United States Department of the Interior
BUREAU OF RECLAMATION
Lower Colorado Regional Office
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Boulder City, NV 89006-1470

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BCOO-4200
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CERTIFIED – RETURN RECEIPT REQUESTED

Mr. Steve B. Robbins
General Manager-Chief Engineer
Coachella Valley Water District
P.O. Box 1058
Coachella, CA 92236-1058

Subject: Transmittal of the Interim Determination by the Secretary of the Interior of the Quantity of Water Conserved by Reach 2 and Reach 3 of the All-American Canal Lining Project and the Amount of Water Available for Allocation (Secretarial Determination)

Dear Mr. Robbins:

Enclosed is the interim Secretarial Determination, which is developed in accordance with Section 204 of Public Law 100-675 and Article 5 of the Allocation Agreement Among the United States of America, The Metropolitan Water District of Southern California, Coachella Valley Water District, Imperial Irrigation District, San Diego County Water Authority, the La Jolla, Pala, Pauma, Rincon, and San Pasqual Bands of Mission Indians, the San Luis Rey River Indian Water Authority, the City of Escondido, and Vista Irrigation District.

If you have questions regarding the interim Secretarial Determination, please contact Ms. Ruth Thayer at 702-293-8426.

Sincerely,

Lorri Gray
Regional Director

Enclosure

Identical Letters Sent To (with enclosure):

Ms. Maureen A. Stapleton
San Diego County Water Authority
4677 Overland Avenue
San Diego, CA 92123-1233

Mr. Ed Smith
General Manager
Palo Verde Irrigation District
180 West 14th Avenue
Blythe, CA 92225-2889

Mr. Robert Pelcyger
Special Counsel
San Luis Rey River Indian Water Authority
1335 Marshall Street
Boulder, CO 80302

Mr. Brian J. Brady
General Manager
Imperial Irrigation District
P.O. Box 937
Imperial, CA 92251

Mr. Roger K. Patterson
Assistant General Manager
The Metropolitan Water District
of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153

Mr. Gerald R. Zimmerman
Executive Director
Colorado River Board of California
770 Fairmont Avenue, Suite 100
Glendale, CA 91203-1035

**Interim Determination by the Secretary of the Interior of the Quantity of Water Conserved by the All-American Canal Lining Project Between Drops 1 and 2 and Between Drops 2 and 3 and the Amount of Water Available for Allocation**

## Introduction

Section 204 of Public Law (P.L.) 100-675 provides that the Secretary of the Interior is to determine the quantity of water conserved as a result of the All-American Canal Lining Project (AACLP) and that the Secretary may revise such determination at reasonable intervals. Section 204 requires that the determination of the quantity of water conserved by the AACLP and any revisions to such determination are to be made in consultation with the California Contractors[1] as defined in P.L. 100-675.

On October 10, 2003, an Allocation Agreement[2] was signed as part of the Quantification Settlement Agreement in California. Article 5.2 of the Allocation Agreement provides for the determination to be made at the completion of construction of the lining of each reach of the AACLP. A determination of the amount of water conserved by the AACLP between Drops 1 and 2 (Reach 2) and between Drops 2 and 3 (Reach 3) and the amount of water available for allocation from each reach is now required because construction of Reach 2 and Reach 3 has progressed to the point that water is being conveyed.

This document is the Secretary's interim determination of the quantity of water conserved as a result of the AACLP for Reach 2 and Reach 3 and the amount of water available for allocation (Secretarial Determination). This Secretarial Determination is effective upon the date of signature, but is temporary in nature, pending the completion of the construction of the AACLP and transfer of the facility to an operation and maintenance (O&M) status.

## Background

The Parallel Canal Alternative is the preferred alternative in the AACLP Final Environmental Impact Statement/Environmental Impact Report (FEIS/EIR), published in March 1994, and is the alternative that is selected within the AACLP Record of Decision (ROD) (May 1994). A reevaluation of the environmental assessments in the 1994 FEIS/EIR was published by the Bureau of Reclamation in January 2006, which did not alter the decision in the ROD to implement the construction of the Parallel Canal Alternative.

The new concrete lined canal is being constructed parallel to 23 miles of the earthen All-American Canal (AAC), beginning approximately 1.6 miles downstream of Pilot Knob and

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[1] California Contractors as defined by P.L. 100-675 includes the Palo Verde Irrigation District, the Imperial Irrigation District, the Coachella Valley Water District, and The Metropolitan Water District of Southern California.

[2] Allocation Agreement Among the United States of America, The Metropolitan Water District of Southern California, Coachella Valley Water District, Imperial Irrigation District, San Diego County Water Authority, the La Jolla, Pala, Pauma, Rincon, and San Pasqual Bands of Mission Indians, the San Luis Rey River Indian Water Authority, the City of Escondido, and Vista Irrigation District.

ending at Drop 3 according to the Parallel Canal Alternative. As of the date of this Secretarial Determination, the newly constructed Reach 2 and Reach 3 have been completed to the point of conveying water. Reach 2 and Reach 3 of the AACLP have not been transferred from a construction status to an O&M status.

The amount of water conserved by the lining of Reach 2 and Reach 3 shall be based on the lined canal lengths as constructed. The amount of water conserved by lining Reach 2 and Reach 3 and available for allocation each year is calculated to be greater than the amounts included in Exhibit A of the Allocation Agreement for these reaches due to lining differences that are discussed below.

**Unlined Canal Seepage**

The FEIS/EIR for constructing replacement concrete-lined canal sections of the AAC was published by Reclamation and the Imperial Irrigation District in March 1994. The draft Geohydrology Appendix was completed by Reclamation in May 1991 and published in March 1994.

The amount of seepage for the unlined portion of Reach 2 will be calculated from the point at which the concrete lining begins. The concrete lined section of Reach 2 as constructed is 1,380 feet less than the distance used to calculate the amount of seepage from the AAC in the Geohydrology Appendix (lining begins approximately 2,550 feet downstream of Drop 1).

The concrete lined section of Reach 2 replaces 16,720 feet of unlined canal with an estimated seepage rate of 0.47 feet per day (ft/day), and 8,220 feet of unlined canal with an estimated seepage rate of 0.34 ft/day. The estimated seepage rate for Reach 2 is not uniform because one section of this reach is in partial hydraulic connection with the water table, while a separate section of the reach is in full hydraulic connection with the water table. Based on these lengths and the associated seepage rates, the annual seepage from the unlined Reach 2 is 16,511.80 acre-feet per year. The calculation of the amount of seepage is described in Appendix 1 of this Secretarial Determination.

Annual seepage from Reach 3 of the unlined AAC was estimated at 7,415 acre-feet per year in the Geohydrology Appendix.

**Concrete Lined Canal Seepage**

When the FEIS/EIR was prepared, it was estimated that the seepage rate through the concrete lining is 0.07 ft/day, which is equivalent to 0.07 cubic feet per day per square foot of wetted perimeter. This seepage rate was applied to the entire lined length of the Parallel Canal Alternative.

**Discussion**

The seepage rate used to estimate seepage from the newly lined Reach 2 and Reach 3 for this Secretarial Determination is 0.07 ft/day.

The seepage from the unlined Reach 2 of the AAC is estimated to be 16,511.80 acre-feet per year. Based on 0.07 ft/day seepage through the lining, seepage from the lined portion of Reach 2 is estimated to be 1,983.20 acre-feet per year (Appendix 2). The difference between the two estimates (as adjusted for decreased evaporation) results in 14,760 acre-feet per year of conserved water from Reach 2.

The seepage from the unlined Reach 3 of the AAC is estimated in the Geohydrology Appendix to be 7,415 acre-feet per year. Based on 0.07 ft/day of seepage through the lining, seepage from the lined portion of Reach 3 is estimated to be 2,305 acre-feet per year (Appendix 3). There is an additional decrease in conserved water for Reach 3 of 2,000 acre-feet per year due to induced seepage below Drop 3 (Exhibit A, Allocation Agreement). The difference between the two estimates (as adjusted for induced seepage and decreased evaporation) results in 3,320 acre-feet per year of conserved water from Reach 3.

Calculation of conserved water amounts for periods of less than 1 year shall be calculated according to the methodology that is included in Appendix A of the Allocation Agreement.

**Secretarial Determination of the Water Conserved by the Works of the AACLP and Available for Allocation**

After consultation with the California Contractors, and in accordance with Section 204 of P.L. 100-675 and Section 5.3 of the Allocation Agreement, the quantity of water conserved by the AACLP and the amount of water available for allocation as a result of the AACLP is determined as follows:

1. In accordance with Section 204 of P.L. 100-675, the Secretary, after consultation with the California Contractors, may revise this Secretarial Determination at reasonable intervals based on such information as the Secretary deems appropriate. In accordance with Section 5.3 of the Allocation Agreement, the Secretary will, at a minimum, revisit this Secretarial Determination at the completion of construction of the AACLP.

2. The quantity of water conserved by lining Reach 2 through the term of this Secretarial Determination is determined to be 14,760 acre-feet per year. The quantity of water conserved by lining Reach 3 through the term of this Secretarial Determination is determined to be 3,320 acre-feet per year.

3. The amount of water available for allocation as a result of lining Reach 2 of the AACLP each year shall be 14,760 acre-feet per year.

4. The amount of water available for allocation as a result of lining Reach 3 of the AACLP each year shall be 3,320 acre-feet per year.

5. The amount of water allocated to the San Diego County Water Authority (SDCWA) each year shall be the amount of water available for allocation from Reach 2 and

Reach 3 of the AACLP minus the amount delivered for the benefit of the San Luis Rey Settlement parties pursuant to Article 7 of the Allocation Agreement, and minus the amount, if any, delivered to the Imperial Irrigation District (IID) under Article 9 of the Allocation Agreement.

6. During 2008, calculation of the amount of water conserved in Reach 2 began on June 12, 2008. The amount of water available for allocation as a result of lining Reach 2 in 2008 is 8,128 acre-feet. Pursuant to Article 7 of the Allocation Agreement, the Secretary shall deliver for the benefit of the San Luis Rey Settlement Parties 17 percent of the water determined to be available for allocation as a result of the AACLP.

7. During 2008, the Secretary shall allocate 1,382 acre-feet of water for the benefit of the San Luis Rey Settlement Parties as a result of lining Reach 2 of the AACLP.

8. During 2008, the Secretary shall allocate 6,746 acre-feet of water to SDCWA as a result of lining Reach 2 of the AACLP.

9. During 2008, calculation of the amount of water conserved in Reach 3 began on October 6, 2008. The amount of water available for allocation as a result of lining Reach 3 in 2008 is 770 acre-feet. Pursuant to Article 7 of the Allocation Agreement, the Secretary shall deliver for the benefit of the San Luis Rey Settlement Parties 17 percent of the water determined to be available for allocation as a result of the AACLP.

10. During 2008, the Secretary shall allocate 131 acre-feet of water for the benefit of the San Luis Rey Settlement Parties as a result of lining Reach 3 of the AACLP.

11. During 2008, the Secretary shall allocate 639 acre-feet of water to SDCWA as a result of lining Reach 3 of the AACLP.

12. Notwithstanding the above, beginning in 2009, of the quantity of water conserved by the lining of Reach 2 and Reach 3 of the AACLP each year during the term of this Secretarial Determination, the Secretary shall allocate at least 3,074 acre-feet for the benefit of the San Luis Rey Settlement parties and 15,006 acre-feet to the SDCWA, minus the amount, if any, delivered in excess of 3,074 acre-feet for the benefit of the San Luis Rey Settlement parties, and minus the amount, if any, delivered to IID under Article 9 of the Allocation Agreement.

Lori Gray

Lorri Gray
Regional Director

2/6/09

Date

## References

Bookman-Edmonston in Association with MWH, All-American Canal Lining Project, Drawings for the Construction of the All-American Canal Lining Project, June 2006.

Bureau of Reclamation, All-American Canal Lining Project, Final Environmental Impact Statement/Environmental Impact Report, March 1994.

Bureau of Reclamation, All-American Canal Lining Project, Final Environmental Impact Statement/Environmental Impact Report, Geohydrology Appendix, March 1994.

Bureau of Reclamation, All-American Canal Lining Project, Supplemental Information Report, January 2006.

Bureau of Reclamation, Lower Colorado River Accounting System, Evapotranspiration and Evaporation Calculations, Calendar Years 2004-2007.

**Appendix 1: Calculation of Seepage Reduction**
**All American Canal Lining Project Between Drops 1 and 2 (Reach 2)**
**Unlined Canal Seepage**

**Length of canal left unlined downstream of Drop 1:**

Upstream edge of Drop 1 = Station (sta) 1905+70 (Original station and Reach 2 new canal station)
Downstream edge of Drop 1 = sta 1908+50 (Drop 1 is 280 ft long)
Beginning of lining downstream of Drop 1 = sta 1934+00
Length left unlined = 2,550 ft (1934+00 minus 1908+50)

**Unlined canal seepage replaced by lined canal:**

Canal lengths and seepage rates listed below are from of Table 3 in the Geohydrology Appendix

- Hydraulically connected section begins 1,760 ft downstream of Drop 1 (begins sta 1926+10)
- Length of connected section is 8,476 ft (ends sta 2010+86)
- Stationing "equation" adjustment of 531 ft, not accounted for in the Geohydrology Appendix, is in the hydraulically disconnected reach (adjustment at sta 2016+81.3)
- Wetted perimeter = 183.8 feet (ft)

Connected section length replaced by lined canal = 8,476-(2,550-1,760) = 7,686 ft

- Seepage at 0.34 feet per day per square foot = 4,024.67 acre-feet per year (af/yr)

Disconnected section length replaced by lined canal = 16,720 + 531 = 17,251 ft

- Seepage at 0.47 feet per day per square foot = 12,487.13 af/yr

**Total seepage from unlined Reach 2:** 16,511.80 af/yr

**Appendix 2: Calculation of Seepage Reduction and Amount of Water Conserved**
**All American Canal Lining Project Between Drops 1 and 2 (Reach 2)**
**Lined Canal Seepage (0.07 feet/day)**

**Length of lined canal between Drops 1 and 2:** 25,576.3 ft
(stations 1934+00 to 2189+76.30)

**Unlined canal seepage:** 16,511.80 af/yr (Appendix 1)

**Length of lined canal sections between Drops 1 and 2:**

Section 1: sta 1934+00 to 1942+50 = 850 ft (prism approximates old unlined canal)
Section 2: sta 1942+50 to 1943+60 = 110 ft (transition to lined canal prism)
Section 3: sta 1943+60 to 2188+66.30 = 24,506.3 ft (lined canal prism)
Section 4: sta 2188+66.30 to 2189+76.30 = 110 ft (transition from lined canal prism to Drop 2)

**Wetted perimeter of lined canal sections between Drops 1 and 2:**
(d = design water depth, ss = side slope, bw = bottom width, wp = wetted perimeter)

Section 1* = 186.0 ft (d = 15.24, ss = 2.0:1, bw = 118 ft, wp = 186.0 calculated with AutoCad)
Section 2 = 158.1 ft (used average of sections 1 and 3)
Section 3 = 130.1 ft (d = 19.91, ss = 1.75:1, bw = 50 ft, wp = 130.1 calculated with AutoCad)
Section 4 = 158.1 ft (used average of sections 1 and 3)

* Section 1 maintains the unlined canal dimensions, with the exception that the design water depth for the canal after lining is 15.24 ft versus the design water depth of 14.73 ft for the canal prior to lining.

**Seepage of lined canal sections:** Wetted perimeter x length x 0.07 feet/day x 365/43,560

Section 1 = 92.73 af/yr
Section 2 = 10.20 af/yr
Section 3 = 1870.07 af/yr
Section 4 = 10.20 af/yr
Total lined canal seepage = 1,983.20 af/yr

**Seepage reduction between Drops 1 and 2 (Reach 2):** (Seepage reduction is unlined canal seepage minus lined canal seepage)
**16,511.80 – 1,983.20 = 14,528.6 af/yr**
**(Round to 14,530 af/yr)**

**Adjustment for evaporation between Drops 1 and 2 (Reach 2) (See Appendix 4):**
(Evaporation adjustment is seepage reduction plus reduced evaporation)
**14,530 + 230 = 14,760 af/yr**

**Appendix 3: Calculation of Seepage Reduction and Amount of Water Conserved**
**All American Canal Lining Project Between Drops 2 and 3 (Reach 3)**
**Lined Canal Seepage (0.07 feet/day)**

**Length of lined canal between Drops 2 and 3:** 29,110.16 ft
(stations 2183+28 to 2474+38.16)
Note: Full length lined between Drops 2 and 3.

**Unlined canal seepage:** 7,415 af/yr (Table 3, Geohydrology Appendix, Final EIS, March 1994)

**Length of lined canal sections between Drops 2 and 3:**

Section 1: sta 2183+28 to 2184+38 = 110 ft (transition from Drop 2 to lined canal prism)
Section 2: sta 2184+38 to 2473+28.16 = 28,890.16 ft (lined canal prism)
Section 3: sta 2473+28.16 to 2474+38.16 = 110 ft (transition from lined canal prism to Drop 3)

**Wetted perimeter of lined canal sections between Drops 2 and 3:**
(d = design water depth, ss = side slope, bw = bottom width, wp = wetted perimeter)

Section 1 = 157.8 ft (average of old canal section* and section 2)
Section 2 = 134.8 ft (d=19.00, ss=2:1, bw=50 ft, wp calculated with AutoCad)
Section 3 = 157.8 ft (average of old canal section and section 2)
*Used wetted perimeter of old canal section (180.7 ft) downstream of Drop 2 for wetted perimeter of Drop 2 downstream edge and Drop 3 upstream edge (earth section no. 9, 1935 drawings, d=14.48, ss=2:1, bw=116)

**Seepage of lined canal sections:** Wetted perimeter x length x 0.07 ft/day x 365/43,560

Section 1 = 10.18 af/yr
Section 2 = 2284.25 af/yr
Section 3 = 10.18 af/yr
Total lined canal seepage = 2,304.61 af/yr

**Seepage reduction between Drops 2 and 3 (Reach 3):** (Seepage reduction is unlined canal seepage minus lined canal seepage)
**7,415 – 2,304.61 = 5,110.39 af/yr**
**(Round to 5,110 af/yr)**

**Adjustment for evaporation between Drops 2 and 3 (Reach 3) (See Appendix 4):**
(Evaporation adjustment is seepage reduction plus reduced evaporation)
**5,110 + 210 = 5,320 af/yr**

**Adjustment for induced increase in seepage below Drop 3: 5,320 – 2,000 = 3,320 af/yr**

## Appendix 4: Calculation of Evaporation Reduction
## All-American Canal Lining Project Between Drops 1 and 2 (Reach 2)

**Area of unlined canal replaced by lined canal between Drops 1 and 2**

Length of unlined canal replaced by lined canal = 24,937 ft
(Appendix 1: 7,686 ft plus 17,251 ft)
Width of water surface of unlined canal = 184.36 ft
(Drawing 212-D-249: Bottom width 118 ft plus 2 × 2 × 16.59 ft water depth)
Area of water surface of unlined canal replaced by lined canal = 105.54 acres
(24,937 ft × 184.36 ft ÷ 43,560 = 105.54)

**Area of lined canal between Drops 1 and 2**

Lining in original canal channel: Length = 850 ft. Water surface width = 179.0 ft
(Width = 118 ft bottom plus 2 × 2 × 15.24 ft water depth)
Water surface area in original canal channel = 3.49 acres
Inlet transition: Length = 110 ft. Water surface average width = 149.4 ft
(Width = average of lined original channel [179.0 ft] and new canal [119.7 ft])
Water surface area in inlet transition = 0.38 acres
Lining in parallel canal: Length = 24,506.3 ft. Water surface width = 119.7 ft
(Width = 50 ft bottom plus 2 × 1.75 × 19.91 ft water depth)
Water surface area in lined parallel canal = 67.34 acres
Outlet transition to Drop 2: Length = 110 ft. Water surface average width = 149.4 ft
(Width = average of unlined channel [179.0 ft] and lined canal [119.7 ft])
Water surface area in outlet transition to Drop 2 = 0.38 acres
Sum of water surface areas of lined canal = 71.59 acres

**Evaporation reduction between Drops 1 and 2**

The evaporation rate is based on Reference Evapotranspiration (ET) rates at two stations in the Imperial Irrigation District and two stations in the Yuma area for years 2004-2007, as reported in the Lower Colorado River Accounting System (LCRAS) report appendices for those years. The ET rates were converted to water surface evaporation rates using factors developed for the LCRAS program by Dr. Marvin E. Jensen. The average evaporation rate is approximately 6.8 feet per year.

Evaporation from unlined canal replaced by lined canal = 717.7 acre-feet
(105.54 acres × 6.8 ft of evaporation)
Evaporation from lined canal between Drops 1 and 2 = 486.8 acre-feet
(71.59 acres × 6.8 ft of evaporation)
Reduction in evaporation loss (difference) = 230.9 acre-feet

**Round to 230 af/yr.**

## Appendix 4: Calculation of Evaporation Reduction
## All-American Canal Lining Project Between Drops 2 and 3 (Reach 3)

**Area of unlined canal replaced by lined canal between Drops 2 and 3**

Length of unlined canal replaced by lined canal = 28,741 ft
(Drawings 212-D-249, -250: sta 2183+28 to sta 2470+69)
Width of water surface of unlined canal = 173.9 ft
(Drawing 212-D-249: Bottom width 116 ft plus 2 × 2 × 14.48 ft water depth)
Area of water surface of unlined canal replaced by lined canal = 114.74 acres
(28,741 ft × 173.9 ft ÷ 43,560 = 114.74)

**Area of lined canal between Drops 2 and 3**

Inlet transition: Length = 110 ft. Water surface average width = 150.0 ft
(Width = average of unlined canal [173.9 ft] and new canal [126.0 ft])
Water surface area of inlet transition = 0.38 acres
Lined parallel canal: Length = 28,890.16 ft. Water surface width = 126.0 ft
(Width = 50 ft bottom plus 2 × 2 × 19.0 ft water depth)
Water surface area of lined parallel canal = 83.57 acres
Outlet transition to Drop 3: Length = 110 ft. Average width = 150.0 ft
(Width = average of unlined channel [173.9 ft] and lined canal [126.0 ft])
Water surface area of outlet transition to Drop 3 = 0.38 acres
Sum of water surface areas of lined canal = 84.33 acres

**Evaporation reduction between Drops 2 and 3**

The evaporation rate is based on Reference Evapotranspiration (ET) rates at two stations in the Imperial Irrigation District and two stations in the Yuma area for years 2004-2007, as reported in the Lower Colorado River Accounting System (LCRAS) report appendices for those years. The ET rates were converted to water surface evaporation rates using factors developed for the LCRAS program by Dr. Marvin E. Jensen. The average evaporation rate is approximately 6.8 feet per year.

Evaporation from unlined canal replaced by lined canal = 780.2 acre-feet
(114.74 acres × 6.8 ft of evaporation)
Evaporation from lined canal between Drops 2 and 3 = 573.4 acre-feet
(84.33 acres × 6.8 ft of evaporation)
Reduction in evaporation loss (difference) = 206.8 acre-feet

**Round to 210 af/yr.**