Discussion Paper

California Water Commission Regulations on New Water Storage: A Fair and Equitable Review Process?

How Can Applicants Maximize Their Demonstrated Public Benefits?

By Robert Shibatani

Preamble

California voters passed Proposition 1, the Water Bond (Assembly Bill 1471), on November 4, 2014. The measure enacts the *Water Quality, Supply, and Infrastructure Improvement Act of 2014*. Proposition 1 (Prop. 1) dedicated $2.7 billion for investment in derived public benefits related to the development of new water storage projects in California.

Since its passing, the California Water Commission (Commission) has been investigating how best to identify, evaluate, and quantify, the public benefits to be derived from these pending new water storage projects. Significant work has been undertaken and notable progress has been made. Final guidance will be provided through new regulations under the pending California Code of Regulations, Title 23, Waters, Division 7, California Water Commission. Chapter 1. Water Storage Investment Program.

Commission staff have been diligent in reviewing comments, working with their own experts, agency staff, public trust agency staff, as well as external experts, in promoting an open, transparent, and fully documented regulation development process. To this, the Commission is to be commended. The issues, however, are complex, not so much in their technical scope, but rather in how the Commission ultimately sets up the inter-comparative framework for evaluation and the environmental baselines that will serve as the boundary conditions to ensure equitability in public benefit verification. How the Commission is ultimately judged to have effectively met this key provision of Prop. 1, will largely be based on how its Regulations fully capture the requirements necessary to support a fair, equitable, and technically sound screening and evaluation process.

Last month, the Commission provided notice that it is accepting *concept papers* from applicants, agencies, and the public related to new water storage projects under their Water Storage Investment Program (WSIP). Intended to summarize potential water storage projects and their public benefits, these concept papers will provide helpful insight to both the Commission and potential project proponents. The opportunity to inspect the range of projects being considered, their geographic distribution, the types of allowable public benefits being proposed, various analytical methodologies, among other key attributes, are to be provided. The concept papers will be made public, so project proponents will be able to identify

potential regional partners or possible conflicts with other projects. Project proponents will also be able to identify potential eligibility issues early and assess the likely competitiveness of their projects. At this stage of the process, the concept papers will also allow Commission staff to assess the number and scope of potential projects that may apply for WSIP funding to determine how to best assist applicants through the application process. More importantly, it will allow for the identification of any critical issues requiring immediate attention. It is anticipated that Commission staff will also be able to refine and adjust the application review timeline for the WSIP based on progress status information provided in the concept papers.

Scope of Discussion Paper

This paper is intended to illustrate how, as currently depicted, the draft Regulations (and related Guidelines) will be able to support the analyses required by project proponents. Specifically, this paper focuses on key provisions in the current draft Regulations (dated January 11, 2016), in particular, Article 3, Quantification and Management of Benefits. In this paper, focused references are made to Section 6004. Quantification of Benefits. Here is where the suggested methodologies to be used by project proponents are laid out. Specifically, the paper focuses on Section 1 – Define the Without-Project Future Conditions; Section 3 – Calculating Physical Changes; and Section 8 – Sources of Uncertainty.

While the ensuing discussion might be viewed as a *critique* (and will inevitably be viewed as such by some), it is not intended to represent overt criticism. Rather, it is intended to show how various elements of the draft Regulations (as currently written) may, or may not, support the ultimate aims of either the applicants or the Commission. From the Commission's perspective, it is important to know what gaps exist, how those gaps may compromise their duties to fairly evaluate and compare identified public benefits between projects, what steps can be taken to eliminate any such gaps, and whether any decisions they make on setting future hydrological/operational baselines can be defended against potential future challenges.

From the applicant's perspective, many of these same shortcomings become important, but for different reasons. Do the draft Regulations compel analyses contrary to their obligations under CEQA or any of the other regulatory permitting requirements? Do the draft Regulations force additional analyses to these requirements? Will they have to re-do analyses based on timing/schedule differences between their own permitting work and the finalization of the Regulations? Do the gaps in the draft Regulations provide an opportunity to leverage one's own public benefit claims (and ultimate ranking against others) by choosing an analytical process (e.g., baseline assumptions, sensitivity bias, location-specific climate analysis, etc.) that is undefined under the draft Regulations? Or, do they hedge their bets on the 'best available science' provision, disregard the draft Regulation requirements, and proceed with their own technical elements?

This paper carefully examines the specific wording of the draft Regulations, compares it to contemporary hydrologic and analytic reality and considers its implications to known operational constraints within CVP/SWP and reservoir/riverine hydrology. It examines whether (and how) applicants can devise their own defensible assessment platforms that maximize public benefit claims through the use of *select* hydrology. Most importantly, however, it reflects upon how the draft Regulations, as currently written, can, or cannot, support the obligation for effective and efficient screening, evaluation, and ultimate ranking of the new water storage projects based on their public benefit claims.

What Are the Current Issues?

The pertinent issues to both the Commission and project applicants are both several and obvious. Key among these is the need for uniform, consistent, and reasonable environmental baseline(s), that all project applicants must use. As project proponents begin to prepare their various technical, economic, and environmental analyses, critical questions arise (as they always do) regarding the framework of those evaluations. This is no small, insignificant matter, since it is analytical framework that will determine the hydrological changes brought about by each proposed project and, therefore, the basis upon which the claimed public benefits are derived. Looked at another way; it is the analytical frameworks (between projects) that will determine how much money each project proponent may ultimately be awarded. As currently written, the draft Regulations do not provide the required level of detail to ensure consistent baselines across projects.

> *Without requiring and setting forth a consistent analytical framework, the Commission will have no accurate means of fairly comparing the claimed public benefits between projects.*

There are of course legal issues associated with this shortcoming, many which could surface, if at all, after the ranking and selection process is completed. If asked to demonstrate the current process as providing the necessary details to foster a uniform, consistent, and unbiased analytical framework, the Commission would be hard pressed to do so today. Too many key details are left unaddressed, providing applicants the discretion to choose, among many options, the various elements of their technical analysis. And while such discretion may be beneficial to the applicants, so as to generate the largest demonstration of public benefits, it makes comparing the true benefits between projects virtually impossible.

The key issues, therefore, are those of consistency (or lack thereof), in how comparisons between projects are being regulated under the Prop. 1 process. The challenges facing the Commission in meeting its obligations to assess and compare projects given the likelihood of varying analytical frameworks are notable and require attention. The issues also include the ability, likelihood, and manner with which applicants may select their own analytical platforms; and the project-specific advantages of those selections, relative to other competitors.

Why is Hydrologic Consistency Important?

Hydrological analysis in California water resources is complex, especially when having to address the inter-connected waterbodies and waterways of the Delta watershed and their coordinated 'system operations'. For new water storage projects, properly setting out each of the many physical, operational, legal, and institutional assumptions is important in that it establishes the appropriate hydrologic baseline (see **Comparative Framework: Why Baselines are Important**). The details of each of these assumptions and their sheer number imply that if project proponents are free to develop their own hydrologic baselines, the assumptions between them will likely differ.

Because the system is *integrated*, having one or two key assumptions that differ can change the hydrology at any point across the system. We must always remember what *operationally drives* much of CVP/SWP

system hydrology; the need to maintain Delta water quality, compliance with operative Biological Opinions, relevant instream flow provisions, and regional institutional agreements. All of which are made possible by maintaining yield potential across the many terminal reservoirs that establish CVP/SWP carryover. And that annual yield potential, in part, is a result of how operators manage the reservoirs during the flood season; how flexibly or conservatively they manage storage, relative to mandated rule curves for empty space.

Where any of these assumptions differ between projects, the ripple effect of those differences will be translated across the entire system. And the effect of such differences will change depending on WY type. The whole objective in ensuring consistency across hydrologic modeling and analytical platforms is to safeguard against the "creation" of claimed public benefits between projects that are unrealistic, based on fabricated (albeit, unintentional) overlapping. Inconsistent hydrologic baselines would promote the likelihood of those overlaps occurring.

Fortunately, the Commission, has already preliminary identified the various physical common assumptions that define operational and regulatory hydrology conditions. These were set out in their July 30, 2015, "*Working Paper for Proposed WSIP Common Assumptions and Recommendations – Physical Changes*". These assumptions are similar to the 'Common Assumptions' framework used in the ongoing CVP-OCAP deliberations, where the need to solidify the wide range of assumptions involved in simulating California hydrology were developed.

What are the key elements that must then be made consistent across all hydrologic modeling efforts undertaken by project applicants? There are several, the more notable of which include;

- Demand projections
- Infrastructure
- Reservoir operations
- Planning horizon year
- Climate-sensitized input hydrology
- Changing institutional agreements
- Projected regulatory requirements (existing and new)

At present, the draft Regulations do not either directly (or indirectly, through possible technical appendices) provide specificity on these key elements. For the Commission, establishing a singular and fixed set of requisite operational, regulatory, and infrastructural assumptions that will *reasonably* define a future condition that all stakeholders can support is essential. A precise working baseline for all analyses is critical to ensuring that all projects are generating their public benefit claims from the same starting point.

Avoidance of Duplicative Analysis

For individual project applications, each new storage option requires its own environmental approval analyses and documentation. The need to identify and quantify the project's public benefits under Prop. 1 is replicated by the need to maintain consistency with environmental approval regulations. After all,

without the latter, there is no project (regardless of what the claimed public benefits might be). Every effort should be made, therefore, to minimize the level, frequency, and time necessary to complete the required, climatic, hydrologic, environmental, and economic analyses. And ideally, there should only be one undertaking. There is no utility in doing things twice.

Unfortunately, regulatory timelines are not always (if ever) amicable to one's own project schedule. And without such synchronization, there exists the very real risk of having to do parts of, or the entire technical analyses over again. More troubling, if the requirements under the draft Regulations differ from those set forth by typical environment review processes, the risk of repetition again arises. For example, the analytical frameworks for CEQA, NEPA, and the federal ESA all differ. If a singular environmental document is to be relied upon, it will important that the analytical framework cover the requirements of each or all of these regulatory requisites.

For those projects that have already initiated their environmental reviews and, in lieu of ratified Regulations (or Guidelines), a risk exists that what is being prepared now may not ultimately fully meet the requirements of the Prop 1. Regulations.

Alternatively, a project proponent may choose to await the finalization of the draft Regulations. But, in doing so, they would concede any timing advantages they may currently hold. In any open and knowingly competitive process, it is often (though not always) tactically advantageous to be *out in front*. Moreover, knowing the long and onerous nature of typical environmental review processes (even for those avoiding legal challenge), there is lot to be said about starting early. Certainly for those projects involving new dams on any main stem river within the Delta watershed or their notable tributaries, final EIR certification, EIS ROD, or an ESA No Jeopardy determination will likely take at least 3-5-years. And this does <u>not</u> include any of the other regulatory approval processes that are typical of new water storage projects that would involve, for example, a new water right (e.g., SWRCB Hearing), Corps mandated flood encroachment curve for new dams (e.g., under the Flood Control Act), CWA 404 permit, etc.

Clearly, timing is an issue. But more importantly, is the need to integrate and synchronize one's own obligations under Prop. 1 with the time consuming and technically independent needs of the many regulatory approvals required for any new water storage project.

Comparative Framework: Why Baselines are Important

As noted earlier, since the ultimate ranking between projects will be based on a comparison of the claimed public benefits between projects, having a single, uniform baseline condition is vital. All hydrologic, institutional, regulatory, infrastructural, and environmental conditions must be clearly set out. The easiest way to do this would be for the Commission to provide all of the necessary templates, common assumption frameworks, and listing of accepted model(s). It could be a written description accompanied by computer files that contain all potential modeling assumptions.

The Commission's comparative process is facilitated by the differential between what they identify as the Without-Project Future Condition and the With-Project Future Condition. These are the two baselines that determine the comparative framework. The incremental difference between the two baselines,

which can be easily established arithmetically, for any one among a large range of hydrologic parameters, is what will determine a public benefit.

The Without-Project Future Condition, synonymous with a *Future No-Action* (using the NEPA vernacular) should be identical for all projects. At present, however, there is no assurance that this prerequisite, namely, the consistency of the Without-Project Future Condition between projects, is being required. Again, this would be a lot easier, if the Commission simply provided that baseline to all applicants. By doing so, they would essentially be saying, "*Here is what we, the State of California, believe to be the future hydrologic condition in 2030; all of you applicants, incorporate your own proposed project into this future baseline and then tell us what those benefits would be*."

In any comparative analysis, it is absolutely essential that a common, consistent, and uniform baseline be used. In other words, everyone has to '*start at the same place*'. Where those baselines differ between projects, it becomes virtually irresolvable to distinguish differences between alternative projects. Individual project effects (or benefits, as is the case here), become impossible to *fairly* assess between competing proponents. And that is the critical point; a loss of fairness.

Turning to the particulars of the draft Regulations. A broad statement in the draft Regulations reads as follows:

> "*Calculating Physical Changes. The applicant shall quantify the physical changes between the with-project future conditions and without-project future conditions that would be created or caused provided by the proposed project. The calculation of potential physical benefits (i.e., positive or beneficial physical changes) should consider any negative physical changes or impacts on physical public benefits, including any non-mitigable (SIC) impacts*." (§6004 (a)(3))

On face value, there appears nothing wrong with this statement. But the draft Regulations immediately continue by requesting that applicants shall:

> *"Use sequential hydrologic datasets (including precipitation, inflows, storage, flows, water diversions, water consumption), drawn from the available <u>historical</u> records sufficient to account for the range of meteorologic and hydrologic variability, including <u>driest</u> and <u>wettest</u> years, and extended droughts."* (§6004 (a)(3)(A)(1)) [Emphasis added]

This is a recurring shortcoming of many water initiatives. It is inherently improper to continue reliance on *historic* data to define a *future* condition. Especially when such future conditions are widely acknowledged to be changing and, this is the important point, available future projected data exists to address the future condition directly. It compels one to ask the simple question, *"Why would one rely on a <u>historic</u> dataset, when attempting to determine <u>future</u> conditions?"* It would be one thing if the objective of the exercise was simply to characterize historic conditions. In such a case, use of historical data would be appropriate. But that is not what is being sought here.

Project applicants are being asked to demonstrate the physical changes to the environment resulting from the implementation of their projects in the *future*. Any analysis must, therefore, be *forward-looking*.

Accordingly, the question arises, *"Why would one deliberately choose to use a historic dataset that offers no rationalized benefit when available future datasets exist?"* The answers to these questions, to a large extent, would depend on whether the agency accepts that there has been a shift or continuing shift in hydrometeorology over the past century. In other words, does the agency believe in *climate change*?

The second observation from this draft Regulation language is the statement that the hydrologic record for analysis capture the "…*driest and wettest years, and extended droughts.*" Again, the question arises, are these existing WY classifications or, are they future climate-sensitized WY classifications? The draft Regulations do not say. And there is a significant difference between the two. If the former, are the draft Regulations suggesting that applicants continue to use the existing river indices (e.g., Sacramento River Index, originally the SV 40-30-30 and SJ 60-20-20 indices) well into the future? As most know, these indices are based on a historical characterization of temporally weighted runoff. In other words, they account for the traditional snowmelt runoff peak which, under a continually shifting climatic regime has, and continues to become less pronounced. Are we to still weight the April-July runoff higher than the November-March runoff? And do so, continually, to 2030 and beyond? To properly address WY type classifications in the future context, their derivations must better reflect what we know to be occurring.

Project applicants would be well advised to selectively choose an appropriate future climate-sensitized modeling ensemble as the input data source to conduct all of their hydrologic simulation modeling. This includes adjusted metrics that may be used to characterize any part of ensuing analyses (e.g., WY type classifications). If challenged, there is a far better chance to successfully defend these choices, given their widespread acceptance as *best available science*, the wealth of support in published research across the globe, and the State's own extensive archive of climate-related hydrologic analyses. Further discussion is provided under **Climate Change**, later in this paper.

As part of the proposed analytical process, the draft Regulations go on to request that applicants:

> *"Use a geographic scope, spatial resolution, and time-step that are sufficient to accurately quantify the physical benefits claimed."* (§6004 (a)(3)(A)(2)) [Emphases added]

These are important variables. Again, the consistency issue arises. The two notable variables are spatial resolution and time-step. For example, consider two applicants that attempt to demonstrate the public benefits of their projects on the same river. One applicant does a broader scale analysis and describes the river benefits (e.g., flow enhancement) downstream of its new proposed dam. The other applicant, applying a higher spatial resolution, describes at various key river locations, a variety of differing flow benefits (e.g., backwater pond restoration, side channel flow augmentation, etc.). How would these two benefit portfolios be compared and which of the two would rank higher?

On the issue of time-step and using the same example, if one applicant adopts an annual assessment while another uses a monthly time-step, similar comparative challenges arise. What if the applicant undertaking a year-to-year assessment, presents annual benefits that show a positive yearly ecosystem benefit for flow, but for critical times of say, the returning adult spawning period, there are actual negative effects for attraction flow-related water temperatures? Would such a perceived benefit (at the annual scale) become nullified? Another applicant, adopting a monthly, or even weekly hydrologic modeling time-step, may show many temporally discrete benefits.

As a consolation, the draft Regulations do provide the opportunity for applicants to set aside the requirements in this section and proceed with another approach.

> *"If the applicant determines that an alternative approach is appropriate, the applicant shall provide justification for the alternative approach."* (§6004 (a)(3)(A)(3))

But what the draft Regulations do not identify is how such requests for a variance would be handled. Since most applicants already have their own developed analytical processes (some, long-established), what specific 'approval' would be required from the Commission in order for an applicant to proceed with an *alternative* approach? How timely would such an approval be granted, if at all? Moreover, would pre-approval be necessary? Would the pursuit of any alternative approach, bias the review process agains*t* the applicant? Obviously, many questions remain unanswered.

Future Condition Baseline (With or Without a Proposed Project)

The future condition baseline is important in that it defines the period (i.e., the future) where the proposed project would allegedly bestow its claimed public benefits. It is set in some future year, typically corresponding to existing planning horizons to ensure consistency with approved growth, demand, and land use projections. The Commission has already identified the year 2030 as the planning horizon year. In other words, 2030 is the year for which all project applicants will target their future condition baseline, regardless of whether it is the With- or Without-Project scenario.

The draft Regulations require the use of a Without-Project Future Condition. At the outset, it states:

> *"[T]he without-project future conditions shall include the infrastructure, population, land use, water use, water operations, laws, regulations, future climate and sea level conditions, and other characteristics relevant to the project that are assumed at a particular year in the planning horizon…"* (§6004 (a)(1))

This is a good start. However, ideally, it should set out <u>precisely</u> what those various future developments would be. Local agencies could define what they know, namely, local population projections, land use, water use, and local infrastructure expectations. And the State, could define what it is anticipating. In the end, there must be a consolidated singular future baseline. But, to ask individual local agencies to 'guess' what the State is envisioning in the future is arguably improper and evades responsibility.

While leaving the characterization of a future condition baseline to the project applicants may seem efficient, it only *seems* that way. What the Commission is sacrificing is immediate term efficiency, for a long-term problem; one that may end up insurmountable as the Commission will inevitably have to disentangle the various future condition baselines provided by the applicants.

The draft Regulations continue with language regarding how the Without-Project Future Condition should be developed by stating;

"The without-project future conditions shall be developed using best available information on existing conditions and projections of reasonable and foreseeable future conditions. Reasonable and foreseeable future conditions that require actions of others or that are structural in nature must be defined sufficiently and documented in feasibility study or environmental documentation in order to be included in the without-future conditions." (§6004 (a)(1)) [Emphases added]

Let's take this requirement in three parts. In a very broad sense, these requirements are fine; they are similar to what one normally sees in a CEQA future condition cumulative effects analysis. But a perplexing requirement is included. While the first part requires the use of best available information to develop or identify the reasonable and foreseeable future conditions (and/or actions), it is the second requirement that is troubling. It takes the *reasonable and foreseeable* threshold and places a direct obligation on the applicant to justify the inclusion of such actions by asking that they provide the environmental documentation for those actions. The word "and" is notably significant.

The language states that reasonable and foreseeable actions include the "actions of others". As stated, that would include, well, *everything*; new regulations, guidelines, operational rules, institutional agreements, etc. So, extending that line of reasoning; if there is a pending (or even long-term) regulatory "action" that say, the SWRCB or Corps was intending to pass, then based on the language of this provision, the applicant would be obligated to provide a feasibility study or environmental review on that proposed future action just to include it as part of their future condition. What this amounts to is an applicant having to produce the analyses for many of these other pending projects and actions if, they feel, it is pertinent to include certain reasonable and foreseeable actions.

As most appreciate, many such actions are often wide in scope, undertaken by federal/State agencies, and take years to complete. For example, the SWRCB is amending its water quality objectives for the Delta through a revision (and amendment) to D-1641. Several phases of this effort are continuous and the current status is ongoing. By law, we know that these changes will occur and, as such, they will become part of the future condition. However, based on the draft Regulations, any future condition that assumes the inclusion of any of these water quality objectives must provide the environmental documentation as proof.

Another intriguing problem is whether to include *other* new water storage projects that are being proposed under this same Prop 1 process. We know that more than one new water storage project will be proposed and that these projects will be part of the future condition. This generates an interesting chicken and egg conundrum. How does one include a competing reasonable and foreseeable new water storage project into its future condition baseline, when that project too is undergoing the same environmental review and similarly, has no completed environmental document to offer? Surely, under a strict application of the traditional *reasonable and feasible* test, they would be justified in doing so. However, since the draft Regulations compel the inclusion of feasibility and/or environmental documentation (the latter of which no specific applicant has yet completed), it puts the applicant in a difficult position. They can knowingly omit these projects and risk criticism for skewing the future hydrology upon which their derived public benefits are based or, they can include these projects without the necessary information the draft Regulations say you should include and risk penalty from the Commission.

The bigger problem, however, lies is how these other new storage projects will affect an applicant's own public benefit claims. Each applicant must include these projects in both their With- and Without-Project Future Condition baselines, if they view these as reasonable and feasible. To not include them is risky. But to include them requires specific knowledge of how these projects will be operated, in order to incorporate them into one's own modeling baselines.

There is another practical issue regarding both the With- and Without-Project Future Conditions. Since the comparative framework is intended to *isolate* the effects (i.e., public benefits) of a proposed new water storage project, it assumes that the only difference between these two baselines are those effects or changes to the physical environment brought about by the proposed project. Conceptually, that is true. But to implement that assumption, it is necessary to fully develop the details (in this case, the operational hydrology) of these other actions, to ensure that the isolated increment of effect (or benefit) of your project is genuine. In other words, one must know the specific operational prescriptions of these other projects to demonstrate no *double-counting* and ensure that what your proposed project is claiming is really the result of <u>your</u> project and not some cumulative benefit derived from the collective actions of others. Again, the draft Regulations provide no instruction in this regard.

Clearly, this provision of the draft Regulations is an unrealistic requirement. For those documents that do not exist (or are in-preparation), the applicant may have no choice but to prepare them themselves. If they did not, and here's the unsavory point, they could not include that "action" in their future condition baseline. "*Why would an applicant incur the costs and effort of preparing environmental documentation on actions, many legislative and others institutional in nature that are completely outside of what they, under any "lead agency" responsibility, would otherwise be asked to do?*" The short and correct answer is; there is no reason. This is why the phrase *reasonable and foreseeable* was first established. It was intended to provide proponents with some guidance to rationalize their selection of those future "actions" and "changes" that would define a future condition without undue encumbrance to themselves. To not include the projects of others, each applicant will incur criticism that they are not meeting the *reasonable and feasible* standard.

Leaving aside these various shortcomings, the most significant omission of the draft Regulations is that it does not provide the future condition baseline that everyone can immediately use. These are straightforward to develop, lead agencies across California do it all the time. There need not be consensus on what the Commission would ultimately identify and present to the public. That is not the point. So long as it is a *reasonable and foreseeable* depiction of a hydrologic future condition, it would be acceptable. However, by not providing this essential analytical baseline, the Commission exposes itself to unnecessary forensic analysis when it comes time to evaluate individual projects. The Commission would better serve its own interests (and the interests of the applicants) were it to simply define a Without-Project Future Condition itself and require all applicants to use it.

Examples of Why Hydrologic Modeling Assumptions are Important

Much of what has been discussed may appear in the abstract. To best illustrate the potential implications to project applicants (as well as the Commission and associated 'responsible' agencies) on the importance of developing and ascribing to a consistent hydrologic baseline, a few specific examples may be useful.

Let's say, for example, that we have three projects, A, B, and C. Each project, through their own independent analyses, allege that for a particular downstream river reach, their own project, by its anticipated operation, will generate certain public benefits. The questions for the Commission would include, firstly, "*Which, if any, of these three projects would actually generate the benefits that they are claiming?*" And secondly, "*How much of the alleged public benefits of one project is actually an overlap, either caused by, or indirectly prompted, from another project?*"

Now, let's take that a further step. Let's assume that the proponent for project A is very knowledgeable and adept at modeling upstream watersheds and the integrated CVP/SWP; they know how to simulate project effects. As a result, they are very aware of how certain facets of the modeling platforms (e.g., assumed demands, infrastructure, physical operations, regulatory constraints, etc.) affect simulated hydrology. As one part of their modeling assumptions, they assume that future reservoir inflow hydrology will be different from that historically assumed, while projects B and C simply rely on historic data. Project A utilizes climate-sensitized upper watershed hydrology from CMIP5-derived archives and uses that new hydrology to drive all of the upper basin runoff models. That new reservoir inflow data is then used to run a system operations model, like CALSIM II. Even if none of their infrastructural, regulatory, operational, or accretion/depletion assumptions differ from projects B and C, the fact that they have a different source hydrology will change all ensuing CVP/SWP simulated results. Such a scenario will prove challenging to the Commission. If all three projects claim water temperature benefits in a particular river reach, how will the Commission know which of the three is *accurate* when the primary inputs to derive such benefits, namely, reservoir inflow, differs between the projects?

In a variant of this example, let's assume that projects B and C assume current reservoir operating rules for all existing CVP/SWP reservoirs. The proponent for project A, however, uses different rule curves for a few reservoirs; one example might be Folsom Reservoir. A changing rule curve, that alters the spill/fill constraints will, over time, change the expected end-of-season carryover, all other considerations being equal. Such changes in managed yield over the course of a WY would affect hydrology in not only the immediate downstream river reach, but also the entire CVP/SWP due its linkage to coordinated system operations. Project applicants offered the discretion to choose between any number of possible future rule curves (e.g., for Folsom, 400-600 TAF; 400-670 TAF; 400 TAF; or some other more relaxed forms) would change the ability to meet end-of-season carryover targets. Without defining what applicants should use, the Commission leaves the prospect of opposing applicants showing differing levels of storage a very real possibility.

In another example, let's say these same three projects each choose a different minimum flow standard for certain rivers. One applicant chooses the legally established State minimum for the river in question (e.g., D-X); another chooses a flexible minimum based on a local/regional water agreement (e.g., Water Forum Agreement); still another, uses a new 'fish friendly' minimum established under a pending instream flow petition (e.g., LAR Flow Management Standard); and yet another, uses the minimums established under recent (or old) ESA RPA terms and conditions. Differing minimums, as coded into system models like CALSIM, compel "releases" from the upstream dams that change seasonal and annual water balances for each river system. This can have significant effects on the magnitude, frequency, and timing of any claimed public benefits associated with those waterbodies. Again, without defining what applicants should use, the Commission leaves the prospect of opposing applicants routing system hydrology through different operational constraints.

As most people appreciate, Delta water quality standards represent a significant control on how CVP/SWP operations are coordinated and managed. The complex and often overlapping ways in which D-1641 is woven into how various Biological Opinions and system operational guidance (e.g., OCAP) are applied is well known. But as most also know, these water quality objectives are under review by the SWRCB in its multi-phased program to amend D-1641. Many of these objectives have significant histories; with the details regarding season of operation, WY type application, magnitudes, in-Delta locations, etc. These components of D-1641 are highly complex. Each can meaningfully affect water management in the Delta at any given time. Differences in future assumptions of these components, between projects, therefore, would lead to significantly changed hydrologic responses and, inevitably, inaccuracies between public benefit claims.

Turning to groundwater, another example might be in how differing projects assume future ground/surface water interactions. In surface water system modeling like CALSIM II, there are standard assumptions used to account for such interactions. But the representation of groundwater in such models is not refined; there are many areas where ground/surface water interactions can (and should) be significantly improved. With the increased interest in groundwater management in California, it is not unreasonable to expect important advances in this area as more water managers attempt to gain a better understanding of this resource.

Would all project applicants assume similar processes such as infiltration/percolation, recharge, pumping, and the use of consistent time-steps within each of the various depletion study area (DSA) boundaries? Are all stream-aquifer interactions assumed identical across all projects? Or, does one project take a more liberal stance on return flows? What if one project, an actual groundwater storage project, proposes to store quantities of water that alters the local hydraulic gradients and, therefore, potential return flow fluxes to the Sacramento Valley mainstem rivers? Would such changes be reflected in their system modeling?

The same challenges exist with water use. Accepting that M&I water use has an assumed return flow component that varies with season, what if our same three project applicants (e.g., A, B, and C) each use a different return flow assumption? Return flow flux is based on total quantity diverted/pumped, use area (e.g., paved or non-paved), season of use, and a water conservation offset. What if each of the three projects assume a different water conservation rate? Recent events (even mandates) have shown the widely varying nature of water conservation commitment, so it would not be surprising to see projects each assuming a different value. Different assumptions for water conservation, all other factors being equal, could easily affect the realized return flow rate and, therefore, change resulting river hydrology. How would the Commission account for those differences?

As noted previously, since hydrologic analysis lies at the center of any quantitative comparative framework, modeling assumptions and the skill and knowledge of expert modelers becomes essential. Given the freedom to choose between assumptions, modelers can create any baseline they desire. Moreover, modeling requires significant pre- and post-processing work; the ability to adjust hydrologic response outside of modeling code is an inherent value of using experts in system modeling and operational hydrology.

In all of these previous examples, one can appreciate the elusiveness of establishing hydrologic consistency across all projects. Each applicant will seek to maximize demonstration of public benefits resulting from their own projects. Given the discretion offered them (by the lack of specificity in the draft Regulations), this will be accomplished by the use of differing baseline assumptions, differing pre- and post-processing of initial stage modeling output, and the operational parameters of their own projects. In doing so, would these project proponents be leveraging the hydrologic condition to their advantage? Well, yes, they would be. But these efforts would not be untoward or dishonest. Their representations of the future conditions, both with- and without their own projects, would simply be their own depiction of a *reasonable and foreseeable* future. And the Commission, by its lack of specificity, would have promoted these outcomes.

While there may be reluctance by the Commission to ascribe a specific environmental baseline, DWR, as well as many other State and federal agencies have the internal expertise to create such future baselines. In fact, technical teams for lead agencies do this all the time under various CEQA, NEPA, and ESA actions. It does not imbue an unacceptable level of risk; in fact, this is precisely what the *reasonable and foreseeable* provision was intended to address. The risks of not doing it actually appear at this stage to be far greater.

Until such time as the overseeing regulatory agencies provide the specific direction necessary to ensure an equitable and consistent baseline framework; I suspect that savvy project proponents will create their own baselines. In fact, they have no choice. They must, otherwise they cannot complete their hydrologic inter-comparisons. Given the number of potential applicants, there stands the very real likelihood that many different baselines will ultimately come before the Commission. At that point, the onus will shift to the Commission.

Climate Change

The draft Regulations address climate change in two sections. First, as part of the Without-Project Future Conditions discussion, it states,

> *"[T]he without-project future conditions shall represent the "median level of change in future climate and sea level conditions" for California at mid-century (characterized by climate conditions during the 30 years surrounding 2050). The "median level of change in future climate and sea level conditions are represented by a combination of changes in temperature and sea level for the period of (2036-2065) that differs from the historical period average (1961-1990) by the following amounts:*
>
> 1. *No change in average statewide precipitation;*
> 2. *Average statewide temperature of 4.9 degrees Fahrenheit warmer; and*
> 3. *Sea level rise of 30 centimeters…"* (§6004 (a)(1)(C))

There are obvious flaws and shortcomings in this guidance. The most obvious is the reference to statewide averages. Average future statewide precipitation is largely irrelevant. Why? Because the fundamental objective of the Commission's responsibility to evaluate projects involves the delineation of effects *between* projects. Since each project has a specific geographic location, their response(s) to

climate change will vary, in some cases, significantly. Using a Statewide average masks a key objective of this inter-project comparative process under Prop 1.

The ability to capture and store new runoff from the inherent precipitation patterns incident upon the State lies at the core of the water supply development mandate of Prop 1. And it is the spatiality, or distribution of that precipitation, that makes some areas better than others, in terms of their ability to generate new water storage opportunities. In fact, it is the hydrologic basis by which some projects will be able to demonstrate greater public benefits than others. By simply requiring the assumption of 'no change in average statewide precipitation' be applied, the draft Regulations will result in two undesirable results, 1) ignoring the spatial variability of precipitation, hence, runoff, and water storage potential, across California, and 2) losing the ability to compare the critical water storage potentials between projects. This defeats the climate change benefit offered many applicants.

In the Sources of Uncertainty section (Section 8) of the draft Regulations, the use of sensitivity analyses is promoted:

> *"The applicant shall conduct sensitivity analyses to describe how the expected physical changes and public benefits that would be provided by the proposed project might change due to potential uncertainties not included in the without-project future conditions and the with-project future conditions described in Section 6004(a)(1)-(2)."* (§6004 (a)(8)) [Emphasis added]

This introductory statement to the sensitivity analysis requirement is circular when comparing it to the previous discussion in §6004 (a)(1)(C)). Here, in this section, climate change is included with other "potential uncertainties" that supposedly address those not yet included in the with- and without-project future conditions. The climate change threshold, however, was specifically and already mandated earlier in §6004 (a)(1)(C)).

In this section, the Commission requests that applicants bracket the analysis between two anticipated future extreme boundary conditions. For the drier end of the bracket, the draft Regulations state:

> *"[Q]uantitative analysis that incudes changes in precipitation, temperature, and sea level that represent the 'high degree of change toward challenging future climate and sea level conditions' for California at mid-century. The 'highly challenging future climate and sea level conditions' are represented by a combination of changes in precipitation, temperature, and sea level for the period [2036-2065], that differs from the historical period average [1961-1990] by the following amounts….(i) Average statewide precipitation of 11 percent drier…."* (§6004 (a)(8)(A)(1)(a) [Emphasis added]

Again, for an individual applicant trying to demonstrate the uniqueness of their geographic, hydroclimatic, and inherent basin characteristics under an anticipated changing climatic regime; this particular requirement is odd. Why (and if proven, how) would there be any value in these Statewide averages? A possible answer lies in the next provision which notes a watershed level focus.

> *"Potential changes should represent climate changes at the watershed level that are regionally consistent in magnitude with projections of statewide changes in precipitation, temperature, and*

sea level for the period (2070-2099), that differs from the historical period average (1961-1990) by the following amounts:

(i) Average statewide precipitation of up to 15 percent wetter and up to 6 percent drier;

(ii) Average statewide temperature of at least 5.3 and up to 8.8 degrees Fahrenheit warmer; and

(iii) Sea level of at least 60 and up to 105 centimeters." (§6004 (a)(8)(A)(1)(b) [Emphasis added]

It appears that the draft Regulations seek to establish upper limits (i.e., drier or wetter on a Statewide level) to constrain the sensitivity boundaries, but acknowledge the importance of a watershed, or basin-level effort to address changes in key hydroclimatic variables. The wording, however, is confusing. Let's examine the wording more closely. Such watershed level analyses should be "*…regionally consistent in magnitude with projections of statewide changes in precipitation…".* What precisely does this mean? How can regional consistency (with a Statewide average) be demonstrated, unless one undertakes a cumulative regional analysis across the State? More importantly, why would regional consistency even matter? Regional or local hydrology is what it is; it is the foundation upon which Statewide averages are based, not the other way around.

As most realize, California's future precipitation, like most snow-dominated areas of the world, will experience a continuing change in precipitation *form*. This climatic change alters the *timing* of runoff, and has less to do with overall *magnitude*. For virtually all watersheds in the southern Cascades and Sierra Nevada, that is, those relying on snowmelt, focusing on differentials in direct annual precipitation magnitude (and not the shift in form) is misguided. For those that focus instead on a change in precipitation form; therein lie the opportunities to demonstrate new yield capture and, hence, public benefits never before realized. This is the essence of climate change in California runoff hydrology.

The draft Regulations then proceed to lay out the level of analysis required. It states:

"*Discussion and supporting <u>quantitative or qualitative</u> analysis to disclose how potential changes in precipitation, temperature, and sea level in the region(s) that supply water to the project and receive water from the project <u>might reduce the public benefits claimed</u> and how, if reduced, operations of the proposed project could be adapted to sustain public benefits." (§6004 (a)(8)(A)(1)(b)* [Emphasis added]

Accomplishing this objective would be possible if the comparative analysis were between today's existing condition and a future condition. But that is not what the draft Regulations require. Remember, all that the draft Regulations identify are the With- and Without-Project Future Condition baselines. It is <u>impossible</u> to determine changes in climatic variables (e.g., precipitation, temperature, and sea level) when one is comparing two baselines at the <u>same</u> point in time.

Here, the phrase, "*…might reduce the public benefits claimed…*" is particularly telling. If, as suggested, one is being asked to state how climatic change might affect one's project, then it is inherent that a temporal comparison is be used. In other words, the only way this can be accomplished is if there is a "with- and with-out" <u>climate change</u> scenario. And the only way to do that is if one compares an

existing condition (without climate change) and a future condition (with climate change). But again, that is not what the draft Regulations require. They require a With- and Without-Project Future Condition comparison where both scenarios, by definition, would have to have climate change incorporated.

The draft Regulations go on to state:

> *"Future projects and water management actions:*
>
> a. *Qualitative analysis using future projects and water management actions included in the applicant's CEQA cumulative impact analysis that could affect the public benefits claimed."* (§6004 (a)(8)(A)(2)(a) [Emphasis added]

These two provisions, placed later in the draft Regulations, appear progressively counter to previous language that require a quantified analysis. To wit,

> *"The applicant shall quantify the physical changes between the with-project future conditions and without-project future conditions that would be created or caused provided by the proposed project…."* (§6004 (a)(3)) [Emphasis added]
>
> *"The applicant shall define the without-project future conditions for surface water and groundwater operations and physical, chemical, biological, economic, and other resource conditions as needed to quantify the potential benefits and costs of the proposed project..."* (§6004 (a)(1)) [Emphasis added]

The applicant's CEQA cumulative analysis would include the same "*future projects and water management actions"* as both the With- and Without-Project Future Condition scenarios. Since, as discussed previously, many (if not most) would include projects and actions having influence on waterbodies and waterways, each would be already incorporated into the hydrologic modeling. It is unclear why there is the suggestion here to now move away from quantification and provide a qualitative analysis of these same *future projects and water management actions.*

Conclusion

In conclusion, the draft Regulations are the product of a concerted effort by the Commission in addressing some very complex issues. The draft Regulations, given the nature of the responsibilities of the Commission under Prop. 1, creates a very different process than what would otherwise be necessary under more typical initiatives. This inherited complexity results from the inter-comparative or screening objective that these draft Regulations are meant to support. In order to meet that responsibility, the Commission must firmly establish and present a fully articulated future condition baseline; one that leaves no ambiguity, no opportunity for bias. And it must do so forthrightly in order to reaffirm its commitment to all participating parties that its ultimate evaluation, screening, and ranking process will unfold in a fair and equitable manner and that there are no embedded deficiencies. This paper was intended to highlight some of those current deficiencies.

But there is good news. Many of these exposed issues can be effectively addressed. Each of the various prerequisite solutions are clearly within the Commission's control and have been known for some time. As noted in past correspondence to the Commission, the critical nature of selecting appropriate environmental baselines, the incorporation of a singular climate-sensitized future hydrological dataset, and the identification of assumed operational protocols, demands, infrastructure, and regulatory frameworks have been previously identified as key issues facing the Prop. 1 screening and selection process (see October 22, 2012, letter to then Chairman Saracino; November 11, 2014 letter to Chairman Byrne).

All that needs to be done now is for the Commission to make those choices, assure itself that what they develop is an appropriate representation of a *reasonable and foreseeable* future hydrologic condition (which it would be), and then release it to an awaiting public.

About the Author:

Robert Shibatani is an international expert witness on reservoir-operations, climate change hydrology, flood damage reduction, and new water supply development. He has been following the Water Commission draft Regulations and Guidelines development process since 2011 and moderated the initial Water Commission Public Workshops on the CalFED water storage options and high elevation storage. He is the Managing Partner & Principal Hydrologist of The SHIBATANI GROUP International and is the Founder and Chair of the international consortium, "*Implementable Dam and Reservoir Development*" (IMDAM) with corporate partners in the UK, Germany, New Zealand, Australia, Canada, and across the U.S. He is based in Sacramento, California.