

FORM APPROVED COUNTY COUNSEL  
 BY: GREGORY P. PRIAMOS  
 DATE: 4/16/15

Departmental Concurrence

**SUBMITTAL TO THE FLOOD CONTROL AND  
 WATER CONSERVATION DISTRICT BOARD OF SUPERVISORS  
 COUNTY OF RIVERSIDE, STATE OF CALIFORNIA**

602B



**FROM:** General Manager-Chief Engineer

**SUBMITTAL DATE:**  
 April 14, 2015

**SUBJECT:** Certify Final Programmatic EIR (SCH #2012041013); Adopt Resolution No. 2015-11 for the Moreno Master Drainage Plan Revision; Approve Moreno Master Drainage Plan (Revision No. 2; April 2014); Project No. 4-0-00828; District 5 [0]

**RECOMMENDED MOTION:** That the Board of Supervisors:

1. Certify the Final Programmatic Environmental Impact Report (SCH #2012041013), Adopt Findings of Fact, and a Statement of Overriding Considerations, in compliance with CEQA;
2. Adopt Resolution No. 2015-11 for the Moreno Master Drainage Plan (Revision No. 2; April 2014); and
3. Direct the Clerk of the Board to file the Notice of Determination with the County Clerk and the Office of Planning and Research within five days of Project approval.

**BACKGROUND:**

**Summary**

Continued on Page 2.

JMV:mcv  
 P8\168934

WARREN D. WILLIAMS  
 General Manager-Chief Engineer

FINANCIAL DATA	Current Fiscal Year:	Next Fiscal Year:	Total Cost:	Ongoing Cost:	POLICY/CONSENT (per Exec. Office)
COST	\$ N/A	\$ N/A	\$ N/A	\$ N/A	Consent <input type="checkbox"/> Policy <input type="checkbox"/>
NET DISTRICT COST	\$ N/A	\$ N/A	\$ N/A	\$ N/A	

**SOURCE OF FUNDS:**

Budget Adjustment: N/A  
 For Fiscal Year: N/A

**C.E.O. RECOMMENDATION:**

APPROVE

BY:   
 Steven C. Horn

**County Executive Office Signature**

**MINUTES OF THE FLOOD CONTROL AND WATER CONSERVATION DISTRICT**

On motion of Supervisor Benoit, seconded by Supervisor Jeffries and duly carried, IT WAS ORDERED that the above matter is approved as recommended.

Ayes: Jeffries, Tavaglione, Washington and Benoit  
 Nays: None  
 Absent: None  
 Abstained: Ashley  
 Date: April 14, 2015  
 xc: Flood, Recorder, Planning/Research

Kecia Harper-Ihem  
 Clerk of the Board

BY:   
 Deputy

- A-30
- Positions Added
- 4/5 Vote
- Change Order

Prev. Agn. Ref.:

District: 5<sup>th</sup>

Agenda Number:

11-2

**SUBMITTAL TO THE FLOOD CONTROL AND WATER CONSERVATION DISTRICT  
BOARD OF SUPERVISORS, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA**

**FORM 11:** Certify Final Programmatic EIR (SCH #2012041013); Adopt Resolution No. 2015-11 for the Moreno Master Drainage Plan Revision; Approve Moreno Master Drainage Plan (Revision No. 2; April 2014); Project No. 4-0-00828; District 5 [\$0]

**DATE:** April 14, 2015

**PAGE:** Page 2 of 2

**BACKGROUND:**

**Summary (continued)**

The District, working with the City of Moreno Valley, proposes to adopt the Moreno Master Drainage Plan Revision No. 2 dated April 2014 (MDP). Based on various studies and analyses of the watershed, the District determined the following:

1. The Moreno Valley area has experienced serious flooding problems in the past. As this area continues to develop, these damages are expected to increase.
2. A drainage system is required to safely convey storm runoff through the area with the least interruption to public services. The proposed MDP meets the project objectives and is the most economical of the alternatives studied.
3. The proposed Plan lends itself to a staged construction as funds become available.

Pursuant to CEQA and the State CEQA Guidelines, a programmatic EIR has been prepared for the Project, which studied the physical environmental impacts related to the Moreno Master Drainage Plan Revision. As described in the attached Resolution No. 2015-11, implementation of the MDP may generate project level short-term significant and unavoidable air quality impacts and cumulative significant and unavoidable air quality impacts, despite the implementation of all feasible mitigation.

**Impact on Residents and Businesses**

N/A

**ATTACHMENTS:**

1. Resolution No. F2015-11
2. Moreno MDP Report Revision No. 2 dated April 2014 [Exhibit "A"] (on CD)
3. CEQA Findings [Exhibit "B"] (on CD)
4. Mitigation Monitoring and Reporting Program (MMRP) [Exhibit "C"] (on CD)
5. Notice of Determination
6. Authorization to Bill for Notice of Determination CDFW Filing Fees
7. Final Programmatic EIR and related technical appendices for the Moreno MDP (on CD)

P8\168934

FORM APPROVED COUNTY COUNSEL  
BY:  AARON C. GETTIS DATE 4-6-15

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28

**BOARD OF SUPERVISORS**

**RIVERSIDE COUNTY FLOOD CONTROL  
AND WATER CONSERVATION DISTRICT**

**RESOLUTION NO. F2015-11**

**CERTIFYING THE FINAL PROGRAM ENVIRONMENTAL IMPACT  
REPORT FOR THE MORENO MASTER DRAINAGE PLAN REVISION  
(SCH #2012041013); ADOPTING ENVIRONMENTAL FINDINGS, A  
MITIGATION MONITORING AND REPORTING PROGRAM, AND A  
STATEMENT OF OVERRIDING CONSIDERATIONS PURSUANT TO  
THE CALIFORNIA ENVIRONMENTAL QUALITY ACT; AND  
APPROVING THE MORENO MASTER DRAINAGE PLAN REVISION**

WHEREAS, the Riverside County Flood Control and Water Conservation District (hereinafter referred to as the "District") is proposing Revision No. 2 to the Moreno Master Drainage Plan (MDP), which was originally approved October 1980 and later revised in April 1991 (Revision No. 1); and

WHEREAS, this Moreno MDP Revision (hereinafter referred to as the "Project") provides a variety of modifications to the existing MDP related to the size, type, and conceptual locations of drainage facilities and basins in order to improve flood protection for both existing users and future development within the Moreno watershed; and

WHEREAS, ultimately, the Project proposes the construction of approximately 30 miles of storm drains and channels, and approximately 82 acres of detention and debris basins, and also includes the administration of the MDP, and operation and maintenance of such facilities; and

WHEREAS, the Project is located in the city of Moreno Valley and the unincorporated County of Riverside; and

WHEREAS, the Moreno MDP Revision No. 2 report and map are attached herein as Exhibit "A"; and

1  
2 WHEREAS, pursuant to §21067 of the California Environmental Quality Act (CEQA)  
3 [Public Resources Code §21000 et seq.] and §15367 of the State CEQA Guidelines [14  
4 California Code of Regulations §15000 et seq.], the District is the lead agency for the Project;  
5 and

6  
7 WHEREAS, the District solicited comments, including input about the scope and content  
8 of the environmental review as well as potential feasible alternatives and mitigation measures,  
9 from responsible agencies, trustee agencies, and the public in a Notice of Preparation (NOP) for  
10 the Draft Program Environmental Impact Report (Draft PEIR) for the Project, which was filed on  
11 April 3, 2012 and circulated for a period of 30 days pursuant to State CEQA Guidelines  
12 §15082(a) and §15375; and

13  
14 WHEREAS, 10 comment letters and two late comment letters were received by the  
15 District in response to the NOP, which assisted the District in refining the issues for analysis in  
16 the Draft PEIR; and

17  
18 WHEREAS, pursuant to Public Resources Code §21083.9 and State CEQA Guidelines  
19 §15082(c) and §15083, the District held a public agency and public scoping meeting on April 19,  
20 2012, to solicit agency and public comments on the Draft PEIR for the Project; and

21  
22 WHEREAS, in compliance with CEQA and the State CEQA Guidelines, the District  
23 prepared a Draft PEIR (SCH #2012041013) to analyze the potential environmental effects of the  
24 Project; and

25  
26 WHEREAS, the Draft PEIR was completed and released for public review on May 22,  
27 2014, and the District initiated a 47-day public comment period by filing a Notice of Completion  
28 and Availability with the State Clearinghouse and the Riverside County Assessor-Clerk-  
Recorder's Office; and

1  
2 WHEREAS, pursuant to Public Resources Code §21092 and State CEQA Guidelines  
3 §15087, the District also provided a Notice of Completion and Availability to all organizations  
4 and individuals who had previously requested such notice, and published the Notice of  
5 Availability on May 22, 2014, in The Press-Enterprise, a newspaper of general circulation in the  
6 Project area; and

7  
8 WHEREAS, during the 47-day Draft PEIR comment period (May 22, 2014 to July 7,  
9 2014), the District consulted with, and requested comments from, responsible and trustee  
10 agencies, other regulatory agencies and other interested parties, including the Native American  
11 Tribes, pursuant to State CEQA Guidelines §15086; and

12  
13 WHEREAS, during the official public review period for the Draft PEIR, the District  
14 received six written comment letters; and

15  
16 WHEREAS, pursuant to Public Resources Code §21092.5 and State CEQA Guidelines  
17 §15088(b), the District provided each public agency that submitted comments on the Draft PEIR  
18 with written responses to the agency's comments at least 10 days before considering the Final  
19 PEIR for certification; and

20  
21 WHEREAS, the District consulted with the Native American Heritage Commission, the  
22 Pechanga Band of Luiseño Indians, and the Soboba Band of Luiseño Indians, and discussed the  
23 Project's potential impacts and Mitigation Measures concluding that the Soboba Band of Luiseño  
24 Indians is the appropriate Tribe with jurisdiction over the Project location, regarding any  
25 potential traditional cultural resources; and

26  
27 WHEREAS, pursuant to State CEQA Guidelines §15132, the District released the Final  
28 PEIR, which consists of the Initial Study and Notice of Preparation; Draft PEIR and technical  
appendices; a list of all agencies, organizations, and individuals who commented on the Draft

1  
2 PEIR; written responses to all the significant environmental issues raised in the review,  
3 consultation, and comment processes for the Draft PEIR; and the errata to the Draft PEIR, which  
4 includes minor text edits and clarifications to the Draft PEIR; and

5 WHEREAS, the Final PEIR, with all its components, shall herein be referred to as simply  
6 the "EIR" unless it is otherwise necessary to reference a specific document or section; and

7  
8 WHEREAS, all EIR documents and evidence related to the Project have been reviewed  
9 by the District and Board of Supervisors (hereinafter referred to as the "Board"), and are hereby  
10 incorporated by reference into this Resolution; and

11 WHEREAS, all requirements of the Public Resources Code, the State CEQA Guidelines,  
12 and the District CEQA implementing procedures have been satisfied in the EIR, which is  
13 sufficiently detailed so that all of the potentially significant environmental effects of the Project,  
14 as well as feasible Alternatives and Mitigation Measures, have been adequately evaluated; and

15  
16 WHEREAS, all of the findings and conclusions made by the Board pursuant to this  
17 Resolution are based upon oral and written evidence presented as a whole and not based solely  
18 on the information provided in this Resolution; and

19  
20 WHEREAS, the CEQA Findings of Fact and Statement of Overriding Considerations  
21 supporting the Board's decision on the Project are attached herein as Exhibit "B"; and

22  
23 WHEREAS, the Mitigation Monitoring and Reporting Program attached herein as  
24 Exhibit "C" sets forth the Mitigation Measures that the Board shall require as binding obligations  
25 of the District in connection with the Project; and

26  
27 WHEREAS, the EIR identifies short-term (construction) air quality impacts that may be  
28 potentially significant and unavoidable despite the imposition of all feasible Mitigation  
Measures; and

1  
2 WHEREAS, the EIR identifies short-term (construction) air quality impacts that may be  
3 potentially cumulatively considerable and/or significant and unavoidable despite the imposition  
4 of all feasible Mitigation Measures; and

5  
6 WHEREAS, the EIR adequately analyzed a reasonable range of Alternatives to the  
7 Project that could eliminate or reduce these significant environmental impacts, and the Board has  
8 selected the Project for approval; and

9  
10 WHEREAS, prior to taking action, the Board has heard, been presented with, reviewed,  
11 and considered all information and data in the administrative record, including the EIR, and all  
12 oral and written evidence presented regarding the Project's environmental impacts; and

13  
14 WHEREAS, the EIR reflects the independent judgment of the Board and is deemed  
adequate for purposes of making decisions on the merits of the Project; and

15  
16 WHEREAS, the Board has not received any comments or information that produced  
substantial new information requiring recirculation pursuant to Public Resources Code §21092.1  
17 and State CEQA Guidelines §15088.5; and

18  
19 WHEREAS, the Board, as the decision making body for the District, has reviewed and  
20 considered the EIR, Project Alternatives, Mitigation Measures and the Mitigation Monitoring  
21 and Reporting Program in evaluating the Project; and

22  
23 WHEREAS, the EIR and the Mitigation Monitoring and Reporting Program are  
incorporated herein by this reference in their entirety; and

24  
25 WHEREAS, the Project is consistent with the Western Riverside County Multiple  
Species Habitat Conservation Plan; and

26  
27 WHEREAS, as contained herein, the Board has endeavored in good faith to set forth the  
28 basis for its decision on the Project; and

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28

WHEREAS, all other legal prerequisites to the adoption of this Resolution have occurred.

**NOW, THEREFORE, BE IT RESOLVED, FOUND, DETERMINED, AND ORDERED** by the Board of Supervisors of the Riverside County Flood Control and Water Conservation District in regular session assembled on **April 14, 2015** that:

1. Pursuant to Public Resources Code §21081 et seq., the Board of Supervisors hereby adopts the CEQA Findings of Fact attached to this Resolution as Exhibit "B", including the Statement of Overriding Considerations.
2. The Board has considered a reasonable range of Alternatives to the Project and finds based on substantial evidence in the record that the Project is the best alternative that can be feasibly implemented in light of relevant economic, legal, social, technological, and other reasons, as discussed herein. The Board hereby rejects all other Alternatives, and combinations and variations, thereof. Supporting information for this finding is detailed in Exhibit "B" (Section VII), and is further supported by analyses within the EIR.
3. After considering the EIR, in conjunction with the attached CEQA Findings of Fact and Statement of Overriding Considerations (Exhibit "B"), the Board hereby finds that pursuant to Section 15092 of the State CEQA Guidelines that approval of the Project may result in significant effects on the environment; however, the Board has eliminated or substantially lessened these significant effects where feasible, and has determined that remaining significant effects are found to be unavoidable under Section 15091 and acceptable under Section 15093. Supporting information for this finding is detailed in Exhibit "B" (Section VIII).



- 1  
2 4. The Board has made a reasonable and good faith effort to eliminate or substantially  
3 mitigate the Project's significant and unavoidable impacts and has balanced the  
4 benefits against any unavoidable environmental impacts in determining whether to  
5 approve the Project.
- 6  
7 5. Pursuant to Section 15091 and 15093 of the State CEQA Guidelines, the CEQA  
8 Findings of Fact and Statement of Overriding Considerations for the Project are  
9 supported by substantial evidence in the record, and are further supported by the  
10 analyses within the EIR. Therefore, the Board hereby adopts the Statement of  
11 Overriding Considerations as detailed in Section VIII of the Findings attached to  
12 this Resolution as Exhibit "B".
- 13  
14 6. The Board hereby certifies the EIR in accordance with the requirements of CEQA  
15 (Section 21000 et seq. of the Public Resources Code and Section 15000 et seq. of  
16 Title 14 of the California Code of Regulations).
- 17  
18 7. Pursuant to Public Resources Code §21081.6, the Board of Supervisors hereby  
19 adopts the Mitigation Monitoring and Reporting Plan (MMRP) attached to this  
20 Resolution as Exhibit "C" as identified in Section X of the Findings. In the event of  
21 any inconsistencies between the Mitigation Measures as set forth in the Findings  
22 and the MMRP, the MMRP shall prevail.
- 23  
24 8. The Board finds that the Project is consistent with the District's purpose, policies  
25 and goals, and that approval of the Project is in the public interest and is necessary  
26 for the public health, safety, and welfare.
- 27  
28 9. Based upon the entire administrative record before the Board of Supervisors for the  
Riverside County Flood Control and Water Conservation District, including the

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28

attached Findings of Fact and Statement of Overriding Considerations (Exhibit "B"), and all written and oral evidence presented during the administrative process, the Board of Supervisors hereby approves the Moreno Master Drainage Plan Revision No. 2 dated April 2014, as detailed in Section XI of the Findings attached to this Resolution as Exhibit "B".


10. The custodians of the documents and materials that constitute the record of proceedings on which this decision is based are with the Clerk of the Board of Supervisors and the District's Planning Division. These documents and materials are located at 4080 Lemon Street, Riverside, California (Board) and at 1995 Market Street, Riverside, California (District), respectively. This information is provided in compliance with Public Resources Code §21081.6.

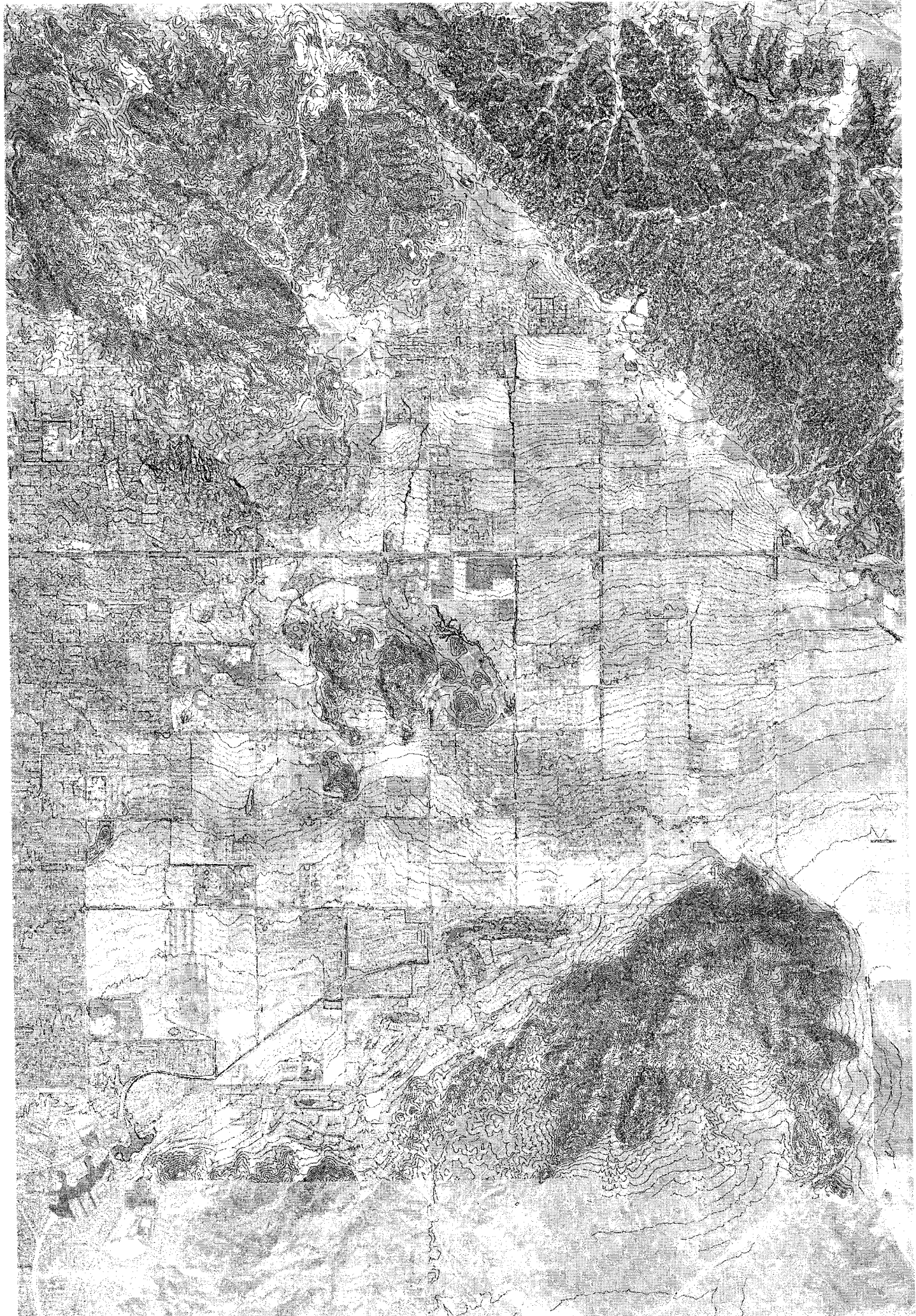
11. The Board of Supervisors hereby directs staff to execute and file a Notice of Determination with the Riverside County Clerk's Office and the Office of Planning and Research within five (5) working days of adoption of this Resolution.

ROLL CALL:

AYES: Jeffries, Tavaglione, Washington and Benoit  
NAYS: None  
ABSENT: None  
ABSTAIN: Ashley

The foregoing is certified to be a true copy of a resolution duly adopted by said Board of Supervisors on the date therein set forth.

KECIA HARPER-IHEM, Clerk of said Board  
By  Deputy



RIVERSIDE COUNTY FLOOD CONTROL  
AND WATER CONSERVATION DISTRICT  
Riverside, California

**MORENO**  
**MASTER DRAINAGE PLAN**

ZONE FOUR

Original Plan – September 1980  
Revision No. 2 – April 2014

WARREN D. WILLIAMS  
General Manager-Chief Engineer

**MORENO**  
**MASTER DRAINAGE PLAN**  
(Revision No. 2)

TABLE OF CONTENTS

	<u>Page</u>
SECTION I - PURPOSE.....	1
SECTION II - SCOPE.....	1
SECTION III - GENERAL DISCUSSION.....	2
SECTION IV - MASTER DRAINAGE PLAN OBJECTIVES.....	2
SECTION V - HYDROLOGY.....	3
SECTION VI - EXISTING FACILITIES.....	4
SECTION VII - FACILITY SIZING CRITERIA.....	5
SECTION VIII - PROPOSED IMPROVEMENTS.....	6
SECTION IX - ALTERNATIVES.....	13
SECTION X - ESTIMATED COST.....	14
SECTION XI - CONCLUSIONS.....	17
SECTION XII - RECOMMENDATIONS.....	17

TABLES

TABLE 1 - NOAA Atlas 14 Point Rainfall Values.....	3
TABLE 2 - Existing Facilities.....	4
TABLE 3 - Cost Summary.....	14
TABLE 4 - Alternatives: Basin Footprint Summary.....	21
TABLE 5 - Decision Matrix.....	24

APPENDIX

ALTERNATIVES ANALYSIS.....	APPENDIX A
EXHIBIT 1 - Alternative 1.....	APPENDIX B
EXHIBIT 2A - Alternative 2A.....	APPENDIX B
EXHIBIT 2B - Alternative 2B.....	APPENDIX B
EXHIBIT 3 - Alternative 3.....	APPENDIX B
EXHIBIT 4 - Alternative 4.....	APPENDIX B

MAP

Master Drainage Plan.....	INSIDE BACK COVER
---------------------------	-------------------

## **SECTION I - PURPOSE**

The purpose of this report is to identify the network of drainage facilities needed to alleviate currently known and anticipated drainage problems within the eastern portion of the City of Moreno Valley. A Master Drainage Plan (MDP) was originally adopted for the Moreno watershed in 1980 and was later revised in 1991 due to the development of the watershed at a higher density than anticipated. Since the 1991 revision, the City of Moreno Valley has updated its general plan, approved zone changes, and continued to grow significantly; prompting the District to once again revise the Moreno MDP to address these changes. In addition, this new revision seeks to address changes in regulation that favor the incorporation of flood control facilities which encourage infiltration.

Readers should bear in mind that the drainage network presented herein is conceptual in nature. Simply stated, the MDP provides a conceptual solution that addresses the known and anticipated drainage problems in the Moreno area based on various engineering, environmental, and economic considerations. By no means does the proposed MDP represent the only feasible solution.

The alignment and location of the facilities proposed in this MDP are approximate. Precise locations will be dictated by site specific conditions and other factors existing at the time of detailed design. Similarly, the facility sizing information shown on the enclosed map is preliminary. More detailed analysis performed at the facility design stage will determine the final facility sizing.

## **SECTION II - SCOPE**

Tasks involved in the development of this master plan include:

1. Determination of the points of concentration and quantity of storm water runoff produced at various locations.
2. Determination of the quantity of debris produced by major canyons in the watershed.
3. Determination of the location and size of the proposed drainage facilities.
4. Investigation of alternative routes and conveyance methods as a basis for selecting the most economical, environmental, and soundly engineered plan.
5. Preparation of a drainage facility map.
6. Preparation of preliminary plan and profile sheets.
7. Preparation of individual facility cost estimates.

### **SECTION III – GENERAL DISCUSSION**

The Moreno MDP encompasses a portion of the City of Moreno Valley and surrounding Riverside County lands. The watershed is generally bounded by Lasselle Street on the west, Theodore Street on the east, the Badlands on the north, and the city boundary on the south.

The proposed drainage plan involves the construction of detention basins, debris basins, open channels, and a network of underground storm drains. The drainage system will collect local urban runoff and transport the flows through this developing community to an outlet at the upper terminus of the Kitching Street Channel.

The revision presented here is a re-evaluation and expansion of the 1991 Moreno MDP Revision (Adopted MDP). The proposed plan shall supersede all past plans and reports. The plan presented herein will provide flood protection from the 100-year flood to the community when implemented, serve as a guide for the long term construction scheduling of the primary drainage facilities, and serve the basis for revising the existing Moreno Area Drainage Plan (ADP). The plan will also act as a planning guide for the location and sizing of local drainage facilities to be constructed by developers and others within the area.

### **SECTION IV – MASTER DRAINAGE PLAN OBJECTIVES**

The following objectives were established for the Moreno Master Drainage Plan Revision:

1. Revise the Moreno MDP to provide a drainage plan which supports the existing and proposed land use as set forth in the “Riverside County General Plan” updated in 2008, “City of Moreno Valley General Plan” updated in July 2006, and any proposed amendments thereto.
2. The fully implemented plan should, in conjunction with ultimate street improvements for the area within the boundaries of the Moreno MDP, contain the 100-year frequency flows and alleviate the primary sources of flooding.
3. Identify preferred facility alignments, sizing, and right-of-way required for the future construction of MDP facilities to protect existing and future development.
4. Identify the most economical combination of facilities considering right-of-way acquisition, construction, and maintenance costs.
5. Develop a plan which, when implemented, will result in the elimination of FEMA designated Special Flood Hazard Areas within the boundaries of the Moreno MDP.
6. Revise the Moreno MDP to minimize major diversions and perpetuate the natural drainage pattern of the area to the maximum extent practicable.
7. Where feasible, incorporate facilities which encourage infiltration.
8. Minimize environmental impacts to the maximum extent practicable.

## SECTION V – HYDROLOGY

### Revision Studies:

This section outlines methodology, assumptions, and rainfall values used for new studies within the drainage area boundary for this MDP revision. The areas restudied were those tributary to Line F north of Cactus Avenue, areas tributary to Quincy Channel (Line G), and areas north of California State Route 60 (SR 60) not tributary to Nason Basin. New studies for the western portion of the plan (west of the Line G system) were not performed during the revision since many of the facilities here have already been constructed and were designed based on the Adopted MDP flow rates and alignments (see Previous Studies section below for additional information).

Two methods were used to develop the hydrology for this MDP revision: the Rational Method and the Synthetic Unit Hydrograph Method. The Rational Method was used to determine the peak discharges (cubic feet per second) generated from smaller watersheds less than 300 to 500 acres in size. For watersheds larger than 500 acres, the Synthetic Unit Hydrograph Method was used. To account for the attenuating effects of channel and basin storage, the Convex Routing Method and Modified Puls Methods were used, respectively. Methodology and supportive data for both the Rational and Synthetic Unit Hydrograph Methods may be found in the *Riverside County Flood Control and Water Conservation District Hydrology Manual*, dated April 1978 (District Hydrology Manual).

Future land use assumptions were based on the following:

- "The City of Moreno Valley General Plan," updated July 2006
- "The Riverside County General Plan," updated December 2008
- Potential changes to areas currently zoned under the "Moreno Highlands Specific Plan," adopted in 1992.

NOAA Atlas 14 Version 4 rainfall values were used in the hydrology calculations performed for this MDP revision. The rainfall frequencies examined were the 2-year (50% annual chance) and the 100-year (1% annual chance) recurrence intervals with 1, 3, 6 and 24 hour durations. The calculated slope of the intensity-duration curve is 0.577. Table 1 highlights the NOAA Atlas 14 Version 4 area weighted point rainfall values used to develop the revision studies:

**TABLE 1 – NOAA Atlas 14 Point Rainfall Values**

Storm Frequency and Duration	Area Weighted Point Rainfall (Inches)
2 Year – 1 Hour	0.52
2 Year – 3 Hour	0.90
2 Year – 6 Hour	1.29
2 Year – 24 Hour	2.29
100 Year – 1 Hour	1.57
100 Year – 3 Hour	2.42
100 Year – 6 Hour	3.38
100 Year – 24 Hour	6.43



Previous Studies:

Line K System – The flow rates for the Line K system have remained the same as in the Adopted Plan. No changes were proposed to the alignment and no major changes in land use have occurred. Hydrology backup calculations for this line are from studies performed for the Adopted MDP. Line K was sized in these studies using NOAA Atlas 2 rainfall values.

Line H System – Hydrology for this system comes from the approved hydrology study for Tract 31128 and 31129 performed by PHB & Associates, Inc. This study reflects changes to the Adopted MDP alignment. This study uses NOAA Atlas 2 rainfall values.

**SECTION VI – EXISTING FACILITIES**

In preparing this master drainage plan revision an inventory of known existing facilities was made and is summarized in Table 2. Those facilities serving as part of revised Moreno MDP drainage system are shown on the updated Moreno MDP map.

**TABLE 2 – Existing Facilities**

<b>Facility</b>	<b>Drawing Number</b>	<b>Maintenance</b>
Line A	4-473	RCFC
Line D	4-1007	RCFC
Line D-5	4-1007	RCFC
Line D-6	4-1007	RCFC
Line F	4-502,4-5271 4-1007, 4-912(Future RCFC)	RCFC
Line F-2	4-491,4-847	RCFC
Line F-3	4-501, 4-506	RCFC
Line F-4	4-501	RCFC
Line F-5	4-570	RCFC
Line F-6	4-528	RCFC
Line F-7	4-501	RCFC
Line F-8	4-509	RCFC
Line F-9	-	MV
Line F-9	4-1007	RCFC
Line F-11	4-847	RCFC
Line F-12	4-847	RCFC
Line F-14	4-719	RCFC
Line G	4-526, 4-886	RCFC
Line G-5 (Auto Mall Dr Lateral)	4-526	MV
Line G-7	4-879	RCFC
Line H-1	4-885	RCFC
Line H-2	4-875	RCFC
Line H-3	-	MV
Line H-6	4-875	RCFC

Facility	Drawing Number	Maintenance
Line H-7	4-867	RCFC
Line H-8	4-875	RCFC
Line H-9	4-834	RCFC
Line I	4-583, 4-647, 4-738, 7-405, 4-904, 4-905	RCFC
Line J	4-858, (4-955 Future RCFC)	RCFC
Line J-2	4-858	RCFC
Line J-3	4-858	RCFC
Line J-4	4-858	RCFC
Line J-5	4-858	MV
Line J-6	4-858	RCFC
Line J-9	4-1027	(Future RCFC)
Line J-10	4-646, 4-647	RCFC
Line K-1	-	MV
Line K-3	-	MV
Moreno Cold Creek SD - Line A	4-929	RCFC

## SECTION VII – FACILITY SIZING CRITERIA

### Underground Storm Drains

The underground facilities proposed in this MDP are located within existing or assumed future right-of-way, whenever possible, and consists of reinforced concrete pipe (RCP) ranging in size from 27 inches to 108 inches in diameter and reinforced concrete boxes (RCB) ranging in dimensions from 7'W x 7'D to 10'W x 8'D. Underground storm drain facilities were sized based on their full flow capacity.

### Open Channels

The open channel facilities proposed are generally located along existing drainage ditches, washes, and where the proposed construction of the channel would have minimal impacts on adjacent properties. The open channels serve as flow conveyors and provide outlets for underground facilities proposed in the plan. Two types of open channels are proposed in this MDP, concrete lined channels and earthen bottomed channels with rock lined side slopes (unlined). The hydraulic sizing of open channels is based on normal depth calculations. The right-of-way requirements for both lined and unlined facilities include the full channel width, maintenance access roads, as well as a 5 foot buffer on either side for anticipated cut and fill. Channels with top widths of less than 20 feet require one 15 foot maintenance access road; where the top width exceeds 20 feet, two maintenance access roads are necessary.

### Detention Basins

The detention basins proposed in this MDP are located upstream existing facilities with limited hydraulic capacity (e.g. freeway culverts, Line F). The purpose of the detention basin is to attenuate peak flow rates to match the capacity of downstream existing facilities through the use of temporary detention storage. It should be noted that the detention basins proposed in this plan are sized for the 1% annual chance ("100-year" storm) event. Flows exceeding the design capacity of the basin would pass over an emergency spillway in flow patterns approximating present conditions.

### Debris Basins

Debris basins are proposed in watersheds where significant amount of debris would be expected and are

generally located upstream of the proposed facilities to capture the debris before it enters the downstream conveyance system. The proposed debris basins were sized using the Tatum Method by the U.S. Army Corps of Engineers Los Angeles District, dated 1963.

## **SECTION VIII – PROPOSED IMPROVEMENTS**

The improvements proposed in this MDP are shown on the enclosed map found at the back of this report. Supporting data for proposed facilities is available at the Riverside County Flood Control and Water Conservation District's Office.

The design engineer should be aware that a detailed utility search was not completed. This means that, while the major known facilities were considered during the development of this MDP, a more thorough search may reveal additional or newly placed utilities that may necessitate minor alignment and size changes, or utility relocations during final design.

**Line A** – Line A begins approximately 300 feet west of the intersection of Locust Avenue and Quincy Street as a 4.5 foot deep concrete lined trapezoidal channel with side slopes of 1.5:1 and a base width of 6 feet. The channel extends southerly and connects to an existing section of Line A which continues southerly and southeasterly to a confluence point with the proposed Line A-1 just south of Kalmia Street. At the confluence point Line A transitions into a 8'W x 7'D RCB and continues southerly. The RCB then transitions into a 9'W x 7'D and continues southerly to an outlet into the proposed Sinclair Basin just north of California State Route 60 (SR 60).

**Line A-1** – Line A-1 begins at a point approximately 1,315 feet north and 235 feet east of the intersection of Locust Avenue and Quincy Street as a 72-inch RCP. The 72-inch RCP extends westerly to Quincy Street and southerly in Quincy Street. At Kalmia Avenue, the 72-inch RCP transitions into a 78-inch RCP until the confluence with Line A.

**Line A-2** – Line A-2 begins approximately 650 feet east of the intersection of Locust Avenue and Quincy Street as a 42-inch RCP. The 42-inch RCP extends westerly until the confluence with the proposed Line A-1.

**Line A-3** – Line A-3 begins at the intersection of Edmonson Avenue and Kalmia Avenue as a 42-inch RCP. The 42-inch RCP extends easterly in Kalmia Avenue until the confluence with an existing portion of Line A.

**Line A-6** – Line A-6 begins at a point approximately 1,300 feet west and 1,300 feet north of the intersection of Quincy Street and Ironwood Avenue as a 36-inch RCP. The 36-inch RCP extends southerly and transitions into a 42-inch and then a 48-inch RCP. At Hemlock Avenue the 48-inch RCP continues easterly and transitions into a 78-inch RCP, then into a 84-inch RCP, and finally into a 7'W x 7'D RCB until the confluence with Line A.

**Line A-7** – The upstream origin of Line A-7 begins approximately 850 feet east of the intersection of Petit Street and Ironwood Avenue as a 42-inch RCP. The 42-inch RCP extends to the westerly until the confluence with line A-6.

**Line A-8** – Line A-8 begins approximately at the intersection of Hinson Street and Hemlock Avenue as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 54-inch RCP until the confluence with Line A-6.

**Line B** – Line B begins approximately 1,200 feet southeast of the intersection of Redlands Boulevard and

Highland Boulevard as a 66-inch RCP. The 66-inch RCP extends easterly for 720 feet and then transitions into an 8'W x 7'D RCB following Highland Boulevard southeasterly for 1850 feet. The facility then extends southerly to Ironwood Avenue. From here the facility transitions into an 8'W x 8'D RCB extending easterly for approximately 740 feet before heading southerly for 1,310 feet to the confluence with Line C. At the confluence, the facility transitions into a 10'W x 8'D RCB which continues southerly to an outlet into the proposed Sinclair Basin just North of SR 60.

**Line B-1** – Line B-1 begins approximately 730 feet west of the intersection of Theodore Street and Ironwood Avenue along Ironwood Avenue Street as a 78-inch RCP. The 78-inch RCP extends westerly along Ironwood Avenue until the confluence with Line B.

**Line B-2** – Line B-2 begins approximately 850 feet west of the intersection of Juniper Avenue and Highland Boulevard as a 54-inch RCP. The 54-inch RCP extends easterly in Juniper Avenue until the confluence with Line B.

**Line B-3** – Line B-3 begins approximately 2,110 feet east of the intersection of Redlands Boulevard and Ironwood Avenue as a 42-inch RCP. The 42-inch RCP extends easterly in Ironwood Avenue until the confluence with Line B.

**Line C** – The upstream origin of Line C begins at the outlet of the proposed Ironwood Debris Basin as a 66-inch RCP. The 66-inch RCP extends southerly in Theodore Street for 930 feet before transitioning into a 78-inch RCP and heading easterly until the confluence with Line B.

**Line D-1** – Line D-1 begins approximately 820 feet west of the intersection of Locust Avenue and Redlands Boulevard as a 42-inch RCP. The 42-inch RCP extends easterly in Locust Avenue and transitions into a 48-inch RCP until the confluence with Redlands Boulevard.

**Line D-2** – Line D-2 begins approximately 1,750 feet west of the intersection of Kalmia Avenue and Redlands Boulevard as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 60-inch RCP, and finally to a 66-inch RCP until the confluence with Line D-5.

**Line D-3** – Line D-3 begins approximately 1,750 feet west of the intersection of Juniper Avenue and Redlands Boulevard as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 60-inch RCP, and finally to a 66-inch RCP until the confluence with Line D-5.

**Line D-4** – Line D-4 begins approximately 670 feet east of the intersection of Juniper Avenue and Redlands Boulevard as a 42-inch RCP. The 42-inch RCP extends westerly until the confluence with Line D-5.

**Line D-5** – Line D-5 begins at the intersection of Locust Avenue and Redlands Boulevard as a 48-inch RCP. The 48-inch RCP extends southerly in Redlands Boulevard, transitioning into a 66-inch RCP until Ironwood Avenue where the 66-inch RCP transitions into a 90-inch RCP and turns easterly for approximately 1,310 feet. At this point the 90-inch RCP turns southerly for 1,300 feet, easterly for 690 feet, and finally southerly for 530 feet to an outlet into the proposed Sinclair Basin just north of SR 60.

**Line D-7** – Line D-7 begins approximately 1,750 feet west of the intersection of Ironwood Avenue and Redlands Boulevard as a 36-inch RCP. The 36-inch RCP extends easterly and transitions into a 48-inch RCP, to a 60-inch RCP, and finally to a 66-inch RCP until the confluence with Line D-5.

**Line D-8** – The upstream origin of Line D-8 begins at a point approximately 1,300 feet south and 240 feet east of the intersection of Ironwood Avenue and Redlands Boulevard as a 42-inch RCP. From there the 42-inch

RCP extends easterly and transitions into a 54-inch RCP until the confluence with Line D-5.

**Line D-9** – Line D-9 begins at a point approximately 1,640 feet east of the intersection of Redlands Boulevard and Ironwood Avenue as a 36-inch RCP. The 36-inch RCP extends westerly until the confluence with Line D-5.

**Line E-1** – Line E-1 begins at a point approximately 2,600 feet south of State Route 60 and 250 feet east of Redlands Boulevard as a 36-inch RCP. The 36-inch pipe extends easterly and transitions into a 54-inch RCP and then to a 66-inch RCP until the confluence with Line F.

**Line E-2** – Line E-2 begins at a point approximately 2,600 feet south of State Route 60 and 1,750 feet west of the Theodore Street as a 36-inch RCP. The 36-inch RCP extends westerly and transitions into a 54-inch RCP, to a 60-inch RCP, and then finally to a 66-inch RCP until the confluence with Line F.

**Line E-3** – Line E-3 begins at a point approximately 250 feet east of the intersection of Redlands Boulevard and Dracaea Avenue as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 54-inch RCP, to a 66-inch RCP, and finally into a 72-inch RCP until the confluence with Line F.

**Line E-4** – Line E-4 begins at a point approximately 2,000 feet west of the intersection of Theodore Street and Dracaea Avenue as a 48-inch RCP. The 48-inch RCP extends westerly and transitions into a 60-inch RCP and finally to a 66-inch RCP until the confluence with Line F.

**Line E-5** – Line E-5 begins at a point approximately 250 feet east of the intersection of Redlands Boulevard and Cottonwood Avenue as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 66-inch RCP, and finally to a 72-inch RCP until the confluence with Line F.

**Line E-6** – Line E-6 begins at a point approximately 1,975 feet west of the intersection of Theodore Street and Cottonwood Avenue as a 48-inch RCP. The 48-inch RCP extends westerly and transitions into a 60-inch RCP and finally into a 66-inch RCP until the confluence with Line F.

**Line E-7** – Line E-7 begins at a point approximately 275 feet east of the intersection of Redlands Boulevard and Bay Avenue as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 60-inch RCP, to a 66-inch RCP, and finally to a 72-inch RCP until the confluence with Line F.

**Line E-8** – Line E-8 begins at a point approximately 1,975-feet west of the intersection of Theodore Street and Bay Avenue as a 48-inch RCP. The 48-inch RCP extends westerly and transitions into a 54-inch RCP and finally into a 66-inch RCP until the confluence with Line F.

**Line E-10** – Line E-10 begins at a point approximately 1,975 feet east of the intersection of Merwin Street and Alessandro Boulevard as a 36-inch RCP. The 36-inch RCP transitions into a 54-inch RCP and finally into a 60-inch RCP until the confluence with Line F.

**Line F** – Line F begins approximately 1,350 feet south of SR 60 and 1,600 feet east of Redlands Boulevard as an earthen bottom trapezoidal channel with rock-lined side slopes. The earthen channel runs southerly to Alessandro Boulevard and southwesterly from below Alessandro Boulevard to Redlands Boulevard where it connects to an existing box culvert in Redlands Boulevard. Typical channel sections in this reach have a depth of 8 feet, base widths of 6 to 38 feet, and side slopes of 2:1. There is another proposed section of Line F which begins approximately 500 feet north of the intersection of Oliver Street and John F. Kennedy Drive running southwesterly for 850 feet before connecting to existing Line F.

**Line F-2** – Line F-2 begins at the intersection of Ironwood Ave. and Redlands Boulevard as a 54-inch RCP

and connects to Line F-15. The 54-inch RCP extends southerly to an existing 60-inch Caltrans culvert which extends the pipe to the south side of the State Route 60 Redlands Boulevard off ramp. Line F-2 resumes from the downstream terminus of the existing culvert as a 66-inch RCP which continues southerly transitioning to a 72-inch RCP, to a 78-inch RCP, to a 84-inch RCP, to a 90-inch RCP, to a 96-inch RCP, and finally into a 108-inch RCP until an outlet into the proposed Cactus Basin.

**Line F-5** – Line F-5 begins approximately 100 feet south of the intersection of Oliver Street and John F. Kennedy Drive at the downstream terminus of an existing portion of Line F-5 as a double 8'W x 4'D RCB. The RCB extends westerly for 700 feet to the confluence with existing Line F.

**Line F-13** – Line F-13 begins at a point approximately 1,330 feet north of the intersection of Moreno Beach Drive and Cactus Boulevard as a 33-inch RCP. The 33-inch RCP extends southerly and transitions into a 39-inch RCP until the confluence with existing Line F-4.

**Line F-15** – Line F-15 begins at a point approximately 1,310 feet south and 1,750 feet west of the intersection of Redlands Boulevard and Ironwood Avenue as a 36-inch RCP. The 36-inch RCP extends easterly and transitions into a 48-inch RCP and then to a 54-inch RCP until the confluence with Line F-2 at Redlands Boulevard.

**Line F-16** – Line F-16 begins at a point approximately 1,350 feet south of SR 60 and 2,250 feet west of the Redlands Boulevard as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 54-inch RCP and finally to a 72-inch RCP until the confluence with Line F-2.

**Line F-17** – Line F-17 begins at a point approximately 2,630 feet south of SR 60 and 2,250 feet west of the Redlands Boulevard as a 42-inch RCP. From there the 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 54-inch RCP, and finally to a 60-inch RCP until the confluence with Line F-2.

**Line F-18** – Line F-18 begins at a point approximately 1,000 feet east of the intersection of Redlands Boulevard and Alessandro Boulevard as a 48-inch RCP. The 48-inch RCP extends westerly and transitions into a 60-inch RCP until the confluence with Line F-2.

**Line F-19** – Line F-19 begins at a point approximately 500 feet east of the intersection of Redlands Boulevard and Brodiaea Avenue as a 60-inch RCP. The 60-inch RCP extends westerly until the confluence with Line F-2.

**Line G** – Line G begins approximately 850 feet south and 450 feet east of the intersection of Eucalyptus Avenue and Auto Mall Drive as an earthen bottom trapezoidal channel with rock-lined side slopes. The earthen channel runs southeasterly until a confluence with proposed Line G-7, approximately 400 feet north of the intersection of Cottonwood Avenue and Quincy Street. Line G continues southerly, parallel to Quincy Street, until an outlet into existing Line F. Typical channel sections in this reach have depths of 6 to 8 feet, base widths of 6 to 16 feet, and side slopes of 2:1.

**Line G-1** – Line G-1 begins at a point approximately 1,200 feet north of SR 60 and 250 feet east of the Moreno Beach Drive as a 42-inch RCP. The 42-inch RCP extends easterly until the confluence with Line G-4.

**Line G-2** – Line G-2 begins at the intersection of Hemlock Avenue and Petit Street as a 42-inch RCP. The 42-inch RCP extends westerly and transitions into a 54-inch RCP until the confluence with Line G-4.

**Line G-3** – Line G-3 begins at a point approximately 1,975 feet east of Moreno Beach Drive immediately north of SR 60 as a concrete lined rectangular channel. The channel extends westerly until the confluence with

Line G-4. Typical sections for this channel have a depth of 6.5 feet and a base width of 10 feet.

**Line G-4** – Line G-4 begins at a point approximately 1,200 feet north of SR 60 and 500 feet east of Moreno Beach Drive as a 54-inch RCP. The 54-inch RCP extends southerly until it transitions and connects with the existing Caltrans culvert crossing under SR 60.

**Line G-7** – Line G-7 begins at a point approximately 2,600 feet west of Redlands Boulevard, just south of SR 60, as an earthen bottom trapezoidal channel with rock-lined side slopes. The channel extends southerly until the confluence with Line G approximately 400 feet north of the intersection of Quincy Street and Cottonwood Avenue. Typical sections for this channel have a depth of 5 feet, base widths of 5 feet, and side slopes of 2:1.

**Line G-8** – Line G-8 begins at a point approximately 500 feet east of the intersection of Quincy Street and Bay Avenue as a 48-inch RCP. The 48-inch RCP extends westerly until the confluence with Line G.

**Line G-9** – Line G-9 begins at a point approximately 1,300 feet east of the intersection of Quincy Street and Alessandro Avenue as a 48-inch RCP. The 48-inch RCP extends westerly and transitions to a 54-inch RCP and then to a 60-inch RCP until the confluence with Line G.

**Line G-10** – Line G-10 begins at a point approximately 750 feet east of the intersection of Quincy Street and Brodiaea Avenue as a 48-inch RCP. The 48-inch RCP extends easterly and transitions into a 54-inch RCP until the confluence with Line G.

**Line G-11** – Line G-11 begins at a point approximately 1,250 feet east of the intersection of Quincy Street and Cactus Avenue as a 36-inch RCP. From there the 36-inch RCP extends easterly and transitions into a 48-inch RCP and then to a 54-inch RCP until the confluence with Line G.

**Line H** – Line H begins at the intersection of Mill Creek Road and Dracaea Avenue as a 42-inch RCP. The 42-inch RCP extends southerly to Cottonwood Avenue and then transitions to an 8.25' W x 5'D RCB which extends easterly in Cottonwood Avenue for 610 feet. Here the line runs southerly, transitions to a 75-inch RCP, to a 87-inch RCP, and continues southerly until Alessandro Boulevard. The 87-inch RCP then runs easterly in Alessandro Boulevard to Oliver Street, southerly in Oliver Street to Brodiaea Avenue, transitions to a 90-inch RCP, and continues southerly until the confluence with existing Line H at Cactus Avenue.

**Line H-1** – Line H-1 begins at a point approximately 1,020 feet east of the intersection of Moreno Beach Drive and Alessandro Boulevard at the downstream terminus of an existing portion of Line H-1 as a 48-inch RCP. The 48-inch RCP extends westerly and transitions into a 63-inch RCP and then to a 75-inch RCP until the confluence with Line H-2 and H-1a approximately 650 feet east of Pearl Lane.

**Line H-1a** – Line H-1a begins at a point approximately 370 feet east of the intersection of Pearl Lane and Alessandro Boulevard as a 36-inch RCP. The 36-inch RCP extends easterly for 280 feet until the confluence with Line H-1 and H-2.

**Line H-2** – Line H-2 begins at the intersection of Bethany Road and Cottonwood Avenue as a 33-inch RCP. The 33-inch RCP extends southerly and transitions into a 39-inch RCP, to a 42-inch RCP, and finally to a 54-inch RCP until the confluence with Line H-1 at Alessandro Boulevard. Line H-2 then resumes from the confluence with Line H-1 and Line H-1a approximately 650 feet east of Pearl Lane on Alessandro Boulevard as an 84-inch RCP. The 84-inch RCP extends southerly until the confluence with an existing portion of Line H-2 at Brodiaea Avenue.

**Line H-3** – Line H-3 begins at the intersection of Moreno Beach Drive and Cottonwood Avenue as a 42-inch RCP. The 42-inch RCP extends southerly and transitions into a 45-inch RCP until the confluence with Line H-1 at Alessandro Boulevard.

**Line H-4** – Line H-4 begins at a point approximately 1,550 feet east of the intersection of Nason Street and Bay Avenue as a 30-inch RCP. The 30-inch RCP extends westerly until the confluence with a Line H.

**Line H-5** – Line H-5 begins at a point approximately 1,350 feet west of the intersection of Olive Street and Brodiaea Avenue as a 30-inch RCP. The 30-inch RCP extends easterly and transitions into a 33-inch RCP until the confluence with Line H.

**Line H-5a** – Line H-5a begins at a point approximately 290 feet east of the intersection of Olive Street and Brodiaea Avenue as a 36-inch RCP and extends westerly until the confluence with Line H.

**Line H-6** – Line H-6 begins at a point approximately 1,130 feet east of the intersection of Landon Road and Brodiaea Ave as a 36-inch RCP. From there the 36-inch extends westerly until the confluence with the existing portion of Line H-6 approximately 500 feet east of the intersection of Landon Road and Brodiaea Avenue.

**Line H-11** – Line H-11 begins at a point approximately 1,050 feet east of the intersection of Mill Creek Road and Dracaea Avenue at the terminus of Cold Creek Court Storm Drain Line A as a 60-inch RCP. The 60-inch RCP extends westerly for approximately 430 feet and then southerly until the confluence with line H at Cottonwood Avenue.

**Line J** – Line J begins at the intersection of Morrison Street and Dracaea Avenue at the confluence with Line J-1 as a 48-inch RCP. The 48-inch RCP extends southerly until connecting to the existing portion of Line J at the intersection of Morrison Street and Rockport Drive. Line J then resumes at the intersection of Morrison Street and Alessandro Boulevard at the terminus of the existing underground Line J facility as a 78-inch RCP. The 78-inch RCP extends southerly and transitions into a 84-inch RCP until Cactus Avenue where it connects with an existing portion of Line J.

**Line J-1** – Line J-1 begins at a point approximately 1400 feet east of the intersection of Morrison Street and Dracaea Avenue as a 27-inch RCP. The 27-inch RCP extends westerly and transitions into a 39-inch RCP until the confluence with Line J at the intersection of Morrison Street and Dracaea Avenue.

**Line J-7** – Line J-7 begins at a point approximately 1350 feet south and 810 feet west of the intersection of Morrison Street and Alessandro Boulevard as a 24-inch RCP. The 24-inch RCP extends easterly until the confluence with Line J.

**Line J-8** – Line J-8 begins at a point approximately 1350 feet south and 1450 feet east of the intersection of Morrison Street and Alessandro Boulevard as a 39-inch RCP. The 39-inch RCP extends westerly and transitions into a 42-inch RCP until the confluence with Line J.

**Line K** – Line K begins at the outlet of the proposed Reche Canyon Debris Basin, approximately 1500 feet east and 350 feet north of the intersection of Moreno Beach Drive and Locust Drive, as a concrete lined trapezoidal channel located on the southerly side of Reche Canyon Road. The channel extends southeasterly along Reche Canyon Road and easterly on Locust Avenue until the intersection with Moreno Beach Drive. Typical channel sections for this reach have a depth of 7 feet, base widths of 10 feet, and side slopes of 1.5:1. From the intersection the channel transitions into a 14'W x 7'D RCB for 160 feet as it turns southerly along



Moreno Beach Drive. The 14'W x 7'D RCB then transitions to a 9.5'W x 7'D RCB and continues southerly until a point approximately 300 feet north of Juniper Avenue. At this point Line K extends southeasterly, transitions to an earthen channel with rock-lined side slopes and continues past Ironwood Avenue until an outlet into the existing Nason Basin. Typical channel sections for this reach have a depth of 6 feet, bottom widths of 25 to 30 feet, and side slopes of 2:1.

**Line K-1** – Line K-1 begins at the intersection of Locust Avenue and Carrie Lane as a 42-inch RCP. The 42-inch RCP extends southerly to Kalmia Avenue, transitions to a 51-inch RCP as it extends westerly along Kalmia Avenue to Petit Street, and then southerly along Petit Street to the existing portion of Line K-1 approximately 665 feet north of the intersection of Petit Street and Juniper Avenue. Line K-1 then resumes at the downstream terminus of the existing Line K-1 facility at the intersection of Petit Street and Juniper Avenue as a 63-inch RCP. The 63-inch RCP extends southerly to Ironwood Avenue and then transitions to a 90-inch RCP as it extends westerly until the confluence with Line K.

**Line K-2** – Line K-2 begins at a point approximately 640 feet east of the intersection of Petit Street and Juniper Avenue as a 33-inch RCP. The 33-inch RCP extends westerly until the confluence with Line K-1.

**Line K-4** – Line K-4 begins at a point approximately 240 feet east of the intersection of Carrie Lane and Locust Avenue and extends westerly until the confluence with Line K-1.

**Reche Canyon Debris Basin** – The Reche Canyon Debris Basin is located at a point approximately 1500 feet east and 350 feet north of the intersection of Locust Avenue and Moreno Beach Drive, just upstream of proposed Line K. The debris basin will require approximately 7.5 acres of right-of-way.

**Ironwood Debris Basin** – The Ironwood Debris Basin is located just north of the intersection of Theodore Street Ironwood Avenue. The basin will require approximately 2.3 acres of right-of-way.

**Quincy Basin** – The proposed Quincy Basin is located approximately 2600 feet west of Redlands Boulevard just north of SR 60. The basin has a right-of-way footprint of approximately 22.5 acres, a storage volume of 150 ac-ft, and an embankment height of approximately 12.5 feet. The basin outlet is proposed as one 60-inch RCP which will connect to an existing 60-inch CMP culvert crossing under SR 60.

**Cactus Basin** – The proposed Cactus Basin is located between Redlands Boulevard and Wilmot Street just north of Cactus Avenue. The basin has a right-of-way footprint of approximately 21.7 acres, a storage volume of 100 ac-ft, and an embankment height of approximately 8 feet. The basin outlet utilizes the existing quadruple 8'W x 6'D RCB culverts under Cactus Avenue.

**Sinclair Basin** – The proposed Sinclair Basin is located approximately 2600 feet east of Theodore Street just north of SR 60. The basin has a right-of-way footprint of approximately 25 acres, a storage volume of 170 acre-ft, and an embankment height of approximately 12.5 feet. The basin outlet is proposed as two 60-inch RCPs which connect to two existing 72-inch CMP culverts crossing under SR 60.

## SECTION IX – ALTERNATIVES

Given that this Master Drainage Plan (MDP) update is essentially a refinement of the adopted Moreno MDP, a relatively narrow range of alternatives was considered. Nonetheless, several alternatives were developed and evaluated against the project objectives established by the District and the City of Moreno Valley. The following section provides a brief summary of each alternative and indicates the preferred alternative. For the full alternative analysis and discussion, see appendix A.

### Alternatives Overview

The following paragraphs describe the major components of each alternative developed during the MDP revision. Each description is supplemented with an exhibit in the appendix which displays the layout of facilities and basin locations. It should also be noted that, while the MDP update was being developed, the District and City mutually agreed that the existing Line F-2 storm drain facility, which is currently sized as a 10-year facility, would be reconstructed to provide 100-year flood capacity. Thus, the proposed reconstruction of Line F-2 was assumed to be a part of each alternative considered for the Moreno MDP Revision.

**Alternative 1:** This alternative consists of the same types of facilities and alignments as in the Adopted MDP. Two detention basins are proposed along the Line F channel alignment: 1) Sinclair Basin just north of SR 60; and 2) Bay Avenue Basin located on the north side of Bay Avenue. In addition, Reche Canyon Debris Basin has been added to capture debris upstream of Line K. It should be noted that, similar to the Adopted MDP, this alternative proposes 1) concrete lining for all channel segments; and 2) makes use of the existing highway drainage culverts located under SR 60. See Exhibit 1 in the appendix for further detail.

**Alternative 2a and 2b:** The principal difference between these two alternatives and Alternative 1 is the realignment of proposed facilities upstream of SR 60 in an effort to maintain the current natural drainage patterns within the upper watershed. This was accomplished by realigning the mainline facilities, specifically Line A, to convey flows from the foothills southerly to the existing culverts at SR 60 instead of diverting flows into the proposed Sinclair Basin. Both of these alternatives propose Lines F, G, and K as earthen channels with rock-lined side slopes (unlined channels) in place of the concrete lined channels proposed in Alternative 1. Reche Canyon Debris Basin has been included to capture debris upstream of Line K. Alternatives 2a and 2b differ from each other primarily in the size, number, and location of proposed detention basins. See Exhibit 2A and 2B for further detail.

**Alternative 3:** This alternative retains the major realignment of Line A, as proposed in Alternatives 2a and 2b, but proposes three detention basins downstream of SR 60 in place of the various basins proposed in Alternatives 2a and 2b. This option would require the upsizing the existing highway drainage culverts under SR 60 to convey the 100-year flows to the proposed basin locations. The three detention basins proposed in Alternative 3 are: 1) Brodiaea Basin along Line G just north of Brodiaea Avenue; 2) Fir Basin just south of SR 60 along Line G-7; and 3) Cactus Basin at the downstream end of proposed Line F. This alternative also proposes Lines F, G, and K as earthen channels with rock-lined side slopes in place of the concrete lined channels proposed in Alternative 1. Reche Canyon Debris Basin has been included to capture debris upstream of Line K. See Exhibit 3 for further detail.

**Alternative 4 – Preferred Alternative:** Similar to Alternatives 2a, 2b and 3, this alternative also calls for the realignment of proposed facilities upstream of SR 60 in an effort to maintain the current natural drainage patterns of the area. Alternative 4 proposes the implementation of three detention basins: 1) Quincy Basin located along Line A just north of the freeway; 2) Sinclair Basin located just north of SR 60 at the upstream end of Line F; and 3) Cactus Basin located at the confluence of Line F and Line F-2 just north of Cactus Avenue. Similar to Alternative 2a, 2b, and 3, this alternative also proposes Lines F, G and K as earthen

channels with rock-lined side slopes in place of the concrete lined channels proposed in Alternative 1. Reche Canyon Debris Basin has been included to capture the expected debris upstream of Line K, as well as Ironwood Debris Basin to capture expected debris upstream of Line C. See Exhibit 4 for further detail.

**SECTION X – ESTIMATED COST**

A cost summary for the MDP facilities is shown in Table 3. Cost estimates were based on 2013 Planning Unit Cost Sheets and include construction, right-of-way, and 40% for engineering, administration, and environmental mitigation and contingencies.

The costs estimates for the proposed facilities include the cost of manholes, catch basins and pipe installations. Manholes are located as necessary with a maximum spacing of 500 feet. Catch basins are not specifically located but the total number of lineal feet is included in the cost estimate. The cost for the open channel facilities includes the cost of access roads and right-of-way requirements. Channel access roads are assumed to be 15 feet wide and two (2) access roads were included where channel top widths exceed 20 feet. An additional 5 foot buffer has been included on either side of channel access roads for anticipated cut and fill. Detention basin costs include the cost of a 20 foot wide access road around the perimeter.

**TABLE 3  
MORENO MASTER DRAINAGE PLAN REVISION 2  
COST SUMMARY**

<u>Facility</u>	<u>Construction Cost</u>	<u>Right-of-Way Cost</u>	<u>Total Cost</u>
Line A	\$4,941,000	\$10,000	\$4,951,000
Line A-1	\$2,658,000	-	\$2,658,000
Line A-2	\$302,000	-	\$302,000
Line A-3	\$297,000	-	\$297,000
Line A-6	\$2,366,000	-	\$2,366,000
Line A-7	\$224,000	-	\$224,000
Line A-8	\$447,000	-	\$447,000
Line B	\$7,967,000	-	\$7,967,000
Line B-1	\$1,269,000	-	\$1,269,000
Line B-2	\$482,000	-	\$482,000
Line B-3	\$263,000	-	\$263,000
Line C	\$2,091,000	-	\$2,091,000
Line D-1	\$404,000	-	\$404,000
Line D-2	\$973,000	-	\$973,000
Line D-3	\$973,000	-	\$973,000
Line D-4	\$310,000	-	\$310,000
Line D-5	\$6,014,000	-	\$6,014,000
Line D-7	\$951,000	-	\$951,000

<u>Facility</u>	<u>Construction Cost</u>	<u>Right-of-Way Cost</u>	<u>Total Cost</u>
Line D-8	\$538,000	-	\$538,000
Line D-9	\$145,000	-	\$145,000
Line F	\$13,675,000	\$1,055,000	\$14,730,000
Line F-2	\$8,804,000	-	\$8,804,000
Line F-5	\$1,430,000	-	\$1,430,000
Line F-13	\$613,000	-	\$613,000
Line F-15	\$886,000	-	\$886,000
Line F-16	\$1,401,000	-	\$1,401,000
Line F-17	\$1,149,000	-	\$1,149,000
Line F-18	\$588,000	-	\$588,000
Line F-19	\$347,000	-	\$347,000
Line E-1	\$885,000	-	\$885,000
Line E-2	\$885,000	-	\$885,000
Line E-3	\$1,092,000	-	\$1,092,000
Line E-4	\$801,000	-	\$801,000
Line E-5	\$1,052,000	-	\$1,052,000
Line E-6	\$788,000	-	\$788,000
Line E-7	\$1,109,000	-	\$1,109,000
Line E-8	\$745,000	-	\$745,000
Line E-10	\$624,000	-	\$624,000
Line G	\$10,121,000	\$935,000	\$11,056,000
Line G-1	\$129,000	-	\$129,000
Line G-2	\$431,000	-	\$431,000
Line G-3	\$1,664,000	\$50,000	\$1,714,000
Line G-4	\$617,000	-	\$617,000
Line G-7	\$2,913,000	\$305,000	\$3,218,000
Line G-8	\$264,000	-	\$264,000
Line G-9	\$735,000	-	\$735,000
Line G-10	\$420,000	-	\$420,000
Line G-11	\$647,000	-	\$647,000
Line H	\$7,367,000	-	\$7,367,000
Line H-1	\$1,841,000	-	\$1,841,000
Line H-1a	\$115,000	-	\$115,000
Line H-2	\$2,507,000	-	\$2,507,000
Line H-3	\$1,251,000	-	\$1,251,000
Line H-4	\$177,000	-	\$177,000
Line H-5	\$525,000	-	\$525,000
Line H-5a	\$132,000	-	\$132,000

<u>Facility</u>	<u>Construction Cost</u>	<u>Right-of-Way Cost</u>	<u>Total Cost</u>
Line H-6	\$278,000	-	\$278,000
Line H-11	\$981,000	-	\$981,000
Line J	\$11,776,000	-	\$11,776,000
Line J-1	\$591,000	-	\$591,000
Line J-7	\$258,000	-	\$258,000
Line J-8	\$682,000	-	\$682,000
Line K	\$9,816,000	\$570,000	\$10,386,000
Line K-1	\$4,240,000	-	\$4,240,000
Line K-2	\$283,000	-	\$283,000
Line K-4	\$138,000	-	\$138,000
Cactus Basin	\$5,047,000	\$3,300,000	\$8,347,000
Sinclair Basin	\$6,014,000	\$2,400,000	\$8,414,000
Quincy Basin	\$5,174,000	\$2,150,000	\$7,324,000
Reche Canyon Debris Basin	\$706,000	\$713,000	\$1,419,000
Ironwood Debris Basin	\$197,000	\$219,000	\$416,000
<b>Total</b>	<b>\$148,526,000</b>	<b>\$11,707,000</b>	<b>\$160,233,000</b>

NOTE: Total Costs include 40% for Engineering, Administration, MSHCP Fee and Contingencies.

## **SECTION XI - CONCLUSIONS**

Based on the studies and investigations made for this report, it is concluded that:

1. The Moreno Valley area has experienced serious flooding problems in the past. The fully implemented plan should, in conjunction with ultimate street improvements for the area within the boundaries of the Moreno MDP, contain the 100-year frequency flows and alleviate the primary sources of flooding.
2. The proposed plan addresses the denser development anticipated in the Moreno Valley area and provides network of drainage facilities which, when implemented, will provide adequate flood protection to the community as development continues.
3. The proposed MDP lends itself to a staged construction as funds become available.
4. The total cost of the recommended improvements, including right-of-way, engineering, environmental mitigation, administration, and contingencies is estimated to be \$160,233,000.

## **SECTION XII - RECOMMENDATIONS**

It is recommended that:

1. The Moreno Master Drainage Plan revision, as set forth herein, be adopted by the City of Moreno Valley and the District's Board of Supervisors.
2. The revisions to the Moreno Master Drainage Plan, as set forth herein, replace the Master Drainage Plan adopted in April 1991.
3. The revision to the Moreno Master Drainage Plan, as set forth herein, be used as a guide for all the future developments in the study area and that such developments be required to conform to the Plan insofar as possible.
4. Right-of-way necessary for the implementation of the MDP be protected from encroachment.

## ALTERNATIVES ANALYSIS

### Alternatives Overview

Given that this Master Drainage Plan (MDP) update is essentially a refinement of the adopted Moreno MDP, a relatively narrow range of alternatives was considered. Nonetheless, several alternatives were developed and evaluated against the project objectives established by the District and the City of Moreno Valley. This section provides a brief description of the major components of each alternative and indicates preferred alternative. Each description is supplemented with an exhibit in the appendix which displays the layout of facilities and basin locations.

It should also be noted that, while the MDP update was being developed, the District and City mutually agreed that the existing Line F-2 storm drain facility, which is currently sized as a 10-year facility, would be reconstructed to provide 100-year flood capacity. Thus, the proposed reconstruction of Line F-2 was assumed to be a part of each alternative considered for the Moreno MDP Revision.

**Alternative 1:** This alternative consists of the same types of facilities and alignments as in the currently adopted Moreno MDP (Adopted MDP). Two detention basins are proposed along the Line F channel alignment: 1) Sinclair Basin just north of California State Route 60 (SR 60); and 2) Bay Avenue Basin located on the north side of Bay Avenue. In addition, Reche Canyon Debris Basin has been added to capture debris upstream of Line K. It should be noted that, similar to the Adopted MDP, this alternative proposes 1) concrete lining for all channel segments; and 2) makes use of the existing highway drainage culverts located under SR 60. See Exhibit 1 in the appendix for further detail.

**Alternative 2a and 2b:** The principal difference between these two alternatives and Alternative 1 is the realignment of proposed facilities upstream of SR 60 in an effort to maintain the current natural drainage patterns within the upper watershed. This was accomplished by realigning the mainline facilities, specifically Line A, to convey flows from the foothills southerly to the existing culverts at SR 60 instead of diverting flows into the proposed Sinclair Basin. Both of these alternatives propose Lines F, G, and K as earthen channels with rock-lined side slopes (unlined channels) in place of the concrete lined channels proposed in Alternative 1. Reche Canyon Debris Basin has been included to capture debris upstream of Line K. Alternatives 2a and 2b differ from each other primarily in the size, number, and location of proposed detention basins. See Exhibit 2A and 2B for further detail.

**Alternative 3:** This alternative retains the major realignment of Line A, as proposed in Alternatives 2a and 2b, but proposes three detention basins downstream of SR 60 in place of the various basins proposed in Alternatives 2a and 2b. This option would require the upsizing the existing highway drainage culverts under SR 60 to convey the 100-year flows to the proposed basin locations. The three detention basins proposed in Alternative 3 are: 1) Brodiaea Basin along Line G just north of Brodiaea Avenue; 2) Fir Basin just south of SR 60 along Line G-7; and 3) Cactus Basin at the downstream end of proposed Line F. This alternative also proposes Lines F, G, and K as earthen channels with rock-lined side slopes in place of the concrete lined channels proposed in Alternative 1. Reche Canyon Debris Basin has been included to capture debris upstream of Line K. See Exhibit 3 for further detail.

**Alternative 4 – Preferred Alternative:** Similar to Alternatives 2a, 2b and 3, this alternative also calls for the realignment of proposed facilities upstream of SR 60 in an effort to maintain the current natural drainage patterns of the area. Alternative 4 proposes the implementation of three detention basins: 1) Quincy Basin located along Line A just north of the freeway; 2) Sinclair Basin located just north of SR 60 at the upstream end of Line F; and 3) Cactus Basin located at the confluence of Line F and Line F-2 just north of Cactus

Avenue. Similar to Alternative 2a, 2b, and 3, this alternative also proposes Lines F, G and K as earthen channels with rock-lined side slopes in place of the concrete lined channels proposed in Alternative 1. Reche Canyon Debris Basin has been included to capture the expected debris upstream of Line K, as well as Ironwood Debris Basin to capture expected debris upstream of Line C. See Exhibit 4 for further detail.

#### **Comparing Alternatives: Total Project Footprint**

Given that this MDP update is essentially a refinement of an adopted MDP, a relatively narrow range of alternatives was considered. One way of analyzing the potential for impacts or expected plan benefits is by comparing the overall project footprint of each alternative. In order to do so the following observations and assumptions were made:

- 1) Each of the four conceptual alternatives has the same drainage boundary and provides a similar level of flood protection.
- 2) The overall footprint of proposed lateral facilities is similar between the four alternatives.
- 3) In comparison to concrete lined channels, unlined channels provide greater infiltration potential.
- 4) In comparison to concrete lined channels, unlined channels will have larger footprints.
- 5) The principal difference between the four alternatives is the size, number, and location of proposed detention and debris basins.
- 6) The relative differences in project footprint for the detention and debris basins may be used to develop comparative rankings of the alternatives against the project objectives.

A summary of the approximate total basin footprints is shown in Table 4.



**TABLE 4: Alternatives: Basin Footprint Summary**

<b>Moreno MDP Revision Alternatives: Approximate Basin Footprint Summary</b>		
<b>Alternative</b>	<b>Proposed Basin</b>	<b>Basin Footprints (Detention and Debris) in acres</b>
<b>1</b>	Sinclair Basin*	28.5
	Bay Basin*	36.8
	Reche Canyon Debris Basin*	10.0
	<i>Total</i>	<i>75.3</i>
<b>2a</b>	Sinclair Basin*	14.0
	Bay Basin*	17.4
	Redlands Basin*	6.0
	Quincy Basin*	13.2
	Brodiaea Basin*	11.3
	Reche Canyon Debris Basin*	10.0
<i>Total</i>	<i>71.9</i>	
<b>2b</b>	Highland Basin*	14.4
	Bay Basin*	30.5
	Ironwood Basin*	13.6
	Eucalyptus Basin*	6.4
	Reche Canyon Debris Basin*	10.0
<i>Total</i>	<i>74.9</i>	
<b>3</b>	Brodiaea Basin*	10.5
	Fir Basin*	28.3
	Cactus Basin*	29.5
	Reche Canyon Debris Basin*	10.0
<i>Total</i>	<i>78.3</i>	
<b>4</b>	Sinclair Basin	25.0
	Cactus Basin	21.7
	Quincy Basin	22.5
	Reche Canyon Debris Basin*	10.0
	Ironwood Debris Basin*	3.1
<i>Total</i>	<i>82.3</i>	
<p><i>*Note: These basin footprint acreages have been adjusted by a factor 1.33 to account for additional right-of-way requirements (e.g., access road right-of-way, embankment slopes, property boundaries, basin grading, existing topography, spillway requirements, etc.) that were included in the more detailed footprint estimations developed for the Alternative 4 detention basins. The factor was based on comparisons of basin modeling methodologies for Alternative 4 and engineering judgment.</i></p>		

## Alternative Analysis

A decision matrix was developed in order to evaluate the alternatives against the project objectives established by the District and the City of Moreno Valley. Criteria for the matrix were selected to represent aspects of the project objectives which could be qualitatively evaluated between the alternatives. The matrix is shown in Table 5.

### Criteria Descriptions:

- 1) **Provide 100 Year Flood Protection:** This criterion represents the ability of an alternative to provide 100 year flood protection in conjunction with ultimate street improvements.
- 2) **Removal of FEMA mapped Special Flood Hazard Areas:** This criterion represents the ability of an alternative to remove FEMA mapped Special Flood Hazard Areas within the drainage boundary.
- 3) **Potential for Infiltration:** This criterion represents the extent to which an alternative is able to promote infiltration of runoff back into the ground through the presence of basins and earthen bottomed channels.
- 4) **Perpetuating Natural Drainage Course:** This criterion represents the extent to which an alternative reduces the major diversion upstream of SR 60 proposed in the Adopted MDP.
- 5) **Providing Noise Buffer for the Community:** The basins located adjacent to SR 60 have the potential to serve as buffer zones for the noise generated by traffic on SR 60. This criterion represents the extent to which an alternative incorporates this benefit into its proposed basin locations.
- 6) **Minimizing Potential Disturbances (Project Footprint):** Alternatives with larger footprints were viewed as having a higher potential of environmental impacts during construction (e.g. air quality, disturbing natural habitats, cultural resources, etc...). This criterion represents the relative potential for such disturbances based upon a comparison of anticipated project footprints for each alternative.
- 7) **Sediment/Debris Reduction:** This criterion represents how well each alternative achieves the reduction of debris from watersheds with high debris producing potential. The prevention of debris and sediment at its source will remove the need to use bulking factors for design flow rates of downstream facilities and reduce the final size of the mainline facilities as well as improve water quality.
- 8) **Ease of Maintenance:** This criterion represents the relative amount of maintenance which can be expected of each alternative in regards to logistics and routine/non-routine maintenance.

Scoring:

Each alternative was scored against the criteria according to the following schematic:

- Alternatives were compared and assigned a score of 2 if their ability to satisfy a criterion is reasonably comparable to any other alternative.
- Alternatives which satisfy a criterion more than those alternatives assigned a score of 2 were be assigned a score of 3.
- Alternatives which satisfy a criterion less than those alternatives assigned a score of 2 were be assigned a score of 1.
- All criteria was given a weight of 1.
- The total sum of the criteria scores for each alternative represents the overall ability of each alternative to satisfy the objectives of the MDP revision.
- Criteria for “Providing 100-year Flood Protection” and “Removal of FEMA Mapped Special Flood Hazard Areas” were included solely as reminders of key project objectives and were not scored according to the schematic described above.

**TABLE 5: Decision Matrix**

Name	1) Provide 100 Year Flood Protection	2) Removal of FEMA Mapped Special Flood Hazard Areas	3) Potential for Infiltration	4) Perpetuating the Natural Drainage Course	5) Providing Noise Buffer for the Community	6) Project Footprint (Potential Disturbances)	7) Sediment/Debris Reduction	8) Ease of Maintenance	Totals
Score Range	N/A	N/A	More = 3 Comparable = 2 Less = 1	More = 3 Comparable = 2 Less = 1	More = 3 Comparable = 2 Less = 1	More = 3 Comparable = 2 Less = 1	More = 3 Comparable = 2 Less = 1	More = 3 Comparable = 2 Less = 1	MAX 18
Alternative 1	YES	YES	1	1	2	2	2	3	11
Alternative 2a	YES	YES	2	3	2	3	2	1	13
Alternative 2b	YES	YES	2	2	1	2	2	1	10
Alternative 3	YES	YES	3	2	2	1	2	2	12
Alternative 4*	YES	YES	3	2	3	1	3	2	14

\*Alternative 4 was selected as the preferred alternative and has received concurrence from the City of Moreno Valley.

## Criteria Scoring Discussion

### 1) Provide 100 Year Flood Protection:

- Each alternative was developed to provide the same level of flood protection in conjunction with ultimate street improvements.

### 2) Removal of FEMA mapped Special Flood Hazard Areas:

- Each alternative was developed to reduce flooding and allow the removal FEMA mapped Special Flood Hazard Areas within the drainage boundary.

### 3) Potential for Infiltration:

- It was assumed that larger basin footprints and earthen channels in lieu of concrete channels would better facilitate the infiltration of runoff.
- Alternatives were scored for this criterion based upon the estimated total basin footprint required for the full implementation of each alternative with the exception of Alternative 1 which automatically received a lower score (see next point for further details).
- Alternative 1, 2a and 2b all have comparable basin footprints; however, Alternative 1 proposes concrete lined channels (as in the Adopted MDP) and Alternatives 2a and 2b propose earthen bottom channels. Alternative 1 therefore has a lower potential for infiltration and received a score of 1. Alternatives 2a and 2b both received a score of 2.
- Alternatives 3 and 4 both received a score of 3 for having larger total basin footprints than Alternative 2a and 2b. Alternatives 3 and 4 also proposed earthen bottom channels.

### 4) Perpetuating Natural Drainage Course:

- Alternatives 2b, 3, and 4 all include the realignment of facilities to reduce the major Line A diversion proposed in the Adopted MDP; however, all alternatives still include minor diversions primarily related to their proposed Line D alignments. Alternatives 2b, 3 and 4 received a score of 2.
- Alternative 1 received a score of 1 because it would maintain the Line A diversion proposed in the Adopted MDP.
- Alternative 2a received a score of 3 because it most effectively removes the Line A diversion proposed in the Adopted MDP and minimizes diversions within the drainage area better than all other alternatives.

### 5) Providing Noise Buffer for the Community:

- Alternatives 1, 2a, and 3 received a score of 2 because they all propose one basin to be located immediately adjacent to SR 60 and would provide the community with some buffer from the noise generated by the freeway.
- Alternative 2b received a score of 1 because it proposes no basins immediately next to SR 60 and would not provide any noise buffer.

- Alternative 4 received a score of 3 because it proposes 2 basins to be located immediately next to SR 60 and would provide the most buffer area for the future residential communities.

6) Minimizing Potential Disturbances (Project Footprint):

- Each alternative was scored based upon the relative differences between their anticipated project footprints.
- The relative anticipated project footprints for each alternative were compared using approximate total basin footprint acreages (see previous Comparing Alternatives section).
- The largest difference between the largest and the smallest total basin footprint is approximately 15% (71.9 Ac. vs. 82.3 Ac.).
- Alternative 1, 2a and 2b all have comparable basin footprints; however, Alternative 1 proposes concrete lined channels (as in the Adopted MDP) and Alternatives 2a and 2b propose earthen bottom channels. Alternative 1 therefore has a smaller anticipated project footprint, less potential for environmental impacts during construction, and received a score of 3. Alternatives 2a and 2b both received a score of 2.
- Alternatives 3 and 4 both received a score of 1 for having the largest anticipated project footprints.

7) Sediment/Debris Reduction:

- Alternatives 1, 2a, 2b, and 3 received a score of 2 because they propose Reche Canyon Debris Basin to capture debris and sediment from the watershed with the most debris producing potential.
- Alternative 4 received a score of 3 because it proposes Reche Canyon Debris Basin and Ironwood Debris basin to capture debris from the two watersheds with the most debris producing potential.

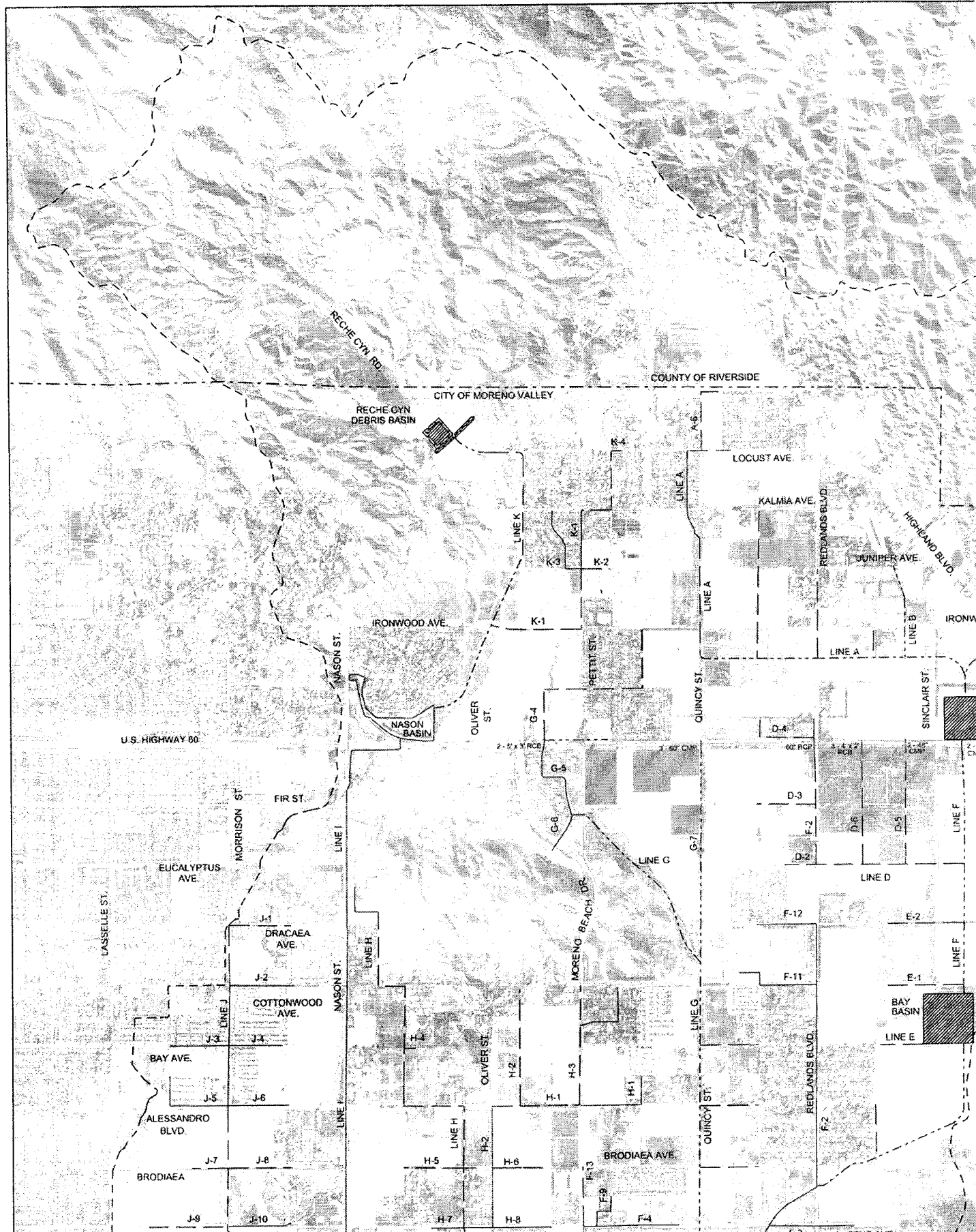
8) Ease of Maintenance:

- Detention basins were assumed to require routine maintenance for mowing/weed abatement and erosion control.
- Debris basins were assumed to require routine maintenance for sediment removal from the basins themselves while reducing the amount of sediment deposited in underground facilities.
- Earthen channels were assumed require routine maintenance for mowing/weed abatement.
- The complexity of scheduling for maintenance activities was expected to increase with the number of basins proposed in an alternative.
- Alternative 1 received a score of 3 because it proposed the fewest basins which, when coupled with the proposed concrete lined channels, would require the least amount of routine maintenance of all four alternatives.
- Alternatives 3 and 4 were viewed as comparable and received a score of 2 under this criterion. Alternative 3 proposes 3 detention basins and 1 debris basin while Alternative 4 proposes 3 detention basins and 2 debris basins. While an additional debris basin in Alternative 4 may require additional maintenance on the basin itself it reduces the potential for downstream facilities to clog and require maintenance.

- Alternatives 2a and 2b received scores of 1 for proposing the largest number of basins. Alternative 2a proposes 5 detention basins and 1 debris basin and Alternative 2b proposes 4 detention basins and 1 debris basin.

#### Preferred Alternative

Table 5 shows the completed matrix with the total scores for each alternative. Based upon the evaluation, and as highlighted by the matrix, Alternative 4 best fits the objectives set forth for the project and was selected as the Preferred Alternative. Although the anticipated project footprint for Alternative 4 is slightly larger than the other alternatives, Alternative 4 would provide more opportunities for infiltration of runoff; it would provide a noise buffer for the surrounding community; and would reduce the amount of sediment and debris in the drainage system by capturing it at its source. Alternative 4 was discussed with City of Moreno Valley staff and they provided their concurrence with its selection as the Preferred Alternative.



RECHE CYN RD

COUNTY OF RIVERSIDE

CITY OF MORENO VALLEY

RECHE CYN DEBRIS BASIN

LOCUST AVE

KALMA AVE

REDLANDS BLVD

JUNIPER AVE

HIGHLAND BLVD

IRONW

IRONWOOD AVE

PETTY ST

QUINCY ST

SINCLAIR ST

NASON BASIN

U.S. HIGHWAY 60

MASON ST

OLIVER ST

MORRISON ST

FIR ST

EUCALYPTUS AVE

LASSELIE ST

DRACAEA AVE

COTTONWOOD AVE

BAY AVE

ALESSANDRO BLVD

BRODIAEA

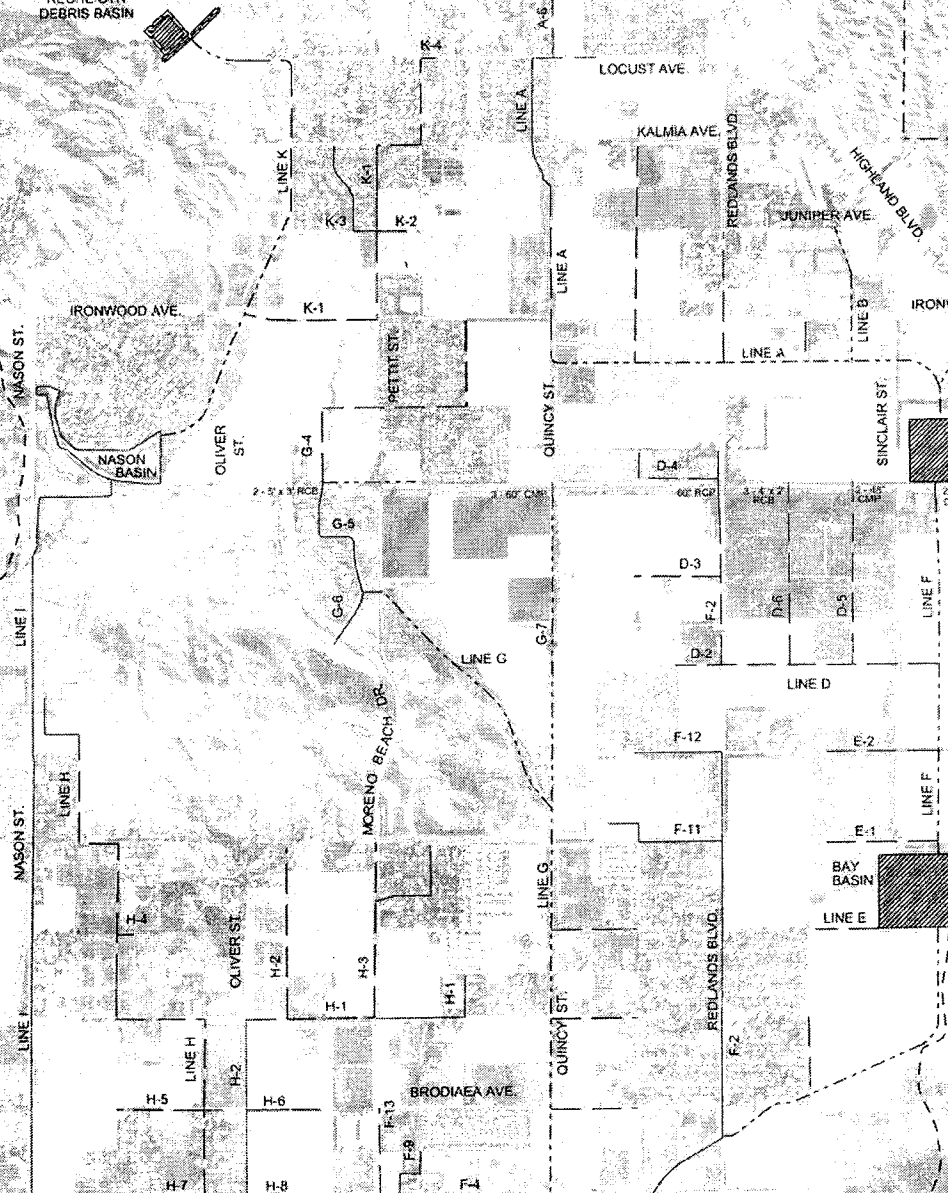
MORENO BEACH DR

OLIVER ST

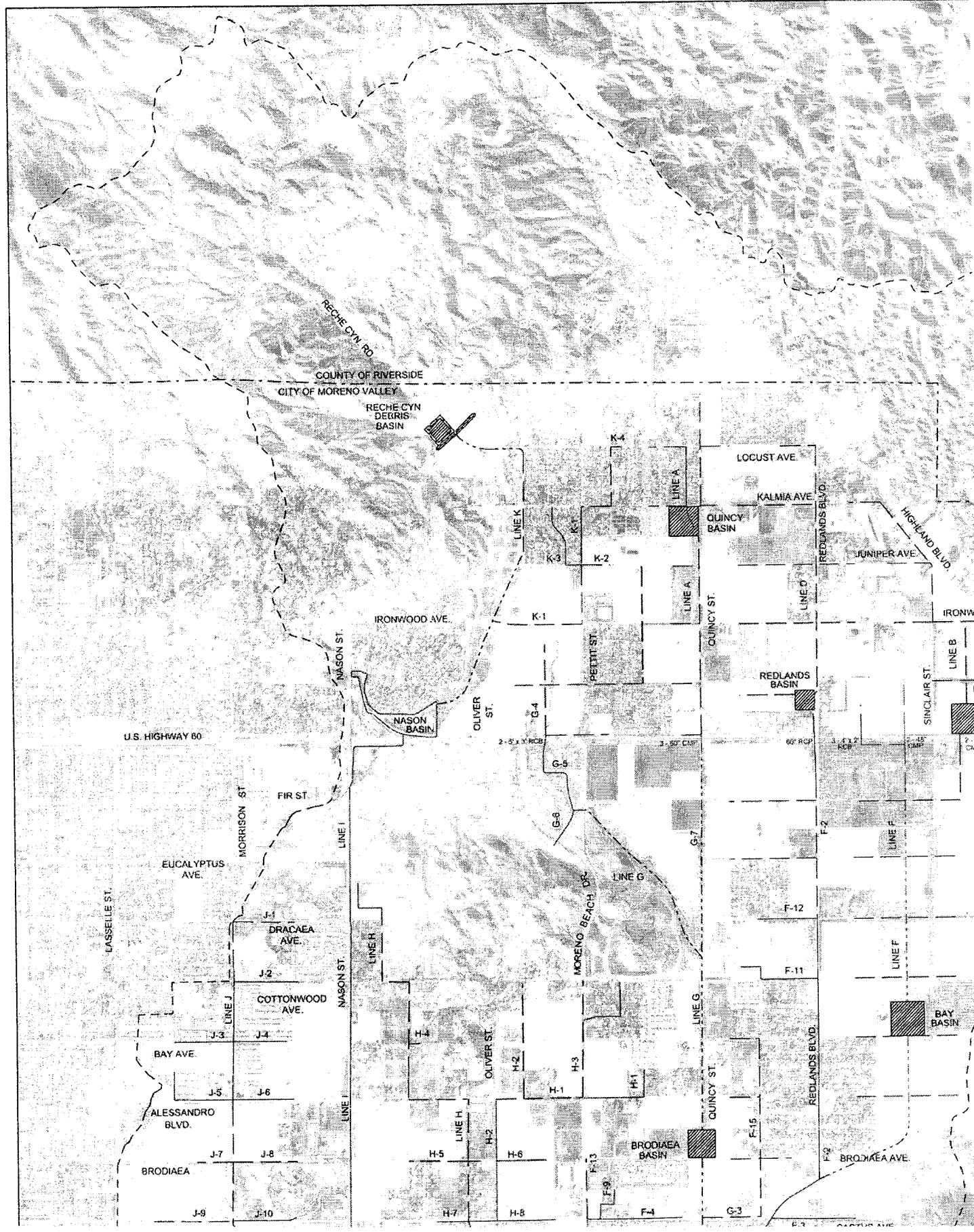
BRODIAEA AVE

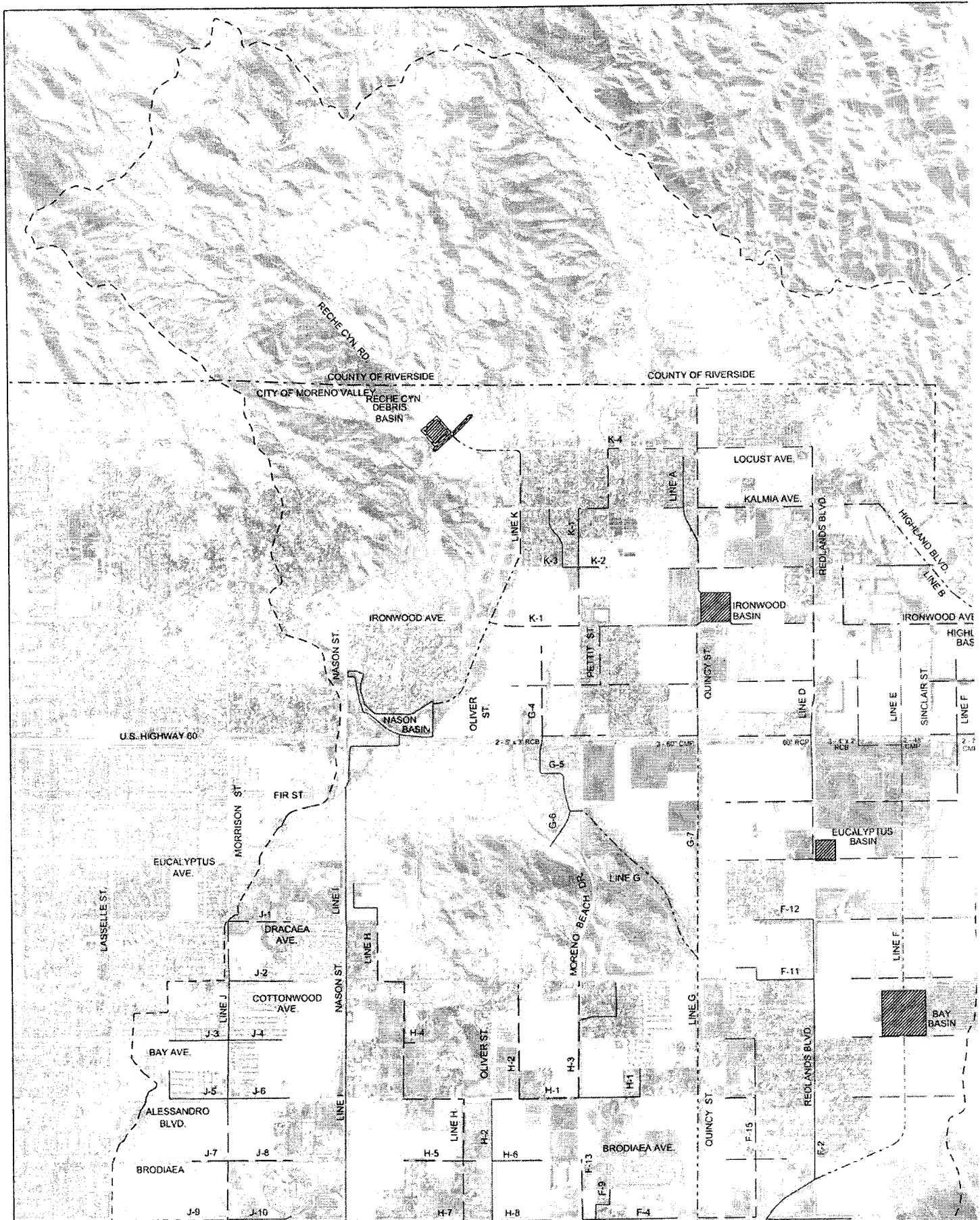
REDLANDS BLVD

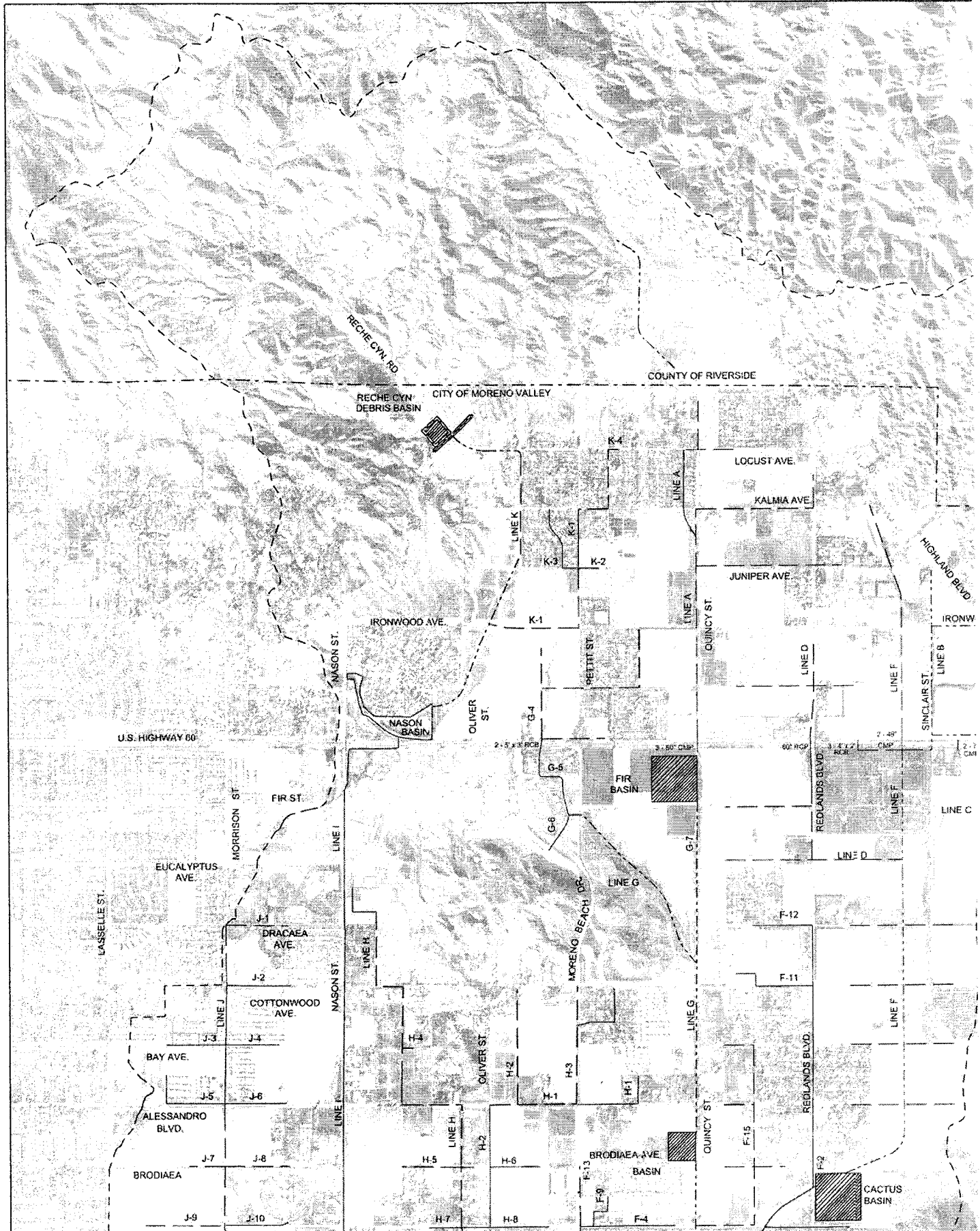
BAY BASIN

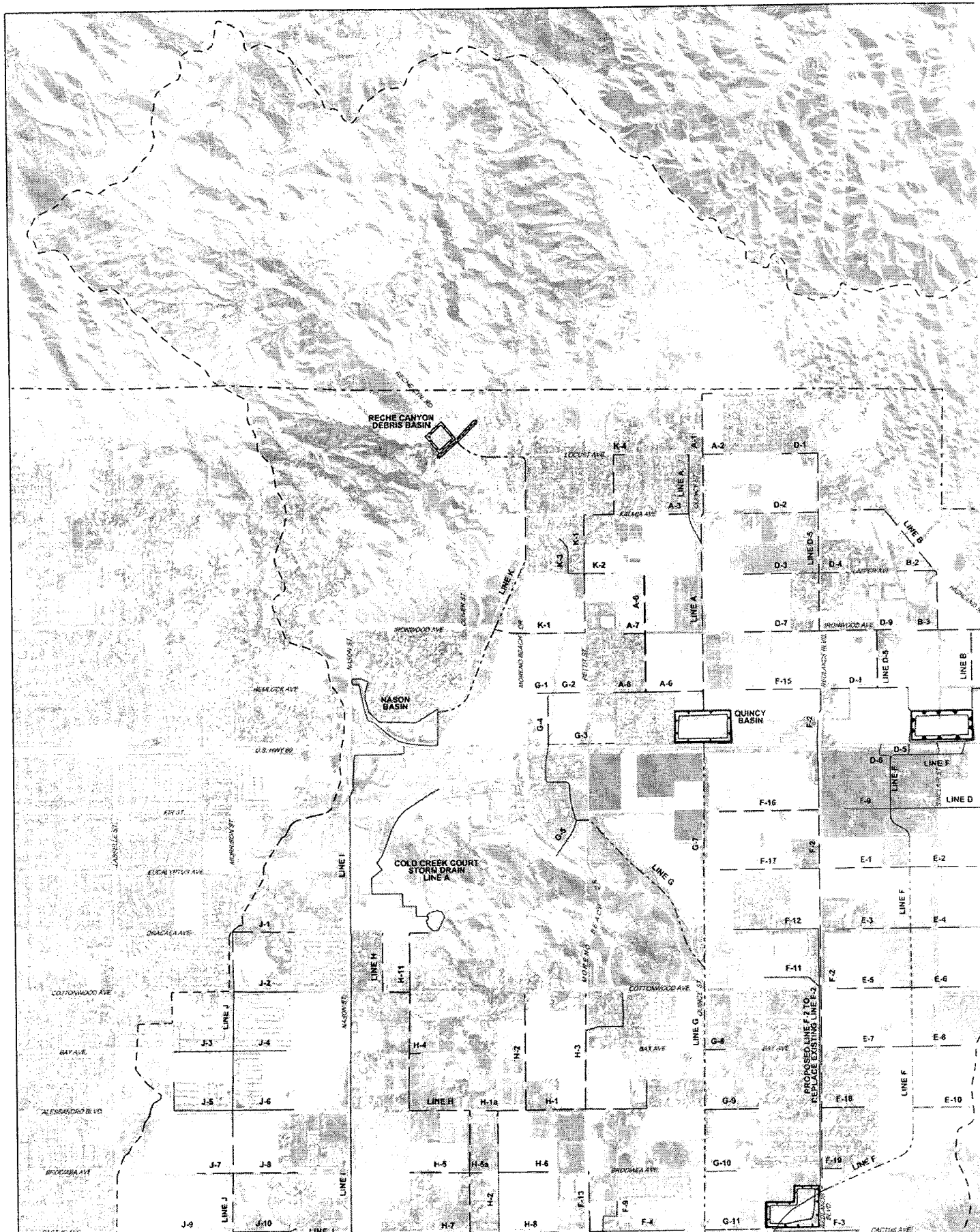












**Notice of Determination**

**To: Office of Planning and Research**  
*For U.S. Mail:*  
 P.O. Box 3044  
 Sacramento, CA 95812-3044

*Street Address:*  
 1400 Tenth Street  
 Sacramento, CA 95814

**From: Riverside County Flood Control**  
 1995 Market Street  
 Riverside, CA 92501  
 Contact: Kris Flanigan  
 Phone: 951.955.8581

**County Clerk**  
 County of Riverside  
 2724 Gateway Drive  
 Riverside, CA 92507

Original Negative Declaration/Notice of  
 Determination was routed to County  
 Clerks for posting on.

**Lead Agency:** Same as above

4/21/15      KB  
 Date                                  Initial

**Subject:** Filing of Notice of Determination in compliance with Section 21152 of the Public Resources Code.

**State Clearinghouse Number:** 2012041013

**Project Title:** Moreno Master Drainage Plan Revision

**Project Location**

The Project is located in the city of Moreno Valley and unincorporated Riverside County, California. The Project area (Moreno watershed) encompasses all or a portion of Sections 30 and 31, Township 2 South, Range 2 West; Sections 21 through 23, 25 through 29, 33 through 36, Township 2 South, Range 3 West; Sections 1 through 4, 9 through 16, 21 through 24, 27, and 28, Township 3 South, Range 3 West, San Bernardino Base and Meridian. Longitude/Latitude for the Project is 117 degrees, 11 minutes, 58 seconds north and 33 degrees, 56 minutes, 57 seconds west.

**Project Description**

The Project provides a variety of modifications to the existing MDP related to the size, type, and conceptual locations of drainage facilities and basins in order to improve flood protection for both existing users and future development within the Moreno watershed. The Project proposes the administration, construction, operation, and maintenance of approximately 30 miles of storm drains and channels, and approximately 82 acres of detention and debris basins.

**Determination**

This is to advise that the Riverside County Flood Control and Water Conservation District (Lead Agency) has approved and certified pursuant to the California Environmental Quality Act (CEQA) the above-described Project on April 14, 2015 and has made the following determinations regarding the above-described Project:

- 1) The Project will have a significant effect on the environment.
- 2) A Programmatic Environmental Impact Report was prepared pursuant to the provisions of CEQA.
- 3) Mitigation measures were made a condition of the approval of the Project.
- 4) A Mitigation Monitoring Program was adopted for this Project.
- 5) A Statement of Overriding Considerations was adopted for this Project.
- 6) Findings were made pursuant to the provisions of CEQA.

**Public Access to Environmental Document**

The Programmatic Environmental Impact Report and record of the project approval is available to the General Public at the Office of the Clerk of the Board, County Administrative Center, 4080 Lemon Street, Riverside, CA 92501; the EIR is also available at the Riverside County Flood Control and Water Conservation District office located at 1995 Market Street, Riverside, CA 92501; and an electronic copy is available on the District's website at <http://rcflood.org/>.

Karen Walker  
 Signature (Public Agency)

Board Assistant  
 Title

April 14, 2015  
 Date

\_\_\_\_\_  
 Date Received for Filing at OPR

RIVERSIDE COUNTY CLERK-RECORDER

AUTHORIZATION TO BILL

TO BE FILLED OUT BY SUBMITTING AGENCY

DATE: 3/4/2015 BUSINESS UNIT/AGENCY: FLOOD CONTROL - FCARC

ACCOUNTING STRING:

ACCOUNT: 526410 FUND: 25140  
DEPT ID: 947460 PROGRAM: \_\_\_\_\_

AMOUNT: \$3,069.75

REF: Final CEQA posting notice of Determinatin posting Authorization for Moreno Master Drainage Plan Revision 224 4-6-00828-00-00-0000-902

THIS AUTHORIZES THE COUNTY CLERK & RECORDER TO ISSUE AN INVOICE FOR PAYMENT OF ALL DOCUMENTS INCLUDED.

NUMBER OF DOCUMENTS INCLUDED: 1

AUTHORIZED BY: Michael Reyes *Michael Reyes* 3-4-15

PRESENTED BY: Kris Flanigan EXT 58581

CONTACT: Michael Reyes

TO BE FILLED OUT BY COUNTY CLERK

ACCEPTED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

DOCUMENT NO(S)/INVOICE NO(S): \_\_\_\_\_  
\_\_\_\_\_

**ATTACHMENTS FILED**  
**WITH**  
**THE CLERK OF THE BOARD**