

Contents

CHAPTER S: SUMMARY.....	S-1
S.1 Background of the Project and Organization of This Summary.....	S-1
S.1.1 Background of the Project.....	S-1
S.1.2 Organization of This Summary	S-2
S.2 Proposed Action and Preferred Alternative.....	S-2
S.2.1 Elements of the Preferred Alternative	S-2
S.2.2 Structural Features of the Preferred Alternative.....	S-3
S.3 Purpose of and Need for the Proposed Action	S-5
S.3.1 Need for Action.....	S-5
S.3.2 Purposes of Action	S-6
S.4 Project Alternatives.....	S-7
S.4.1 No-Action Alternative.....	S-8
S.4.2 Orange Alternative	S-9
S.4.3 Blue Alternative	S-11
S.4.4 Alternatives Considered but Eliminated from Further Study	S-14
S.5 Affected Environment	S-15
S.5.1 Land-Use Plans, Policies, and Controls	S-16
S.5.2 Social and Economic Conditions	S-16
S.5.3 Natural Resources	S-17
S.6 Environmental Consequences of the Proposed Action.....	S-18
S.6.1 Impacts and Mitigation	S-18
S.6.2 Cumulative Effects.....	S-19
S.6.3 Hazard Potential of Each Alternative	S-20
S.6.4 Permits and Approvals	S-20
S.7 Public Participation and Agency Consultation.....	S-21
S.7.1 Scoping.....	S-21
S.7.2 Agency Consultation	S-22
S.7.3 Additional Opportunities for Public Involvement	S-22
CHAPTER 1: INTRODUCTION	1-1
1.1 History of and Authority for the Proposed Action	1-1
1.1.1 History.....	1-1
1.1.2 Authority	1-1
1.2 Organization of This Document	1-4
CHAPTER 2: PURPOSE OF AND NEED FOR ACTION.....	2-1
2.1 Introduction	2-1
2.1.1 Project Setting.....	2-1
2.1.2 Canal Management and Operation	2-3
2.2 Proposed Action.....	2-7
2.2.1 Need for Action.....	2-8
2.2.2 Purposes of Action	2-11

2.3 Laws, Regulations, Policies, and Determinations	2-13
2.4 Decisions To Be Made	2-17
2.5 Scoping Summary.....	2-17
CHAPTER 3: ALTERNATIVES	3-1
3.1 Introduction	3-1
3.2 Alternatives Studied in This EIS	3-1
3.2.1 No-Action Alternative.....	3-2
3.2.2 Purple Alternative: LHPS Canal POD to 1500 North	3-3
3.2.3 Orange Alternative: LHPS Canal POD to 2900 North or 3100 North	3-14
3.2.4 Blue Alternative: Reconstruct LN Canal.....	3-19
3.3 Alternative Summary.....	3-27
3.4 Alternatives Eliminated from Detailed Study	3-31
3.5 Preferred Alternative	3-53
3.6 Environmentally Preferable Alternative	3-54
CHAPTER 4: AFFECTED ENVIRONMENT.....	4-1
4.1 Introduction	4-1
4.2 Land-Use Plans, Policies, and Controls	4-1
4.2.1 Land Use and Zoning	4-2
4.2.2 General Plan Guidance.....	4-5
4.3 Social and Economic Conditions	4-7
4.3.1 Community Resources	4-7
4.3.2 Environmental Justice	4-10
4.3.3 Economics	4-12
4.3.4 Recreation	4-14
4.3.5 Scenic Beauty and Landscape Resources.....	4-18
4.3.6 Energy	4-25
4.4 Natural Resource Conditions	4-26
4.4.1 Agriculture	4-26
4.4.2 Biological Resources.....	4-30
4.4.3 Special-Status Species.....	4-37
4.4.4 Cultural and Tribal Resources.....	4-40
4.4.5 Topography, Soils, and Geology	4-41
4.4.6 Water Resources.....	4-57
CHAPTER 5: ENVIRONMENTAL CONSEQUENCES.....	5-1
5.1 Land-Use Plans, Policies, and Controls	5-2
5.1.1 Laws, Policies, and Direction.....	5-2
5.1.2 No-Action Alternative.....	5-2
5.1.3 Purple Alternative	5-3
5.1.4 Orange Alternative	5-6
5.1.5 Blue Alternative	5-8
5.1.6 Summary of Impacts and Mitigation.....	5-9
5.2 Social and Economic Resources	5-10
5.2.1 Community Resources	5-10
5.2.2 Quality of Life.....	5-13
5.2.3 Environmental Justice	5-18
5.2.4 Economics	5-20

5.2.5	Recreation	5-23
5.2.6	Scenic Beauty and Landscape Resources.....	5-30
5.2.7	Energy	5-37
5.3	Natural Resources	5-42
5.3.1	Agriculture	5-42
5.3.2	Biological Resources.....	5-46
5.3.3	Special-Status Species.....	5-55
5.3.4	Cultural and Tribal Resources.....	5-58
5.3.5	Topography, Soils, and Geology.....	5-62
5.3.6	Water Resources.....	5-67
5.4	Construction Impacts.....	5-97
5.4.1	Land Use	5-97
5.4.2	Social and Economic Environment.....	5-100
5.4.3	Natural Resource Environment	5-106
5.5	Cumulative Effects	5-124
5.5.1	Methodology	5-125
5.5.2	Analysis.....	5-129
5.6	Hazard Potential of Each Alternative.....	5-137
5.6.1	No-Action Alternative.....	5-138
5.6.2	Purple Alternative	5-141
5.6.3	Orange Alternative	5-145
5.6.4	Blue Alternative	5-146
5.6.5	Summary of Hazard-Related Impacts and Mitigation	5-149
5.7	Consistency with Approved Regional Plans for Water Resource Management	5-151
5.7.1	Bear River Basin Planning Documents	5-151
5.7.2	Interim Cache Valley Ground-Water Management Plan	5-153
5.7.3	Logan General Plan.....	5-154
5.7.4	North Logan General Plan.....	5-156
5.8	Relationship between Short-Term Uses and Long-Term Productivity	5-157
5.9	Irreversible and Irretrievable Commitments of Resources	5-158
5.9.1	Social and Economic Environment	5-158
5.9.2	Natural Resource Environment	5-160
5.10	Summary of Mitigation Measures and Adverse Environmental Impacts That Cannot Be Avoided.....	5-162
5.10.1	Land Use	5-169
5.10.2	Social and Economic Resources.....	5-169
5.10.3	Natural Resources	5-170
CHAPTER 6:	CONSULTATION AND PUBLIC PARTICIPATION	6-1
6.1	Introduction	6-1
6.2	Chronology.....	6-1
6.3	Scoping	6-2
6.3.1	Notice of Intent	6-2
6.3.2	Consultations.....	6-2
6.3.3	Scoping Meeting	6-2
6.4	Public Participation during Planning	6-4
6.4.1	Consultations and Meetings	6-4
6.4.2	Handling of Comments	6-5

6.5 Draft EIS	6-6
6.5.1 List of Agencies, Organizations and Persons to Whom Copies of the Draft EIS Were Sent.....	6-6
6.5.2 Public Meeting for the Draft EIS	6-6
6.5.3 Comments on the Draft EIS	6-6
6.6 Final EIS.....	6-7
6.6.1 Notice of Availability and Distribution.....	6-7
6.6.2 List of Agencies, Organizations and Persons to Whom Copies of the Final EIS Were Sent.....	6-7
CHAPTER 7: LIST OF PREPARERS	7-1
CHAPTER 8: DISTRIBUTION.....	8-1
CHAPTER 9: REFERENCES.....	9-1
CHAPTER 10: ACRONYMS AND ABBREVIATIONS	10-1
CHAPTER 11: INDEX.....	11-1

List of Tables

Chapter S Tables

Table S-1. Comparison of Alternatives – Summary of Impacts and Potential Mitigation Measures	S-23
--	------

Chapter 1 Tables

There are no tables in Chapter 1.

Chapter 2 Tables

Table 2-1. Laws, Regulations, and Policies That Could Apply to the Proposed Action	2-14
Table 2-2. Issues Raised during Scoping.....	2-18

Chapter 3 Tables

Table 3-1. Proposed Structure Acquisitions along the North Side of Canyon Road in Logan	3-8
Table 3-2. Cost Summary for the Purple Alternative	3-12
Table 3-3. Cost Summary for the Orange Alternative (3100 North Option)	3-18
Table 3-4. Cost Summary for the Blue Alternative	3-26
Table 3-5. Summary of Alternatives Studied in Detail.....	3-29
Table 3-6. Comparison of Initial Alternatives	3-34
Table 3-7. Comparison of Operation and Maintenance Costs of the Gravity and Pump Options	3-49
Table 3-8. Comparison of Impacts Associated with the Action Alternatives.....	3-55

Chapter 4 Tables

Table 4-1. Zoning near the LN Canal	4-4
Table 4-2. Zoning near the LHPS Canal.....	4-5
Table 4-3. Emergency and Law Enforcement Service Providers in the Study Area	4-8
Table 4-4. Public Schools in the Study Area	4-8
Table 4-5. Employment and Businesses in Cache County in 2004 and 2009.....	4-12
Table 4-6. Largest Employers in Cache County	4-12
Table 4-7. Real and Personal Property Value in the Study Area.....	4-13
Table 4-8. Public Parks and Open Spaces in the Study Area	4-16
Table 4-9. Cropland or Farmland in the Study Area in 2009	4-28
Table 4-10. Specially Designated Farmland in the Study Area	4-29
Table 4-11. Birds Likely To Be Present in the Eastern Part of the Study Area (Logan Canyon Area)	4-35
Table 4-12. Anticipated Ground Accelerations for the Study Area.....	4-55
Table 4-13. Definitions of Liquefaction Potential	4-56
Table 4-14. Summary of LN Canal Water Rights	4-78

Chapter 5 Tables

Table 5-1. Regulatory Authorities for Biological Resources.....	5-46
Table 5-2. Cultural Resource Impacts from the Purple Alternative.....	5-60

Table 5-3. Cultural Resource Impacts from the Orange Alternative	5-61
Table 5-4. Cultural Resource Impacts from the Blue Alternative	5-61
Table 5-5. Construction Easements Required for the Purple Alternative	5-97
Table 5-6. Construction Easements Required for the Orange Alternative.....	5-98
Table 5-7. Construction Easements Required for the Blue Alternative	5-99
Table 5-8. Comparison of Alternatives – Summary of Impacts and Potential Mitigation Measures.....	5-163

Chapter 6 Tables

Table 6-1. Public Notifications and Meetings	6-1
Table 6-2. Scoping Comments Received by Affiliation.....	6-5

List of Figures

Chapter S Figures

There are no figures in Chapter S.

Chapter 1 Figures

There are no figures in Chapter 1.

Chapter 2 Figures

Figure 2-1. Project Study Area	2-2
Figure 2-2. Route of the Logan Northern Canal	2-5
Figure 2-3. Historic Landslides	2-10

Chapter 3 Figures

Figure 3-1. Purple Alternative	3-4
Figure 3-2. Typical Cross-Section A	3-5
Figure 3-3. Typical Cross-Section B	3-5
Figure 3-4. Typical Cross-Section C	3-6
Figure 3-5. Parcels From Which Structures Would Be Acquired.....	3-7
Figure 3-6. Orange Alternative.....	3-15
Figure 3-7. Typical Cross-Section D	3-16
Figure 3-8. Blue Alternative	3-20
Figure 3-9. Proposed Soil Buttress	3-25
Figure 3-10. Initial Alternatives	3-33
Figure 3-11. Logan River Diversions	3-47

Chapter 4 Figures

Figure 4-1. Generalized Zoning of and Land Use in the Study Area	4-3
Figure 4-2. Recreation Resources in the Study Area	4-15
Figure 4-3. Cropland and Farmland in the Study Area.....	4-27
Figure 4-4. Topographic Map.....	4-43
Figure 4-5. Surface Soils Map	4-44
Figure 4-6. General Geologic Map	4-49
Figure 4-7. Geologic Cross-Section.....	4-50
Figure 4-8. Surface Waters in the Study Area	4-59
Figure 4-9. Logan Northern Canal and Logan Hyde Park Smithfield Canal Alignments	4-60
Figure 4-10. Wetlands in the Study Area	4-67
Figure 4-11. Mapped Floodplains in the Study Area.....	4-72
Figure 4-12. Groundwater Zones in the Study Area.....	4-74
Figure 4-13. Points of Diversion in the Study Area.....	4-77
Figure 4-14. Drinking Water Source Protection Zones in the Study Area	4-80
Figure 4-15. Logan Northern Canal, Upper Reach (1 of 3)	4-81
Figure 4-16. Logan Northern Canal, Logan City Reach (2 of 3).....	4-82
Figure 4-17. Logan Northern Canal, Lower Reach (3 of 3).....	4-83
Figure 4-18. Logan Hyde Park Smithfield Canal, Logan Canyon Reach (1 of 3)	4-84
Figure 4-19. Logan Hyde Park Smithfield Canal, Logan City Reach (2 of 3).....	4-85
Figure 4-20. Logan Hyde Park Smithfield Canal, North Logan City Reach (3 of 3)	4-86

Chapter 5 Figures

Figure 5-1. Alternative Alignments and Recreation Resources.....	5-25
Figure 5-2. Green Canyon Creek Floodplain along LHPs Canal.....	5-86
Figure 5-3. Logan River Floodplain near LN Canal POD	5-87
Figure 5-4. Cumulative Effects Study Area.....	5-127

List of Photos

Photo 4-1. LHPs Canal on hillside above US 89 in Logan Canyon	4-20
Photo 4-2. Canal through a residential area in Logan.....	4-21
Photo 4-3. Canal access road in Logan posted for no trespassing	4-21
Photo 4-4. Canal access road in Logan used as a trail	4-22
Photo 4-5. Canal incorporated into the urban community in Logan.....	4-22
Photo 4-6. Canal through agricultural land with little to no landscape elements.....	4-23
Photo 4-7. Canal through agricultural land with some landscape elements.....	4-24
Photo 4-8. Canal with some distinguishable landscape elements	4-24
Photo 5-1. Logan City Light and Power Hydro 2 facility at the mouth of Logan Canyon	5-143
Photo 5-2. Site of 2009 landslide and affected LN Canal.....	5-147

List of Charts

Chart 4-1. Average Annual Flows in the Logan River as Reported by USGS Gage 10109000 above First Dam	4-61
Chart 4-2. Average Monthly Flows in the Logan River as Reported by USGS Gage 10109000 above First Dam	4-62

List of Appendices

Appendix A. Scoping Report	
Appendix B. Agency Correspondence	
Appendix C. Technical Studies	
Appendix C1. Action Alternative Cost Estimates	
Appendix C2. Alternatives Development Cost Estimates	
Appendix C3. NRCS Economic Analysis Calculations	
Appendix C4. Demographics and Environmental Justice	
Appendix C5. Special-Status Species	
Appendix C6. Compliance with the Standards and Guidelines in the <i>Revised Forest Plan for the Wasatch-Cache National Forest</i>	
Appendix D. Background Information	
Appendix D1. U.S. Census Bureau Information	
Appendix D2. Sensitive Species List	