BENEFIT/ COST ANALYSIS
DRAFT

Project P-12
City of Moore Resiliency Center
Moore, Oklahoma

U.S. Department of Housing and Urban Development

October 16, 2015

Revision Sheet

Release No.	Date	Revision Description
Rev. 0		
Rev. 1		
Rev. 2		

Benefit/Cost Analysis
Authorization Memorandum

I have carefully assessed the Cost/Benefit Analysis for the [Project Name]. This document has been completed in accordance with the requirements of the HUD's National Disaster Resilience Competition (NDRC) NOFA, particularly Appendix H.

MANAGEMENT CERTIFICATION - Please check the appropriate statement.

_____ The document is accepted.

_____ The document is accepted pending the changes noted.

_____ The document is not accepted.

We fully accept the changes as needed improvements and authorize initiation of work to proceed. Based on our authority and judgment, the continued operation of this system is authorized.

_____	_____
NAME Project Leader	DATE
_____	_____
NAME Operations Division Director	DATE
_____	_____
NAME Program Area/Sponsor Representative	DATE
_____	_____
NAME Program Area/Sponsor Director	DATE

BENEFIT/COST ANALYSIS

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1.0 GENERAL INFORMATION

1.1 Purpose

The purpose of this Cost/Benefit Analysis is to determine the benefit of building a resiliency center in the City of Moore.

1.2 Scope

The scope of the Cost/Benefit Analysis consists of the planned building uses and the benefit it will provide the citizens of Moore and the surrounding area in terms of emergency preparedness and response when natural disasters occur as well as overall education and community cohesion.

The Resiliency Center is intended to be used for training, education, and community events to help develop a more resilient and sustainable citizenry in Moore. The analysis also takes into account the initial and life-cycle costs of the building and compares those to the anticipated benefits it will provide.

1.3 Project overview

The Resiliency Center is currently in the conceptual phase and is planned to be approximately 50,000 square feet and consist of the following space uses:

Indoor:	40% Classroom	(20,000 sf)
	27% Circulation	(13,500 sf)
	7% Office	(3,500 sf)
	14% Public Assembly	(7,000 sf)
	3% Lobby & Reception	(1,500 sf)
	3% Restrooms	(1,500 sf)
	6% Conference	(3,000 sf)
Outdoor:	65% Restored landscape	
	16% Pedestrian/non-motorized vehicle path	
	11% Driveways/roadways	
	8% Parking	

The center will be built in the City of Moore's Central Park located to the southwest of the intersection of Broadway Ave and 4th Street (Oklahoma State Highway No. 37), which is near the oldest part of Moore and is referred to locally as Old Town. The building will incorporate several LEED building items with the goal of achieving LEED Platinum certification.

The center will include a National Weather Service Station mock up and will have a direct connection to the University of Oklahoma (OU) for educational and interactive presentations.

The center will work with OU and the local public school systems to establish a curriculum for K-12 educational institutions in the areas of water and tornado resiliency. The building will provide space for public education, and for meetings of community organizations, community stakeholders, educators, and scientists. The center will also have interactive components designed to increase awareness of tornadoes and resiliency. These components will provide the educational background needed to enhance community understanding and involvement in planning for the future.

The center will have multiple functions, including but not limited to creating and sustaining data collection and analysis, providing a forum for the exchange of trends and outcomes in the context of the latest science and technology, to providing outreach to vulnerable populations and state and regional stakeholders through public education, and as a forum to spark innovation across the spectrum of water and tornado resiliency.

The building is programmed to achieve LEED Platinum status and to be a sustainable site, both of which would be the first in Oklahoma. By achieving this level of project status, the building itself will become an educational tool to the public by showing them how they can implement some of these principals in their own homes and businesses. Examples of these items are rainwater collection, photovoltaic energy, light wells, geothermal heating and cooling, and optimized indoor and outdoor water conservation. These process will made visible to the public in key areas of the building. The building will consist of a green roof and potentially a roof garden, rainwater harvesting techniques, and sections of walls that are transparent construction allowing a view of the construction details. Approximately 1/3 of the 1st floor will be built into the earth, serving as a safe room during future storm events. Additionally, due to the increase of earthquakes in Oklahoma, the building would have seismic isolators included in its foundation design.

1.4 Project references

Resiliency Center Conceptual Drawings
FEMA BCA Analysis Guidelines
US Green Building Council Documents
BOMA Exchange Experience Report
LEED Building Cost Estimating Resources f
LEED Building Case Studies
City of Moore Demographic Information.
City of Moore Disaster Recovery Program Action Plan

1.5 Acronyms and abbreviations

LEED:	Leadership in Energy and Environmental Design
USGBC:	United States Green Building Code
BOMA:	Building Owners and Managers Association
MRC:	Moore Resiliency Center

MPS: Moore Public Schools
NWS: National Weather Service
OU: University of Oklahoma

1.6 Points of contact

1.6.1 Information

CEC Corporation: phone: 405-753-4200
Felicia Jackson (Felicia.jackson@connectcec.com
Taylor Barnes (taylor.barnes@connectcec.com)

1.6.2 Coordination

2.0 BCA NARRATIVE DESCRIPTION

The BCA is based on regional building cost information provided by LEED and USGBC resources. These are average costs that were applied to the Resiliency Center conceptual plans to determine the initial costs and the on-going operation and maintenance costs into the future. The building is anticipated to be in use for the next 50 years, so the life-cycle costs were estimated for that duration.

The BCA includes projected future cost savings that can be attained by providing education and training to the citizens of Moore to help them be more prepared for emergencies and make them more educated on construction and living practices to be more environmentally friendly.

2.1 Process for preparing BCA

This BCA has been prepared through collaboration and research from the Resiliency Center Architect, City of Moore On-Call Civil Engineer, Community Development Consultants, and the City of Moore Resilience Staff.

2.2 Full proposal cost

Initial construction costs:	$21,252,500
Initial library book costs:	$500,000
Operations & Maintenance:	$547,250 per year

2.3 Current situation and problem to be solved

The MRC will provide social and community value by including a public library for all ages of Moore citizens, interactive weather monitoring and education classroom, and education and demonstration of sustainable living practices such as the conservation of resources and alternative energy methods. Additionally, the center will be constructed in the City of Moore Central Park that is located in the oldest portion of the City of Moore, referred to locally as Old Town Moore. This will provide an overall benefit to the community but more specifically, a benefit to Low/Moderate Income households.

The MRC has the potential to provide significant economic benefit to the City of Moore and neighboring communities by providing education and training on emergency preparedness and disaster recovery and environmentally friendly construction techniques. In terms of economic impact, a more educated, prepared, and therefore resilient city will result in a significant reduction of costs associated with injuries, loss of productive time, and loss of property.

2.4 Proposed project description

The MRC is proposed to provide educational and social benefits to the city and its citizens. It is planned to consist of the latest 'Green' building techniques to attempt a LEED Platinum certification, so the building itself will be a showcase of sustainable, energy efficient, and environmentally friendly construction materials and techniques. The building will be located in the city's newly created Central Park and will be close to a new Community Center. For this reason, the building will be an integral part of community activities and learning and will have a significant social impact to the city. The park is located near LMI housing and will be easily accessible by these residents. The construction of the Central Park, Community Center, and Resiliency Center will provide new development in the oldest part of Moore.

2.5 Risks if proposal is not implemented

If the proposed MRC is not implemented the future benefit of having the citizens of Moore educated and trained on emergency preparedness, disaster recovery, and environmentally friendly building techniques will result in a loss of economic benefit when natural disasters do occur because a reduction in deaths, injuries, loss of productive time, property loss, and energy conservation will not have been realized and incorporated into people's daily lives. Additionally, the on-going social benefit that the new facility will provide through the library and community meeting space will not be available to impact the community.

2.6 Categories of Costs and Benefits

2.6.1 Lifecycle Costs

MRC Initial Costs				
Item	Unit Cost	Units	Total	
Design	$0.06	$20,000,000	$1,200,000	(1)
Construction	$400.00	50,000	$20,000,000	(2)
Commissioning	$1.00	50,000	$50,000	(3)
LEED Certification	$0.05	50,000	$2,500	(3)
		Total	$21,252,500	

(1) (Design & Construction Administration estimated at 6% of construction cost)

(2) (Estimated at $400 per square foot per the building Architect)

(3) (Green Building Certification Institute)

(3) (Green Building Certification Institute)

MRC Operations & Maintenance Costs							
Employees		Salary		Annual Costs	Projection	Reduction for LEED Platinum [2]	Total
	Director	$80,000		$80,000	50		$4,000,000
	Educators (2)	$92,000		$92,000	50		$4,600,000
	Receptionist	$30,000		$30,000	50		$1,500,000
	Librarian	$30,000		$30,000	50		$1,500,000
	Maintenance	$45,000		$45,000	50		$2,250,000
							$13,850,000
Operating Costs		Square Foot Costs [1]	Building Size				
	Cleaning	$1.45	50,000	$72,500.00	50		$3,625,000
	Repairs & Maintenance	$1.98	50,000	$99,000.00	50		$4,950,000
	Utilities	$2.15	50,000	$107,500.00	50	0.5	$2,687,500
	Roads & Grounds	$0.21	50,000	$10,500.00	50		$525,000
	Security	$0.69	50,000	$34,500.00	50		$1,725,000
							$13,512,500

Total O&M Cost	$27,362,500

[1] Per square foot costs from BOMA International 2014 Experience Exchange Report

[2] 50% reduction for Platinum LEED compared to non-LEED per USGBC reports

2.6.2. Benefits

1) Severe Weather Preparedness
2) First Aid
3) Emergency Response
4) Storm Resistant construction
5) Water Conservation
6) Energy Conservation
7) Alternative energy
8) Community interaction/cohesion
9) Education

Resiliency value

The MRC is programmed and will be designed to provide training on emergency response procedures & actions, methods for sustainable living such as energy conservation, water conservation, rainwater harvesting, alternate energy sources and drought tolerant landscaping techniques. The building will also demonstrate green and sustainable building practices by providing visual demonstration of its LEED certified components.

Environmental Value

The environmental benefits that are anticipated to be included and result from the Resiliency Center are described below:

Ecosystem and Biodiversity: The city's Central Park where the center will be constructed consists of native prairie restoration and native and adapted species that will provide food and forage for pollinator insect and bird species. The center will incorporate similar landscape features that will not only provide habitat for native insect and animal species, but it will also provide outdoor education opportunities for the citizens of Moore and visitors.

Reduced Energy Use: The native vegetation requires less irrigation, mowing, and general care and maintenance, thus lowering the water use at the center and the use of fossil fuels. This will result on overall lower maintenance costs for the city in future years.

Noise Levels: A portion of the building will be built into a berm which will help mitigate sounds into and out of the library.

Climate Change: The reduction of fossil fuel use in future years will be achieved through the use of native vegetation and adapted species requiring less maintenance. The prairie restoration and large number of tree plantings will act as a carbon sink that will absorb and store carbon while also reducing fossil fuel pollutants.

Air Quality: Trees and prairie grasses are proven to increase air quality by removing particulates from the atmosphere.

Water Quality: The storm water from the parking lots will be directed to bioswales within the parking lots that that will give a first clean to the stormwater runoff from the site before it is moved to an onsite retention pond that is used for irrigation. The bioswales will also allow excess water to infiltrate into the soil and help recharge the aquifer. Also, the site will be graded to minimize slopes and maximize soil infiltration; the deep roots of the native landscape will help facilitate ground water recharge.

Reduction of Urban Heat Island Effect: Paved or hard surfaces will be minimized as much as possible to reduce the heat produced by the site. Porous pavement and paving that has a high albedo rating as well as trees to provide shade to non-porous paving will be utilized.

Sustainable Site: A goal for this project is for it to be a sustainable site, which would be the first in Oklahoma. This will provide direct focus on sustainability and resiliency in the site landscaping.

The building site will incorporate areas in the building that will allow visitors to visually see the process of rain water harvesting. The building will also have a green roof and potentially a roof garden adding additional educational areas.

The resiliency center will incorporate a landscape approach that will not only provide habitat for native insects and animal species but it will provide outdoor education opportunities for the citizens of Moore and visitors. (*Information Provided by TAP)*

Adding environmental education to regular curricular activities helps children understand why their actions contribute to the condition of the world.

http://www.nesc.wvu.edu/educators.cfm

Community Development/Social Value

Reductions in Human Suffering Through Education:
The center will include a National Weather Service station mock-up and will have a direct connection to the University of Oklahoma (OU) for educational and interactive presentations. The center will work with OU and the local public school systems to establish a curriculum for K-12 educational institutions in the areas of reduced water use and tornado resiliency.

The center will be used for education and training and can result in a reduction in human suffering as described below:

Classroom Space:

The Moore Resiliency Center (MRC) will provide approximately 20,000 square feet of space for educational classrooms and the National Weather Service branch equipment. The educational space will be utilized to create a weather education program that will be unique to MRC and provide no-cost educational opportunities for residents in the area.

Program / Educator Cost:

Based on the State of Oklahoma minimum teacher salary schedule, the program will plan to employ two educators to run the weather education program, with anticipated compensation (including fringe) of $46,000 per educator. The weather education program will also employ a director, with an anticipated fully-loaded cost of $80,000. The two educators will be able to process approximately 60 students per session, with two sessions being scheduled per day – one during the morning from 8-11am and the other during the afternoon from 12-3pm. It is estimated that the program will need approximately $12,000 per year for supplies to support the educational initiatives. The total cost for the education program is estimated to be $184,000 per year, or $9,200,000 over the anticipated 50-year life of the center.

Student Participation:

Moore Public Schools (MPS) is the third largest school system within the State of Oklahoma with total student enrollment in 2014 of 22,899 students. Enrollments by facility type were 56.97% in elementary school, 15.22% in junior high, and 27.8% in high school. The weather education program will initially target students enrolled in grades 3 through 12, with a potential of reaching approximately 10,000 (43%) students enrolled within the MPS system alone.

Assuming average daily attendance of 120 students, the program will be able to operate 4 months of the school year just focused on the eligible student enrollment at MPS.

Other school systems within Cleveland County include Robin Hill (280), Norman (15,819), Noble (2,860), Lexington (1,159), and Little Axe (1,286). Assuming a similar 43% participation rate from the other schools in the county, an additional potential of 9,200 students could be impacted by the education program.

With its close proximity to other community buildings, a less-structured open house concept will be applied to the facility during the summer months (when schools are not in session) where the facility will be open to citizens throughout the day for leisurely-paced learning. A similar format will be offered during the evening, by appointment, where other civic groups could tour the facility for weather-related learning opportunities.

Curriculum:

The weather education program will address weather resiliency through a two-pronged approach. The first being a life safety class that highlights the importance of precautions to take during severe weather events, such as tornadoes. The second class will address drought and flood conditions. These two classes will be created in collaboration with the National Weather Service Storm Prediction Center in Norman, OK and the University of Oklahoma School of Meteorology.

The goal of the educational classes is to provide the students with real-world ideas and innovations that they can take home and implement with their families. These concepts include, but are not limited to, building a storm shelter for use during a tornado and/or placing a cistern or "rain barrel" outside the home to collect rain water that could be used for non-potable needs during drought or during periods when city water supplies are disrupted following a weather event.

Community Economic Impact:

Assuming a 25,000 annual visitor population utilizing the center, it is estimated the 5% (1,250) will implement the learning in their home by installing a cistern on their property and 2% (500) will implement the learning by installing a tornado shelter in their home.

Harvesting Rain Water

The Gleick 1996 study recommended that residential consumers needed 20 liters (5.28 gallons) of water per day for basic sanitation, which could be sourced from the cistern in the event of water supply disruption. Using the 2010 median household population of 2.68 for Moore, the average household would need 56.6 gallons of water for essential basic sanitation for a 4-day disruption of water services. Using the EPA 2003 average cost of bottled water adjusted to

August 2015 dollars at $2.07** per gallon, the cost to the average household in Moore for essential basic sanitation during a 4-day disruption of water service is $117.17. The City of Oklahoma City ran a promotion during early 2015 whereby residents could purchase a 55-gallon rain barrel for $63.50. A one-time use during a 4-day disruption of water service would provide a benefit-cost ratio of 1.845.

If the entire 1,250 implementing visitors to the center were to add a rain barrel to the 1,250 homes in the community, the economic impact during a 4-day disruption of water service would be approximately $146,450 in savings through avoidance of using bottled water for essential basic sanitation needs. The investment per year by the community residents in this initiative is approximately $79,375, placing $6,746.88 in tax dollars back into the community per year, or $337,344 over the 50-year anticipated life of the facility.

**Aug 2015 CPI of 238.316 divided by 2003 CPI of 184.000 x $1.60 per gallon from 2003 EPA study.

Installing Residential Tornado Shelter

With 500 homes adding a tornado shelter per year, 1,340 lives in the community will be impacted by having improved shelter during severe weather events. The average cost of an installed residential tornado shelter is $5,000, so the economic investment by the community residents in storm shelters is $2,500,000 per year, placing $212,500 in tax dollars back into the community per year, or $10,625,000 over the 50-year anticipated life of the facility.

**August 2015 CPI of 238.316 divided by 2012 CPI of 229.594 x 2012 value

Loss of Life and Injury Severity

The National Weather Services (NWS) in Norman, OK has researched the history of tornadoes in Central Oklahoma and determined that from 1893 to 2013 there were at least 156 tornadoes, and likely more, due to the weaker tornadoes not being documented prior to 1950. This is an average of 1.3 tornadoes per year, and since 1950 there have only been 3 periods of time with a 2 year gap between tornadoes.

Based on information for the City of Moore from 1960 to 2013, the number of injuries and fatalities per tornadic storm can be calculated as follows:

Past Tornadoes = 49
Total number of injuries = 1167
Total number of fatalities = 55

Average Injuries per tornado = 1167/49= 23.82
Average Fatalities per tornado = 55/49 = 1.12

The average economic value of Minor to Serious injuries per the Tornado Injury Severity Levels = $498,798**.

**August 2015 CPI of 238.316 divided by 2008 CPI of 215.303 x 2008 value

Through education and training at the Resiliency Center, if the number of injuries per tornado can be reduced by half, it would be a potential benefit of 11.91 injuries x $498,798 = $ 5,940,684 per tornadic storm.

Through education and training at the Resiliency Center, if the number of fatalities per tornado can be eliminated, it would be a potential benefit of 1.12 injuries x $6.6 million = $ 7,392,000 per tornadic storm.

Based on the historic data for Moore and Central Oklahoma, it is reasonable to calculate this benefit on an annual basis for the 50 year duration being used for the useful life of the MRC. This would result in an overall estimated benefit of $5,940,684 + $7,392,000 = $13,332,684 per tornadic storm per year. Projecting this ahead through the 50 year useful life of the MRC results in a calculated benefit of $13,332,684 x 50 = $666,634,200.

Loss of Productive Time

The US Department of Labor, Bureau of Labor Statistics (March 2011) calculates the Value of Lost Time to be $30.07 per hour. Using the CPI to adjust this value to 2015 is 30.07 x 1.066 (238.316/223.467) = $32.05

2010 Moore Population: 55,081
Average Persons Per Household = 2.68

From the March 25, 2015 storm that caused an EF2 tornado to touch down in Moore. Per FEMA/SBA/OEM extensive damage survey over the past two days, the damage assessment is as follows:

33 homes destroyed
27 with major damage
47 with minor damage
347 affected

The total value of lost time for this storm event can be calculated as 347 homes x 2.68 people per home x $32.05 per hour = $29,805 per hour. Using a reasonable loss of productive time of 2 weeks for each household to recover from the damages results in a cost of $29,805 per hour x 140 hours = $4,172,700. Based on the historic storm data for Moore and Central Oklahoma, storms of this type are anticipated to occur once a year.

Through education and training at the Resiliency Center to help the citizens of Moore and Cleveland County become more emergency prepared and resilient when a disaster strikes if the amount of lost time for a smaller storm event such as the March 25th, 2015 storm can be reduced

by 10%, the potential benefit can be calculated as follows: $4,172,700 x .10 = $417,270 per tornadic storm per year. Projecting this out for the 50 year useful life of the MRC results in a calculated benefit of $417,270 x 50 years = $20,863,500.

The EF5 tornado that hit Moore and the surrounding areas on May 20th, 2013 resulted in 1,150 homes destroyed. The total value of list time due to the destroyed homes for this storm can be calculated as 1,150 homes x 2.68 people per home x $32.05 per hour = $98,778 per hour. Again using a reasonable loss of productive time of 2 weeks for each household to recover from the damages results in a cost of $98,778 per hour x 140 hours = $13,828,920. Based on historic and recent storm events in Moore and Central Oklahoma, it is reasonable to estimate at least one EF4 or EF5 tornadic storm will occur every 5 years

Through education and training at the Resiliency Center to help the citizens of Moore and Cleveland County become more emergency prepared and resilient when a disaster strikes if the amount of lost time for a smaller storm event can be reduced by 10%, the potential benefit can be calculated as follows: $13,828,920 x .10 = $1,382,892 per catastrophic tornadic storm event of EF4 or EF5. Projecting this out for the 50 year useful life of the MRC results in a calculated benefit of $1,382,892 x 10 storms = $13,828,920.

After the May 20th, 2013 EF5 tornado, through the organization of ServeMoore – a local grassroots coalition of community members and faith-based groups that organized in the hours after our event – more than 35,000 volunteers spent over 230,000 hours assisting Moore residents.

Through education and training at the Resiliency Center to help the citizens of Moore and Cleveland County become more emergency prepared and resilient when a disaster strikes if the amount of lost time due to volunteer efforts can be reduced by 10%, the potential benefit can be calculated as follows: 230,000 hours x $32.05 per hour x .10 = $737,150 per catastrophic tornadic storm event of EF4 or EF5.

Based on historic and recent storm events in Moore and Central Oklahoma , it is reasonable to estimate at least one EF4 or EF5 tornadic storm will occur every 5 years. This results in 10 of these storms over the projected 50 year life of the MRC. Projecting this ahead would be an overall estimated benefit of $737,150 x 10 storms = $7,371,500.

Benefit to Low-and Moderate-Income (LMI) Persons and/or Households:

The city's new central park where the Resiliency Center will be built is located near the original and therefore oldest part of town, referred to as Old Town. This area is where the city's lowest household incomes and minorities reside, so this group will have the most accessibility to the park, the resiliency center, the new community center, and swimming pool. These new facilities will provide activities that improve the overall quality of life and educational opportunities through the resiliency center's connection with OU , the library that will be part of the building, and other topics taught in the buildings classroom space.

Old Town/Crestmoore, Census Tract 2021.02, Block Group 4: This block group incorporates the entire neighborhood of Crestmoore, and a portion of Old Town. Crestmoore is an urbanized subdivision constructed in the 1970's. It consists of small single-family homes and duplex units. Old Town is the original town-site of Moore, originally settled in the 1880's. This neighborhood is a traditional neighborhood with a mixture of small homes, multi-family housing, and businesses. Old Town has many high-density housing developments, primarily developed for the elderly. The Brand Senior Center, the City's only Senior Center, is located in this portion of Old Town.

The block group has the highest percentage of minorities within Moore, at 26% of the total block group population being a minority, and it has the second highest population of Low-Moderate Income residents at 60%. (See Figure 2)

Regency Park, Census Tract 2020.05, Block Group 4: This area is an urbanized subdivision constructed in the 1960's-1970's. It is characterized by a large amount of Section 8 Apartment Housing. This Block Group has the highest percentage of low moderate income individuals within Moore, at 69.3%.

http://www.cityofmoore.com/sites/default/files/main-site/5%20year%20consolidated%20plan.pdf

Economic Revitalization

The project will provide initial economic stimulus to the local economy due to construction activities and a resulting increase to local restaurants and fuel sales.

Long term, the areas adjacent to the park and Resiliency Center are expected to experience increase economic activity due to people visiting the park and Resiliency and therefore stopping to eat at local restaurants, visit local shops, and re-fuel at local filling stations.

2.7 BCA for City of Moore Resiliency Center Project

1	2	3	4	5	6
Costs and Benefits by category	**Page # in Factor Narratives or BCA Attachment**	**Qualitative Description of Effect and Rationale for Including in BCA**	**Quantitative assessment (Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)**	**Monetized effect (if applicable)**	**Uncertainty**
Life cycle costs					
Project Investment Costs		Cost of building construction	Per square foot building costs of similar LEED structures	$21,752,500	2
Operations & Maintenance		Cost of maintaining the building	Per square foot building costs of similar LEED structures	$13,512,500	2
Personnel		Cost of personnel to staff the building		$13,850,000	
Resiliency Value					
Expected reduction of injury severity from future natural disasters		Historic tornadic storm data for Cleveland County and injuries & fatalities per storm		$666,634,200	3
Expected reduction of loss of productive time from future natural disasters.		Reduced economic impact due to a better educated and trained populace to respond in		$20,863,500	3

		times of disaster & emergency			
Environmental Value					
Alternative Energy		Benefit from alternate (sustainable/renewable) energy sources		+	
Energy Conservation		Benefit from reduced energy use and associated energy production costs.		$2,687,500	
Water conservation		Benefit from reduced water use and water treatment costs		$7,322,500	
Climate change		Benefit to the environmental from more efficient materials and building design, reduced carbon footprint		+	
Community Development Value					
New Park Benefits	15-20	Improved life in the community		++	
Educational Benefits	15-20	Improved quality of life		++	
Increase resiliency of citizens	15-20			++	
Social Cohesion	15-20			++	
Economic Revitalization					
New development	21	Revitalization of the oldest part of Moore		++	

Increased activity in area	21	Increased circulation of Moore residents and visitors from other cities and towns.		++	

2.7.1 Net Present Value

Using a 7% discount rate over 50 years and an initial investment of $21,752,500 with annual benefits totaling $13,888,281 per year, the NPV of the project is **$169,916,143**.

**Used NPV Calculator from www.calculatorsoup.com

2.7.2 Benefit/Cost Ratio

Based on the financial assumptions, the benefit/cost ratio for the center is $169,916,143 / $21,752,500 = **7.81**

2.7.3 Payback Period

Based on the financial assumptions, the payback period for the center is **1.7 years**.

2.8 Risk to ongoing benefits

A description of risks to ongoing benefits from the proposed project or program

- The MRC could be damaged or destroyed by a future tornado which would reduce its effectiveness and impact on the community or remove it altogether.
- The planned collaboration with the OU Weather Center could end.
- The benefits related to tornados and drought may not be realized if weather patterns change and the Moore area does not experience tornados and drought in the coming years.

2.9 Challenges with implementation

An assessment of challenges faced with implementing the proposal.

- The design and implementation of the building technologies required to achieve LEED Platinum certification could be more difficult than non-LEED construction.
- Obtaining public approval of the MRC may be difficult. The city is planning several public meetings to educate the public on the purpose and need for the building in order to build consensus as much as possible.

2.10 Basic Assumptions and Definitions

2.10.1 Analysis Period

An analysis period of 50 years was selected for this proposal. This duration was selected as a reasonable period to use the building as it was originally intended. Beyond this time, this original intent may change and the building may undergo modifications.

2.10.2 Price level

We recommend using 2015 constant prices. No general price inflation should be used in projecting benefits and costs.

2.10.3 Discount Rate

The 7% discount rate has been used.

2.10.4 Value of statistical life and other immaterial damage valuation

This information was used and referenced previously in the document.