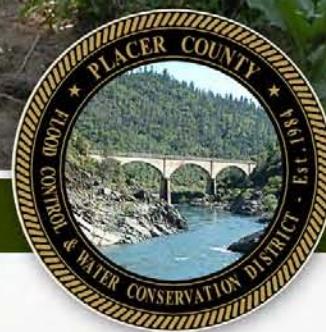




Update to the Dry Creek Watershed Flood Control Plan

November 2011

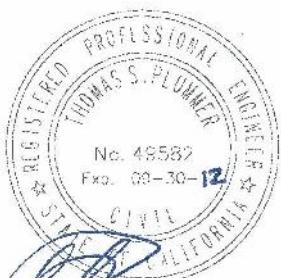
Placer County Flood Control and Water Conservation District



Prepared by:



The Dry Creek Watershed Plan Update was prepared under the direction of:



 11/1/11
Thomas S. Plummer, P.E.
Civil Engineering Solutions, President



 11/1/11
Harvey R. Oslick, P.E.
RBF Consulting, Senior Associate

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

TABLE OF CONTENTS

EXECUTIVE SUMMARY

ES-1 PURPOSE	ES-1
ES-2 BACKGROUND	ES-1
ES-3 CURRENT CONDITIONS.....	ES-2
ES-4 HYDROLOGY.....	ES-2
ES-5 RECOMMENDATIONS	ES-3
ES-6 FUNDING	ES-5

1.0 PROJECT BACKGROUND	1
1.1 PURPOSE	1
1.2 WATERSHED DESCRIPTION	1
1.2.1 <i>Topography</i>	2
1.2.2 <i>Soils</i>	2
1.2.3 <i>Land Use and Development Projections</i>	3
1.3 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN	5
1.4 INFORMATION SOURCES	6
1.4.1 <i>Hydrologic Reports</i>	6
1.4.2 <i>Environmental Documents</i>	8
1.5 COMPUTER MODELING	9
1.5.1 <i>Application of HEC-1 and HEC-HMS</i>	9
1.5.2 <i>Application of HEC-RAS</i>	10
1.5.3 <i>Topographic Data</i>	11
1.5.4 <i>Land Use</i>	12
1.6 HISTORIC FLOODING.....	12
1.6.1 <i>March 1983</i>	13
1.6.2 <i>February 1986</i>	13
1.6.3 <i>March 25, 1989</i>	14
1.6.4 <i>January 1995</i>	14
1.6.5 <i>January 1997</i>	15
1.6.6 <i>February 1998</i>	15
1.6.7 <i>December 2005</i>	16
1.7 GAGE DATA.....	17
1.8 RELATED FLOOD MANAGEMENT PROGRAMS.....	18
1.8.1 <i>FEMA</i>	18
1.8.2 <i>Roseville</i>	19
1.8.3 <i>Rocklin</i>	20
1.8.4 <i>Loomis</i>	20
1.8.5 <i>Unincorporated Placer County</i>	21
1.8.6 <i>Sacramento County</i>	21



2.0 EXISTING CONDITIONS	23
2.1 MAIN CHANNEL AND TRIBUTARIES	23
2.1.1 <i>Dry Creek</i>	23
2.1.2 <i>Miners Ravine and False Ravine</i>	23
2.1.3 <i>Secret Ravine and Sucker Ravine</i>	23
2.1.4 <i>Antelope Creek and Clover Valley Creek</i>	24
2.1.5 <i>Cirby Creek, Linda Creek and Strap Ravine</i>	24
2.2 LOCAL AND REGIONAL STRUCTURAL FLOOD CONTROL PROJECTS	
COMPLETED SINCE 1992	24
2.2.1 <i>Miners Ravine Off-Channel Detention Basin</i>	25
2.2.2 <i>Local Structural Flood Control Projects</i>	25
2.3 NON-STRUCTURAL IMPROVEMENTS SINCE 1992	25
2.3.1 <i>Building Elevation Projects</i>	26
2.3.2 <i>Residential Buy-outs</i>	26
2.3.3 <i>ALERT Flood Warning System</i>	26
2.3.4 <i>Annual Streambed Maintenance Program</i>	26
2.4 EXISTING FLOOD HAZARDS	27
2.4.1 <i>Rocklin</i>	27
2.4.2 <i>Roseville</i>	28
2.4.3 <i>Loomis</i>	28
2.4.4 <i>Placer County</i>	29
2.4.5 <i>Sacramento County</i>	29
3.0 UPDATED HYDROLOGY	30
3.1 MODELING SYSTEM DEVELOPMENT	30
3.1.1 <i>Key Locations for Summary Comparisons</i>	30
3.2 UPDATE OF THE 1992 PLAN MODEL TO CURRENT DISTRICT	
METHODOLOGY	31
3.3 WATERSHED DELINEATION AND SUBDIVISION	33
3.4 LAND USE HYDROLOGIC FACTORS FOR 1992, 2007, AND GENERAL PLAN	
BUILD-OUT	33
3.4.1 <i>Land Use</i>	33
3.4.2 <i>Impervious Area</i>	34
3.4.3 <i>Loss Rates</i>	35
3.4.4 <i>Response Time Factors</i>	36
3.5 CHANNEL ROUTING	36
3.5.1 <i>Channel Routing in the Hydrology Models</i>	37
3.5.2 <i>Unsteady-State Hydraulic Routing Model</i>	37
3.6 HYDROLOGIC COMPUTER MODEL CALIBRATIONS	39
3.7 COMPARATIVE ANALYSIS SCHEME	39
3.8 UPDATED 1992 BASELINE CONDITIONS MODELING IN HEC-HMS	43
3.8.1 <i>Storm Centering Analysis for Key Locations of Interest (HEC-1)</i>	43
3.9 CURRENT CONDITIONS MODELING	44
3.9.1 <i>Current Condition HEC-HMS Modeling</i>	45
3.9.2 <i>Hydraulic Routing for Pre-Miners Ravine – 2006 Conditions Evaluation</i>	46
3.9.3 <i>Miners Ravine Off-channel Detention Basin – 2007 Conditions Evaluation</i>	47



3.9.4	<i>Sierra College Boulevard at Secret Ravine – 2010 Conditions Evaluation..</i>	48
3.10	GENERAL PLAN BUILD-OUT MODELING	48
3.10.1	<i>General Plan with Current Mitigation</i>	48
3.10.2	<i>General Plan with LID</i>	49
3.10.3	<i>Future Fully Developed Unmitigated Other Regulatory Flows</i>	49
3.11	PEAK FLOW TABLES FOR VARIOUS RECURRENCE INTERVALS	49
4.0	POTENTIAL IMPROVEMENT PROJECTS AND MITIGATION MEASURES ..	60
4.1	PLANNED BRIDGE AND CULVERT IMPROVEMENTS.....	60
4.2	BRIDGE AND CULVERT PROJECT RECOMMENDATIONS.....	60
4.3	REGIONAL DETENTION BASIN PROJECT OPTIONS.....	61
4.3.1	<i>Antelope Creek at Atlantic Street</i>	62
4.3.2	<i>Secret Ravine at Sierra College Boulevard</i>	63
4.3.3	<i>Linda Creek at Old Auburn Road</i>	63
4.3.4	<i>Linda Creek at Wedgewood Drive.....</i>	63
4.3.5	<i>Linda Creek near Auburn-Folsom Road.....</i>	64
4.4	CHANNEL IMPROVEMENT AND RESTORATION OPPORTUNITIES, AND POTENTIAL PROJECT CONSTRAINTS	64
4.4.1	<i>Antelope Creek at Atlantic Street</i>	64
4.4.2	<i>Secret Ravine at Sierra College Boulevard</i>	65
4.4.3	<i>Linda Creek at Old Auburn Road</i>	65
4.4.4	<i>Linda Creek at Wedgewood Drive.....</i>	65
4.4.5	<i>Linda Creek near Auburn-Folsom Road.....</i>	65
4.5	NON-STRUCTURAL FLOOD HAZARD REDUCTION MEASURES	66
4.5.1	<i>Local Storage and Detention Facilities</i>	66
4.5.2	<i>Elevation and Buy-Out Projects.....</i>	66
4.5.3	<i>ALERT Flood Warning Response System.....</i>	67
4.5.4	<i>Low Impact Development.....</i>	68
4.6	COST ESTIMATES	74
4.7	PROJECT RECOMMENDATIONS.....	75
4.8	POLICY RECOMMENDATIONS	76
5.0	FUNDING PLAN	77
5.1	FUNDING MECHANISMS UTILIZED TO DATE	77
5.2	FUNDING TO MITIGATE IMPACTS FROM NEW DEVELOPMENT	78
5.3	FUNDING TO CORRECT EXISTING DEFICIENCIES AND O&M COSTS	80
5.4	IMPLEMENTATION ROLES	83



LIST OF TABLES

TABLE 1: DRY CREEK WATERSHED HYDROLOGIC SOIL TYPES.....	3
TABLE 2: WATERSHED IMPERVIOUSNESS	5
TABLE 3: PEAK FLOW (CFS) COMPARISON OF ORIGINAL 1992 PLAN BASELINE MODEL TO 1992 PLAN MODEL ADAPTED TO SWMM	32
TABLE 4: LAND USE BY SCENARIO	34
TABLE 5: COMPOSITE UNSTEADY-STATE HEC-RAS MODEL DATA SOURCES.....	38
TABLE 6: MODEL SCENARIO MATRIX	40
TABLE 7: COMPARISON SUMMARY	42
TABLE 8: SUMMARY OF STORM CENTERING LOCATIONS AND ANGLES.....	43
TABLE 9: PEAK FLOW (CFS) COMPARISON OF PLAN UPDATE BASELINE TO ORIGINAL 1992 PLAN BASELINE	50
TABLE 10: PEAK FLOW (CFS) IMPACTS FROM DEVELOPMENT FROM 1992 TO 2007 WITHOUT ANY MITIGATION	51
TABLE 11: PEAK FLOW (CFS) IMPACTS OF LOCAL DETENTION FROM 1992 THROUGH 2007	52
TABLE 12: PEAK FLOW (CFS) IMPACTS OF DEVELOPMENT AND LOCAL DETENTION FROM 1992 THROUGH 2007	53
TABLE 13: PEAK FLOW (CFS) IMPACTS OF LINDA CREEK BYPASS AND SOUTHERN PACIFIC RAILROAD PROJECTS.....	54
TABLE 14: PEAK FLOW (CFS) IMPACTS OF MINERS RAVINE OFF-CHANNEL DETENTION FACILITY	55
TABLE 15: PEAK FLOW (CFS) IMPACTS OF MODIFICATION TO SIERRA COLLEGE BOULEVARD AT SECRET RAVINE.....	56
TABLE 16: NET PEAK FLOW (CFS) IMPACTS FROM 1992 THROUGH 2010	57
TABLE 17: UNMITIGATED PEAK FLOW (CFS) IMPACTS OF FUTURE DEVELOPMENT FROM 2010 TO BUILD-OUT.....	58
TABLE 18: PLAN UPDATE UNMITIGATED BUILD-OUT AND REGULATORY PEAK FLOWS (CFS)	59
TABLE 19: SCHEDULED AND COMPLETED BRIDGE AND CULVERT PROJECTS.....	60
TABLE 20: POTENTIAL REGIONAL DETENTION BASIN PROJECTS.....	62
TABLE 21. APPROXIMATE SQUARE FOOT COSTS OF ELEVATING A HOME (2009 DOLLARS).....	67
TABLE 22: POTENTIAL PEAK FLOW (CFS) REDUCTION BENEFITS FROM LID FEATURES.....	70
TABLE 23: POTENTIAL PEAK FLOW (CFS) REDUCTION BENEFITS FROM IDENTIFIED PROJECTS	71
TABLE 24: POTENTIAL NET PEAK FLOW (CFS) IMPACTS FROM 2010 TO BUILD-OUT WITH ALL IDENTIFIED PROJECTS AND LID MEASURES	72
TABLE 25: POTENTIAL NET PEAK FLOW (CFS) IMPACTS FROM 1992 TO BUILD-OUT WITH ALL IDENTIFIED PROJECTS AND LID MEASURES	73
TABLE 26: PROJECT COST ESTIMATES AND PEAK FLOW REDUCTION SUMMARY FOR REGIONAL MITIGATION PROJECTS.....	74
TABLE 27: ESTIMATED MAINTENANCE AND REPLACEMENT COSTS	74
TABLE 28: SUMMARY OF CURRENT AND FUTURE PEAK FLOW INCREASES DUE TO DEVELOPMENT	78
TABLE 29: POTENTIAL MITIGATION MEASURES IDENTIFIED BY THE DRY CREEK PLAN UPDATE.....	78
TABLE 30: 2010 DEVELOPMENT FEES AND DEVELOPMENT FEES FOR THREE OPTIONS	80
TABLE 31: BASIS FOR O&M COST ALLOCATION OPTIONS.....	82
TABLE 32: ALLOCATION OPTIONS FOR CURRENT O&M AND CAPITAL REPLACEMENT COSTS ¹	82
TABLE 33: ALLOCATION OPTIONS FOR O&M AND CAPITAL REPLACEMENT COSTS AFTER COMPLETION OF ANTELOPE CREEK PROJECT AND ALERT UPGRADES.....	82



LIST OF FIGURES

FIGURE 1: DEVELOPMENT SCENARIO	4
FIGURE 2: PORTIONS OF DOWNTOWN ROSEVILLE DURING THE 1995 FLOOD EVENT	13
FIGURE 3: MINERS RAVINE OVERTOPPING SIERRA COLLEGE BOULEVARD DURING THE JANUARY 1995 STORM EVENT.....	15
FIGURE 4: LINDA CREEK OVERTOPPING CHAMPION OAKS DRIVE IN 2005	16
FIGURE 5: MINERS RAVINE OVERTOPPING BARTON ROAD DURING THE 2005 FLOOD EVENT ...	17
FIGURE 6: EXAMPLE STORM CENTERING FOR VERNON STREET CROSSING	44

LIST OF PLATES

PLATE 1: VICINITY MAP	1
PLATE 2: WATERSHED OVERVIEW.....	2
PLATE 3: HYDROLOGIC SOIL GROUPS	3
PLATE 4: 1992 LAND USE IMPERVIOUSNESS.....	4
PLATE 5: 2007 LAND USE IMPERVIOUSNESS.....	5
PLATE 6: GENERAL PLAN BUILD-OUT IMPERVIOUSNESS.....	6
PLATE 7: 1992 BASELINE LAND USE	7
PLATE 8: 2007 CURRENT LAND USE	8
PLATE 9: GENERAL PLAN BUILD-OUT LAND USE	9
PLATE 10: PRECIPITATION AND STREAM GAGE LOCATIONS	10
PLATE 11: EXISTING FLOOD HAZARD LOCATIONS	11
PLATE 12: PRECIPITATION COMPARISON BETWEEN 1992 PLAN AND PLAN UPDATE	12
PLATE 13: WATERSHED DELINEATION COMPARISON BETWEEN 1992 PLAN AND PLAN UPDATE	13
PLATE 14: LOCATIONS WHERE STORM CENTERINGS CONTROL PEAK FLOOD RATES	14
PLATE 15: STORM CENTERING SE40N @ 0	15
PLATE 16: STORM CENTERING LC5A @ 0.....	16
PLATE 17: STORM CENTERING SE40M @ 30.....	17
PLATE 18: STORM CENTERING MR15J @ 30.....	18
PLATE 19: STORM CENTERING LC40L @ 30.....	19
PLATE 20: STORM CENTERING CC5G @ 90.....	20
PLATE 21: STORM CENTERING AC5I @ 60.....	21



APPENDICES

APPENDIX	TITLE
A	References
B	Topographic Mapping and Watersheds
C	Hydrologic Model Calibration
D	Completed Local Structural Flood Control Projects
E	Summary of Bridges and Culverts
F	Hydrology Model Development
G	Peak Flow Comparison Tables
H	Evaluation of Potential Projects
I	Existing Local Detention Basins
J	Dry Creek Desktop Software Users Guide & Tutorials
K	Project Environmental Opportunities and Constraints
L	Funding Plan Supporting Information

