Flexibility



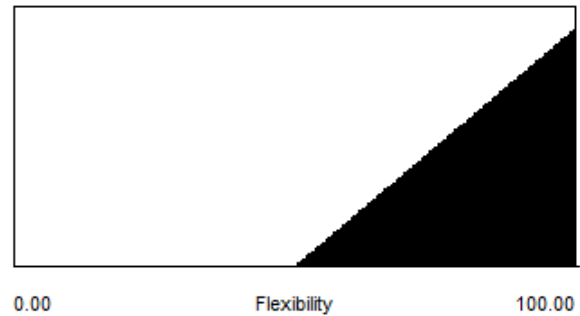
**Uncertainty in: Flexibility  
For: Reuse for Agriculture**

Triangular distribution with parameters:  
Minimum: 50.00 Flexibility  
Likeliest: 75.00 Flexibility  
Maximum: 100.00 Flexibility



**Uncertainty in: Flexibility  
For: Aquifer Restoration**

Triangular distribution with parameters:  
Minimum: 50.00 Flexibility  
Likeliest: 100.00 Flexibility  
Maximum: 100.00 Flexibility



THE END

## MODEL: 650 MG Gap

**Question:** How much does each high-level criterion matter to you when addressing a 650 MG shortfall?

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

### Implementability

**Notes:** The likelihood of getting this approach done.

**Question:** How much does each subcriterion matter to you and your constituents in evaluating how well an approach meets the requirements for Implementability?

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

### Technical Feasibility

**Notes:** Technical feasibility is an estimate of whether this approach would work as envisioned. For complex proposals, rated on the basis of core elements. When rating, City staff used the 10-year horizon on the assumption that it would be very difficult to make predictions about what technical innovations would occur more than 10 years out. If you want to change the ratings and look at a longer timeframe, the scale gives you the leeway to do that.

**Question:** How feasible is this approach technically?

**Scale:** Widely used, Demonstrated in field, Promising in 3-5 years, Promising in 6-10 years, Maybe 10-20 years, More than 20, Never

### Legal Feasibility

**Notes:** Remember the initial ratings you see here are default ratings. You, the Ctte members, initiate these ratings (not the City). This addresses siting, water rights, environmental and other legal rights relevant to implementing this approach as envisioned. As you learned from Martha Lennihan, to have a water right is only the beginning: numerous factors affect the way the right can be exercised. A water right that has limitations or questions about how it can be exercised would rate as having 'some ambiguities.'

**Question:** Within the required timeframe for this approach, are the necessary rights currently held in the form needed or feasible to acquire or modify as needed?

**Scale:** Unambiguous yes, Yes but some ambiguities, Can probably acquire, Difficult to acquire, Very unlikely]

### Regulatory Feasibility

**Notes:** This addresses environmental and regulatory review. When rating, the City staff looked at the difficulty of getting regulatory approvals under existing regulations as well as the possible necessity of responding to or taking advantage of potential new regulations that might come into place over the next decade. If you wish to adjust these ratings, please be sure to identify which type of regulatory approvals you think would be easier or harder to get (environmental, earthquake hazard, etc). In the scale, the analysis of regulatory feasibility includes the possibility of needing new regs or policies. Water Department staff did not think that any of the elements of our local situation would result in having regulatory agencies relax regulations to help Santa Cruz address the water situation. On the other hand, continuing drought at a state/western US level could over time result in regulatory revisions to facilitate addressing the larger water problem. This relaxation, if it occurred, could make some options more feasible from a regulatory point of view. When rating, City staff used a 10-year horizon on the assumption that it would be very difficult to make predictions about what regulatory innovations would occur more than 10 years out. If you want to change the ratings and encompass a longer timeframe, the scale gives you the leeway to do that.

**Question:** Is this approach likely to receive easy, quick regulatory approval?

**Scale:** Easy and quick, Slow but relatively sure, V slow no regulatory chng, Up to 10 year new reg, Not feasible (regulatory)

### Political Feasibility

**Notes:** Remember the initial ratings you see here are default ratings. You, the Ctte members, initiate these ratings (not the City). Extent to which an approach will claim and retain the support of formal political entities as well as informal social and political groups. This applies to demand reduction (e.g. volunteerism, finances for incentives or enforcement of regulations) and to supply (e.g. majority public vote requirement for desalination, willingness to make large capital investments, or concerns about oversupply and immigration).

**Question:** What level of political support is this approach likely to have?

**Scale:** Enthusiasm now, Acceptable now, Active resistance now, Acceptable in 5 years, Acceptable in 10 years, Acceptable in 20 years, Likely never

### Cost-Effectiveness

**Question:** How important are the subcriteria to you or your constituents in evaluating how well an approach meets the requirements for Cost-effectiveness?

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

### Cost to City: Upfront Costs

**Notes:** This includes siting, permitting, installation or construction and other start-up costs.

**Question:** What are the upfront costs of this proposal?

**Scale:** Worst - 2.00E+5; Best - 0.00

### Cost to City: Operation and Maintenance

**Notes:**

**Scale:** Worst - 2.00E+6; Best - 1.00E+5

### Cost to Customer: Rates

**Notes:** This cost is based on a simplified lifecycle cost (capital cost divided by the life of the project plus annual O&M converted to cost per gallon) and compared to estimates of the cost of a gallon of water to an average single family residential customer in 2018, which is about 1 penny per gallon. An average single family residential customer uses 8 ccg (6,000 gallons) per month. Had to make scale in "per 100 gallons" to stay on the good side of the software. With any luck, Carrie's tryptophane-affected brain managed the conversion. (And if not, it is all relative and won't affect the decision model!)

**Question:** How does the cost of this option compare to the cost of an average single family residential customer's cost for a gallon of water in 2018?

**Scale:** Worst - 6.00; Best - 0.00

### Cost to Customer: Individual Purchase

**Notes:** This subcriterion gets to the cost to an individual of buying, installing and maintaining a system that helps reduce demand or provide storage or supply for that particular household. Example: installing a cistern.

**Question:** What is the cost to the individual of buying, installing and maintaining this system?

**Scale:** None, Small, Significant

## Community Well-being

**Notes:** Encompasses a range of social and community values. Notice now that this criterion now encompasses a pretty narrow range of social and community values (it was hacked back at the November meeting). When you assign your weights, make sure that you don't inadvertently give the subcriteria more weight than you really intended to.

**Question:** How important are the subcriteria to you and your constituents in evaluating how well an approach meets the criterion 'Community Well-being?'

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

### Regional Water Stability

**Notes:** This gets at approaches that would benefit SC water customers and the region.

**Question:** Would this approach improve regional water stability?

**Scale:** Across County, 4 jurisdictions, 3 jurisdictions, 2 jurisdictions, SC Water only

### Local Economy

**Notes:** This criterion is measured in terms of numbers of jobs and is meant to synthesize the effect of water supply, water reliability, confidence and local jobs as they might affect local economy. This is one of the technical criteria that changed across simplified scenarios. It turns out that the zero gap simplified scenario leaned into this criterion in some interesting ways.

**Question:** How might this proposal affect Santa Cruz's economy, as reflected in local jobs?

**Scale:** Positive local job, Slight positive, No effect, Slight negative, Negative for local jobs

## Environmental Well-being

**Notes:** This criterion relates to the degree to which a water supply or demand management strategy contributes to or impacts the quality and sustainability of the natural environment.

**Note:** "terrestrial" was taken out as a subcriterion because none of these proposals appeared to impact terrestrial resources. Note on the note: Unless you count laying of pipe-- which ought to be counted. This is my bad. --CF

**Question:** How important are the subcriteria to you and your constituents in evaluating how well an approach meets the criterion "Environmental Well-being?'

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

## Energy

**Notes:** In providing some very broad guesstimates for this criterion, the City staff considered the energy usage of the City's current treatment plant as a 4 and rated the others with respect to that. The City recently compared energy intensity of the treatment of desal vs traditional sources (surface and groundwater) as 15, 1.5 and 2.1 kWh/1000 gallons respectively. This subcriterion has gone back and forth between carbon emissions and kWh/1000

gallons; later in the process you will want to look at both. There are several issues wrapped up (or lost) in the present kWh/1000 gallon scale that you will want to tease out in Real Deal. There is the actual energy use at the plant along with pumping and delivery. Differing emissions for different sources of energy. The energy that goes into construction parts including, as Bob outlined in his Reuse discussion, the impact of actually making (delivering, digging, installing?) the pipe. Where the emissions occur and what time of mitigation requirements there may be. ...Do you care about energy because of its cost? The volatility of its cost? Because it is a surrogate for carbon emissions?

**Question:** How much energy will this approach require per MG of water? (Treating surface water, which the City rated as a 4, is about 1.5 kWh/1000 gallons, see accompanying note.)

**Scale:** 5, 4, 3, 2, 1

## Marine Ecosystem Health

**Notes:**

**Question:** How would this approach affect marine ecosystem health?

**Scale:** Positive effect, does not harm, may harm, cumulative harm, Sig harm to population

## Freshwater and Riparian Health

**Notes:** This rating encompasses the positive (e.g. when restoring watersheds or by creating an easier option to leave more water in the river) as well as potential harm. One of the commenters on the Convention model referred to the former as 'direct beneficial impact' and the latter as 'indirect beneficial impact.'

**Question:** If this approach were implemented, how would it affect freshwater and riparian ecosystems?

**Scale:** Plentiful healthier water, About as it is now, Degraded ecosystem health

### Groundwater Resources

**Notes:** The word "active" in the scale means putting water back not just resting wells.

**Question:** How would this approach affect groundwater resources?

**Scale:** Actively restores, Allows restoration, Does not affect, Depletes Resource, Greatly Depletes Resource

### Adaptability

**Notes:** Characteristic of a supply project that relates to how well the approach can be modified over time to respond to changing conditions.

**Question:** How important are the subcriteria to you and your constituents in evaluating how well an approach meets the criterion 'Adaptability?'

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

### Infrastructure Resilience

**Notes:** Infrastructure resilience relates to the extent to which this approach will help the overall system to withstand natural disasters such as earthquakes, fires, floods, tsunamis and or systemic power outages related to the above--but not drought. (That is the next subcriterion.) Potable reuse rated lower than desal for resilience because desal uses another source of supply (the ocean) and would be a brand new facility built to all current seismic codes. In an earthquake, these factors would be assets compared to possible impacts of losing the wastewater treatment, which in turn would affect the reuse plant. In your rating, remember that in the extreme climate change simplified scenario (1 BG shortfall), fire and landslides may put more pressure on the system's resilience.

**Question:** How well would this approach contribute to the system's ability to withstand natural disasters and other disturbances? (The top of the scale is "meets most challenges well.")

**Scale:** Most challenges well, Many moderately well, Some somewhat, Few barely, Doesn't improve resilience, Slightly degrades, Significantly degrades]

### Reliable Supply

**Notes:** Reliability of water supply relates to how much water can be produced under various climate conditions such as drought or extreme precipitation. Remember that in

the extreme climate change simplified scenario (the billion gallon shortfall), less rainfall isn't the only issue: turbidity, timing of storm events or other factors may also affect the supply. In rating the alternatives against this subcriterion, City staff saw demand strategies as potentially reducing the reliability of supply. They felt that the water demand offset program generally makes the system less reliable. With demand management actions being used to offset growth, new customers can be added without increasing supply. But at the same time, all customers are living closer to some reasonable limit of possible reduction in water use or increases in water use efficiency. This means that if the supply drops even further, there is no cushion--little or no discretionary water use that can be eliminated or reduced--so curtailments would be more difficult for customers and, in worst case scenarios could significantly cut in to the water used to protect public health and safety.

**Question:** How much will this approach help the existing system to produce consistently?

**Scale:** Makes system sig more rel, Somewhat more reliable, Slightly more reliable, No change, Makes system less reliabl

### Scalability

**Notes:** Scalability measures the extent to which an approach can be scaled up as needs change. Note that for Loquifer, as with some of the other proposals, the design is scalable but once you commit to one of the designs, the project is not. One of the Ctte members had asked for a negative scale for scalability, but that just didn't make sense; it was hard to imagine a circumstance where adding one of these approaches would make the system less scalable.

**Question:** How easily can this approach be scaled up within the overall system? (The tilde~ in the scale is shorthand for 'might not meet by itself but sure would help a lot.')

**Scale:** Scales up w no limit, Can scale to ~1BG gap, Can scale to ~650 MG gap, Can scale to ~ 300 MG gap, Not scalable

### Preserves Future Choices

**Notes:** In general, this rating was about the extent to which large capital investments might lock the city in to a certain set of solutions. The Ranney collectors rated well because they would be helpful in perfecting the Felton water right at a higher level. What is missing in the structure of the model is a way to send a signal about options lost by INaction.

**Question:** How well does this approach preserve future choices?

**Scale:** Increases choice, Somewhat inc choice, No effect, Reduces choice, City locked in



## Effectiveness

**Notes:** The ability of a particular approach to meet the gap by decreasing demand, increasing supply or instituting management changes that help the Water Department "do more with less."

**Question:** How important are these subcriteria to you and your constituents in evaluating the how well a proposal meets the requirements for "Effectiveness?"

**Scale:** Critical, Very Important, Moderately Important, Somewhat Important, Not Salient

## Yield

**Notes:** Reduction in demand or increase in supply.

**Question:** How much water will this approach save or produce?

**Scale:** Worst - 17.00; Best - 1800.00

## Flexibility

**Notes:** The degree to which this approach increases management flexibility that in turn helps the system "get by with less" while still meeting resilience, reliability and other goals. (This is particularly designed for approaches that don't actually increase supply or reduce demand, but might nevertheless be useful.) In rating 'flexibility,' the City staff looked at an approach's ability to provide diversity, the ability to create a cushion in terms of water availability and other factors. For instance, reuse and desal were seen as "adding another treatment plant" and therefore tended to rate well for flexibility.

**Question:** To what extent does this approach increase flexibility?

**Scale:** Greatly increases, Moderately increases, Somewhat increases, Does not increase, Decreases

## Addresses Peak Season Demand

**Notes:** This subcritierion addresses the extent to which a proposal reduces peak season demand or provides water that is not dependent on winter rains.

**Question:** To what extent would this approach help address peak season demand?

**Scale:** Yes, Maybe, No

## PROPOSAL:

### WaterSmart

**Notes:** Life of project is 10 years, so annualized up front cost is \$180. Annual cost is \$100,000.

### Landscaping, Capture, Reuse

**Notes:** Proposal states this approach could reduce residential use with rain catchment by 30 to 40%. Residential use is avg of 1.9 bgy, so using 30%, we'd be looking at .57bgy, which is a lot of water. Maddaus has estimated the utility cost of this kind of program at \$43,000 per mg, so the total cost of this would be \$248 m. If half were incentivized = \$124 m with avg life of 20 years so  $6.2 \text{ m/year} + 100,000 = 6.3 \text{ m}$  for 576 mg = \$0.011 per gallon. Total capital costs estimated at \$25 million.

### Water Neutral Development

**Notes:** Estimated that of the 0.5 bgy in projected demand for new growth, 240 mg will be offset as a result of building code changes that will occur without investments (these building code changes are those already planned to be in place, not the "beyond building codes" alternative), leaving 260 mg. Using the remaining years of the General Plan (15), this equates to an average yield of 17 mg. Program costs were comprised of the cost of all the non-building code programs in the Long Term Conservation Master Plan divided by the estimated number of new equivalent dwelling (or residential) units per year estimated in the General Plan. This is where the \$4,000 per unit used in the 'cost to consumer' came from.

### North Coast Water

**Notes:** Chose the 11,000 af option = 3.6 bg total storage. Figure 1/2 available in a given year (constrained not by available water in storage but by ability to refill from sources experiencing drought conditions) Multiple cost estimate of \$28 m x 5 due to under representation of costs (karst, steep side walls) = \$140 m = \$12,860/mg  
Life is 50 years =  $\$2.8 \text{ m/year} + 1.5 \text{ m O\&M} = \$4.3 \text{ m/year}$   
Total capital cost estimated at \$128 million.

### The Loquifer Alternative

**Notes:** Proposer estimated yield at 6000 afy (= 2 bgy). The project proposes in lieu recharge of Scotts Valley and Soquel Creek aquifers by having the City provide water service to them instead of pumping from their wells. 6000 is about the annual demand of both of these other water agencies. City could not provide water to them in the summer, only in the winter, so winter demand is approximately 40% of annual demand, making the yield 800 mg.

As described, this project makes no specific assumptions about how, how much or when the city could get water back from these other water districts and no infrastructure or infrastructure costs are included in the project that would support returning water to the city.

Calculations are based on the following Yield is 800 mg, with no specifically identified benefit to Santa Cruz

Proposed treatment plant at Loch Lomond is not needed so up front cost is \$50 m not \$85 m, making the cost per mg = \$62,500. Life of the project is 20 year (aquifers full by then?) so annualized upfront cost is \$2.5 m + \$1.2 m for annual O&M, which makes cost per gallon \$0.0046/gal (as compared to \$0.01/gal for water in 2018).  
Total capital costs estimated at \$50 million.

### Expanded Treatment Capacity

**Notes:**

The assumption is that new water would be equal to 30 additional days of pumping to Loch Lomond at 11 mgd = 330 mgy

Assume 20 year life. Total capital costs estimated at \$65 million.

### Ranney Collectors on SLR

**Notes:** The assumption is that new water would be equal to 30 additional days of pumping to Loch Lomond at 11 mgd = 330 mgy

Assume 50 year life. Total capital costs estimated at \$15 million.

### Reuse for Agriculture

**Notes:** Project life is 50 years; most of these numbers from Catherine Borroman, so only did the calculations. Total capital cost: \$98 million.

### Aquifer Restoration

**Notes:** For the purposes of this analysis, using the cost of infrastructure in Lochquifer plus 30% to account for the infrastructure needed to get water back to the City (complete WAG) using for a yield 600 mgy which comes from 180 mgy from more pumping of existing beltz wells, 260 mgy of water back from SqCWD using existing infrastructure (upgraded pump station at 41st) and 160 mgy from SVWD, which requires infrastructure ranging from wells, pipelines, pumpstations etc. The big difference between this alt and Lochquifer is this one focuses on what the City gets back not what it provides to others with no guarantee of getting anything back. Also increased annual O&M by 300,000 to account for pumping to get the water back. Note the cost of operating this project to give water to other agencies is annual (as in Lochquifer) but the cost of getting water back is only in a drought. Total capital costs estimated at \$65 million.

### Water Reuse (Potable)

**Notes:** Total capital cost estimated as \$70 million.

### Desal RO

**Notes:** Total capital costs estimated at \$70 million, assuming regional cost split.

### Desal FO

**Notes:** Assume 20 year life. Total capital costs \$70 million assuming regional cost split.

Agenda Item 4i			
Web_Page	Simple Scenario	SubCriterion	Comments
Alts Ratings	Billion Gallon Gap	Cost to City: Operation and Maintenance	Some of the "Cost to the City: O&M" figures seem out of whack with each other but I lack the expertise to provide any meaningful critique. I would like to see the "calculations" behind the figures explaining how the figures were developed. For example: N. Coast Water (a reservoir) costs as much as "Desal FO", "Aquifer Restoration" and "Expanded Treatment"; and, the "Loquifer" alternative which includes "Aquifer Restoration" plus many more pieces of infrastructure is significantly cheaper than just "Aquifer Restoration" alone.
Alts Ratings	640 MG Gap	Cost to City: Operation and Maintenance	Some of the "Cost to the City: O&M" figures seem out of whack with each other but I lack the expertise to provide any meaningful critique. I would like to see the "calculations" behind the figures explaining how the figures were developed. For example: N. Coast Water (a reservoir) costs as much as "Desal FO", "Aquifer Restoration" and "Expanded Treatment"; and, the "Loquifer" alternative which includes "Aquifer Restoration" plus many more pieces of infrastructure is significantly cheaper than just "Aquifer Restoration" alone.
Alts Ratings	Zero Gap	Cost to City: Operation and Maintenance	Some of the "Cost to the City: O&M" figures seem out of whack with each other but I lack the expertise to provide any meaningful critique. I would like to see the "calculations" behind the figures explaining how the figures were developed. For example: N. Coast Water (a reservoir) costs as much as "Desal FO", "Aquifer Restoration" and "Expanded Treatment"; and, the "Loquifer" alternative which includes "Aquifer Restoration" plus many more pieces of infrastructure is significantly cheaper than just "Aquifer Restoration" alone.
Alts Ratings	Zero Gap	Cost to City: Operation and Maintenance	Comments on Costs to City: OpEx * Here, actually, the scale probably SHOULD be per MG/yr, since OpEx (energy costs, wear and tear, etc.) will scale based on volume. * I simply can't believe that OpEx for a reservoir (North Coast Water) would be the same as FO Desal, and would be less than Loquifer. Makes no sense, so I down-rated it to \$850,000 (a la Ranneys).
Alts Ratings	Billion Gallon Gap	Cost to City: Upfront Costs	With regards to "Cost to the City: Upfront Costs" some of the figures seem out of whack with each other but I lack the expertise to provide any meaningful critique. I would like to see the "calculations" behind the figures explaining how the figures were developed. For example: Desal RO and Desal FO cost the same; and, the "Loquifer" alternative which includes "Aquifer Restoration" plus many more pieces of infrastructure is significantly cheaper than just "Aquifer Restoration" alone.
Alts Ratings	Billion Gallon Gap	Cost to City: Upfront Costs	I disagree that Water Nuetral Development (WND) would be a no cost to the City alternative but don't know how to determine the real cost of the following: - Administration / staffing of a WND program - Lost property tax revenue and loss of building permit revenue due to probable dramatic reduction in new development
Alts Ratings	640 MG Gap	Cost to City: Upfront Costs	With regards to "Cost to the City: Upfront Costs" some of the figures seem out of whack with each other but I lack the expertise to provide any meaningful critique. I would like to see the "calculations" behind the figures explaining how the figures were developed. For example: Desal RO and Desal FO cost the same; and, the "Loquifer" alternative which includes "Aquifer Restoration" plus many more pieces of infrastructure is significantly cheaper than just "Aquifer Restoration" alone.
Alts Ratings	640 MG Gap	Cost to City: Upfront Costs	I disagree that Water Nuetral Development (WND) would be a no cost to the City alternative but don't know how to determine the real cost of the following: - Administration / staffing of a WND program - Lost property tax revenue and loss of building permit revenue due to probable dramatic reduction in new development
Alts Ratings	Zero Gap	Cost to City: Upfront Costs	Some of the "cost to the City" figures seem out of whack with each other but I lack the expertise to provide any meaningful critique. I would like to see the "calculations" behind the figures explaining how the figures were developed. For example: Desal RO and Desal FO cost the same; and, the "Loquifer" alternative which includes "Aquifer Restoration" plus many more pieces of infrastructure is significantly cheaper than just "Aquifer Restoration" alone.
Alts Ratings	Zero Gap	Cost to City: Upfront Costs	I disagree that Water Nuetral Development (WND) would be a no cost to the City alternative but don't know how to determine the real cost of the following: - Administration / staffing of a WND program - Lost property tax revenue and loss of building permit revenue due to probable dramatic reduction in new development
Alts Ratings	640 MG Gap	Cost to City: Upfront Costs	Water Neutral development will result in a cost to the City that will be difficult to quantify. The cost of discouraging new business due to the higher cost of new construction or major remodels.
Alts Ratings	Zero Gap	Cost to City: Upfront Costs	Comments on "up front costs to City" * The "MG/yr" scale doesn't really make sense here. Rather, it should just be per MG (either of capacity [storage] or production [treatment]). * I *assume* that re-use for ag is so expensive because it includes tertiary treatment as well as additional conveyance to the North Coast ranchlands.
Alts Ratings	Zero Gap	Cost to City: Upfront Costs	Did I read somewhere that the cost info on this page was inaccurate? Desal cost, for example, was listed as \$10,750/million gallons in the EIR. Here it's listed as \$78,000. -Rick
Alts Ratings	Zero Gap	Cost to Customer: Individual Purchase	changed this because we feel developers will pass the cost on to the tenant /customer

Web_Page	Simple Scenario	SubCriterion	Comments
Alts Ratings	Zero Gap	Cost to Customer: Rates	Tried to fix a couple of these that looked wacky: * North Coast water changed to \$0.04 / 100 ga (was \$0.02) * Expanded Treatment Capacity to \$0.05 / 100 ga (was \$0.01) Neither of these made sense in context of CapEx and OpEx figures provided previously.
Alts Ratings	Billion Gallon Gap	Energy	The scale for energy intensity seems inverted. To me, a lower magnitude on the scale would seem to reflect a lower energy intensity.
Alts Ratings	Zero Gap	Energy	Comments about Energy (General): I've come around to the notion that we should consider scrapping this criterion and replacing it with "non-operational carbon footprint". That is, assess the carbon-impact of the solution separate from its operational (energy) requirements. Energy costs (and consequent carbon impacts - carbon taxes, etc.) are captured in Operating Expenses.
Alts Ratings	Zero Gap	Flexibility	Comments on Flexibility: * Another asymmetrical scale - "does not increase" is not mid-point. Again, same for all so ignoring this for this execise. * I don't understand why Water Neutral "somewhat increases" flexibility" if other demand reduction solutions (WaterSmart and Landscaping) don't. I changed Water Neutrol to "does not increase".
Alts Ratings	Zero Gap	Freshwater and Riparian Health	If one assumes under the Zero Gap scenario, no alternatives would be needed nor implemented other than the very low cost / good ideas of "WaterSmart" and "Landscaping, Capture, Reuse" all other alternatives would not be implemented and therefore the result would be everything staying "About as it is now". Accordingly, I changed all alts to reflect this result.
Alts Ratings	Billion Gallon Gap	Groundwater Resources	With regards to Groundwater Resources, I fail to see how the "North Coast Water" Alternative would "Depletes Resource" so I changed it to "Does not affect".
Alts Ratings	640 MG Gap	Groundwater Resources	With regards to Groundwater Resources, I fail to see how the "North Coast Water" Alternative would "Depletes Resource" so I changed it to "Does not affect".
Alts Ratings	Zero Gap	Groundwater Resources	If one assumes under the Zero Gap scenario, no alternatives would be needed nor implemented other than the very low cost / good ideas of "WaterSmart" and "Landscaping, Capture, Reuse" all other alternatives would not be implemented and would therefore have no effect on Groundwater Resources. Accordingly, I rated them so.
Alts Ratings	Zero Gap	Groundwater Resources	Comments on Groundwater Resources. * I am consciously ignoring the construct that any conservation measure "allows restoration" just as much as any water-manufacturing measure (desal) does, and therefore leaving WaterSmart, Landscaping, Water Neutral, etc. as they are (for now). * Changed North Coast water from "depletes" to "does not affect", since we are just storing the same water that we are currently using from those streams, within our rights and DFW provisions. I don't see the change.
Alts Ratings	Billion Gallon Gap	Infrastructure Resilience	With regards to Infrastructure Resilience, "The Loquifer Alternative" which includes aquifer restoration as part of its program should be rated the same as "Aquifer Restoration" so I changed The Loquifer Alternative to match the "Many moderately well" rating of "Aquifer Restoration"
Alts Ratings	Zero Gap	Infrastructure Resilience	Comments on "infrastructure resilience" * Down-rated Desal (RO & FO) due to high reliance on power (no water if power goes out). *
Alts Ratings	Billion Gallon Gap	Legal Feasibility	Regarding "Legal Feasibility" I am no lawyer so I offer my uninformed opinions as follows: Most alternatives would rate "Yes but some ambiguities" so I changed them to be so. However, since "The Loquifer Alternative" is similar to the "Aquifer Restoration" alternative in that it involves transferring water across District boundaries and will require some modification of existing water rights and new agreements to be negotiated, I changed "The Loquifer Alternative" to be the same as "Aquifer Restoration" i.e. "Difficult to acquire". Accordingly, I rated them both 'Difficult to acquire'.
Alts Ratings	640 MG Gap	Legal Feasibility	Regarding "Legal Feasibility" I am no lawyer so I offer my uninformed opinions as follows: I see no reason why "WaterSmart" wouldn't be an 'Unambiguous yes', so I changed it to be so. Since the passage of time is not considered for this criterion, I opine "Desal FO", "Landscaping, Capture, Reuse", "Water Neutral Development", "Water Reuse (Potable)", "North Coast Water", "Expanded Treatment Capacity", "Ranney Collectors on SLR", "Reuse for Agriculture" and "Desal RO" wouldn't be considered 'Yes but some ambiguities', so I changed them all to be so. Lastly, since both "Aquifer Restoration" and "The Loquifer Alternative" involve transfering water across District boundaries, both will require some modification of existing water rights and new agreements to be negotiated, I rated them both 'Difficult to acquire'.
Alts Ratings	Zero Gap	Legal Feasibility	These comments relate to Legal Feasibility: * Changed WaterSmart, Landscaping, Water Neutral, and Expanded Treatment to "unambiguous yes", since they're in use in the State of CA and have been for some time, with no legal challenges of which I'm aware. * Changed both FO and RO Desal, water reuse (potable), and re-use for ag to "some ambiguity" out of deference to needed environmental approvals * Changed North Coast Water, Ranneys, Loquifer to "some ambiguity" due to need to confirm that our water rights work here * Changed
Alts Ratings	Billion Gallon Gap	Local Economy	My sense is most of the alternatives would result in a positive effect on the local economy as the initial construction effort would utilize local labor forces, long term O&M would utilize local labor and any alternative that provides a more robust, reliable and plentiful water supply will be good for business in general as businesses will be able expand and development will be allowed to occur without fear that there will be no water or not enough water. Accordingly, I changed "Desal FO" Aquifer Restoration" Water Reuse (Potable)" The Loquifer Alternative" and "Reuse for Agriculture" to "Slight positive".
Alts Ratings	640 MG Gap	Local Economy	My sense is most of the alternatives would result in a positive effect on the local economy as the initial construction effort would utilize local labor forces, long term O&M would utilize local labor and any alternative that provides a more robust, reliable and plentiful water supply will be good for business in general as businesses will be able expand and development will be allowed to occur without fear that there will be no water or not enough water. Accordingly, I changed "Desal FO" Aquifer Restoration" Water Reuse (Potable)" Expanded Treatment Capacity" Ranney Collectors on SLR" The Loquifer Alternative" Reuse for Agriculture" and "Desal RO" to "Slight positive".

Web_Page	Simple Scenario	SubCriterion	Comments
Alts Ratings	Zero Gap	Local Economy	If one assumes under the Zero Gap scenario, no alternatives would be needed nor implemented other than the very low cost / good ideas of "WaterSmart" and "Landscaping, Capture, Reuse" all other alternatives would not be implemented and would therefore have no effect on the local economy. Accordingly, I rated them so.
Alts Ratings	640 MG Gap	Local Economy	Whether through conservation or new supply, reducing the gap will benefit the local economy
Alts Ratings	Billion Gallon Gap	Local Economy	To be clear, I'd like this to say "more local jobs" or "fewer local jobs." As written, there's a chance someone might think it means more job growth or less/slower job growth, rather than (as I think it means) fewer jobs. Just a thought; maybe picky, but let's be clear.
Alts Ratings	Zero Gap	Local Economy	I am confused about why the staff ratings for impacts to the local economy show a negative effect for local jobs. Just about any project, even if awarded to a firm from outside the area, is going to have the potential for creating some local jobs for sub contractors, City staffing, or the hospitality industry. How do 10 of the projects actually hurt local employment?
Alts Ratings	640 MG Gap	Local Economy	Under this scenario the lack of water is already affecting local jobs so by filling the gap you are addressing that issue. Also don't undersatnd the positive affect about north coast storage
Alts Ratings	Zero Gap	Local Economy	Comments on Local Economy (Jobs Impacts): * Changed Desal (FO & RO) to "slight negative" - couple of local jobs created both during construction and during operation; preponderance of funds spent leave the county. * Same logic for Aquifer Restoration and Loquifer; some local jobs during construction, but not permanent. Bulk of money travels out. * Landscaping - changed to "positive" - all of this work would/could be done by local folks. * Water Neutral - changed to 'slight negative' on the presumption that it would make new construction more expensive and therefore slow projects in general and stop some that would become infeasible. * Water re-use potable, Ranneys, reuse for ag & Expanded treatment - same logic as for Desal - "slight negative" * North Coast Water - no effect - would seem that at least some of the money would stay here.
Alts Ratings	Zero Gap	Local Economy	It is not clear to me why under employment impacts all but two of the projects have a negative impact on jobs. The info button says this category is a synthesis of jobs generated by the project, but the impact of water supply, etc. on local employment. How can all of these projects have a negative impact? they all should have a positive impact even if of various degrees.
Alts Ratings	Zero Gap	Marine Ecosystem Health	Marine Ecosystem * Changed both Desal to "may harm", because they (1) draw sea water and (2) create discharge products.
Welcome	Billion Gallon Gap	N/A	For future reference it would have been more efficient if the 12 emailed files of proposals were labeled with the same names used in the ratings headings.
Weights	640 MG Gap	N/A	With a larger gap, money matters less than providing water.
Weights	640 MG Gap	N/A	Again - technical and legal feasibility are more important than more malleable factors like regulatory and political concerns. If the drought persists, regulators will be forced to work with local utilities on proposals once considered impossible
Weights	Billion Gallon Gap	N/A	Here are the general values I'm reflecting in my 1000MGY weightings/ratings: "ç Available supply less often sufficient; storage augmentation / management changes needed to a greater degree than with 650MGY o Need greater storage buffer because must capture flows in narrower time window "ç Willing to spend what it takes to augment available supplies; less price-sensitive to those budgetary items "" focus is on productivity (effectiveness) more than cost-effectiveness o Investments that provide operational flexibility would be beneficial (enhances reliability of the system, internally) o Can only afford minimal improvements to existing infrastructure, because of need to focus on supply enhancements o Maintain substantial dry powder in case need to further augment supply "ç Want to maximize conservation, including landscape swaps o Make sure folks can afford to do it o Rates will be (much?) higher, so may starve out conservation measures that require investment "ç Want rate structure to reinforce maximized conservation, esp. in landscape and commercial accounts "ç Not able to work with others, because need to focus on SCWD clients first o To the extent possible, would want to help others, but not a primary focus "ç Make sure City can afford the investments "ç Make sure Community Rates are reasonable (relates to City affordability)
Weights	640 MG Gap	N/A	Here are the general values I'm reflecting in my 650MGY weightings/ratings: "ç Supply often, but not always, sufficient; storage augmentation / management changes needed "ç Investments that provide operational flexibility would be beneficial (enhances reliability of the system, internally) o Can only afford modest improvements to existing infrastructure, because of need to focus on supply enhancements o Maintain moderate dry powder in case need to further augment supply "ç Want to maximize conservation, including landscape swaps o Make sure folks can afford to do it "ç Want rate structure to reinforce maximized conservation, esp. in landscape and commercial accounts "ç Environmental considerations begin to wane a bit "ç Less able to work with others, because need to focus on SCWD clients first o To the extent possible, would want to help others, but not a primary focus "ç Make sure City can afford the investments "ç Make sure Community Rates are reasonable (relates to City affordability)
Weights	Zero Gap	N/A	Here are my general comments about the values I'm reflecting in my Zero Gap weightings/ratings: "ç Relatively few large-scale investments, because supply already sufficient. o Relatively more concerned about project costs and cost-effectiveness, because spending relatively less here and more on infrastructure resilience, reliability and flexibility "ç Want to maximize conservation, including landscape swaps o Make sure folks can afford to do it "ç Want rate structure to reinforce maximized conservation, esp. in landscape and commercial accounts "ç Want to ensure that the system we have is reliable and flexible, since will have less redundancy, by dint of fewer investments "ç Can "afford"to focus on environmental and community well being concerns (separate from local jobs "" ambience and such) "ç Can opt to invest in projects that help others, and we would gain reliability by partnering with others (since we aren't doing much supply development of our own)

Web_Page	Simple Scenario	SubCriterion	Comments
Welcome	Billion Gallon Gap	N/A	(Don't care if you figure out who I am.) What I see at the end of doing this exercise is that as the gap between supply and demand gets greater, I care more about yield and effectiveness and reliability, etc. of each project. If we don't need much from a new water source, we can afford to not care so much about how much a project produces or how much we can depend upon it or when we can depend upon it, etc. This might be common sense, but the exercise made it clear to me. I know we are going here on very rough estimates from staff about how each of these alternatives should be scored on how they meet various criteria, but we shouldn't be surprised that the real fight (or, because we are so civilized,the real discussion), both within our group and among the public, will be about which scenario is the correct one; or to put it more directly, the question of what our gap is, which, in turn, depends upon what kind of and what level of water use we want to support in our community. The membership of the WSAC is diverse and representative enough to make a recommendation about that, once we get more information from the Real Deal, but the question will probably need to be taken back to the City Council, in a clearer way than in the past and with more information about the quantitative impacts and implications of various choices along a spectrum of water demand. I think our group can play a key role in guiding that process, even if we don't have the final say in the outcome.
Weights	Zero Gap	N/A	What is money if you don't have water? We all are in this together and the notion that some people will "bear the cost more than others" is dubious at best. Of course, it should be the policy of the water department to always make rates and costs as equitable as possible to ratepayers. Determining what "equitable" means, however, is not easy but is an important concept that warrants frequent attention.
Weights	Zero Gap	N/A	All of these areas are important to those in the community but whatever solution(s) we pursue need to be technically feasible and legal. Clearly. Regulatory and political feasibility are malleable and dynamic which makes them important but not as important as actually being able to do something and whether what you are doing is legal.
Weights	Zero Gap	N/A	I'm not sure anyone believes we face a zero gap. Differences in opinion do exist as to the extent of the problem, but the zero gap scenario is fanciful at best. Debating a 300-400 million gallons per year scenario would be more worthwhile.
Weights	Zero Gap	N/A	Regional water stability is very important but like us, our neighbors in the various districts, agencies, and utilities surrounding Santa Cruz, must grapple with their distinct political differences before the optimum solution can be crafted. Whether it be an enhanced conservation ethic, metering wells, or improving bureaucratic efficiency, all utility providers in our watershed must look inward and ask what actions can be taken to upgrade operations. Doing so will make the development of a regional solution much easier.
Weights	Zero Gap	N/A	Its not just about jobs, local economy should also be about the cost of doing business how it specifically impacts the different business sectors (construction,real estate,hospitality etc)
Alts Ratings	Billion Gallon Gap	Political Feasibility	Regarding Political Feasibility under the "Billion Gallon Gap" scenario, my constituency would find the low cost / low risk WaterSmart alternative "Acceptable now". Because of the general risk associated with using unproven technology my constituency would find "Desal FO"Alternative "Acceptable in 10 years". Because of the legal and probable regulatory difficulties as well as the risk of transferring water out of SCWD"s control, my constituency would rate "Aquifer Restoration"and "The Loquifer Alternative"less attractive than other alternatives, so I rated them both "Acceptable in 10 years". Because of the probable high cost to individual homeowners and low effectiveness, my constituency would probably rate "Landscaping, Capture, Reuse"less attractive than other alternatives, so I rated it "Acceptable in 10 years". Because "Water Neutral Development"(WND) would result in raising the cost of housing and general construction even higher than it already is, would result in depressing future development and depressing the local economy on many levels, my constituency would rate WND "Likely never" acceptable. Regarding all other alternatives, my constituency would rate them "Acceptable now".
Alts Ratings	640 MG Gap	Political Feasibility	Regarding Political Feasibility under the "650 MG Shortfall" scenario, my constituency would find the low cost / low risk WaterSmart alternative "Acceptable now". Because of the general risk associated with using unproven technology my constituency would find "Desal FO"Alternative "Acceptable in 10 years". Because of the legal and probable regulatory difficulties as well as the risk of transferring water out of SCWD"s control, my constituency would rate "Aquifer Restoration"and "The Loquifer Alternative"less attractive than other alternatives, so I rated them both "Acceptable in 10 years". Because of the probable high cost to individual homeowners and low effectiveness, my constituency would probably rate "Landscaping, Capture, Reuse"less attractive than other alternatives, so I rated it "Acceptable in 10 years". Because "Water Neutral Development"(WND) would result in raising the cost of housing and general construction even higher than it already is, would result in depressing future development and depressing the local economy on many levels, my constituency would rate WND "Likely never" acceptable. Regarding all other alternatives, my constituency would rate them "Acceptable now".
Alts Ratings	Zero Gap	Political Feasibility	Regarding Political Feasibility under the "zero gap" scenario, it is my opinion our community would be unwilling to spend any significant money on any alternatives but would probably go along with low cost alternatives that seem like a good idea. Accordingly, I rated the relatively low cost alternatives "WaterSmart" "Landscaping Capture & Reuse" with the "Enthusiasm now" rating and all other alternatives as "Likely never"
Alts Ratings	Billion Gallon Gap	Political Feasibility	With a billion gallon gap, political considerations change. The gap, however, has to be an agreed upon number.
Alts Ratings	Billion Gallon Gap	Political Feasibility	Comments on Political Feasibility (1BGY) * Moved Water Neutral to "acceptable now" - under such an extreme circumstance, I think that the town would embrace the approach. * Moved Water Re-use to 5 years - under pressure of bigger shortfall would be interesting to see how FO and Re-use compete in the marketplace of ideas.
Alts Ratings	640 MG Gap	Political Feasibility	Comments on Political Feasibility (650 MG): * Rated Desal FO at 5 years - increased need for water and presumption that it's a lower-energy approach make it more palatable than was the case at Zero Gap. * Rated Water Neutral Development at 2 years - increased need for conservation makes it more politically palatable than in the Zero Gap case.

Web_Page	Simple Scenario	SubCriterion	Comments
Alts Ratings	Zero Gap	Political Feasibility	Political Feasibility (Zero Gap): * Rated Desal FO at 10 years out due to lower energy requiremnts than RO. * Rated Desal RO at 20 years out due to higher energy requirements leading to resistance. * DPR at 10 years out due to concerns about emerging contaminants. * Water Neutral development at 5 years out due to concerns about economic impacts. * All others acceptable or enthusiasm now
Alts Ratings	Billion Gallon Gap	Regional Water Stability	I fail to see how "Water Smart", "N. Coast Water", "Expanded Treatment Capacity", "Ranney Collectors on SLR", or "Reuse for Agriculture" would benefit any other jurisdiction besides our own so I changed them all to SC only...
Alts Ratings	640 MG Gap	Regional Water Stability	I fail to see how "Water Smart", "N. Coast Water", "Expanded Treatment Capacity", "Ranney Collectors on SLR", or "Reuse for Agriculture" would benefit any other jurisdiction besides our own so I changed them all to SC only...
Alts Ratings	Zero Gap	Regional Water Stability	I fail to see how "Water Smart", "N. Coast Water", "Expanded Treatment Capacity", "Ranney Collectors on SLR", or "Reuse for Agriculture" would benefit any other jurisdiction besides our own so I changed them all to SC only...
Alts Ratings	Zero Gap	Regional Water Stability	why do the Ranney collectors help other jurisdictions ? and couldnt Desal be county wide?
Alts Ratings	640 MG Gap	Regional Water Stability	Comments on Regional Water Stability (650 MG): * Leaving both Desal as 2 jurisdictions, though that assumes facts not in evidence - that SoqCWD would collaborate. * WaterSmart - affects SC water only - it's an SCWD only program. * North Coast Water - affects SC water only, as I read and understand the proposal - we are using our rights on Liddell. * Expanded Treatment - affects SC water only, as I read and understand the proposal - we are increasing our take on SLR and using (or perhaps storing) that water. * Ranneys - same as for expanded treatment (to an extent they are twinned)
Alts Ratings	Zero Gap	Regional Water Stability	Comments on Regional Water Stability: * Changed North Coast Water to SC Water Only. I don't see who else it benefits * Same with WaterSmart - Only benefits SCWD. * Same with Reuse for Ag - only benefits SCWD (just like potable reuse) * Same with Ranneys on SLR - only benefits SCWD. * Same with Expanded Treatment - only benefits SCWD. * I left both Desal as 2 Jurisdications, though that assumes facts not in evidence (that we would re-boot our SCWD/SoqCWD collaboration)
Alts Ratings	Billion Gallon Gap	Regulatory Feasibility	Not sure why "Reuse for Agriculture" would require new regulations - isn't this alternative already in use elsewhere? According to the documents submitted by Ripley, use of recycled water is embraced / required by regulatory authorities. Accordingly, I upgraded this alt to be the same as "Ranney Collectors" i.e. "Slow but relatively sure". It is unclear what the difference is between "slow but relatively sure" and "very slow - no regulatory changes". Since the next tick on the scale is ten years, I am guessing slow means 2 years and v slow means 5 years. Accordingly, my guess is that since "north coast water" (a reservoir) and ranney collectors are both widely used, they would both be "slow but relatively sure". So I changed "north coast water" to match "Ranney Collectors" I downgraded the Lochquifer alternative compared to the Ranney alternative as the Lochquifer alt includes Ranney collectors and has the added complexity of water transfers which I assume involve water rights issues which jst has to take longer. So I changed Loquifer to 'Up to 10 years - new reg' because it involves moving water from one jurisdiction to another and will require new water rights be obtained - no guarantees that process would take any less than 10 years, and may actually turnout to be never. Similarly, I changed "Aquifer Restoration" to 'Up to 10 years - new reg'
Alts Ratings	640 MG Gap	Regulatory Feasibility	Not sure why Reuse for Agriculture would require new regulations - isn't this alternative already in use elsewhere? According to the documents submitted by Ripley, use of recycled water is embraced / required by regulatory authorities. Accordingly, I upgraded this alt to be the same as Ranney Collectors and North Coast Water. It is unclear what the difference is between "slow but relatively sure" and "very slow - no regulatory changes". Since the next tick on the scale is ten years, I am guessing slow means 2 years and v slow means 5 years. Accordingly, my guess is since north coast water (a reservoir) and ranney collectors are both widely used, they would both be slow but relatively sure. I downgraded the Lochquifer alternative compared to the Ranney alternative as the Lochquifer alt includes Ranney collectors and has the added complexity of water transfers which I assume involve water rights issues. Just has to take longer so I changed Loquifer to '10 years - new reg' because it involves moving water from one jurisdiction to another and will require new water rights be obtained - no guarantees that process would take any less than 1o years, and may actually turnout to be never.
Alts Ratings	Zero Gap	Regulatory Feasibility	Changed Loquifer to 10 years - new reg because it involves moving water from one jurisdiction to another and will require new water rights be obtained - no guarantees that process would take any less than 1o years, and may actually turnout to be never.
Alts Ratings	Zero Gap	Regulatory Feasibility	Not sure why Reuse for Agriculture would require new regulations - isn't this alternative already in use elsewhere? According to the documents submitted by Ripley, use of recycled water is embraced / required by regulatory authorities. Accordingly, I upgraded this alt to be the same as Ranney Collectors and North Coast Water.
Alts Ratings	Zero Gap	Regulatory Feasibility	I downgraded the Lochquifer alternative compared to the Ranney alternative as the Lochquifer alt includes Ranney collectors and has the added complexity of water transfers which I assume involve water rights issues. Just has to take longer...



Web_Page	Simple Scenario	SubCriterion	Comments
Alts Ratings	Zero Gap	Regulatory Feasibility	It is unclear what the difference is between "slow but relatively sure" and "very slow - no regulatory changes". Since the next tick on the scale is ten years, I am guessing slow means 2 years and v slow means 5 years. Accordingly, my guess is since north coast water (a reservoir) and ranney collectors are both widely used, they would both be slow but relatively sure.
Alts Ratings	Zero Gap	Regulatory Feasibility	These comments relate to Regulatory Feasibility: * Changed Reuse for Ag to "slow but sure" - it's in use in Pajaro already, so just not clear why it would take longer for agencies to approve for SCWD. * Changed North Coast water to "slow but sure" to match Ranneys and Loquifer; the regulatory issues would seem to be the same (and, in fact, perhaps easier given our pre 1914 right to Liddell).
Alts Ratings	640 MG Gap	Reliable Supply	Comments on Reliability (650 MGY): * I have chosen to disagree about the effect of demand reduction on system reliability. Given that this exercise is in the context of a given "gap", we are assessing the solution's ability to operate within that gap. While demand reduction doesn't improve reliability, I don't agree that it makes it worse and have set these solutions as "no change" as a result.
Alts Ratings	Zero Gap	Reliable Supply	Comments on Reliable Supply: * Scale seems imbalanced - "no change" is not the middle. Applies to all of them, so I think it washes out for now. * Loquifer is a tough one here - I believe that the provided rating is getting at the issue of Loch management and the resulting buffer we have there (cf. Aquifer Restoration, which rates relatively highly). Hmmm
Alts Ratings	Zero Gap	Scalability	Comments on Scalability: * Need to know more about productive capacity of Expanded Treatment and Ranneys. I had thought that each could do more than 1MGD (300MGY gap), and I have changed them both to 650MGY gap as a result for the sake of this exercise.
Alts Ratings	Billion Gallon Gap	Technical Feasibility	Regarding "Technical Feasibility" I changed the rating for "North Coast Water" to Widely Used as this alternative is basically building a dam to create a reservoir, a technology that has been used around the world for perhaps thousands of years.
Alts Ratings	640 MG Gap	Technical Feasibility	Regarding "Technical Feasibility" I changed the rating for "North Coast Water" to Widely Used as this alternative is basically building a dam to create a reservoir, a technology that has been used around the world for perhaps thousands of years.
Alts Ratings	Zero Gap	Technical Feasibility	These comments relate to the provided ratings under "technical feasibility" * Changed landscaping, capture, re-use from "Demonstrated in Field" to "Widely Used", for what I believe are the obvious reasons: it is widely used, worldwide. * Changed Potable Re-use to "Demonstrated in Field" from "Widely used" again for what I hope are obvious reasons: it's not "widely used" in comparable settings. * Changed Loquifer from "widely used" to "promising in 3-5 years" since no one is now doing Loquifer (so how can it be widely used?). * Changed North Coast Water to "widely used", since reservoirs are widely used.
Alts Ratings	Zero Gap	Yield	Comments on "Yield" * Improved Water Neutral Development so that it offsets our growth in demand due to GP growth (300 MGY, estimated) * Per my previous comment on Scalability regarding Expanded Treatment and Ranneys, changed to 650 MGY, pending further discussion.

			Agenda Item 4j
Web_Page	Simple Scenario	SubCriterion	Comment
Alts Ratings	Zero Gap	Technical Feasibility	Reduced the rating for potable reuse. Depending on the type of reuse it is not widespread.
Alts Ratings	Zero Gap	Technical Feasibility	I changed the potable reuse from widely used to demonstrated mainly because potable reuse is a broad area and for example indirect potable reuse is not widely used, nor is direct potable reuse.
Alts Ratings	640 MG Gap	Technical Feasibility	Downrated potable reuse--based on the type being considered.
Alts Ratings	Zero Gap	Legal Feasibility	I am having difficulty with this model. When I try to "click" out and get back to the previous page to perform additional ratings, it appears all of my weight changes and ratings have been eliminated and chnaged back to the default settings. Each time I leave I am brought back to the email and need to start over again. Aml dong something wrong? I am not sure why this is happening.
Alts Ratings	Zero Gap	Freshwater and Riparian Health	My only comment is on potable water. Will the regulatory agencies agree that the effect on aquatic life is positive??
Alts Ratings	640 MG Gap	Freshwater and Riparian Health	Will the regulators agree that augmenting freshwater with reuse water does not have adverse impacts to aquatic life in streams?
Alts Ratings	Zero Gap	Reliable Supply	I am not sure I agree with the assessment that reducing demand makes the system less reliable. That all depends on the reliability goal that the agency is setting. Hardwiring a reduction in demand would seem to increase reliability of a given supply.
Alts Ratings	640 MG Gap	Reliable Supply	Disagree somewhat that reducing the demand reduces reliability--seems counterintuitive and sends the wrong message to the community. "Saving water is making us less reliable" is not the message to send out.
Alts Ratings	Billion Gallon Gap	Reliable Supply	Similarly, I would change the proposals on landscaping and water neutral development from negatino "no change". I dont see how these proposals would reduce reliability. Also, I would move expanded treatment plant (which includes an option for an additional plant) to a high rating of reliability.
Alts Ratings	Billion Gallon Gap	Reliable Supply	How does watersmart make system less reliable. At most it would be no change, but not less reliable.
Alts Ratings	Zero Gap	Preserves Future Choices	Again, I am not sure I fully understand this criterion. I view it as a no regrets criterion. For example the city may need an additional treatment plant for operational reliability anyways. This would not reduce future choices to augment supply reliability. If the idea is that by pursuing this approach it may impact future options then I could see how these rating were done but I am not sure this is as important as a no regrets solution.
Alts Ratings	640 MG Gap	Preserves Future Choices	Same comment as before regarding "No regrets solutions" versus eliminating future choices--I am not sure the latter can be taken without no regrets considered.
Alts Ratings	Billion Gallon Gap	Preserves Future Choices	I dont quite understand this criterion. Is is saying are these now regrets solutions? For example, an expanded treatment plant I think, is an example of a no regrets solution since it provides infrastructure and operational reliability. Thus, even though this proposal may be "locking in", I dont think it reduces future choices, but I may be misunderstanding this criterion.
Alts Ratings	Billion Gallon Gap	Flexibility	I rated expanded treatment capacity higher since the city has only one 50 year old plant and greater ooperational resiliency would be provided.
Alts Ratings	Zero Gap	Cost to Customer: Rates	Why is the expanded treatment plant among the lowest cost in term of cents/1000 gallons, when it had the highest capital and second highest O&M costs?
Alts Ratings	640 MG Gap	Cost to Customer: Rates	Again, the cost per 100 gallons for expanded treatment is the lowest at "1", yet it has the highest capital costs and the second highest O&M cost. Something seems wrong.
Alts Ratings	Zero Gap	Local Economy	Raised the ratings in almost every category. I done see how improving the water supply and or reliability has a negative effect on the economy.

Web_Page	Simple Scenario	SubCriterion	Comment
Alts Ratings	640 MG Gap	Local Economy	Again, ratings seem too low. I dont see how improving reliability adversely impacts the economy. Maybe I dont understand this criterion.
Alts Ratings	Billion Gallon Gap	Local Economy	I dont understand why a number of proposals would have a negative effect on the economy--such as expanded treatment capacity. It seems like this would increase reliability and this would have a positive effect?
Weights	Zero Gap	N/A	If I'm not mistaken, many of these proposals would have terrestrial impacts (of course those would be less than the aquatic impacts). "Environmental Well-being This criterion relates to the degree to which a water supply or demand management strategy contributes to or impacts the quality and sustainability of the natural environment.Note: "terrestrial" was taken out as a subcriterion because none of these proposals appeared to impact terrestrial resources."

# Interim Report B

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Philip Murphy, InfoHarvest & Carie Fox, Fox Mediation

*Prepared for the Water Supply Advisory Committee December Packet*

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## I.

## Introduction

This document is a continuation of Interim Report A: a pastiche of graphs, tables and brief narratives capturing Committee Member work on the online WSAC Decision model. The purpose of these packet materials is to provide fodder for discussion in the December meeting and to help fulfill the goals of Recon.

This document contains a preliminary analysis of the City's and Cttee-member ratings and the changes the Cttee-members made to those ratings.

The second person—'you'—refers to the Cttee Members.

To make in-meeting references to the graphics easier, we picked up the numbering of the substantive sections where we left off in Interim Report A, starting with roman numeral IV. For the same reason, this document starts with Appendix B

You can relate this report back to the website by going to [https://www.decisionharvest.com/dhroot/dhowners/santacruz/vreports/scwsac\\_recon\\_cmtee\\_comments.asp](https://www.decisionharvest.com/dhroot/dhowners/santacruz/vreports/scwsac_recon_cmtee_comments.asp)

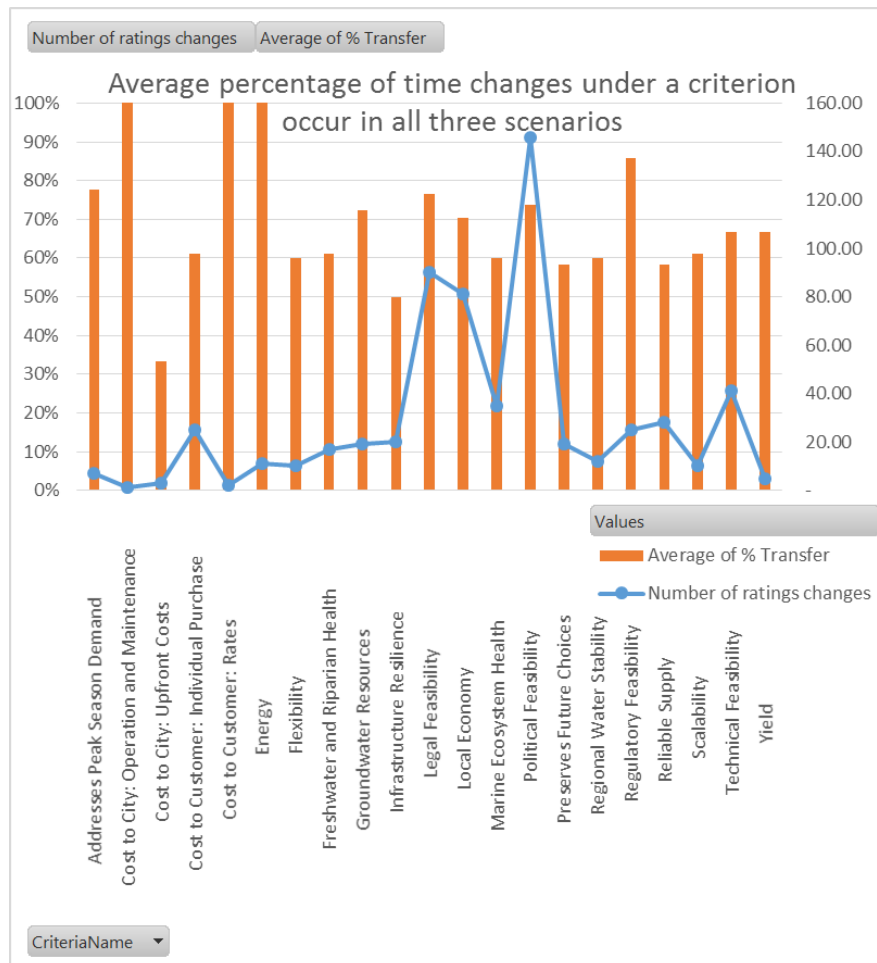
Don't worry about the tokens—we aren't gathering data any more.

*The 'graph of all graphs' is decomposed in section VIII!*

## IV. Usage Statistics: Ratings Changes

As a Ctte, you were conscientious about changing the City's ratings across all scenarios, as you can see in Figure IV.1. Seven of you made changes to all three scenarios; six did two. Your efforts were evenly distributed. Therefore, variance across scenarios is not an artifact of your work patterns. (For graphs exploring these patterns further, see Appendix B and also II.2 from the first Interim Report.)

As described in the last report, you were stalwart in rating *political feasibility* and fell away on *legal feasibility*. Understandably.



**Figure IV.1. Ratings Changes across Scenarios**

*Focus on the places where the blue line—the number of ratings changes—spikes up. Then look to the left—that number shows the percentage of time ctte members re-rated that criterion for all three scenarios.*

## V. Variance in Ratings Across Criteria and Proposals

Figure V.1 shows the variance in the City's ratings by criteria. You can see here that *political feasibility* has no variance—that is because these ratings were set at a default (the same, unvaried default) and left for you to rate properly later. *Legal feasibility* has a very small variance because of Carrie's goof—remember that **Water Smart** was erroneously set one measure off of the default? Look at the ratings x criterion variance for **Water Smart** and you can get a sense of scale. Fortunately the real variances are significantly greater.

Why do you care about this? Wide variances suggests that you have a set of approaches that has an interesting range for nearly all the criteria, which in turn makes for a useful palette to use in portfolio-building.

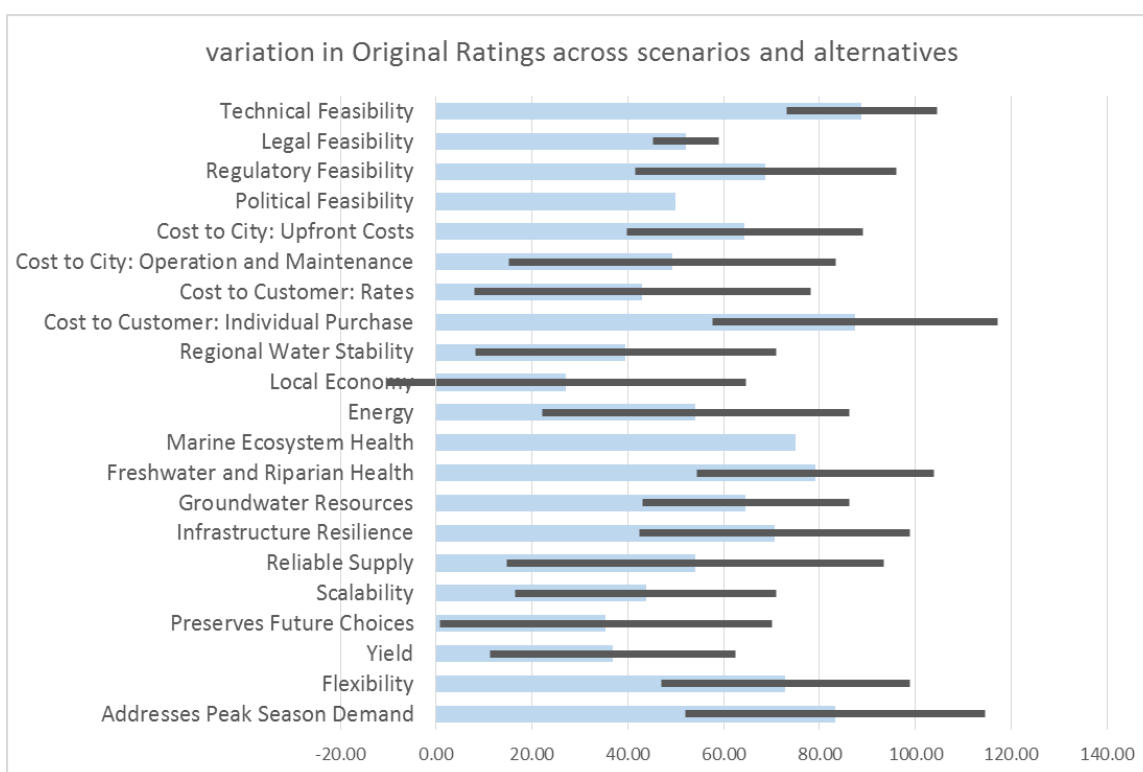
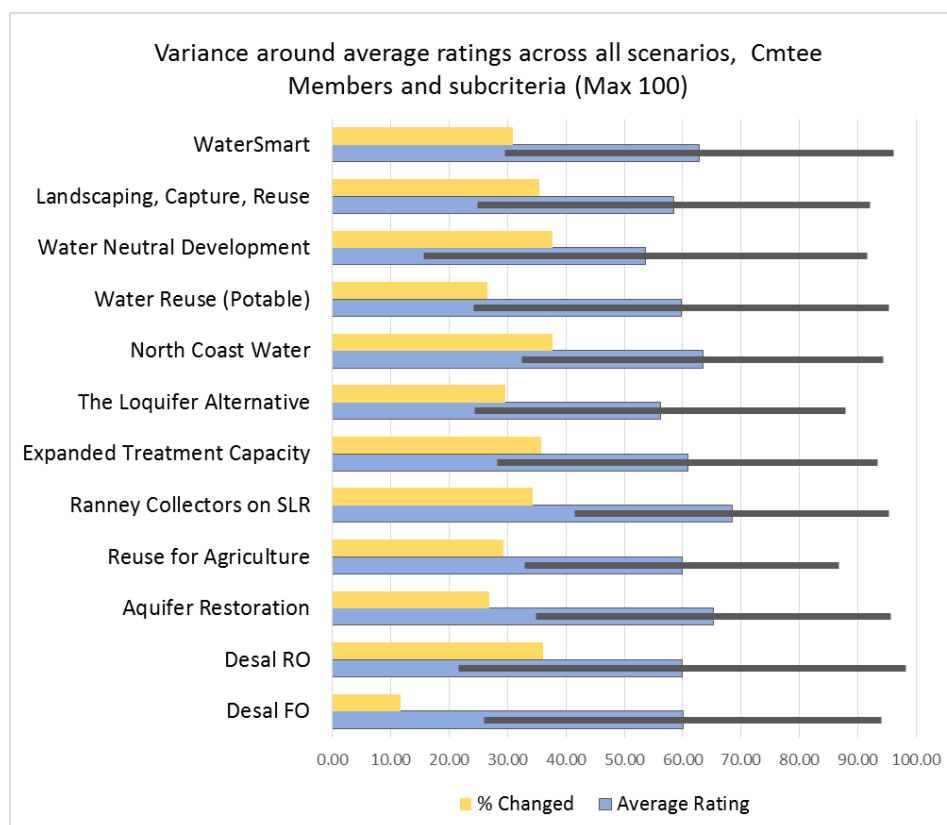


Figure V.1: Variation in the City's Original Ratings

Figure IV.2 shows the same information, but this time by proposal. At first glance, this doesn't mean much—it lumps all the ratings for, say **Water Smart** and then says how much they varied from their weakest to their strongest subcriterion. What we find interesting is the fact that the proposals got similar levels of review. To Carrie, this looks like the pattern of people who are seeking understanding rather

than the pattern of people who are posturing for an outcome. Or, as Philip said “blah is good.”

If you wish to see this graph broken down by scenario, please refer to Appendix B, where you can see that the ‘blah’ we like so well holds up scenario by scenario.



**Figure V.2: Committee Rates Evenhandedly**

One other thing to think about in Figure V.2: if the average rating for a proposal is ~ 60 out of one hundred (and they do hover around there), remember that even if you weigh a subcriterion as being very important, it will be watered down about 60% on average by its imperfect rating. (Think of the stacked bars with which you are familiar—imagine you gave the white section a heavy weight—it’s still only going to be filled up 60%-ish. To get 100% on the white part of the bar you would need to put all your weight on that subcriterion and have it be rated much, much higher than average.)



## VI. How Much did Ratings Change across Scenarios?

As expected, the ratings were seldom different from simplified scenario to simplified scenario—in its original ratings the City only changed *local economy* and *reliable supply*. The Ctte did see more reasons to change the ratings across scenario, as you can see in Figure VI.1—thank you, Ctte, for that nuance. The results make sense: *cost* hardly changes, except for *individual purchase*. *Political feasibility* ratings go up as the gap worsens. And so forth.

Not surprising, but a good gut check. These trends also confirm that Ctte members are putting a lot of thought into this work.

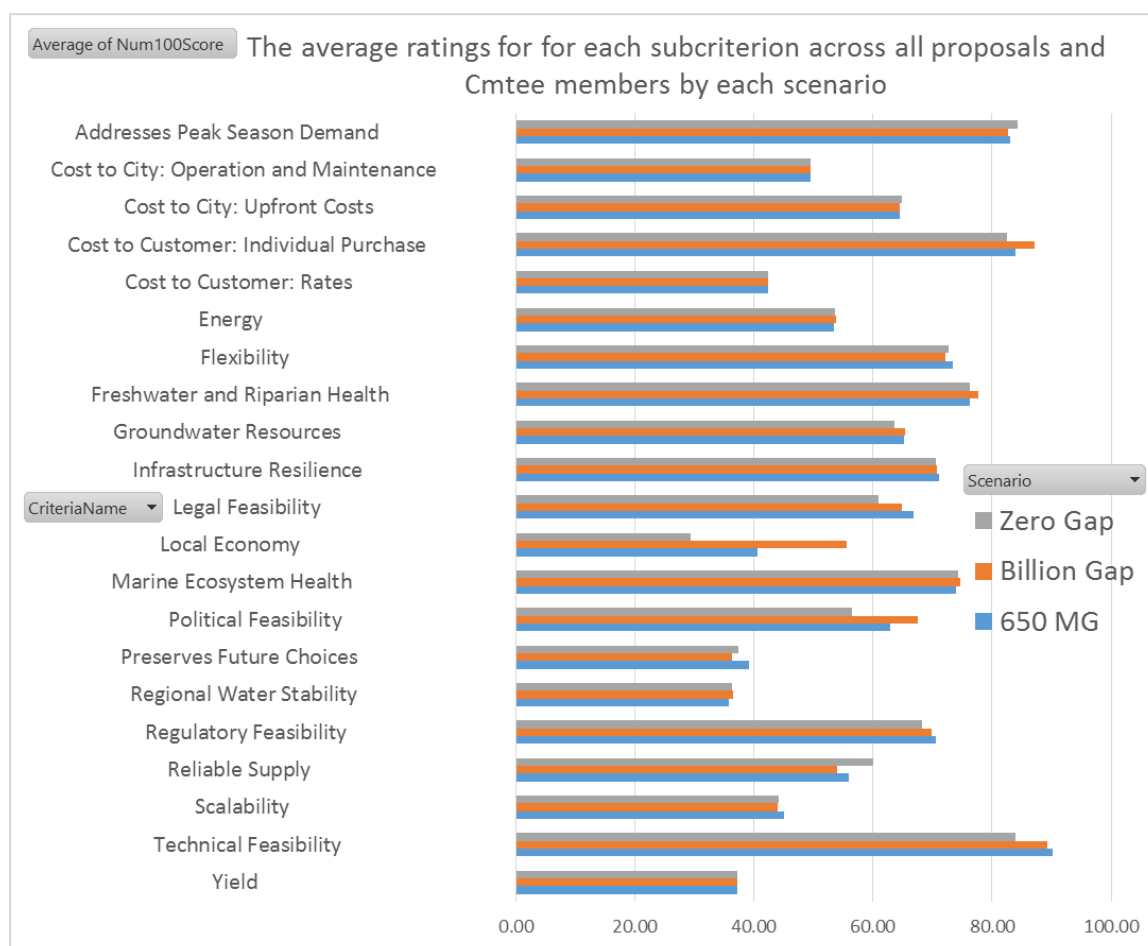


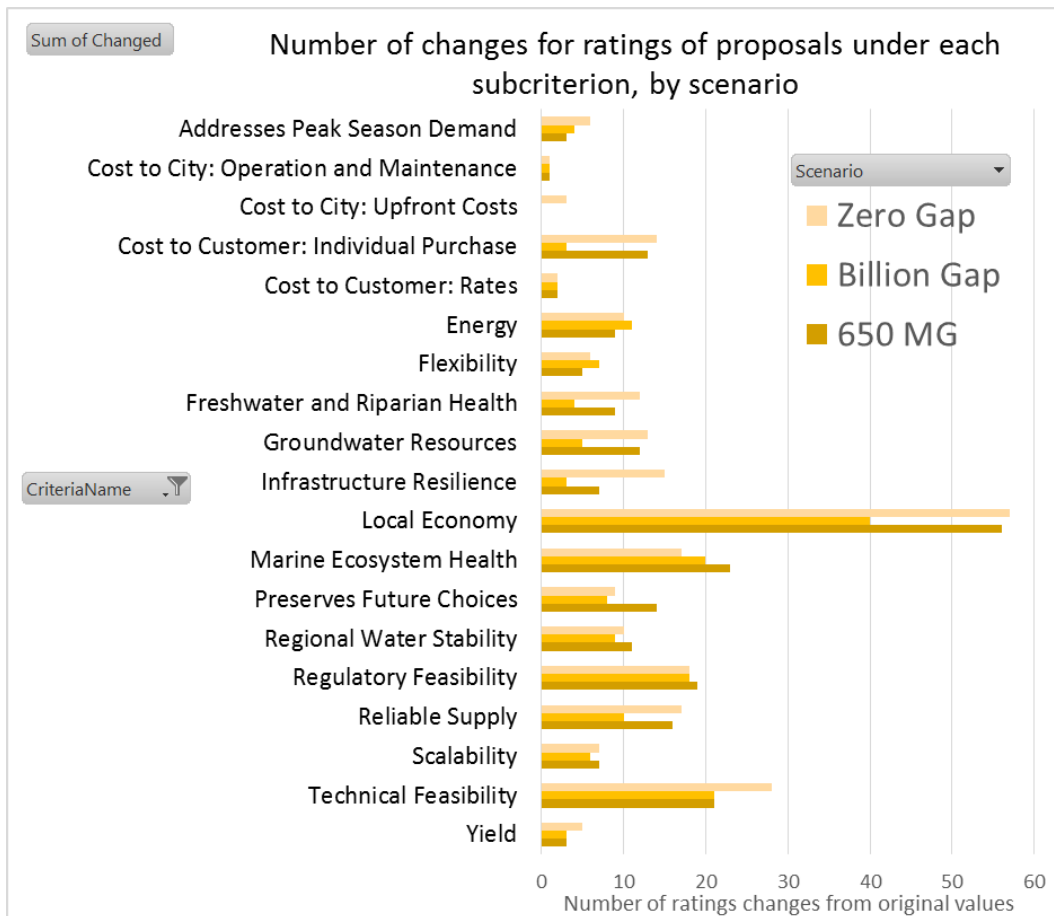
Figure VI.1: Comparing Average Ratings for Subcriteria Across Scenario

## VII. When Did the Committee Members Change Ratings?

In Figure VII.1, you see the criteria the City rated and the number of times a Ctte member changed those ratings, by criterion. This is a useful foreshadowing of the sensitivity ratings you'll discuss in the December meeting. It sure looks as though *marine ecosystem health* and *technical feasibility* will be important for your eventual agreement, more so than (for instance) cost.

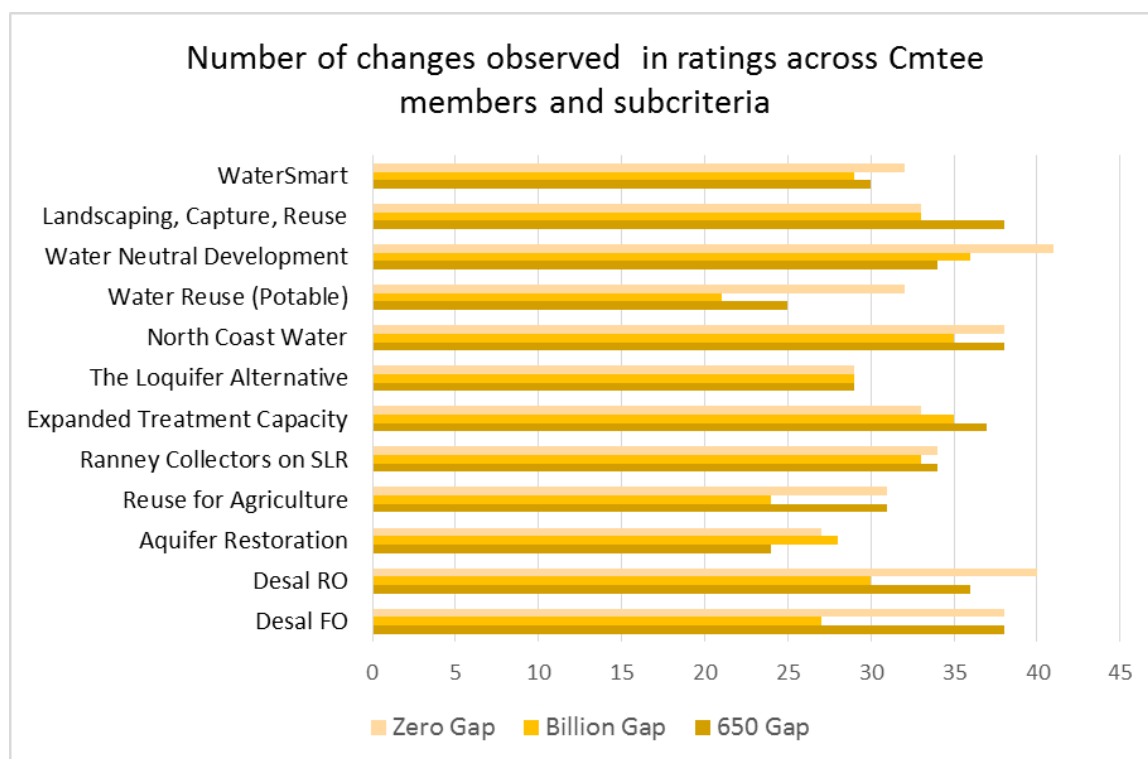
Overall, we were struck by how infrequent these Ctte changes to City ratings were.

As one skeptic put it “they didn’t change the ratings because they don’t know enough yet.” Yes, of course. As you learn more, the tension between City and Ctte ratings opinions (or among Ctte-members) will intensify and relax, intensify and relax. But that doesn’t change the optimism we see in these generally low change numbers, especially when we consider the evidence that Ctte members gave these ratings a great deal of thought. (Remember, the maximum would have been more than 300.)



**Figure VII.1: Which Criteria Were Changed the Most, by Scenario**

Figure VII.2 shows the same information, but by proposal:



**Figure VII.2: Which Proposals had the Most Ratings Changes, by Scenario**

## VIII. Variation in Ratings by Rating

The graphs before were interesting for trends and gut checks. But they suffer from a lot of noise.

To eliminate the noise, we go to the graph of all graphs (you will remember this from the Convention) showing the variance for each pairing of a proposal and a subcriterion (such as **Loquifer** by *Regulatory Feasibility* or **Desal RO** by *Peak Season Demand*). One per row, 252 rows.

Within each row, you see that the black bars stretch from the lowest value entered by any Cmtte member in any scenario, and extend to the highest-ever value on the right: a true min-max. If the city ratings were left unchanged, there is no black bar. (There are 74 left-unchanged rows—that means everyone agreed, for every scenario, with the city for 74 out of the possible 252 areas of dis/agreement!)

The rows are ordered from the broadest min-max to the narrowest:

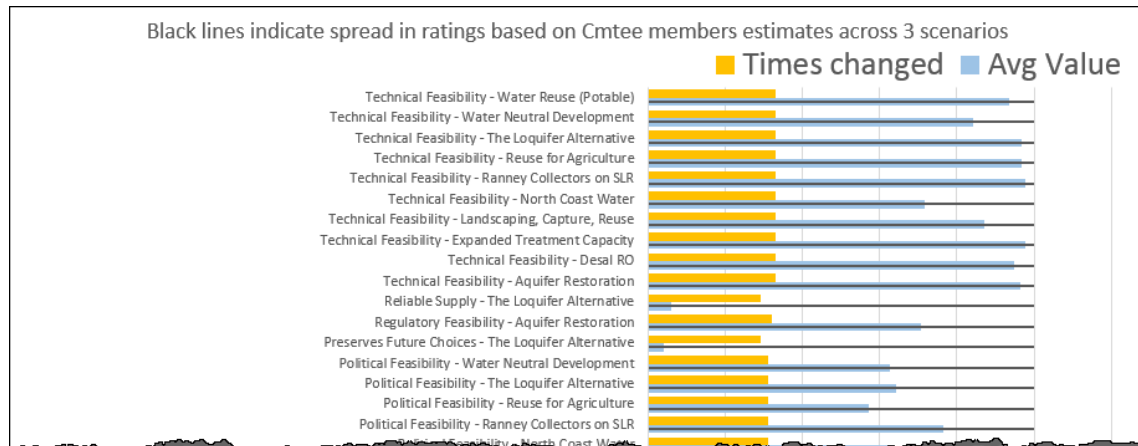


Figure VIII.1: Section of the Graph of all Graphs For Illustration Purposes

The 44 ratings where Cmtte members entered values ranging from 0 to 100 are worth examining. Many were in response to questions about *Feasibility*.

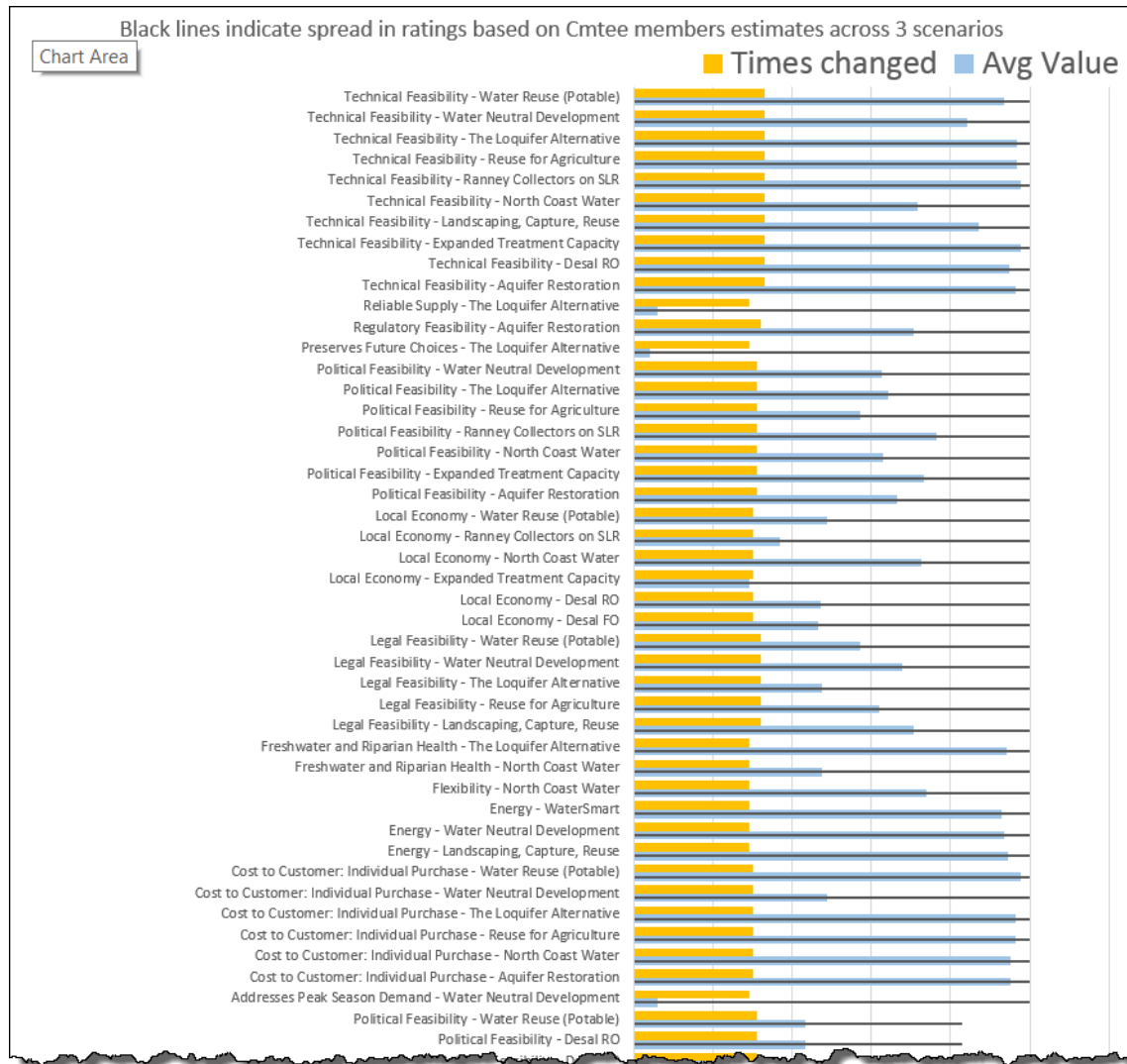


Figure VIII.2: The Subcriterion x Proposal Pairings with the Widest Ratings Spreads.

Throughout this analysis, we spent a lot of time checking the results for soundness. Was this peculiar? Did the two graphs support the same story? Is this what we might have expected? The heavy min-max for *technical feasibility* felt odd. Philip examined this in detail and realized that it relates to the fact that one Cttee member changed the *technical feasibility* ratings for all the proposals--except **Water Smart**—to zero. This does crowd out the other information. We are working now on a graph that can correct for this without doing a disservice to the person who gave out the large

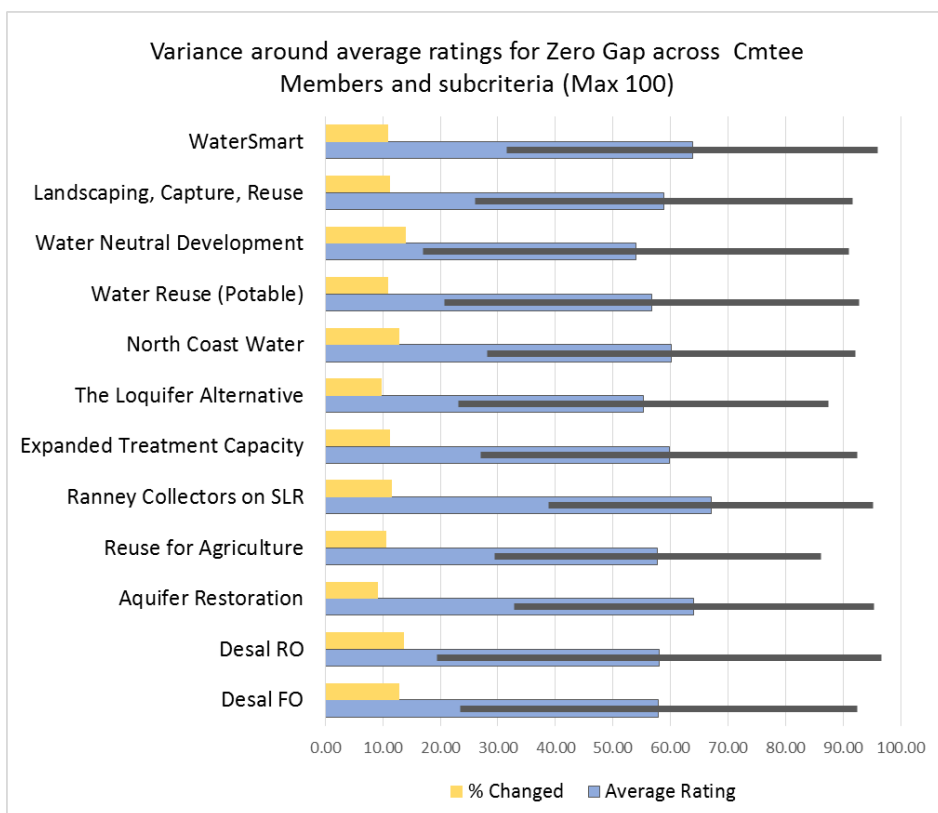
serving of technical zeros, probably by using standard deviation. But at the moment we haven't figured out a version of the *graph of all graphs* that has *more* information without driving you into a cognitive breakdown. Hang on! We will figure out an 'absorbable' version of this graph.

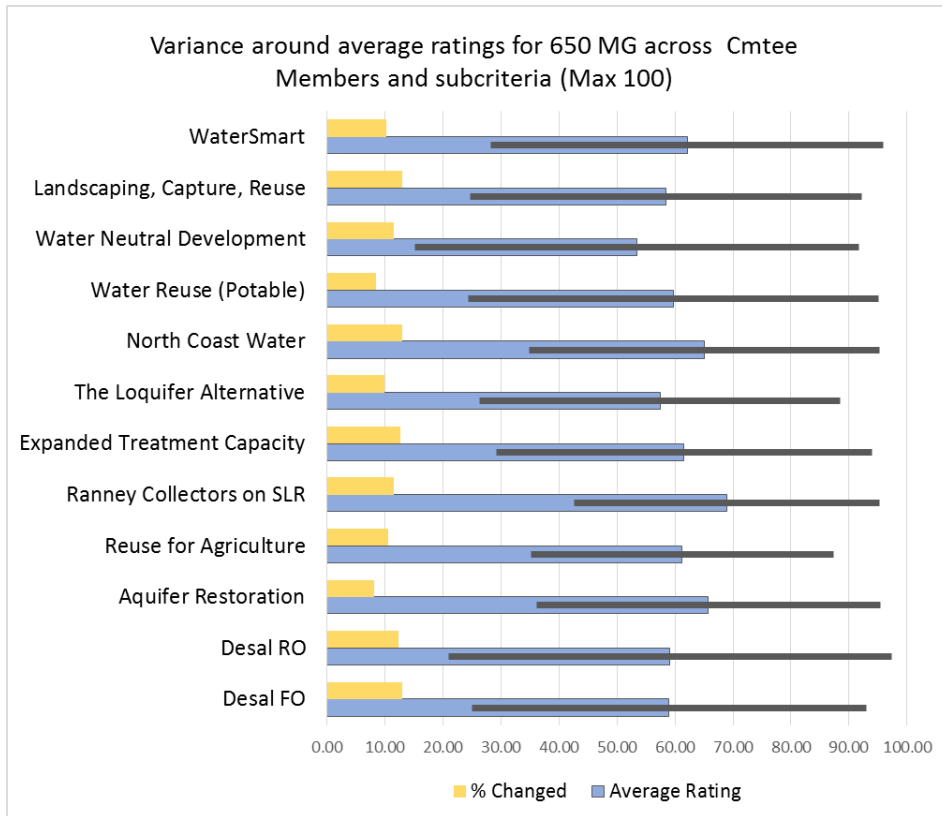
## IX. Up Next?

In this packet, you have uncertainty information provided by the City—the uncertainty related to their original ratings. Philip needs to merge this uncertainty with your data and set the stage for a discussion about uncertainty, decision scores and sensitivity analysis for the December meeting.

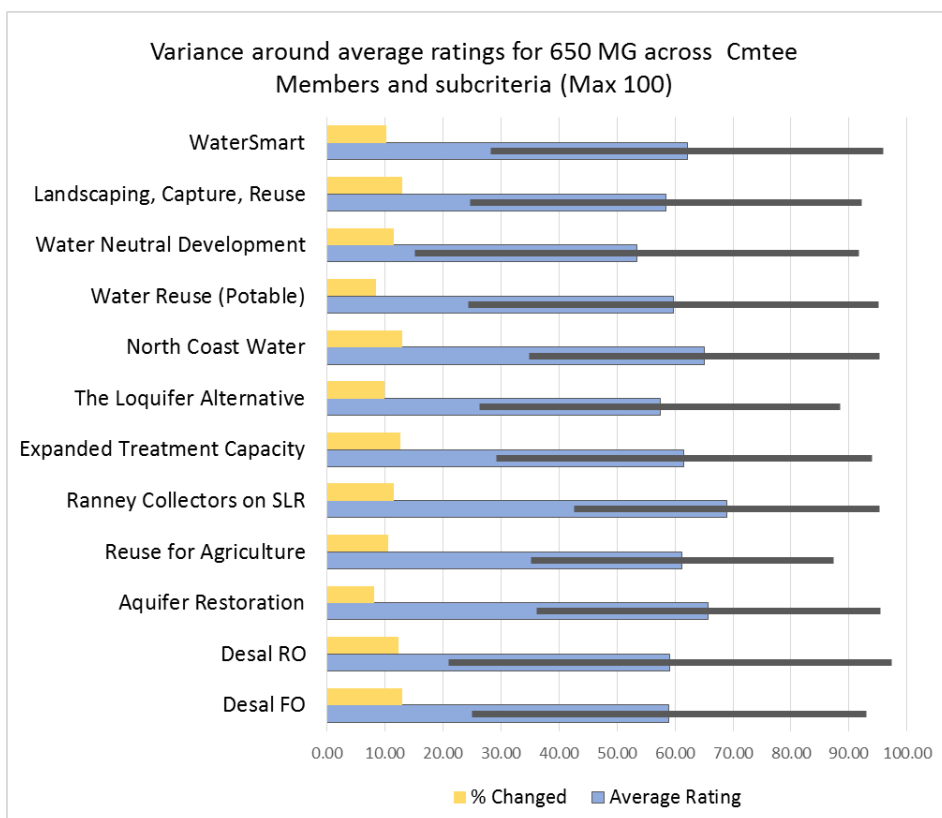
Please let Carie know if there are any other analyses you would like to see at the meeting. If we can, we'll perform them. Thank you for your attention and for the beautiful work you did providing this data.

## Appendix B. Miscellaneous Graphs









### **Proposed WSAC Meeting Schedule**

Below is the schedule I'm proposing for the remainder of the WSAC Process. An action item on a proposed revised schedule will be included on the December meeting agenda.

Ultimately this (or any other proposed) schedule will need to be approved by the City Council, but for planning purposes I have developed this schedule and, assuming that it works for everyone, this proposed schedule change would be included in the report to Council planned for January 27, 2015.

The blue meeting dates below would be focused on the technical analyses – these meetings are 6 weeks apart.

The red meeting dates would be focused on developing and finalizing the Committee's agreements and recommendations. These meetings aren't always 4 weeks apart because I'm making the assumption that there will be less work going on between one meeting and the next at this stage of the work. The W/F sessions occur due to the Thursday of that week being a Planning Commission Thursday.

W/F February 4/6\*

W/F March 18/20

Th/F April 30/May 1

Th/F June 11/12

Th/F July 23/24

Th/F August 13/14

Th/F September 10/11

W/F September 30/October 2

\*The February 4<sup>th</sup> session of the Modeling and Forecasting Working Group presenting the baselines for supply and demand will be integrated into the WSAC meeting planned for Wednesday, February 4<sup>th</sup>.

**WSAC**

**Proposed Planning Subcommittee Work Plan**

**Reviewed and Discussed By the Planning Subcommittee Tuesday, December 9, 2014**

Planning Subcommittee Work Plan – December through mid-March:

1. Strategic Planning Meeting related to designing and integrating full Committee Process with the technical work plan
  - a. Hold meeting and work with staff to turn around a product for discussion and action at Friday session of the WSAC meeting;
2. Work with staff on the Recon Report for presentation to the City Council on January 27, 2015:
  - a. Review and comment on draft versions of the Recon Report and accompanying Staff Report;
  - b. Provide comments on Staff Reports for facilitation and technical support consultant services;
3. In early January, work with staff and technical team to develop a proposed set of consolidated alternatives that would eliminate the duplication, identify a representative project or program for each major type of alternative:
  - a. Working with staff and technical team members, participate in conference calls and/or meetings to work through the full range of alternatives and consolidate them into a proposed set of representative alternatives for consideration and action by the full Committee at their February meeting.
4. Possible follow up work on “problem statement(s)” planned to be developed during February meeting.
  - a. If assigned by the full Committee to do so, work on writing and/or refining any problem statement developed by the Committee at its February meeting.
  - b. If assigned by the full Committee to work on the problem statement, present resulting work product at March meeting.
5. Scenario development for use in scenario planning exercise scheduled for March meeting
  - a. Work with staff and Stratus consultant team member to create scenarios and plan for scenario planning exercise
6. Consider and recommend to the full committee possible enrichment activities for January through April 2015.

November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 1

Santa Cruz Police Department  
Police Community Room  
155 Center St.  
Santa Cruz, CA 95060

Peace United Church of Christ  
Fellowship Hall  
900 High St.  
Santa Cruz, California 95060



**WATER SUPPLY ADVISORY COMMITTEE (WSAC) AGENDA**

**Special Meeting**

**November 19 & November 21, 2014**

**ACTION Agenda prepared December 8, 2014 with action taken in bold type.**

5:00 P.M. SPECIAL MEETING - SESSION ONE (**NOVEMBER 19**): FELLOWSHIP HALL

2:00 P.M. SPECIAL MEETING - SESSION TWO (**NOVEMBER 21**): COMMUNITY  
ROOM

**Statements of Disqualification:** Section 607 of the City Charter states that "...All members present at any meeting must vote unless disqualified, in which case the disqualification shall be publicly declared and a record thereof made."

The City of Santa Cruz has adopted a Conflict of Interest Code, and Section 8 of that Code states that no person shall make or participate in a governmental decision which he or she knows or has reason to know will have a reasonably foreseeable material financial effect distinguishable from its effect on the public generally.

**General Business:** Any document related to an agenda item for the General Business of this meeting distributed to the WSAC less than 72 hours before this meeting is available for inspection at the Water Administration Office, 212 Locust Street, Suite A, Santa Cruz, California. These documents will also be available for review at the WSAC meeting with the display copy at the rear of the Council Chambers.

**Appeals:** Any person who believes that a final action of this advisory body has been taken in error may appeal that decision to the City Council. Appeals must be in writing, setting forth the nature of the action, the basis upon which the action is considered to be in error, and addressed to the City Council in care of the City Clerk Administrator.

**Other - Appeals** must be received by the City Clerk Administrator within ten (10) calendar days following the date of the action from which such appeal is being taken. An appeal must be accompanied by a fifty dollar (\$50) filing fee.

**City Councilmember Attendance:** Four or more members of the City Council may be in attendance at this meeting.

## WATER SUPPLY ADVISORY COMMITTEE (WSAC) AGENDA

November 19, 2014 - 5:00 PM

### SESSION ONE

Call to Order - Co-Facilitator Nicholas Dewar called the meeting to order at 5:00pm

Roll Call: Doug Engfer, Sid Slatter, Peter Beckman, Mike Rotkin, Sue Holt, Sarah David B, Erica Rick, Greg Pepping, Mark Mesiti Miller, Charlie Keutman, Dana Jacobson (arrived late), and David Stearns (absent).

### Welcome to Public and Public Comment

Co-facilitators Fox and Dewar welcomed the public. No public comment.

### Committee Member Updates

A committee member discussed SCDA and encouraged other members to attend Modeling and Forecasting Workshops.

### Agenda Review

Committee Members reviewed the agenda for the WSAC's eighth meeting.

- No modifications of agenda.
- Desired outcomes met.
- Action: The WSAC accepted the Agenda as proposed

### Results from the Civinomics website rating of Alternatives from the Water Supply Convention

Manu Koenig and Robert Singleton from Civinomics presented the results of community ratings of alternatives presented at the October 16 Water Supply Convention and answered questions.

- Alternatives Convention needed to be promoted more

November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 3

- More outreach through organizations
- Standardized presentation format (metrics, work more with individual authors, combine similar ideas).
- Committee asked questions about how to do it better?
- Why is water/energy nexus so highly rated (the Candace Brown concept).
- Sample size and composition.
- Desired outcome met.
- **Action: None.**

**MCDS - Selection of the Alternatives for Recon**

Bob Raucher provides overview of the 13 alternatives being reviewed in RECON, both how they were selected, what they are, how they will be used. (Note: Agenda states 12 alternatives; there are 13.)

- WSAC agrees to: add water smart concept to the existing list and remove water conservation savings account (Smallman alternative)
- Beyond Building Code was identified as a possible replacement but was not included because the actions to be taken weren't specified in the proposal and not having these details makes it impossible to rate this alternative.

**MCDS - Running "what if's" through the model**

Bob Raucher will demonstrate the way that the MCDS Recon model responds to "what if" changes to the assumptions underlying two different alternatives

- Committee agrees to delete this item from agenda due to time constraints.

**MCDS – the Two Futures scenarios**

Rick Longinotti presented the two scenarios he developed at the Committee's request. These scenarios are intended to be used with the MCDS tool to evaluate and compare the selected alternatives for the Recon MCDS exercise.

- Agreement to add 650mg shortfall as a future scenario, to the 0mg and the 1,000mg
- The Committee understood that the scenarios need some narrative to supply texture to each scenario as well as simply specifying a water shortfall.
- The Committee agreed that the City will develop texture for each of the three scenarios.
- Planning horizon: In recon we want to understand the timing of things. Punt

November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 4

issue of timing to city and hear back from them on Friday. Carie asked the Committee for guidance regarding planning horizons to be considered by City staff when it meets on Thursday rate alternatives.

- The Committee agreed that the City will determine suitable planning horizons for use in the development of rating scales and will provide its answers to the Committee on Friday.
- **Desired outcomes met, albeit modifications were made.**

**MCDS Criteria & Scales for Recon**

Carie Fox updated the Committee on the criteria and the scales to be used to rate the alternatives against those criteria in Recon.

- Agreement on removing Traditional Landscape and Climate Adapted Landscape from Community Well Being, at least for now. Could be reevaluated in Real Deal.
- Additional changes will be documented by Carie and redistributed to the Committee.
- Desired outcomes met.

**Presentation on Local Hydrogeology**

WSAC IRP member and registered professional geologist, Mike Cloud will give a presentation on local hydrogeology with a focus on local aquifers, aquifer characteristics, and their current condition. (includes time for Committee Q/A and discussion)

- Committee discussion included mechanism of seawater intrusion; how recharge occurs; impact of small wells and pumpers; volume of storage along North Coast; feasibility of ability to assess recharge ability; what further studies needed to see if Purisma can be recharged and how long it would take for the District to send water back to City;
- Santa Margarita would take water easily but not store – there would be a certain amount of leakage to Bean Creek.
- Desired outcomes were met from the perspective of understanding local groundwater; many questions posed in terms of the potential for groundwater recharge and storage.
- **Action: None.**

**Written Review and Wrap Up** – Identification of any incomplete issues to be carried forward to tomorrow's session.

- Bring Bill Faisst item to Friday's meeting.
- **Action: None.**

November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 5

**Adjournment** The Water Supply Advisory Committee adjourned from its first session on November 19 at 9:34 PM of the regular meeting of November 19 - 21, 2014 to its second and final session on November 21 for an open session after the hour of 2:00 p.m. in the Police Community Room at the Santa Cruz Police Department.



November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 6

## Water Supply Advisory Committee Agenda

November 21, 2014 - 2:00 PM - 6:00 PM

### SESSION TWO

#### Call to Order - Meeting Reconvenes

**Roll Call:** Roll call was not recorded in the meeting notes.

#### **Public Comment:**

Five members of the public spoke on matters regarding demand forecasting, other community demand projections, health risks in using recycled water, storage at quarries, and interest rate money going out of the county.

#### **Presentation - Correspondence Received from the Community**

Committee Corresponding Secretary Mike Rotkin led the Committee Members in a discussion on correspondence received from the community regarding another proposal that was submitted which will join existing proposals in the repository.

#### **Review of Previous Session**

Committee Member asked a question about the Kaffeklatches.

#### **Water Rights 101**

Water rights attorney, Martha Lennihan presented a briefing on water rights law, policy and procedures, and provided preliminary discussions of possible water rights issues related to selected alternatives, as examples only.

- **Action: None.**

#### **Example of Triple Bottom Line analysis of a couple of different alternatives**

Bob Raucher shared some preliminary analysis of what kind of information about alternatives could be developed using the Triple Bottom Line (TBL) framework.

- **Action: None.**

November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 7

### Planning Horizon

Technical team and Committee members discussed issues related to specifying a planning horizon for the Committee's work.

- Action: None.

### Technical Work Plan

Bob Raucher and Bill Faisst presented and discussed progress on the technical work plan, including laying out new work resulting from ongoing efforts by the technical team and City staff to develop a technical work plan that will support the Committee's decision-making effort.

- Action: None.

### Agenda for November and December

Committee Members discussed the agenda outlines for the Committee's February and March meetings.

- Action: None.

### Real Deal Planning Subcommittee

The Committee discussed how the Real Deal Planning Subcommittee's role fits in the time-table of the Committee's work

- Subcommittee won't become meeting facilitators, there will still be some sort of facilitation
- Specificity needed about what it is Committee is ultimately going to produce, with goal of getting as close to option 4 as possible.
- Time frame: work with consultant team to make sure that timeline is being kept

### Materials Resulting from the Previous Meeting

The Committee Members will review the Action Agenda and Meeting Summary prepared for the previous meeting.

- **Agenda Approved**

November 19 & 21, 2014 WATER SUPPLY ADVISORY COMMITTEE ACTION AGENDA 8

**Oral Communication**

Four members of the public spoke on matters regarding taking more winter water from San Lorenzo and fixing the WSAC website by January.

**Written Review and Wrap Up** - Identification of any incomplete issues to be carried forward to next meeting.

**Adjournment** - The Water Supply Advisory Committee meeting adjourned at 6 p.m. from the second session on November 21 of the regular meeting of November 19 - 21, 2014 to its next meeting on February 4, 2014 at 5:00 PM and February 6, 2014 at 2:00 PM. Location to be determined.

Alternative Number and Title

5. Bevirt - North Coast Water

Cost Estimate

Ad			200
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
650-MG Liddell alternative:			
Capital	\$25M	\$20M to \$50M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$125,000	\$125,000 to \$250,000	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

6. McKinney - Expanded Treatment Capacity

Estimated Annual Yield (million gallons [MG]): Up to 977 MGY if City perfects its right to SLR diversion with about 560 MGY in new water. Availability of water may decrease substantially in drier years.

Reliability Over Time (seasonal and inter-annual variability)			
Costs; see pages 7 and 8 of the "McKinney: Expanded Treatment Capacity" document	Best Estimate	Likely Range	Comments
Capital	\$86M	\$57M to \$129M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$154,000	\$103,000 to \$231,000	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

7. McKinney Ranney Collectors SLR

Estimated Annual Yield (million gallons [MG]): Up to 977 MGY if City perfects its right to SLR diversion with about 560 MGY in new water. Availability of water may decrease substantially in drier years.

Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$16M	\$11M to \$24M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$30,000	\$20,000 to \$45,000	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

8. Paul-Lochquifer

Estimated Annual Yield (million gallons [MG])			640
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$30M	\$20M to \$45M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$50,000	\$33,000 to \$75,000	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

9. Ripley - Reuse for Agriculture

Estimated Annual Yield (million gallons [MG])			Up to 780
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$88M	\$70M to \$140M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$113,000	\$75,000 to \$170,000	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$3,300	\$3,200 to \$3,500	

10. SCDA - Regional Aquifer Restoration

Estimated Annual Yield (million gallons [MG])			78
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$0	\$0	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$0	\$0	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

Costs would be similar to Alternative 8. Lochquifer but unit cost higher owing to projected reduced extraction and return.

11. SCWD - Water Reuse

Estimated Annual Yield (million gallons [MG])			Up to 1350
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$105M	\$72M to \$162M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG annual capacity	\$80,000	\$60,000 to \$120,000	
PV Cost/MG	\$3,600	\$2,400 to \$6,000	
Energy (KWh/MG)	\$0	\$0	

12. SWC - Desalination

Estimated Annual Yield (million gallons [MG])			915
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$105M	\$70M to \$160M	
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG annual capacity	\$115,000	\$77,000 to \$172,000	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

13. Trevi - Forward Osmosis Desalination

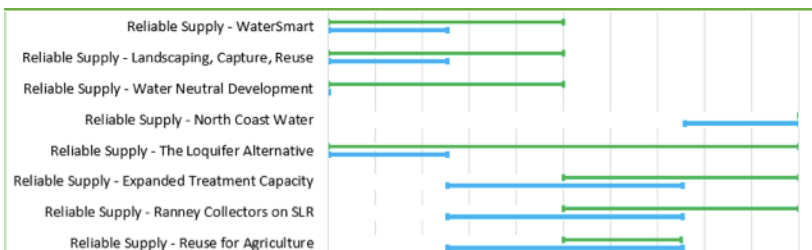
Estimated Annual Yield (million gallons [MG]) assuming that a new facility would produce 2.5 mgd			915
Reliability Over Time (seasonal and inter-annual variability)			
Costs	Best Estimate	Likely Range	Comments
Capital	\$0	\$0	Costs would be similar to RO desalination. Technology is not proven and required low grade heat source unidentified. City could swap out RO desalting for FO
Annual	\$0	\$0	
Present Value	\$0	\$0	
Capital cost/MG	\$0	\$0	
PV Cost/MG	\$0	\$0	
Energy (KWh/MG)	\$0	\$0	

Esteemed Ctte Members-- This document is intended to support and focus the criteria discussion you asked for, about the criteria and scales. I made a table with the existing definitions, the scales (except for cost), some notes based on your conversations and a graph that shows the City uncertainty in blue and the Ctte variance in green. In these graphs, if the variance is relatively small and nests into the uncertainty I take that as a good sign:



*City's blue uncertainty encompasses the Ctte's green variance.*

But if the Ctte variance lies outside the City's uncertainty, then I take that as a hint of something awry:



*The variance in the Ctte's green ratings seems to be all over the place. A sign there is something awry with the definition or scale?*

I didn't use these tables for the 3 remaining cost criteria. I think the cost discussion should be framed differently—by a memo from Bill which you'll get tomorrow.

Going through the materials, I only see three criteria that are (I think) 'done':

- Yield
- Flexibility and
- Cost to Individual.

That leaves 18 criteria to do in ~100 - 140 minutes. (The exact agenda details need to be discussed.)

If you wish this marathon (and I know some of you do, but I will check with all of you), how to accomplish it?

1. If you can, please flip through these pages—there's one page per criterion—and make a note of issues I haven't captured. Be ready.
2. It's useful to think about the source of the problem:
  - a. Murky definitions
  - b. Stupid scales
  - c. Insufficient information as yet (and we are not solving that today!)
3. When thinking about dumping criteria, things to consider are:
  - a. Do I need this criterion to discriminate among options?
  - b. Does it communicate something to people that it is important for you to communicate?
4. Some of the issues simply won't emerge without a bit of discussion—think of the downstream piece in *Cost to Individual*.
5. Scales are the quality control for definitions, so you can't avoid those. And sometimes, to test what's right or wrong about a definition, you have to delve into the actual ratings-by-proposal to see where the sticking point might be. But don't go further than that. This is not a discussion about the actual ratings.

6. We will start at the end and work backwards because the end criteria get consistently less attention. If, as we go, you see a better logic for prioritizing, ok. But let's plunge in with this rule to begin with.
7. Lay all your issues on the table; don't wait for near-resolution and then pop us with a new one.
8. Make your point once. Only once.
9. We're going to have a timer. In the 3 to 4 minute range I'll do a quick triage
  - a. Go for resolution
  - b. Go for problem identification and future resolution\*

If the latter, then we'll also identify the people who care a great deal about this criterion and seem to have something to contribute to its resolution.

Please try to avoid dickering about whether the triage is right or not—if that meta discussion drags on you'll never get the 18 criteria done.

Thanks. Take your vitamins!

Carie

\*On Wednesday you said that you didn't want to farm this problem to the RDPlanning Subctte because it seems that many of the rich points came from non-sctte-members. Excellent point. I do think that there is likely to be a constellation of people who emerge for a given criterion. If a criteria definition can't be agreed to in the meeting, I suggest you create ad hoc subgroups to hash them out and bring some ideas back to the next Ctte meeting.

Subc riteri on	Definition	Scale	Ratings min-max: Cmtee spread (Green) and City Uncertainty (Blue) in the 650 MG scenario.																																							
Technical Feasibility	Technical feasibility is an estimate of whether this approach would work as envisioned. For complex proposals, rated on the basis of core elements. When rating, City staff used the 10-year horizon on the assumption that it would be very difficult to make predictions about what technical innovations would occur more than 10 years out. If you want to change the ratings and look at a longer timeframe, the scale gives you the leeway to do that.	Widely used, Demonstrated in field, Promising in 3-5 years, Promising in 6-10 years, Maybe 10-20 years, More than 20, Never	<table><caption>Technical Feasibility Ratings (Estimated from Chart)</caption><thead><tr><th>Alternative</th><th>City Uncertainty (Blue)</th><th>Cmtee spread (Green)</th></tr></thead><tbody><tr><td>Technical Feasibility - WaterSmart</td><td>50 - 100</td><td>85 - 100</td></tr><tr><td>Technical Feasibility - Landscaping, Capture, Reuse</td><td>50 - 100</td><td>85 - 100</td></tr><tr><td>Technical Feasibility - Water Neutral Development</td><td>50 - 100</td><td>85 - 100</td></tr><tr><td>Technical Feasibility - North Coast Water</td><td>25 - 75</td><td>65 - 75</td></tr><tr><td>Technical Feasibility - The Loquifer Alternative</td><td>25 - 100</td><td>100 - 100</td></tr><tr><td>Technical Feasibility - Expanded Treatment Capacity</td><td>25 - 100</td><td>100 - 100</td></tr><tr><td>Technical Feasibility - Ranney Collectors on SLR</td><td>25 - 100</td><td>100 - 100</td></tr><tr><td>Technical Feasibility - Reuse for Agriculture</td><td>75 - 100</td><td>85 - 100</td></tr><tr><td>Technical Feasibility - Aquifer Restoration</td><td>25 - 100</td><td>100 - 100</td></tr><tr><td>Technical Feasibility - Water Reuse (Potable)</td><td>45 - 100</td><td>85 - 100</td></tr><tr><td>Technical Feasibility - Desal RO</td><td>75 - 100</td><td>85 - 100</td></tr><tr><td>Technical Feasibility - Desal FO</td><td>25 - 75</td><td>50 - 70</td></tr></tbody></table>	Alternative	City Uncertainty (Blue)	Cmtee spread (Green)	Technical Feasibility - WaterSmart	50 - 100	85 - 100	Technical Feasibility - Landscaping, Capture, Reuse	50 - 100	85 - 100	Technical Feasibility - Water Neutral Development	50 - 100	85 - 100	Technical Feasibility - North Coast Water	25 - 75	65 - 75	Technical Feasibility - The Loquifer Alternative	25 - 100	100 - 100	Technical Feasibility - Expanded Treatment Capacity	25 - 100	100 - 100	Technical Feasibility - Ranney Collectors on SLR	25 - 100	100 - 100	Technical Feasibility - Reuse for Agriculture	75 - 100	85 - 100	Technical Feasibility - Aquifer Restoration	25 - 100	100 - 100	Technical Feasibility - Water Reuse (Potable)	45 - 100	85 - 100	Technical Feasibility - Desal RO	75 - 100	85 - 100	Technical Feasibility - Desal FO	25 - 75	50 - 70
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notes	Generally speaking the Cttee variance nests within the City’s uncertain estimates (exception: North Coat). So unless Cttee members flag other issues, assume that the criterion and scales themselves are ok. (One possible issue: whether should look as far out as >20)																																									
Resolution																																										
Next Steps	People:																																									



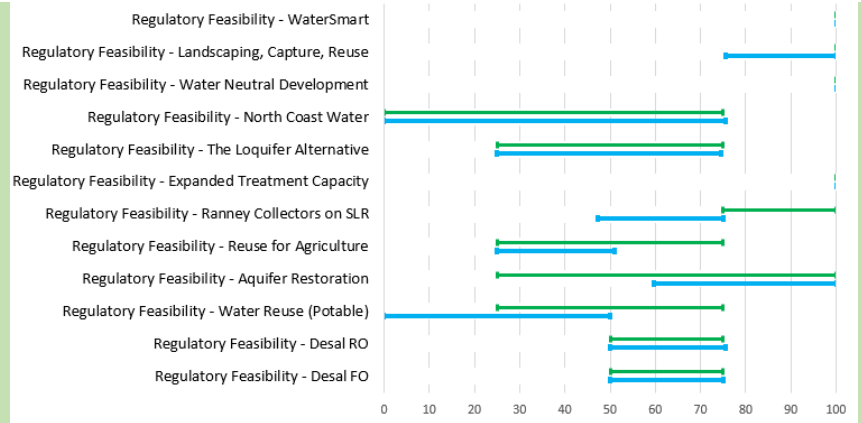
Legal Feasibility			
Legal Feasibility	<p>This addresses siting, water rights, environmental and other legal rights relevant to implementing this approach as envisioned. As you learned from Martha Lennihan, to have a water right is only the beginning: numerous factors affect the way the right can be exercised. A water right that has limitations or questions about how it can be exercised would rate as having 'some ambiguities.'</p>	<p>Unambiguous yes, Yes but some ambiguities, Can probably acquire, Difficult to acquire, Very unlikely</p>	Graph not relevant
Notes	Suggestion to roll regulatory and legal together and tweak the scale accordingly.		
Resolution			
Next Steps	People:		

## Regulatory Feasibility

### Regulatory Feasibility

This addresses environmental and regulatory review. When rating, the City staff looked at the difficulty of getting regulatory approvals under existing regulations as well as the possible necessity of responding to or taking advantage of potential new regulations that might come into place over the next decade.

Easy and quick,  
Slow but relatively sure,  
V slow no regulator y chng,  
Up to 10 year new reg,  
Not feasible (regulatory)



### Notes

The mismatch between City uncertainty (blue) and Ctte variance (green) on Ranney, Ag Reuse, Aquifer and Potable Reuse suggests that there is a problem with this one—scale would be a good place to look.

### Resolution

### Next Steps

People:

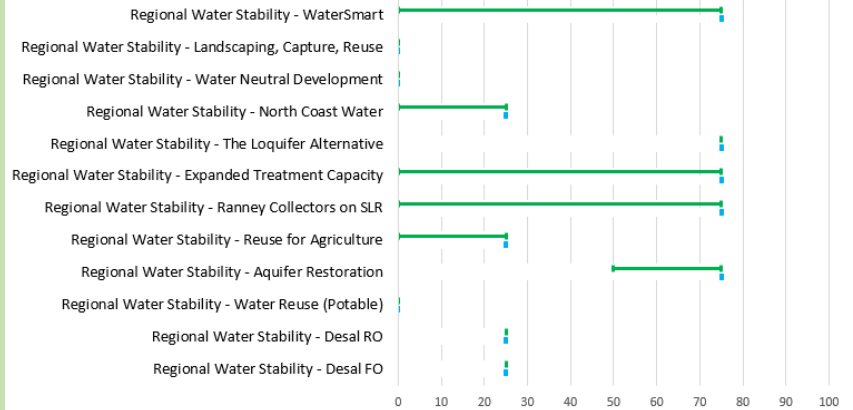
## Political Feasibility

Political Feasibility	Extent to which an approach will claim and retain the support of formal political entities as well as informal social and political groups. This applies to demand reduction (e.g. volunteerism, finances for incentives or enforcement of regulations) and to supply (e.g. majority public vote requirement for desalination, willingness to make large capital investments, or concerns about oversupply and immigration).	Enthusiasm now, Acceptable now, Active resistance now, Acceptable in 5 years, Acceptable in 10 years, Acceptable in 20 years, Likely never	Graph not relevant
Notes			
Resolution			
Next Steps	People:		

## Regional

## Regional Water Stability

Across County,  
4 jurisdictions,  
3 jurisdictions,  
2 jurisdictions,  
SC Water only



## Notes

Graph differences hard to interpret.  
Suggestion make this two point scale: one jurisdiction and more than one jurisdiction

## Resolution

## Next Steps

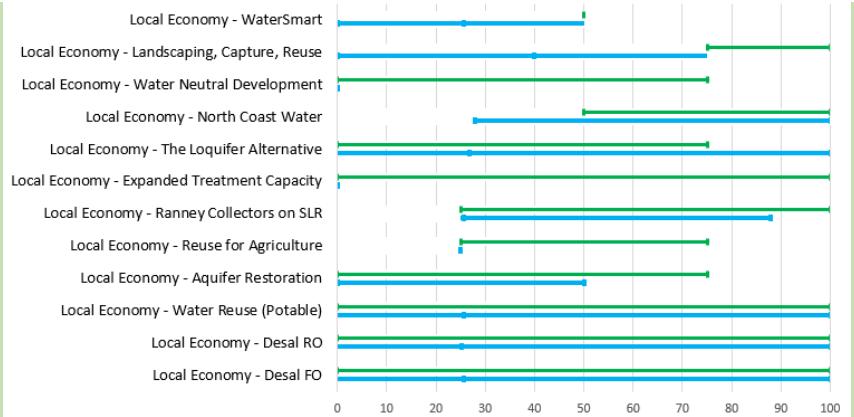
People:

## Local Economy

### Local Economy

This criterion is measured in terms of numbers of jobs and is meant to synthesize the effect of water supply, water reliability, confidence and local jobs as they might affect local economy.

Positive local job, Slight positive,  
No effect,  
Slight negative,  
Negative for local jobs



### notes

Many issues.

### Resolution

### Next Steps

People:

## Energy

Energy	<p>City staff considered the energy usage of the City's current treatment plant as a 4 and rated the others with respect to that. The City recently compared energy intensity of the treatment of desal vs traditional sources (surface and groundwater) as 15, 1.5 and 2.1 kWh/1000 gallons respectively.</p>	<p>5, 4, 3, 2, 1</p>	<table><thead><tr><th>Alternative</th><th>Energy Intensity (kWh/1000 gallons)</th></tr></thead><tbody><tr><td>Energy - WaterSmart</td><td>~95</td></tr><tr><td>Energy - Landscaping, Capture, Reuse</td><td>~95</td></tr><tr><td>Energy - Water Neutral Development</td><td>~95</td></tr><tr><td>Energy - North Coast Water</td><td>~50</td></tr><tr><td>Energy - The Loquifer Alternative</td><td>~75</td></tr><tr><td>Energy - Expanded Treatment Capacity</td><td>~50</td></tr><tr><td>Energy - Ranney Collectors on SLR</td><td>~75</td></tr><tr><td>Energy - Reuse for Agriculture</td><td>~75</td></tr><tr><td>Energy - Aquifer Restoration</td><td>~50</td></tr><tr><td>Energy - Water Reuse (Potable)</td><td>~50</td></tr><tr><td>Energy - Desal RO</td><td>~75</td></tr><tr><td>Energy - Desal FO</td><td>~50</td></tr></tbody></table>	Alternative	Energy Intensity (kWh/1000 gallons)	Energy - WaterSmart	~95	Energy - Landscaping, Capture, Reuse	~95	Energy - Water Neutral Development	~95	Energy - North Coast Water	~50	Energy - The Loquifer Alternative	~75	Energy - Expanded Treatment Capacity	~50	Energy - Ranney Collectors on SLR	~75	Energy - Reuse for Agriculture	~75	Energy - Aquifer Restoration	~50	Energy - Water Reuse (Potable)	~50	Energy - Desal RO	~75	Energy - Desal FO	~50
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Notes	<p>Several problems: first, the scale was odd because 5 was the best (and it did appear on top in the website) but in all the other scales the higher numbers were the worse scores.</p> <p>Second, it is not clear what you care about here—is it energy as a (perhaps erratic) component of cost, or is it the carbon footprint?</p> <p>If the former then why not model it as part of the cost estimates? If it is the latter, need a lot more research to get the numbers.</p> <p>Either way, this should be a numeric scale.</p>																												
Resolution																													
Next Steps	<p>People:</p>																												

Marine																													
Marine Ecosystem Health		Positive effect, does not harm, may harm, cumulative harm, Sig harm to population	<table><thead><tr><th>Scenario</th><th>Score (approx.)</th></tr></thead><tbody><tr><td>Marine Ecosystem Health - WaterSmart</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Landscaping, Capture, Reuse</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Water Neutral Development</td><td>75</td></tr><tr><td>Marine Ecosystem Health - North Coast Water</td><td>75</td></tr><tr><td>Marine Ecosystem Health - The Loquifer Alternative</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Expanded Treatment Capacity</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Ranney Collectors on SLR</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Reuse for Agriculture</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Aquifer Restoration</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Water Reuse (Potable)</td><td>75</td></tr><tr><td>Marine Ecosystem Health - Desal RO</td><td>25</td></tr><tr><td>Marine Ecosystem Health - Desal FO</td><td>25</td></tr></tbody></table>	Scenario	Score (approx.)	Marine Ecosystem Health - WaterSmart	75	Marine Ecosystem Health - Landscaping, Capture, Reuse	75	Marine Ecosystem Health - Water Neutral Development	75	Marine Ecosystem Health - North Coast Water	75	Marine Ecosystem Health - The Loquifer Alternative	75	Marine Ecosystem Health - Expanded Treatment Capacity	75	Marine Ecosystem Health - Ranney Collectors on SLR	75	Marine Ecosystem Health - Reuse for Agriculture	75	Marine Ecosystem Health - Aquifer Restoration	75	Marine Ecosystem Health - Water Reuse (Potable)	75	Marine Ecosystem Health - Desal RO	25	Marine Ecosystem Health - Desal FO	25
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Marine Ecosystem Health - Water Reuse (Potable)	75																												
Marine Ecosystem Health - Desal RO	25																												
Marine Ecosystem Health - Desal FO	25																												
Notes	<p>Nobody seemed to think that any of the proposals would have a ‘significant harm’ to the population, so may want to drop that.</p> <p>What does it mean to have a ‘positive effect’? Why do Watersmart or Landscaping etc have a positive effect?</p> <p>Why would desal?</p> <p>Do you want a 3-pt scale?</p>																												
Resolution																													
Next Steps	People:																												

Freshwater			
Freshwater and Riparian Health	<p>This rating encompasses the positive (e.g. when restoring watersheds or by creating an easier option to leave more water in the river) as well as potential harm. One of the commenters on the Convention model referred to the former as 'direct beneficial impact' and the latter as 'indirect beneficial impact.'</p>	<p>Plentiful healthier water, About as it is now, Degrade d ecosystem health</p>	
Notes	<p>Loquifer got the full spread—why?          Disagreement about whether Desal (but not Reuse) would make water ‘plentiful’—why?          This scale begs the issue, so top of scale really means “would make it easier to leave more water in the river” aside from the length why not say that?</p>		
Resolution			
Next Steps	<p>People:</p>		

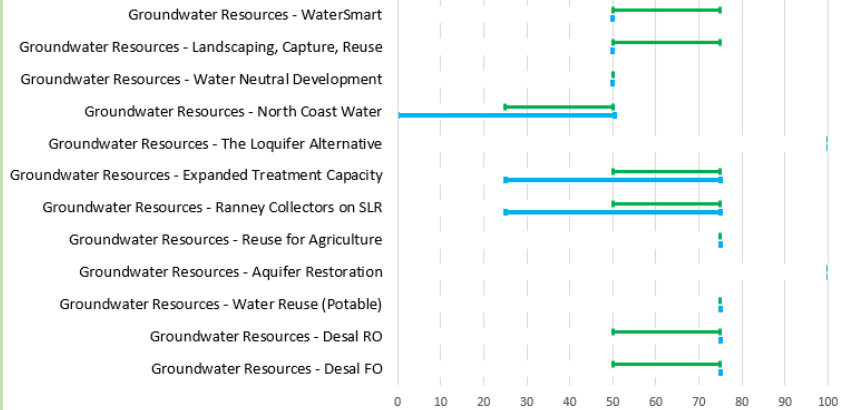


## Groundwater

### Groundwater Resources

The word "active" in the scale means putting water back not just resting wells.

Actively restores,  
Allows restoration,  
Does not affect,  
Depletes Resource,  
Greatly Depletes  
Resource



### notes

The Ctte variance seems to nest nicely inside the City uncertainty, so perhaps this one...  
Ooops! No. Desal was downgraded from 'Allows Restoration' to 'Does not Affect' yet potable reuse was left as is. Why?  
Note: these types of questions are meant to get at any possible flaws/ambiguities in the definition or scale, not to resolve what the proper rating for Desal is.

### Resolution

### Next Steps

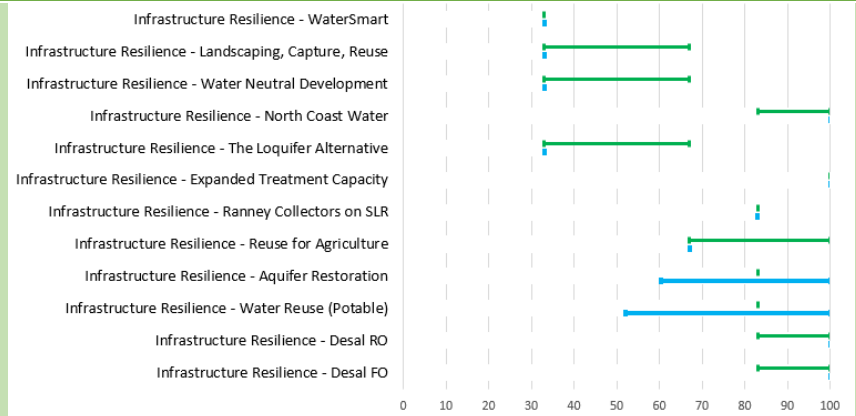
People:

Terrestrial Impacts			
Terrestrial Resources			
notes	This is just a reminder that terrestrial impacts was quite erroneously taken out because none of the 12 were off stream storage. But... what about piping! Should have been a criterion.		
Resolution			
Next Steps	People:		

## Infrastructure Resilience

### Infrastructure Resilience

Infrastructure resilience relates to the extent to which this approach will help the overall system to withstand natural disasters such as earthquakes, fires, floods, tsunamis and or systemic power outages related to the above--but not drought. Potable reuse rated lower than desal for resilience because desal uses another source of supply (the ocean) and would be a brand new facility built to all current seismic codes. In an earthquake, these factors would be assets compared to possible impacts of losing the wastewater treatment, which in turn would affect the reuse plant.



Most challenges well, Many moderately well,  
Some somewhat,  
Few barely, Doesn't improve resilience,  
Slightly degrades,  
Significantly degrades

### Notes

At the approach level (as opposed to Portfolio) some approaches may be immune to earthquakes but they don't make a big difference to the system, so there is a confounding with yield.  
Demand mngt needs discussion.

### Resolution

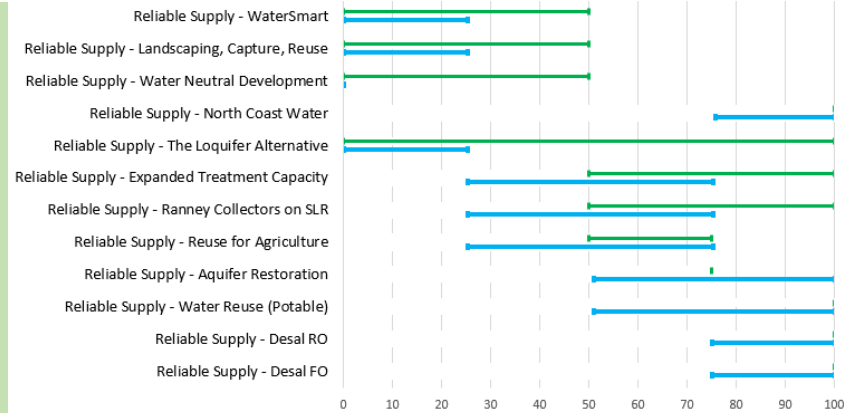
### Next Steps

People:

## Reliable Supply

### Reliable Supply

Reliability of water supply relates to how much water can be produced under various climate conditions such as drought or extreme precipitation. Remember that in the extreme climate change simplified scenario (the billion gallon shortfall), less rainfall isn't the only issue: turbidity, timing of storm events or other factors may also affect the supply. In rating the alternatives against this subcriterion, City staff saw demand strategies as potentially reducing the reliability of supply. They felt that the water demand offset program generally makes the system less reliable. With demand management actions being used to offset growth, new customers can be added without increasing supply. But at the same time, all customers are living closer to some reasonable limit of possible reduction in water use or increases in water use efficiency. This means that if the supply drops even further, there is no cushion--little or no discretionary water use that can be eliminated or reduced--so curtailments would be more difficult for customers and, in worst case scenarios could significantly cut in to the water used to protect public health and safety.



Makes system sig more rel,  
Somewhat more reliable,  
Slightly more reliable,  
No change,  
Makes system less reliable

Reliable Supply

Notes

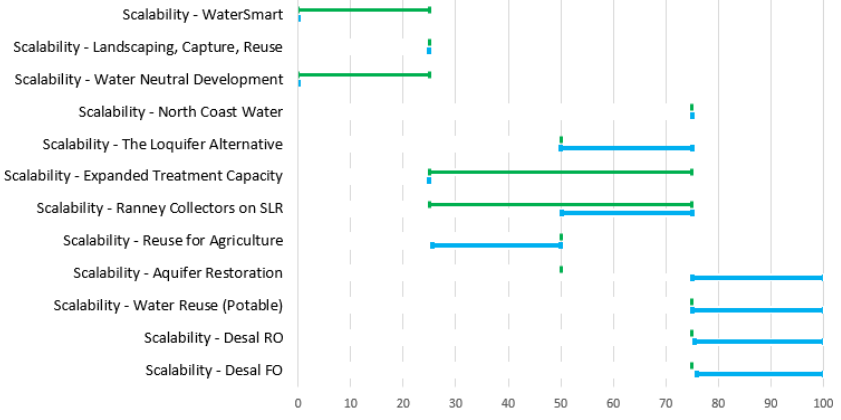
As Roy pointed out, reliable supply is probably pretty close to your goal (and yet it didn't get much weight). Part of the complexity here is that you haven't defined 'reliability' --or you haven't defined the sweet spot of reliability. Then there is the difference in how you view demand management! Some Ctte members wanted to give Ranney Collectors and Exp Trtmnt higher ratings for reliable supply.

Resolution

Next Steps

People:

## Scalability

Scalability	<p>Scalability measures the extent to which an approach can be scaled up as needs change. Note that for Loquifer, as with some of the other proposals, the design is scalable but once you commit to one of the designs, the project is not. One of the Ctte members had asked for a negative scale for scalability, but that just didn't make sense; it was hard to imagine a circumstance where adding one of these approaches would make the system less scalable.</p>	<p>Scales up w no limit,</p> <p>Can scale to ~1BG gap,</p> <p>Can scale to ~650 MG gap,</p> <p>Can scale to ~ 300 MG gap,</p> <p>Not scalable</p>	 <table><thead><tr><th>Approach</th><th>Scalability Scale (0-100)</th></tr></thead><tbody><tr><td>Scalability - WaterSmart</td><td>0 to 25</td></tr><tr><td>Scalability - Landscaping, Capture, Reuse</td><td>0 to 25</td></tr><tr><td>Scalability - Water Neutral Development</td><td>0 to 25</td></tr><tr><td>Scalability - North Coast Water</td><td>0 to 25</td></tr><tr><td>Scalability - The Loquifer Alternative</td><td>0 to 25</td></tr><tr><td>Scalability - Expanded Treatment Capacity</td><td>0 to 25</td></tr><tr><td>Scalability - Ranney Collectors on SLR</td><td>0 to 25</td></tr><tr><td>Scalability - Reuse for Agriculture</td><td>0 to 25</td></tr><tr><td>Scalability - Aquifer Restoration</td><td>0 to 25</td></tr><tr><td>Scalability - Water Reuse (Potable)</td><td>0 to 25</td></tr><tr><td>Scalability - Desal RO</td><td>0 to 25</td></tr><tr><td>Scalability - Desal FO</td><td>0 to 25</td></tr></tbody></table>	Approach	Scalability Scale (0-100)	Scalability - WaterSmart	0 to 25	Scalability - Landscaping, Capture, Reuse	0 to 25	Scalability - Water Neutral Development	0 to 25	Scalability - North Coast Water	0 to 25	Scalability - The Loquifer Alternative	0 to 25	Scalability - Expanded Treatment Capacity	0 to 25	Scalability - Ranney Collectors on SLR	0 to 25	Scalability - Reuse for Agriculture	0 to 25	Scalability - Aquifer Restoration	0 to 25	Scalability - Water Reuse (Potable)	0 to 25	Scalability - Desal RO	0 to 25	Scalability - Desal FO	0 to 25
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Notes	<p>Doubts about Exp Trtmnt being a mere ‘can scale to 300 MG’ I think the City may have gotten confounded with “why would you want to?” as opposed to “can you?”</p> <p>Q about how scalable water neutral dev’t or watersmart are.</p> <p>What does ‘can scale up with no limit’ mean?</p>																												
Resolution																													
Next Steps	<p>People:</p>																												

Future Choices																																										
Preserves Future Choices	<p>In general, this rating was about the extent to which large capital investments might lock the city in to a certain set of solutions. The Ranney collectors rated well because they would be helpful in perfecting the Felton water right at a higher level. What is missing in the structure of the model is a way to send a signal about options lost by INaction.</p>	<p>Increases choice, Somewhat inc choice, No effect, Reduces choice, City locked in</p>	<div><p>Preserves Future Choices - WaterSmart</p><p>Preserves Future Choices - Landscaping, Capture, Reuse</p><p>Preserves Future Choices - Water Neutral Development</p><p>Preserves Future Choices - North Coast Water</p><p>Preserves Future Choices - The Loquifer Alternative</p><p>Preserves Future Choices - Expanded Treatment Capacity</p><p>Preserves Future Choices - Ranney Collectors on SLR</p><p>Preserves Future Choices - Reuse for Agriculture</p><p>Preserves Future Choices - Aquifer Restoration</p><p>Preserves Future Choices - Water Reuse (Potable)</p><p>Preserves Future Choices - Desal RO</p><p>Preserves Future Choices - Desal FO</p></div> <table><caption>Preserves Future Choices - Data from Chart</caption><thead><tr><th>Strategy</th><th>Score (Blue Bar)</th><th>Range (Green Line)</th></tr></thead><tbody><tr><td>Preserves Future Choices - WaterSmart</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - Landscaping, Capture, Reuse</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - Water Neutral Development</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - North Coast Water</td><td>25</td><td>25-75</td></tr><tr><td>Preserves Future Choices - The Loquifer Alternative</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - Expanded Treatment Capacity</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - Ranney Collectors on SLR</td><td>75</td><td>75-100</td></tr><tr><td>Preserves Future Choices - Reuse for Agriculture</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - Aquifer Restoration</td><td>75</td><td>75-100</td></tr><tr><td>Preserves Future Choices - Water Reuse (Potable)</td><td>52</td><td>50-75</td></tr><tr><td>Preserves Future Choices - Desal RO</td><td>25</td><td>25-75</td></tr><tr><td>Preserves Future Choices - Desal FO</td><td>25</td><td>25-75</td></tr></tbody></table>	Strategy	Score (Blue Bar)	Range (Green Line)	Preserves Future Choices - WaterSmart	52	50-75	Preserves Future Choices - Landscaping, Capture, Reuse	52	50-75	Preserves Future Choices - Water Neutral Development	52	50-75	Preserves Future Choices - North Coast Water	25	25-75	Preserves Future Choices - The Loquifer Alternative	52	50-75	Preserves Future Choices - Expanded Treatment Capacity	52	50-75	Preserves Future Choices - Ranney Collectors on SLR	75	75-100	Preserves Future Choices - Reuse for Agriculture	52	50-75	Preserves Future Choices - Aquifer Restoration	75	75-100	Preserves Future Choices - Water Reuse (Potable)	52	50-75	Preserves Future Choices - Desal RO	25	25-75	Preserves Future Choices - Desal FO	25	25-75
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Notes	<p>Yeah. This one is weird.</p> <p>Since physical limitations don't seem to be an issue, is this maybe just about cost (or upfront cost)?</p>																																									
Resolution																																										
Next Steps	<p>People:</p>																																									

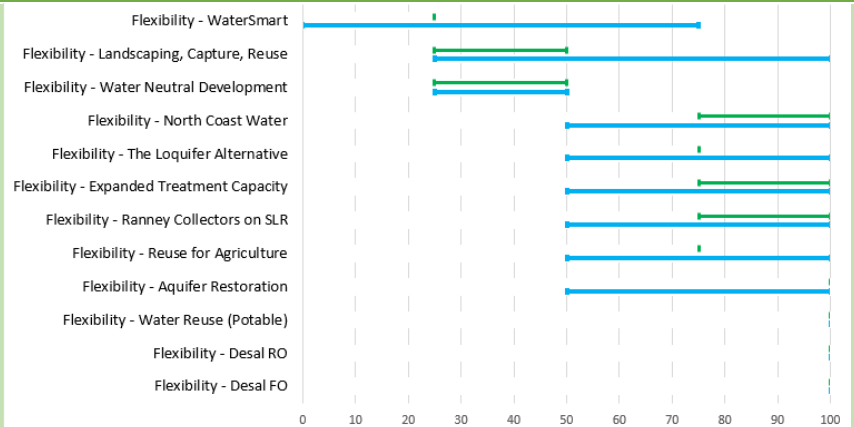
Yield																																										
Yield		[17-1,800]	<table><thead><tr><th>Alternative</th><th>Blue Bar Range (Approx.)</th><th>Green Dot Value (Approx.)</th></tr></thead><tbody><tr><td>Yield - WaterSmart</td><td>50 - 100</td><td>80</td></tr><tr><td>Yield - Landscaping, Capture, Reuse</td><td>100 - 600</td><td>580</td></tr><tr><td>Yield - Water Neutral Development</td><td>50 - 350</td><td>320</td></tr><tr><td>Yield - North Coast Water</td><td>1400 - 1800</td><td>-</td></tr><tr><td>Yield - The Loquifer Alternative</td><td>100 - 1000</td><td>820</td></tr><tr><td>Yield - Expanded Treatment Capacity</td><td>250 - 650</td><td>620</td></tr><tr><td>Yield - Ranney Collectors on SLR</td><td>250 - 650</td><td>620</td></tr><tr><td>Yield - Reuse for Agriculture</td><td>650 - 1000</td><td>850</td></tr><tr><td>Yield - Aquifer Restoration</td><td>450 - 750</td><td>600</td></tr><tr><td>Yield - Water Reuse (Potable)</td><td>700 - 1100</td><td>900</td></tr><tr><td>Yield - Desal RO</td><td>850 - 900</td><td>880</td></tr><tr><td>Yield - Desal FO</td><td>850 - 900</td><td>880</td></tr></tbody></table>	Alternative	Blue Bar Range (Approx.)	Green Dot Value (Approx.)	Yield - WaterSmart	50 - 100	80	Yield - Landscaping, Capture, Reuse	100 - 600	580	Yield - Water Neutral Development	50 - 350	320	Yield - North Coast Water	1400 - 1800	-	Yield - The Loquifer Alternative	100 - 1000	820	Yield - Expanded Treatment Capacity	250 - 650	620	Yield - Ranney Collectors on SLR	250 - 650	620	Yield - Reuse for Agriculture	650 - 1000	850	Yield - Aquifer Restoration	450 - 750	600	Yield - Water Reuse (Potable)	700 - 1100	900	Yield - Desal RO	850 - 900	880	Yield - Desal FO	850 - 900	880
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Notes	I think this one is fine for now.																																									

## Flexibility

Flexibility

The degree to which this approach increases management flexibility that in turn helps the system "get by with less" while still meeting resilience, reliability and other goals. (This is particularly designed for approaches that don't actually increase supply or reduce demand, but might nevertheless be useful.) In rating 'flexibility,' the City staff looked at an approach's ability to provide diversity, the ability to create a cushion in terms of water availability and other factors. For instance, reuse and desal were seen as "adding another treatment plant" and therefore tended to rate well for flexibility.

Greatly increases,  
Moderately increases,  
Somewhat increases,  
Does not increase,  
Decreases



Notes

No problemo?



Addresses Peak Season Demand			
Addresses Peak Season Demand	<p>This subcritierion addresses the extent to which a proposal reduces peak season demand or provides water that is not dependent on winter rains.</p>	<p>Yes, Maybe, No</p>	<div><div>Addresses Peak Season Demand - WaterSmart</div><div>Addresses Peak Season Demand - Landscaping, Capture,...</div><div>Addresses Peak Season Demand - Water Neutral...</div><div>Addresses Peak Season Demand - North Coast Water</div><div>Addresses Peak Season Demand - The Loquifer Alternative</div><div>Addresses Peak Season Demand - Expanded Treatment...</div><div>Addresses Peak Season Demand - Ranney Collectors on SLR</div><div>Addresses Peak Season Demand - Reuse for Agriculture</div><div>Addresses Peak Season Demand - Aquifer Restoration</div><div>Addresses Peak Season Demand - Water Reuse (Potable)</div><div>Addresses Peak Season Demand - Desal RO</div><div>Addresses Peak Season Demand - Desal FO</div></div>
Notes	Explore why water neutral dev't reduces peak season demand in particular?		
Resolution			
Next Steps	People:		

# Report on your Web Activity

# Report on your Web Activity

- Extensive, thoughtful and conscientious

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- Why does it matter?

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  - **Prioritize your deliberations and research**

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  - **Increase Community Capacity.**

# Report on your Web Activity

- Supports Recon Goals
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  - Understand the approaches inside and out
  - Compare uncertainty and variance in the ratings
  - Prioritize your deliberations and research
  - Prepare for the Real Deal
  - Increase Community Capacity
  - **Very well set-up for criteria and scales in RD.**

# Starting with Weights

# Starting with Weights

- Why care?

# Starting with Weights

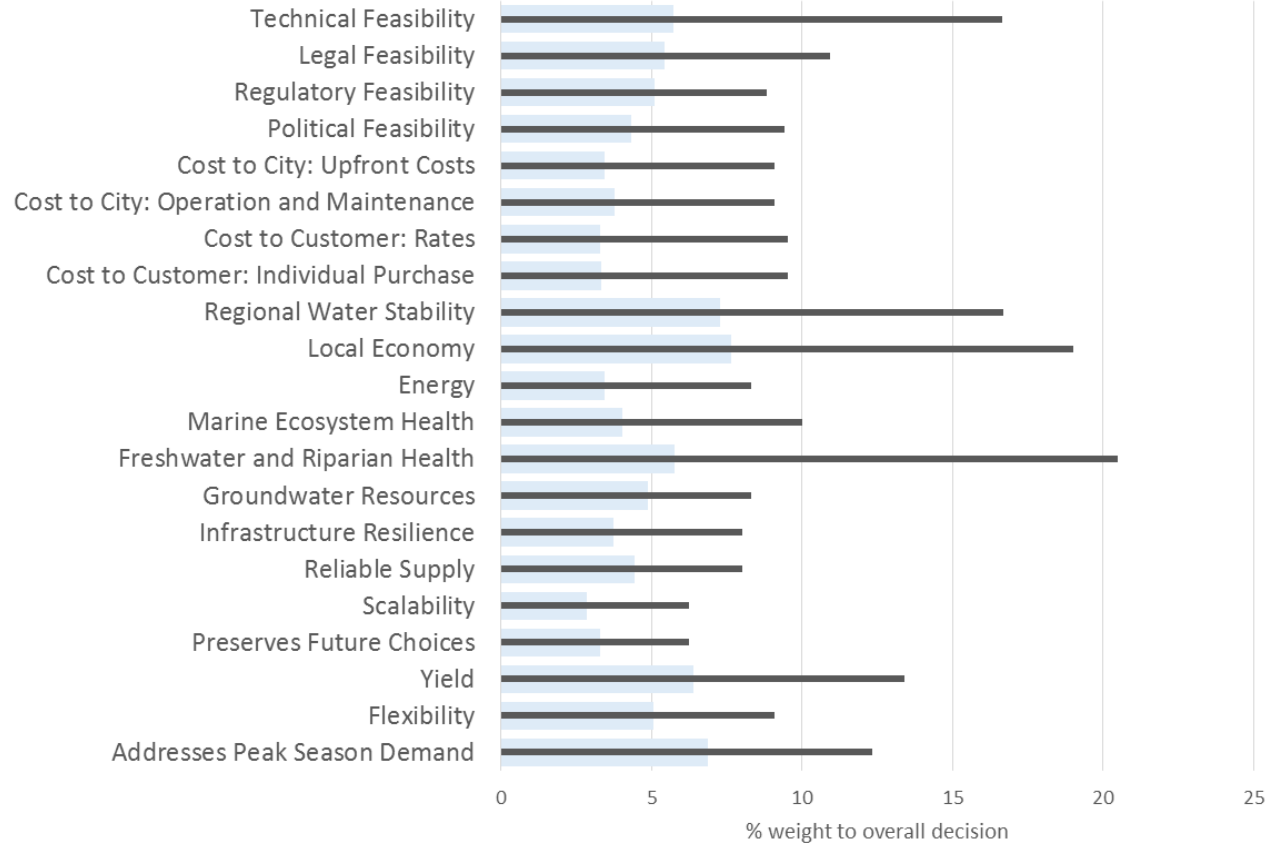
- Why care?
- Are the radar graphs worth the effort?

# Starting with Weights

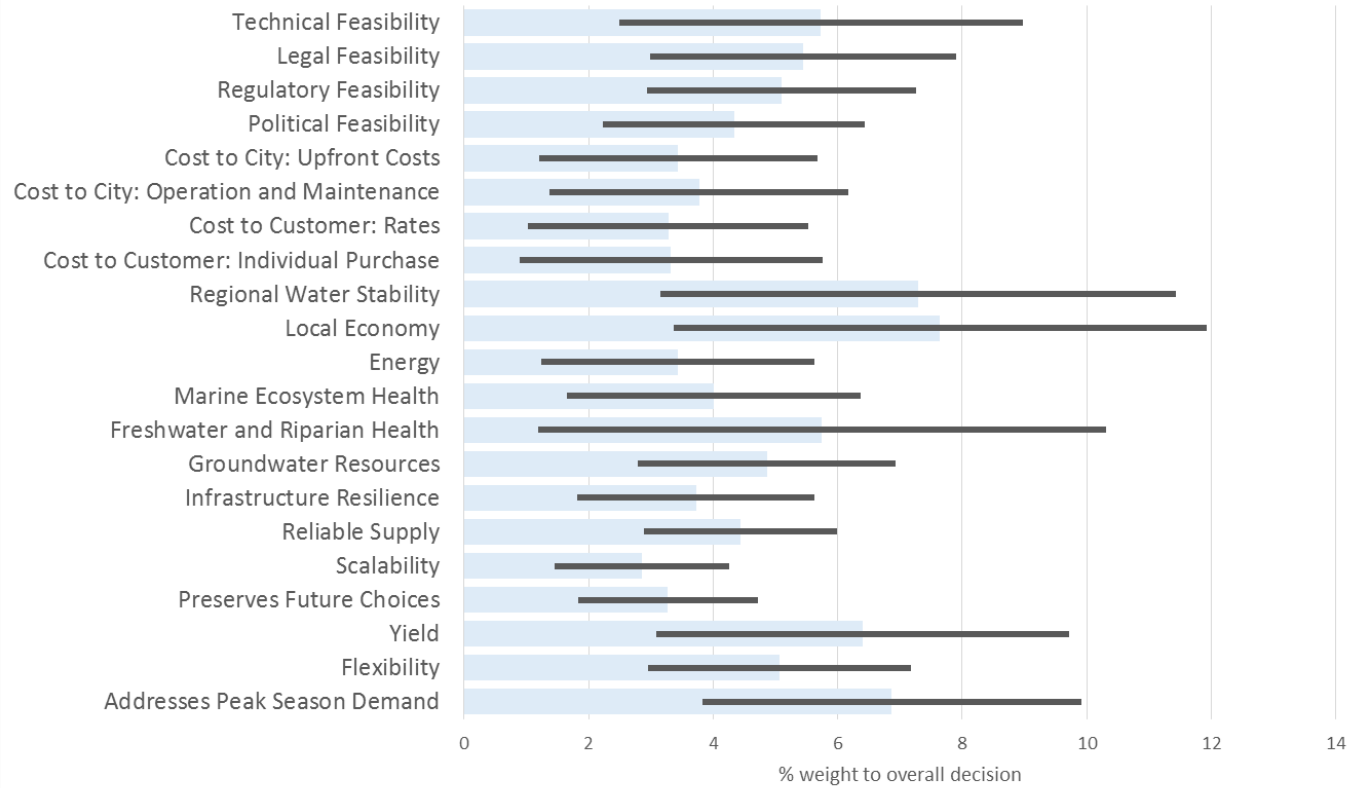
- Focus for this discussion
  - You were courageous and interesting
  - Certain emphases pop out, either because of comparatively high values or high variance, or both
  - How you change your weights as the gap gets worse
  - The composite portrait is encouraging
  - The portraits themselves are rich with information



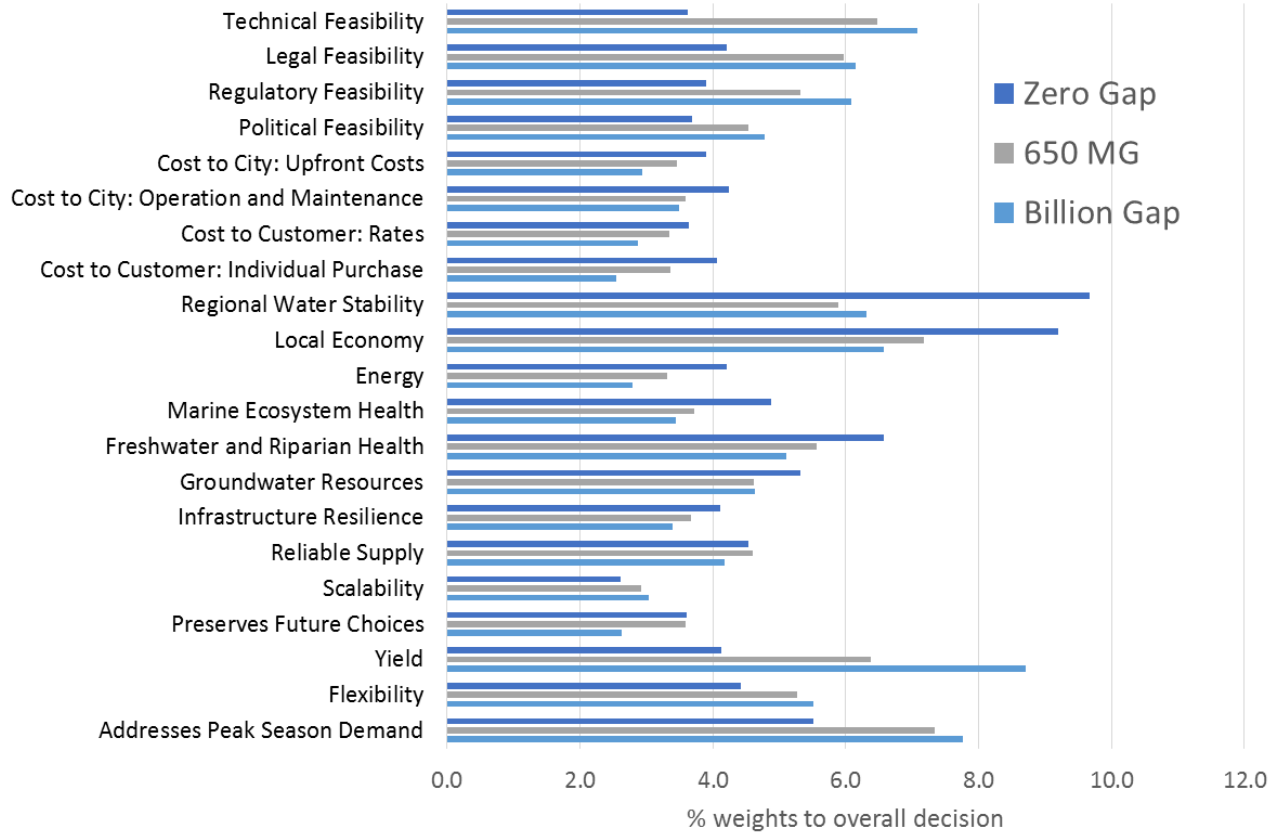
Min-Max Spread of Combined Weights across all scenarios (max 100%)




Standard deviation variation of Combined Weights across all scenarios (max 100%)









Average of Cmtee weights for subcriteria by scenarios



# Your weights in a weights portrait

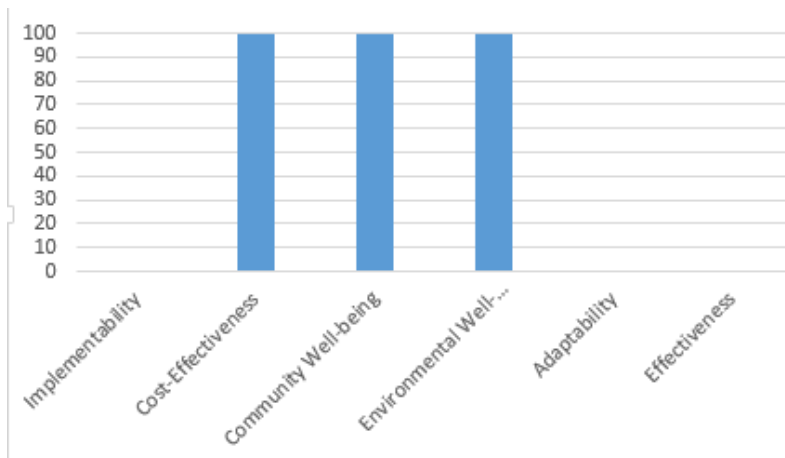
 **Zero Gap**

How much does each high-level criterion matter to you when addressing a zero shortfall?

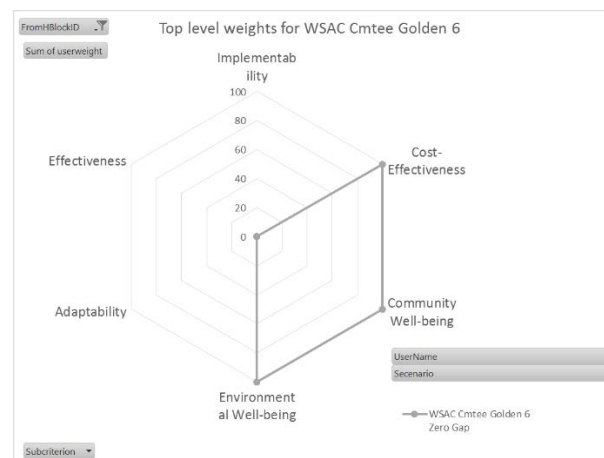
Implementability 	<input type="text" value="Not Salient"/>
Cost-Effectiveness 	<input type="text" value="Critical"/>
Community Well-being 	<input type="text" value="Critical"/>
Environmental Well-being 	<input type="text" value="Critical"/>
Adaptability 	<input type="text" value="Not Salient"/>
Effectiveness 	<input type="text" value="Not Salient"/>

(This is page 1 out of 7 weights pages.)

Weights Histogram – Zero Gap Criteria Level



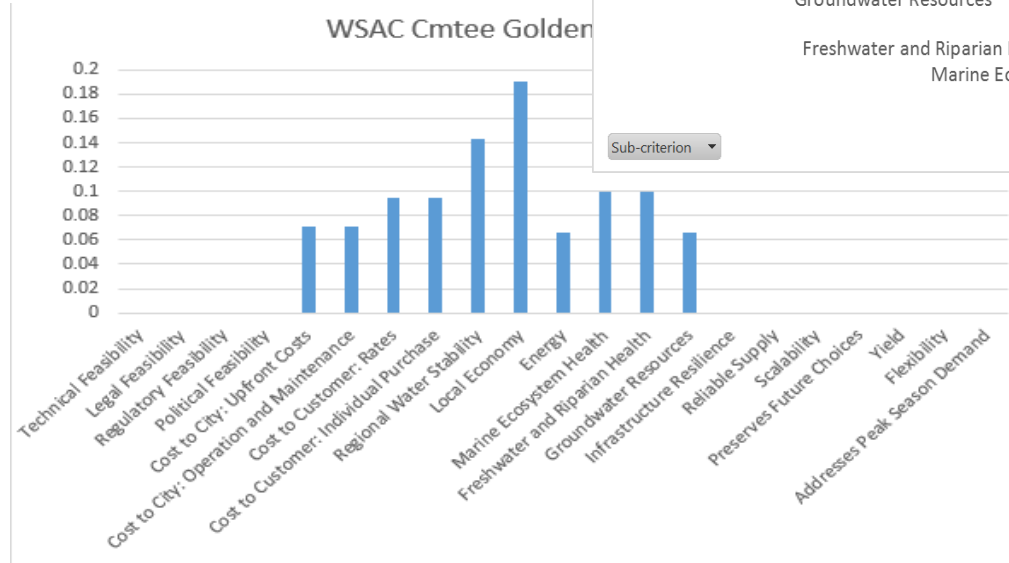
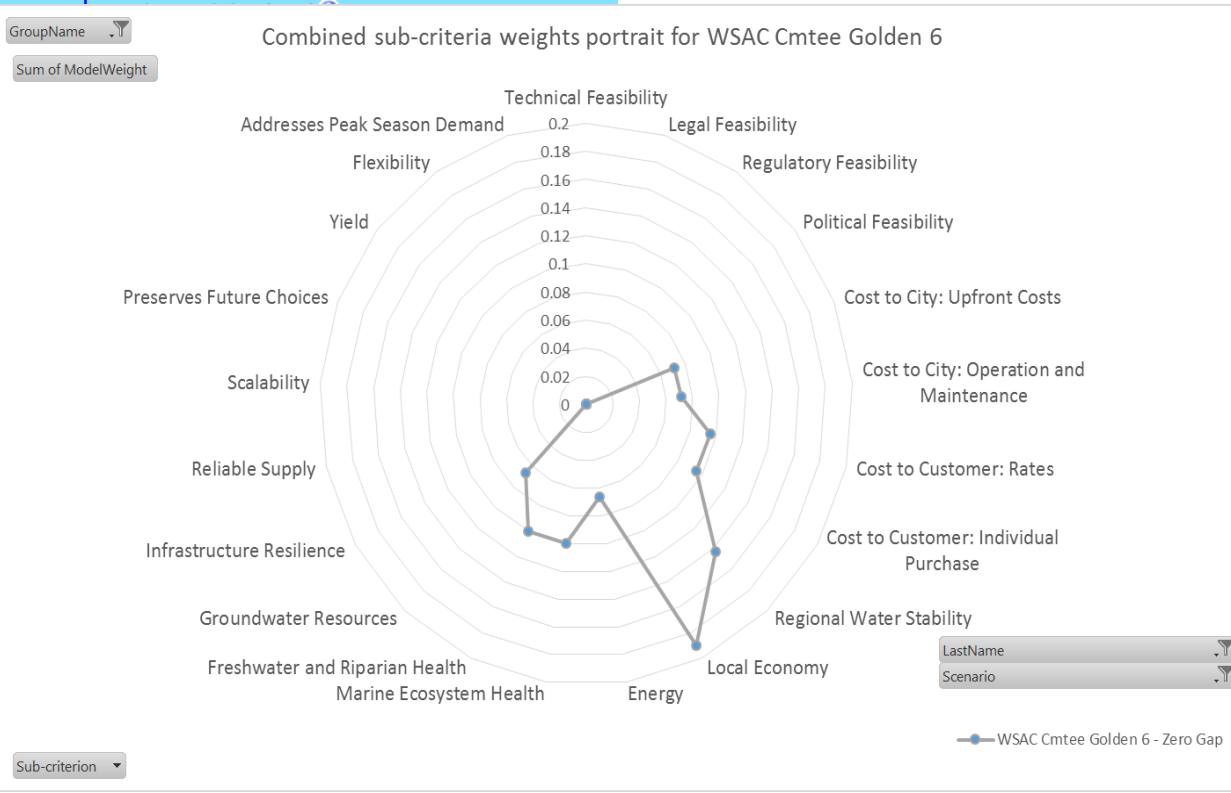
Weights Portrait – Spider Graph – Zero Gap Criteria Level

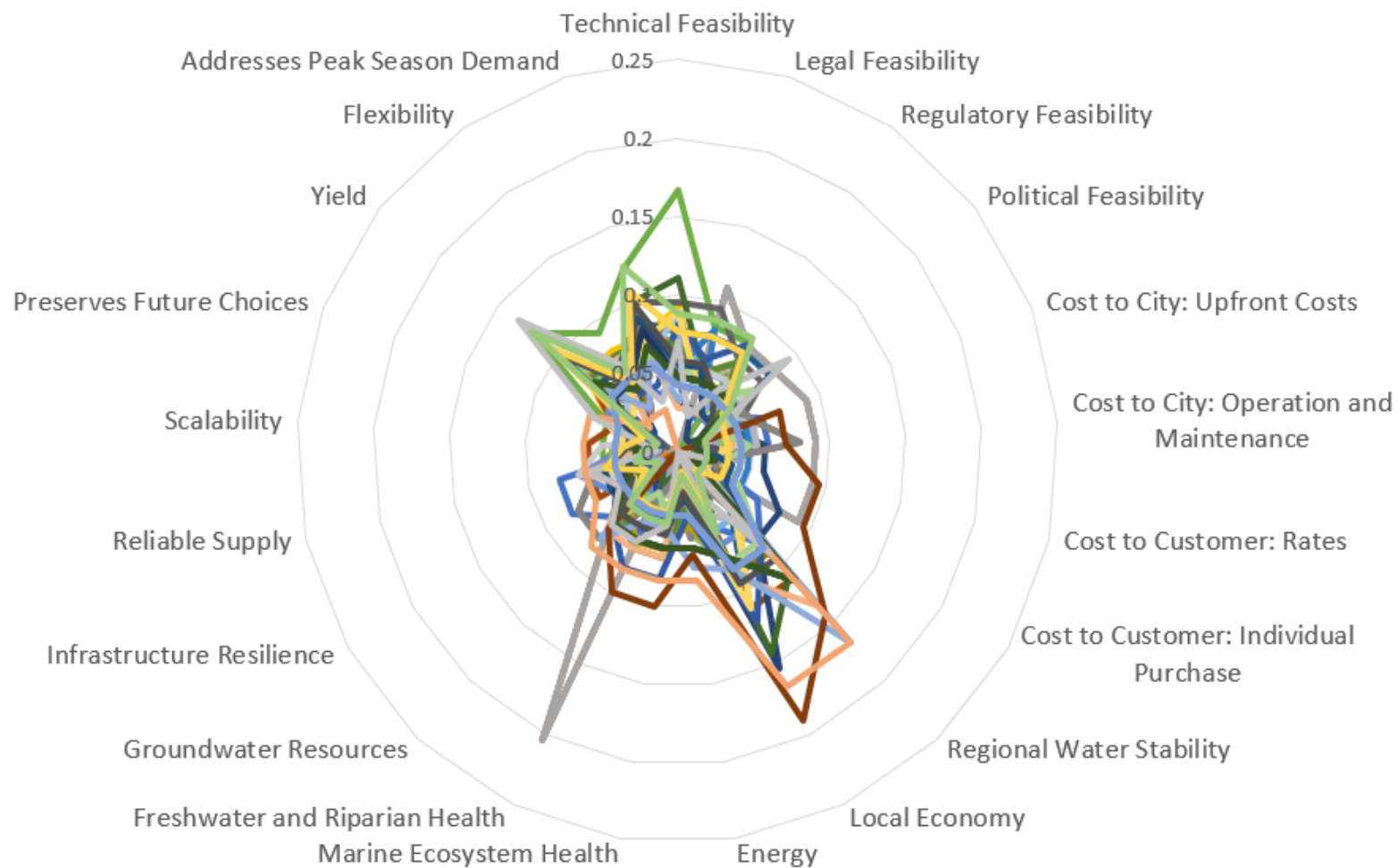


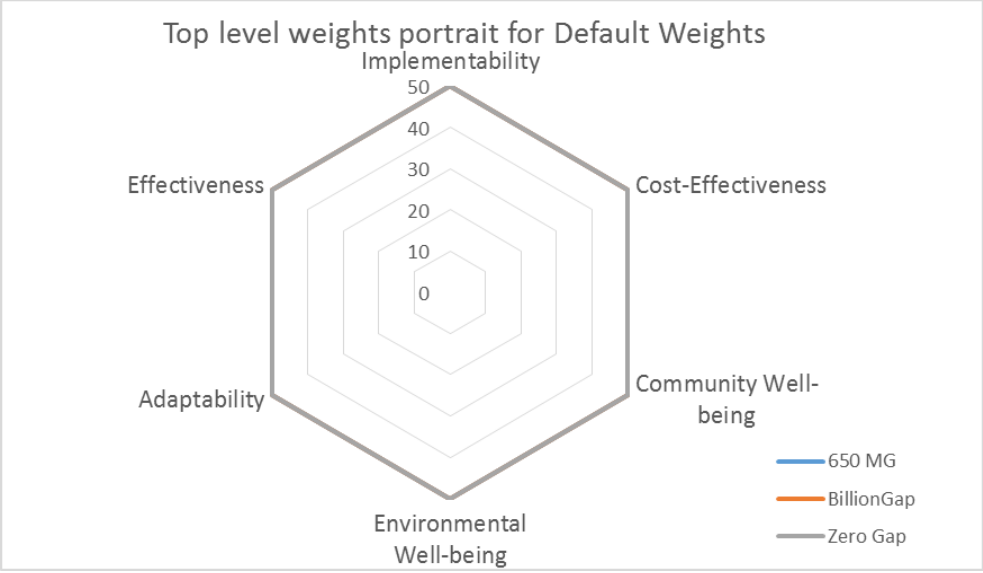
# Your combined weights for the Zero Gap Scenario

Simplified Scenario	Criteria	Subcriteria
---------------------	----------	-------------

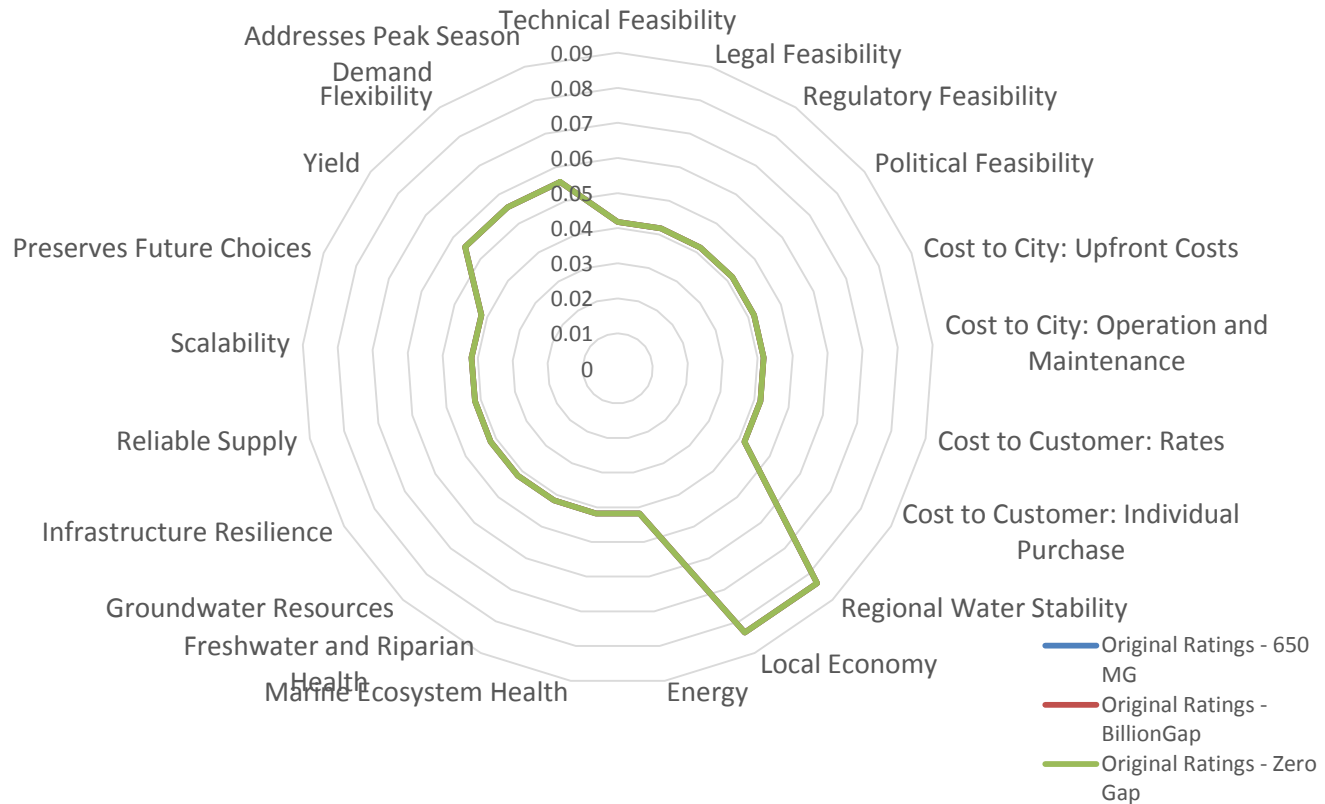
Zero Gap(100%)	Implementability(0%)	
	Cost-Effectiveness(33%)	
	Environmental Well-being(33%)	
	Community Well-being(33%)	
	Adaptability(0%)	
	Effectiveness(0%)	



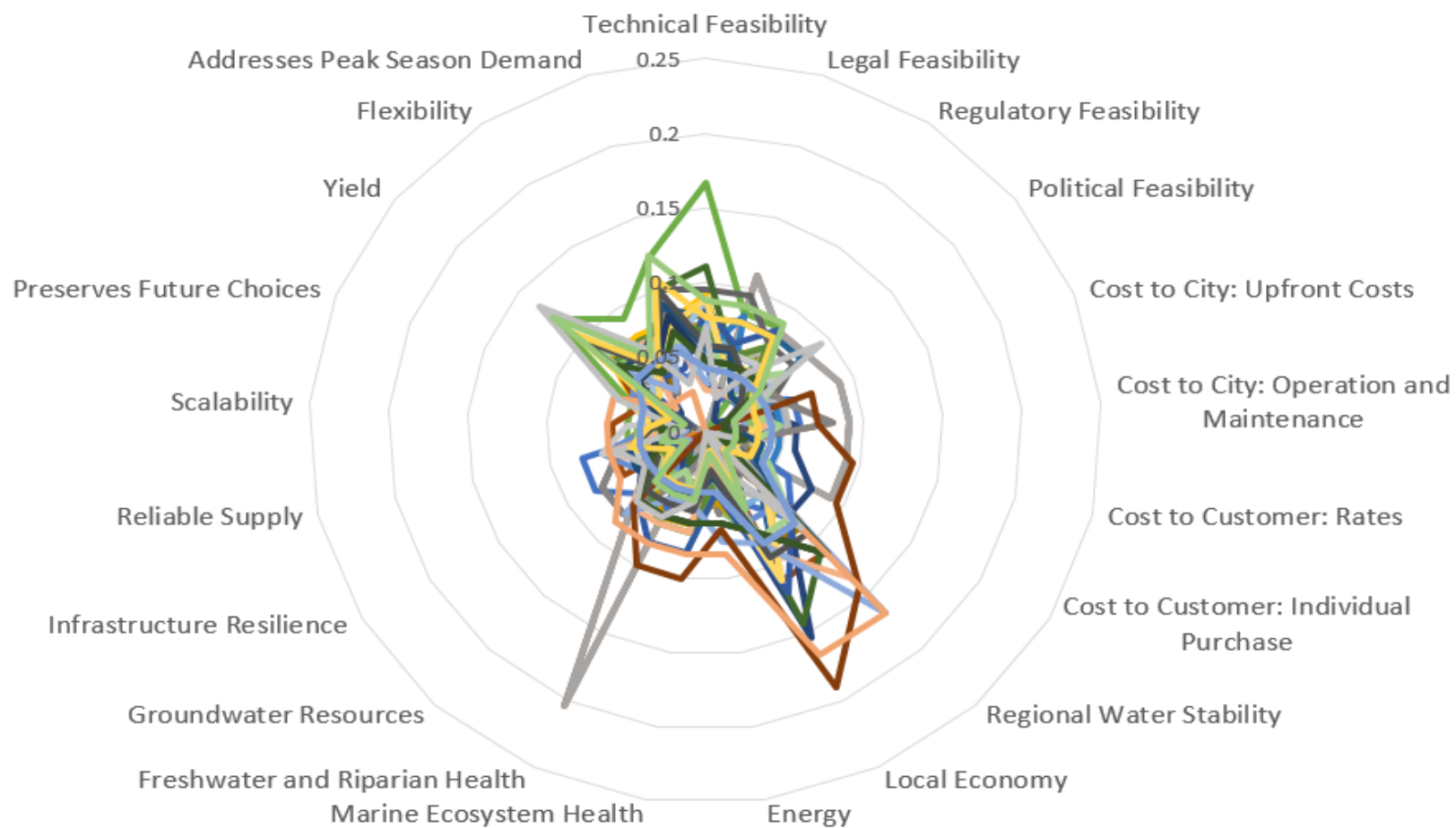





## Combined sub-criteria weights portrait for Original Ratings



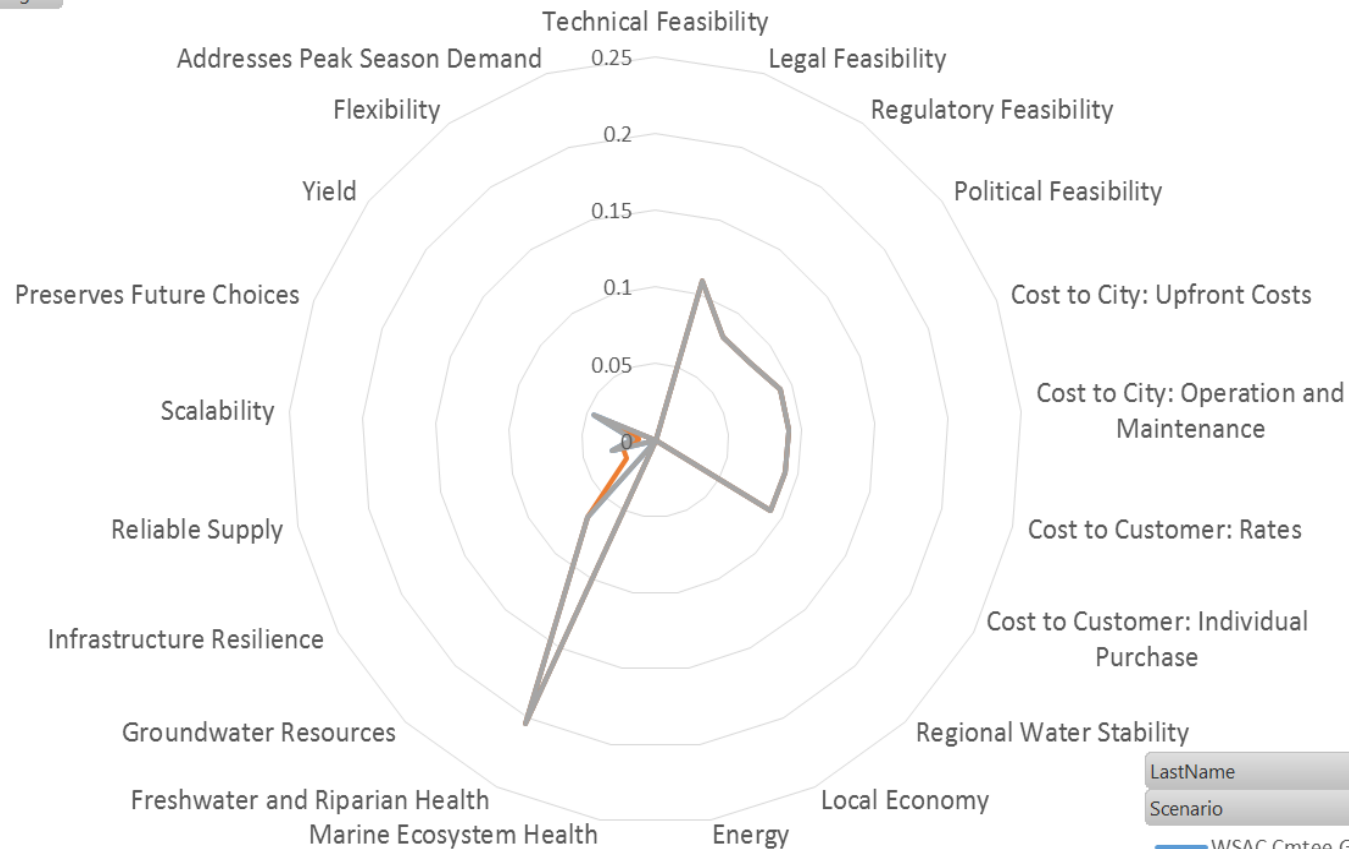





GroupName 

Sum of ModelWeight


## Combined sub-criteria weights portrait for WSAC Cmtee Golden 1

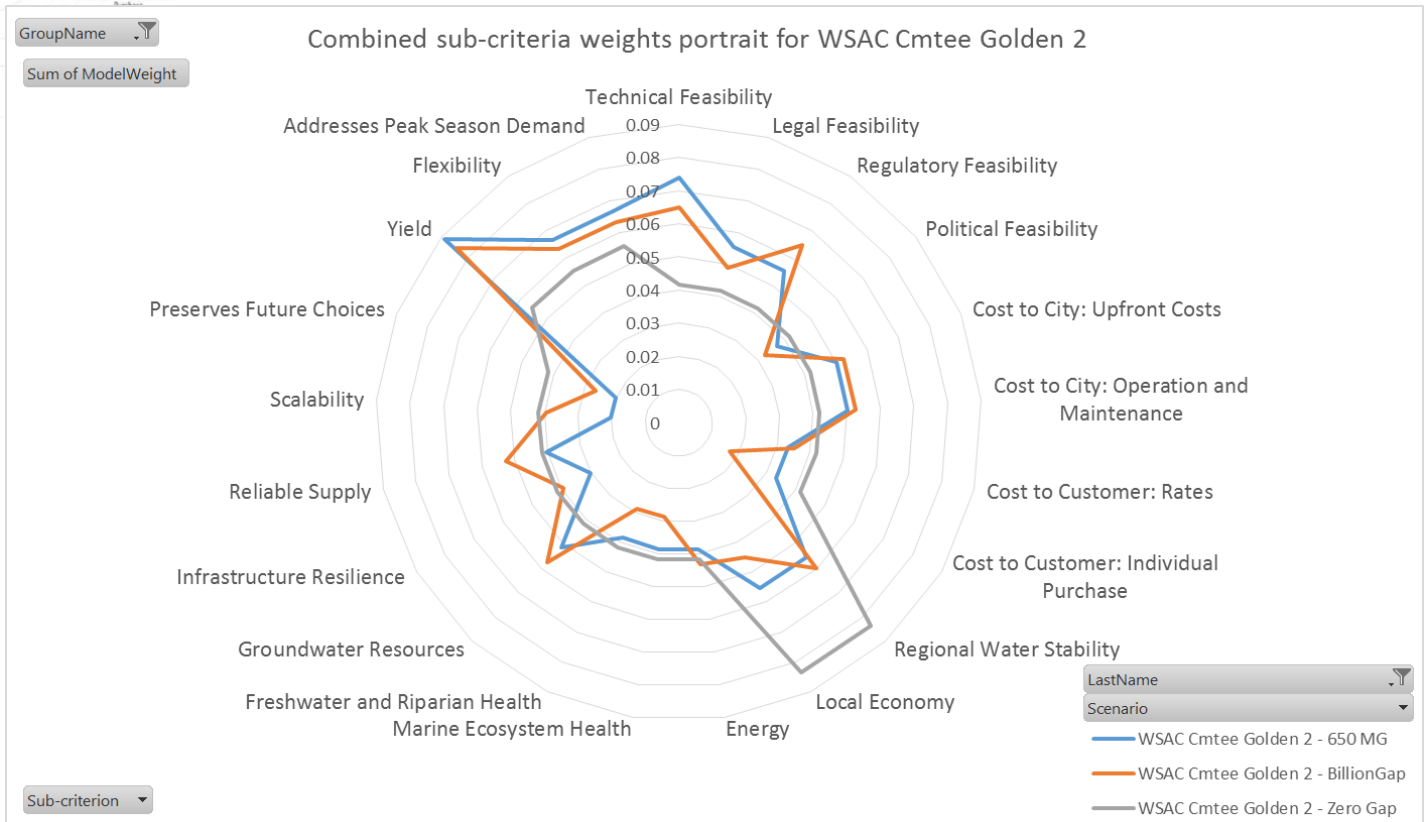
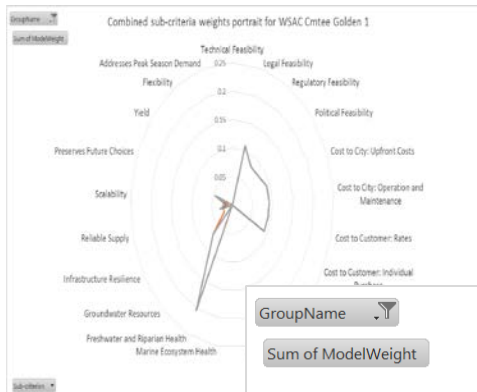



LastName 

Scenario 

- WSAC Cmtee Golden 1 - 650 MG
- WSAC Cmtee Golden 1 - BillionGap
- WSAC Cmtee Golden 1 - Zero Gap

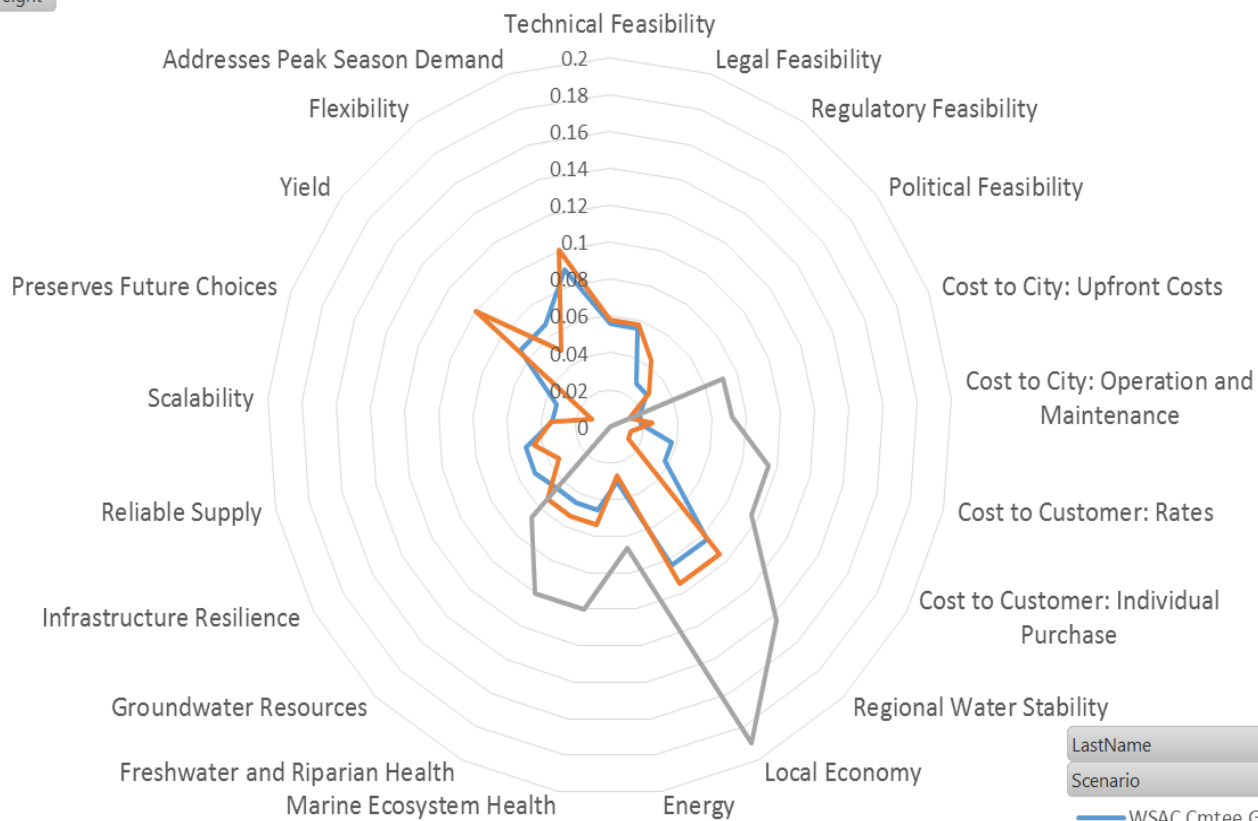
Sub-criterion 




GroupName 

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 6

Sum of ModelWeight




LastName 

Scenario 

— WSAC Cmtee Golden 6 - 650 MG

— WSAC Cmtee Golden 6 - BillionGap

— WSAC Cmtee Golden 6 - Zero Gap

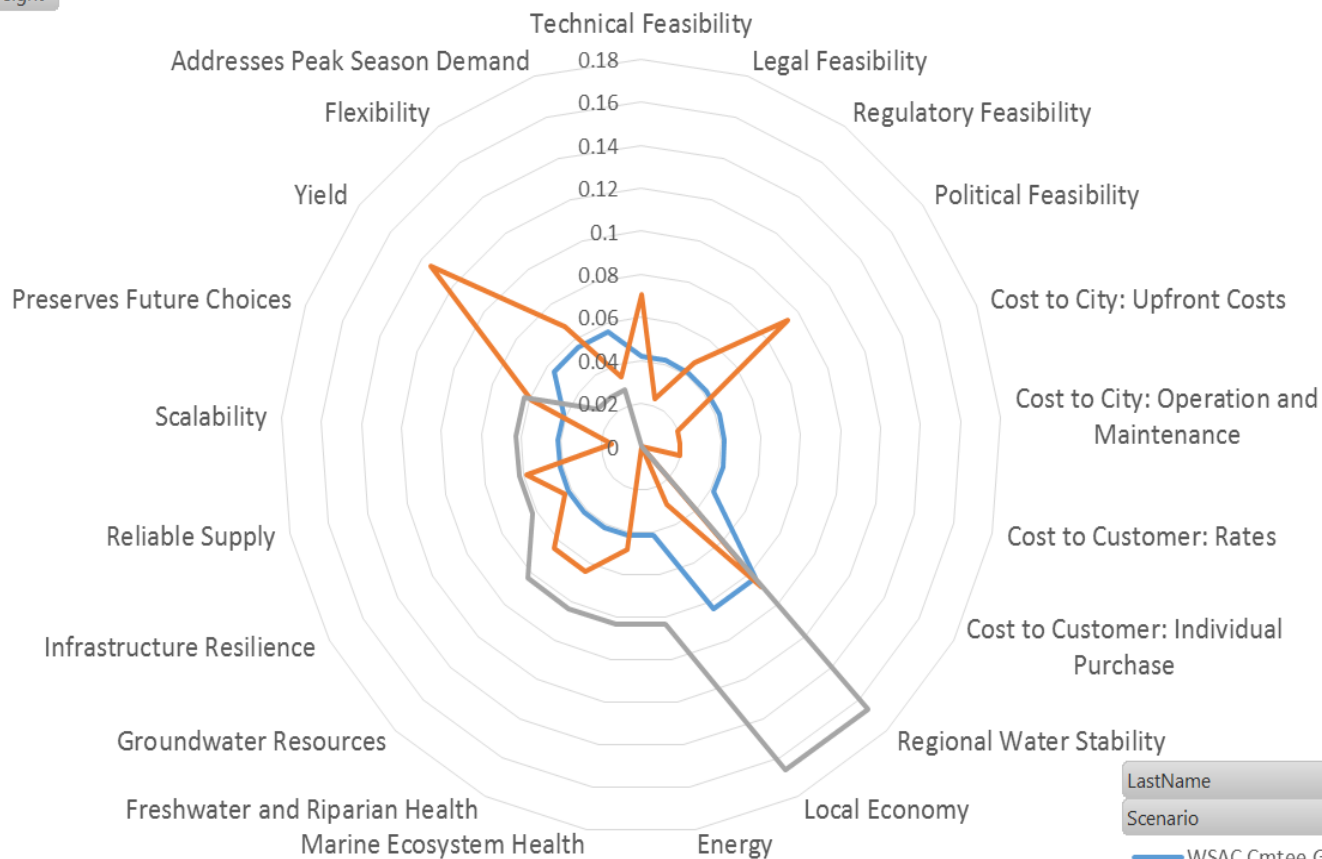
Sub-criterion 

GroupName



Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 8



LastName



Scenario

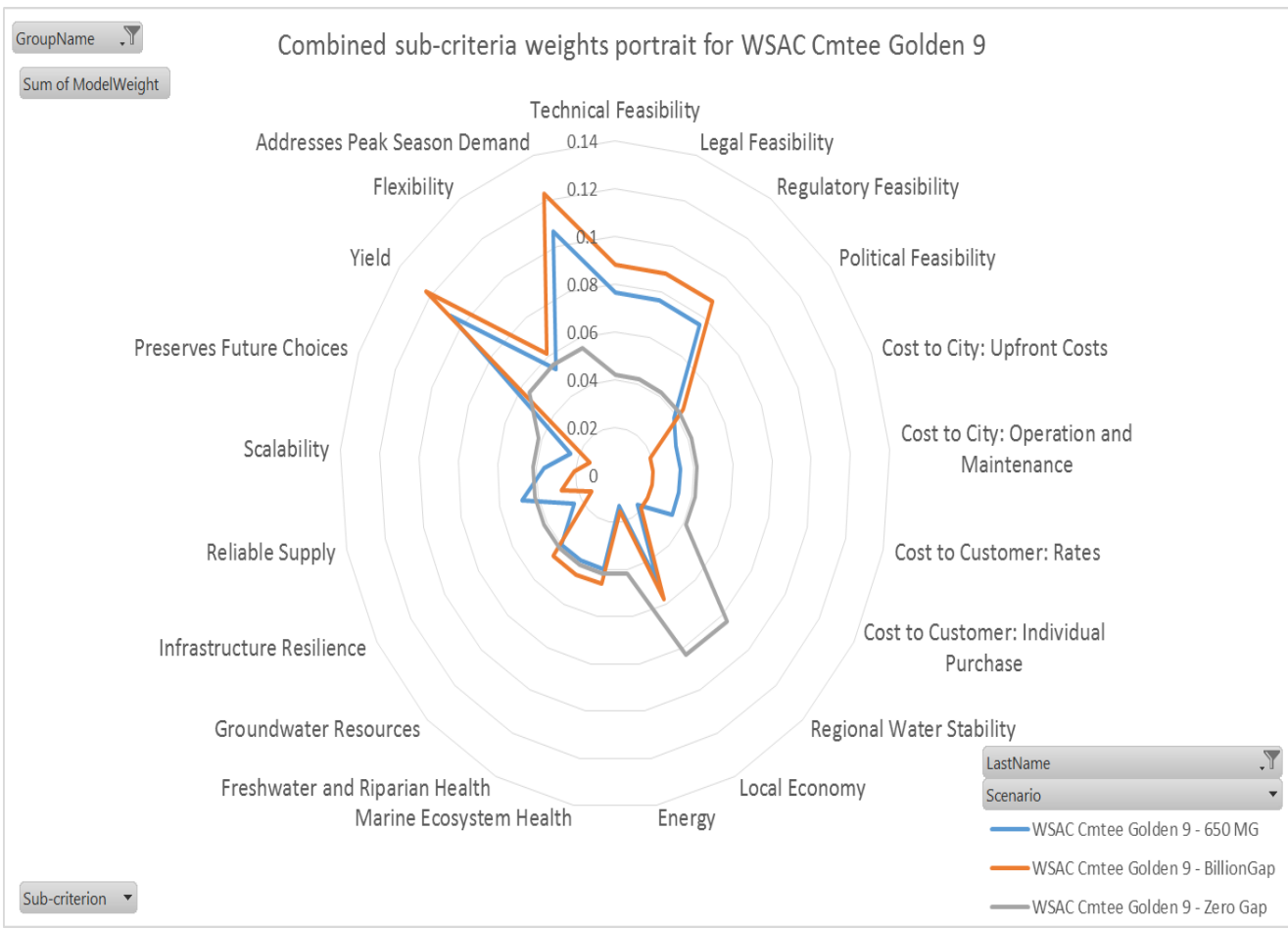


WSAC Cmtee Golden 8 - 650 MG

WSAC Cmtee Golden 8 - BillionGap

WSAC Cmtee Golden 8 - Zero Gap

Sub-criterion

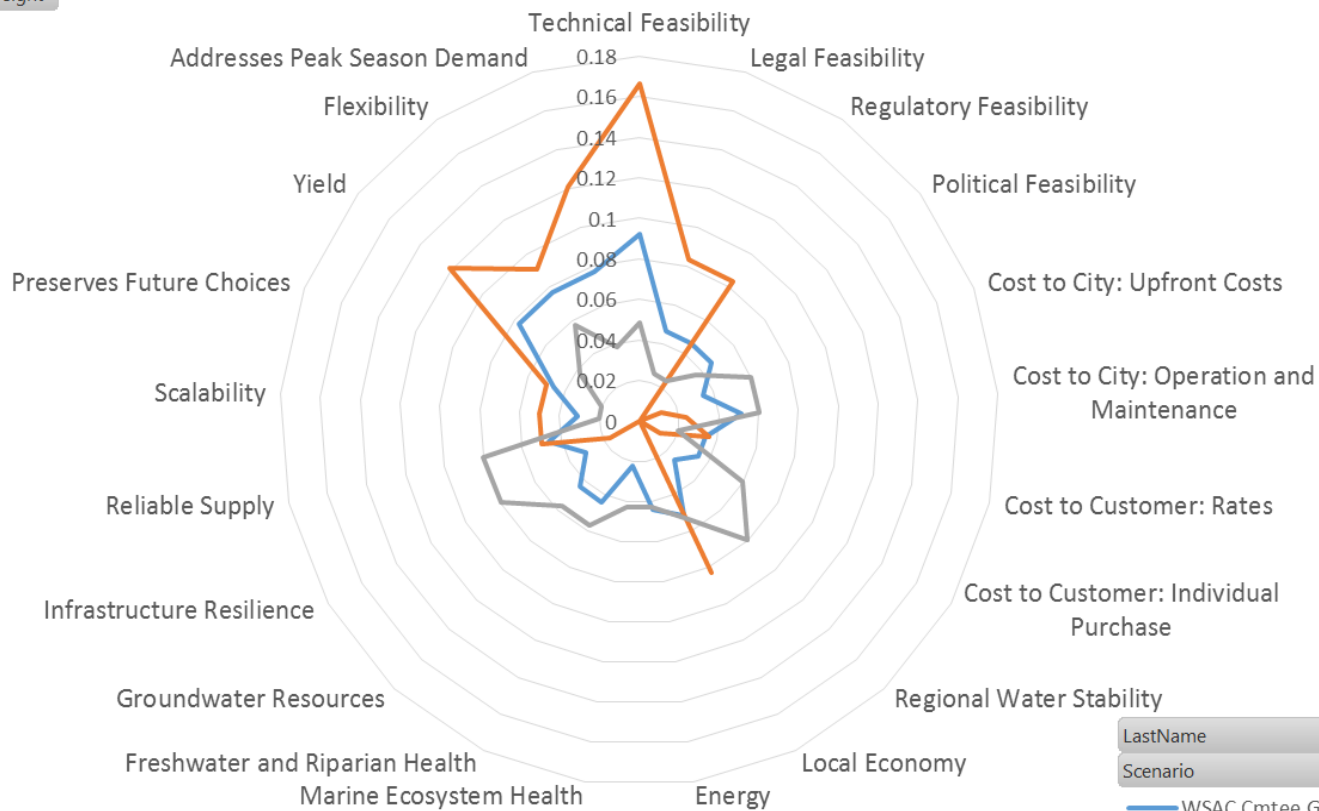


GroupName



Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 10



LastName



Scenario

- WSAC Cmtee Golden 10 - 650 MG
- WSAC Cmtee Golden 10 - BillionGap
- WSAC Cmtee Golden 10 - Zero Gap

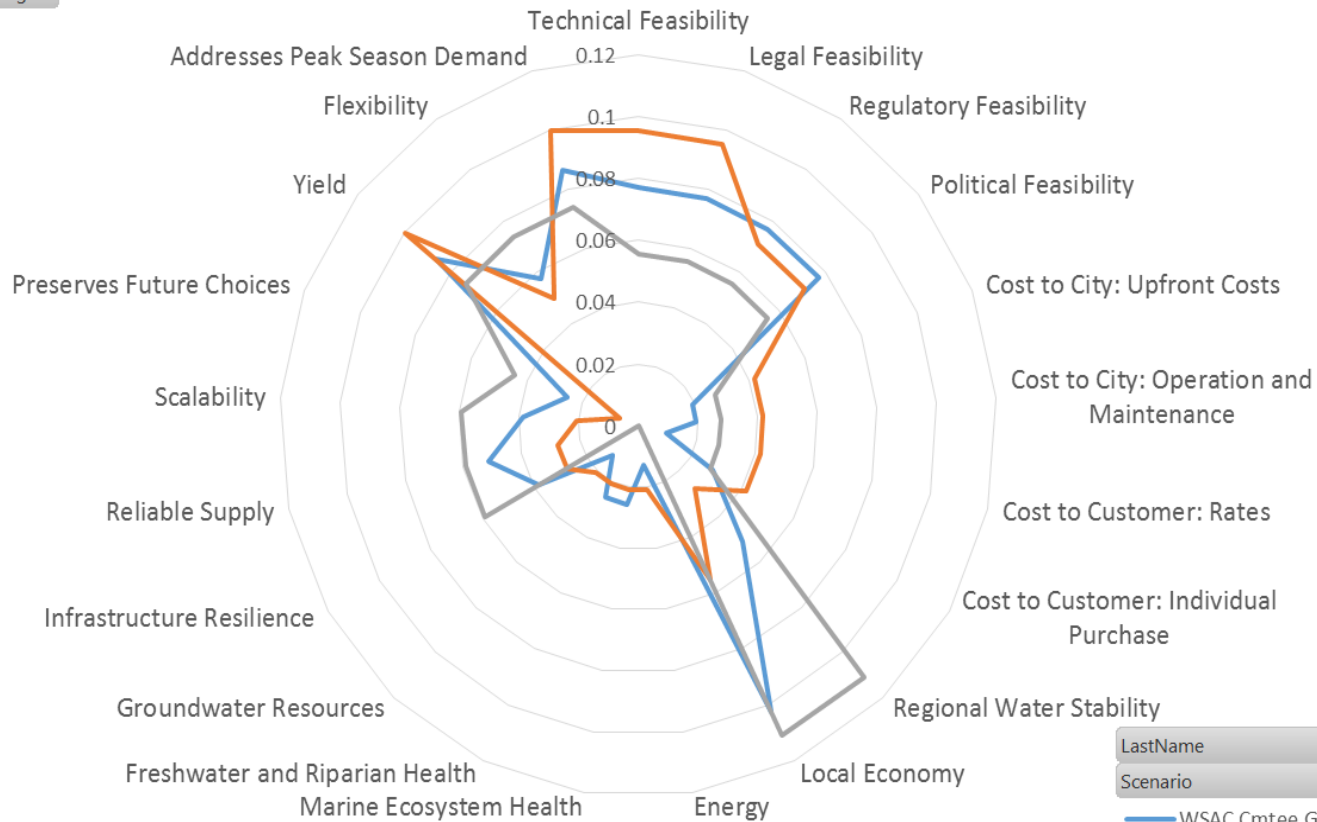
Sub-criterion

GroupName



Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 11



LastName



Scenario



- WSAC Cmtee Golden 11 - 650 MG
- WSAC Cmtee Golden 11 - BillionGap
- WSAC Cmtee Golden 11 - Zero Gap

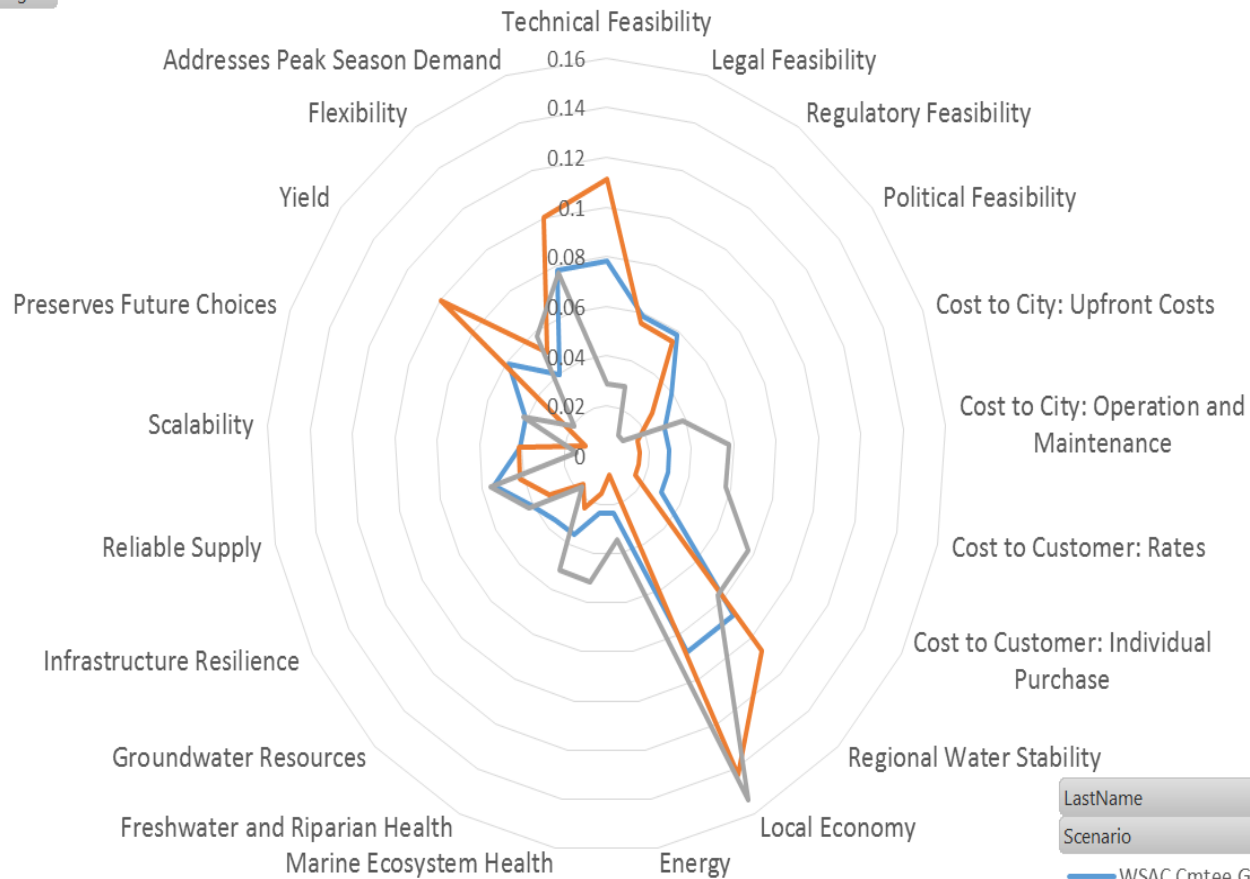
Sub-criterion



GroupName

Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 19



LastName

Scenario

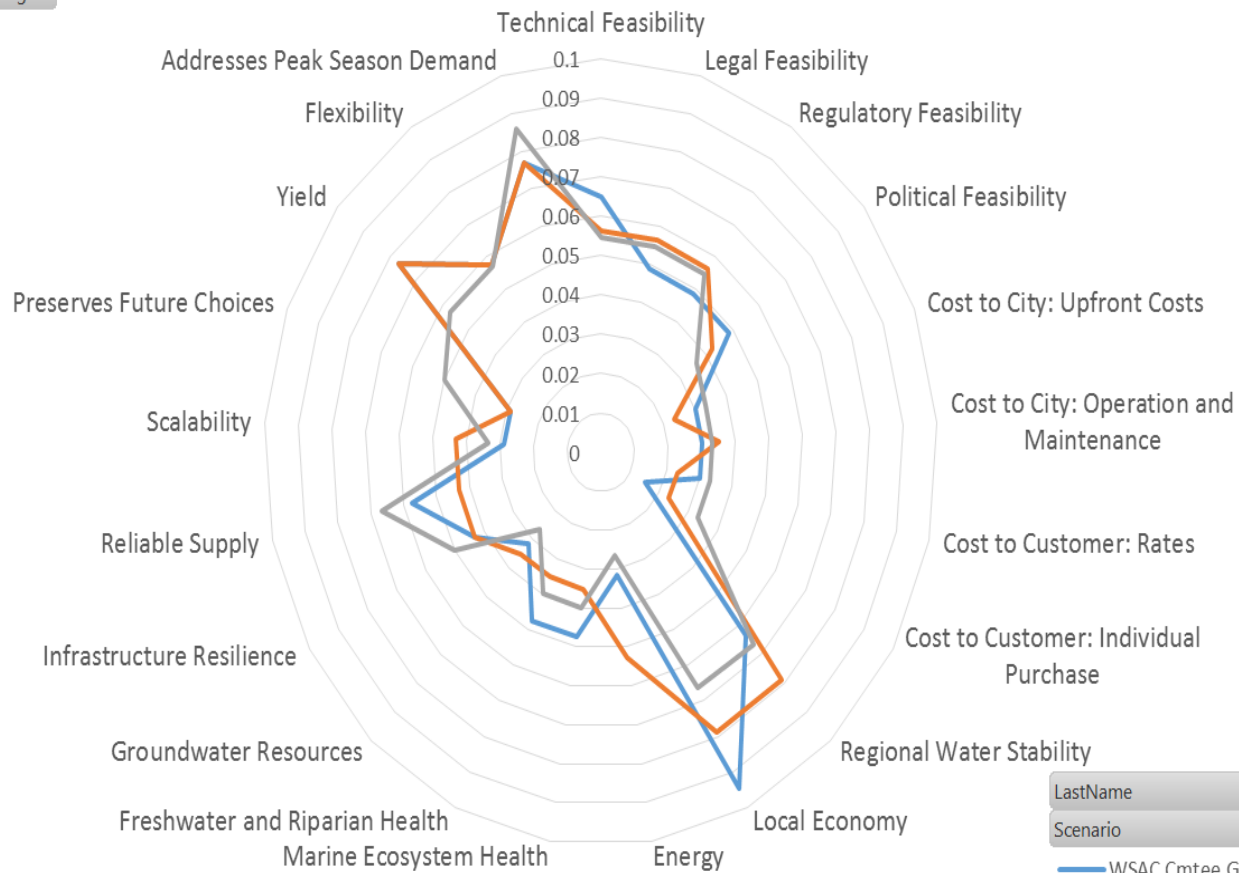
- WSAC Cmtee Golden 19 - 650 MG
- WSAC Cmtee Golden 19 - BillionGap
- WSAC Cmtee Golden 19 - Zero Gap

Sub-criterion

GroupName

Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 21



LastName

Scenario

WSAC Cmtee Golden 21 - 650 MG

WSAC Cmtee Golden 21 - BillionGap

WSAC Cmtee Golden 21 - Zero Gap

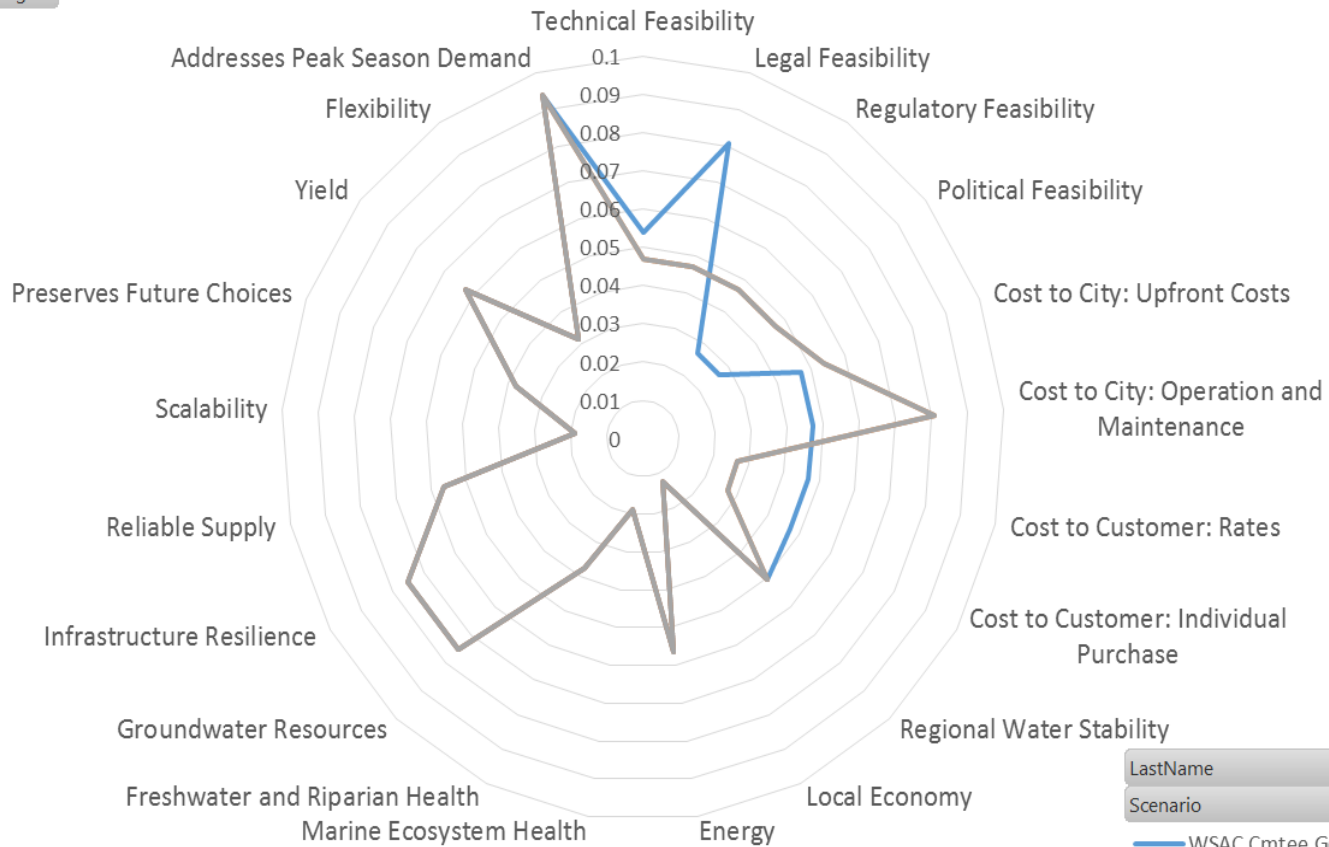
Sub-criterion

GroupName



Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 22



LastName



Scenario



- WSAC Cmtee Golden 22 - 650 MG
- WSAC Cmtee Golden 22 - BillionGap
- WSAC Cmtee Golden 22 - Zero Gap

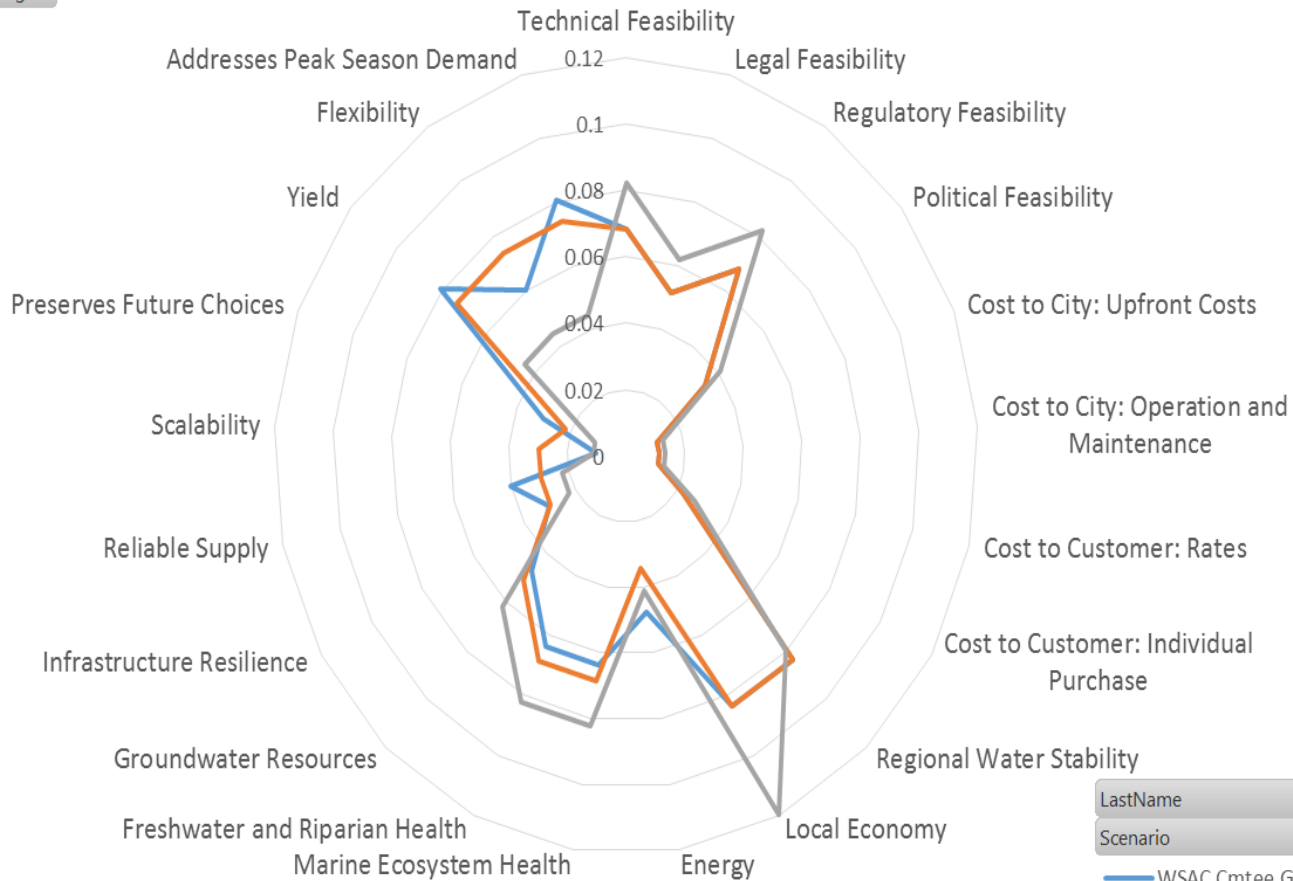
Sub-criterion

GroupName



Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 23



LastName



Scenario



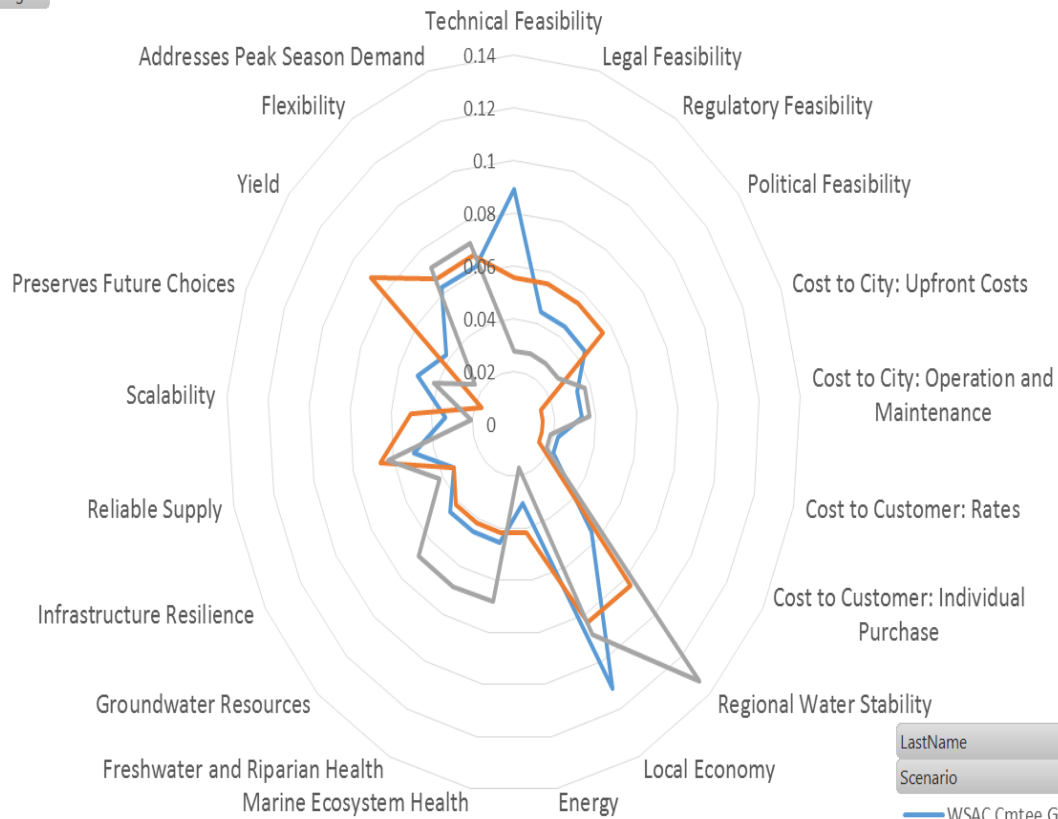
- WSAC Cmtee Golden 23 - 650 MG
- WSAC Cmtee Golden 23 - BillionGap
- WSAC Cmtee Golden 23 - Zero Gap

Sub-criterion

GroupName

Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 24



LastName

Scenario

WSAC Cmtee Golden 24 - 650 MG

WSAC Cmtee Golden 24 - BillionGap

WSAC Cmtee Golden 24 - Zero Gap

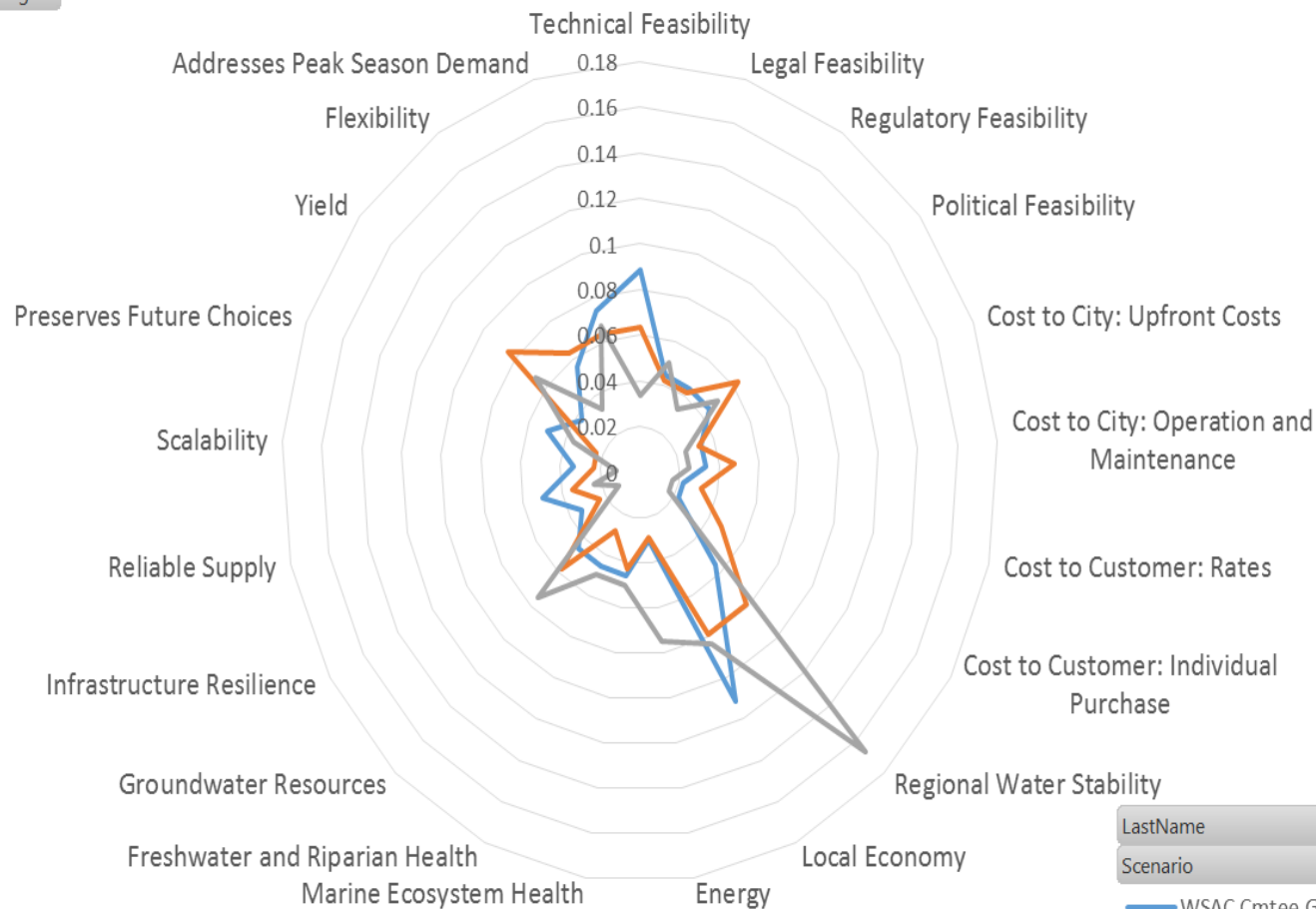
Sub-criterion

GroupName



Sum of ModelWeight

## Combined sub-criteria weights portrait for WSAC Cmtee Golden 25



LastName



Scenario



WSAC Cmtee Golden 25 - 650 MG

WSAC Cmtee Golden 25 - BillionGap

WSAC Cmtee Golden 25 - Zero Gap

Sub-criterion

# Recap

- did a good job; showed your individual values and thinking
- made changes across scenarios can see major weights variability areas—worth hashing out
- can see things that were weighed higher (or lower!) and x scenario
- negative space on the portraits
- ogling the portraits

# Questions?

- Shift from community well-being to yield
- Resilience and Preserves Future Choices...
- Our favorite: local economy!



# How Good So Far?

- Supports Recon Goals
  - Understand one's values and others'
  - Understand the approaches inside and out
  - Compare uncertainty and variance in the ratings
  - Prioritize your deliberations and research
  - Prepare for the Real Deal
  - Increase Community Capacity
  - Very well set-up for criteria and scales in RD.

# Now for the Ratings

(fear not, this is 'easier!')

- What we'll cover:

# Now for the Ratings

(fear not, this is 'easier!')

- What we'll cover:
  - How you rated political feasibility

# Now for the Ratings

(fear not, this is 'easier!')

- What we'll cover:
  - How you rated political feasibility
  - How you reacted to the City's ratings

# Now for the Ratings

(fear not, this is 'easier!')

- What we'll cover:
  - How you rated political feasibility
  - How you reacted to the City's ratings
  - Your variance in re-ratings

# Now for the Ratings

(fear not, this is 'easier!')

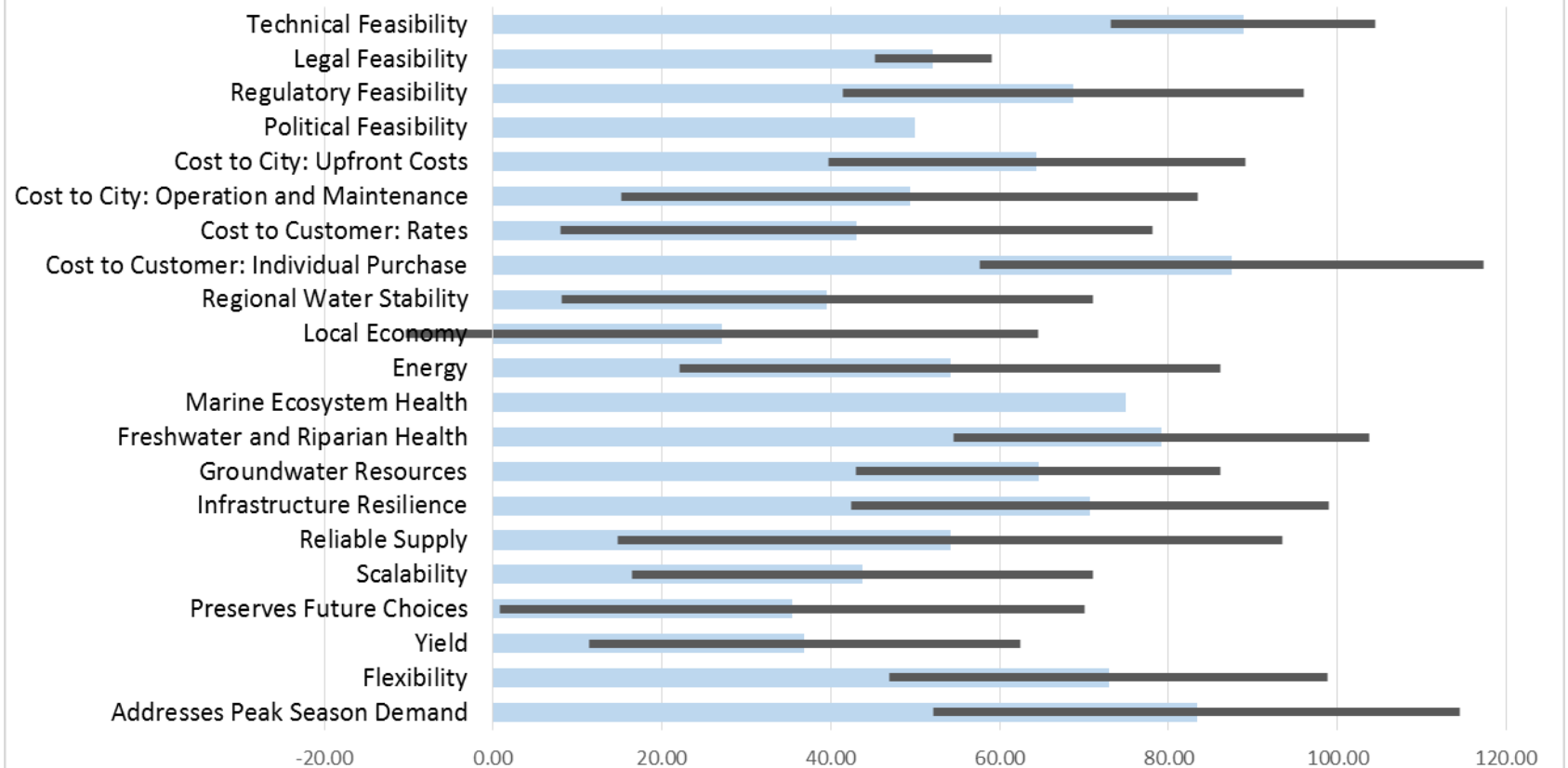
- What we'll cover:
  - How you rated political feasibility
  - How you reacted to the City's ratings
  - Your variance in re-ratings

# Now for the Ratings

(fear not, this is 'easier!')

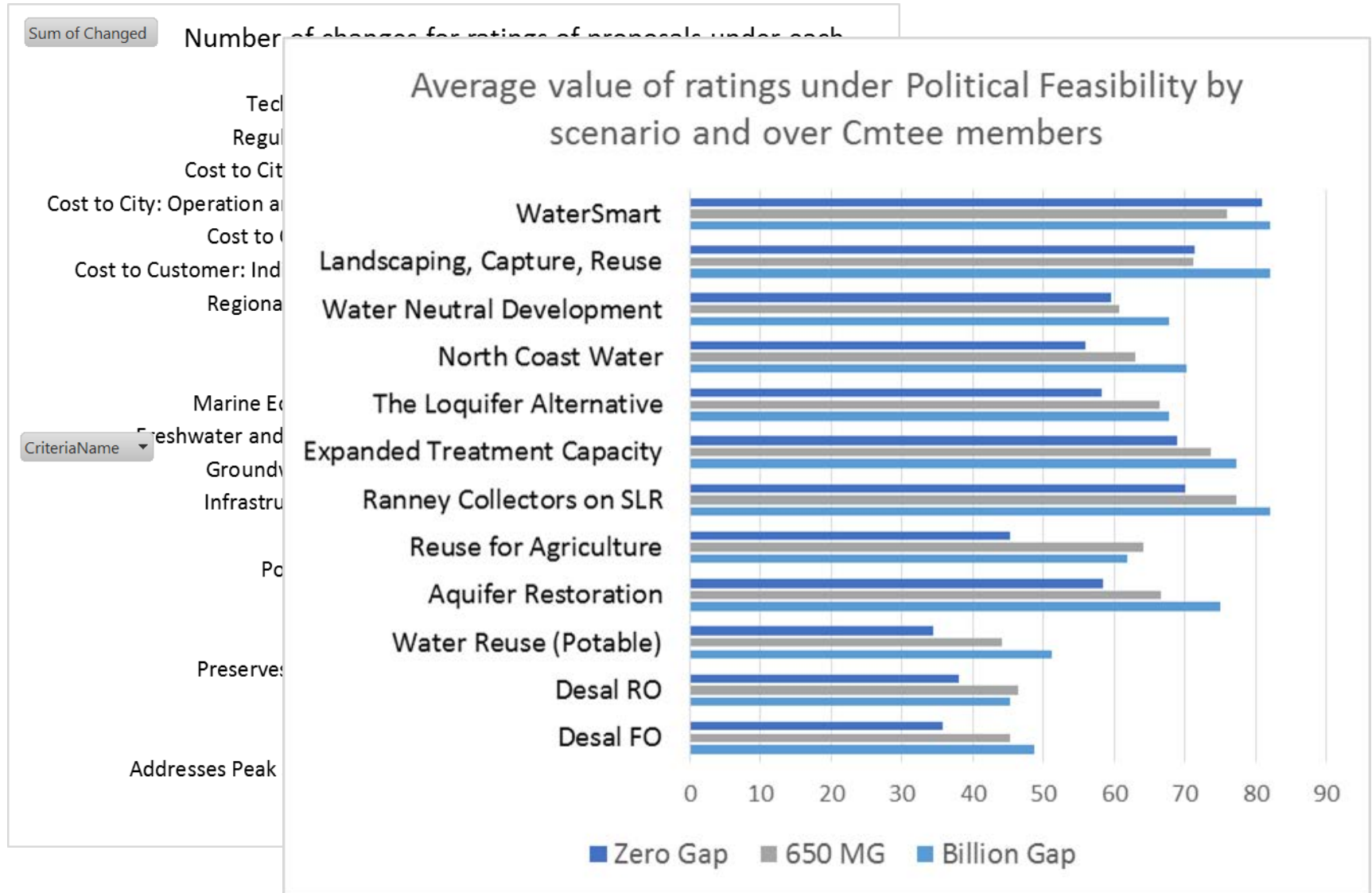
- What we'll cover:
  - How you rated political feasibility
  - How you reacted to the City's ratings
  - Your variance in re-ratings
  - Your obvious sticking points (just based on the ratings)

variation in Original Ratings across scenarios and alternatives





# Political Feasibility



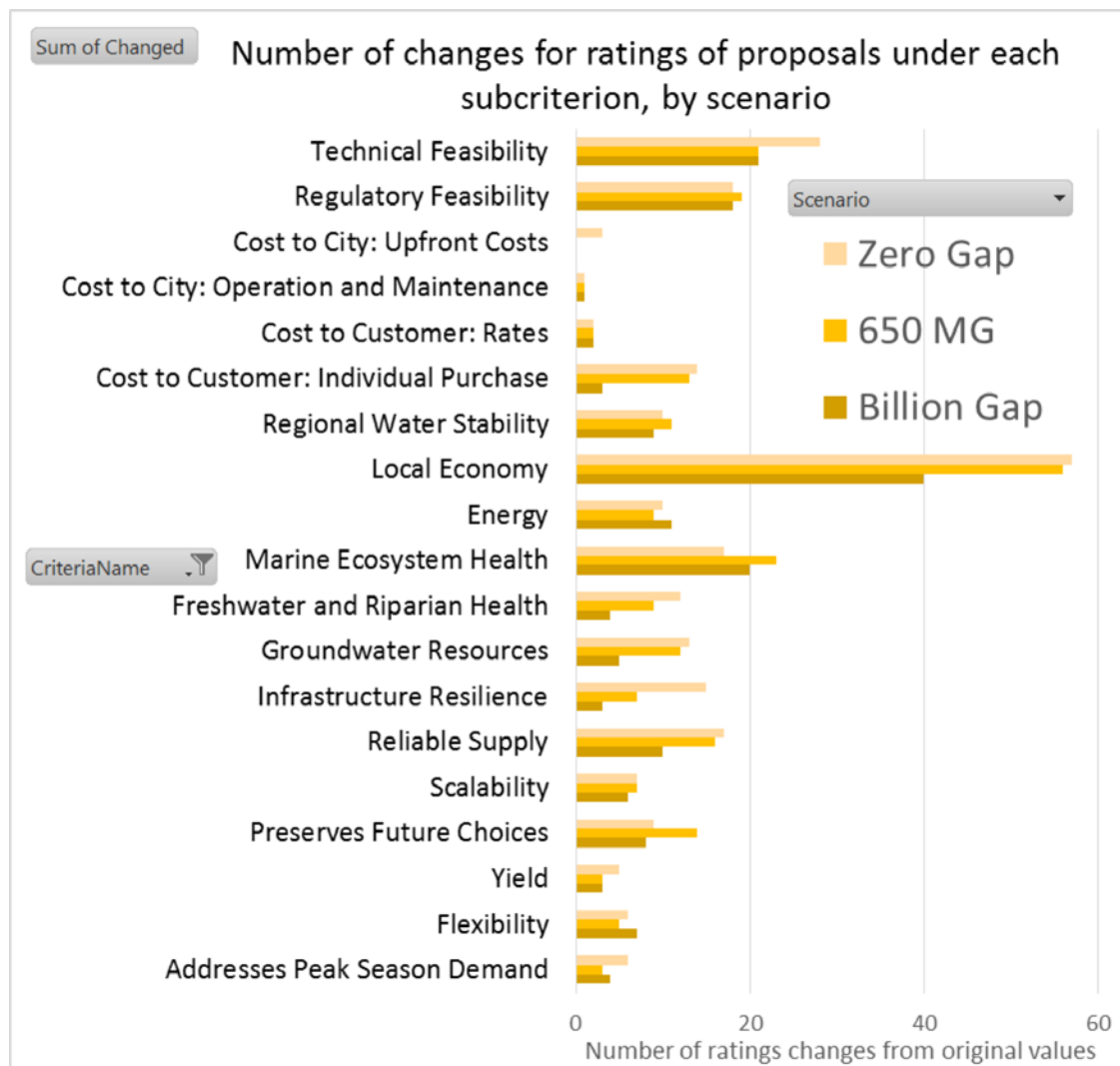
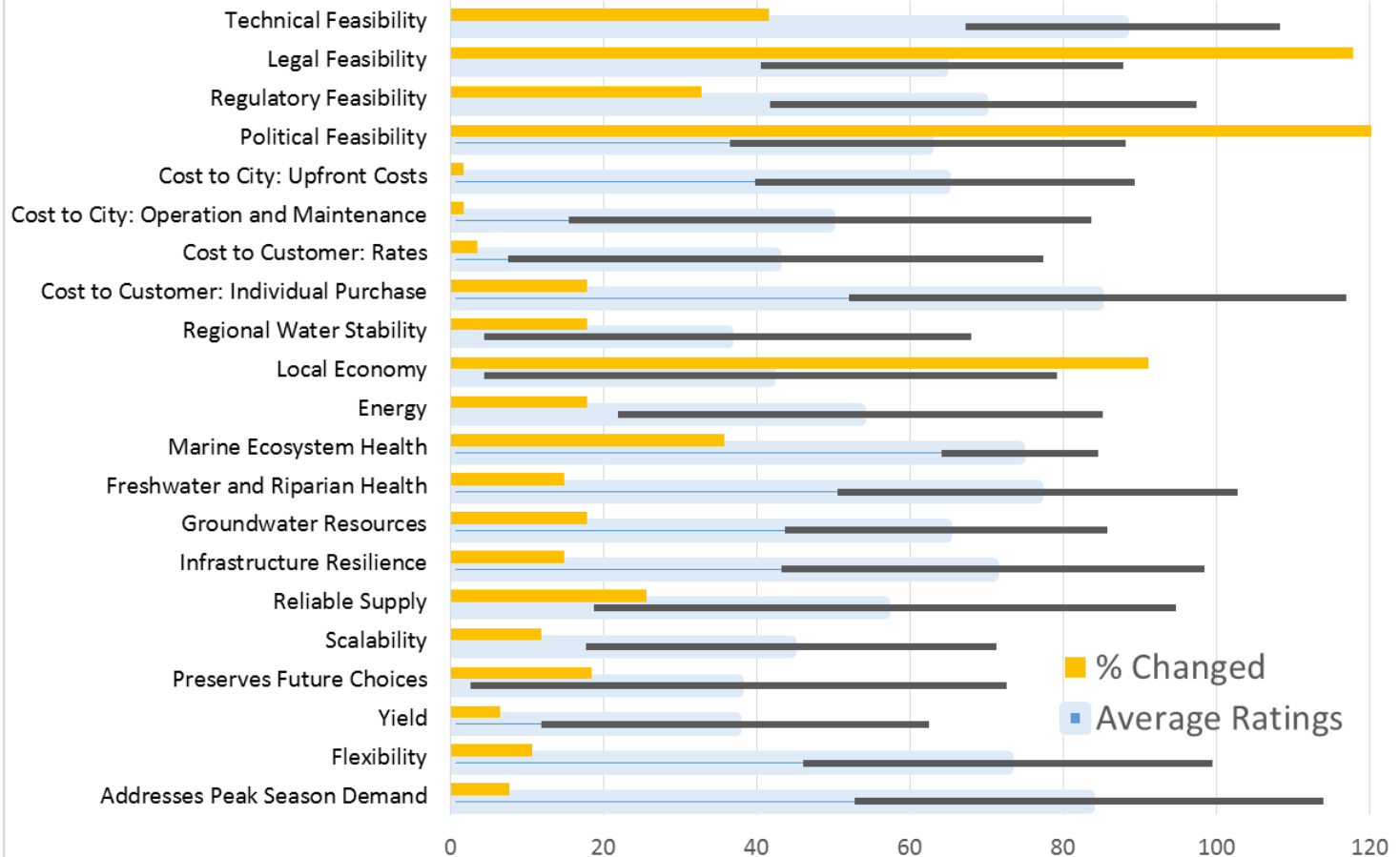
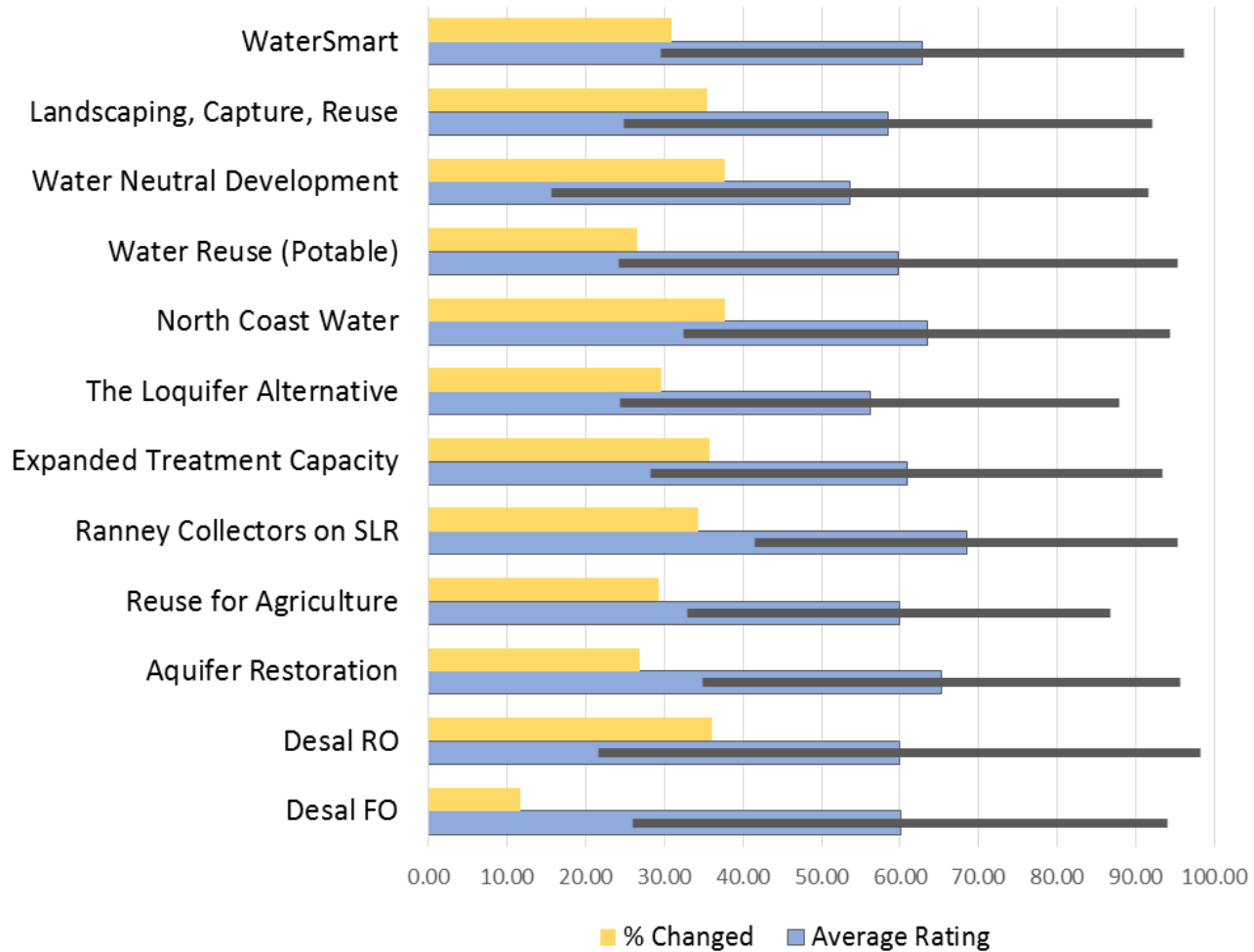


Figure VII.1: Which Criteria Were Changed the Most, by Scenario

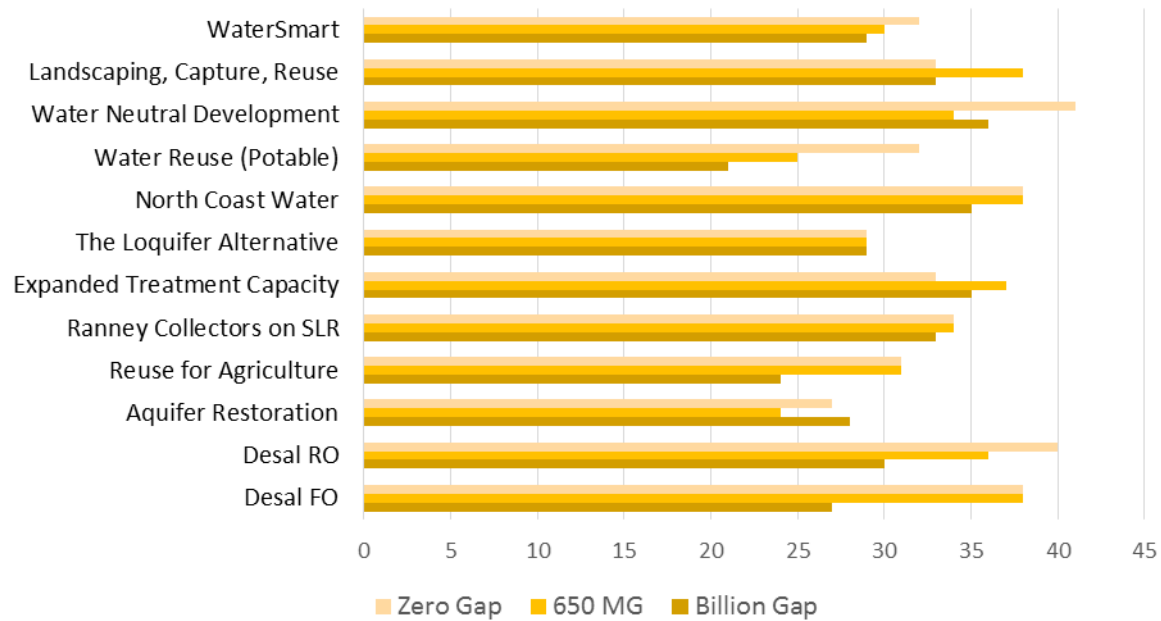
## Spread in ratings across all scenarios, alternatives and Cmtee Members



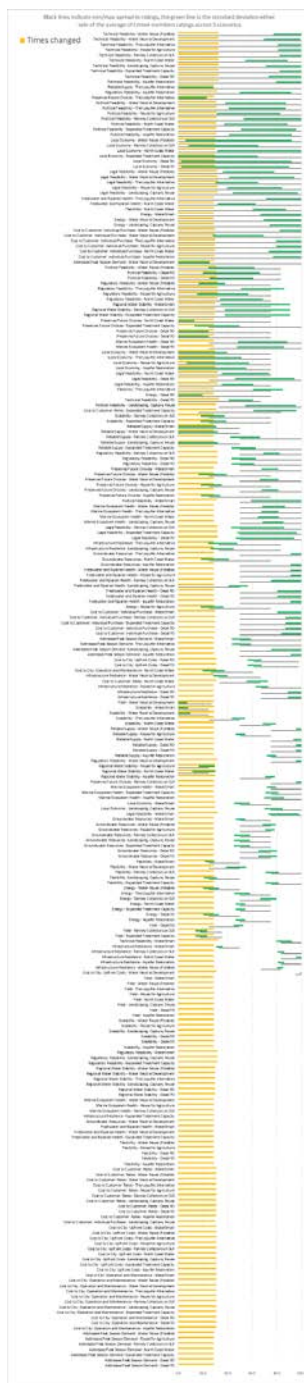
Variance around average ratings across all scenarios, Cmtee  
Members and subcriteria (Max 100)



### Number of changes observed in ratings across Cmtee members and subcriteria



# The graph of all graphs



Technical Feasibility - Water Reuse (Potable)  
 Technical Feasibility - Water Neutral Development  
 Technical Feasibility - The Loquifer Alternative  
 Technical Feasibility - Reuse for Agriculture  
 Technical Feasibility - Ranney Collectors on SLR  
 Technical Feasibility - North Coast Water  
 Technical Feasibility - Landscaping, Capture, Reuse  
 Technical Feasibility - Expanded Treatment Capacity  
 Technical Feasibility - Desal RO  
 Technical Feasibility - Aquifer Restoration  
 Reliable Supply - The Loquifer Alternative  
 Regulatory Feasibility - Aquifer Restoration  
 Preserves Future Choices - The Loquifer Alternative  
 Political Feasibility - Water Neutral Development  
 Political Feasibility - The Loquifer Alternative  
 Political Feasibility - Reuse for Agriculture



# How Good So Far?

- Supports Recon Goals
  - Understand one's values and others'
  - Understand the approaches inside and out
  - Compare uncertainty and variance in the ratings
  - Prioritize your deliberations and research
  - Prepare for the Real Deal
  - Increase Community Capacity
  - Very well set-up for criteria and scales in RD.

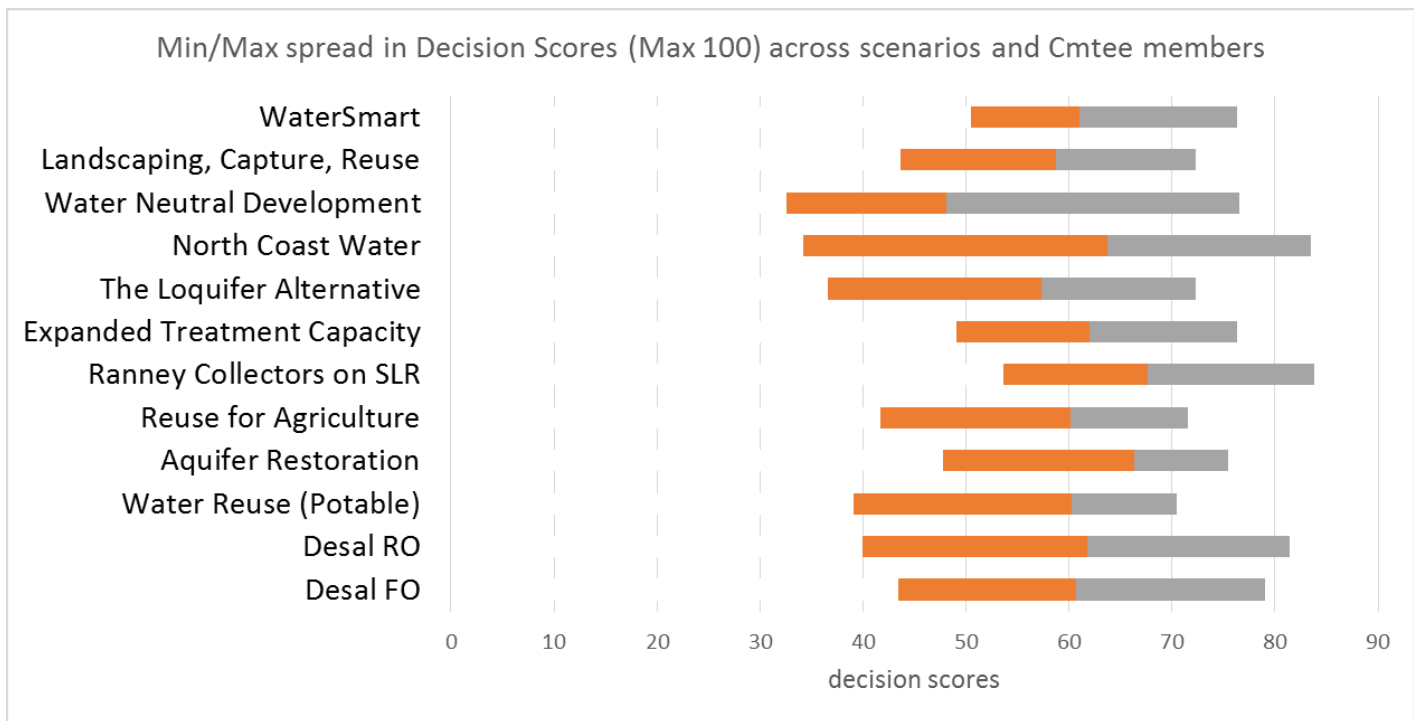
Now About Decision Scores

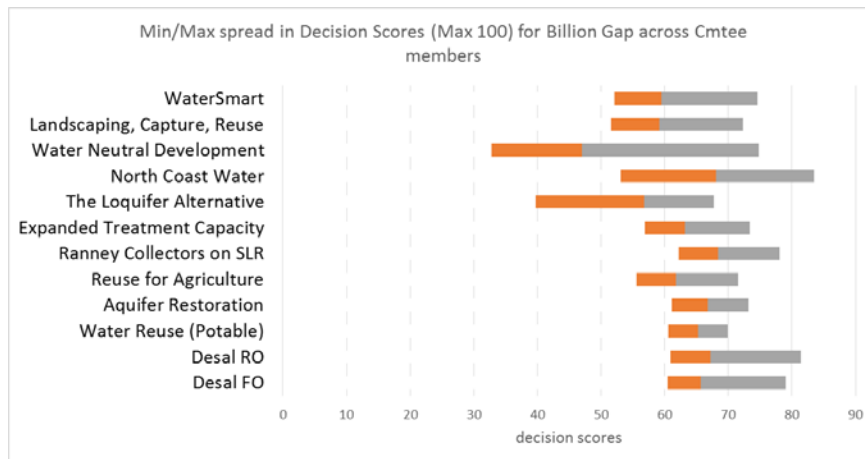
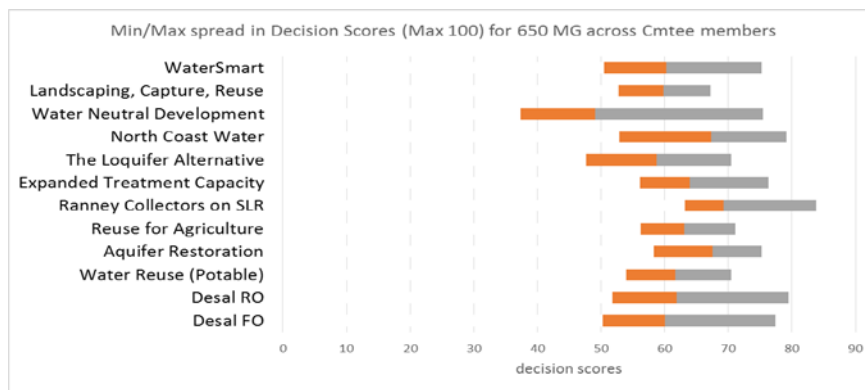
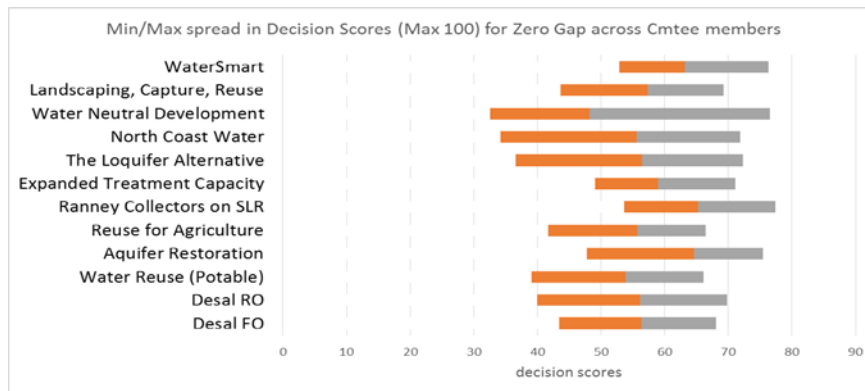


# Combining Weights and Ratings:

## **Decision Scores**

- Why Does this Matter? (*Discussion*)



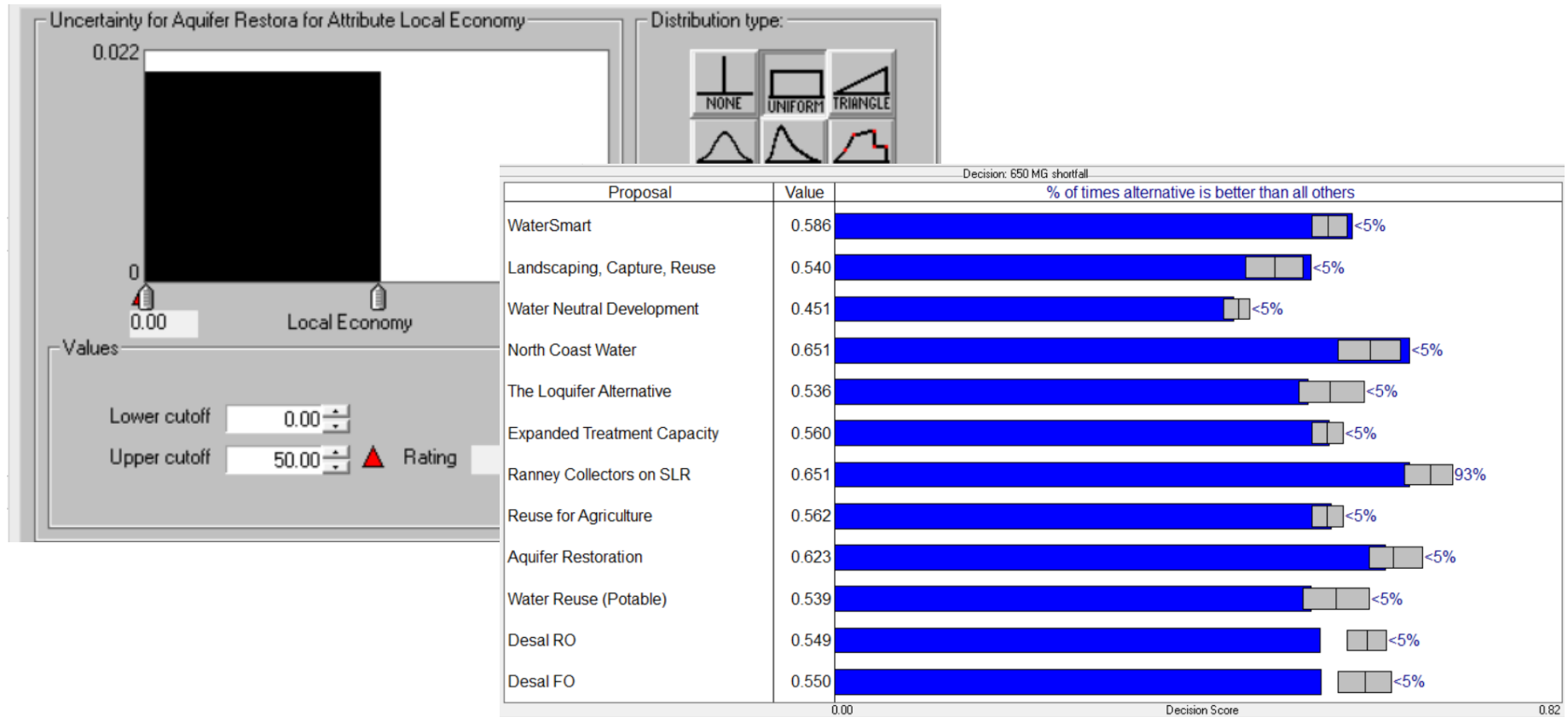


# Decision Scores

What did they do for you?

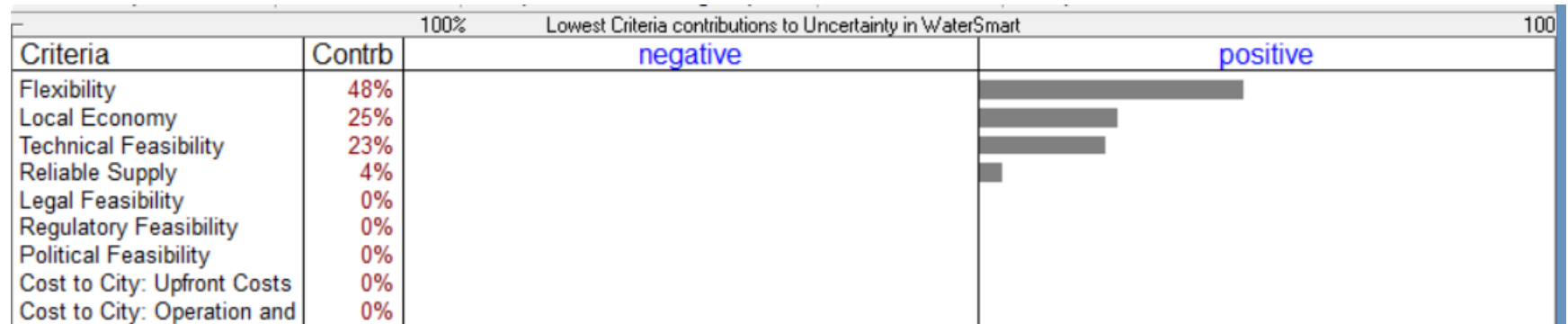
- Understand the approaches before ‘losing’ some of their detail in portfolios
- Is the interaction between weights and ratings more clear?
- Other.... ours...

# Using uncertainty to prioritize Research/Analysis

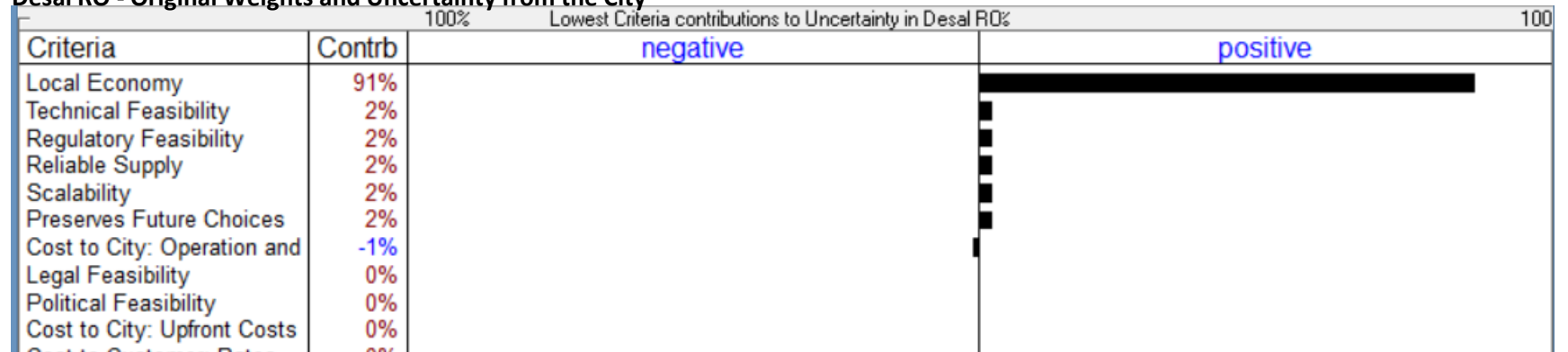


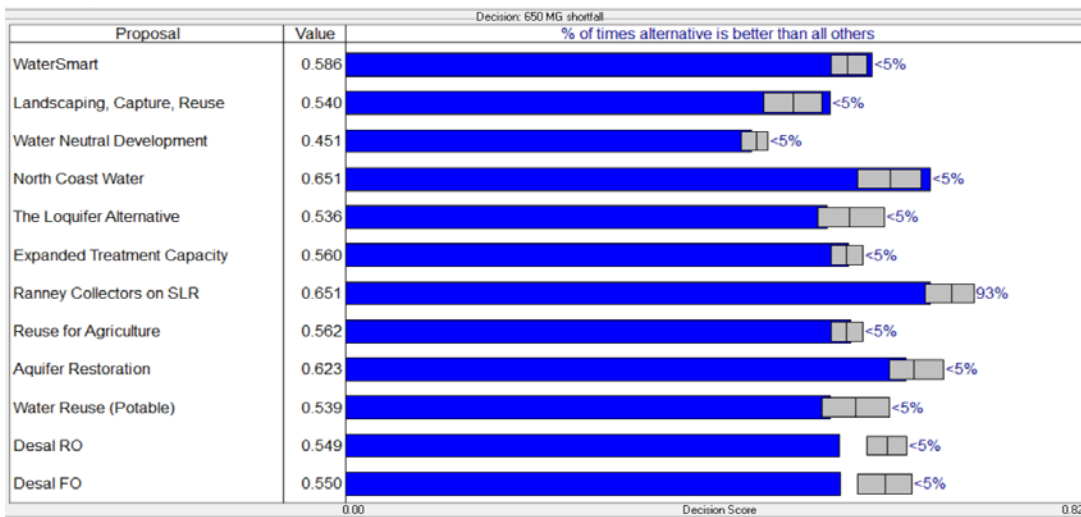
# What is driving overall uncertainty?

Watersmart – Original Weights and Uncertainty from the City

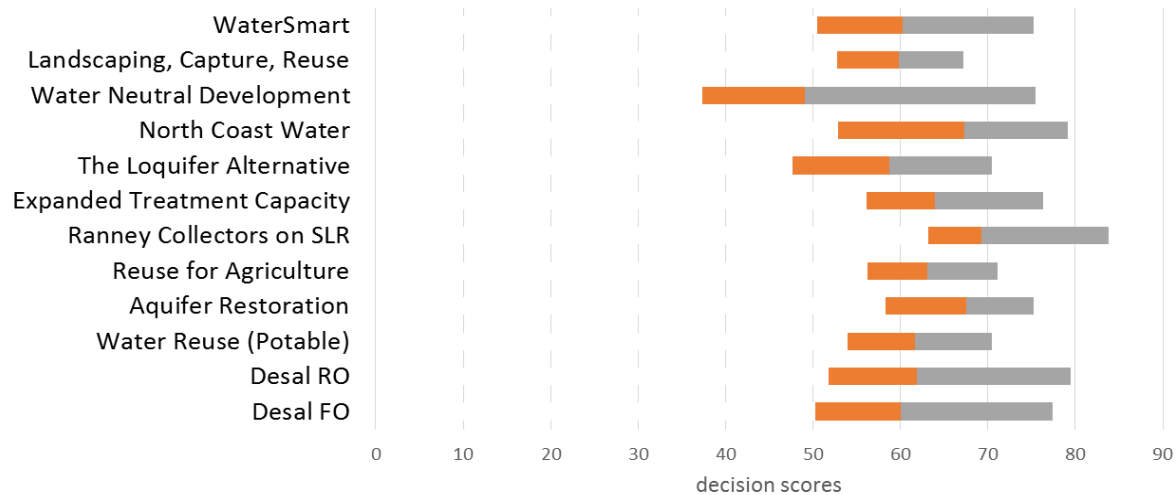


Desal RO - Original Weights and Uncertainty from the City

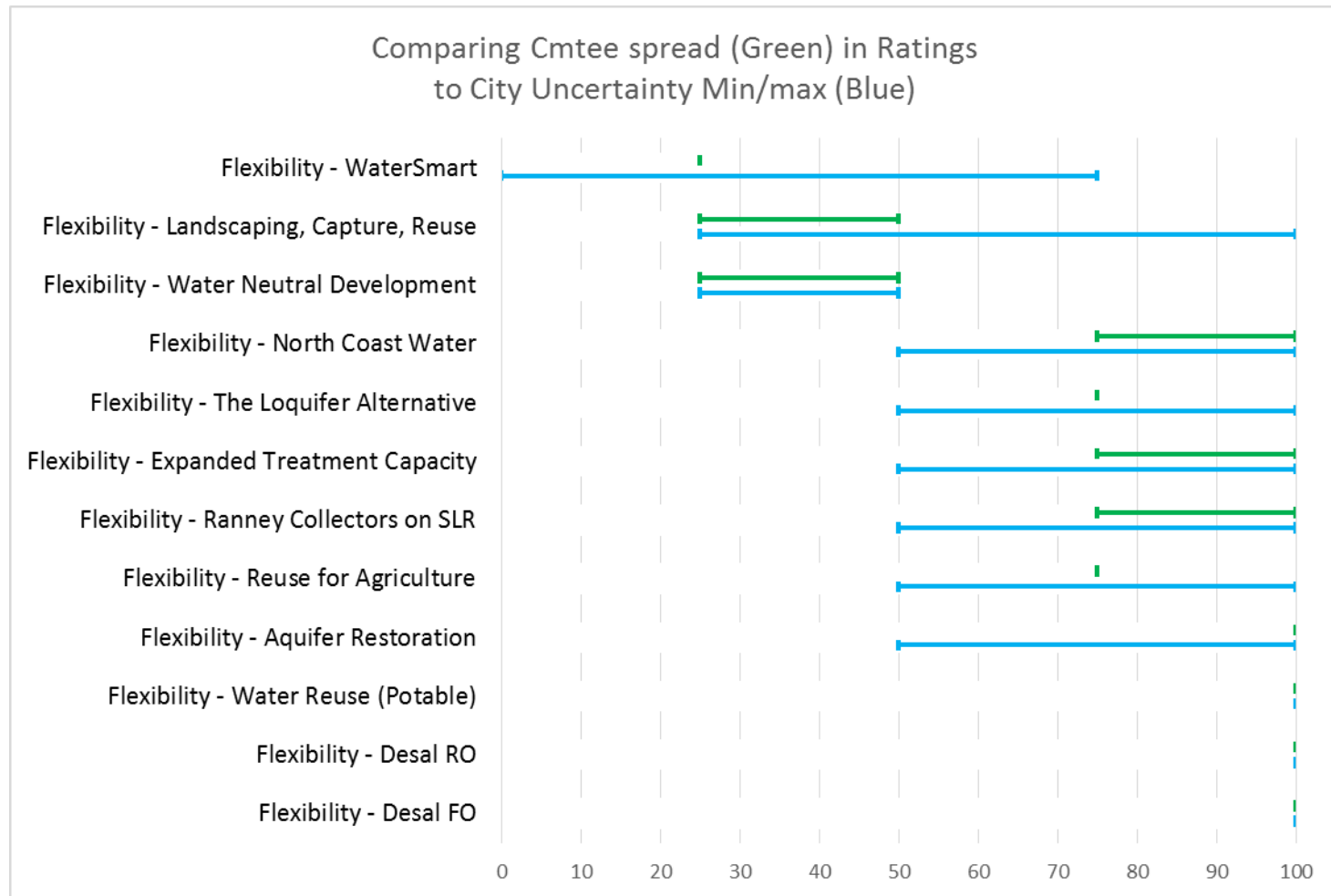




Min/Max spread in Decision Scores (Max 100) for 650 MG across Cmtee members

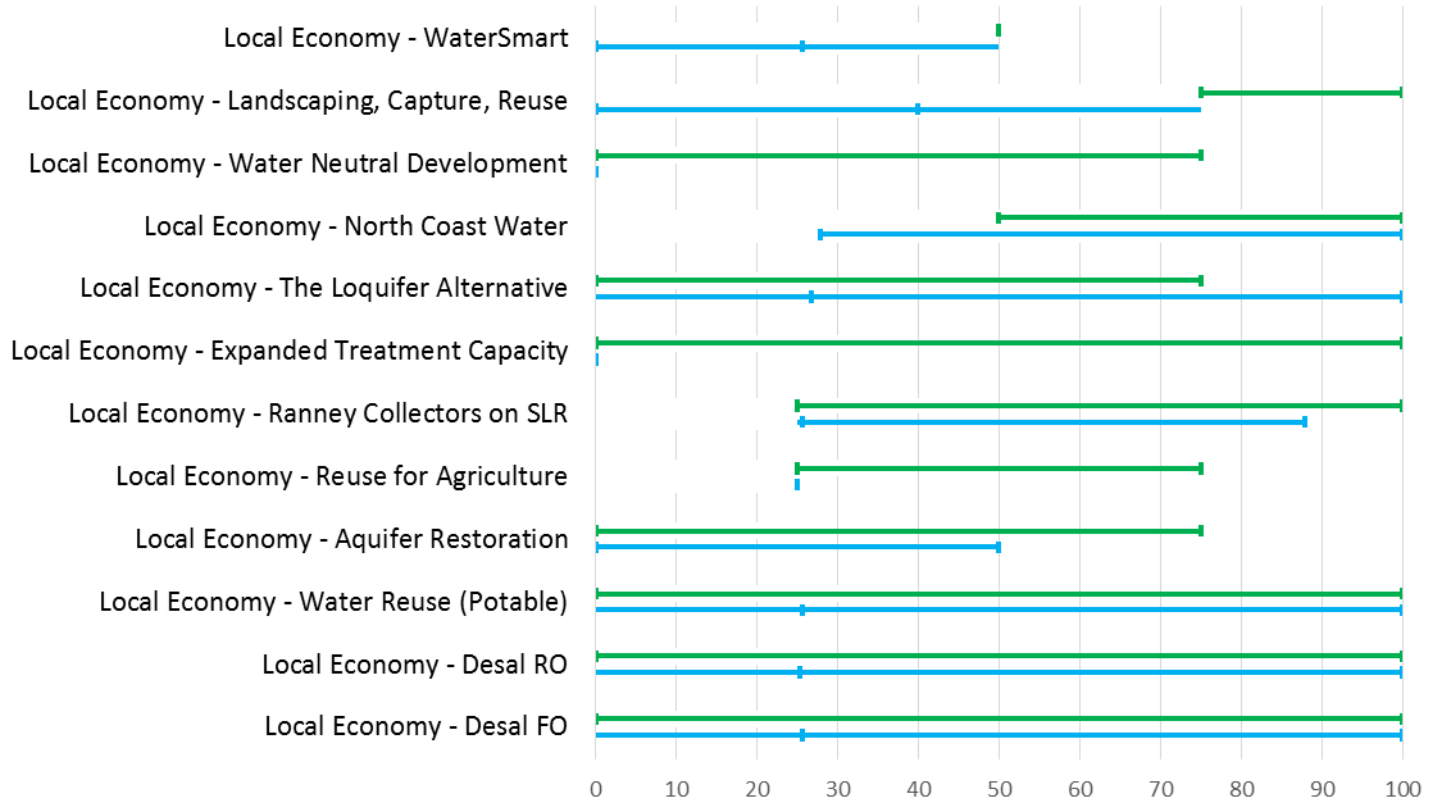


## Flexibility: how to City's uncertainty and Cmtee's ratings spread compare

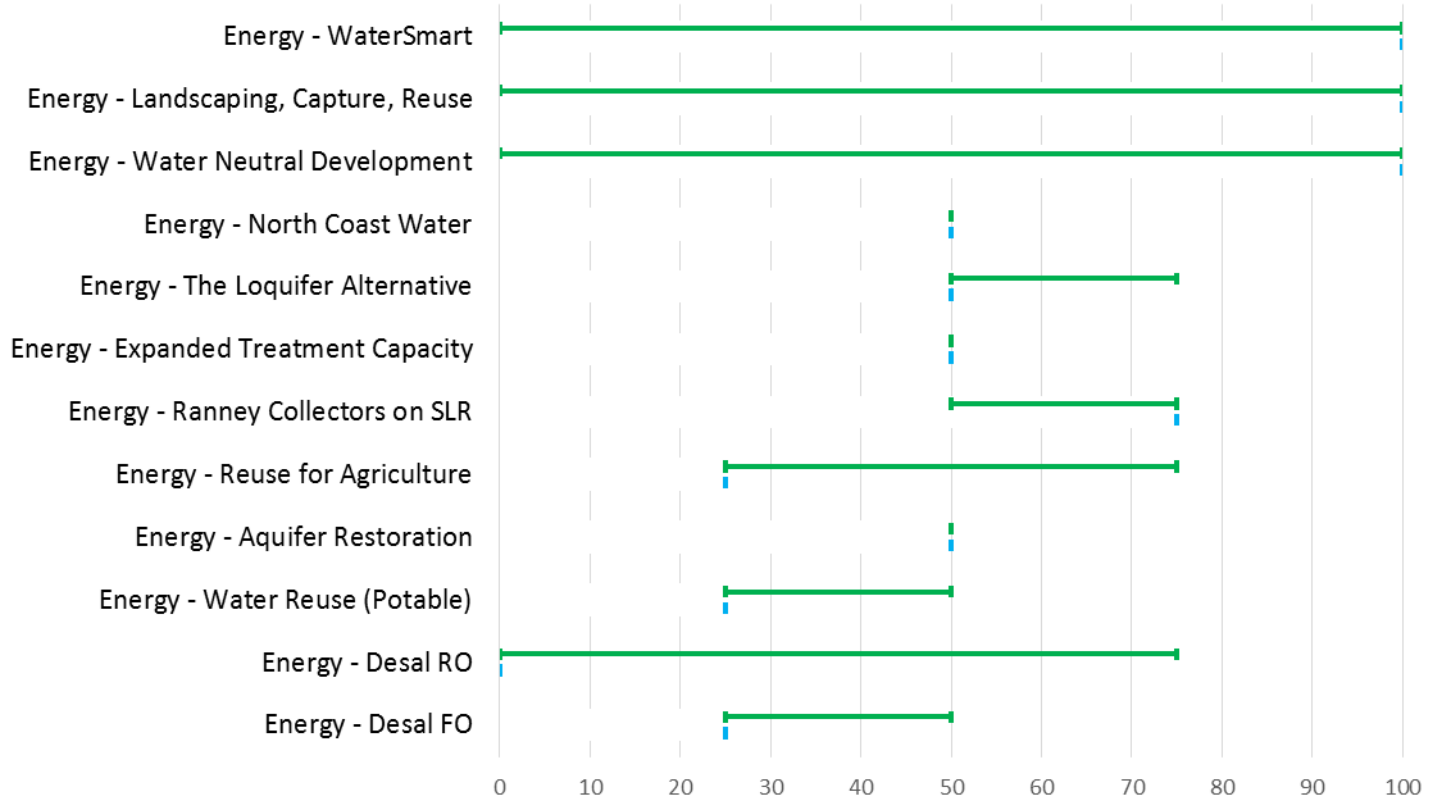




Comparing Cmtee spread (Green) in Ratings  
to City Uncertainty Min/max (Blue)



Comparing Cmtee spread (Green) in Ratings  
to City Uncertainty Min/max (Blue)



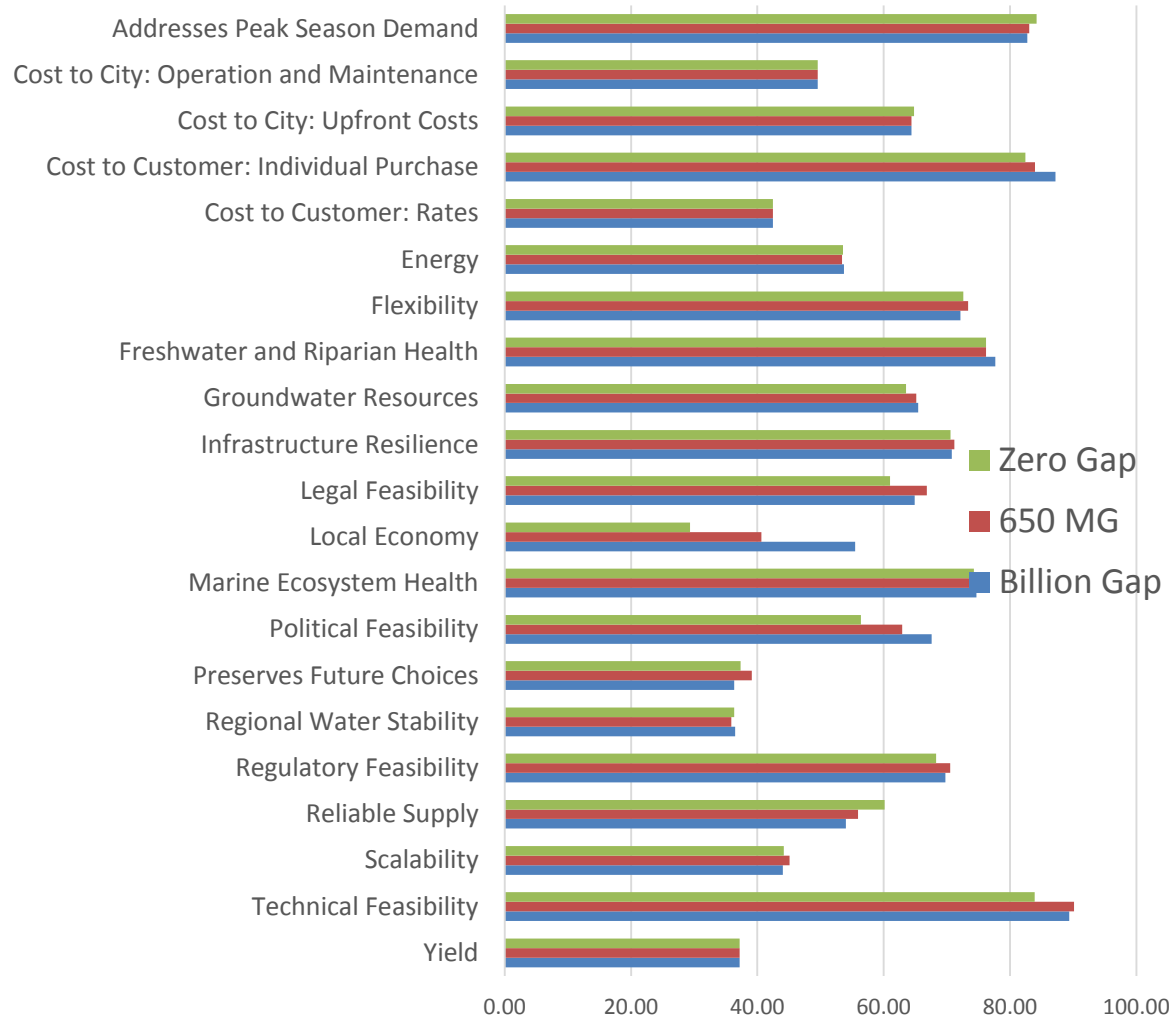
# Suggestion for proceeding

- For all ratings, take broader spread from City Uncertainty and Cmtee ratings > New Uncertainty
- Take 2-3 “characterists” weights portraits and generate analysis of contributions to uncertainty
- Tabulate which uncertainty in ratings drive the most uncertainty in outcomes > basis for prioritizing effort

Thank you!

# Extra Slides

## The average ratings for each subcriterion across all proposals and Cmtee members by each scenario



**Real Deal Planning Subcommittee**  
**Notes of meetings**  
**12/9/14, 12/16/14**

These notes are intended to show the breadth of the discussion about the draft schedule prepared by Heidi Luckenbach with input from the Subcommittee, and the Road Map for the Consensus Building Process.

**Road Map for the Consensus Building Process**

A variety of approaches were suggested:

**1. The Consensus Building Process is the “How” of the Cttee’s work**

One member proposed to consider the Consensus Building process as the How of the Cttee’s work, compared to the substantial part of the work already contained in the Work Plan. This “How” component will enable the Cttee to develop the capacity to reach agreement once the facts have been sufficiently clarified.

**2. Simplify the process and build on existing consensus**

One member noted that the Cttee has sufficient consensus to assemble some proposed solutions and see what Cttee Members think of them. For example, there is significant agreement about the need for more storage. This would be a simple approach that will allow the Cttee to make immediate progress.

Other members felt that there is, as yet, no consensus about anything, as we have not yet discussed things with real facts and in real terms. So this proposal is premature. This approach was not considered further.

**3. Build the process as if developing a case before a court:**

WSAC is like a jury. We have barely had an opening statement; we now need to have the facts presented in a way that builds the case step-by-step in a logical sequence

- Problem Statement
- Baseline
- Scenarios based on reality
- Vetting of alternatives
- Composition of Portfolios

Later in the discussion, one member asked whether the Cttee should re-visit its charter as a reference point for the development of the Consensus Building Process. Others felt that it would be better simply to compose a series of tasks in a logical sequence.

**4. But how will Consensus Building actually work?**

The members discussed their concerns about how the consensus building process works in practice.

- One said he was worried about the “soft stuff”, that is, the tools and techniques that Cttee members will use in order to build consensus. Few, if

- any, of the Cttee members have political backgrounds, so many / most of us will be learning by doing. How we can make sure that everyone is similarly aware of, and competent and comfortable with those tools and techniques.
- One explained that, while keeping an open mind to all alternatives it is important to prioritize the values that we hold to be important by giving high weights to relevant criteria. How can the consensus building process accommodate prioritization of values and simultaneously allow productive deliberation about alternatives?
  - One felt that the development of hypothetical contingency agreements is too ethereal for meaningful discussion at this stage, but agreed with others that it would be useful to review examples of contingent agreements, and acknowledged that, before the end of the process, the Cttee will be “fact-challenged” so it will need to be able to consider contingency agreements.

In response to these questions about the way that consensus building works, a facilitator suggested the Cttee might benefit from an explanation of interest-based negotiation, which is the basis of collaborative consensus building, as well as case-studies of the process and outcomes of some other, relevant consensus-based decision processes.

One member noted that the basic Problem Statement is “How do we get agreement on a recommendation for the Council?” The answer to this problem statement includes the various steps in the consensus building process and understanding how interest-based negotiation works and how members will negotiate around their interests and their positions.

Another member proposed starting the process with a basic discussion of interest-based negotiation, then proceeding to build provisional agreements on a series of issues that each provide a step towards the eventual agreement. In this way the Cttee will fill the Consensus Building Road Map with a series of useful steps.

## **5. How to recognize and avoid impasses**

One member emphasized the need to include joint fact finding in this process in order to provide a way out of impasses.

Another member recognized that awareness of the possibility of failing to produce a coherent agreement could serve as a motivator to keep the Cttee on a productive track, and suggested that this awareness should be accentuated when the Cttee reached key points at which it might fail.

## **6. How to prepare portfolios without completion of all technical assessments?**

One member suggested that, since many alternatives are variations on a particular theme, thematic alternatives can be developed to enable portfolios to be compiled without preparing technical evaluations of all alternatives.



### **7. How to prepare Scenarios swiftly and efficiently?**

One member suggested that the task of preparing scenarios could be assigned to Kaffeeklatches in which members would collaborate to increase each others' understanding and develop scenario proposals outside of the Cttee's meetings.

### **8. Can the Cttee's work schedule be shorter?**

One member proposed aiming to conclude the work of the Cttee in July. Others felt that three or four meetings would be needed for the agreement phase. Planning for a shortened approach was not considered further.

### **9. Should there be a Joint Work Session with the Council**

Members considered the proposal to hold a joint work session with Council in April.

- This would be an opportunity to engage with the Council and help them understand the work of the Cttee.
- Some members were concerned that this might precipitate premature politicization of the Cttee's work
- Other members felt that the Cttee needs to hear from the Cncl, to know what's on their minds, and ensure that the Cttee knows what the Council cares about.

### **10. Who will present Enrichment Sessions during Real Deal?**

Someone will ask Cttee members to provide the Friday session with a list of desired speakers for Real Deal. The Sub-Cttee will then, based on direction from the Cttee and after receiving recommendations from the technical team, develop a list of proposed speakers that will help the Cttee make effective decisions.

### **11. Additional detail for Technical Work Plan**

A member asked that additional detail be provided regarding the flow, timing and content of the Technical Work Plan prepared by Heidi Luckenbach and supplemented by the RDP Sctee's discussions. Staff agreed that that information would be provided as the plan firmed up. The Subcttee recommends proceeding with this draft schedule for the Real Deal process.

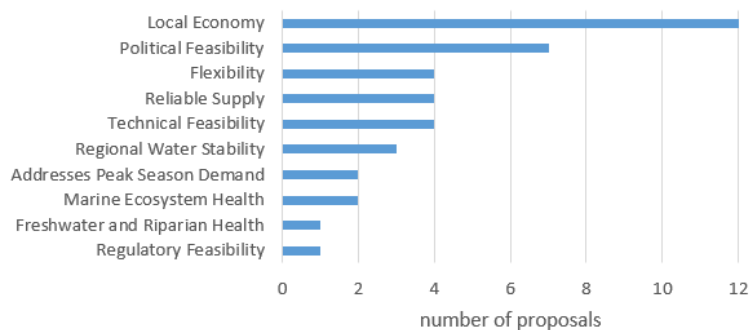
## Results from RECON MCDS that Prioritize Research for Real Deal

Philip Murphy, Ph.D. – Dec 18th, 2014

### Results - Prioritized Research

Subcriteria	Times in top 3 drivers
Local Economy	12
Political Feasibility	7
Technical Feasibility	4
Reliable Supply	4
Flexibility	4
Regional Water Stability	3
Marine Ecosystem Health	2
Addresses Peak Season Demand	2
Regulatory Feasibility	1
Freshwater and Riparian Health	1

Times subcriterion is in top 3 drivers of uncertainty in proposal's decision score

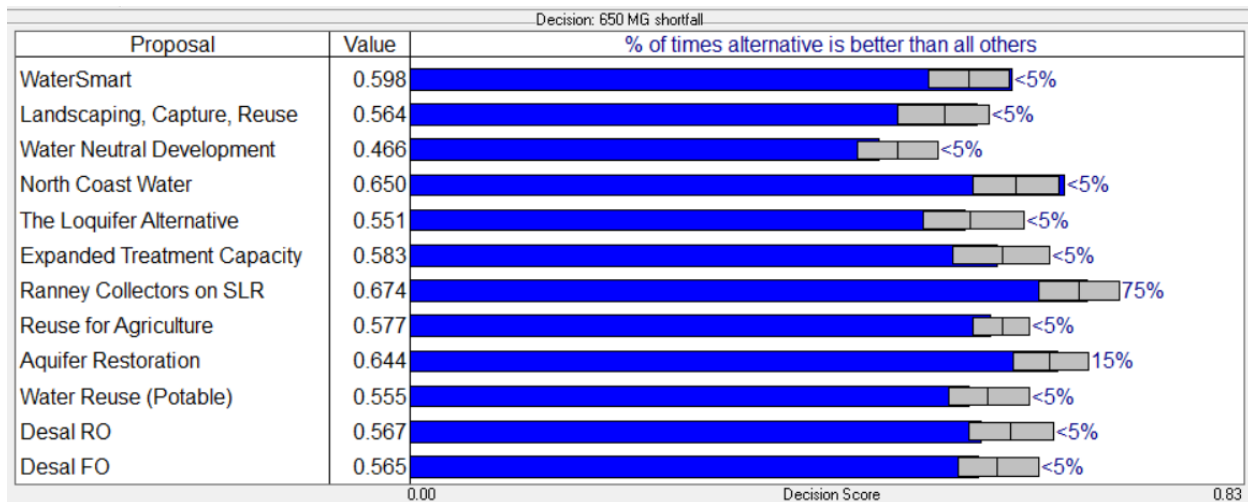
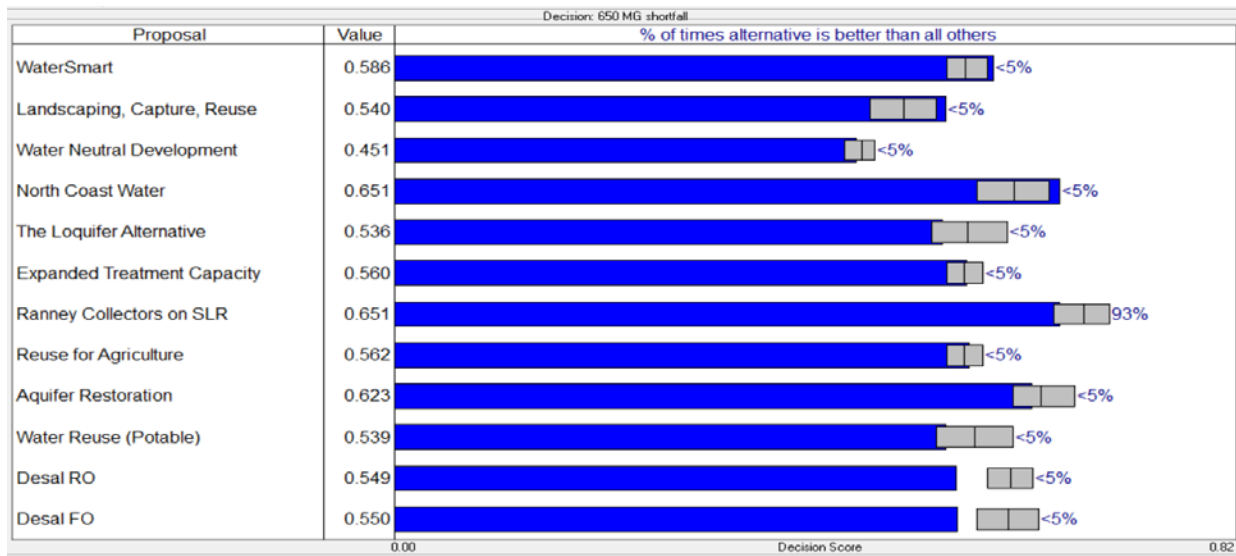


Subcriteria	Times accounts for 20%	Affected Proposals
Local Economy	12	All
Regional Water Stability*	3	WaterSmart, Expanded Treatment Capacity, Ranney Collectors on SLR
Political Feasibility*	2	Water Neutral Development, Reuse for Agriculture
Marine Ecosystem Health*	2	Desal RO, Desal FO
Reliable Supply*	2	The Loquifer Alternative, Expanded Treatment Capacity
Flexibility*	1	WaterSmart

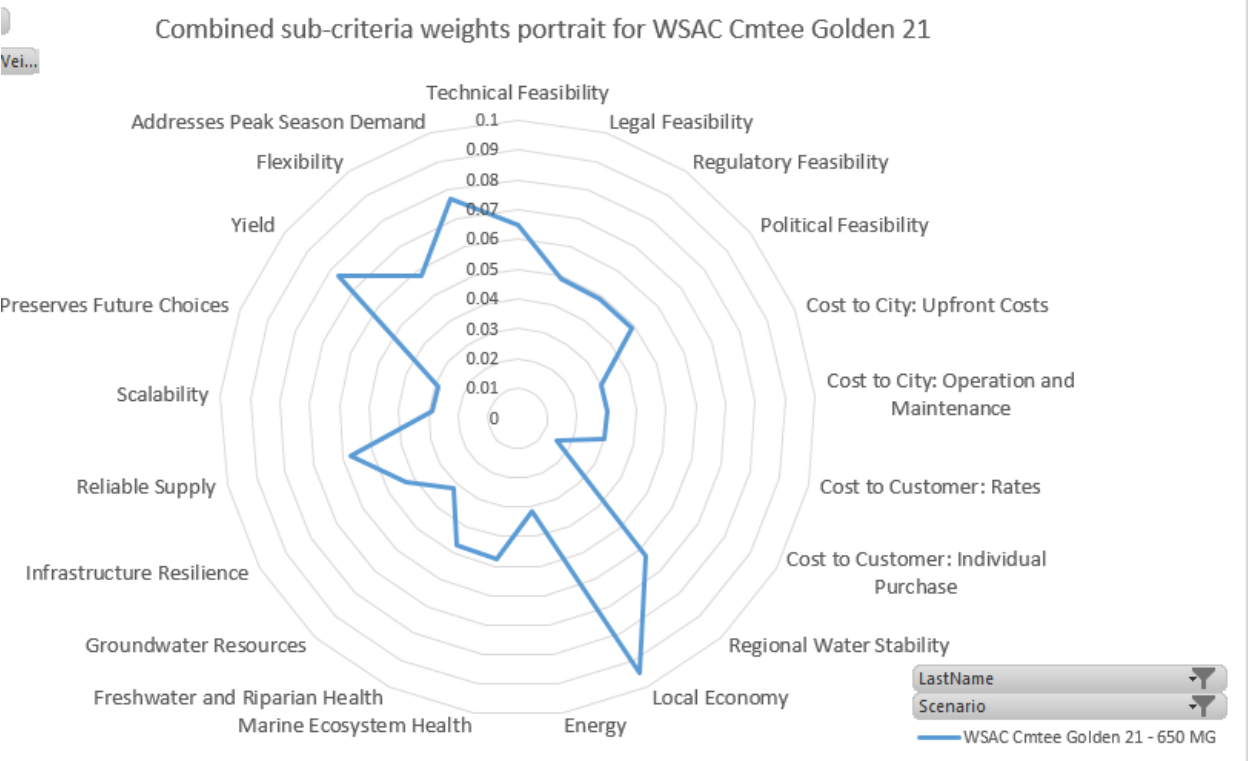
\*subcriteria whose % contribution were recalculated with the contribution from Local Economy removed, and that recalculated % topped 20%.

## Methodology

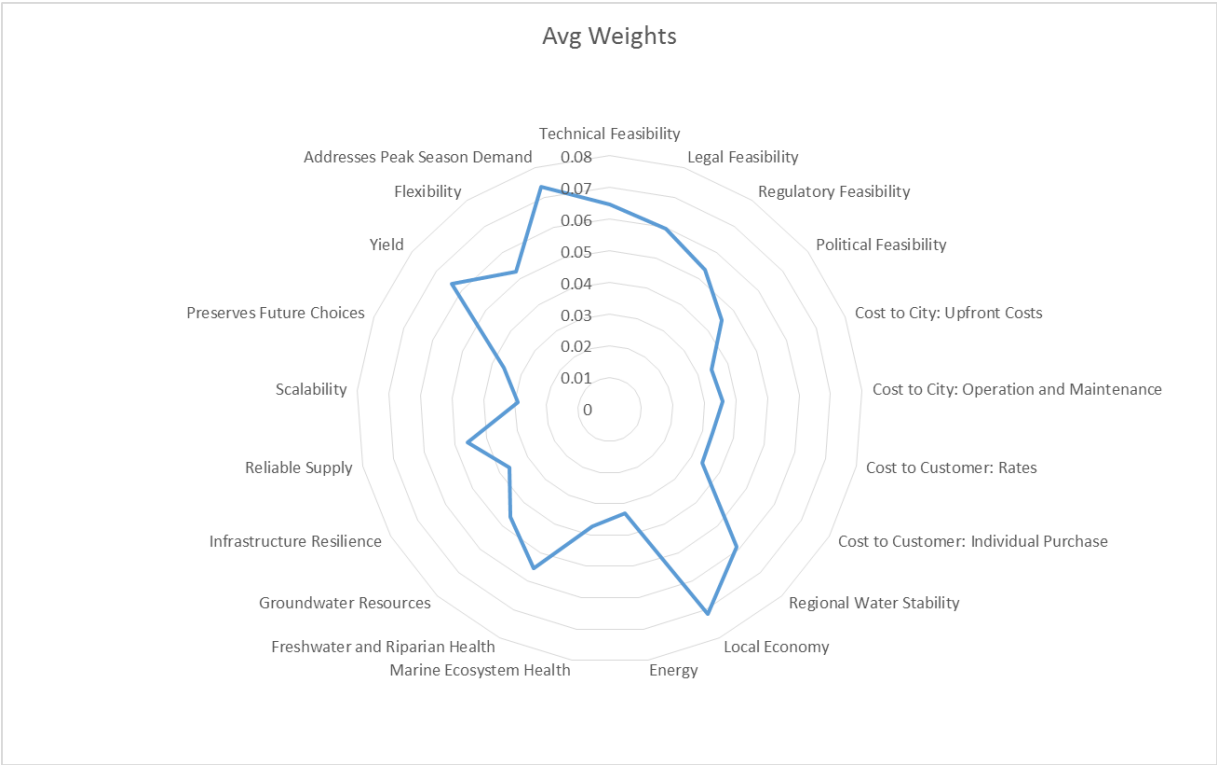
We had shown on Friday that based on the City's setting formal uncertainty distribution to some of the input ratings, the uncertainty in results, for an equi-weighted MCDS model of the 650 Gap was:



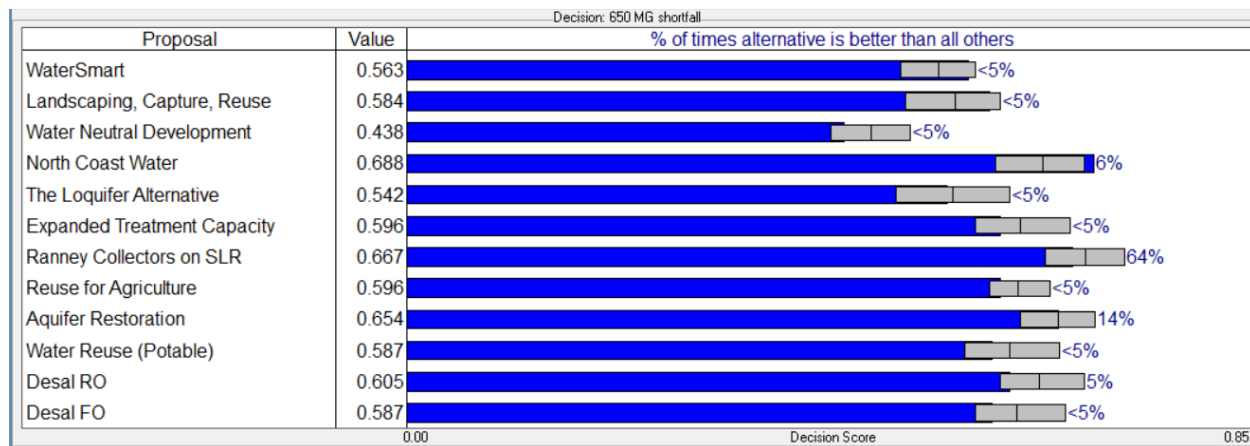
I then searched the weights portraits for the portrait closest to the average of the Cmtee’s ratings. Based on the smallest Euclidean distance from the average weights, it was Cmtee Member #21’s:



Whereas the average of the Cmtee members combined weights looked like:

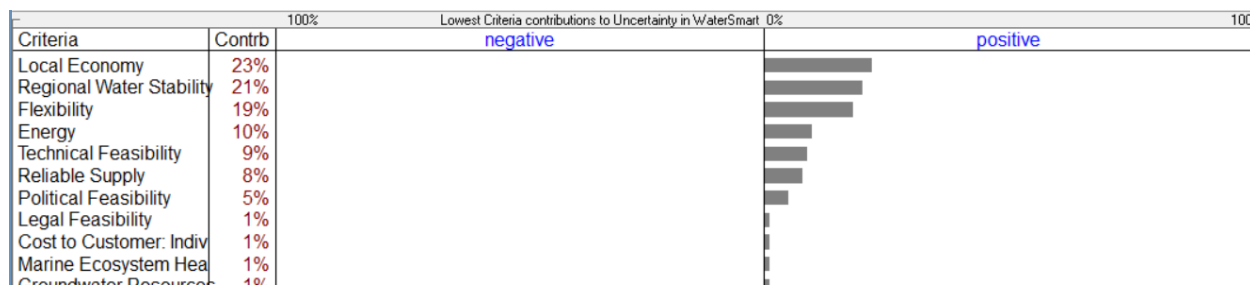


Applying Cmtee member #1's weights to the average ratings with the new, combined uncertainty, the uncertainty in their decision scores are:

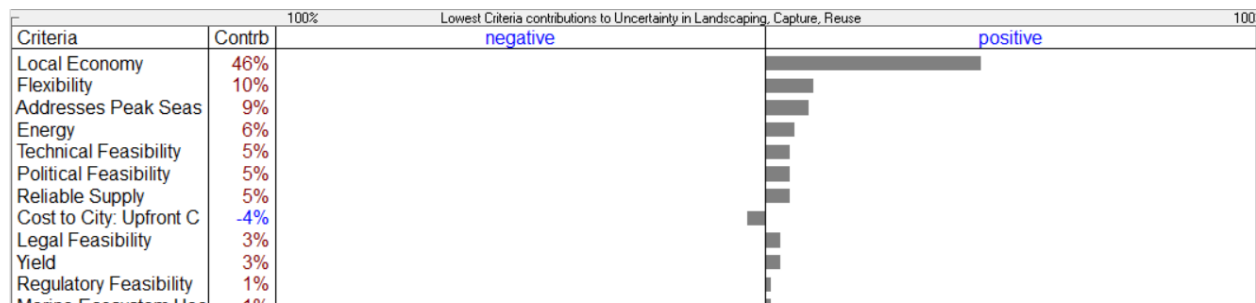


More to our purpose, the contribution to the uncertainty in the decision scores for each alternative are:

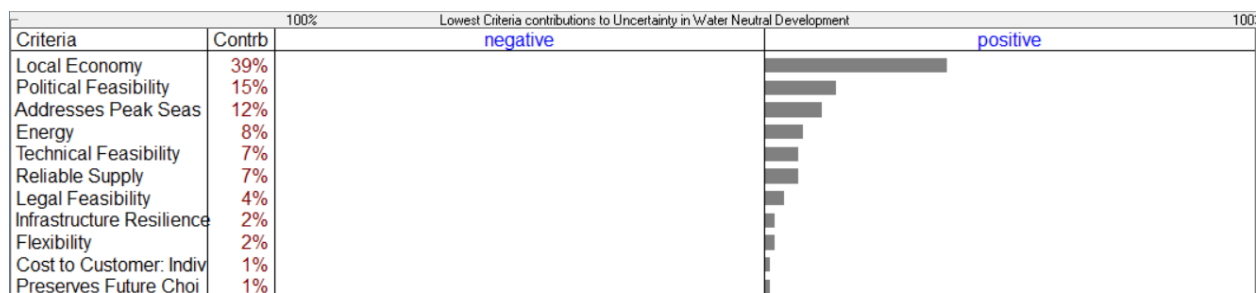
#### WaterSmart



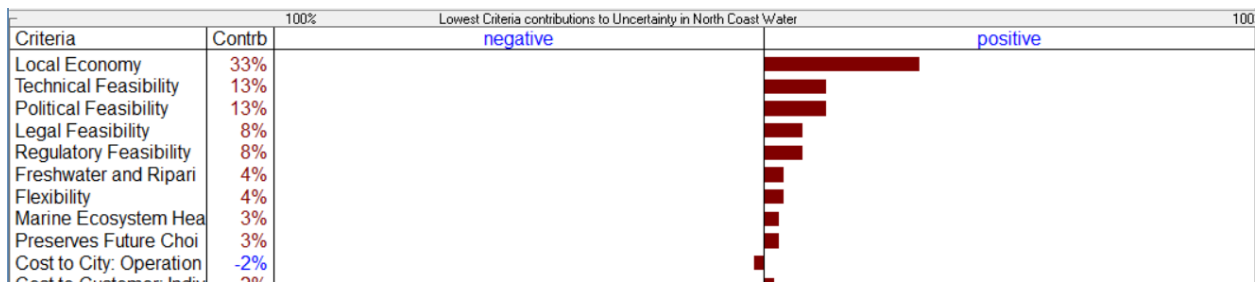
#### Landscaping, Capture, Reuse



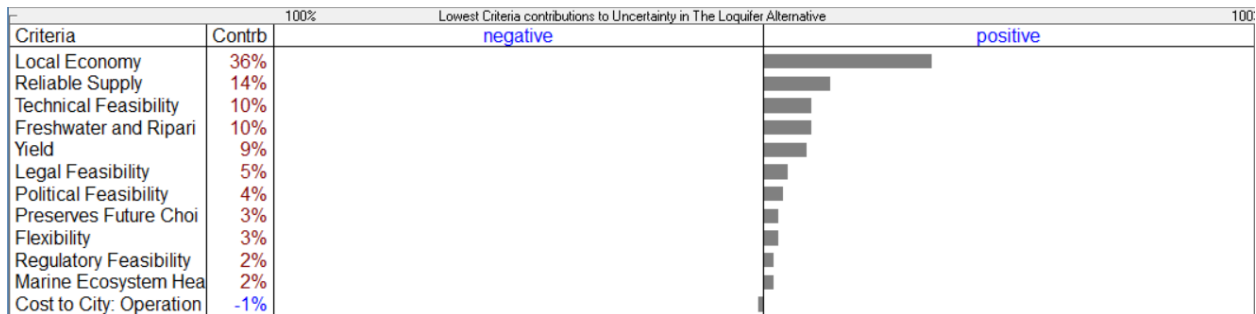
#### Water Neutral Development



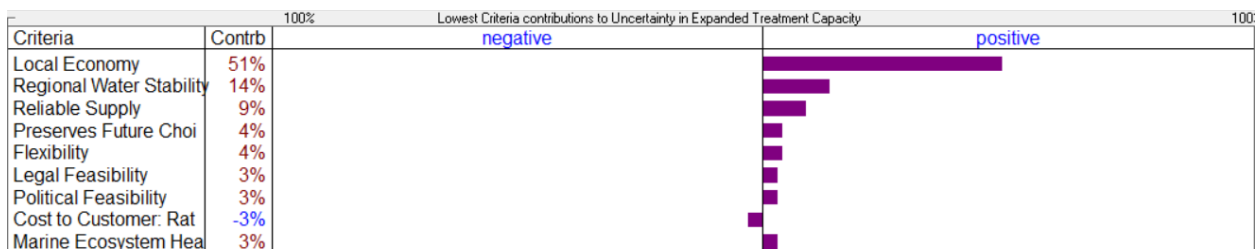
#### North Coast Water



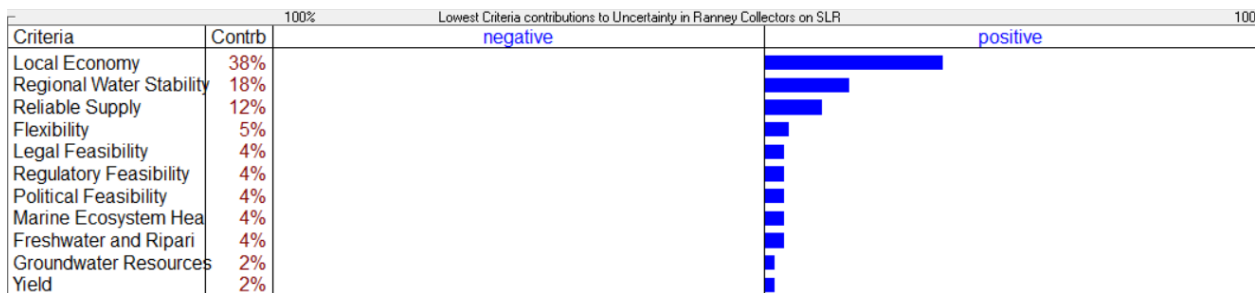
## The Loquifer Alternative



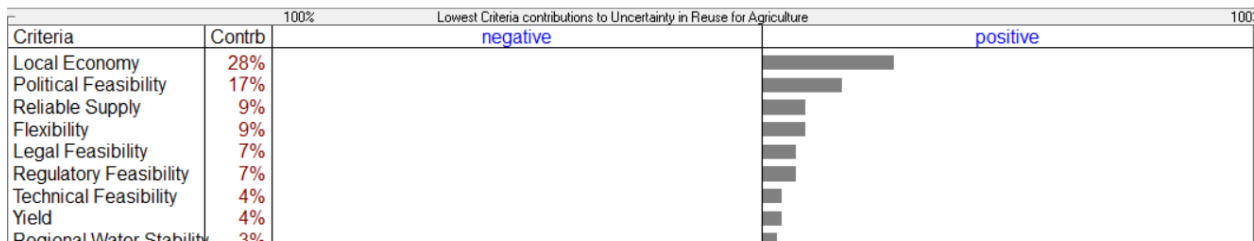
## Expanded Treatment Capacity



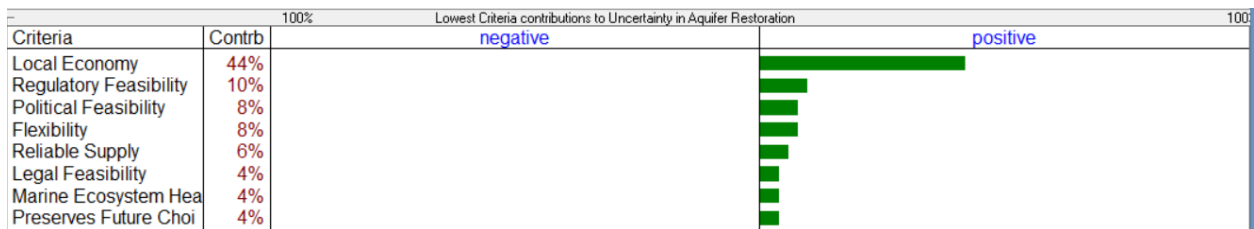
## Ranney Collectors on SLR



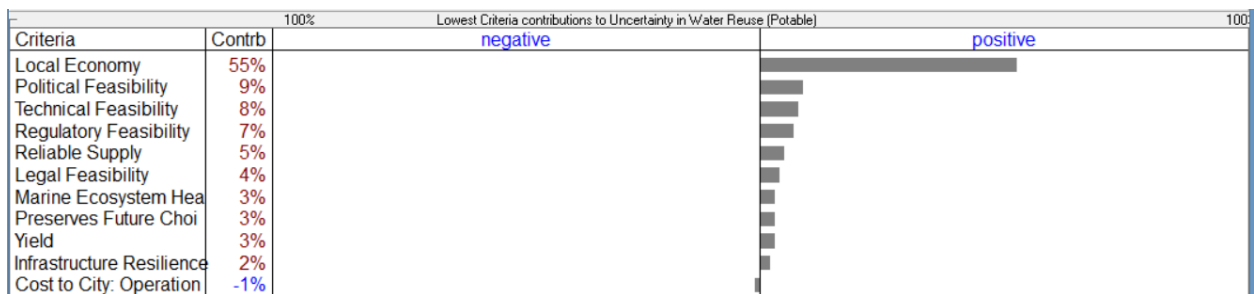
## Reuse for Agriculture



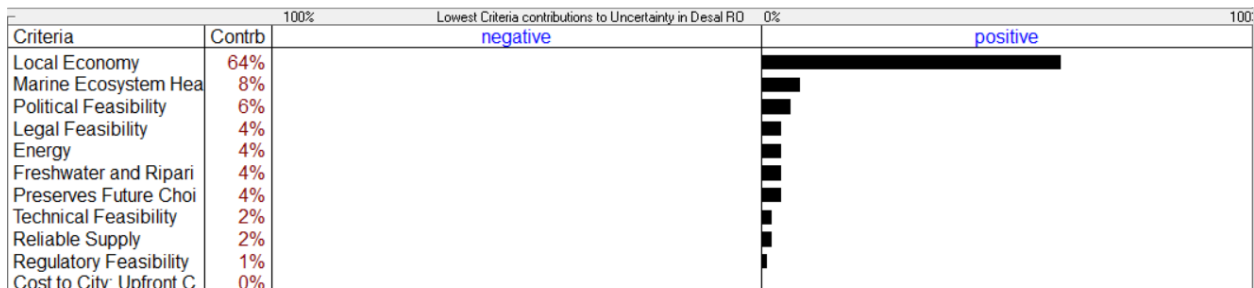
## Aquifer Restoration



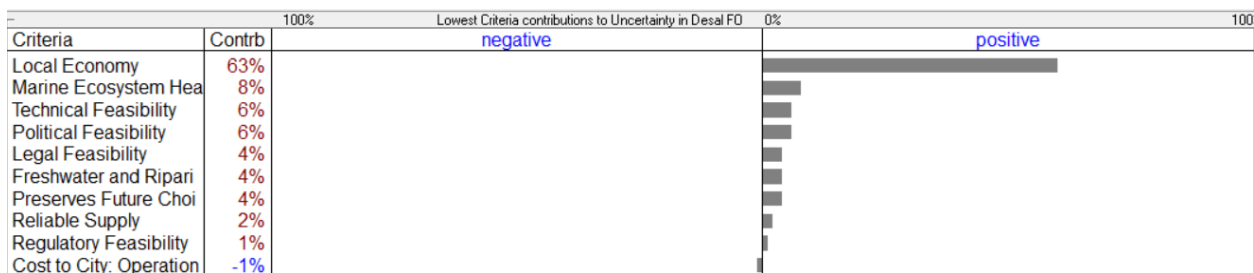
## Water Reuse (Potable)



## Desal RO



## Desal FO



## Preliminary Descriptions for Demand Management Alternatives Selected for Recon Evaluation and MCDS Exercise

This summary presents descriptions and a preliminary evaluation of three Recon Level alternatives based on input from Maddaus Water Management and Rosenblum Environmental Engineering.

- ▶ **WaterSmart Software.** WaterSmart software is a tool to help start engaging customers' interest in active conservation programs. The software organizes water use information to help engage customers, and allows customer-specific responses by staff. WaterSmart software analyzes billing data to disaggregate indoor and outdoor usage, lot size, home characteristics, location, the impact of weather and seasons, and any efficiency measures installed as part of a conservation program. Comparisons are made with other similar customers but no physical measures or incentives are delivered.

The WaterSmart software needs to interface with billing data, and this could require a very large effort outside the scope of any contract with WaterSmart. The effectiveness of customer communications increases with the timeliness of the information conveyed, which could require upgrades to both billing software and hardware (especially if the website is to deliver monthly values shortly after meter readings).

Providing tailored recommendations to customers, including rapid detection of leaks, could require installation of advanced meters. Although the cost of the advanced meters themselves has gone down in recent years, installation costs and data acquisition and management software make up most of the implementation cost.

Another expense of effective deployment will be hiring and training staff to answer customer queries, to initiate communications with customers using unusually high volumes, and to modify the website in response to needs and demands.

WaterSmart software - and similar offerings by others - should be seen as one tool to help start engaging customers' interest in active conservation programs. It could become the basis for gradually building effective conservation program performance monitoring, but currently - like all "big data" efforts - it only compares individual customers to the overall population. Software to analyze and validate overall trends and evaluate the value of possible technical and behavioral changes could be developed as monitoring results accumulate.

Maddaus has provided some preliminary cost and water savings information on WaterSmart. Their analysis is below.

*Cost Basis:* Utility costs of \$6.20/account are based on WaterSmart's software program cost of \$132,000 per year. A pilot study for 5,000 accounts for 6 months was estimated to be \$20,000 for WaterSmart software.

*Savings Basis:* Water savings are based on WaterSmart's reporting of approximately 2%-5% savings per account while taking into account the City's lower per capita use; this results in a smaller savings at about 1% per account. Because City residents are already on high alert about their water use due to drought restrictions and pricing and because



the City is planning a very robust conservation program, the marginal savings of having this measure as well is much less than it would be in a community that is just waking up to conservation and not going through a drought. The California Water Foundation presents WaterSmart Software's water savings in their online "Project Profile" series found here: <http://californiawaterfoundation.org/uploads/1363734622-CWFProjectProfile-WATERSMART.pdf>

- **Water Neutral Development.** The water neutral development proposal envisions that developers of new buildings offset water demands by (a) implementing the most water-efficient measures in new construction and (b) funding conservation in existing buildings and facilities so that in total, water demand will not increase. Since the water supply system is already stretched beyond sustainable yields, and salt water intrusion already needs to be halted, a net reduction in demand is likely needed - not only stabilization.

This measure would most likely apply to projects over a certain size, such as housing projects of 5 or more dwellings or nonresidential developments of more than 50,000 square feet. Projects below the minimum size standards would only save water through the existing applicable – plumbing and landscape codes - that would make new development approximately 20% more efficient than existing homes. Determining overall savings would require additional research into current city development sizes, the minimum size standards set, the technology/requirements required, etc.

A quantitative analysis is needed to define a cost-effective implementation path:

- The depth of conservation needed for a significant impact on water supply and salt-water intrusion.
- Feasible demand reduction in new construction and in existing facilities, and the balance between them required to attain significant impacts on supply and salt-water intrusion.
- Evaluation of wastewater benefits, including on-site reclamation.
- Life cycle cost analysis of demand-reduction scenarios beyond code, including all water and wastewater costs and benefits. Financing options, such as low-interest/long-term loans with "on bill" repayment, should also be considered.

Other considerations include:

- The impact fee would need to be set to be equitable, but high enough to generate needed water savings without making new housing much more expensive. In the example from Alamo Creek the utility (East Bay Municipal Utility District) set the initial conservation fee at \$6,000 per home. This amount was less than one percent of the typical price of new homes in this project. It was also low compared to water and sewer connection fees. The fee for Santa Cruz could be determined with some effort on modeling the measures with and without additional money for higher incentives generating more participants.

- The size of the threshold for this measure to be triggered would need to be set after reviewing typical current project sizes and the cost of the city to administer this measure.

- **On-site Rainwater Harvesting and Gray Water Use at the Residential Level.** This option pursues reuse of gray water to irrigate landscape and storage and use of rainwater for domestic, non-potable use. This could involve using large rain catchment systems or rain barrels.

In Australia, where bans on the use of potable water for irrigation were in effect for many years, rainwater tanks are popular. In addition, most home-owners collect sink and shower water in containers and irrigate manually. Rain tanks make up a large majority of rebate applications for water conservation programs, but even with the rebates, payback periods are very long (14-60 years), indicating that cost-effectiveness is not the prime motivation.

Maddaus Water Management provided the following evaluation of costs and water savings for this alternative.

#### **Support Residential Rain Barrels**

This measure will provide incentives for the installation of rain barrels. This could involve rebates or bulk purchase and giveaways of barrels plus workshops on proper installation and use of captured rain water for landscape irrigation.

*Cost Basis:* The City will pay for 50% funded through rate payers. The customer performs the installation. If the rain barrel the City provides were available locally, the City would probably stop selling them and offer a rebate instead due to storage and delivery challenges. The City may also add a rebate anyway so people have more choice in models and sizes. Currently the City sells subsidized rain barrels to customers. This measure also includes an education and promotion element.

*Savings Basis:* Water savings assumes 4 effective rain barrel fills per year for 20 years. A rain barrel has a 20 year useful life. The savings from this measure is due in part to 1.5% savings from actual water savings from barrel and 3.5% from behavioral change.

Residential Rain Barrel Fixture Costs			
	Utility	Customer	Fix/Acct
SF	\$30.00	\$30.00	1

Residential Rain Barrel Savings Per Replacement	
	% Savings per Account
SF Irrigation	5.0%

#### **Large Rain Catchment System**

This measure provides incentives for the installation of large rainwater catchment systems up to 2,500 gallons. This could involve rebates, grants and other cost share methods. This measure might require the

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simultaneous installation of water efficient landscaping to assure that amount of water collected is capable of lasting into the peak irrigation season.

*Cost Basis:* City pays 30%. This measure is modeled after the City of Santa Rosa's program.

*Savings Basis:* Water savings assume 3 effective fills per year for 20 years.

Large Rain Catchment System Fixture Costs			
	Utility	Customer	Fix/Acct
SF	\$500.00	\$1,500.00	1

Rain Catchment Savings Per Replacement	
	% Savings per Account
SF Irrigation	5.0%

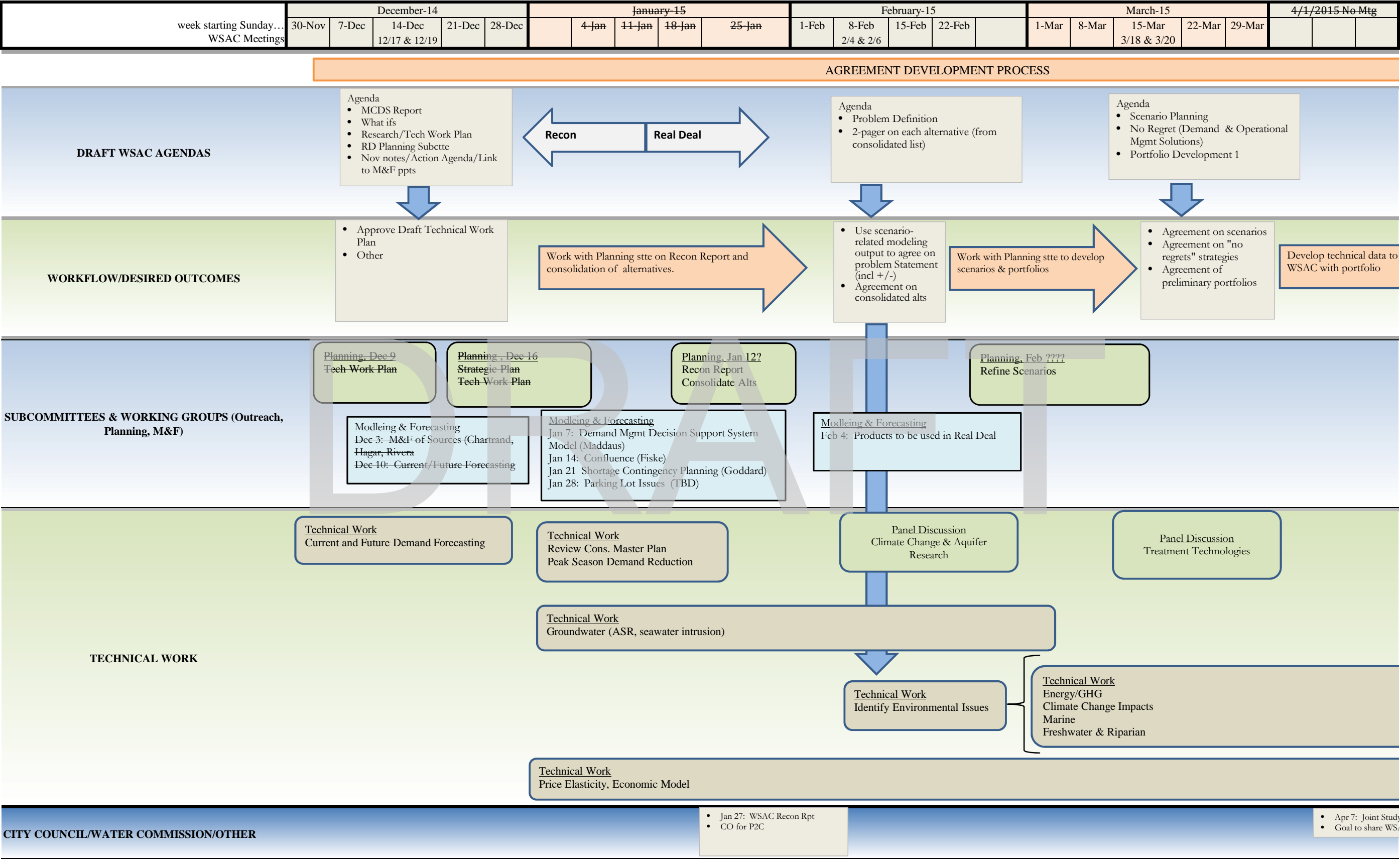
### Gray Water Retrofit

In this measure the City will provide a workshop to support a Gray water Challenge similar to the 2013 event that was modeled after the Sonoma County program. This measure will offer a rebate to assist single family homeowners in covering a certain percentage of the cost to install a gray water system. Package from local hardware stores have the primary components of this retrofit that would be supported by City's rebate.

*Cost Basis:* The grey water retrofit system costs approximately \$450 and the City will pay approximately 30%. The customer pays for installation.

*Savings Basis:* Water savings assumes a single fixture type system will be used to replace a portion of garden watering on new or existing homes. In the summer, a washing machine use of approximately 25 gpd would cover about 25% of summer use (2x annual average). This measure is based on the continuation of the City's 2013 Gray Water Challenge.

Gray Water Retrofit Fixture Costs			
	Utility	Customer	Fix/Acct
SF	\$150.00	\$300.00	1



May-15					June-15					July-15					August-15					September-15				
26-Apr 4/30 & 5/1	3-May	10-May	17-May	24-May	31-May	7-Jun 6/11 & 6/12	14-Jun	21-Jun	28-Jun	28-Jun	5-Jul	12-Jul	19-Jul 7/23 & 7/24	26-Jul	2-Aug	9-Aug 8/13 & 8/14	16-Aug	23-Aug	30-Aug	30-Aug	6-Sep 9/10 & 9/11	13-Sep	20-Sep	27-Sep