

DISCLAIMERS

FEMA DISCLAIMER

The results produced by use of this Benefit-Cost Analysis Program are neither conclusive evidence that a proposed project is cost-effective, nor a guarantee that a project is eligible for any government grant for whatever purpose.

SOFTWARE DISCLAIMER

The software program accompanying this manual was developed under contract from the Federal Emergency Management Agency (FEMA).

FEMA and the software developers have checked this version carefully and have verified the results by comparison to earlier versions to ensure that the program is fully operable. However, users of this manual or the accompanying software assume responsibility for the results of calculations.

Please document and report any problems discovered with this version of the Benefit-Cost User's manual or software to Goettel & Horner Inc. by telephone at (916) 451-4160 or fax at (916) 451-3460.

TABLE OF CONTENTS

CHAPTER 1 THE ROLE OF BENEFIT-COST ANALYSIS IN HAZARD MITIGATION PROJECTS	1-1
Introduction	1-1
Acknowledgements	1-1
Hazard Mitigation Projects	1-1
The Benefit-Cost Program	1-1
Level One vs. Level Two B-C Analyses	1-2
What Data are Needed for B-C Analysis?	1-2
Myths and Misconceptions About Benefit-Cost Analysis	1-3
Overview of User's Manual	1-4
 CHAPTER 2 GETTING STARTED	 2-1
Hardware and Software Required	2-1
Computer Hardware	2-1
Computer Software	2-2
Windows	2-2
Quattro Pro for Windows	2-3
Installing the Benefit-Cost Program	2-5
Network Systems	2-5
Stand-Alone Computers	2-5
 CHAPTER 3 PROGRAM BASICS	 3-1
Starting Quattro Pro for Windows (QPW)	3-1
Start Windows	3-1
Start QPW	3-1
Opening Files	3-2
Screen Display	3-3
Zoom List	3-3
Moving Around in the Program	3-4
Several Easy Ways	3-4
Benefit-Cost Menu Tree	3-4
Basic Commands and Procedures	3-7
Naming and Saving Files	3-7
Save	3-7
Save As	3-7
OOPS!	3-9
Start a New Benefit-Cost Analysis	3-9
Exit From the Benefit-Cost Program	3-9
Run a Different Benefit-Cost Program	3-10
Exit from QPW	3-10
Exit from Windows	3-10
Cell Colors	3-11

Unprotected Blocks	3-11
Protected Blocks	3-11
Data Entry	3-12
Correcting Errors	3-12
Entering Commas and Dollars	3-13
Entering Addresses	3-13
Syntax Error	3-13
CHAPTER 4 TUTORIAL	4-1
Level One and Level Two Benefit-Cost Analyses	4-1
Level One (Minimum Data) B-C Analysis	4-1
Level Two (Detailed) B-C Analysis	4-2
Starting the Tutorial	4-3
Level One Data	4-4
Project Information	4-4
Building Data	4-6
Building Contents	4-8
Displacement Costs Due to Flood Damage	4-9
Value of Public/Nonprofit Services	4-10
Rent & Business Income	4-11
Mitigation Project Data	4-12
Flood Hazard	4-14
Benefit-Cost Results	4-15
Summary	4-16
Print Menu	4-17
To End the Tutorial	4-17
CHAPTER 5 BENEFIT-COST PROGRAM: GUIDANCE	5-1
Introduction	5-1
Exact Data vs. Estimates	5-2
Data Requirements	5-2
Level One (Minimum Data) B-C Analysis	5-3
Level Two (Detailed) B-C Analysis	5-5
Expediting B-C Analysis	5-6
Summary	5-8
CHAPTER 6 BENEFIT-COST PROGRAM: LEVEL ONE ANALYSIS	6-1
Introduction	6-1
Data Differences: Public, Commercial, & Residential Buildings	6-1
Data Input: Color Codes	6-2
Level One Data	6-3
Introduction	6-3
Project Information	6-3
Building Name, Address, City, State, Zip	6-3

Owner	6-3
Contact Person	6-4
Disaster Number	6-4
Project Number	6-4
Application Date	6-4
Discount Rate	6-4
Scenario Run ID	6-5
Analyst	6-5
Building Data	6-5
Building Type	6-5
Building Information	6-6
Zero Flood Depth Elevation	6-6
Number of Stories above Grade	6-6
Construction Date	6-6
Historic Building Controls	6-7
Building Size and Use	6-7
Total Floor Area	6-7
Area Occupied by Owner or Public/Nonprofit Agencies ...	6-7
Building Value	6-7
Building Replacement Value (\$/sf)	6-8
Total Building Replacement Value	6-8
Demolition Threshold	6-8
Building Contents	6-9
Contents Description	6-9
Total Value of Contents	6-9
Value of Contents (\$/sf)	6-10
Displacement Costs Due to Flood Damage	6-10
Rental Cost of Temporary Building Space (\$/sf/month)	6-10
Rental Cost of Temporary Building Space (\$/month)	6-10
Other Displacement Costs	6-10
Total Displacement Costs	6-10
Value of Public/Nonprofit Services	6-11
To Bypass This Section	6-11
Value of Public/Nonprofit Services	6-11
Description of Services Provided	6-11
Annual Budget	6-12
Is Rent Included?	6-12
Proxy Rent	6-12
User-Entered Rent Estimate	6-12
Cost of Providing Services	6-12
Post-Disaster Continuity Premium	6-12
Total Value of Lost Services	6-13
Rent & Business Income	6-14
Total Monthly Rent from All Tenants	6-14
Estimated Net Income of Commercial Businesses	6-14
Mitigation Project Data	6-14
Select Mitigation Measure	6-14
Project Description	6-15
Project Useful Life	6-15

Mitigation Effectiveness Estimates	6-15
Elevation	6-15
Relocation/Buyout	6-16
Flood Barriers	6-16
Other	6-16
Mitigation Project Costs	6-17
Project Cost	6-17
Base Year of Costs	6-17
Annual Maintenance Costs	6-17
Relocation Costs for Mitigation Project	6-17
Relocation Time Due to Project	6-17
Rental Cost During Occupant Relocation	6-18
Other Relocation Costs	6-18
Total Relocation Costs	6-18
Total Mitigation Project Costs	6-18
CHAPTER 7 BENEFIT-COST PROGRAM: FLOOD HAZARD RISK	7-1
Introduction	7-1
Level One Analysis	7-1
Level Two Analysis	7-1
Flood Hazard Risk	7-2
Carry over Information	7-2
Flood Hazard Data	7-2
Flood Data	7-2
Flood Discharge Data	7-2
Flood Elevation Data	7-2
Example Flood Profile Graph	7-4
Expected Annual Number of Floods	7-5
Default Flood Estimates	7-5
User-Entered Estimates	7-6
Level Two Flood Analysis	7-6
Flood Hazard Risk: Technical Appendix	7-7
Flood Recurrence Intervals	7-7
Flood Exceedance Probabilities	7-7
Expected Annual Number of Floods	7-8
Flood Elevation vs. Flood Depth	7-9
Review of Scientific Notation	7-9
CHAPTER 8 BENEFIT-COST PROGRAM: LEVEL TWO ANALYSIS	8-1
Introduction	8-1
Level Two Data: Building Depth-Damage Function	8-2
Reference Information From Level One Data	8-2
Building Depth-Damage Function (DDF)	8-2
Building Depth-Damage Table	8-3
Default Building DDF	8-3
FIA Depth-Damage Table	8-4

User-Entered Building DDF	8-6
Modified Building DDF	8-6
Comments: Building DDF	8-7
Level Two Data: Contents Depth-Damage Function	8-8
Reference Information from Level One Data	8-8
Contents Depth-Damage Function (DDF)	8-9
Contents Depth-Damage Table	8-9
Default Contents DDF	8-9
User-Entered Contents DDF	8-9
Contents DDF (\$)	8-10
Comments: Contents DDF	8-10
Level Two Data: Displacement Time	8-11
Reference Information From Level One Data	8-11
Displacement Time Estimates	8-12
Displacement Time Estimate Table	8-12
Default Displacement Time Estimates	8-12
User-Entered Displacement Time Estimates	8-12
Displacement Costs (\$)	8-13
Rental Income Losses	8-13
Comments: Displacement Time Estimates	8-13
Level Two Data: Functional Downtime	8-14
Reference Information from Level One Data	8-14
Functional Downtime Estimates	8-15
Functional Downtime Table	8-15
Default Functional Downtime Estimates	8-15
User-Entered Functional Downtime Estimates	8-15
Value of Lost Services	8-16
Lost Business Income	8-16
Comments: Functional Downtime	8-16
Level Two Data: Mitigation Project Effectiveness	8-17
Reference Information from Level One Data	8-17
Mitigation Effectiveness (Percent of Damages Avoided)	8-18
Mitigation Effectiveness Table	8-18
Building Damages Default Effectiveness (%)	8-18
Building Damages User-Entered Effectiveness (%)	8-19
Contents Damages Default Effectiveness (%)	8-19
Contents Damages User-Entered Effectiveness (%)	8-19
Other Effectiveness Assumptions	8-20
Comments: Mitigation Effectiveness Estimates	8-20
CHAPTER 9 BENEFIT-COST PROGRAM: RESULTS	9-1
Introduction	9-1
Summary of Damages Before Mitigation	9-2
Scenario Damages Before Mitigation	9-2
Expected Annual Damages Before Mitigation	9-3
Interpreting Damages Before Mitigation	9-3
Summary of Damages After Mitigation	9-4

Scenario Damages After Mitigation	9-4
Expected Annual Damages After Mitigation	9-5
Interpreting Damages After Mitigation	9-6
Benefits	9-7
Expected Annual Benefits from Mitigation	9-7
Benefit-Cost Results	9-8
Reference Information from Level One Data	9-8
Discount Rate	9-8
Project Useful Life	9-9
Present Value Coefficient	9-9
Summary of Expected Annual Damages and Benefits	9-11
Expected Annual Damages and Losses Before Mitigation	9-11
Expected Annual Damages and Losses After Mitigation	9-11
Expected Annual Benefits	9-11
Present Value of Annual Benefits	9-12
Summary of Project Benefits and Project Costs	9-12
Project Benefits	9-12
Project Costs	9-12
Benefits Minus Costs	9-12
Benefit-Cost Ratio	9-12
Interpreting Benefit-Cost Results	9-13
Summary	9-15
Single-Valued Data Entries	9-15
Data that Vary by Flood Depth	9-15
Summary of Benefits and Costs	9-15
 CHAPTER 10 BENEFIT-COST PROGRAM PRINT-OUT	10-1
 CHAPTER 11 GLOSSARY	11-1
 APPENDIX 1 ECONOMIC ASSUMPTIONS AND EQUATIONS	A-1
Benefit-Cost Program	A-1
Economic Assumptions for Modeling Benefits	A-3
Underlying Assumptions	A-3
Detailed Economic Assumptions and Equations	A-5
Scenario Damages	A-5
Building Damages	A-5
Contents Damages	A-6
Displacement Expenses	A-6
Lost Business Income	A-7
Rental Income Losses	A-7
Public/Nonprofit Services Lost	A-8
Expected Annual Damages	A-8
Expected Annual Benefits	A-9

Total Expected Annual Benefits	A-9
Benefits	A-10
Costs	A-10
Present Value of Annual Maintenance Costs	A-11
Relocation Costs	A-11
Benefit-Cost Ratio	A-12
Present Value Criterion	A-12
Technical Economic Terms	A-13
Benefit-Cost Analysis	A-13
Cost-Benefit Analysis	A-13
Cost-Effectiveness Analysis	A-13
Economic Efficiency	A-14
Economic Impact Assessment	A-14
Informal Benefit-Cost Analysis	A-14
Risk-Benefit Analysis	A-14