



SUMMARY OF HISTORICAL MANAGEMENT OF THE PASADENA SUBAREA

INTRODUCTION

The Raymond Basin Management Board (RBMB) adopted Resolution 42-0109 during January 2009, establishing a self-imposed reduction ramp-down of 30 percent to the Raymond Basin 1955 Decreed Rights for the “Pasadena Subarea”, to help address decreasing groundwater levels and to reduce accumulated Long-term Storage. The 30 percent reduction ramp-down in total pumping was fully applied by fiscal year 2013-14 and has been in place continuously since then. Separately, in response to a request from Kinneloa Irrigation District (KID), the RBMB adopted Resolution 47-0415 during April 2015, establishing a Short-term Storage Program for the Pasadena Subarea for Producers without alternative imported sources of water supply, which may require flexibility to balance pumping rights with water demands.

During 2016, Kinneloa Irrigation District submitted a request to RBMB, in a memorandum dated March 7, 2016, requesting an evaluation be performed to develop and “Operating Plan” for the Pasadena Subarea. KID suggested the Operating Plan include a “Key Well” to monitor water level trends, an annual flexible “Operating Safe Yield” instead of the fixed 30 percent roll-back of the 1955 Decreed Rights, and possibly reinstate Long-Term Storage. The KID proposal was presented at the May 10, 2016 Pumping and Storage (P&S) Committee meeting, at which time the RBMB staff was requested to prepare a Scope of Work and Budget to develop a brief summary of prior studies that have been prepared on management and water supply of the Pasadena Subarea. Subsequently, during the February 2, 2017 P&S Committee meeting, RBMB staff was authorized to proceed with the summary and prepare a Technical Memorandum.

The purpose of this Technical Memorandum is to provide background on historical water rights and management of the Pasadena Subarea, and the potential need for a modification of the existing management practices. The Technical Memorandum summarizes legal documents and prior reports which have quantified the Safe Yield of the Pasadena Subarea prior to, and since, the Raymond Basin Judgment was entered in 1944.

SUMMARY OF PRIOR DOCUMENTS

1943 Report of Referee

The California Department of Public Works, Division of Water Resources served as Referee for the Raymond Basin adjudication and published the draft “Report of Referee”, on March 15, 1943. The analysis was based on conditions as of 1937-38 and consisted of an 11-year study period from 1927-28 through 1937-38, inclusive. The average annual rainfall for the 11-year study period was 21.54 inches (based on numerous rainfall stations), as noted on page 78 of the Report of Referee. Over that same period of time, for comparison purposes, the average annual rainfall at Station 610B (Pasadena) was 20.8 inches indicating rainfall at solely Station 610B is representative of the regional average. (The long-term (90-year) average annual rainfall at Station 610B is 20.0 inches.) Consequently, the rainfall that was used for the hydrologic evaluation in the Report of Referee is still reasonable. Table 37 of the “Report of Referee” (see Attachment A), notes the “Safe Yield and Overdraft with Present Development” is 17,970 acre-feet for the Western Unit, consisting of 6,060 acre-feet for the Monk Hill Subarea and **11,910** acre-feet for the Pasadena Subarea. The Report of Referee also noted in Table 39, the estimated safe yield “with ultimate development” was **10,750** acre-feet.

1944 Judgment

The Raymond Basin Judgment was entered on December 23, 1944 (see Attachment B). Section I of the Judgment states in part “...the safe yield of said Western Unit is 18,000 acre-feet per year.” This is consistent with the Report of Referee, which identified the safe yield of the Western Unit (Monk Hill and Pasadena) as 17,970 acre-feet.

Section IV of the Judgment states the total “unadjusted rights” of the Western Unit is 25,608 acre-feet. Section V of the Judgment states “...in order to maintain and protect the supply of water in the ground in said Raymond Basin Area, it is necessary that the respective parties to this action be limited in the exercise of their respective present unadjusted rights, and the right, so limited, in acre feet per year, of each party to pump water from wells or otherwise take water from the ground, in the Western Unit, is as set forth in the table at the end of this paragraph V, ...said right, for convenience, is designated the ‘decreed right.’ That in said Western Unit the amount of the decreed right of each party hereby is determined by reducing the present unadjusted right of each party as tabulated in paragraph IV hereof, in the proportion that the safe yield of said unit (18,000 acre-feet) less the water taken therein by non-parties hereto (340

acre-feet), bears to the aggregate of such rights of the parties hereinto in said unit.” In other words, the 1944 Decreed rights of the Western Unit are 17,660 acre-feet (18,000 – 340). The Pasadena Subarea’s Decreed Rights are **11,621** acre-feet and the Monk Hill Subarea’s Decreed Rights are 6,039 acre-feet for the for a total of 17,660 acre-feet.

1955 Decreed Rights

In an order dated April 29, 1955, the Court modified the Decreed Rights of the Western Unit to 25,332.0 acre-feet, consisting of 17,843.0 acre-feet from the Pasadena Subarea and 7,489.0 acre-feet for the Monk Hill Subarea (see Attachment C). In comparison, the “unadjusted rights” of the Western Unit, as noted in Section IV of the 1944 Raymond Basin Judgment, were 25,608 acre-feet. Chapter II of the 1954-55 Raymond Basin Watermaster Annual Report notes “...the referee...found that under conditions prevailing in 1952 the safe yield of the Raymond Basin Area had substantially increased over the safe yield under 1938 conditions...”

The 1944 Decreed Rights were based on hydrologic conditions between 1927-28 and 1937-38. The average annual rainfall for the 11-year study period (1927-28 to 1937-38) based on numerous rainfall stations was 21.54 inches, as noted on page 78 of the 1943 Report of Referee. Over that same period of time, for comparison purposes, the average annual rainfall at Station 610B (Pasadena) was 20.8 inches indicating rainfall at solely Station 610B is representative of the regional average.

The 1955 Decreed Rights were based on hydrologic conditions between 1938-39 and 1949-50. Over the 12-year period of 1938-39 to 1949-50, the average annual rainfall at Station 610B (Pasadena) was 21.1 inches. (The long-term (90-year) average annual rainfall at Station 610B is 20.0 inches.) Although the precipitation during the study period for the 1944 Decreed Rights and the 1955 Decreed Rights were about the same, the 1955 Judgment modification effectively increased the Decreed Rights in the Pasadena Subarea by about 54 percent (17,843/11,621).

Page 77 of the 1954 Report of Referee states in part “...the increase in safe yield from 1937-38 to the present is the result of a large increase in the amount of applied water, with no corresponding increase in consumptive use and with but small increase in sewage outflow. The growth in residential type development, still not connected to sewers, is believed to be largely responsible for this condition. The continuing expansion of sewerage facilities and increase in connections thereto suggests the probability that the volume of sewage outflow may, at some time in the future, increase more rapidly than the amount of applied water, in which case the present safe yield would decline...” (Emphasis added.) It appears the 1954 Report of Referee anticipated potential changed conditions which could have justified future review and reduction of the safe yield, which never occurred

Baseline Ground Water Assessment (2004)

In a report entitled “Baseline Ground Water Assessment of the Raymond Basin” (Baseline Study), dated February 2, 2004 (see Attachment D for Executive Summary), the “...current conditions and basin management...” were evaluated. The report noted on page ES-3, “the RBMB needed a baseline evaluation of the Basin before MWD begins to store up to a maximum of 75,000 acre-ft. in the Raymond Basin through the Raymond Basin Conjunctive Use Project...” The Baseline Study period was from 1983 to 2002. Over the 20-year period of 1983 to 2002, the average annual rainfall at Station 610B (Pasadena) was 20.8 inches. The Baseline Study did not quantify the safe yield of the Western Unit. However, on page ES-8 it stated “... despite increases in spreading (between 1983 and 2002), the volume of ground water in storage has decreased by 112,600 acre-ft. from 1983 to 2002.” The Baseline Study quantified basin replenishment, subsurface flow, ground water levels, groundwater production, change in storage and groundwater quality.

The Baseline Study recommended 1) “...future management of the ground water resources in the Raymond Basin be conducted based on both ground water levels and safe yield...”, 2) ten new wells for groundwater level and water quality data monitoring, and 3) conduct an annual groundwater audit. The Baseline Study clarified a water audit “... involves evaluating ground water level trends, production rates, ground water quality or other aquifer/well/pump considerations from the previous year. This information is used to make recommendations for pumping in the following year.” The recommendations from the Baseline Study have not been implemented. A water audit has not been used and pumping has been based on the Decreed Rights (or agreed upon modifications thereto.)

Evaluation of Groundwater Production from Pasadena Subarea (2007)

In a Technical Memorandum (TM) dated December 12, 2007, (see Attachment E), the groundwater production and water levels in the Pasadena Subarea were evaluated for the period 1910 to 2006. The TM noted the depth to groundwater was about 300 feet during the mid-1950s (at the time the 1955 Decreed Rights were established), as shown on Plate 7 of that TM. However, by 2006 the depth to groundwater fell to 400 feet to 450 feet below ground surface, reflecting a groundwater level decrease of 100 feet to 150 feet since the 1955 Decreed Rights were increased, as ordered by the Court. The TM evaluated the 1955 Decreed Rights, groundwater production, surface water spreading, precipitation, and groundwater levels. The TM concluded the net recharge (safe yield) of the Pasadena Subarea was **11,400** acre-feet, while average annual production was about 20,400 acre-feet. The estimated safe yield in the TM is consistent with the 1943 Report of Referee (**11,910** acre-feet) and the 1944 Decreed Rights (**11,621** acre-feet).

A supplemental TM dated April 14, 2008 (see Attachment F) was prepared as the result of peer review of the December 12, 2007 TM. Plate 3 of the April 2008 TM shows the depth to water at the Pasadena Water and Power "Woodbury Well" was about 250 feet around 2006. Plate 3 shows that had the 1944 Decreed Rights not been increased, the depth to water at the Woodbury Well would have been relatively constant around 250 feet. In addition, Plate 3 projected the depth to water would remain relatively stable at 350 feet over the next 20 years from calendar year 2006 through calendar year 2026, assuming annual production (and Decreed Rights) were reduced by 50 percent effective immediately (2008). Neither projection from Plate 3 reflected an increase in the groundwater levels. Groundwater levels were projected to continue to decrease assuming no changes were made.

RESOLUTION NO. 42-0109

In response to decreasing groundwater levels in the Pasadena Subarea and supported by the Baseline Study, and 2007 and 2008 TMs evaluating groundwater production in the Pasadena Subarea, the Pasadena Subarea pumpers supported, and the RBMB Board of Directors adopted, Resolution No. 42-0109 (see Attachment G) "Adopting a Cooperative Pumping Reduction Plan for the Parties with Water Rights in the Pasadena Subarea." The Resolution noted "... the Board has determined that the adjustment in Decreed Rights in 1955 was based on a snapshot of conditions during the first ten years the judgement was in place and represented roughly a 30% increase in allowable production rights. The re-determination of the Safe Yield in 1955, which results in an increase in production rights along with the adoption of the Long-Term Storage Policy by the Board in 1993 played a major role in lower overall groundwater levels the Pasadena Subarea is experiencing today."

The Resolution included Exhibit "A", which directed the 1955 Decreed Rights for the Pasadena Subarea (17,843 acre-feet) be reduced over a five-year period to 12,493 acre-feet, equating to a 30 percent reduction. (Although a reduction was implemented, the resulting water rights (12,493 acre-feet) are higher than the 1944 Decreed Rights of 11,621 acre-feet.) In addition, the balance in the Long-term Storage accounts were to be used for additional production and effectively eliminated.

Each year between fiscal year 2009-10 through fiscal year 2013-14, the Pasadena Subarea Decreed Rights were gradually reduced such that as of fiscal year 2013-14, the total rights were 12,493 acre-feet. Producers were allowed to use water from their Long-Term Storage accounts on an annual basis to address production between the reduced Decreed Rights up to their 1955 Decreed Rights, until such time the water in the Long-Term Storage account was exhausted. The reduction in 1955 Decreed Rights are to remain in effect until the groundwater level at Pasadena Water and Power's (PWP's) Woodbury Well (or Monte Vista Well) increased by 50 feet above "current" levels, which was identified at about elevation 410 feet above mean sea level. Consequently, the groundwater would need to increase to about elevation 460 feet

above mean seal level. As of June 2016, the groundwater elevation at the Monte Vista Well was about 399 feet above mean sea level.

The “30 percent” reduction was fully implemented as of fiscal year 2013-14. In separate staff reports dated May 31, 2012 and March 23, 2015 (see Attachments H and I), the “Cooperative Pumping Reduction Plan for the Pasadena Subarea” was evaluated. Average annual production for fiscal years 2005-06 through 2009-10 (essentially preceding the implementation of the “30 percent” reduction) was 18,779 acre-feet. Average annual production for the period 2013-14 to 2015-16 was 14,735 acre-feet, indicating the “30 percent” reduction has had the desired impact of reducing production from the Pasadena Subarea.

The “30 percent” reduction water rights are 12,493 acre-feet, while production averaged 14,735 acre-feet. It indicates Long-Term Storage account water is gradually being dissolved, which was one of the stated objectives of the “30 percent” reduction. As of June 30, 2009 the Long-Term Storage was 27,016 acre-feet and by June 30, 2016 Long-Term Storage was 23,934 acre-feet Despite the reduced production, the recent drought has resulted in below-average stormwater replenishment. Consequently, the static water level at the Monte Vista Well as of June 2016, was about 399 feet above mean sea level, which is significantly below the 50-foot increase goal of 460 feet above mean sea level.

CORPS OF ENGINEERS STUDY

The Foothill Water Coalition (including the RBMB) entered into an agreement with the United States Army Corps of Engineers (USACE) for the Foothill Communities Water Supply Reliability Study. A component of that study is the Raymond Basin Stormwater Capture Program. Preliminary results were published in a report dated January 26, 2011, and were summarized in the Executive Summary (see Attachment J). The study did not address the safe yield, but instead modeled the potential impacts of a variety of groundwater replenishment scenarios. The “baseline” (no projects) computer model run indicated groundwater levels could decrease by up to 40 feet in the southeasterly portion of the Pasadena Subarea, but increase by up to 30 feet in the southwesterly portion of the Pasadena Subarea.

Four scenarios were modeled, assuming a variety of new groundwater replenishment projects. In particular, “Scenario 2” evaluated the impact of replenishing additional stormwater from the Devil’s Gate/Eaton Canyon Pipeline project. The planning horizon from the computer model was 2032. The computer model simulations indicated the average annual additional stormwater replenishment would be about 3,054 acre-feet per year. The computer model indicated “...the change in groundwater levels by 2032 is predicted to improve (i.e., either increase more or decrease less) ...” Compared to a “no project” scenario, additional groundwater replenishment under Scenario 2 would

result in a decrease of 20 feet in the southeasterly portion of the Pasadena Subarea (compared to a 40-foot decrease with “no project”) and an increase of 60 feet on the southwest (compared to an increase of 30 feet with “no project”). An important takeaway from the study was that by 2032, portions of the Pasadena Subarea will still exhibit a decrease in groundwater levels, even with a potential Devil’s Gate/Eaton Canyon Pipeline Project.

SUMMARY

Since about 2007, the RBMB has reviewed the issues/concerns related to decreasing groundwater levels in the Pasadena Subarea. Recently, Kinneloa Irrigation District (KID) submitted a request to RBMB in a memorandum dated March 7, 2016, requesting an evaluation be performed to develop and “Operating Plan” for the Pasadena Subarea. KID suggested the Operating Plan include a “Key Well” to monitor water level trends, a flexible “Operating Safe Yield” instead of the fixed 30 percent roll-back of the 1955 Decreed Rights, and reinstatement of Long-term Storage. Subsequently, RBMB staff was requested to develop a brief summary of prior studies that historically had been prepared on management and water supply of the Pasadena Subarea.

The 1943 Report of Referee, determined the Safe Yield of the Pasadena Subarea was 11,910 acre-feet and the 1944 Raymond Basin Judgment noted the collective Decreed Rights of Parties in the Pasadena Subarea 11,621 acre-feet. The Court authorized a review of the hydrologic conditions over the 12-year period of 1938-39 to 1949-50. Based on findings from that safe yield analysis, the 1955 Decreed Rights for the Pasadena Subarea were increased to 17,843.0 acre-feet. In general, the depth to groundwater in the Pasadena Subarea was about 300 feet during the mid-1950s (at the time the 1955 Decreed Rights were established), as shown on Plate 7 of the 2007 TM (see Attachment E). However, by 2006 the depth to groundwater was 400 feet to 450 feet, reflecting a groundwater level decrease of 100 feet to 150 feet since the 1955 Decreed Rights were ordered by the Court. The 2007 TM evaluated the 1955 Decreed Rights, groundwater production, surface water spreading, precipitation, and groundwater levels. The TM concluded the net recharge (safe yield) of the Pasadena Subarea was 11,400 acre-feet, while average annual production was about 20,400 acre-feet.

In response to decreasing groundwater levels in the Pasadena Subarea and supported by the 2007 and 2008 TMs evaluating groundwater production in the Pasadena Subarea, the RBMB Board of Directors adopted Resolution No. 42-0109 (see Attachment G) “Adopting a Cooperative Pumping Reduction Plan for the Parties with Water Rights in the Pasadena Subarea.” Each year between fiscal year 2009-10 through fiscal year 2013-14, the Pasadena Subarea Decreed Rights were gradually reduced such that as of fiscal year 2013-14, the total rights were 12,493 acre-feet. Producers were allowed to use water from their Long-Term Storage accounts to address production between the reduced Decreed Rights up to their 1955 Decreed

Rights until such time the water in the Long-Term Storage account was exhausted. The reduction in 1955 Decreed Rights are to remain in effect until the groundwater level at Pasadena Water and Power's (PWP's) Woodbury Well (or Monte Vista Well) increased by 50 feet above "current" levels, which was identified at about elevation 410 feet above mean sea level. Consequently, the groundwater would need to increase to about elevation 460 feet above mean seal level. As of June 2016, the groundwater elevation at the Monte Vista Well was about 399 feet above mean sea level.

The RBMB also had the 2004 "Baseline Study" and the 2011 Stormwater Capture Program studies conducted. These studies did not calculate a safe yield for the Pasadena Subarea, but did recognize groundwater levels had been decreasing and may continue to decrease in the future.

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