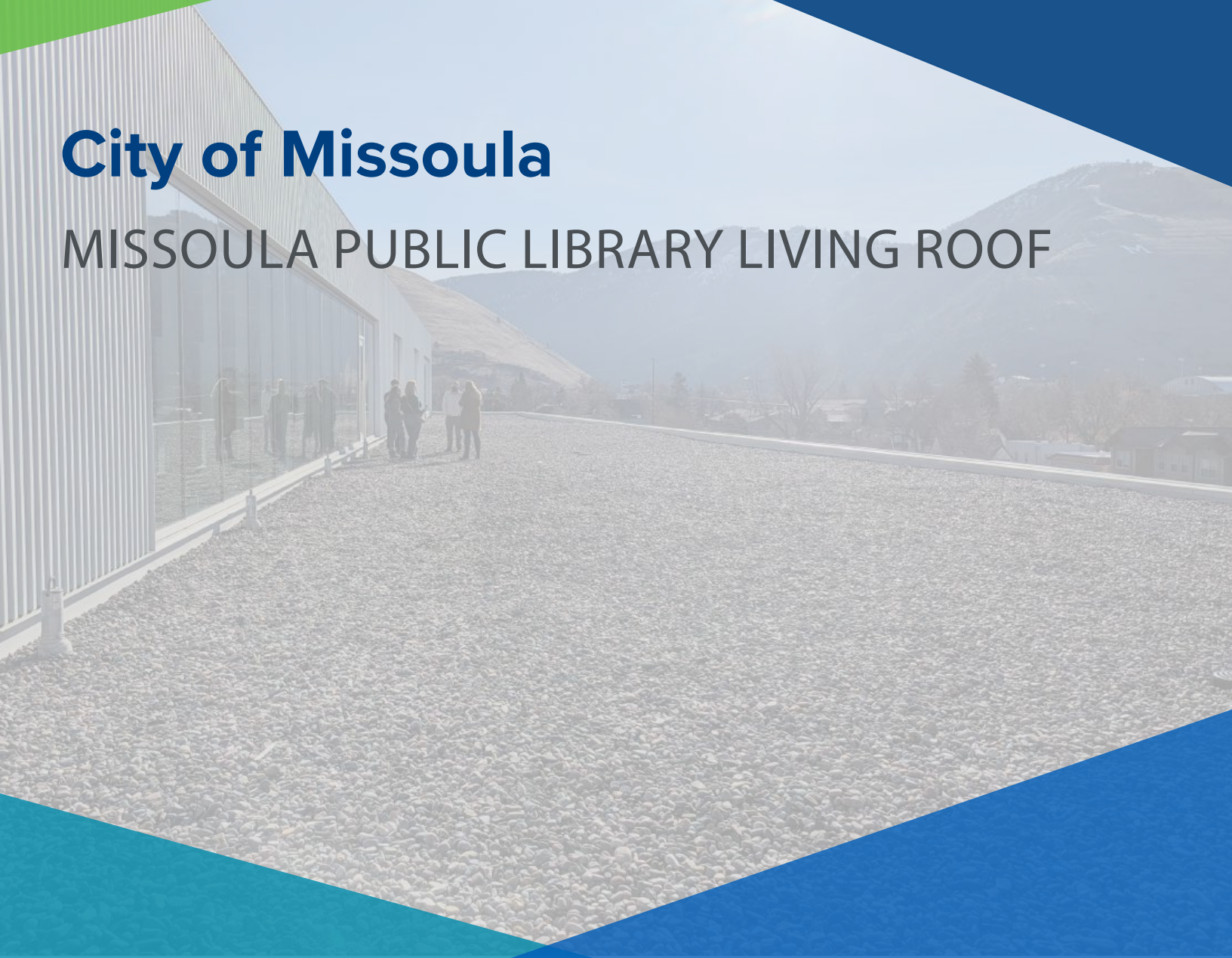


RENEWABLE RESOURCE GRANT APPLICATION

May 2024

City of Missoula

MISSOULA PUBLIC LIBRARY LIVING ROOF



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PART 1

APPLICATION SUMMARY

1. Applicant/Authorized Representative Name: Andrea Davis, Mayor
2. Project Title: Missoula Public Library Living Roof Project
3. Public Entity Name: City of Missoula
4. Project Type: Stormwater, Green Infrastructure
5. Project Location: Include a project map, site photograph, and the project location coordinates
 - Latitude: 46.869577
 - Longitude: -113.989927
6. State Senate District # 92
7. State House District # 46

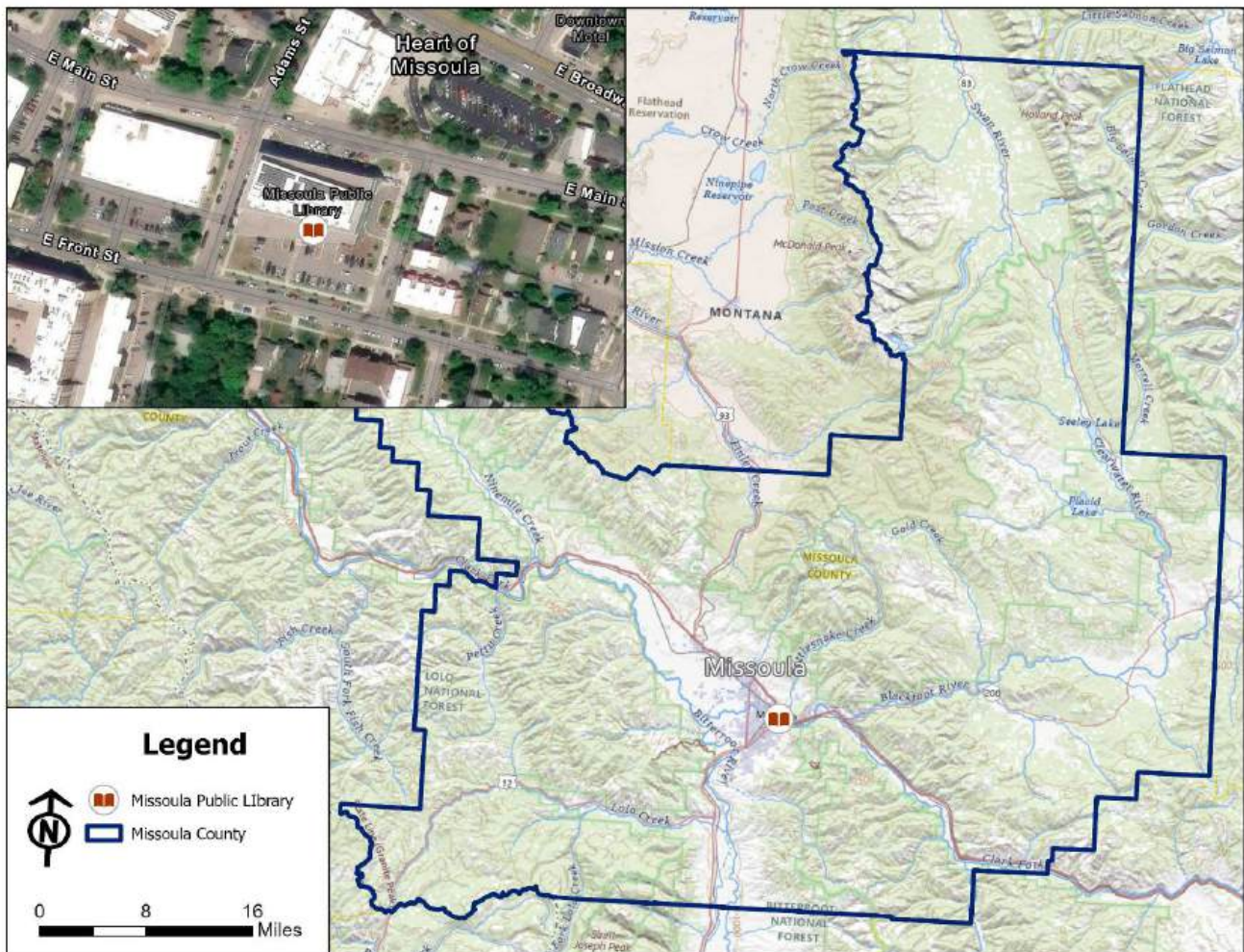


Figure 1-1: Project Map and Aerial Photo

PROJECT CONTACTS

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GRANT/LOAN ADMINISTRATOR:

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(Name)

Stormwater Superintendent

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PROJECT ENGINEER/ARCHITECT/CONSULTANT:
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LEGAL COUNSEL:

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CLERK/CHIEF FINANCIAL OFFICER:

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BOND COUNSEL: N/A

INSERT AUTHORIZATION STATEMENT

PART 2 PROPOSAL ABSTRACT

The Missoula Public Library is a city-county library that sees over 180,000 visitors annually. The library is an invaluable resource to Missoula County, providing creator labs, a test kitchen, children's library, event space, an outdoor balcony, and hosting three non-profits within the facility. The Missoula Public Library has 13,000 square feet of roof space covered with conventional rock ballast. The roof is highly visible through floor-to-ceiling windows on the upper floors. Stormwater runoff management from the roof does not include any quality pre-treatment or retention. The stormwater system is not resilient to intense precipitation events anticipated as the climate changes. Additionally, the Library contributes to heat island impacts experienced in urban Missoula. The rock ballast roof absorbs energy and heat from sunlight. This heat flux increases the temperature of the building, creating additional stress on the air-cooling system, in turn increasing energy usage and greenhouse gas emissions from conventional power sources.

The proposed project will replace 6,228 square feet of rock ballast roof with a living roof, comprised of 6 inches of soil, a variety of plant species, and a 3-inch water retention layer. The living roof will provide additional stormwater capacity, increasing resiliency to climate change. The soil and vegetation will filter runoff, improving quality and significantly reducing the amount of runoff that is infiltrated to the Missoula Valley Aquifer, the sole drinking water source for the community. A vegetated surface will reduce heat island effects, reducing demand on the cooling system and increasing energy efficiency. Air quality benefits include reduced emissions related to power generation and reduced temperature. The new green roof in downtown Missoula will be suitable habitat for pollinators species, such as bats, songbirds, butterflies and bees. Pollinators will benefit from improvements to existing habitat fragmentation caused by development, providing a resting place between the Clark Fork River corridor and the foothills north of Missoula. The highly visible location from the Library windows will allow the new living roof demonstrate the benefits of green infrastructure. An exhibit will be installed in the Library to educate visitors on the resource benefits provided by the living roof.

PART 3 RESOURCE AND CITIZEN BENEFITS

PRIMARY PURPOSE

The proposed project will replace an estimated 6,228 square-foot area of rock ballast with a living roof (or green roof) at the Missoula Public Library. Research studies have documented the effectiveness and wide range of resource and public benefits offered by a living roof. In fact, the U.S. Environmental Protection Agency (EPA) has published a case study, in addition to many other resources, about estimating the environmental benefits of green roofs. Documented benefits of living roofs include mitigation of urban heat island effect, improved energy efficiency, attenuation and filtering stormwater, promotion of biodiversity and pollinator habitat, and increased resiliency to climate change. All of these benefits directly correlate to renewable resource benefits recognized by the DNRC Renewable Resource Grant program. Due to the location and visibility of the project at the Missoula Public Library, the green roof will provide an excellent public outreach and educational opportunity to promote green infrastructure and low impact design throughout Montana.

The Missoula Public Library, in partnership with the City of Missoula, considers sustainable practices as a core to their identity and aim to create a holistic model of sustainability. Identified under the Library's Sustainability & Wellness strategic priorities is a plan for renewable energy use and efficiency in conjunction with community-wide carbon neutrality goals. The Library intends to assess current energy performance and identify short and long-term goals for reducing fossil fuel reliance and increasing efficiency. The Living Roof project is in alignment with these strategic goals.

In addition to meeting established goals of energy efficiency and reduced emissions, the proposed project will benefit the City of Missoula Stormwater Utility by creating a green infrastructure project that can be seen by the community, offering education to citizens, designers, and contractors alike. The City aims to reduce stormwater runoff, provide quality treatment, and showcase the benefits of green infrastructure to inspire similar projects throughout Missoula.



Figure 1: Missoula Public Library – 2nd and 3rd level rock ballast roof

IDENTIFICATION OF PRESENT RESOURCES

Renewable resources benefitting from the proposed project include surface water, groundwater, urban habitat, energy consumption and air quality. Specific resources that will be conserved, preserved, developed, and managed as a result of the proposed project are outlined in Table 1.

Table 3-1: Renewable Resource Identification and Significance

Resource Type	Name/Location	Significance
Water	Stormwater runoff – Missoula Public Library	As rainfall events increase over time due to climate change, the stormwater system of the library is less resilient.
Groundwater	Missoula Valley Aquifer	EPA designated sole source of drinking water for more than 40,000 households.
Habitat	Pollinator habitat – Downtown Missoula	The proposed project includes 3,709 square-feet of new habitat for pollinator species in a location that is void of vegetation
Energy	Energy efficiency – Missoula Public Library	The mechanical, electrical, and plumbing (MEP) system of the Missoula Library provides the lighting, heating, cooling, and generally operation of the 106,676 square-foot Public Library.
Air	Air Quality – Downtown Missoula	Downtown Missoula is within an EPA classified carbon monoxide maintenance area and a PM10 nonattainment area. These areas require monitoring and regulate air quality in Missoula.

RENEWABLE RESOURCE BENEFITS

Manage Stormwater Runoff:

There is overwhelming scientific consensus that our climate is changing. Missoula County is already experiencing the effects of climate change, including warmer and wetter springs. Stormwater runoff in urban areas will be an increasingly prominent issue as climate change brings more intense and frequent storms. According to the Climate Ready Missoula strategic plan, average annual precipitation for Missoula County is projected to increase by 2-3% by mid-century and up to 6% by the end of the century. As rainfall events increase in magnitude and frequency, the stormwater system of the library has potential to be overwhelmed. Currently, the stormwater facilities that capture runoff from the roof are appropriately sized for a conservative event; however, a change in precipitation patterns may cause increased flooding and surcharge of the system.

As increasing precipitation trends begin to exceed the design capacity of existing stormwater infrastructure, addressing stormwater runoff at the source will be increasingly important. Retrofitting stormwater infrastructure to be larger and have more capacity is not a preferable solution since it is expensive and requires a larger footprint than the existing facility. To maintain infrastructure capacity without increasing size, runoff from the contributing site must be reduced. This could be accomplished by storing and releasing stormwater at the rate that the infrastructure can handle, or by replacing impervious surfaces with pervious or vegetated areas that transpire runoff. Vegetated areas, opposed to

pavement and hardscapes, drastically reduce the amount of stormwater that runs offsite. For example, a half-acre parcel covered with pavement in Missoula would generate 2.5 cfs of stormwater runoff during a 50-year storm event. If covered with vegetation, that same parcel would generate 0.8 cfs of runoff during the same event. By providing friction that slows the water and allowing it time to infiltrate into soil, vegetation can reduce stormwater runoff by nearly 70%. Remaining runoff that percolates through the soil media will usually reach the stormwater infrastructure hours after peak flows, providing additional time for sewer systems to handle runoff volumes from the surrounding impervious surfaces.

The proposed project will manage stormwater by reducing the amount of runoff and attenuating peak flows that are discharged through stormwater infrastructure, which maintains system capacity for larger rain events and increases resiliency to climate change. Appropriate management of stormwater also reduces maintenance, increases the design life, and mitigates overwhelming and flooding of the system.

The proposed project will replace the impervious rock ballast roof of the library with a vegetative living roof. Rainfall on the living roof will be infiltrated through 6 inches of soil media and stored in 3 inches of a water retention layer, reducing runoff volumes and allowing evapotranspiration of the water through plants. The Center for Green Roof Research of Penn State estimates that a 3.5-inch-thick living roof will capture and retain about 55% of annual rainfall volume, therefore reducing overall runoff into the storm drainage system.

The total impervious area of the library's level 2 and 3 roofs is approximately 13,000 square-feet. This results in 450 cubic feet of stormwater runoff discharging from these roofs during a 50-year storm event. The proposed project will create 6,228 square-feet of vegetated living roof. With an estimated 55% reduction of runoff for the living roof area, the total runoff volume during a 50-year storm event from the library will be reduced to 300 cubic feet. The library's stormwater system capacity will be increased by 33%. The total runoff volume that exits the roof and enters the stormwater system is greatly reduced, maintaining capacity for larger rain events that are anticipated with climate change projections.



Figure 2: Storm Drains on Roof of Library

The proposed project objective to manage stormwater aligns with the following natural resource plans:

Climate Ready Missoula - The climate resiliency strategic plan "Climate Ready Missoula" was developed by the City of Missoula, Missoula County, and Climate Smart Missoula to identify risks that Missoula County faces as a result of climate change and to develop strategies to address those risks. Goals of the plan include enhancing water storage opportunities to reduce incidence and impact of flooding and

prioritizing green infrastructure. Also, climate change resiliency for infrastructure is encouraged by the plan. A letter of support from Climate Smart Missoula is included in Appendix C.

Montana Climate Solution Plan – This report was completed by the Montana Climate Solutions Council in 2020 under the order of the Montana Governor’s office. The plan provides recommendations and strategies aimed at preparing Montanans for climate impacts. One key strategy identified in the plan is to safeguard Montana’s water quality and quantity from climate change. This strategy suggests incorporated green infrastructure and adaptive water management that provides flood mitigation and water quality improvement into stormwater infrastructure. The proposed project aligns with this plan by providing climate change resiliency, flood mitigation, and water quality benefits to the stormwater system at the Missoula Public Library.

Preserve Groundwater Quality:

The Missoula Aquifer is a highly conductive, unconfined, shallow sand and gravel aquifer. Municipal and private drinking water supply is sourced from the aquifer, extracting thousands of gallons per minute. It is designated as a “sole source aquifer” by the EPA. The unique geological setting of the Missoula Valley allows the Stormwater Utility to discharge a significant volume of untreated stormwater to the aquifer via infiltration through Class V injection wells (commonly referred to as dry wells or sumps). There are at least 7,814 dry wells within the city limits. A minimum groundwater separation of four feet is required by the city; however, the present soils do not have high treatment capacity to filter out pollutants before they reach groundwater.

Stormwater from the Missoula Public Library and its impervious surfaces is collected and routed to five dry wells located south of the building in the parking lot. Drywells are bottomless manholes that capture runoff from the surface or a piped connection and allow it to infiltrate directly into the ground. Rain captures airborne particles, dust, and often contains nutrients and metals. These pollutants are known concerns for stormwater quality. The EPA requires monitoring of stormwater discharge for sediment, nutrients, and metals when discharging to surface waters. The City of Missoula is proactive in applying similar protections to stormwater that discharges to groundwater in effort to protect the Missoula Valley Aquifer that exists less than 4 feet below the ground surface in some areas of Missoula.

The proposed project will preserve groundwater quality by filtering runoff through the soil media and plants of the living roof. Sediment particles will be trapped in soil and retained. According to the Center for Green Roof Research at Penn State, the soil also acts as a cation exchange filter for charged ions such as nutrients and metals. Charged ions in the rainwater can undergo ion exchange due to the soil properties which will retain metals and nutrients and remove them from the runoff.

Additionally, during large rain events, which are projected to increase due to climate change, the drywells can surcharge and flood the parking area. Ponding water picks up pollutants and carries them back to the drywell, ultimately infiltrating to the aquifer. Retrofitting the existing rock ballast roof to a living roof provides storage for runoff in the soil and additional capacity in the stormwater management system, resulting in the ability to safely handle large precipitation events without flooding.

A study published by Whole Building Design Guide reports that up to 30% of total nitrogen and total phosphorus released into receiving waterways is derived from dust that accumulates on rooftops and other paved surfaces. The proposed living roof will act as a bio-filtration device by capturing and retaining pollutants and dust.

The proposed project aligns with the following natural resource plans:

City of Missoula Comprehensive Stormwater Quality Plan – This plan is currently being developed to identify water quality improvement opportunities for stormwater infrastructure in Missoula. Water quality recommendations include green infrastructure to reduce runoff and provide water quality treatment.

Climate Ready Missoula – A goal of the climate resiliency strategic plan includes preservation of water quality through improved stormwater management and prioritizing green infrastructure. A letter of support from Climate Smart Missoula is included in Appendix C.

Develop Habitat

Urbanization and growth of cities presents an increasing threat to wildlife. Wildlife habitat is fragmented by roads and developments, creating “habitat patches” such as parks, ravines, stream corridors, and gardens. Ecological habitat fragmentation leads to species habitat loss and overall change in habitat quality. Green roofs are suitable habitats for a variety of pollinator species and also increase habitat connectivity by serving as stepping stones between habitats.

It is estimated that approximately 35% of the food and beverages consumed world-wide depend on pollinators. Montana Fish, Wildlife, and Parks reports that pollinator numbers are declining. In fact, seven native Montana butterfly species and one bee species are classified as a statewide “species of concern” and are at risk of escalating to endangered species status if populations continue to decline. Loss of pollinator habitat appears to be driving the decline in population.

The proposed project will develop habitat by providing a new green space, suitable for nesting, foraging, resting, and breeding for pollinators and other species, such as bats, songbirds, insects, butterflies and bees. Downtown Missoula is nestled between the Clark Fork River corridor to the south and Waterworks Hill recreation area to the north. These two major habitat areas are separated by about a half mile of commercial and residential area. The Missoula Public Library is in the center of this urban area, providing an ideal half-way point for pollinator migration between these two points.

It is estimated that there are over 700 species of native bees in Montana. Montana State University reports that 70% of native bee species nest in the ground by burrowing and caving. Many other native bee species nest in cavities such as within herbaceous material or dry plant stalks. Along with bees, green roofs offer habitat, food sources, and breeding grounds for butterflies, including the Monarch butterfly, which is a candidate species for the endangered species list. Studies have shown that the observation of bee species at green roof sites is similar in species richness to observations at city gardens and parks.

The existing combined surface area of the Missoula Public Library's roof is approximately 0.7 acres of impervious rock ballast with no habitat potential. The proposed project will convert 6,228 square feet of that urban area into a biodiverse landscape that would provide new habitat for plants and birds and encourage local biodiversity. The proposed green roof will be comprised of 6 inches of soil and vegetation such as sedum, grasses, and other flowering species.

The proposed project objective of developing pollinator habitat aligns with the following natural resource plans:

Missoula Urban Area Open Space Plan – The City of Missoula Parks & Recreation department develops an open space plan to prioritize open space conservation in the Missoula urban area. The goal of the plan, last updated in 2019, is to conserve natural systems, protect community open spaces, and connect urban green spaces. The plan recognizes that urban green spaces provide areas for recreation, education and respite from the urban environment. Another benefit of urban green spaces, such as the proposed living roof, is providing a buffer between developed areas and providing habitat for urban wildlife. A letter of support from Missoula Parks & Recreation is included in Appendix C.

Conserve Energy

Conventional roofs absorb energy and heat from sunlight, which increases the temperature of the building and requires more air cooling power to keep the library at a comfortable temperature during hot summer days. A greater demand for air cooling results in increased electricity usage, increased cost, and greater production of greenhouse gases that generate pollution.

Energy prices and greenhouse gas emissions are increasing as use of fossil fuel for energy declines. Based on power usage data provided by the Missoula Public Library, the facility uses 695,000 kilowatt-hours (kWh) of power per year to heat and cool the 106,000 square foot space. At the national average price of \$0.16 per kWh, the annual cost of power for the Library is estimated to be over \$111,000.

The proposed project will conserve energy by reducing the amount of heating from solar radiation experienced by the Library in the summer months. The living roof will also provide insulation and heat retention in the winter. Protection from heat provided by soil and vegetation reduces the electricity demand for heating and cooling.

The EPA conservatively estimates that a green roof can reduce energy use by 0.7% compared to a conventional roof. The library's annual power consumption is estimated to be 6.5 kWh per square foot as calculated based on annual energy usage. The proposed green roof will convert 6,228 square-ft of conventional roof, which is 22% of the total roof coverage. This coverage results in an estimated energy savings of .15%. On an annual basis, the living roof will save 1,070 kwh of energy. Cost savings associated with this energy efficiency is \$170 per year.

The proposed project objective to conserve energy is aligned with the following natural resource plans:

Montana Climate Pollution Reduction Plan – Montana Dept. of Environmental Quality developed this priority climate action plan in 2024 to outline strategies to reduce emissions and support Montana

communities through innovation. A priority measure of this plan includes High Performance Homes and Businesses which focuses on the adoption of energy efficiency measures in publicly owned buildings. The proposed project will improve the Library's efficiency in energy usage for heating and cooling the space.

Climate Ready Missoula – A goal of the climate resiliency strategic plan includes reducing cooling costs by increasing efficiency of building stock. A letter of support from Climate Smart Missoula is included in Appendix C.

Preserve Air Quality

Hardscapes, such as the rock ballast used for the existing library roof, absorb the sun's warmth and radiate heat, creating what is known as heat islands. A heat island is the phenomenon of urban areas having temperatures far greater than surrounding suburban and undeveloped areas due to the amount of hardscape present. The rock ballast on the lower levels of the building roof absorb energy and heat from the sunlight and transfer it to the roof and nearby walls on the upper levels of the library. A large portion of the proposed project area is on the south-facing side of the building. Temperatures can get very high due to constant sun exposure during the summer months.

Heat islands increase the temperature, which in turn increases the demand for electricity to cool the building. Using fossil fuels to generate electricity increases levels of pollutants in the atmosphere such as particulate matter, ozone, and carbon monoxide. These pollutants impact air quality and can be harmful to human health. Another negative consequence of urban heat islands include severe temperature fluctuations that can cause sensitive plants and animals to abandon habitat.

The proposed project will conserve air quality by mitigating the heat island effect, lowering air temperatures, and absorbing pollutants like carbon dioxide directly from the air to the vegetation. By moderating surrounding air temperature and reducing heat island effects, the proposed living roof will reduce air pollution associated with heating and cooling the building.

Evapotranspiration by plants plays a key role in transferring heat away from the building and disposing of solar energy that contributes to heat island effects. Studies estimate that a vegetated roof can lower temperatures by up to 40 degrees Fahrenheit compared to conventional roofs.

The Greenhouse Gas Equivalencies Calculator was developed by the EPA to estimate how increased energy efficiency leads to changes in emissions and air quality. This calculator was used to estimate air quality benefits as a result of the estimated 0.15% decrease in electricity usage from the proposed living roof. The annual decrease of 1,070 kwh in energy usage is estimated to prevent emissions containing pollutants such as ozone, particulate matter, sulfur dioxide, and most notably, 1,650 pounds of carbon dioxide. This estimate in emissions reduction is only related to electricity generation. Additional air quality improvements are expected from direct adsorption from the plants.

The proposed project objective to conserve air quality aligns with the following resource plans:

Missoula Climate Action Plan – The City of Missoula developed this plan to outline goals and strategies related to reducing emissions in Missoula. The City has a goal of complete carbon neutrality by 2025. The plan outlines multiple strategies to reduce emissions and the carbon footprint of Missoula. This project aligns directly with the plans carbon offset development strategy and urban open space and vegetation.

CITIZEN BENEFITS

Economic Benefits

The proposed project will be a prominent example of green infrastructure in the community. The Missoula Public Library sees over 180,000 visitors a year. With such a visible and highly trafficked location, this project will be able to demonstrate the effectiveness of green infrastructure and the benefits it provides.

Along with short-term job opportunities, the project will provide short-term local economic benefits by providing job opportunities to local construction contractors, growers, suppliers, and designers. The City of Missoula will hire local engineering and architecture firms to provide design and feasibility. A construction contractor will be hired to complete the work and install the project. A local nursery specializing in living roof plantings will provide the soil media and vegetation for the project.



Figure 3: Outdoor Terrace Overlooking Future Living Roof Location

Resource Based Recreation

Living roofs, which provide a variety of environmental benefits to communities, such as their ability to reduce the urban heat island effect and increase the number of pollinators (birds, bees and butterflies) through the creation of new habitat, can also offer aesthetically appealing and psychological benefits. The proposed green roof will be visible through glass windows on the 3rd floor and is also located adjacent to the 4th floor balcony. The view of the rooftop will be transformed to a more natural space. Plants and natural surroundings have been found to reduce stress, lower blood pressure, and increase satisfaction for community members.

As well as provide a more natural aesthetic to the library, the living roof will be accompanied by an educational exhibit. The exhibit will describe the green roof and the benefits it brings to the library and visitors. The Library sees over 180,000 people per year and has an entire floor dedicated to children and families. The living roof will provide a more pleasing natural aesthetic, a demonstration on green

infrastructure, and serves as an education and public outreach opportunity. The project embodies the principles of environmental stewardship and community engagement that are essential for building a sustainable future.

Public Health

The proposed living roof will benefit public health by reducing heat island effects and improving air quality. Heat island impacts in urban areas can cause heat-related illnesses and exacerbate other illnesses such as cardiovascular and respiratory diseases. Providing vegetation and evapotranspiration at the rooftop keeps temperatures down and mitigates the overall urban temperature increases typical for heat island.

The living roof will also improve air quality for Missoula. It has been shown that a reduction in electricity usage leads to less pollutants being generated. Hundreds of pounds of pollutants such as particulate matter, sulfur dioxide, carbon dioxide, and ozone will be prevented from entering our atmosphere.

In addition to reducing emissions from electricity generation, air pollutants will be reduced by the vegetation on the living roof itself. Research has shown that the air quality on green roofs is significantly better than air quality on conventional roofs elsewhere in the same city. In fact, Ohio University monitors air quality for particulate matter on their demonstration green roof and directly west of the green roof on the same building. As you can see on the graph below, the blue lines are the particulate matter concentration in the center of the green roof, while the red lines are the same readings for a conventional rooftop area on the same building.

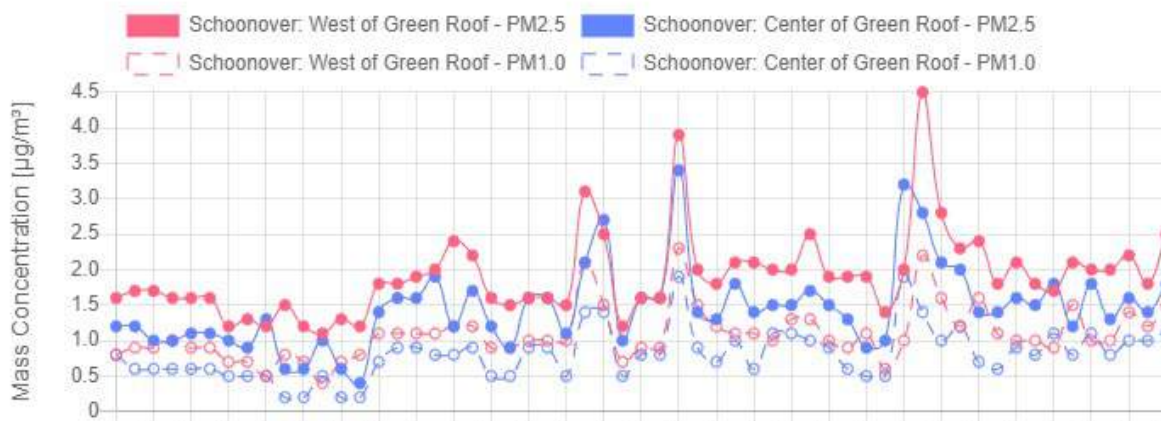


Figure 4: Ohio University Air Quality Monitoring - Green vs Conventional Roof

QUANTIFIED RENEWABLE RESOURCE BENEFITS

The project provides the following quantifiable resource benefits:

- Reduce stormwater runoff by 150 cubic feet
- Increase capacity the Library's stormwater system by 33%

- Provide filtration and removal of up to 30% of the nutrients that typically enter groundwater via stormwater runoff.
- Develop 6,228 square feet of pollinator habitat, benefitting over 700 species of native bees.
- Provide \$170 and 1,070 kwh in annual electricity usage savings.
- Reduce carbon dioxide emissions related to electricity generation by 1,650 pounds per year.

PART 4 TECHNICAL PRESENTATION

4.1. PROJECT IDENTIFICATION

Location

The Missoula Public Library, newly constructed and opened in 2021, is a city-county library located in downtown Missoula, Missoula County. The Library is precisely located at 455 E Main Street, with coordinates of 46.870490, -113.989870. Missoula County spans over 2,500 square miles and contains numerous small mountain and rural towns with a total population over 120,000. The City of Missoula is the second largest city in Montana with a population of 75,000 people.

The 106,000 square-foot facility includes designated creator labs, a test kitchen, a children's library, and event and reception space with an outdoor terrace balcony. In 2022, the Missoula Public Library was named "Public Library of the Year" by the International Federation of Library Associations and Institutions. The title, which had 20 libraries from 17 different countries in the running, was awarded to the Missoula Library because of the architectural, cultural, and multi-functional features of the new building.

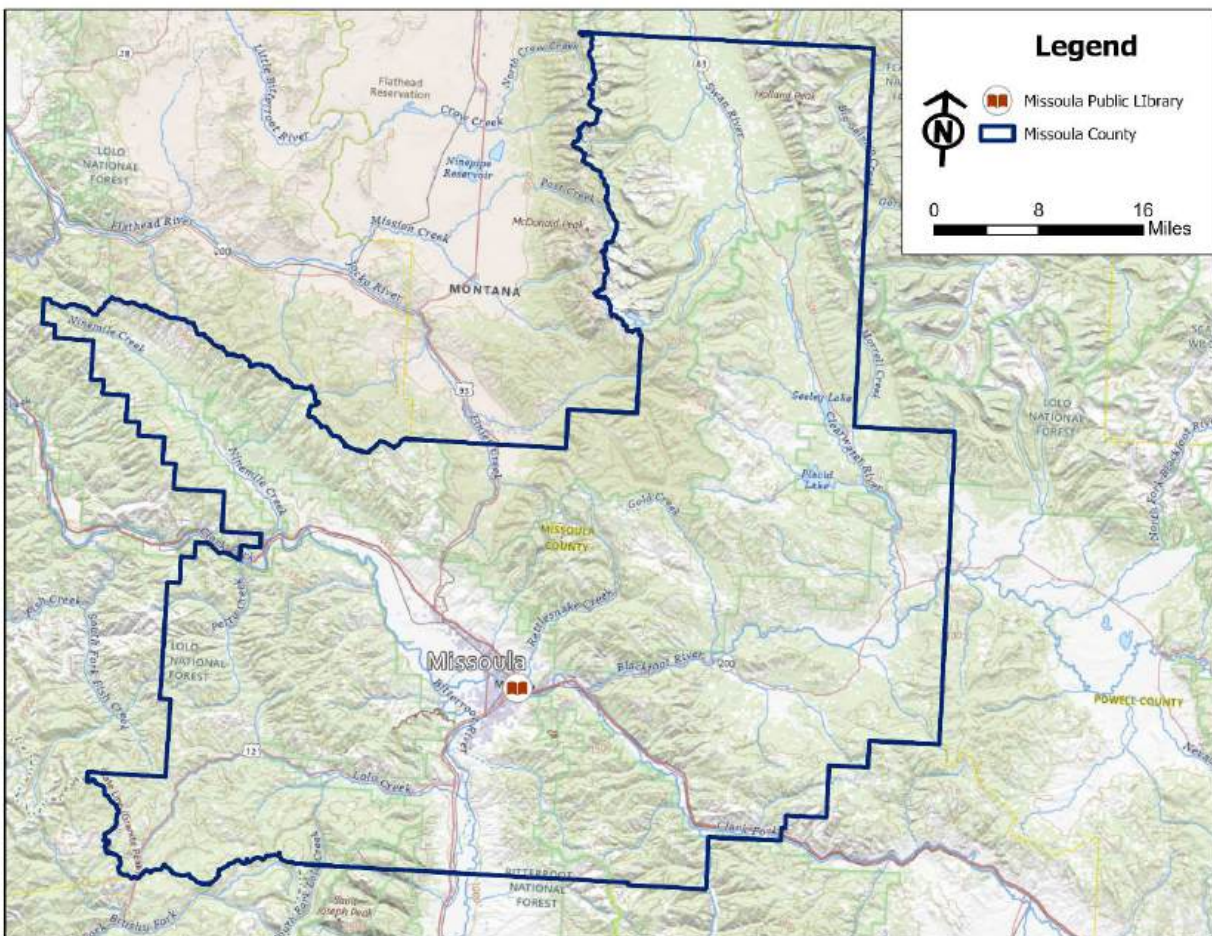


Figure 4-1: Vicinity Map

Project Type

The City of Missoula is requesting funding in collaboration with the Missoula Public Library to convert the existing rock ballast roof of the library to a living roof. A living roof, also known as a green roof, takes advantage of the open space on a building roof by covering it partially or completely with vegetation. A living roof design typically includes elements such as a waterproof membrane, growing medium, and a drainage and irrigation system. The proposed project includes engineering design and construction to retrofit the existing open roof space of the library from rock to a living roof.

Problem Statement

The Missoula Public Library has 13,000 square feet of roof space covered with conventional rock ballast. Portions of the multi-level roof can be seen through large glass windows on the 2nd and 3rd levels. There is significant heat flux that occurs between the roof and the building, exacerbating the urban heat island effect. This heat flux increases the temperature of the building, creating additional stress on the air cooling system, in turn increasing energy usage and greenhouse gas emissions from conventional power sources.

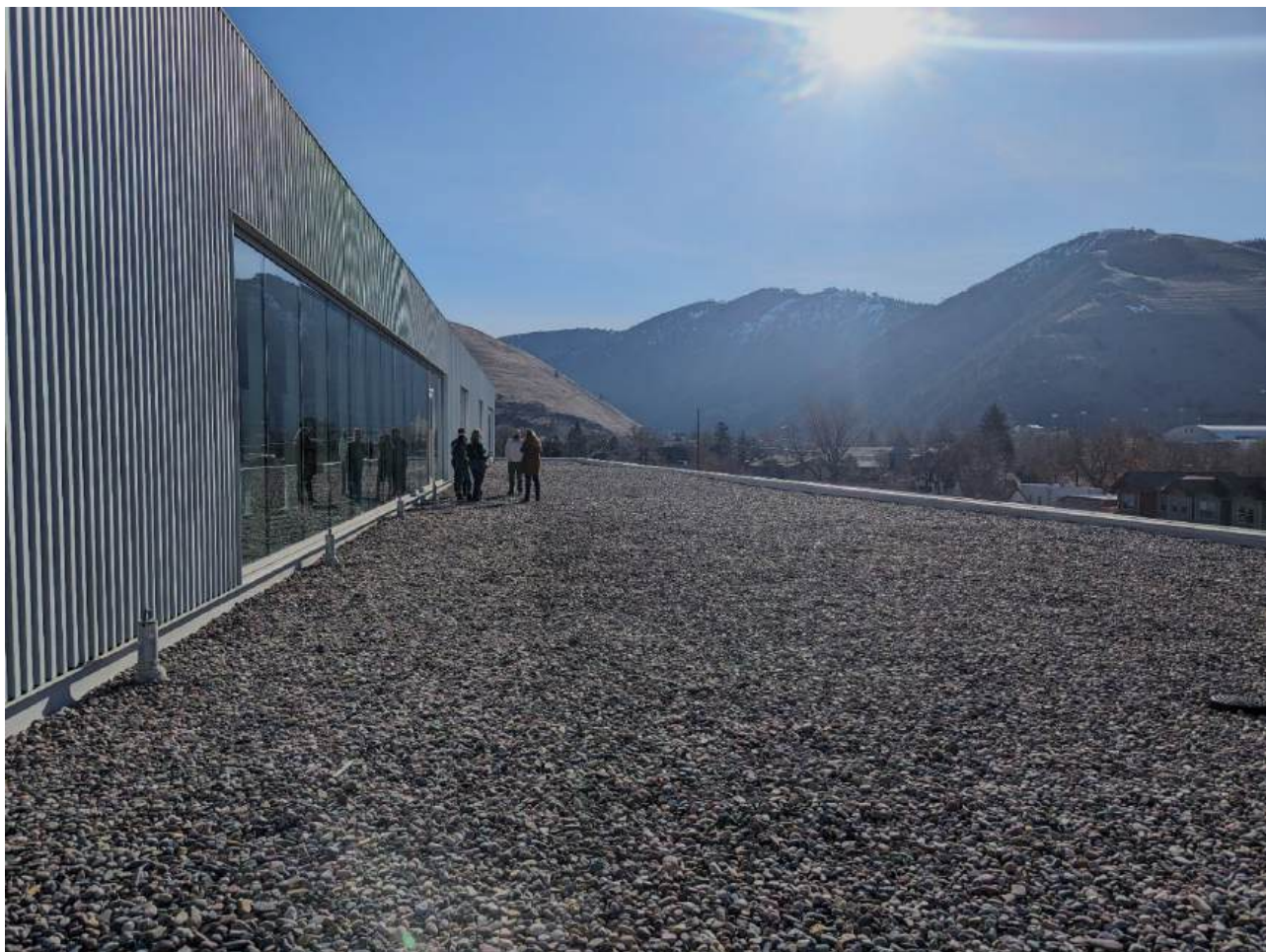


Figure 4-2: Level 2 Roof – South Facing

Additionally, stormwater precipitation amounts and storm frequencies changing due to climate change. Stormwater runoff that is generated by the roof is captured by a drainage system and directed to stormwater drywells for infiltration. These drywells, located in the parking lot, also capture and infiltrate runoff from the impervious parking area. The proposed project will aid in the reduction of runoff and help exacerbate the effects of climate change.

4.2. PROJECT HISTORY

According to the Montana Public Libraries Survey, the Missoula Public Library saw over 180,000 visitors in fiscal year 2022. The library was reconstructed in 2021 to be able to comfortably accommodate this increasing volume of users. The new building was intentionally designed to pay homage to the surrounding landscape while prioritizing energy efficiency and sustainability.

Project Need and Existing Circumstances

The Missoula Library has a rock ballast multi-level roof. Stormwater management does not include any quality pre-treatment, retention, or additional capacity. The stormwater system will not be resilient to the more intense precipitation events anticipated as the climate changes. Additionally, the Library contributes to the heat island impacts that are experienced in urban Missoula. Heat measurements taken at the Library throughout April 2024 show as much as a 60-degree difference in the rock ballast roof and the ambient air temperature. On the same day, the grass outside the library was measured only 10 degrees warmer than the ambient air temperature. This data shows that the rock ballast absorbs heat energy much more than vegetation, in turn increasing building temperatures and demand for cooling and power usage at the Library. The Library used 695,000 kilowatt-hours of power in 2023. This cost is estimated to be over \$100,000.

The Missoula Public Library is an asset to Missoula County and provides invaluable resources and educational opportunities for visitors. The Library was designed with floor to ceiling windows to allow natural light and vista views of the surrounding mountains. The multi-level rock ballast roof is highly visible through the windows and from the outdoor patio space on the level 3 roof. The high visibility of the Library roof spaces make it a prime location for the public to view green infrastructure in action. Education on the proposed living roof as green infrastructure includes the following benefits:

- Groundwater Quality Improvements
- Mitigation of Urban Heat Island Effects
- Stormwater Management and Climate Change Resiliency
- Urban Habitat for Pollinators
- Energy Efficiency and Emissions Reduction

The proposed living roof will benefit the Missoula Public Library directly by improving stormwater management and energy efficiency, but the impact of the project extends far beyond the Library building. Due to the high visibility of the project, the general public will have a better understanding of how implementing green infrastructure can benefit both the immediate space and the community as a whole.

Past and Ongoing Efforts

The City of Missoula is working to identify opportunities for low-impact development and stormwater quality facilities. Often referred to as “green infrastructure,” stormwater facilities that reduce runoff, utilize vegetation and minimize impervious area are proven to be resilient to climate change and benefit communities in multiple ways.

In 2023, the City of Missoula was awarded a Renewable Resources Grant (RRG) from the DNRC to complete a Comprehensive Stormwater Quality Plan. This plan will provide baseline technical information for the City to form a framework for addressing stormwater quality to benefit receiving surface water and groundwater. An objective of the plan is to identify water quality opportunities, specifically for stormwater that discharges to drywells. This plan is underway and scheduled to be completed December 2024.

The City of Missoula has submitted a grant application to the 2024 cycle of FEMA’s Building Resilient Infrastructure and Communities (BRIC) grant program for the Library Living Roof project. This grant application is currently under FEMA review. The proposed project includes covering the entire 6,725 square feet of library roof with a living roof to mitigate flooding, heat island effects, and reduce energy consumption.

In an effort to secure funding to complete a larger scope of work, the City of Missoula and the Missoula Public Library are pursuing additional grant opportunities. The City is receiving direct technical assistance to evaluate the possibility of obtaining a Community Change grant from the US EPA to implement this project. Additional funding will allow the project scope to be maximized, increasing resource and public citizen benefits.

Related Programs and Support

One of the three main strategic priorities of the Library is Sustainability & Wellness. The objective of this priority is “to create a holistic model of sustainability through resources and programs that address resiliency issues.” An action plan to under this Sustainability & Wellness strategic priority is to develop a plan for renewable energy use and efficiency in conjunction with community-wide carbon neutrality goals. The Library intends to assess current energy performance and identify short and long-term goals for reducing fossil fuel reliance and increasing efficiency.

Additionally, due to the large windows that showcase the mountain view from the third and fourth floors of the library, the living roof will be on display for patrons. The Library will use this opportunity to set up an educational exhibit about the green roof and its benefits.

In 2020, Missoula County and the City of Missoula adopted the climate adaptation plan “Climate Ready Missoula” which includes information on what climate change means for Missoula County, the vulnerabilities Missoula faces given climate change, and a series of goals and strategies that will increase resiliency in Missoula County. The proposed project relates to several goals identified in this plan including goals related to building efficiency, urban heat island effects, and preserving water quality through stormwater management and green infrastructure. A letter of support from Climate Smart Missoula is included in Appendix C.

The Library is home to three non-profit organizations. In addition to these organizations, the project partners identified in the table below have expressed support and interest in the proposed living roof project.

Table 4-1: Key Entities

Entity	Role
City of Missoula, Stormwater Utility	Manages stormwater infrastructure in Missoula. Strongly encourages use of green infrastructure for water quality treatment and climate resilience.
Missoula Public Library Foundation	Advocate for Missoula Public Library and partner in fundraising and outreach initiatives.
Missoula County	Owns and operates Missoula Public Library. Will maintain living roof upon completion.

4.3. PROJECT PURPOSE

Objectives and RRGL Compatibility

- Conserve energy usage: By reducing the effects of urban heat islands, the demand on the cooling system will be lessened, resulting in a more energy efficient building.
- Manage stormwater runoff: The proposed project will convert the roof surface from hardscape to vegetation, which significantly reduces stormwater runoff and increases resiliency to climate change. Instead of being drained and discharged to groundwater, runoff is stored in the soil media, used by the plants, and exits the system by evapotranspiration.
- Preserve groundwater quality: By reducing the amount of runoff that is drained from the roof and discharged to groundwater, the library's stormwater system will be more resilient to climate change. Reducing runoff will maintain capacity for large precipitation events that may cause surcharge of the drywells resulting in ponding and pollutants being picked up and discharged to groundwater.
- Develop pollinator habitat: Creating urban habitat contributes to overall ecosystem health. Bees and other pollinators rely on soil and plants for foraging and nesting. Urbanization causes fragmentation of habitat that disrupts the movement of wildlife. Despite the fact that birds, bees, butterflies, and other pollinators are better at moving between urban habitat patches than other species, a continuous habitat is always preferable. Green roofs can help reduce the impacts of habitat fragmentation for pollinators.
- Develop recreational and education opportunities: The proposed project and its highly trafficked and visible location will be accompanied by an education exhibit. The exhibit will inform library visitors about the benefits of a green roof.

- Benefit public health and wellness: Reducing heat island effects not only benefits the library and energy efficiency, but it also contributes to the overall reduction of temperature in downtown Missoula. Research shows that plants and green spaces improves mental health and well-being. The proposed project benefits the public by reducing heat island impacts and providing a public green space.

Project Implementation Tasks

Upon grant award, the City of Missoula will procure an engineer following public procurement policies required by state law, or select a pre-qualified firm which has already been procured for general services.

Grant Administration:

The engineer will provide a grant administrator to coordinate with the grant manager and the City of Missoula. The consultant grant administrator will prepare progress reports, track grant budget, and prepare reimbursement documentation for the City of Missoula to review and submit to the DNRC. Grant administration efforts will

Engineering Design:

The engineer will review the existing library structural capacity and mechanical systems. Modifications to the existing systems will be designed to accommodate the living roof. Anticipated modifications include an irrigation system, drainage port modifications, and waterproof membrane layer. The engineer will partner with an architect and landscape architect to recommend plant species, soil properties, and placement.

Construction Contracting:

The engineer will prepare the construction drawings and specifications. These documents will be included in the project manual with the contract documents. The engineer will assist the City of Missoula in advertising and publicly procuring a construction contractor following applicable state and federal procurement regulations.

Construction:

The contractor will complete construction of the project in accordance with the project manual and specifications. The engineer will provide a resident project representative to oversee construction activities to ensure quality and monitor progress.

Project Closeout:

The engineer will assist the City of Missoula in closing the project and grant. Closeout documentation will be submitted to the grant manager. The Library will assume maintenance responsibilities of the completed project.

4.4. CURRENT RESOURCE CONDITION

Groundwater Quality:

The stormwater facilities at the library include a collection system that captures runoff from the roofs and conveys it to a number of drywells located in the parking lot. These drywells also capture surface runoff from landscaped areas and impervious parking areas. Once discharged to the drywell, the stormwater is infiltrated and ultimately discharged to the aquifer.

The Missoula Valley Aquifer has been designated as a sole source aquifer by the EPA. This designation recognizes the importance of the aquifer as a drinking water source. Due to the geologic nature of the Missoula Valley, soils in the area have been observed to have infiltration rates over 100 inches per hour. Much of the stormwater in Missoula is discharged to groundwater; however, with granular soils and a high water table, there is not a high level of treatment as the runoff passes through the ground and meets groundwater.

Stormwater that is collected from the library and discharged to drywells has no pre-treatment or buffering management to control peak flows. As precipitation patterns shift with climate change, higher intensity storms can overwhelm existing stormwater systems. Retention or change in the surface runoff potential, such as converting from impervious to vegetated, are some of the very limited options to retrofit stormwater systems at source. Additionally, a study published by Whole Building Design Guide reports that up to 30% of total nitrogen and total phosphorus released into receiving waterways is derived from dust that accumulates on rooftops and other paved surfaces.

Air Quality and Heat Island:

Hardscapes, such as the rock ballast used for the existing library roof, absorb the sun’s warmth and radiate heat, creating what is known as heat islands. A heat island is the phenomenon of urban areas having temperatures far greater than surrounding suburban and undeveloped areas due to the amount of hardscape present. The rock ballast on the lower levels of the building roof absorb energy and heat from the sunlight and transfer it to the roof and nearby walls on the upper levels of the library. The proposed project area is on the south-facing side of the building. Temperatures can get very high due to constant sun exposure during the summer months.

Air temperature was monitored by City of Missoula staff through the month of April 2024. Temperature measurements were taken on the rock ballast roof of the level 3 and level 4 roofs, library windows on level 3 and 4, and grass and concrete sidewalk on the ground level outside the library. This data shows the difference between the hardscapes, grass, and ambient air temperature in the Spring. The data shows that the rock ballast roof on the fourth floor is as much as 60 degrees higher than the ambient air temperature, which grass is only 10 degrees warmer on a typical spring day. See data measured on April 23, 2024 in the table below. All collected data from April 2024 is included in Appendix C.

Table 4-2: Temperature Measurements at Library (degrees Fahrenheit)

Date	Ambient Temp	4 th Floor Rock Ballast	4 th Floor Window	Ground Level Concrete Sidewalk	Ground Level Grass
4/23/24	65	124	98	81	75

Heat islands increase the temperature, which in turn increases the demand for electricity to cool the building. Using fossil fuels to generate electricity increases levels of pollutants in the atmosphere such as particulate matter, ozone, and carbon monoxide. These pollutants impact air quality and can be harmful to human health. Another negative consequence of urban heat islands include severe temperature fluctuations that can cause sensitive plants and animals to abandon habitat.

High temperatures and greater emissions required to cool the building impact air quality and health of the community. A living roof will improve air quality by mitigating the heat island effect, lowering air temperatures, and absorbing pollutants like carbon dioxide directly from the air to the vegetation. By moderating surrounding air temperature and reducing heat island effects, the proposed living roof will reduce air pollution associated with heating and cooling the building.

Stormwater Management:

Future projections show an increase in storm intensity and frequency due to climate change. According to the Climate Ready Missoula strategic plan, average annual precipitation for Missoula County is projected to increase by 2-3% by mid-century and up to 6% by the end of the century. As rainfall events increase in magnitude and frequency, the stormwater system of the library has potential to be overwhelmed. Currently, the stormwater facilities that capture runoff from the roof are appropriately sized for a conservative event; however, a change in precipitation patterns may cause increased flooding and surcharge of the system.

As Missoula continues to grow and develop, addressing stormwater runoff at the source will be increasingly important. Retrofitting existing runoff-generating facilities to decrease the amount of stormwater runoff is the only way to do this. Surface runoff potential can be changed by converting impervious surfaces to vegetated. Also, providing retention can buffer the intense peak flows that overwhelm a system.

The proposed project will replace the impervious rock ballast roof of the library with a vegetative living roof. Rainfall on the living roof will be infiltrated through 6 inches of soil media and stored in 3 inches of a water retention layer, reducing runoff volumes and allowing evapotranspiration of the water through plants. The total impervious area of the library's level 2 and 3 roofs is approximately 13,000 square-feet. This results in 450 cubic feet of stormwater runoff discharging from these roofs during a 50-year storm event. The proposed project will create 6,228 square-feet of vegetated living roof. With an estimated 55% reduction of runoff for the living roof area, the total runoff volume during a 50-year storm event from the library will be reduced to 300 cubic feet. The library's stormwater system capacity will be increased by 33%. The total runoff volume that exits the roof and enters the stormwater system is greatly reduced, maintaining capacity for larger rain events that are anticipated with climate change projections.

Urban Pollinator habitat:

Montana Fish, Wildlife, and Parks reports that pollinator numbers are declining. In fact, a half-dozen native Montana butterfly species are classified as a state "species of concern" and are at risk of escalating to endangered species status if populations continue to decline. Loss of pollinator habitat appears to be driving the decline in population.

Urbanization and growth of cities leads to increasing threat to wildlife. Habitat is fragmented by roads and developments, creating "habitat patches" such as parks, ravines, stream corridors, and gardens. Ecological habitat fragmentation leads to species habitat loss and overall change in habitat quality. Green roofs are suitable habitats for a variety of pollinator species and also increase habitat connectivity by serving as stepping stones between habitats.

Downtown Missoula is nestled between the Clark Fork River corridor to the south and Waterworks Hill recreation area to the north. These two major habitat areas are separated by about a half mile of commercial and residential area. The Missoula Public Library is in the center of this urban area, providing an ideal half-way point for pollinator migration between these two points. The proposed living roof will develop habitat by providing a new green space, suitable for nesting, foraging, resting, and breeding for pollinators and other species, such as bats, songbirds, insects, butterflies and bees.

Energy Usage:

Conventional roofs absorb energy and heat from sunlight, which increases the temperature of the building and requires more air cooling power to keep the library at a comfortable temperature during hot summer days. A greater demand for air cooling results in increased electricity usage, increased cost, and greater production of greenhouse gases that generate pollution.

Reduced energy usage results in reduced emissions. These benefits are full circle in reducing impacts from climate change, stormwater, heat island, and water quality. The strategic plan Climate Ready Missoula states:

"We are already experiencing the impacts of climate change in Missoula County, and those impacts are projected to intensify over the coming decades and to touch every sector of our county. Changes are likely to include reduced low elevation snowpack, earlier spring snowmelt, and more frequent and intense wildfires, droughts, and floods. The severity of the impacts we experience will depend on how quickly global carbon emissions are reduced."

The Missoula Public Library spends an estimated \$111,000 on electricity each year. A living roof will increase the efficiency of the Library's power usage by reducing the amount of heating from solar radiation experienced by the Library in the summer months. The living roof will also provide insulation and heat retention in the winter. Protection from heat provided by soil and vegetation reduces the electricity demand for heating and cooling.

4.5. DESIRED OUTCOME

Installing a living roof at the Missoula Public Library would achieve several desirable outcomes, which include:

- More efficient and reduced energy use
- Development of new pollinator habitat
- Reducing stormwater runoff volume
- Preserving groundwater quality
- Mitigating the urban heat island effect
- Education on benefits of green infrastructure
- Public health and well-being

Overall, the desired outcome of installing a living roof at the Library is to create a multifunctional, sustainable, and vibrant space that benefits both the environment and the community it serves. A living roof contributes to a healthier and more sustainable urban environment. A Living roof would also enhance the visual aesthetic of the building and its surroundings.

4.6. ALTERNATIVES

Three alternatives were developed to meet the needs of the City of Missoula and Missoula Public Library. Living roofs are typically characterized as intensive (having 6 to 24 inches of media and large vegetation such as trees and shrubs) or extensive (having 3 to 6 inches of media and smaller vegetation). The alternatives presented fall into the extensive living roof category. Extensive living roofs are designed to be lightweight, low-maintenance. More detailed concept drawings and the cost estimates are provided in Appendix B.

Alternative 1: No Action.

The no action alternative is analyzed to provide a baseline of current conditions. Under this alternative, no retrofits will occur, and no benefits will be realized. The library roofs will remain as rock ballast. Sun exposure in the summers will reflect off the rock ballast roof and absorb and transfer heat to the building. Increased temperature of the building will result in higher demand on the air cooling system. The library will continue to operate at the current level with no reduction in energy usage, emissions, or carbon footprint. The stormwater system will continue to collect runoff from the roofs and discharge to drywells with no increase in capacity. As climate change progresses and precipitation patterns change and increase, the system may become undersized. This change in anticipated runoff would cause surcharge of existing drywells, resulting in pooling water in the parking lot, picking up pollutants from the asphalt and eventually discharging to groundwater and precipitation decreases.

Alternative 2: Level 2 Living Roof and Educational Display

This alternative will retrofit the second level of Missoula Public Library's rock ballast roof and convert it to living roof. This area of the roof is 6,500 square-feet of rock ballast and faces south, receiving maximum sunlight exposure. Temperatures on this area have been measured to be up to 60 degrees warmer than the ambient air temperature due to solar radiation of the rock ballast material. The level two roof is highly visible through floor-to-ceiling windows that enclose the third floor of the library. Additionally, the outdoor patio on the fourth floor of the library overlooks the level two roof and proposed living roof site as shown in the figure below.



Figure 4-3: Outdoor Patio Overlooking Level 2 Roof

Alternative two involves removing 6,228 square feet of existing rock and replacing it with living roof modules. The modules will include 6 inches of soil media planted with hardy sedum and native plant species and 3 inches of a water retention layer that stores water and reduces runoff so it can be utilized by the plantings. The living roof will be outfitted with an irrigation and drainage system to help maintain the plants during dry summer days. A rock ballast path will remain around the outer edge of the roof for maintenance access without stepping on the plants. Prior to construction, technical consultants will verify structural capacity and design the necessary mechanical and plumbing modifications. A living roof specialist will recommend specific plant species, spacing and maintenance schedule. A Missoula Public Library staff person will be trained on maintenance requirements.

A structural engineer has reviewed the structural capacity of the existing library roof system and has provided a statement that feasibility is favorable pending final engineering design. This statement is included in Appendix C. During the engineering design phase, the engineer will consider retrofits to plumbing, mechanical, and electrical systems as needed to accommodate the living roof and maintenance activities. An irrigation system will be installed and will utilize the runoff retention layer to minimize irrigation and provide drainage during large rain events. The engineer will provide a design report and verify exact structural specifications of the design prior to construction.



Figure 4-4: Alternative 2 – Level 2 Living Roof Rendering

An educational exhibit will be installed on the third floor of the library that looks out to the living roof. The exhibit will provide an explanation of what the living roof is and how it benefits the community and library. The living roof will serve as a green infrastructure demonstration project and will highlight the multi-faceted benefits for green infrastructure in stormwater management, energy efficiency, and biodiverse habitat.

This alternative will provide stormwater retention, water quality benefits, pollinator habitat, energy efficiencies that are proportionate to the total living roof area, 6,228 square feet.

Alternative 3: Levels 2/3 Living Roof and Level 2 Public Use Space

The Missoula Public Library third level roof is entirely rock ballast with an outdoor patio that is accessible by the fourth floor of the library. The patio overlooks the level two roof and provides a public outdoor space.

This alternative includes transforming 9,316 square feet of rock ballast on the library's level 2 and 3 roofs to a vegetative living roof and outdoor patio space. A rock ballast maintenance path will remain around the outer edge of the roof to provide maintenance access without stepping on the vegetation. The level three roof will be covered living roof modules growing a variety of plant species. The plant species will be chosen by a living roof specialist based on hardiness, native plant species, and sunlight exposure for north and south facing roofs of the building. The level three roof wraps around the entirety of the building

and is visible from every window of the Library's fourth floor, which is home to the conference and meeting spaces as well as access to the existing outdoor patio.



Figure 4-5: Alternative 3 – Levels 2/3 Living Roof and Level 2 Roof Outdoor Use Space

The level 2 roof will include 4,200 square feet of new living roof and be modified to accommodate an outdoor space accessible by the public from the Library's third floor. The accessible space will include pavers to create a walkway and a railing for safety and to prevent foot traffic from damaging the vegetation. An additional entrance/exit door will be added to accommodate the capacity and safety restrictions of the patio space. The outdoor space will be surrounded by the vegetated living roof, populated with a variety of plant species. The vegetation will vary in height, flowering time, and color to provide maximum benefits to pollinator for habitat and foraging. This alternative will transform all visible areas of rock ballast roof to a vegetated living roof that provides stormwater management, energy efficiency, and public health benefits to the community.

A structural engineer has reviewed the structural capacity of the existing library roof system and has provided a statement that feasibility is favorable pending final engineering design. This statement is included in Appendix C. During the engineering design phase, the engineer will consider retrofits to plumbing, mechanical, and electrical systems as needed to accommodate the living roof and maintenance activities. Also, retrofits for safety and capacity include installing a new door in the window frame of the library. An irrigation system will be installed and will utilize the runoff retention layer to minimize irrigation and provide drainage during large rain events. The engineer will provide a design report and verify exact structural specifications of the design prior to construction.

4.7. COST-BENEFIT COMPARISON

Benefit - Cost Analysis

Due to the nature of the proposed living roof project, resource benefits can be nearly directly proportionate to the area of living roof installed. Benefits related to stormwater management, habitat, and energy efficiency increase with the size of the proposed living roof area. The alternatives analyzed below vary in size, but provide the same resource benefits. Citizen benefits, such as recreation and education, vary per each alternative.

Alternative 1: No Action This alternative will not provide any benefits or improve the conditions of the existing circumstances. No objectives of the proposed project will be achieved, therefore this alternative will not be considered as a viable solution moving forward in this analysis.

Alternative 2: Level 2 Living Roof and Educational Exhibit This alternative will provide 6,228 square feet of living roof on the level 2 roof of the Library. This project utilizes the entire level two roof and prioritizes resource benefits over citizen benefits by excluding public outdoor access to the living roof. The educational exhibit will provide an opportunity for visitors to learn about green infrastructure and the benefits related to urban heat island, stormwater runoff reduction, water quality, and habitat. Based on the total project cost shown in the table below, the unit cost of the living roof and the accompanying resource benefits is \$74 per square foot.

Table 4-3: Preliminary Cost Estimate – Alternative 2

Alternative 2 – Level 2 Living Roof and Educational Display					
Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Cost
100	General Conditions	1	LS	\$56,800	\$56,800
101	Rock Ballast Removal	6228	SF	\$9	\$56,100
102	Roof slip sheet membrane	6228	SF	\$5	\$31,200
103	LiveRoof modules 6" with roof blue	6228	SF	\$23	\$143,300
104	LiveRoof install	6228	SF	\$10	\$62,300
105	Irrigation	6228	SF	\$1	\$7,800
106	Educational Exhibit	1	LS	\$2,000	\$2,000
Subtotal					\$359,500
Contingency				25%	\$89,880
Estimated Total Construction Cost					\$449,380
200	City of Missoula Grant Administration (In-Kind)				\$2,960.00
201	Consultant Grant Administration				\$2,450.00
202	Design and Bidding Support			10%	\$44,700.00
203	Construction Administration				\$12,600.00
Estimated Total Project Cost					\$512,090

Alternative 3: Levels 2/3 Living Roof and Level 2 Public Outdoor Space This alternative will provide 7,120 square feet of living roof and levels 2 and 3 roofs of the Library, and a 2,000 square foot outdoor patio space on the level 2 roof. The area of living roof is 14% larger than that provided by alternative 2, providing proportionately greater resources benefits; however, the project cost is 53% higher. The greater cost is due to the larger area and the additional cost related to patio access modifications. This alternative provides slightly greater resource benefits for a much larger cost. Citizen benefits are much greater for this alternative, providing an outdoor space where the public can interact with the living roof. Based on the total project cost shown in the table below, the unit cost of the living roof and the accompanying resource benefits is \$110 per square foot.

Table 4-4: Preliminary Cost Estimate – Alternative 3

Alternative 3 – Levels 2/3 Living Roof and Level 2 Public Outdoor Space					
Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Cost
100	General Conditions	1	LS	\$71,648	\$71,648
101	Rock Ballast Removal	9316	SF	\$9	\$83,844
102	Safety Railing - post and cable	176	LF	\$300	\$52,800
103	Roof slip sheet membrane	9316	SF	\$5	\$46,580
104	LiveRoof modules 6" with roof blue	7120	SF	\$23	\$163,760
105	LiveRoof install	7120	SF	\$10	\$71,200
106	Irrigation	7120	SF	\$1	\$7,120
107	Wood pavers on 10" pedestal	2000	SF	\$18	\$36,000
108	Metal grating on pedestal	196	SF	\$12	\$2,352
109	Exterior storefront door w/ modification to existing	1	LS	\$12,000	\$12,000
110	Educational exhibit	1	LS	\$2,000	\$2,000
Subtotal					\$549,400
Contingency				25%	\$137,400
Estimated Total Construction Cost					\$686,800
200	City of Missoula Grant Administration (In-Kind)				\$2,960
201	Consultant Grant Administration				\$2,800
202	Design and Bidding Support			10%	\$68,680
203	Construction Administration				\$20,300
Estimated Total Project Cost					\$781,540

Basis for Selection of Preferred Alternative

The alternatives presented in this evaluation are compared in a variety of monetary and non-monetary ways. To provide structure to this basis of selection, the alternatives will be compared based the following broad criteria:

- Renewable Resource Benefit – is the alternative the most beneficial for renewable resources in terms of conservation, development, management, and preservation?
- Cost Effectiveness – is the alternative cost effective in terms of capital costs?
- Stormwater Management and Green Infrastructure Education – will the project provide innovative stormwater management and an opportunity for green infrastructure education for

contractors, designers, and the general public alike?

- Operations and Maintenance – what is the scale of anticipated maintenance efforts?

Each alternative is compared below within the framework of these criteria.

For each of the criteria discussed above, each alternative was assigned a ranking score of 1 through 3 with 3 being the most favorable and 1 being least favorable. The ranking factors are then multiplied by the relative weight of importance assigned to each evaluation criteria. The weighted rank scores are then summed, resulting in a weighted rank total score with the greatest score indicating the highest ranking.

The weighting of each criterion, in descending order, is as follows:

- Renewable Resource Benefit - 10
- Cost Effectiveness - 8
- Stormwater Management and Green Infrastructure Education- 6
- Operations and Maintenance – 4

Ranking of Alternatives

Table 4-5: Weighted Scoring of Alternatives

Renewable Resource Benefit				
Alternative	Rank	Comments	Weight	Total
Alternative 2:	2	This alternative provides the same resource benefits on a smaller scale. Resource benefits are prioritized over citizen benefits.	10	20
Alternative 3:	2	This alternative includes a larger green roof area and proportionately larger resource benefits. With a public space reducing the amount of living roof, citizen benefits such as recreation are prioritized.		20
Cost Effectiveness				
	Rank	Comments	Weight	Total
Alternative 2	3	This alternative is most cost effective due to the lower cost and funding currently available	8	24
Alternative 3	1	This alternative would require multiple grant funding sources and most funding is not currently committed.		8
Stormwater Benefits and Green Infrastructure Education				
	Rank	Comments	Weight	Total
Alternative 2	2	This alternative will provide an innovative stormwater management technique and provide a highly visible example of green infrastructure in action.	6	12
Alternative 3	3	This alternative will provide an innovative stormwater management technique on a large scale and provide a highly visible and interactive example of green infrastructure in action.		18

<u>Operations and Maintenance</u>				
	Rank	Comments	Weight	Total
Alternative 2	2	This alternative includes a smaller area of living roof and minimal required maintenance.	4	8
Alternative 3	1	This alternative is a larger living roof area on two floors, and a public outdoor space. Maintenance requirements will be larger, though not significantly		4
				SCORE
Highest Ranked Alternative		Alternative 2: Level 2 Living Roof and Educational Display		64

Alternative two was selected as the preferred alternative due to the lower capital cost and availability of funding at the time of analysis. Both alternatives provide a similar area of living roof and resource benefits. If additional funding is available in the future, alternative three is recommended due to the increased resource benefits and citizen recreational benefits.

4.8. PROJECT IMPLEMENTATION PLAN

Overall Approach

The City of Missoula and the Missoula Public Library are currently working on the funding strategy and awaiting funding from multiple grant sources to implement this project. Upon the award of the anticipated grants and commitment of required funding, the project will begin.

The City of Missoula will serve as the project manager. Invoices will be paid by the City and reimbursed by grant funding as applicable. The City will contract with an engineer to complete the project. Upon completion, the Missoula Public Library will assume operations and maintenance duties for the living roof.

Project Tasks

Grant Administration Phase

It is anticipated that effort related to grant administration will be completed by a consultant in coordination with the City of Missoula. This task ensures that all funding agency requirements are being met and reporting is completed. The following grant administration tasks are anticipated:

- Coordinating all grant and financial aspects of the project with the Department of Natural Resources (DNRC),
- Tracking budget and submitting invoices for approval to the DNRC, and
- Progress reporting.

Architect/Engineering Design Phase

The Engineering Design Phase is initiated with the signing of a contract with an engineering firm to complete feasibility and retrofit design. The Engineering Design Phase consists of the following tasks:

- Selection of an engineering firm to complete the feasibility and design. The City of Missoula has the option of retaining Morrison-Maierle or they may choose to select an engineer through

advertised request for proposals process.

- Finalize all design calculations for structural, mechanical, and electrical retrofit.
- Coordination with landscape architect for living roof design and plant selection.
- Prepare drawings indicating the scope, extent, and character of the work to be performed and furnished by the contractor.
- Submit a review package to the sponsor and governmental authorities having jurisdiction to review or approve the final design of the project. This would include the Department of Natural Resources and Conservation.
- Prepare construction cost estimate and submit to the City of Missoula.
- Prepare and furnish bidding documents for review and approval by the City of Missoula.

Construction Contracts Phase

The Construction Contracts Phase includes advertising for and obtaining bids and negotiating for the construction work. The following tasks will be completed during this phase:

- The project will be advertised in accordance with Montana Code Annotated and any other applicable grant-related, state, or federal procurement requirements.
- Bidding documents are issued to prospective bidders.
- A pre-bid conference is held prior to the bid opening, but typically with enough time between the pre-bid and the bid opening to allow for issuance of addenda if needed. The pre-bid conference allows prospective bidders to receive general information about the project, ask questions, and view the site.
- Addenda may be issued as deemed appropriate to clarify, correct, or change the bidding documents.
- Bid are opened and read publicly at the time and date established in the bidding documents.
- Bid tabulation will be prepared to assist in evaluating the bids or proposal and in assembling and awarding contracts for work.
- A letter of award recommendation is prepared and submitted to the owner and sponsoring agency for approval of the award following review of the bid submittal and completion of contractor reference checks.
- Negotiation may take place if the bid submitted exceeds the funding available.

This phase is complete when the Construction Phase commences or when negotiations with prospective contracts is completed.

Construction Phase

Construction of the project, and supporting work such as construction administration, takes place during the Construction Phase. The Construction Phase generally includes the following tasks:

- The successful bidder submits bonds and insurance as required by the specifications. After review and approval of these documents, contract documents are prepared for signature by the owner or owner's representative and the contractor.
- A pre-construction conference is held prior to commencement of work at the project site.
- A Notice to Proceed is typically issued within 30 days of the effective date of the agreement.
- Construction administration occurs in both the office and the field. In the office, an engineer is available to answer questions, make clarifications, and process paperwork including pay

requests, change orders, work change directives, and field orders. Shop drawings and submittals are also reviewed for their compliance with specifications. Construction administration in the field includes observing and documenting work, issues, and work quantities. Construction observation may be completed by a resident project representative or an owner's representative with assistance from the engineer. This task will document how the contractor constructs the project in relation to the plans and specifications.

- During construction, it is assumed that the contractor will complete the construction layout of the work by using the benchmarks placed in the field during the Final Design Phase. If this is not feasible, a surveyor would provide construction staking or at a minimum ensure that the benchmarks are still in place.
- Progress meetings are held at appropriate intervals through the work. At a minimum, City of Missoula, engineer, and contractor attend these meetings.
- The contractor completes all construction work within the specified contract time. A Certificate of Substantial Completion is issued after the work is considered substantially complete and a walk through of the site is provided. Punchlist items are noted and the contractor is allowed a specified length of time by contract to address all remaining items of work.
- After all punchlist items are completed, a request for final payment is prepared and issued to the City.

Project Closeout Phase

The Project Closeout Phase consists of the following tasks:

- A one-year warranty period begins with the issuance of the Certificate of Substantial Completion. If any problems or defects are observed during this period, the contractor is notified of the problem and must resolve the issue in a timely manner.
- Record drawings are prepared by the engineer and submitted to the City of Missoula for their files and future reference.
- Grant closeout reports are completed and submitted to the grant agency.

Project Staff and Time

Staffing and management time are further detailed in Part 5, Project Management of this application. Efforts from the City of Missoula and a technical consultant are estimated in the table below.

Table 4-6: Estimated Staff Time

Position	Total Hours
City of Missoula Staff	
Project Manager	12
Accountant	12
Attorney	4
Technical Consultant Staff	
Project Manager	35
Design Engineer	120
Grant Administrator	14
Architect	61
Resident Project Representative	84

Contracted Services

Technical consultants will be contracted to complete design and feasibility of the project. An engineer will design modifications of the irrigation and drainage system, roof protective layers, and verify structural capacity. A landscape architect will design the layout, plant species, and material thickness for the proposed project. The technical consultants will provide construction plans and oversee construction activities. The technical consultant will also provide a grant administrator to develop progress reports and track grant budget. The consultant grant administrator will coordinate closely with the City of Missoula project manager and DNRC grant manager. A construction contractor will be contracted to complete the work.

Necessary Permits and Easements

Missoula County Building Department will be consulted on the necessity of a permit. No environmental permitting is anticipated. No easements are required as the Missoula Public Library will own and maintain the living roof.

Project Phasing and Funding

The City and Library are committed to energy efficiency and understand the wide range of benefits that are provided by the proposed green roof. Although the project is not intended to be phased, it is possible that additional funding would allow expansion of the scope of work to maximize resource and citizen benefits. Both entities will continue to monitor and pursue funding opportunities that can expand the area of living roof installed at the Library.

Measures for Long-Term Effectiveness

The long-term effectiveness of the living roof project will increase with consistent maintenance and irrigation as needed. The Missoula Library has committed a staff person for maintenance of the green roof, including pulling weeds, irrigation, and monitoring. The annual maintenance responsibility is estimated to be about 20 hours per year.

Reporting Requirements

The project sponsor is committed to reporting the grant status to DNRC per the RRGL program requirements. The City of Missoula is familiar with grant administration and understands documentation requirements such as budget tracking, progress reports, vendor invoices, and closeout. The City will contract a technical consultant to assist with grant administration duties.

4.9. PROJECT SCHEDULE

The following schedule is anticipated. This schedule is contingent on the review and award of the grants anticipated to fund implementation. Installation of the living roof will occur in the spring after danger of frost is passed.

Table 4-7: Schedule

Task	Estimated Start Date
DNRC Grant Award	Summer 2025
BRIC Grant Award	Summer 2025
Grant Administration	August 2025
Engineering Design	August 2025
Construction	May 2026
Project Closeout	June 2026

4.10. SUPPORTING DOCUMENTATION

Natural Features

Missoula is located in the southern end of the Missoula-Ninemile Valley. The valley elevation ranges from approximately 3000 to 3200 feet above sea level, with surrounding mountain ranges, including the Sapphire Range to the east, the Bitterroot Range to the south, the Rattlesnake Range to the north, and the Ninemile Divide to the west, rising to elevations of 5000 to 8000 feet. The Clark Fork and Bitterroot Rivers drain the valley; the Clark Fork flows westward through the valley, and the Bitterroot flows across the southwest corner of the valley, and joins the Clark Fork at Kelly Island, approximately 4 miles west of the City of Missoula.

The soils in the central Missoula valley are generally gravelly or silty loam. Near the western part of the Valley, soils transition to higher clay content. Slopes vary throughout the Valley.

Vegetation in the Missoula Valley is comprised of grasslands and riparian areas in the valley floor and transition to coniferous forests as elevations increase.

Technical Reports and Studies

A professional paper published in 2011 titled *Green Roofs in the Garden City: Exploring the Opportunities for Green Roof Policies in Missoula, Montana* examined if Living roofs were politically, practically, and economically feasible for the city of Missoula. Hodge conducted fourteen interview polls during his research and eleven stakeholders (out of fourteen) recommended that a city-led effort on the installation of a living roof would be among the best firsts steps to promote the implementation of living roofs throughout the community.

A structural engineer has completed a feasibility study to ascertain the potential for a living roof and/or outdoor patio space on the Library roofs. Based on the structural capacity of the existing library structure, a living roof and/or patio space is feasible and should be verified by a structural engineer prior to implementation. The feasibility statement from the structural engineer is included in Appendix C.

Topographic Map

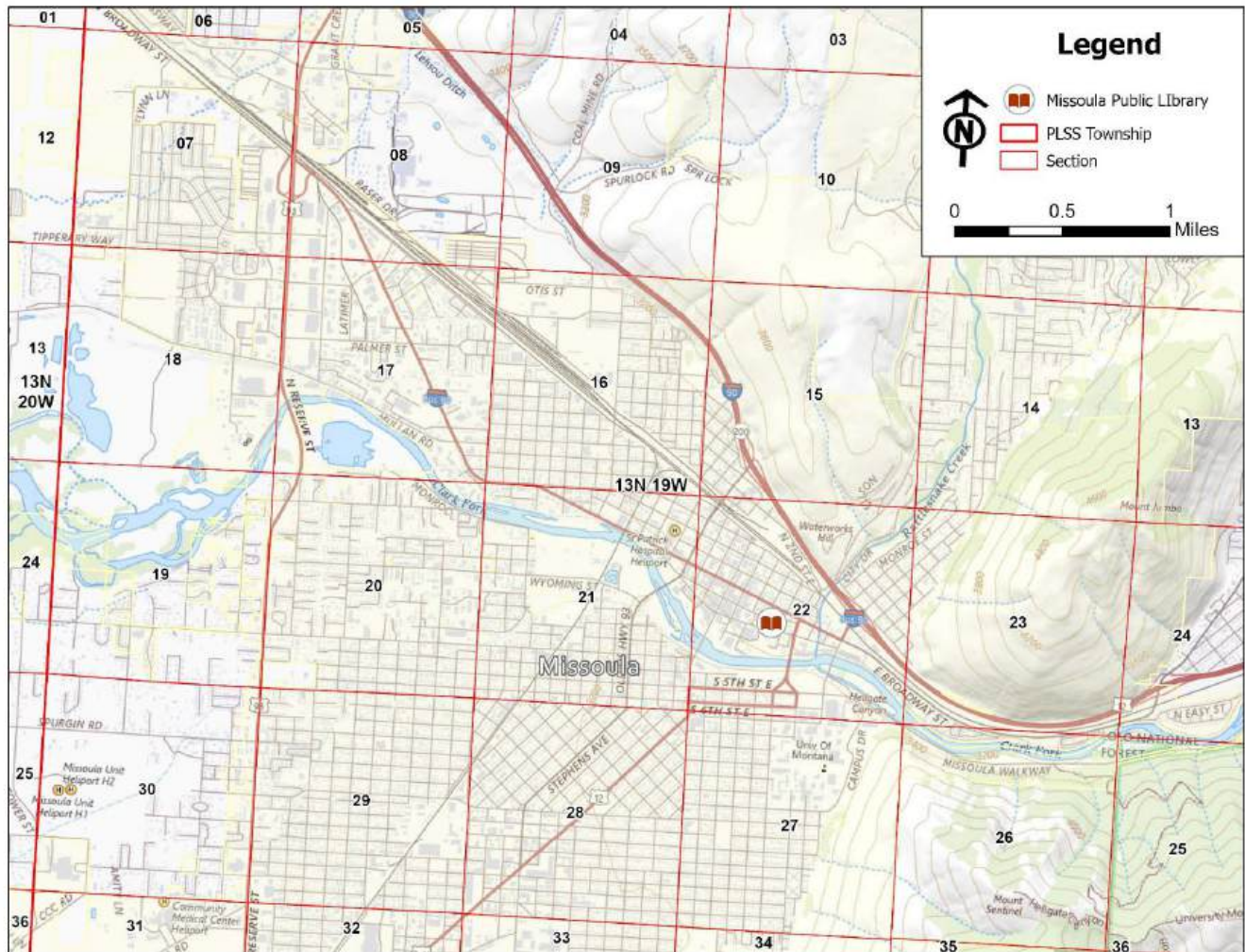


Figure 4-6: Missoula Public Library PLSS and Topography Map

Applicable statutes, rules, regulations

The proposed Living Roof project at the Missoula Public Library will follow applicable building codes enforced at the federal, state, and local level. Procurement for technical services and construction will follow applicable state and grant-related requirements.

PART 5 PROJECT MANAGEMENT

5.1. STAFF REQUIREMENTS

The City of Missoula personnel listed in Table 5-1 will provide project management efforts. Additional City of Missoula staff are available to provide legal support, accounting, and grant administration services as needed. A technical consultant will be determined prior to project initiation. Contact information and role responsibilities are further outlined in the draft grant management plan included in Appendix D.

Table 5-1: City of Missoula Personnel

Role	Title	Name
Authorized Recipient	Mayor	Andrea Davis
Project Manager	Stormwater Superintendent	Tracy Campbell

5.2. PROCUREMENT

An engineering firm will be procured for services using a qualification-based selection process for this project or selected from the City of Missoula's pre-qualified list of consultants that followed the qualification-based selection process.

To complete construction, a licensed contractor will be hired in accordance with state procurement procedures outlined in Montana Code Annotated and the Montana Procurement Act. Other procurement requirements required by state law or grant funding will be followed.

If federal grant funding such as a BRIC grant is issued to implement the project, federal laws and grant requirements related to construction and procurement will be followed. Possible contract clauses include, but are not limited to, National Environmental Policy Act (NEPA), Buy America Build America Act (BABAA) and Equal Opportunity Act.

5.3. COORDINATED ACTIVITIES

This planning project will coordinate and comply with all applicable local, state, and federal laws. Local coordination will include the chosen consultant, City of Missoula, Missoula County, Missoula Public Library, Montana DNRC, and any other grant agencies providing funding for implementation. The consultant's and City's project managers will coordinate correspondence and collaboration between entities.

5.4. PUBLIC INVOLVEMENT

The City of Missoula will host a public meeting to solicit feedback on the proposed living roof as required by grant funding agencies. Additionally, public fundraising initiatives may be pursued by the City and Missoula Public Library to maximize funding and scope of the proposed project.

5.5. CONSULTANT AND PROJECT STATUS MANAGEMENT

The City of Missoula will have regular progress updates and meetings with the technical consultant throughout the design process. Design deliverables will be submitted to the City for review at incremental completion points, including 30%, 60%, and 90% completion. The final construction documents will be submitted to the City and grant agency for review prior to bidding. Once the project is under construction, weekly on-site meetings will be held with the contractor, City, engineer, and resident project representative. These meetings will discuss schedule, progress, and any questions or outstanding documentation.

PART 6 FINANCIAL PRESENTATION

6.1. TOTAL BUDGET

The proposed Missoula Public Library living roof will utilize City staff, a procured technical consultant, and a contractor procured to complete construction. The following financial narrative describes the estimated cost for the preferred alternative as outlined in the DNRC standard budget tables. The City of Missoula and Missoula Public Library has committed these funds through commitment letters included in Appendix D.

Table 6-1: Total Budget Overview

Budget Category	Total Budget
Administrative (In-Kind)	\$2,960
Contracted Technical Services	\$59,750
Construction	\$449,380
Total	\$512,090

Administrative Costs

The City of Missoula (COM) will coordinate grant reporting to Department of Natural Resources and Conservation (DNRC). They will also procure legal services for audit if needed. Project specific communication and payroll will be performed as necessary throughout the project. These values are estimated based on hourly rate of employees.

Table 6-2: In-Kind Administrative Efforts

Position	Hourly Rate	Total Hours	Total Cost
Grant Administration and Reporting			
COM Project Manager	\$50	12	\$600
Payroll			
COM Accountant	\$30	12	\$360
Audit			
Legal Services	\$500	4	\$2,000
Total In-Kind Administrative Efforts			\$2,960

Technical Services Costs

The City will hire a technical consultant to perform grant administration and prepare documentation for the City to submit to DNRC during quarterly reporting. Efforts are estimated hourly per task. Personnel, hourly effort, and associated costs for each task are summarized in Table 6-3.

Table 6-3: Technical Consultant Estimated Effort

Contracted Technical Services	Hours	Hourly Rate	Total Cost
Grant Administration	14	\$175	\$2,450
Engineering (Mechanical, Electrical, Plumbing)	120	\$190	\$22,800
Architect & Landscape Architect	61	\$250	\$15,250
Bidding & Contracting	35	\$190	\$6,650
Construction Administration	84	\$150	\$12,600
Total Contracted Technical Services			\$59,750

Construction Costs

Costs for construction of the preferred alternative were estimated based on preliminary design quantities and unit prices based on industry standard values and historical price quotes. General requirements are a standard item included in all construction projects that includes the contractor's costs for mobilization, overhead, taxes, bonds, and insurance. This value is approximately 15% of the construction total. A local supplier provided costs for living roof modules as proposed with preliminary design. The final products used in construction may be provided by this supplier or an approved equivalent product that meets project requirements. A 25% contingency was applied as a conservative practice due to the preliminary level of design and cost estimating.

Table 6-4: Estimated Construction Costs

Item Description	Estimated Quantity	Unit	Unit Price	Total Cost
General Requirements	1	LS	\$56,800	\$56,800
Rock Ballast Removal	6228	SF	\$9	\$56,100
Roof slip sheet membrane	6228	SF	\$5	\$31,200
LiveRoof modules 6" with roof blue	6228	SF	\$23	\$143,300
LiveRoof install	6228	SF	\$10	\$62,300
Irrigation	6228	SF	\$1	\$7,800
Educational Exhibit	1	LS	\$2,000	\$2,000
Subtotal				\$ 359,500
Contingency			25%	\$ 89,880
Construction Total				\$ 449,380

6.2. OPERATIONS AND MAINTENANCE

The Missoula Public Library has a maintenance specialist on staff that will take on the responsibilities of maintaining the living roof. Estimated maintenance activities include:

- bi-weekly weed pulling throughout the summer,
- as-needed irrigation during dry periods,
- annual inspection for potential drain blockages, displaced soil, and plant health

These activities are estimated equate to 20 hours of maintenance per year. For a maintenance staff with a \$50 hourly rate, the total annual maintenance cost is estimated to be \$1,000. This cost will be covered by the Missoula Public Library operating budget.

6.3. FUNDING STRUCTURE

Anticipated funding sources to complete the preferred alternative are outlined in Table 6-5. The DNRC RRG Grant and BRIC grant are pending review. Both pending grants are anticipated to be announced for award in the summer of 2025. The City of Missoula has committed to a cash match and in-kind project management. The Missoula Public Library has committed to a cash match. Letters of commitment for cash funding are included in Appendix D.

To address currently uncommitted funding, the City of Missoula is currently pursuing other funding opportunities for this project, such as the Community Change Grant Program, managed by the EPA. If pending grant applications are not successful, the City and Missoula Public Library will continue to pursue grant funding options and campaign for public fundraising to complete the project in the future.

Table 6-5: Funding Structure

Funding Source	Status	Administrative	Technical Services	Construction	Total Cost
DNRC Grant	Submitted, Pending Review	\$2,450	\$57,300	\$65,250	\$125,000
BRIC Grant	Submitted, Pending Review			\$212,914	\$212,914
COM	Committed, Cash			\$35,971	\$35,971
COM	Committed, In-Kind	\$2,960			\$2,960
Library	Committed, Cash			\$35,000	\$35,000
COM	Uncommitted			\$100,245	\$100,245
Total		\$5,410	\$5,410	\$57,300	\$449,380

6.4. LOAN INFORMATION

No loan funding is being requested with this application. Loan funding is not part of the current project funding strategy.

6.5. FINANCIAL DOCUMENTATION

Cost Estimate Sources

Values included in the construction cost estimate are based on industry standard values and historical data from bidding of similar projects. Cost proposals from living roof suppliers are included in Appendix B. Technical services are estimated based on an average hourly rate for a consultant.

Other Grant Funding Sources

The City of Missoula has submitted a Building Resilient Infrastructure and Communities (BRIC) grant to FEMA for the living roof project. This grant application is under review and is anticipated to notify awardees in Summer 2025.

The City of Missoula and Missoula Public Library intend to prepare a Community Change Grant application for the US EPA. This grant is due in November 2024 and is awarded on a rolling basis. It is anticipated that awardees may be notified by Fall 2025.

Funding Commitment

The City of Missoula is committed to financing \$35,971 of cash match and \$2,690 of in-kind effort match. A letter documenting this commitment is included in Appendix D.

The Missoula Public Library is committed to financing \$35,000 of cash match to fund the project. A letter documenting this commitment is included in Appendix D.

To address currently uncommitted funding, the City of Missoula is currently pursuing other funding opportunities for this project, such as the Community Change Grant Program, managed by the EPA. If pending grant applications are not successful, the City and Missoula Public Library will continue to pursue grant funding options and campaign for public fundraising to complete the project in the future.

BUDGET FORMS FOR RENEWABLE RESOURCE PROJECTS

Budget Tables are included below and also included in Appendix D.

Table 6-6: Project Administration Tasks

Category	DNRC Grant	BRIC Grant	City of Missoula	Missoula Public Library	Total
Grant/Loan Administration (Applicant)			\$960		\$960
Grant/Loan Administration (Contracted Services)	\$2,450				\$2,450
Audit			\$2,000		\$2,000
Total Administrative Cost	\$2,450		\$2,960		\$5,140

Table 6-7: Professional and Technical Tasks

Category	DNRC Grant	BRIC Grant	City of Missoula	Missoula Public Library	Total
Engineering Design	\$22,800				\$22,800
Architect & Landscape Architect	\$15,250				\$15,250
Bidding and Contracting	\$6,650				\$6,650
Construction Administration	\$12,600				\$12,600
Total Technical Services	\$57,300				\$57,300

Table 6-8: Construction Tasks

Category	DNRC Grant	BRIC Grant	City of Missoula	Missoula Public Library	COM (Uncommitted)	Total
Construction	\$65,250	\$212,914	\$35,971	\$35,000	\$10,365	\$359,500
Contingency (25%)					\$89,880	\$89,880
Total Construction	\$65,250	\$212,914	\$35,971	\$35,000	\$100,245	\$449,380

Table 6-9: Total Task Summary

Category	DNRC Grant	BRIC Grant	Missoula Public Library - Cash	City of Missoula – In-Kind	City of Missoula – Cash	City of Missoula (Uncommitted)	Total
Total Administration	\$2,450			\$2,960			\$5,410
Total Professional & Technical	\$57,300						\$57,300
Total Construction	\$65,250	\$212,914	\$35,000		\$35,971	\$100,245	\$449,380
Total Project Cost	\$125,000	\$212,914	\$35,000	\$2,960	\$35,971	\$100,245	\$512,090

PART 7 ENVIRONMENTAL EVALUATION

This project will retrofit the existing Library roof and will not disturb any ground or develop a new footprint. Due to the contained nature of the project, Montana DNRC suggested the environmental impacts of this project be evaluated with the simplified environmental checklist. No environmental impacts are anticipated as a result of the project or during construction. The simplified MEPA checklist is attached to this application in Appendix E.

**APPENDIX A:
MAPS AND PHOTO LOG**

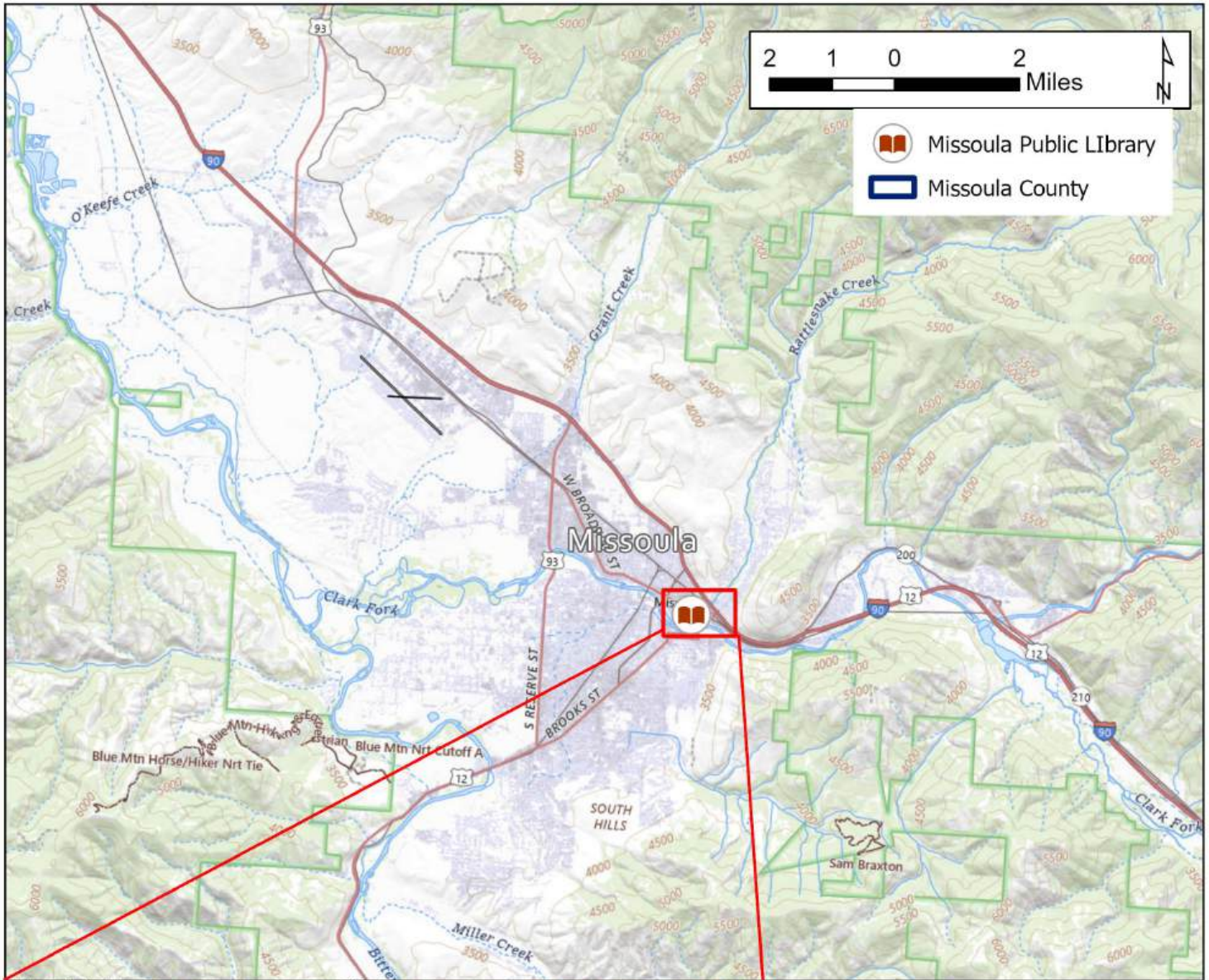


FIG 1. VICINITY MAP

Missoula Public Library 455 E Main St. Missoula, Montana	
City of Missoula - Living Roof RRGL	
 Morrison Maierle <small>engineers - surveyors - planners - scientists</small>	MORRISON-MAIERLE INC 1055 Mount Ave Missoula, MT 59801 P: 406-542-8880 www.m-m.net

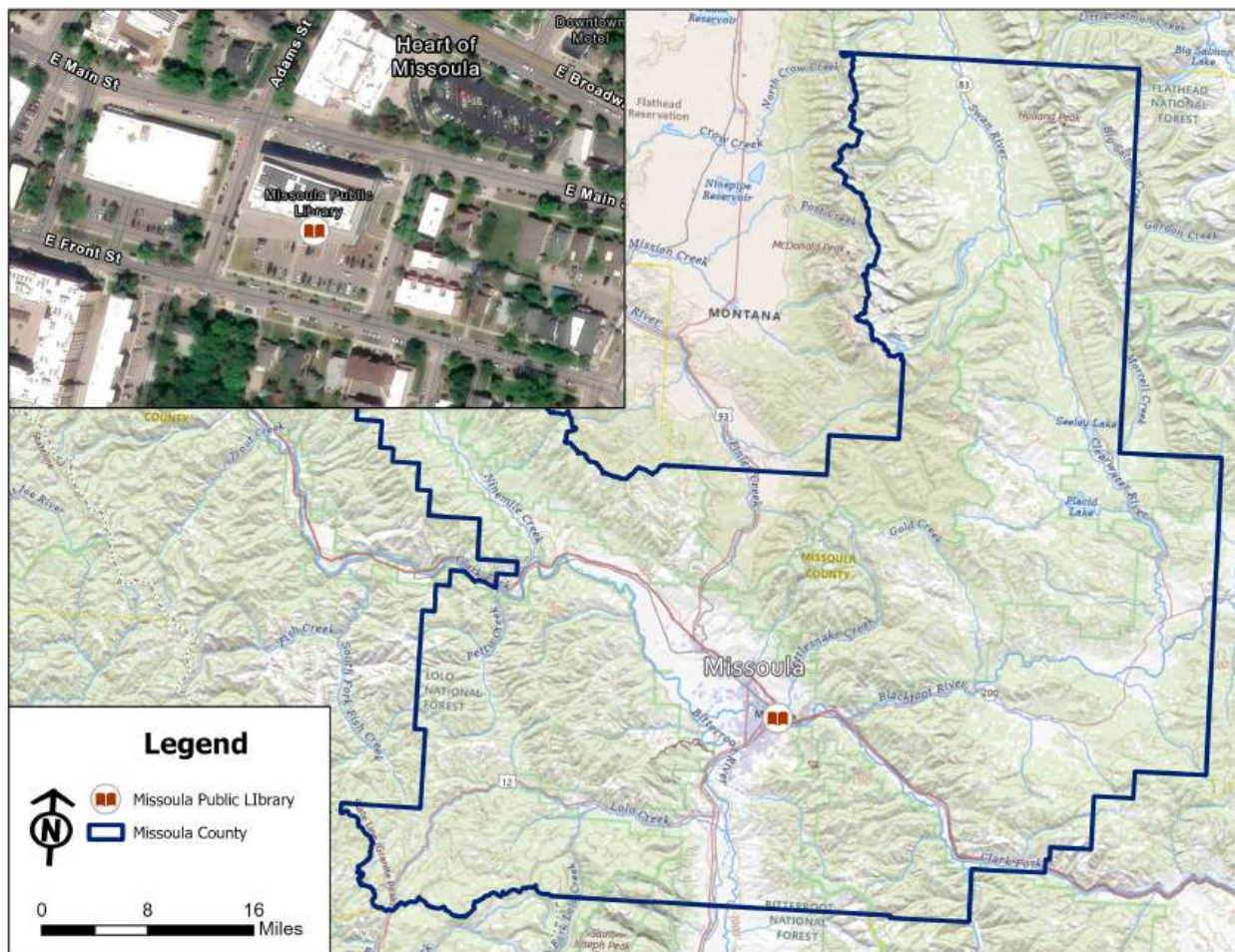


FIG 2. MISSOULA LIBRARY SERVICE AND BENEFITTING AREA

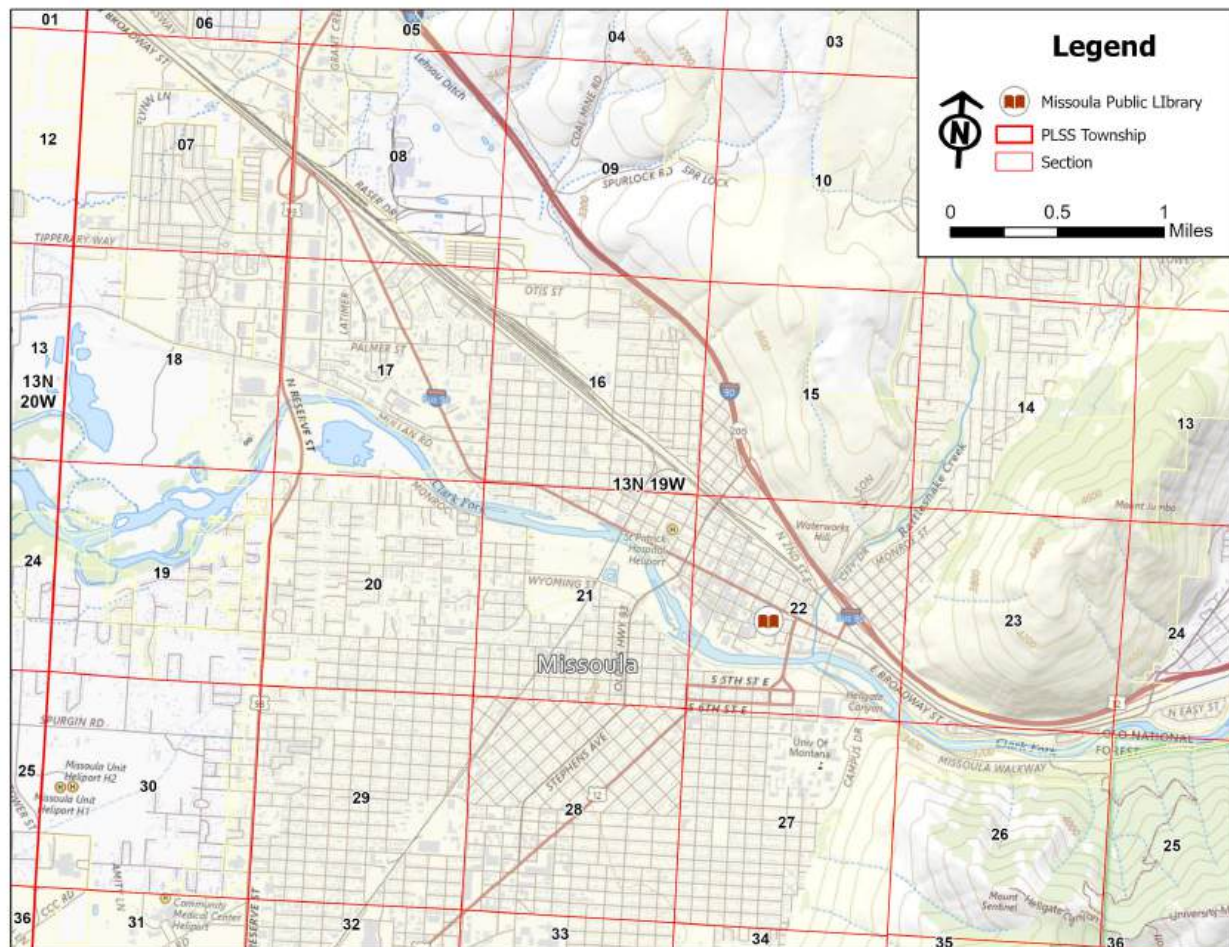


FIG 3. PLSS TOWNSHIP AND SECTION MAP



LEVEL 2 ROCK BALLAST ROOF



LEVEL 2 ROCK BALLAST ROOF



LEVEL 2 ROCK BALLAST ROOF



VIEW OF LEVEL 2 ROCK BALLAST ROOF FROM LEVEL 3
OUTDOOR PATIO

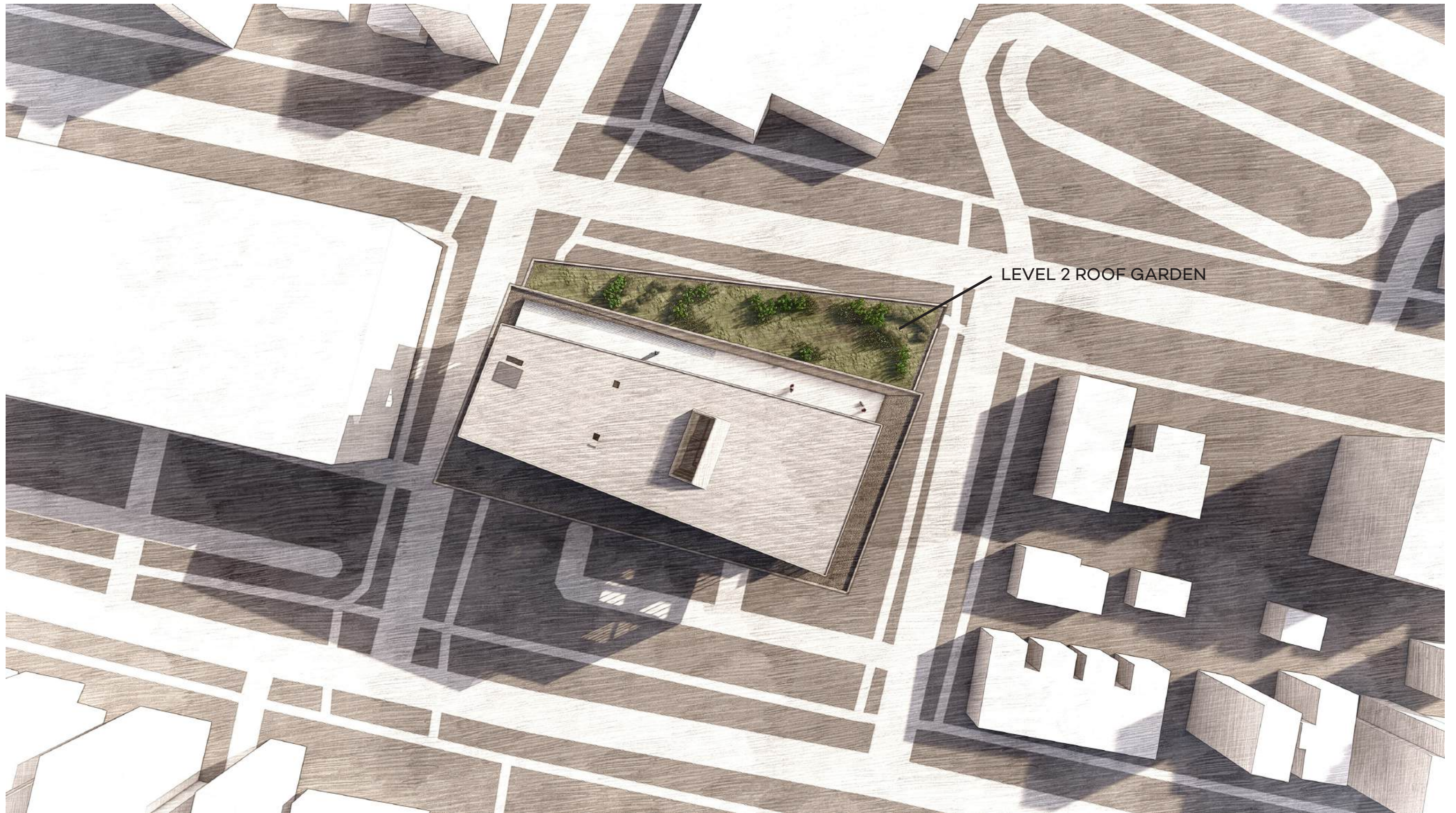


LEVEL 3 OUTDOOR PATIO



VIEW FROM LEVEL 3 OUTDOOR PATIO

**APPENDIX B:
ALTERNATIVES AND COST
DATA**



alternative 2.
MISSOULA PUBLIC LIBRARY
ROOF GARDEN





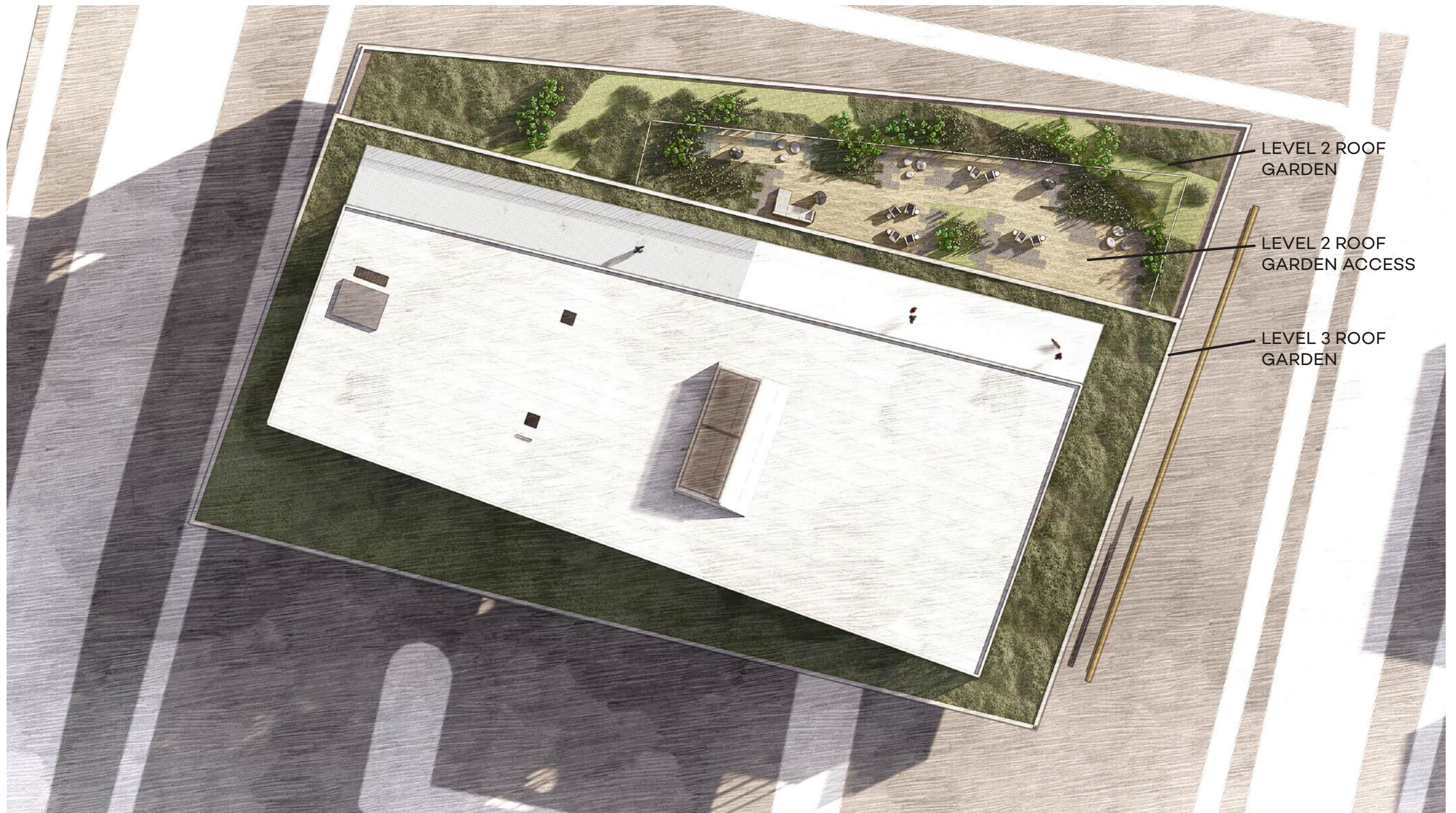
alternative 2.
MISSOULA PUBLIC LIBRARY
ROOF GARDEN



PRELIMINARY COST ESTIMATE

ALTERNATIVE 2: LEVEL 2 LIVING ROOF AND EDUCATIONAL DISPLAY

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Cost
100	General Conditions	1	LS	\$56,800	\$56,800
101	Rock Ballast Removal	6228	SF	\$9	\$56,100
102	Roof slip sheet membrane	6228	SF	\$5	\$31,200
103	LiveRoof modules 6" with roof blue	6228	SF	\$23	\$143,300
104	LiveRoof install	6228	SF	\$10	\$62,300
105	Irrigation	6228	SF	\$1	\$7,800
106	educational exhibit	1	LS	\$2,000	\$2,000
Subtotals					\$ 359,500
Contingency				25%	\$ 89,880
Estimated Total Construction Cost					\$ 449,380
200	City of Missoula Grant Administration (In-Kind)				\$ 2,960.00
201	Consultant Grant Administration				\$ 2,450.00
202	Design and Bidding Support			10%	\$ 44,700.00
203	Construction Administration				\$ 12,600.00
Estimated Total Project Cost					\$ 512,090



LEVEL 2 ROOF
GARDEN

LEVEL 2 ROOF
GARDEN ACCESS

LEVEL 3 ROOF
GARDEN

alternative 3.

MISSOULA PUBLIC LIBRARY
ROOF GARDEN





alternative 3.

MISSOULA PUBLIC LIBRARY
ROOF GARDEN





alternative 3.

MISSOULA PUBLIC LIBRARY
ROOF GARDEN

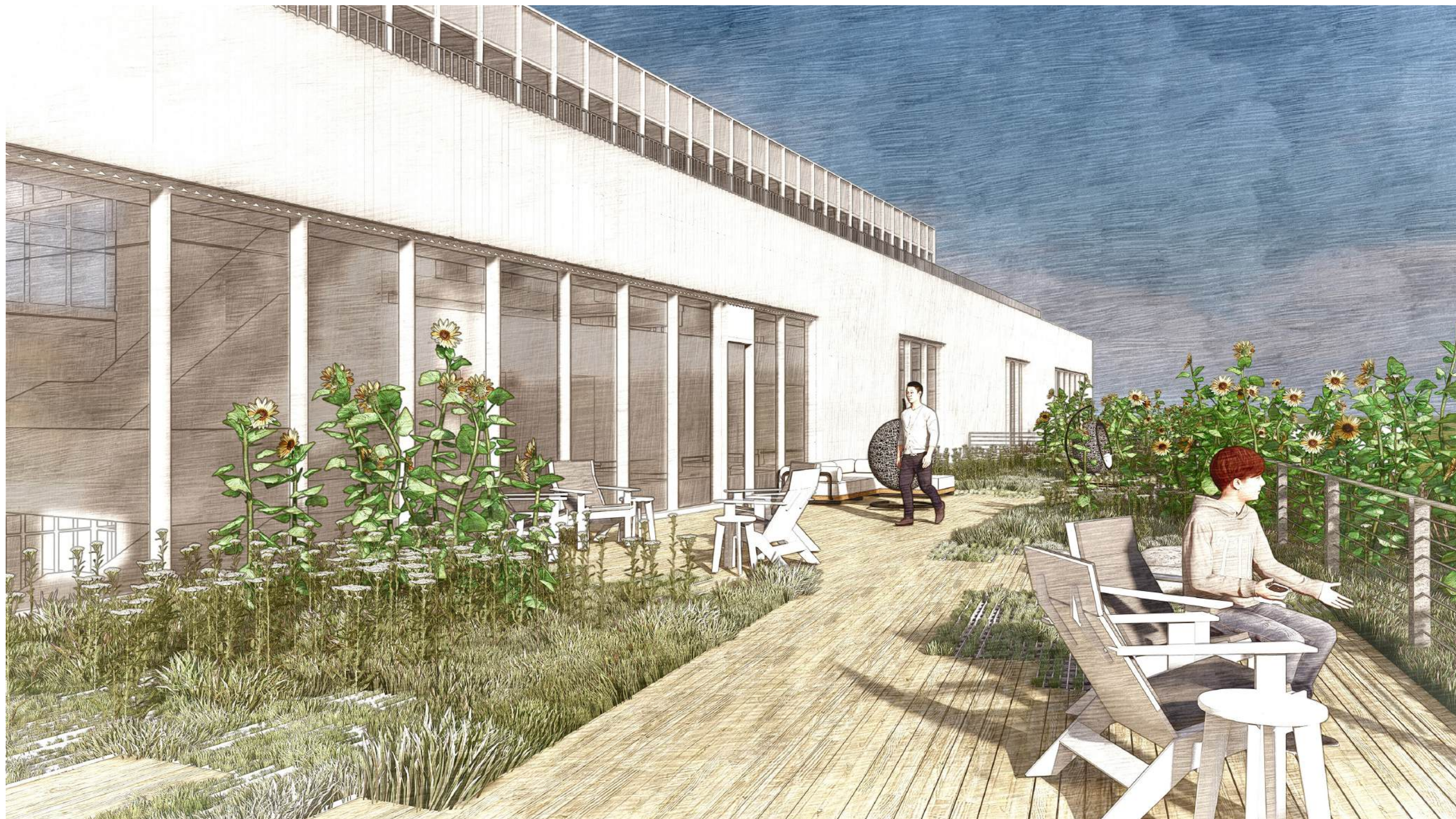




alternative 3.

MISSOULA PUBLIC LIBRARY
ROOF GARDEN





alternative 3.

MISSOULA PUBLIC LIBRARY
ROOF GARDEN



PRELIMINARY COST ESTIMATE

ALTERNATIVE 3: LEVEL 2/3 LIVING ROOF AND LEVEL 2 PUBLIC SPACE

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Cost
100	General Conditions	1	LS	\$71,648	\$71,648
101	Rock Ballast Removal	9316	SF	\$9	\$83,844
102	Safety Railing - post and cable	176	LF	\$300	\$52,800
103	Roof slip sheet membrane	9316	SF	\$5	\$46,580
104	LiveRoof modules 6" with roof blue	7120	SF	\$23	\$163,760
105	LiveRoof install	7120	SF	\$10	\$71,200
106	Irrigation	7120	SF	\$1	\$7,120
107	Wood pavers on 10" pedestal	2000	SF	\$18	\$36,000
108	Metal grating on pedestal	196	SF	\$12	\$2,352
109	Exterior storefront door w/ modification to existing	1	LS	\$12,000	\$12,000
110	Educational exhibit	1	LS	\$2,000	\$2,000
Subtotals					\$ 549,400
Contingency				25%	\$ 137,400
Estimated Total Construction Cost					\$ 686,800
200	City of Missoula Grant Administration (In-Kind)				\$ 2,960.00
201	Consultant Grant Administration				\$ 2,800.00
202	Design and Bidding Support			10%	\$ 68,680.00
203	Construction Administration				\$ 20,300.00
Estimated Total Project Cost					\$ 781,540

From: Chris Martison <cmartison@ae.design>
Sent: Wednesday, May 8, 2024 8:23 AM
To: Molly R. Davidson; Carly Andregg
Subject: FW: Ballast Removal Cost

This message originated from an **External Source**. Please use proper judgment and caution when opening attachments, clicking links, or responding to this message.

Good morning,

I circled back to Martel Construction to firm up our ballast removal assumptions and I'd probably put it at the \$8-10/foot mark....

You can see his rationale below.

Let us know if you need anything else.

Chris

CHRIS MARTISON

AIA, GGP
principal

o 406 721 5643
c 406 544 3725

A&E Design
222 N. Higgins Ave.
Missoula, MT

www.ae.design

From: Travis Frey <tfrey@martelconstruction.com>
Sent: Monday, May 6, 2024 4:35 PM
To: Chris Martison <cmartison@ae.design>; Tyler Ragen <tragen@martelconstruction.com>
Cc: Dayton Rush <drush@ae.design>
Subject: RE: Ballast Removal Cost

Chris-

I reached out to Shane Coburn (MSM) asked him about ballast removal costs. He said the typical roof would fall in at about \$5-\$8 per square foot, but the higher roofs would land somewhere around \$8-\$10, assuming that there is not abnormal amount of ballast material. They prefer to use a vacuum truck, when possible, but the process is generally hard on the equipment (especially at 75') and it has been difficult to find someone willing to do the work. In the past Nash Enterprises has subcontracted the ballast removal for their company or they just use plastic shovels and wheelbarrows. The wheelbarrow method is usually limited to about 45'-50' (forklift reach) unless the material is hoisted down using a crane.

We are getting ready to pull the ballast off a project down the valley and are planning to use the shovel method. It's a much simpler project (lower to the ground) and it looks like the cost is closer to the lower end of Shane's price range.

-TF

From: Chris Martison <cmartison@ae.design>

Sent: Monday, May 6, 2024 1:52 PM

To: Tyler Ragen <tragen@martelconstruction.com>

Cc: Travis Frey <tfrey@martelconstruction.com>; Dayton Rush <drush@ae.design>

Subject: Ballast Removal Cost

Hey there Tyler/Travis,

Wondering if you could give me a rough idea on Cost per square foot for Ballast removal from multiple roof level(s). 25-75' above grade.

A conservative number is fine!

Would this be a Vac removal?

We are helping the City on a Grant project, but we've never had to price the removal of Ballast from a 4 story building.

Thanks again.

CHRIS MARTISON

AIA, GGP
principal

o 406 721 5643
c 406 544 3725

A&E Design
222 N. Higgins Ave.
Missoula, MT

www.ae.design

From: Charissa Wagner <greenroofmontana@gmail.com>
Sent: Monday, March 25, 2024 7:19 PM
To: Carly Andregg
Subject: Re: Living Roof - Estimate

This message originated from an **External Source**. Please use proper judgment and caution when opening attachments, clicking links, or responding to this message.

Hi Carly-

Thanks for reaching out! We are a nursery so you would just ask a roofer for the slip sheet which is a lighter mill waterproofing layer that is loosely layed on top of the membrane. Our system includes the module/LiveRoof Soil/ and vegetation grown to 95%. A 4 1/4 inch LiveRoof system is approximately \$14.25 a square foot plus delivery, and you can add another \$10.00 a square foot for the installation/irrigation/ballast material. If you have any other questions, please let me know. The larger the roof, the square footage cost does go down a little bit. If you have any other questions, please feel free to call. Thanks!

Thank You!

Charissa Wagner

Intermountain Roofscape Supply/ Summit Valley Turf Farms

O:406-287-2268 C:406-490-7844

Note- Intermountain Roofscape Supply and Summit Valley Turf are nurseries. We do not do takeoffs and are not responsible for architectural plans and schematics. Please have amounts of product and square footages needed when asking for pricing. Product on invoices and signed contracts will be the responsibility of the buyer. *PLEASE DOUBLE CHECK YOUR CONTRACT/MODULE DEPTH/ COLOR OF EDGER/AND INVOICE BEFORE SIGNING.**




<http://www.intermountainroofscapes.com>

On Mon, Mar 25, 2024 at 3:34 PM Carly Andregg <candregg@m-m.net> wrote:

Hi Charissa,

I am a consultant helping the City of Missoula and the Missoula Public Library write a grant application to pursue funding to retrofit the rock ballast roof on the library to a living roof. We are analyzing alternatives of different size, and the ultimate area of living roof may depend on the grant award. Could you provide a budgetary estimate, ideally for square foot of living roof, installed? I anticipate this to include a waterproof liner, soils, sedum, and edger. The structural capacity of the roof is 17 psf dead load plus 150 psf live load. Please let me know if you need any further information.

Thank you,



Carly Andregg, PE
Water Resources Engineer, Morrison-Maierle
[+14065424866](tel:+14065424866) direct | [+14063969763](tel:+14063969763) mobile
1055 Mount Ave, Missoula, MT 59801

A 100% Employee-Owned Company

APPENDIX C: SUPPORTING DOCUMENTATION

- 1. STRUCTURAL FEASIBILITY LETTER**
- 2. COLLECTED TEMPERATURE MEASUREMENTS**
- 3. LETTERS OF SUPPORT**

03.25.2024

To: Molly Davidson
Project Manager

Morrison-Maierle
1055 Mount Ave, Missoula, MT 59801
mdavidson@m-m.net

From: Troy Leistiko
Interim Project Manager

Eclipse Engineering, P.C.
113 W Main St, Suite B, Missoula, MT 59802
tleistiko@eclipse-engineering.com

Re: Project Number: 24-03-214

As requested, I have completed a feasibility study to ascertain the idea of renovating the outdoor space on Levels 2 and 3 facing toward the South. The Record Set by A&E Architects denotes these spaces as Room 237 OUTDOOR BALCONY, and LEVEL 2 ROOF on sheets A102 and A103, respectively. Per our Structural Drawings, these two spaces were engineered to support a superimposed Dead Load of 17 psf plus a Live Load (including Snow Load) of 150 psf. Refer to sheet S005 of the Record Set for the Design Loading Diagrams.

The idea of renovating these spaces for public access with shade structures and/or green roof areas is a favorable one. As always, a structural engineer shall review and approve any modifications to these spaces to ensure compliance with the current building codes and design standards in order to protect the safety and wellbeing of the public.

Please contact me with any questions.

Sincerely,

Troy Leistiko, P.E.
Interim Project Manager
tleistiko@eclipse-engineering.com/406-721-5733 x204



Temperature Data Collected by City of Missoula staff
Location: Missoula Public Library
Temperature in degrees Fahrenheit

OBJECTID	* Locations	Media	Time	Weather	Temperature	Heat Sensor Reading	Distance of Measurement
2	4th Floor	Rock	4/8/2024 20:21	Coudy	47	58	1 ft
3	4th Floor	Rock	4/8/2024 20:24	Coudy	47	57.4	1 ft
4	3rd Floor	Rock	4/8/2024 20:29	Coudy	47	58.7	1 ft
5	3rd Floor	Window	4/8/2024 20:31	Coudy	47	56.4	1 ft
6	Perimeter	Concrete	4/8/2024 20:37	Coudy	47	54	1 ft
7	Perimeter	Grass	4/8/2024 20:39	Coudy	47	50.7	1 ft
8	4th Floor	Rock	4/10/2024 20:17	Sunny	54	87.4	1 ft
9	4th Floor	Window	4/10/2024 20:21	Sunny	54	96.7	1 ft
10	3rd Floor	Rock	4/10/2024 20:25	Sunny	54	102.9	1 ft
11	3rd Floor	Window	4/10/2024 20:28	Sunny	54	94.7	1 ft
12	Perimeter	Concrete	4/10/2024 20:38	Sunny	54	71.9	1 ft
13	Perimeter	Grass	4/10/2024 20:39	Sunny	54	73.7	1 ft
14	4th Floor	Rock	4/16/2024 20:11	Coudy	48	55.5	1 ft
15	4th Floor	Window	4/16/2024 20:15	Coudy	48	59.1	1 ft
16	3rd Floor	Rock	4/16/2024 20:25	Coudy	48	57.4	1 ft
17	3rd Floor	Window	4/16/2024 20:28	Coudy	48	61.3	1 ft
18	Perimeter	Concrete	4/16/2024 20:35	Coudy	48	59	1 ft
19	Perimeter	Grass	4/16/2024 20:38	Coudy	48	55.6	1 ft
20	4th Floor	Rock	4/18/2024 19:53	Sunny	48	99.7	1 ft
21	4th Floor	Window	4/18/2024 19:55	Sunny	48	87	1 ft
22	3rd Floor	Rock	4/18/2024 20:02	Coudy	48	84.7	1 ft
23	3rd Floor	Window	4/18/2024 20:05	Coudy	48	91.6	1 ft
24	Perimeter	Concrete	4/18/2024 20:11	Coudy	48	71.1	1 ft
25	Perimeter	Grass	4/18/2024 20:13	Coudy	48	54.7	1 ft
26	4th Floor	Rock	4/23/2024 21:25	Sunny	65	123.7	1 ft
27	4th Floor	Window	4/23/2024 21:28	Sunny	65	98.4	1 ft
28	3rd Floor	Rock	4/23/2024 21:36	Sunny	65	114.7	1 ft
29	3rd Floor	Window	4/23/2024 21:38	Sunny	65	109	1 ft
30	Perimeter	Concrete	4/23/2024 21:42	Sunny	65	81.3	1 ft
31	Perimeter	Grass	4/23/2024 21:46	Sunny	65	75.3	1 ft
32	4th Floor	Rock	4/25/2024 20:25	Sunny	62	113.3	1 ft
33	4th Floor	Window	4/25/2024 20:31	Sunny	62	86.1	1 ft
34	3rd Floor	Rock	4/25/2024 20:42	Sunny	62	107.9	1 ft
35	3rd Floor	Window	4/25/2024 20:44	Sunny	62	87.6	1 ft
36	Perimeter	Concrete	4/25/2024 20:52	Sunny	62	79.7	1 ft
37	4th Floor	Rock	4/30/2024 20:29	Sunny	42	52.8	1 ft
38	4th Floor	Window	4/30/2024 20:32	Sunny	41	69.2	1 ft
39	3rd Floor	Rock	4/30/2024 20:36	Coudy	41	56.9	1 ft
40	3rd Floor	Window	4/30/2024 20:40	Coudy	41	68.8	1 ft
41	Perimeter	Concrete	4/30/2024 20:45	Coudy	41	58.2	1 ft
42	Perimeter	Grass	4/30/2024 20:47	Coudy	41	52.3	1 ft
43	4th Floor	Rock	5/2/2024 19:17	Coudy	51	88.3	1 ft
44	4th Floor	Window	5/2/2024 19:20	Coudy	51	86.6	1 ft
45	3rd Floor	Rock	5/2/2024 19:25	Coudy	51	95.3	1 ft
46	3rd Floor	Window	5/2/2024 19:28	Coudy	51	92.3	1 ft
47	Perimeter	Concrete	5/2/2024 19:31	Coudy	51	71.2	1 ft
48	Perimeter	Grass	5/2/2024 19:34	Coudy	51	61.2	1 ft

April 29, 2024

To DNRC Renewable Resource Grant and Loan Program:

My name is Bryce Christiaens, I currently serve as the Director of the Missoula County Department of Ecology & Extension in Missoula, MT. I am writing to express my strong support for the Missoula Public Library's application for retrofitting their roof to include a living roof. The mission of my department, and extension generally, is to empower the communities we work in to be resilient and successful. We provide information, resources, and hands-on training for residents in the areas of ecosystem management, horticulture, nutrition education and youth development. Climate resilience is a theme that informs all of the programs and resources we provide in each of those areas, and I am excited to lend my support to a project that has the potential to bring work on all of them together into such a vibrant and visible space.

This proposed living roof project not only aligns with my department's efforts to increase the visibility of climate resiliency actions and their benefits, but also directly provides those benefits to a valued public resource in our community. As a result, I am proud to lend my support to this request to you to fund this project. Please let me know if I can be of further assistance.

Thank you for your time and consideration.

Sincerely,



Bryce Christiaens
Director
Missoula County Department of Ecology & Extension
bcrhristiaens@missoulacounty.us
406-258-4217

April 24, 2024

TO: DNRC Renewable Resource Grant and Loan Program
RE: Missoula Public Library Living Roof



Dear RRGL Planning Grant Review Committee,

I am writing on behalf of Climate Smart Missoula in support of the City of Missoula's implementation grant proposal to retrofit the Missoula Public Library to include a living roof. Climate Smart Missoula is a local nonprofit organization whose mission is to build and accelerate climate solutions for Missoula and beyond. We do this through collaborative programs, advocacy, and catalyzing diverse leadership.

The existing roof of the Missoula Public Library is an excellent candidate for this environmental retrofit. It is covered with over 6,000 square feet of conventional rock ballast. Significant heat flux occurs between the roof and the building, exacerbating the urban heat island effect and increasing air cooling demand. Stormwater from the roof and parking lot is captured in drywells and infiltrated without detention or treatment, eventually reaching groundwater. The proposed project would involve converting the existing imperviable urban area into a landscape that would provide new habitat for plants and animals, reduce our reliance on fossil fuels, improve building efficiency, and conserve air quality by reducing air pollution associated with heating and cooling the building.

In short, the Missoula Public Library Living Roof Project promises to provide the following benefits:

- Energy conservation and reduced emissions,
- Reduced heat island effects,
- Development of pollinator habitat and biodiversity,
- Improved resiliency to climate change, and
- Educational opportunities and public green space.

Such a project aligns extremely well with Climate Ready Missoula – our City and County's adopted climate resiliency plan. Climate Smart co-led the development of this plan, and we work collaboratively to implement the plan strategies. The proposed Living Roof is just the kind of project that this plan envisions. Climate Ready highlights the need for a watershed approach to protecting and enhancing our local ecosystems, given the current and anticipated impacts of our changing climate. It calls for outreach, monitoring, citizen science, and collaboration among myriad stakeholders. This Living Roof is exactly the type of project identified in the Climate Ready Missoula plan, and we are excited to be of assistance.

This library project will also increase and focus dialogue about how to best restore and preserve vulnerable and crucial resources, something that will have lasting positive impact beyond the program grant.

We strongly encourage you to fund this proposal. Thank you for your consideration.

Sincerely,

A handwritten signature in dark ink, appearing to read "Amy Cilimburg".

Amy Cilimburg, Executive Director, Climate Smart Missoula
amy@climatesmartmissoula.org; 406-465-1141



January 2, 2024

Missoula County Department of Ecology & Extension
1075 South Ave W
Missoula, MT 59801
Building Resilient Infrastructure and Communities Grant

RE: Committed Support for the Missoula County Library Living Roof Demonstration Project

Dear Review Committee:

This letter represents a commitment of education and outreach support by the Missoula County Department of Ecology & Extension to further expand on the demonstration capabilities of the Missoula County Library Living Roof Demonstration Project. Our office values demonstration opportunities in our community and seeks to address educational needs around climate resiliency topics. This project would create a living roof system in a very public and visual place. We would support the library and the city in their endeavors to showcase climate resilient opportunities to our growing community. The 'green' commercial industry in Montana is growing and we see the many demonstration and training prospects for both commercial green roof installers as well as the public.

Thank you so much for your consideration.

Respectfully,

Sarah Holden
Montana State University Horticulture Extension Agent



missoula public library
FOUNDATION

455 E. Main Street, Missoula MT 59802
foundation@missoulapubliclibrary.org
406.493.5900

January 15, 2024

RE: Funding commitments for a BRIC living roof application

Dear Review Committee:

This letter represents a commitment by the Missoula Public Library Foundation to provide \$35,000 to match the support of a Building Resilient Infrastructure and Communities grant application for a living roof project at Missoula Public Library.

We understand that the total project is estimated to cost \$283,885, and that \$70,971 is required from other sources to match BRIC funding. Missoula Public Library Foundation has reviewed a summary of the project and commits to a portion of this match.

Thank you for your consideration.

Sincerely,

Karl Olson
Executive Director

January 19, 2024



Dear Building Resilient Infrastructure and Communities (BRIC) Grant Selection Committee,

Climate Smart Missoula enthusiastically offers a letter of support for the City of Missoula Stormwater Utility's application for a Building Resilient Infrastructure and Communities (BRIC) grant to fund development of a living roof on the Missoula Public Library.

Climate Smart Missoula is a small community-based nonprofit organization with a mission to build and accelerate climate solutions for Missoula and beyond. We do this through collaborative programs, advocacy, and catalyzing climate leadership. We work closely with local government on myriad climate, energy, and health efforts, and especially on two of our core programs: Building(s) for the Future and implementation of the Climate Ready Missoula resiliency plan.

This project is an excellent opportunity to move forward both of those programs. A living or "green" roof on the Missoula Public Library, which is one of the most well-used public spaces in the City and serves a wide diversity of the community, achieves myriad climate resiliency and mitigation goals. These include saving energy by reducing reflective heat and cooling the roof; absorbing stormwater and filtering and reducing runoff; and offering a highly visible space for public education on green infrastructure.

If the City of Missoula is awarded this grant, we are aware there is a 25% local cost share. Climate Smart Missoula is willing to help raise up to 10 % of that local funding, in collaboration with community members and other local businesses and organizations. In addition, we could providing support on educational materials and programming to engage the wider Missoula community around the climate resiliency and mitigation benefits of green infrastructure and low-impact building design.

We are excited to support this valuable project and the City of Missoula's efforts to build a resilient, equitable, and low-carbon community. They have the expertise, passion, creativity, and dedication to excel.

Thank you for your consideration of this important project.

Sincerely,

A handwritten signature in black ink that reads "Abby Huseth". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Abby Huseth
Deputy Director, Climate Smart Missoula
Abby@climatesmartmissoula.org

Parks & Recreation

City of Missoula • 600 Cregg Lane • 721-PARK

April 27, 2024

Program Administrator
DNRC Renewable Resource Grant and Loan Program
Helena Montana

Re: Missoula Public Library Living Roof

Program Administrator:

I am writing on behalf of Missoula Parks and Recreation to express our strong support for the Missoula Public Library's Living Roof application to the DNRC Renewable Resource Grant and Loan Program. We believe that the proposed project aligns seamlessly with our organizational values and the community's shared goals of addressing and adapting to climate change, while increasing equity for all residents.

The proposed project will:

- Increase our ability to sequester carbon in the atmosphere.
- Help with storm water runoff mitigation and help to filter pollutants from stormwater runoff.
- Reduce the demand for energy-intensive cooling systems in warmer months by reducing temperatures and mitigating the urban heat island effect.
- Provide education benefits related to climate adaptation and resilience.
- Improve human health and well-being, as access to nature has been linked to improved mental health, well-being, and overall improved quality of life
- Add beauty, form, function, structure, to the Library.

In recognition of the important role this project will play in climate benefits, Parks and Recreation is enthusiastic about the opportunity to support this initiative.

Thank you for considering our support for the Missoula Public Library's application.

Sincerely,



Donna Gaukler, Director
Missoula Parks and Recreation

DEPARTMENT OF PLANNING, DEVELOPMENT & SUSTAINABILITY

Mailing: 200 W. Broadway
Physical: 127 E. Main, Suite 2
Missoula, MT 59802
P: 406.258.4657 | F: 406.258.3920
E: pds@missoulacounty.us



January 18, 2024

US Department of Homeland Security
Federal Emergency Management Agency
Building Resilient Infrastructure and Communities

Re: Support for City of Missoula Stormwater Utility FEMA BRIC grant application

I am writing on behalf of Missoula County's Climate Action Program in support of the City of Missoula Stormwater Utility's application for a FEMA Building Resilient Infrastructure and Communities grant.

We appreciate the City's leadership in implementing nature-based solutions to storm water management thereby enhancing the resilience of our stormwater system while mitigating the effects of climate change. As a steward for our public health, natural resources, waterways, and aquifer, the City of Missoula Storm Water Management Program is a key partner in our climate resilience work.

Climate Ready Missoula, our county-wide climate resilience plan co-authored with the City of Missoula, identifies several strategies that are relevant to this proposal:

- Reduce cooling costs by increasing efficiency of building stock
- Address urban heat island effect
- Preserve water quality through improved stormwater management, prioritizing green infrastructure over traditional methods

This proposal is also a key strategy for reaching our goal of carbon neutral government operations by 2035. Prioritizing green infrastructure would both reduce energy demand in the summer and pull harmful greenhouse gas emissions out of the atmosphere. Additionally, a living roof on the Missoula Public Library would serve as a highly visible demonstration space. The result would enable us to lead by example and demonstrate nature-based solutions on a community-wide scale, effectively advancing climate action in our county.

We encourage you to fund this proposal. Thank you for your consideration.

Sincerely,

Allison Kane
Climate Action Program Coordinator
Missoula County

**APPENDIX D:
BUDGET TABLES AND
GRANT MANAGEMENT**

Renewable Resource Grant and Loan Program
Budget Table 1: Project Funding Package

Instructions: Identify all sources of funding for the project, the amount, type of funding, status of commitment and date of commitment.

Project Funding Package				
Funding Source	Amount	Type of Fund	Status of Commitment	Date of Commitment
RRG Grant Request		Grant	--	--
Other Funding Sources (Match)	Amount	Type of Fund	Status of Commitment	Date of Commitment
Subtotal Other Funding Sources		--	--	--
ProjectTotal		--	--	--

Budget Table 2. RRGL Project Budget Summary Form							
Instructions: Please fill in the areas in blue. Add columns and rows as needed. All costs MUST be directly related to the project. Indirect costs are not allowed.							
Category		RRGL Grant Request	Source 1	Source 2	Source 3	Source 4	Total
			Identify each source of funding. These should match Budget Table 1. Add more sources if needed.				
			BRIC GRANT	CITY OF MISSOULA	MISSOULA PUBLIC LIBRARY	CITY OF MISSOULA (UNCOMMITTED)	
Project Administration Tasks							
Grant/Loan Administration (Applicant)					\$ 960		\$ 960
Grant/Loan Administration (Contracted)		\$ 2,450					\$ 2,450
Payroll and/or Accounting Expenses							\$ -
Audit					\$ 2,000		\$ 2,000
DNRC Reporting							\$ -
Other, please itemize							\$ -
							\$ -
Subtotal		\$ 2,450	\$ -	\$ -	\$ 2,960	\$ -	\$ 5,410
Project specific communication expenses (describe)							
Administrative supplies (describe)							
Other, please itemize							\$ -
Total Administration		\$ 2,450	\$ -	\$ -	\$ 2,960	\$ -	\$ 5,410
Professional and Technical Tasks (project design, engineering oversight, etc..)							
Category		RRGL Grant Request	BRIC GRANT	CITY OF MISSOULA	MISSOULA PUBLIC LIBRARY	CITY OF MISSOULA (UNCOMMITTED)	Total
Professional/Technical Service (describe)							
Professional:	Engineering Design	\$ 22,800					\$ 22,800
Technical:	Architect & Landscape Architect	\$ 15,250					\$ 15,250
Other:	Bidding & Contracting	\$ 6,650					\$ 6,650
	Construction Administration	\$ 12,600					\$ 12,600
							\$ -
Subtotal Professional and Technical		\$ 57,300	\$ -	\$ -	\$ -	\$ -	\$ 57,300
Other costs, Please itemize:							\$ -
							\$ -
							\$ -
							\$ -
Total Professional and Technical Costs		\$ 57,300	\$ -	\$ -	\$ -	\$ -	\$ 57,300
Construction Tasks							
Category		RRGL Grant Request	BRIC GRANT	CITY OF MISSOULA	MISSOULA PUBLIC LIBRARY	CITY OF MISSOULA (UNCOMMITTED)	Total
Construction Items (describe)							
Labor							\$ -
Materials							\$ -
Construction		\$ 65,250	\$ 212,914	\$ 35,971	\$ 35,000	\$ 10,365	\$ 359,500
Other, please itemize							\$ -
							\$ -
Subtotal Construction		\$ 65,250	\$ 212,914	\$ 35,971	\$ 35,000	\$ 10,365	\$ 359,500
Other, please itemize:							\$ -
							\$ -
							\$ -
Contingency						\$ 89,880	\$ 89,880
Total Construction		\$ 65,250	\$ 212,914	\$ 35,971	\$ 35,000	\$ 100,245	\$ 449,380
Additional/Other Tasks							
Category		RRGL Grant Request	BRIC GRANT	CITY OF MISSOULA	MISSOULA PUBLIC LIBRARY	CITY OF MISSOULA (UNCOMMITTED)	Total
Items (describe)							
							\$ -
							\$ -
							\$ -
							\$ -
							\$ -
Total Additional/Other		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Project Costs							
Category		RRGL Grant Request	BRIC GRANT	CITY OF MISSOULA	MISSOULA PUBLIC LIBRARY	CITY OF MISSOULA (UNCOMMITTED)	
Total Administration		\$ 2,450	\$ -	\$ 2,960		\$ -	\$ 5,410
Total Professional and Technical		\$ 57,300	\$ -	\$ -	\$ -	\$ -	\$ 57,300
Total Construction		\$ 65,250	\$ 212,914	\$ 35,971	\$ 35,000	\$ 100,245	\$ 449,380
Additional/Other		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOTAL PROJECT COSTS		\$ 125,000	\$ 212,914	\$ 38,931	\$ 35,000	\$ 100,245	\$ 512,090



missoula public library
FOUNDATION

455 E. Main Street, Missoula MT 59802
foundation@missoulapubliclibrary.org
406.493.5900

January 15, 2024

RE: Funding commitments for a BRIC living roof application

Dear Review Committee:

This letter represents a commitment by the Missoula Public Library Foundation to provide \$35,000 to match the support of a Building Resilient Infrastructure and Communities grant application for a living roof project at Missoula Public Library.

We understand that the total project is estimated to cost \$283,885, and that \$70,971 is required from other sources to match BRIC funding. Missoula Public Library Foundation has reviewed a summary of the project and commits to a portion of this match.

Thank you for your consideration.

Sincerely,

Karl Olson
Executive Director



PUBLIC WORKS & MOBILITY DEPARTMENT – STORMWATER

1345 W. Broadway • Missoula, Montana 59802 • (406) 552-6379

December 27, 2023

Montana Department of Natural Resources and Conservation
Renewable Resource Grant Review Committee

RE: Committed Funds for the Missoula Public Library Living Roof Project

Dear RRG Review Committee:

This letter represents a commitment by the City of Missoula Stormwater Utility to provide \$38,661 in matching support for the RRG Project Application entitled, "Missoula Public Library Living Roof".

The City of Missoula has reviewed the Stormwater Utility financials and commits to financing \$35,971 of matching funds for construction. Additionally, \$2,690 of in-kind project management efforts are committed. While we are committed to funding this project with rate revenue, we will also seek additional funding opportunities to assist us with the cost share.

Thank you so much for your consideration.

Respectfully,

Tracy Campbell
Superintendent

**APPENDIX E:
ENVIRONMENTAL CHECKLIST**

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION



GREG GIANFORTE, GOVERNOR

1539 ELEVENTH AVENUE

STATE OF MONTANA

DIRECTOR'S OFFICE: (406) 444-2074
FAX: (406) 444-2684

PO BOX 201601
HELENA, MONTANA 59620-1601

Conservation and Resource Development Division Environmental Checklist Instructions

Purpose of This Document:

All applicants must consider the potential environmental impacts of their projects. Consideration of these impacts on the location, design, or construction actions may help avoid unexpected expensive costs. A project will not be eligible for funding if it results in significant negative impact on the human environment.

The Montana Environmental Policy Act (MEPA), Montana Code Annotated (MCA Title 75, Chapter 1) and associated Administrative Rules (ARM 36.2.523) requires state agencies to prepare a detailed statement on any project, program, or activity directly undertaken by the agency; a project or activity supported through a contract, grant, subsidy, loan, or other form of funding assistance from the agency; and a project or activity involving the issuance of a lease, permit, license, certificate, or other entitlement for use or permission by the agency. Grant applications are subject to a detailed review to ensure that DNRC complies with the statutes that authorizes the grant programs as well as meets the intent of the MEPA.

What Does This Mean for Applicants?

- ☐ All applicants must complete the Environmental Checklist in its entirety.
- ☐ Public participation, or project scoping depends on the complexity of the proposed action and should include engagement from stakeholders, landowners, and the community. These efforts can be in the form of documented public meetings (e.g., meeting minutes, pdf presentations) or letters of support.
 - The public meeting must be properly noticed (advertised) and the public must be provided with an opportunity at the meeting to comment on the project.
 - Minutes of the meeting should reflect what was discussed about the project, including all comments received from the public.
 - Letters of support must be included from any identified or interested stakeholders.
- ☐ Agency Comment Letters (to be submitted/attached within the application).

How Will DNRC Use the Information Provided?

The information provided within the Environmental Checklist will be subject to review by DNRC. If this review should result in the need to complete an Environmental Assessment, please be aware that DNRC will draft the Environmental Assessment (EA). The drafted EA decision will be posted for a public comment period of up to 30 days dependent on the level of public interest and the seriousness and complexity of the potential impact of the project.

Instructions:

Complete the Environmental Checklist on the following pages. DNRC retains the ultimate decision-making authority on all MEPA decisions. If DNRC determines this section to be incomplete, additional information will be required before consideration for funding.

The Environmental Checklist is not required for project activities that are exempt from MEPA:

- Administrative actions (*example: Conservation District Administrative Grants*).
- Minor repairs, operations, and maintenance of existing facilities (*example: RRGL Grant to upgrade water treatment plant SCADA system by replacing old system*).
- Investigation, enforcement, and data collection activities (*example: Grant for a Preliminary Engineering Report, Technical Memo or Watershed Restoration Plan*).
- Actions that are primarily social or economic in nature and that do not otherwise affect the human environment (*example: CD Education Mini-Grant to conduct outreach and education in a community*).

Missoula Public Library Living Roof Project

Impact	Yes	No	Unsure	N/A
Disturbance to Soils – Is the project going to disturb previously undisturbed soils by digging, grading, or otherwise impacting the soil structure?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soils Management – Does the project include erosion control best management practices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air Quality – Will fugitive dust, odors, or emissions be created by construction activities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air Quality Management – Does the project include dust control best management practices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Water Quality – Does the project have the potential to discharge pollutants to surface water or groundwater?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water Quality Management – Does the project include construction stormwater best management practices to control erosion and sedimentation of surface water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Water Quality Discharge – Will the project result in a new discharge or relocate an existing discharge to ground or surface waters?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water Quality Discharge – Will the project result in an increase above permit levels established for a facility under the Montana pollutant discharge elimination system or Montana groundwater pollution control system?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water Quantity – Will this project change the quantity of water in surface or groundwater or change the distribution of water in surface or groundwater?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water Rights – Are water rights or a change to water rights required as part of project activities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Floodplain – Does this project take place within a floodplain or adjacent to a floodplain?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Riparian Habitats – Will project activities occur within riparian areas?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetation – Does this project include significant vegetation removal and/or revegetation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agricultural/Farmland Protection – Are areas within the project boundary considered prime or important farm ground or forest lands?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sensitive Environmental Areas – Are areas within the project boundary considered as unique environmental resources such as wetlands, unique recreation areas, wilderness, etc.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Terrestrial Wildlife and Habitats – Will project activities impact terrestrial wildlife and/or habitats?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Endangered Species and Habitats – Has the project applicant consulted with wildlife agencies (FWP, USFWS, DNRC Sage Grouse) to ensure threatened or endangered species and their critical habitats will not be impacted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Avian Wildlife and Habitats – Is there nesting habitat within the project area? Keep in mind, bald eagles are protected by the Montana Bald Eagle Act.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aquatic Wildlife and Habitats – Will the project activities impact aquatic wildlife and/or habitats?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agency Contact – Has the project applicant consulted with wildlife agencies (FWP, USFWS) to ensure threatened or endangered species and their critical habitats will not be impacted?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Nuisances – Will there be noise, fumes, or glare associated with project implementation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nuisance Mitigation – Does the project include best management practices to reduce the impact of nuisances during the project activities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Historic, Cultural, and Archaeological Resources – Is the project occurring in an area with historic, cultural, or archeological significance?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Required Historical Contact – Has the State Historical Preservation Office (SHPO) been contacted about this project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Demands on Environmental Resources – Will the project result in increased demands on land, water, air, or energy?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infrastructure Growth – Will the project result in a facility that will provide capacity to serve a population at least 30 percent greater than the existing population?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Future Growth – Is the project upgrading or extending infrastructure systems primarily for the purposes of future development?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planning – Is the project specifically identified in a state, regional or locally adopted growth plan or environmental plan or goal? Examples include Community Improvement Plans, Growth Plans, Preliminary Engineering Reports, Watershed Restoration Plans, Conservation District Strategic Plans, etc.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public Involvement – Is there is public controversy over the project's potential effects on the quality of the human environment?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>