December 4, 2019

Ms. Hope Smythe
Executive Officer
Santa Ana Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501-3348

Re: Comments on the NPDES Permit Renewal for Proposed Huntington Beach Desalination Project

Hope:

On December 6, 2019, the Santa Ana Regional Water Quality Control Board (Regional Board) will hold a workshop on the renewal of the National Pollutant Discharge Elimination System (NPDES) Permit for Poseidon Water's proposed Huntington Beach Desalination Project (HBDP). IRWD has conducted technical investigations of the impacts that the HBDP will have on the water quality of potable and recycled water supplies of IRWD and other retail water agencies that utilize local groundwater. These investigations provide important information that is essential when considering the renewal of the HBDP permit. Attachment A to this letter provides a summary of the investigations and an overview of the expected water quality impacts from the HBDP to the local groundwater basin and to the retail water agencies that rely on this water. The purpose of this letter is to provide you, the Regional Board, and your staff the results of these investigations and to describe impacts, conclusions, and recommendations related to the renewal of the NPDES permit.

Overview of Investigations:

Many months ago, IRWD retained three highly-qualified consulting firms to investigate the expected water quality impacts of the HBDP. The three firms were Thomas Harder & Co., HDR, and Trussell Technologies, Inc. Harder and HDR quantified water quality impacts to IRWD's potable and recycled water supplies. Harder also quantified water quality impacts to the potable water supplies of other Orange County Groundwater Producer Agencies (Producers), while Trussell analyzed specific water quality impacts to the Orange County Groundwater Basin (Basin) from boron.

HBDP Product Water Distribution Options:

Orange County Water District (OCWD) and Poseidon have executed a non-binding term sheet for the purchase of product water from the HBDP. Harder and HDR assessed the water quality impacts associated with the following options that OCWD is considering for the distribution of the product water, should it decide to execute a water purchase contract with Poseidon:

- Recharging the product water into the Basin;
- Making direct deliveries of the product water to Producers willing to accept the water in-lieu of groundwater pumping (an alternate form of recharging); and
- Making direct deliveries to South Orange County water agencies that do not have access to groundwater.

OCWD has acknowledged that it has not received any firm commitments from retail groundwater agencies willing to accept deliveries of the HBDP product water. The non-binding commitments from the South Orange County (non-groundwater producing) agencies were highly conditional, with deliveries taken only during certain times of the year and in amounts that are a fraction of the expected output of the proposed facility. Without firm commitments to accept direct deliveries of water from the HBDP on a year-round basis, OCWD will have to resort to recharging into the Basin nearly all of the HBDP product water it purchases from Poseidon. This approach will force all of the groundwater producer agencies to accept and pay for water that many agencies have no need for; agencies that have no need for the water produced by the HBDP should be allowed to opt-out of this supply.

Water Quality Impacts:

The investigations conducted by Harder and HDR quantified water quality impacts to IRWD's potable and recycled water supplies from total dissolved solids (TDS), chloride and boron that will be in HBDP product water. Trussell quantified additional water quality impacts to the Basin that will result from the additional accumulation of boron as HBDP product water is used for recharge. Such degradation of the high quality groundwater in the Basin would be a contravention of the State Water Resources Control Board Anti-Degradation Policy (Resolution No. 68-16). To mitigate the expected water quality impacts, Trussell recommends second pass Reverse Osmosis (RO) treatment systems that would need to be implemented by Poseidon.

Conclusions:

The investigations conducted by Harder, HDR and Trussell quantified significant water quality impacts to the Basin as well as to the water supplies of IRWD and other Producers that have not been previously analyzed in compliance with the California Environmental Quality Act (CEQA). Trussell has demonstrated that avoiding the impacts of boron will require subjecting 80 percent to 100 percent of the flow through the HBDP to a second pass RO treatment process. These second pass treatment requirements will significantly increase the flow rates through the seawater intake and brine discharge facilities proposed by Poseidon. The draft NPDES permit being considered by the Regional Board does not consider the increased flow rates through the HBDP seawater intake and brine discharge facilities that will be needed to avoid the identified significant impacts to water quality.

To Avoid Impacts:

The HBDP, as it is currently being proposed, would require an ocean water intake capacity of 106.7 million gallons per day (MGD) and a brine discharge capacity back to the ocean of 56.6 MGD. Using an 80 percent second pass RO treatment process to avoid water quality impacts to IRWD's recycled water system (caused by the recharge of the HBDP product water) would require approximately a 127-MGD intake and a 77-MGD brine discharge. Using a 100 percent second pass RO treatment process to avoid additional boron accumulation in the Orange County Groundwater Basin would require approximately a 131-MGD intake and an 81-MGD brine discharge. Until the HBDP treatment process is refined, the HBDP cannot be evaluated by the Regional Board for an NPDES permit.

Recommendations:

Based on the comments provided above and the summary of the investigations provided as Attachment A, IRWD recommends that the Regional Board defer consideration of an order to renew the NPDES permit for the HBDP until such a time the following have been accomplished:

- Water agencies interested in purchasing the water produced by the HBDP have committed to purchase and take delivery of this water;
- OCWD has developed a plan for distributing water from the HBDP and water supply integration studies have been completed based on the distribution method(s);
- Water quality specifications for the HBDP product water have been identified that are compatible with the selected distribution option and that avoid water quality impacts;
- A preliminary design of the HBDP has been completed that complies with the identified water quality specifications;
- Final HBDP intake and brine discharge flow requirements have been identified; and
- A new or subsequent Environmental Impact Report is prepared and certified by the water agencies that have committed to purchase and take delivery of the product water, that evaluates the final HBDP intake and brine discharge flow requirements.

Should the Regional Board decide to proceed with an NPDES permit for the HBDP, it should require a more complete anti-degradation analysis to determine that the project meets the "maximum benefit" test under the State Water Resources Control Board Anti-degradation Policy. This complete analysis should include a degradation analysis of groundwater due to recharge of the product water and a degradation analysis of the ocean that includes intake and brine discharge flow scenarios associated with a two-pass RO system that will be needed to avoid water quality impacts. The Regional Board should also include a requirement for routine monitoring of boron in the seawater intake, brine discharge and product water. This will allow maintaining a mass balance of boron that will assist in avoiding impacts to the Basin and retail agency water supplies.

IRWD greatly appreciates the opportunity to provide its comments. Please provide a copy of this letter and Attachment A to each of the members of the Regional Board. We hope that the information provided is helpful to you, your staff and the Board in evaluating the renewal of the NPDES Permit for the HBDP Project. If you would like to discuss these issues further, feel free to contact Paul Weghorst at (949) 453-5632.

Sincerely,

Paul A. Cook P.E.
General Manager

Enclosure: Attachment A – Summary of IRWD Investigations of the Water Quality Impacts

cc: Members of the Santa Ana Regional Water Quality Control Board

Attachment A

Summary of IRWD Investigations of Water Quality Impacts of the Proposed Huntington Beach Seawater Desalination Project

Submitted as an Attachment to Irvine Ranch Water District's Comment Letter to Santa Ana Regional Water Quality Control Board Regarding the NPDES Permit Renewal for the Project

Irvine Ranch
WATER DISTRICT

December 4, 2019

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1.0 HBDP Project Overview

Poseidon Resources has proposed that the Huntington Beach Seawater Desalination Project (HBDP) would produce 50 million gallons per day (MGD) of drinking water. The HBDP would withdraw seawater from the ocean, purify it utilizing reverse osmosis (RO) technology, discharge concentrated brine back to the ocean and deliver potable product water for groundwater recharge or direct delivery. The treatment process would require an ocean water intake capacity of 106.7 MGD and a brine discharge capacity back to the ocean of 56.6 MGD. The Orange County Water District (OCWD) is considering entering into a contract for the purchase of product water from the proposed HBDP. In July 2018, OCWD executed a non-binding term sheet for the purchase of the water through an agreement with Poseidon (OCWD/Poseidon Term Sheet) that would commit OCWD to purchasing product water from the HBDP over the 50-year life of the project.

2.0 Options for Distribution of Product Water

To date, OCWD has not developed a final plan for the distribution of product water from the HBDP and is waiting to do so until the costs of the water are better known and Poseidon is successful in securing all the permits needed to construct and operate the project. The impact that the project will have on water quality in the Orange County Groundwater Basin (Basin) and in the potable and recycled water supplies of IRWD and other retail water agencies will depend on how OCWD decides to distribute the desalinated water. The HBDP product water distribution options being considered by OCWD involve:

- Recharging the product water into the Basin using injection wells;
- Making direct deliveries of the product water to Orange County Ground Water Producing Agencies (Producers) willing to accept the water in-lieu of groundwater pumping (an alternate form of recharging); and
- Making direct deliveries to South Orange County water agencies that do not have access to groundwater.

OCWD has acknowledged that it has not received any commitments to accept direct deliveries of HBDP product water in-lieu of pumping groundwater. However, it is IRWD's understanding that OCWD has received two highly conditioned letters of interest from two South Orange County agencies (non-groundwater producing) willing to consider accepting direct delivery of a small percentage of the expected output from the HBDP and during limited times of the year.

3.0 Need for HBDP Product Water

Without a firm commitments to accept direct deliveries of water from the HBDP on a year-round basis, OCWD will have to resort to recharging all or nearly all of the HBDP product water it purchases from Poseidon or find a way to compel the Producers to take direct delivery of the water in-lieu of pumping groundwater. Either option would force the groundwater producer

agencies to accept and pay for water that many agencies have no need for; agencies that have no need for the water produced by the HBDP should be allowed to opt-out of this supply.

Should OCWD resort to recharging all of the HBDP product water, OCWD would have to design, construct and operate over 20 new additional injections wells and the Producers would have to design, construct and operate new production wells and pipelines to make use of the water at a combined total capital cost of between $200 and $300 million. Without these new production wells, the Basin would quickly fill up leaving no place to recharge the HBDP product water. It is estimated that the Producers would have to use groundwater to meet up to 95 percent of their demands. By doing so, the Producers would have to abandon substantially less expensive and reliable water supplies that are available from Metropolitan Water District of Southern California. These facts, along with the prospect that the project will have significant impacts on the water quality of the Basin and the Producers potable and recycled water, make the identification of the need for the HBDP difficult to ascertain.

3.1 MWDOC Water Supply Reliability Studies

MWDOC's 2016 study considered the water needs of all of Orange County. The study demonstrated that water supply reliability is achievable in Orange County without the HBDP Project[1]. Recently, MWDOC completed a 2018 Update to its Orange County Reliability Study and concluded that the HBDP Project ranked last among eight alternatives evaluated relative to the ability to provide cost effect water supply reliability benefits to Orange County[2].

The 2016 and 2018 Orange County Water Supply Reliability Study reports are important state-of-the-art planning documents that describe alternative future water supplies available to Orange County. These studies demonstrate that water supply reliability in Orange County is achievable through the implementation of alternatives that are more cost effective than the HBDP Project. Accordingly, the studies should be considered when making a feasibility determination whether there is a need for the HBDP.

3.2 IRWD Has No Need for Product Water From the HBDP

IRWD is greatly concerned about being forced to receive water from the HBDP because the corresponding increased costs for water and the negative impacts that the HBDP would have on the water quality in the Basin and on IRWD's potable and recycled water supplies. IRWD is the largest retail water agency in Orange County and has invested significantly in projects that ensure water supply reliability to its customers. IRWD's recycled water projects, groundwater desalter projects and state-of-the-art water banking projects provide substantial reliability benefits. Upon consideration of these projects along with IRWD's own studies of future water supply reliability, IRWD has determined that it does not need water from the HBDP Project.

[1] MWDOC's Executive Report from the 2016 Orange County Reliability Study is available online at: https://www.mwdoc.com/wp-content/uploads/2017/06/OC-Study-Executive-Report_with-Appendices_1-4-2017-FINAL-Low-Resolution.pdf

[2] MWDOC's 2018 Update to its Orange County Reliability Study is available online at: https://www.mwdoc.com/wp-content/uploads/2019/02/2018-FINAL-OC-Study-Report_Final-Report_02-01-2019-with-appendices.pdf

3.3 Participation in the HBDP Should be Voluntary

The cost of the water supply from the HBDP should be funded exclusively by the retail water agencies that choose to voluntarily participate in the projects. Participation in county wide desalination projects should be available to agencies on an optional basis.

Agencies volunteering to participate in the HBDP should take into consideration comparisons of the costs and methods of delivery of the design, construction and operation of desalination facilities by public agencies. Participant should select the most cost effective and least risk method of project implementation.

4.0 Water Quality Concerns

The HBDP product water must meet all applicable drinking water standards, and must not create water quality impacts that impair the production of recycled water, reduce the quality of potable water delivered to IRWD customers or result in corrosive impacts to facilities. The use of HBDP product water for recharge or direct delivery has the potential to impact the water quality of IRWD's potable and recycled water supplies. To gain an understanding of these potential impacts, IRWD has conducted technical investigations of the potential impact of three constituents of concern; Total Dissolved Solids (TDS), chloride and boron. Following is an overview of each of the constituents.

4.1 Total Dissolved Solids

TDS is a measure of all dissolved substances in water. High concentrations of TDS can damage crops, affect plant growth, degrade drinking water, damage home or industrial equipment and can be a health threat. IRWD has three recycled water reservoirs located in waters of the United States. This designation has resulted in the RWQCB establishing a 720 mg/l running annual average limit for TDS in recycled water produced at the Michelson Water Recycling Plant (MWRP) that is discharged into the reservoirs.

IRWD gets 70 percent of its potable water supply from groundwater with a TDS of about 280 mg/l. The remainder of IRWD's potable water supply is predominately potable water purchased from Metropolitan Water District of Southern California at a TDS of about 400 mg/l. IRWD has observed and modeled that any significant increased TDS any either of these sources can result in significant increases in TDS in the recycled water produced at MWRP, which can cause IRWD to exceed its 720 mg/l running average annual limit.

The OCWD/Poseidon Term Sheet establishes an average TDS requirement in the HBDP product water of 350 mg/l and a maximum value of 500 mg/l. However, OCWD staff has stated that Poseidon's experience at its Carlsbad seawater desalination project indicates that 150 mg/l is a more likely average to be expected from the HBDP.

4.2 Chloride

High levels of chloride can create problems for agricultural producers and landscapers by decreasing yields and causing leaf burn in highly sensitive plants such as avocados, strawberries and other landscaping. A recent agreement between IRWD and The Irvine Company requires a maximum chloride concentration of 150 mg/l for recycled water that IRWD delivers to the company for the irrigation of avocados. Accordingly, a value of 150 mg/l is considered by IRWD as a maximum acceptable limit in its recycled water. Any significant increases in chloride concentrations in IRWD's potable water can result in chloride concentrations in IRWD's recycled water exceeding the 150 mg/l limit.

The OCWD/Poseidon Term Sheet establishes an average chloride concentration requirement in the HBDP product water of 75 mg/l and a maximum value of 100 mg/l. However, OCWD staff has stated that Poseidon's experience at its Carlsbad seawater desalination project indicates that 75 mg/l is a more likely average to be expected.

4.3 Boron

Boron is an unregulated chemical without an established Maximum Contaminant Level (MCL). The California State has established a Notification Level (NL) for boron in potable water at 1.0 mg/l. Public water systems are required to test for boron on a schedule established by the State Water Resources Control Board (SWRCB). When boron is detected at levels greater than the NL, the utility or responsible agency must report that detection to relevant public agencies.

Boron is essential for plant growth. However, accumulation of boron in plants from irrigation using water with a high concentration of boron can cause chlorosis (yellowing) and even leaf death. Concentrations of boron in irrigation water as low as 0.8 mg/l have been observed to stunt growth in some plants. Some ornamental plants found in Orange County, such as Photinia, Yellow Sage and Bird of Paradise, have been observed to be sensitive to boron concentrations at less than 0.5 mg/l. To avoid such impacts, IRWD has established a 0.5 mg/l limit on boron concentrations in potable and recycled water delivered to its customers.

The OCWD/Poseidon Term Sheet establishes an average boron concentration in the HBDP product water of 0.75 mg/l and a maximum value of 1.0 mg/l. However, it is IRWD's understanding that Poseidon's experience at its Carlsbad seawater desalination project indicates that an average boron concentration of 0.60 mg/l may be expected from the HBDP.

5.0 IRWD Technical Investigations

IRWD contracted with three consulting firms to evaluate the potential water quality impacts of the HBDP product water distribution options that OCWD is considering as described above. These firms are: Thomas Harder and Co. (Harder), HDR and Trussell Technologies, Inc. (Trussell). The reports provided by these consultants are included as appendices to this *Attachment to Irvine Ranch Water District's Comment Letter to Santa Ana Regional Water Quality Control Board Regarding the NPDES Permit Renewal for the Project* and can be downloaded along with the letter and attachment from IRWD's website at:

https://www.irwd.com/about-us/water-desalination-information.

The work completed by these firms is described below.

5.1 Hydrogeologic Modeling

Thomas Harder coupled a groundwater flow model provided by OCWD with a groundwater quality model to evaluate the complex transport of TDS, chloride and boron as well as the impacts associated with recharging desalinated ocean water into the Basin on the potable groundwater supplies pumped from the ground by IRWD' and other Producers. Thomas Harder's technical report is provided as **Appendix "A"**.

5.2 Salt Balance Modeling

HDR developed and applied a Salt Balance Model to IRWD's service area that simulates IRWD's potable supplies, residential, commercial and industrial customer uses and discharges as well as sewage treatment on the quality of IRWD's recycled water supplies. HDR's Salt Balance Model utilizes the results from Harder's groundwater flow and quality models to evaluate the potential TDS, chloride and boron impacts of the distribution of HBDP product water by both recharge and direct deliveries on IRWD's recycled water. HDR's technical report is provided as **Appendix "B"**.

5.3 Boron Removal Modeling

Trussell Technologies provided: an evaluation of the state of the science of boron removal from desalinated seawater; a review of boron removal strategies that have been implemented at existing seawater desalination facilities; and performed a modeling evaluation of various boron removal strategies using 2nd pass RO operations at the HBDP. Trussell's technical memorandum titled *Boron Mitigation for Seawater Desalination* in provided as **Appendix "C"**.

6.0 Water Quality Impacts to IRWD

Tables 1 thru 3 present the results of Thomas Harder's and HDR's modeling studies of the TDS, chloride and boron impacts of both the recharge and direct delivery of HBDP product water on IRWD's potable and recycled water supplies. The impacts are measured against a baseline condition that includes the operation of OCWD's Final Expansion of the Groundwater Replenishment System and the implementation of OCWD's Mid-Basin Injection Project, both of which are currently under construction. Each of impacts described in the tables is supported by referenced figures contained at the end of this summary report. Under both the recharge and direct delivery options for the HBDP product water, IRWD would experience improvements in TDS concentrations in its recycled and potable water supplies. Significant impacts would occur to chloride concentrations in IRWD's recycled water if the product water is distributed by direct delivery. Significant impacts would occur to boron concentrations in IRWD's recycled water from both the recharge and direct delivery option and significant impacts would occur to IRWD's potable water under the direct delivery option.

Table 1 - HBDP Product Water Distribution Impacts to TDS in IRWD Potable and Recycled Water Supplies

HBDP Product Water Distribution Option	Recycled Water Supply Impacts (See Figure 1)	Potable Water Supply Impacts (See Figure 4)
Recharge	Improvement	Improvement
Direct Delivery	Improvement	Improvement

Table 2 - HBDP Product Water Distribution Impacts to Chloride Concentrations in IRWD Potable and Recycled Water Supplies
(Significant Impacts Occur When Chloride Concentrations Exceed 150 mg/l)

HBDP Product Water Distribution Option	Recycled Water Supply Impacts (See Figure 2)	Potable Water Supply Impacts (See Figure 5)
Recharge	Improvement	Improvement
Direct Delivery	Significant Impacts	Less Than Significant Impacts

Table 3 - HBDP Product Water Distribution Impacts to Boron Concentrations in IRWD Potable and Recycled Water Supplies
(Significant Impacts Occur When Boron Concentrations Exceed 0.5 mg/l)

HBDP Product Water Distribution Option	Recycled Water Supply Impacts (See Figure 3)	Potable Water Supply Impacts (See Figure 6)
Recharge	Significant Impacts	Less Than Significant Impacts
Direct Delivery	Significant Impacts	Significant Impacts

6.1 Sensitivity of Water Quality Impacts to HBDP Boron Concentrations

Both Thomas Harder and HDR cooperated in conducting a sensitivity analysis of varying concentrations of boron in HBDP product water to see how impacts to IRWD's potable and recycled water would respond. The results of these sensitivity analyses are presented in **Figures 8 through 10**. These figures depict the following:

- Figure 7 - Sensitivity Analysis: Recharge Impact to IRWD Recycled Water Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l;
- Figure 8 - Sensitivity Analysis: Direct Delivery Impact to IRWD Recycled Water Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l;
- Figure 9 - Sensitivity Analysis: Recharge Impact to IRWD Potable Supply Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l; and
- Figure 10 - Sensitivity Analysis: Direct Delivery Impact to IRWD Potable Supply Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l

Table 4 is a summary of the boron concentrations in HBDP product water that would be needed to avoid impacts to IRWD's recycled and potable water supplies.

Table 4 - Boron Concentrations in HBDP Product Water that Would Need to be Achieved to Avoid Impacts to IRWD's Recycled and Potable Water

HBDP Product Water Distribution Option	Boron Concentration in HBDP Product Water to Avoid Impacts to IRWD's Recycled Water Supply (See Figures 7 and 8)	Boron Concentration in HBDP Product Water to Avoid Impacts to IRWD's Potable Water Supply (See Figure 9 and 10)
Recharge	< 0.25 mg/l	< 1.0 mg/l[3]
Direct Delivery	0.25 mg/l	< 0.5 mg/l

7.0 Water Quality Impacts to Other Agencies

Thomas Harder's groundwater flow and transport modeling also identified the impacts that the recharge of HBDP product water will have on other Producers. The Producers for which they evaluated water quality impacts include Mesa Water District as well as the cities of Fountain Valley, Huntington Beach, Newport Beach, Santa Ana, Tustin and Westminster. Harder's report provided as **Appendix "A"** to this summary report can be referenced for information on the water quality impacts to these other Producers.

[3] An impact is expected to occur at 1.0 mg/l when boron concentration in HBDP product water because of the existing SWRCB Notification Limit of 1.0 mg/l.

8.0 Boron Accumulation in Orange County Groundwater Basin

In Trussell Technologies technical memorandum provided as **Appendix "C"**, Trussell describes the scenario where 100 percent of the HBDP product water is recharged into the Orange County Groundwater Basin with boron concentrations equal to the average OCWD/Poseidon Term Sheet value of 0.75 mg/l. In this scenario, 57 tons per year of additional boron will accumulate in the Basin above baseline conditions. The baseline includes boron accumulations that are already occurring from the existing and final expansion of OCWD's Groundwater Replenishment System. Such an increase in boron loading to the Basin would represent a significant degradation of the Ground Basin which is the primary water supply to approximately 2.5 million residents in north and central Orange County.

If boron concentrations in the HBDP were reduced to 0.25 mg/l, then 19 tons per year of additional boron would accumulate in the Basin, which would also degrade the water supply. Such degradation of the high quality groundwater in the Basin is in contravention of the SWRCB Anti-Degradation Policy (Resolution No. 68-16). If boron concentrations in the HBDP were reduced to 0 mg/l, then there would be no additional degradation of the groundwater water quality as a result of the HBDP.

9.0 Water Quality Impacts Require a New or Subsequent EIR

The California Environmental Quality Act requires preparation of a new or subsequent EIR to address newly available information of substantial importance to the HBDP that was not known and could not have been known at the time with the exercise of reasonable diligence nine years ago when the 2010 Final Subsequent Environmental Impact Report (FSEIR) for the HBDP was certified by the City of Huntington Beach. The significant water quality impacts, described above and substantiated by the professional reports provided in the appendices to this letter, that will occur with the distribution of product water from the HBDP, either by recharge or direct delivery, dictate that a new or subsequent EIR must be prepared. The RWQCB must have sufficient CEQA documentation or CEQA functional equivalent analysis to conduct feasibility analysis determinations required by the May 2015 SWRCB amendment to the Statewide Water Quality Control Plan for the Ocean Waters of California and Water Code section 13142.5(b). The RWQCB cannot rely on the 2010 FSEIR in making its determinations.

10.0 Reducing Boron Concentrations in HBDP Product Water

Trussell Technologies assessment of what potential measures could be implemented at the HBDP to reduce impacts due to boron concentrations in product water from the project is presented in the technical memorandum attached to this letter as **Appendix "C"**.

Trussell identifies in its assessment, that the most common way to improve the performance of an RO treatment process for boron removal is the installation of a full 2nd pass RO using brackish water membranes. Often the pH in the 2nd pass feed is adjusted using caustic (NaOH) to improve the removal of boron by converting it to the ionized form. Trussell reports that Poseidon's

seawater desalter in Carlsbad reportedly uses a four-stage cascade process that is state-of-the-art at boron removal and that pH is increased to convert boron to an ionized form prior to a partial 2nd pass.

10.1 Boron Concentrations in Carlsbad Product Water

Vallecitos Water District (VWD) purchases water produced at Poseidon's Carlsbad facility and has published in its Annual Consumer Confidence Report that boron concentrations in the product water have averaged 0.59 mg/l and 0.61 mg/l for years 2017 and 2018, respectively. Maximum boron concentrations for these years were 0.95 mg/l and 0.92 mg/l. These values are within the 0.75 mg/l average and 1.00 mg/l maximum boron specifications for the HBDP included in the OCWD/Poseidon Term Sheet.

10.2 Expected Boron Concentrations in HBDP Water

It is expected that Poseidon will use a design similar to the Carlsbad facility to construct the HBDP. It is expected that the average boron concentrations in product water from the HBDP would be similar to those from the Carlsbad facility. The VWD values are substantially higher than would be required to prevent impacts to the potable and recycled water supplies of IRWD and other retail water agencies that could be required to rely on supplies from the HBDP.

10.3 Mitigating HBDP Boron Concentrations

Trussell conducted state-of-the-art computer modeling to evaluate how 2nd pass RO configurations could be used to further mitigate boron levels to acceptable levels. The modeling considered two ocean water temperatures, 63°F and 74°F, to represent average and maximum conditions. The 2nd pass configurations represent percentages of flow through the HBDP that would be subject to a full 2nd pass. Each configuration would result in different ocean water intake flow and brine discharge requirements as well as boron concentrations in the product water. **Table 5** depicts a summary of Trussell's model results that indicate the various HBDP intake and brine discharge requirements of RO treatment processes that would be required to mitigate product water boron concentration levels down to indicated levels:

Table 5 - HBDP Intake and Brine Discharge Flow Requirements to Mitigate Boron Concentration Levels: Assuming Average Ocean Water Temperatures

HBDP Performance Item	Percent of Flow Through Full 2nd Pass					
	0%	20%	40%	60%	80%	100%
Product Water Flow (MGD)	50.0	50.0	50.0	50.0	50.0	50.0
Product Water Boron (mg/l)	0.57	0.42	0.31	0.23	0.16	0.10
Intake (MGD)	111	**114**	**118**	**122**	**127**	**131**
Brine Discharge (MGD	61.3	**64.4**	**68.0**	**72.1**	**76.6**	**80.6**

The values shown in red significantly exceed the average 106.7 MGD and 56.69 MGD intake and brine discharge flow limits that are included in the Draft NPDES Permit being considered by the RWQCB.

10.4 Second Pass RO Requirements to Avoid Impacts

To avoid impacts to IRWD's recycled water from the recharge of product water from the HBDP (**see Tables 4 and 5**), 80 percent of flow through the HBDP would be required to be treated through a full 2nd pass RO process. To avoid additional boron accumulation in the Basin (see Section 8.0), 100 percent of flow through the HBDP would be required to be treated through a full 2nd pass RO process.

11.0 Conclusions

The investigations conducted by Harder, HDR and Trussell quantified significant water quality impacts to the Basin as well as to the water supplies of IRWD and other Producer's that have not been previously reviewed consistent with the California Environmental Quality Act (CEQA). Trussell has demonstrated that avoiding the impacts of boron will require subjecting 80 to 100 percent of the flow through the HBDP to a 2nd pass RO treatment process. These 2nd pass treatment requirements will significantly increase the flow rates through the seawater intake and brine discharge facilities proposed by Poseidon for the HBDP. The draft NPDES permit being considered by the Regional Board does not consider the increased flow rates through the HBDP seawater intake and brine discharge facilities that will be needed to avoid the identified significant impacts to water quality.

The HBDP, as it is currently being proposed, would require an ocean water intake capacity of 106.7 MGD and a brine discharge capacity back to the ocean of 56.6 MGD. Using an 80 percent 2nd pass RO treatment process to avoid water quality impacts to IRWD's recycled water system (caused by the recharge of the HBDP product water) would require a 127 MGD intake and a 77 MGD brine discharge. Using a 100 percent 2nd pass RO treatment process to avoid boron accumulation in the Orange County Groundwater Basin would require a 131 MGD intake and a 81 MGD brine discharge. Until the HBDP treatment process is refined, the HBDP cannot be evaluated by the Regional Board for a NPDES permit.

12.0 Recommendations

Based on the comments provided above and the summary of the investigations provided as Attachment A, IRWD recommends that the Regional Board defer consideration of an order to renew the NPDES Permit for the HBDP until such a time the following have been accomplished:

- Water agencies interested in purchasing the water produced by the HBDP have committed to purchase and take delivery of this water;

- OCWD has developed a plan for distributing water from the HBDP and water supply integration studies have been completed based on the distribution method(s);
- Water quality specifications for the HBDP product water have been identified that are compatible with the selected distribution option and that avoid water quality impacts;
- A preliminary design of the HBDP has been completed that complies with the identified water quality specifications;
- Final HBDP intake and brine discharge flow requirements have been identified; and
- A new or subsequent EIR is prepared and certified by the water agencies that have committed to purchase and take delivery of the product water, that evaluates the final HBDP intake and brine discharge flow requirements.

Should the Regional Board decide to proceed with a NPDES Permit for the HBDP, it should require a more complete anti-degradation analysis to determine that the project meets the "maximum benefit" test under the SWRCB Anti-degradation Policy. This complete analysis should include a degradation analysis of groundwater due to recharge of the product water and a degradation analysis of the ocean that includes intake and brine discharge flow scenarios associated with a two pass RO system that will be needed to avoid water quality impacts. The Regional Board should also include a requirement for routine monitoring of boron in the seawater intake, brine discharge and product water. This will allow maintaining a mass balance of boron that will assist in avoiding impacts to the Basin and retail agency water supplies.

Figures in Support of Water Quality Impacts

Figure 1 - HBDP Impacts to IRWD Recycled Water Assuming HBDP Product Water TDS Concentration = 150 mg/l

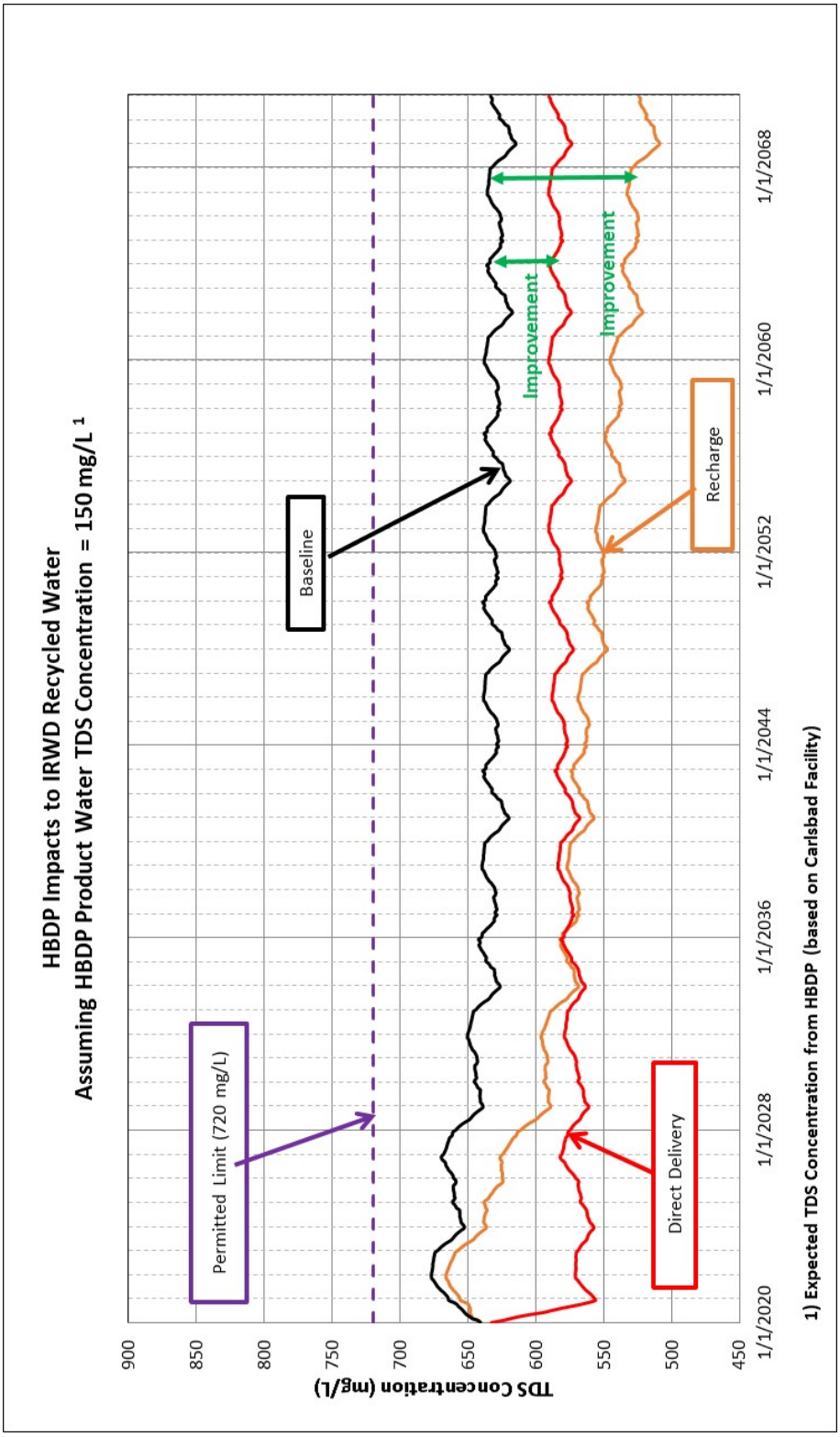

Figure 2 - HBDP Impacts to IRWD Recycled Water Assuming HBDP Product Water Chloride Concentration = 75 mg/l

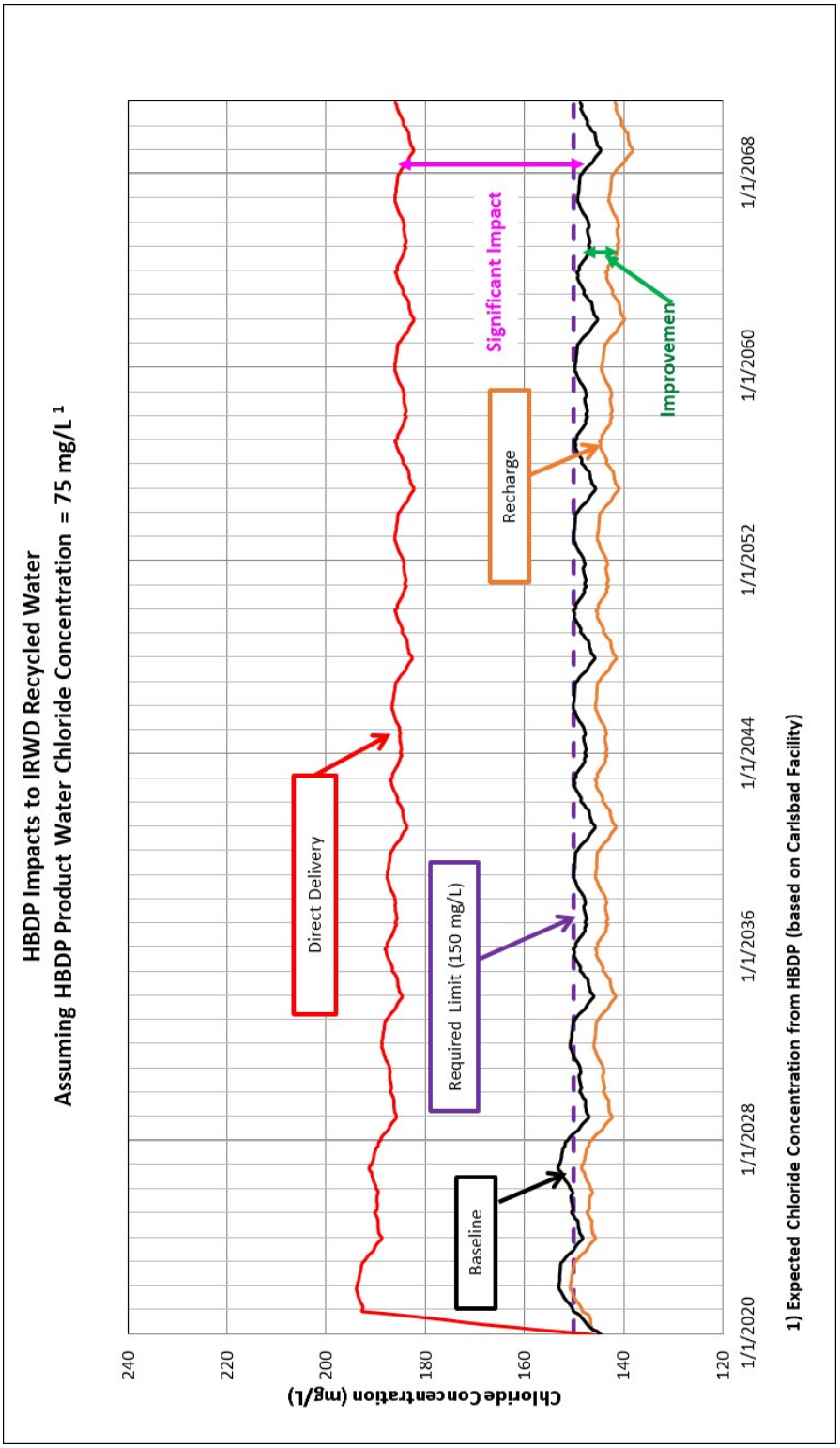

Figure 3 - HBDP Impacts to IRWD Recycled Water Assuming HBDP Product Water Boron Concentration = 0.75 mg/l

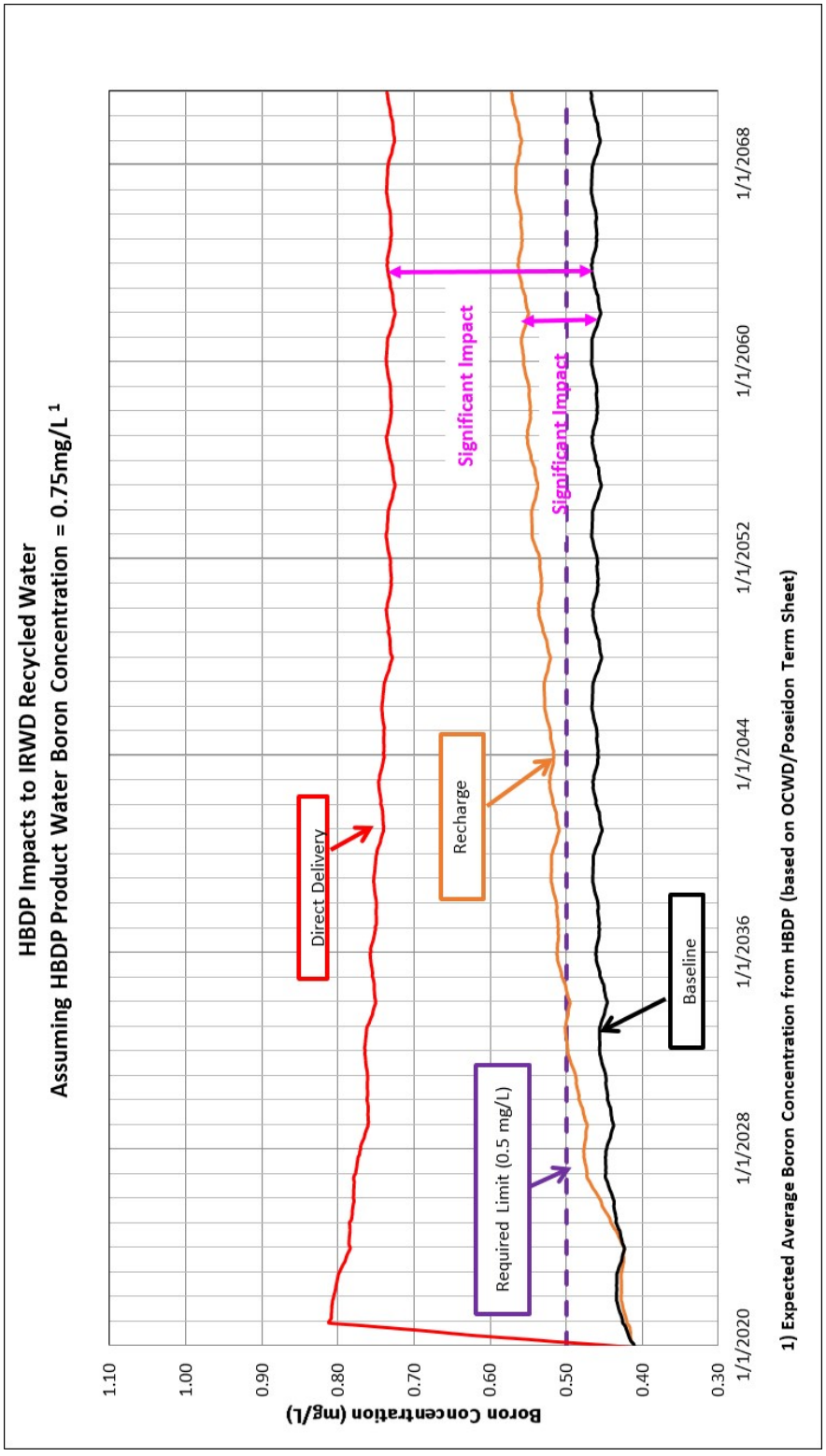

Figure 4 - HBDP Impacts to IRWD Potable Water Assuming HBDP Product Water TDS Concentration = 150 mg/l

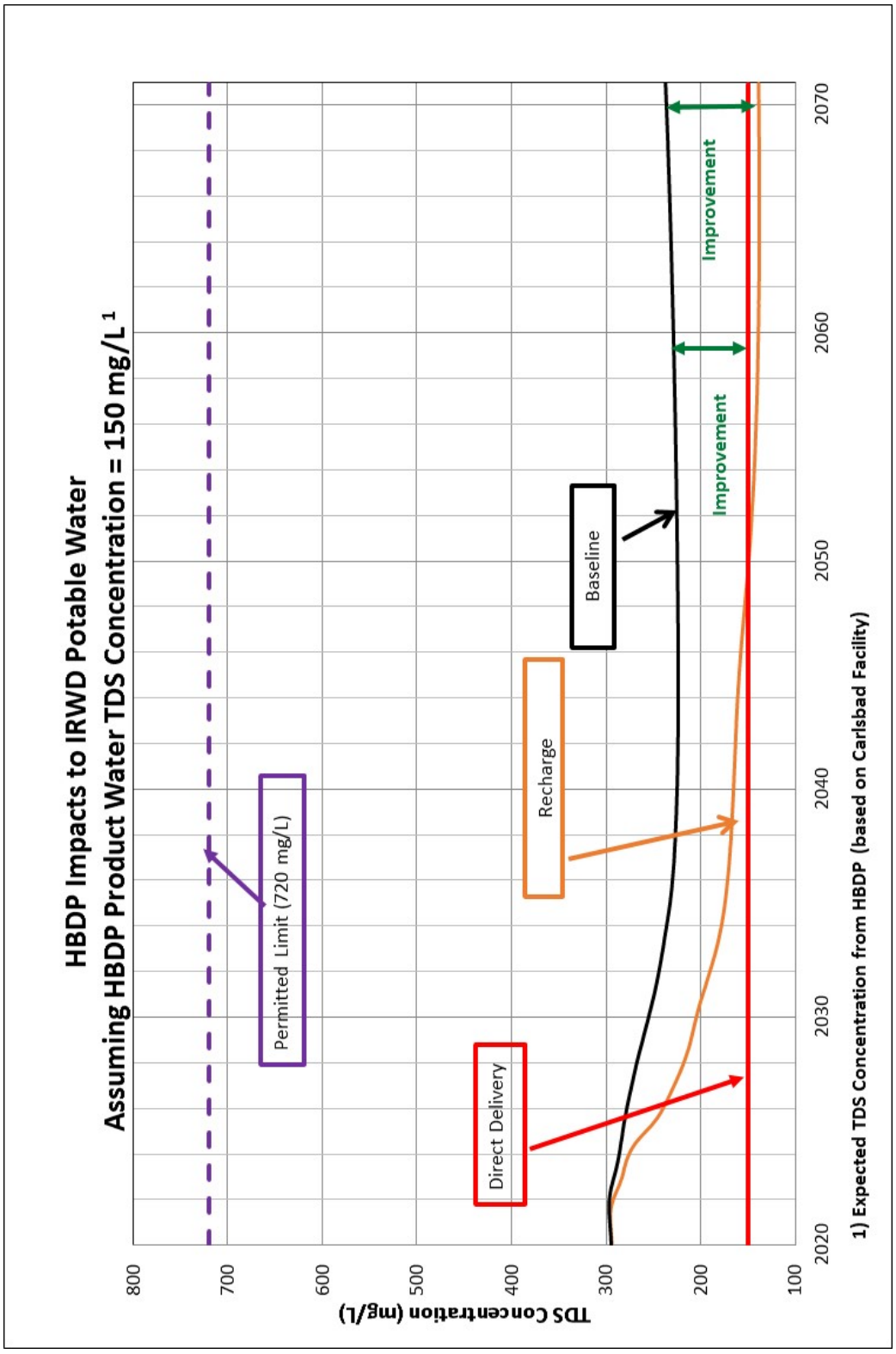

Figure 5 - HBDP Impacts to IRWD Potable Water Assuming Product Water Chloride Concentration = 75 mg/l

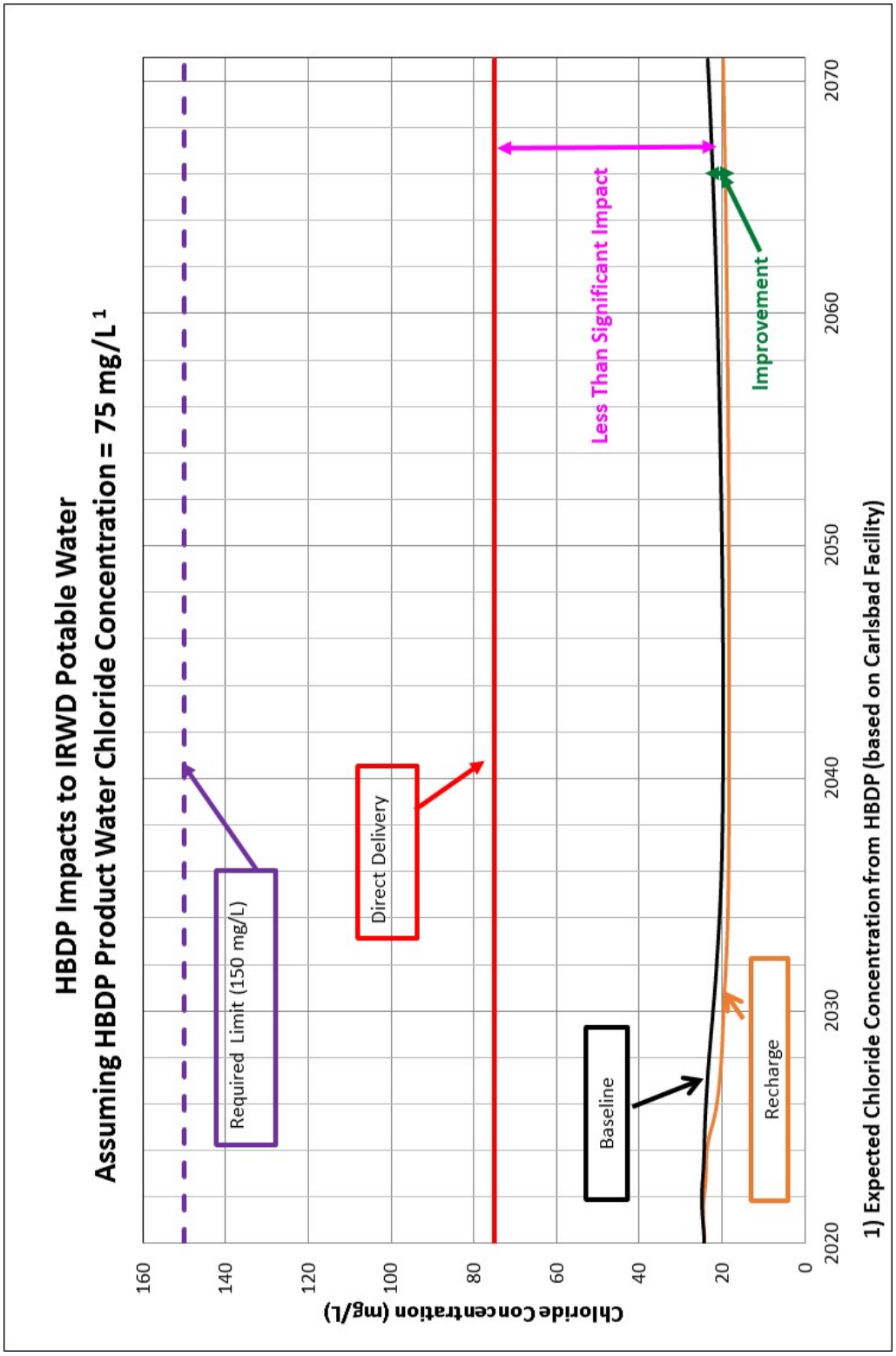

Figure 6 - HBDP Impacts to IRWD Potable Water Assuming HBDP Product Water Boron Concentration = 0.75 mg/l

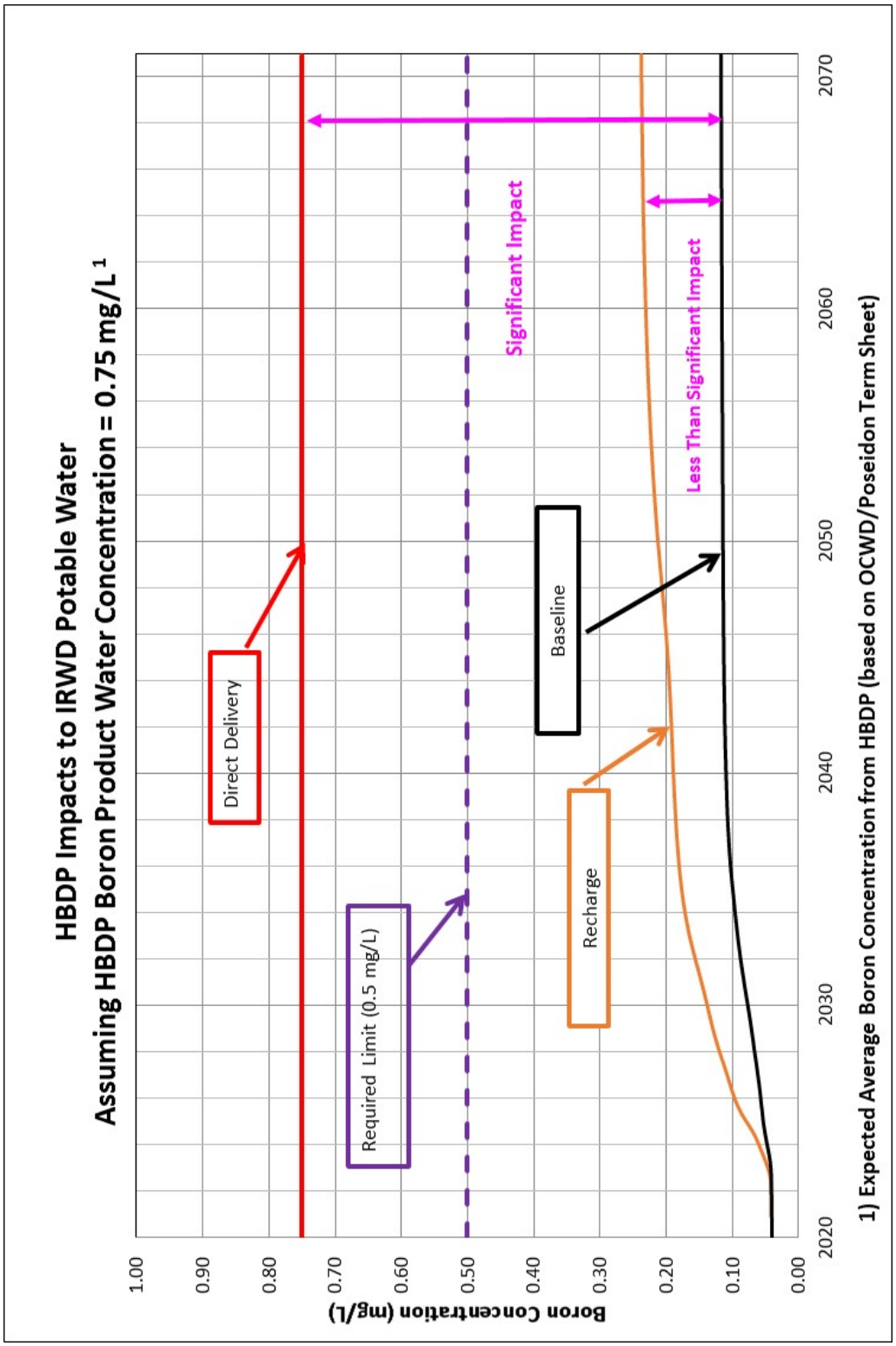

Figure 7 - Sensitivity Analysis: Recharge Impact to IRWD Recycled Water Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l

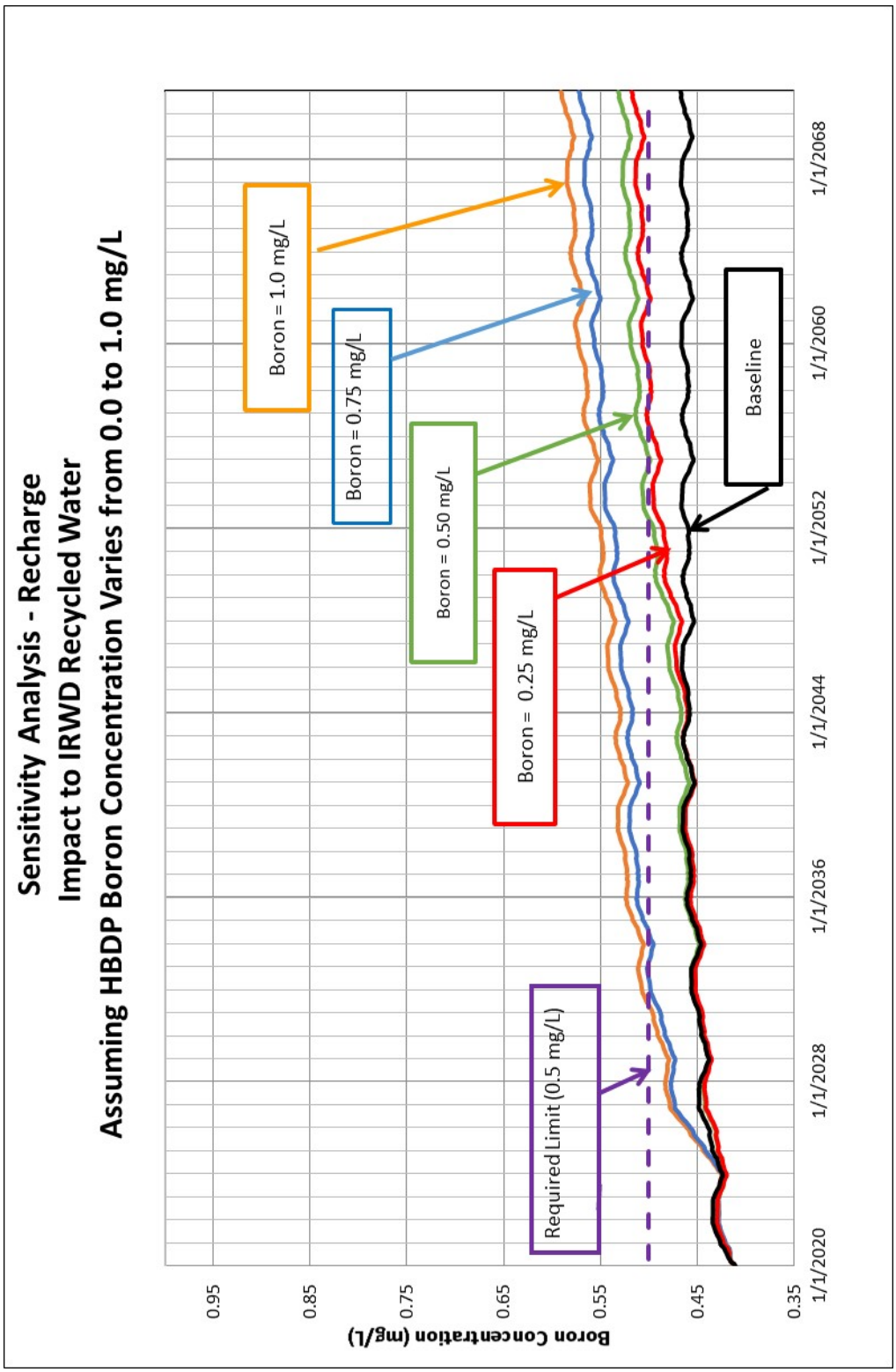

Figure 8 - Sensitivity Analysis: Direct Delivery Impact to IRWD Recycled Water Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l

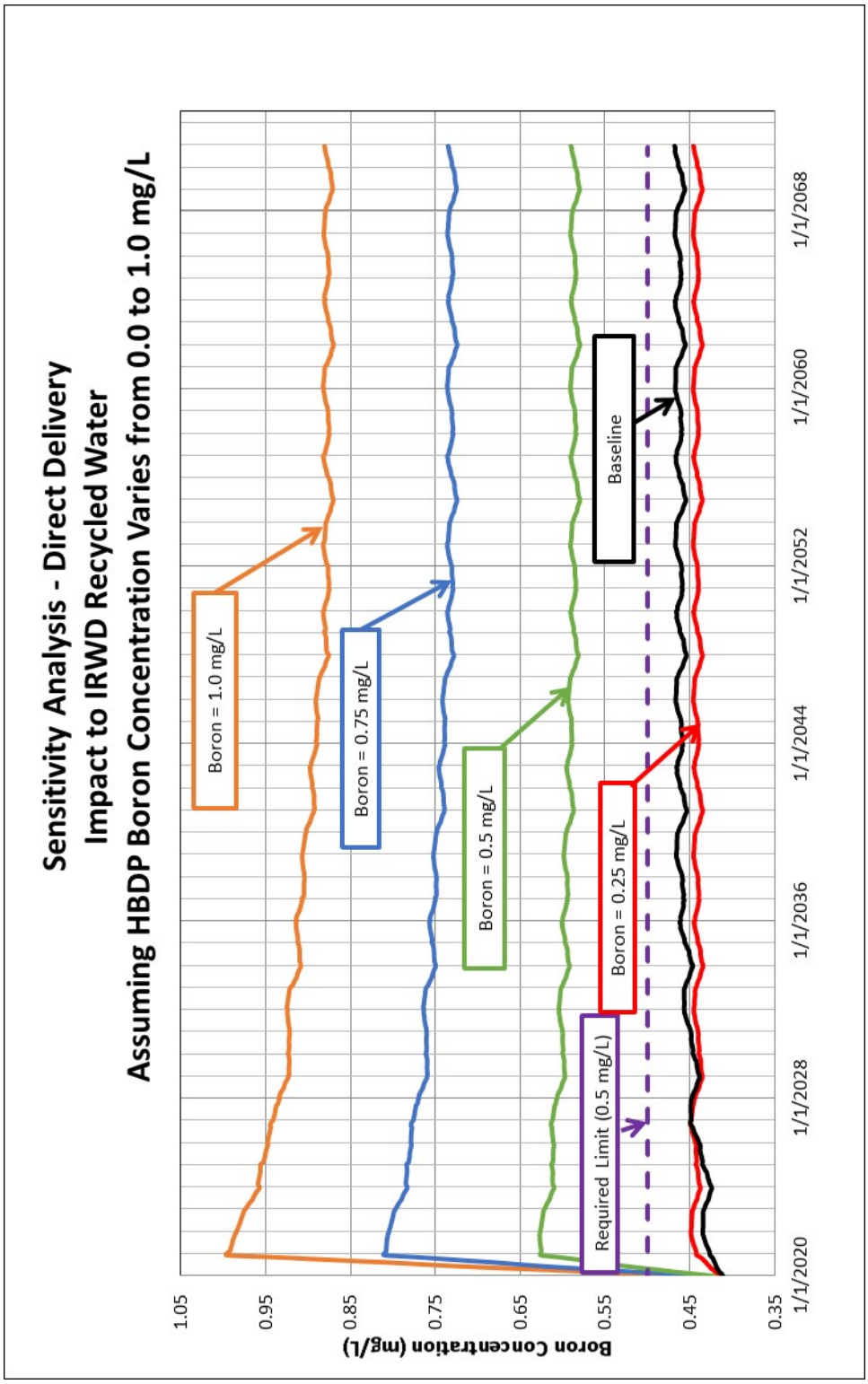

Figure 9 - Sensitivity Analysis: Recharge Impact to IRWD Potable Supply Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l

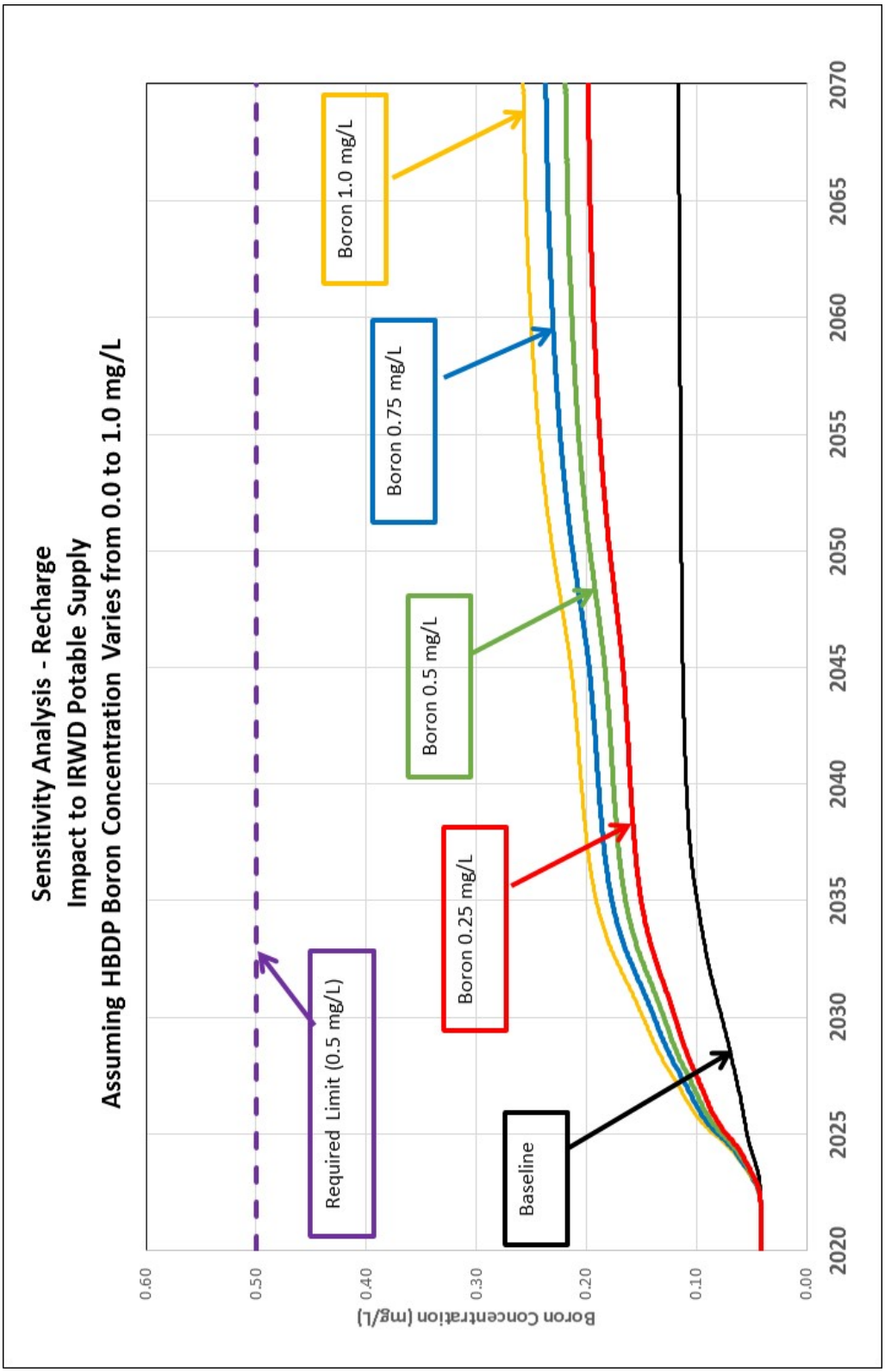

Figure 10 - Sensitivity Analysis: Direct Delivery Impact to IRWD Potable Supply Assuming HBDP Boron Concentration Varies from 0.0 to 1.0 mg/l