San Joaquin River Dissolved Oxygen TMDL
Screening Criteria for Non-Aeration Feasibility Studies

August 30, 2004

I. Background and Process:

The California Bay-Delta Authority (CBDA), working with the California Department of Water Resources (DWR) and the Central Valley Regional Water Quality Control Board (Board), is pursuing construction and operation of an aeration facility for the San Joaquin River Deep Water Ship Channel (DWSC) near Stockton. While it is extremely important to improve DO concentrations in the DWSC through aeration, it is also important to consider non-aeration solutions. In other words, while aeration will improve DO concentrations at times when oxygen demand would be highest, reducing the oxygen demand might also yield improvements to DO concentrations.

To provide a starting point for assessing actions that might lead to improvements, a list of possible actions and geographical areas that could impact dissolved oxygen (D.O.) conditions in the DWSC was compiled. A set of basic screening criteria was then developed in an effort to provide some insight into which actions or geographic areas were most significant for solving the low DO impairment. , Members of the Technical Working Group (TWG) who have been study sources and causes of oxygen demand in the DWSC were asked to rate the importance of the list of actions using the criteria.
From January through June, the Screening Criteria Matrix process went through a number of iterations and changes. The first draft criteria matrix was rated by nine TWG experts and then reviewed by the TWG at its May 20 meeting. Based on the review, a new version was developed and organized into Possible Actions by General Categories, by Waste Water Treatment Plants, by Geographical Areas (subwatersheds) and by DWSC Channel Geometry options. Changes were also made to clarify the criteria and directions. The revised Screening Criteria Matrix was then circulated to reviewers (for a copy of the on -line rating form, see http://www.sjrdotmdl.org/criteria/exampleWorksheet.htm). To review the cumulated results and the individual ratings, see http://www.sjrdotmdl.org/criteria/results.htm. While reviewers were requested to provide ratings for as many of the categories and criteria as they wished, none of the nine reviewers rated all the categories. Reviewers were also asked to provide notes to clarify ratings whenever they felt it was appropriate. Below is a description of the actions and criteria, and an analysis of the results.

II. Possible Actions

The Possible Actions were organized into macro areas; General (Loads and Flows), Loads by Water Treatment Plant, Loads by Geographic Area, and Changes in DWSC Geometry. The original list of possible actions was compiled from the from the TWG members and suggestions that were raised over the past five years of study and stakeholder involvement. All ideas identified were included in the list. The specific tasks and programs that would be needed to advance a Possible Action or decrease loads in a watershed were not identified. It was up to the reviewers to imagine what could be done in each of these categories as they attempted to rate the Action against the criteria.

This matrix does not attempt to evaluate specific actions and methods that would be needed to affect load, flow or geometry related benefits or to further study their feasibility. Proposals for specific demonstration projects or feasibility studies will be evaluated through the grant application processes.

III. Criteria

Potential Net Impact of Possible Actions

Reviewers were asked to think about how the Possible Actions positively or negatively affected loading of algae and other labile organic carbon material, loading of ammonia and labile organic nitrogen, Ship Channel depth and residence time (flow).

Some actions might produce benefits in one of these categories and improve D.O. conditions while perhaps negatively impacting D.O. in another. For example, reduction in Ag diversions might improve flow (reducing residence time) while reducing the amount of algal load removed from the river (and increasing the algal load that arrived at the DWSC). After considering how the Possible Action affected these factors, the reviewer was asked to rate the Possible Net Impact on a 1-5 scale with "1" meaning it had no impact and "5" indicating that it was a major factor in low D.O. conditions.

Knowledge of the Potential Net Impacts

Next, the reviewers were asked if the Possible Action was implemented, what did they think was the general level of *Knowledge of the Potential Net Impacts* on dissolved oxygen conditions in the DWSC. The purpose of this criterion was to help identify areas where data gaps and lack of knowledge has high or low. A Possible Action that was rated high in potential net benefit but low in knowledge should help applicants and reviewers in funding processes.

Potential to Advance the Possible Action

This criterion provided reviewers with the opportunity to rate how "technically feasible" they thought it would be to implement the possible action category. Possible Actions that rated high in Potential Net Impact but low in potential to implement should warn grant applicants that they will need to address this problem if they want to increase their chances of gaining funding for their proposal.

Verifiable

The last criteria allowed reviewers to rate how *Verifiable* implementing the Possible Action would be, first at the location in which the action took place and second, in terms of D.O. improvements in the DWSC itself. If the benefits of a Possible Action could not be well verified, an applicant for funding in this area would need to address this issue. How could investment in this Possible Action be justified if it couldn't be verified as to its effectiveness either locally or in terms of improved D.O. conditions in the DWSC?

IV. Summary of Results

A. Potential Net Impact

Directions to reviewers: *This criterion ascertains how advancing the Possible Action would have a net impact on D.O. conditions in the DWSC. Reviewer should consider their individual comments on the three preceding factors and weigh their rating in consideration with the other Possible Actions and how they might be rated. The rating is 5 for high and 1 for low. No comments should go into this field*

Ratings on the potential benefits of individual possible actions varied widely. Some had ratings from individual reviewers in the full range of 1-5. Clearly reviewers were thinking about the possible actions quite differently if they could vary so widely in estimating the potential benefit of implementing the action. It is not safe to assume that one or two reviewers with a high rating are wrong. It could be that the reviewers who gave the lower ratings are mistaken. To help compensate for this, the summary below includes a list of those Possible Actions that had at least one reviewer rate it a 4 or 5 in potential importance.

Ten of the possible actions had at least one reviewer rate it as a 5 in potential net impact. One of those actually had an average rating less than 3.0. A little more than half (14 of the 27) of the possible actions received an average rating of 3.0 or higher in potential importance. Twenty of the possible actions had at least one reviewer rate them a 4.0 or better in potential net impact.

1. Possible Actions (including Waste Water Treatment Plants) with Potential Net Impact averaging 4.0 or better.

1. Reduce loading from the City of Stockton's WWTP – 4.9
   All nine responded. This rated highest of any possible action or geographic area.
2. Reduce algal production in mainstem SJR upstream of DWSC – 4.0
2. Reduce export pumping rates – 4.0

2. Possible Actions with Potential Net Impact with at least one reviewer rating it a 5.

The above plus –
Reduce algal production in tributaries* (average rating 2.8)
Reduce nutrient loading from confined animal operations
Reduce drainages from wetlands and wildlife refuges.
Reduce agricultural diversions
Operate Head of Old River Barrier for O2
Reduce export pumping rates
Release Eastside Tributaries Fall pulse flows
Release water from Friant Dam
* The only one of these that did not have an average rating of at least 3.0.

3. Possible Actions with Potential Net Impact averaging between 3 and 3.99.

Reduce loading from the City of Modesto WWTP – 3.75
Reduce loading from City of Manteca/Lathrup WWTP – 3.67
Low head pumping at the Head of Old River – 3.67
Operate Head of Old River Barrier for O2 – 3.6
Reduce sediment loading – 3.57
Reduce nutrient loading from confined animal operations – 3.4
Reduce drainage from wetlands and wildlife refuges 3.4
Release Eastside Tributaries Fall Pulse Flows – 3.4
Close Delta Tidal Barriers (permanent and operable) – 3.33
Reduce agricultural diversions 3.25
Release water from Friant Dam – 3.0
Recirculate water at Mendota Pool – 3.0 **

Recirculate water at Newman Wasteway – 3.0 **
Reduce algal production in the DWSC – 3.0

4. Possible Actions with Potential Net Impact of at least one rating 4 or better.

The above plus –
Reduce agricultural return flows (drainage) – 2.83
Decrease suspended S.O.D. in DWSC – 2.67 **
Decrease embedded S.O.D. in DWSC – 2.67 **
Increase sediment loading – 2.43
Reduce agricultural stormwater runoff – 2.43
Increase grazing pressure – 2.375

** Less than three reviewers rated this Possible Action.

5. Reduction in Loading from Specific Geographic Areas

In ranking by average rating (3.0 or higher)

Stockton Sloughs including the Turning - 3.67
Merced River – 3.5
Stanislaus River – 3.5
Tuolumne River – 3.2
Mud and Salt Slough – 3.0
French Camp Slough – 3.0

Geographic areas with at least one reviewer rating it 5.0

Stockton Sloughs
Calaveras River – average 4.0 (only two reviewers)
Tuolumne River

6. **DWSC Geometry Changes**

Note: Only two reviewers rated the first two and a third rated the last one.

Extend Burns Cut to Turner Cut and fully isolate upstream DWSC – 4.5
Run river through Burns Cut and isolate upper 2 miles of DWSC – 4.5
Allow DWSC to fill in over time - 3.67

B. Knowledge of Potential Net Impact

***Directions to Reviewers**: This criterion allows reviewers to rate how much knowledge they think is available on the potential net impact of implementing the possible action. A rating of 1 means that almost nothing is known. A rating of 5 would indicate that there is little to no need to gather additional information. This criterion will help identify the data gaps. A high potential net impact with a low knowledge rating should provide applicants and grant reviewers with information on where important data gaps exist.*

This criterion was designed to help identify actions that the reviewers thought might be valuable to implement but for which they thought knowledge was lacking.

In general the reviewers rated their understanding of the scientific knowledge of the Potential Net Impact of the possible actions at a lower score than they rated the potential itself. There were some exceptions to this. For example, the potential benefits of shading streams and

reducing light penetration to reduce algal growth rated less than 2.0 in importance while the knowledge of this rated an average 2.4.

There was only one Possible Action that rated 3.0 or higher in Potential Net Impact where the knowledge of the net impact rated lower than 3.0 (reduce loading from the Tuolumne River).

The following Possible Actions received an average rating in Knowledge of Potential Net Impacts of 4.0 or greater.

Reduce Stockton WWTP loading - 4.56
Reduce export pumping rates – 4.5
Reduce embedded S.O. D. in the DWSC – 4.33 *
Operate the Head of Old River Barrier – 4.25
Low head pumping at the Head of Old River Barrier – 4.0
Reduce Manteca/Lathrop WWTP loading – 4.0
Allow the DWSC to fill in over time – 4.0

C. Potential to Technically Advance Action

Directions to Reviewers: *Based on technical considerations only, not political, regulatory or other, can the action(s) in the category be implemented? Rate high if it would use relatively common and proven technology. Rate low if it would be an extreme technical challenge to implement.*

Those Possible Actions with a technical potential to be implemented of 4.0 or greater are listed below.

Reduce Stockton WWTP loading - 4.67
Reduce Manteca/Lathrop WWTP loading – 4.3
Reduce point and non-point nutrient loading from Confined Animal Operations– 4.2
Operate the Head of Old River Barrier – 4.0
Low head pumping at the Head of Old River – 4.0
Reduce export pumping rates – 4.0
Extend Burns Cut around Terminal Island 4.0
Extend Burns Cut to Turner Cut – 4.0

The lowest score for waste water treatment plants in terms of technical potential was 3.75 for the City of Modesto.

The other high scores for Possible Actions in Technical Potential were"

Close Tidal Barriers – 3.67
Tributary Fall Pulse Flows – 3.6

Almost every watershed was rated 3.0 or greater in terms of the being able to technically reduce loads. In general, the smaller the watershed area, the higher the rating was for Technical Potential. The four highest rated watersheds in this category were:

Harding Drain - 3.67
Calaveras River - 3.5
Stockton Sloughs - 3.5
Mud and Salt Sloughs 3.33

In general the technical potential tracked closely the overall the Potential Net Impact. Only a few possible actions technical potential rated lower then their Potential Net Impact (e.g. Reduce Algal Production in the Mainstem River and Reduce Algal Production in the DWSC).

D. Verifiable

***Direction to Reviewers**: This criterion rates the potential to gain verifiable results if action in the category was advanced. There are two parts to this criterion - local and DWSC. The first rates if results can be verified at the local level, the place at which the action is being implemented. . The second rates how well a local action be tracked or modeled to an effect on D.O. in the DWSC. The reviewer should keep in mind the strength of the measurement or technique used to verify the affect of the action. Verification could come from the use of computer modeling, downstream monitoring, or other methods. In some cases, actual measurements could be used to "verify" the results. In other cases computer modeling will be the only way to estimate the impact of the action on D.O. conditions in the DWSC. A Rating of 5 indicates the results are highly verifiable and a rating of 1 indicates it will be very difficult to verify the results of the action. You are welcome to add comments on this in the Comments field.*

In general, the verifiable rating for what could be tracked in the DWSC was lower than the average rating given for what could be tracked in the field where the action was being implemented.

In almost all cases, the Verifiable ratings in both categories were very close to or higher than the rating given for the Potential Net Impact Rating.

The possible actions that were considered 3.0 or better in their potential to have a net impact all rated at least 3.0 in the ability to verify them locally. Only a few rated less than this in the ability to verify the results in the DWSC.

The following Possible Actions rated 4.0 or higher in being Verifiable locally:

Reduce Stockton WWTP loads – 4.89
Reduce algal loads from tributaries – 4.6
Reduce Lathrop/Manteca WWTP loads – 4.33
Operate the Head of Old River Barrier – 4.2
Low head pumping at Old River Barrier – 4.0
Reduce Stanislaus River loading – 4.0
Reduce Merced River loading – 4.0
Reduce Mud and Salt Slough loading – 4.0
Extend Burns Cut to the end of Terminal Island – 4.0
Extend Burns Cut to Turner Cut – 4.0
Fill in the DWSC over time – 4.0

V. Observations

A. Potential Net Impact

After discussing the ratings with many of the reviewers, it appears that a main reason why these actions were rated so differently was that the reviewers had different underlying hypotheses for what drove the low D.O. conditions. This then acted as a filter for their ratings. For example,

some believe that the mainstem San Joaquin River will produce and deliver the same amount of algae to the DWSC whether or not a subwatershed provides a load of algal "seed stock." Other reviewers think that ammonia and nitrification processes occurring in the DWSC are the main drivers, while others think that flow and residence time are most critical. When the Possible Action is viewed through the filter of the reviewers driving hypothesis, the Potential Net Impact can vary greatly.

Overall, the ratings do not correspond with the Algal Seed Stock hypothesis that was developed in the Strawman Analysis of 2001. There the driving hypothesis is that the further away a watershed is from the DWSC, the more negative impact its algal load creates in terms of dissolved oxygen conditions because the algal load has more time to grow and double in size than loads arriving from watersheds close to the DWSC. The ratings though indicate that a number of the reviewers do not subscribe to the Algal Seed Stock hypothesis.

It appears that some Possible Actions that were supported by more than one major hypothesis rated higher than those Possible Actions that was supported by only one hypothesis. For example, Reduce Sediment Loading scored the highest of any non-point source load reduction except for Reduce Algal Production in the Mainstem River. Reduction in sediment loading could reduce algal growth in the tributaries, in the mainstem and allow more oxygen production by phytoplankton in the DWSC.

In some cases a reviewer rated a Possible Action very differently than the other reviewers and skewed the average, because there weren't many reviewers. For example, the Potential Net Impact of reducing loads from Mud and Salt Sloughs had two reviewers rate it 4.0 and one rate it 1.0 with the average dropping to a 3.0. Such an extreme difference in ratings is probably due to an underlying difference of opinion on the hypotheses that drive algal growth and its impact on D.O. in the DWSC.

The results of the criteria ratings do not presently allow the analysis for why different Possible Actions were rated so differently without going back and providing the reviewers with an opportunity to clarify what they think are the underlying driving hypotheses.

B. Knowledge of Potential Impact

It makes sense that the highest Knowledge ratings related to flow/residence time, Waste Water Treatment Plant loads and the Geometry of the DWSC itself. These are the areas in which the research and modeling have made the most progress.

One way to estimate the need for further study is to identify those Possible Actions with the largest rating spread by reviewers and which rated high in Potential Net Impact. Some examples include:

* Reduce Algal Production in the Mainstem River rated 4.0 in Potential Net Impact with a range of Potential Knowledge of 2.5.

* Reduce Sediment Loading rated 3.57 in Potential Net Impact with a range in Potential Knowledge of 1-4. This rated high in Potential but relatively low in knowledge.

* Reduce Drainage from Wetlands and Wildlife Refuges rated 3.4 in Potential Net Impact with a Knowledge rating range of 2-5.

* Reduce Agricultural Diversions rated 3.25 in Potential yet had a Knowledge range of 1-5.

* Release Water from Friant rated 3.0 in Potential with a Knowledge rating range of 2-5.

* Reduce Loading from Stockton Sloughs rated 3.67 in Potential with a Knowledge range of 2-5.

* Reduce Algal Production in the Tributaries rate 2.8 (a lower rating than many of given to many of the individual tributaries) and had a rating range of 1-5.

On the other hand, many of the flow related Possible Actions that rated high in Potential Net Impact rated high in Potential Knowledge with a lot of agreement on the knowledge level.

C. Potential to Technically Advance Action

In general, it seems that some reviewers failed to understand or follow the directions and included political and other considerations in their ratings. For example the Head of Old River Barrier has been put in twice a year for decades, one would expect the Potential to Technically Advance this action to be 5.0 yet it rated 4.2 in potential. Reduce Export Pumping is done all the time, yet it rated only 4.0 in Potential to Technically Advance the action. Probably political reality did enter some of the reviewers rating in this category.

But overall, the ratings for the Potential to Advance the Actions appear to track well with higher ratings given for actions that are being implemented in the watershed now and with lower ratings for actions that are more theoretical in their potential to implement.

For example, a great deal is known about how to reduce loads from waste water treatment plants (average above 4.0) and confined animal operations such as dairies (4.2), and thus these actions rated much higher in Technical Potential than did non-point source reduction actions. It is not as easy to see how to implement sediment load reduction (3.15) or to realistically reduce agricultural diversions (3.0). Even releasing flows out of Friant Dam (2.83) are problematic because it isn't clear how much of the released water would reach the DWSC or in what month it would arrive there and in what quantities. Yes, flows could be released from the tributary dams, but doing so in a manner in which the flows created positive benefits for D.O. conditions in the DWSC is in doubt. Comments by reviewers on the Fall pulse flows show how concerns over the duration of the release, whether it would reach the DWSC if the Head of Old River Barrier wasn't in place, and the timing of the release all created doubts on the potential to implement the action in a manner that could benefit the low D.O. conditions.

D. Verifiable

There was some confusion on the directions because some actions such as whether the Head of Old River was being operated (4.2) or whether export pumps were pumping (4.3) should be rated a 5.0 because it absolutely could be verified if the action was implemented and a change in flow was occurring. Whether that change in flow was actually reaching the DWSC would not be as firm and thus should be rated lower. In both these cases, the local and DWSC verifiable average ratings were the same.

In general, the Verifiable criteria were rated higher than the Potential Net Impact giving hope to the possibility that one could verify whether implementing action were creating measurable benefits for D.O. Of course, for the load reduction alternatives, there was no sense of scale.

VII. Overall Conclusions

The Screening Criteria for Non-Aeration Feasibility Studies will be useful to grant applicants and reviewers because it provides a snapshot review of the relative value and other factors that should be considered when pursuing investigations in each Possible Action area. Those grant proposals for investigating actions that were rated low in Potential or in another category should have more explanation on why this low rating should not affect the proposal's consideration for funding. It can be anticipated that applicants will more likely propose dissolved oxygen related studies in action areas that are rated high because it seemingly would increase their chances of being funded.

The Screening Criteria provides an organizational structure for thinking about actions that could benefit (or harm) dissolved oxygen conditions in the DWSC. The 33 possible action categories and the 16 geographical areas should encompass all reasonable proposals. The structure does allow additions to it if new ideas and hypotheses arise.

The Criteria Matrix can become more helpful to grant applicants and reviewers if it included a conceptual model of the main and subhypotheses that are associated with each possible action and geographic area. For example, which geographic areas might have ammonia loads that affect D.O. in the DWSC versus other areas, because of their distance might have a greater impact with their algal loads? Which areas discharge large amounts of fine sediments while other areas do not?

The Matrix would also be more useful if important references of past and ongoing studies were linked to each Action and Geographic area. This would allow applicants and reviewers easy access to the most current literature associated with the main and subhypotheses of each Action.

Table X. Possible actions with Potential Net Impact averaging 4 or greater.

Ranking	No. of Responses	Possible Action
4.875	8	Reduce WWTP loading - Stockton
4	5	Reduce algal production in mainstem SJR upstream of DWSC
4	4	Operate Head of Old River for O2 benefit

Table X. Possible actions with at least one response of 5 for Potential Net Impact.

Ranking	No. of Responses	Possible Action
4.875	8	Reduce WWTP loading - Stockton
4.5	2	Reduce loading from Stockton Sloughs including the Turning Basin
4.5	2	Extend Burns Cut to Turner Cut and fully isolates upstream DWSC
4.5	2	Extend Burns Cut to the west end of Terminal Island
4	5	Reduce algal production in mainstem SJR upstream of DWSC
4	3	Reduce agricultural diversions
4	4	Operate Head of Old River for O2 benefit
4	3	Reduce export pumping rates
4	2	Reduce loading from Calaveras River watershed
3.75	4	Reduce drainage from wetlands/wildlife refuges
3.5	4	Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)
3.5	4	Release Eastside tributary Fall Pulse flows
3	4	Reduce algal production in tributaries
3	6	Release water from Friant Dam (with flows reaching DWSC)

Table X. Possible actions with score averaging between 3 and 3.99 for Potential Net

Ranking	No. of Reviewers	Possible Action
3.75	4	Reduce drainage from wetlands/wildlife refuges
3.75	4	Reduce WWTP loading - Modesto
3.6667	3	Allow the DWSC to fill in over time
3.6667	3	Low head pumping at the Head of Old River
3.6667	3	Reduce WWTP loading - Lathrop/Manteca
3.5	4	Reduce loading from Merced River watershed
3.5	4	Reduce loading from Stanislaus River watershed
3.5	4	Reduce loading from Tuolumne River watershed
3.5	4	Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)
3.5	6	Reduce sediment loading
3.5	4	Release Eastside tributary Fall Pulse flows
3.3333	3	Close Delta Tidal Barriers (permanent and operable)
3.2	5	Reduce agricultural return flows (irrigation drainage)

Table X. Possible actions with at least one response of 4 for Potential Net Impact.

Ranking	No. of Reviewers	Possible Action
2.75	4	Reduce algal production in the DWSC
2.6667	6	Reduce agricultural stormwater runoff
2.5	6	Increase sediment loading
2.3333	3	Decrease Embedded S.O.D. in DWSC
2.2857	7	Increase grazing pressure (clams, zooplankton, fish)

Table X. Reduction in loading from specific geographic areas..

Ranking	No. of Reviewers	Possible Action
4.5	2	Reduce loading from Stockton Sloughs including the Turning Basin
4	2	Reduce loading from Calaveras River watershed
4	2	Reduce loading from Mud and Salt Slough watersheds
3.5	4	Reduce loading from Stanislaus River watershed
3.5	4	Reduce loading from Tuolumne River watershed
3.5	4	Reduce loading from Merced River watershed
3	1	Reduce loading from Del Puerto Creek watershed
3	1	Reduce loading from Ingram Creek watershed
3	1	Reduce loading from Hospital Creek watershed
3	1	Reduce loading from westside to SJR from Newman to South Delta
3	4	Reduce loading from French Camp Slough watershed
3	2	Reduce loading from Los Banos Creek watershed

Table X. Deep water ship channel geometry changes.

Ranking	No. of Reviewers	Possible Action
4.5	2	Extend Burns Cut to Turner Cut and fully isolates upstream DWSC
4.5	2	Extend Burns Cut to the west end of Terminal Island
3.6667	3	Allow the DWSC to fill in over time

Table X. Actions with the ranking for knowledge less than 3.

Ranking	Action
2.75	Reduce algal production in tributaries
2.75	Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)
2.5	Extend Burns Cut to the west end of Terminal Island
2.5	Extend Burns Cut to Turner Cut and fully isolates upstream DWSC
2.5	Reduce loading from Harding Drain
2.5	Reduce loading from San Joaquin watershed upstream of Lander Avenue
2.5	Release water from Friant Dam (with flows reaching DWSC)
2.4	Increase sediment loading
2.4	Reduce agricultural stormwater runoff
2.25	Increase shading and riparian zone restoration
2.1667	Increase grazing pressure (clams, zooplankton, fish)
2	Reduce loading from Del Puerto Creek watershed
2	Reduce loading from Hospital Creek watershed
2	Reduce loading from Ingram Creek watershed
2	Reduce loading from westside to SJR from Newman to South Delta
2	Reduce urban dry season runoff
2	Reduce urban stormwater runoff
1.3333	Reduce herbicide impact on algal growth
1	Reduce loading from Kern Creek watershed

Rankins for high net impact and locally verifiable

What is the net impact on DO in the DWSC?	Could the benefit of the action be measured locally?	Action
4.875	4.875	Reduce WWTP loading - Stockton
4.5	4	Extend Burns Cut to the west end of Terminal Island
4.5	4	Extend Burns Cut to Turner Cut and fully isolates upstream DWSC
4.5	3.5	Reduce loading from Stockton Sloughs including the Turning Basin
4	4.5	Reduce loading from Mud and Salt Slough watersheds
4	4.4	Reduce algal production in mainstem SJR upstream of DWSC
4	4.3333	Reduce export pumping rates
4	4.25	Operate Head of Old River for O2 benefit

Rankings for high technical feasibility

Is action technically feasible?	Action
4.625	Reduce WWTP loading - Stockton
4.3333	Reduce WWTP loading - Lathrop/Manteca
4.25	Operate Head of Old River for O2 benefit
4.25	Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies
4	Extend Burns Cut to the west end of Terminal Island
4	Extend Burns Cut to Turner Cut and fully isolates upstream DWSC
4	Reduce export pumping rates
4	Low head pumping at the Head of Old River

Action	What is the net impact on DO in the DWSC?	Existing knowledge	Is action technical feasible?
Reduce WWTP loading - Stockton	4.875	4.5	4
Reduce WWTP loading - Lathrop/Manteca	3.6667	4	4.3
Operate Head of Old River for O2 benefit	4	4.3333	
Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairie	3.5	2.75	
Extend Burns Cut to the west end of Terminal Island	4.5	2.5	
Extend Burns Cut to Turner Cut and fully isolates upstream DWSC	4.5	2.5	
Reduce export pumping rates	4	4.5	
Low head pumping at the Head of Old River	3.6667	4	
Reduce WWTP loading - Modesto	3.75	3	
Reduce agricultural diversions	4	3.6667	3.6
Close Delta Tidal Barriers (permanent and operable)	3.3333	3.5	3.6
Reduce loading from Stockton Sloughs including the Turning Basin	4.5	3.5	
Reduce loading from Mud and Salt Slough watersheds	4	4	
Reduce loading from Calaveras River watershed	4	3.5	
Allow the DWSC to fill in over time	3.6667	4	3.3
Reduce drainage from wetlands/wildlife refuges	3.75	3.6667	
Release Eastside tributary Fall Pulse flows	3.5	3.6667	
Reduce algal production in mainstem SJR upstream of DWSC	4	3.2	
Reduce loading from Merced River watershed	3.5	3	
Reduce loading from Stanislaus River watershed	3.5	3	
Reduce loading from Tuolumne River watershed	3.5	3	
Reduce loading from Los Banos Creek watershed	3	3.5	
Reduce loading from French Camp Slough watershed	3	3.25	
Recirculate at Mendota Pool	3	3	
Recirculate at Newman Wasteway	3	3	
Reduce loading from Del Puerto Creek watershed	3	2	
Reduce loading from Hospital Creek watershed	3	2	
Reduce loading from Ingram Creek watershed	3	2	
Reduce loading from San Joaquin watershed upstream of Lander Avenue	2.6667	2.5	
Reduce loading from Orestimba Creek watershed	2.5	3	
Reduce loading from Harding Drain	2.5	2.5	
Reduce sediment loading	3.5	3.2	2.8

Release water from Friant Dam (with flows reaching DWSC)	3	2.5	2.8
Reduce agricultural stormwater runoff	2.6667	2.4	2.8
Reduce algal production in tributaries	3	2.75	3
Increase agricultural water use efficiency	2	3	2.6
Reduce herbicide impact on algal growth	1.6667	1.3333	2.6
Decrease Suspended S.O.D. in DWSC	3	3.25	
Reduce algal production in the DWSC	2.75	3.75	
Increase Sacramento River flows through the Delta Cross Channel/TDF	2.5	3	
Reduce urban stormwater runoff	2.5	2	
Reduce agricultural return flows (irrigation drainage)	3.2	3	
Increase shading and riparian zone restoration	1.8	2.25	
Decrease Embedded S.O.D. in DWSC	2.3333	4	2.3
Reduce loading from westside to SJR from Newman to South Delta	3	2	
Increase sediment loading	2.5	2.4	
Reduce urban dry season runoff	2.3333	2	
Reduce loading from Kern Creek watershed	2	1	
Increase grazing pressure (clams, zooplankton, fish)	2.2857	2.1667	1.6

minimum response 5 for results

indicates formula

	No Reviewers	Potent score
Reduce WWTP loading - Stockton	8	
Reduce algal production in mainstem SJR upstream of DWSC	5	
Operate Head of Old River for O2 benefit	4	
Reduce algal production in tributaries	4	
Reduce algal production in the DWSC	4	
Reduce herbicide impact on algal growth	3	
Increase grazing pressure (clams, zooplankton, fish)	7	
Reduce sediment loading	6	
Increase sediment loading	6	
Increase shading and riparian zone restoration	5	
Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)	4	
Reduce agricultural stormwater runoff	6	
Increase agricultural water use efficiency	4	
Reduce drainage from wetlands/wildlife refuges	4	
Reduce urban dry season runoff	3	
Reduce urban stormwater runoff	4	
Reduce agricultural return flows (irrigation drainage)	5	
Reduce agricultural diversions	3	
Close Delta Tidal Barriers (permanent and operable)	3	
Low head pumping at the Head of Old River	3	
Reduce export pumping rates	3	
Release Eastside tributary Fall Pulse flows	4	
Release water from Friant Dam (with flows reaching DWSC)	6	
Recirculate at Mendota Pool	2	
Recirculate at Newman Wasteway	2	
Increase Sacramento River flows through the Delta Cross Channel/TDF	2	
Decrease Suspended S.O.D. in DWSC	5	
Decrease Embedded S.O.D. in DWSC	3	
Reduce WWTP loading - Lathrop/Manteca	3	
Reduce WWTP loading - Modesto	4	
Reduce loading from Stockton Sloughs including the Turning Basin	2	
Reduce loading from Calaveras River watershed	2	
Reduce loading from French Camp Slough watershed	4	
Reduce loading from Stanislaus River watershed	4	

Reduce loading from Harding Drain	2
Reduce loading from Tuolumne River watershed	4
Reduce loading from Merced River watershed	4
Reduce loading from San Joaquin watershed upstream of Lander Avenue	3
Reduce loading from Mud and Salt Slough watersheds	2
Reduce loading from Los Banos Creek watershed	2
Reduce loading from Orestimba Creek watershed	2
Reduce loading from Del Puerto Creek watershed	1
Reduce loading from Kern Creek watershed	1
Reduce loading from Ingram Creek watershed	1
Reduce loading from Hospital Creek watershed	1
Reduce loading from westside to SJR from Newman to South Delta	1
Extend Burns Cut to Turner Cut and fully isolates upstream DWSC	2
Extend Burns Cut to the west end of Terminal Island	2
Allow the DWSC to fill in over time	3

minimum response for results 5

indicates formula

Action	No Reviewers	score	1 re
Reduce WWTP loading - Stockton	8	4.875	
Reduce loading from Stockton Sloughs including the Turning Basin	2	4.5	
Extend Burns Cut to Turner Cut and fully isolates upstream DWSC	2	4.5	
Extend Burns Cut to the west end of Terminal Island	2	4.5	
Reduce algal production in mainstem SJR upstream of DWSC	5	4	
Reduce agricultural diversions	3	4	
Operate Head of Old River for O2 benefit	4	4	
Reduce export pumping rates	3	4	
Reduce loading from Calaveras River watershed	2	4	
Reduce drainage from wetlands/wildlife refuges	4	3.75	
Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)	4	3.5	
Release Eastside tributary Fall Pulse flows	4	3.5	
Reduce algal production in tributaries	4	3	
Release water from Friant Dam (with flows reaching DWSC)	6	3	
Reduce loading from Mud and Salt Slough watersheds	2	4	
Reduce WWTP loading - Modesto	4	3.75	
Low head pumping at the Head of Old River	3	3.6667	
Reduce WWTP loading - Lathrop/Manteca	3	3.6667	
Allow the DWSC to fill in over time	3	3.6667	
Reduce sediment loading	6	3.5	
Reduce loading from Stanislaus River watershed	4	3.5	
Reduce loading from Tuolumne River watershed	4	3.5	
Reduce loading from Merced River watershed	4	3.5	
Close Delta Tidal Barriers (permanent and operable)	3	3.3333	
Reduce agricultural return flows (irrigation drainage)	5	3.2	
Recirculate at Mendota Pool	2	3	
Recirculate at Newman Wasteway	2	3	
Decrease Suspended S.O.D. in DWSC	5	3	
Reduce loading from French Camp Slough watershed	4	3	
Reduce loading from Los Banos Creek watershed	2	3	
Reduce loading from Del Puerto Creek watershed	1	3	
Reduce loading from Ingram Creek watershed	1	3	
Reduce loading from Hospital Creek watershed	1	3	
Reduce loading from westside to SJR from Newman to South Delta	1	3	
Reduce algal production in the DWSC	4	2.75	
Reduce agricultural stormwater runoff	6	2.6667	

Reduce loading from San Joaquin watershed upstream of Lander Avenue	3	2.6667
Increase sediment loading	6	2.5
Reduce urban stormwater runoff	4	2.5
Increase Sacramento River flows through the Delta Cross Channel/TDF	2	2.5
Reduce loading from Harding Drain	2	2.5
Reduce loading from Orestimba Creek watershed	2	2.5
Reduce urban dry season runoff	3	2.3333
Decrease Embedded S.O.D. in DWSC	3	2.3333
Increase grazing pressure (clams, zooplankton, fish)	7	2.2857
Increase agricultural water use efficiency	4	2
Reduce loading from Kern Creek watershed	1	2
Increase shading and riparian zone restoration	5	1.8
Reduce herbicide impact on algal growth	3	1.6667

		min score	max score 3.99
			3
Action	No Reviewers	score	
Reduce draina	4		3.75
Reduce WWTI	4		3.75
Allow the DW	3		3.6667
Low head pur	3		3.6667
Reduce WWTI	3		3.6667
Reduce loadir	4		3.5
Reduce loadir	4		3.5
Reduce loadir	4		3.5
Reduce point	4		3.5
Reduce sedim	6		3.5
Release Easts	4		3.5
Close Delta T	3		3.3333
Reduce agricu	5		3.2
Decrease Sus	5		3
Recirculate at	2		3
Recirculate at	2		3
Reduce algal	4		3
Reduce loadir	1		3
Reduce loadir	4		3
Reduce loadir	1		3
Reduce loadir	1		3
Reduce loadir	2		3
Reduce loadir	1		3
Release wate	6		3
Decrease Eml	3		0
Extend Burns	2		0
Extend Burns	2		0
Increase agri	4		0
Increase graz	7		0
Increase Sacr	2		0
Increase sedi	6		0
Increase shad	5		0
Operate Head	4		0
Reduce agricu	3		0
Reduce agricu	6		0
Reduce algal	5		0
Reduce algal	4		0
Reduce expor	3		0
Reduce herbi	3		0
Reduce loadir	2		0
Reduce loadir	2		0
Reduce loadir	1		0
Reduce loadir	2		0
Reduce loadir	2		0
Reduce loadir	3		0

Action	No Reviewers	score	1 resp with max pot >4
Reduce loadir	2	4	4
Reduce WWTI	4	3.75	3.75
Reduce WWTI	3	3.6667	3.6667
Low head pur	3	3.6667	3.6667
Allow the DW	3	3.6667	3.6667
Reduce sedim	6	3.5	3.5
Reduce loadir	4	3.5	3.5
Reduce loadir	4	3.5	3.5
Reduce loadir	4	3.5	3.5
Close Delta Ti	3	3.3333	3.3333
Reduce agricu	5	3.2	3.2
Reduce loadir	2	3	3
Reduce loadir	4	3	3
Decrease Sus	5	3	3
Reduce algal	4	2.75	2.75
Reduce agricu	6	2.6667	2.6667
Increase sedi	6	2.5	2.5
Decrease Eml	3	2.3333	2.3333
Increase graz	7	2.2857	2.2857
Release wate	6	3	0
Release Easts	4	3.5	0
Reduce WWTI	8	4.875	0
Reduce urban	4	2.5	0
Reduce urban	3	2.3333	0
Reduce point	4	3.5	0
Reduce loadir	1	3	0
Reduce loadir	2	4.5	0
Reduce loadir	3	2.6667	0
Reduce loadir	2	2.5	0
Reduce loadir	1	2	0
Reduce loadir	1	3	0
Reduce loadir	1	3	0
Reduce loadir	2	2.5	0
Reduce loadir	1	3	0
Reduce loadir	2	4	0
Reduce herbic	3	1.6667	0
Reduce expor	3	4	0
Reduce draina	4	3.75	0
Reduce algal	4	3	0
Reduce algal	5	4	0
Reduce agricu	3	4	0
Recirculate at	2	3	0
Recirculate at	2	3	0
Operate Head	4	4	0
Increase shac	5	1.8	0

Reduce loading from Kern Creek watershed	1	2	0
Reduce loading from Harding Drain	2	2.5	0
Reduce loading from Orestimba Creek watershed	2	2.5	0
Reduce loading from San Joaquin watershed upstream of Lander Avenue	3	2.6667	0
Reduce loading from Del Puerto Creek watershed	1	3	0
Reduce loading from Ingram Creek watershed	1	3	0
Reduce loading from Hospital Creek watershed	1	3	0
Reduce loading from westside to SJR from Newman to South Delta	1	3	0
Reduce loading from French Camp Slough watershed	4	3	0
Reduce loading from Los Banos Creek watershed	2	3	0
Reduce loading from Stanislaus River watershed	4	3.5	3
Reduce loading from Tuolumne River watershed	4	3.5	3
Reduce loading from Merced River watershed	4	3.5	3.5
Reduce loading from Calaveras River watershed	2	4	3.5
Reduce loading from Mud and Salt Slough watersheds	2	4	3.5
Reduce loading from Stockton Sloughs including the Turning Basin	2	4.5	4

Possible Actions By General Category	Potential Net Impact of Factors	Knowledge of Potential Net Impact	Potential to Advance Action	Verifable
Action	What is the net impact on DO in the DWSC?	Existing knowledge	Is action technically feasible?	Could th benefit c the actic measure locally?
Reduce export pumping rates	4	4.5	4	4.
Reduce WWTP loading - Stockton	4.875	4.5	4.625	4
Operate Head of Old River for O2 benefit	4	4.3333	4.25	
Allow the DWSC to fill in over time	3.6667	4	3.3333	
Decrease Embedded S.O.D. in DWSC	2.3333	4	2.3333	3.
Low head pumping at the Head of Old River	3.6667	4	4	
Reduce loading from Mud and Salt Slough watersheds	4	4	3.5	
Reduce WWTP loading - Lathrop/Manteca	3.6667	4	4.3333	4.
Reduce algal production in the DWSC	2.75	3.75	2.5	
Reduce agricultural diversions	4	3.6667	3.6667	3.
Reduce drainage from wetlands/wildlife refuges	3.75	3.6667	3.25	
Release Eastside tributary Fall Pulse flows	3.5	3.6667	3.25	
Close Delta Tidal Barriers (permanent and operable)	3.3333	3.5	3.6667	3.
Reduce loading from Calaveras River watershed	4	3.5	3.5	
Reduce loading from Los Banos Creek watershed	3	3.5	3	
Reduce loading from Stockton Sloughs including the Turning Basin	4.5	3.5	3.5	
Decrease Suspended S.O.D. in DWSC	3	3.25	2.6	
Reduce loading from French Camp Slough watershed	3	3.25	3	
Reduce algal production in mainstem SJR upstream of DWSC	4	3.2	3.2	
Reduce sediment loading	3.5	3.2	2.8333	3.
Increase agricultural water use efficiency	2	3	2.6667	
Increase Sacramento River flows through the Delta Cross Channel/TDF	2.5	3	2.5	
Recirculate at Mendota Pool	3	3	3	
Recirculate at Newman Wasteway	3	3	3	
Reduce agricultural return flows (irrigation drainage)	3.2	3	2.4	
Reduce loading from Merced River watershed	3.5	3	3	
Reduce loading from Orestimba Creek watershed	2.5	3	3	
Reduce loading from Stanislaus River watershed	3.5	3	3	

Reduce loading from Tuolumne River watershed	3.5	3	3	
Reduce WWTP loading - Modesto	3.75	3	3.75	
Reduce algal production in tributaries	3	2.75	2.75	
Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)	3.5	2.75	4.25	
Extend Burns Cut to the west end of Terminal Island	4.5	2.5	4	
Extend Burns Cut to Turner Cut and fully isolates upstream DWSC	4.5	2.5	4	
Reduce loading from Harding Drain	2.5	2.5	3	
Reduce loading from San Joaquin watershed upstream of Lander Avenue	2.6667	2.5	3	
Release water from Friant Dam (with flows reaching DWSC)	3	2.5	2.8333	
Increase sediment loading	2.5	2.4	2	
Reduce agricultural stormwater runoff	2.6667	2.4	2.8333	
Increase shading and riparian zone restoration	1.8	2.25	2.4	
Increase grazing pressure (clams, zooplankton, fish)	2.2857	2.1667	1.6667	2.3
Reduce loading from Del Puerto Creek watershed	3	2	3	
Reduce loading from Hospital Creek watershed	3	2	3	
Reduce loading from Ingram Creek watershed	3	2	3	
Reduce loading from westside to SJR from Newman to South Delta	3	2	2	
Reduce urban dry season runoff	2.3333	2	2	1.(
Reduce urban stormwater runoff	2.5	2	2.5	
Reduce herbicide impact on algal growth	1.6667	1.3333	2.6667	
Reduce loading from Kern Creek watershed	2	1	2	

Criteria Evaluation

	criteria	3	3	3	4		
	Possible Actions By General Category	**Potential Net Impact of Factors**	**Knowledge of Potential Net Impact**	**Potential to Advance Action**	**Verifable**		**Abs Split Btwn Pot and Verifiable**
110	**Possible Actions By Waste Water Treatment**	**Potential Net Impact of**	**Knowledge of Potential Net**	**Potential to Advance**	**Verifable**		#VALUE!
	Possible Actions By Watershed	**Potential Net Impact of Factors**	**Knowledge of Potential Net Impact**	**Potential to Advance Action**	**Verifable**		
124							#VALUE!
	Possible Actions DWSC Geometry Changes	**Potential Net Impact of Factors**	**Knowledge of Potential Net Impact**	**Potential to Advance Action**	**Verifable**		
190							#VALUE!
2	min	1	1	1	4	2	3
6	min	3	2	1	4	3	3
1	Reduce algal production in tributaries	**3**	**2.75**	**2.75**	**4.75**	**3.5**	2
120	min	4	4	2	4	3	2
139	max	4	4	3	5	4	2
147	max	4	4	3	5	4	2
151	max	4	4	3	5	4	2
155	max	3	3	3	5	4	2
163	max	4	4	3	5	3	2
167	max	3	4	3	5	3	2
200	min	3	4	2	4	4	2
9	Reduce algal production in the DWSC	**2.75**	**3.75**	**2.5**	**3.75**	**3.75**	1.25
5	Reduce algal production in mainstem SJR upstream of DWSC	**4**	**3.2**	**3.2**	**4.4**	**4.2**	1.2
3	max	5	5	4	5	5	1
10	min	1	3	1	2	2	1
11	max	4	5	4	5	5	1
15	max	2	2	3	2	2	1
19	max	4	4	3	4	3	1
27	max	4	3	3	4	4	1

43	max	3	3	3	4	3	1
51	max	3	3	3	2	2	1
55	max	3	3	4	3	4	1
59	max	4	5	3	4	5	1
60	responses	**5**	**4**	**5**	**4**	**4**	1
63	max	5	4	5	4	4	1
66	min	3	4	3	4	4	1
78	min	3	4	3	4	4	1
83	max	5	5	4	5	5	1
86	min	2	1	1	2	3	1
88	responses	**6**	**4**	**6**	**5**	**5**	1
91	max	3	3	3	4	4	1
95	max	3	3	3	4	4	1
97	Increase Sacramento River flows through the Delta Cross Channel/TDF	**2.5**	**3**	**2.5**	**3.5**	**3.5**	1
98	min	2	3	2	3	3	1
99	max	3	3	3	4	4	1
105	Decrease Embedded S.O.D. in DWSC	**2.3333**	**4**	**2.3333**	**3.3333**	**3.3333**	1
106	min	1	4	1	2	2	1
134	min	2	3	2	3	3	1
135	max	4	4	4	5	4	1
137	Reduce loading from Stanislaus River watershed	**3.5**	**3**	**3**	**4**	**3**	1
140	responses	**4**	**3**	**4**	**3**	**3**	1
145	Reduce loading from Tuolumne River watershed	**3.5**	**3**	**3**	**4**	**3**	1
148	responses	**4**	**3**	**4**	**3**	**3**	1
149	Reduce loading from Merced River watershed	**3.5**	**3**	**3**	**4**	**3**	1
152	responses	**4**	**3**	**4**	**3**	**3**	1
153	Reduce loading from San Joaquin watershed upstream of Lander Avenue	**2.6667**	**2.5**	**3**	**4**	**2.6667**	1
157	Reduce loading from Mud and Salt Slough watersheds	**4**	**4**	**3.5**	**4.5**	**3**	1
158	min	4	4	3	4	3	1
159	max	4	4	4	5	3	1
161	Reduce loading from Los Banos Creek watershed	**3**	**3.5**	**3**	**4**	**2.5**	1
165	Reduce loading from Orestimba Creek watershed	**2.5**	**3**	**3**	**4**	**2.5**	1
185	Reduce loading from westside to SJR from Newman to South Delta	**3**	**2**	**2**	**3**	**2**	1
186	min	3	2	2	3	2	1
187	max	3	2	2	3	2	1
201	max	4	4	5	4	4	1

13	Reduce herbicide impact on algal growth	**1.6667**	**1.3333**	**2.6667**	**2**	**1.6667**	0.6667
199	Allow the DWSC to fill in over time	**3.6667**	**4**	**3.3333**	**4**	**4**	0.6667
17	Increase grazing pressure (clams, zooplankton, fish)	**2.2857**	**2.1667**	**1.6667**	**2.3333**	**2**	0.6666
25	Increase sediment loading	**2.5**	**2.4**	**2**	**2.6**	**2.5**	0.6
101	Decrease Suspended S.O.D. in DWSC	**3**	**3.25**	**2.6**	**3.2**	**3.2**	0.6
29	Increase shading and riparian zone restoration	**1.8**	**2.25**	**2.4**	**1.8**	**1.8**	0.6
33	Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)	**3.5**	**2.75**	**4.25**	**3.75**	**2.5**	0.5
81	Release Eastside tributary Fall Pulse flows	**3.5**	**3.6667**	**3.25**	**3.75**	**4**	0.5
89	Recirculate at Mendota Pool	**3**	**3**	**3**	**3.5**	**3.5**	0.5
93	Recirculate at Newman Wasteway	**3**	**3**	**3**	**3.5**	**3.5**	0.5
85	Release water from Friant Dam (with flows reaching DWSC)	**3**	**2.5**	**2.8333**	**3.2**	**3.6**	0.3667
21	Reduce sediment loading	**3.5**	**3.2**	**2.8333**	**3.1667**	**3**	0.3334
77	Reduce export pumping rates	**4**	**4.5**	**4**	**4.3333**	**4.3333**	0.3333
41	Increase agricultural water use efficiency	**2**	**3**	**2.6667**	**3**	**3**	0.3333
49	Reduce urban dry season runoff	**2.3333**	**2**	**2**	**1.6667**	**1.6667**	0.3333
53	Reduce urban stormwater runoff	**2.5**	**2**	**2.5**	**2.25**	**2.5**	0.25
119	Reduce WWTP loading - Stockton	**4.875**	**4.5**	**4.625**	**4.875**	**4.625**	0.25
37	Reduce agricultural stormwater runoff	**2.6667**	**2.4**	**2.8333**	**2.6**	**2.4**	0.2333
57	Reduce agricultural return flows (irrigation drainage)	**3.2**	**3**	**2.4**	**2.5**	**2.75**	0.1
4	responses	**4**	**4**	**4**	**4**	**4**	0
7	max	5	5	5	5	5	0
8	responses	**5**	**5**	**5**	**5**	**5**	0
12	responses	**4**	**4**	**4**	**4**	**4**	0
14	min	1	1	2	2	1	0
16	responses	**3**	**3**	**3**	**3**	**3**	0
18	min	1	1	1	1	1	0
20	responses	**7**	**6**	**6**	**6**	**5**	0
22	min	3	3	2	2	3	0
23	max	4	4	4	4	3	0
24	responses	**6**	**5**	**6**	**6**	**5**	0
26	min	1	1	1	1	1	0

36	responses	**4**	**4**	**4**	**4**	**4**	0
38	min	1	1	1	1	1	0
39	max	4	4	4	4	3	0
42	min	0	3	2	2	3	0
44	responses	**4**	**2**	**3**	**3**	**3**	0
46	min	3	2	2	2	2	0
47	max	5	5	5	5	5	0
48	responses	**4**	**3**	**4**	**4**	**4**	0
50	min	2	1	1	1	1	0
52	responses	**3**	**2**	**3**	**3**	**3**	0
54	min	2	1	1	1	1	0
56	responses	**4**	**3**	**4**	**4**	**4**	0
58	min	2	1	1	1	1	0
61	Reduce agricultural diversions	**4**	**3.6667**	**3.6667**	**3.6667**	**3.6667**	0
62	min	3	3	3	3	3	0
64	responses	**3**	**3**	**3**	**3**	**3**	0
65	Operate Head of Old River for O2 benefit	**4**	**4.3333**	**4.25**	**4.25**	**4.25**	0
67	max	5	5	5	5	5	0
68	responses	**4**	**3**	**4**	**4**	**4**	0
69	Close Delta Tidal Barriers (permanent and operable)	**3.3333**	**3.5**	**3.6667**	**3.6667**	**4**	0
70	min	3	3	3	3	4	0
71	max	4	4	4	4	4	0
72	responses	**3**	**2**	**3**	**3**	**3**	0
73	Low head pumping at the Head of Old River	**3.6667**	**4**	**4**	**4**	**4**	0
74	min	3	4	4	4	4	0
75	max	4	4	4	4	4	0
76	responses	**3**	**2**	**3**	**3**	**3**	0
79	max	5	5	5	5	5	0
80	responses	**3**	**2**	**3**	**3**	**3**	0
82	min	3	3	3	3	3	0
84	responses	**4**	**3**	**4**	**4**	**4**	0
87	max	5	3	4	4	4	0
90	min	3	3	3	3	3	0
92	responses	**2**	**1**	**2**	**2**	**2**	0
94	min	3	3	3	3	3	0
96	responses	**2**	**1**	**2**	**2**	**2**	0
100	responses	**2**	**1**	**2**	**2**	**2**	0
102	min	2	2	2	2	2	0
103	max	4	4	4	4	4	0
104	responses	**5**	**4**	**5**	**5**	**5**	0
107	max	4	4	4	4	4	0
108	responses	**3**	**2**	**3**	**3**	**3**	0
109							0

114	responses	**3**	**3**	**3**	**3**	**3**	0
115	Reduce WWTP loading - Modesto	**3.75**	**3**	**3.75**	**3.75**	**3**	0
116	min	3	2	3	3	2	0
117	max	4	4	5	5	4	0
118	responses	**4**	**4**	**4**	**4**	**4**	0
121	max	5	5	5	5	5	0
122	responses	**8**	**8**	**8**	**8**	**8**	0
123							0
125	Reduce loading from Stockton Sloughs including the Turning Basin	**4.5**	**3.5**	**3.5**	**3.5**	**3.5**	0
126	min	4	2	2	2	2	0
127	max	5	5	5	5	5	0
128	responses	**2**	**2**	**2**	**2**	**2**	0
129	Reduce loading from Calaveras River watershed	**4**	**3.5**	**3.5**	**3.5**	**3.5**	0
130	min	3	2	2	2	2	0
131	max	5	5	5	5	5	0
132	responses	**2**	**2**	**2**	**2**	**2**	0
136	responses	**4**	**4**	**4**	**4**	**4**	0
138	min	3	2	3	3	2	0
141	Reduce loading from Harding Drain	**2.5**	**2.5**	**3**	**3**	**2.5**	0
142	min	2	2	2	2	2	0
143	max	3	3	4	4	3	0
144	responses	**2**	**2**	**2**	**2**	**2**	0
146	min	3	2	3	3	2	0
150	min	3	2	3	3	2	0
154	min	2	2	3	3	2	0
156	responses	**3**	**2**	**3**	**3**	**3**	0
160	responses	**2**	**2**	**2**	**2**	**2**	0
162	min	2	3	3	3	2	0
164	responses	**2**	**2**	**2**	**2**	**2**	0
166	min	2	2	3	3	2	0
168	responses	**2**	**2**	**2**	**2**	**2**	0
169	Reduce loading from Del Puerto Creek watershed	**3**	**2**	**3**	**3**	**2**	0
170	min	3	2	3	3	2	0
171	max	3	2	3	3	2	0
172	responses	**1**	**1**	**1**	**1**	**1**	0
173	Reduce loading from Kern Creek watershed	**2**	**1**	**2**	**2**	**1**	0
174	min	2	1	2	2	1	0
175	max	2	1	2	2	1	0
176	responses	**1**	**1**	**1**	**1**	**1**	0
177	Reduce loading from Ingram Creek watershed	**3**	**2**	**3**	**3**	**2**	0

	Reduce loading from Hospital	**3**	**2**	**3**	**3**	**2**	
181	Creek watershed						0
182	min	3	2	3	3	2	0
183	max	3	2	3	3	2	0
184	responses	**1**	**1**	**1**	**1**	**1**	0
188	responses	**1**	**1**	**1**	**1**	**1**	0
189							0
	Extend Burns Cut to Turner Cut and fully isolates upstream	**4.5**	**2.5**	**4**	**4**	**4**	
191	DWSC						0
192	min	4	2	4	4	4	0
193	max	5	3	4	4	4	0
194	responses	**2**	**2**	**2**	**2**	**2**	0
	Extend Burns Cut to the west	**4.5**	**2.5**	**4**	**4**	**4**	
195	end of Terminal Island						0
196	min	4	2	4	4	4	0
197	max	5	3	4	4	4	0
198	responses	**2**	**2**	**2**	**2**	**2**	0
202	responses	**3**	**2**	**3**	**3**	**3**	0
		What is the net impact on DO in the DWSC?	**Existing knowledge**	**Is action technically feasible?**	**Could the benefit of the action be measured locally?**	**Could the benefit of the action be tracked or modeled to or in the DWSC?**	

Criteria Evaluation

count	49	49
minimum response for results	0	

indicates formula

Potential Net Impact of Factors		Knowle of Pote Net Im
min score	max score	
0		5

criteria

	Possible Actions By General Category	Potential Net Impact of Factors	Knowledge of Potential Net Impact	Potential to Advance Action	Verifable		Action	No Reviewers	score	1 resp with max pot >4
		3	3	3	4					
		What is the	Existing	Is action	Could the	Could the				
1	Reduce algal production in tributaries	3	2.75	2.75	4.75	3.5	Reduce algal production in tributaries	4	3	0
2	min	1	1	1	4	2				
3	max	5	5	4	5	5				
4	responses	4	4	4	4	4				
5	Reduce algal production in mainstem SJR upstream of DWSC	4	3.2	3.2	4.4	4.2	Reduce algal production in mainstem SJR upstream of DWSC	5	4	0
6	min	3	2	1	4	3				
7	max	5	5	5	5	5				
8	responses	5	5	5	5	5				
9	Reduce algal production in the DWSC	2.75	3.75	2.5	3.75	3.75	Reduce algal production in the DWSC	4	2.75	2.75
10	min	1	3	1	2	2				
11	max	4	5	4	5	5				
12	responses	4	4	4	4	4				
13	Reduce herbicide impact on algal growth	1.6667	1.3333	2.6667	2	1.6667	Reduce herbicide impact on algal growth	3	1.6667	0
14	min	1	1	2	2	1				
15	max	2	2	3	2	2				
16	responses	3	3	3	3	3				
17	Increase grazing pressure (clams, zooplankton, fish)	2.2857	2.1667	1.6667	2.3333	2	Increase grazing pressure (clams, zooplankton, fish)	7	2.2857	2.2857
18	min	1	1	1	1	1				
19	max	4	4	3	4	3				
20	responses	7	6	6	6	5				
21	Reduce sediment loading	3.5	3.2	2.8333	3.1667	3	Reduce sediment loading	6	3.5	3.5
22	min	3	3	2	2	3				
23	max	4	4	4	4	3				

24	responses	**6**	**5**	**6**	**6**	**5**				
25	Increase sediment loading	**2.5**	**2.4**	**2**	**2.6**	**2.5**	**Increase sediment loading**	**6**	2.5	2.5
26	min	1	1	1	1	1				
27	max	4	3	3	4	4				
28	responses	**6**	**5**	**6**	**5**	**4**				
29	Increase shading and riparian zone restoration	**1.8**	**2.25**	**2.4**	**1.8**	**1.8**	**Increase shading and riparian zone restoration**	**5**	1.8	0
30	min	1	1	1	1	1				
31	max	2	3	4	3	3				
32	responses	**5**	**4**	**5**	**5**	**5**				
33	Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)	**3.5**	**2.75**	**4.25**	**3.75**	**2.5**	**Reduce point and non-point nutrient loading from Confined Animal Operations (e.g. dairies and feedlots)**	**4**	3.5	0
34	min	3	2	2	3	1				
35	max	5	5	5	5	4				
36	responses	**4**	**4**	**4**	**4**	**4**				
37	Reduce agricultural stormwater runoff	**2.6667**	**2.4**	**2.8333**	**2.6**	**2.4**	**Reduce agricultural stormwater runoff**	**6**	2.6667	2.6667
38	min	1	1	1	1	1				
39	max	4	4	4	4	3				
40	responses	**6**	**5**	**6**	**5**	**5**				
41	Increase agricultural water use efficiency	**2**	**3**	**2.6667**	**3**	**3**	**Increase agricultural water use efficiency**	**4**	2	0
42	min	0	3	2	2	3				
43	max	3	3	3	4	3				
44	responses	**4**	**2**	**3**	**3**	**3**				
45	Reduce drainage from wetlands/wildlife refuges	**3.75**	**3.6667**	**3.25**	**4**	**3.5**	**Reduce drainage from wetlands/wildlife refuges**	**4**	3.75	0
46	min	3	2	2	2	2				
47	max	5	5	5	5	5				
48	responses	**4**	**3**	**4**	**4**	**4**				
49	Reduce urban dry season runoff	**2.3333**	**2**	**2**	**1.6667**	**1.6667**	**Reduce urban dry season runoff**	**3**	2.3333	0
50	min	2	1	1	1	1				
51	max	3	3	3	2	2				
52	responses	**3**	**2**	**3**	**3**	**3**				
53	Reduce urban stormwater runoff	**2.5**	**2**	**2.5**	**2.25**	**2.5**	**Reduce urban stormwater runoff**	**4**	2.5	0
54	min	2	1	1	1	1				
55	max	3	3	4	3	4				
56	responses	**4**	**3**	**4**	**4**	**4**				

	Reduce agricultural return flows (irrigation drainage)	**3.2**	**3**	**2.4**	**2.5**	**2.75**	**Reduce agricultural return flows (irrigation drainage)**	**5**	3.2	3.2
57										
58	min	2	1	1	1	1				
59	max	4	5	3	4	5				
60	responses	**5**	**4**	**5**	**4**	**4**				
	Reduce agricultural diversions	**4**	**3.6667**	**3.6667**	**3.6667**	**3.6667**	**Reduce agricultural diversions**	**3**	4	0
61										
62	min	3	3	3	3	3				
63	max	5	4	5	4	4				
64	responses	**3**	**3**	**3**	**3**	**3**				
	Operate Head of Old River for O2 benefit	**4**	**4.3333**	**4.25**	**4.25**	**4.25**	**Operate Head of Old River for O2 benefit**	**4**	4	0
65										
66	min	3	4	3	4	4				
67	max	5	5	5	5	5				
68	responses	**4**	**3**	**4**	**4**	**4**				
	Close Delta Tidal Barriers (permanent and operable)	**3.3333**	**3.5**	**3.6667**	**3.6667**	**4**	**Close Delta Tidal Barriers (permanent and operable)**	**3**	3.3333	3.3333
69										
70	min	3	3	3	3	4				
71	max	4	4	4	4	4				
72	responses	**3**	**2**	**3**	**3**	**3**				
	Low head pumping at the Head of Old River	**3.6667**	**4**	**4**	**4**	**4**	**Low head pumping at the Head of Old River**	**3**	3.6667	3.6667
73										
74	min	3	4	4	4	4				
75	max	4	4	4	4	4				
76	responses	**3**	**2**	**3**	**3**	**3**				
	Reduce export pumping rates	**4**	**4.5**	**4**	**4.3333**	**4.3333**	**Reduce export pumping rates**	**3**	4	0
77										
78	min	3	4	3	4	4				
79	max	5	5	5	5	5				
80	responses	**3**	**2**	**3**	**3**	**3**				
	Release Eastside tributary Fall Pulse flows	**3.5**	**3.6667**	**3.25**	**3.75**	**4**	**Release Eastside tributary Fall Pulse flows**	**4**	3.5	0
81										
82	min	3	3	3	3	3				
83	max	5	5	4	5	5				
84	responses	**4**	**3**	**4**	**4**	**4**				
	Release water from Friant Dam (with flows reaching DWSC)	**3**	**2.5**	**2.8333**	**3.2**	**3.6**	**Release water from Friant Dam (with flows reaching DWSC)**	**6**	3	0
85										
86	min	2	1	1	2	3				
87	max	5	3	4	4	4				
88	responses	**6**	**4**	**6**	**5**	**5**				
	Recirculate at Mendota Pool	**3**	**3**	**3**	**3.5**	**3.5**	**Recirculate at Mendota Pool**	**2**	3	0
89										
90	min	3	3	3	3	3				
91	max	3	3	3	4	4				
92	responses	**2**	**1**	**2**	**2**	**2**				

93	Recirculate at Newman Wasteway	**3**	**3**	**3**	**3.5**	**3.5**	**Recirculate at Newman Wasteway**	**2**	3	0
94	min	3	3	3	3	3				
95	max	3	3	3	4	4				
96	responses	**2**	**1**	**2**	**2**	**2**				
97	Increase Sacramento River flows through the Delta Cross Channel/TDF	**2.5**	**3**	**2.5**	**3.5**	**3.5**	**Increase Sacramento River flows through the Delta Cross Channel/TDF**	**2**	2.5	0
98	min	2	3	2	3	3				
99	max	3	3	3	4	4				
100	responses	**2**	**1**	**2**	**2**	**2**				
101	Decrease Suspended S.O.D. in DWSC	**3**	**3.25**	**2.6**	**3.2**	**3.2**	**Decrease Suspended S.O.D. in DWSC**	**5**	3	3
102	min	2	2	2	2	2				
103	max	4	4	4	4	4				
104	responses	**5**	**4**	**5**	**5**	**5**				
105	Decrease Embedded S.O.D. in DWSC	**2.3333**	**4**	**2.3333**	**3.3333**	**3.3333**	**Decrease Embedded S.O.D. in DWSC**	**3**	2.3333	2.3333
106	min	1	4	1	2	2				
107	max	4	4	4	4	4				
108	responses	**3**	**2**	**3**	**3**	**3**				
109										
110	**Possible Actions By Waste Water Treatment Plant**	**Potential Net Impact of Factors**	**Knowledge of Potential Net Impact**	**Potential to Advance Action**	**Verifable**					
111	Reduce WWTP loading - Lathrop/Manteca	**3.6667**	**4**	**4.3333**	**4.3333**	**3.3333**	**Reduce WWTP loading - Lathrop/Manteca**	**3**	3.6667	3.6667
112	min	3	3	4	4	3				
113	max	4	5	5	5	4				
114	responses	**3**	**3**	**3**	**3**	**3**				
115	Reduce WWTP loading - Modesto	**3.75**	**3**	**3.75**	**3.75**	**3**	**Reduce WWTP loading - Modesto**	**4**	3.75	3.75
116	min	3	2	3	3	2				
117	max	4	4	5	5	4				
118	responses	**4**	**4**	**4**	**4**	**4**				
119	Reduce WWTP loading - Stockton	**4.875**	**4.5**	**4.625**	**4.875**	**4.625**	**Reduce WWTP loading - Stockton**	**8**	4.875	0
120	min	4	4	2	4	3				
121	max	5	5	5	5	5				
122	responses	**8**	**8**	**8**	**8**	**8**				
123										
124	**Possible Actions By Watershed**	**Potential Net Impact of Factors**	**Knowledge of Potential Net Impact**	**Potential to Advance Action**	**Verifable**					

	Reduce loading from Stockton Sloughs including the Turning Basin	**4.5**	**3.5**	**3.5**	**3.5**	**3.5**	**Reduce loading from Stockton Sloughs including the Turning Basin**	**2**	4.5	0
125										
126	min	4	2	2	2	2				
127	max	5	5	5	5	5				
128	responses	**2**	**2**	**2**	**2**	**2**				
	Reduce loading from Calaveras River watershed	**4**	**3.5**	**3.5**	**3.5**	**3.5**	**Reduce loading from Calaveras River watershed**	**2**	4	0
129										
130	min	3	2	2	2	2				
131	max	5	5	5	5	5				
132	responses	**2**	**2**	**2**	**2**	**2**				
	Reduce loading from French Camp Slough watershed	**3**	**3.25**	**3**	**3.75**	**3.5**	**Reduce loading from French Camp Slough watershed**	**4**	3	3
133										
134	min	2	3	2	3	3				
135	max	4	4	4	5	4				
136	responses	**4**	**4**	**4**	**4**	**4**				
	Reduce loading from Stanislaus River watershed	**3.5**	**3**	**3**	**4**	**3**	**Reduce loading from Stanislaus River watershed**	**4**	3.5	3.5
137										
138	min	3	2	3	3	2				
139	max	4	4	3	5	4				
140	responses	**4**	**3**	**4**	**3**	**3**				
	Reduce loading from Harding Drain	**2.5**	**2.5**	**3**	**3**	**2.5**	**Reduce loading from Harding Drain**	**2**	2.5	0
141										
142	min	2	2	2	2	2				
143	max	3	3	4	4	3				
144	responses	**2**	**2**	**2**	**2**	**2**				
	Reduce loading from Tuolumne River watershed	**3.5**	**3**	**3**	**4**	**3**	**Reduce loading from Tuolumne River watershed**	**4**	3.5	3.5
145										
146	min	3	2	3	3	2				
147	max	4	4	3	5	4				
148	responses	**4**	**3**	**4**	**3**	**3**				
	Reduce loading from Merced River watershed	**3.5**	**3**	**3**	**4**	**3**	**Reduce loading from Merced River watershed**	**4**	3.5	3.5
149										
150	min	3	2	3	3	2				
151	max	4	4	3	5	4				
152	responses	**4**	**3**	**4**	**3**	**3**				
	Reduce loading from San Joaquin watershed upstream of Lander Avenue	**2.6667**	**2.5**	**3**	**4**	**2.6667**	**Reduce loading from San Joaquin watershed upstream of Lander Avenue**	**3**	2.6667	0
153										
154	min	2	2	3	3	2				
155	max	3	3	3	5	4				
156	responses	**3**	**2**	**3**	**3**	**3**				

	Reduce loading from Mud and Salt Slough watersheds	**4**	**4**	**3.5**	**4.5**	**3**	**Reduce loading from Mud and Salt Slough watersheds**	**2**	4	4
157										
158	min	4	4	3	4	3				
159	max	4	4	4	5	3				
160	responses	**2**	**2**	**2**	**2**	**2**				
	Reduce loading from Los Banos Creek watershed	**3**	**3.5**	**3**	**4**	**2.5**	**Reduce loading from Los Banos Creek watershed**	**2**	3	3
161										
162	min	2	3	3	3	2				
163	max	4	4	3	5	3				
164	responses	**2**	**2**	**2**	**2**	**2**				
	Reduce loading from Orestimba Creek watershed	**2.5**	**3**	**3**	**4**	**2.5**	**Reduce loading from Orestimba Creek watershed**	**2**	2.5	0
165										
166	min	2	2	3	3	2				
167	max	3	4	3	5	3				
168	responses	**2**	**2**	**2**	**2**	**2**				
	Reduce loading from Del Puerto Creek watershed	**3**	**2**	**3**	**3**	**2**	**Reduce loading from Del Puerto Creek watershed**	**1**	3	0
169										
170	min	3	2	3	3	2				
171	max	3	2	3	3	2				
172	responses	**1**	**1**	**1**	**1**	**1**				
	Reduce loading from Kern Creek watershed	**2**	**1**	**2**	**2**	**1**	**Reduce loading from Kern Creek watershed**	**1**	2	0
173										
174	min	2	1	2	2	1				
175	max	2	1	2	2	1				
176	responses	**1**	**1**	**1**	**1**	**1**				
	Reduce loading from Ingram Creek watershed	**3**	**2**	**3**	**3**	**2**	**Reduce loading from Ingram Creek watershed**	**1**	3	0
177										
178	min	3	2	3	3	2				
179	max	3	2	3	3	2				
180	responses	**1**	**1**	**1**	**1**	**1**				
	Reduce loading from Hospital Creek watershed	**3**	**2**	**3**	**3**	**2**	**Reduce loading from Hospital Creek watershed**	**1**	3	0
181										
182	min	3	2	3	3	2				
183	max	3	2	3	3	2				
184	responses	**1**	**1**	**1**	**1**	**1**				
	Reduce loading from westside to SJR from Newman to South Delta	**3**	**2**	**2**	**3**	**2**	**Reduce loading from westside to SJR from Newman to South Delta**	**1**	3	0
185										
186	min	3	2	2	3	2				
187	max	3	2	2	3	2				
188	responses	**1**	**1**	**1**	**1**	**1**				
189										

	Possible Actions DWSC Geometry Changes	Potential Net Impact of Factors	Knowledge of Potential Net Impact	Potential to Advance Action	Verifable						
190											
191	Extend Burns Cut to Turner Cut and fully isolates upstream DWSC	**4.5**	**2.5**	**4**	**4**	**4**	**Extend Burns Cut to Turner Cut and fully isolates upstream DWSC**	**2**	4.5	0	
192	min	4	2	4	4	4					
193	max	5	3	4	4	4					
194	responses	**2**	**2**	**2**	**2**	**2**					
195	Extend Burns Cut to the west end of Terminal Island	**4.5**	**2.5**	**4**	**4**	**4**	**Extend Burns Cut to the west end of Terminal Island**	**2**	4.5	0	
196	min	4	2	4	4	4					
197	max	5	3	4	4	4					
198	responses	**2**	**2**	**2**	**2**	**2**					
199	Allow the DWSC to fill in over time	**3.6667**	**4**	**3.3333**	**4**	**4**	**Allow the DWSC to fill in over time**	**3**	3.6667	3.6667	
200	min	3	4	2	4	4					
201	max	4	4	5	4	4					
202	responses	**3**	**2**	**3**	**3**	**3**					