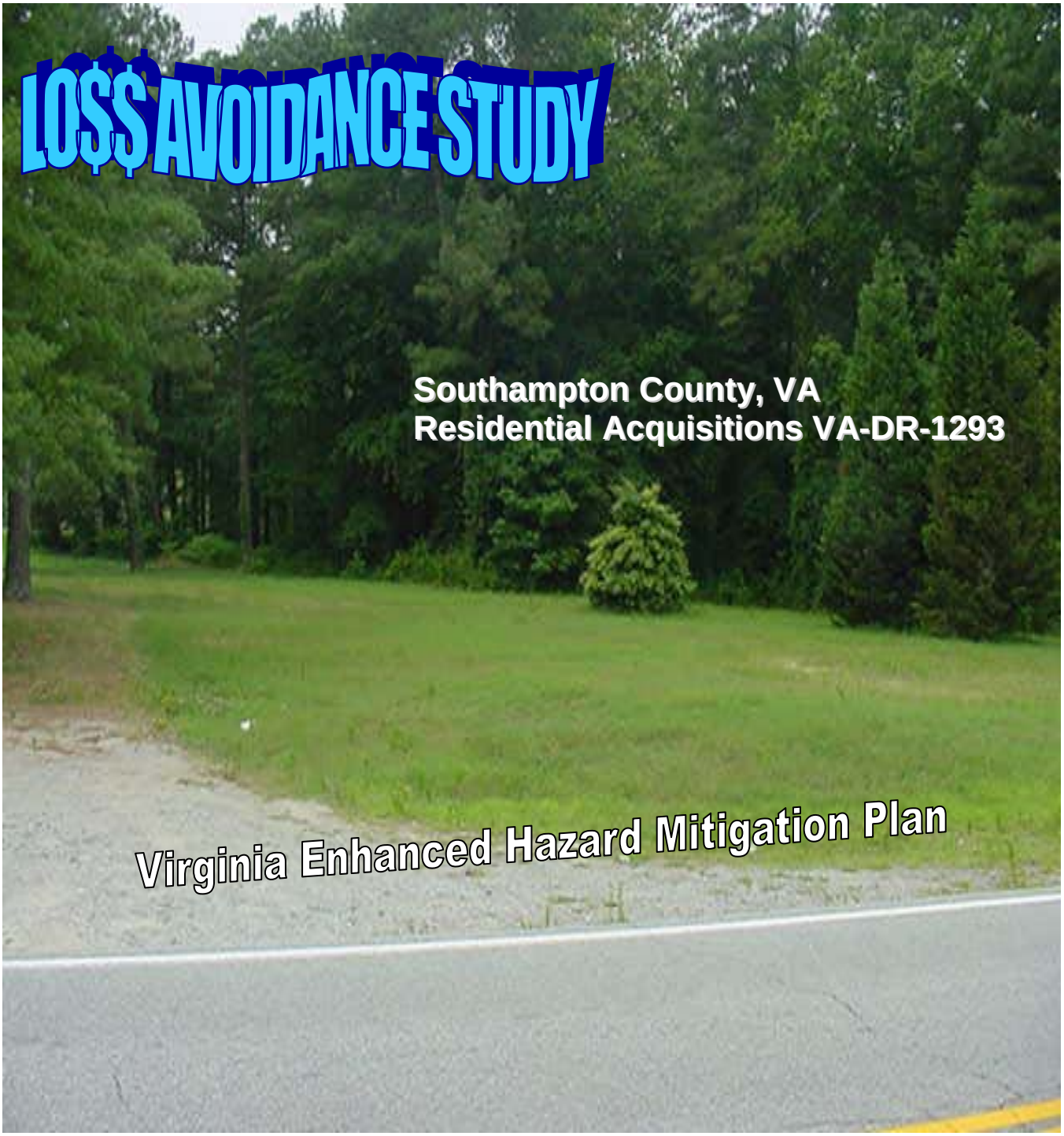
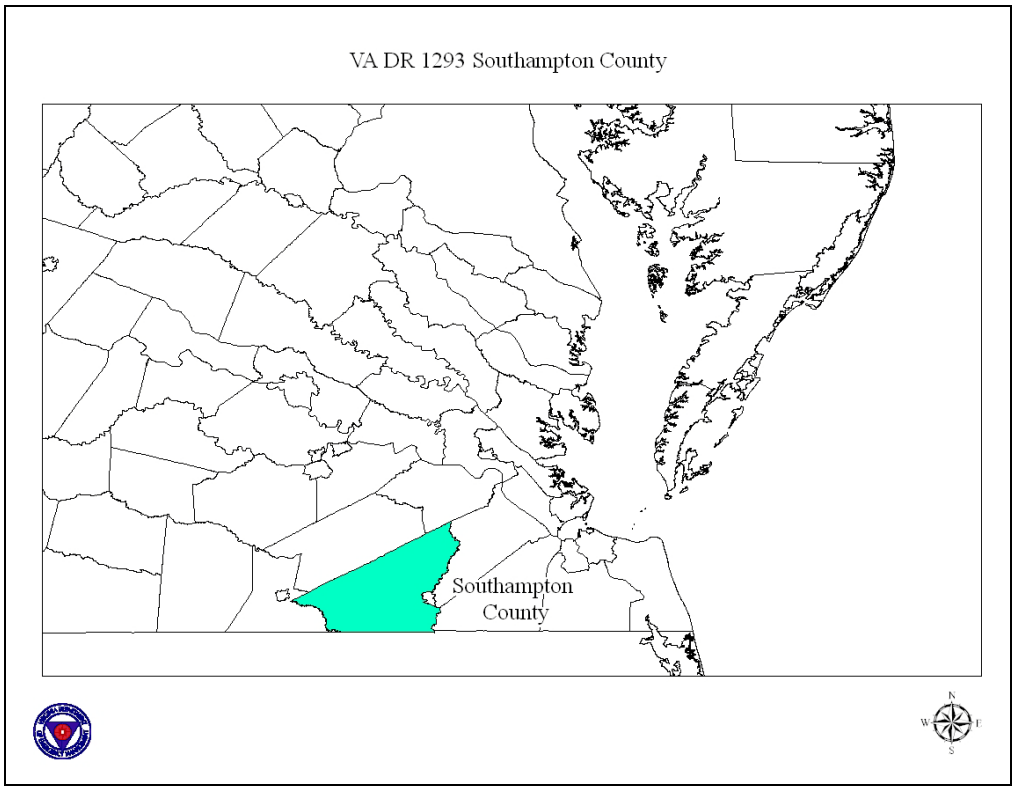

LOSS AVOIDANCE STUDY
Southampton County, VA
Residential Acquisitions VA-DR-1293
Virginia Enhanced Hazard Mitigation Plan



Introduction

Parts of Southampton County and the City of Franklin were devastated by Hurricane Floyd that dropped 10-20 inches of rain on the region in September of 1999. The intense rainfall amounts resulted in the flood of record on the Blackwater River reaching 26.27 ft. As a result of the disaster, federal funds were authorized through the Robert T. Stafford act to provide mitigation assistance through the Hazard Mitigation Grant Program (HMGP). HMGP provides funds to mitigate at-risk structures to reduce the risk of future damages. This disaster became known as VA-DR-1293.

One of the questions that is always asked is how effective are FEMA and state funded mitigation projects? When developing and implementing a project, it is designed to reduce risk and over time result in a cost savings. It isn't until after an event occurs at the location of the mitigated property that one can determine how much money or damages were avoided as a result of the project.

The purpose of this study is to determine the losses that were avoided by mitigating properties through FEMA Hazard Mitigation Assistance (HMA) programs in the Commonwealth. There were several target communities to conduct loss avoidance, but in this instance Southampton County will be used as an example. The methodology and format for this study was modeled after the FEMA report titled *"Evaluated Losses Avoided Through Hazard Mitigation, City of Centralia, Washington."*

The Event

In October of 2006 a Nor'Easter stalled over the eastern portion of the state, causing torrential rain to fall over southeastern Virginia. The event resulted in the 2nd flood of record on the Blackwater River, again inundating the City of Franklin and parts of Southampton and Isle of Wight Counties. It was VDEMs goal to perform loss avoidance calculations based on this event and mitigated properties from VA-DR-1293. There were many properties that were acquired in Southampton County, but for this study only 20 where chosen. The number of properties was narrowed down to 20 due to high first floor elevations, or lack of elevation certificates.

Methodology

To be able to conduct a loss-avoidance study several important pieces of information are needed. They include:

- Location of Structure
- Flood Insurance Study (FIS)
- Structure Square Footage
- First Floor Elevation (for acquisition only pre-mitigation is needed)
- Number of Floors
- BCAR Software
- Flood Depths of events occurring after mitigation

Assumptions

- Building replacement value of $81.41/sq foot (2006 prices and conditions) were obtained from R.S. Means 2006. This was a generic value of a one story economy structure with no basement. The value was the average of a 600sq/ft building through a 1400sq/ft building which was the range of the structures in this study.
- A contents value of 30 percent of the building replacement value was used
- Depth Damage functions from the BCAR 4.5.2 module were used for each structure to determine avoided building, contents, and displacement costs during the 2006 event.

Calculation of Losses Avoided

Building Data

Table 2 provides building data and HMGP Disaster number for 20 homes that were acquired after the 1999 FEMA flood disaster declarations. VDEM VA-DR-1293 project files contained structure specific information and FEMA Elevation Certificates for the 20 structures. Files contained address, structure square footage, first floor elevation, number of floors, type of foundation, and pictures of structures. Southampton County also provided building elevation data on the acquired properties that helped to confirm what was in VDEM's project folders. Southampton County also provided flood depths from the 1999 event, and flood depths from the 2006 events.

FIS Data Needed

- 10, 50, 100, 500 year flood elevation and associated discharge in cubic feet per second (cfs).
- Flood Profile Number
- Date of FIS
- FIRM Panel Number

Table 1 – Sample FIS Data Used for Study

Recurrence Interval	Elevation	Discharge
10	9.2	8110
50	13.7	14900
100	15.4	18800
200	20	31000

Depth-Damage Function

Data from Tables 1 and 2 were entered into the BCAR version 4.5.2 for flooding and acquisition projects to determine the depth-damage relationship. The BCAR gave an output of expected building, contents, and displacement costs. Table 3 provides an example of the depth-damage output for a 1 story building without a basement. The building replacement values and contents values from Table 2 were multiplied by the depth damage function associated with the 2006 flood depths (Table 3) to get the losses avoided. Each of the 20 structures were run through the BCAR to confirm the results, and also to get the anticipated displacement costs.

The BCAR module recognizes flood depths on a 0.5ft interval, so for instance the damages associated with 1 foot of flooding is actually the damages associated with flooding from 0.5 feet to 1.5 feet. To simplify this study, 2006 flood depths that fell within that range were given the damage value associated with the whole number. So 1.2 feet would be assigned damages associated with a 1 ft flood depth.

Figure 1 – Acquire and demolished properties remain green space.

Figure 2 - Study area and location of the 20 acquired properties with relationship to the Blackwater River.

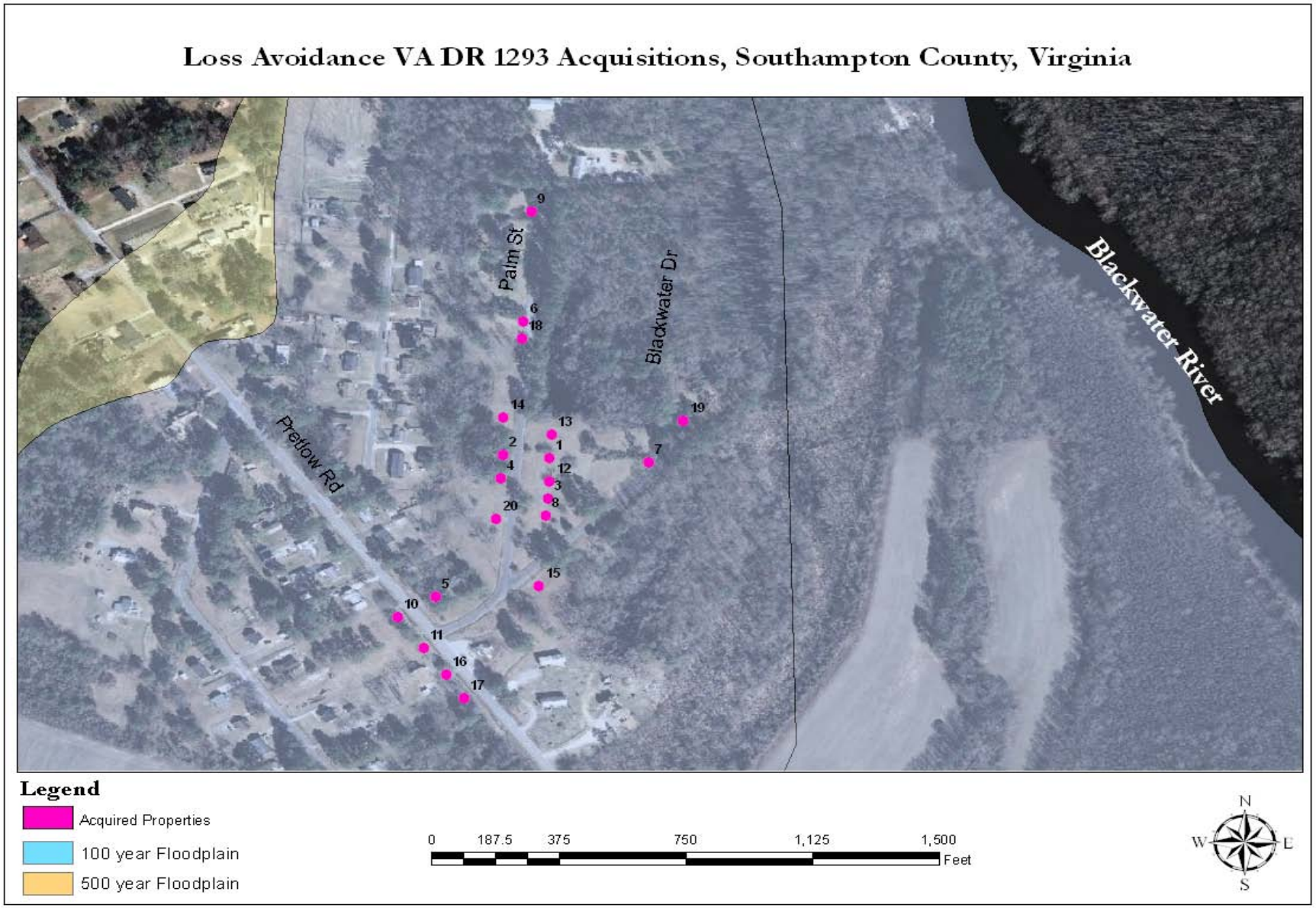


Table 2 – Building data for acquired structures in Southampton County.

Property ID	Base Flood Elevation	FFE (Before)	FFE (After)	Structure Type	Square Footage	Structure Replacement Value	Assumed Contents Value	2006 Flood Depths at Structure
FEMA DISASTER DR 1293 VA - Southampton County Acquisitions								
1	13.3	13.5	Acquired	1 Story	962	$78,316.42	$23,494.93	14.5
2	13.3	13	Acquired	1 Story	884	$71,966.44	$21,589.93	14.5
3	13.3	12.5	Acquired	1 Story	630	$51,288.30	$15,386.49	14.5
4	13.3	12.9	Acquired	1 Story	884	$71,966.44	$21,589.93	14.5
5	13.2	12.9	Acquired	1 Story	1173	$95,493.93	$28,648.18	14.5
6	13.3	13.8	Acquired	1 Story	883	$71,885.03	$21,565.51	14.5
7	13.2	11.5	Acquired	1 Story	1244	$101,274.04	$30,382.21	14.5
8	13.2	11.5	Acquired	1 Story	992	$80,758.72	$24,227.62	14.5
9	13.3	14.3	Acquired	1 Story	1260	$102,576.60	$30,772.98	14.5
10	13.2	14.3	Acquired	1 Story	1128	$91,830.48	$27,549.14	14.5
11	13.2	13.3	Acquired	1 Story	1080	$87,922.80	$26,376.84	14.5
12	13.3	12.3	Acquired	1 Story	630	$51,288.30	$15,386.49	14.5
13	13.3	13.5	Acquired	1 Story	960	$78,153.60	$23,446.08	14.5
14	13.3	13.4	Acquired	1 Story	944	$76,851.04	$23,055.31	14.5
15	13.4	12.7	Acquired	1 Story	1531	$124,638.71	$37,391.61	14.5
16	13	12.2	Acquired	1 Story	1484	$120,812.44	$36,243.73	14.5
17	13	12.1	Acquired	1 Story	1250	$101,762.50	$30,528.75	14.5
18	13.3	13.6	Acquired	1 Story	1018	$82,875.38	$24,862.61	14.5
19	13.2	11.4	Acquired	1 Story	1082	$88,085.62	$26,425.69	14.5
20	13.2	12.6	Acquired	1 Story	884	$71,966.44	$21,589.93	14.5
Assumption: Building Replacement Value is 81.41 per square foot, which is an average of the range of square footage from 600 to 1400 sq ft								

Note:

FFE designates First Floor Elevation
BRV designates Building Replacement Value
BFE designates Base Flood Elevation
Contents Value is 30% of the Building Replacement Value
Structure Replacement Value is the BRV multiplied by the Square Footage
Base Flood Elevation and FFE referenced to NGVD 1929

Table 3 – BCAR depth damage relationship for a 1 story building without basement

Flood Depth	Building (DDF)	Contents (DDF)	Displacement (Days)
-2	0	0	0
-1	2.5%	2.4%	0
0	13.4%	8.1%	0
1	23.3%	13.3%	45
2	32.1%	17.9%	90
3	40.1%	22.0%	135
4	47.1%	25.7%	180
> 5	53.2%	28.8%	225

The depth damage function represents damages expected on a half foot interval. So for instance a flood depth of 1 foot would indicate flood damages expected from 0.5 ft to 1.5 ft.

Table 4 – Losses Avoided

Property ID	Water Depth above FFE Pre-Mitigation (feet)	Flood Depth Used	Building Repair Costs	Content Losses	Displacement Costs	Total
1	1	1	$18,248	$3,125	$2,049	$23,422
2	1.5	1	$16,768	$2,871	$1,883	$21,523
3	2	2	$16,464	$2,754	$2,648	$21,866
4	1.6	2	$23,101	$3,865	$3,767	$30,733
5	1.6	2	$30,654	$5,128	$4,998	$40,780
6	0.7	1	$16,749	$2,868	$1,881	$21,498
7	3	3	$40,611	$6,770	$7,951	$55,332
8	3	3	$32,384	$5,330	$6,350	$44,064
9	0.2	0	$13,745	$2,493	$0	$16,238
10	0.2	0	$12,305	$2,231	$0	$14,537
11	1.2	1	$20,486	$3,508	$2,301	$26,295
12	2.2	2	$16,463	$2,754	$2,684	$21,902
13	1	1	$18,210	$3,118	$2,045	$23,373
14	1.1	1	$17,906	$3,066	$2,011	$22,984
15	1.8	2	$40,009	$6,693.10	$6,523	$53,225
16	2.3	2	$38,781	$6,488	$6,323	$51,591
17	2.4	2	$32,666	$5,465	$5,326	$43,456
18	0.9	1	$19,310	$3,307	$2,169	$24,786
19	3.1	3	$35,322	$5,814	$6,915	$48,051
20	1.9	2	$23,101	$3,865	$3,767	$30,733
Total			$483,284	$81,513	$71,591	$636,388

Table 5 – Total Mitigation Savings

Property ID	Total Losses Avoided	Mitigation Funds Spent	% Savings in 7 Years
1	$23,422	$44,958	52%
2	$21,523	$36,914	58%
3	$21,866	$24,011	91%
4	$30,733	$51,127	60%
5	$40,780	$38,642	106%
6	$21,498	$39,885	54%
7	$55,332	$29,100	190%
8	$44,064	$42,263	104%
9	$16,238	$54,000	30%
10	$14,537	$49,792	29%
11	$26,295	$43,000	61%
12	$21,902	$40,000	55%
13	$23,373	$51,000	46%
14	$22,984	$47,000	49%
15	$53,225	$32,000	166%
16	$51,591	$78,000	66%
17	$43,456	$23,730	183%
18	$24,786	$49,695	50%
19	$48,051	$38,000	126%
20	$30,733	$43,000	71%
Total	$636,388	$856,117	74%

Summary

Had these structures not been acquired, all 20 homes in the study area would have inundation damage from the October 2006 flood event. Four structures would have experienced less than one foot of water, 9 structures would have been flooded from 1-2 feet, and 7 structures would have been flooded over 2 feet. Had these 20 homes not been acquired, an estimated $636,388 in flood damages would have occurred. Since the total cost to acquire these properties was $856,117, in just seven years there was a savings in 74% of damages. It can be expected that the benefits or savings from this project will increase overtime as the Blackwater River will flood the areas of the acquired properties.