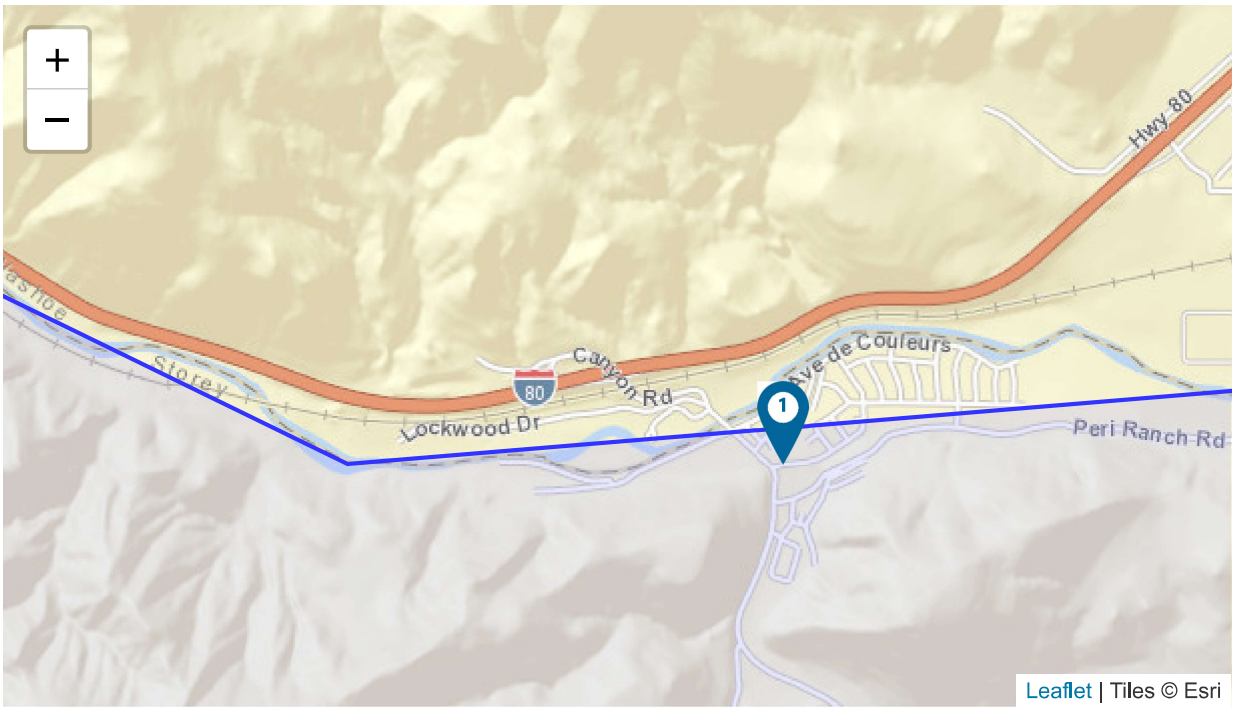
Appendix D

FEMA Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Long Valley Creek Flood Hazard Mitigation



				Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)			
Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
1	Drainage Improvement @ 39.5084030; -119.6461170		DFA - Riverine Flood	$ 7,071,640	$ 12,782,045	0.55	$ 11,169,860	$ 12,818,002	0.87	
TOTAL (SELECTED)				**$ 7,071,640**	**$ 12,782,045**	**0.55**	**$ 11,169,860**	**$ 12,818,002**	**0.87**	
TOTAL				**$ 7,071,640**	**$ 12,782,045**	**0.55**	**$ 11,169,860**	**$ 12,818,002**	**0.87**	

Property Configuration

Property Title:	Drainage Improvement @ 39.5084030; -119.6461170
Property Location:	89434, Storey, Nevada
Property Coordinates:	39.508403, -119.646117
Hazard Type:	Riverine Flood
Mitigation Action Type:	Drainage Improvement
Property Type:	Residential Building
Analysis Method Type:	Professional Expected Damages

Cost Estimation
Drainage Improvement @ 39.5084030; -119.6461170

Project Useful Life (years):	30
Project Cost:	$12,720,000
Number of Maintenance Years:	30 Use Default:Yes
Annual Maintenance Cost:	$5,000

Comments

-

Mitigation Project Cost:

Based on cost estimates for the 100-year rectangular concrete lined channel. This cost includes the engineering, permitting, construction management and contingency costs.

-

Annual Maintenance Cost:

This is the cost of annual maintenance and upkeep for the 100-yr concrete lined rectangular channel.

Damage Analysis Parameters - Damage Frequency Assessment
Drainage Improvement @ 39.5084030; -119.6461170

Year of Analysis was Conducted:	2023
Year Property was Built:	1997
Analysis Duration:	27 Use Default:Yes

Comments

-

Year Built:

The developments in the project area were built between 1987 and 2006 and therefore 1997 is the average year built for residential homes within the flood area of the model. Based on the description of the majority of the residences we assumed they were single story homes with no basements for the Loss Avoidance calculations.

Professional Expected Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	16,354,325.75	9,633,506.72	2,023,605	0	0	0	28,011,437
100	25,260,319.35	14,293,719.06	7,234,650	0	0	0	46,788,688

Comments

-

Damages Before Mitigation:

The calculated values for the Professional Expected Damages Before Mitigation come from the Loss Avoidance spreadsheet which is originally developed by FEMA. The Other Damages column is structural damages, Category 1 column is damage to content, and Category 2 is displacement costs. Hydraulic models for the 10, 25 and 100 year storm intervals were developed for the lower reach of Long Valley Creek and its confluence with the Truckee River using HEC-RAS version 6.3.1. Flood depth rasters were extracted from these models to be used in an ArcGIS Pro tool that quantified an integer value for the maximum flood depth are each of the residential structures. Integer values were rounded up. These flood depth integers were input into the Loss Avoidance spreadsheet in the "Inundation Above FFE" column. Sources for the depth damage curves and for the unit cost per square foot used in the analysis can be found in the spreadsheet as well.

Annualized Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,460,350
25	28,011,437	1,086,074
100	46,788,688	467,882
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	95,948,439	3,014,306

Professional Expected Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	13,342,052.97	8,052,197.74	83,880	0	0	0	21,478,131
100	19,508,073.76	11,287,138.75	3,889,935	0	0	0	34,685,148

Comments

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Damages After Mitigation:

It is not anticipated that any flooding will occur. However, we understand that some residual damage will occur to homes in a large storm event, and have tried accounting for that by using low percentages of damage to structures and contents for each recurrence interval storm studied. These percentages can be seen in the Loss Avoidance spreadsheet. The Other Damages correlate to the structural damages in the spreadsheet, Category 1 are content damages, and Category 2 is displacement costs.

Annualized Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,278,755
25	21,478,131	818,825
100	34,685,148	346,848
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	77,311,591	2,444,428

Standard Benefits - Ecosystem Services
Drainage Improvement @ 39.5084030; -119.6461170

Total Project Area (acres):	197
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$0

Comments

-

Total Project Area:

Total project area includes the size of the hydraulic model area in HEC-RAS.

Additional Benefits - Social
Drainage Improvement @ 39.5084030; -119.6461170

Number of Workers:	0
Expected Annual Social Benefits:	$0

Comments

-

Number of Residents:

See Loss Avoidance spreadsheet.

Benefits-Costs Summary
Drainage Improvement @ 39.5084030; -119.6461170

Total Standard Mitigation Benefits:	$7,071,640
Total Social Benefits:	$0
Total Mitigation Project Benefits:	$7,071,640
Total Mitigation Project Cost:	$12,782,045
Benefit Cost Ratio - Standard:	0.55
Benefit Cost Ratio - Standard + Social:	0.55

FEMA Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Long Valley Creek Flood Hazard Mitigation

				Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)			
Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
1	Drainage Improvement @ 39.5084030; -119.6461170		DFA - Riverine Flood	$ 6,319,143	$ 6,502,636	0.97	$ 9,981,270	$ 6,531,402	1.53	
TOTAL (SELECTED)				**$ 6,319,143**	**$ 6,502,636**	**0.97**	**$ 9,981,270**	**$ 6,531,402**	**1.53**	
TOTAL				**$ 6,319,143**	**$ 6,502,636**	**0.97**	**$ 9,981,270**	**$ 6,531,402**	**1.53**	

Property Configuration

Property Title:	Drainage Improvement @ 39.5084030; -119.6461170
Property Location:	89434, Storey, Nevada
Property Coordinates:	39.508403, -119.646117
Hazard Type:	Riverine Flood
Mitigation Action Type:	Drainage Improvement
Property Type:	Residential Building
Analysis Method Type:	Professional Expected Damages

Cost Estimation
Drainage Improvement @ 39.5084030; -119.6461170

Project Useful Life (years):	30
Project Cost:	$6,453,000
Number of Maintenance Years:	30 Use Default:Yes
Annual Maintenance Cost:	$4,000

Comments

-

Mitigation Project Cost:

Based on cost estimates for the 100-year rectangular concrete lined channel. This cost includes the engineering, permitting, construction management and contingency costs.

-

Annual Maintenance Cost:

This is the cost of annual maintenance and upkeep for the 100-yr concrete lined rectangular channel.

Damage Analysis Parameters - Damage Frequency Assessment
Drainage Improvement @ 39.5084030; -119.6461170

Year of Analysis was Conducted:	2023
Year Property was Built:	1997
Analysis Duration:	27 Use Default:Yes

Comments

-

Year Built:

The developments in the project area were built between 1987 and 2006 and therefore 1997 is the average year built for residential homes within the flood area of the model. Based on the description of the majority of the residences we assumed they were single story homes with no basements for the Loss Avoidance calculations.

Professional Expected Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	16,354,325.75	9,633,506.72	2,023,605	0	0	0	28,011,437
100	25,260,319.35	14,293,719.06	7,234,650	0	0	0	46,788,688

Comments

-

Damages Before Mitigation:

The calculated values for the Professional Expected Damages Before Mitigation come from the Loss Avoidance spreadsheet which is originally developed by FEMA. The Other Damages column is structural damages, Category 1 column is damage to content, and Category 2 is displacement costs. Hydraulic models for the 10, 25 and 100 year storm intervals were developed for the lower reach of Long Valley Creek and its confluence with the Truckee River using HEC-RAS version 6.3.1. Flood depth rasters were extracted from these models to be used in an ArcGIS Pro tool that quantified an integer value for the maximum flood depth are each of the residential structures. Integer values were rounded up. These flood depth integers were input into the Loss Avoidance spreadsheet in the "Inundation Above FFE" column. Sources for the depth damage curves and for the unit cost per square foot used in the analysis can be found in the spreadsheet as well.

Annualized Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,460,350
25	28,011,437	1,086,074
100	46,788,688	467,882
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	95,948,439	3,014,306

Professional Expected Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	13,321,477.83	8,041,390.6	199,215	0	0	0	21,562,083
100	20,722,392.99	11,923,790.28	4,655,340	0	0	0	37,301,523

Comments

-

Damages After Mitigation:

It is not anticipated that any flooding will occur. However, we understand that some residual damage will occur to homes in a large storm event, and have tried accounting for that by using low percentages of damage to structures and contents for each recurrence interval storm studied. These percentages can be seen in the Loss Avoidance spreadsheet. The Other Damages correlate to the structural damages in the spreadsheet, Category 1 are content damages, and Category 2 is displacement costs.

Annualized Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,281,252
25	21,562,083	850,805
100	37,301,523	373,012
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	80,011,920	2,505,069

Standard Benefits - Ecosystem Services
Drainage Improvement @ 39.5084030; -119.6461170

Total Project Area (acres):	197
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$0

Comments

-

Total Project Area:

Total project area includes the size of the hydraulic model area in HEC-RAS.

Additional Benefits - Social
Drainage Improvement @ 39.5084030; -119.6461170

Number of Workers:	0
Expected Annual Social Benefits:	$0

Comments

-

Number of Residents:

See Loss Avoidance spreadsheet.

Benefits-Costs Summary
Drainage Improvement @ 39.5084030; -119.6461170

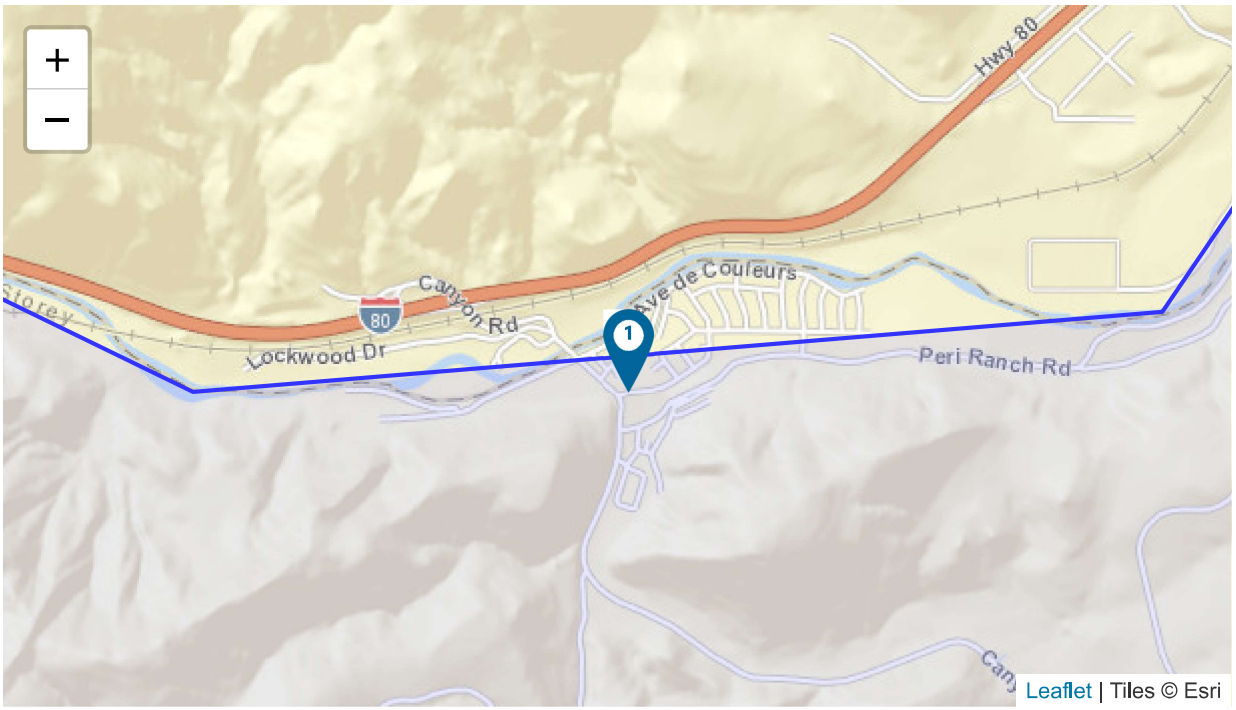
Total Standard Mitigation Benefits:	$6,319,143
Total Social Benefits:	$0
Total Mitigation Project Benefits:	$6,319,143
Total Mitigation Project Cost:	$6,502,636
Benefit Cost Ratio - Standard:	0.97
Benefit Cost Ratio - Standard + Social:	0.97

FEMA Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Long Valley Creek Flood Hazard Mitigation



				Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)			
Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
1	Drainage Improvement @ 39.5084030; -119.6461170		DFA - Riverine Flood	$ 4,868,973	$ 4,333,227	1.12	$ 7,690,684	$ 4,354,801	1.77	
TOTAL (SELECTED)				**$ 4,868,973**	**$ 4,333,227**	**1.12**	**$ 7,690,684**	**$ 4,354,801**	**1.77**	
TOTAL				**$ 4,868,973**	**$ 4,333,227**	**1.12**	**$ 7,690,684**	**$ 4,354,801**	**1.77**	

Property Configuration

Property Title:	Drainage Improvement @ 39.5084030; -119.6461170
Property Location:	89434, Storey, Nevada
Property Coordinates:	39.508403, -119.646117
Hazard Type:	Riverine Flood
Mitigation Action Type:	Drainage Improvement
Property Type:	Residential Building
Analysis Method Type:	Professional Expected Damages

Cost Estimation
Drainage Improvement @ 39.5084030; -119.6461170

Project Useful Life (years):	30
Project Cost:	$4,296,000
Number of Maintenance Years:	30 Use Default:Yes
Annual Maintenance Cost:	$3,000

Comments

-

Mitigation Project Cost:

Based on cost estimates for the 100-year rectangular concrete lined channel. This cost includes the engineering, permitting, construction management and contingency costs.

-

Annual Maintenance Cost:

This is the cost of annual maintenance and upkeep for the 100-yr concrete lined rectangular channel.

Damage Analysis Parameters - Damage Frequency Assessment
Drainage Improvement @ 39.5084030; -119.6461170

Year of Analysis was Conducted:	2023
Year Property was Built:	1997
Analysis Duration:	27 Use Default:Yes

Comments

-

Year Built:

The developments in the project area were built between 1987 and 2006 and therefore 1997 is the average year built for residential homes within the flood area of the model. Based on the description of the majority of the residences we assumed they were single story homes with no basements for the Loss Avoidance calculations.

Professional Expected Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	16,354,325.75	9,633,506.72	2,023,605	0	0	0	28,011,437
100	25,260,319.35	14,293,719.06	7,234,650	0	0	0	46,788,688

Comments

-

Damages Before Mitigation:

The calculated values for the Professional Expected Damages Before Mitigation come from the Loss Avoidance spreadsheet which is originally developed by FEMA. The Other Damages column is structural damages, Category 1 column is damage to content, and Category 2 is displacement costs. Hydraulic models for the 10, 25 and 100 year storm intervals were developed for the lower reach of Long Valley Creek and its confluence with the Truckee River using HEC-RAS version 6.3.1. Flood depth rasters were extracted from these models to be used in an ArcGIS Pro tool that quantified an integer value for the maximum flood depth are each of the residential structures. Integer values were rounded up. These flood depth integers were input into the Loss Avoidance spreadsheet in the "Inundation Above FFE" column. Sources for the depth damage curves and for the unit cost per square foot used in the analysis can be found in the spreadsheet as well.

Annualized Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,460,350
25	28,011,437	1,086,074
100	46,788,688	467,882
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	95,948,439	3,014,306

Professional Expected Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	13,810,704.2	8,298,193.06	545,220	0	0	0	22,654,117
100	22,108,282.8	12,648,646.87	5,504,625	0	0	0	40,261,555

Comments

-

Damages After Mitigation:

It is not anticipated that any flooding will occur. However, we understand that some residual damage will occur to homes in a large storm event, and have tried accounting for that by using low percentages of damage to structures and contents for each recurrence interval storm studied. These percentages can be seen in the Loss Avoidance spreadsheet. The Other Damages correlate to the structural damages in the spreadsheet, Category 1 are content damages, and Category 2 is displacement costs.

Annualized Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,313,296
25	22,654,117	906,025
100	40,261,555	402,612
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	84,063,985	2,621,933

Standard Benefits - Ecosystem Services
Drainage Improvement @ 39.5084030; -119.6461170

Total Project Area (acres):	197
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$0

Comments

-

Total Project Area:

Total project area includes the size of the hydraulic model area in HEC-RAS.

Additional Benefits - Social
Drainage Improvement @ 39.5084030; -119.6461170

Number of Workers:	0
Expected Annual Social Benefits:	$0

Comments

-

Number of Residents:

See Loss Avoidance spreadsheet.

Benefits-Costs Summary
Drainage Improvement @ 39.5084030; -119.6461170

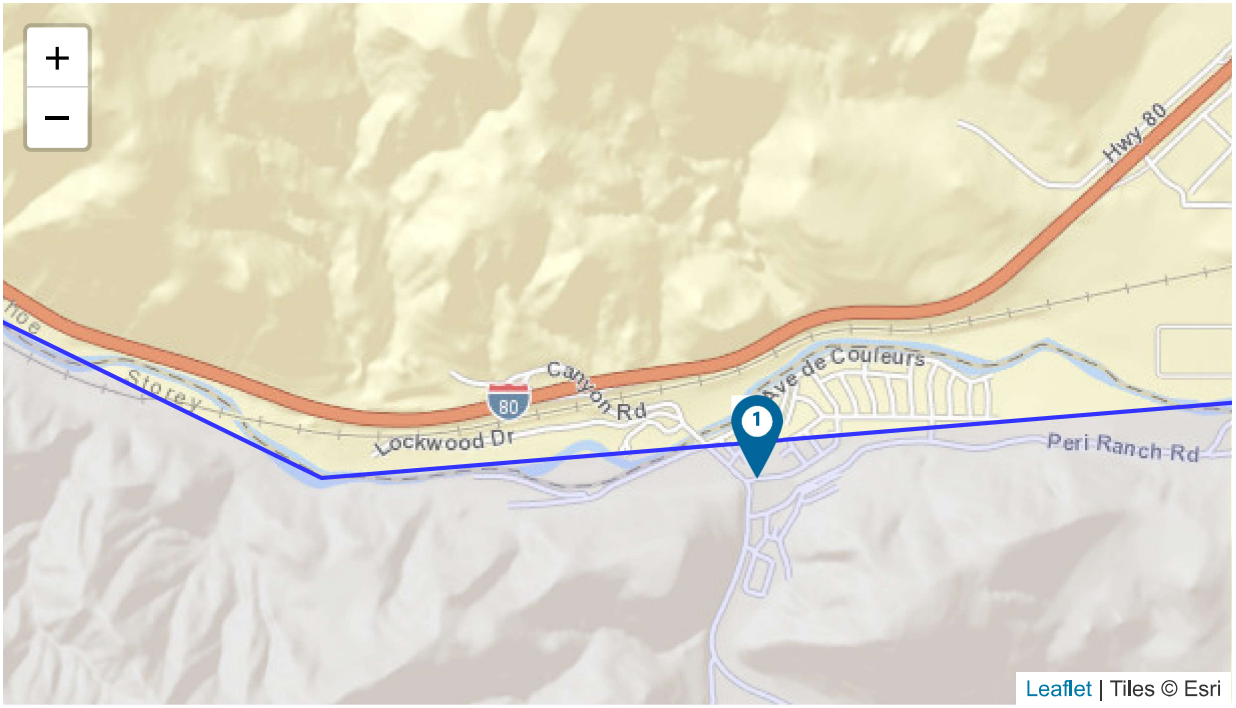
Total Standard Mitigation Benefits:	$4,868,973
Total Social Benefits:	$0
Total Mitigation Project Benefits:	$4,868,973
Total Mitigation Project Cost:	$4,333,227
Benefit Cost Ratio - Standard:	1.12
Benefit Cost Ratio - Standard + Social:	1.12

FEMA Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Long Valley Creek Flood Hazard Mitigation



				Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)			
Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
1	Drainage Improvement @ 39.5084030; -119.6461170		DFA - Riverine Flood	$ 2,486,660	$ 3,024,023	0.82	$ 3,927,752	$ 3,042,001	1.29	
TOTAL (SELECTED)				**$ 2,486,660**	**$ 3,024,023**	**0.82**	**$ 3,927,752**	**$ 3,042,001**	**1.29**	
TOTAL				**$ 2,486,660**	**$ 3,024,023**	**0.82**	**$ 3,927,752**	**$ 3,042,001**	**1.29**	

Property Configuration

Property Title:	Drainage Improvement @ 39.5084030; -119.6461170
Property Location:	89434, Storey, Nevada
Property Coordinates:	39.508403, -119.646117
Hazard Type:	Riverine Flood
Mitigation Action Type:	Drainage Improvement
Property Type:	Residential Building
Analysis Method Type:	Professional Expected Damages

Cost Estimation
Drainage Improvement @ 39.5084030; -119.6461170

Project Useful Life (years):	30
Project Cost:	$2,993,000
Number of Maintenance Years:	30 Use Default:Yes
Annual Maintenance Cost:	$2,500

Comments

-

Mitigation Project Cost:

Based on cost estimates for the 100-year rectangular concrete lined channel. This cost includes the engineering, permitting, construction management and contingency costs.

-

Annual Maintenance Cost:

This is the cost of annual maintenance and upkeep for the 100-yr concrete lined rectangular channel.

Damage Analysis Parameters - Damage Frequency Assessment
Drainage Improvement @ 39.5084030; -119.6461170

Year of Analysis was Conducted:	2023
Year Property was Built:	1997
Analysis Duration:	27 Use Default:Yes

Comments

-

Year Built:

The developments in the project area were built between 1987 and 2006 and therefore 1997 is the average year built for residential homes within the flood area of the model. Based on the description of the majority of the residences we assumed they were single story homes with no basements for the Loss Avoidance calculations.

Professional Expected Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	16,354,325.75	9,633,506.72	2,023,605	0	0	0	28,011,437
100	25,260,319.35	14,293,719.06	7,234,650	0	0	0	46,788,688

Comments

-

Damages Before Mitigation:

The calculated values for the Professional Expected Damages Before Mitigation come from the Loss Avoidance spreadsheet which is originally developed by FEMA. The Other Damages column is structural damages, Category 1 column is damage to content, and Category 2 is displacement costs. Hydraulic models for the 10, 25 and 100 year storm intervals were developed for the lower reach of Long Valley Creek and its confluence with the Truckee River using HEC-RAS version 6.3.1. Flood depth rasters were extracted from these models to be used in an ArcGIS Pro tool that quantified an integer value for the maximum flood depth are each of the residential structures. Integer values were rounded up. These flood depth integers were input into the Loss Avoidance spreadsheet in the "Inundation Above FFE" column. Sources for the depth damage curves and for the unit cost per square foot used in the analysis can be found in the spreadsheet as well.

Annualized Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,460,350
25	28,011,437	1,086,074
100	46,788,688	467,882
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	95,948,439	3,014,306

Professional Expected Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	14,909,010.08	8,874,845.82	1,300,140	0	0	0	25,083,996
100	23,807,820.02	13,535,410.38	6,437,790	0	0	0	43,781,020

Comments

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Damages After Mitigation:

It is not anticipated that any flooding will occur. However, we understand that some residual damage will occur to homes in a large storm event, and have tried accounting for that by using low percentages of damage to structures and contents for each recurrence interval storm studied. These percentages can be seen in the Loss Avoidance spreadsheet. The Other Damages correlate to the structural damages in the spreadsheet, Category 1 are content damages, and Category 2 is displacement costs.

Annualized Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,381,935
25	25,083,996	994,174
100	43,781,020	437,806
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	90,013,329	2,813,915

Standard Benefits - Ecosystem Services
Drainage Improvement @ 39.5084030; -119.6461170

Total Project Area (acres):	197
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$0

Comments

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Total Project Area:

Total project area includes the size of the hydraulic model area in HEC-RAS.

Additional Benefits - Social
Drainage Improvement @ 39.5084030; -119.6461170

Number of Workers:	0
Expected Annual Social Benefits:	$0

Comments

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Number of Residents:

See Loss Avoidance spreadsheet.

Benefits-Costs Summary
Drainage Improvement @ 39.5084030; -119.6461170

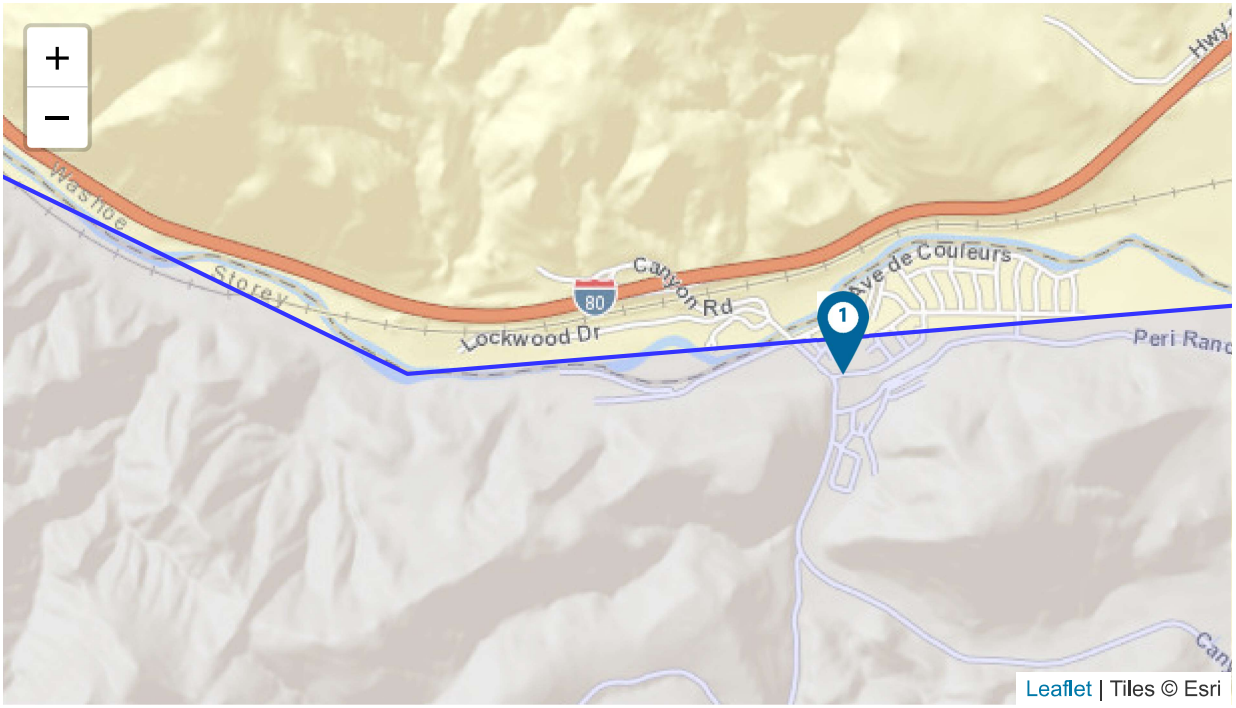
Total Standard Mitigation Benefits:	$2,486,660
Total Social Benefits:	$0
Total Mitigation Project Benefits:	$2,486,660
Total Mitigation Project Cost:	$3,024,023
Benefit Cost Ratio - Standard:	0.82
Benefit Cost Ratio - Standard + Social:	0.82

FEMA Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Long Valley Creek Flood Hazard Mitigation



				Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)			
Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
1	Drainage Improvement @ 39.5084030; -119.6461170		DFA - Riverine Flood	$ 2,138,028	$ 898,023	2.38	$ 3,377,078	$ 916,001	3.69	
TOTAL (SELECTED)				**$ 2,138,028**	**$ 898,023**	**2.38**	**$ 3,377,078**	**$ 916,001**	**3.69**	
TOTAL				**$ 2,138,028**	**$ 898,023**	**2.38**	**$ 3,377,078**	**$ 916,001**	**3.69**	

Property Configuration

Property Title:	Drainage Improvement @ 39.5084030; -119.6461170
Property Location:	89434, Storey, Nevada
Property Coordinates:	39.508403, -119.646117
Hazard Type:	Riverine Flood
Mitigation Action Type:	Drainage Improvement
Property Type:	Residential Building
Analysis Method Type:	Professional Expected Damages

Cost Estimation
Drainage Improvement @ 39.5084030; -119.6461170

Project Useful Life (years):	30
Project Cost:	$867,000
Number of Maintenance Years:	30 Use Default:Yes
Annual Maintenance Cost:	$2,500

Comments

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Mitigation Project Cost:

Based on cost estimates for the 100-year rectangular concrete lined channel. This cost includes the engineering, permitting, construction management and contingency costs.

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Annual Maintenance Cost:

This is the cost of annual maintenance and upkeep for the 100-yr concrete lined rectangular channel.

Damage Analysis Parameters - Damage Frequency Assessment
Drainage Improvement @ 39.5084030; -119.6461170

Year of Analysis was Conducted:	2023
Year Property was Built:	1997
Analysis Duration:	27 Use Default:Yes

Comments

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Year Built:

The developments in the project area were built between 1987 and 2006 and therefore 1997 is the average year built for residential homes within the flood area of the model. Based on the description of the majority of the residences we assumed they were single story homes with no basements for the Loss Avoidance calculations.

Professional Expected Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	16,354,325.75	9,633,506.72	2,023,605	0	0	0	28,011,437
100	25,260,319.35	14,293,719.06	7,234,650	0	0	0	46,788,688

Comments

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Damages Before Mitigation:

The calculated values for the Professional Expected Damages Before Mitigation come from the Loss Avoidance spreadsheet which is originally developed by FEMA. The Other Damages column is structural damages, Category 1 column is damage to content, and Category 2 is displacement costs. Hydraulic models for the 10, 25 and 100 year storm intervals were developed for the lower reach of Long Valley Creek and its confluence with the Truckee River using HEC-RAS version 6.3.1. Flood depth rasters were extracted from these models to be used in an ArcGIS Pro tool that quantified an integer value for the maximum flood depth are each of the residential structures. Integer values were rounded up. These flood depth integers were input into the Loss Avoidance spreadsheet in the "Inundation Above FFE" column. Sources for the depth damage curves and for the unit cost per square foot used in the analysis can be found in the spreadsheet as well.

Annualized Damages Before Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,460,350
25	28,011,437	1,086,074
100	46,788,688	467,882
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	95,948,439	3,014,306

Professional Expected Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
10	13,180,808.92	7,967,503.9	0	0	0	0	21,148,313
25	15,309,285.1	9,084,833.84	1,205,775	0	0	0	25,599,894
100	23,945,237.08	13,605,833.16	6,406,335	0	0	0	43,957,405

Comments

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Damages After Mitigation:

It is not anticipated that any flooding will occur. However, we understand that some residual damage will occur to homes in a large storm event, and have tried accounting for that by using low percentages of damage to structures and contents for each recurrence interval storm studied. These percentages can be seen in the Loss Avoidance spreadsheet. The Other Damages correlate to the structural damages in the spreadsheet, Category 1 are content damages, and Category 2 is displacement costs.

Annualized Damages After Mitigation
Drainage Improvement @ 39.5084030; -119.6461170

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
10	21,148,313	1,396,073
25	25,599,894	1,006,367
100	43,957,405	439,570
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	90,705,612	2,842,010

Standard Benefits - Ecosystem Services
Drainage Improvement @ 39.5084030; -119.6461170

Total Project Area (acres):	197
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$0

Comments

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Total Project Area:

Total project area includes the size of the hydraulic model area in HEC-RAS.

Additional Benefits - Social
Drainage Improvement @ 39.5084030; -119.6461170

Number of Workers:	0
Expected Annual Social Benefits:	$0

Comments

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Number of Residents:

See Loss Avoidance spreadsheet.

Benefits-Costs Summary
Drainage Improvement @ 39.5084030; -119.6461170

Total Standard Mitigation Benefits:	$2,138,028
Total Social Benefits:	$0
Total Mitigation Project Benefits:	$2,138,028
Total Mitigation Project Cost:	$898,023
Benefit Cost Ratio - Standard:	2.38
Benefit Cost Ratio - Standard + Social:	2.38